



COMMONWEALTH of VIRGINIA

Jennifer B. DeBruhl
Director

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PRE -AWARD PURCHASER'S REQUIREMENTS CERTIFICATION

As required by Title 49 of the CFR. Part 663 - Subpart B, Department of Rail and Public Transportation (the recipient) certifies that the buses to be purchased, 12-Year Heavy Duty Low-Floor Transit Bus (description of buses) from Proterra Operating Company, Inc. (the manufacturer), are the same product described in the recipient's solicitation specification and that the proposed manufacturer is a responsible manufacturer with the capability to produce a bus that meets the specifications.

Date: 10/16/2022

Signature:

A handwritten signature in blue ink, appearing to read "Avery Daugherty".

Avery Daugherty, Statewide Program Manager



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1. Cover Letter



October 11th, 2022

Pamela Copeland
Statewide Sourcing and
Contracting Officer
1111 E Broad Street
Patrick Henry Bldg. 6th Floor
Richmond, VA 23219

Subject: Cover Letter, Proterra Proposal, IFB #6447 Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys Heavy Duty, 12 year (29ft. – 60 ft. sizes)

Dear Ms. Copeland:

Proterra Operating Company, Inc. (“Proterra”) is pleased to offer the Commonwealth of Virginia our Heavy Duty Low Floor Battery Electric Zero Emission Buses. Proterra is submitting this bid to the Commonwealth of Virginia in response to the above-referenced Invitation for Bid (IFB). While we understand that the Commonwealth has requested bids for three (3) distinct groups of transit, Proterra only manufactures Battery Electric Buses (BEBs) and therefore our proposal is only for Low Floor BEB Transit buses.

Executive Summary

As one of North America’s leading manufacturers of heavy-duty, low-floor Battery BEBs, Proterra is excited about the opportunity to provide technical information and pricing to the Commonwealth of Virginia for our purpose-built, 35 Foot and 40 Foot ZX5 BEBs. The ZX5 offers the Commonwealth:

1. the longest documented Altoona operating range,
2. the safest high-voltage batteries, designed explicitly for heavy-duty transportation, and
3. proven vehicle technology that is currently operating in revenue service across North America.

Additionally, Proterra understands state contract procurement requirements. Proterra successfully supports four (4) state contracts including California, Florida, Georgia and Washington. As outlined further in this bid, Proterra is the only North American OEM manufacturing a purpose-built BEB. Proterra is the only OEM eligible for FTA funding that manufactures our own battery systems; reducing the risk of supply constraints or



integration issues between the buses and the batteries. In fact, Proterra battery systems now power 15+ other commercial electric vehicles, all based on the performance and safety testing of our battery systems.

At Proterra, we know what it takes to deliver a comprehensive and successful BEB program and we're prepared to leverage our expertise to assist the Commonwealth in offering safe and robust BEBs through their statewide procurement marketplace.

Proterra: Miles Ahead of the Competition

Proterra offers the Commonwealth the following benefits over other manufacturers.

- **Because Proterra only builds BEBs, your EV success is our success.**
Proterra is the only OEM building purpose-built BEBs, a highly technical project much more complicated than just adding batteries to a conventional bus. More than 1000+ people at Proterra will work daily to make the Commonwealth's BEB state contract procurement offering successful.
- **Safety-First Philosophy.** Proterra understands that the Commonwealth has the ultimate responsibility for providing safe, reliable transportation to the public. Partnering with Proterra will provide the Commonwealth with peace of mind, as Proterra's 900+ BEBs have operated over 31+ million miles without any safety incidents. Furthermore, our battery systems are designed for heavy-duty transit operations and tested/validated extensively before entering production. To date, Proterra has 15+ OEM partners that have selected Proterra battery systems for their commercial EV programs; including Daimler, Nikola, Thomas Bus, etc.
 - The ZX5 uses a **non-conductive body** which offers superior safety for the BEB maintenance personnel, operators, and passengers; significantly reducing hazardous electrical current risks when interacting with Proterra BEBs. As a result, Proterra has the safest bus in the market, with the lowest (safest) possible hazard category for electrical risk (arc flash rating of 0). This may not be true of other BEBs manufactured by conventional transit vehicle manufacturers.
 - The ZX5 has the **safest battery pack location**, away from the back of the bus, which is the most common crash zone in a heavy-duty transit environment.
 - Proterra engineers **safe, reliable, and high-performing batteries** with the best cells from a Tier 1 supplier (LG Chem) with advanced safety features built into each battery pack.



- Battery safety is a binary risk. The risk can be understood and managed if batteries have been properly designed, engineered, and tested. If proper design and testing have not been completed and cannot be verified or validated, the risk may be significant enough to remove a particular technology from consideration.
 - Proterra believes it is not appropriate for any BEB manufacturer that does not manufacture its battery packs to simply provide self-assurances that their HV batteries are safe and have been rigorously tested. Instead, proof of third-party testing and validation should be considered when deciding on how new technologies will perform under duress.
 - Proterra meets all the recognized tests and standards for battery safety and testing and strongly encourages the Commonwealth to consider this important factor in scoring IFBs.
- **Proterra offers the longest range 40' BEB on the market** with our onboard energy storage up to 738 kWh (ZX5 Max). This means the customer will have **more beginning-of-life and end-of-life energy** with Proterra's ZX5 Max buses than with any other OEM buses. BEBs with more energy provide greater flexibility for the customer and reduce the need for costly on-route charging infrastructure and/or mid-day charging which can disrupt operations.
 - Proposed ZX5 buses have already been **Altoona tested and are transporting passengers in revenue service today**. Other OEMs have announced plans to implement new, larger battery packs that will be required to meet the 300-mile range requirement, but those vehicles are not yet in production, much less delivered, accepted, and active in revenue service across the country.
 - Proterra has developed an efficient manufacturing process resulting in the **delivery and acceptance of over 900 electric buses, more than any other OEM in North America**. For context, Metro Magazine reported in their Annual Bus Survey that in 2021, Proterra delivered 33% of all BEBs; more BEBs than any other OEM. Additionally, electric propulsion vehicles increased deliveries by 50% over electric buses delivered in 2020. This BEB manufacturing experience allows Proterra to deliver the BEBs on time, with little to no risk since the technology we are proposing is currently in production.



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- Proterra provides fleet solutions, enabling turnkey delivery of a full BEB ecosystem with highly integrated components and a vertically integrated business model. We have direct control over our bus, battery technology, telematics system, and charging platforms. This ensures that all products work together, as designed, for successful deployment. Product integration risk, which can cause significant delays in fleet deployment, can be avoided by working with Proterra. Additionally, warranty claims are much more straightforward when you're only dealing with a single supplier instead of a bus OEM, a battery OEM, and/or a drivetrain OEM.
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- Proterra offers the most comprehensive approach to helping customers **model and optimize BEBs, energy, and charging requirements** to help design the lowest overall cost approach to deploying BEBs and charging infrastructure. In the event we are awarded a contract, Proterra can offer additional options to customers such as our proprietary route simulation tool to simulate the ZX5 performance in the customer's operating environment. Furthermore, we can determine the appropriate charging infrastructure for the buses and determine how locally generated solar energy and battery energy storage systems can provide the lowest overall energy-related costs. The Valence fleet and energy management platform by Proterra is a cloud-based data platform, offering historical and real-time performance information about your battery electric vehicle fleet and chargers, to optimize vehicle and charging operations and reduce costs. Proterra offers these services to our customers because we understand that BEBs, charging, and energy all need to be viewed as a part of the same ecosystem. BEBs are only as successful as the charging and energy solution that support the BEB fleet daily.



- Proterra's ZX5 BEBs have a **low center of gravity**, providing for greater stability and safer, more predictable handling for the operator, with less risk of having a top-heavy bus tip over.

Purpose Built BEB, Technical Specifications

Proterra recognizes that each customer has certain bus specifications it requires that are similar to its historical fleet of buses, some of which Proterra may not be able to meet. However, we do hope that each customer will consider that Proterra has built the industry's only purpose-built battery electric bus that integrates design elements that work best for an electric bus, which is not necessarily in line with what works best for a diesel, Hybrid, or CNG bus.

Point of Contact for this Proposal

If you have any questions or concerns regarding this proposal, please contact the individual below who is responsible for managing proposal-related activities for Proterra's proposal:

Mary Reeder
Bid Manager
Phone: 864-909-6198
Email: mreeder@proterra.com

Conclusion

Proterra is committed to ensuring the success of the Commonwealth's Low Floor Transit state contract program. As many transit customers begin to transition their fleet to 100% zero-emission buses. We are confident that our bid can meet the Commonwealth's needs by providing the best overall value to our customers. We believe the Commonwealth will gain this same confidence when considering the points outlined above, especially when comparing Proterra's product offering and experience to other conventional powertrain bus manufacturers who also offer an electric bus.



Sincerely,

Michael E. Hennessy
VP, Bid Administration
Proterra Operating Company,
Inc. 1 Whitlee Court
Greenville, SC 29607

Cc:

West Coast Manufacturing
383 Cheryl Lane, City of Industry, CA
91789



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2. Attachment A - Delivery

14. **ADDITIONAL USERS:** This procurement is being conducted as a “Joint and Cooperative Procurement”, as defined by *Code of Virginia § 2.2-4304*. Public bodies outside of the Commonwealth of Virginia may enter into mutual agreements with the Contractor(s) upon written consent from the Contractor(s) for the goods or services awarded against this solicitation and the resulting contract. Approval from the Commonwealth of Virginia is not required for public bodies outside of the Commonwealth of Virginia to utilize this contract. Should a public body require approval or acknowledgement from the Commonwealth of Virginia, the public body shall contact the Contract Officer responsible for managing the solicitation and subsequent contract.

15. **DELIVERY: Bidders shall fill out one of the two delivery clauses:**

a. **For Dealers:** Bidders shall be held to the time it takes for them to deliver the vehicle to the customer fully titled or with a completed Certificate of Origin after they receive it from the manufacturer (turn time). Whether the vehicle is required to be fully titled or only delivered with a Certificate of Origin will be at the discretion of the Authorized User. Authorized Users will communicate which is required and establish the process with the Dealer prior to the delivery of the vehicle(s). Bidders shall also indicate how long it takes for the vehicle to be delivered to the dealer after an order has been placed with the manufacturer (lead-time).

1. **TURN TIME PER VEHICLE ORDERED: N/A DAYS AFTER RECEIPT FROM MANUFACTURER**

2. **MANUFACTURER'S LEAD TIME PER VEHICLE: N/A DAYS ARO**

Throughout the life of the contract, the Commonwealth understands that issues may arise during the model year and delay the vehicle lead-time. If the manufacturer communicates a manufacturing delay, contractor shall notify the DPS Statewide Sourcing and Contracting Officer, as well as the authorized users who are impacted.

\$100 dollars per day shall be deducted from the final price on vehicles that are not delivered within the Turn Time Per Vehicle Ordered. This deduction is not to be considered a factor when calculating whether the financial deal offered to another public body in Virginia is better than that offered to DGS pursuant to the Financial Warranty clause. This deduction shall not apply to delivery delays initiated, authorized, or requested by the Authorized User. Failure to deliver in a timely manner may result in the termination of the contract. This deduction shall only apply to contractors acting as dealers.

b. **For Manufacturer Direct Sales:** Delivery of goods or performance of services shall be within the number of calendar days stated below after receipt of order (ARO) by the bidder. Bidders shall indicate their current expected delivery time below:

BIDDER'S CURRENT EXPECTED DELIVERY TIME: 365 CALENDAR DAYS ARO*

*Since each agency will purchase a different configuration the above delivery time would be upon final configuration of each individual user.

If during the life of the contract there are any delays in production of the vehicles, the contractor shall notify both the Statewide Sourcing and Contracting Officer and the impacted authorized users. If the contractor's delivery is delayed due to an event beyond the contractor's control including, but not limited to, natural disaster, fire, an act of war or terrorism, or a labor strike



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3. Attachment C - Vendor Data Sheet

VENDOR DATA SHEET

The following information is required as part of the Bidder's response to this solicitation. Failure to complete and provide this sheet may result in bid being declared nonresponsive. (In the case of a Combined Two-Step IFB, it may cause the Technical Proposal to be determined to be not acceptable.)

1. Qualification: The Bidder must have the capability and capacity in all respects to satisfy fully all of the contractual requirements.
2. Bidder's Primary Contact:
Name: Mary Reeder Phone: (864) 909-6198 Email: mreeder@proterra.com
3. Years in Business: Indicate the length of time Bidder has been in business providing this type of good or service:
18 Years 9 Months
4. eVA Vendor ID or DUNS Number: 193186066 - HQ
5. Indicate below a listing of at least four (4) current or recent accounts, either commercial or governmental, that the Bidder is servicing, has serviced, or has provided similar goods/services. Include the length of service and the name, address, and telephone number of the point of contact.
 - A. Company: Hampton Roads Transit (HRT) Contact: Michael Perez
Phone: (757) 222-6000 x 6691 Email: mperez@hrtransit.org
Dates of Service: 9/24/2019 - \$ Value: \$7,502,764 (buses, chargers & infrastructure)
 - B. Company: Alexandria Transit Company (DASH) Contact: Raymond Mui
Phone: (703) 746-5645 Email: raymond.mui@alexandriava.gov
Dates of Service: 8/31/2020 - \$ Value: \$4,218,006 (buses and chargers)
 - C. Company: California Dept of General Services Contact: Erica Seghesio-Groves
Phone: (910) 376-3802 Email: erica.seghesiogroves@dgs.ca.gov
Dates of Service: 12/16/2019 - Current \$ Value: Varies - multi-purchase contract
 - D. Company: Georgia Dept. of Administrative Services Contact: Jennifer Hallock
Phone: (404) 657-8458 Email: jennifer.hallock@doas.ga.gov
Dates of Service: 4/1/2021 - Current \$ Value: Varies - multi-purchase contract

I certify the accuracy of this information.

Signed:  _____ Title: Chief Commercial Officer Date: 9/7/2022



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4. Attachment D - Subcontracting Plan

Small Business Subcontracting Plan

It is the goal of the Commonwealth that over 42% of its purchases be made from small businesses. All potential bidders are required to include this document with their bid response in order to be considered responsive.

Small Business: "Small business (including micro)" means a business which holds a certification as such by the Virginia Department of Small Business and Supplier Diversity (DSBSD) on the due date for bids. This shall also include DSBSD-certified women- owned and minority-owned businesses and businesses with DSBSD service disabled veteran owned status when they also hold a DSBSD certification as a small business on the bid due date. Currently, DSBSD offers small business certification and micro business designation to firms that qualify.

Certification applications are available through DSBSD online at www.SBSD.virginia.gov (Customer Service).

Bidder Name: Proterra Operating Company, Inc. Proterra Operating Company, Inc.

Preparer Name: Mary Reederry Reeder **Date:** 10/21/2022

Who will be doing the work: I plan to use subcontractors I plan to complete all work

Instructions

- A. If you are certified by the DSBSD as a micro/small business, complete only Section A of this form.
- B. If you are not a DSBSD-certified small business, complete Section B of this form. For the bid to be considered and the bidder to be declared responsive, the bidder shall identify the portions of the contract that will be subcontracted to DSBSD-certified small business for the initial contract period in relation to the bidder's total price for the initial contract period in Section B.

Section A

If your firm is certified by the DSBSD provide your certification number and the date of certification.

Certification number: N/A Certification Date: N/A

Section B

If the "I plan to use subcontractors box is checked," populate the requested information below, per subcontractor to show your firm's plans for utilization of DSBSD-certified small businesses in the performance of this contract for the initial contract period in relation to the bidder's total price for the initial contract period. Certified small businesses include but are not limited to DSBSD-certified women-owned and minority-owned businesses and businesses with DSBSD service disabled veteran-owned status that have also received the DSBSD small business certification. Include plans to utilize small businesses as part of joint ventures, partnerships, subcontractors, suppliers, etc. It is important to note that these proposed participation will be incorporated into the subsequent contract and will be a requirement of the contract. Failure to obtain the proposed participation dollar value or percentages may result in breach of the contract.

B. Plans for Utilization of DSBSD-Certified Small Businesses for this Procurement

Subcontract #1

Company Name: N/A SBSB Cert #: _____

Contact Name: _____ SBSB Certification: _____

Contact Phone: _____ Contact Email: _____

Value % or \$ (Initial Term): _____ Contact Address: _____

Description of Work: _____

Subcontract #2

Company Name: _____ SBSD Cert #: _____
Contact Name: _____ SBSD Certification: _____
Contact Phone: _____ Contact Email: _____
Value % or \$ (Initial Term): _____ Contact Address: _____
Description of Work: _____

Subcontract #3

Company Name: _____ SBSD Cert #: _____
Contact Name: _____ SBSD Certification: _____
Contact Phone: _____ Contact Email: _____
Value % or \$ (Initial Term): _____ Contact Address: _____
Description of Work: _____

Subcontract #4

Company Name: _____ SBSD Cert #: _____
Contact Name: _____ SBSD Certification: _____
Contact Phone: _____ Contact Email: _____
Value % or \$ (Initial Term): _____ Contact Address: _____
Description of Work: _____

Subcontract #5

Company Name: _____ SBSD Cert #: _____
Contact Name: _____ SBSD Certification: _____
Contact Phone: _____ Contact Email: _____
Value % or \$ (Initial Term): _____ Contact Address: _____
Description of Work: _____

NOTE: This information can be captured using this template or using the sourcing tools available in eVA.



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5. Attachment E - State Corporation Commission Form

STATE CORPORATION COMMISSION FORM

The following information is required as part of the Bidder’s response to this solicitation. Failure to complete and provide this form may result in bid being declared nonresponsive. (In the case of a Combined Two-Step IFB, it may cause the Technical Proposal to be determined to be not acceptable.)

Virginia State Corporation Commission (“SCC”) registration information: The Bidder:

is a corporation or other business entity with the following SCC identification number:

-OR-

is not a corporation, limited liability company, limited partnership, registered limited liability partnership, or business trust

-OR-

is an out-of-state business entity that does not regularly and continuously maintain as part of its ordinary and customary business any employees, agents, offices, facilities, or inventories in Virginia (not counting any employees or agents in Virginia who merely solicit orders that require acceptance outside Virginia before they become contracts, and not counting any incidental presence of the Bidder in Virginia that is needed in order to assemble, maintain, and repair goods in accordance with the contracts by which such goods were sold and shipped into Virginia from Bidder’s out-of-state location)

-OR-

is an out-of-state business entity that is including with this bid an opinion of legal counsel which accurately and completely discloses the undersigned Bidder’s current contacts with Virginia and describes why those contacts do not constitute the transaction of business in Virginia within the meaning of § 13.1-757 or other similar provisions in Titles 13.1 or 50 of the Code of Virginia.

NOTE >> Check the following box if you have not completed any of the foregoing options but currently have pending before the SCC an application for authority to transact business in the Commonwealth of Virginia and wish to be considered for a waiver to allow you to submit the SCC identification number after the due date for bids (the Commonwealth reserves the right to determine in its sole discretion whether to allow such waiver):

Signature:  _____ Date: 9/7/2022

Name: John Walsh _____

Print

Title: Chief Commercial Officer _____

Name of Firm: Proterra Operating Company, Inc. _____



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6. Attachment F - NDAA 2020 Section 7613 Compliance
Form

NDA 2020 Section 7613 Compliance Form

Regarding compliance with Section 7613 of the National Defense Authorization Act for Fiscal Year 2020 (NDA 2020), subsection 49 U.S.C. § 5323 (u), the undersigned Bidder:

IS COMPLIANT with the provisions of this subsection and certifies the manufacturer is not “owned or controlled by, is a subsidiary of, or is otherwise related legally or financially to a corporation based in” certain foreign countries covered by the restrictions outlined.

IS NOT COMPLIANT with the provisions of this subsection and certifies the manufacturer is “owned or controlled by, is a subsidiary of, or is otherwise related legally or financially to a corporation based in” certain foreign countries covered by the restrictions outlined.

For more information regarding the restriction criteria and the provisions of subsection 49 U.S.C. § 5323 (u), visit the FTA Frequently-Asked-Questions for Section 7613 at the following link: <https://www.transit.dot.gov/funding/procurement/frequently-asked-questions-regarding-section-7613-national-defense>

PLEASE NOTE: Failure to provide this information, may result in your bid being declared non-responsive

Signature:  190E3CD36916412... _____ Date: 9/7/2022

Name: John Walsh
Print

Title: Chief Commercial Officer

Name of Firm: Proterra Operating Company, Inc.



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7. Attachment H - Pricing Schedule

**IFB 6447 - Attachment H - Pricing Schedule (ADDENDUM #2)
Low-Floor Transit Buses, and Commuter Coach Buses Heavy Duty, 12 Year (29 ft.- 60 ft. sizes)**

Manufacturer and/or Dealer Name:	Proterra Operating Company, Inc.
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This specification is for a 2022, or most current production model year, Battery Low-Floor Transit Buses, and Commuter Coach Buses. The specifications are written to meet the needs of the Commonwealth of Virginia and the Department of Rail and Public Transportation (DRPT); however, the contract resulting from this bid will be made available for use by all state agencies, institutions of higher education, public bodies and other entities authorized to use the contract by the Code of Virginia or any other entities as mutually agree to by all parties.

The requirements below are for the base vehicle. All components, unless otherwise required by these specifications, shall be the standard or optional equipment specifically advertised and installed by the manufacturer for the vehicle which the bidder proposes to furnish. The only source of information in determining whether or not the equipment is specifically advertised for the vehicle being offered shall be the manufacturer's published vehicle literature. If, prior to the IFB due date and time, the Manufacturer revises its standard or optional features that result in a conflict with any Base Vehicle Specification Description contained herein, the Bidder must submit their bid based on the manufacturer's most current standard feature. Bidders must document equivalence to the specification to clearly explain the changes made by the manufacturer, include any Order/Option Code updates, and provide supporting documentation. In no other case shall changes to the Base Vehicle specifications be made by the bidder.

If, prior to the IFB due date and time, any Options (Add-on/Deletes) specified in the pricing schedule (factory or dealer installed) are modified or discontinued by the Manufacturer, the bidder may submit their bid noting the Manufacturer's changes, additions or deletions. In no other case shall changes to the Options specified be made by the bidder. Bidders may include other Options (Add-ons and Deletes) and Local Government Additional Options as instructed in the Solicitation and Attachments.

Vehicles and equipment must conform to the BASE VEHICLE requirements set forth in the pricing schedule and as required in Attachment A. Minimum requirements are stated for certain equipment and may be exceeded, subject to buyer approval.

These specifications incorporate where appropriate all provisions of the Americans with Disabilities Act Final Rule as stated in the Federal Register Vol. 56, No 173 of September 6, 1991, Subpart B-Buses, Vans and Systems, pages 45756 through 45761. The minimum specifications for a Battery Electric Low-Floor Transit Buses, and Commuter Coach Buses Heavy Duty 12-Year type are as follows:

BASE STANDARD BUS - List Quantity Discount Prices (All prices are to be in United States dollars)/ (Enter data in highlighted areas only)				
Discount for volume level:	Order Volume / Quantity / Volume Discount	1 to 5 / each	6 to 10 / each	11 + / each
Base Price		\$910,457.00	\$890,457.00	\$890,457.00
Less Discount from List Price		0.00%	0.00%	0.00%
Single Unit/Net Price (Ref. Attachment A, Section IV. Specification, Section C. Requirements, #11)		\$910,457.00	\$890,457.00	\$890,457.00
Delivery Price (flat fee)		\$5,856.00	\$5,856.00	\$5,856.00
Total Bid Price (add net price + delivery price) - Virginia Authorized Users Only		\$916,313.00	\$896,313.00	\$896,313.00

ADDITIONAL SPECIFICATIONS: Bidders shall fill out the below section. Failure to fill out this section shall result in your bid being non-responsive!

Feature	Description	Meets Specs? Y/N	Comments
Year Model 2022 or current production model year	Model Year ___2022___	Y	See CER 5 for Technical Specification clarification
GVWR	State Vehicle GVWR: ___43,650___	Y	
Wheelbase	State Vehicle Wheelbase: ___243 inches___	Y	
Battery Access Door/Disconnect Switch	Two Low-Voltage Battery AGM deep-cycle batteries	Y	Batteries are located behind the curbside rear lower access panel.
Battery	Lithium nickel manganese cobalt. Energy to be a minimum of 225 kWh	Y	
Overall Vehicle Length (Bumper to Bumper)	State Vehicle Length: ___443 inches___	Y	
Overall Exterior Width	State Vehicle Width: ___102 inches___	Y	
Exterior Height	State Vehicle Height (Not including Roof Hatch or AC): ___128 inches___	Y	
Axle/Springs/Frame	As required for vehicle GVWR	Y	
Ground to Step Threshold	Maximum 14.0" +/- .5"	N	Front 15.7" and rear 17.1"
Interior width at Seat Level	Minimum 91"	Y	
Interior Height	Minimum 75" at center aisle	Y	Front- 90.7"; Rear Upper Level- 74.8"
Shock Absorbers	Heavy-duty type to give maximum trouble free life in transit operations. Shall be load rated and the heaviest duty available	Y	
Suspension	Standard unmodified Suspension and be load rated and of the heaviest duty available for the GVW of the vehicle.	Y	
Parts List	Ability to provide complete AS BUILT parts list for all items, including body panels, added by the body manufacturer.	Y	All-composite monocoque bus body. Composite body buses do not have exterior body panels.
Lighting	Shall conform to the specifications as outlines in the ADA regulations Subpart B-Buses, Vans and Systems, 38.31 Lighting	Y	
Directional Signals	Shall be in compliance with FMVSS and state statutes.	Y	
Controls and Switches	Included on control panel mounted to the engine cover or on a molded housing above the windshield trim within reach.	N	Not applicable to electric buses (no engine)
Insulation	Roof, sides and rear doors including front and rear cab area must be insulated with polystyrene with minimum R factor of 6.	N	Proterra's proposed monocoque composite body construction provides excellent insulation properties
Interior	Panels, materials and treatments shall be flame retardant meeting requirements of FMVSS 302. The headliner, sidewalls and cab liner shall be antimicrobial fiberglass reinforced plastic.	N	Proposed bus includes panels that are FMVSS 302 but are not antimicrobial fiberglass reinforced plastic
Floor Covering	Sealant applied in body to all floor corners, OEM insulated in cab floor, White/yellow standee line at forward are of passenger compartment	Y	
Floor Plan	All bidder shall submit a floor plan drawn specifically for this procurement, drawn to scale and indicate hip to knee dimensions.	Y	See Exhibit A.
Tires and Wheels	State Tire Size: _____ Tubeless radials. Balanced and with even weight distribution of vehicle with maximum load. Whittle paint rims standard.	N	Michelin X InCity Energy 2 LR L - 315/80R 22.5. Wheels are Brushed Aluminum with DuraBright and
Mirrors	Heated, remotely operated exterior rear view mirrors. One interior rear view mirror shall be included factory standard	Y	
Windshield wipers	Electric, four position switch have Off, Intermittent, Low and High positions	Y	
Instrumentation	Factory installed gauges and dome light.	Y	Instruments and alarms provided in this section may or may not apply to
Sun Visor	Vent shade (string-pull-type), fully adjustable, to provide sun glare protection either at the windshield and the driver's side window. Friction device, or equivalent mounting, shall hold it securely in either location and in any position during travel over rough road surfaces.	Y	Sun shade: Front and side 48" (Half solid/Half Mesh)
License Plate Bracket	Vehicle shall be preconfigured for front and rear license plates or equipped with front and rear license plate brackets	Y	
Safety Equipment	Shall be mounted in a location within the vehicle approved by DRPT so as to not interfere with the driver or passenger: 16 unit Virginia Bus First Aid Kit to include the following: (2) Band Aids, (3) 4" Bandage compress, (2) 2" Bandage compress, (2) Triangle Bandage, (2) 4" Gauze compress, (1) Bee Sting swabs, (2) Zeph chloride swabs; Fire extinguisher, 5# ABC type; Warning triangles, reflective type (3) units; webcutter; OSHA approved Body Fluid Clean Up Kit	Y	Mounted on the bus curbside wheelwell storage box.
Seating	Minimum seating capacity of 28 adults including driver, 2 wheelchair passengers. Hip to knee spacing 27 inches. Padded vandal resistant seat back grab handles, compliance with FMVSS standards: 207, 208, 209, 210, 225, and 302 as applicable.	N	See proposed Base Bus Floor Plan. Note: the proposed seating layout does not include Padded vandal

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Seat Covering	Please include pricing options.		Y	Seat covering options to be quoted on a case by case basis.
Priority Seating Signs	Shall conform to the specifications as outlined in the ADA regulations Subpart B-Buses, Vans and Systems, 38.27 Priority seating signs.		Y	
Interior Circulation, Handrails and Stanchions	Shall conform to the specifications as outlined in the ADA regulations Subpart B-Buses, Vans, and Systems 38.29 Interior circulation, handrails and stanchions. Stanchions to be comprised of corrosion resistant stainless steel 1-1/4" in diameter and padded permanently bonded, to be located at side entrance door, Anti-Vandal grab handles at top of each forward facing aisle seat, passenger assist stainless steel grab bar on both sides of entrance door running parallel to entryway for ADA compliance, Floor to ceiling stanchion on left side of aisle at entry to passenger compartment and include cross bar that attaches to sidewall. Modesty panel installed on curbside stanchion to separate first seats from from stepwell.		Y	
Front End Alignment	Final front-end alignment at dealer location before delivery. Printed before and after readings to be included.		N	Front end alignment is done at the factory prior to shipment.
Wheelchair Ramp/Lift (Coach Buses)	To be installed and conform to all requirements as outlined in the ADA regulations. Manual over-ride feature allowing ramp to be deployed or stowed manually. Operating instructions, schematics, and trouble-shooting guide, rated at 1,000 pounds, 62 inches, 1:6 angle when deployed to the ground. Maximum of 48 inches of portion of the ramp extending outside of the bus.		N	Our proposed ramp exceeds the 62 inches in length, however the portion of the ramp extending outside of the bus is 48 inches.
Towing Devices	There shall be attachment points (2) at the front. The towing devices shall be adequate in design and construction to permit towing the vehicle without distortion or failure.		Y	
Securement Devices	Floor-mounted attachments flush mounted and comply with ADA regulations Subpart B-Buses, Vans and Systems, 28.23 Mobility aid accessibility (d) Securement devices, and ANS/RESNA WC-18, self-tensioning and self-locking retractors, storage container or bag, hand-held web cutter.		N	Proposed bus includes our standard configuration which does not include a storage container or bag, nor a hand-held web cutter. It is not our proposed 35ft ZX5 includes two (2) egress windows located on the street side.
Windows	Solid Pane with black anodized frames. Passenger windows minimum of 18 1/2", 36", or 45" wide and 36" high. Hinge-out emergency escape windows labeled with operation instruction. Compliance with FMVSS-217. Manual handle re-lock. Complies with F.A.C. 14-90.		Y	Transit striping and vinyl requirements were not included with the IFB. Price includes white gel coat paint. We can provide a price for exterior paint and graphics when determined by the agency.
Exterior Finish	Manufacturer's Standard fleet white paint, with accent striping to match recipients existing fleet designs. The Transit systems name shall be reproduced with direct contact 3M seven-year vinyl on each side of the vehicle and approved by the recipient. Some recipients will require logo reproduction on the exterior of the vehicle. The price for this graphic work is to be included in the price. If end user paint schemes are changes or modified during the lift of this contract, vendor will be allowed to re-negotiate the cost to paint an individual agency's equipment.		N	HVAC is independent from the defroster. Defroster is an electric, not a diesel fired heater. Our proposed bus is not equipped with an independent rear heater.
Heating	Fresh air type front hot water heater with defroster, located in front of passenger compartment, operated from driver's seat		N	
Rear Heater	Minimum of 40,000 BTU / hour controlled from driver's position, located to not adversely affect wheelchair tie down area.		N	
Parking Brake	Manually operated to rear when brakes/driveshaft. Ability to hold "fully loaded vehicle" on 15% incline.		Y	
Steering	Power steering with tilt steering wheel		Y	
Brakes	Four wheel antilock, compliance with FMVSS-121 or FMVSS-105		Y	
Wiring	Shall be manufacturer's standard for circuits involved. All wiring shall be run inside the body in a protected area. Any wiring shall be run inside the body in a protected area. Any wiring that is exposed to the elements shall be in loom and securely clipped for maximum protection. Rubber or plastic coated clips. Color-coded and labeled. Programmable electrical system. 12V multiplex system with standard bus bar including two six-way fuse blocks for added accessories / systems. Schematics made available to the recipient via electronic customer specific data portal.		N	Proterra's proposed bus some spare fuse positions at the rear and front of the vehicle (24 and 12, switched and unswitched power) as well as a customer dedicated fuse box in the electronics cabinet. However, our price does not include these items.
Battery Access Door/Disconnect Switch	Exterior battery disconnect switch with access door panel.		Y	
Fast Idle/ Interlock	Voltage monitor/ engine idler. Engages when vehicle is in discharge situation, transmission in park and parking brake applied. Deactivates when parking brake is released and vehicle is put in gear.		N	Not applicable to electric buses (no engine)
Floor Structure	Steel sub floor isolated from chassis with OEM rubber isolation mounts, bolted to the chassis frame rails. Floor decking 5/8" engineered wood w/ moisture barrier laminated to lower surface and moisture sealed edges.		N	All-composite monocoque bus body including flooring which is bonded to the body.
Combination Roof Ventilator/ Emergency Exit	24"x24" installed in roof (front and rear). Ventilator able to allow fresh air inside when raised.		Y	
Bumpers	Shall be provided at both front and rear of the vehicle. They shall wrap around the body sufficiently to give protection against impact at the body corners. The front and rear bumpers shall be supplied by the chassis OEM. The bumper brackets are to be bolted to the chassis frame.		Y	
Air Condition	State AC System: _____ Valeo _____		Y	HVAC manufacturer Valeo (R407 refrigerant)
Standard Warranty - Minimum	Bus: Twelve (12) month, 50,000 miles (which ever comes first) Bumper-to-Bumper		Y	
OPTIONAL EQUIPMENT	Model Number/Order Code	Description	MSRP/LIST PRICE	CONTRACT PRICE
Please list all optional equipment, additional safety options, paint schemes, graphics/wraps, and accessories below that your firm can provide beyond the factory options.				
Overhead Charging Interface	N/A	Overhead, Conductive - SAE J3105 Pantograph Rails (Inverted Pantograph)	N/A	\$ 12,737.00
Charging Ports	N/A	Two J1772-CCS Charge Ports: (1) Curbside Rear & (1) Streetside Rear	N/A	\$ 1,828.00
Towing	N/A	Capable of front tow and rear ditch extraction (no rear tow)	N/A	\$ 6,189.00
Tow Connections	N/A	Base plus additional Male Industrial fitting @ bumper for brake control	N/A	\$ 905.00
Wheels	N/A	Polished Aluminum with Durabright and DuraFlange, ALCOA 896513DD	N/A	\$ 3,510.00
Wheel and Tire Accessories	N/A	Hubodometer	N/A	\$ 374.00
Driver Foot Controls	N/A	Adjustable Pedals	N/A	\$ 2,462.00
HVAC	N/A	Eberspacher 136 All Electric HVAC - 30 kW cooling, 16 kW heating, R134a refrigerant	N/A	\$ 7,567.00
Winter Weather Package	N/A	Auxiliary Heat diesel fuel fired heater	N/A	\$ 24,201.00
Passenger Windows	N/A	Varies by customer selection.	N/A	Quote
Bike Rack	N/A	Varies by customer selection.	N/A	Quote
Exterior Graphics	N/A	Varies by customer selection.	N/A	Quote
Operator's Barrier	N/A	Varies by customer selection.	N/A	Quote
Floor Covering	N/A	Varies by customer selection.	N/A	Quote
Fare Collection	N/A	Varies by customer selection.	N/A	Quote
Passenger Seating	N/A	Varies by customer selection.	N/A	Quote
Passenger Doors	N/A	Varies by customer selection.	N/A	Quote
Loading Systems - ADA Ramp	N/A	Varies by customer selection.	N/A	Quote
Wheelchair Accommodations	N/A	Varies by customer selection.	N/A	Quote
Destination Signs	N/A	Varies by customer selection.	N/A	Quote
For unlisted options (not listed above), please provide a percentage off MSRP/Catalog price	% Off MRSP/Catalog/List			0%
Battery Charging Infrastructure (Equipment Only - No infrastructure/installation prices)	Model Number/Order Code	Please provide options. (Equipment only - no installation)	MSRP/LIST PRICE	CONTRACT PRICE
PI Cabinet	N/A	120 kW with a single 18", 200A dispenser	N/A	\$ 64,750.00
PI Cabinet	N/A	120 kW with multiple dispensers	N/A	Quote
PI Cabinet	N/A	180 kW with a single 18", 200A dispenser	N/A	\$ 76,250.00
PI Cabinet	N/A	180 kW with multiple dispensers	N/A	Quote
PI Cabinet	N/A	450 kW with a single 18", 200A dispenser	N/A	\$ 188,000.00
PI Cabinet	N/A	450 kW with multiple dispensers	N/A	Quote
PL Station	N/A	1440 kW with 10 single 18", 200A dispensers	N/A	\$ 574,000.00
PL Station	N/A	1440 kW with a variety of plug-in dispensers or pantograph dispensers	N/A	Quote
Extended Warranty and Price (include coverage description, number of years, and price) e.g. bus, batteries, electric motor, or other major systems	Coverage		MSRP/LIST PRICE	Contract Price
Bumper To Bumper	2 years/100,000 miles	Complete Bus Warranty for 2 years / 100,000 miles	N/A	\$ 7,500.00
Propulsion System	12 years/500,000 miles	12 year / 500,000 mile Propulsion System Warranty	N/A	\$ 36,753.00
Energy Storage System	12 years/500,000 miles	12 year / 500,000 mile (492 kWh) 70% Capacity Warrantable End Of Life (WEOL)	N/A	\$ 78,750.00
Low-Voltage and High-Voltage Wiring harnesses	12 Years	12 years	N/A	\$ 7,085.00
Auxiliary Heating	3 years/150,000 miles	Two (2) years/100,000 miles standard with an additional 1 year/50,000 mile Ext. Total 3 years/150,000 miles	N/A	\$ 327.00
Chassis System Warranty	3 years/150,000 miles	Two (2) years/100,000 miles standard with an additional 1 Year/50,000 mile Ext. Total 3 years/150,000 miles	N/A	\$ 3,482.00
Valeo HVAC Warranty	4 years	Three (3) years standard with an additional 1 Year Ext. Total 4 years.	N/A	\$ 3,240.00
HV Power Electronics & Cooling Warranty	3 years/150,000 miles	Two (2) years/100,000 miles standard with an additional 1 year/50,000 mile Ext. Total 3 years/150,000 miles	N/A	\$ 1,782.00

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Control Systems & Driver Convenience Warranty	3 years/150,000 miles	Two (2) years/100,000 miles standard with an additional 1 year/50,000 mile Ext. Total 3 years/150,000 miles	N/A	\$	2,060.00
				\$	-
Post-Warranty Maintenance	Contract Amount				
Labor (hourly rate)	\$ / per hour	\$ 195.00			
Parts (Discount Percentage)	% discount off of list/MRSP	0%			

Body Manufacturer's Electronic Customer Specific Portal and Fleet Database: The manufacturer of the body must make a bus and customer specific electronic data portal available for each bus built that includes (at a minimum) the following information:

- Manufacturer Serial Number
- Chassis VIN
- Sold date
- Body warranty expiration date
- Service / Operations manual
- Body warranty information
- Post Award Buy America Certificate
- Bus body parts listing (with photos when available)
- Bus body electrical schematics
- List of items shipped with bus

Bus Testing: The bus offered must have completed testing at The Federal Bus Testing Facility in Altoona, PA in the 5 year / 150,000-mile category. [Proof of completed test to accompany bid.](#) Failure on the part of the Bidder to provide all requested documentation may cause to deem the bid non-responsive.

Maintenance Provisions: [A description of how and by whom warranty service can be provided is to be included with bid.](#) Failure on the part of the Bidder to provide all requested documentation may cause to deem the bid non-responsive. The vendor shall act as the first source for performing warranty work. This must cover both mechanical and body work. The manufacturer's warranty covering parts, materials and workmanship shall apply for a minimum period of twelve (12) months or 12,000 miles, whichever occurs first, and this warranty shall include repair and replacement of defective parts and labor. The structural body warranty to be a minimum of three (3) years or 150,000 miles, whichever occurs first. The successful vendor shall be required to offer a toll-free number to all recipients for warranty inquiries, parts orders and service related questions. The vendor shall have personnel available to answer warranty, parts, and service inquiries Monday Through Friday, 8 A.M. to 5 P.M., except during holidays recognized by the Commonwealth of Virginia. The vendor shall respond to warranty, parts, and service inquiries and offer a reasonable initial plan to address such inquiries within 24 hours of call receipt or the next business day, whichever is later, via phone or email.

All bidders must offer proof of both chassis and body warranty (including bus body, air conditioning and wheelchair ramp) service points within the Commonwealth of Virginia. All bidders shall be required to submit documentation providing the names of the vendors. Successful vendor shall be required to maintain service facilities in Central / Southwest Virginia, Richmond, Tidewater and Northern Virginia.

The vehicle to be furnished shall conform to all applicable Federal and Motor Vehicle Safety Standards and all equipment shall conform to Title 46.1, Chapter 4, and Article 9 of the Code of Virginia. Chassis to be a standard proven model of manufacturer's latest current production and include all standard equipment as advertised with additional optional equipment as outlined above. All components, unless otherwise required by these specifications, shall be the standard or optional equipment specifically advertised and installed by the manufacturer including any additional warranties.

Prior to delivery the vendor must perform new vehicle service preparation. The vehicle shall be in acceptable condition upon delivery and will be accepted only by an authorized person designated by the agency. Delivery shall be during normal business hours, i.e. 8 AM - 5 PM, Monday through Friday. Payment will not be initiated until the agency is assured that the vehicle has been delivered in an acceptable condition and everything is working properly.

**IFB 6447 - Attachment H - Pricing Schedule (ADDENDUM #2)
Low-Floor Transit Buses, and Commuter Coach Buses Heavy Duty, 12 Year (29 ft.- 60 ft. sizes)**

Manufacturer and/or Dealer Name:	Proterra Operating Company, Inc.
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This specification is for a 2022, or most current production model year, Battery Low-Floor Transit Buses, and Commuter Coach Buses. The specifications are written to meet the needs of the Commonwealth of Virginia and the Department of Rail and Public Transportation (DRPT); however, the contract resulting from this bid will be made available for use by all state agencies, institutions of higher education, public bodies and other entities authorized to use the contract by the Code of Virginia or any other entities as mutually agree to by all parties.

The requirements below are for the base vehicle. All components, unless otherwise required by these specifications, shall be the standard or optional equipment specifically advertised and installed by the manufacturer for the vehicle which the bidder proposes to furnish. The only source of information in determining whether or not the equipment is specifically advertised for the vehicle being offered shall be the manufacturer's published vehicle literature. If, prior to the IFB due date and time, the Manufacturer revises its standard or optional features that result in a conflict with any Base Vehicle Specification Description contained herein, the Bidder must submit their bid based on the manufacturer's most current standard feature. Bidders must document equivalence to the specification to clearly explain the changes made by the manufacturer, include any Order/Option Code updates, and provide supporting documentation. In no other case shall changes to the Base Vehicle specifications be made by the bidder.

If, prior to the IFB due date and time, any Options (Add-on/Deletes) specified in the pricing schedule (factory or dealer installed) are modified or discontinued by the Manufacturer, the bidder may submit their bid noting the Manufacturer's changes, additions or deletions. In no other case shall changes to the Options specified be made by the bidder. Bidders may include other Options (Add-ons and Deletes) and Local Government Additional Options as instructed in the Solicitation and Attachments.

Vehicles and equipment must conform to the BASE VEHICLE requirements set forth in the pricing schedule and as required in Attachment A. Minimum requirements are stated for certain equipment and may be exceeded, subject to buyer approval.

These specifications incorporate where appropriate all provisions of the Americans with Disabilities Act Final Rule as stated in the Federal Register Vol. 56, No 173 of September 6, 1991, Subpart B-Buses, Vans and Systems, pages 45756 through 45761. The minimum specifications for a Battery Electric Low-Floor Transit Buses, and Commuter Coach Buses Heavy Duty 12-Year type are as follows:

BASE STANDARD BUS - List Quantity Discount Prices (All prices are to be in United States dollars)/ (Enter data in highlighted areas only)				
Discount for volume level:	Order Volume / Quantity / Volume Discount	1 to 5 / each	6 to 10 / each	11 + / each
Base Price		\$900,457.00	\$880,457.00	\$880,457.00
Less Discount from List Price		0.00%	0.00%	0.00%
Single Unit/Net Price (Ref. Attachment A, Section IV. Specification, Section C. Requirements, #11)		\$900,457.00	\$880,457.00	\$880,457.00
Delivery Price (flat fee)		\$5,856.00	\$5,856.00	\$5,856.00
Total Bid Price (add net price + delivery price) - Virginia Authorized Users Only		\$906,313.00	\$886,313.00	\$886,313.00

ADDITIONAL SPECIFICATIONS: Bidders shall fill out the below section. Failure to fill out this section shall result in your bid being non-responsive

Feature	Description	Meets Specs? Y/N	Comments
Year Model 2022 or current production model year	Model Year ____2022____	Y	See CER 5 for Technical Specification clarification
GVWR	State Vehicle GVWR: ____43,650____	Y	
Wheelbase	State Vehicle Wheelbase: ____296 inches____	Y	
Battery Access Door/Disconnect Switch	Two Low-Voltage Battery AGM deep-cycle batteries	Y	Batteries are located behind the curbside rear lower access panel.
Battery	Lithium nickel manganese cobalt. Energy to be a minimum of 225 kWh	Y	
Overall Vehicle Length (Bumper to Bumper)	State Vehicle Length: ____510 inches____	Y	
Overall Exterior Width	State Vehicle Width: ____102 inches____	Y	
Exterior Height	State Vehicle Height (Not including Roof Hatch or AC): ____128 inches____	Y	
Axle/Springs/Frame	As required for vehicle GVWR	Y	
Ground to Step Threshold	Maximum 14.0" +/- .5"	N	Front 15.7" and rear 17.1"
Interior width at Seat Level	Minimum 91"	Y	
Interior Height	Minimum 75" at center aisle	Y	Front- 90.7"; Rear Upper Level- 74.8"
Shock Absorbers	Heavy-duty type to give maximum trouble free life in transit operations. Shall be load rated and the heaviest duty available	Y	
Suspension	Standard unmodified Suspension and be load rated and of the heaviest duty available for the GVW of the vehicle.	Y	
Parts List	Ability to provide complete AS BUILT parts list for all items, including body panels, added by the body manufacturer.	Y	All-composite monocoque bus body. Composite body buses do not have exterior body panels.
Lighting	Shall conform to the specifications as outlines in the ADA regulations Subpart B-Buses, Vans and Systems, 38.31 Lighting	Y	
Directional Signals	Shall be in compliance with FMVSS and state statutes.	Y	
Controls and Switches	Included on control panel mounted to the engine cover or on a molded housing above the windshield trim within reach.	N	Not applicable to electric buses (no engine)
Insulation	Roof, sides and rear doors including front and rear cab area must be insulated with polystyrene with minimum R factor of 6.	N	Proterra's proposed monocoque composite body construction provides excellent insulation properties
Interior	Panels, materials and treatments shall be flame retardant meeting requirements of FMVSS 302. The headliner, sidewalls and cab liner shall be antimicrobial fiberglass reinforced plastic.	N	Proposee bus includes panels that are FMVSS 302 but are not antimicrobial fiberglass reinforced plastic
Floor Covering	Sealant applied in body to all floor corners, OEM insulated in cab floor, White/yellow standee line at forward are of passenger compartment	Y	
Floor Plan	All bidder shall submit a floor plan drawn specifically for this procurement, drawn to scale and indicate hip to knee dimensions.	Y	See Exhibit B.
Tires and Wheels	State Tire Size: _____ Tubeless radials. Balanced and with even weight distribution of vehicle with maximum load. Whittle paint rims standard.	N	Michelin X InCity Energy 2 LR L - 315/80R 22.5. Wheels are Brushed Aluminum with DuraBright and
Mirrors	Heated, remotely operated exterior rear view mirrors. One interior rear view mirror shall be included factory standard	Y	
Windshield wipers	Electric, four position switch have Off, Intermittent, Low and High positions	Y	
Instrumentation	Factory installed gauges and dome light.	Y	Instruments and alarms provided in this section may or may not apply to
Sun Visor	Vent shade (string-pull-type), fully adjustable, to provide sun glare protection either at the windshield and the driver's side window. Friction device, or equivalent mounting, shall hold it securely in either location and in any position during travel over rough road surfaces.	Y	Sun shade: Front and side 48" (Half solid/Half Mesh)
License Plate Bracket	Vehicle shall be preconfigured for front and rear license plates or equipped with front and rear license plate brackets	Y	
Safety Equipment	Shall be mounted in a location within the vehicle approved by DRPT so as to not interfere with the driver or passenger: 16 unit Virginia Bus First Aid Kit to include the following: (2) Band Aids, (3) 4" Bandage compress, (2) 2" Bandage compress, (2) Triangle Bandage, (2) 4" Gauze compress, (1) Bee Sting swabs, (2) Zeph chloride swabs; Fire extinguisher, 5# ABC type; Warning triangles, reflective type (3) units; webcutter; OSHA approved Body Fluid Clean Up Kit	Y	Mounted on the bus curbside wheelwell storage box.
Seating	Minimum seating capacity of 28 adults including driver, 2 wheelchair passengers. Hip to knee spacing 27 inches. Padded vandal resistant seat back grab handles, compliance with FMVSS standards: 207, 208, 209, 210, 225, and 302 as applicable.	Y	See Exhibit B. Note: the proposed seating layout does not include Padded vandal resistant seat back

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Seat Covering	Please include pricing options.		Y	
Priority Seating Signs	Shall conform to the specifications as outlined in the ADA regulations Subpart B-Buses, Vans and Systems, 38.27 Priority seating signs.		Y	Seat covering options to be quoted on a case by case basis.
Interior Circulation, Handrails and Stanchions	Shall conform to the specifications as outlined in the ADA regulations Subpart B-Buses, Vans, and Systems 38.29 Interior circulation, handrails and stanchions. Stanchions to be comprised of corrosion resistant stainless steel 1-1/4" in diameter and padded permanently bonded, to be located at side entrance door, Anti-Vandal grab handles at top of each forward facing aisle seat, passenger assist stainless steel grab bar on both sides of entrance door running parallel to entryway for ADA compliance, Floor to ceiling stanchion on left side of aisle at entry to passenger compartment and include cross bar that attaches to sidewall. Modesty panel installed on curbside stanchion to separate first seats from from stepwell.		Y	
Front End Alignment	Final front-end alignment at dealer location before delivery. Printed before and after readings to be included.		N	Front end alignment is done at the factory prior to shipment.
Wheelchair Ramp/Lift (Coach Buses)	To be installed and conform to all requirements as outlined in the ADA regulations. Manual over-ride feature allowing ramp to be deployed or stowed manually. Operating instructions, schematics, and trouble-shooting guide, rated at 1,000 pounds, 62 inches, 1:6 angle when deployed to the ground. Maximum of 48 inches of portion of the ramp extending outside of the bus.		N	Our proposed ramp exceeds the 62 inches in length, however the portion of the ramp extending outside of the bus is 48 inches.
Towing Devices	There shall be attachment points (2) at the front. The towing devices shall be adequate in design and construction to permit towing the vehicle without distortion or failure.		Y	
Securement Devices	Floor-mounted attachments flush mounted and comply with ADA regulations Subpart B-Buses, Vans and Systems, 28.23 Mobility aid accessibility (d) Securement devices, and ANS/RESNA WC-18, self-tensioning and self-locking retractors, storage container or bag, hand-held web cutter.		N	Proposed bus includes our standard configuration which does not include a storage container or bag, nor a hand-held web cutter.
Windows	Solid Pane with black anodized frames. Passenger windows minimum of 18 1/2", 36", or 45" wide and 36" high. Hinge-out emergency escape windows labeled with operation instruction. Compliance with FMVSS-217. Manual handle re-lock. Complies with F.A.C. 14-90.		Y	(4) egress windows: three (3) located on the street side and one (1) located on the curb side.
Exterior Finish	Manufacturer's Standard fleet white paint, with accent striping to match recipients existing fleet designs. The Transit systems name shall be reproduced with direct contact 3M seven-year vinyl on each side of the vehicle and approved by the recipient. Some recipients will require logo reproduction on the exterior of the vehicle. The price for this graphic work is to be included in the price. If end user paint schemes are changes or modified during the lift of this contract, vendor will be allowed to re-negotiate the cost to paint an individual agency's equipment.		N	Transit striping and vinyl requirements were not included with the IFB. Price includes white gel coat paint. We can provide a price for exterior paint and graphics when determined by the agency.
Heating	Fresh air type front hot water heater with defroster, located in front of passenger compartment, operated from driver's seat		N	HVAC is independent from the defroster. Defroster is an electric, not a hot water heater.
Rear Heater	Minimum of 40,000 BTU / hour controlled from driver's position, located to not adversely affect wheelchair tie down area.		N	Our proposed bus is not equipped with an independent rear heater.
Parking Brake	Manually operated to rear when brakes/driveshaft. Ability to hold "fully loaded vehicle" on 15% incline.		Y	
Steering	Power steering with tilt steering wheel		Y	
Brakes	Four wheel antilock, compliance with FMVSS-121 or FMVSS-105		Y	
Wiring	Shall be manufacturer's standard for circuits involved. All wiring shall be run inside the body in a protected area. Any wiring shall be run inside the body in a protected area. Any wiring that is exposed to the elements shall be in loom and securely clipped for maximum protection. Rubber or plastic coated clips. Color-coded and labeled. programmable electrical system. 12V multiplex system with standard bus bar including two six-way fuse blocks for added accessories / systems. Schematics made available to the recipient via electronic customer specific data portal.		N	Proterra's proposed bus some spare fuse positions at the rear and front of the vehicle (24 and 12, switched and unswitched power) as well as a customer dedicated fuse box in the electronics cabinet. However, our price does not include these items.
Battery Access Door/Disconnect Switch	Exterior battery disconnect switch with access door panel.		Y	
Fast Idle/ Interlock	Voltage monitor/ engine idler. Engages when vehicle is in discharge situation, transmission in park and parking brake applied. Deactivates when parking brake is released and vehicle is put in gear.		N	Not applicable to electric buses (no engine)
Floor Structure	Steel sub floor isolated from chassis with OEM rubber isolation mounts, bolted to the chassis frame rails. Floor decking 5/8" engineered wood w/ moisture barrier laminated to lower surface and moisture sealed edges.		N	All-composite monocoque bus body including flooring which is bonded to the body.
Combination Roof Ventilator/ Emergency Exit	24"x24" installed in roof (front and rear). Ventilator able to allow fresh air inside when raised.		Y	
Bumpers	Shall be provided at both front and rear of the vehicle. They shall wrap around the body sufficiently to give protection against impact at the body corners. The front and rear bumpers shall be supplied by the chassis OEM. The bumper brackets are to be bolted to the chassis frame.		Y	
Air Condition	State AC System: _____ Valeo _____		Y	HVAC manufacturer Valeo (R407 refrigerant)
Standard Warranty - Minimum	Bus: Twelve (12) month, 50,000 miles (which ever comes first) Bumper-to-Bumper		Y	
OPTIONAL EQUIPMENT	Model Number/Order Code	Description	MSRP/LIST PRICE	CONTRACT PRICE
Please list all optional equipment, additional safety options, paint schemes, graphics/wraps, and accessories below that your firm can provide beyond the factory options.				
Overhead Charging Interface	N/A	Overhead, Conductive - SAE J3105 Pantograph Rails (Inverted Pantograph)	N/A	\$ 12,737.00
Charging Ports	N/A	Two J1772-CCS Charge Ports: (1) Curbside Rear & (1) Streetside Rear	N/A	\$ 1,828.00
Towing	N/A	Capable of front tow and rear ditch extraction (no rear tow)	N/A	\$ 6,189.00
Tow Connections	N/A	Base plus additional Male Industrial fitting @ bumper for brake control	N/A	\$ 905.00
Wheels	N/A	Polished Aluminum with Durabright and DuraFlange, ALCOA 896513DD	N/A	\$ 3,510.00
Wheel and Tire Accessories	N/A	Hubodometer	N/A	\$ 374.00
Driver Foot Controls	N/A	Adjustable Pedals	N/A	\$ 2,462.00
HVAC	N/A	Eberspacher 136 All Electric HVAC - 30 kW cooling, 16 kW heating, R134a refrigerant	N/A	\$ 7,567.00
Winter Weather Package	N/A	Auxiliary Heat diesel fuel fired heater	N/A	\$ 24,201.00
Passenger Windows	N/A	Varies by customer selection.	N/A	Quote
Bike Rack	N/A	Varies by customer selection.	N/A	Quote
Exterior Graphics	N/A	Varies by customer selection.	N/A	Quote
Operator's Barrier	N/A	Varies by customer selection.	N/A	Quote
Floor Covering	N/A	Varies by customer selection.	N/A	Quote
Fare Collection	N/A	Varies by customer selection.	N/A	Quote
Passenger Seating	N/A	Varies by customer selection.	N/A	Quote
Passenger Doors	N/A	Varies by customer selection.	N/A	Quote
Loading Systems - ADA Ramp	N/A	Varies by customer selection.	N/A	Quote
Wheelchair Accommodations	N/A	Varies by customer selection.	N/A	Quote
Destination Signs	N/A	Varies by customer selection.	N/A	Quote
For unlisted options (not listed above), please provide a percentage off MSRP/Catalog price	% Off MRSP/Catalog/List			0%
Battery Charging Infrastructure (Equipment Only - No infrastructure/installation prices)	Model Number/Order Code	Please provide options. (Equipment only - no installation)	MSRP/LIST PRICE	CONTRACT PRICE
PI Cabinet	N/A	120 kW with a single 18", 200A dispenser	N/A	\$ 64,750.00
PI Cabinet	N/A	120 kW with multiple dispensers	N/A	Quote
PI Cabinet	N/A	380 kW with a single 18", 200A dispenser	N/A	\$ 76,250.00
PI Cabinet	N/A	380 kW with multiple dispensers	N/A	Quote
PI Cabinet	N/A	450 kW with a single 18", 200A dispenser	N/A	\$ 188,000.00
PI Cabinet	N/A	450 kW with multiple dispensers	N/A	Quote
PL Station	N/A	1440 kW with 10 single 18", 200A dispensers	N/A	\$ 574,000.00
PL Station	N/A	1440 kW with a variety of plug-in dispensers or pantograph dispensers	N/A	Quote
Extended Warranty and Price (include coverage description, number of years, and price) e.g. bus, batteries, electric motor, or other major systems	Coverage		MSRP/LIST PRICE	Contract Price
Bumper To Bumper	2 years/100,000 miles	Complete Bus Warranty for 2 years / 100,000 miles	N/A	\$ 7,500.00
Propulsion System	12 years/500,000 miles	12 year / 500,000 mile Propulsion System Warranty	N/A	\$ 36,753.00
Energy Storage System	12 years/500,000 miles	12 year / 500,000 mile (492 kWh) 70% Capacity Warrantable End Of Life (WEOL)	N/A	\$ 78,750.00
Energy Storage System	12 years/500,000 miles	12 year / 500,000 mile (738 kWh) 70% Capacity Warrantable End Of Life (WEOL)	N/A	\$ 118,125.00
Low-Voltage and High-Voltage Wiring harnesses	12 Years	12 years	N/A	\$ 7,085.00
Auxiliary Heating	3 years/150,000 miles	Two (2) years/100,000 miles standard with an additional 1 year/50,000 mile Ext. Total 3 years/150,000 miles	N/A	\$ 327.00
Chassis System Warranty	3 years/150,000 miles	Two (2) years/100,000 miles standard with an additional 1 Year/50,000 mile Ext. Total 3 years/150,000 miles	N/A	\$ 3,482.00
Valeo HVAC Warranty	4 years	Three (3) years standard with an additional 1 Year Ext. Total 4 years.	N/A	\$ 3,240.00

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HV Power Electronics & Cooling Warranty	3 years/150,000 miles	Two (2) years/100,000 miles standard with an additional 1 year/50,000 mile Ext. Total 3 years/150,000 miles	N/A	\$	1,782.00
Control Systems & Driver Convenience Warranty	3 years/150,000 miles	Two (2) years/100,000 miles standard with an additional 1 year/50,000 mile Ext. Total 3 years/150,000 miles	N/A	\$	2,060.00
Post-Warranty Maintenance	Contract Amount				
Labor (hourly rate)	\$ / per hour	\$ 195.00			
Parts (Discount Percentage)	% discount off of list/MRSP	0%			

Body Manufacturer's Electronic Customer Specific Portal and Fleet Database: The manufacturer of the body must make a bus and customer specific electronic data portal available for each bus built that includes (at a minimum) the following information:

- Manufacturer Serial Number
- Chassis VIN
- Sold date
- Body warranty expiration date
- Service / Operations manual
- Body warranty information
- Post Award Buy America Certificate
- Bus body parts listing (with photos when available)
- Bus body electrical schematics
- List of items shipped with bus

Bus Testing: The bus offered must have completed testing at The Federal Bus Testing Facility in Altoona, PA in the 5 year / 150,000-mile category. [Proof of completed test to accompany bid.](#) Failure on the part of the Bidder to provide all requested documentation may be cause to deem the bid non-responsive.

Maintenance Provisions: [A description of how and by whom warranty service can be provided is to be included with bid.](#) Failure on the part of the Bidder to provide all requested documentation may be cause to deem the bid non-responsive. The vendor shall act as the first source for performing warranty work. This must cover both mechanical and body work. The manufacturer's warranty covering parts, materials and workmanship shall apply for a minimum period of twelve (12) months or 12,000 miles, whichever occurs first, and this warranty shall include repair and replacement of defective parts and labor. The structural body warranty to be a minimum of three (3) years or 150,000 miles, whichever occurs first. The successful vendor shall be required to offer a toll-free number to all recipients for warranty inquiries, parts orders and service related questions. The vendor shall have personnel available to answer warranty, parts, and service inquiries Monday Through Friday, 8 A.M. to 5 P.M., except during holidays recognized by the Commonwealth of Virginia. The vendor shall respond to warranty, parts, and service inquiries and offer a reasonable initial plan to address such inquiries within 24 hours of call receipt or the next business day, whichever is later, via phone or email.

All bidders must offer proof of both chassis and body warranty (including bus body, air conditioning and wheelchair ramp) service points within the Commonwealth of Virginia. All bidders shall be required to submit documentation providing the names of the vendors. Successful vendor shall be required to maintain service facilities in Central / Southwest Virginia, Richmond, Tidewater and Northern Virginia.

The vehicle to be furnished shall conform to all applicable Federal and Motor Vehicle Safety Standards and all equipment shall conform to Title 46.1, Chapter 4, and Article 9 of the Code of Virginia. Chassis to be a standard proven model of manufacturer's latest current production and include all standard equipment as advertised with additional optional equipment as outlined above. All components, unless otherwise required by these specifications, shall be the standard or optional equipment specifically advertised and installed by the manufacturer including any additional warranties.

Prior to delivery the vendor must perform new vehicle service preparation. The vehicle shall be in acceptable condition upon delivery and will be accepted only by an authorized person designated by the agency. Delivery shall be during normal business hours, i.e. 8 AM - 5 PM, Monday through Friday. Payment will not be initiated until the agency is assured that the vehicle has been delivered in an acceptable condition and everything is working properly.



PROTERRA

Commonwealth of Virginia

8. Attachment J - Anti-Lobbying, TVM, and Government-Wide Debarment and Suspension

TRANSIT VEHICLE MANUFACTURER (TVM) CERTIFICATION

Pursuant to the provisions of Section 105(f) of the Surface Transportation Assistance Act of 1982, each bidder for this contract must certify that it has complied with the requirements of 49 CFR Part 26.49, regarding the participation of Disadvantaged Business Enterprises (DBE) in FTA assisted procurements of transit vehicles. Absent this certification, properly completed and signed, a bid shall be deemed non-responsive.

Certification

I hereby certify, for the bidder named below, that it has complied with the provisions of 49 CFR Part 26.49 and that I am duly authorized by said bidder to make this certification.

BIDDER/COMPANY

Name of Bidder/Company Proterra Operating Company, Inc.

Signature of Representative 

Type or Print Name John Walsh

Title Chief Commercial Officer Date 08 / 25 / 2022

NOTARY

Type or Print Name Lesley M. Fonokalafi - Notary Public

Signature of Notary 

Place Notary SEAL Here:

Lesley M. Fonokalafi
Notary Public, State of South Carolina
My Commission Expires June 30, 2025

BUS TESTING CERTIFICATION

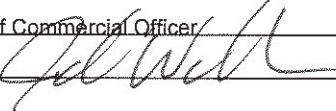
The undersigned bidder [Contractor/Manufacturer] certifies that the vehicle model or vehicle models offered in this bid submission complies with 49 CFR Part 665.

A copy of the test report (for each bid ITEM) prepared by the Federal Transit Administration's (FTA) Altoona, Pennsylvania Bus Testing Center is attached to this certification and is a true and correct copy of the test report as prepared by the facility.

The undersigned understands that misrepresenting the testing status of a vehicle acquired with Federal financial assistance may subject the undersigned to civil penalties as outlined in the U.S. Department of Transportation's regulation on Program Fraud Civil Remedies, 49 CFR Part 31. In addition, the undersigned understands that FTA may suspend or debar a manufacturer under the procedures in 49 CFR Part 29.

Name of Bidder/Company Name: Proterra Operating Company, Inc.

Type or print name: John Walsh - Chief Commercial Officer

Signature of authorized representative:  _____

Signature of notary and SEAL: _____

Date of Signature: 08 / 25 / 2022

Federal Certifications

CERTIFICATION AND RESTRICTIONS ON LOBBYING

I, John Walsh - Chief Commercial Officer hereby certify
(Name and title of official)

On behalf of Proterra Operating Company, Inc. that:
(Name of Bidder/Company Name)

- No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.
- If any funds other than federal appropriated funds have been paid or will be paid to any person influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form — LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including sub-contracts, sub-grants and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The undersigned certifies or affirms the truthfulness and accuracy of the contents of the statements submitted on or with this certification and understands that the provisions of 31 U.S.C. Section 3801, et seq., are applicable thereto.

Name of Bidder/Company Name: Proterra Operating Company, Inc.

Type or print name: John Walsh - Chief Commercial Officer

Signature of authorized representative: [Signature] Date 08/25 /2022

Signature of notary and SEAL: [Signature] Lesley M. Fonokalafi - Notary Public

Lesley M. Fonokalafi
Notary Public, State of South Carolina
My Commission Expires June 30, 2025

**GOVERNMENT-WIDE DEBARMENT AND SUSPENSION
(NONPROCUREMENT)**

Instructions for Certification By signing and submitting this bid or proposal, the prospective lower tier participant is providing the signed certification set out below.

(1) It will comply and facilitate compliance with U.S. DOT regulations, "Nonprocurement Suspension and Debarment," 2 CFR part 1200, which adopts and supplements the U.S. Office of Management and Budget (U.S. OMB) "Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," 2 CFR part 180,

(2) To the best of its knowledge and belief, that its Principals and Subrecipients at the first tier:

- a. Are eligible to participate in covered transactions of any Federal department or agency and are not presently:
 1. Debarred,
 2. Suspended,
 3. Proposed for debarment,
 4. Declared ineligible,
 5. Voluntarily excluded, or
 6. Disqualified,
- b. Its management has not within a three-year period preceding its latest application or proposal been convicted of or had a civil judgment rendered against any of them for:
 1. Commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction, or contract under a public transaction,
 2. Violation of any Federal or State antitrust statute, or,
 3. Commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making any false statement, or receiving stolen property,
- c. It is not presently indicted for, or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses listed in the preceding subsection 2.b of this Certification,
- d. It has not had one or more public transactions (Federal, State, or local) terminated for cause or default within a three-year period preceding this Certification,
- e. If, at a later time, it receives any information that contradicts the statements of subsections 2.a —2.d above, it will promptly provide that information to FTA,
- f. It will treat each lower tier contract or lower tier subcontract under its Project as a covered lower tier contract for purposes of 2 CFR part 1200 and 2 CFR part 180 if it:
 1. Equals or exceeds \$25,000,
 2. Is for audit services, or,
 3. Requires the consent of a Federal official, and
- g. It will require that each covered lower tier contractor and subcontractor:
 1. Comply and facilitate compliance with the Federal requirements of 2 CFR parts 180 and 1200, and
 2. Assure that each lower tier participant in its Project is not presently declared by any Federal department or agency to be:
 - a. Debarred from participation in its federally funded Project,
 - b. Suspended from participation in its federally funded Project,
 - c. Proposed for debarment from participation in its federally funded Project,
 - d. Declared ineligible to participate in its federally funded Project,
 - e. Voluntarily excluded from participation in its federally funded Project, or
 - f. Disqualified from participation in its federally funded Project, and
 3. It will provide a written explanation as indicated on a page attached in FTA's TrAMS platform or the Signature Page if it or any of its principals, including any of its first tier Subrecipients or its Third-Party Participants at a lower tier, is unable to certify compliance with the preceding statements in this Certification Group.

(3) It will provide a written explanation as indicated on a page attached in FTA's TrAMS platform or the Signature Page if it or any of its principals, including any of its first tier Subrecipients or its Third-Party Participants at a lower tier, is unable to certify compliance with the preceding statements in this Certification Group.

Certification

Contractor: PProterra Operating Company, Inc. roterra Operating Company, Inc.

Signature of Authorized Official: DocuSigned by: John Walsh 190E3C038916112 Date 9/7/2022

Name and Title of Contractor's Authorized Official: John Walsh, Chief Commercial Officer



PROTERRA

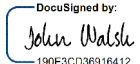
Commonwealth of Virginia

9. Forms and Certifications

Request for Proposal
August 2, 2022
IFB# 6447

CER 3. Acknowledgement of Addenda

Failure to acknowledge receipt of all addenda may cause the Proposal to be considered nonresponsive to the Solicitation. Acknowledged receipt of each addendum must be clearly established and included with the Proposal.

The undersigned acknowledges receipt of the following addenda to the documents:	
Addendum No.: 1	Dated: 9/13/2022
Addendum No.: 2	Dated: 9/27/2022
Addendum No.:	Dated:
Addendum No.:	Dated:
Proposer: Proterra Operating Company, Inc. Name: John Walsh Title: Chief Commercial Officer Phone: (864) 438-0000 Street address: 1815 Rollins Rd. City, state, ZIP: Burlingame, CA 94010	
 190E3CD36916412	9/8/2022
Authorized signature	Date

CER 4. Contractor Service and Parts Support Data

Location of nearest Technical Service Representative to Agency

Name: Davis Elswick Mark Acree Ihar Pushyla
Address: Washington, DC Greensboro, NC Raleigh, NC
Telephone: (864) 438-0000

Describe technical services readily available from said representative: Davis, Mark, and Ihar will provide full technical support to ensure successful product launch and operation. They will also have access to Proterra's complete Customer Service Team as necessary.

Location of nearest Parts Distribution Center to Agency:

Name: Proterra Operating Company, Inc.
Address: 1 Whitlee Ct. Greenville, SC 29607
Telephone: (864) 438-0000

Describe the extent of parts available at said center: This Proterra location is where the buses for the Commonwealth of Virginia Department of General Services will be manufactured, and will house all parts required to maintain and support Proterra buses.

Policy for delivery of parts and components to be purchased for service and maintenance:

Regular method of shipment: UPS/FedEx ground for normal circumstances. Priority shipping can be arranged as needed

Cost to Agency: During warranty period, all shipping is covered by Proterra. After warranty period, cost will vary based on actual shipping cost due to size, weight, and shipping method.

CER 5. Form for Proposal Deviation

This form shall be completed for each condition, exception, reservation or understanding (i.e., Deviation) in the Proposal according to “Conditions, Exceptions, Reservations or Understandings.” One copy without any price/cost information is to be placed in the Technical Proposal as specified in “Technical Proposal Requirements,” and a separate copy with any price/cost information placed in the Price Proposal as specified in “Price Proposal Requirements.”

Virginia Department of Rail and Public Transportation
 IFB 6447

Deviation No.: 1	Contractor: Proterra Operating Company, Inc.	RFP section: Section 6 Technical Specifications	Page:
<p>Complete description of Deviation:</p> <p>Please see the attached list of deviations and clarifications derived from the questions that were not approved or denied by Virginia Department of Rail and Public Transportation.</p>			
<p>Rationale (pros and cons):</p>			

Deviations and Clarifications
Department of General Service/Division of Purchases and Supply (DGS/DPS)
 IFB# 6447
 Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys
 Heavy Duty, 12 Year (29 ft. – 60 ft. sizes)

Proposer's Company Name: Proterra Operating Company, Inc.

Request Number	Spec Title, Section, No.	Spec Page No.	Specification Wording	Deviations and Clarifications
1.	SP 1.2 Pilot Bus	76	<p>The Contractor shall produce one pilot vehicle for each type of vehicle with respect to the base order.</p> <p>The step height shall not exceed 16.5 in. at either doorway without kneeling and shall not exceed 15.5 in. at the step. A maximum of two steps are allowed to accommodate a raised aisle floor in the rear of the bus.</p>	<p>Given the variety of different Authorized Users that can access this contract, pilot buses will only be required when agreed to between the Authorized User and the Contractor.</p> <p>Step height of 15.7 in. at the front door and 17.1 in. at the rear door. The buses are still capable of full kneel functionality where the steps can be lowered by ~3 inches.</p> <p>One of the major benefits of the ZX5 vehicle is the placement of the battery packs under the floor and between the wheels. Having the batteries located in this location allows for the following benefits:</p> <ul style="list-style-type: none"> • Lower center of gravity, better handling; • Increased safety; • No HV batteries inside the passenger compartment; • Batteries are lower than the side impact height for automobiles <p>However, as a result, the step height and floor height are slightly taller than average vehicles at nominal ride height.</p>
2.	TS 6.4 Step Height TS 6.4.1 Transit Coach	111	<p>Front breakover 8 deg (min.)</p>	<p>Proterra's ZX5+ has a breakover angle of 7.8 deg. Note: With the over-raise feature engaged, the breakover angle increases to 8.9 degrees.</p>
3.	TS 6.6 Ramp Clearances Table 2	112	<p>Wheel area clearance shall be no less than 8 in. for parts fixed to the bus body and 6 in. for parts that move vertically with the axles.</p> <p>Height of the step above the street shall be no more than 16 in. measured at the centerline of the front and rear doorway. All floor measurements shall be with the bus at the design running height and on a level surface and with the standard installed tires. A maximum of two steps are allowed to accommodate a raised aisle floor in the rear of the bus.</p>	<p>The wheel area clearance is no less than 7.85" for parts fixed to the bus body and 6" for parts that move vertically with the axles.</p>
4.	TS 6.7 Ground Clearance	112	<p>TS 6.8 Floor Height TS 6.8.1 Transit Coach</p>	<p>Step height of 15.7 in. at the front door and 17.1 in. at the rear door. The buses are still capable of full kneel functionality where the steps can be lowered by ~3 inches.</p> <p>One of the major benefits of the ZX5 vehicle is the placement of the battery packs under the floor and between the wheels. Having the batteries located in this location allows for the following benefits:</p> <ul style="list-style-type: none"> • Lower center of gravity, better handling; • Increased safety;
5.		113		

Deviations and Clarifications
 Department of General Service/Division of Purchases and Supply (DGS/DPS) IFB#
 6447

Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys
 Heavy Duty, 12 Year (29 ft. – 60 ft. sizes)

				<ul style="list-style-type: none"> • No HV batteries inside the passenger compartment, • Batteries are lower than the side impact height for automobiles <p>However, as a result, the step height and floor height are slightly taller than average vehicles at nominal ride height.</p>
6.	TS 7.3 Acceleration	115	<p>NOTE: The system shall be programmable to allow optimization of acceleration. Performance may be affected when reprogramming. The manufacturer shall supply the new performance data.</p>	<p>Bus design provides three performance modes that adjust the power and torque capabilities of the power train; however, the acceleration and deceleration rates are not further programmable by customer technicians.</p>
7.	TS 7.3.1 Acceleration (Hybrid or Battery Electric Coach)	115	<p>The system shall be programmable to allow optimization of acceleration and deceleration rate. Performance may be affected when reprogramming. The manufacturer shall supply the new performance data.</p> <p>The proposal shall also include a comprehensive statement of the warranty terms relating to the battery, including explanation of all disclaimers within the warranty. The battery life shall be stated in terms of cyclic life and calendar life in the proposal with a description of all factors that will affect the battery life, including charging, operation and environmental effects. The Agency operating profile shall be considered when making this analysis. A life- cycle cost analysis of the proposed battery system in the specified application shall be provided.</p>	<p>Bus design provides three performance modes that adjust the power and torque capabilities of the power train; however, the acceleration and deceleration rates are not further programmable by customer technicians.</p> <p>Our standard warranty is provided in terms of gross discharge throughput rather than cyclic life. Please refer to Exhibit A for additional information.</p>
8.	TS 9.3.5 Energy Storage System	122		
9.	TS 9.3.5 Energy Storage System	126	<p>DEFAULT AC CHARGING/ALTERNATE DC CHARGING</p> <p>The bus must support SAE J3068 charging standard. This means that the bus would be capable of being charged from an alternating current or direct current EVSE compliant with SAE J3068, using a Type 2 connector for AC6</p>	<p>DC charging compliant with SAE J1772 rather than SAE J3068. J3068 is not an option our vehicles currently support.</p>

Deviations and Clarifications
 Department of General Service/Division of Purchases and Supply (DGS/DPS) IFB#
 6447

Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys
 Heavy Duty, 12 Year (29 ft. – 60 ft. sizes)

	plugs or CCS Combo 2 connector for AC6 and DC8/AC6 plugs.			
10.	<p>DC charging complaint with SAE J3105 rather than SAE J2954/2. Inductive charging is not an option our vehicles currently support.</p>	<p>DEFAULT Wireless Inductive Charging The bus must support published standards including [add applicable standards if published, e.g., SAE J2954/2] for wireless inductive bus charging. Proposers shall include a detailed description of their charging system and specify its compliance with one of the above-listed standards. Proposers shall include a description of the charging infrastructure required to charge the bus on route and/or at the depot. Proposers shall describe the expected level of interoperability of the proposed charging system with other vehicles and transit buses</p>	TS 9.3.5 Energy Storage System	126
11.	<p>Protterra's system design, does not use a Propulsion System Controller (PSC). We utilize a powertrain controller to manage the traction motor and transmission, an ESM to interface to the batteries, a charge controller for charging, and a vehicle controller to integrate the systems all together. The vehicle controller manages all power flow and ancillary load management. Additionally, our standard design uses a proprietary SOC algorithm rather than SAE J2711.</p>	<p>The PSC regulates energy flow throughout hybrid system components in order to provide motive performance and accessory loads, as applicable, while maintaining critical system parameters (voltages, currents, temperatures, etc.) within specified operating ranges. The controller shall monitor and process inputs and execute outputs as appropriate to control the operation of all propulsion system components. Energy storage system SoC correction methods stated in SAE J2711 shall be used (for all-electric or hybrid only).</p>	TS 9.3.6 Propulsion System Controller (PSC)	126
12.	<p>Our standard design maintains pressure relief through an overpressure relief cap and an electrically actuated solenoid valves which are opened during fill to relieve pressure and can be manually actuated by activating the fill switch. The fill ports are located behind the upper rear curbside charge plate access door. A fill switch will open a valve to relieve pressure. The operator can check if the coolant is low via the low Coolant LEDs. One (or both) of these will be illuminated indicating which system is low on coolant.</p>	<p>A means of determining satisfactory component coolant level shall be provided. A spring-loaded, push-button type valve or lever shall be provided to safely release pressure or vacuum in the cooling system with both it and the water filler no more than ±60 in. above the ground. Both shall be accessible through the same access door.</p>	TS 10.1 Component Thermal Management	128

Deviations and Clarifications
 Department of General Service/Division of Purchases and Supply (DGS/DPS) IFB#
 6447
 Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys
 Heavy Duty, 12 Year (29 ft. – 60 ft. sizes)

13.	TS 10.1.4 Mounting	129	Whole section	Proterra's standard design does not include a charge air cooler.
14.	TS 10.2 Charge Air Cooling	130	Whole section	Proterra's bus does not have an engine this section is not applicable.
15.	TS 10.3 Transmission Cooling	130	If a transmission is present in the bus, the transmission shall be cooled by a heat exchanger sized to maintain operating fluid within the transmission manufacturer's recommended parameters of flow, pressure and temperature. Where applicable, the transmission cooling system shall be matched to the retarder and engine cooling systems to ensure that all operating fluids remain within recommended temperature limits established by each component manufacturer. Where applicable, the engine cooling system should provide coolant bypassflow to the transmission cooling system with the engine thermostats closed.	Proterra's standard bus design does not have a transmission cooler. Based on testing, there is enough oil volume that the temperature always stays within reasonable levels. This approach meets with the alternative requirement "The transmission shall not have a cooler." provided in this section.
16.	TS 11. Transmission	130	NOTE: Not applicable to battery electric buses.	Proterra's standard bus design includes a multi speed transmission paired with an electric traction motor. This design optimizes performance and efficiency as evidenced by our most recent partial Altoona report showing the longest documented range on a battery electric bus. The range for the three Altoona driving cycles were 288 miles, 304 miles and 305 miles respectively.
17.	TS 11. Transmission	104	An electronic transmission fluid level monitoring and protection system shall be provided.	Proterra's standard design does not include an electronic transmission fluid level monitoring and protection. The transmission is a completely sealed system. There is no external heat exchanger. Therefore, there is really no failure mode where oil leaks out of the transmission eliminating the need for fluid level monitoring.
18.	TS 14.1 Service	135	DEFAULT Engine oil and the radiator filler caps shall be hinged to the filler neck and closed with spring pressure or positive locks to prevent leakage. All fluid fill locations shall be properly labeled with permanent metal tags to help ensure that	Proterra's filler caps are threaded but properly labeled to help ensure that correct fluid is added.

Deviations and Clarifications
 Department of General Service/Division of Purchases and Supply (DGS/DPS) IFB#
 6447

Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys
 Heavy Duty, 12 Year (29 ft. – 60 ft. sizes)

			correct fluid is added. All fillers shall be easily accessible with standard funnels, pour spouts and automatic dispensing equipment. All lubricant sumps shall be fitted with magnetic-type drain plugs or magnets in pan.	
19.	TS 14.1 Service	136	DEFAULT Engine Oil Pressure and Coolant Temperature Display Engine oil pressure and coolant temperature gauges required in engine compartment. Whole section	Proterra's bus has no engine and therefore no gauges are provided in the rear compartment.
20.	TS 15.3 Charge Air Piping	137	Whole section	Proterra's bus has no engine and therefore no Turbocharger is required.
21.	TS 28.5 Construction	137	Whole section	Proterra's standard design incorporates an all-composite monocoque structure with composite flooring. This complies with the alternative requirement "Composite flooring." provided in this section.
22.	TS 30.5 Bellows	155	Whole section	Proterra will provide our standard design which does not incorporate bellows.
23.	TS 31.3.4 Kneeling	157	A warning light mounted near the curbside of the front door, a minimum 2.5 in. diameter amber lens, shall be provided that will blink when the kneel feature is activated. Kneeling shall not be operational while the wheelchair ramp is deployed or in operation. Whole section	Proterra's standard warning light provides a minimum of 1.75" diameter lens as opposed to the required 2.5" diameter.
24.	TS 32.1 Wheels	158	Whole section	Proterra's will provide our standard brushed aluminum wheels. This complies with the alternative requirement "Brushed aluminum." provided in this section.
25.	TS 32.2 Tires	158	Whole section	Proterra will supply tires rather than leased. This complies with the alternative requirement "The tires shall be supplied by the Contractor." provided in this section.
26.	TS 33. Steering	159	Whole section	Proterra's standard bus design includes an electrically driven power steering hydraulic pump. This complies with the alternative requirement "On battery-electric and hybrid coaches capable of supporting it, electrically driven hydraulic power steering may be used." provided in this section.

Deviations and Clarifications
 Department of General Service/Division of Purchases and Supply (DGS/DPS) IFB#
 6447

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 Heavy Duty, 12 Year (29 ft. – 60 ft. sizes)

27.	TS 33.1 Steering Axle (Transit Coach)	159	Whole section	Proterra's standard design incorporates an Independent Suspension Front Axle. This approach meets complies the alternative requirement "Independent Suspension Axle" provided in this section.
28.	TS 37.4 Hubs and Drums/Discs	164	Whole section	Proterra provides disc brakes on front and rear axles. This approach meets the alternative requirement "Disc Brakes on All Axles" provided in this section.
29.	TS 39.3 Air Lines and Fittings	167	Whole section	Proterra will provide the following color combination for air lines: <ul style="list-style-type: none"> • Green: Indicates primary brakes and supply • Red: Indicates secondary brakes • Brown: Indicates parking brake • Yellow: Indicates transmission and ride height controller feed (we don't have governor air lines) • Black: Indicates accessories & doors • Blue: Indicates curb side air bags • Orange: Indicates street side air bags This complies with the alternative requirement "Contractor to designate color coding" provided in this section.
30.	TS 42.1.1 Low-Voltage Batteries (24 V)	170	Whole section	Proterra uses two, Group 31, deep cycle, maintenance free batteries. This is enough to ensure reliable vehicle startup. This complies with the alternative requirement "Two Group 31 AGM Batteries" provided in this section.
31.	TS 42.1.4 Battery Compartment	173	The batteries shall be securely mounted on a stainless steel or equivalent tray that can accommodate the size and weight of the batteries. The battery tray, if applicable, shall pull out easily and properly support the batteries while they are being serviced. The tray shall allow each battery cell to be easily serviced. A locking device shall retain the battery tray to the stowed position.	Proterra's standard design provides a A1011 steel tray that's E-coated and powder coated. This provides a stronger tray that exceeds 1000 hours of salt spray testing.
32.	TS 42.1.5 Auxiliary Electronic Power Supply	173	If required, gel-pack, or any form of sealed (non-venting) batteries used for auxiliary power are allowed to be mounted on the interior of the vehicle if they are contained in an enclosed, non-airtight compartment and accessible only to maintenance personnel. This compartment shall contain a warning label prohibiting the use of vented (flooded) lead-acid batteries.	Proterra's standard design does not include an auxiliary battery pack in the vehicle. Not required due to our vehicle design.

Deviations and Clarifications
 Department of General Service/Division of Purchases and Supply (DGS/DPS) IFB#
 6447

Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys
 Heavy Duty, 12 Year (29 ft. – 60 ft. sizes)

33.	TS 46.5 Normal Bus Operation Instrumentation and Controls	182	Whole section	<p>The list of instruments and alarms provided in this section may or may not apply to the Proterra electric bus and would like to request a note to be included which says, "to be used for reference purposes only". Details on dash layout and final list of switches will be discussed in detail at the preproduction meeting.</p>
34.	TS 46.6.1 Pedal Angle	187	<p>The vertical angle of the accelerator and brake pedals shall be determined from a horizontal plane regardless of the slope of the cab floor. The accelerator and brake pedals shall be positioned at an angle of 37 to 50 deg at the point of initiation of contact and extend downward to an angle of 10 to 18 deg at full throttle.</p>	<p>Proterra's accelerator and brake pedals angles are as follows: Accelerator (non-adjustable) Initiation 45°-> APTA 35-50° Full Throttle 25° -> APTA 10-18° Brake (non adjustable) Initiation 45°-> APTA 35-50° Full Throttle 25° -> APTA 10-18°</p>
35.	TS 51.1 Glazing	198	<p>DEFAULT Shaded Band The upper portion of the windshield above the driver's field of view shall have a dark, shaded band and marked AS-3, with a minimum luminous transmittance of 5 percent when tested in accordance to ASTM D1003.</p>	<p>Proterra's standard design incorporates a windshield that does not have a shaded band as our overhead panel is fairly low and a shaded band may interfere with mirror visibility. However, proposer could apply a tint film with 5% LT that sits just below the blackout on the street side of the windshield if this is acceptable and/or desired by the Agency. This complies with the alternative requirement "No band required." provided in this section.</p>
36.	TS 51.1 Glazing	198	<p>DEFAULT Two-piece windshield.</p>	<p>Proterra will provide our single-piece windshield which is made of 1/4" thick laminated glass with 73% LT conforming to the requirements of ANSI Z26.1 Test Grouping 1A and the Recommended Practices defined in SAE J673. This approach meets the alternative requirement "One-piece windshield." provided in this section.</p>
37.	TS 52. Driver's Side Window	198	<p>The driver's side window shall be the sliding type, requiring only the rear half of the sash to latch upon closing, and shall open sufficiently to permit the seated operator to easily adjust the street-side outside rearview mirror. When in an open position, the window shall not rattle or close during braking. This window section shall slide in tracks or channels designed to last the service life of the bus. The operator's side window shall not be bonded in place and shall be easily replaceable. The glazing material shall have a single-density tint.</p>	<p>Proterra will provide our tempered glazing, non-egress, hidden frame driver's window designed as shown in Exhibit B. Traditional frame is not an option we currently offer. Our street side mirror is remotely adjustable with a driver's switch rather than manually adjusted. Additionally, the driver's side window allows the view through the glazing at the front of the assembly beginning not more than 27.2 in. above the operator's floor</p>

Deviations and Clarifications
 Department of General Service/Division of Purchases and Supply (DGS/DPS) IFB#
 6447
 Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys
 Heavy Duty, 12 Year (29 ft. – 60 ft. sizes)

38.	TS 53.2 Emergency Exit (Egress) Configuration	200	<p>The driver's view, perpendicular through the operator's side window glazing, should extend a minimum of 33 in. (840 mm) to the rear of the heel point on the accelerator, and in any case must accommodate a 95th percentile male operator. The view through the glazing at the front of the assembly should begin not more than 26 in. (560 mm) above the operator's floor to ensure visibility of an under-mounted convex mirror.</p> <p>Driver's window construction shall maximize ability for full opening of the window.</p> <p>DEFAULT Traditional Frame</p>	<p>Proterra will provide our standard hidden frame windows. Traditional frame windows are not an option we currently offer. This complies with the alternative requirement "Hidden Frame (Seamless)," provided in this section.</p> <p>Proterra will provide our current HVAC testing as proof of our compliance with this requirement rather having to perform additional testing.</p>
39.	TS 54. Capacity and Performance	207	<p>Additional testing shall be performed as necessary to ensure compliance to performance requirements stated herein.</p>	
40.	TS 55. Controls and Temperature Uniformity	209	<p>ALTERNATIVE (BATTERY ELECTRIC BUS/FUEL CELL BUS) Reduced Energy Consumption Setpoint</p> <p>Interior temperature distribution shall be uniform to the extent practicable to prevent hot and/or cold spots. After stabilization with doors closed, the temperatures between any two points in the passenger compartment in the same vertical plane, and 6 to 72 in. above the floor, shall not vary by more than 5 °F with doors closed. T</p>	<p>Proterra's standard HVAC controls design provides a manual mode selection option with a single control setpoint rather than a dual setpoint as describe in this section.</p> <p>Proterra's HVAC design after stabilization with doors closed, the temperatures between any two points in the passenger compartment in the same vertical plane, and 6 to 72 in. above the floor, will not vary by more than +/- 15.</p>
41.	TS 55. Controls and Temperature Uniformity	210		
42.	TS 56.3 Controls for the Climate Control System (CCS)	212	<p>•A manually operated control valve shall control the coolant flow through the heater core.</p>	<p>Proterra's bus design is equipped with an electric, resistive driver's heater/defroster unit. There is no hot coolant on board the bus utilized for this purpose.</p>
43.	TS 56.4 Driver's Compartment Requirements	213	<p>A ventilation system shall be provided to ensure driver comfort and shall be capable of providing fresh air in both the foot and head</p>	<p>Proterra's system design does not have provisions to provide direct fresh-air (exterior air) to the driver's area. Fresh air is only provided from the HVAC system or from the driver's window.</p>

Deviations and Clarifications
 Department of General Service/Division of Purchases and Supply (DGS/DPS) IFB#
 6447

Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys
 Heavy Duty, 12 Year (29 ft. – 60 ft. sizes)

			areas. Vents shall be controllable by the driver from the normal driving position. Decals shall be provided, indicating “operating instructions” and “open” and “closed” positions. When closed, vents shall be sealed to prevent the migration of water or air into the bus.	
44.	TS 59. Maintainability	215	DEFAULT High and low refrigerant pressure electronic gauges to be located in the return air area.	Proterra's standard design does not incorporate remote "mechanical" gauges and has no provisions for them. The high and low pressures can be viewed through an unlocked service screen on our HVAC controller (KLI). Also, the high and low pressure are on the CAN messages and are visible through the service tool.
45.	TS 64.1 Side Body Panels (Transit Coach)	217	Whole section	Proterra's vehicle design has an all-composite body. Composite body buses do not have exterior paneling. The outer skin is integral to the body structure. When damage occurs to the exterior of the vehicle, the repair is contained to just the damaged area. The side body from floor to window is repairable with common composite repair techniques. The body is also covered with a gel coat that resists chips and cracks.
46.	TS 69.1 Access Doors (Transit Coach)	219	Access doors, when opened, shall not restrict access for servicing other components or systems.	Proterra's bus design does have certain lower side access doors for the motor compartment which, when opened, will restrict access to the upper side access doors. All other access doors, when opened, do not restrict access for servicing other components or systems. Please see Exhibit C for additional information.
47.	TS 80.1.2 Rear Door(s)	246	Whole section	Proterra's standard rear door is located at the curbside rearward of the point midway between the front door centerline and the rearmost seat back. This is the only door location we offer.
48.	TS 80.5 Door Glazing	249	Whole section	Proterra's standard pneumatic actuation doors with bonded glazing.
49.	TS 84.2 Exterior Displays	260	Provisions shall be made to integrate advertising into the exterior design of the bus. Advertising media, frames or supporting structures shall not detract from the readability of destination signs and signal lights, and shall not compromise passenger visibility. Advertising provisions shall not cause	Proterra will provide vinyl advertisements decals rather than metal ad frames. In addition to adding weight, metal ad frames are more difficult to design and install because the side body includes a curvature inherent in the composite body design.

Deviations and Clarifications
 Department of General Service/Division of Purchases and Supply (DGS/DPS)
 IFB# 6447

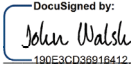
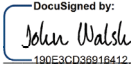
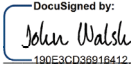
Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys
 Heavy Duty, 12 Year (29 ft. – 60 ft. sizes)

			pedestrian hazards or foul automatic bus washing equipment, and shall not cover or interfere with doors, air passages, vehicle fittings or in any other manner restrict the operation or serviceability of the bus.
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CER 7. Pre-Award Evaluation Data Form

NOTE: This form is to be completed and included in the Qualification Package. Attach additional pages if required.

Commonwealth of Virginia
 IFB# 6447 Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys

<p>1. Name of firm: Proterra Operating Company, Inc.</p> <p>2. Address: 1815 Rollins Rd. Burlingame, CA 94010</p> <p>3. <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input checked="" type="checkbox"/> Corporation <input type="checkbox"/> Joint Venture</p> <p>4. Date organized: June 2, 2010 State in which incorporated: Delaware</p> <p>5. Names of officers or partners:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">a. Jack Allen - Non-executive Chairman</td> <td style="width: 50%;">f. Joan Robinson-Berry - Board Member</td> </tr> <tr> <td>b. Gareth Joyce - CEO & Board Member</td> <td>g. Jeannine Sargent - Lead Independent Director</td> </tr> <tr> <td>c. ML Krakauer - Board Member</td> <td>h. Constance Skidmore - Board Member</td> </tr> <tr> <td>d. Roger Nielsen - Board Member</td> <td>i. Mike Smith - Board Member</td> </tr> <tr> <td>e. Brook Porter - Board Member</td> <td>j. Jan Hauser - Board Member</td> </tr> </table> <p>6. How long has your firm been in business under its present name? June 14, 2021</p>	a. Jack Allen - Non-executive Chairman	f. Joan Robinson-Berry - Board Member	b. Gareth Joyce - CEO & Board Member	g. Jeannine Sargent - Lead Independent Director	c. ML Krakauer - Board Member	h. Constance Skidmore - Board Member	d. Roger Nielsen - Board Member	i. Mike Smith - Board Member	e. Brook Porter - Board Member	j. Jan Hauser - Board Member
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b. Gareth Joyce - CEO & Board Member	g. Jeannine Sargent - Lead Independent Director									
c. ML Krakauer - Board Member	h. Constance Skidmore - Board Member									
d. Roger Nielsen - Board Member	i. Mike Smith - Board Member									
e. Brook Porter - Board Member	j. Jan Hauser - Board Member									
<p>7. Attach as SCHEDULE ONE a list of similar current contracts that demonstrates your available capacity, including the quantity and type of bus, name of contracting party, percentage completed and expected completion date.</p> <p>8. Attach as SCHEDULE TWO a list of at least three similar contracts that demonstrates your technical proficiency, each with the name of the contracting party and number and they type of buses completed within the last five years.</p> <p>9. Have you been terminated or defaulted, in the past five years, on any Contract you were awarded? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, then attach as SCHEDULE THREE the full particulars regarding each occurrence.</p> <p>10. Attach as SCHEDULE FOUR Proposer's last three (3) financial statements prepared in accordance with generally accepted accounting principles of the jurisdiction in which the Proposer is located, and audited by an independent certified public accountant; or a statement from the Proposer regarding how financial information may be reviewed by the Agency (This may require execution of an acceptable nondisclosure agreement between the Agency and the Proposer.)</p> <p>11. Attach as SCHEDULE FIVE a list of all principal Subcontractors and the percentage and character of Work (Contract amount) that each will perform on this Contract.</p> <p>12. If the Contractor or Subcontractor is a joint venture, submit PRE-AWARD EVALUATION DATA forms for each member of the joint venture.</p>										
<p>The above information is confidential and will not be divulged to any unauthorized personnel.</p>										
<p>The undersigned certifies to the accuracy of all information: Name and title: John Walsh, Chief Commercial Officer Company: Proterra Operating Company, Inc.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 60%; border: none;">  <small>DocuSigned by: John Walsh 190E3CD36918412</small> </td> <td style="width: 40%; border: none; text-align: right;"> 9/8/2022 <hr style="width: 100%;"/> Date </td> </tr> <tr> <td style="border: none;"> Authorized signature </td> <td style="border: none;"></td> </tr> </table>	 <small>DocuSigned by: John Walsh 190E3CD36918412</small>	9/8/2022 <hr style="width: 100%;"/> Date	Authorized signature							
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PROTERRA

Schedule 1

Account Name	Bus Qty	Plant Location	Projected Completion Date (First Bus)	Percentage Complete	Model
District Department of Transportation (DDOT)	7	GVL	4/13/2022	14%	Proterra ZX5
Prince George's County	6	GVL	5/26/2022	50%	Proterra ZX5
Miami – Dade County Transit	75	GVL	06/02/2022	42%	Proterra ZX5
John Wayne Airport Orange County	2	LAX	8/31/2022	50%	Proterra ZX5
Bridgeport Regional Transit	3	LAX	09/27/2022	95%	Proterra ZX5
City of San Luis Obispo	1	LAX	11/12/2022	50%	Proterra ZX5
Spokane Transit Authority	10	LAX	11/17/2022	40%	Proterra ZX5
Bloomington-Normal Public Transit System	5	GVL	11/19/2022	5%	Proterra ZX5
Town of Breckenridge	3	GVL	12/10/2022	0%	Proterra ZX5
City of Tallahassee (StarMetro)	1	GVL	12/21/2022	0%	Proterra ZX5
Delaware Transit Corporation (DTC)	6	GVL	12/22/2022	0%	Proterra ZX5
Rock Region Metro	4	LAX	12/28/2022	1%	Proterra ZX5
Shreveport Area Transit System (SporTran)	1	GVL	12/28/2022	0%	Proterra ZX5
Central Florida Regional Transportation Authority (LYNX)	3	GVL	1/6/2023	0%	Proterra ZX5
Broward County Transit Division (BCT)	14	GVL	1/13/2023	0%	Proterra ZX5
Roseville Transit	10	LAX	1/15/2023	0%	Proterra ZX5

Proterra Proprietary and Confidential



PROTERRA

Port Authority of New York and New Jersey	14	GVL	2/17/2023	0%	Proterra ZX5
University of California – San Diego	4	LAX	2/26/2023	0%	Proterra ZX5
University of California – Irvine	5	LAX	3/13/2023	0%	Proterra ZX5
Capital Metropolitan Transportation Authority (CapMetro)	18	GVL	3/23/2023	0%	Proterra ZX5
Santa Cruz Metropolitan Transit District	5	LAX	4/2/2023	0%	Proterra ZX5
PACE, the Suburban Bus Division of the RTA	11	GVL	5/19/2023	0%	Proterra ZX5
BC Transit	5	GVL	7/6/2023	0%	Proterra ZX5
Metropolitan Washington Airports Authority (MWAA)	1	GVL	7/19/2023	0%	Proterra ZX5
Standard Parking Plus	5	GVL	7/21/2023	0%	Proterra ZX5
Raleigh Durham Airport Authority	2	GVL	8/4/2023	0%	Proterra ZX5

Please note that the dates above are subject to change, and the available capacities of our manufacturing facilities fluctuate daily. The final facility location where the buses purchased from the VA State schedule bus will be determined during the contract phase.

Proterra Proprietary and Confidential



Schedule Two

City of Alexandria (DASH)

3000 Business Center Dr

Alexandria, VA 22314

Raymond Mui – Director of Planning & Scheduling

raymond.mui@alexandriava.gov

(703) 746-5645



Alexandria Transit Company (DASH) is a repeat customer for Proterra. Their first order was for a pilot program and consisted of three 40' ZX5+ buses. These pilot buses were delivered in Q1 2021. They later placed a second order for an additional four 40' ZX5+ buses that were delivered in Q3 2021. DASH utilized the previous Virginia state contract to purchase all seven of their current Proterra buses.

Hampton Roads Transit (HRT)

509 East 18th St

Norfolk, VA 23510

Michael Perez – Director of Rolling Stock

mperez@hrtransit.org

(757) 222-6000



Hampton Roads Transit (HRT) currently has six Proterra 40' Catalyst buses in service. These buses were purchased from the previous Virginia state schedule and were delivered in September 2020. HRT also purchased seven 125kW charging systems from Proterra to support the electrification of their fleet.

Spokane Transit Authority

701 W Riverside Ave

Spokane, WA 99201

Angie Fitchner – Technical Project Specialist

afitchner@spokanetransit.com

(509) 325-6000



Spokane Transit Authority currently has two Proterra 40' ZX5+ buses in their fleet. These were purchased by the agency from the previous Virginia state purchasing schedule and saw customer acceptance in September 2021.

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549**

FORM 10-K

(Mark One)

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the fiscal year ended December 31, 2021

OR

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the transition period from to

Commission file number 001-39546

PROTERRA INC

(Exact name of registrant as specified in its charter)

Delaware

(State or other jurisdiction of incorporation or organization)

1815 Rollins Road

Burlingame, California

(Address of Principal Executive Offices)

98-1551379

(I.R.S. Employer Identification No.)

94010

(Zip Code)

(864) 438-0000

Registrant's telephone number, including area code

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, \$0.0001 par value per share	PTRA	The Nasdaq Stock Market LLC

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes No

Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports); and (2) has been subject to such filing requirements for the past 90 days. Yes No

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T

(§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes No

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of "large accelerated filer," "accelerated filer" and "smaller reporting company" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer	<input checked="" type="checkbox"/>	Accelerated filer	<input type="checkbox"/>
Non-accelerated filer	<input type="checkbox"/>	Smaller reporting company	<input checked="" type="checkbox"/>
		Emerging growth company	<input type="checkbox"/>

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C.7262(b)) by the registered public accounting firm that prepared or issued its audit report.

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes No

The aggregate market value of voting stock held by non-affiliates of the registrant as of June 30, 2021, the last business day of the registrant's most recently completed second fiscal quarter, based on the closing price of \$17.11 for shares common stock then listed on the Nasdaq Global Select Market, was approximately \$3.0 billion.

The registrant had outstanding 222.4 million shares of common stock as of March 9, 2022.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive proxy statement relating to its 2022 Annual Meeting of Stockholders (the "Proxy Statement") are incorporated herein by reference in Part III, Items 10 through 14 of this Annual Report on Form 10-K ("Annual Report"), as specified in the responses to those item numbers. Except with respect to information specifically incorporated by reference in this Annual Report, the Proxy Statement is not deemed to be filed as part hereof. The Proxy Statement will be filed with the Securities and Exchange Commission within 120 days of the registrant's fiscal year ended December 31, 2021.

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Explanatory Note – Certain Defined Terms

Unless otherwise stated in this Annual Report on Form 10-K or the context otherwise requires, references to:

- “ArcLight” means ArcLight Clean Transition Corp., a Cayman Islands exempted company, prior to the consummation of the Domestication;
- “Business Combination” means the Domestication, the Merger and the other transactions contemplated by the Merger Agreement, collectively, including the PIPE Financing;
- “Class A ordinary shares” means the Class A ordinary shares, par value \$0.0001 per share, of ArcLight, prior to the Domestication, which automatically converted, on a one-for-one basis, into shares of common stock in connection with the Domestication;
- “Class B ordinary shares” means the Class B ordinary shares, par value \$0.0001 per share, of ArcLight that were initially issued to the Sponsor in a private placement prior to ArcLight’s initial public offering, and, in connection with the Domestication, which automatically converted, on a one-for-one basis, into shares of common stock;
- “Closing” means the closing of the Business Combination;
- “Closing Date” means June 14, 2021;
- “common stock” means the common stock, par value \$0.0001 per share, of Proterra;
- “Convertible Notes” means the secured convertible promissory notes of Proterra issued in August 2020;
- “Domestication” means the transfer by way of continuation and deregistration of ArcLight from the Cayman Islands and the continuation and domestication of ArcLight as a corporation incorporated in the State of Delaware;
- “initial public offering” means ArcLight’s initial public offering that was consummated on September 25, 2020;
- “Legacy Proterra” means Proterra Inc, a Delaware corporation, prior to the consummation of the Business Combination;
- “Merger” means the merger of Phoenix Merger Sub with and into Legacy Proterra pursuant to the Merger Agreement, with Legacy Proterra as the surviving company in the Merger and, after giving effect to such Merger, Legacy Proterra becoming a wholly-owned subsidiary of Proterra;
- “Merger Agreement” means that certain Merger Agreement, dated as of January 11, 2021 (as may be amended, supplemented or otherwise modified from time to time), by and among ArcLight, Phoenix Merger Sub and Legacy Proterra;
- “Phoenix Merger Sub” refers to Phoenix Merger Sub, Inc., a Delaware corporation and a wholly-owned direct subsidiary of ArcLight;
- “PIPE Financing” means the transactions contemplated by the Subscription Agreements, pursuant to which the PIPE Investors collectively subscribed for 41,500,000 shares of common stock for an aggregate purchase price of \$415,000,000 in connection with the Closing;
- “PIPE Investors” means the investors who participated in the PIPE Financing and entered into the Subscription Agreements;

- “private placement warrants” means the 7,550,000 private placement warrants outstanding as of September 30, 2021 that were issued to the Sponsor as part of ArcLight’s initial public offering, which were substantially identical to the public warrants, subject to certain limited exceptions; the Sponsor exercised the private placement warrants on a “cashless” basis in connection with our redemption of our remaining outstanding public warrants on October 26, 2021;
- “Proterra” means ArcLight upon and after Closing;
- “public warrants” means the 13,874,994 redeemable warrants to purchase common stock outstanding as of September 30, 2021 that were issued by ArcLight in its initial public offering; on October 29 2021, we redeemed the remaining outstanding public warrants that had not previously been exercised at a redemption price of \$0.10 per public warrant;
- “Sponsor” means ArcLight CTC Holdings, L.P., a Delaware limited partnership; and
- “Subscription Agreements” means the subscription agreements, entered into by ArcLight and each of the PIPE Investors in connection with the PIPE Financing.

In addition, unless otherwise indicated or the context otherwise requires, references in this Annual Report to the “Company,” “we,” “us,” “our” and other similar terms refer to Legacy Proterra prior to the Business Combination and to Proterra and its consolidated subsidiaries after giving effect to the Business Combination.

Note About Forward-Looking Statements

This Annual Report contains certain forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended (the “Securities Act”), and Section 21E of the Securities Exchange Act of 1934, as amended (the “Exchange Act”). This Annual Report contains forward-looking statements regarding, among other things, our plans, strategies and prospects, both business and financial. These statements are based on the beliefs and assumptions of our management. We also may provide forward-looking statements in oral statements or other written materials released to the public. Although we believe that our plans, intentions and expectations reflected in or suggested by these forward-looking statements are reasonable, we cannot assure you that we will achieve or realize these plans, intentions or expectations. Forward-looking statements are inherently subject to risks, uncertainties and assumptions. Generally, statements that are not historical facts, including statements concerning possible or assumed future actions, business strategies, events or results of operations, are forward-looking statements. These statements may be preceded by, followed by or include the words “believes”, “estimates”, “expects”, “projects”, “forecasts”, “may”, “will”, “should”, “seeks”, “plans”, “scheduled”, “anticipates” or “intends” or similar expressions. Forward-looking statements contained in this Annual Report may include, for example, statements about:

- our financial and business performance, including business metrics;
- the ability to maintain the listing of our common stock on the Nasdaq Global Select Market (the “Nasdaq”), and the potential liquidity and trading of our common stock;
- changes in applicable laws or regulations;
- our success in retaining or recruiting, or changes required in, our officers, key employees or directors, and our ability to attract and retain key personnel;
- the anticipated success of our most recent business expansion with Proterra Powered and Proterra Energy, and our ability to attract the customers and business partners we expect;
- forecasts regarding long-term end-customer adoption rates and demand for our products in markets that are new and rapidly evolving;
- our ability to compete successfully against current and future competitors in light of intense and increasing competition in the transit bus and commercial vehicle electrification market;

- macroeconomic conditions resulting from the global novel coronavirus (“COVID-19”) pandemic;
- the availability of government economic incentives and government funding for public transit upon which our transit business is significantly dependent;
- willingness of corporate and other public transportation providers to adopt and fund the purchase of electric vehicles for mass transit;
- availability of a limited number of suppliers for our products and services;
- material losses and costs from product warranty claims, recalls, or remediation of electric transit buses for real or perceived deficiencies or from customer satisfaction campaigns;
- increases in costs, disruption of supply, or shortage of materials, particularly lithium-ion cells;
- our dependence on a small number of customers that fluctuate from year to year, and failure to add new customers or expand sales to our existing customers;
- rapid evolution of our industry and technology, and related unforeseen changes, including developments in alternative technologies and powertrains or improvements in the internal combustion engine that could adversely affect the demand for our electric transit buses;
- development, maintenance and growth of strategic relationships in the Proterra Powered or Proterra Energy business, identification of new strategic relationship opportunities, or formation strategic relationships;
- competition for the business of both small and large transit agencies, which place different demands on our business, including the need to build an organization that can serve both types of transit customers;
- substantial regulations, which are evolving, and unfavorable changes or failure by us to comply with these regulations;
- accident or safety incidents involving our buses, battery systems, electric drivetrains, high-voltage systems or charging solutions;
- product liability claims, which could harm our financial condition and liquidity if we are not able to successfully defend or insure against such claims;
- changes to U.S. trade policies, including new tariffs or the renegotiation or termination of existing trade agreements or treaties;
- various environmental and safety laws and regulations that could impose substantial costs upon us and negatively impact our ability to operate our manufacturing facilities; outages and disruptions of our services if we fail to maintain adequate security and supporting infrastructure as we scale our information technology systems;
- availability of additional capital to support business growth;
- failure to protect our intellectual property;
- intellectual property rights claims by third parties, which could be costly to defend, related significant damages and resulting limits on our ability to use certain technologies;
- developments and projections relating to our competitors and industry;
- our anticipated growth rates and market opportunities;

- the period over which we anticipate our existing cash and cash equivalents will be sufficient to fund our operating expenses and capital expenditure requirements;
- the potential for our business development efforts to maximize the potential value of our portfolio;
- our estimates regarding expenses, future revenue, capital requirements and needs for additional financing;
- our financial performance;
- the inability to develop and maintain effective internal controls;
- the diversion of management's attention and consumption of resources as a result of potential acquisitions of other companies;
- failure to maintain adequate operational and financial resources or raise additional capital or generate sufficient cash flows;
- cyber-attacks and security vulnerabilities; and
- the effect of the COVID-19 pandemic on the foregoing.

These forward-looking statements are based on information available as of the date of this Annual Report, and current expectations, forecasts and assumptions, and involve a number of judgments, risks and uncertainties. Important factors could cause actual results to differ materially from those indicated or implied by forward-looking statements such as those contained in documents we have filed with the Securities and Exchange Commission (the "SEC"). Accordingly, forward-looking statements should not be relied upon as representing our views as of any subsequent date, and we do not undertake any obligation to update forward-looking statements to reflect events or circumstances after the date they were made, whether as a result of new information, future events or otherwise, except as may be required under applicable securities laws.

As a result of a number of known and unknown risks and uncertainties, our actual results or performance may be materially different from those expressed or implied by these forward-looking statements. For a discussion of the risks involved in our business and investing in our common stock, see the section entitled "Risk Factors."

Should one or more of these risks or uncertainties materialize, or should any of the underlying assumptions prove incorrect, actual results may vary in material respects from those expressed or implied by these forward-looking statements. You should not place undue reliance on these forward-looking statements.

Summary of Risk Factors

The below summary of risk factors provides an overview of many of the risks we are exposed to in the normal course of our business activities. As a result, the below summary risks do not contain all of the information that may be important to you, and you should read the summary risks together with the more detailed discussion of risks set forth following this section under the heading "Risk Factors," as well as elsewhere in this Annual Report. Additional risks, beyond those summarized below or discussed elsewhere in this Annual Report, may apply to our activities or operations as currently conducted or as we may conduct them in the future or in the markets in which we operate or may in the future operate. Consistent with the foregoing, we are exposed to a variety of risks, including risks associated with the following:

- Our limited history of selling battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses, and related technologies makes it difficult to evaluate our business and prospects and may increase the risks associated with your investment.
- Our most recent business expansion with Proterra Powered and Proterra Energy may not be as successful as anticipated, may not attract the customers and business partners we expect, and the assumptions underlying the growth prospects of these businesses may not prove to be accurate.

- Because many of the markets in which we compete are new and rapidly evolving, it is difficult to forecast long-term end-customer adoption rates and demand for our products.
- We face intense and increasing competition in the transit bus market and may not be able to compete successfully against current and future competitors, which could adversely affect our business, revenue growth, and market share.
- We have been and may continue to be impacted by macroeconomic conditions resulting from the global COVID-19 pandemic, including supply chain disruptions.
- Our transit business is significantly dependent on government funding for public transit, and the unavailability, reduction, or elimination of government economic incentives would have an adverse effect on our business, prospects, financial condition, and operating results.
- The growth of our transit business is dependent upon the willingness of corporate and other public transportation providers to adopt and fund the purchase of electric vehicles for mass transit.
- Our dependence on a limited number of suppliers introduces significant risk that could have adverse effects on our financial condition and operating results.
- We have a long sales, production, and technology development cycle for new public transit customers, which may create fluctuations in whether and when revenue is recognized, and may have an adverse effect on our business.
- We have a history of net losses, anticipate increasing our operating expenses in the future, and may not achieve or sustain positive gross margin or profitability in the future.
- We could incur material losses and costs from product warranty claims, recalls, or remediation of electric transit buses for real or perceived deficiencies or from customer satisfaction campaigns.
- Increases in costs, disruption of supply, or shortage of materials, particularly lithium-ion cells, could harm our business.
- Our annual revenue has in the past depended, and will likely continue to depend, on a small number of customers that fluctuate from year to year, and failure to add new customers or expand sales to our existing customers could have an adverse effect on our operating results for a particular period.
- Our industry and its technology are rapidly evolving and may be subject to unforeseen changes. Developments in alternative technologies and powertrains or improvements in the internal combustion engine may adversely affect the demand for our electric transit buses.
- We may not be able to develop, maintain and grow strategic relationships in the Proterra Powered or Proterra Energy business, identify new strategic relationship opportunities, or form strategic relationships, in the future.
- We are competing for the business of both small and large transit agencies, which place different demands on our business, and if we do not build an organization that can serve both types of transit customers, our business may be harmed.
- We also compete for the business of smaller transit agencies. Although smaller transit agencies often have less complicated procurement processes than larger transit agencies, serving these smaller agencies requires processing small order sizes while still catering to the specific vehicle configurations for each customer. If we continue to serve both large and small transit agency customers, we will need to effectively and efficiently scale our internal resources to meet varying customer needs. Our failure to do so could have an adverse effect on our business, prospects, financial condition, and operating results. Our business is subject to substantial regulations, which are evolving, and unfavorable changes or failure by us to comply with these regulations could have an adverse effect on our business.

- Our business could be adversely affected from an accident or safety incident involving our battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses.
- We may become subject to product liability claims, which could harm our financial condition and liquidity if we are not able to successfully defend or insure against such claims.
- Changes to U.S. trade policies, including new tariffs or the renegotiation or termination of existing trade agreements or treaties, may adversely affect our financial performance.
- We are subject to various environmental and safety laws and regulations that could impose substantial costs upon us and negatively impact our ability to operate our manufacturing facilities if we fail in our efforts to abide by these laws and regulations.
- We may experience outages and disruptions of our services if we fail to maintain adequate security and supporting infrastructure as we scale our information technology systems.
- We may require additional capital to support business growth, and such capital might not be available on terms acceptable to us, if at all.
- Failure to protect our intellectual property could adversely affect our business.
- We may be subject to intellectual property rights claims by third parties, which could be costly to defend, could require us to pay significant damages and could limit our ability to use certain technologies.
- Our loan and security agreements contain covenants that may restrict our business and financing activities.
- We received a loan under the Paycheck Protection Program of the CARES Act, and all or a portion of the loan may not be forgivable.
- If we fail to develop and maintain an effective system of disclosure controls and internal control over financial reporting, our ability to produce timely and accurate financial statements or comply with applicable law and regulations could be impaired.
- Regulations related to “conflict minerals” may force us to incur additional expenses, may make our supply chain more complex and may result in damage to our reputation with customers.
- Our management team has limited experience managing a public company.

PART I

Item 1. Business

Overview

Proterra's mission is to advance electric vehicle technology to deliver the world's best performing commercial vehicles.

Our business is organized into two business units comprised of three business lines, with each business line addressing a critical component of commercial vehicle electrification.

- **Proterra Powered and Energy** is our business unit that provides our technology solutions to commercial vehicle manufacturers and owners of commercial fleets, and is comprised of two business lines.
 - **Proterra Powered** designs, develops, manufactures, sells, and integrates proprietary battery systems and electrification solutions into vehicles for global commercial vehicle original equipment manufacturer ("OEM") customers serving the Class 3 to Class 8 vehicle segments, including delivery trucks, school buses, and coach buses, as well as construction and mining equipment, and other applications.
 - **Proterra Energy** provides turnkey fleet-scale, high-power charging solutions and software services, ranging from fleet and energy management software-as-a-service, to fleet planning, hardware, infrastructure, installation, utility engagement, and charging optimization. These solutions are designed to optimize energy use and costs, and to provide vehicle-to-grid functionality.
- **Proterra Transit** is our business unit that designs, develops, manufactures, and sells electric transit buses as an OEM for North American public transit agencies, airports, universities, and other commercial transit fleets. Proterra Transit vehicles showcase and validate our electric vehicle technology platform through rigorous daily use by a large group of sophisticated customers focused on meeting the wide-ranging needs of the communities they serve.

The first application of Proterra Powered commercial vehicle electrification technology was through Proterra Transit's heavy-duty electric transit bus, which we designed from the ground up for the North American market. Our industry experience, the performance of our transit buses, and compelling total cost of ownership has helped make us the leader in the U.S. electric transit bus market. With over 800 electric transit buses on the road, our electric transit buses have delivered more than 25 million cumulative service miles spanning a wide spectrum of climates, conditions, altitudes and terrains. From this experience, we have been able to continue to iterate and improve our technology.

Our decade of experience supplying battery electric heavy duty transit buses provided us the opportunity to validate our products' performance, fuel efficiency and maintenance costs with a demanding customer base and helped broaden our appeal as a supplier to OEMs in other commercial vehicle segments and geographies. Proterra Powered has partnered with more than a dozen OEMs spanning from Class 3 to Class 8 trucks, several types of buses, and multiple off-highway categories. Through December 31, 2021, Proterra Powered has delivered battery systems and electrification solutions for more than 400 vehicles to our OEM partner customers.

In addition, Proterra Energy has established our Company as a leading commercial vehicle charging solution provider by helping fleet operators fulfill the high-power charging needs of commercial electric vehicles and optimize their energy usage, while meeting our customers' space constraints and continuous service requirements. As of December 31, 2021, we had installed more than 60 MW of charging infrastructure across North America.

We delivered 208 new transit buses in 2021, 170 in 2020, and 177 in 2019. We also delivered 9 pre-owned buses in 2021. We delivered battery systems for 273 vehicles in 2021, 107 vehicles in 2020, and 20 vehicles in 2019.

For the years ended December 31, 2021, 2020 and 2019, our total revenue was \$242.9 million, \$196.9 million, and \$181.3 million, respectively. As of December 31, 2021, in aggregate, we have generated revenue of \$621.1 million for the past three years. We generated a gross profit of \$2.1 million for the year ended December 31, 2021 and a gross profit of \$7.5 million for the year ended December 31, 2020, and a gross loss of \$1.6 million for the year ended December 31, 2019. We have also invested significant resources in research and development, operations, and sales and marketing to grow our business and, as a result, generated losses from operations of \$127.6 million, \$96.0 million, and \$99.7 million for the years ended December 31, 2021, 2020 and 2019, respectively.

Business Combination

On June 14, 2021, we consummated the transactions contemplated by Merger Agreement, by and among ArcLight (and, after the Domestication, Proterra), Phoenix Merger Sub, and Legacy Proterra. As contemplated by the Merger Agreement, on June 11, 2021, ArcLight filed a notice of deregistration with the Cayman Islands Registrar of Companies, together with the necessary accompanying documents, and filed a certificate of incorporation and a certificate of corporate domestication with the Secretary of State of the State of Delaware, under which ArcLight was domesticated and continues as a Delaware corporation. Further, on June 14, 2021, as contemplated by the Merger Agreement, Proterra consummated the Merger, whereby Phoenix Merger Sub merged with and into Legacy Proterra, the separate corporate existence of Phoenix Merger Sub ceasing and Legacy Proterra being the surviving corporation and a wholly owned subsidiary of Proterra. Legacy Proterra was incorporated in Delaware on February 2, 2010, and upon the Merger on June 14, 2021 changed its name to “Proterra Operating Company, Inc.” and continues as a Delaware Corporation.

In addition, pursuant to subscription agreements entered into in connection with the Merger Agreement, the PIPE Investors purchased an aggregate of 41,500,000 shares of Proterra common stock concurrently with the Closing of the Business Combination for an aggregate purchase price of \$415,000,000.

We received \$649.3 million in net cash proceeds upon Closing to fund our growth initiatives, including research and development and our next-generation battery program.

On September 27, 2021, we announced that we would redeem all of the outstanding public warrants and private placement warrants that were issued in connection with ArcLight’s initial public offering. On October 27, 2021, our public warrants ceased trading on the Nasdaq, and we subsequently redeemed the outstanding warrants that remained unexercised as of 5:00 p.m. New York City time on October 29, 2021 at a redemption price of \$0.10 per warrant.

Our products

We design, manufacture, and sell proprietary battery systems, electrification and charging solutions and fleet and energy management systems purpose-built for commercial vehicles. Our battery systems, electrification and charging solutions and fleet and energy management systems are also used in electric transit buses that we design, sell, and manufacture. Our Proterra Energy business also provides charging infrastructure solutions to simplify the adoption of electric commercial vehicles and improve fleet operations, as well as software services relating to fleet management, remote diagnostics, smart charging and vehicle-to-grid energy management.

Battery system

Our highly modular battery systems meet the needs of a variety of commercial vehicle segments and sizes. We sell our battery packs in two different widths and heights depending upon the frame rail length constraints of the vehicle. In addition, each module is available in two different lengths, and three different voltages (25V, 35V and 50V). Modules can be strung in series up to 1,200V within a pack. Packs can be combined up to 16 strings in parallel.

We design, validate, test, and manufacture high-voltage battery packs that are used in our electric transit buses, as well as other commercial vehicle applications. We have designed our batteries based on the core principles of modularity, durability, safety, and scalability.

Our batteries have been designed around standardized form factor cylindrical cells that are produced by numerous global cell manufacturers. Our battery design is flexible to chemistry and manufacturer, allowing us to utilize the best cells commercially available in terms of energy density, cost, cycle life performance, charge rate acceptance, and safety. We have worked with LG Chem Ltd., now LG Energy Solution, to develop cells that are optimized for our applications. Each module contains a proprietary battery monitoring board, and each pack contains a proprietary battery management system, which together monitor the performance of the battery pack and communicate with the vehicle.

We engineered the battery pack with safety and durability as core principles. The battery enclosure is a rugged structure, built using aluminum extrusions and castings, and may include an aluminum base plate to protect the cells. The module and enclosure architecture are designed to be safe in extreme mechanical and environmental abuse scenarios. We internally test our battery cells, modules, and packs to ensure they meet our durability, cycle life performance, and safety and warranty requirements.

Inherent to the mechanical and electrical architecture of our battery modules and battery packs is the flexibility to rapidly reconfigure components for use in various commercial vehicle applications. Battery modules and packs can be connected electrically in a series of strings to increase system voltage up to 1,200V. Additionally, multiple strings can be connected in parallel to enable megawatt-hour-scale battery systems. While our battery system is optimized for commercial vehicle applications, we have also created an architecture with second-life use in mind. For instance, our battery packs are designed to be stackable in order to be deployed with minimal modification in stationary energy storage applications.

We operate a battery research and development laboratory at our Burlingame headquarters, co-located with battery engineering, advanced manufacturing engineering, and manufacturing operations. Capabilities of this lab include mechanical and environmental durability testing, highly accelerated life testing, electrical safety testing, cell lifecycle and safety testing, mechanical abuse testing, and prototype assembly for new applications. Prototype and production variants of our battery products are tested and certified to industry standards, including Society of Automotive Engineers (“SAE”) J2929, as well as proprietary internal test requirements.

Electric drivetrains

A key driver of vehicle performance, and biggest consumer of battery energy, is the drivetrain, which includes the traction motor, inverter, controller, and transmission. We have partnered with leading engineering and manufacturing companies to design and develop both a single- and a dual-motor drivetrain: the 295 horsepower ProDrive and the 510 horsepower DuoPower drivetrains. Both systems utilize three-phase, permanent-magnet, liquid-cooled motors. In contrast to internal combustion engines, electric motors provide high and immediate torque that remains steady whether the motor is starting from a standing stop or already operating at high speed, helping provide our buses with superior performance to a comparably sized commercial diesel vehicle. Our drivetrains also have significant advantages over traditional powertrains in weight and serviceability. Our motor weighs 90 kilograms, compared to over 800 kilograms for a typical diesel engine, and may be removed in four hours, compared to 12 hours for a standard diesel engine.

The traction motor inverter is a liquid-cooled power electronics unit that converts high-voltage direct-current into the three-phase power required for the desired torque and speed of the traction motor. This unit operates bi-directionally, acting as the control to turn the motor into a regenerative brake, recovering energy back into the battery packs. The drivetrain controller translates the accelerator and brake pedal commands into torque and speed commands for the inverter. The drivetrain also has a number of safety functions, including anti-lock brake system activation, hill-hold features, and programmable responsiveness for both acceleration and regeneration. We believe that multispeed gearboxes, paired with small high-performance motors, provide our customers compelling value, performance, and vehicle range.

High-voltage systems, controls, and telemetry gateways

To integrate the battery, drivetrain, charging, and other vehicle hardware, we developed a controls architecture for optimal system function, reliability, and safety. The core components of the control system are the battery management system, the charge controller that manages the interface between the battery and the charging system during charging, the telematics unit that provides wireless connectivity and supports vehicle

monitoring and analytics, the drivetrain controller that interfaces with the motor and inverter, the vehicle controller that manages all base vehicle systems, including the high voltage and thermal systems, and the body controller that manages customer configurable functions such as HVAC, doors, lighting, and vehicle ride height.

Developed expressly for heavy duty and high-occupancy vehicle applications, our battery management system (“BMS”) and battery monitoring board (“BMB”) hardware, software, and patented control algorithms are designed to ensure safe and reliable operation in all commercial vehicle applications. The BMS is deployed on an automotive grade controller within the battery pack responsible for actively and safely managing a lithium ion battery pack. It controls the battery pack electrical contactors, monitors all relevant parameters, determines real-time state and limits designed to ensure safe and reliable operation, and communicates with the vehicle. Moreover, the BMS performs electrical safety functions such as isolation monitoring and high voltage interlock control. These functions are critical to performance and safety. Additional functions performed include measuring cell operating parameters such as voltage, temperature, and relative humidity and performing dissipative cell balancing.

These units and other devices, such as dashboard displays and other onboard electronics, are interconnected with industry standard Controller Area Network (“CAN Bus”) vehicle networking. Our controls team uses model-based control architecture to create software for each of these units and ensure proper validation through automated software testing. At the system level, we use these models in conjunction with industry-standard Hardware-In the-Loop and Software-In the-Loop test set-ups, which allow for full vehicle simulation and development.

ZX5 electric transit bus

The Proterra electric transit bus is our flagship product and the only finished vehicle we manufacture ourselves as an OEM. In 2014, we launched our first 40-foot electric low-floor transit bus seating up to 40 people, followed one year later by a 35-foot version seating up to 29 people. We focus on 35-foot and 40-foot buses because these buses represent more than three-quarters of the market according to the Federal Transit Authority’s National Transit Database. Currently offered with battery sizes including 225 kilowatt-hours (“kWh”), 450 kWh, and 675 kWh, our buses can provide a range of up to 329 miles on a single charge. With the batteries mounted in ballistic-grade enclosures below the floor of the vehicle between the axles, the bus has been designed to optimize for mass distribution and safety. Enabled by our battery and electric drive train technology and a body made of light-weight composite materials, our purpose-built electric transit bus also offers compelling acceleration, gradeability, and energy efficiency. Along with zero tailpipe emissions and low maintenance costs, the Proterra Electric Transit Bus offers a compelling value proposition to transit agencies seeking to electrify their fleets.

While other manufacturers use a modified steel body and frame that was originally designed for an internal combustion engine, we have partnered with a supplier, TPI Composites, Inc. to architect a lighter weight bus body with advanced materials specifically designed for an electric powertrain. Our composite bus body houses the battery packs below the floor of the vehicle, between the axles, to achieve a low center of gravity and ride comfort and safety. Utilizing carbon fiber and fiberglass, our design approach optimizes mass, stiffness, and durability. Our bus body has been tested on a four-post shaker table to a simulated 750,000 miles and 18 years of useful life, and has also undergone 125,000 effective miles at the Bus Research and Testing Center’s test track in Altoona, Pennsylvania which executes federally mandated transit vehicle durability testing.

The ZX5 bus can be charged by either a standard J1772 CCS charge port for in-depot charging, with an estimated charge time of three hours, or an overhead charging dock that can enable rapid energy replenishment for on-route charging or be used for depot charging.

Our electric transit bus can also offer significant total cost of ownership savings as compared to the equivalent diesel- and natural gas-powered buses. Our electric transit bus uses approximately 75% less energy per mile than the average legacy diesel bus. In a typical transit operation, the total cost of ownership of our bus is lower than diesel, diesel-hybrid, and compressed natural gas-powered vehicles. Our electric transit bus combines a competitive upfront price with low operations and maintenance costs, which we estimate results in a lower total cost of ownership over the lifetime of the vehicle.

Proterra Transit electric buses can also be acquired with a battery lease through our battery leasing program. We offered this program in 2021 through a partnership with Mitsui, whose contract with us ends in March 2022. We are currently offering this program directly. This program enables the customer to pay for the price of the battery over time rather than upfront with the price of the bus. Given the operational savings our buses typically offer in both fuel and maintenance costs, we seek to structure the battery lease payments so they are covered by the operating cost savings.

Fleet-scale charging solutions

Fleet charging requires a complex balance of multiple stakeholder groups, fleet logistics, battery operational requirements, variable charging times, and electric utility engagement, which together present more challenges than passenger vehicle charging. Successful charging infrastructure implementation is critical to scaling the deployment of commercial electric vehicles. We have designed our charging solutions with a focus on high power, scalability, bi-directional power capability, autonomous charge docking, and charge management. We believe our software algorithms and planning solutions can enable as much as 50% fewer chargers, while optimizing both charging time and energy costs.

We currently offer five charger capacities for small fleet solutions: 60 kW, 90 kW, 120 kW, 150 kW, and 180 kW. We also offer a Megawatt class of charger for large fleet solutions. Our charger architecture is designed for commercial fleet applications and allows for the larger charging hardware cabinet to be placed up to 500 feet away from the charger dispensers. This architecture provides commercial fleets with more siting flexibility in depots with limited space. The dispensers can be ground-, wall-, or overhead structure-mounted to meet a customer's specific requirements. Charging systems include a wireless data connection to our APEX software platform that allows for over-the-air software updates.

APEX software platform

The Proterra APEX connected vehicle intelligence system is a cloud-based data platform that can provide customers performance information about their fleets, and is designed to provide management of vehicle and charging operations to reduce operating costs.

Our hardware and software connectivity platform is designed for compatibility with each vehicle and charging system that we deliver. Each gateway on a bus or charging system automatically connects securely with our cloud-based platform. Applications that run on this platform are accessible to registered users through a role-based, access-controlled web portal. Our data exploration tools offer users current and historical metrics, insights, and reports. Metrics include odometer readings and mileages, battery state-of-charge, energy usage by subsystem, overall energy efficiency, route geolocation, and environmental impact. Charging voltages, power, energy delivered, and session start and stop times are also available. Real-time fault and status alert capabilities provide user notifications through email and text message. The telematics platform also provides charge management capability enabling optimization of power levels and energy costs based on bus arrival and departure schedules. The telematics platform can enable over-the-air updates, and over time we expect to expand its functionality to include further charge management capabilities which is expected to enable customers to minimize demand charges and further reduce energy costs. The APEX platform is designed to be flexible and can also be configured for use with other commercial electric vehicles.

Our Technology

Our technology platform supports our broad portfolio of products and services across the electrification ecosystem designed to overcome the most significant obstacles to commercial vehicle electrification. The primary features of our electric vehicle technology platform, designed to meet the unique requirements of commercial fleet electrification and differentiate it from the competition, include:

- ***Integrated technology solutions spanning the electrification ecosystem.*** Our proprietary commercial electric vehicle platform is centered on our Proterra Powered battery and electric drivetrain technology, is complemented by our Proterra Energy fleet-scale, high-power charging infrastructure solutions, and enhanced by our Apex fleet and energy management software-as-a-service platform, which is designed to enable customers to manage their vehicles and charging operations in real-time, reducing

the total cost of ownership. Proterra Transit offers real-world validation, testing, and a positive feedback loop for our technology platform.

- **Modular and flexible battery platform.** We offer a modular battery platform available in different form factors, which can be produced on the same manufacturing line, to satisfy the specific needs of our customers and the design constraints of their vehicles. Commercial vehicles are not homogenous and span a wide range of weight classes (from Class 3 over 10,000 pounds to Class 8 over 33,000 pounds), chassis sizes, and frame rail lengths. We believe offering compatibility with as many different vehicle segments as possible without requiring equipment retooling or manufacturing customization is key to achieving higher market penetration. Enabled by the simplicity of design and integrated architecture of our battery modules, our battery packs are available in two widths and heights to accommodate different frame rails, various lengths ranging from 3-feet to 9-feet, and four different voltages which can be strung together in up to 16 parallel strings, with voltages as high as 1,200V. The modularity and manufacturability of our batteries enable us to provide solutions for a wide variety of commercial vehicle sizes and segments, ranging from as low as 35 kWh systems for commercial vans and shuttles up to 1 megawatt-hour (“MWh”) or more for long haul trucks and heavy-duty equipment.
- **Highly efficient design enabling exceptional energy density and range.** Our battery systems are structurally designed to optimize energy density, safety, and cost. We achieve this through a highly efficient design in which the cooling mechanisms, module structure, and pack structure are all the same element, reducing space, weight and cost. The high energy density of our battery systems increases vehicle efficiency, extends range and allows higher occupant or cargo capacity. Our focus on efficiency extends to our drivetrains, which we have designed to optimize torque and efficiency through the use of multi-speed transmissions to meet the demands of the most rigorous and diverse routes for commercial vehicles. As a result, relative to diesel’s low fuel efficiency of less than 5 miles per gallon, our electric vehicles can exceed 20 miles per gallon equivalent, generating significant cost savings. By implementing these efficient designs, maintenance costs can also be materially reduced given fewer moving parts, no need for oil changes, and less frequent brake replacements due to regenerative braking systems.
- **Designed and certified for safety.** Safety is a top priority in our battery design. In addition to offering higher energy density than typical electric passenger vehicle batteries, our commercial-grade batteries offer a high degree of safety and durability due in large part to two core design attributes: cooling and structural rigidity. Through the use of both active cooling and passive propagation resistance in module and pack construction, we have designed our batteries to achieve a lifespan required for commercial vehicle use while operating under daily charge/discharge cycles and to maintain safe and reliable operation. Our battery systems incorporate hundreds of sensors that continuously monitor the active and passive safety systems with multiple layers of redundancy. In addition, we designed our battery packs to be structurally robust, providing protection against strenuous duty cycles and high impact incidents. Our battery systems have been certified by Underwriter Laboratories to be compliant to ISO 26262, which represents today’s state-of-the-art for functional safety for road vehicles. We have also received ECE-R100 certification required to deliver certain product to our European customers. These certifications can provide us a competitive advantage, especially in markets where the certification is a prerequisite to sell electric vehicles and with vehicle OEMs that have their own standards for component safety.

Competition

Our main sources of competition fall into four categories:

- companies, including established vehicle manufacturers and component suppliers, that design and manufacture, or are reported to have plans to design and manufacture, commercial electric vehicle batteries or powertrains;
- specialized developers of electric and other zero-emission powertrain technology that are beginning to enter the market;
- incumbent transit vehicle integrators that have served our market with legacy diesel, diesel-hybrid and compressed natural gas products for many years; and

- Chinese battery manufacturers and transit bus makers that offer an array of vehicle and other products, including electric transit vehicles.

The principal competitive factors in our market include:

- cost;
- product quality and safety;
- performance;
- customer experience.
- integrated business model;
- technology innovation;
- charging expertise;
- manufacturing efficiency; and
- service capability.

Because of our singular focus on electric vehicle technology for commercial applications, we believe that we compete favorably across these factors.

Customers

Proterra Powered and Energy As of December 31, 2021, Proterra Powered had delivered electric vehicle battery systems and electrification solutions to customers in commercial and industrial vehicle segments including school buses, coach buses, delivery trucks, and off-highway equipment. As of December 31, 2021, Proterra Energy had installed more than 60 MW of charging infrastructure across North America.

Proterra Transit As of December 31, 2021, Proterra Transit customers include municipal transit agencies, corporations, airports, universities, and national parks.

In the year ended December 31, 2021, we did not have any individual customer account for 10% or more of total revenue.

Distribution, Sales and Marketing

Distribution

We distribute our products by truck and rail in North America and to overseas customers by boat and if necessary, by air freight.

Sales

We sell our battery/powertrain systems, electrification and charging solutions, fleet and energy management software and electric transit buses using a business development team as well as a channel sales team for certain markets. These teams are located in North America and focus on the customers and industries that are likely to adopt commercial vehicle electrification. The sales team for Proterra Powered works closely with the engineering team to develop optimal electrification solutions for our customers, depending on their vehicle requirements. Proterra Transit sells buses through a direct sales force, which is comprised of a small team of sales directors who maintain an active dialogue with the largest 400 transit agencies in the United States. Given the well-defined and consolidated nature of our customer base, we are able to cover our market with a lean and focused sales team. We organize our transit sales team by designated geographical regions. Our transit sales

organization also includes a demo team, and a proposals and contracts team. Our demo team leads product experiences with customers and has been an integral tool in our sales process. Our proposals and contracts team leads customer engagement in the procurement process, assisting with documentation related to the request for information or request for proposal process, as well as detailed customer-specific product configuration. Proterra Energy has a sales team that directly sells to Proterra Powered and Proterra Transit customers but also responds to requests for proposals from other customers. The Proterra Energy team includes a fleet modeling specialist and sales engineers to help design optimal charging solutions for customers. In addition to the sales teams, we have a government relations team that helps to facilitate our sales effort by building and supporting relationships with public utilities, local governments, the federal government, and transit agencies to educate these entities about our company and facilitate the adoption of electric vehicles.

Marketing

We utilize strategic marketing to accelerate sales opportunities and build brand awareness. Our current marketing programs primarily target commercial vehicle OEMs and transit agencies, and include:

- conferences and industry events that we participate in, sponsor, and exhibit at, such as the American Public Transportation Association Annual Meeting and the Annual Mobility Conference;
- press releases and email campaigns;
- print and digital advertising campaigns;
- graphical wraps for our demo buses;
- cooperative marketing efforts with customers and suppliers; and
- communicating our differentiated selling points and product features through marketing collateral such as our website, print and digital brochures, presentation slides, webinars, and videos.

To date, conferences and industry events have been the primary drivers of our sales leads and have helped us achieve sales with relatively low marketing costs.

Engineering

We have made significant investments in our development and customer engineering teams. These teams provide components, sub-systems and assemblies for our Proterra Powered, Proterra Energy, and Proterra Transit businesses. Our team members have a broad range of expertise from the commercial vehicle, automotive, aerospace, industrial, and consumer goods industries. We also use external engineering consultants in specialized development areas, including custom circuit board layouts, CAD design, and custom gear box and axle development. They support the full product lifecycle from new product innovation to sustaining engineering, including range improvement, product features, cost reduction, and mass optimization.

Our engineering team in the Burlingame includes battery and charging system engineers with significant industry experience. We have launched several battery and charger families using a rigorous multi-phase process in collaboration with our design and internal manufacturing teams, as well as outside vendors. Key areas of technical focus include battery structure, thermal and battery management systems, charging systems, high voltage power distribution, and embedded electronics. The team uses the latest combined environment durability test methods and rigorous safety testing protocols that are designed to assure product reliability and safe operation.

Proterra Transit's vehicle engineering team, based primarily in Greenville includes a number of experienced sub-teams organized by vehicle technology. Those include body, interior/exterior, chassis, pneumatics, mechanical systems, low and high voltage electrical, thermal systems, controls, embedded electronics and drivetrain.

Supply chain

We have developed close relationships with several key suppliers, particularly for lithium-ion cells, drivetrain components, charging systems, and bus bodies. Our bus bodies are purchased from TPI Composites, Inc. While we obtain some components from multiple sources, in some cases we also purchase significant components used in our products from a single source that we have validated. For our battery cells, we have two qualified suppliers for supply chain resiliency but have only used one of these suppliers, LG Energy Solution, for our current battery system to date. We also operate a cell testing lab where we regularly test new cells from a wide range of global cell manufacturers.

We obtain systems, components, raw materials, parts, manufacturing equipment, and other supplies from suppliers that we believe to be reputable and reliable. We have established and follow internal quality control processes to source suppliers, considering engineering validation, quality, cost, delivery, and lead-time. We have a quality management team that is responsible for managing and ensuring that supplied components meet quality standards. Our quality standards are guided by industry standards, including Automotive Industry Action Group, Advanced Product Quality Planning, and Production Part Approval Process procedures, which were developed by the U.S. auto industry.

Our electric transit buses use purchased parts that are primarily sourced from American suppliers. We developed our supply chain to comply with the Federal Transit Administration's ("FTA") Buy America requirements and the Federal Aviation Administration's ("FAA") Buy American requirements, which govern transit bus procurements that are paid for, in part, with federal funds by transit agencies and airports, respectively. For certain Canadian customers, we source select vehicle content from Canadian suppliers in order to comply with Canadian Content requirements.

Manufacturing

We have battery manufacturing facilities in City of Industry and Burlingame. We manufacture electric transit buses at each of our facilities in City of Industry and Greenville. We strive to instill a manufacturing culture of continuous improvement and leverage best practices in quality control and worker safety across our facilities. We are ISO 14001 certified in our Burlingame, City of Industry, and Greenville facilities.

Quality control

We have adopted an integrated, end-to-end approach to quality control. We have strategies to identify and correct any defects at each of the design, supplier development, production, and field performance stages for our battery systems, electrification and charging solutions, fleet and energy management software, and our electric transit buses. Our battery lines are required to undergo end-of-line testing for safety, and to assess readiness for vehicle integration. We designed our bus manufacturing line with multiple quality checkpoints, commissioning and functional validation, and road testing. Our customers typically inspect our buses at our facilities prior to shipment. In August of 2020, we passed the ISO audit and became ISO 9001 and 14001 certified. We believe these certifications are a testament to our commitment to quality control.

Service and warranty

Service

We believe customer service is a critical component of promoting adoption of our technology. Our customer service team provides various onsite services for our vehicles at our customers' locations. Our services typically include training for operators and technicians, onsite delivery support, field support, engineering escalation support, and procurement of spare parts. By performing vehicle services ourselves, we can efficiently identify problems, find solutions, and incorporate improvements into our products.

We design our charging systems and buses with the capability to connect to our telematics platform. We use this data to inform product development and assist with service calls. We are constantly evaluating our service offerings to make sure we are properly aligned with our customers' needs.

Warranty

We offer warranties for our battery systems, electric transit buses, including their major subsystems, and charging systems.

Our battery system warranty is dependent on the vehicle and its usage. We offer 6-year standard warranty and 12-year extended warranty on the battery for materials and workmanship, and an energy capacity warranty that depends on vehicle capacity and expected usage. We typically offer two to five-year warranties on other ancillary components of our powertrain system. Our standard warranty on battery systems reserves the right to replace components with different items of equal or better performance to keep pace with improvements in battery technology development.

Our electric transit bus warranty is comprised of a one-year complete bus warranty, a 12-year warranty on our composite bus body, and warranties on other components generally ranging from one to three years. Transit agencies will often request additional coverage as part of the initial capital purchase, in part to minimize their operational costs. We price these extended warranties into our contract bids.

Under the fleet defect provisions included in some electric transit bus purchase contracts, we are required to proactively prevent re-occurrences of a defect in the entire fleet of electric transit buses delivered under a contract if the same defect occurs in more than a specified percentage of the fleet within the base warranty period (or sometimes base warranty period plus one year) following delivery of the electric transit bus.

We offer a standard two-year warranty on our charging hardware. Warranties for installed third party hardware can extend up to five years. When we have offered extended warranty coverage beyond the suppliers' warranty, we have priced these extended warranties into our contract bid.

Government regulations, funding, and other programs

Regulations and programs

Battery safety and testing

Our battery system complies with all requirements of the SAE J2929 Safety Standard for Electric and Hybrid Vehicle Propulsion Battery Systems Utilizing Lithium-based Rechargeable Cells. In addition, we test our battery systems according to industry standards, including from the SAE, the Economic Commission for Europe ("ECE"), and Underwriters Laboratories ("UL"), as well as our own internal standards, for conditions, including mechanical abuse, thermal cycling, humidity, water immersion, corrosion, and short circuit events. We have also completed applicable transportation tests for our battery packs, demonstrating our compliance with applicable regulations that govern the transport of lithium-ion batteries.

Certain materials in our battery packs contain trace amounts of hazardous chemicals, whose use, storage, and disposal are regulated under federal and state law. In addition, we are subject to international regulatory and safety requirements, including the European Union's directives related to hazardous substances such as Registration, Evaluation, Authorization and Restriction of Chemicals ("REACH") and the Restriction of Hazardous Substances ("RoHS"). Most of our battery systems are recyclable, which enables us to develop battery recycling programs with third parties to recycle our battery packs at the end of their useful life.

Model bus testing program

The FTA mandates that new transit bus models, and subsequent material changes to those models, be physically tested to meet certain performance standards in order to be eligible to receive federal transit funding. Altoona Testing is designed to promote production of better transit vehicles and components, and to ensure that transit customers purchase vehicles that are able to withstand the rigors of transit service. Altoona Testing, typically a required pre-condition for customer acceptances, is available to vendors on a first-come, first-served basis and subject to a waiting list. To date, our 40-foot and 35-foot buses have completed Altoona Testing, but as material changes are made to our bus platform, we must undergo new rounds of testing.

The vehicles we sell in Canada are subject to different safety testing regulations and may require redesign or additional testing.

Zero Emission Certifications

In addition, we are subject to the Environmental Protection Agency (“EPA”) and California Air Resources Board’s (“CARB”) annual certification greenhouse gas emissions requirements related to our transit vehicle and powertrain. The CARB certification is required to participate in California’s Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (“HVIP”), which offers vouchers to our customers to reduce the purchase price of zero-emission vehicles.

Motor Vehicle Safety Standards

The United States NHTSA mandates that vehicles, including transit buses, meet all the Federal Motor Vehicle Safety Standards (“FMVSS”) testing requirements issued by the agency. We self-certify that our electric transit buses comply with applicable FMVSS as of the date of vehicle production. Our electric transit buses must also conform to state and local requirements which vary by jurisdiction. Transit buses sold in Canada must also meet Canada Motor Vehicle Safety Standards (“CMVSS”). Transport Canada monitors FMVSS for applicability to Canada to further align with U.S. regulations, adopting or modifying an FMVSS to address unique usage and environmental conditions in the Canadian market.

Government funding opportunities

Federal funding programs for zero-emission commercial vehicles

On November 15, 2021, President Biden signed the Infrastructure and Investment Jobs Act, also referred to as the “Bipartisan Infrastructure Law”, into law. The Bipartisan Infrastructure Law created a number of new funding opportunities for Proterra Powered & Energy customers. The EPA will receive \$5 billion over 5 years for the Clean School Bus program, which provides \$500 million per year for zero emission school buses, as well as an additional \$500 million per year for low or zero emission school buses. The EPA also continues to administer the Diesel Emission Reduction Act grant program, which provides funding for transit, school bus, drayage, refuse, and other vehicle types that are low or zero emission. Finally, the Bipartisan Infrastructure Law also provides funding through discretionary and formula programs to various departments at the US Department of Transportation and, can potentially fund opportunities to electrify commercial vehicles at airports, ports, and other locations.

Federal formula and competitive funding programs for transit customers

Our transit customers are generally transit authorities who depend on federal government funding and programs authorized for public transportation under Title 49, Chapter 53 of the United States Code, and administered by the FTA, as well as other state funding programs. Federal and state funding has accelerated the adoption of electric vehicles in this market. Our principal customers are eligible for government funding, including, in particular, programs authorized under the Fixing America’s Surface Transportation (FAST) Act, to accelerate their investments in electric transit fleets. Passed in December 2015, the FAST Act allocated over \$305 billion for highway, transit, and vehicle safety programs for a five-year period ending September 30, 2020. The FAST Act was subsequently extended and then reauthorized by the Bipartisan Infrastructure Law through the federal government’s fiscal year 2026.

The Bipartisan Infrastructure Law provides approximately \$567 billion to discretionary and formula programs under the U.S. Department of Transportation’s (“USDOT”) jurisdiction, including approximately \$39 billion of funding to transit, which represents an increase of 43% compared to amounts authorized under the FAST Act. Among other programs, the Bipartisan Infrastructure Law authorized over \$70 million per year for the Low or No Emission Program, as well as a supplemental appropriation of \$5.25 billion over five years for the Low or No Emission Program. Although 25% of this funding is reserved for low-emission buses only, it will provide over \$850 million per year for funding zero-emission transit buses and infrastructure, a 14-fold increase over the authorized amounts in the FAST Act. The Bipartisan Infrastructure Law also funds the Buses and Bus Facilities competitive program at \$376 million in 2022 to \$412 million in 2026.

State funding programs

Certain states offer vouchers and other incentives for clean energy vehicles. California offers HVIP, which provides a point-of-sale discount to organizations that purchase fleets of hybrid and electric trucks and buses. The HVIP vouchers are targeted to offset about 80% of the incremental cost of hybrid and electric trucks and buses. In 2021, the state of California passed a historic zero-emission vehicle and infrastructure funding package for fiscal year 2021-2022, which includes \$269.5 million for the HVIP program as well as \$130 million set aside for HVIP for school buses, \$70 million set aside for transit vehicles, and \$75 million for HVIP for drayage trucks. California also offers vouchers for clean off-road equipment ("CORE"), such as cargo handling equipment. California's FY2021-2022 budget includes \$194.95 million for CORE vouchers. California's zero-emission vehicle and infrastructure funding package for fiscal year 2021-2022 also provided for \$873 million in funding for clean heavy-duty vehicles and off-road equipment in fiscal year 2021-2022 (to be implemented by the California Air Resources Board) and \$391 million in funding for medium- and heavy-duty ZEV infrastructure in fiscal year 2021-2022 (to be implemented by the California Energy Commission).

New York offers the Truck Voucher Incentive Program, which funds low- and zero-emission transit buses and other vehicles. Other states offer similar programs that provide point-of-sale discounts to purchasers of electric vehicles, which help our customers offset the costs of purchasing our transit vehicles. To be eligible vehicles, our electric transit buses must meet certification requirements for electric vehicles from the EPA and, where applicable, California Air Resources Board. Additionally, there are other state programs that help fund electric bus purchases. For example, states are allocating portions of settlement funds from the approximately \$15 billion Volkswagen Emissions Settlement Program to investments in zero-emission transit buses, and the state of California has allocated about 10% of its annual Cap-and-Trade funds to California's Transit and Intercity Rail Capital Program.

State emissions credits

Public transit agencies and other customers may be eligible for emission reduction credits through state programs.

The California Low Carbon Fuel Standard ("LCFS") enables transit agencies using electricity as a source of fuel to opt into the LCFS program and earn credits that can be monetized. While the value of these credits fluctuates, the credits may help to offset up to half of the fuel costs for our transit customers.

Intellectual property

The protection of our technology and intellectual property is an important aspect of our business. We rely upon a combination of patents, trademarks, trade secrets, copyrights, confidentiality procedures, contractual commitments, and other legal rights to establish and protect our intellectual property. We generally enter into confidentiality agreements and invention or work product assignment agreements with our employees and consultants to control access to, and clarify ownership of, our proprietary information.

As of December 31, 2021, we held 67 issued U.S. patents and had 24 U.S. patent applications pending. We also held 27 issued patents and 31 patent applications pending in a foreign jurisdiction. Our U.S. issued patents expire between 2029 and 2040. As of December 31, 2021, we held 10 registered trademarks in the United States, including the Proterra mark, and also held 12 registered trademarks in foreign jurisdictions. We continually review our development efforts to assess the existence and patentability of new intellectual property. We intend to continue to file additional patent applications with respect to our technology.

Employees

As of December 31, 2021, we had 870 full-time employees. We believe the positive relationship we have with our employees and our mission led culture differentiate us and are key drivers of business success. Our production employees in City of Industry are represented by the United Steel Paper & Forestry, Rubber, Manufacturing, Energy, Allied & Industrial Service Workers International Union AFL-CIO, CLC and we have a collective bargaining agreement with the union that will continue in effect until May 31, 2024, and then continue

from year to year until the following May 31 unless either party serves written notice upon the other of a desire to alter, amend, or terminate the collective bargaining agreement sixty days prior to the expiration date.

Availability of Information

We file Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, Proxy Statements, any amendments to those reports and statements and other information with the SEC. These SEC filings are made available free of charge on our website at www.proterra.com as soon as reasonably practicable after we file or furnish the materials with the SEC. Information contained on or accessible through our website is not incorporated into this filing unless expressly noted, and the inclusion of our website address in this filing is an inactive textual reference only.

Item 1A. Risk Factors

Investing in our securities involves risks. You should consider carefully the risks and uncertainties described below, together with all of the other information in this Annual Report, including the section titled “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and our consolidated financial statements and related notes, before deciding whether to purchase any of our securities. Our business, results of operations, financial condition, and prospects could also be harmed by risks and uncertainties that are not presently known to us or that we currently believe are not material. If any of these risks actually occur, our business, results of operations, financial condition, and prospects could be materially and adversely affected. Unless otherwise indicated, references in these risk factors to our business being harmed will include harm to our business, reputation, brand, financial condition, results of operations, and prospects. In such event, the market price of our securities could decline, and you could lose all or part of your investment.

Risks Related to Our Business

Our limited history of selling battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses, and related technologies makes it difficult to evaluate our business and prospects and may increase the risks associated with your investment.

Although we were incorporated in 2004, we only began delivering electric vehicles in 2010, and through December 31, 2021, had delivered over 800 electric transit buses. In 2021, 2020, and 2019, we recognized \$242.9 million, \$196.9 million, and \$181.3 million in total revenue, respectively. Since 2010, our product line has changed significantly, and our most recent transit bus model has only been in operation since 2020. In addition, certain variations of our 40-foot and 35-foot ZX5 transit buses have not yet passed the FTA federal bus testing program, which is a necessary condition to selling our buses to customers that use federal money to fund their purchases. Further, we started developing our battery technology in 2015 and did not begin battery pack production in any significant volume until 2017. We also have limited experience deploying our electric powertrain technology in vehicles other than electric transit buses. In 2018, we announced our software platform for connected vehicle intelligence, which we now refer to as our Apex fleet and energy management software-as-a-service platform. Our energy services, which includes fleet planning, charging infrastructure and related energy management services, only began generating limited revenue in 2019. We began providing integrated charging solutions in 2019 and have only begun sourcing our new charging hardware from a new partner in 2020, with our first deliveries occurring in 2021.

As a result, we have a limited operating history upon which to evaluate our business and future prospects, which subjects us to a number of risks and uncertainties, including our ability to plan for and predict future growth. Our limited operating experience is particularly concentrated in our Proterra Transit line of business, and that limited experience may not prove to be relevant to Proterra Powered and Proterra Energy. As a result, the operating history of Proterra Transit may not prove to be predictive of the success of Proterra Powered and Proterra Energy.

Moreover, because of the limited deployment of our products and services to date and our focus on electric transit buses, defects or other problems with our products or industry-wide setbacks that impact the electric vehicle market may disproportionately impact our ability to attract additional customers or sell to existing customers, and harm our brand and reputation relative to larger, more established vehicle manufacturers that

have a longer operating history and investments in more than one technology. We have encountered and expect to continue to encounter risks and difficulties experienced by growing companies in rapidly developing and changing industries, including challenges related to achieving market acceptance of our existing and future products and services, competing against companies with greater financial and technical resources, competing against entrenched incumbent competitors that have long-standing relationships with our prospective customers in the commercial vehicle market, including the public transit market and other transportation markets, recruiting and retaining qualified employees, and making use of our limited resources. We cannot ensure that we will be successful in addressing these and other challenges that we may face in the future, and our business may be adversely affected if we do not manage these risks appropriately. As a result, we may not attain sufficient revenue to achieve or maintain positive cash flow from operations or profitability in any given period, or at all.

If our battery systems, electrification and charging solutions, electric transit buses, fleet and energy management software, or other products have product defects and if our customer service is not effective in addressing customer concerns, our ability to develop, market and sell our products and services could be harmed.

Our battery systems, electrification and charging solutions, fleet and energy management software and electric transit buses have in the past contained, and may in the future contain, product defects. Due to the limited deployment of our battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses, and related technologies, there may be latent problems with our products that have not yet been discovered.

We have in the past found defects in our battery systems, electric transit buses, and charging systems. We may in the future find additional design and manufacturing defects that cause our products to require repair or not perform as expected. While we perform our own and in some cases third-party testing on the products we manufacture, we currently have a limited amount of customer operating experience with our battery systems, drivetrains, high-voltage systems, electric transit buses, software systems, and charging solutions by which to evaluate detailed long-term quality, reliability, durability, and performance characteristics of these products and solutions. There can be no assurance that we will be able to detect and fix any defects in our products prior to their sale to or operation by customers. Our efforts to remedy any issues may not be timely, may hamper production, or may not be satisfactory to our customers. Further, our business has grown rapidly in recent periods, and we may not be able to scale our service organization or partner with an existing service network quickly enough to satisfactorily provide timely customer service and address product defects, customer complaints, and warranty issues, which could result in customer dissatisfaction and negatively impact further sales.

Any product defects, delays, or legal restrictions on our products, or other failure of our products to perform as expected could harm our reputation, negatively impact our ability to market and sell our products, and result in delivery delays, product recalls, product liability claims, customer contract terminations, adverse regulatory actions, and significant warranty and other expenses, and could have an adverse effect on our business, prospects, financial condition, and operating results.

Defects in the materials or workmanship of our composite bus bodies could harm our reputation, expose us to product warranty or other liability claims, decrease demand for our buses, or materially harm existing or prospective customer relationships.

We are the only transit bus manufacturer in the United States to use a composite unibody for our electric transit buses. In the past, we have sourced composite bus bodies from three suppliers, and now use only one supplier. Defects in the composite body, including non-structural concerns, whether caused by design, engineering, materials, manufacturing errors, or deficiencies in manufacturing or quality control processes at our suppliers, are an inherent risk in manufacturing technically advanced products for new applications. We offer our customers a twelve-year warranty on the composite bus body structure and bear the risk of possible defects. We have experienced defects in some bus bodies and have had to make repairs. For example, in October 2018 we discovered cracking in the wheel wells on some of our buses which required us to repair these defects under our warranty and will increase our field and customer service costs. In addition, in 2020 and 2021, we discovered a manufacturing quality issue that required us to repair laminate cracks that occurred near door frames of certain customer buses, and we expect that we will have to make more of these types of repairs. In 2020, we filed a recall related to the attachment of a torque limiter plate to the composite bus body that did not have proper adhesive

application and could compromise the steering gear box and steering of the vehicle. We have recently voluntarily filed a new recall on the same issue for a new population of buses. Certain customers have experienced superficial cracking in the exterior gel coat or skin coat of the composite body which has caused certain customers to remove buses from revenue service and required us to develop inspection criteria and repair protocols, when applicable. We have also had to address vehicle inspection guidelines that are designed for metal frame buses with chassis and are not necessarily applicable to composite unibody architecture. Though these defects have not materially impacted us to date, we expect to continue to address these issues, and these defects or future defects with our advanced body materials whether structural or not may harm our existing and prospective customer relationships, damage our brand, and result in a reduction of awards, customer contract terminations, adverse regulatory actions, increased warranty claims, product liability claims and other damages.

Our most recent business expansion with Proterra Powered and Proterra Energy may not be as successful as anticipated, may not attract the customers and business partners we expect, and the assumptions underlying the growth prospects of these businesses may not prove to be accurate.

We have recently introduced and, in the future may introduce, new services and products that our customers and prospective customers may not utilize to the extent we anticipate or at all. For example, Proterra Powered and Proterra Energy products and services are designed to simplify the complexities of electric vehicle energy delivery and the deployment of large electric vehicle fleets for our customers. Through these businesses, we offer to design, build, finance, operate, and maintain the energy ecosystem that we believe to be required to power commercial electric vehicles. We have made, and will continue to be required to make, significant investments to scale these businesses, but we cannot be certain that such investments will be successful or meet the needs of our customers. Moreover, even if our customers use these services, we may encounter new challenges related to the delivery of energy solutions and competition from companies that may be better positioned to provide energy management services. If we invest in services or products that are not adopted by our customers or fail to invest in new services and products that meet the needs of our customers, our business, prospects, financial condition, and operating results could be adversely affected. In addition, we have limited history operating these businesses and providing the products and services they offer. There can be no assurances that these products and services will be accepted by our customers, or that we will effectively be able to market and sell them to existing customers, especially our transit customers who comprise the vast majority of our current revenues. Further, the limited experience we have acquired operating Proterra Transit may not prove to be applicable to Proterra Powered and Proterra Energy.

While Proterra Powered and Proterra Energy currently comprise a small amount of our revenues, and we expect them to account for a growing percentage of our revenue in the future, it is possible that certain assumptions underlying the launch of these businesses are subsequently determined to be inaccurate, such as assumptions regarding the growing adoption of electrification by commercial vehicle manufacturers and their customers in general; the attractiveness of our products and services to OEMs that would use our battery systems, electric drivetrains, high-voltage systems, vehicle controls, telemetry gateways, charging solutions, software and telematics platforms and related technologies in their electric transit buses or elsewhere; government and regulatory initiatives and directives impacting the adoption of electrification technologies for commercial vehicle applications; and the overall reliance by enterprises on commercial vehicles and the demand for medium- and heavy-duty trucks in the future.

Because many of the markets in which we compete are new and rapidly evolving, it is difficult to forecast long-term end-customer adoption rates and demand for our products.

We are pursuing opportunities in markets that are undergoing rapid changes, including technological and regulatory changes, and it is difficult to predict the timing and size of the opportunities. Commercial vehicle battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses, and related technologies, represent complex products and services. Because these automotive systems depend on technology from many companies, commercialization of commercial vehicle electrification products could be delayed or impaired due to unavailability of technology or integration challenges inherent in the use of multiple vendors in commercial vehicle production. Although we currently have contracts with several commercial customers, these companies may not be able to implement our technology immediately, or at all. Regulatory, safety or reliability requirements, many of which are outside of our control, could also cause delays or otherwise impair commercial adoption of these new technologies, which will adversely affect our growth. Our future financial

performance will depend on our ability to make timely investments in the correct market opportunities. If one or more of these markets experience a shift in customer or prospective customer demand, our products may not compete as effectively, if at all, and they may not be designed into commercialized products. Given the evolving nature of the markets in which we operate, it is difficult to predict customer demand or adoption rates for our products or the future growth of the markets in which we operate. If demand does not develop or if we cannot accurately forecast customer demand, the size of our markets, or our future financial results, our business, prospects, financial condition, and operating results could be adversely affected.

We face intense and increasing competition in the transit bus market and may not be able to compete successfully against current and future competitors, which could adversely affect our business, revenue growth, and market share.

The transit bus industry is relationship driven and dominated by incumbent companies that have served their respective markets longer than we have. In the transit bus industry, our main sources of competition are incumbent transit vehicle integrators that have served our market with legacy diesel, diesel-hybrid and compressed natural gas products for many years, such as NFI Group Inc., Gillig Corporation, and Nova Bus Company; BYD Company Ltd., a Chinese company that offers an array of vehicles and other products, including electric transit vehicles; and new entrants and companies in adjacent markets, including other vehicle manufacturers that have entered or are reported to have plans to enter the transit bus market.

In the transit bus industry, electric bus procurements still represent a minority of annual transit bus purchases. As the number of electric bus OEMs increases, we may not be able to maintain our leading market position in North America. We also may not be successful in competing against incumbent competitors that have longer histories of serving the transit bus market and established track records of service, or with much larger, well-funded companies that choose to invest in the electric transit bus market. As more established bus companies develop their electric vehicle or competing zero-emission solutions, their long history in the transit sector could prove to be a competitive advantage which may have a negative impact on our ability to compete with them. Moreover, our competitors that also manufacture diesel-hybrid and compressed natural gas vehicles may have an advantage with their existing and prospective customers that are interested in exploring diesel alternatives without committing to electric vehicles or to pursue a gradual electrification strategy with the same manufacturer. Additionally, these competitors have more experience with the procurement process of public transit authorities, including bid protests. Competitors, potential customers, or regulators may also make claims that our electric transit buses or competitive bid activity are not in compliance with laws, regulatory requirements, or industry standards, which may impact our ability to sell our electric transit buses and to compete successfully for current and future customers. For example, in 2017 and 2018 one of our competitors notified certain of our customers that our transit bus was overweight on the front axle and lobbied those customers to withdraw their business from us. While this competitor's actions did not result in the termination of customer awards or contracts, similar actions by this or other competitors may have consequences for future business or effects that we have not anticipated on other future opportunities.

We face intense and increasing competition in the commercial vehicle electrification market and may not be able to compete successfully against current and future competitors, which could adversely affect our business, revenue growth, and market share.

The electric powertrain, electric commercial vehicle and charging solutions industries are highly competitive. We may not be successful in competing against companies in the battery systems, electric powertrain, charging solutions and related industries who may have more resources than we do or who are able to produce products and deliver services that are perceived by the market to be superior to ours. Global battery makers in particular may be able to leverage their superior scale and access to capital to sell their products more effectively to potential customers. We may also face competitive pressure from incumbent vehicle producers that decide to enter the battery system or electric powertrain business, or vertically integrate their supply chain, and that are able to leverage their superior resources and capital to produce products that perform or are priced competitively when compared to our own.

In the battery system and electric powertrain industry, our main sources of competition include large Chinese battery suppliers such as CATL; new companies that are focused on battery electric technology for the commercial vehicle market, such as Romeo Power and BorgWarner; incumbent tier one automotive suppliers that

are developing electric powertrain alternatives to internal combustion engines, such as Cummins, Allison Transmission and Dana; and passenger and commercial vehicle manufacturers that are developing their own internal electric powertrain solutions for their vehicles including large automotive companies, such as Daimler, General Motors and Tesla. In the future, incumbents and new companies offering competing zero emission solutions such as fuel cell electric vehicles may also become significant competitors.

In the charging solutions industry, our main sources of competition are incumbent charging solutions providers that develop charging solutions for commercial vehicles such as Siemens, ABB, Heliox, ChargePoint and Rhombus; and software companies that offer charging management solutions and can partner with hardware providers to provide complete solutions to end customers.

These competitors may have greater financial, technical, manufacturing, marketing, sales, and other resources than we do, and may have more experience and ability to devote greater resources to designing, developing, testing, manufacturing, distributing, deploying, promoting, selling or supporting battery systems, electrification and charging solutions, fleet and energy management software, and related technologies. Similarly, our principal competitors that also design, test, manufacture and deploy battery systems, electrification and charging solutions, fleet and energy management systems and related technologies for passenger vehicles may have a competitive advantage, through their established distribution and service networks for legacy vehicle technology, brand recognition and market acceptance of their products and services, and perceived reliability or popularity, all of which could be attractive to prospective partners and manufacturers that are exploring commercial vehicle electrification alternatives. As a result, our current and potential competitors may be able to respond more quickly and effectively than we can to new or changing opportunities, technologies, standards, or customer requirements, or devote greater resources than we can to the development, promotion, distribution and sale of their products and services. Our competitors and potential competitors may also be able to develop products or services that are equal or superior to ours, achieve greater market acceptance of their products and services, and increase sales by utilizing different distribution channels than we do. Some of our competitors may aggressively discount their products and services in order to gain market share, which could result in pricing pressures, reduced profit margins, lost market share, or a failure to grow market share for us. As the market for commercial electric vehicles grows and battery systems, electrification and charging solutions, fleet and energy management software, and related technologies gain wider adoption, we expect that additional specialized providers of battery systems, electric powertrain technology, charging infrastructure, and related software solutions and related technologies will enter the markets that we address and that larger competitors could more effectively sell their offerings.

In addition, we developed our battery system and powertrain systems and related components to be compliant with “Buy America” regulations applicable to the transit business, which means that we may have higher costs to procure components, and design, test and manufacture such products in the United States than competitors that are not compliant with Buy America or similar regulations. Our competitors may be able to manufacture comparable or competitive products in more cost-effective jurisdictions and import them to the United States at prices lower than ours, which competition could cause us to lose market share or compel us to reduce prices for goods or services to remain competitive, which could result in reduced sales and revenue in industry segments that are not subject to Buy America or similar regulation. The production of battery systems, electrification and charging solutions, fleet and energy management systems, and related technologies in China, where production costs are lower and where the development of such technologies could be subsidized by the state, could negatively impact our competitive profile by presenting our customers and partners a more cost-effective alternative to our products and services, which could result in reduced sales and revenue and loss of market share or compel us to reduce prices for goods or services to remain competitive.

Moreover, current and future competitors may also make strategic acquisitions or establish cooperative relationships among themselves or with others, including our current or future suppliers or business partners. By doing so, these competitors may increase their ability to meet the needs of our customers or potential customers. These developments could limit our ability to generate revenue from existing and new customers. If we are unable to compete successfully against current and future competitors, our business, prospects, financial condition, and operating results would be adversely affected.

Increases in costs, disruption of supply, or shortage of materials, particularly lithium-ion cells, could harm our business.

We may experience, and did experience in 2021, increases in the cost or a sustained interruption in the supply or shortage of materials necessary for the production, maintenance and service of our transit buses, battery systems, electrification and charging solutions, fleet and energy management systems, and related technologies. Any such increase in cost, including due to inflation, supply interruption, materials shortage, or increase in freight and logistics costs, could adversely impact our business, prospects, financial condition, and operating results. Our suppliers use various materials, including aluminum, carbon fiber, lithium, cobalt, nickel, copper and neodymium. The prices and supply of these materials may fluctuate, depending on market conditions, geopolitical risks, such as the war in Ukraine, fluctuations in currency exchange rates, and global supply and demand for these materials, including increased production of electric transit buses and other energy storage applications by our competitors and companies in adjacent markets such as passenger cars and stationary storage. Our contracts do not all have mechanisms in place that allow us to raise prices to the end customer due to inflation or other material cost increases. If we are not able to raise our prices to our end customers, inflationary pressures and other material cost increases could, in turn, negatively impact our operating results.

Moreover, we are subject to risks and uncertainties associated with changing economic, political, and other conditions in foreign countries where our suppliers are located, such as disruptions due to the COVID-19 pandemic and related global supply chain disruptions, increased import duties, tariffs, and trade restrictions. Unavailability or delay of imports from our foreign suppliers would likely cause interruptions in our supply chain.

Our business is dependent on reliable availability of lithium-ion cells for our battery packs. While we believe other sources of lithium-ion cells will be available for our battery packs, to date, we have only used one supplier for lithium-ion cells for the battery packs used in commercial applications for our Proterra Transit and Proterra Powered customers. Any disruption in the supply of battery cells could disrupt production of our battery systems and electric transit buses we produce until we are able to find a different supplier that can meet our specifications. Such disruption could have an adverse effect on our business, prospects, financial condition, and operating results.

We expect raw material prices to remain elevated throughout 2022 due to inflation and continued global supply chain issues. While we believe our exposure to the potential increased costs is no greater than the industry as a whole, our business and results of operations may be adversely affected if our efforts to mitigate their effects are unsuccessful. Substantial increases in the prices for our materials or prices charged to us, particularly those charged by lithium-ion cell suppliers or charger hardware providers, would increase our operating costs and could reduce our margins if we cannot recoup the increased costs through increased sale prices on our battery system, vehicle or charging systems. Furthermore, fluctuations in fuel costs, or other economic conditions, may cause us to experience significant increases in freight charges and material costs. Additionally, because the negotiated price of an existing battery system, vehicle or charging system is established at the outset, we, rather than our customers, bear the economic risk of increases in the cost of materials. Moreover, any attempts to increase battery system, vehicle or charging system prices in response to increased material costs could increase the difficulty of selling our electric transit buses or battery systems at attractive prices to new and existing customers and lead to cancellations of customer orders. If we are unable to effectively manage our supply chain and respond to disruptions to our supply chain in a cost-efficient manner, we may fail to achieve the financial results we expect or that financial analysts and investors expect, and our business, prospects, financial condition, and operating results may be adversely affected.

We have been and may continue to be impacted by macroeconomic conditions resulting from the global COVID-19 pandemic including supply chain disruptions.

The COVID-19 pandemic has impacted worldwide economic activity since the first quarter of 2020. Government regulations and shifting social behaviors have limited or closed non-essential transportation, government functions, business activities and person-to-person interactions. In some cases, the relaxation of such trends has been followed by actual or contemplated returns to stringent restrictions on gatherings or commerce, including in parts of the United States. At this time, it is difficult to predict the extent of the impact of the COVID-19 pandemic, and whether more stringent restrictions on commerce or non-essential interaction will be imposed, including as a result of new strains or variants of the virus.

We temporarily suspended operations at each of our manufacturing facilities in the United States for short periods of time during 2020, and have in several periods operated at reduced capacity in our battery and bus manufacturing plants because of a shortage of available workers, quarantine restrictions and social-distancing requirements. Some of our suppliers, shippers and partners have also experienced labor shortages due to the COVID-19 pandemic, including, for example, a Michigan-based supplier of battery system components, which resulted in the delayed launch of our battery production line in City of Industry, California because of delays in receiving necessary manufacturing equipment. We have experienced delays in parts deliveries from some of our overseas suppliers related to congestion at the port of Los Angeles, California. Most recently, during the third and fourth quarters of 2021, our vehicle and equipment deliveries were impacted by constraints and inefficiencies in production driven by shortages in component parts, particularly resin for connectors, resulting from global supply chain disruptions stemming from the pandemic. These delays have not caused any plant shutdowns, but have caused delays in production and incremental shipping costs for air freight. Reduced operations or closures at the Bus Testing Center at Altoona, Pennsylvania, and delayed product inspections by customers, also resulted in delayed delivery and acceptances of electric transit buses. Macroeconomic conditions and changes to levels of consumer outlook and spend in the future may further adversely impact the energy product and automotive industries generally. For example, many of our customers, especially those in public transit, have postponed deliveries of our electric transit buses, and other potential customers have delayed requests for product proposals for new electric bus procurements or postponed changing infrastructure projects. If there is lower demand for public transportation in the future and a corresponding decrease in electric transit bus purchases and school bus purchases, our revenue and results of operations could be adversely affected. In addition, the COVID-19 pandemic delayed interest in commercial vehicle electrification for some school bus customers as school districts have reduced spending on capital investments and scaled back their operations generally.

We cannot predict the duration or direction of current domestic or global trends, the sustained impact of which is largely unknown, rapidly evolving, and varied across geographic regions, including within the United States. We continue to monitor macroeconomic conditions and we may not accurately project demand and infrastructure requirements and deploy our production, workforce, and other resources effectively in response. In the event of more stringent restrictions on commerce or non-essential interactions, our operations could be further suspended, perhaps indefinitely. If current market conditions continue or worsen, if we cannot or do not maintain operations appropriately scaled to such conditions, or are later required to or choose to suspend such operations again, our business, prospects, financial condition, and operating results may be harmed. Sustaining our production trajectory will also require the readiness and solvency of our suppliers and vendors, a stable and healthy production workforce, and ongoing government cooperation, including for travel allowances, each of which could be negatively affected by the duration and long-term effects of the COVID-19 pandemic.

Our suppliers may fail to deliver components according to schedules, prices, quality and volumes that are acceptable to us, or we may be unable to manage these components effectively.

Some of our products contain thousands of parts that we purchase from hundreds of mostly single-source direct suppliers, generally without long-term supply agreements. This exposes us to multiple potential sources of component shortages. Unexpected changes in business conditions, materials pricing, labor issues, wars, governmental changes, tariffs, natural disasters, health epidemics such as the global COVID-19 pandemic and its related disruption of global supply chains, particularly in the industrial sector, and other factors beyond our or our suppliers' control could also affect these suppliers' ability to deliver components to us or to remain solvent and operational. The unavailability of any component or supplier could result in production delays, idle manufacturing facilities, product design changes, loss of access to important technology and tools for producing and supporting our products, and delays in providing replacement parts to our customers. We have experienced component shortages and delays. For example, we have experienced component shortages and delays during the COVID-19 pandemic, and may continue to experience similar shortages and delays as the pandemic continues. We have also experienced delays in sourcing replacement parts for some of our oldest transit buses in customer fleets, which has led to customer dissatisfaction and buses being out of service for lengthy periods while awaiting replacement parts.

Moreover, significant increases in our production, or product design changes made by us have required and may in the future require us to procure additional components in a short amount of time. Our suppliers may not be able to sustainably meet our timelines or our cost, quality and volume needs, or may increase prices to do so, requiring us to replace them with other sources. Our supply for battery cells and other raw materials is critical in

allowing us to scale our operations and meet our growth profitability and cash flow targets, such that any supply delay or vulnerability in the battery cell supply chain could alter our growth plans. Further, we have limited manufacturing experience and we may experience issues increasing the level of localized procurement at our current or future facilities. While we have to date secured additional or alternate sources or developed our own replacements for many of our components, and we believe that we will be able to continue to do so, there is no assurance that we will be able to do so quickly or at all, particularly with highly customized components. Additionally, we may be unsuccessful in our continuous efforts to negotiate with existing suppliers to obtain cost reductions and avoid unfavorable changes to terms, source less expensive suppliers for certain parts, and redesign certain parts to make them less expensive to produce. Any of these occurrences may harm our business, prospects, financial condition and operating results.

As the scale of our production increases, we will also need to accurately forecast, purchase, warehouse and transport components at high volumes to our manufacturing facilities across the United States. If we are unable to accurately match the timing and quantities of component purchases to our actual needs or successfully implement automation, inventory management and other systems to accommodate the increased complexity in our supply chain and parts management, we may incur unexpected production disruption, storage, transportation and write-off costs, which may harm our business and operating results.

Our transit business is significantly dependent on government funding for public transit, and the unavailability, reduction, or elimination of government economic incentives would have an adverse effect on our business, prospects, financial condition, and operating results.

Our principal transit customers are transit authorities that depend on government funding and programs authorized for public transportation under Title 49, Chapter 53 of the U.S. Code, and administered by the FTA, including Urbanized Area Formula Grants, Formula Grants for Rural Areas, the Capital Investment Program, and the Bus and Bus Facilities Program. The Fixing America's Surface Transportation Act, or FAST Act, enacted in December 2015, allocated over \$305 billion for highway, transit, and vehicle safety programs for the five-year period that ended on December 31, 2020. Among other programs, the FAST Act reinstated a competitive Bus and Bus Facilities Infrastructure Investment Program, which grew from \$268 million in 2016 to \$344 million in 2020, resulting in an 89% increase over the 2015 funding levels for buses and bus facilities. To date, a substantial majority of our customers have received funding through these FAST Act programs in order to purchase new electric transit buses. For example, in 2018, nearly 70% of transit agencies that ordered buses from us were recipients of grants through the Low or No Emission Vehicle Program. The Low or No Emission Vehicle Program has enabled public transit agencies to purchase electric transit buses when the upfront cost of the electric bus was significantly higher than legacy diesel buses and the technology was new to customers. On November 15, 2021, President Biden signed the Infrastructure and Investment Jobs Act (IIJA), also referred to as the "Bipartisan Infrastructure Law", into law, reauthorizing surface transportation programs through the federal government's fiscal year in 2026, increasing funding for transit focused programs and establishing additional funding opportunities for no and low emission vehicles..

In addition to funding under the FAST Act and the Bipartisan Infrastructure Law, certain states and cities offer vouchers for the purchase of electric buses, such as California's Hybrid & Zero Emission Truck & Voucher Incentive Project, and the New York Truck Voucher Incentive Program. These vouchers provide point-of-sale discounts to vehicle purchasers. Additionally, there are other state programs that help fund electric bus purchases, including California's Transit and Intercity Rail Capital Program, which has been allocated a portion of California's Cap-and-Trade funds annually. The California Low Carbon Fuel Standard, or LCFS, also enables transit agencies using electricity as a source of fuel to opt into the LCFS program and earn credits that can be monetized. While the value of these credits fluctuates, the credits may help to offset up to half of the fuel costs for our transit customers.

There can be no assurance that these programs will be reauthorized following expiration of their current terms, that other government funding programs will continue to be available at the current levels or at all in the future, or that new government funding programs will be adopted, including with respect to products and services that are currently or will in the future be offered by Proterra Powered and Proterra Energy. Uncertainty or delay in extending, renewing, or adopting these incentives beyond their current or future expiration dates could negatively impact our business because sales cycles for public and other transit customers are long and customers may be

unwilling to adopt electric technology if supportive funding is not assured. For example, transit authorities have reduced order sizes in the past because of a decrease in available funding.

Available government funding and economic incentives are subject to change for a variety of reasons that are beyond our control, including budget and the policy initiatives and priorities of current and future administrations at the federal and state level. In addition, future government shutdowns may impact the availability and administration of government funding, which could adversely impact future bus orders and result in payment delays for existing orders. For example, we experienced payment delays from customers during the U.S. federal government shutdown in January 2019 related to the FTA's inability to administer grant funding during the shutdown. If government support for adoption of electric vehicles and clean energy initiatives wanes, as it did during the Trump Administration, this could adversely affect the growth of the North American public transit electric bus market and the commercial electric vehicle market generally, and could have an adverse effect on our business, prospects, financial condition, and operating results.

Our future growth prospects depend upon the interest of commercial vehicle manufacturers in adopting our products and services that are designed to facilitate the electrification of commercial vehicles.

Our growth is highly dependent upon the adoption of our battery systems, electrification and charging solutions, fleet and energy management software and electric transit buses by commercial vehicle manufacturers and OEMs, and their willingness to partner with us on the design, development, testing, manufacturing, distribution, deployment, promotion, sale, and support of our products. The market for commercial electric vehicles and electrification technologies is relatively new, rapidly evolving, and characterized by rapidly changing technologies, price competition, additional competitors, evolving government regulation and industry standards, frequent new product and vehicle announcements, and changing demands and behaviors of customers and potential partners. As a result, we spend resources educating our potential customers and partners on the benefits of adopting electric vehicle technology and engaging in lobbying efforts to promote clean energy initiatives.

Other factors that may influence the adoption of our commercial vehicle electrification technologies by manufacturers and OEMs include:

- perceptions about commercial electric vehicle performance, total cost of ownership, design, quality, cost and reliability that may be attributed to the use of advanced technology (in particular with respect to lithium-ion battery packs), especially if adverse events or accidents occur that are linked to the quality or safety of commercial electric vehicles;
- the amount and availability of federal, state, or other government funding and, in particular, the availability of economic incentives promoting fuel efficiency and alternate forms of energy, such as the Low or No Emission Vehicle Program and the Advanced Technology Vehicle Manufacturing Loan Program;
- the range over which commercial electric vehicles may be driven on a single battery charge and the time it takes to recharge the batteries of these vehicles;
- the cost and feasibility of installing new charging infrastructure;
- concerns about electric grid capacity and reliability, the cost of electricity, and reliance of utilities on fossil fuels for electricity generation, which could derail our past and present efforts to promote commercial electric vehicles as a practical substitution for vehicles that require fossil fuels;
- the availability of alternative fuel vehicles, including diesel-hybrid and compressed natural gas vehicles, and battery electric fuel cell vehicles;
- improvements in the fuel economy of the internal combustion engine;
- perceptions about the impact of electric vehicles on the environment and the health and welfare of communities;

- perceptions about the use of electric batteries, sourcing of battery components, recyclability, and safe disposal of batteries;
- the availability of service for commercial electric vehicles;
- the environmental consciousness of corporations and public agencies;
- volatility in the cost of diesel fuel and oil;
- government regulations;
- social and political support for clean energy initiatives and commercial electric vehicles;
- perceptions about and the actual cost of alternative fuel vehicles; and
- macroeconomic factors.

Moreover, the willingness of commercial vehicle manufacturers and OEMs to embrace our battery systems, electrification and charging solutions, fleet and energy management software, and related technologies depends, in part, on the real or perceived reliability of these products and services, and their ability to provide complete electrification solutions to potential customers. Any lapse in quality, reliability or performance of any of these products or services could harm the perception of our other products and negatively impact the adoption of our products or services.

Any of the factors described above may cause current or potential customers not to purchase or adopt our products or services. If the market for commercial electric vehicles does not develop as we expect or develops more slowly than we expect, our business, prospects, financial condition, and operating results could be adversely affected.

The growth of our transit business is dependent upon the willingness of corporate and other public transportation providers to adopt and fund the purchase of electric vehicles for mass transit.

The growth of our transit business is highly dependent upon the adoption of electric transit buses for mass transit by corporate and public transportation providers. The market for electric transit buses is relatively new, rapidly evolving, and characterized by rapidly changing technologies, price competition, additional competitors, evolving government regulation and industry standards, frequent new vehicle announcements, and changing demands and behaviors of riders. As a result, we spend resources educating our potential customers on the benefits of adopting electric vehicle technology and engaging in lobbying efforts to promote clean energy initiatives.

The same factors described above that may influence the adoption of our commercial vehicle electrification technologies by manufacturers and OEMs, also may influence the adoption of electric transit buses by corporate and public transportation providers. Moreover, the willingness of corporate and public transportation providers to embrace electric transit buses depends, in part, on the willingness of users of public transportation to continue to use buses instead of alternative modes of transportation, including private car, rail, and ridesharing services including Uber, Lyft, and electric bikes and scooter services, on-demand shuttles and, in the future, autonomous vehicles. Bus ridership has been severely impacted by the COVID-19 pandemic and has been declining in large transportation markets, which may lead to fewer investments in electric transit buses in the long term.

Any of these factors may cause current or potential corporate and other public transit customers not to purchase our electric transit buses or use our services. If the market for electric vehicles for mass transit does not develop as we expect or develops more slowly than we expect, our business, prospects, financial condition, and operating results could be adversely affected.

Our dependence on a limited number of suppliers introduces significant risk that could have adverse effects on our financial condition and operating results.

We are a relatively low-volume producer of battery systems, electrification and charging solutions, fleet and energy management software and electric transit buses, and related technologies, and do not have significant purchasing power with suppliers in the electric vehicle market for many components of our products, including batteries, drivetrains, high-voltage systems and electric transit buses. As a result, suppliers and other third parties may be less likely to invest time and resources in developing business relationships with us if they are not convinced that our business will succeed. To build and maintain our business and obtain favorable contract terms, we must maintain our suppliers' and other vendors' confidence in our stability, liquidity, and business prospects. Maintaining such confidence may be complicated by certain factors, such as our limited operating history, suppliers' unfamiliarity with our products, competition, and uncertainty regarding the future of commercial vehicle electrification. Some of these factors are outside of our control and any negative perception about our business prospects, even if exaggerated or unfounded, would likely harm our business and make it more difficult to contract with suppliers on favorable terms. In addition, some of our suppliers may have more established relationships with our competitors, and as a result of those relationships, some suppliers may choose to limit or terminate their relationship with us.

In addition, with respect to our battery manufacturing business that supports Proterra Transit and Proterra Powered, our battery production volumes are relatively small and we are currently sole sourcing key components from select suppliers, such as LG Energy Solution, for the lithium-ion cells that we use to manufacture our battery packs and other sole source suppliers for key elements of the battery pack. Disruptions in production may result if we had to replace any of these sole source suppliers on short notice.

With respect to our transit business, we have few long-term agreements with suppliers and typically purchase supplies on an order-by-order basis depending on the material requirements to build customers' buses. In many cases, we rely on a small group of suppliers, many of which are single-source suppliers, to provide us with components for our products, such as our bus body and our drivetrains. Moreover, transit bus customers have specified a certain supplier for components, such as its preferred seating or heating, ventilation, and air conditioning units, and we are then beholden to that specified supplier's terms and delivery schedule. While we obtain components from multiple sources when that is a viable alternative, certain components used in our electric transit buses, such as bus bodies, must be custom made for us. For example, TPI Composites, Inc. is the current sole source supplier for our bus body.

If these suppliers become unwilling or unable to provide components, there may be few alternatives for supply of specific components, which may not be available to us on acceptable terms or favorable prices, or that meet our published specifications. We may also experience delays while we qualify new suppliers and validate their components. In addition, replacing our sole source suppliers may require us to reengineer our products, which could be time consuming and costly.

Our reliance on a small group of sole-source suppliers as well as certain suppliers specifically chosen by customers creates multiple potential sources of delivery failure or component shortages for the production of our products. As a result, we may be required to renegotiate our existing agreements with our suppliers, potentially with less favorable terms, and incur additional costs associated with the production. In the past, we have experienced delays related to supply shortages, including, most recently, as a result of the global supply chain disruptions related to the COVID-19 pandemic, and untimely or unsatisfactory delivery of components that have stalled production with respect to our electric transit buses. Moreover, although we continue to expend significant time and resources vetting and managing suppliers and sourcing alternatives, we may experience future interruptions in our supply chain. Failure by our suppliers to provide components for our electric transit buses, battery systems or other products could severely restrict our ability to manufacture our products and prevent us from fulfilling customer orders in a timely fashion, which could harm our relationships with our customers and result in contract fines, negative publicity, damage to our reputation, and adverse effects on our business, prospects, financial condition, and operating results.

If we fail to make the right investment decisions in our technologies and services, we may be at a competitive disadvantage.

Electrification of commercial vehicles is a relatively new field. We have invested significant resources into our technologies, including our battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses, and related technologies. For example, we invested in a single-blade overhead charging system that we have deployed and must continue to support for transit customers, even though the industry has moved to other solutions such as overhead pantograph or plug-in charging which also have required, and may continue to require, new investments on our part. If we select and invest in technology standards that are not widely adopted or invest in technologies that are not widely adopted by large customers who influence the industry in the future, we may not recover our investments in these technologies and may be at a competitive disadvantage, and our business, prospects, financial condition, and operating results could be adversely affected.

We have a long sales, production, and technology development cycle for new public transit customers, which may create fluctuations in whether and when revenue is recognized, and may have an adverse effect on our business.

The vast majority of our current and historical sales are to transit agencies that do not procure electric transit buses every year. The complexity, expense, and nature of government procurement processes result in a lengthy customer acquisition and sales process. It can take us years to attract, obtain an award from, contract with, and recognize revenue from the sale of a vehicle to a new customer, if we are successful at all. Before awarding an order for electric transit buses, transit agencies generally conduct a comprehensive and competitive proposal process based on a variety of criteria, including technical requirements, reliability, reputation, and price. Even if we are awarded an order, the actual realization and timing of revenue is subject to various contingencies, many of which are beyond our control, including the customer's interpretation of technical or performance requirements for acceptance, timing and conditions of customer acceptance, and the customer's reduction, modification, or termination of an order. A customer is not obligated to purchase the electric transit buses and may cancel or modify an award prior to entering into a contract with us. We have in the past, and may in the future, experience customer cancellations or modifications of awards. A customer can cancel or modify an award for a variety of reasons, including as a result of improvements in our technology or the technology of our competitors between the dates of award and signed contract, or as the result of a successful bid protest.

Our sales and production cycle for a transit customer can be a long and time-consuming process. The initial sales process from first engagement to award typically ranges from 6 to 18 months. The award of a proposal is typically followed by a pre-production process where the design and specifications of the customized buses are mutually agreed and we negotiate a final contract and purchase order with our customer. Procurement of parts and production typically follow this final agreement between us and the customer. Once a bus is fully manufactured, the customer performs a final inspection and determines whether to accept delivery of the bus, at which time we recognize revenue on the sale. The length of time between a customer award and vehicle acceptance typically varies between 12 and 24 months, depending on product availability, production capacity, and the pre-delivery and post-delivery inspection process by the customer which often results in additional changes to the transit bus after manufacturing completion, re-works, further product validation and acceptance periods, and additional costs to us that we may not be able to recover. Consequently, we may invest significant resources and incur substantial expenses before a customer accepts a bus order and these expenses may not be recovered at all if a customer does not accept the completed bus, the bus requires costly modifications, or we extend additional warranties. For instance, we create a bill of materials and obtain the appropriate parts for each customized bus for a customer, which can result in excessive inventory risk if a customer changes or cancels the order. In addition, we may devote significant management effort to develop potential relationships that do not result in bus orders, acceptance of the bus as delivered, and the corresponding recognition of revenue, and the diversion of that effort may prevent us from pursuing other opportunities. As a result, our long sales and development cycle may subject us to significant risks that could have an adverse effect our business, prospects, financial condition, and operating results.

If we are unable to attract new customers and expand sales to existing customers, our revenue growth could be slower than we expect and our business would be adversely affected.

Our ability to achieve significant future revenue will depend in large part upon our ability both to attract new customers and to expand our sales to existing customers, including sales of Proterra Powered and Proterra Energy products and services to current and future customers, including Proterra Transit customers. If we fail to attract new customers or fail to maintain and expand our customer relationships, our business would be adversely affected. For example, if our existing transit customers do not expand their orders, our revenue may grow more slowly than expected, may not grow at all, or may decline. Additionally, we have a small direct sales force for each part of our business. We plan to continue expanding our sales efforts, but we cannot be assured that our efforts will result in sales to new customers, or increased sales to existing customers, with respect to our Proterra Powered, Proterra Transit or Proterra Energy offerings. Further, given the small size of our sales team, losing a member of our team may adversely affect our sales efforts with existing or potential new customers. If our efforts to expand sales to our existing customers are not successful, our existing customers do not continue to purchase additional products and services, or we are unable to attract new customers, our business, prospects, financial condition, and operating results would be adversely affected.

We have a history of net losses, have experienced rapid growth and anticipate increasing our operating expenses in the future, and may not achieve or sustain positive gross margin or profitability in the future.

We incurred net losses of \$250.0 million in 2021, \$127.0 million in 2020, and \$101.6 million in 2019, and we expect to incur net losses for the foreseeable future. As of December 31, 2021, we had an accumulated deficit of \$858.2 million. We expect to make significant expenditures related to the development and expansion of our business, including: making new capital investments and continuing investments in our electric powertrain, including advancements in our battery technology and high voltage systems; hiring and retaining qualified employees; adding additional production lines or production shifts in our manufacturing facilities; expanding our software offerings; expanding our business into new markets and geographies; research and development in new product and service categories; and in connection with legal, accounting, and other administrative expenses related to operating as a public company.

We have also experienced rapid growth in recent periods. For example, our number of employees has increased significantly over the last few years, from 492 full-time employees as of December 31, 2018 to 870 full-time employees as of December 31, 2021. Sustaining our growth will place significant demands on our management as well as on our administrative, operational, legal and financial resources. To manage our growth effectively, we must continue to improve and expand our infrastructure, including our information technology, financial, legal, compliance and administrative systems and controls. We must also continue to effectively and efficiently manage our employees, operations, finances, research and development, and capital investments.

All of these efforts may prove more expensive than we currently anticipate, and we may not succeed in increasing our revenue sufficiently, or at all, to offset these higher expenses. While our revenue has grown in recent periods, our operating expenses have also increased significantly. If our revenue declines or fails to grow at a rate faster than increases in our operating expenses, or we are unable to increase gross margin, whether through reducing the cost of production or increasing sales, we would not be able to achieve and maintain profitability in future periods. As a result, we may continue to generate losses. We cannot ensure that we will achieve profitability in the future or that, if we do become profitable, that we will be able to sustain profitability.

Our operating results may fluctuate from quarter to quarter, which makes our future results difficult to predict.

Our quarterly operating results have fluctuated in the past and may fluctuate in the future. Our revenue recognition with respect to electric transit buses and charging systems depends on the timing of customer acceptance. Large order sizes may result in a significant number of electric transit buses or charging systems being accepted or rejected at one time, which could disproportionately impact revenue recognition in a given quarter. Revenue for battery systems and electrification and charging solutions is less dependent on customer acceptance but can be unpredictable based on our customers' ability to cancel within lead times. Additionally, we have a limited operating history, which makes it difficult to forecast our future results and subjects us to several

risks and uncertainties, including our ability to plan for and anticipate future growth. As a result, our past quarterly operating results may not be reliable indicators of future performance, particularly in our rapidly evolving market.

Our operating results in any given quarter can be influenced by numerous factors, many of which are unpredictable or are outside of our control, including:

- our ability to maintain and grow our customer base and to sell additional products to our existing customers;
- our ability to build a reputation as a manufacturer of quality battery systems, electrification and charging solutions, fleet and energy management software and electric transit buses and to build trust and long-term relationships with customers;
- the effects of the ongoing COVID-19 pandemic, particularly with respect to funding for state and federal transit programs and reduced operating revenue from reduced passenger levels, and the effect on our suppliers;
- the amount of funding appropriated annually for state and federal transit programs and the amount and timing of government funding programs for electric vehicles;
- our ability to deliver our products as planned to meet our revenue goals and avoid liquidated damages within certain contracts, which may depend on factors such as supply shortages of components and component quality issues, customer configuration, manufacturing, or shipping delays, our ability to manage logistics, and to accurately forecast inventory and labor requirements;
- the mix of order size for transit bus orders, and variations in profit margins for each contract, which may affect our overall gross margin in any particular period;
- fluctuations in the cost and availability of raw materials, including as a result of tariffs and other trade restrictions;
- cancellations or modifications of awards or orders by our customers;
- our ability to design and produce safe, reliable, and quality products on an ongoing basis;
- levels of warranty claims or estimated costs of warranty claims and vehicle or equipment recalls;
- our ability to distinguish ourselves from competitors in our industry by developing and offering competitive products, effectively partner with manufacturers in adjacent markets and respond to competitive developments, including the introduction of new battery systems, electrification and charging solutions, fleet and energy management software or electric transit buses and pricing changes by our competitors;
- our ability to promote the adoption of electric vehicles over other fuel solutions such as diesel-hybrid, hybrid, or compressed natural gas vehicles or battery electric fuel cell vehicles;
- the success and timing of our strategic relationships to enter adjacent markets;
- pricing pressure as a result of competition or otherwise;
- our ability to implement cost reduction measures;
- buying patterns of customers, and the procurement schedules of our current and prospective customers in the public transit market, school bus market, and other commercial vehicle markets;
- current and evolving industry standards and government regulations that impact our business at the federal, state, and local level, particularly in the areas of product safety and rules of origin such as Buy

America, Buy American, and provincial Canadian Content regulations, and competitive bidding regulations at the federal, state and local level for electric transit buses;

- the timing of testing by, and the ability of our buses to pass, the FTA's federal bus testing program;
- delays or disruptions in our supply, manufacturing, or distribution chain, including insolvency, credit, or other difficulties confronting our key suppliers;
- our ability to effectively manage the length and complexity of our sales cycles;
- the mix of financing alternatives that we offer and our customers choose to utilize;
- our ability to continuously improve our product without obsoleting inventory or production tooling;
- litigation, adverse judgments, settlements, or other litigation-related costs;
- timing of stock-based compensation expense; and
- general economic and political conditions and government regulations in the United States and Canada and the countries where we may expand in the future.

The impact of one or more of the foregoing and other factors may cause our operating results to vary significantly. As such, we believe that quarter-to-quarter comparisons of our operating results may not be meaningful and should not be relied upon as an indication of future performance. If we fail to meet or exceed the expectations of investors or securities analysts, then the trading price of our common stock could fall substantially, and we could face costly lawsuits, including securities class action suits.

Failure to execute cost-reduction measures successfully could adversely affect our profitability.

While we have experienced, and expect in the future to realize, cost reductions both in the products and services that we procure from our suppliers and in our own cost base, we may not be able to achieve sufficient cost savings to reach our profitability goals. While we have implemented, and intend to continue to implement, cost-reduction strategies in order to meet these goals, if we do not achieve expected savings or if operating costs increase as a result of investments in strategic initiatives, our total operating costs would be greater than anticipated. We may also incur substantial costs or cost overruns in utilizing and increasing our production capability, particularly if we build new battery production lines, and if we vertically integrate subsystem production into our manufacturing facilities. In addition, if we do not manage cost-reduction efforts properly, such efforts may affect the quality of our products and our ability to generate future revenue. Moreover, significant portions of our operating expenses are fixed costs that will neither increase nor decrease proportionately with revenue. In addition, we incur significant costs related to procuring the materials required to manufacture our battery systems, electrification and charging solutions, fleet and energy management systems and electric transit buses, as well as assembling electric transit buses and systems, and compensating our personnel. If we are not able to implement further cost-reduction efforts or reduce our fixed costs sufficiently in response to a decline in revenue, our business, prospects, financial condition, and operating results may be adversely affected.

We could incur material losses and costs from product warranty claims, recalls, or remediation of electric transit buses for real or perceived deficiencies or from customer satisfaction campaigns.

We provide warranties on our Proterra Transit, Proterra Powered and Proterra Energy hardware products and process warranty claims in the ordinary course of our business. Warranty estimates are inherently uncertain and changes to our historical or projected experience, especially with respect to new battery systems, electrification and charging solutions, fleet and energy management systems or other vehicle technologies, may cause material changes to our warranty reserves in the future. If our warranty reserves are inadequate to cover future warranty claims on our products, our business, prospects, financial condition, and operating results could be adversely affected. In addition, we may also choose to upgrade parts or systems across an entire vehicle fleet or electric drivetrain product line for our own service or customer satisfaction needs, which may result in unforeseen costs.

We provide a limited warranty to customers on battery systems, electric transit buses and charging systems. The limited warranty ranges from one to twelve years depending on the components. Specifically, under the fleet defect provisions included in some transit bus purchase contracts, we are required to establish proactive programs to prevent the re-occurrence of defects in electric transit buses delivered under the contract if the same defect occurs in more than a specified percentage of the fleet within the base warranty period following delivery of the electric transit bus. We calculate an estimate of these costs into each of our contracts based on our historical experience and technical expectations. Warranty reserves include management's best estimate of the projected costs to repair or to replace items under warranty. These estimates are based on actual claims incurred to date and an estimate of the nature, frequency, and costs of future claims.

Because of the short operating history of our current product line, we have had limited data upon which to base our warranty expense estimates. Also, although we may offer customers lengthy warranties, our ability to recover warranty claims from underlying suppliers may be limited to a shorter period by contract. We are currently aware of warranty claims on certain transit bus structures and components which may result in material warranty costs. For example, we have received warranty claims related to cracked wheel wells and rear door framing in our buses and failures with third-party charging systems installed by us that did not meet customer specifications.

We are potentially subject to recalls of our products to cure real or perceived manufacturing defects or if we fail to comply with applicable U.S. Federal Motor Vehicle Safety Standards, or FMVSS. We have filed voluntary recalls with the United States National Highway Transportation Safety Administration. We are potentially subject to recalls made by the suppliers of components or parts that we purchase and incorporate into our electric transit buses. In October 2018, for example, we initiated a recall on certain of our electric transit buses because of a defect in a brake caliper after an equipment recall by our axle supplier, even though none of our customers had experienced a problem with the part. We may also need to bring battery systems back to our facilities for warranty work and deploy staff to assist customers with battery system issues, and we may need to transport buses back to one of our facilities or retrofit transit buses in the field to address a warranty claim, a recall campaign, or to otherwise satisfy customer concerns, which may require significant staff to be deployed to customer locations.

Even if a defect or perceived defect is not subject to a warranty claim or a current recall process, we may still incur costs of a customer satisfaction campaign when we choose to upgrade our battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses, and related technologies without cost to the customer. For example, we are currently aware that the amount of weight on the front axle of certain of our buses in operation may exceed the manufacturer's gross axle weight rating. To address this issue with our customers, in 2019 we launched a customer satisfaction campaign to upgrade our electric transit buses' front axle, which will result in increased labor and parts costs, for which we have accrued a reserve. We are also aware of cracks in the gel coat finish on some of our composite bus bodies which has required and is expected to require customer service support at our cost.

A product warranty claim, product recall, or product remediation, as a result of real or perceived defects, caused by systems or components engineered or manufactured by us or our suppliers, could involve significant expense and could have an adverse effect on our business, prospects, financial condition, and operating results. In addition, adverse publicity or industry rumors and speculation that may result from a customer or customers taking our battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses, and related technologies out of service pending a repair or remedy, product warranty claims, or product recalls, could slow market acceptance of our products and have an adverse effect on our reputation, brand image, and our ability to successfully market and sell our products.

If we are unable to scale production and deliver battery systems and buses on time, our business could be adversely affected.

Our business plan calls for significant increases in both vehicle and battery system production in a short amount of time to meet expected delivery dates to customers. Our ability to achieve our production plans will depend upon many factors, including adding additional battery lines, auxiliary vehicle production lines and production shifts, recruiting and training new staff while maintaining our desired quality levels, and improving our vehicle configuration process, supply chain management, and our suppliers' ability to support our needs. Moreover, because many of our orders are with respect to products that will be delivered only after 2021, whether we are the battery system supplier or, in the case of electric transit buses, the vehicle OEM, there can be no

assurance that we will be able to accurately forecast our supply chain demands or scale our manufacturing accordingly to meet the delivery deadlines for these orders. In addition, we have adopted, and may adopt in the future, new factory and supply chain management technologies and manufacturing and quality control processes, which we must successfully introduce and scale for production across our factories. We have introduced new battery system configurations for our customers and we are new to modifying our production processes to complete different configurations. Moreover, our electric transit buses are customized for our customers and certain battery systems require custom integration with our customer electric transit buses, which means that each new electric transit bus order brings its own set of challenges to vehicle configuration and supply chain. For example, each new electric transit bus configuration may introduce a multitude of parts that we have not used in previous electric transit bus builds, which in turn requires obtaining parts from new suppliers that engineering must validate and incorporate into our vehicle configuration. In the past, we have experienced changes in work instructions for electric transit buses that have not been timely communicated between factories, resulting in recalls of delivered product. We have limited experience developing, manufacturing, selling, servicing, and allocating our available resources among multiple products and multiple factories simultaneously. If we fail to effectively manage the complexity of our production process, our business, prospects, financial condition, and operating results could be adversely affected.

Our inability to deliver electric transit buses that meet customer specifications in a timely manner could significantly delay recognition of revenue and receipt of payment, because we do not recognize revenue and are not paid for electric transit buses until they are delivered to the customer. Moreover, some of our contracts with transit agencies include liquidated damages clauses that apply monetary penalties on a per vehicle per day basis if electric transit buses are not delivered to the customer by the date specified in the contract. Per day penalties can be significant depending on the contract. We have delivered battery systems, charging systems and electric transit buses late in the past, and have incurred substantial penalties with respect to certain of these late deliveries, which have reduced our revenue and margin. Although we actively manage our production schedule and our customers' expectations, we may still fail to meet delivery deadlines and may incur penalties as a result. If we are unable to realize our production plans and deliver our battery systems and buses on time, our reputation, business, prospects, financial condition, and operating results could be adversely affected.

Our business could be adversely affected if utilities and state utility commissions do not, or are slow to, support transportation electrification efforts.

Fleet-wide adoption of electric vehicles will benefit from favorable electricity rate structures for transit authorities and other large fleet operators and investment in make-ready infrastructure for electric vehicle charging at scale by utilities. For example, pursuant to California Senate Bill 350: Clean Energy and Pollution Reduction Act, the California investor-owned utilities have submitted Integrated Resource Plans that detailed how each utility will meet its customers' resource needs and reduce greenhouse gas emissions, including support for transportation electrification. The California Public Utilities Commission approved the plans in May 2018, including Pacific Gas and Electric Company's proposed investment in infrastructure and rebates and Southern California Edison Corporation's proposed time-of-use rates for charging electric transit buses. In September 2018, the Public Service Enterprise Group in New Jersey outlined a number of initiatives, including providing funding for charging system installations, deploying make-ready electric infrastructure and making grants for electric school buses. The New Jersey Board of Public Utilities will now evaluate the filing. In addition, utility commissions in several states are also evaluating the needs and benefits of transportation electrification, including the transit bus sector.

Our customers expect to pay lower electricity costs and generally look to the utilities to invest in infrastructure upgrades that will support commercial vehicle electrification plans. Therefore, efforts on the part of utility companies and state utility commissions to develop an appropriate rate designed to ensure that electricity as a fuel is competitive with fossil fuels will improve the total cost of ownership benefits for our transit customers and vehicle fleet owners, and enhance the attractiveness of our other products and offerings. Similarly, investments that utilities make to upgrade the infrastructure necessary to support additional load on the electrical grid will save our customers from potentially having to make their own investments. However, if utilities and utility commissions do not make the necessary investments to support commercial vehicle electrification and develop the appropriate, cost-competitive electricity rates, or delay such efforts, the market for battery systems, electrification and charging solutions, fleet and energy management software and electric transit buses, and related technologies may not

develop as we expect or may develop more slowly than we expect, and our business, prospects, financial condition, and operating results could be adversely affected.

Our annual revenue has in the past depended, and will likely continue to depend, on a small number of customers that fluctuate from year to year, and failure to add new customers or expand sales to our existing customers could have an adverse effect on our operating results for a particular period.

Because the majority of our historical and current customers are public transit authorities who do not procure new vehicle fleets every year, the composition of customers that account for a significant portion of our revenue is likely to vary from year to year based on which customers have accepted delivery of large fleet orders with us during the applicable period. For example, in 2018, Southeastern Pennsylvania Transportation Authority, Regional Transportation Commission of Washoe County and District Department of Transportation accounted for 15%, 12%, and 12%, respectively, of our total revenue. Moreover, because public transit authorities tend to procure new vehicles in large batch orders, our revenue in any given quarter may be highly dependent on a single customer. For example, in the second quarter of 2020, approximately 50% of the electric transit buses we delivered were delivered to a single customer, the Port Authority of New York and New Jersey and in the fourth quarter of 2020, approximately 40% of the buses we delivered were delivered to a single customer, the City of Edmonton. Because we generally do not recognize revenue until a customer accepts delivery of our buses, the timing of the acceptance of large orders may impact our revenue recognition and create fluctuations in our revenue and other operating results. We believe that we will continue to depend upon a relatively small number of customers for a significant portion of our revenue in any given period for the foreseeable future because we have only recently begun to deliver our buses and other products at a larger scale and we have a lengthy sales cycle and on-ramp for new customers. Our failure to diversify our customer base by adding new customers or expanding sales to our existing transit customers and our failure to add new customers and expand sales to existing customers in our Proterra Powered and Proterra Energy businesses outside of the transit industry could therefore have an adverse effect on our operating results for a particular period.

Our industry and its technology are rapidly evolving and may be subject to unforeseen changes. Developments in alternative technologies and powertrains or improvements in the internal combustion engine may adversely affect the demand for our electric transit buses.

The electric vehicle industry, and the electric commercial vehicle industry in particular, is relatively new and has experienced substantial change in the last several years. As more companies invest in electric vehicle and autonomous vehicle technology and alternative modes of transportation, we may be unable to keep up with technology advancements and, as a result, our competitiveness may suffer. As technologies change, we plan to spend significant resources in ongoing research and development, and to upgrade or adapt our products and services, and introduce new products and services in order to continue to provide battery systems, electrification and charging solutions, fleet and energy management software electric transit buses, and related technologies with the latest technology, in particular battery technology. Our research and development efforts may not be sufficient or could involve substantial costs and delays and lower our return on investment for our technologies. For example, we recently entered a new contract for supply of charging systems, replacing the solution that we invested substantial resources in developing in 2018. Additionally, due to the impacts of COVID-19 in 2020 and 2021, we have experienced delays in battery development and testing which could delay certain customer deliveries in the second half of 2021. Delays or missed opportunities to adopt new technologies could adversely affect our business, prospects, financial condition, and operating results.

In addition, we may not be able to compete effectively with other alternative fuel vehicles and integrate the latest technology, which may include autonomous vehicle technology, into our battery systems, electrification and charging solutions, fleet and energy management systems, and related technologies. Even if we are able to keep pace with changes in technology and develop new products and services, we are subject to the risk that our prior models, products, services and designs will become obsolete more quickly than expected, resulting in unused inventory and potentially reducing our return on investment, or become increasingly difficult to service or provide replacement parts at competitive prices. For example, we incurred \$4.9 million, \$3.0 million and \$1.9 million in inventory write-offs in 2019, 2020 and 2021, respectively, as the result of unused raw materials or adopting new technologies. Additionally, given the long sales cycle of each of our products and services, customers may delay purchases and modify or cancel existing orders in anticipation of the release of new models and technology. Moreover, developments in alternative technologies, such as advanced diesel, ethanol, fuel cells, or compressed

natural gas, or improvements in the fuel economy of the internal combustion engine, may adversely affect our business and prospects in ways we do not currently anticipate. Any developments with respect to these technologies, in particular fuel cell technologies and related chemical research, or the perception that they may occur, may prompt us to invest heavily in additional research to compete effectively with these advances, which research and development may not be effective. Any failure by us to successfully react to changes in existing technologies could adversely affect our competitive position and growth prospects.

If we are unable to successfully manufacture and sell our battery systems, electrification and charging solutions, fleet and energy management software and electric transit buses, and related technologies, our business could be adversely affected.

We have limited experience with manufacturing and selling battery systems, electrification and charging solutions, fleet and energy management software and electric transit buses, and related technologies to global commercial vehicle manufacturers and other types of manufacturers. As we develop partnerships with global commercial vehicle manufacturers to provide these products and other component parts to these partners and customers, we must introduce and implement manufacturing and quality control processes across our factories that are comparable to those of other Tier 1 suppliers in the automotive industry. We have identified areas for improvement as we scale and mature, such as ISO certification for our operations, that would allow us to meet quality standards required by companies such as Daimler and its subsidiaries. Furthermore, we must compete against more established battery designers, drivetrain designers, vehicle manufacturers, charging solution designers and component suppliers with greater resources and more experience in large scale manufacturing and deployment than we have. To compete effectively against these incumbent manufacturers and suppliers, we will have to devote substantial resources and effort to efficiently and effectively scale our manufacturing capabilities, implement new manufacturing and quality control processes, and enhance our existing processes. The implementation of a Tier 1 automotive supplier manufacturing operations inherently involves risks related to infrastructure and process development, quality control, and customer acceptance. If we fail to mature our manufacturing operations to the satisfaction of our customers, then our business, prospects, financial condition, and operating results could be adversely affected.

If we are unable to design, develop, market, and sell new products and services that address adjacent market opportunities, our business, prospects, and operating results may be adversely impacted.

We may not be able to successfully develop new products and services or develop a significantly broader customer base. For the past several years, we have focused our business on the development and sale of electric transit buses for the mass transit market. Our product line in the transit market is currently limited to the 40-foot and 35-foot ZX5 transit buses, and spare parts. We have recently expanded our offerings to include battery systems, electrification and charging solutions, and fleet and energy management software, and related technologies that are designed for broader application to other commercial vehicles.

In this regard, we have entered into development and supply agreements to develop and sell our battery systems, electrification and charging solutions and fleet and energy management software to other medium-duty and heavy-duty commercial vehicle manufacturers. Our business model offers end-to-end powertrain systems, energy system integrations when electric drivetrains are supplied by a third party, and battery system supply when integration and electric drivetrains are supplied by third parties to the end customer. Achieving success in these relatively new markets will require us to, among other things:

- enter into strategic agreements with leading manufacturers in these markets and maintain and grow these relationships;
- adapt our electric powertrain technology to meet the specifications of additional commercial vehicle categories;
- successfully compete with other manufacturers in the new markets;
- effectively and efficiently scale our manufacturing capabilities;
- effectively and efficiently grow and manage our supply chain;

- expand our sales and marketing capabilities;
- enter into service partnerships or expand our internal service and parts capabilities;
- expand our integration and engineering services to compete with other integrators and suppliers of high voltage systems, controls and drivetrains;
- expand our software and telematics platform to offer competitive solutions;
- develop technology solutions that are compatible with offerings of third-party providers;
- develop charging solutions, including software and telematics that are compatible with electric vehicle technology independent of manufacturer or supplier; and
- comply with changing regulations applicable to our products and services.

If we fail to adequately improve our products and services to compete effectively against our competitors, we may not be successful in expanding our customer base in the electric commercial vehicle market.

In addition, our failure to address additional market opportunities could harm our business, financial condition, operating results, and prospects. We may not be able to successfully design, develop, or test new products and services in order to effectively compete with our competitors in these new markets. Furthermore, there may be no demand by customers to purchase newly developed or improved products and services, there may be risks and unbudgeted costs associated with launching new products and services, and we may not be able to recoup our research and development costs, all of which could have an adverse effect on our business, prospects, financial condition, and operating results.

We may not be able to develop, maintain and grow strategic relationships in the Proterra Powered or Proterra Energy business, identify new strategic relationship opportunities, or form strategic relationships, in the future.

We expect that our ability to establish, maintain, and manage strategic relationships, such as development and supply agreements with customers that could have a significant impact on the success of our business. While we expect to increase the amount of revenue associated with Proterra Powered and Proterra Energy to become a more substantial in the future, there can be no assurance that we will be able to identify or secure suitable and scalable business relationship opportunities in the future or that our competitors will not capitalize on such opportunities before we do. We entered a strategic collaboration agreement with Daimler in 2018, which has since expired, that involved Daimler making a significant equity investment in our company and a representative from Daimler joining our board of directors. We may not be able to offer similar benefits to other companies with which we would like to establish and maintain strategic relationships, which could impair our ability to establish such relationships. Moreover, identifying such opportunities could demand substantial management time and resources, and may involve significant costs and uncertainties.

Additionally, we cannot guarantee that the companies with which we have developed or will develop strategic relationships will continue to devote the resources necessary to promote mutually beneficial business relationships and grow our business. Our current arrangements are not exclusive, and some of our strategic partners offer competing products. As a result of these factors, many of the companies with which we have development and supply agreements may choose to develop alternative products in addition to or in lieu of our solutions, either on their own or in collaboration with others, including our competitors. If we are unsuccessful in establishing or maintaining our relationships with key strategic partners, our overall growth could be impaired, and our business, prospects, financial condition, and operating results could be adversely affected.

Lack of long-term customer contracts, uncertainty regarding customer option exercises, and customer suspension or termination of contracts may have adverse effects on our Proterra Transit business.

Proterra Transit relies heavily on sales to public and other transit authorities, which, consistent with general industry practice, do not make long-term purchase commitments with transit vendors. Most transit authorities

usually undertake significant procurement of new transit buses once every few years and typically acquire a relatively small percentage of their fleet each time. Often, the terms of our procurements allow customers, without notice or penalty, to suspend or terminate their relationship with us at any time and for any reason. For example, one of our customers previously made an award to us for buses in 2017, but due in part to improvements in electric vehicle technology and the release of new bus models, withdrew the award in 2018 in favor of considering a new request for proposal process. Even if customers continue their relationship with us, they may not purchase the same volume of products as in the past or they may not pay the same price for those products. This may also be true with respect to Proterra Powered, where customers may have long-term contracts, but are not subject to fixed quantity order requirements such that final orders may be below our revenue expectations or estimates.

Further, many transit authority contracts include options to purchase additional electric transit buses in the future, and while a portion of future orders may be represented by options, customers may not end up exercising these options. Although options represent a significant source of potential orders for us, we do not have an extensive history of fulfilling orders based on our customer option agreements. Even if we had a history of significant option exercises by customers, customers may not continue to exercise such options at the same rate or at all in the future. Any loss of customers or decrease in the number of electric transit buses purchased under a contract could have an adverse effect on our business, prospects, financial condition, and operating results.

We are competing for the business of both small and large transit agencies, which place different demands on our business, and if we do not build an organization that can serve both types of transit customers, our business may be harmed.

Proterra Transit has begun competing for the business of larger transit agencies that maintain fleets of thousands of vehicles, including New York City, Toronto and Chicago. These customers place significant demands on our business because they have large, specialized groups of professionals focused on different requirements or systems related to transit bus procurement and rigorous inspections with multiple levels of review to assure each bus meets their specifications, which may be driven by conformity with other vehicles in the fleet, large long-term supply contracts, such as for tires and other wear items, and operating contracts with maintenance and operations teams. Serving these customers requires significant investment in customer relationship managers and service professionals to support the levels of design, review, change orders, inspection, and commissioning and delivery of the electric transit buses. Similarly, servicing our Proterra Powered customers requires significant investments in customer relationship managers and other professionals as each customer requires different levels of battery integration support and service.

We also compete for the business of smaller transit agencies. Although smaller transit agencies often have less complicated procurement processes than larger transit agencies, serving these smaller agencies requires processing small order sizes while still catering to the specific vehicle configurations for each customer. If we continue to serve both large and small transit agency customers, we will need to effectively and efficiently scale our internal resources to meet varying customer needs. Our failure to do so could have an adverse effect on our business, prospects, financial condition, and operating results. Our business is subject to substantial regulations, which are evolving, and unfavorable changes or failure by us to comply with these regulations could have an adverse effect on our business.

The majority of our current transit customers are government entities and we are subject to many local, state, and federal laws that add significant compliance costs to our operations. In addition, local, state, and federal regulations may conflict, making it difficult to build one vehicle that satisfies all requirements in all jurisdictions. Moreover, competitive bidding rules for government contracts add additional layers of complexity and require compliance with federal and state conflict of interest rules and rules governing our choice of suppliers and components.

Our electric transit buses and component products must comply with the National Traffic and Motor Vehicle Safety Act of 1966, as amended (“NTMVSA”), and regulations promulgated thereunder, which are administered by the National Highway Traffic Safety Administration (“NHTSA”). NTMVSA requires vehicle and equipment manufacturers to provide notice of safety defects to NHTSA and initiate a recall process within five days of such a determination by a manufacturer. NHTSA also administers reporting requirements from vehicle manufacturers under the Transportation Recall Enhancement, Accountability and Documentation Act of 2000 (the “TREAD Act”). We have ongoing reporting requirements under the TREAD Act and in the past have failed to timely report under

the TREAD Act. NHTSA may also require a manufacturer to recall and repair vehicles that contain safety defects or that are not compliant with FMVSS or other certification requirements for vehicles. Sales into foreign countries may be subject to similar regulations. We cannot assure you that violations of these laws and regulations will not occur in the future or have not occurred in the past as a result of human error, accidents, equipment failure, manufacturing or design defects, or other causes. It is possible that our reporting for historical periods for which we failed to timely report may reveal instances where we should have taken actions required by law but failed to do so. For example, we became subject to certain early warning reporting obligations under the TREAD Act in 2018. Our ongoing reporting obligations require us to provide certain early warning data to help identify potential safety-related defects, including certain safety data dating back ten years. While we have filed reports for current periods, we are currently not in full compliance with these early warning reporting requirements for prior periods. As we work to remediate our non-compliance, we may be subject to retrospective safety recall notices on our electric transit buses. Recalls of our electric transit buses or components, whether initiated by us, NHTSA or another authority, or penalties for regulatory compliance failures could have a material adverse effect on our reputation, business and operating results and be used by our competitors to our disadvantage.

Furthermore, if we choose to expand internationally, we would likely face additional international requirements that may not be compatible with regulations that govern our business in the United States. For example, in the United States, we developed our supply chain to ensure that we comply with Buy America regulations, which govern manufactured products and rolling stock, including transit bus, procurements that are paid for, in part, with funds administered by the FTA. Buy America regulations currently require that 70% of our vehicle components by cost be manufactured in the United States, and the Made in America Office opened under the Biden-Harris administration has proposed rules which may raise this requirement further. Buy America regulations have the effect of rendering the cost of our supply chain more expensive when compared with our competitors. As we began selling buses to airports, we had to modify our operations to comply with the Buy American requirements under the "FAA rules, which differ from the Buy America requirements under the FTA rules. In June 2018, we received our first order from a Canadian transit authority, and as a result, we need to comply with Canadian Content requirements, which will require sourcing components from Canadian suppliers or assembly of components in Canada. These regulations may increase the costs of doing business and add operational challenges.

In addition, there is no assurance that the current Buy America, Buy American, or Canadian Content requirements will not change or become stricter or that we will continue to be able to meet those requirements in the future. Our competitors have lobbied extensively to alter Buy America regulations to effectively prohibit our use of cylindrical battery cells produced outside of the United States for which there currently is no source of domestic supply available to us. Our ability to meet domestic content requirements is, in part, dependent on hundreds of suppliers. If any of these suppliers change the source of the components or subcomponents comprising their products, they could potentially prevent us from meeting domestic content requirements and negatively impact our business. Conversely, if domestic content requirements become less stringent in the future, foreign competitors without significant U.S. operations may be able to enter the U.S. market more easily and gain market share. Thus, any change to domestic content regulations could have an adverse effect on our business, prospects, financial condition, and operating results.

Delays in FTA mandated Model Bus Testing Program, or failure to successfully complete federally mandated testing, could adversely impact our business.

The FTA mandates that new transit bus models must undergo testing at its testing facility in Altoona, Pennsylvania and meet certain performance standards set by the FTA's Model Bus Testing Program, known as "Altoona Testing," in order to be eligible to receive federal funding. There is only one facility approved for testing by the FTA and in the past, we have experienced delays of several months receiving regulatory approval to test our buses at Altoona, as well as delays in the actual testing at Altoona. The COVID-19 pandemic resulted in a shut-down of the Altoona facility in 2020 and there can be no assurances that the facility will not be shut down again due to the COVID-19 pandemic or otherwise.

When available, Altoona Testing is designed to promote production of better transit vehicles and components and to ensure that transit customers purchase vehicles that can withstand the rigors of transit service. Our 40-foot and 35-foot electric transit buses, including the ZX5 with DuoPower drivetrain, have satisfactorily completed Altoona Testing, but for each material change that we make to our transit bus platform, we must undergo a new

round of testing. We have in the past and may in the future experience failures of components of our transit bus during Altoona Testing, which may prolong the test process, and cause us to be required to redesign components on the test bus and restart the testing process. Testing is available to vendors on a first-come, first-served basis. We cannot receive payment from customers relying on federal funds unless the applicable bus platform has satisfactorily completed Altoona Testing, and thus testing delays could have an adverse effect on our business, prospects, financial condition, and operating results. We have in the past and may in the future experience delays in Altoona Testing availability, including as a result of COVID-19, other pandemics, or other unforeseen events. In the past, a delay in receiving a required Altoona test report resulted in late delivery of buses to a customer and caused us to incur monetary penalties, delayed acceptance and delayed revenue recognition and customer payments. Moreover, there can be no assurance that the current Altoona Testing requirements will not change or become more onerous or that our future bus models will pass Altoona Testing. For instance, in 2016, the Model Bus Testing Program regulations changed to require a pass/fail test result. If we cannot produce electric transit buses that pass Altoona Testing, we would not be able to continue to sell buses to customers in the United States that rely on federal funds for their procurements, which would have a material and adverse effect on our business, prospects, financial condition, and operating results.

Failure to comply with the Disadvantaged Business Enterprise (“DBE”) program requirements or our failure to have our DBE goals approved by the FTA could adversely impact our transit business.

The FTA requires transit vehicle manufacturers that bid on federally-assisted rolling stock procurements to submit annual goals to support qualified DBEs (as defined in the DBE program regulations), and to certify that they have complied with the requirements of the DBE program established by the U.S. Department of Transportation (“DOT”), which aims to increase the participation of DBEs in state and local procurements. Companies are certified as DBE if they are for-profit small businesses majority-owned by socially and economically disadvantaged individuals. The FTA reviews and approves transit vehicle manufacturers’ DBE goals for the upcoming year and maintains a certified list of transit vehicle manufacturers that are eligible to bid on federally funded vehicle procurements based on their goals to contract with DBEs and good faith implementation of those goals. Our failure to comply with the DBE program requirements or a delay in having our DBE goals approved by the FTA could result in our ineligibility to bid on federally funded transit vehicle procurements, which could have an adverse effect on our business, prospects, financial condition, and operating results.

Our business and prospects depend significantly on our ability to build our brand. We may not succeed in continuing to establish, maintain, and strengthen our brand, and our brand and reputation could be harmed by negative publicity regarding our company or products.

Our business and prospects are heavily dependent on our ability to develop, maintain, and strengthen our brand. Promoting and positioning our brand will depend significantly on our ability to provide high quality battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses, and related technologies, and we have limited experience in these areas, particularly with respect to products and services that are not used in electric transit buses. In addition, we expect that our ability to develop, maintain, and strengthen our brand will also depend heavily on the success of our branding efforts. To promote our brand, we need to incur increased expenses, including product demonstrations and attending trade conferences. Brand promotion activities may not yield increased revenue, and even if they do, the increased revenue may not offset the expenses we incur in building and maintaining our brand and reputation. If we fail to promote and maintain our brand successfully or to maintain loyalty among our customers, or if we incur substantial expenses in an unsuccessful attempt to promote and maintain our brand, we may fail to attract new customers and partners, or retain our existing customers and partners and our business and financial condition may be adversely affected.

Moreover, any negative publicity relating to our employees, current or future partners, original equipment manufacturers deploying our battery or powertrain technology in their electric transit buses, partners or customers who use our high-voltage systems or software and telematics platforms, or others associated with these parties may also tarnish our own reputation simply by association and may reduce the value of our brand. Additionally, if safety or other incidents or product defects occur or are perceived to have occurred, whether or not such incidents or defects are our fault, we could be subject to adverse publicity, which could be particularly harmful to our business given our limited operating history. Given the popularity of social media, any negative publicity about our products or their safety, whether true or not, could quickly proliferate and harm customer and community perceptions and confidence in our brand. For example, in 2021, we were the subject of negative publicity arising

out of the appearance of cracks in the composite bus body architecture, potential early retirement of some of our first generation transit buses and negative political commentary. Public transit agencies and OEMs are particularly sensitive to concerns and perceptions of the passenger and community constituencies they serve. If the passengers in our electric transit buses or people in communities where electric transit buses using our technology are deployed form a negative opinion of our electric transit buses or battery systems or charging solutions, our current and potential customers might not choose our products, and strategic partners in other markets may not adopt our battery systems or electric powertrain technology or charging solutions. Other businesses, including our competitors, and organized labor, may also be incentivized to fund negative campaigns against our company to damage our brand and reputation to further their own purposes. Future customers of our products and services may have similar sensitivities and may be subject to similar public opinion and perception risks. Damage to our brand and reputation may result in reduced demand for our products and increased risk of losing market share to our competitors. Any efforts to restore the value of our brand and rebuild our reputation may be costly and may not be successful, and our inability to develop and maintain a strong brand could have an adverse effect on our business, prospects, financial condition, and operating results.

The use of lithium-ion cells may become disfavored as a result of the availability, or perceived superiority of, other types of batteries or yet undeveloped or unknown technologies.

The battery packs that we currently produce make use of lithium-ion cells, which we believe currently represent the industry standard for battery technology for electric vehicles. It is possible, however, that other types of batteries or yet undeveloped or unknown technologies may become favored in the future, such as lithium iron phosphate (“LFP”) batteries. LFP batteries currently have a wide range of applications, including in electric vehicle applications, and are perceived by many as offering cost-effective performance as compared to lithium-ion cells. The cost-effectiveness of LFPs is due, in part, to substantial investments in this technology development and manufacturing capability in China. While we believe that our products and services based on the lithium-ion cells that we have chosen to offer our customers present advantages with respect to ease of integration with their products and services and underlying performance, it is possible that these customers and partners may deem LFP-based technology, or other technologies, as sufficient or superior for their purposes, and may demand that we shift to LFP-based technology or decide to partner with other service providers who employ such technologies. In addition, it is possible that the performance, safety features or characteristics, reliability or cost-effectiveness of LFP batteries, or another form of battery, could improve in the future such that our current lithium-ion cell based offerings would become, or be perceived as, inferior or obsolete. In addition, it is possible that new forms of batteries or electrification technologies, such as solid state batteries, could emerge as a more cost effective or safer alternative to the batteries we currently offer. In the event that LFP or a new form of battery emerges or is deemed to exhibit better performance, operate at lower cost or exhibit better safety features, we could be compelled to attempt to integrate those new types of batteries into our platform, which may not be possible or feasible at a price that would be attractive to our customers or potential partners. Any developments with respect to LFP or new battery technology, or new electrification technologies that are based on unforeseen developments in fuel cell technology, or the perception that they may occur, may prompt us to invest heavily in additional research to compete effectively with these advances, which research and development may not be effective. Any failure by us to successfully react to changes in existing technologies could adversely affect our competitive position and growth prospects.

Battery packs for our electric transit buses make use of lithium-ion cells, which in other settings have been observed to catch fire, and our charging solutions operate at high voltages which may cause concerns regarding the use of battery systems, electrification and charging solutions and fleet and energy management software in public transit and other commercial vehicles.

The battery packs that we produce make use of lithium-ion cells. On rare occasions, it is possible for lithium-ion cells to rapidly release contained energy by venting smoke and flames in a manner that can ignite nearby materials as well as other lithium-ion cells. Highly publicized incidents of laptop computers and cell phones containing lithium-ion batteries bursting into flames have focused consumer attention on the safety of these cells. Fires have also been reported in electric cars using lithium-ion batteries. These events have raised questions about the suitability of using lithium-ion cells for commercial vehicle applications.

Despite the safety features that we design into our battery packs, there could be a failure of the battery packs in our buses or battery packs that we may produce for third parties, which could subject us to lawsuits, product

recalls, cancelled contracts, lost customers, and potentially slow market adoption of our electric transit buses by transit authorities and our technologies by other customers. Also, negative public perceptions regarding the suitability of lithium-ion cells for commercial vehicle applications or any future incident involving lithium-ion cells, such as a vehicle or other fires, particularly public transit vehicle incidents, even if unrelated to our products, could have an adverse effect on our business, prospects, financial condition, and operating results.

In addition to thermal risk related to battery packs, related accessories and ancillary products could also be subject to similar safety concerns and risks as a result of the high voltage they carry and transmit. Our charging solutions also operate at high voltages and charging equipment must be properly maintained. In the past, our legacy single blade chargers have experienced charger fires which caused damage to the chargers and the bus. In particular, we experienced four such thermal incidents related to our legacy overhead single blade chargers over 2019 and 2020, including one incident in which a charger was completely destroyed. While none of these events resulted in personal injury or significant property damage to the bus or other property, it is possible that other such or related incidents could occur in the future, or that such thermal discharge could result in personal injury or property damage.

We also store a significant number of lithium-ion cells and design, test, and produce battery modules and packs at our manufacturing facilities and other locations. While we have implemented safety procedures for handling cells, we may experience a safety issue or fire related to the cells. Once we ship our customers battery systems, those systems are out of immediate control. Any mishandling of battery systems or equipment failures in our operations or in our customers operations may cause accidents that could potentially harm our employees or third parties or result in disruptions to our business or our customers' business. While we have implemented safety procedures and require our customers to implement safety procedures, we or our customers could experience a safety issue or fire which could disrupt operations or cause injuries and could have an adverse effect on our business, prospects, financial condition, and operating results.

Our business could be adversely affected from an accident or safety incident involving our battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses.

An accident or safety incident involving one of our battery systems, electrification and charging solutions, fleet and energy management systems or electric transit buses could expose us to significant liability and a public perception that our electric transit buses and products are unsafe or unreliable. Our agreements with customers contain broad indemnification provisions, and in the event of a major accident, we could be subject to significant personal injury and property claims that could subject us to substantial liability. While we maintain liability insurance in amounts and of the type generally consistent with industry practice, the amount of such coverage may not be adequate to cover fully all claims, and we may be forced to bear substantial losses from an accident or safety incident. In addition, any accident or safety incident involving one of our buses, even if fully insured, could harm our reputation and result in a loss of future customer demand if it creates a public perception that our electric transit buses are unsafe or unreliable as compared to those offered by other transit bus manufacturers or other means of transportation. While we have not experienced significant accident or safety incidents involving our electric transit buses, we have experienced malfunctions, such as the overhead single blade charger thermal events and a bus fire related to low voltage wiring. Moreover, the public may be more sensitive to incidents involving transit buses and school buses, thereby compounding the effects of such incidents on the public and customer perception of our electric transit buses. As a result, any accident or safety incident involving our buses, or the buses of our competitors could materially and adversely affect our business, prospects, financial condition, and operating results.

Our work with government customers exposes us to unique risks inherent in government contracting.

We must comply with and are affected by laws and regulations relating to the award, administration, and performance of government contracts. Government contract laws and regulations affect how we do business with our customers and impose certain risks and costs on our business. A violation of specific laws and regulations by us, our employees, or others working on our behalf could harm our reputation and result in the imposition of fines and penalties, the termination of our contracts, suspension or debarment from bidding on or being awarded contracts, and civil or criminal investigations or proceedings.

Our performance under our contracts with government entities and our compliance with the terms of those contracts and applicable laws and regulations are subject to periodic audit, review, and investigation by various agencies of the government. If such an audit, review, or investigation uncovers a violation of a law or regulation or improper or illegal activities relating to our government contracts, we may be subject to civil or criminal penalties or administrative sanctions, including the termination of contracts, forfeiture of profits, the triggering of price reduction clauses, withholding of payments, suspension of payments, fines, and suspension or debarment from contracting with government agencies. There is inherent uncertainty as to the outcome of any audit, review, or investigation. If we incur a material penalty or administrative sanction or otherwise suffer harm to our reputation, our business, prospects, financial condition, or operating results could be adversely affected.

Further, if a government regulatory authority were to initiate suspension or debarment proceedings against us as a result of a conviction or indictment for illegal activities, we may lose our ability to be awarded contracts in the future or receive renewals of existing contracts for a period of time. We could also suffer harm to our reputation if allegations of impropriety were made against us, which would impair our ability to win awards of contracts in the future or receive renewals of existing contracts. Inability to be awarded contracts in the future or receive renewal of existing contracts could have an adverse effect on our business, prospects, financial condition, and operating results.

A portion of our business is dependent upon U.S. government contracts and grants, which are highly regulated and subject to oversight audits by U.S. government representatives and subject to cancellations. Such audits could result in adverse findings and negatively impact our business.

Our U.S. government business is subject to specific procurement regulations with numerous compliance requirements. These requirements, although customary in government contracting in the United States, increase our performance and compliance costs. These costs may increase in the future, thereby reducing our margins, which could have an adverse effect on our financial condition. Failure to comply with these regulations or other compliance requirements could lead to suspension or debarment from U.S. government contracting or subcontracting for a period. Among the causes for debarment are violations of various laws or policies, including those related to procurement integrity, export control, U.S. government security regulations, employment practices, protection of criminal justice data, protection of the environment, accuracy of records, proper recording of costs, foreign corruption, Trade Agreements Act, Buy America Act, and the False Claims Act.

Generally, in the United States, government contracts and grants are subject to oversight audits by government representatives. For example, in December 2020, the FTA released an audit of our and other manufacturers compliance with Buy America requirements. Such audits could result in adjustments to our contracts. For contracts covered by the Cost Accounting Standards, any costs found to be improperly allocated to a specific contract may not be allowed, and such costs already reimbursed may have to be refunded. Future audits and adjustments, if required, may materially reduce our revenues or profits upon completion and final negotiation of audits. Negative audit findings could also result in investigations, termination of a contract or grant, forfeiture of profits or reimbursements, suspension of payments, fines and suspension or prohibition from doing business with the U.S. government. All contracts with the U.S. government can be terminated for convenience by the government at any time.

In addition, contacts with government officials and participation in political activities are areas that are tightly controlled by federal, state, local and international laws. Failure to comply with these laws could cost us opportunities to seek certain government sales opportunities or even result in fines, prosecution, or debarment.

We may not be able to obtain, or comply with terms and conditions for, government grants, loans, and other incentives for which we have applied and may apply for in the future, which may limit our opportunities to expand our business.

We have in the past applied for and received state grants and tax incentives designed to promote the manufacturing of electric vehicles and related technologies, including charging solutions. In April 2015, the California Energy Commission awarded us \$3.0 million based on our investment of approximately \$8.4 million in our manufacturing facilities in California through December 31, 2018. In April 2017, California's Office of Business and Economic Development entered into a California Competes Tax Credit Allocation Agreement with us for an award of a California Competes Tax Credit in the amount of \$7.5 million if certain conditions in that agreement are

met in the prescribed time periods. In April 2019, the California Energy Commission awarded us a \$1.8 million grant based on our expected investment of approximately \$4.3 million in our manufacturing facility in City of Industry, California.

We anticipate that in the future there will be new opportunities for us to apply for grants, loans, and other federal and state incentives. Our ability to obtain funds or incentives from government sources is subject to the availability of funds under applicable government programs and approval of our applications to participate in such programs. The application process for these funds and other incentives is and will remain highly competitive. We may not be successful in obtaining any of these additional grants, loans, and other incentives. We have in the past failed and may also in the future fail to comply with the conditions of these incentives, which could cause us to lose funding or negotiate with governmental entities to revise such conditions. For example, we received a grant in South Carolina in 2010 that was subject to certain performance criteria, including a condition that we create no fewer than 400 new full-time jobs. We were unable to meet the original deadline but negotiated with the South Carolina Coordinating Council for Economic Development (the "Council") for an extension on the date of job creation and we have since fulfilled the revised condition to the Council's satisfaction. Our estimates of job growth under our California Competes Tax Credit have also not come to fruition for certain fiscal years. We may be unable to find alternative sources of funding to meet our planned capital needs, in which case, our business, prospects, financial condition, and operating results could be adversely affected.

We may become subject to product liability claims, which could harm our financial condition and liquidity if we are not able to successfully defend or insure against such claims.

We provide indemnification to our customers who may be sued for product liability related to our electric transit buses and electric powertrain solutions, and we may otherwise be subject to product liability claims, including with respect to our charging solutions. The commercial vehicle market experiences significant product liability claims and we face inherent risk of exposure to claims in the event our electric transit buses or components do not perform as expected. Commercial vehicles including public transit buses have been involved and may in the future be involved in crashes resulting in death or personal injury, and in some cases catastrophic crashes resulting in the death and injury to many passengers.

While we carry insurance for product liability, it is possible that our insurance coverage may not cover the full exposure on a product liability claim of significant magnitude. A successful product liability claim against us could require us to pay a substantial monetary award. A product liability claim could also generate substantial negative publicity about our products and business and could have an adverse effect on our brand, business, prospects, financial condition, and operating results.

Changes to U.S. trade policies, including new tariffs or the renegotiation or termination of existing trade agreements or treaties, may adversely affect our financial performance.

We currently manufacture our products in the United States, but may consider other international locations, including locations in Canada. Although many of our suppliers are in the United States, we rely on a number of suppliers in other countries for key components. We are subject to risks and uncertainties associated with changing economic, political, and other conditions in foreign countries where our vendors are located, such as increased import duties, tariffs, trade restrictions, and quotas or other government regulations, work stoppages, fluctuations of foreign currencies, natural disasters, political unrest, and customs delays. Unavailability or delay of imports from our foreign vendors would likely cause interruptions in our supply chain and could have an adverse effect on our business, prospects, financial condition, and operating results.

Moreover, the U.S. federal government may alter U.S. international trade policy and to renegotiate or terminate certain existing trade agreements and treaties with foreign governments. The U.S. federal government renegotiated the North American Free Trade Agreement, renamed the U.S.-Mexico-Canada Agreement, which was signed on November 30, 2018. The U.S. federal government's potential decision to re-enter, withdraw or modify other existing trade agreements or treaties could adversely impact our business, customers, and suppliers by disrupting trade and commercial transactions and adversely affecting the U.S. economy.

In addition, the U.S. federal government has imposed tariffs on certain foreign goods. For example, in 2018, the U.S. federal government imposed additional tariffs under Section 232 of the Trade Expansion Act of 1962, as

amended, on many products including certain aluminum products imported into the United States, which may impact the commercial vehicle market and our supply chain. Moreover, these tariffs, as well as country-specific or product-specific exemptions, may also lead to retaliatory actions from foreign governments that could adversely affect our business. Certain foreign governments, including China and the European Union, have instituted or may consider imposing additional tariffs on certain U.S. goods. Restrictions on trade with foreign countries, imposition of customs duties, or further modifications to U.S. international trade policy have the potential to disrupt our supply chain or the supply chains of our suppliers and to adversely impact our costs, customers, suppliers, and the economy, which could have an adverse effect on our business, prospects, financial condition, and operating results.

We are subject to various environmental and safety laws and regulations that could impose substantial costs upon us and negatively impact our ability to operate our manufacturing facilities if we fail in our efforts to abide by these laws and regulations.

As a manufacturer, producer and seller of battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses, and related technologies, we are subject to numerous environmental, health, and safety laws and regulations in the United States, including laws relating to exposure to, use, handling, storage, and disposal of hazardous materials, and the building, testing and use of batteries and high-voltage systems, and other components, such as HVAC systems. Moreover, we may be subject to additional regulations as we expand our operations internationally. The costs of compliance, including assessing changes to our operations and notices required in our facilities and on our electric transit buses regarding potential hazards could be substantial. In addition, we may be required to manufacture product with alternative technologies and materials that require changes to our engineering, supply and product development programs that could result in significant cost and delays in product introduction. We also may not be successful in complying with such laws and regulations which could impact our ability to sell our products in certain locations, or result in substantial fines and penalties if our products in service are found to be non-compliant with certain laws and regulations. We also expect regulation of electric powertrains will increase over time, and result in increased compliance costs. For example, beginning in 2023, we will need to receive a zero emission powertrain certification in California. In addition, we have indemnified certain of our landlords for any hazardous waste that may be found on or about property that we lease. Furthermore, any violations of applicable environmental and safety laws and regulations may result in substantial fines and penalties, prevent us from selling products in certain markets, remediation costs, third-party damages, a suspension or cessation of our operations, and negative publicity that could harm our business, reputation, prospects, financial condition, and operating results.

Our future success depends on the continuing efforts of our key employees and on our ability to hire, retain, and motivate additional key employees.

Our future success depends upon the continuing services of our key employees and on our ability to attract and retain members of our management team and other highly skilled employees, including battery and high voltage systems engineers, electric powertrain designers and engineers, vehicle systems and integration engineers, supply chain and quality control employees, sales personnel, service personnel, and software engineers. In our key areas of operations, including California, there is increasing competition for individuals with skill sets needed for our business, including specialized knowledge of batteries, electric vehicles, software engineering, and manufacturing engineering and quality control. This competition affects both our ability to retain key employees and hire new ones. Moreover, none of our key employees has an employment agreement for a specific term and any of our employees may terminate his or her employment with us at any time. Our continued success depends upon our continued ability to retain current employees and hire new employees in a timely manner, especially to support our expansion plans and to continue to ramp up our suite of offerings related to commercial vehicle electrification. Additionally, we compete for talent with both large and established companies that have far greater financial resources than we do and start-ups and emerging companies that may promise more attractive growth opportunities.

In addition, new employees often require significant training and, in many cases, take significant time before they achieve full productivity. As a result, we may incur significant costs to attract and retain new employees, including significant expenditures related to salaries and benefits and compensation expenses related to equity awards, and we may lose new employees to our competitors or other companies before we realize the benefit of our investment in recruiting and training them. Moreover, new employees may not be or become as productive as

we expect, as we may face challenges in adequately or appropriately integrating them into our workforce and culture. Difficulties in retaining current employees or recruiting new ones could have an adverse effect on our business, prospects, financial condition, and operating results.

Our businesses rely heavily on our specialized sales personnel and technical sales support to market and sell our products. If we are unable to effectively hire, train, manage, and retain our sales personnel, our business may be adversely impacted.

The success of our businesses largely depends on our ability to hire, train, and manage our sales personnel who have experience with and connections to the public and other transit agencies and commercial vehicle OEMs that are our current and potential customers. Because we employ a small and specialized sales force, the loss of any member of our sales team or technical sales support professionals could weaken our sales expertise and our customer reach, and adversely affect our business, and we may not be able to find adequate replacements on a timely basis, or at all. Moreover, there are no assurances that we will be able to maintain a sufficient level of sales personnel to effectively meet our needs as our business continues to grow, particularly with respect to Proterra Powered and Proterra Energy.

Competition for sales personnel who are familiar with and trained to sell our products and services continues to be strong. We train our sales personnel to better understand our existing and new product technologies and how they can be positioned against our competitors' products. We also train our sales personnel to be adept at working with long sales cycles characteristic of public agency customers and commercial vehicle manufacturers, as well as the special requirements attendant to each.

These initiatives are intended to improve the productivity of our sales personnel and our revenue and profitability. It takes time for the sales professionals to become productive following their hiring and training and there can be no assurance that sales representatives will reach adequate levels of productivity, or that we will not experience significant levels of attrition in the future. Measures we implement to improve the productivity may not be successful and may instead contribute to instability in our operations, departures from our sales and technical support organizations, or reduce our revenue, profitability, and harm our business.

If we are unable to obtain bid bonds, performance bonds, or letters of credit required by public transit agencies or other customers, our ability to obtain future projects could be negatively affected.

We have in the past been, and may in the future be, required to provide bid bonds or performance bonds to secure our performance under customer contracts or, in some cases, as a prerequisite to submitting a bid on a potential project. Our continued ability to obtain these bonds will depend primarily upon our capitalization, working capital, past performance, management expertise, reputation and certain external factors, including the overall capacity of the surety market. Surety companies consider these factors in relation to the amount of our awards and their underwriting standards, which may change from time to time. Surety companies also require that we collateralize a percentage of the bond with cash or other form of credit enhancement. With a decreasing number of insurance providers in that market, it may be difficult to find sureties who will continue to provide contract-required bonding on acceptable terms and conditions, or at all. Furthermore, events that affect surety markets generally may result in bonding becoming more difficult to obtain in the future or being available only at a significantly greater cost.

In addition, some of our Proterra Transit and Proterra Energy customers also require collateral guarantees in the form of letters of credit to secure performance or to fund possible damages in the event of default under our contracts with them. If we enter agreements that require the issuance of letters of credit, our liquidity could be negatively impacted. Our inability to obtain adequate bonding or letters of credit and, as a result, to bid or enter into agreements, could have an adverse effect on our business, prospects, financial condition, and operating results.

We may experience outages and disruptions of our services if we fail to maintain adequate security and supporting infrastructure as we scale our information technology systems.

As we grow our business, we expect to continue to invest in our existing information technology systems, including data centers, network services, data storage, and database technologies, and cybersecurity

technologies both to assist us in our business and to better provide our fleet-scale, high-power charging solutions and software services to our customers. Creating the appropriate information technology support systems for our business is time intensive, expensive, and complex. Our implementation, maintenance, and improvement of these systems may create inefficiencies, operational failures and increased vulnerability to cyber-attacks. Moreover, there are inherent risks associated with developing, improving, and implementing new information technology systems, including the disruption of our current data management, procurement, manufacturing, execution, finance, supply chain, sales, and service processes. As we continue to grow our services that rely on collecting and analyzing customer telematics and charging data, our exposure to information technology risks will increase. These risks may affect our ability to manage our data and inventory, procure parts or supplies or manufacture, sell, deliver, and service electric transit buses, or achieve and maintain compliance with applicable regulations.

We also maintain information technology measures designed to protect us against system security risks, data breaches, and cyber-attacks. Cyber-attacks could include denial-of-service attacks impacting customer service availability and reliability, the exploitation of software vulnerabilities in internet facing applications, social engineering of system administrators (for example, tricking company employees into releasing control of their systems to a hacker), or the introduction of computer viruses or malware into our systems to steal confidential or proprietary data. In 2020, we were the victim of a successful social engineering attack that resulted in the diversion of significant funds the Company intended to pay a supplier to a fraudulent account. In the third quarter of 2021, human error also resulted in a server for our APEX platform being accessible to the public a short period of time, allowing unauthorized access to a telematics data and, resulting in the deletion of a limited amount data used by employees and customers for report functionality. Cyber-attacks of increasing sophistication may be difficult to detect and could result in the theft of our funds, intellectual property and data. In addition, we are vulnerable to unintentional errors or malicious actions by persons who have authorized access to our systems but exceed the scope of their access rights, or unintentionally or intentionally alter parameters or otherwise interfere with the intended operations of our technology services. The steps we take to increase the reliability, integrity, and security of our systems as they scale may be expensive and may not prevent system failures or unintended vulnerabilities resulting from the increasing number of persons with access to our systems, complex interactions within our technology platform and the increasing number of connections with third-party partners' and vendors' technology. Operational errors or failures or successful cyber-attacks could compromise our proprietary information, the quality of our services, and our ability to perform for our customers, resulting in damage to our reputation, which could have an adverse effect on our business, prospects, financial condition, and operating results. In addition, these events could increase the risk of claims alleging that we do not comply with applicable laws and regulations, subjecting us to potential liability and regulatory penalties under privacy laws protecting personal information.

We may require additional capital to support business growth, and such capital might not be available on terms acceptable to us, if at all.

We intend to continue to make investments to support our business growth and may require additional funds to respond to business challenges, including the need to improve our operating infrastructure or acquire complementary businesses and technologies. Accordingly, we may need to engage in the issuance of public or private equity, equity-linked, or debt securities to secure additional funds. We may not be able to obtain additional financing on terms favorable to us, if at all. If we raise additional funds through future issuances of equity or convertible debt securities, our existing stockholders could suffer significant dilution, and any new equity securities we issue could have rights, preferences, and privileges superior to those of holders of our common stock. Any debt financing that we secure in the future could involve restrictive covenants relating to our capital raising activities and other financial and operational matters, including the ability to pay dividends. This may make it more difficult for us to obtain additional capital and to pursue business opportunities, including potential acquisitions. If we are unable to obtain adequate financing or financing on terms satisfactory to us when we require it, our ability to continue to support our business growth and respond to business challenges could be significantly impaired, and our business, prospects, financial condition, and operating results could be adversely affected.

If we update our manufacturing equipment more quickly than expected, we may have to shorten the useful lives of any equipment to be retired as a result of any such update, and the resulting acceleration in our depreciation could negatively affect our financial results.

We have invested and expect to continue to invest significantly in what we believe is state-of-the-art tooling, machinery, and other manufacturing equipment for production of our battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses, and related technologies. We depreciate the cost of such equipment and electric transit buses over their expected useful lives. However, manufacturing and commercial vehicle technology may evolve rapidly, and we may decide to update our manufacturing process with more advanced equipment or tooling. Moreover, as our engineering and manufacturing expertise and efficiency increase, we may be able to manufacture our products using less of our installed equipment. The useful life of any equipment that would be retired early as a result would be shortened, causing the depreciation on such equipment to be accelerated, and our operating results could be negatively impacted.

Failure to protect our intellectual property could adversely affect our business.

Our success depends in large part on our proprietary technology, software and data. We rely on various intellectual property rights, including patents, copyrights, trademarks, and trade secrets, as well as confidentiality provisions and contractual arrangements, and other forms of statutory protection to protect our proprietary rights. If we do not protect and enforce our intellectual property rights adequately and successfully, our competitive position may suffer, which could adversely affect our business, prospects, financial condition, and operating results.

Our pending patent or trademark applications may not be approved, or competitors or others may challenge the validity, enforceability, or scope of our patents, the scope of our copyrights, the registrability of our trademarks or the trade secret status of our proprietary information. There can be no assurance that additional patents will be issued or that any issued patents will provide significant protection for our intellectual property or for those portions of our proprietary technology and software that are the most key to our competitive positions in the marketplace. In addition, our patents, copyrights, trademarks, trade secrets, and other intellectual property rights may not provide us a significant competitive advantage. There is no assurance that the forms of intellectual property protection that we seek, including business decisions about when and where to file patents and when and how to maintain and protect copyrights, trade secrets, license and other contractual rights will be adequate to protect our business.

Moreover, recent amendments to developing jurisprudence regarding and current and possible future changes to intellectual property laws and regulations, including U.S. and foreign patent, copyright, trade secret and other statutory law, may affect our ability to protect and enforce our intellectual property rights and to protect our proprietary technology, software and data. In addition, the laws of some countries do not provide the same level of protection for our intellectual property as do the laws of the United States. As we expand our international activities, our exposure to unauthorized copying and use of our technology and proprietary information will likely increase. Despite our precautions, our intellectual property is vulnerable to unauthorized access and copying through employee or third-party error or actions, including malicious state or state-sponsored actors, theft, hacking, cybersecurity incidents, and other security breaches and incidents, and such incidents may be difficult to detect or unknown for a significant period of time. It is possible for third parties to infringe upon or misappropriate our intellectual property, to copy or reverse engineer our bus and battery pack designs, and to use information that we regard as proprietary to create products and services that compete with ours. Effective intellectual property protection may not be available to us in every country in which we may sell our electric transit buses and related or other products and services. In addition, many countries limit the enforceability of patents against certain third parties, including government agencies or government contractors, or make patents subject to compulsory licenses to third parties under certain circumstances. In these countries, patents may provide limited or no benefit.

Intellectual property laws, procedures, and restrictions provide only limited protection and any of our intellectual property rights may be challenged, invalidated, circumvented, infringed, or misappropriated. Further, the laws of certain countries do not protect proprietary rights to the same extent as the laws of the United States, and, therefore, in certain jurisdictions, we may be unable to protect our proprietary technology.

We enter into confidentiality and invention assignment or intellectual property ownership agreements with our employees and contractors and enter into confidentiality agreements with other third parties. We cannot ensure that these agreements, or all the terms thereof, will be enforceable or compliant with applicable law, or otherwise effective in controlling access to, use of, reverse engineering, and distribution of our proprietary information or in effectively securing exclusive ownership of intellectual property developed by our current or former employees and contractors. Further, these agreements with our employees, contractors, and other parties may not prevent other parties from independently developing technologies, products and services that are substantially equivalent or superior to our technologies, products and services.

We may need to spend significant resources securing and monitoring our intellectual property rights, and we may or may not be able to detect infringement by third parties. Our competitive position may be adversely impacted if we cannot detect infringement or enforce our intellectual property rights quickly or at all. In some circumstances, we may choose not to pursue enforcement because an infringer has a dominant intellectual property position, because of uncertainty relating to the scope of our intellectual property or the outcome of an enforcement action, or for other business reasons. In addition, competitors might avoid infringement by designing around our intellectual property rights or by developing non-infringing competing technologies. Litigation brought to protect and enforce our intellectual property rights could be costly, time-consuming, and distracting to management and our development teams and could result in the impairment or loss of portions of our intellectual property. Further, our efforts to enforce our intellectual property rights may be met with defenses, counterclaims attacking the scope, validity, and enforceability of our intellectual property rights, or with counterclaims and countersuits asserting infringement by us of third-party intellectual property rights. Our failure to secure, protect, and enforce our intellectual property rights could adversely affect our brand and our business, any of which could have an adverse effect on our business, prospects, financial condition, and operating results.

We may be subject to intellectual property rights claims by third parties, which could be costly to defend, could require us to pay significant damages and could limit our ability to use certain technologies.

Third parties may assert claims of infringement of intellectual property rights or violation of other statutory, license or contractual rights in technology, software or data against us or against our customers for which we may be liable or have an indemnification obligation. Any such claim by a third party, even if without merit, could cause us to incur substantial costs defending against such claim and could distract our management and our development teams from our business.

Although third parties may offer a license to their technology, software or data, the terms of any offered license may not be acceptable and the failure to obtain a license or the costs associated with any license could cause our business, prospects, financial condition, and operating results to be adversely affected. In addition, some licenses may be non-exclusive, and therefore our competitors may have access to the same technology, software or data licensed to us. Alternatively, we may be required to develop non-infringing technology, software or data which could require significant effort and expense and ultimately may not be successful. Furthermore, a successful claimant could secure a judgment or we may agree to a settlement that prevents us from selling certain products or performing certain services or that requires us to pay substantial damages, including treble damages if we are found to have willfully infringed such claimant's patents, copyrights, trade secrets or other statutory rights, royalties or other fees. Any of these events could have an adverse effect on our business, prospects, financial condition, and operating results.

Adverse litigation judgments or settlements resulting from legal proceedings in which we may be involved could expose us to monetary damages or limit our ability to operate our business.

We have in the past and may in the future become involved in private actions, collective actions, investigations, and various other legal proceedings by customers, employees, suppliers, competitors, government agencies, or others. The results of any such litigation, investigations, and other legal proceedings are inherently unpredictable and expensive. Any claims against us, whether meritorious or not, could be time consuming, result in costly litigation, damage our reputation, require significant management time, and divert significant resources. If any of these legal proceedings were to be determined adversely to us, or we were to enter into a settlement arrangement, we could be exposed to monetary damages or limits on our ability to operate our business, which could have an adverse effect on our business, financial condition, and operating results.

Our business is subject to the risk of earthquakes, fire, power outages, floods, and other catastrophic events and to interruption by man-made problems such as terrorism.

We maintain production facilities in Northern and Southern California and South Carolina. Any of our facilities may be harmed or rendered inoperable by disasters, including earthquakes, tornadoes, hurricanes, wildfires, floods, nuclear disasters, acts of terrorism or other criminal activities, infectious disease outbreaks (such as COVID-19), and power outages. In the event of natural disaster or other catastrophic event, we may be unable to continue our operations and may endure production interruptions, reputational harm, delays in manufacturing, development and testing of our battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses, and related technologies, and loss of critical data, all of which could have an adverse effect on our business, prospects, financial condition, and operating results. Moreover, our corporate headquarters and one of our current battery production facilities are in the San Francisco Bay Area and our West Coast bus production factory and newest battery production facilities are in Los Angeles County, regions known for seismic activity and potentially subject to catastrophic fires. If our facilities are damaged by such natural disasters or catastrophic events, our repair or replacement would likely be costly and any such efforts would likely require substantial time that may affect our ability to produce and deliver our products. For example, in July 2015, we experienced a fire in our Greenville, South Carolina manufacturing facility and then-headquarters, in which substantially all of our computer equipment, furniture and fixtures, leasehold improvements, work in progress, raw material, and finished goods inventories were damaged or destroyed. While we were insured for our losses and resumed manufacturing shortly thereafter, the disruption temporarily impacted our business. Similarly, any future disruptions in our operations could negatively impact our business, prospects, financial condition, and operating results and harm our reputation. In addition, we may not carry enough insurance to compensate for the losses that may occur.

Our business may be adversely affected by workforce disruptions.

Our production employees in our City of Industry facility are represented by a union and we are subject to a collective bargaining agreement that expires in May 2024. Our other employees are not represented by a union, though it is common throughout the commercial vehicle industry for employees to belong to a union, and if more of our employees decide to join or form a labor union, we may become party to additional collective bargaining agreements, which could result in higher employee costs, higher administrative and legal costs, and increased risk of work stoppages. It is also possible that a union seeking to organize our facilities may mount a corporate campaign, resulting in negative publicity or other actions that require attention by our management team and our employees. Negative publicity, work stoppages, or strikes by unions could have an adverse effect on our business, prospects, financial condition, and operating results.

Moreover, some of our suppliers and vendors, including freight companies, have workforces represented by unions and are subject to collective bargaining agreements. The failure of our suppliers and vendors to successfully negotiate collective bargaining agreements could result in disruptions to our supply chain, manufacturing, and sale of our electric transit buses. Such delays could have an adverse impact on our business, prospects, financial condition, or operating results.

Our loan and security agreements contain covenants that may restrict our business and financing activities.

Our Loan, Guaranty and Security Agreement (which we refer to as the Senior Credit Facility) is secured by substantially all our assets including our intellectual property and other restricted property. Subject to certain exceptions, our Senior Credit Facility and Convertible Notes also restrict our ability to, among other things:

- dispose of or sell our assets;
- make material changes in our business or management, or accounting and reporting practices;
- acquire, consolidate, or merge with other entities;
- incur additional indebtedness;

- create liens on our assets;
- pay dividends;
- make investments;
- enter transactions with affiliates; and
- pre-pay other indebtedness.

The covenants in our Senior Credit Facility, Convertible Notes, and any future financing agreements that we may enter, may restrict our ability to finance our operations, engage in, expand or otherwise pursue our business activities and strategies. If we fail to comply with certain of these covenants, there can be no guarantee that we will be allowed to amend the Senior Credit Facility or Convertible Notes to remediate such defaults. Our ability to comply with these covenants may be affected by events beyond our control. If not waived, our failure to comply with such covenants could result in a default under our Senior Credit Facility or Convertible Notes, causing all the outstanding indebtedness under our Senior Credit Facility or Convertible Notes to become immediately due and payable and Lender may terminate all commitments to extend further credit.

Moreover, we may not have or may be unable to generate sufficient cash available to repay our debt obligations when they become due and payable, either upon maturity or in the event of a default, which would have an immediate adverse effect on our business and operating results. This could potentially cause us to cease operations and result in a complete loss of your investment in our common stock.

We received a loan under the Paycheck Protection Program of the CARES Act, and all or a portion of the loan may not be forgivable.

On May 6, 2020, we received a \$10 million loan pursuant to the Paycheck Protection Program of the CARES Act (the “PPP loan”). We used these funds to continue to employ our production and other staff during the pandemic. The PPP loan matures in 2025 with an annual interest rate of 1%. This loan has a six-month deferral of payments period and may be prepaid at any time without penalty. Under the CARES Act, we are eligible to apply for forgiveness of all loan proceeds used to pay payroll costs, rent, utilities and other qualifying expenses during the 24-week period following receipt of the loan, provided that we maintain our number of employees and compensation within certain parameters during such period. We applied for such forgiveness in December 2020, and in January 2022, the Small Business Administration (“SBA”) denied our forgiveness application. We are in the process of appealing this denial and cannot provide any assurance that any amount of the PPP loan will ultimately be forgiven by the SBA. Any forgiven amounts will not be included in our taxable income.

Conversion of the Convertible Notes will dilute the ownership interest of existing stockholders or may otherwise depress our stock price.

In August 2020, we issued \$200.0 million in original aggregate principal amount of Convertible Notes, with cash interest of 5.0% per annum payable at each quarter end and paid-in-kind interest of 4.5% per annum payable by increasing the principal balance at each quarter end. Certain holders of Convertible Notes with aggregate original principal amounts of \$46.5 million elected to convert their Convertible Notes, including accrued PIK interest and cash interest, at the Closing resulting in the issuance of 7.4 million shares of common stock. The remaining Convertible Notes with an original aggregate principal of \$153.5 million remain outstanding post-Closing. To the extent the remaining outstanding Convertible Notes are converted pursuant to their mandatory conversion provisions, the balance under the Convertible Notes will grow and the number of shares that may be issued upon conversion will increase accordingly. The conversion of the Convertible Notes will dilute the ownership interests of existing stockholders. Any sales in the public market of the common stock issuable upon such conversion could adversely affect prevailing market prices of our common stock. In addition, the existence of the Convertible Notes may encourage short selling by market participants because the anticipated conversion of the Convertible Notes into shares of our common stock could depress our stock price.

We may be unable to integrate acquired businesses and technologies successfully or achieve the expected benefits of such acquisitions. We may acquire or invest in additional companies, which may

divert our management's attention, result in additional dilution to our stockholders, and consume resources that are necessary to sustain our business.

Although we have not made any acquisitions to date, our business strategy in the future may include acquiring other complementary products, technologies, or businesses. We also may enter relationships with other businesses to expand our domestic and international operations and to create services networks to support our products. An acquisition, investment, or business relationship may result in unforeseen operating difficulties and expenditures. We may encounter difficulties assimilating or integrating the businesses, technologies, products, services, personnel, or operations of the acquired companies particularly if the key personnel of the acquired companies choose not to work for us. Acquisitions may also disrupt our business, divert our resources, and require significant management attention that would otherwise be available for the development of our business. Moreover, the anticipated benefits of any acquisition, investment, or business relationship may not be realized or we may be exposed to unknown liabilities.

Negotiating these transactions can be time consuming, difficult, and expensive, and our ability to close these transactions may often be subject to approvals that are beyond our control. Consequently, these transactions, even if undertaken and announced, may not close. Even if we do successfully complete acquisitions, we may not ultimately strengthen our competitive position or achieve our goals, and any acquisitions we complete could be viewed negatively by our customers, securities analysts, and investors.

Our ability to use our net operating loss carryforwards and certain other tax attributes may be limited.

We may be limited in the portion of net operating loss ("NOL") carryforwards that we can use in the future to offset taxable income for U.S. federal and state income tax purposes. As of December 31, 2021, we had U.S. federal NOL carryforwards and state NOL carryforwards of approximately \$599.7 million and \$437.9 million, respectively, which if not utilized will begin to expire for federal and state tax purposes beginning in 2030 and 2023, respectively. Federal NOLs generated after December 31, 2017 have an indefinite carryover period, and federal NOLs generated after December 31, 2017 may be utilized to offset no more than 80% of taxable income annually. Realization of NOL carryforwards that expire beginning in 2030 and 2023, respectively, depends on future income, and there is a risk that these carryforwards could expire unused and be unavailable to offset future income tax liabilities, which could adversely affect our operating results.

In addition, under Sections 382 and 383 of the Code, if a corporation undergoes an "ownership change," generally defined as a greater than 50% change (by value) in its equity ownership over a three-year period, the corporation's ability to use its pre-change NOL carryforwards and other pre-change tax attributes, such as research tax credits, to offset its post-change income may be limited. While we have conducted a Section 382 study in the past, we may experience ownership changes in the future, including as a result of subsequent shifts in our stock ownership. As a result, if we earn net taxable income, our ability to use our pre-change NOL carry-forwards and other tax attributes to offset U.S. federal taxable income may be subject to limitations, which could potentially result in increased future tax liability to us.

If we fail to develop and maintain an effective system of disclosure controls and internal control over financial reporting, our ability to produce timely and accurate financial statements or comply with applicable law and regulations could be impaired.

The Sarbanes-Oxley Act requires, among other things, that we maintain effective disclosure controls and procedures and internal control over financial reporting. We are continuing to develop and refine our disclosure controls and other procedures that are designed to ensure that information required to be disclosed by us in the reports that we file with the SEC is recorded, processed, summarized, and reported within the time periods specified in SEC rules and forms, and that information required to be disclosed in reports under the Exchange Act is accumulated and communicated to our principal executive and financial officers. We are also continuing to improve our internal control over financial reporting. In order to maintain and improve the effectiveness of our disclosure controls and procedures and internal control over financial reporting, we have expended, and anticipate that we will continue to expend, significant resources, including accounting-related costs and significant management oversight. If any of these new or improved controls and systems do not perform as expected, we may experience material weaknesses in our controls. Our ERP system is critical to our ability to accurately maintain books and records and prepare our financial statements. Despite our recent technology and process

updates, we continue to depend on a number of systems that are not fully integrated with one another and we have in the past, and may in the future, encounter difficulty as a result of the lack of integration of all of our technology and process systems. If we encounter unforeseen problems with our ERP system or other systems and infrastructure, it could adversely affect our financial reporting systems and our ability to produce financial reports, the effectiveness of internal controls over financial reporting, and our business, prospects, financial condition, and operating results.

Our current controls and any new controls that we develop may become inadequate because of changes in conditions in our business. Further, weaknesses in our disclosure controls and internal control over financial reporting may be discovered in the future. Any failure to develop or maintain effective controls or any difficulties encountered in their implementation or improvement could harm our operating results or cause us to fail to meet our reporting obligations and may result in a restatement of our financial statements for prior periods. Effective December 31, 2021, we are a large accelerated filer based on the assessment of our public float as of June 30, 2021. We have excluded management's report on our internal control over financial reporting in this Annual Report based on certain compliance and disclosure interpretations of the SEC (see Item 9A. Controls and Procedures of this Annual Report for more information). However, we will be required to provide an annual management report on the effectiveness of our internal controls over financial reporting in our subsequent annual reports on Form 10-K, as we will no longer be an emerging growth company and not eligible to rely on those compliance and disclosure interpretations. Additionally, our independent registered public accounting firm will be required to formally attest to the effectiveness of our internal control over financial reporting in subsequent annual reports on Form 10-K. Our independent registered public accounting firm may issue a report that is adverse in the event it is not satisfied with the level at which our internal control over financial reporting is documented, designed, or operating. Any failure to implement and maintain effective internal control over financial reporting also could adversely affect the results of periodic management evaluations and annual independent registered public accounting firm attestation reports regarding the effectiveness of our internal control over financial reporting that we will eventually be required to include in our periodic reports that are filed with the SEC. Ineffective disclosure controls and procedures and internal control over financial reporting could also cause investors to lose confidence in our reported financial and other information, which would likely have a negative effect on the trading price of our common stock. In addition, if we are unable to continue to meet these requirements, we may not be able to remain listed on the the Nasdaq.

Any potential future international expansion will subject us to additional costs and risks that could harm our business, including unfavorable regulatory, political, tax, and labor conditions, and our potential future efforts to expand internationally may not be successful.

Should we choose to expand our business internationally in the future and establish business relationships with new international partners, we may be subject to legal, political, and regulatory requirements and social and economic conditions that may be very different from those affecting us domestically. For example, we have expanded our transit business into Canada. As we expanded into Canada, our electric transit buses were required to comply with Canadian Motor Vehicle Safety Standards, which differ from the FMVSS. Funding for transit bus procurement from certain provincial governments in Canada also requires compliance with Canadian Content requirements, which will require different supply chain partners than those that we rely on for our electric transit buses sold in the U.S. market and assembly of certain components or subcomponents in Canada. In addition, we are providing products and services to OEMs in Australia and Western Europe, and as we expand our Proterra Powered or Proterra Energy business internationally, or should we choose to further expand our Proterra Transit business outside the United States and Canada, we may face a number of risks associated with international business activities that may increase our costs, impact our ability to sell our electric transit buses, and require significant management attention. These risks include:

- conforming our products to various international regulatory and safety requirements as well as charging and other electric infrastructures;
- difficulty in establishing, staffing, and managing foreign operations and service networks;
- challenges in attracting international customers;
- preferences of foreign nations for domestically manufactured products;

- our ability to enforce our contractual rights;
- longer sales and collection cycles in some countries;
- weaker intellectual property protection in some countries;
- compliance with multiple, potentially conflicting and changing governmental laws, regulations and permitting processes, including environmental, product safety, banking, employment, and tax;
- compliance with U.S. and foreign anti-bribery laws including the U.S. Foreign Corrupt Practices Act of 1977, as amended, or FCPA, and the UK Bribery Act of 2010;
- currency exchange rate fluctuations;
- regional economic and political instability, including as a result of acts of war or terrorism in countries where we may operate;
- restrictions on repatriations of earnings;
- trade restrictions, customs regulations, tariffs, and price or exchange controls;
- increased competition from local providers of similar products;
- increased costs to establish and maintain effective controls at foreign locations; and
- overall higher costs of doing business internationally.

As a result of these risks, any potential future international expansion efforts that we may undertake may not be successful and may incur significant operational expenses. Our failure to manage these risks and challenges successfully could have an adverse effect on our business, prospects, financial condition, and operating results.

Failure to comply with anti-corruption, anti-money laundering laws, and sanctions laws, including the FCPA and similar laws associated with our activities outside of the United States, could subject us to penalties and other adverse consequences.

We are subject to the FCPA, the U.S. domestic bribery statute contained in 18 U.S.C. § 201, the U.S. Travel Act, the USA PATRIOT Act, the UK Bribery Act of 2010, U.S. and foreign laws relating to economic sanctions, including the laws and regulations administered by the U.S. Department of the Treasury's Office of Foreign Assets Control, and may be subject to other anti-bribery, anti-money laundering, and sanctions laws in countries in which we conduct activities. We face significant risks if we fail to comply with the FCPA and other anti-corruption laws that prohibit companies and their employees and third-party intermediaries from promising, authorizing, offering, or providing, directly or indirectly, improper payments or benefits to foreign government officials, political parties, and private sector recipients for the purpose of obtaining or retaining business, directing business to any person, or securing any advantage. In many foreign countries, particularly in countries with developing economies, it may be a local custom that businesses engage in practices that are prohibited by the FCPA or other applicable laws and regulations. We may have direct or indirect interactions with officials and employees of government agencies or state-owned or affiliated entities and we can be held liable for the corrupt or other illegal activities of these third-party intermediaries, our employees, representatives, contractors, partners, and agents, even if we do not explicitly authorize such activities. We have implemented an anti-corruption compliance program but cannot assure you that all of our employees and agents, as well as those companies to which we outsource certain of our business operations, will not take actions in violation of our policies and applicable law, for which we may be ultimately held responsible.

Any violation of the FCPA, other applicable anti-corruption laws, anti-money laundering and other applicable laws could result in whistleblower complaints, adverse media coverage, investigations, loss of export privileges, or severe criminal or civil sanctions, which could have an adverse effect on our business, prospects, financial

condition, and operating results. In addition, responding to any enforcement action may result in a significant diversion of management's attention and resources, significant defense costs, and other professional fees.

The requirements of being a public company may strain our resources, divert management's attention and affect our ability to attract and retain additional executive management and qualified board members.

We are subject to the reporting requirements of the Exchange Act, the Sarbanes-Oxley Act of 2002, or the Sarbanes-Oxley Act, the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (the "Dodd-Frank Act"), the listing requirements of Nasdaq and other applicable securities rules and regulations. Compliance with these rules and regulations will increase our legal and financial compliance costs, make some activities more difficult, time-consuming, or costly, and increase demand on our systems and resources, particularly after we are no longer an emerging growth company. The Exchange Act requires, among other things, that we file annual, quarterly, and current reports with respect to our business and operating results. The Sarbanes-Oxley Act requires, among other things, that we maintain effective disclosure controls and procedures and internal control over financial reporting. In order to maintain and, if required, improve our disclosure controls and procedures and internal control over financial reporting to meet this standard, significant resources and management oversight may be required. As a result, management's attention may be diverted from other business concerns, which could adversely affect our business and operating results. Although we have already hired additional employees to comply with these requirements, we may need to hire more employees in the future or engage outside consultants, which would increase our costs and expenses.

In addition, changing laws, regulations, and standards relating to corporate governance and public disclosure are creating uncertainty for public companies, increasing legal and financial compliance costs, and making some activities more time consuming. These laws, regulations, and standards are subject to varying interpretations, in many cases due to their lack of specificity, and, as a result, their application in practice may evolve or otherwise change over time as new guidance is provided by regulatory and governing bodies. This could result in continuing uncertainty regarding compliance matters and higher costs necessitated by ongoing revisions to disclosure and governance practices. We intend to invest resources to comply with evolving laws, regulations, and standards (or changing interpretations of them), and this investment may result in increased selling, general and administrative expenses and a diversion of management's time and attention from revenue-generating activities to compliance activities. If our efforts to comply with new laws, regulations, and standards differ from the activities intended by regulatory or governing bodies due to ambiguities related to their application and practice, regulatory authorities may initiate legal proceedings against us, and our business may be adversely affected. We also expect that being a public company and the associated rules and regulations will make it more expensive for us to obtain director and officer liability insurance, and we may be required to accept reduced coverage or incur substantially higher costs to obtain coverage. These factors could also make it more difficult for us to attract and retain qualified members of our board of directors, particularly to serve on our audit committee, compensation committee, and nominating and governance committee, and qualified executive officers.

As a result of disclosure of information in the filings required of a public company, our business and financial condition is more visible, which may result in threatened or actual litigation, including by competitors. If such claims are successful, our business and operating results could be adversely affected, and even if the claims do not result in litigation or are resolved in our favor, these claims, and the time and resources necessary to resolve them, could divert the resources of our management and adversely affect our business and operating results. In addition, as a result of our disclosure obligations as a public company, we have reduced flexibility and are under pressure to focus on short-term results, which may adversely affect our ability to achieve long-term profitability.

Regulations related to "conflict minerals" may force us to incur additional expenses, may make our supply chain more complex and may result in damage to our reputation with customers.

Pursuant to the Dodd-Frank Act, the SEC has adopted requirements for companies that use certain minerals and metals, known as conflict minerals, in their products, whether or not these products are manufactured by third parties. These requirements require companies to perform due diligence, disclose, and report whether such minerals originate from the Democratic Republic of Congo and adjoining countries, or come from recycled or scrap sources. These requirements could adversely affect the sourcing, availability, and pricing of minerals used in the manufacture of heavy-duty electric vehicles, including our products. While these requirements continue to be subject to administrative uncertainty, we will incur additional costs to comply with the disclosure requirements,

including costs related to determining the source of any of the relevant minerals and metals used in our products. Since our supply chain is complex, we may not be able to sufficiently verify the origins for these minerals and metals used in our products through the due diligence procedures that we implement, which may harm our reputation. In such event, we may also face difficulties in satisfying customers who require that all of the components of our products are certified as conflict mineral free.

Our management team has limited experience managing a public company.

Most members of our management team have limited experience managing a publicly traded company, interacting with public company investors, and complying with the increasingly complex laws pertaining to public companies. Our management team may not successfully or efficiently manage our transition to a public company subject to significant regulatory oversight and reporting obligations under the federal securities laws and the continuous scrutiny of securities analysts and investors. These obligations and constituents will require significant attention from our senior management and could divert their attention away from the day-to-day management of our business, which could have an adverse effect on our business, prospects, financial condition, and operating results.

Economic uncertainty or downturns could adversely affect our business and operating results.

In recent years, the United States and other significant markets have experienced cyclical downturns and worldwide economic conditions remain uncertain, including downturns of economic displacement unrelated to COVID-19 or other similar pandemics. Economic uncertainty and associated macroeconomic conditions make it extremely difficult for our customers and us to accurately forecast and plan future business activities, and could cause our customers to slow spending on our battery systems, electrification and charging solutions, fleet and energy management systems, electric transit buses, and related technologies, which could delay and lengthen sales cycles. Furthermore, during uncertain economic times our customers may face issues gaining timely access to sufficient funding, which could result in an impairment of their ability to make timely payments to us. If that were to occur, we may be required to increase our allowance for doubtful accounts and our results could be negatively impacted.

A significant downturn in economic activity, or general spending on transit or commercial vehicle electrification technologies, may cause our current or potential customers to react by reducing their capital and operating expenditures in general or by specifically reducing their spending on electric commercial vehicles and related technologies. In addition, our customers may delay or cancel projects to upgrade or replace existing vehicles in their fleets, or other projects to electrify commercial vehicle fleets, with our products or seek to lower their costs by renegotiating contracts. Moreover, competitors may respond to challenging market conditions by lowering prices and attempting to lure away our customers.

We cannot predict the timing, strength, or duration of any economic slowdown or any subsequent recovery generally, or in any industry. If the conditions in the general economy and the markets in which we operate worsen from present levels, our business, financial condition, and operating results could be adversely affected.

If our estimates or judgments relating to our critical accounting policies prove to be incorrect or financial reporting standards or interpretations change, our operating results could be adversely affected.

The preparation of financial statements in conformity with U.S. GAAP requires management to make estimates, judgments, and assumptions that affect the amounts reported in our financial statements and accompanying notes. We base our estimates on historical experience and on various other assumptions that we believe to be reasonable under the circumstances. The results of these estimates form the basis for making judgments about the carrying values of assets, liabilities, and equity as of the date of the financial statements, and the amount of revenue and expenses, during the periods presented, that are not readily apparent from other sources. Significant assumptions and estimates used in preparing our financial statements include those related to determination of revenue recognition, stock-based compensation, inventory, warranties, and accounting for income taxes. Our operating results may be adversely affected if our assumptions change or if actual circumstances differ from those in our assumptions, which could cause our operating results to fall below the expectations of industry or financial analysts and investors, resulting in a decline in the trading price of our common stock.

Additionally, we regularly monitor our compliance with applicable financial reporting standards and review new pronouncements and drafts thereof that are relevant to us. As a result of new standards, changes to existing standards, and changes in interpretation, we might be required to change our accounting policies, alter our operational policies, or implement new or enhance existing systems so that they reflect new or amended financial reporting standards, or we may be required to restate our published financial statements. Changes to existing standards or changes in their interpretation may have an adverse effect on our reputation, business, financial position, and profit, or cause an adverse deviation from our revenue and operating profit target, which may negatively impact our financial results.

U.S. federal income tax reform could adversely affect us.

New legislation or regulation which could affect our tax burden could be enacted by any governmental authority. United States federal legislation affecting the tax laws was enacted in December 2017 (the “Tax Cuts and Jobs Act” or “TCJA”), March 2020 (the “Families First Coronavirus Response Act”), March 2020 (the “CARES Act”), and in December 2020 (“Consolidated Appropriations Act, 2021”).

We continue to examine the impact the TCJA and CARES Act may have on our business. The TCJA is a far-reaching and complex revision to the U.S. federal income tax laws with disparate and, in some cases, countervailing impacts on different categories of taxpayers and industries, and will require subsequent rulemaking and interpretation in a number of areas. The long-term impact of the TCJA on the overall economy, the industries in which we operate and our and our partners’ businesses cannot be reliably predicted at this early stage of the new law’s implementation. There can be no assurance that the TCJA will not negatively impact our operating results, financial condition, and future business operations. The estimated impact of the TCJA is based on our management’s current knowledge and assumptions, following consultation with our tax advisors. Because of our valuation allowance in the United States, ongoing tax effects of the Act are not expected to materially change our effective tax rate in future periods.

In response to the COVID-19 pandemic, California’s Legislature passed Assembly Bill 85 (“A.B. 85”), which suspends the use of net operating losses for tax years beginning in 2020, 2021, and 2022 for taxpayers with taxable income of \$1.0 million or more before an application of net operating loss. A.B. 85 includes an extended carryover period for the suspended net operating losses with an additional year carryforward for each year of suspension. A.B. 85 also limits the utilization of business incentive tax credits for taxable years 2020, 2021, and 2022, requiring that taxpayers can only claim a maximum of \$5.0 million in tax credit on an aggregate basis.

We use our best judgment in attempting to quantify and reserve for these tax obligations. However, a challenge by a taxing authority, our ability to utilize tax benefits such as carryforwards or tax credits, or a deviation from other tax-related assumptions may cause actual financial results to deviate from previous estimates.

We do not intend to pay dividends for the foreseeable future.

We have never declared or paid any cash dividends on our common stock and do not intend to pay any cash dividends in the foreseeable future. Additionally, our ability to pay dividends on our common stock is limited by restrictions under the terms of our Loan Agreements. We anticipate that for the foreseeable future we will retain all our future earnings for use in the development of our business and for general corporate purposes. Any determination to pay dividends in the future will be at the discretion of our board of directors. Accordingly, investors must rely on sales of their common stock after price appreciation, which may never occur, as the only way to realize any future gains on their investments.

Provisions in our charter documents and under Delaware law could make an acquisition of our company more difficult, limit attempts by our stockholders to replace or remove our current management, limit our stockholders’ ability to obtain a favorable judicial forum for disputes with us or our directors, officers, or employees, and limit the market price of our common stock.

Provisions in our restated certificate of incorporation and restated bylaws that are in effect may have the effect of delaying or preventing a change of control or changes in our management. Our restated certificate of incorporation and restated bylaws include provisions that:

- provide that our board of directors will be classified into three classes of directors with staggered three-year terms;
- permit the board of directors to establish the number of directors and fill any vacancies and newly created directorships;
- require super-majority voting (or if two-thirds of the board of directors approves, a majority) to amend some provisions in our restated certificate of incorporation and restated bylaws;
- authorize the issuance of “blank check” preferred stock that our board of directors could use to implement a stockholder rights plan;
- provide that only a majority of our board of directors will be authorized to call a special meeting of stockholders;
- prohibit stockholder action by written consent, which requires all stockholder actions to be taken at a meeting of our stockholders;
- provide that the board of directors is expressly authorized to make, alter, or repeal our bylaws; and
- establish advance notice requirements for nominations for election to our board of directors or for proposing matters that can be acted upon by stockholders at annual stockholder meetings.

In addition, our restated certificate of incorporation provides the Court of Chancery of the State of Delaware, to the fullest extent permitted by law, will be the exclusive forum for any derivative action or proceeding brought on our behalf, any action asserting a breach of fiduciary duty, any action asserting a claim against us arising pursuant to the Delaware General Corporation Law, or DGCL, our restated certificate of incorporation, or our restated bylaws, or any action asserting a claim against us that is governed by the internal affairs doctrine. The provision will not apply to suits brought to enforce a duty or liability created by the Exchange Act. Our restated bylaws provide that the federal district courts of the United States of America will, to the fullest extent permitted by law, be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act or the Exchange Act, which we refer to as a Federal Forum Provision. Our decision to adopt a Federal Forum Provision followed a decision by the Supreme Court of the State of Delaware holding that such provisions are facially valid under Delaware law. While there can be no assurance that federal courts or state courts will follow the holding of the Delaware Supreme Court or determine that the Federal Forum Provision should be enforced in a particular case, application of the Federal Forum Provision means that suits brought by our stockholders to enforce any duty or liability created by the Securities Act or the Exchange Act must be brought in federal court and cannot be brought in state court. These choice of forum provisions may limit a stockholder’s ability to bring a claim in a judicial forum that it finds favorable for disputes with us or any of our directors, officers, or other employees, which may discourage lawsuits against us and our directors, officers, and other employees.

Moreover, Section 203 of the DGCL may discourage, delay, or prevent a change of control of our company. Section 203 imposes certain restrictions on mergers, business combinations, and other transactions between us and holders of 15% or more of our common stock. See the section titled “Description of Capital Stock” for additional information.

Risks Related to our Common Stock

We were previously a “smaller reporting company”, and we are able to take advantage of certain exemptions from disclosure requirements available to “smaller reporting companies” through the year ended December 31, 2021, which could make our common stock less attractive to investors.

We were previously a “smaller reporting company” as defined in Item 10(f)(1) of Regulation S-K and we are therefore able to take advantage of certain reduced disclosure obligations in our periodic reports for the year ended December 31, 2021, including reduced disclosure obligations regarding executive compensation in the Proxy Statement for our 2022 Annual Meeting of Stockholders. As a result, our stockholders may not have access to certain information they may deem important, and we cannot predict whether investors will find our common stock less attractive because we will have been able to rely on this exemption. If some investors find our common stock less attractive as a result of our reliance on this exemption, the trading price of our common stock may be lower than it otherwise would be, there may be a less active trading market for our common stock and the trading price of our common stock may be more volatile.

The price of our common stock may be volatile.

The price of our common stock may fluctuate due to a variety of factors, including:

- changes in the industries in which we and our customers operate;
- variations in our operating performance and the performance of our competitors in general;
- material and adverse impact of the COVID-19 pandemic on the markets and the broader global economy;
- actual or anticipated fluctuations in our quarterly or annual operating results;
- the public’s reaction to our press releases, our other public announcements and our filings with the SEC;
- negative publicity regarding our company or products;
- our failure or the failure of our competitors to meet analysts’ projections or guidance that we or our competitors may give to the market;
- additions and departures of key personnel;
- changes in laws and regulations affecting its business;
- commencement of, or involvement in, litigation involving us;
- changes in our capital structure, such as future issuances of securities or the incurrence of additional debt;
- publication of research reports by securities analysts about us or our competitors or our industry;
- sales of shares of our common stock by the PIPE Investors;
- the volume of shares of our common stock available for public sale, including as a result of the conversion of the Convertible Notes into shares of our common stock or termination of the lock-up pursuant to the terms thereof; and
- general economic and political conditions such as recessions, changes in interest rates, fuel prices, foreign currency fluctuations, international tariffs, social, political and economic risks, geopolitical conflicts (including the current conflict in Ukraine), and acts of war or terrorism.

These market and industry factors may materially reduce the market price of our common stock regardless of our operating performance.

Future resale of our common stock may cause the market price of our common stock to drop significantly, even if our business is doing well.

Sales of a substantial number of shares of our common stock in the public market could occur at any time. These sales, or the perception in the market that the holders of a large number of shares intend to sell shares, could reduce the market price of our common stock.

Immediately after the closing of the Business Combination: (i) holders of former Legacy Proterra common stock owned approximately 69.5% of our total outstanding common stock, (ii) holders of ArcLight's former Class A ordinary shares owned 11.2% of our total outstanding common stock, (iii) holders of ArcLight's former Class B ordinary shares owned 2.5% of our total outstanding common stock and (iv) PIPE Investors owned approximately 16.8% of our total outstanding shares of common stock.

Although the Sponsor and certain of our stockholders were subject to certain lock-up restrictions regarding the transfer of our common stock, these lock-up restrictions expired on December 11, 2021. Furthermore, our registration statement on Form S-1 relating to the offer and sale from time to time by the selling securityholders named therein of up to 168,719,124 shares of common stock has been declared effective by the SEC. Because these lock-up restrictions have expired for such stockholders and the registration statement on Form S-1 is available for use, the market price of our common stock could decline if the holders of our common stock sell them or are perceived by the market as intending to sell them.

Reports published by analysts, including projections in those reports that differ from our actual results, could adversely affect the price and trading volume of our common stock.

Securities research analysts may establish and publish their own periodic projections for us. These projections may vary widely and may not accurately predict the results we actually achieve. Our share price may decline if our actual results do not match the projections of these securities research analysts. Similarly, if one or more of the analysts who write reports on us downgrades our stock or publishes inaccurate or unfavorable research about our business, our share price could decline. If one or more of these analysts ceases coverage of us or fails to publish reports on us regularly, our share price or trading volume could decline. While we expect research analyst coverage, if no analysts commence coverage of us, the market price and volume for our common stock could be adversely affected.

We are subject to changing law and regulations regarding regulatory matters, corporate governance and public disclosure that will increase our costs and the risk of non-compliance.

We are subject to rules and regulations by various governing bodies, including, for example, the SEC, which are charged with the protection of investors and the oversight of companies whose securities are publicly traded, and to new and evolving regulatory measures under applicable law. Our efforts to comply with new and changing laws and regulations will result in increased general and administrative expenses and a diversion of management time and attention.

Moreover, because these laws, regulations and standards are subject to varying interpretations, their application in practice may evolve over time as new guidance becomes available. This evolution may result in continuing uncertainty regarding compliance matters and additional costs necessitated by ongoing revisions to our disclosure and governance practices. If we fail to address and comply with these regulations and any subsequent changes, we may be subject to penalty and our business may be harmed.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

Our corporate headquarters are in Burlingame, California, where we occupy facilities totaling approximately 34,400 square feet under a lease that expires in September 2024. We use these facilities for administration, finance, legal, human resources, information technology, sales and marketing, engineering, technology, and development. Our Burlingame headquarters also includes one of our battery manufacturing facilities and our test lab.

We also have bus manufacturing facilities in City of Industry and Greenville. Battery manufacturing is also in City of Industry where we lease approximately 157,100 square feet of space under a lease that expires in August 2022, and for which we are actively negotiating an extension. In Greenville, we lease approximately 209,300 square feet under a lease that expires in June 2026, for which we have two five-year options to extend our lease to June 2036. In November 2021, we entered into a lease arrangement for a new plant with approximately 327,000 square feet at Greer, South Carolina, to expand our battery system manufacturing capacity. The lease expires in January 2032, and we have two five-year options to extend our lease to 2042.

We have in the past applied for and received state grants and tax incentives designed to promote the manufacturing of electric vehicles and related technologies. In April 2015, the California Energy Commission awarded us \$3.0 million based on our investment of approximately \$8.4 million in our manufacturing facilities in California through December 31, 2018. In addition, in April 2019, the California Energy Commission awarded us a \$1.8 million grant based on our expected investment of approximately \$4.3 million in our manufacturing facility in City of Industry, California. The California Energy Commission awards were made after a competitive grant solicitation that offered to fund development of advanced vehicle technology manufacturing facilities in California.

We intend to procure additional space as we add employees and expand geographically. We believe that our facilities are adequate to meet our needs for the immediate future, and that suitable additional space will be available to accommodate any expansion of our operations if needed in the future.

Item 3. Legal proceedings

From time to time we may be involved in various disputes and litigation matters that arise in the ordinary course of business. We are currently not a party to any material legal proceedings.

Item 4. Mine Safety Disclosures

Not applicable.

PART II

Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities

Market Information

Our outstanding common stock has been listed on the Nasdaq Global Select Market under the ticker symbol "PTRA" since June 15, 2021.

Holders

As of March 9, 2022, there were approximately 732 holders of record of our common stock. The actual number of holders of our common stock is greater than the number of record holders and includes stockholders who are beneficial owners, but whose shares are held in street name by brokers or other nominees. The number of holders of record presented here also does not include stockholders whose shares may be held in trust by other entities.

Dividend Policy

We have never declared or paid any cash dividends on our capital stock, and we do not currently intend to pay any cash dividends for the foreseeable future. We expect to retain future earnings, if any, to fund the development and growth of our business. Any future determination to pay dividends on our common stock will be at the discretion of our board of directors and will depend upon, among other factors, our financial condition, operating results, current and anticipated cash needs, plans for expansion and other factors that our board of directors may deem relevant.

Securities Authorized for Issuance Under Equity Compensation Plans

The information required by this item is incorporated by reference to our Proxy Statement for the 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2021.

Sales of Unregistered Securities

None.

Use of Proceeds

On September 25, 2020, ArcLight completed its initial public offering of 25,000,000 units, plus an additional 2,750,000 units subsequently issued upon partial exercise of the underwriters' overallocation option, at a price of \$10.00 per unit generating gross proceeds of \$277,500,000 before underwriting discounts and expenses. Each unit consisted of one Class A ordinary share and one-half of one public warrant. Each whole public warrant entitled the holder thereof to purchase one Class A ordinary share at an exercise price of \$11.50 per share, subject to certain adjustments. The units sold in the offering were registered under the Securities Act on a registration statement on Form S-1 (File No. 333-248625). The registration statement became effective on September 22, 2021.

Simultaneous with the closing of ArcLight's initial public offering, ArcLight completed the private placement of 7,550,000 private placement warrants at a price of \$1.00 per private placement warrants to the Sponsor. The private placement warrants sold to the Sponsor were substantially identical to the public warrants forming a part of the warrants sold in the initial public offering of ArcLight, except that if held by the Sponsor or its permitted transferees, they (i) were permitted to be exercised for cash or on a cashless basis, (ii) were not subject to being called for redemption and (iii) subject to certain limited exceptions, were subject to transfer restrictions until 30 days following the consummation of the Business Combination.

ArcLight incurred approximately \$15.9 million in offering costs for its initial public offering including approximately \$8.8 million of deferred underwriting fees and approximately \$1.5 million in additional offering costs

related to the partial exercise of the underwriters' overallotment option. Following the initial public offering, the partial exercise of the over-allotment option, and the sale of the private placement shares, a total of \$250.0 million was deposited into the trust account for the purpose of effecting an initial business combination. As of May 4, 2021, the record date of the Business Combination, there was approximately 277.6 million held in the trust account. After deducting payments to existing ArcLight shareholders of \$155,772.59 in connection with their exercise of redemption rights, the remainder of the approximately \$277.4 million held in the trust account is now held on our balance sheet to fund our operations and continued growth.

Issuer Purchases of Securities

On September 27, 2021, we issued a notice of redemption of all of our outstanding public and private warrants with a redemption date of October 27, 2021, which was later extended to October 29, 2021. Warrants were permitted to be exercised through the redemption date on a cash basis at an exercise price of \$11.50 per share of our common stock, or on a cash-less basis for 0.255 shares of common stock per warrant. The redemption was completed in October 29, 2021. Any warrants not exercised by October 29, 2021 were redeemed for a price of \$0.10 per warrant, and subsequently cancelled.

Item 6. [Reserved]

Item 7. Management's Discussion and Analysis Of Financial Condition and Results of Operations

You should read the following discussion and analysis of our financial condition and results of operations together with our audited financial statements and notes thereto included elsewhere in this Annual Report. Certain of the information contained in this discussion and analysis or set forth elsewhere in this Annual Report, including information with respect to plans and strategy for Proterra's business, includes forward-looking statements that involve risks and uncertainties. As a result of many factors, including those factors set forth in the section entitled "*Risk Factors*," Proterra's actual results could differ materially from the results described in or implied by the forward-looking statements contained in the following discussion and analysis. You should carefully read the section entitled "*Risk Factors*" to gain an understanding of the important factors that could cause actual results to differ materially from Proterra's forward-looking statements.

Overview

We are a leading developer and producer of commercial electric vehicle technology with an integrated business model focused on providing end-to-end solutions that enable commercial vehicle electrification.

Our business is organized into two business units comprised of three business lines, with each business line addressing a critical component of commercial vehicle electrification.

- **Proterra Powered and Energy** is our business unit that provides our technology solutions to commercial vehicle manufacturers and owners of commercial fleets, and is comprised of two business lines.
 - **Proterra Powered** designs, develops, manufactures, sells, and integrates proprietary battery systems and electrification solutions into vehicles for global commercial vehicle original equipment manufacturer ("OEM") customers serving the Class 3 to Class 8 vehicle segments, including delivery trucks, school buses, and coach buses, as well as construction and mining equipment, and other applications.
 - **Proterra Energy** provides turnkey fleet-scale, high-power charging solutions and software services, ranging from fleet and energy management software-as-a-service, to fleet planning, hardware, infrastructure, installation, utility engagement, and charging optimization. These solutions are designed to optimize energy use and costs, and to provide vehicle-to-grid functionality.
- **Proterra Transit** is our business unit that designs, develops, manufactures, and sells electric transit buses as an OEM for North American public transit agencies, airports, universities, and other commercial transit fleets. Proterra Transit vehicles showcase and validate our electric vehicle technology platform

through rigorous daily use by a large group of sophisticated customers focused on meeting the wide-ranging needs of the communities they serve.

The first application of Proterra Powered commercial vehicle electrification technology was through Proterra Transit's heavy-duty electric transit bus, which we designed from the ground up for the North American market. Our industry experience, the performance of our transit buses, and compelling total cost of ownership has helped make us the leader in the U.S. electric transit bus market. With over 800 electric transit buses on the road, our electric transit buses have delivered more than 25 million cumulative service miles spanning a wide spectrum of climates, conditions, altitudes and terrains. From this experience, we have been able to continue to iterate and improve our technology.

Our decade of experience supplying battery electric heavy duty transit buses provided us the opportunity to validate our products' performance, fuel efficiency and maintenance costs with a demanding customer base and helped broaden our appeal as a supplier to OEMs in other commercial vehicle segments and geographies. Proterra Powered has partnered with more than a dozen OEMs spanning from Class 3 to Class 8 trucks, several types of buses, and multiple off-highway categories. Through December 31, 2021, Proterra Powered has delivered battery systems and electrification solutions for more than 400 vehicles to our OEM partner customers.

In addition, Proterra Energy has established our Company as a leading commercial vehicle charging solution provider by helping fleet operators fulfill the high-power charging needs of commercial electric vehicles and optimize their energy usage, while meeting our customers' space constraints and continuous service requirements. As of December 31, 2021, we had installed more than 60 MW of charging infrastructure across North America.

Through December 31, 2021, we have generated the majority of our revenue from Proterra Transit's sales of electric transit buses, complemented by additional revenue from Proterra Powered's sales of battery systems and Proterra Energy's sales and installation of charging systems, as well as from the sale of spare parts and other services provided to customers. As fleet electrification continues to expand beyond buses to trucks and other commercial vehicles, we expect Proterra Powered and Proterra Energy to grow into a significantly larger portion of our overall business and generate a greater portion of revenue. Through December 31, 2021, our chief operating decision maker, the Chief Executive Officer, reviewed financial information presented at the entity level for ongoing operations and for internal planning and forecasting purposes, and we had a single reportable segment.

Proterra Powered's strategy is to leverage Proterra Transit's success in the electric transit bus market to showcase the performance of our technology and demonstrate a strong track record of range and reliability in order to provide our battery systems and electrification solutions to other commercial vehicle segments. We believe our success in the transit bus market using our battery systems and electrification solutions to power heavy-duty vehicles with faster acceleration than a diesel-powered bus up steep hills, all while maintaining a rigorous regular schedule of operation with little tolerance for error, helps demonstrate the broad applicability of our technology to other commercial vehicle segments with similar requirements. We sell our electric powertrains using a business development team as well as a channel sales team for certain end markets. These teams work closely with our engineering team to develop optimal electrification solutions for our customers, depending on their vehicle requirements.

Enhanced by Proterra Powered's high performance battery systems and electrification solutions and our purpose-built transit bus vehicle designed to optimize power, weight, and efficiency, Proterra Transit has been a leader in the North American electric transit market since 2012. Our sales efforts are focused on the 400 largest public transit agencies, which range in size from approximately 50 buses to thousands of buses in their fleets. These agencies operate more than 85% of the more than 70,000 transit buses on the road in North America, according to the FTA's National Transit Database, as well as airports, universities, hospitals, and corporate shuttles. As of December 31, 2021, there are, in aggregate, more than 25,000 buses in operation at fleets that are mandated to convert to 100% zero-emission by 2040, including fleets in the state of California and the cities of New York City, Chicago, and Seattle, among others. The fleet size of our primary public transit agency customer targets ranges between approximately 100 to more than 4,000 buses, and their electrification plans typically involve a phased approach. Our strategy is to maintain the No. 1 market share of the North American electric transit bus market as electric penetration continues to rise by both acquiring new customers and expanding our

share of existing customers as transit agencies' average order rates increase to meet their zero emission targets. We believe we have a competitive advantage in winning new bus sales due to our extensive track record, with more than 800 vehicles on the road which have accumulated more than 25 million real-world service miles spanning a wide spectrum of climates, conditions, altitudes and terrains. We believe that repeat orders of increasing scale represent a considerable growth opportunity for our electric transit buses. After initial purchase, our customers often expand their electric vehicle programs and place additional orders for electric buses and charging systems. Repeat orders lower our customer acquisition costs and increase visibility into our sales pipeline. Many of our existing customers have announced long-term goals to transition to fleets completely comprised of electric vehicles.

We have a long sales and production cycle given our customers' structured procurement processes and vehicle customization requirements, and believe that our proven ability to deliver commercial-quality battery systems, electrification and charging solutions, and electric transit buses gives us a distinct first mover advantage in end markets that are electrifying rapidly. For Proterra Powered, new vehicle development programs for commercial vehicle OEMs typically last between one and three years. As a result, volume production and revenue generation tend to trail initial contract signatures by a few years. For Proterra Transit, public transit agencies typically conduct a request for proposal process before awards are made and purchase orders are issued. Proposals are evaluated on various criteria, including but not limited to technical requirements, reliability, reputation of the manufacturer, and price. This initial sales process from first engagement to award typically ranges from 6 to 18 months. Once a proposal has been awarded, a pre-production process is completed where customer specific options are mutually agreed upon. A final purchase order follows the pre-production process. Procurement of parts and production typically follow the purchase order. Once a bus is fully manufactured, the customer performs a final inspection before accepting delivery, allowing us to recognize revenue. The length of time between a customer award and vehicle acceptance typically varies between 12 and 24 months, depending on product availability and production capacity.

We have significant manufacturing capacity already in place and at scale with approximately 350,000 square feet of manufacturing space across three facilities in two states. In City of Industry, California, we operate a battery production facility as well as a bus manufacturing facility. We also operate a battery production facility in Burlingame, California. Our largest bus manufacturing facility is located in Greenville, South Carolina. Battery manufacturing capacity at our City of Industry facility, once fully staffed on a three shift structure, is 675 MWh, sufficient to supply batteries for both our total bus manufacturing capacity of 680 transit buses across our two bus assembly facilities in Greenville, SC and City of Industry, CA, as well as more than 350 MWh of Proterra Powered batteries for third-party customers, equivalent to 1,500 school buses and/or delivery vehicles per year. In November 2021, we entered into a lease arrangement for a new plant with approximately 327,000 square feet at Greer, South Carolina to expand our battery system manufacturing capacity and to multiple gigawatt-hours per year. We have specifically developed our battery modules using a design for manufacturability (DFM) approach that enables high-volume automated production of the module using a modular manufacturing line that can be rapidly built with low capital expenditures. Enabled by the simplicity of design and integrated architecture of our battery modules, we manufacture our battery packs in two widths and heights, various lengths ranging from 3-feet to 9-feet, and four different voltages. In the year ended December 31, 2020, our battery production was 111 MWh and in the year ended December 31, 2021, our production was 189 MWh, a 70% increase year over year. As we increase our production volumes, we believe that we will be able to leverage our historical investments in capacity to reduce our labor and overhead costs as a percentage of total revenue. We currently have sufficient capacity to fulfill our current backlog and anticipated near-term growth.

For the years ended December 31, 2021, 2020 and 2019, our total revenue was \$242.9 million, \$196.9 million, and \$181.3 million, respectively. As of December 31, 2021, in aggregate, we have generated revenue of \$621.1 million for the past three years. We generated a gross profit of \$2.1 million for the year ended December 31, 2021 and a gross profit of \$7.5 million for the year ended December 31, 2020, and a gross loss of \$1.6 million for the year ended December 31, 2019. We have also invested significant resources in research and development, operations, and sales and marketing to grow our business and, as a result, generated losses from operations of \$127.6 million, \$96.0 million, and \$99.7 million for the years ended December 31, 2021, 2020 and 2019, respectively.

Key metrics and select financial data*Deliveries*

We delivered 217 (208 new and 9 pre-owned), 170 and 177 vehicles in 2021, 2020 and 2019, respectively. We delivered battery systems for 273, 107 and 20 vehicles in 2021, 2020 and 2019, respectively.

Deliveries is an indicator of our ability to convert awarded orders into revenue and demonstrates the scaling of our operations. Vehicles delivered represents the number of buses that have met revenue recognition criteria during a period. Battery systems delivered represents the battery systems sold to OEMs that have met revenue recognition criteria during a period and is measured based on the number of underlying vehicles in which they are to be used. In addition to batteries, battery systems could include drivetrains and high voltage systems and controls, depending upon the customer contract.

Growth rates between deliveries and total revenue are not perfectly correlated because our total revenue is affected by other variables, such as the mix of products sold during the period or other services provided in addition to the hardware delivered.

Adjusted EBITDA

Adjusted EBITDA is a non-GAAP financial measure that we use to evaluate our ongoing operations and for internal planning and forecasting purposes, because, among other reasons, it eliminates the effect of financing, non-recurring items, capital expenditures, and non-cash expenses such as stock-based compensation and (gain) loss on valuation of derivative and warrant liabilities. We believe that adjusted EBITDA provides useful information to investors and others in understanding and evaluating our operating results in the same manner as our management and board of directors.

(in thousands)	Year Ended December 31,		
	2021	2020	2019
Adjusted EBITDA Reconciliation:			
Net income (loss)	\$ (250,006)	\$ (127,007)	\$ (101,552)
Add (deduct):			
Interest expense, net	50,982	15,413	2,704
Provision for income taxes	16	22	—
Depreciation and amortization expense	15,689	15,536	12,643
Stock-based compensation expense	16,061	10,282	8,520
Loss on valuation of derivative and warrant liabilities	70,177	12,989	—
Asset impairment charge	—	121	6,440
Adjusted EBITDA	\$ (97,081)	\$ (72,644)	\$ (71,245)

Business Combination

On June 14, 2021, we consummated the transactions contemplated by the Merger Agreement, by and among ArcLight, Phoenix Merger Sub, and Legacy Proterra. As contemplated by the Merger Agreement, on June 11, 2021, ArcLight consummated the Domestication. Further, on June 14, 2021, as contemplated by the Merger Agreement, Proterra consummated the Merger.

In addition, pursuant to subscription agreements entered into in connection with the Merger Agreement, the PIPE Investors purchased an aggregate of 41,500,000 shares of Proterra common stock concurrently with the Closing for an aggregate purchase price of \$415,000,000.

We received \$649.3 million in net cash proceeds upon Closing to fund our growth initiatives, including research and development and our next-generation battery program.

In October 2021, majority of the public warrants and private placement warrants were exercised, and we redeemed the remaining outstanding public warrants at a redemption price of \$0.10 per public warrant.

Key factors affecting our performance

COVID-19 Pandemic:

The outbreak of the novel coronavirus COVID-19, which was declared a pandemic by the World Health Organization on March 11, 2020, has led to adverse impacts on the U.S. and global economies and created uncertainty regarding potential impacts to our supply chain, operations, and customer demand. Our manufacturing operations, and our transit agency customers, have been designated as an “Essential Business” under applicable public health orders. We made adjustments to our business operations and have continued to operate with limited interruptions since March 2020 with no material adverse impact to our operations, financial position, or liquidity through December 31, 2021. Most recently, during the third and fourth quarters of 2021, our vehicle and equipment deliveries were impacted by constraints and inefficiencies in production driven by shortages in component parts, particularly resin for connectors, resulting from global supply chain disruptions stemming from the pandemic. Although we achieved revenue growth during the year ended December 30, 2021 compared to the year ended December 31, 2020, these disruptions decreased our revenue and increased our overhead. More generally, the COVID-19 pandemic is currently expected to continue to have an impact on our results of operations, financial position, and liquidity. If the outbreak, and related shutdowns, logistics delays, part shortages, production inefficiencies or extended customer order and acceptance processes, are prolonged or worsen, including as a result of variant strains of the virus, it could lead to more significant delays in production, the signing of new customer contracts, and customer acceptances of near-term deliveries.

Ability to sell additional powertrains, vehicles, chargers and other products to new and existing customers

Our results will be impacted by our ability to sell our battery systems, electrification solutions including charging and energy management software, and electric transit buses, to new and existing customers. We have had initial success with Proterra Powered establishing strategic partnerships and with Proterra Transit selling electric transit buses and chargers to more than 130 customers. Our growth opportunity is dependent on commercial vehicle manufacturers electrifying their product offerings and increasing production as well as transit agencies electrifying more of their fleets, both of which we believe will increase with continued improvement in battery performance and costs over time. Our ability to sell additional products to existing customers is a key part of our success, as follow-on purchases indicate customer satisfaction and decrease the likelihood of competitive substitution. In order to sell additional products to new and existing customers, we will need to continue to invest significant resources in our products and services. If we fail to make the right investment decisions in our technology and electrification solutions, including our battery systems and electrification and charging solutions, if customers do not adopt our technology or our products and services, or if our competitors are able to develop technology or products and services that are superior to ours, our business, prospects, financial condition, and operating results could be adversely affected.

Ability to improve profit margins and scale our business

We intend to continue investing in initiatives to improve our operating leverage and significantly ramp production. We believe continued reduction in costs and an increase in production volumes will enable commercial vehicle manufacturers to electrify faster. Purchased materials represent the largest component of cost of goods sold in all products and we continue to explore ways to reduce these costs through improved design for cost, strategic sourcing, long-term contracts, and in some cases vertical integration. We launched two new manufacturing facilities in 2017 and a new battery manufacturing facility in 2020. We believe that an increase in volume and additional experience will allow us to leverage those investments and reduce our labor and overhead costs, as well as our freight costs, as a percentage of total revenue. By reducing material costs, increasing facility utilization rates and improving overall economies of scale, we can reduce prices while maintaining or growing gross margins of our products to improve customers’ total cost of ownership and help accelerate commercial electric vehicle adoption. Our ability to achieve our cost-saving and production-efficiency objectives could be negatively impacted by a variety of factors including, among other things, lower-than-expected facility utilization rates, manufacturing and production cost overruns, increased purchased material costs, and unexpected supply-chain quality issues or interruptions. If we are unable to achieve our goals, we may not be able to reduce price

enough to accelerate commercial vehicle electrification and our cost of goods sold and operating costs could be greater than anticipated, which would negatively impact gross margin and profitability.

Continued emissions regulation and environmental stewardship

Our business benefits from international, federal, state, and local government interest in regulating air pollution and greenhouse gas emissions that contribute to global climate change. In July 2020, 15 states, including California and New York, pledged to work jointly towards a unified goal of zero emissions for 100% of new sales of medium- and heavy-duty commercial vehicles by 2050. In August 2019, the European Union passed Regulation 2019/1242, mandating a reduction in emissions from new trucks by 2025 and 2030. In addition, a growing number of cities and transit agencies have pledged to convert their entire transit bus fleets to zero-emission vehicles by a specific target date, and many have already begun to purchase electric vehicles in order to meet this goal. For example, on December 14, 2018, the California Air Resources Board adopted a state-wide mandate, the Innovative Clean Transit Rule, mandating transit agencies to commit to purchasing zero-emission buses starting in 2029. The Infrastructure Investment and Jobs Act enacted on November 15, 2021 will provide additional funding for electric vehicles and electric vehicle charging infrastructure through the creation of new programs and grants and the expansion of existing programs, including over \$4.0 billion to replace existing buses with zero emission buses and at least \$2.5 billion to replace existing school buses with zero emission school buses. The move away from diesel- and natural gas-powered commercial vehicles is a significant step forward to accelerate the use of advanced technologies in medium- and heavy-duty vehicles to meet air quality and public health, thereby boosting near-term deployment of battery-electric commercial vehicles. As legacy internal combustion engine technology becomes more heavily regulated and costly across the globe, commercial vehicle manufacturers are investing in electrification. While this investment may increase competition, we believe that it will also increase customer demand, and help build the necessary supply chain and adjacent industry investments to support powertrain electrification. However, the uncertainty related to the passage of new legislation could impact the timing and number of vehicle orders, and any reduction in governmental interest in emissions regulation could negatively impact our business prospects or operating results.

Government programs accelerating adoption of zero-emission vehicles

Federal and state funding has accelerated the adoption of electric vehicles in our target markets. For instance, our U.S. transit customers have partially funded electric bus purchases through competitive grant programs, including the Low or No Emission Vehicle Program authorized by the federal Fixing America's Surface Transportation Act in 2015, and other state-specific funding. In the United States, states are also allocating portions of settlement funds from the approximately \$15 billion Volkswagen Emissions Settlement Program to investments in zero-emission transit buses and school buses. We expect that the continued availability of government funding for our customers to help fund purchases of our electric transit buses and battery systems will remain an important factor in our company's growth prospects.

Components of results of operations

Revenue

We derive revenue primarily from the sale of vehicles, the sale of battery and powertrain systems, the sale and installation of charging systems, as well as the sale of spare parts and other services provided to customers.

Product revenue. Product revenue consists of revenue earned from the sale of vehicles, sale of battery and powertrain systems as well as sales and installation of charging systems. We generally recognize product revenue from contracts with customers for the sales of our vehicles once we deliver a vehicle to a customer. A vehicle is considered delivered once met revenue recognition criteria. Revenue from the sale of battery and powertrain systems is typically recognized upon shipping. Revenue from sales and installation of charging systems is typically recognized at a point of time once met revenue recognition criteria. Under certain contract arrangements, revenue related to the charging systems is recognized over the installation period using an input measure based on costs incurred to date relative to total estimated costs to completion. Product revenue also includes revenue from leasing vehicles and charging systems under operating leases. Revenue from operating lease arrangements is recognized ratably over the lease term. The amount of product revenue we recognize in a given period depends on the number of vehicles accepted and the type of financing used by the customer.

Parts and other service revenue. Parts and other service revenue includes sales of spare parts, revenue earned from the development of electric vehicle powertrain components, the design and development of battery and drive systems for other vehicle manufacturers, and sales of extended warranties. The amount of parts and service revenue tends to grow with the number of vehicles delivered. However, variability can exist as customers have different methodologies for sourcing spare parts for their fleets. Revenue related to the design, development and integration of battery and drive systems is typically recognized upon shipping or delivery of services and prototypes, depending on the terms in customer contracts.

For a description of our revenue recognition policies, see the section titled “— Critical Accounting Policies and Estimates.”

Cost of goods sold

Product cost of goods sold. Product cost of goods sold consists primarily of direct material and labor costs, manufacturing overhead, other personnel-related expenses, which include salaries, bonuses, benefits, and stock-based compensation expense, reserves for estimated warranty costs, freight expense, and depreciation expense. Product cost of goods sold also includes charges to write-down the carrying value of inventory when it exceeds its estimated net realizable value, including on-hand inventory that is either obsolete or in excess of forecasted demand. We expect our product cost of goods sold to increase in absolute dollars in future periods as we sell more vehicles and charging systems. As we grow into our current capacity and execute on cost-reduction initiatives, we expect our product cost of goods sold as a percentage of revenue to decrease over time.

Parts and other service cost of goods sold. Parts and other service cost of goods sold consists primarily of material costs and the cost of services provided, including field service costs and costs related to our development team. We record costs of development services incurred in periods prior to the finalization of an agreement as research and development expense. Once a development agreement is finalized, we record these costs in parts and other service cost of goods sold. We expect our parts and other service cost of goods sold to increase in absolute dollars in future periods as more customers put additional vehicles into service and sign new development agreements.

Because purchased materials comprise more than 50% of cost of goods sold, lowering our bill of materials cost is our most critical cost reduction initiative. Bill of materials cost reduction is a cross-functional effort involving engineering, supply chain, manufacturing, and finance. These cost-reduction efforts have yielded improvements in bill of materials costs since 2018, and we have identified additional opportunities to address cost reduction in the near and medium term.

Gross profit (loss) and margin

Gross profit (loss) is total revenue less total cost of goods sold. Gross margin is gross profit (loss) expressed as a percentage of total revenue. Our gross profit (loss) and margin may fluctuate from period-to-period. Such fluctuations have been and will continue to be affected by a variety of factors, including the timing of vehicle acceptance, mix of products sold, manufacturing costs, financing options, and warranty costs. We expect our gross margin to improve over time as we continue to scale our operations and execute on cost reduction initiatives.

Operating expenses

Research and development. Research and development expense consists primarily of personnel-related expenses, consulting and contractor expenses, validation and testing expense, prototype parts and materials, depreciation expense, and allocated overhead costs. Through December 31, 2021, we have expensed certain software development costs related to our fleet and energy management platform as incurred because technological feasibility has not been fully achieved. We intend to continue to make significant investments in developing new products and enhancing existing products. Research and development expense will be variable relative to the number of products that are in development, validation or testing. However, we expect it to decline as a percentage of total revenue over time.

Selling, general and administrative. Selling, general and administrative expenses consist primarily of personnel-related expenses for our sales, marketing, supply chain, finance, legal, human resources, and administrative personnel, as well as the costs of customer service, information technology, professional services, insurance, travel, allocated overhead, and other marketing, communications and administrative expenses. We will continue to actively promote our products. We also expect to invest in our corporate organization and incur additional expenses associated with transitioning to, and operating as, a public company, including increased legal and accounting costs, investor relations costs, higher insurance premiums, and compliance costs. As a result, we expect that selling, general and administrative expenses will increase in absolute dollars in future periods but decline as a percentage of total revenue over time.

Interest expense, net

Interest expense, net consists primarily of interest expense associated with our debt facilities and amortization of debt discount and issuance costs. Interest income consists primarily of interest income earned on our cash and cash equivalents and short-term investments balances.

(Gain) loss on valuation of derivative and warrant liabilities

(Gain) loss on valuation of derivative and warrant liabilities relates to the changes in the fair value of derivative and warrant liabilities, which are subject to remeasurement at each balance sheet date.

Other expense (income), net

Other expense (income), net primarily relates to sublease income and currency fluctuations that generate foreign exchange gains or losses on invoices denominated in currencies other than the U.S. dollar, sublease income, amortization of short-term investment premium/discount, and other non-operational financial gains or losses.

Provision for income taxes

We are subject to income taxes in the United States and certain states, but due to our net operating loss position, we have not recognized any material provision or benefit through December 31, 2021.

Deferred income taxes reflect the net tax effects of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. A valuation allowance is provided when it is more likely than not that the deferred tax assets will not be realized. We have established a full valuation allowance to offset our U.S. net deferred tax assets due to the uncertainty of realizing future tax benefits from our net operating loss carryforwards and other deferred tax assets.

As of December 31, 2021, we had U.S. federal net operating loss carryforwards of \$599.7 million, and state net operating loss carryforwards of \$437.9 million. The federal net operating loss carryforwards generated prior to 2018 will begin to expire in 2030, and the federal net operating loss carryforwards generated since 2018 do not expire. The state net operating loss carryforwards will begin to expire in 2023. Also, as of December 31, 2021, we had U.S. federal research and development tax credit carryforwards of \$3.5 million, and state research and development tax credit carryforwards of \$2.5 million. The federal research credits begin to expire in 2037, and the South Carolina research and development tax credit carryforwards begin to expire in 2027. California state research and development tax credit carryforwards have no expiration date. Our ability to use net operating loss carryforwards and other tax attributes to reduce future taxable income and liabilities may be subject to limitations based on possible ownership changes in the future. As a result, if we earn net taxable income, our ability to use our pre-change net operating loss carryforwards or other pre-change tax attributes to offset U.S. federal and state taxable income may still be subject to limitations, which could potentially result in increased future tax liability to us. Additionally, a challenge by a taxing authority, a change in our ability to utilize tax benefits such as carryforwards or tax credits, or a deviation from other tax-related assumptions may cause actual financial results to deviate from previous estimates.

In response to the COVID-19 pandemic, California's Legislature passed Assembly Bill 85 ("A.B. 85"), which suspends the use of net operating losses for tax years beginning in 2020, 2021, and 2022 for taxpayers with

taxable income of \$1.0 million or more before an application of net operating loss. A.B. 85 includes an extended carryover period for the suspended net operating losses with an additional year carryforward for each year of suspension. A.B. 85 also limits the utilization of business incentive tax credits for taxable years 2020, 2021, and 2022, requiring that taxpayers can only claim a maximum of \$5.0 million in tax credit on an aggregate basis. However, since we continue to generate taxable losses, this did not have an impact on our operating results or financial condition.

Results of operations

The following tables set forth our results of operations for the periods presented and as a percentage of our total revenue for those periods. Percentages presented in the following tables may not sum due to rounding.

(in thousands)	Year Ended December 31,		
	2021	2020	2019
Product revenue	\$ 232,450	\$ 190,411	\$ 172,295
Parts and other service revenue	10,410	6,532	8,989
Total revenue	242,860	196,943	181,284
Product cost of goods sold	229,142	181,987	173,428
Parts and other service cost of goods sold	11,666	7,417	9,467
Total cost of goods sold ⁽¹⁾	240,808	189,404	182,895
Gross profit (loss)	2,052	7,539	(1,611)
Research and development ⁽¹⁾	43,840	36,233	35,477
Selling, general and administrative ⁽¹⁾	85,841	67,139	56,132
Asset impairment charge	—	121	6,440
Total operating expenses	129,681	103,493	98,049
Loss from operations	(127,629)	(95,954)	(99,660)
Interest expense, net	50,982	15,413	2,704
Loss on valuation of derivative and warrant liabilities	70,177	12,989	—
Other expense (income), net	1,202	2,629	(812)
Loss before income taxes	(249,990)	(126,985)	(101,552)
Provision for income taxes	16	22	—
Net loss	\$ (250,006)	\$ (127,007)	\$ (101,552)

(1) Includes stock-based compensation as follows:

(in thousands)	Year Ended December 31,		
	2021	2020	2019
Cost of goods sold	\$ 1,385	\$ 929	\$ 826
Research and development	2,507	1,616	1,436
Selling, general and administrative	12,169	7,737	6,258
Total stock-based compensation expense	\$ 16,061	\$ 10,282	\$ 8,520

	Year Ended December 31,		
	2021	2020	2019
Product revenue	96 %	97 %	95 %
Parts and other service revenue	4	3	5
Total revenue	100	100	100
Product cost of goods sold	94	92	96
Parts and other service cost of goods sold	5	4	5
Total cost of goods sold ⁽¹⁾	99	96	101
Gross profit (loss)	1	4	(1)
Research and development ⁽¹⁾	18	18	19
Selling, general and administrative ⁽¹⁾	35	34	31
Asset impairment charge	—	—	4
Total operating expenses	53	52	54
Loss from operations	(53)	(48)	(55)
Interest expense, net	21	8	1
Loss on valuation of derivative and warrant liabilities	29	7	—
Other (income) expense, net	—	1	—
Loss before income taxes	(103)	(64)	(56)
Provision for income taxes	—	—	—
Net loss	(103)%	(64)%	(56)%

(1) Includes stock-based compensation expense as follows:

	Year Ended December 31,		
	2021	2020	2019
Cost of goods sold	1 %	— %	1 %
Research and development	1	1	1
Selling, general and administrative	5	4	3
Total stock-based compensation expense	7 %	5 %	5 %

Comparison of the Year Ended December 31, 2021 and Year Ended December 31, 2020

Revenue

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2021	2020		
Product revenue	\$ 232,450	\$ 190,411	\$ 42,039	22 %
Parts and other service revenue	10,410	6,532	3,878	59 %
Total revenue	\$ 242,860	\$ 196,943	\$ 45,917	23 %

Total revenue increased by \$45.9 million in the year ended December 31, 2021 compared to the year ended December 31, 2020. The \$42.0 million increase in product revenue was primarily due to \$38.0 million increase of vehicle revenue and \$11.5 million increase of battery systems revenue, which was offset by \$7.3 million decreased revenue from charging systems and installation revenue. We delivered and our customers accepted 217 buses in the year ended December 31, 2021 as compared to 170 buses accepted in the year ended December 31, 2020. Both production and deliveries during fiscal year 2020 were negatively impacted by the COVID-19 pandemic due to inefficiencies experienced with required safety measures and complications with inspections and regulatory testing. Both production and deliveries during fiscal year 2021 were negatively impacted by the COVID-19 pandemic due to supplier constraints and delays in equipment delivery. For the year ended December 31, 2021, we delivered battery systems for 273 vehicles, which increased from 107 vehicles for the year ended December 31, 2020. Parts and other service revenue increased by \$3.9 million in the year ended

December 31, 2021 as compared to the year ended December 31, 2020 primarily as a result of a \$2.2 million increase in prototype sales and \$1.6 million increase of service revenue.

Cost of goods sold and gross profit

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2021	2020		
Product cost of goods sold	\$ 229,142	\$ 181,987	\$ 47,155	26 %
Parts and other service cost of goods sold	11,666	7,417	\$ 4,249	57 %
Total cost of goods sold	\$ 240,808	\$ 189,404	\$ 51,404	27 %
Gross profit	\$ 2,052	\$ 7,539	\$ (5,487)	(73) %

Cost of goods sold increased by \$51.4 million in the year ended December 31, 2021 compared to the year ended December 31, 2020. The \$47.2 million increase in product cost of goods sold was mainly driven by an increase in vehicle and battery systems delivered. To support the growth, we have increased headcount, which increased personnel related expense by \$7.3 million. However, COVID-19 related supply chain interruptions caused delays in production, which negatively impacted our ability to absorb such increased labor and manufacturing overhead costs. The \$4.2 million increase in parts and other service cost of goods sold was primarily the result of the increased volume and product mix of prototype revenue and increased personnel cost of the service department.

Gross profit decreased by \$5.5 million for the year ended December 31, 2021 compared to the year ended December 31, 2020, which was mainly due to the unabsorbed labor and manufacturing overhead costs from delayed production caused by parts shortages stemming from the COVID-19 related supply chain interruption.

Operating expenses

Research and development

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2021	2020		
Research and development	\$ 43,840	\$ 36,233	\$ 7,607	21 %

Research and development expense increased by \$7.6 million in the year ended December 31, 2021 compared to the year ended December 31, 2020. The increase was primarily due to an increase in personnel related expenses of \$6.4 million and stock-based compensation of \$0.9 million, an increase in professional and consulting fees of \$0.5 million to support increased product development efforts, and an increase in IT expense of \$0.7 million. These increases were partially offset by a decrease in prototype parts and tools expense of \$1.5 million following the completion of the development of the advanced composite bus body and the ZX5 bus platform.

Selling, general and administrative

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2021	2020		
Selling, general and administrative	\$ 85,841	\$ 67,139	\$ 18,702	28 %

Selling, general and administrative expense increased by \$18.7 million in the year ended December 31, 2021 compared to the year ended December 31, 2020 primarily due to an increase in personnel related expenses of \$7.3 million and stock-based compensation of \$4.4 million, an increase in insurance expense of \$3.5 million, an increase in IT expense of \$2.0 million due to increased cybersecurity measures, more users and incremental data usage costs, and an increase in travel expense of \$1.2 million as a result of the relaxation of COVID-19 restrictions.

Asset impairment charge

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2021	2020		
Asset impairment charge	\$ —	\$ 121	\$ (121)	(100)%

In 2020, we incurred an impairment charge of \$0.1 million related to certain operating lease right-of-use assets due to the execution of a sublease agreement.

Interest expense, net

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2021	2020		
Interest income	\$ (1,735)	\$ (240)	\$ (1,495)	623 %
Interest expense	52,717	15,653	37,064	237
Interest expense, net	\$ 50,982	\$ 15,413	\$ 35,569	231

Interest expense, net increased by \$35.6 million in the year ended December 31, 2021 compared to the year ended December 31, 2020 primarily due to the write-off of \$21.0 million of unamortized debt issuance costs associated with the Convertible Notes with an original aggregate principal of \$46.5 million that were converted upon the Closing of the Business Combination, and additional interest expense resulting from the original aggregate principal of \$200.0 million of Convertible Notes issued in August 2020. These amounts were offset by increased interest income earned on investments from cash equivalents and short-term investments. For more information regarding the Convertible Notes, see “—Liquidity and capital resources” below.

Loss on valuation of derivative and warrant liabilities

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2021	2020		
Loss on valuation of derivative and warrant liabilities	\$ 70,177	\$ 12,989	\$ 57,188	440 %

The \$70.2 million loss in the year ended December 31, 2021 was related to losses on revaluation of the derivative and warrant liabilities arising from the Convertible Notes and related warrants of \$111.7 million and \$47.3 million, respectively, offset by the \$50.3 million and \$38.6 million of gains recognized on revaluation of the liabilities arising from the public warrants and private placement warrants, respectively.

The \$13.0 million loss in the year ended December 31, 2020 related to the fair value change of derivative and warrant liabilities arising from the Convertible Notes.

Other expense, net

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2021	2020		
Other expense, net	\$ 1,202	\$ 2,629	\$ (1,427)	(54) %

Other expense, net includes currency fluctuations that generate foreign exchange gains or losses on invoices denominated in currencies other than the U.S. dollar, sublease income and other non-operational financial losses. The higher expense in the year ended December 31, 2020 was mainly due to foreign exchange rate fluctuations in the first quarter of 2020, and other non-operational financial gains or losses.

Provision for income taxes

We are subject to income taxes in the United States and certain states, but due to our net operating loss position, we have not recognized any material provision or benefit through December 31, 2021. In the years

ended December 31, 2021 and 2020, we recorded a provision for taxes in certain states, where tax is not based solely on income before taxes.

Comparison of the Year Ended December 31, 2020 and Year Ended December 31, 2019

Revenue

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2020	2019		
Product revenue	\$ 190,411	\$ 172,295	\$ 18,116	11 %
Parts and other service revenue	6,532	8,989	(2,457)	(27) %
Total revenue	\$ 196,943	\$ 181,284	\$ 15,659	9 %

Total revenue increased by \$15.7 million in the year ended December 31, 2020 compared to the year ended December 31, 2019. The \$18.1 million increase in product revenue was primarily due to a \$13.7 million increase of battery systems revenue, a \$5.4 million increase of vehicle revenue including battery lease assignment, and a \$0.4 million increase of charging systems revenue in the year ended December 31, 2020, which was offset by decreased revenue from leasing in the year ended December 31, 2020. We delivered and our customers accepted 170 buses in the year ended December 31, 2020 as compared to 177 buses accepted in the year ended December 31, 2019. COVID-19 impacted both production and deliveries due to inefficiencies experienced with required safety measures and complications with inspections and regulatory testing. However, the financial impact from the decrease of vehicles delivered in 2020 was offset by the higher selling price due to product mix. For the year ended December 31, 2020, we delivered battery systems for 107 vehicles, which is increased from 20 vehicles for the year ended December 31, 2019. Parts and other service revenue decreased by \$2.5 million in the year ended December 31, 2020 as compared to the year ended December 31, 2019 primarily as a result of a \$4.0 million decrease in prototype sales in 2020 as certain 2019 development programs converted to OEM battery system sales in 2020.

Cost of goods sold and gross profit

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2020	2019		
Product cost of goods sold	\$ 181,987	\$ 173,428	\$ 8,559	5 %
Parts and other service cost of goods sold	7,417	9,467	\$ (2,050)	(22) %
Total cost of goods sold	\$ 189,404	\$ 182,895	\$ 6,509	4 %
Gross profit (loss)	\$ 7,539	\$ (1,611)	\$ 9,150	NM

Cost of goods sold increased by \$6.5 million in the year ended December 31, 2020 compared to the year ended December 31, 2019. The \$8.6 million increase in product cost of goods sold was mainly driven by the increase in battery systems sold, the increased cost in vehicles delivered, which is correlated to the increase in average vehicle selling price, and unabsorbed labor and manufacturing overhead costs due to COVID-19 related delays in production. These increases were partially offset by a \$2.6 million increase in reduction of pre-existing vehicle warranty liabilities. The \$2.1 million decrease in parts and other service cost of goods sold was primarily the result of decreased prototype sales, which were partially offset by the increased cost from higher headcount in the service organization to meet the needs of our growing customer base.

Gross profit improved by \$9.2 million to a gross profit of \$7.5 million in the year ended December 31, 2020 compared to a gross loss of \$1.6 million in the year ended December 31, 2019. The improvement of gross profit was primarily driven by the increased volume of battery systems sold, product mix, and lower vehicle warranty costs.

Operating expenses

Research and development

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2020	2019		
Research and development	\$ 36,233	\$ 35,477	\$ 756	2 %

Research and development expense increased by \$0.8 million in the year ended December 31, 2020 compared to the year ended December 31, 2019. The increase was primarily due to the design of new features and functionality for our buses and APEX software. Personnel expenses and IT expense increased by \$1.9 million and \$0.6 million in the year ended December 31, 2020 when compared to the year ended December 31, 2019 due to increased product development efforts. These increases were partially offset by the decrease in prototype parts and tools expense of \$0.8 million due to more stability in the bus platform, and the decrease in travel expense of \$0.8 million due to COVID-19.

Selling, general and administrative

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2020	2019		
Selling, general and administrative	\$ 67,139	\$ 56,132	\$ 11,007	20 %

Selling, general and administrative expense increased by \$11.0 million in the year ended December 31, 2020 compared to the year ended December 31, 2019 primarily due to an increase in contract labor and consulting expense of \$4.3 million, professional fees of \$3.6 million, stock-based compensation expense of \$1.5 million and IT expenses of \$1.5 million. Contract labor and consulting expense was mainly related to market studies, certain process improvement projects and supplier development expenses. Stock-based compensation and personnel expenses increased due to higher headcount related to the growth in the business. The increase of professional fees was primarily the result of the write-off of \$2.2 million of deferred financing costs for our previously contemplated IPO based upon our pursuit of the Business Combination. These increases were partially offset by a decrease in travel expense of \$1.8 million due to COVID-19.

Asset impairment charge

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2020	2019		
Asset impairment charge	\$ 121	\$ 6,440	\$ (6,319)	NM

In 2020, we incurred an impairment charge of \$0.1 million related to certain operating lease right-of-use assets due to the execution of a sublease agreement. In 2019, we incurred an impairment charge of \$6.4 million related to certain assets leased to customers due to introduction of new products and related technological advancements and the resulting change in expectations for the future cash flows associated with those assets.

Interest expense, net

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2020	2019		
Interest income	\$ (240)	\$ (1,447)	\$ 1,207	(83) %
Interest expense	15,653	4,151	11,502	277
Interest expense, net	\$ 15,413	\$ 2,704	\$ 12,709	470

Interest expense, net increased by \$12.7 million in the year ended December 31, 2020 compared to the year ended December 31, 2019 primarily due to additional interest expense resulting from the Convertible Notes and decreased interest income earned on investments from cash equivalents and short-term investments.

Loss on valuation of derivative and warrant liabilities

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2020	2019		
Loss on valuation of derivative and warrant liabilities	\$ 12,989	\$ —	\$ 12,989	NM

The \$13.0 million loss in the year ended December 31, 2020 related to the non-cash fair value change of derivative and warrant liabilities arising from the Convertible Notes.

Other (income) expense, net

(dollars in thousands)	Year Ended December 31,		\$ Change	% Change
	2020	2019		
Other (income) expense, net	\$ 2,629	\$ (812)	\$ 3,441	NM

In the year ended December 31, 2020, we recognized other expense of \$2.6 million, compared to other income of \$0.8 million for the year ended December 31, 2019. Other income and expense includes sublease income, currency fluctuations that generate foreign exchange gains or losses on invoices denominated in currencies other than the U.S. dollar, and other non-operational financial losses.

Provision for income taxes

We are subject to income taxes in the United States and certain states, but due to our net operating loss position, we have not recognized any provision or benefit until 2020. In the year ended December 31, 2020, we booked a provision for taxes in certain states, where tax is not based solely on income before taxes.

Liquidity and capital resources

As of December 31, 2021, we had cash and cash equivalents and short-term investments of \$661.0 million. Our primary requirements for liquidity and capital are investment in new products and technologies, the improvement and expansion of existing manufacturing facilities, working capital, debt service, and general corporate needs. Historically, these cash requirements have been met through the net proceeds we received through private sales of equity securities, borrowings under our credit facilities, and payments received from customers.

We believe that our sources of existing cash and cash equivalents and short-term investments, funds raised in connection with the Business Combination and the PIPE Financing, funds available under our Senior Credit Facility described in more detail below, and payments from customers will be sufficient to meet our working capital and capital expenditure needs for at least the next twelve months. However, if we are unable to generate sufficient cash flows from operations in the future, or fund availability under our Senior Credit Facility is not sufficient, we may have to obtain additional equity or debt financing. The issuance and sale of additional equity would result in further dilution to our stockholders. The incurrence of indebtedness would result in increased fixed obligations and could result in significant financial and operating covenants that would restrict our operations. We cannot assure you that we will be able to obtain refinancing or additional financing on favorable terms or at all.

With the funds raised in connection with the Business Combination and the PIPE Financing, we expect no additional capital will be needed to execute our business plan over the next 12 months. We will continue to invest in increasing and optimizing production and expanding the portfolio of products and services. These investments will be approached with a view to improving profitability in the long-term.

Senior Credit Facility

In May 2019, we entered into a Loan, Guaranty and Security Agreement (the "Senior Credit Facility"), which is a senior secured asset-based lending facility with borrowing capacity up to \$75.0 million. The Senior Credit Facility is available on a revolving basis through the earlier of May 2024 or 91 days prior to the stated maturity of any subordinated debt in aggregate amount of \$7.5 million or more. The maximum availability under the Senior

Credit Facility is based on certain specified percentages of eligible accounts receivable and inventory, subject to certain reserves, to be determined in accordance with the Senior Credit Facility. The commitment under the Senior Credit Facility includes a \$10.0 million letter of credit sub-line. Subject to certain conditions, the commitment may be increased by \$50.0 million upon approval by the lender, and at our option, the commitment can be reduced to \$25.0 million or terminated upon at least 15 days written notice.

The Senior Credit Facility is secured by a security interest on substantially all our assets except for intellectual property and other restricted property.

Borrowings under the Senior Credit Facility bear interest at per annum rates equal to, at our option, either (i) the base rate plus an applicable margin for base rate loan, or (ii) the London Interbank Offered Rate, or LIBOR, plus an applicable margin for LIBOR loan. The base rate is calculated as the greater of (a) the Lender prime rate, (b) the federal funds rate plus 0.5%, and (c) one-month LIBOR plus 1.0%. The applicable margin is calculated based on a pricing grid linked to quarterly average excess availability (as a percentage of borrowing capacity). For base rate loans, the applicable margin ranges from 0.0% to 1.5%, and for LIBOR Loans, it ranges from 1.5% to 3.0%. The unused line fee is 0.375% per annum of the actual daily amount of the unutilized revolver commitment and will be reduced to 0.25% under certain conditions.

The Senior Credit Facility contains certain customary non-financial covenants. In addition, the Senior Credit Facility requires us to maintain a Fixed Charge Coverage Ratio of at least 1.00:1.00 during such times as a covenant trigger event shall exist.

As of December 31, 2021, we do not have outstanding balance under this credit facility although we utilized \$14.4 million of the facility's borrowing capacity for letters of credit.

Small Business Administration Loan

In May 2020, we received SBA loan proceeds of \$10.0 million from Town Center Bank pursuant to the Paycheck Protection Program (the "PPP loan") under CARES Act. The PPP loan was in the form of a note that originally matured on May 6, 2022, and which was extended to May 2025 based on the SBA's interim final rule. As of December 31, 2021, the interest rate is 1.0% per annum and interest is payable monthly commencing in October 2021. All or a portion of the loan may be forgiven by the SBA upon application with supporting documentation of expenditures in accordance with SBA requirements, which include employees being kept on the payroll for eight weeks after the date of the loan and the proceeds being used for payroll, rent, mortgage interest, or utilities. In January 2022, the SBA denied our PPP loan forgiveness application on the grounds that the Company was subject to a size standard that applies to businesses under NAICS Code 488999 (all other support services for transportation). We have filed an appeal on the grounds that the NAICS code that applies to our business activity is NAICS Code 336120 (heavy duty truck and bus manufacturing).

Secured Convertible Promissory Notes

In August 2020, we entered into the Convertible Notes. The Convertible Notes have an aggregate principal amount of \$200.0 million, with a cash interest of 5.0% per annum payable at each quarter end and a paid-in-kind interest of 4.5% per annum payable by increasing the principal balance at each quarter end. The Convertible Notes will mature in August 2025, and the Company may not make prepayment unless approved by the required holders of the Convertible Notes.

Each of the Convertible Notes shall rank equally without preference or priority of any kind over one another, but senior in all rights, privileges and preferences to all other shares of our capital stock and all other securities that are convertible into or exercisable for our capital stock directly or indirectly.

Prior to the maturity date or conversion of the entire balance of the Convertible Notes, in the event of a liquidation or sale of the Company, we shall pay to the holders of Convertible Notes the greater of (i) 150% of the principal balance of the Convertible Notes or (ii) the consideration that the holders would have received had the holders elected to convert the Convertible Notes into preferred stock immediately prior to such liquidation event.

The Convertible Notes do not entitle the holders to any voting rights or other rights as a stockholder of the Company, unless and until the Convertible Notes are actually converted into shares of our capital stock in accordance with their terms.

The Note Purchase Agreement contains certain customary non-financial covenants. In addition, the Note Purchase Agreement requires us to maintain liquidity at quarter end of not less than the greater of (i) \$75.0 million and (ii) four times of cash burn for the three-month period then ended.

In connection with the issuance of the Convertible Notes, we issued to the purchasers of the Convertible Notes warrants to purchase 4.6 million shares of our stock at an exercise price of \$0.02 per share. These warrants are freestanding financial instruments and, prior to the Closing, were classified as liability due to the possibility that they could become exercisable into Legacy Proterra convertible preferred stock. The warrant liability was remeasured on a recurring basis at each reporting period date, with the change in fair value reported in the statement of operations. Upon any exercise of the warrants for shares of common stock, the carrying amount of the warrant liability was reclassified to stockholders' equity. Upon the consummation of the Merger, the warrants became exercisable for Proterra common stock, with no possibility to convert to Legacy Proterra convertible preferred stock. As a result, the carrying amount of the warrant liability was reclassified to stockholders' equity. The loss from change in fair value of the warrant liability was \$47.3 million for the year ended December 31, 2021. An aggregate of \$69.3 million in warrant liability was reclassified to additional paid-in capital upon exercise and consummation of the Merger. In the fourth quarter of 2021, all remaining outstanding warrants were exercised for shares of common stock.

Prior to the Closing, the embedded features of the Convertible Notes were composed of conversion options that had the economic characteristics of a contingent early redemption feature settled in shares of our stock rather than cash, because the total number of shares of our stock delivered to settle these embedded features would predominantly have a fixed value. These conversion options were bifurcated and accounted for separately from the host debt instrument. The derivative liability of \$68.5 million was initially measured at fair value on its issuance date and recorded as a debt discount and was amortized during the term of the Convertible Notes to interest expense using effective interest method. The derivative liability was remeasured on a recurring basis at each reporting period date, with the change in fair value reported in the statement of operations. The loss from the change in fair value of the derivative liability was \$111.7 million for the year ended December 31, 2021. Upon the consummation of the Merger, the embedded conversion features associated with the Convertible Notes no longer qualified for derivative accounting since the conversion price became fixed. The \$182.6 million carrying amount of the embedded derivative, fair value as of the date of the Closing, was reclassified to stockholders' equity in accordance with Topic 815, Derivatives and Hedging.

At the closing of the Merger, certain Convertible Note holders with an original aggregate principal amount of \$46.5 million elected to convert their Convertible Notes at the Closing of the Business Combination, resulting in the issuance of 7.4 million shares of common stock. An aggregate of \$48.8 million principal and interest was reclassified to stockholders' equity, and \$21.0 million of remaining related debt issuance costs were expensed to interest expense.

As of December 31, 2021, the outstanding balance of the Convertible Notes was \$163.3 million including PIK interest of \$9.8 million.

The remaining Convertible Notes including accrued interest will be automatically converted to common stock at \$6.5712 per share pursuant to the mandatory conversion provisions, if and when the VWAP of our common stock exceeds \$9.86 over 20 consecutive days subsequent to January 13, 2022.

Performance bonds

Public transit agencies may require their suppliers to obtain performance bonds from surety companies or letters of credit to protect against non-performance. These performance guarantees are normally valid from contract effective date to completion of the contract, which is generally upon customer acceptance of the vehicle. Surety companies limit the maximum coverage they will provide based on financial performance and do not provide committed bonding facilities. Currently, we are required to cash collateralize a portion of the total performance bond amount. The collateral provided is shown as restricted cash on the balance sheet. As of

December 31, 2021, we had \$12.6 million of restricted cash related to performance bonds. We believe that we currently have sufficient capacity to meet the performance guarantee needs of our business through our arrangements with our primary surety provider.

Cash flows

The following table summarizes our cash flows:

(in thousands)	Year Ended December 31,		
	2021	2020	2019
Cash flows (used in) provided by:			
Operating activities	\$ (126,261)	\$ (76,070)	\$ (97,294)
Investing activities	(447,281)	(54,525)	(35,227)
Financing activities	632,449	200,643	83,196
Net increase (decrease) in cash and cash equivalents, and restricted cash	\$ 58,907	\$ 70,048	\$ (49,325)

Operating activities

Net cash used in operating activities in 2021 was \$126.3 million compared to \$76.1 million in 2020. In both years, the cash used in operating activities was due to net losses and increases in working capital. The increase in net loss of \$123.0 million in the year ended December 31, 2021 as compared to the year ended December 31, 2020 included increases of non-cash items of \$57.2 million of loss on change in the fair value of derivative and warrant liabilities, \$33.5 million of interest expense and debt discount and issuance costs amortization expense, and \$5.8 million of stock-based compensation expense. For the year ended December 31, 2021, cash used in operating activities primarily related to \$29.9 million, \$20.2 million, and \$8.0 million for accounts receivable, inventory, prepaid expenses and other current assets, respectively, and was partially offset by cash provided by accounts payable and accrued liabilities and deferred revenue of \$27.4 million and \$6.6 million, respectively. For the year ended December 31, 2020, cash used in operating activities primarily related to \$7.2 million and \$4.1 million for accounts receivable and accounts payable and accrued liabilities, respectively, and was partially offset by cash provided by deferred revenue, inventory, and other non-current liabilities of \$9.6 million, \$2.2 million, and \$2.2 million, respectively.

Net cash used in operating activities in 2020 was \$76.1 million compared to \$97.3 million in 2019. In both years, the cash used in operating activities was due to net losses and increases in working capital. The increase in net loss of \$25.5 million in the year ended December 31, 2020 as compared to the year ended December 31, 2019 included increases of non-cash items of \$13.0 million of loss on change in the fair value of derivative and warrant liabilities, \$8.6 million of interest expense and debt discount and issuance costs amortization increased by \$2.9 million of depreciation expense, and \$1.8 million of stock-based compensation expense. For the year ended December 31, 2020, cash used in operating activities primarily related to \$7.2 million and \$4.1 million for accounts receivable and accounts payable and accrued liabilities, respectively, and was partially offset by cash provided by deferred revenue, inventory, and other non-current liabilities of \$9.6 million, \$2.2 million, and \$2.2 million, respectively. For the year ended December 31, 2019, cash used in operating activities primarily related to \$15.7 million, \$9.0 million and \$4.7 million for inventory, accounts receivables and other assets, respectively, and was partially offset by cash provided by deferred cost of goods sold of \$4.2 million.

Investing activities

Net cash used in investment activities was \$447.3 million in the year ended December 31, 2021 compared to \$54.5 million in the year ended December 31, 2020. The \$392.8 million change was primarily driven by a net increase of \$394.9 million related to the purchase of investments in the year ended December 31, 2021 as compared to the year ended December 31, 2020, and a \$2.1 million increase in capital expenditures. The increased purchase of investments was driven by our investment of the net proceeds from the Business Combination.

Net cash used in investment activities was \$54.5 million in the year ended December 31, 2020 compared to \$35.2 million in the year ended December 31, 2019. The change is primarily driven by an \$11.8 million increase in capital expenditures and \$7.5 million of net increase of purchase of investments.

Financing activities

Net cash provided by financing activities was \$632.4 million, \$200.6 million, and \$83.2 million for the years ended December 31, 2021, 2020 and 2019, respectively. The net cash provided by financing activities for the year ended December 31, 2021 primarily resulted from net proceeds of \$644.7 million from the Business Combination and the PIPE Financing and \$6.8 million from the exercise of stock options and warrants, which was partially offset by a Senior Credit Facility repayment of \$17.1 million. The net cash provided by financing activities for the year ended December 31, 2020 primarily resulted from proceeds from borrowings of \$200.0 million through the issuance of Convertible Notes, \$14.5 million under the Senior Credit Facility, \$10.0 million from PPP loan, and \$4.2 million from the exercise of stock options, offset by \$12.8 million repayment under the Senior Credit Facility and \$10.0 million repayment of a prior credit facility with Hercules Capital, Inc. For the year ended December 31, 2019, we received net proceeds of \$86.7 million from the issuance of Series 8 convertible preferred stock, \$21.4 million in proceeds from borrowing under the Senior Credit Facility, and \$1.7 million in proceeds from the exercise of stock options.

Off-balance sheet arrangements

We have not created, and are not party to, any special-purpose or off-balance sheet entities for the purpose of raising capital, incurring debt, or operating our business. With the exception of letters of credit primarily used to guarantee payments under a product supply agreement, a lease arrangement, or performance bond obligations, we do not have any off-balance sheet arrangements or relationships with entities that are not disclosed in our consolidated financial statements that have, or are reasonably likely to have, a material current or future effect on our financial condition, revenue, expenses, results of operations, liquidity, capital expenditures, or capital resources. In addition, we do not engage in trading activities involving non-exchange traded contracts.

Contractual obligations

The purchase commitments including purchase orders or contracts for the purchase of certain goods and services was \$2.1 billion as of December 31, 2021, of which 11% was expected to due within one year, 28% in 2023 and 2024, and the remainder thereafter through 2028.

The Convertible Notes had an outstanding principal amount including PIK interest of \$163.3 million as of December 31, 2021, which will mature in August 2025. The outstanding balances will be automatically converted into common stock at \$6.5712 per share pursuant to the mandatory conversion provisions, if and when the VWAP of our common stock exceeds \$9.86 over 20 consecutive days subsequent to January 13, 2022.

Critical accounting policies and estimates

Our financial statements are prepared in accordance with U.S. GAAP. The preparation of financial statements in conformity with U.S. GAAP requires us to make estimates, assumptions, and judgments that affect amounts of assets and liabilities reported in the financial statements, the disclosure of contingent assets and liabilities as of the date of the financial statements and reported amounts of revenues and expenses during the applicable periods. We base our estimates, assumptions, and judgments on historical experience and on various other factors that we believe to be reasonable under the circumstances. Different assumptions and judgments would change the estimates used in the preparation of our financial statements, which, in turn, could change the results from those reported. We evaluate our estimates, assumptions, and judgments on an ongoing basis. The critical accounting estimates, assumptions, and judgments that we believe have the most significant impact on our financial statements are described below.

Revenue recognition

We derive revenue primarily from the sale of vehicles and charging systems, the installation of charging equipment, and the sale of batteries and powertrain components to other vehicle manufacturers, as well as the

sale of spare parts and other services provided to customers. Product revenue consists of revenue earned from vehicles and charging systems, batteries and powertrain components, installation of charging systems, and revenue from leased vehicles, charging systems, and batteries under operating leases. Parts and other service revenue includes revenue earned from spare parts, the design and development of battery and drive systems for other vehicle manufacturers, and extended warranties.

Customer contracts typically have multiple performance obligations. Generally, our goods and services are considered separate performance obligations. Development services are typically sold on a stand-alone basis and are not bundled with other goods or services.

We recognize revenue when or as we satisfy a performance obligation by transferring control of a product or service to a customer. Amounts collected in advance of meeting all of the revenue recognition criteria are not recognized in the statement of operations and are instead recorded as deferred revenue on the balance sheets.

Warranty

We provide a limited warranty to customers on vehicles, charging systems, and battery and powertrain systems. The limited warranty ranges from one to twelve years depending on the components. Separately, we also periodically perform field service actions related to product service campaigns. Pursuant to these warranties and field service actions, we will repair, replace, or adjust the parts on the products that are defective in factory-supplied materials or workmanship. We record a warranty reserve for the products sold at the point of revenue recognition, which includes the best estimate of the projected costs to repair or replace items under the limited warranty and field service actions. These estimates are based on actual claims incurred to date and an estimate of the nature, frequency, and costs of future claims. These estimates are inherently uncertain given our relatively short history of sales, and changes to the historical or projected warranty experience may cause material changes to the warranty reserve in the future. The warranty reserve does not include projected warranty costs associated with the vehicles subject to lease accounting, as the costs to repair these warranty claims are expensed as incurred. The portion of the warranty reserve expected to be incurred within the next twelve months is included within accrued liabilities while the remaining balance is included within other long-term liabilities on the balance sheets.

Stock-based compensation expense

We use the fair value method for recording stock-based compensation expense. Stock-based compensation expense for stock options is estimated at the grant date based on each stock option's fair value as calculated using the Black-Scholes option pricing model. We recognize stock-based compensation expense for stock option grants on a straight-line basis over the requisite service period for the entire award.

Determining the fair value of stock-based awards at the grant date requires judgment. The determination of the grant date fair value of stock options using an option pricing model is affected by our estimated common stock fair value prior to the Merger Close, as well as assumptions regarding a number of complex and subjective variables. The major subjective assumptions used in the Black-Scholes option pricing model are estimated as follows:

Expected volatility. Since the Company has limited trading history by which to determine the volatility of its own common stock price, the expected volatility being used is primarily derived from the historical stock volatility of a representative industry peer group of comparable publicly listed companies over a period approximately equal to the expected term of the stock options.

Common stock valuations. Historically, for all periods prior to our Merger Close, the fair value of our common stock was determined by our board of directors, with input from management, taking into account our most recent valuations from an independent third-party valuation firm. Our board of directors intended all stock options granted to have an exercise price per share not less than the per share fair value of our common stock on the date of grant. The valuations of our common stock were determined in accordance with the guidelines outlined in the American Institute of Certified Public Accountants Practice Aid, *Valuation of Privately-Held-Company Equity Securities Issued as Compensation*. The assumptions we use in the valuation models were based on future

expectations combined with management judgment, and considered numerous objective and subjective factors to determine the fair value of our common stock as of the date of each option grant, including the following factors:

- the liquidation preferences, rights, and privileges of our convertible preferred stock relative to the common stock;
- our actual operating and financial performance;
- current business conditions and projections;
- our stage of development;
- the likelihood and timing of achieving a liquidity event for the shares of common stock underlying the stock options, such as an initial public offering or sale of our company, given prevailing market conditions;
- any adjustment necessary to recognize a lack of marketability of the common stock underlying the granted options;
- the market performance of comparable publicly traded companies; and
- the U.S. and global capital market conditions.

In valuing our common stock, our board of directors relied in part upon independent third-party valuation reports to determine the equity value of our business using various valuation methods including combinations of income and market approaches with input from management.

In August 2020, we issued Convertible Notes that contain several conversion options. The Monte Carlo simulation was the most appropriate valuation method given the variability of distributions to different share classes depending on the conversion terms upon various potential exit events of the Company and considering that the likelihood of such exit events and potential exit values were speculative as of the valuation date.

Application of these approaches involves the use of estimates, judgment, and assumptions that are highly complex and subjective, such as those regarding our expected future revenue, expenses, and future cash flows, discount rates, market multiples, the selection of comparable companies, and the probability of possible future events. Changes in any or all of these estimates and assumptions or the relationships between those assumptions impact our valuations as of each valuation date and may have a material impact on the valuation of our common stock.

Embedded Derivatives and Warrant Liability

In August 2020, we issued Convertible Notes that contain embedded features subject to derivative accounting. These embedded features are composed of conversion options that have the economic characteristics of a contingent early redemption feature settled in a variable number of shares of our stock. These conversion options are bifurcated and accounted for as a derivative liability separately from the host debt instrument. We measure these instruments at their estimated fair value and recognize changes in their estimated fair value in our statement of operations during the period when they occur.

We value these embedded derivatives as the difference between the estimated value of the Convertible Notes with and without such conversion features utilizing Monte Carlo simulation pricing model.

We classify warrants issued in connection with the Convertible Notes as a liability. Such warrants are measured and recognized at fair value and are subject to remeasurement at each balance sheet date, with changes in the estimated fair value recorded in our statement of operations during the period when they occur. The fair value of the warrant liability is measured using Monte Carlo Simulation pricing model.

The key inputs to the valuation model include common stock fair value, equity volatility, expected term until a liquidity event, expected term until exercise, and risk-free interest rate.

In connection with ArcLight's initial public offering in September 2020, 21,425,000 warrants to purchase ArcLight ordinary shares were issued, including 13,875,000 public warrants and 7,550,000 private placement warrants. These warrants were classified as liabilities as they did not meet the requirements for equity classification under Topic 815, Derivatives and Hedging. These warrants were continually measured at fair value, subject to remeasurement at each balance sheet date, until they were exercised or redeemed in October 2021.

Inventory

Inventories are recorded at the lower of cost and net realizable value using the first-in, first-out method. Inventory costs consist primarily of the costs of materials, manufacturing support costs, including labor and factory overhead associated with such production, and shipping costs. We assess the valuation of inventory and periodically record a provision, which increases cost of goods sold, to adjust inventory to its estimated net realizable value, including when we determine inventory to be in excess of anticipated demand or obsolete. Once inventory has been written-off or written-down, it creates a new cost basis for the inventory that is not subsequently written-up.

Income taxes

Income taxes are computed using the asset and liability method, under which deferred tax assets and liabilities are determined based on the difference between the financial statement and tax bases of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to affect taxable income. Valuation allowances are established when necessary to reduce deferred tax assets to the amount expected to be realized. In assessing the realizability of deferred tax assets, management determined that it is more likely than not that no deferred tax assets will be realized. Therefore, we have provided a full valuation allowance against deferred tax assets. A history of earnings will be required to release this valuation allowance.

Recent accounting pronouncements

See Note 2 of our Notes to Consolidated Financial Statements for information regarding recent accounting pronouncements that are of significance, or potential significance to us.

Item 7A. Quantitative and Qualitative Disclosures about Market Risk

We are exposed to market risks in the ordinary course of our business.

Interest rate and market risk

As of December 31, 2021, we had cash and cash equivalents and short-term investments of \$661.0 million. Our cash and cash equivalents and short-term investments are held primarily in U.S. treasury and corporate debt securities, and money market funds. Our primary objectives for investment activities are to preserve principal, provide liquidity, and maximize income without significantly increasing risk.

Our investments in fixed rate debt securities are subject to market risk due to changes in interest rates. Our future investment income may fluctuate due to changes in interest rates or we may suffer losses in principal if we are forced to sell securities that decline in market value due to changes in interest rates. Our debt securities are classified as "available for sale." When the fair value of the security declines below its amortized cost basis, any portion of that decline attributable to credit losses, to the extent expected to be nonrecoverable before the sale of the security, is recognized in our consolidated statement of operations. When the fair value of the security declines below its amortized cost basis due to changes in interest rates, such amounts are recorded in other comprehensive loss, and are recognized in our consolidated statement of operations only if we sell or intend to sell the security before recovery of its cost basis.

As of December 31, 2021, an immediate increase of 100-basis points in interest rates would have resulted in a decline in the fair value of our cash equivalents and short-term investment of approximately \$2.9 million. This estimate is based on a sensitivity model that measures market value changes when changes in interest rates occur.

We had non-controlling equity investment in a privately-held company \$1.6 million as of December 31, 2021. The fair value of this strategic investment may fluctuate depending on the financial condition and near-term prospects of this company, and we may be required to record an impairment loss if the carrying value of this investment exceed its fair value.

We are exposed to interest rate risk related to our indebtedness under the Senior Credit Facility that bears interest at floating rates based on the prime rate plus a specified margin. As of December 31, 2021, we had no borrowing outstanding under the Senior Credit Facility.

Foreign currency exchange rate risk

We are exposed to foreign currency exchange rate risk, primarily related to certain raw material purchases denominated in Euros and certain accounts receivables from one customer denominated in Canadian dollars. Payments denominated in foreign currencies represented less than 5% of our total payments during the years ended December 31, 2021, 2020 and 2019. The revenue from the customer with accounts receivable denominated in Canadian dollars was less than 10% of our total revenue for all periods presented. The exchange rate fluctuations accounted for less than \$0.1 million of other expense, \$1.1 million of other expense, and \$0.1 million of other income in the year ended December 31, 2021, 2020, and 2019, respectively. The higher expense in 2020 was mainly due to foreign exchange rate fluctuations in the first half of 2020. As a result, we believe that we currently do not have any material exposure to changes in foreign currency exchange rates.

Inflation Risk

Volatility in the prices of commodities and third-party parts and components or the impact of inflationary increases could increase the costs of our products and services. We may not be able to pass on these costs to our customers and this could have a material adverse impact on our results of operations and cash flows. The reasons for these fluctuations include the impact by global supply and demand trends, both within and outside our industry, as well as commodity price fluctuations, conversion costs, energy costs, labor costs, and transportation costs, competition, worldwide currency fluctuations, regulatory costs, and product and process evolutions that impact demand for the same materials. We have experienced inflation in our material costs, including increased costs for freight, due to supply chain challenges as a result of COVID-19.

Item 8. Financial Statements and Supplementary Data

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and Board of Directors
Proterra Inc:

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of Proterra Inc and subsidiary (the Company) as of December 31, 2021 and 2020, the related consolidated statements of operations, comprehensive loss, stockholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2021, and the related notes (collectively, the consolidated financial statements). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2021 and 2020, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2021, in conformity with U.S. generally accepted accounting principles.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matter

The critical audit matter communicated below is a matter arising from the current period audit of the consolidated financial statements that was communicated or required to be communicated to the audit committee and that: (1) relates to accounts or disclosures that are material to the consolidated financial statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of a critical audit matter does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Product warranty reserve

As discussed in note 1 to the consolidated financial statements, the Company's product warranty reserve as of December 31, 2021 was \$23.3 million, including a warranty reserve on vehicles sold to customers. The Company records a warranty reserve for vehicles sold at the point of revenue recognition, which includes management's best estimate of the projected costs to repair or replace items under the limited warranty and field service actions. These estimates are based on actual claims incurred to date and an estimate of the nature, frequency and costs of future claims.

We identified the evaluation of the product warranty reserve related to the sale of vehicles as a critical audit matter. Specifically, a high degree of subjective auditor judgment was required to evaluate the Company's estimate of the total warranty cost per vehicle due to the relatively short period of the Company's historical

warranty claim experience and lack of relevant industry data for warranty costs. In addition, changes in the total warranty cost per vehicle could have had a significant effect on the estimate of the warranty reserve.

The following are the primary procedures we performed to address this critical audit matter. We evaluated the design of certain internal controls related to the Company's warranty reserve process, including controls related to the relevance and reliability of the data on actual claims incurred to date used in the estimate of the total warranty cost per vehicle. We assessed the estimated future warranty repair costs used in the development of the total warranty cost per vehicle by comparing them to the Company's historical warranty claims data. We tested a sample of the current year claims used as the basis for the estimated future warranty repair costs by comparing them to the relevant underlying documentation. We also assessed the consistency of the Company's warranty reserve with recent trends in actual warranty claims, taking into account changes in conditions affecting the Company.

/s/ KPMG LLP

We have served as the Company's auditor since 2012

Santa Clara, California

March 14, 2022

PROTERRA INC
CONSOLIDATED BALANCE SHEETS
(in thousands, except share and per share data)

	December 31,	
	2021	2020
Assets:		
Cash and cash equivalents	\$ 170,039	\$ 110,719
Accounts receivable, net	81,644	51,716
Short-term investments	490,967	68,990
Inventory	114,556	92,330
Prepaid expenses and other current assets	15,300	7,455
Deferred cost of goods sold	1,816	2,037
Restricted cash, current	12,105	8,397
Total current assets	886,427	341,644
Property, plant, and equipment, net	62,246	53,587
Operating lease right-of-use assets	24,282	10,310
Restricted cash, non-current	460	4,581
Other assets	8,472	4,789
Total assets	\$ 981,887	\$ 414,911
Liabilities and Stockholders' Equity:		
Accounts payable	\$ 53,404	\$ 25,074
Accrued liabilities	20,634	19,736
Deferred revenue, current	13,821	16,015
Operating lease liabilities, current	4,084	3,153
Total current liabilities	91,943	63,978
Debt, non-current	110,999	133,252
Derivative liability	—	70,870
Warrant liability	—	39,670
Deferred revenue, non-current	22,585	12,206
Operating lease liabilities, non-current	20,963	7,891
Other long-term liabilities	15,245	12,578
Total liabilities	261,735	340,445
Commitments and contingencies (Note 8)		
Stockholders' equity:		
Convertible preferred stock, \$0.0001 par value; zero shares authorized and zero shares issued and outstanding as of December 31, 2021; 115,644 shares authorized and 115,136 shares issued and outstanding as of December 31, 2020; liquidation preference zero as of December 31, 2021 and \$631.3 million as of December 31, 2020	—	13
Common stock, \$0.0001 par value; 500,000 shares authorized and 221,960 shares issued and outstanding as of December 31, 2021; 156,277 shares authorized and 5,678 shares issued and outstanding as of December 31, 2020	22	1
Preferred stock, \$0.0001 par value; 10,000 shares authorized and zero shares issued and outstanding as of December 31, 2021; zero shares authorized, issued and outstanding as of December 31, 2020	—	—
Additional paid-in capital	1,578,943	682,671
Accumulated deficit	(858,225)	(608,219)
Accumulated other comprehensive loss	(588)	—
Total stockholders' equity	720,152	74,466
Total liabilities and stockholders' equity	\$ 981,887	\$ 414,911

See accompanying notes to consolidated financial statements.

PROTERRA INC
CONSOLIDATED STATEMENTS OF OPERATIONS
(in thousands, except share and per share data)

	Year Ended December 31,		
	2021	2020	2019
Product revenue	\$ 232,450	\$ 190,411	\$ 172,295
Parts and other service revenue	10,410	6,532	8,989
Total revenue	242,860	196,943	181,284
Product cost of goods sold	229,142	181,987	173,428
Parts and other service cost of goods sold	11,666	7,417	9,467
Total cost of goods sold	240,808	189,404	182,895
Gross profit (loss)	2,052	7,539	(1,611)
Research and development	43,840	36,233	35,477
Selling, general and administrative	85,841	67,139	56,132
Asset impairment charge	—	121	6,440
Total operating expenses	129,681	103,493	98,049
Loss from operations	(127,629)	(95,954)	(99,660)
Interest expense, net	50,982	15,413	2,704
Loss on valuation of derivative and warrant liabilities	70,177	12,989	—
Other expense (income), net	1,202	2,629	(812)
Loss before income taxes	(249,990)	(126,985)	(101,552)
Provision for income taxes	16	22	—
Net loss	\$ (250,006)	\$ (127,007)	\$ (101,552)
Net loss per share of common stock, basic and diluted	\$ (2.07)	\$ (28.96)	\$ (28.08)
Shares used in computing net loss per share of common stock, basic and diluted	120,886	4,385	3,616

See accompanying notes to consolidated financial statements.

PROTERRA INC
CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS
(in thousands)

	Year Ended December 31,		
	2021	2020	2019
Net loss	\$ (250,006)	\$ (127,007)	\$ (101,552)
Other comprehensive loss, net of taxes:			
Available-for-sale securities:			
Unrealized losses on available-for-sale securities	(588)	—	—
Other comprehensive loss, net of taxes	(588)	—	—
Total comprehensive loss, net of taxes	<u>\$ (250,594)</u>	<u>\$ (127,007)</u>	<u>\$ (101,552)</u>

See accompanying notes to consolidated financial statements.

PROTERRA INC
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(in thousands)

	Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total
	Shares	Amount	Shares	Amount				
Balance, December 31, 2018	103,911	\$ 11	3,124	—	\$ 571,129	\$ (379,660)	\$ —	\$ 191,480
Issuance of stock, net of costs	11,225	2	803	—	88,388	—	—	88,390
Issuance of warrants	—	—	—	—	141	—	—	141
Stock-based compensation	—	—	—	—	8,520	—	—	8,520
Net loss	—	—	—	—	—	(101,552)	—	(101,552)
Balance, December 31, 2019	115,136	13	3,927	—	668,178	(481,212)	—	186,979
Issuance of stock, net of costs	—	—	1,751	1	4,211	—	—	4,212
Stock-based compensation	—	—	—	—	10,282	—	—	10,282
Net loss	—	—	—	—	—	(127,007)	—	(127,007)
Balance, December 31, 2020	115,136	13	5,678	1	682,671	(608,219)	—	74,466
Conversion of convertible preferred stock into common stock in connection with the reverse recapitalization	(115,136)	(13)	115,576	11	2	—	—	—
Conversion of Convertible Notes into common stock	—	—	7,424	1	48,780	—	—	48,781
Issuance of common stock upon the reverse recapitalization, net of issuance costs	—	—	76,172	8	502,307	—	—	502,315
Reclassification of derivative liability upon the reverse recapitalization	—	—	—	—	182,554	—	—	182,554
Reclassification of Legacy Proterra warrant liability upon the reverse recapitalization	—	—	—	—	87,016	—	—	87,016
Issuance of common stock upon exercise of options and warrants	—	—	7,012	1	6,711	—	—	6,712
Issuance of Earnout Shares, net of repurchase	—	—	4,736	—	(634)	—	—	(634)
Issuance of common stock upon warrant redemption	—	—	5,362	—	53,475	—	—	53,475
Stock-based compensation	—	—	—	—	16,061	—	—	16,061
Net loss	—	—	—	—	—	(250,006)	—	(250,006)
Other comprehensive loss, net of taxes	—	—	—	—	—	—	(588)	(588)
Balance, December 31, 2021	—	\$ —	221,960	\$ 22	\$ 1,578,943	\$ (858,225)	\$ (588)	\$ 720,152

See accompanying notes to consolidated financial statements.

PROTERRA INC
CONSOLIDATED STATEMENTS OF CASH FLOWS
(in thousands)

	Year Ended December 31,		
	2021	2020	2019
Cash flows from operating activities:			
Net loss	\$ (250,006)	\$ (127,007)	\$ (101,552)
Adjustments to reconcile net loss to net cash used in operating activities:			
Depreciation and amortization	15,689	15,536	12,643
Loss on disposal of fixed assets	645	143	527
Asset impairment charge	—	121	6,440
Stock-based compensation	16,061	10,282	8,520
Amortization of debt discount and issuance costs	34,809	6,045	306
Accretion of debt end of term charge and PIK interest	8,207	3,501	604
Loss on valuation of derivative and warrant liabilities	70,177	12,989	—
Others	1,281	(153)	(284)
Changes in operating assets and liabilities:			
Accounts receivable	(29,928)	(7,216)	(9,005)
Inventory	(20,181)	2,182	(15,692)
Prepaid expenses and other current assets	(8,021)	(1,043)	563
Deferred cost of goods sold	221	(797)	4,207
Operating lease right-of-use assets and liabilities	30	87	—
Other assets	(1,974)	1,575	(4,746)
Accounts payable and accrued liabilities	27,447	(4,090)	(1,025)
Deferred revenue, current and non-current	6,586	9,599	132
Other non-current liabilities	2,696	2,176	1,068
Net cash used in operating activities	(126,261)	(76,070)	(97,294)
Cash flows from investing activities:			
Purchase of investments	(587,846)	(108,960)	(71,817)
Proceeds from maturities of investments	164,000	80,000	50,400
Purchase of property and equipment	(23,435)	(25,565)	(13,810)
Net cash used in investing activities	(447,281)	(54,525)	(35,227)
Cash flows from financing activities:			
Merger and PIPE financing	644,695	—	—
Payment of tax withholding obligations on earnout shares	(634)	—	—
Proceeds from debt, net of issuance costs	—	219,471	21,362
Repayment of debt	(17,083)	(22,787)	(26,708)
Repayment of finance obligations	(2,642)	(484)	(452)
Proceeds from government grants	1,323	275	522
Proceeds from exercise of stock options and warrants	6,790	4,168	1,726
Proceeds from issuance of stock, net of issuance costs	—	—	86,746
Net cash provided by financing activities	632,449	200,643	83,196
Net increase (decrease) in cash and cash equivalents, and restricted cash	58,907	70,048	(49,325)
Cash and cash equivalents, and restricted cash at the beginning of period	123,697	53,649	102,974
Cash and cash equivalents, and restricted cash at the end of period	\$ 182,604	\$ 123,697	\$ 53,649
Supplemental disclosures of cash flow information:			
Cash paid for interest	\$ 9,074	\$ 5,827	\$ 4,881
Cash paid for income taxes	15	9	—

PROTERRA INC
CONSOLIDATED STATEMENTS OF CASH FLOWS
(in thousands)

	Year Ended December 31,		
	2021	2020	2019
Non-cash investing and financing activity:			
Issuance of warrants in connection with debt borrowing	\$ —	\$ —	\$ 141
Assets acquired through accounts payable and accrued liabilities	4,955	659	4,017
Non-cash transfer of vehicles from inventory to internal use	—	—	967
Non-cash transfer of leased assets to inventory	2,046	635	—
Reclassification of Convertible Notes warrants liability upon exercise	17,696	—	—
Conversion of Convertible Notes into common stock	48,607	—	—
Reclassification of remaining Convertible Notes warrants liability upon the reverse recapitalization	69,320	—	—
Reclassification of derivative liability upon the reverse recapitalization	182,554	—	—
Conversion of preferred stock into common stock	627,315	—	—
Cashless warrant exercise	53,326	—	—
Non-cash long-term investment	1,600	—	—

See accompanying notes to consolidated financial statements.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies

Organization and Description of Business

Proterra Inc (“Proterra” or the “Company”), formerly known as ArcLight Clean Transition Corp. (“ArcLight”), is a leading developer and producer of electric vehicle technology for commercial application. Proterra designs, develops, manufactures, and sells electric transit buses as an original equipment manufacturer for North American public transit agencies, airports, universities, and other commercial transit fleets. It also designs, develops, manufactures, sells, and integrates proprietary battery systems and electrification solutions for global commercial vehicle manufacturers. Additionally, Proterra provides fleet-scale, high-power charging solutions for its customers.

Proterra was originally formed in June 2004 as a Colorado limited liability company and converted to a Delaware corporation in February 2010. The Company operates from its headquarters and battery production facility in Burlingame, California. The Company also has manufacturing and product development facilities in Greenville and Greer, South Carolina and City of Industry, California.

On June 11, 2021, ArcLight filed a notice of deregistration with the Cayman Islands Registrar of Companies, and filed a certificate of incorporation and a certificate of corporate domestication with the Secretary of State of the State of Delaware, under which ArcLight was domesticated and continued as a Delaware corporation. On June 14, 2021 (the “Closing Date”), ArcLight consummated a merger with Phoenix Merger Sub, Inc., a Delaware corporation and a wholly-owned subsidiary of ArcLight (“Phoenix Merger Sub”), and Proterra Inc, a Delaware corporation (“Legacy Proterra”) with Legacy Proterra surviving as the surviving company and as a wholly-owned subsidiary of ArcLight (the “Merger” and, collectively with the other transactions described in the Agreement and Plan of Merger (the “Merger Agreement”), the “Business Combination”). In connection with the Business Combination, Legacy Proterra changed its name to “Proterra Operating Company, Inc.” and ArcLight changed its name to “Proterra Inc”.

The Merger was accounted for as a reverse merger and a recapitalization with Legacy Proterra being the accounting acquirer. Accordingly, all historical financial information presented in the consolidated financial statements of Proterra represents the accounts of Legacy Proterra and its wholly owned subsidiaries as if Legacy Proterra is the predecessor to Proterra. The shares and net loss per common share, prior to the Merger, have been retroactively restated as shares reflecting the exchange ratio established in the Merger (0.8925 shares of Legacy Proterra common stock for 1 share of Proterra common stock) (the “Exchange Ratio”). Unless otherwise specified or unless the context otherwise requires, references in these notes to the “Company,” “we,” “us,” or “our” refer to Legacy Proterra prior to the Business Combination and to Proterra following the Business Combination.

Prior to the closing of the Business Combination (the “Closing”), ArcLight’s Class A ordinary shares and public warrants were listed on the Nasdaq Capital Market under the symbols “ACTC” and “ACTCW,” respectively. Proterra’s common stock is currently listed on the Nasdaq Global Select Market under the symbol “PTRA”. See Note 3, Reverse Recapitalization, for further details of the Merger. The Company’s public warrants were previously listed on the Nasdaq Global Select Market under the symbol “PTRAW.” On October 29, 2021, the Company redeemed its remaining outstanding public warrants at a redemption price of \$0.10 per public warrant. See Note 10, Warrants, for further details.

The Company has incurred net losses and negative cash flows from operations since inception. As of December 31, 2021, the Company has an accumulated deficit of \$858.2 million, and cash and cash equivalents and short-term investments of \$661.0 million. The Company has funded operations primarily through a combination of equity and debt financing. Management believes that the Company’s currently available resources will be sufficient to fund its cash requirements for at least the next twelve months. However, there can be no assurance that future financings will be successfully completed or completed on terms acceptable to the Company. These financial statements do not include any adjustments that may result from the outcome of this uncertainty.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)*Basis of Presentation*

The Company prepared the financial statements in accordance with U.S. generally accepted accounting principles (“U.S. GAAP”).

The Company has not experienced any significant impact to estimates or assumptions as a result of the COVID-19 pandemic. However, there have been some impacts, specifically as it relates to parts, logistics and overall transit order timing. The Company will continue to monitor impacts of the pandemic on an ongoing basis. While the COVID-19 pandemic has not had a material adverse impact on the Company’s financial condition and results of operations to date, the future impact of the COVID-19 pandemic on the Company’s operational and financial performance will depend on certain developments, including the duration of the pandemic and spread of COVID-19 (including the variant strains of the virus), impact on the Company’s customers and effect on the Company’s suppliers, all of which are uncertain and cannot be predicted.

Segments

The Company operates in the United States and has sales to the European Union, Canada, Australia and Japan. Revenue disaggregated by geography, based on the addresses of our customers, consists of the following (in thousands):

	Year Ended December 31,		
	2021	2020	2019
United States	\$ 227,091	\$ 141,073	\$ 167,574
Rest of World	15,769	55,870	13,710
Total	\$ 242,860	\$ 196,943	\$ 181,284

The Company’s chief operating decision maker is its Chief Executive Officer (CEO), who reviews financial information presented at the entity level. Accordingly, the Company has determined that it has a single reportable segment.

Use of Estimates

The preparation of financial statements in conformity with U.S. GAAP requires the use of estimates and judgments that affect the reported amounts in the financial statements and accompanying notes. U.S. GAAP requires the Company to make estimates and judgments in several areas including, but not limited to, those related to revenue recognition, collectability of accounts receivable, valuation of inventories, valuation of Convertible Notes (See Note 4), warranty liability, contingent liabilities, stock-based compensation expense, useful lives of property, plant, and equipment, recoverability of assets, residual value of leased assets, and the valuation of deferred tax assets. These estimates are based on historical facts and various other assumptions that the Company believes are reasonable. Actual results could differ materially from those estimates.

Foreign Currency Transactions

The U.S. dollar is the Company’s functional currency. Monetary assets and liabilities denominated in currencies other than the U.S. dollar are remeasured to the U.S. dollar at period end, and transaction gains and losses are recorded in other expense (income), net in the statements of operations. Net gains or losses resulting from foreign exchange transactions were not material for the years ended December 31, 2021 and 2019. The net losses resulting from foreign exchange transactions were \$1.1 million for the year ended December 31, 2020.

Cash and Cash Equivalents

The Company considers all highly liquid investments purchased with original maturities of three months or less to be cash equivalents.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

Accounts Receivable and Allowance for Credit Losses

Accounts receivable are recorded at the invoiced amount and do not bear interest. The Company determines the allowance for credit losses based on historical write-off experience, an analysis of the aging of outstanding receivables, customer payment patterns and expectations of changes in macroeconomic conditions that may affect the collectability of outstanding receivables. The allowance for credit losses was not material as of December 31, 2021 and 2020.

Short-Term Investments

The Company's primary objectives for investment activities are to preserve principal, provide liquidity, and maximize income without significantly increasing risk. The Company's short-term investments were primarily comprised of U.S. Treasury and corporate debt securities, and classified as available-for-sale at the time of purchase because it is intended that these investments are available for current operations.

Investments are reported at fair value and are subject to periodic impairment review. Unrealized gains and losses related to changes in the fair value of these securities are recognized in accumulated other comprehensive loss. The ultimate value realized on these securities is subject to market price volatility until they are sold. Realized gains or losses from short-term investments are recorded in other expense (income), net.

As of December 31, 2021 and 2020, short-term investments were \$491.0 million and \$69.0 million, respectively.

Restricted Cash

The Company maintains certain cash amounts restricted as to withdrawal or use. The restricted cash is primarily collateral for performance bonds issued to certain customers. The collateral is provided in the form of a cash deposit to either support the bond directly or to collateralize a letter of credit that supports the performance bonds. As of December 31, 2021 and 2020, restricted cash was \$12.6 million and \$13.0 million, respectively.

Credit Risk and Concentration

The Company's financial instruments that are potentially subject to concentrations of credit risk consist primarily of cash, cash equivalents, restricted cash, short-term investments, and accounts receivable. Cash and cash equivalents and short-term investments are maintained primarily at one financial institution as of December 31, 2021, and deposits exceed federally insured limits. Risks associated with cash and cash equivalents, and short-term investments are mitigated by banking with creditworthy financial institutions. The Company has not experienced any losses on its deposits of cash and cash equivalents or its short-term investments.

Cash equivalents consist of short-term money market funds, corporate debt securities, and debt securities issued by the U.S. Treasury, which are deposited with reputable financial institutions. The Company's cash management and investment policy limits investment instruments to securities with short-term credit ratings at the time of purchase of P-2 and A-2 or better from Moody's and S&P, respectively, with the objective to preserve capital and to maintain liquidity until the funds can be used in business operations.

Accounts receivable are typically unsecured and are generally derived from revenue earned from transit agencies, universities and airports in North America and global commercial vehicle manufacturers in North America, the European Union, Australia, United Kingdom, Japan, and Turkey. The Company periodically evaluates the collectability of its accounts receivable and provides an allowance for potential credit losses as necessary.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

Given the large order value for customers and the relatively low number of customers, revenue and accounts receivable have typically been concentrated with a limited number of customers.

	Revenue			Accounts Receivable	
	Year Ended December 31,			December 31,	
	2021	2020	2019	2021	2020
Number of customers accounted for 10% or more*	—	1	—	1	2

* One customer accounted for 21% of total revenue for year ended December 31, 2020 and 33% of the accounts receivable, net as of December 31, 2020. No other individual customer accounted for more than 20% of total revenue for years ended December 31, 2021, 2020 and 2019, or accounts receivable, net as of December 31, 2021 and 2020.

Single source suppliers provide the Company with a number of components that are required for manufacturing of its current products. In other instances, although there may be multiple suppliers available, many of the components are purchased from a single source. If these single source suppliers fail to meet the Company's requirements on a timely basis at competitive prices, the Company could suffer manufacturing delays, a possible loss of revenue, or incur higher cost of sales, any of which could adversely impact the Company's operating results.

Fair Value of Financial Instruments

The carrying value of the Company's financial instruments, including cash and cash equivalents, accounts receivable, short-term investments, accounts payable, and accrued and other current liabilities, approximates fair value due to the short period of time to maturity, receipt, or payment. The carrying amount of the Company's debt, except for Convertible Notes (as defined below), approximates its fair value as the stated interest rates approximate market rates currently available to the Company.

In August 2020, the Company issued Secured Convertible Promissory Notes (the "Convertible Notes") that, prior to the Closing, contained embedded features subject to derivative accounting. These embedded features were composed of conversion options that had the economic characteristics of a contingent early redemption feature settled in a variable number of shares of the Company's stock. These conversion options were bifurcated and accounted for as a derivative liability separately from the host debt instrument. Embedded derivatives were recognized as a derivative liability on the balance sheets. The derivative liability was measured at fair value and subject to remeasurement at each balance sheet date. Upon the consummation of the Merger, the embedded conversion features associated with the Convertible Notes no longer qualify for derivative accounting after the conversion price became fixed. The carrying amount of the embedded derivative, the fair value as of the date of the Closing, was reclassified to stockholders' equity in accordance with Topic 815, Derivatives and Hedging.

The warrants issued in connection with the Convertible Notes were, prior to the Closing, classified as a liability ("legacy Proterra warrant liability") because they could become exercisable into common stock upon a Qualified Initial Public Offering ("QIPO") or into convertible preferred stock after 5 years from issuance date in the event that there is no QIPO during such period. Such warrants were measured at fair value, subject to remeasurement at each balance sheet date. Upon exercise of the warrants to common stock within 5 years from issuance date, the carrying amount of the warrant liability would be reclassified to stockholders' equity. Upon the consummation of the Merger, the stock issuable upon exercise of the warrants is common stock, with no possibility to convert to Legacy Proterra convertible preferred stock. As a result, the carrying amount of the warrant liability was reclassified to stockholders' equity.

In connection with ArcLight's initial public offering in September 2020, 21,425,000 warrants to purchase ArcLight ordinary shares were issued, including 13,875,000 public warrants and 7,550,000 private placement warrants. These warrants were classified as liabilities as they did not meet the requirements for equity classification under Topic 815, Derivatives and Hedging. These warrants were continually measured at fair value, subject to remeasurement at each balance sheet date. Most of the public warrants and private placement

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

warrants were exercised in October 2021, and the Company redeemed the remaining outstanding public warrants at a redemption price of \$0.10 per public warrant. See Note 10, Warrants, for further details.

Inventories

Inventories are recorded at the lower of cost and net realizable value using the first-in, first-out method. Inventory costs consist primarily of the cost of materials, manufacturing support costs, including labor and factory overhead associated with such production, and shipping costs. The costs of products delivered to customers that have not yet met revenue recognition criteria are also included in inventories. The Company assesses the valuation of inventory and periodically records a provision to adjust inventory to its estimated net realizable value, including when the Company determines inventory to be obsolete or in excess of anticipated demand. Once inventory has been written-off or written-down, it creates a new cost basis for the inventory that is not subsequently written-up. Accelerating the disposal process or incorrect estimates may cause actual results to differ from the estimates at the time such inventory is disposed or sold.

Deferred Cost of Goods Sold

Deferred cost of goods sold primarily includes incurred costs for charging system installations that have not met revenue recognition criteria.

Property, Plant, and Equipment

Property, plant, and equipment, including leasehold improvements, are stated at cost. Depreciation is computed using the straight-line method over the estimated useful lives of the respective assets, as follows:

Property, Plant, and Equipment	Estimated Useful Life
Computer hardware	3 years
Computer software	3 to 5 years
Internally used vehicles and charging systems	over the shorter of their estimated useful lives or 5 years
Machinery and equipment	5 to 12 years
Office furniture and equipment	5 years
Tooling	3 to 5 years
Leasehold improvements	over the shorter of their estimated useful lives or the terms of the related leases
Leased batteries	over the shorter of the terms of the related leases or 12 years
Leased vehicles and charging systems	over the shorter of the terms of the related leases or 5 years

In the fourth quarter of 2019, we completed a review of the estimated useful lives of vehicles and charging equipment used for demonstration purposes. Based on this review, we revised the estimated useful lives of demo vehicles from 12 years to five years effective on November 1, 2019, after considering the condition of assets and our long-term strategy for operating such assets. We believe this change in estimate is appropriate, as it is based on actual experience and the expectations for the ongoing productive use of these assets. The impact to depreciation expense caused by this change in estimate is not material to selling, general and administrative expense on the statement of operations for the year ended December 31, 2019 or future periods.

If the estimated useful life of an asset is less than the stated number of years in our capitalization policy, the depreciation expense will be recorded over the shorter period.

Upon the retirement or sale of property, plant, and equipment, the cost and associated accumulated depreciation are removed from the balance sheets, and the resulting gain or loss is reflected on the statement of operations. Maintenance and repair expenditures are expensed as incurred while major improvements that

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

increase the functionality, output, or expected life of an asset are capitalized and depreciated ratably over the identified useful life.

Impairment of Long-Lived Assets

The Company evaluates the recoverability of property, plant, and equipment and right-of-use assets for possible impairment whenever events or circumstances indicate that the carrying amount of such assets may not be recoverable. Recoverability of these assets is measured by a comparison of the carrying amounts to the future undiscounted cash flows the assets are expected to generate. If such review indicates that the carrying amount of long-lived assets is not recoverable, the carrying amount of such assets is reduced to fair value.

In addition to the recoverability assessment, the Company periodically reviews the remaining estimated useful lives of property, plant, and equipment. If the estimated useful life assumption for any asset is reduced, the remaining net book value is depreciated over the revised estimated useful life.

No impairment charge was recognized in the year ended December 31, 2021. We recorded \$0.1 million impairment charge associated with a facility lease for the year ended December 31, 2020.

The Company reviews long-lived assets for impairment at the lowest level for which separate cash flows can be identified. During the fourth quarter of 2019, due to the introduction of new products and related technology advancements, we determined that an impairment analysis of certain assets leased to customers was required to be performed. The estimated undiscounted future cash flows generated by these assets were less than their carrying amounts. The carrying amounts of the assets were reduced to fair value, which resulted in an impairment charge of \$6.4 million recorded in the statement of operations for the year ended December 31, 2019.

Deferred Revenue

Deferred revenue consists of billings or payments received in advance of revenue recognition that are recognized as revenue once the revenue recognition criteria are met. In some instances, progress billings are issued upon meeting certain milestones stated in the contracts. Accordingly, the deferred revenue balance does not represent the total contract value of non-cancelable arrangements. Invoices are typically due within 30 to 40 days.

The changes in deferred revenue consisted of the following (in thousands):

Deferred revenue as of December 31, 2020	\$ 28,221
Revenue recognized from beginning balance during the year ended December 31, 2021	22,183
Deferred revenue added during the year ended December 31, 2021	(13,998)
Deferred revenue as of December 31, 2021	<u>\$ 36,406</u>

The current portion of deferred revenue represents the amount that is expected to be recognized as revenue within one year from the balance sheet date.

Revenue Recognition

The Company derives revenue primarily from the sale of vehicles and charging systems, the installation of charging systems, the sale of battery systems and powertrain components to other vehicle manufacturers, as well as the sale of spare parts and other services provided to customers. Product revenue consists of revenue earned from vehicles and charging systems, battery systems and powertrain components, installation of charging systems, and revenue from leased vehicles, charging systems, and batteries under operating leases. Leasing revenue recognized over time was approximately \$2.1 million, \$2.3 million and \$3.8 million for the years ended December 31, 2021, 2020 and 2019, respectively. Parts and other service revenue includes revenue earned from

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

spare parts, the design and development of battery systems and powertrain systems for other vehicle manufacturers, and extended warranties.

Goods and services that are promised in the Company's contracts include vehicles, charging systems, battery systems and powertrain components to other vehicle manufacturers, installation of charging systems, spare parts, and extended warranty. The Company assesses the products and services promised in contracts at contract inception, and identifies performance obligations for each promise to transfer to the customer a product or service that is distinct. If a product or service is separately identifiable from other items in the bundled arrangement and a customer can benefit from the product or service on its own or with other resources that are readily available to the customer, then such product or service is considered distinct. Customer contracts typically have multiple performance obligations. Generally, the Company's goods and services are considered separate performance obligations. Development services and products sold to other vehicle manufacturers are typically sold on a stand-alone basis and are not bundled with other goods or services.

The transaction price of the contract is allocated to each performance obligation in a manner depicting the amount of consideration to which the Company expects to be entitled in exchange for transferring the goods or services to the customer (the "allocation objective"). If the allocation objective is met at contractual prices, no further allocations are made. Otherwise, the Company allocates the transaction price to each performance obligation identified in the contract on a relative standalone selling price basis.

To determine the standalone selling price of its promised products or services, the Company conducts an analysis to determine whether its products or services have an observable standalone selling price. In determining the observable standalone selling price, the Company requires that a substantial majority of the standalone selling prices for a product or service fall within a reasonably narrow range. If there is no directly observable standalone selling price for a particular product or service, then the Company estimates a standalone selling price by using the estimated cost plus margin or by reviewing external and internal market factors including, but not limited to, pricing practices including historical discounting, major service groups, and the geographies in which we offer products and services.

The Company recognizes revenue when or as it satisfies a performance obligation by transferring control of a product or service to a customer.

Revenue from product sales is recognized when control of the underlying performance obligations is transferred to the customer. Revenue from vehicles and charging systems, and installation of charging systems is typically recognized upon acceptance by the customer. Under certain contract arrangements, the control of the performance obligations related to the charging systems is transferred over time, and the associated revenue is recognized over the installation period using an input measure based on costs incurred to date relative to total estimated costs to completion. Spare parts revenue is recognized upon shipment. Extended warranty revenue is recognized over the life of the extended warranty using the time elapsed method. Development service contracts typically include the delivery of prototype products to customers. The performance obligation associated with the development of prototype products as well as battery systems and powertrain components to other vehicle manufacturers, is satisfied at a point in time, typically upon shipping.

Revenue derived from performance obligations satisfied over time from charging systems and installation was \$5.8 million, \$6.0 million and \$7.2 million in the years ended December 31, 2021, 2020, and 2019, respectively. Extended warranty revenue was \$1.7 million, \$1.3 million and \$0.8 million in the years ended December 31, 2021, 2020, and 2019, respectively.

As of December 31, 2021 and 2020, the contract assets balance was \$1.3 million and \$2.8 million, respectively. The contract assets are expected to be billed within the next twelve months and are recorded in the prepaid expenses and other current assets on the balance sheets.

As of December 31, 2021, the amount of remaining performance obligations that have not been recognized as revenue was \$336.4 million, of which 73% was expected to be recognized as revenue over the next 12 months

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

and the remainder thereafter. This amount excludes the value of remaining performance obligations for contracts with an original expected length of one year or less.

While our business has historically been centered on the development and sale of electric transit buses, the increased significance of revenue from Proterra Powered has caused the Company to consider reorganizing into two business units with three business lines, each of which addresses a critical component of the commercial vehicle electrification value proposition in a complementary and self-reinforcing manner:

- **Proterra Transit** designs, develops, manufactures, and sells electric transit buses as an original equipment manufacturer (“OEM”) for North American public transit agencies, airports, universities, and other commercial transit fleets.
- **Proterra Powered & Energy** includes Proterra Powered, which designs, develops, manufactures, sells, and integrates proprietary battery systems and electrification solutions into vehicles for global commercial vehicle OEMs, and Proterra Energy, which provides turnkey fleet-scale, high-power charging solutions and software services, ranging from fleet and energy management software-as-a-service, to fleet planning, hardware, infrastructure, installation, utility engagement, and charging optimization.

The revenue of business units are as follows (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Proterra Transit	\$ 195,558	\$ 156,021	\$ 150,476
Proterra Powered & Energy	47,302	40,922	30,808
Total	\$ 242,860	\$ 196,943	\$ 181,284

Lease Arrangements

The Company offers customers leasing alternatives outside of the standard sales contracts for vehicles, charging equipment and batteries used in the vehicles. The leasing arrangements are typically bundled together with the sales contracts. The Company assessed the nature of the bundled arrangements under the revenue accounting standard. For arrangements that contain a lease, we determined the classification of the lease in accordance with Topic 840, Leases, prior to the adoption of Topic 842, Leases, on January 1, 2020. A lease arrangement that transfers substantially all of the benefits and risks incident to ownership of the products is classified as a sales-type lease based on the criteria established by the accounting standard; otherwise the lease is classified as an operating lease.

For sales-type leases, product revenue is generally recognized upon customer acceptance of the underlying leased assets. The current portion of net investment in sales-type leases is recorded in accounts receivable, and the non-current portion is recorded in other assets on the balance sheets. The discounted unguaranteed residual value of underlying leased assets is not material to the net investment in lease balance.

For operating leases, the leasing revenue is recognized on a straight-line basis over the lease term.

We monitor the performance of customers who leased batteries and are subject to ongoing payments. No allowance was recorded for the receivables under the leasing arrangements.

We adopted the new lease accounting standard, Topic 842, Leases, on January 1, 2020. We determine whether an arrangement is or contains a lease at inception. Short-term leases with a term of less than 12 months will not be recognized in the right-of-use assets or lease liabilities. The lease and non-lease components are not separated for all leases regardless of whether the Company is the lessee or a lessor to the lease. See Note 7, Leases, for additional information.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

Cost of Goods Sold

Cost of goods sold includes direct material and labor costs, manufacturing overhead including depreciation expense, freight costs, and reserves for estimated warranty expenses. Cost of goods sold also includes charges to write-down the carrying value of inventory when it exceeds its estimated net realizable value and to provide for on-hand inventory that is either obsolete or in excess of forecasted demand. Costs of development services are expensed as incurred. Costs of development services incurred in periods prior to the finalization of a service agreement with a customer are recorded as research and development expense. Once the customer agreement is finalized, these costs are recorded in cost of goods sold.

Sales and Other Taxes

Taxes assessed by various government entities, such as sales, use, and value added taxes, collected at the time of sale are excluded from revenue.

Shipping Costs

Amounts billed to customers related to shipping and handling are classified as revenue, and the related shipping and handling costs are included in cost of goods sold.

Research and Development Costs

Research and development costs are expensed as incurred. Research and development expense consists primarily of payroll and benefits of those employees engaged in research, design, and development activities, costs related to prototype parts and design tools, license expenses related to intellectual property, supplies and services, depreciation, and other occupancy costs.

Advertising Expenses

Advertising costs are expensed as incurred. Advertising expenses were \$1.1 million, \$0.6 million, and \$0.9 million for the year ended December 31, 2021, 2020 and 2019, respectively.

Product Warranties

The Company provides a limited warranty to customers on vehicles, charging systems, and battery systems. The limited warranty ranges from one to 12 years depending on the components. Separately, the Company also periodically performs field service actions related to product service campaigns. Pursuant to these warranties and field service actions, the Company will repair, replace, or adjust the parts on the products that are defective in factory-supplied materials or workmanship. The Company records a warranty reserve for the products sold at the point of revenue recognition, which includes the best estimate of the projected costs to repair or replace items under the limited warranty and field service actions. These estimates are based on actual claims incurred to date and an estimate of the nature, frequency and costs of future claims. These estimates are inherently uncertain given the relatively short history of sales. Changes to the historical or projected warranty experience may cause material changes to the warranty reserve in the future. The warranty reserve does not include projected warranty costs associated with the vehicles under operating leases, as the costs to repair these warranty claims are expensed as incurred. The portion of the warranty reserve expected to be incurred within the next 12 months is included within accrued liabilities while the remaining balance is included within other long-term liabilities on the balance sheets.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

Warranty expense is recorded as a component of cost of goods sold. Accrued warranty activity consisted of the following (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Warranty reserve – beginning of period	\$ 18,582	\$ 14,926	\$ 10,602
Warranty costs incurred	(7,199)	(4,214)	(6,031)
Net changes in liability for pre-existing warranties, including expirations	(1,710)	(3,392)	(840)
Provision for warranty	13,601	11,262	11,195
Warranty reserve – end of period	\$ 23,274	\$ 18,582	\$ 14,926

Stock-Based Compensation

The Company uses the fair value method for recording stock-based compensation expense. Stock-based compensation expense for stock options is estimated at the grant date based on each stock option's fair value as calculated using the Black-Scholes option pricing model. The stock-based compensation expense is recognized on a straight-line basis over the requisite service period for the entire award.

Income Taxes

Income taxes are computed using the asset and liability method, under which deferred tax assets and liabilities are determined based on the difference between the financial statement and tax bases of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to affect taxable income. Valuation allowances are established when necessary to reduce deferred tax assets to the amount expected to be realized.

The Company recognizes tax benefits from uncertain tax positions only if it is more likely than not that the tax position will be sustained on examination by the taxing authorities based on the technical merits of the position. The Company adjusts these reserves when facts and circumstances change, such as the closing of a tax audit or the refinement of an estimate. The provision for income taxes includes the effects of any reserves that are considered appropriate.

Accrued interest and penalties related to unrecognized tax benefits are classified as income tax expense.

Government Incentives

The Company receives incentives from the federal and state government agencies in the form of grants. Incentives are recorded in the financial statements in accordance with their purposes, either as a reduction of expense or a reduction of the cost of the capital investment. The benefit of these incentives is recorded when performance is complete and all conditions as specified in the agreement are fulfilled.

California and certain other states provide incentives to accelerate the purchase of cleaner, more efficient buses in the form of point-of-sale discounts to vehicle purchasers. These incentives are included in the customer contract value, and recognized as revenue once all revenue recognition criteria are met.

Other Comprehensive Income (Loss)

The Company did not have other comprehensive income (loss) for the years ended December 31, 2020 and 2019.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

The components of accumulated other comprehensive income (loss) and activity, net of related taxes, for the year ended December 31, 2021 were as follows:

	December 31, 2020	Increase/ Decrease	December 31, 2021
Net unrealized losses on available-for-sale securities	\$ —	\$ (588)	\$ (588)
Total accumulated other comprehensive income (loss), net of taxes	\$ —	\$ (588)	\$ (588)

2. Adoption of New Accounting Standards

ASU No. 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes*. This standard simplifies the accounting for income taxes, eliminates certain exceptions within Topic 740, Income Taxes, and clarifies certain aspects of the current guidance to promote consistency among reporting entities. The Company adopted this standard on January 1, 2021, and it had no material impact on the financial statements.

Recent Accounting Pronouncements Not Yet Adopted

ASU No. 2020-06, *Accounting for Convertible Instruments and Contracts in an Entity's Own Equity*. This standard simplifies the accounting for convertible instruments by removing certain separation models in ASC 470-20, Debt — Debt with Conversion and Other Options. This standard updates the guidance on certain embedded conversion features that are not required to be accounted for as derivatives under Topic 815, Derivatives and Hedging, or that do not result in substantial premiums accounted for as paid-in capital, such that those features are no longer required to be separated from the host contract. The convertible debt instruments will be accounted for as a single liability measured at amortized cost. This will also result in the interest expense recognized for convertible debt instruments to be typically closer to the coupon interest rate when applying the guidance in Topic 835, Interest. Further, this standard made amendments to the EPS guidance in Topic 260 for convertible instruments, the most significant impact of which is requiring the use of the if-converted method for diluted earnings per share calculation, and no longer allowing the net share settlement method. This standard also made revisions to Topic 815-40, which provides guidance on how an entity must determine whether a contract qualifies for a scope exception from derivative accounting. The amendments to Topic 815-40 change the scope of contracts that are recognized as assets or liabilities. This standard is effective for interim and annual periods beginning after December 15, 2021, with early adoption permitted after December 15, 2020. Adoption of this standard can either be on a modified retrospective or full retrospective basis. The Company will adopt this standard on January 1, 2022, and expects no material impact on the financial statements.

3. Reverse Recapitalization

On June 14, 2021, Phoenix Merger Sub merged with Legacy Proterra, with Legacy Proterra surviving as a wholly-owned subsidiary of ArcLight. In connection with the Business Combination, Legacy Proterra changed its name to "Proterra Operating Company, Inc." and ArcLight changed its name to "Proterra Inc".

The following transactions occurred upon the Closing:

- each share of outstanding Legacy Proterra convertible preferred stock was converted into shares of Proterra common stock in accordance with the applicable conversion ratio immediately prior to the effective time, and each share of Legacy Proterra common stock (including shares issued upon conversion of Legacy Proterra convertible preferred stock and warrants net exercised upon Closing) was converted into shares of common stock after giving effect of the Exchange Ratio of 0.8925 and resulting in the issuance of 123,752,882 shares of common stock;
- certain holders of Convertible Notes with an original aggregate principal amounts of \$46.5 million elected to convert their outstanding Convertible Notes balances including accrued PIK interest and cash interest at the Closing resulting in the issuance of 7.4 million shares of common stock;

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

3. Reserve Recapitalization (cont.)

- each outstanding Legacy Protterra option was converted into an option to purchase shares of Protterra common stock by multiplying the number of underlying shares by the Exchange Ratio, rounded down to the nearest whole share, resulting in such options being exercisable to purchase for an aggregate of 22,532,619 shares of Protterra common stock; the exercise price of each converted option was determined by dividing the per share exercise price of the respective Legacy Protterra options by the Exchange Ratio of 0.8925, rounded up to the nearest whole cent;
- each outstanding Legacy Protterra warrant to purchase Legacy Protterra common stock and convertible preferred stock was converted into a warrant to purchase shares of Protterra common stock by multiplying the number of underlying shares by the Exchange Ratio, rounded down to the nearest whole share, resulting in such warrants being exercisable to purchase an aggregate of 3,504,523 shares of Protterra common stock; the exercise price of each converted warrant was determined by dividing the per share exercise price of the respective Legacy Protterra warrant by the Exchange Ratio of 0.8925, rounded up to the nearest whole cent;
- each outstanding Convertible Note that was not optionally converted in connection with the Closing remained outstanding and became convertible into shares of Protterra common stock in accordance with the terms of such Convertible Notes.
- 15,172 public shares were redeemed by ArcLight shareholders, and an aggregate of \$0.2 million was paid from the trust account to these redeeming holders; and each share of ArcLight Class A and Class B ordinary shares was converted into the right to receive one share of Protterra's common stock resulting in the issuance of 34,671,900 shares of common stock;
- pursuant to the subscription agreements between ArcLight and certain investors (the "PIPE Investors"), the PIPE Investors purchased 41.5 million shares of Protterra common stock at a purchase price of \$10.00 per share for aggregate gross proceeds of \$415.0 million (the "PIPE Financing");
- each ArcLight warrant outstanding immediately prior to the consummation was converted into a warrant exercisable into an equivalent number of shares of Protterra common stock, resulting in such warrants being exercisable for an aggregate of 21,424,994 shares of Protterra common stock; and
- the 669,375 shares of Protterra common stock underlying certain Milestone Options (as defined below) fully vested upon the Closing.

Upon the occurrence of any of the following events during the first five years following the Closing of the Merger ("earnout period"), up to an additional 22,809,500 shares of Protterra common stock (the "Earnout Stock") may be issued to former holders of Legacy Protterra convertible preferred stock, common stock, warrants, vested options and Convertible Notes as of immediately prior to the closing of the Merger, as follows:

- a. 21.0526% of the Earnout Stock if over any 20 trading days within any 30 trading day period, the volume-weighted average price ("VWAP") of the Protterra common stock is greater than or equal to \$15.00 per share or there occurs any transaction resulting in a change in control with a valuation of the Protterra common stock that is greater than or equal to \$15.00 per share (the "First Earnout Shares");
- b. an additional 26.3158% of the Earnout Stock if over any 20 trading days within any 30 trading day period, the VWAP of the Protterra common stock is greater than or equal to \$20.00 per share or there occurs any transaction resulting in a change in control with a valuation of the Protterra common stock that is greater than or equal to \$20.00 per share;
- c. an additional 26.3158% of the Earnout Stock if over any 20 trading days within any 30 trading day period, the VWAP of the Protterra common stock is greater than or equal to \$25.00 per share or there occurs any transaction resulting in a change in control with a valuation of the Protterra common stock that is greater than or equal to \$25.00 per share;

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

3. Reserve Recapitalization (cont.)

- d. an additional 26.3158% of the Earnout Stock if over any 20 trading days within any 30 trading day period, the VWAP of the Proterra common stock is greater than or equal to \$30.00 per share or there occurs any transaction resulting in a change in control with a valuation of the Proterra common stock that is greater than or equal to \$30.00 per share;

Pursuant to a letter agreement (the "Sponsor Letter Agreement") with ArcLight CTC Holdings, L.P. (the "Sponsor"), 10% of the Proterra common stock received by the Sponsor upon consummation of the Merger in exchange for its outstanding shares of ArcLight Class B ordinary shares, excluding 140,000 shares owned by the ArcLight board of directors, was subject to vesting and forfeiture (the "Sponsor Earnout Stock"). Such shares of Sponsor Earnout Stock would vest if over any 20 trading days within any 30 trading day period during the five-year earnout period, the VWAP of the Proterra common stock was greater than or equal to \$15.00 per share or there occurred any transaction resulting in a change in control with a valuation of the Proterra common stock that is greater than or equal to \$15.00 per share.

The Earnout Stock and Sponsor Earnout Stock met indexation and other criteria under Topic 815, Derivatives and Hedging, and are considered as equity-classified instruments.

The number of shares of Proterra common stock issued immediately following the consummation of the Merger was (in thousands):

	Shares
Ordinary shares Class A of ArcLight, outstanding prior to Merger	27,750
Less redemption of ArcLight shares	(15)
Sponsor	6,257
Sponsor Earnout Stock	680
Common stock of ArcLight	34,672
PIPE Investors	41,500
Legacy Proterra shares	131,176
Total shares of common stock immediately after Merger	<u>207,348</u>

Immediately after the Merger, Proterra is authorized to issue 510.0 million shares, with a par value of \$0.0001 per share. As of the Closing, the authorized shares consisted of 500.0 million shares of common stock and 10.0 million shares of preferred stock, and there were 207.3 million shares of common stock issued and outstanding, and no shares of preferred stock issued and outstanding. In addition, as of the Closing, there were 24.9 million warrants issued and outstanding, including 13.9 million public warrants, 7.6 million private placement warrants, and 3.5 million Legacy Proterra warrants.

As of the Closing, a total of 82.3 million shares were reserved for future issuance upon the exercise of stock options, warrants and the issuance of Earnout Stock, of which 10.4 million shares were reserved for issuance under Proterra's 2021 Equity Incentive Plan, 22.5 million shares were reserved under Legacy Proterra's 2010 Equity Incentive Plan and 1.6 million shares reserved under Proterra's 2021 Employee Stock Purchase Plan.

The Merger has been accounted for as a reverse merger and a recapitalization under U.S. GAAP with Legacy Proterra being the accounting acquirer, based on evaluation of the following facts and circumstances:

- Legacy Proterra's stockholders have a majority of the voting power of Proterra following the Merger;
- Legacy Proterra has initially designated a majority of the board of directors of Proterra;
- Legacy Proterra's management comprise the management of Proterra;
- Legacy Proterra comprises the ongoing operations of Proterra;

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

3. Reserve Recapitalization (cont.)

- Legacy Proterra is the larger entity based on historical revenues and business operations; and
- Proterra has assumed Legacy Proterra's name.

Under this method of accounting, ArcLight is treated as the "acquired" company for accounting and financial reporting purposes. Accordingly, for accounting purposes, this merger transaction is treated as the equivalent of Legacy Proterra issuing equity for the net assets of ArcLight, accompanied by a recapitalization. The net assets of ArcLight have been stated at historical cost, with no goodwill or other intangible assets recorded.

The Company received aggregate cash proceeds of \$649.3 million at the Closing, net of \$13.8 million of PIPE Financing fees, \$18.5 million of other transaction costs paid at Closing, \$9.7 million of ArcLight IPO deferred underwriting fees payable, \$1.3 million of other ArcLight's accrued expenses, and \$0.1 million of ArcLight's related party payable. The unbilled ArcLight expenses incurred prior to the Closing were paid from the cash proceeds received by the Company. The transaction costs including advisory, legal and other professional services directly related to the Merger were recorded in the additional paid-in capital in the balance sheet to offset against proceeds. The deferred transaction costs of approximately \$2.9 million paid by the Company prior to the Closing were recorded to the additional paid-in capital and classified as financing activities in the statement of cash flow for year ended December 31, 2021.

In July 2021, the conditions for the issuance of the First Earnout Shares and the vesting of the Sponsor Earnout Stock were satisfied, resulting in an aggregate of 4,800,563 shares of common stock being issued and the 679,750 shares of Sponsor Earnout Stock fully vesting.

4. Fair Value of Financial Instruments

The Company measures certain financial assets and liabilities at fair value. Fair value is determined based on the exit price that would be received from selling an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. Fair value is estimated by applying the following hierarchy:

Level 1 — Quoted prices in active markets for identical assets or liabilities;

Level 2 — Observable inputs other than quoted prices in active markets for identical assets and liabilities, quoted prices for identical or similar assets or liabilities in inactive markets, or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities; and

Level 3 — Inputs that are generally unobservable and typically reflect management's estimate of assumptions that market participants would use in pricing the asset or liability.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

4. Fair Value of Financial Instruments (cont.)

Financial assets measured at fair value on a recurring basis using the above input categories were as follows (in thousands):

	Pricing Category	Fair Value at	
		December 31,	
		2021	2020
Assets:			
Cash equivalents:			
Money market funds	Level 1	\$ 102,978	\$ 744
U.S. Treasury securities	Level 1	49,996	64,997
Short-term investments:			
U.S. Treasury securities	Level 1	330,053	68,990
Corporate debt securities	Level 2	160,914	—
Total		\$ 643,941	\$ 134,731
Liabilities:			
Other non-current liabilities:			
Derivative liability	Level 3	\$ —	\$ 70,870
Legacy Proterra warrant liability	Level 3	—	39,670
Total		\$ —	\$ 110,540

As of December 31, 2021 and 2020, short-term investments were primarily comprised of U.S. Treasury securities and commercial papers of corporate debt securities.

The following is a summary of cash equivalents and marketable securities as of December 31, 2021 (in thousands):

	Amortized Cost	Unrealized Losses	Estimated Fair Value
Cash equivalents:			
Money market funds	\$ 102,978	\$ —	\$ 102,978
U.S. Treasury securities	49,996	—	49,996
Short-term investments:			
U.S. Treasury securities	330,618	(565)	330,053
Corporate debt securities	160,937	(23)	160,914
Total	\$ 644,529	\$ (588)	\$ 643,941

The unrealized losses as of December 31, 2021 are primarily related to U.S. Treasury securities with maturity longer than one year due to recent changes in interest rates and considered temporary in nature. The unrealized gain/losses related to fixed income debt securities for the year ended December 31, 2020 were immaterial.

The contractual maturities of short-term investments are as follows (in thousands):

	December 31,	
	2021	2020
Due within one year	\$ 291,525	\$ 68,990
Due after one year to two years	199,442	—
Total	\$ 490,967	\$ 68,990

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

4. Fair Value of Financial Instruments (cont.)

In August 2020, the Company issued Convertible Notes that contain embedded features subject to derivative accounting. Refer to Note 6, Debt, for additional information on the Convertible Notes.

The embedded derivatives were recognized as a derivative liability on the balance sheet, and were measured at fair value, subject to remeasurement at each balance sheet date. The warrants issued in connection with the Convertible Notes were, prior to Closing, classified as a liability because they could become exercisable into common stock upon a QIPO or into convertible preferred stock after five years from issuance date in the event that there was no QIPO during such period. Such warrants were measured at fair value, subject to remeasurement at each balance sheet date. The fair value of derivative liability, the Legacy Proterra warrant liability, and the Convertible Notes were measured using Monte Carlo Simulation pricing model.

The fair value of the Convertible Notes was \$278.9 million as of December 31, 2021. The carrying value of the Convertible Notes of \$101.0 million, net of \$62.3 million unamortized debt discount and issuance costs, as of December 31, 2021, was recorded in Debt, non-current on the balance sheets.

The valuation of derivative and Legacy Proterra warranty liabilities and the Convertible Notes are based on significant inputs not observable in the market, and thus represents a level 3 measure. The key inputs to the valuation model include equity volatility, expected term, and risk-free interest rate.

The public warrants and private placement warrants issued in connection with ArcLight's initial public offering were classified as a liability prior to the Closing, as they did not meet the requirements for equity classification under Topic 815, Derivatives and Hedging. These warrants were continually measured at fair value, subject to remeasurement at each balance sheet date subsequent to the Closing. Most of the warrants were exercised in October 2021, and the Company redeemed the remaining outstanding public warrants at a redemption price of \$0.10 per public warrant. See Note 10, Warrants, for further details.

A summary of the changes of the derivative liability and warrant liabilities is as follows (in thousands):

	Derivative liability	Legacy Proterra warrant liability	Private placement warrant liability	Public warrant liability
Fair value as of December 31, 2020	\$ 70,870	\$ 39,670	\$ —	\$ —
Warrant liability acquired as part of the reverse recapitalization	—	—	57,610	84,640
Change in fair value	111,684	47,346	(38,589)	(50,264)
Reclassification of liability upon the reverse recapitalization	(182,554)	(69,320)	—	—
Reclassification of liability upon exercise of warrants	—	(17,696)	(19,021)	(34,376)
Fair value as of December 31, 2021	<u>\$ —</u>	<u>\$ —</u>	<u>\$ —</u>	<u>\$ —</u>

The change in fair value of derivative and warrant liabilities is recorded in the statement of operations.

5. Balance Sheet Components

Cash and cash equivalents consisted of the following (in thousands):

	December 31,	
	2021	2020
Cash	\$ 17,065	\$ 44,978
Cash equivalents	152,974	65,741
Total cash and cash equivalents	<u>\$ 170,039</u>	<u>\$ 110,719</u>

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

5. Balance Sheet Components (cont.)

The following table provides a reconciliation of cash, cash equivalents, and restricted cash reported within the balance sheets to the total of such amounts shown on the statements of cash flows.

	December 31,	
	2021	2020
Cash and cash equivalents	\$ 170,039	\$ 110,719
Restricted cash, current portion	12,105	8,397
Restricted cash, net of current portion	460	4,581
Total restricted cash	12,565	12,978
Total cash and cash equivalents, and restricted cash	<u>\$ 182,604</u>	<u>\$ 123,697</u>

Inventories consisted of the following (in thousands):

	December 31,	
	2021	2020
Raw materials	\$ 65,225	\$ 31,148
Work in progress	25,062	8,042
Finished goods	18,269	47,756
Service parts	6,000	5,384
Total inventories	<u>\$ 114,556</u>	<u>\$ 92,330</u>

The Company recorded a write-down of excess or obsolete inventories to cost of goods sold of \$1.9 million, \$3.0 million and \$4.9 million in the years ended December 31, 2021, 2020 and 2019, respectively.

Property, plant, and equipment, net, consisted of the following (in thousands):

	December 31,	
	2021	2020
Computer hardware	\$ 5,195	\$ 4,708
Computer software	9,561	8,849
Internally used vehicles and charging systems	16,459	19,136
Leased vehicles and batteries	6,863	7,081
Leasehold improvements	10,516	10,234
Machinery and equipment	28,302	26,026
Office furniture and equipment	1,861	1,854
Tooling	21,726	21,727
Finance lease right-of-use assets	179	179
Construction in progress	20,243	1,830
	<u>120,905</u>	<u>101,624</u>
Less: Accumulated depreciation and amortization	(58,659)	(48,037)
Total	<u>\$ 62,246</u>	<u>\$ 53,587</u>

Construction in progress was comprised of various assets that are not available for their intended use as of the balance sheet date.

Depreciation and amortization expense were \$15.7 million, \$15.5 million and \$12.6 million for the years ended December 31, 2021, 2020 and 2019, respectively.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

5. Balance Sheet Components (cont.)

Accrued liabilities consisted of the following (in thousands):

	December 31,	
	2021	2020
Accrued payroll and related expenses	\$ 8,069	\$ 6,695
Accrued sales and use tax	885	975
Warranty reserve	8,116	6,121
Financing obligation	—	3,056
Accrued audit and accounting related expenses	783	428
Accrued charger installation costs	579	769
Other accrued expenses	2,202	1,692
Total	\$ 20,634	\$ 19,736

In July 2016, we entered into a bus sale and lease transaction for ten Catalyst buses. These buses are leased to other parties for five years by the customer. At the end of the lease term, the fourth quarter of 2021, we had an obligation to repurchase the buses back from the customer. We received \$6.0 million from the customer directly upon delivery in 2016. Under U.S. GAAP, this sales transaction is considered as a borrowing and the lease transaction was considered as an operating lease. The financing obligation was \$3.1 million as of December 31, 2020, and paid off in the fourth quarter of 2021.

Other long-term liabilities consisted of the following (in thousands):

	December 31,	
	2021	2020
Warranty reserve	\$ 15,158	\$ 12,461
Finance lease liabilities, non-current	87	117
Total	\$ 15,245	\$ 12,578

6. Debt

Debt, net of debt discount and issuance costs, consisted of the following (in thousands):

	December 31,	
	2021	2020
Senior Credit Facility	—	16,809
PPP loan	10,000	10,000
Convertible Notes	100,999	106,443
Total Debt	110,999	133,252
Less debt, current	—	—
Debt, non-current	\$ 110,999	\$ 133,252

Senior Credit Facility

In May 2019, the Company entered into a Loan, Guaranty and Security Agreement for a senior secured asset-based lending facility (“Senior Credit Facility”) with borrowing capacity up to \$75.0 million. The commitment under the Senior Credit Facility is available to the Company on a revolving basis through the earlier of May 2024 or 91 days prior to the stated maturity of any subordinated debt in aggregate amount of \$7.5 million or more. The maximum availability under the Senior Credit Facility is based on certain specified percentages of eligible accounts receivable and inventory, subject to certain reserves, to be determined in accordance with the Senior Credit Facility. The commitment under the Senior Credit Facility includes a \$10.0 million letter of credit sub-line.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

6. Debt (cont.)

Subject to certain conditions, the commitment may be increased by \$50.0 million upon approval by the lender, and at the Company's option, the commitment can be reduced to \$25.0 million or terminated upon at least 15 days written notice.

The Senior Credit Facility is secured by a security interest in substantially all of the Company's assets except for intellectual property and other restricted property.

Borrowings under the Senior Credit Facility bear interest at per annum rates equal to, at the Company's option, either (i) the base rate plus an applicable margin for base rate loan, or (ii) the London Interbank Offered Rate ("LIBOR") plus an applicable margin for LIBOR loan. The base rate is calculated as the greater of (a) the Lender prime rate, (b) the federal funds rate plus 0.5%, and (c) one-month LIBOR plus 1.0%. The applicable margin is calculated based on a pricing grid linked to quarterly average excess availability (as a percentage of borrowing capacity). For base rate loans, the applicable margin ranges from 0.0% to 1.5%, and for LIBOR Loans, it ranges from 1.5% to 3.0%. The Senior Credit Facility contains certain customary non-financial covenants. In addition, the Senior Credit Facility requires the Company to maintain a Fixed Charge Coverage Ratio of at least 1.00:1.00 during such times as a covenant trigger event shall exist.

While there was no principal outstanding under the Senior Credit Facility as of December 31, 2021, the Company has an aggregate of \$14.4 million letters of credit outstanding, using some available capacity. As of December 31, 2020, the outstanding balance was \$17.1 million, with maturity of May 2024 and interest rate of 3.09% per annum.

Small Business Administration Loan

In May 2020, the Company received Small Business Administration ("SBA") loan proceeds of \$10.0 million from Town Center Bank pursuant to the Paycheck Protection Program ("the PPP loan") under the "Coronavirus Aid, Relief and Economic Security (CARES) Act". The PPP loan was in the form of a note with original maturity in May 2022, and was extended to May 2025 based on SBA's interim final rule. The interest rate is 1.00% per annum.

Convertible Notes

In August 2020, the Company entered into a Note Purchase Agreement for Secured Convertible Promissory Notes ("Convertible Notes"). The Convertible Notes had an aggregate principal amount of \$200.0 million, with a cash interest of 5.0% per annum payable at each quarter end and a paid-in-kind interest of 4.5% per annum payable by increasing the principal balance at each quarter end. The Convertible Notes will mature in August 2025, and the Company may not make prepayment unless approved by the required holders of the Convertible Notes.

Each of the Convertible Notes shall rank equally without preference or priority of any kind over one another, but senior in all rights, privileges and preferences to all other shares of the Company's capital stock and all other securities of the Company that are convertible into or exercisable for the Company's capital stock directly or indirectly.

Prior to the maturity date or prior to the payment or conversion of the entire balance of the Convertible Notes, in the event of a liquidation or sale of the Company, the Company shall pay to the holders of Convertible Notes the greater of (i) 150% of the principal balance of the Convertible Notes or (ii) the consideration that the holders would have received had the holders elected to convert the Convertible Notes into preferred stock immediately prior to such liquidation event.

The Convertible Notes do not entitle the holders to any voting rights or other rights as a stockholder of the Company, unless and until the Convertible Notes are actually converted into shares of the Company's capital stock in accordance with their terms.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

6. Debt (cont.)

The Note Purchase Agreement contains certain customary non-financial covenants. In addition, the Note Purchase Agreement requires the Company to maintain liquidity at quarter end of not less than the greater of (i) \$75.0 million and (ii) four times of cash burn for the three-month period then ended.

The Convertible Notes will mature in August 2025 or will be settled by issuing common stock, and accordingly are classified as a non-current liability on the Company's balance sheets.

In connection with the issuance of the Convertible Notes, the Company issued warrants to the holders of Convertible Notes to purchase 4.6 million shares of Company stock at an exercise price of \$0.02 per share. The warrants are freestanding financial instruments and, prior to the Closing, were classified as liability due to the possibility that they could become exercisable into Legacy Proterra convertible preferred stock. Upon the consummation of the Merger, the stock issuable upon exercise of the warrants is Proterra common stock, with no possibility to convert to Legacy Proterra convertible preferred stock. As a result, the carrying amount of the warrant liability was reclassified to stockholders' equity. The warrant liability of \$29.0 million was initially measured at fair value on its issuance date and recorded as a debt discount, and was amortized during the term of the Convertible Notes to interest expense using the effective-interest method. The warrant liability was remeasured on a recurring basis at each reporting period date, with the change in fair value reported in the statement of operations. Upon any exercise of the warrants to common stock, the carrying amount of the warrant liability is reclassified to stockholders' equity.

Prior to the Closing, the embedded features of the Convertible Notes were composed of conversion options that had the economic characteristics of a contingent early redemption feature settled in a variable number of shares of Company stock. These conversion options were bifurcated and accounted for separately from the host debt instrument. The derivative liability of \$68.5 million was initially measured at fair value on the issuance date of the Convertible Notes and recorded as a debt discount and was amortized during the term of the Convertible Notes to interest expense using the effective-interest method. The derivative liability was remeasured on a recurring basis at each reporting period date, with the change in fair value reported in the statement of operations. Upon the consummation of the Merger, the embedded conversion features associated with the Convertible Notes no longer qualify for derivative accounting since the conversion price became fixed. The carrying amount of the embedded derivative, the fair value as of the Closing Date, was reclassified to stockholders' equity in accordance with Topic 815, Derivatives and Hedging.

Issuance costs of \$5.1 million were also recorded as debt discount and are amortized during the term of the Convertible Notes to interest expense using the effective interest method.

On June 14, 2021, certain Convertible Note holders with an original aggregate principal amount of \$46.5 million elected to convert their Convertible Notes at the Closing of the Merger. An aggregate of \$48.8 million principal and interest was reclassified to additional paid-in capital, and \$21.0 million of remaining related debt issuance costs were expensed to interest expense.

At any time after the expiration of the lock-up period following the closing of the Merger, the remaining outstanding Convertible Notes will automatically be converted into common stock if at any time the volume-weighted average price (VWAP) of the common stock over a period of 20 consecutive trading days exceeds 150% of the conversion price or \$9.86.

The amortization expense of debt discount and issuance costs was \$34.7 million and \$5.6 million for the year ended December 31, 2021 and 2020, respectively.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

6. Debt (cont.)

The Convertible Notes, net of debt discount and issuance costs, consisted of the following (in thousands):

	December 31,	
	2021	2020
Principal	\$ 153,500	\$ 200,000
PIK interest	9,826	3,501
Total principal	163,326	203,501
Less debt discount and issuance costs	(62,327)	(97,058)
Total Convertible Notes	\$ 100,999	\$ 106,443

As of December 31, 2021, the contractual future principal repayments of the total debt were as follows (in thousands):

2022	\$ —
2025 ⁽¹⁾	173,326
Total	\$ 173,326

(1) Including PIK interest added to principal balance through December 31, 2021.

The Company was in compliance with all of the covenants contained in the Senior Credit Facility and Convertible Notes as of December 31, 2021.

7. Leases

The Company adopted the new lease accounting standard on January 1, 2020 using the modified retrospective transition method, recognizing a cumulative-effect adjustment to the balance sheet and not adjusting comparative information for prior periods. In addition, the Company elected the package of practical expedients permitted under the transition guidance, which allowed the Company not to reassess (1) whether any expired or existing contracts are or contain leases, (2) lease classification for any expired or existing leases, and (3) initial direct costs for any existing leases. The Company did not elect the use of hindsight practical expedients in determining the lease term for existing leases. Topic 842 also provides practical expedients for an entity's ongoing accounting. The Company has elected the short-term lease recognition exemption for all leases that qualify. As a result, for those leases with a term of less than 12 months, it will not recognize right-of-use assets or lease liabilities. The Company also elected the practical expedient to not separate lease and non-lease components for all its leases regardless of whether the Company is the lessee or a lessor to the lease.

The adoption resulted in a recognition of \$13.8 million of operating lease assets and \$14.3 million of operating lease liabilities on the balance sheet on January 1, 2020. The difference represents prepaid rent expense and deferred rent for leases existed on the date of adoption, which was an offset to the opening balance of operating lease assets. The adoption has no impact on the Company's operating expenses and cash flows.

As a Lessor

The net investment in leases are as follows:

	December 31,	
	2021	2020
Net investment in leases, current	\$ 411	\$ 398
Net investment in leases, non-current	5,179	3,101
Total net investment in leases	\$ 5,590	\$ 3,499

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

7. Leases (cont.)

Interest income from accretion of net investment in lease is not material for the years ended December 31, 2021, 2020 and 2019.

Future minimum payments receivable from operating and sales-type leases as of December 31, 2021 for each of the next five years are as follows:

	Operating leases	Sales-type leases
2022	\$ 803	\$ 395
2023	384	469
2024	—	548
2025	—	828
2026	—	828
Thereafter	—	3,061
Total minimum lease payments	<u>\$ 1,187</u>	<u>\$ 6,129</u>

As a Lessee

The Company leases its office and manufacturing facilities in Burlingame, California, Greenville and Greer, South Carolina, City of Industry, California, and Rochester Hills, Michigan under operating lease agreements with various expiration dates from 2022 through 2033.

The Company had no material capital leases as of December 31, 2021.

Maturities of operating lease liabilities as of December 31, 2021 were as follows (in thousands):

2022	\$ 5,419
2023	4,796
2024	3,733
2025	3,148
2026	2,615
Thereafter	12,096
Total undiscounted lease payment	<u>31,807</u>
Less: imputed interest	<u>(6,760)</u>
Total lease liabilities	<u>\$ 25,047</u>

Operating lease expense was \$4.2 million, \$4.0 million, and \$3.4 million for the years ended December 31, 2021, 2020 and 2019, respectively.

Short-term and variable lease expenses for the years ended December 31, 2021, 2020 and 2019 were not significant.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

7. Leases (cont.)

Supplemental cash flow information related to leases were as follows (in thousands):

	Year Ended December 31	
	2021	2020
Cash paid for amounts included in the measurement of lease liabilities:		
Operating cash flows from operating leases	\$ (4,209)	\$ (3,855)
Lease liabilities arising from obtaining right-of-use assets:		
Operating lease	\$ 17,573	\$ 7

Operating lease right-of-use assets and liabilities consist of the following (in thousands):

	December 31,	
	2021	2020
Operating leases		
Operating lease right-of-use assets	\$ 24,282	\$ 10,310
Operating lease liabilities, current	\$ 4,084	\$ 3,153
Operating lease liabilities, non-current	20,963	7,891
Total operating lease liabilities	\$ 25,047	\$ 11,044

The weighted average remaining lease term and discount rate of operating leases are 7.6 years and 5.8%, respectively, as of December 31, 2021. The weighted average remaining lease term and discount rate of operating leases are 4.0 years and 4.9%, respectively, as of December 31, 2020.

As of December 31, 2021, the Company had no significant finance leases and no significant additional leases that have not yet commenced.

8. Commitments and Contingencies*Purchase Commitments*

As of December 31, 2021, the Company had outstanding inventory and other purchase commitments of \$2.1 billion.

Letters of Credit

As of December 31, 2021, the Company had letters of credit outstanding totaling \$14.5 million, which will expire over various dates in 2022.

Guarantees

The Company provided guarantees of lease payments for vehicles under the financing transaction discussed in Note 5, in the event the lessee does not make payments to the financing company.

The Company regularly reviews its performance risk under the arrangements, and in the event that it becomes probable that it will be required to perform under a guarantee, the fair value of probable payment will be recorded. No guarantee liability was recorded as of December 31, 2021 and 2020.

Legal Proceedings

The Company accrues contingent liabilities when it is probable that future expenditures will be made and such expenditures can be reasonably estimated. From time to time in the normal course of business, various claims and litigation have been asserted or commenced. Due to uncertainties inherent in litigation and other claims, the

PROTERRA INC
NOTES TO FINANCIAL STATEMENTS

8. Commitments and Contingencies (cont.)

Company can give no assurance that it will prevail in any such matters, which could subject the Company to significant liability or damages. Any claims or litigation could have an adverse effect on the Company's business, financial position, operating results, or cash flows in or following the period that claims or litigation are resolved.

As of December 31, 2021, the Company was not a party to any legal proceedings that would have a material adverse effect on its business.

9. Stockholders' Equity

On June 14, 2021, the Merger was consummated and, following the Closing, the Company is authorized to issue 510,000,000 shares of capital stock, with a par value of \$0.0001 per share. The authorized shares consisted of 500,000,000 shares of common stock and 10,000,000 shares of preferred stock. As of December 31, 2021, 221,959,711 shares of common stock were issued and outstanding, and no shares of preferred stock were issued and outstanding. The holders of each share of common stock are entitled to one vote per share. There were 6,361,952 shares of Legacy Proterra common stock issued and outstanding as of December 31, 2020.

The Company has retroactively adjusted the shares of Legacy Proterra stock issued and outstanding prior to June 14, 2021 to give effect to the Exchange Ratio of 0.8925 established in the Merger Agreement to determine the number of shares of Proterra common stock into which they were converted. Immediately prior to the Merger, Legacy Proterra was authorized to issue 271,920,636 shares of stock, with a par value of \$0.0001 per share, with 156,276,750 shares designated as common stock and 115,643,886 shares of convertible preferred stock. All of the outstanding Legacy Proterra convertible preferred stock was converted to Legacy Proterra common stock immediately prior to the Merger. See Note 3, Reverse Recapitalization.

The following table summarizes Legacy Proterra convertible preferred stock authorized and issued and outstanding as of December 31, 2020 (in thousands):

	Shares Authorized	Shares Issued and Outstanding	Net Carrying Value	Aggregate Liquidation Preference
Series 1 ⁽¹⁾	24,604	24,522	\$ 79,564	\$ 75,006
Series 2	5,417	5,417	24,868	24,953
Series 3	6,799	6,799	36,096	36,475
Series 4	8,175	7,749	29,901	30,000
Series 5	25,339	25,339	138,747	142,987
Series 6	12,888	12,888	79,085	80,000
Series 7	21,197	21,197	151,770	155,000
Series 8	11,225	11,225	86,648	86,875
Total	115,644	115,136	\$ 626,679	\$ 631,296

(1) Including Series 1 convertible preferred stock issued through exercise of warrants and the proceeds was \$0.5 million.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

9. Stockholders' Equity (cont.)

As of December 31, 2021, the Company had reserved shares of common stock for issuance as follows (in thousands):

2010 Equity Incentive Plan	21,040
2021 Equity Incentive Plan	10,856
2021 Employee Stock Purchase Plan	1,630
Warrants	1
Earnout Stock	18,009
Total	<u>51,536</u>

As of December 31, 2020, the Company had reserved shares of common stock, on an as-if-converted basis, for issuance as follows (in thousands):

Exercise of stock options to purchase common stock	23,526
Exercise of common stock warrants to purchase common stock	4,596
Issuances of shares available under stock option plans	395
Conversion of convertible preferred stock	115,576
Conversion of convertible preferred stock warrants	508
Total	<u>144,601</u>

10. Warrants*Public Warrants*

Public warrants were only exercisable for a whole number of shares of common stock at a price of \$11.50 per share, subject to adjustment, at any time commencing on September 25, 2021, provided in each case that the Company had an effective registration statement under the Securities Act covering the common stock issuable upon exercise of the warrants and a current prospectus relating to them was available (or the Company permitted holders to exercise their warrants on a cashless basis under the circumstances specified in the Amended and Restated Warrant Agreement) and such shares were registered, qualified or exempt from registration under the securities, or blue sky, laws of the state of residence of the holder. The warrants were to expire June 14, 2026 or earlier upon redemption or liquidation.

Once the warrants became exercisable, the Company was able to redeem the outstanding warrants (except as described herein with respect to the private placement warrants):

Redemption of warrants when the price per share of common stock equals or exceeds \$18.00.

Once the warrants become exercisable, the Company may redeem the outstanding warrants:

- in whole and not in part;
- at a price of \$0.01 per warrant;
- upon a minimum of 30 days' prior written notice of redemption to each warrant holder; and
- if, and only if, the closing price of the common stock equaled or exceeded \$18.00 per share (as adjusted for share splits, share capitalizations, reorganizations, recapitalizations and the like) for any 20 trading days within a 30- trading day period ending three trading days before the Company sent the notice of redemption to the warrant holders.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

10. Warrants (cont.)

Redemption of warrants when the price per share of common stock equals or exceeds \$10.00.

Once the warrants became exercisable, the Company was able to redeem the outstanding warrants:

- in whole and not in part;
- at \$0.10 per warrant upon a minimum of 30 days' prior written notice of redemption provided that holders were able to exercise their warrants on a cashless basis prior to redemption and receive that number of shares determined by reference to the make-whole exercise table specified in the Amended and Restated Warrant Agreement, based on the redemption date and the "fair market value" of common stock (as provided in such table) except as otherwise provided for in the Amended and Restated Warrant Agreement; and
- if, and only if, the closing price of the shares of common stock equaled or exceeded \$10.00 per public share (as adjusted for share subdivisions, share dividends, reorganizations, reclassifications, recapitalizations and the like) for any 20 trading days within the 30-trading day period ending three trading days before the Company sent the notice of redemption to the warrant holders.

In addition, if the closing price of the common stock for any 20 trading days within a 30-trading day period ending on the third trading day prior to the date on which the Company sent the notice of redemption to the warrant holders was less than \$18.00 per share (as adjusted for share subdivisions, share dividends, reorganizations, reclassifications, recapitalizations and the like), the private placement warrants could also be, and were, concurrently called for redemption on the same terms as the outstanding public warrants, as described above.

Beginning on the date the notice of redemption was given until the warrants were redeemed or exercised, holders were able to elect to exercise their warrants on a cashless basis.

The public warrants were classified as liabilities as they did not meet the requirements for equity classification under Topic 815, Derivatives and Hedging. Immediately prior to the Closing, the warrant liability was \$84.6 million. Such warrants were measured at fair value, subject to remeasurement at each balance sheet date.

Private Placement Warrants

Except as described below, the private placement warrants had terms and provisions that were identical to those of the public warrants. The private placement warrants (including the shares of common stock issuable upon exercise of the private placement warrants) were not transferable, assignable or salable until July 14, 2021, except pursuant to limited exceptions to the Company's officers and directors and other persons or entities affiliated with the Sponsor, and they were not redeemable by the Company, except as described above when the price per share of common stock equaled or exceeded \$10.00, so long as they were held by the Sponsor or its permitted transferees (except as otherwise set forth herein). The Sponsor, or its permitted transferees, had the option to exercise the private placement warrants on a cashless basis. If the private placement warrants were held by holders other than the Sponsor or its permitted transferees, the private placement warrants were redeemable by the Company in all redemption scenarios and exercisable by the holders on the same basis as the public warrants. Any amendment to the terms of the private placement warrants or any provision of the Amended and Restated Warrant Agreement with respect to the private placement warrants required a vote of holders of at least 65% of the number of the then outstanding private placement warrants.

The private placement warrants were classified as liabilities as they did not meet the requirements for equity classification under Topic 815, Derivatives and Hedging. Immediately prior to the Closing, the warrant liability was \$57.6 million. Such warrants were measured at fair value, subject to remeasurement at each balance sheet date.

On September 27, 2021, the Company announced that it would be redeeming all of its outstanding public warrants and private placement warrants (collectively, the "Warrants") based on the terms in the Amended and

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

10. Warrants (cont.)

Restated Warrant Agreement dated June 14, 2021. On October 29, 2021 (the “Redemption Date”), any Warrants that remained unexercised became void and no longer exercisable, and the holders of those Warrants were entitled to receive only the redemption price of \$0.10 per Warrant. In connection with the redemption, holders of Warrants had the option to either exercise the Warrants in cash or on a “cashless” basis to receive 0.255 shares of common stock per warrant.

In October 2021, 10,599 public warrants were exercised for cash resulting in the issuance of 10,599 shares of common stock for an aggregate exercise price of \$121,889, 13,436,250 public warrants and 7,550,000 private placement warrants were exercised on a cashless basis resulting in the issuance of 5,351,231 shares of common stock, and 428,145 public warrants were redeemed for cash for an aggregate redemption price of \$42,815. In connection with the warrant exercise and redemption, \$53.4 million of the carrying amount of the warrant liability was reclassified to stockholder’s equity.

Other Warrants

As of December 31, 2021, the Company had 892 common stock warrants outstanding exchanged from Legacy Proterra warrants. As of December 31, 2020, the Company had 5,104,030 warrants outstanding, including 4,562,533 warrants issued to the holders of Convertible Notes as described in Note 6.

Activity of warrants in the year ended December 31, 2021 is as follows:

	Public warrants	Private placement warrants	Other warrants	Total warrants
Outstanding as of December 31, 2020	—	—	5,104,030	5,104,030
Issued as part of the Merger	13,874,994	7,550,000	—	21,424,994
Exercised ⁽¹⁾	(13,446,849)	(7,550,000)	(5,103,138)	(26,099,987)
Redeemed	(428,145)	—	—	(428,145)
Outstanding as of December 31, 2021	—	—	892	892

(1) An aggregate of 10,348,690 shares of common stock were issued from warrant exercise.

11. Equity Plans and Stock-based Compensation

2010 Equity Incentive Plan

Legacy Proterra’s 2010 Equity Incentive Plan (the “2010 Plan”) was terminated upon the effective date of Proterra’s 2021 Equity Incentive Plan (the “2021 Plan”), and accordingly, no shares will be available for grant under the 2010 Plan. Upon Closing, the outstanding awards under the 2010 Plan were converted into options exercisable to purchase an aggregate of 22,532,619 shares of common stock. Following the Closing, the exchanged options continue to be subject to the terms of the 2010 Plan and applicable award agreements. As of December 31, 2021, options to purchase 21,040,149 shares of common stock remained outstanding under the 2010 Plan.

2021 Equity Incentive Plan

The 2021 Plan was adopted by the ArcLight Board prior to the Closing, approved by ArcLight’s shareholders on June 11, 2021, and became effective upon the Closing Date. The Equity Incentive Plan allows the Company to grant awards of stock options, restricted stock awards, stock appreciation rights (“SARs”), restricted stock units (“RSUs”), performance awards, and stock bonus awards to officers, employees, directors and consultants.

The Company initially reserved 10,000,000 shares of common stock, plus 387,531 reserved shares not issued under the 2010 Plan on the effective date of the 2021 Plan. The number of shares reserved for issuance under the 2021 Plan will increase automatically on January 1 of each of 2022 through 2031 by the number of

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

11. Equity Plans and Stock-based Compensation (cont.)

shares equal to the lesser of 4% of the total number of outstanding shares of all classes of common stock as of the immediately preceding December 31, or a number as may be determined by the Board.

The exercise price of stock options granted must be at least equal to the fair market value of common stock on the date of grant. Incentive stock options granted to an individual who holds, directly or by attribution, more than ten percent of the total combined voting power of all classes of capital stock must have an exercise price of at least 110% of the fair market value of common stock on the date of grant. Subject to certain adjustments, no more than 30,000,000 shares may be issued pursuant to the exercise of incentive stock options granted under the 2021 Plan.

The maximum term of options granted is ten years from the date of grant, except that the maximum permitted term of incentive stock options granted to an individual who holds, directly or by attribution, more than ten percent of the total combined voting power of all classes of capital stock is five years from the date of grant.

Stock option and RSU awards generally vest annually over a four-year period.

2021 Employee Stock Purchase Plan

Proterra's 2021 Employee Stock Purchase Plan (the "ESPP"), including the authorization of the initial share reserve thereunder, was adopted by the ArcLight Board prior to the Closing, approved by ArcLight's shareholders on June 11, 2021, and became effective upon the Closing Date.

An aggregate of 1,630,000 shares of common stock were reserved and available for sale under the ESPP. The aggregate number of shares reserved for sale under the ESPP will increase automatically on January 1 of each of 2022 through 2031 by a number of shares equal to the lesser of 1% of the total number of outstanding shares of common stock as of the immediately preceding December 31 or a number of shares as may be determined by the Board or the compensation committee. The aggregate number of shares issued over the term of the ESPP, subject to certain adjustments, may not exceed 16,300,000 shares.

The ESPP allows eligible employees to purchase shares of our common stock at a discount through payroll deductions of up to 15% of their eligible compensation, at not less than 85% of the fair market value, as defined in the ESPP, subject to any plan limitations. A participant may purchase a maximum of 2,500 shares during each 6-month offering period and \$25,000 in any one calendar year. The offering period generally start on the first trading day on or after November 15th and May 15th of each year. The Company calculated the fair value of the employees' purchase rights relating to the ESPP using the Black-Scholes model and recorded approximately \$0.2 million of stock-based compensation expense for the year ended December 31, 2021.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

11. Equity Plans and Stock-based Compensation (cont.)

A summary of the Company's stock option activity and related information was as follows:

	Options Outstanding			
	Number of Stock Options Outstanding	Weighted- Average Exercise Price	Weighted-Average Remaining Contractual Life (Years)	Aggregate Intrinsic Value (in thousands)
Balance as of December 31, 2018	16,527,278	\$ 2.92	8.3	\$ 42,951
Granted	2,998,747	5.86		
Exercised	(811,514)	2.13		
Cancelled/forfeited/expired	(506,198)	3.92		
Balance as of December 31, 2019	<u>18,208,313</u>	<u>\$ 3.42</u>	<u>7.6</u>	<u>\$ 34,723</u>
Granted	5,829,698	4.89		
Exercised	(1,750,822)	2.40		
Cancelled/forfeited/expired	(2,108,405)	4.61		
Balance as of December 31, 2020 ⁽¹⁾	<u>20,178,784</u>	<u>\$ 3.81</u>	<u>7.4</u>	<u>\$ 65,056</u>
Granted	726,309	10.42		
Exercised	(1,966,532)	3.36		
Cancelled/forfeited/expired	(836,977)	4.65		
Balance as of December 31, 2021 ⁽¹⁾	<u>18,101,584</u>	<u>\$ 4.08</u>	<u>5.5</u>	<u>\$ 87,425</u>
Exercisable as of December 31, 2021 ⁽²⁾	13,200,160	3.44	4.6	\$ 71,087

(1) Excluding Equity Awards of 2,677,500 shares and Milestone Options of 669,375 shares. Refer to section below for further details.

(2) Excluding 1,171,408 shares exercisable under the Equity Awards with weighted average exercise price of \$19.61 per share as of December 31, 2021.

In March 2020, in conjunction with Mr. Allen's appointment as the President and Chief Executive Officer, the board of directors approved a grant to Mr. Allen of stock option awards with respect to 4,685,624 shares, comprised of (1) 1,338,749 shares of a time-based award with an exercise price of \$5.33 per share vesting quarterly over 4 years, (2) 2,677,500 shares of a time-based award consisting of 4 tranches with an exercise price of \$11.21, \$16.81, \$22.41 and \$28.02 per share, respectively, and vesting quarterly over 4 years ("Equity Awards"), and (3) 669,375 shares of milestone-based award with an exercise price of \$5.33 per share vesting entirely and becoming exercisable on the first trading day following the expiration of the lockup period of the Company's initial public offering or the consummation of a change in control of the Company or upon the consummation of a merger involving a Special Purpose Acquisition Company ("Milestone Options").

The stock-based compensation expense for Milestone Options was recognized at the time the performance milestone became probable of achievement, which was at the time of Closing. Upon Closing, 669,375 shares underlying the Milestone Options fully vested, and \$2.1 million stock-based compensation expense was recognized in June 2021.

Aggregate intrinsic value represents the difference between the estimated fair value of the underlying common stock and the exercise price of outstanding, in-the-money stock options. The total intrinsic value of stock options exercised was \$12.1 million, \$4.3 million and \$2.9 million for the year ended December 31, 2021, 2020 and 2019, respectively. The total estimated grant date fair value of stock options vested was \$13.8 million, \$9.9 million and \$8.3 million for the year ended December 31, 2021, 2020 and 2019, respectively. As of December 31, 2021, the total unrecognized stock-based compensation expense related to outstanding stock options was \$23.4 million, which is expected to be recognized over a weighted-average period of 2.3 years.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

11. Equity Plans and Stock-based Compensation (cont.)*Determining Fair Value of Stock Options*

The Company uses the Black-Scholes option pricing model to determine the fair value of stock options. The fair value of each stock option grant is estimated on the date of the grant. The fair value of the Legacy Proterra common stock underlying the stock options has historically been determined by the board of directors, as there was no public market for the Company's common stock prior to Merger Closing. Therefore, the board of directors has determined the fair value of the common stock at the time of the stock option grant by considering a number of objective and subjective factors including independent third-party valuation reports, valuations of comparable companies, sales of convertible preferred stock and common stock to unrelated third parties, operating and financial performance, lack of liquidity of capital stock and general and industry-specific economic outlook, among other factors.

The fair value of stock options granted is estimated on the date of grant using the following assumptions:

	Year Ended December 31,		
	2021	2020	2019
Expected term (in years)	6.2	6.1	6.1
Risk-free interest rate	1.0 %	0.5 %	1.8 %
Expected volatility	54.8 %	69.1 %	65.4 %
Expected dividend rate	—	—	—

Expected Term — The Company estimates the expected term consistent with the simplified method. The Company elected to use the simplified method because of its limited history of stock option exercise activity. The simplified method calculates the expected term as the average of the vesting and contractual terms of the award.

Volatility — Since the Company has limited trading history by which to determine the volatility of its own common stock price, the expected volatility being used is primarily derived from the historical stock volatility of a representative industry peer group of comparable publicly listed companies over a period approximately equal to the expected term of the stock options.

Risk-Free Interest Rate — The risk-free interest rate is based on U.S. Treasury zero coupon issues with remaining terms similar to the expected term on the options.

Expected Dividend — The Company has never declared or paid any cash dividends and does not plan to pay cash dividends in the foreseeable future, and, therefore, used an expected dividend yield of zero in the valuation model.

Forfeiture — All stock-based payment awards are amortized on a straight-line basis over the requisite service periods of the awards, which are generally the vesting periods. The Company accounts for forfeitures when they occur.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

11. Equity Plans and Stock-based Compensation (cont.)
Restricted Stock Units

A summary of the Company's RSU activity and related information is as follows:

	Number of RSUs	Weighted Average Grant Date Fair Value
Balance as of December 31, 2020	—	\$ —
Granted	1,480,201	10.72
Vested	(58,731)	11.41
Forfeited	(96,510)	10.98
Balance as of December 31, 2021	1,324,960	\$ 10.67

The Company started to grant RSUs to employees in the third quarter of 2021. The compensation expense related to the service-based awards is determined using the fair market value of the Company's common stock on the date of the grant. As of December 31, 2021, the total unrecognized stock-based compensation expense related to outstanding RSUs was \$12.8 million, which is expected to be recognized over a weighted-average period of 3.5 years.

Stock-based Compensation Expense

Stock-based compensation expense included in operating results was as follows (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Cost of goods sold	\$ 1,385	\$ 929	\$ 826
Research and development	2,507	1,616	1,436
Selling, general and administrative	12,169	7,737	6,258
Total stock-based compensation expense	\$ 16,061	\$ 10,282	\$ 8,520

12. Net Loss Per Share

Basic net loss per share is computed by dividing the net loss by the weighted-average number of shares of common stock outstanding during the period, less the weighted-average unvested common stock subject to repurchase or forfeiture as they are not deemed to be issued for accounting purposes. Diluted net loss per share is computed by giving effect to all potential shares of common stock, including stock options, RSU, and warrants, to the extent they are dilutive.

The computation of basic and diluted net loss per share of common stock attributable to common stockholders was as follows (in thousands, except for per share data):

	Year Ended December 31,		
	2021	2020	2019
Numerator:			
Net loss	\$ (250,006)	\$ (127,007)	\$ (101,552)
Denominator:			
Weighted-average shares used in computing net loss per share of common stock, basic and diluted	120,886	4,385	3,616
Net loss per share of common stock, basic and diluted	\$ (2.07)	\$ (28.96)	\$ (28.08)

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

12. Net Loss Per Share (cont.)

As a result of the Merger, the Company has retroactively adjusted the weighted-average number of shares of common stock outstanding prior to the Closing Date by multiplying them by the Exchange Ratio of 0.8925 used to determine the number of shares of common stock into which they converted.

Prior to the Closing Date, the Company applied the two-class method to calculate its basic and diluted net loss per share of common stock, as the convertible preferred stock were participating securities. The two-class method is an earnings allocation formula that treats a participating security as having rights to earnings that otherwise would have been available to common stockholders. However, the two-class method did not impact the net loss per share of common stock as the Company was in a loss position for each of the periods presented and holders of convertible preferred stock did not participate in losses. Post the Closing Date, the Company applies the treasury stock method when calculating the diluted net income (loss) per share of common stock and "if-converted" method for Convertible Notes when applicable.

The outstanding Convertible Notes including accrued interest will be automatically converted to common stock at \$6.5712 per share pursuant to the mandatory conversion provisions, if and when the VWAP exceeds \$9.86 over 20 consecutive days subsequent to January 13, 2022.

Since the Company was in a loss position for each of the periods presented, diluted net loss per share is the same as basic net loss per share for each period as the inclusion of potential common stock shares outstanding would have been anti-dilutive. The potentially dilutive securities were as follows (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Convertible preferred stock ⁽¹⁾	—	115,576	115,576
Warrants to purchase convertible preferred stock	—	508	508
Stock options and RSUs to purchase common stock	22,773	23,526	18,209
Warrants to purchase common stock	1	4,596	105
	<u>22,774</u>	<u>144,206</u>	<u>134,398</u>

(1) Represents the shares of common stock that the convertible preferred stock is convertible into.

13. Income Tax

The components of the net loss before the provision for income taxes were as follows (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Domestic	(249,990)	(127,007)	(101,552)

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

13. Income Tax (cont.)

The provision for income taxes consisted of the following (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Current:			
Federal	\$ —	\$ —	\$ —
State	16	13	—
Foreign	—	9	—
Total current provision	16	22	—
Deferred:			
Federal	—	—	—
State	—	—	—
Foreign	—	—	—
Total deferred provision	—	—	—
Total provision for income taxes	\$ 16	\$ 22	\$ —

A reconciliation of the U.S. federal statutory income tax rates to our effective tax rate is as follows (in percentages):

	Year Ended December 31,		
	2021	2020	2019
U.S. federal statutory rate	21.0 %	21.0 %	21.0 %
State income taxes, net of federal benefit	3.9	1.7	3.4
Change in valuation allowance	(17.9)	(17.5)	(23.9)
Research and development credit	0.5	0.2	0.3
Fair market value adjustment ⁽¹⁾	(5.9)	(2.1)	—
Non-deductible Convertible Notes interest expense	(1.5)	(2.2)	—
Other	(0.1)	(1.1)	(0.8)
Effective income tax rate	— %	— %	— %

(1) The adjustments related to the loss on valuation of derivative and warrant liabilities.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

13. Income Tax (cont.)

Our deferred tax assets (liabilities) are as follows (in thousands):

	December 31,	
	2021	2020
Deferred tax assets:		
Net operating loss carryforwards	\$ 150,857	\$ 113,643
Deferred revenue	9,419	6,731
Stock-based compensation	4,679	3,560
Accruals and reserves, not currently deductible for tax purposes	10,665	8,351
Research and development credit	4,562	2,761
Goodwill	888	1,014
Interest expense	1,808	2,097
Lease liability	6,511	2,738
Other	381	44
Gross deferred tax assets	189,770	140,939
Less valuation allowance	(182,113)	(137,437)
Net deferred tax assets	<u>\$ 7,657</u>	<u>\$ 3,502</u>
Deferred tax liabilities:		
Property, plant and equipment	(1,344)	(1,008)
ROU assets	(6,313)	(2,494)
Other	—	—
Gross deferred tax liabilities	(7,657)	(3,502)
Net deferred tax asset (liabilities)	<u>\$ —</u>	<u>\$ —</u>

The net valuation allowance increased by \$44.7 million and \$22.3 million for December 31, 2021 and 2020, respectively.

As of December 31, 2021 and 2020, the Company's net deferred tax assets and liabilities were zero. The deferred tax assets consist primarily of the federal and state net operating losses. Realization of deferred tax assets is dependent upon future taxable income, if any, the amount and timing of which are uncertain. In assessing the realizability of deferred tax assets, management determined that it is more likely than not that no deferred tax assets will be realized. Therefore, the Company has provided a full valuation allowance against these deferred tax assets.

The Company had net operating loss carryforwards as follows (in thousands):

	December 31,	
	2021	2020
Federal (Prior to 2018)	\$ 237,850	\$ 237,850
Federal (Post December 31, 2017)	361,815	216,724
State	437,868	317,801
Total	<u>\$ 1,037,533</u>	<u>\$ 772,375</u>

Net operating loss carryforwards are available to offset future federal and state taxable income. The federal net operating loss carryforwards generated prior to 2018 will begin to expire in 2030 and the net operating loss carryforwards generated after December 31, 2017 do not expire. The state net operating loss carryforwards will begin to expire in 2023.

PROTERRA INC
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

13. Income Tax (cont.)

The Company had research and development credit carryforwards as follows (in thousands):

	December 31,	
	2021	2020
Federal	\$ 3,454	\$ 2,020
State	2,471	1,231
Total	\$ 5,925	\$ 3,251

The research and development credit carryforwards are available to reduce future regular income taxes. The federal research and development credit carryforwards will begin to expire in 2037, while the South Carolina research and development credit carryforwards will begin to expire in 2027. California research and development credit carryforwards have no expiration date.

Utilization of the Company's net operating loss carryforwards and research tax credit carryforwards may be subject to substantial annual limitations due to the ownership change limitations provided by the Internal Revenue Code and similar state provisions. The annual limitation could result in the expiration of the net operating loss carryforwards and research tax credit carryforwards before utilization.

The Company's policy is to recognize interest or penalties related to income tax matters in income tax expense. As of December 31, 2021 and 2020, the Company had no accrued interest or penalties. The unrecognized tax benefits may change during the next year for items that arise in the ordinary course of business. In the event that any unrecognized tax benefits are recognized, the effective tax rate will not be affected.

A reconciliation of the beginning and ending amount of unrecognized tax benefits for 2021, 2020 and 2019 was as follows (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Beginning balance	\$ 813	\$ 707	\$ 527
Increase – tax positions in current period	668	106	180
Ending balance	\$ 1,481	\$ 813	\$ 707

The Company files tax returns in the United States and certain states. Due to the losses being carried forward, the tax years from 2010 forward remain open to examination.

14. 401(k) Plan

The Company sponsors a 401(k) defined contribution plan covering all eligible employees and provides matching contribution for the first 4% of their salaries. The matching contribution costs incurred were \$2.4 million, \$1.9 million, and \$1.7 million for the years ended December 31, 2021, 2020 and 2019, respectively.

Item 9. Changes in and Disagreements With Accountants on Accounting and Financial Disclosures

Not applicable.

Item 9A. Controls and Procedures

Disclosure Controls and Procedures

Disclosure controls and procedures are controls and other procedures that are designed to ensure that information required to be disclosed in our reports filed or submitted under the Exchange Act, is recorded, processed, summarized and reported within the time periods specified in the rules and forms of the Securities and Exchange Commission (the "SEC"). Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed in company reports filed or submitted under the Exchange Act is accumulated and communicated to management, including our Chief Executive Officer and Chief Financial Officer, to allow timely decisions regarding required disclosure.

As of December 31, 2021, as required by Rules 13a-15 and 15d-15 under the Exchange Act, our Chief Executive Officer and Chief Financial Officer carried out an evaluation of the effectiveness of the design and operation of our disclosure controls and procedures. Based upon their evaluation, our Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act) were effective.

Management's Report on Internal Control over Financial Reporting

As discussed elsewhere in this Annual Report, we completed the Business Combination on June 14, 2021. Prior to the Business Combination, we were a special purpose acquisition company formed for the purpose of effecting a merger, capital stock exchange, asset acquisition, stock purchase, reorganization or other similar business combination with one or more operating businesses. As a result, previously existing internal controls are no longer applicable or comprehensive enough as of the assessment date as our operations prior to the Business Combination were insignificant compared to those of the consolidated entity post-Business Combination. We have, since the Closing of the Business Combination, engaged in the process of design and implementation of our internal control over financial reporting in a manner commensurate with the scale of our operations. However, the design of internal control over financial reporting for our company post-Business Combination has required, and will continue to require, significant time and resources from management and other personnel. As a result, management was unable, without incurring unreasonable effort or expense to conduct an assessment of our internal control over financial reporting as of December 31, 2021. Accordingly, we are excluding management's report on internal control over financial reporting pursuant to Section 215.02 of the SEC Division of Corporation Finance's Regulation S-K Compliance & Disclosure Interpretations.

Changes in Internal Control Over Financial Reporting

During the fiscal quarter ended December 31, 2021, we continue to be engaged in the process of design and implementation of our internal control over financial reporting in a manner commensurate with the scale of our operations subsequent to the Business Combination, as described in more detail above.

Item 9B. Other Information

None.

Item 9C. Disclosure Regarding Foreign Jurisdictions that Prevent Inspections

Not applicable.

PART III

Item 10. Directors, Executive Officers and Corporate Governance

The information required by this item is incorporated by reference to our Proxy Statement for the 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2021.

Our Board adopted a code of business conduct and ethics that applies to all of our employees, officers and directors, including our President and Chief Executive Officer, Chief Financial Officer, and other executive and senior officers. The full text of this code of business conduct and ethics is posted on the investor relations page of our website. The reference to our website address in this filing does not include or incorporate by reference the information on that website into this filing. We intend to disclose future amendments to certain provisions of this code of business conduct and ethics, or waivers of these provisions, on our website or in public filings to the extent required by the applicable rules.

Item 11. Executive Compensation

The information required by this item is incorporated by reference to our Proxy Statement for the 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2021.

Item 12. Security Ownership of Certain Beneficial Owner and Management and Related Stockholder Matters

The information required by this item is incorporated by reference to our Proxy Statement for the 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2021.

Item 13. Certain Relationships and Related Person Transactions

The information required by this item is incorporated by reference to our Proxy Statement for the 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2021.

Item 14. Principal Accountant Fees and Services

The information required by this item is incorporated by reference to our Proxy Statement for the 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2021.

PART IV

Item 15. Exhibits and Financial Statement Schedules.

(a) The following documents are filed as part of this report:

1. Financial Statements

See Index to Financial Statements under Part II, Item 8 of this Annual Report.

2. Financial Statement Schedules

Schedules not listed above have been omitted because they are not required, not applicable, or the required information is otherwise included.

3. Exhibits

The exhibits listed below are filed as part of this Annual Report or are incorporated by reference as indicated.

Exhibit Number	Description	Incorporated by Reference		
		Form	Exhibit	Filing Date
2.1†	Agreement and Plan of Merger, dated as of January 11, 2021, by and among Arclight Clean Transition Corp., Phoenix Merger Sub, Inc., and Proterra Inc	8-K	2.1	1/12/2021
3.1	Certificate of Incorporation of the Registrant	8-K	3.1	6/17/2021
3.1.1	Certificate of Amendment to the Certificate of Incorporation of the Registrant	8-K	3.1.1	6/17/2021
3.2	Restated Bylaws of the Registrant	8-K	3.2	6/17/2021
4.1*	Description of Registrant's Securities			
10.1	Form of Registrant's Indemnification Agreement	S-4/A	10.1	4/7/2021
10.2+	2010 Equity Incentive Plan, as amended, and forms of equity agreements thereunder	S-4/A	10.2	4/7/2021
10.3+	Form of Severance Agreement for executive officers	S-4/A	10.3	4/7/2021
10.4**	AIR Commercial Real Estate Association Standard Industrial/Commercial Single-Tenant Lease — Net, dated April 23, 2015 and amended January 30, 2018, and further amended June 18, 2019 by and between G&T Properties and Proterra Inc	S-4/A	10.4	4/7/2021
10.5**	Lease Agreement, dated May 8, 2015, by and between PAC Operating Limited Partnership and Proterra Inc, as amended February 8, 2019	S-4/A	10.5	4/7/2021
10.6	Lease Agreement, dated March 21, 2018, by and between Smith Development Company, Inc. and Proterra Inc	S-4/A	10.6	4/7/2021
10.7**	Sublease Agreement, dated February 26, 2019, by and between International Transport Innovation Center and Proterra Inc	S-4/A	10.7	4/7/2021
10.8**	Amended and Restated Product Supply Agreement, dated November 3, 2017, by and between TPI Inc. and Proterra Inc as amended December 31, 2018, October 1, 2019, and May 13, 2020	S-4/A	10.8	4/7/2021
10.9**	Loan, Guaranty and Security Agreement, dated May 8, 2019, by and between Bank of America, N.A. and Proterra Inc, as amended August 4, 2020	S-4/A	10.9	4/7/2021
10.10**	The Note Purchase Agreement dated August 4, 2020, by and among CSI Prodigy HoldCo L.P. and CSI Prodigy Co-Investment L.P., and Proterra Inc as amended August 31, 2020 by and among Broadscale PT Investors LP., Generation IM Climate Solutions II, L.P., QPB Holdings Ltd., Palindrome Master Fund, L.P., and Proterra Inc	S-4/A	10.10	4/7/2021
10.11	Form of Subscription Agreement	S-4/A	10.11	5/7/2021
10.12	Amended and Restated Registration Rights Agreement, dated June 14, 2021, by and among Proterra Inc, Arclight CTC Holdings, L.P. and the other Holders party thereto	8-K	10.12	6/17/2021
10.13+	Proterra Inc 2021 Equity Incentive Plan	8-K	10.13	6/17/2021
10.14+	Form of Stock Option Agreement under the Proterra Inc 2021 Equity Incentive Plan.	S-8	99.2	8/16/2021
10.15+	Form of Restricted Stock Unit Award Agreement under the Proterra Inc 2021 Equity Incentive Plan.	S-8	99.3	8/16/2021
10.16+	Form of Restricted Stock Agreement under the Proterra Inc 2021 Equity Incentive Plan.	S-8	99.4	8/16/2021
10.17+	Form of Stock Appreciation Right Agreement under the Proterra Inc 2021 Equity Incentive Plan.	S-8	99.5	8/16/2021
10.18+	Form of Performance Shares Award Agreement under the Proterra Inc 2021 Equity Incentive Plan.	S-8	99.6	8/16/2021
10.19+	Form of Global Stock Option Agreement under the Proterra Inc 2021 Equity Incentive Plan.	S-8	99.7	8/16/2021
10.20+	Form of Stock Bonus Agreement under the Proterra Inc 2021 Equity Incentive Plan.	S-8	99.8	8/16/2021
10.21+	Proterra Inc 2021 Employee Stock Purchase Plan	8-K	10.14	6/17/2021
10.22+	Proterra Inc Key Employee Incentive Plan	S-1	10.15	06/29/2021
10.23	Sponsor Letter Agreement, dated as of January 11, 2021, by and among Arclight CTC Holdings, L.P., Arclight Clean Transition Corp. and Proterra Inc, and certain other parties thereto	S-4/A	10.17	5/7/2021
10.24	Amendment No. 1 to the Sponsor Letter Agreement, dated as of February 2, 2021, by and among Arclight CTC Holdings, L.P., Arclight Clean Transition Corp. and Proterra Inc	S-4/A	10.18	5/7/2021

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Exhibit Number	Description	Incorporated by Reference		
		Form	Exhibit	Filing Date
10.25+	Executive Offer Letter of John J. Allen, dated March 29, 2021	S-4/A	10.19	4/7/2021
10.26+	Executive Offer Letter of Gareth T. Joyce, dated March 23, 2021	S-4/A	10.2	4/7/2021
10.27+*	Executive Offer Letter of Gareth T. Joyce, dated December 7, 2021			
10.28+*	Severance Agreement of Gareth T. Joyce, dated January 1, 2022			
10.29+	Executive Offer Letter of Amy E. Ard, dated March 23, 2021	S-4/A	10.21	4/7/2021
10.30+	Letter Agreement by and between Registrant and Amy E. Ard, dated September 25, 2021	10-Q	10.1	11/12/2021
10.31+*	Executive Offer Letter of Joshua P. Ensign, dated March 23, 2021			
10.32+*	Severance Agreement of Joshua P. Ensign, dated September 11, 2018			
10.33+*	Retention Agreement of Joshua P. Ensign, dated September 15, 2021			
10.34+*	Retention Agreement of JoAnn C. Covington, dated September 15, 2021			
21.1*	List of Subsidiaries	S-1	21.1	6/29/2021
23.1*	Consent of KPMG LLP, independent registered accounting firm for Proterra Inc			
31.1*	Certification of Chief Executive Officer, as required by Rule 13a-14(a) of the Securities Exchange Act of 1934			
31.2*	Certification of Chief Financial Officer, as required by Rule 13a-14(a) of the Securities Exchange Act of 1934			
32.1#	Certification of Chief Executive Officer, as required by Rule 13a-14(b) of the Securities Exchange Act of 1934			
32.2#	Certification of Chief Financial Officer, as required by Rule 13a-14(b) of the Securities Exchange Act of 1934			
101.INS*	XBRL Instance Document			
101.SCH*	XBRL Taxonomy Extension Schema Document			
101.CAL*	XBRL Taxonomy Extension Calculation Linkbase Document			
101.DEF*	XBRL Taxonomy Extension Definition Linkbase Document			
101.LAB*	XBRL Taxonomy Extension Label Linkbase Document			
101.PRES*	XBRL Taxonomy Extension Presentation Linkbase Document			
104*	Cover Page Interactive Data File (formatted in iXBRL and contained in Exhibit 101)			

† Certain of the exhibits and schedules to this Exhibit have been omitted in accordance with Regulation S-K Item 601(a)(5). We agree to furnish a copy of all omitted exhibits and schedules to the SEC upon its request.

+ Indicates a management contract or compensatory plan, contract or arrangement.

* Filed herewith.

** Certain portions of this exhibit have been redacted pursuant to Item 601(b)(10)(iv) of Regulation S-K. The omitted information is (i) not material and (ii) would likely cause competitive harm to the Company if publicly disclosed. The Company agrees to furnish supplementally an unredacted copy of the exhibit to the SEC upon its request.

This certification is deemed not filed for purpose of section 18 of the Exchange Act or otherwise subject to the liability of that section, nor shall it be deemed incorporated by reference into any filing under the Securities Act or the Exchange Act.

Item 16. Form 10-K Summary

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

PROTERRA INC

(Registrant)

By: /s/ GARETH T. JOYCE
Name: Gareth T. Joyce
Title: President and Chief Executive Officer
Date: March 14, 2022

Signature	Title	Date
<u>/s/ GARETH T. JOYCE</u> Gareth T. Joyce	President, Chief Executive Officer and Director <i>(Principal Executive Officer)</i>	March 14, 2022
<u>/s/ KARINA F. PADILLA</u> Karina F. Padilla	Chief Financial Officer <i>(Principal Financial and Accounting Officer)</i>	March 14, 2022
<u>/s/ JOHN J. ALLEN</u> John J. Allen	Chairman of the Board	March 14, 2022
<u>/s/ MARY LOUISE KRAKAUER</u> Mary Louise Krakauer	Director	March 14, 2022
<u>/s/ ROGER M. NIELSEN</u> Roger M. Nielsen	Director	March 14, 2022
<u>/s/ BROOK F. PORTER</u> Brook F. Porter	Director	March 14, 2022
<u>/s/ JOAN ROBINSON-BERRY</u> Joan Robinson-Berry	Director	March 14, 2022
<u>/s/ JEANNINE P. SARGENT</u> Jeannine P. Sargent	Director	March 14, 2022
<u>/s/ CONSTANCE E. SKIDMORE</u> Constance E. Skidmore	Director	March 14, 2022
<u>/s/ MICHAEL D. SMITH</u> Michael D. Smith	Director	March 14, 2022

DESCRIPTION OF THE REGISTRANT'S SECURITIES REGISTERED PURSUANT TO SECTION 12 OF THE SECURITIES EXCHANGE ACT OF 1934, AS AMENDED**Authorized Capitalization**

The total amount of our authorized capital stock consists of 500,000,000 shares of common stock, par value \$0.0001 per share and 10,000,000 shares of preferred stock, par value \$0.0001 per share.

The following summary describes the material provisions of our capital stock. Because it is only a summary, it may not contain all information that is important to an investor in our securities, and we urge you to read our restated certificate of incorporation, as amended (the "Certificate of Incorporation") and our restated bylaws (the "Bylaws"), copies of which are exhibits to this Annual Report on Form 10-K (the "Annual Report"). Defined terms used herein and not defined herein shall have the meaning ascribed to such terms in our Annual Report.

Common Stock

Voting rights. Each outstanding share of our common stock entitles the holder thereof to one vote on each matter properly submitted to stockholders for their vote. Except as otherwise required by law, holders of our common stock will not be entitled to vote on any amendment to the Certificate of Incorporation that relates solely to the terms of one or more outstanding series of preferred stock if the holders of such affected series are entitled, either separately or together as a class with the holders of one or more other such series, to vote thereon pursuant to the Certificate of Incorporation.

Dividend rights. Subject to preferences that may apply to any shares of our preferred stock outstanding at the time, the holders of our common stock are entitled to receive dividends out of funds legally available if our Board, in its discretion, determines to issue dividends and then only at the times and in the amounts that our Board may determine.

Rights upon liquidation. Upon our liquidation, dissolution, or winding-up, the assets legally available for distribution to our stockholders would be distributable ratably among the holders of common stock outstanding at that time, subject to prior satisfaction of all outstanding debt and liabilities and the preferential rights of and the payment of liquidation preferences, if any, on any outstanding shares of preferred stock.

Other rights. No holder of shares of common stock is entitled to preemptive or subscription rights contained in the Certificate of Incorporation or in the Bylaws. There are no redemption or sinking fund provisions applicable to the common stock. The rights, preferences and privileges of holders of our common stock are subject to those of the holders of any shares of our preferred stock that we may issue in the future.

Preferred Stock

We may issue preferred stock from time to time in one or more series. The Board is expressly authorized, subject to any limitations prescribed by the laws of the State of Delaware, to provide, out of unissued shares of preferred stock that have not been designated as to series, with respect to each series, to establish the number of shares to be included in each such series, to fix the designation, powers (including voting powers), preferences and relative, participating, optional or other special rights, if any, of each such series and any qualifications, limitations or restrictions thereof, and, subject to the rights of such series, to thereafter increase (but not above the total number of authorized shares of the preferred stock) or decrease (but not below the number of shares of such series then outstanding) the number of shares of any such series. The issuance of preferred stock could have the effect of decreasing the trading price of common stock, restricting dividends on our capital stock, diluting the voting power of the common stock, impairing the liquidation rights of our capital stock, or delaying or preventing a change in control.

Election of Directors and Vacancies

Subject to the rights of any series of preferred stock then outstanding to elect additional directors under specified circumstances, the directors on our Board currently consists of nine (9) directors, and are divided, with respect to the time for which they severally hold office, into three classes designated as Class I, Class II and Class III, respectively. The initial term of office of the Class I directors will expire at our first annual meeting of stockholders, the initial term of office of the Class II directors shall expire at our

second annual meeting of stockholders following the initial classification of our Board and the initial term of office of the Class III directors shall expire at our third annual meeting of stockholders following the initial classification of our Board. At each annual meeting of stockholders following the initial classification of our Board, directors elected to succeed those directors of the class whose terms then expire shall be elected for a term of office expiring at the third succeeding annual meeting of our stockholders after their election.

Under the Bylaws, except as may be required in the Certificate of Incorporation, directors shall be elected by a plurality of the votes cast by the holders of the shares present in person or represented by proxy at the meeting and entitled to vote on the election of directors.

Each director shall hold office until the annual meeting at which such director's term expires and until such director's successor is elected and qualified or until such director's earlier death, resignation, or removal. Subject to the rights of holders of any series of preferred stock to elect directors, directors may be removed only as provided by the Certificate of Incorporation and applicable law. All vacancies occurring in the Board and any newly created directorships resulting from any increase in the authorized number of directors shall be filled in the manner set forth below.

Subject to the rights of any series of preferred stock then outstanding, any vacancy occurring in our Board for any cause, and any newly created directorship resulting from any increase in the authorized number of directors, shall be filled only by the affirmative vote of a majority of the directors then in office, even if less than a quorum, or by a sole remaining director, and shall not be filled by the stockholders. Any director elected in accordance with the preceding sentence shall hold office for a term expiring at the annual meeting of stockholders at which the term of office for the class in which the vacancy was created or occurred or, in the case of newly created directorships, the class to which the director has been assigned expires and until such director's successor shall have been duly elected and qualified, or until such director's earlier death, resignation, or removal.

If and for so long as the holders of any series of preferred stock have the special right to elect additional directors, the then otherwise total authorized number of our directors shall automatically be increased by such specified number of directors, and the holders of such preferred stock will be entitled to elect the additional directors so provided for or fixed pursuant to the terms of the series of preferred stock. Each such additional director shall serve until such director's successor shall have been duly elected and qualified, or until such director's right to hold such office terminates pursuant to said provisions, whichever occurs earlier, subject to his or her earlier death, resignation, or removal.

Quorum

Except as otherwise provided by applicable law, the Certificate of Incorporation or the Bylaws, at each meeting of stockholders the holders of a majority of the voting power of the shares of stock issued and outstanding and entitled to vote at the meeting, present in person or represented by proxy, shall constitute a quorum for the transaction of business. If a quorum shall fail to attend any meeting, the chairperson of the meeting or, if directed to be voted on by the chairperson of the meeting, the holders of a majority of the voting power of the shares entitled to vote who are present in person or represented by proxy at the meeting may adjourn the meeting. If the adjournment is for more than thirty (30) days, or if after the adjournment a new record date is fixed for the adjourned meeting, then a notice of the adjourned meeting shall be given to each stockholder of record entitled to vote at the meeting. At the adjourned meeting, we may transact any business that might have been transacted at the original meeting. If a quorum is present at the original meeting, it shall also be deemed present at the adjourned meeting.

Anti-takeover Effects of the Certificate of Incorporation and the Bylaws

The Certificate of Incorporation and the Bylaws contain provisions that may delay, defer or discourage another party from acquiring control of us. We expect that these provisions, which are summarized below, will discourage coercive takeover practices or inadequate takeover bids. These provisions are also designed to encourage persons seeking to acquire control of us to first negotiate with the Board, which we believe may result in an improvement of the terms of any such acquisition in favor of our stockholders. However, they also give the board of directors the power to discourage acquisitions that some stockholders may favor.

Authorized but Unissued Capital Stock

Delaware law does not require stockholder approval for any issuance of authorized shares. However, the listing requirements of Nasdaq, which would apply so long as our common stock remains listed on

Nasdaq, require stockholder approval of certain issuances equal to or exceeding 20% of the then outstanding voting power or then outstanding number of shares of our common stock. Additional shares that may be issued in the future may be used for a variety of corporate purposes, including future public offerings, to raise additional capital or to facilitate acquisitions.

One of the effects of the existence of unissued and unreserved common stock may be to enable our Board to issue shares to persons friendly to current management, which issuance could render more difficult or discourage an attempt to obtain control of us by means of a merger, tender offer, proxy contest or otherwise and thereby protect the continuity of management and possibly deprive stockholders of opportunities to sell their shares of common stock at prices higher than prevailing market prices.

Special Meeting, Action by Written Consent and Advance Notice Requirements for Stockholder Proposals

Unless otherwise required by law, and subject to the rights, if any, of the holders of any series of preferred stock, special meetings of our stockholders, for any purpose or purposes, may be called only by a majority of the Board, and our stockholders may not take action by written consent in lieu of a meeting. Notice of all meetings of stockholders shall be given in writing stating the date, time and place, if any, of the meeting, the means of remote communications, if any, by which stockholders and proxy holders may be deemed to be present in person and vote at such meeting and the record date for determining the stockholders entitled to vote at the meeting if such date is different from the record date for determining stockholders entitled to notice of the meeting. Such notice shall also set forth the purpose or purposes for which the meeting is called. Unless otherwise required by applicable law or the Certificate of Incorporation, notice of any meeting of stockholders shall be given not less than ten (10), nor more than sixty (60), days before the date of the meeting to each stockholder of record entitled to vote at such meeting as of the record date for determining stockholders entitled to notice. The Bylaws also provide that any action required or permitted to be taken at any meeting of the Board, or of any committee thereof, may be taken without a meeting if all members of our Board or such committee, as the case may be, consent thereto in writing or by electronic transmission, and the writing or writings or electronic transmission or transmissions are filed with the minutes of proceedings of the New Proterra Board or committee, as applicable. Such filing shall be in paper form if the minutes are maintained in paper form and shall be in electronic form if the minutes are maintained in electronic form.

The Bylaws provide advance notice procedures for stockholders seeking to bring business before an annual meeting of stockholders or to nominate candidates for election as directors at an annual meeting of stockholders. The Bylaws also specify certain requirements regarding the form and content of a stockholder's notice, including disclosure of the proposing stockholders' agreements, arrangements and understandings made in connection with such a proposal or nomination. These provisions may preclude stockholders from bringing matters before an annual meeting of stockholders or from making nominations for directors at an annual meeting of stockholders. We expect that these provisions might also discourage or deter a potential acquirer from conducting a solicitation of proxies to elect the acquirer's own slate of directors or otherwise attempting to obtain control of us. These provisions could have the effect of delaying until the next stockholder meeting any stockholder actions, even if they are favored by the holders of a majority of our outstanding voting securities.

Amendment to Certificate of Incorporation and Bylaws

We may amend or repeal any provision contained in the Certificate of Incorporation in the manner prescribed by the laws of the State of Delaware, and all rights conferred upon stockholders are granted subject to this reservation. Notwithstanding any provision of the Certificate of Incorporation or any provision of law that might otherwise permit a lesser vote or no vote, subject to the rights of any outstanding series of preferred stock, but in addition to any vote of the holders of any class or series of our stock required by law or by the Certificate of Incorporation, the affirmative vote of the holders of at least two-thirds of the voting power of all of the then-outstanding shares of our capital stock entitled to vote generally in the election of directors, voting together as a single class, will be required to amend or repeal any provision of the Certificate of Incorporation. If two-thirds of our Board has approved such amendment or repeal, in which case only the affirmative vote of the holders of at least a majority of the voting power of all of the then-outstanding shares of our capital stock entitled to vote generally in the election of directors, voting together as a single class (in addition to any other vote of the holders of any class or series of our stock required by law or by the Certificate of Incorporation), will be required for such amendment or repeal.

Our Board shall have the power to adopt, amend or repeal the Bylaws. Any adoption, amendment or repeal of the Bylaws by our Board shall require the approval by a majority of the directors on our Board. The stockholders shall also have power to adopt, amend or repeal the Bylaws. Notwithstanding any other provision of the Certificate of Incorporation or any provision of law that might otherwise permit a lesser or no vote, but in addition to any vote of the holders of any class or series of our stock required by applicable law or by the Certificate of Incorporation, the affirmative vote of the holders of at least two-thirds of the voting power of all of the then-outstanding shares of our capital stock entitled to vote generally in the election of directors, voting together as a single class, shall be required for the stockholders to adopt, amend or repeal any provision of the Bylaws. In the case of any proposed adoption, amendment or repeal of any provisions of the Bylaws that is approved by our Board and submitted to the stockholders for adoption thereby, if at least two-thirds of our Board has approved such adoption, amendment or repeal of any provisions of the Bylaws, then only the affirmative vote of the holders of a majority of the voting power of all of the then-outstanding shares of our capital stock entitled to vote generally in the election of directors, voting together as a single class, shall be required to adopt, amend or repeal any provision of the Bylaws.

Delaware Anti-Takeover Statute

Section 203 of the DGCL provides that if a person acquires 15% or more of the voting stock of a Delaware corporation, such person becomes an "interested stockholder" and may not engage in certain "business combinations" with the corporation for a period of three years from the time such person acquired 15% or more of the corporation's voting stock, unless:

- (1) the board of directors approves the acquisition of stock or the merger transaction before the time that the person becomes an interested stockholder;
- (2) the interested stockholder owns at least 85% of the outstanding voting stock of the corporation at the time the merger transaction commences (excluding voting stock owned by directors who are also officers and certain employee stock plans); or
- (3) the merger transaction is approved by the board of directors and at a meeting of stockholders, not by written consent, by the affirmative vote of 2/3 of the outstanding voting stock which is not owned by the interested stockholder.

A Delaware corporation may elect in its certificate of incorporation or bylaws not to be governed by this particular Delaware law. Under the Certificate of Incorporation, we have not opted out of Section 203 of the DGCL and therefore we are subject to Section 203 of the DGCL.

Limitations on Liability and Indemnification of Officers and Directors

Section 145 of the DGCL, authorizes a court to award, or a corporation's board of directors to grant, indemnity to directors and officers under certain circumstances and subject to certain limitations. The terms of Section 145 of the DGCL are sufficiently broad to permit indemnification under certain circumstances for liabilities, including reimbursement of expenses incurred, arising under the Securities Act. As permitted by the DGCL, the Certificate of Incorporation contains provisions that eliminate the personal liability of directors for monetary damages for any breach of fiduciary duties as a director, except liability for the following (i) any breach of a director's duty of loyalty to us or our stockholders; (ii) acts or omissions not in good faith or that involve intentional misconduct or a knowing violation of law; (iii) under Section 174 of the DGCL (regarding unlawful dividends and stock purchases); or (iv) any transaction from which the director derived an improper personal benefit. As permitted by the DGCL, the Bylaws provide that: (i) we are required to indemnify our directors and executive officers to the fullest extent permitted by the DGCL, subject to very limited exceptions; (ii) we may indemnify our other employees and agents as set forth in the DGCL; (iii) we are required to advance expenses, as incurred, to our directors and executive officers in connection with a legal proceeding to the fullest extent permitted by the DGCL, subject to very limited exceptions; and (iv) the rights conferred in the Bylaws are not exclusive.

We have entered into indemnification agreements with each director and executive officer to provide these individuals additional contractual assurances regarding the scope of the indemnification set forth in the Certificate of Incorporation and Bylaws and to provide additional procedural protections. There is no pending litigation or proceeding involving one of our directors or executive officers for which indemnification is sought. The indemnification provisions in the Certificate of Incorporation, Bylaws, and the indemnification agreements entered into between us and each of our directors and executive officers may be sufficiently broad to permit indemnification of our directors and executive officers for liabilities

arising under the Securities Act. We currently carry liability insurance for our directors and officers. Certain of our directors are also indemnified by their employers with regard to service on our Board.

Exclusive Jurisdiction of Certain Actions

The Certificate of Incorporation requires, to the fullest extent permitted by law, unless we consent in writing to the selection of an alternative forum, that the Court of Chancery of the State of Delaware will be the sole and exclusive forum for: (i) any derivative action or proceeding brought on behalf of us; (ii) any action asserting a claim of breach of a fiduciary duty owed by any current or former director, officer, stockholder, employee or agent of ours to us or our stockholders; (iii) any action asserting a claim against us arising pursuant to any provision of the DGCL, the Certificate of Incorporation or the Bylaws or as to which the DGCL confers jurisdiction on the Court of Chancery of the State of Delaware; (iv) any action to interpret, apply, enforce or determine the validity of the Certificate of Incorporation or the Bylaws; or (v) any action governed by the internal affairs doctrine.

In addition, the Bylaws require that, unless we consent in writing to the selection of an alternative forum, the federal district courts of United States shall be the sole and exclusive forum for resolving any action asserting a claim arising under the Securities Act or the Exchange Act.

Transfer Agent

The transfer agent for our common stock is Computershare Trust Company, N.A. and Computershare Inc. (together, "Computershare"). We may designate a new or additional transfer agent for such shares, and we will provide you with notice of such action and of any change in the office through which any such agent will act.

Listing of Common Stock

Our common stock is listed on Nasdaq under the trading symbol "PTRA."

December 7, 2021

Mr. Gareth Joyce

Dear Gareth:

We are pleased to extend this offer to serve as President and Chief Executive Officer of Proterra Inc (collectively with its subsidiaries, the "**Company**" or "**Proterra**"), effective January 1, 2022 ("**Effective Date**"), subject to your election by the Board of Directors.

1. Position and Duties. As of the Effective Date, you will serve as the President and Chief Executive Officer (the "**CEO**") of the Company and will report to the Company's Board of Directors (the "**Board**"). You will render such business and professional services in the performance of your duties, consistent with your position within the Company, as will reasonably be assigned to you by the Board.

2. Board Membership. During your service as Chief Executive Officer, you will serve as a member of the Board, subject to any required Board and/or stockholder approval. Upon your resignation or removal as Chief Executive Officer, you will resign from the Board on the same date. Pursuant to the Board's Director Resignation Policy, you will execute the irrevocable resignation letter attached hereto as Exhibit A upon your appointment to the Board.

3. Cash Compensation. The Company will pay you an annual base salary of \$500,000 payable in accordance with the Company's standard payroll practices and schedule. Your pay will be periodically reviewed as a part of the Company's regular reviews of compensation. You will be eligible to participate in the Company's short term cash incentive bonus plans at a target of 125% of your annual base salary.

4. Employee Benefits. You will continue to be eligible to participate in a number of Company-sponsored benefits to the extent that you comply with the eligibility requirements of each such benefit plan. The Company, in its sole discretion, may amend, suspend or terminate its employee benefits at any time, with or without notice. In addition, you will be entitled to paid vacation in accordance with the Company's vacation policy, as in effect from time to time.

5. Equity Compensation. Following commencement of your employment as CEO, you will also be eligible to receive additional equity awards as part of the Company's long term incentive program, as may be determined by the Board or Compensation Committee, consistent with the Company's compensation practices. We will recommend to the Board or Compensation Committee that you be eligible for an equity incentive award with four year ratable vesting, with the vesting commencement date being the Effective Date of your CEO appointment, valued at \$3,000,000 at the time of grant in fiscal year 2022. Such grants are not part of your base compensation and the Board or Committee may change or discontinue the long term incentive program at any time.

7. Termination Benefits. You will be eligible to receive certain change in control and severance payments and benefits under the Severance Agreement approved by the Board and attached to this offer letter as Exhibit B for as long as you serve as Chief Executive Officer.

8. Confidentiality Agreement. By signing this letter agreement, you reaffirm the terms and conditions of the Employee Invention Assignment and Confidentiality Agreements by and between you and the Company.

9. No Conflicting Obligations. You understand and agree that by signing this offer letter, you represent to the Company that your performance will not breach any other agreement to which you are a party and that you have not, and will not during the term of your employment with the Company, enter into any oral or written agreement in conflict with any of the provisions of this letter or the Company's policies. You are not to bring with you to the Company, or use or disclose to any person associated with the Company, any confidential or proprietary information belonging to any former employer or other person or entity with respect to which you owe an obligation of confidentiality under any agreement or otherwise. The Company does not need and will not use such information and we will assist you in any way possible to preserve and protect the confidentiality of proprietary information belonging to third parties. Also, we expect you to abide by any obligations to refrain from soliciting any person employed by or otherwise associated with any former employer and suggest that you refrain from having any contact with such persons until such time as any non-solicitation obligation expires.

10. Outside Activities. While you render services to the Company, you agree that you will not engage in any other employment, consulting or other business activity without the written consent of the Company. In addition, while you render services to the Company, you will not assist any person or entity in competing with the Company, in preparing to compete with the Company or in hiring any employees or consultants of the Company.

11. General Obligations. As an employee, you will be expected to adhere to the Company's standards of professionalism, loyalty, integrity, honesty, reliability and respect for all. You will also be expected to comply with the Company's policies and procedures. The Company is an equal opportunity employer.

12. At-Will Employment. Your employment with the Company is for no specific period of time. Your employment with the Company will be on an "at will" basis, meaning that either you or the Company may terminate your employment at any time for any reason or no reason. The Company also reserves the right to modify or amend the terms of your employment at any time for any reason. Any contrary representations which may have been made to you are superseded by this offer letter. This is the full and complete agreement between you and the Company on this term. Although your job duties, title, compensation and benefits, as well as the Company's personnel policies and procedures, may change from time to time, the "at will" nature of your employment may only be changed in an express written agreement signed by you and the Company's Board of Directors.

13. Withholdings. All forms of compensation paid to you as an employee of the Company shall be less all applicable withholdings.

14. Section 409A. It is intended that all of the severance benefits and other payments payable under this offer letter satisfy, to the greatest extent possible, the exemptions from the application of Section 409A of the Internal Revenue Code of 1986, as amended (the "Code" and "Section 409A") provided under Treasury Regulations 1.409A-1(b)(4), 1.409A-1(b)(5) and 1.409A-1(b)(9), and this offer letter will be construed to the greatest extent possible as consistent with those provisions, and to the extent not so exempt, this offer letter (and any definitions hereunder) will be construed in a manner that complies with Section 409A. All payments and benefits that are payable upon a termination of employment hereunder shall be paid or provided only upon your "separation from service" from the Company (within the meaning of Section 409A).

This offer letter supersedes and replaces any prior understandings or agreements, whether oral, written or implied, between you and the Company regarding the matters described in this letter. This letter will be governed by the laws of South Carolina, without regard to its conflict of laws provisions.

Very truly yours, PROTERRA INC

On behalf of the Board of Directors

/s/ John J. Allen

By: John J. Allen

Title: Chief Executive Officer

ACCEPTED AND AGREED:

/s/ Gareth T. Joyce

By: Gareth T. Joyce

Date: 12/7/2021

Exhibit A: Director Resignation
Exhibit B: Severance Agreement

EXHIBIT A

Director Resignation

(Pursuant to Director Resignation Policy Adopted June 14, 2021)

Chairperson of the Board
Chairperson of the Nominating and ESG Committee Proterra Inc 1815 Rollins Road
Burlingame, CA 94010

Dear Chairpersons:

In accordance with Proterra's Director Resignation Policy, I hereby tender my resignation as a member of the board of directors (the "Board") of Proterra Inc (the "Company"), effective upon acceptance by the Board.

My resignation is a result of compliance with the Director Resignation Policy and not as a result of any disagreement between myself and the Company, its management, the Board or any committee of the Board.

Sincerely,

/s/ Gareth T. Joyce

Gareth T. Joyce

SEVERANCE AGREEMENT

This Severance Agreement (the “**Agreement**”) is entered into as January 1, 2022 (the “**Effective Date**”) by and between Gareth T. Joyce (the “**Executive**”) and Proterra Inc, a Delaware corporation (the “**Company**”).

Term of Agreement.

This Agreement shall terminate on the date the Executive’s employment with the Company or its subsidiary, as applicable, terminates for a reason other than a Qualifying Termination or CIC Qualifying Termination (the “**Expiration Date**”); provided however, if a definitive agreement relating to a Change in Control has been signed by the Company on or before the Expiration Date, then this Agreement shall remain in effect through the earlier of:

- a. The date the Executive’s employment with the Company terminates for a reason other than a Qualifying Termination or CIC Qualifying Termination, or
- b. The date the Company has met all of its obligations under this Agreement following a termination of the Executive’s employment with the Company due to a Qualifying Termination or CIC Qualifying Termination.

Qualifying Termination. If the Executive is subject to a Qualifying Termination, then, subject to Sections 4, 9, and 10 below, Executive will be entitled to the following benefits:

(a) **Severance Benefits.** The Company or its subsidiaries shall pay the Executive 12 months of Executive’s monthly base salary (at the rate in effect immediately prior to the actions that resulted in the Qualifying Termination). The severance benefits shall be paid through salary continuation in equal installments in accordance with the Company’s or its subsidiary’s, as applicable, standard payroll procedures, with the initial payment to occur on the first payroll date following the sixtieth (60th) day following the Separation, with the first installment to include a catchup payment for amounts covering the period from the date of Separation through the first payment date, *provided that* the Release Conditions have been satisfied. However, if the period comprising the sum of the sixty (60)- day period described in the preceding sentence and the ten (10)-day period described in clause (3) of the second sentence of Section 7(e) below spans two calendar years, then the payments which constitute deferred compensation subject to Section 409A will not in any case commence in the first calendar year. The number of months of severance set forth in the first sentence of this subsection (a) shall be referred to herein as the “**Severance Period.**”

(b) **Continued Employee Benefits.** If Executive timely elects continued coverage under the Consolidated Omnibus Budget Reconciliation Act (“**COBRA**”), the Company or its subsidiary shall pay the full amount of Executive’s COBRA premiums on behalf of the Executive for the Executive’s continued coverage under the Company’s or its subsidiary’s, as applicable, health, dental and vision plans, including coverage for the Executive’s eligible dependents, for the Severance Period. Notwithstanding the foregoing, if the Company, in its sole discretion, determines that it cannot provide the foregoing subsidy of COBRA coverage without potentially violating or causing the Company or its subsidiary to incur additional expense as a result of noncompliance with applicable law (including, without limitation, Section 2716 of the Public Health Service Act), the Company or its subsidiary instead shall provide to Executive a taxable monthly payment in an amount equal to the monthly COBRA premium that Executive would be required to pay to continue the group health coverage in effect on the date of the Separation (which amount shall be based on the premium for the first month of COBRA coverage), which payments shall be made regardless of whether Executive elects COBRA continuation coverage and shall commence on the later of (i) the first day of the month following the month in which Executive experiences a Separation and (ii) the effective date of the Company’s determination of violation of applicable law, and shall end on the earlier of (x) the effective date on which Executive becomes covered by a health, dental or vision insurance plan of a subsequent employer, and (y) the last day of the Severance Period, *provided that*, any taxable payments under this Section 2(b) will not be paid before the first business day occurring after the sixtieth (60th) day following the Separation and, once they commence, will include any unpaid amounts accrued from the date of Executive’s Separation (to the extent not otherwise satisfied with continuation coverage). However, if the period comprising the sum of the sixty (60)-day period described in the preceding sentence and the ten (10)-day period described in clause (3) of the second sentence of Section 7(e) below spans two calendar years, then the payments which constitute deferred compensation subject to Section 409A will not in any case be paid in the first calendar year. Executive shall

have no right to an additional gross-up payment to account for the fact that such COBRA premium amounts are paid on an after-tax basis.

CIC Qualifying Termination. If the Executive is subject to a CIC Qualifying Termination, then, subject to Sections 4, 9, and 10 below, Executive will be entitled to the following benefits:

(a) **Severance Benefits.** The Company or its subsidiaries shall pay the Executive 18 months of Executive's monthly base salary and then-current target bonus opportunity (at the rates in effect immediately prior to the actions that resulted in the Separation). The severance benefits shall be paid through salary continuation in equal installments in accordance with the Company's or its subsidiary's, as applicable, standard payroll procedures, with the initial payment to occur on the first payroll date following the sixtieth (60th) day following the Separation, with the first installment to include a catchup payment for amounts covering the period from the date of Separation through the first payment date, *provided that* the Release Conditions have been satisfied. However, if the period comprising the sum of the sixty (60)-day period described in the preceding sentence and the ten (10)-day period described in clause (3) of the second sentence of Section 7(e) below spans two calendar years, then the payments which constitute deferred compensation subject to Section 409A will not in any case commence in the first calendar year.

(b) **Continued Employee Benefits.** The Company or its subsidiary shall pay the Executive the continued employee benefits set forth in Section 2(b) above for the same period that the Executive is paid severance benefits pursuant to Section 3(a) following the Executive's Separation or, if earlier, until Executive becomes covered by a health, dental or vision insurance plan of a subsequent employer or until Executive is no longer eligible for COBRA benefits.

(c) **Equity.** Each of Executive's then outstanding Equity Awards, including awards that would otherwise vest only upon satisfaction of performance criteria, shall accelerate and become vested and exercisable as to 100% of the then unvested shares underlying the Equity Award. For awards that would otherwise vest only upon satisfaction of performance criteria, the foregoing acceleration shall be based on achievement of performance criteria at target, except to the extent otherwise provided in the award agreement evidencing such award. "**Equity Awards**" means all options to purchase shares of Company common stock as well as any and all other stock-based awards granted to the Executive, including but not limited to stock bonus awards, restricted stock, restricted stock units or stock appreciation rights. Subject to Section 4, the accelerated vesting described above shall be effective as of the Separation.

General Release. Any other provision of this Agreement notwithstanding, the benefits under Section 2 and 3 shall not apply unless the Executive (i) has executed a general release (in a form prescribed by the Company) of all known and unknown claims that Executive may then have against the Company or entities or persons affiliated with the Company and such release has become effective and (ii) has agreed not to prosecute any legal action or other proceeding based upon any of such claims. The release must be in the form prescribed by the Company, without alterations (this document effecting the foregoing, the "**Release**"). The Company or its subsidiary will deliver the form of Release to the Executive within thirty (30) days after the Executive's Separation. The Executive must execute and return the Release within the time period specified in the form.

Accrued Compensation and Benefits. Notwithstanding anything to the contrary in Section 2 and 3 above, in connection with any termination of employment upon or following a Change in Control (whether or not a Qualifying Termination or CIC Qualifying Termination), the Company or its subsidiary shall pay Executive's earned but unpaid base salary and other vested but unpaid cash entitlements for the period through and including the termination of employment, including unused earned vacation pay and unreimbursed documented business expenses incurred by Executive prior to the date of termination (collectively "**Accrued Compensation and Expenses**"), as required by law and the applicable Company or its subsidiary, as applicable, plan or policy. In addition, Executive shall be entitled to any other vested benefits earned by Executive for the period through and including the termination date of Executive's employment under any other employee benefit plans and arrangements maintained by the Company or its subsidiary, as applicable, in accordance with the terms of such plans and arrangements, except as modified herein (collectively "**Accrued Benefits**"). Any Accrued Compensation and Expenses to which the Executive is entitled shall be paid to the Executive in cash as soon as administratively practicable after the termination, and, in any event, no later than two and one-half (2-1/2) months after the end of the taxable year of the Executive in which the termination occurs or at such earlier time as may be required by applicable law or Section 10 below, and to such lesser extent as may be mandated by Section 9 below. Any Accrued Benefits to which the Executive is entitled shall be paid to the Executive as provided in the relevant plans and arrangements.

Covenants.

(a) **Non-Competition.** The Executive agrees that, during Executive's employment with the Company, Executive shall not engage in any other employment, consulting or other business activity (whether full-time or part-time) that would create a conflict of interest with the Company.

(b) **Cooperation and Non-Disparagement.** The Executive agrees that, during the Severance Period, he or she shall cooperate with the Company or its subsidiary in every reasonable respect and shall use Executive's best efforts to assist the Company or its subsidiary with the transition of Executive's duties to Executive's successor. The Executive further agrees that following the date of Separation, Executive shall not in any way or by any means disparage the Company, its subsidiaries, or the members of their Board of Directors or their officers and employees.

Definitions.

(a) **"Cause"** means (i) an unauthorized use or disclosure by Executive of the Company's or its subsidiaries' confidential information or trade secrets, which use or disclosure causes or is reasonably likely to cause material harm to the Company or its subsidiaries, (ii) a material breach of any agreement between Executive and the Company or its subsidiaries, (iii) a material failure to comply with the Company's or its subsidiaries' written policies or rules that has caused or is reasonably likely to cause material injury to the Company, its successor, or its affiliates, or any of their business, (iv) conviction of, or plea of "guilty" or "no contest" to, a felony under the laws of the United States or any state thereof, (v) willful misconduct that has caused or is reasonably likely to cause material injury to the Company, its successor, or its affiliates, or any of their business, (vi) embezzlement, (vii) failure to cooperate with the Company or its subsidiaries in any investigation or formal proceeding if the Company or its subsidiary, as applicable, has requested Executive's reasonable cooperation, (viii) violation of any applicable federal, state or foreign statutes, laws or regulations or (ix) a continued failure to perform assigned duties after receiving written notification of such failure from the Company's or its subsidiaries', as applicable, Chief Executive Officer; *provided that* Executive must be provided with written notice of Executive's termination for "Cause" and Executive must be provided with a thirty (30) day period following Executive's receipt of such notice to cure the event(s) that trigger "Cause," with the Company's or its subsidiaries', as applicable, Board of Directors making the final determination whether Executive has cured any Cause.

(b) **"Code"** means the Internal Revenue Code of 1986, as amended.

(c) **"Change in Control."** For all purposes under this Agreement, a Change in Control shall mean a "Change in Control," as such term is defined in the Company's 2010 Equity Incentive Plan, as may be amended from time to time, *provided that* the transaction (including any series of transactions) also qualifies as a change in control under U.S. Treasury Regulation 1.409A-3(i)(5)(v) or 1.409A-3(i)(5)(vii).

(d) **"CIC Qualifying Termination"** means a Separation (A) within twelve (12) months following a Change in Control or (B) within three (3) months preceding a Change in Control (but as to part (B), only if the Separation occurs after a Potential Change in Control) resulting, in either case (A) or (B), from (i) the Company or its subsidiary, as applicable, terminating the Executive's employment for any reason other than Cause or (ii) the Executive voluntarily resigning Executive's employment for Good Reason. A termination or resignation due to the Executive's death or disability shall not constitute a CIC Qualifying Termination. A **"Potential Change in Control"** means the date of execution of a legally binding and definitive agreement for a corporate transaction which, if consummated, would constitute the applicable Change in Control (which for the avoidance of doubt, would include a merger agreement, but not a term sheet for a merger agreement). In the case of a termination following a Potential Change in Control and before a Change in Control, solely for purposes of benefits under this Agreement, the date of Separation will be deemed the date the Change in Control is consummated.

(e) **"Good Reason"** means, without the Executive's consent, (i) a material reduction in the Executive's level of responsibility and/or scope of authority, (ii) a reduction by more than 10% in Executive's base salary (other than a reduction generally applicable to executive officers of the Company or its subsidiary, as applicable, and in generally the same proportion as for the Executive), or (iii) relocation of the Executive's principal workplace by more than thirty-five (35) miles from Executive's then current place of employment. For the purpose of clause (i), a change in responsibility shall not be deemed to occur (A) solely because Executive is part of a larger organization or (B) solely because of a change in title. For the Executive to receive the benefits under this Agreement as a result of a voluntary resignation under this subsection (e), all of the following requirements must be satisfied: (1) the Executive must provide notice to the Company or its subsidiary, as applicable, of Executive's intent to assert Good Reason within sixty (60) days of the initial existence of one or more of the conditions set forth in subclauses (i) through (iii); (2) the Company or its subsidiary, as applicable, will have thirty (30) days (the **"Company Cure Period"**) from the date of such notice to remedy the condition and, if it does so, the Executive may withdraw Executive's resignation or may resign with no benefits; and (3) any termination of employment under this provision must occur within ten (10) days of the earlier of expiration of the Company Cure Period or written notice from the Company or one of its subsidiaries, as applicable, that it will not undertake to cure the condition set forth in subclauses (i) through (iii). Should the Company or one of its subsidiaries, as applicable, remedy the condition as set forth above and then one or more of the conditions arises again within twelve months following the occurrence of a Change in Control, the Executive may assert Good Reason again subject to all of the conditions set forth herein.

(f) **"Release Conditions"** mean the following conditions: (i) Company has received the Executive's executed Release and (ii) any rescission period applicable to the Executive's executed Release has expired.

(g) **“Qualifying Termination”** means a Separation that is not a CIC Qualifying Termination, but which results from (i) the Company or one of its subsidiaries, as applicable, terminating the Executive’s employment for any reason other than Cause or (ii) the Executive voluntarily resigning his or her employment for Good Reason. A termination or resignation due to the Executive’s death or disability shall not constitute a Qualifying Termination.

(h) **“Separation”** means a “separation from service,” as defined in the regulations under Section 409A of the Code.

Successors.

(a) **Company’s Successors.** The Company shall require any successor (whether direct or indirect and whether by purchase, lease, merger, consolidation, liquidation or otherwise) to all or substantially all of the Company’s business and/or assets, by an agreement in substance and form satisfactory to the Executive, to assume this Agreement and to agree expressly to perform this Agreement in the same manner and to the same extent as the Company would be required to perform it in the absence of a succession. For all purposes under this Agreement, the term “Company” shall include any successor to the Company’s business and/or assets or which becomes bound by this Agreement by operation of law.

(b) **Executive’s Successors.** This Agreement and all rights of the Executive hereunder shall inure to the benefit of, and be enforceable by, the Executive’s personal or legal representatives, executors, administrators, successors, heirs, distributees, devisees and legatees.

Golden Parachute Taxes.

(a) **Best After-Tax Result.** In the event that any payment or benefit received or to be received by Executive pursuant to this Agreement or otherwise (**“Payments”**) would (i) constitute a “parachute payment” within the meaning of Section 280G of the Code and (ii) but for this subsection (a), be subject to the excise tax imposed by Section 4999 of the Code, any successor provisions, or any comparable federal, state, local or foreign excise tax (**“Excise Tax”**), then, subject to the provisions of Section 10, such Payments shall be either (A) provided in full pursuant to the terms of this Agreement or any other applicable agreement, or (B) provided as to such lesser extent which would result in the Payments being \$1.00 less than the amount at which any portion of the Payments would be subject to the Excise Tax (**“Reduced Amount”**), whichever of the foregoing amounts, taking into account the applicable federal, state, local and foreign income, employment and other taxes and the Excise Tax (including, without limitation, any interest or penalties on such taxes), results in the receipt by Executive, on an after-tax basis, of the greatest amount of payments and benefits provided for hereunder or otherwise, notwithstanding that all or some portion of such Payments may be subject to the Excise Tax. Unless the Company and Executive otherwise agree in writing, any determination required under this Section shall be made by independent tax counsel designated by the Company and reasonably acceptable to Executive (**“Independent Tax Counsel”**), whose determination shall be conclusive and binding upon Executive and the Company for all purposes. For purposes of making the calculations required under this Section, Independent Tax Counsel may make reasonable assumptions and approximations concerning applicable taxes and may rely on reasonable, good faith interpretations concerning the application of Sections 280G and 4999 of the Code; *provided that* Independent Tax Counsel shall assume that Executive pays all taxes at the highest marginal rate. The Company and Executive shall furnish to Independent Tax Counsel such information and documents as Independent Tax Counsel may reasonably request in order to make a determination under this Section. The Company shall bear all costs that Independent Tax Counsel may reasonably incur in connection with any calculations contemplated by this Section. In the event that Section 9(a)(ii)(B) above applies, then based on the information provided to Executive and the Company by Independent Tax Counsel, the cutback described hereunder will apply as to compensation not subject to Section 409A of the Code prior to compensation subject to Section 409A of the Code and will otherwise apply on a reverse chronological basis from payments latest in time. If the Internal Revenue Service (the **“IRS”**) determines that any Payment is subject to the Excise Tax, then Section 9(b) hereof shall apply, and the enforcement of Section 9(b) shall be the exclusive remedy to the Company.

(b) **Adjustments.** If, notwithstanding any reduction described in Section 9(a) hereof (or in the absence of any such reduction), the IRS determines that Executive is liable for the Excise Tax as a result of the receipt of one or more Payments, then Executive shall be obligated to surrender or pay back to the Company or its subsidiary, as applicable, within one-hundred twenty (120) days after a final IRS determination, an amount of such payments or benefits equal to the **“Repayment Amount.”** The Repayment Amount with respect to such Payments shall be the smallest such amount, if any, as shall be required to be surrendered or paid to the Company or its subsidiary, as applicable, so that Executive’s net proceeds with respect to such Payments (after taking into account the payment of the Excise Tax imposed on such Payments) shall be maximized. Notwithstanding the foregoing, the Repayment Amount with respect to such Payments shall be zero (0) if a Repayment Amount of more than zero (0) would not eliminate the Excise Tax imposed on such Payments or if a Repayment Amount of more than zero would not maximize the net amount received by Executive from the Payments. If the Excise Tax is not eliminated pursuant to this Section 9(b), Executive shall pay the Excise Tax.

Miscellaneous Provisions.

(a) **Section 409A.** To the extent (i) any payments to which Executive becomes entitled under this Agreement, or any agreement or plan referenced herein, in connection with Executive's termination of employment with the Company or its subsidiary, as applicable, constitute deferred compensation subject to Section 409A of the Code and (ii) Executive is deemed at the time of such termination of employment to be a "specified" employee under Section 409A of the Code, then such payment or payments shall not be made or commence until the earlier of (i) the expiration of the six (6)-month period measured from the Executive's Separation; or (ii) the date of Executive's death following such Separation; *provided, however*, that such deferral shall only be effected to the extent required to avoid adverse tax treatment to Executive, including (without limitation) the additional twenty percent (20%) tax for which Executive would otherwise be liable under Section 409A(a)(1)(B) of the Code in the absence of such deferral. Upon the expiration of the applicable deferral period, any payments which would have otherwise been made during that period (whether in a single sum or in installments) in the absence of this paragraph shall be paid to Executive or Executive's beneficiary in one lump sum (without interest). Except as otherwise expressly provided herein, to the extent any expense reimbursement or the provision of any in-kind benefit under this Agreement (or otherwise referenced herein) is determined to be subject to (and not exempt from) Section 409A of the Code, the amount of any such expenses eligible for reimbursement, or the provision of any in-kind benefit, in one calendar year shall not affect the expenses eligible for reimbursement or in kind benefits to be provided in any other calendar year, in no event shall any expenses be reimbursed after the last day of the calendar year following the calendar year in which Executive incurred such expenses, and in no event shall any right to reimbursement or the provision of any in-kind benefit be subject to liquidation or exchange for another benefit. To the extent that any provision of this Agreement is ambiguous as to its exemption or compliance with Section 409A, the provision will be read in such a manner so that all payments hereunder are exempt from Section 409A to the maximum permissible extent, and for any payments where such construction is not tenable, that those payments comply with Section 409A to the maximum permissible extent. To the extent any payment under this Agreement may be classified as a "short-term deferral" within the meaning of Section 409A, such payment shall be deemed a short-term deferral, even if it may also qualify for an exemption from Section 409A under another provision of Section 409A. Payments pursuant to this Agreement (or referenced in this Agreement) are intended to constitute separate payments for purposes of Section 1.409A-2(b)(2) of the regulations under Section 409A.

(b) **Other Arrangements.** This Agreement also supersedes any and all cash severance arrangements and vesting acceleration arrangements on change in control under any agreement governing Equity Awards, severance and salary continuation arrangements, programs and plans which were previously offered, or may be offered on the Effective Date or thereafter, by the Company or its subsidiary, as applicable, to the Executive, including change in control severance arrangements and vesting acceleration arrangements pursuant to an agreement governing Equity Awards, employment agreement or offer letter, and Executive hereby waives Executive's rights to such other benefits. In no event shall any individual receive cash severance benefits under both this Agreement and any other severance pay or salary continuation program, plan or other arrangement with the Company or its subsidiaries. For the avoidance of doubt, in no event shall Executive receive payment under both Section 2 and Section 3 with respect to Executive's Separation.

(c) **Dispute Resolution.** To ensure rapid and economical resolution of any and all disputes that might arise in connection with this Agreement, Executive and the Company agree that any and all disputes, claims, and causes of action, in law or equity, arising from or relating to this Agreement or its enforcement, performance, breach, or interpretation, will be resolved solely and exclusively by final, binding, and confidential arbitration, by a single arbitrator, in San Mateo County, and conducted by Judicial Arbitration & Mediation Services, Inc. ("**JAMS**") under its then-existing employment rules and procedures. Nothing in this section, however, is intended to prevent either party from obtaining injunctive relief in court to prevent irreparable harm pending the conclusion of any such arbitration. Each party to an arbitration or litigation hereunder shall be responsible for the payment of its own attorneys' fees.

(d) **Notice.** Notices and all other communications contemplated by this Agreement shall be in writing and shall be deemed to have been duly given when personally delivered or when mailed by U.S. registered or certified mail, return receipt requested and postage prepaid or deposited with Federal Express Corporation, with shipping charges prepaid. In the case of the Executive, mailed notices shall be addressed to him or her at the home address which he or she most recently communicated to the Company in writing. In the case of the Company, mailed notices shall be addressed to its corporate headquarters, and all notices shall be directed to the attention of its Secretary.

(e) **Waiver.** No provision of this Agreement shall be modified, waived or discharged unless the modification, waiver or discharge is agreed to in writing and signed by the Executive and by an authorized officer of the Company (other than the Executive). No waiver by either party of any breach of, or of compliance with, any condition or provision of this Agreement by the other party shall be considered a waiver of any other condition or provision or of the same condition or provision at another time.

(f) **Withholding Taxes.** All payments made under this Agreement shall be subject to reduction to reflect taxes or other charges required to be withheld by law.

(g) **Severability.** The invalidity or unenforceability of any provision or provisions of this Agreement shall not affect the validity or enforceability of any other provision hereof, which shall remain in full force and effect.

(h) **No Retention Rights.** Nothing in this Agreement shall confer upon the Executive any right to continue in service for any period of specific duration or interfere with or otherwise restrict in any way the rights of the Company or any subsidiary of the Company or of the Executive, which rights are hereby expressly reserved by each, to terminate his or her service at any time and for any reason, with or without Cause.

(i) **Choice of Law.** The validity, interpretation, construction and performance of this Agreement shall be governed by the laws of the State of California (other than its choice-of-law provisions).

IN WITNESS WHEREOF, each of the parties has executed this Agreement, in the case of the Company by its duly authorized officer, as of the day and year first above written.

PROTERRA INC

/s/ John J. Allen

By: John J. Allen
Title: On behalf of the Board of Directors

/s/ Gareth T. Joyce

By: Gareth T. Joyce

March 23, 2021
Mr. Josh Ensign

Dear Josh:

This letter agreement amends and restates the offer letter between you and Proterra Inc. (the "**Company**"), dated August 29, 2016 (the "**Prior Agreement**") effective March 1, 2021.

You will continue to work in the role of Chief Operating Officer, reporting to the Company's Chief Executive Officer.

1. **Cash Compensation.** In this position, the Company will pay you an annual base salary payable in accordance with the Company's standard payroll schedule. Your pay will be periodically reviewed as a part of the Company's regular reviews of compensation.

2. **Employee Benefits.** You will continue to be eligible to participate in a number of Company- sponsored benefits to the extent that you comply with the eligibility requirements of each such benefit plan. The Company, in its sole discretion, may amend, suspend or terminate its employee benefits at any time, with or without notice. In addition, you will be entitled to paid vacation in accordance with the Company's vacation policy, as in effect from time to time.

3. **Termination Benefits.** You will continue to be eligible to receive certain change in control and severance payments and benefits under that certain Severance Agreement by and between you and the Company, dated September 11, 2018 (the "**Severance Agreement**"), attached to this offer letter as **Exhibit A**.

4. **Confidentiality Agreement.** By signing this letter agreement, you reaffirm the terms and conditions of the Confidential Information, Invention Assignment and Arbitration Agreement by and between you and the Company.

5. **No Conflicting Obligations.** You understand and agree that by signing this letter agreement, you represent to the Company that your performance will not breach any other agreement to which you are a party and that you have not, and will not during the term of your employment with the Company, enter into any oral or written agreement in conflict with any of the provisions of this letter or the Company's policies. You are not to bring with you to the Company, or use or disclose to any person associated with the Company, any confidential or proprietary information belonging to any former employer or other person or entity with respect to which you owe an obligation of confidentiality under any agreement or otherwise. The Company does not need and will not use such information and we will assist you in any way possible to preserve and protect the confidentiality of proprietary information belonging to third parties. Also, we expect you to abide by any obligations to refrain from soliciting any person employed by or otherwise associated with any former employer and suggest that you refrain from having any contact with such persons until such time as any non-solicitation obligation expires.

6. **Outside Activities.** While you render services to the Company, you agree that you will not engage in any other employment, consulting or other business activity without the written consent of the Company. In addition, while you render services to the Company, you will not assist any person or entity in competing with the Company, in preparing to compete with the Company or in hiring any employees or consultants of the Company.

7. **General Obligations.** As an employee, you will be expected to continue to adhere to the Company's standards of professionalism, loyalty, integrity, honesty, reliability and respect for all. You will also be expected to continue to comply with the Company's policies and procedures. The Company is an equal opportunity employer.

8. **At-Will Employment.** Your employment with the Company continues to be for no specific period of time. Your employment with the Company will continue to be on an "at will" basis, meaning that either you or the Company may terminate your employment at any time for any reason or no reason. The Company also reserves the right to modify or amend the terms of your employment at any time for any reason. Any contrary representations which may have been made to you are superseded by this letter agreement. This is the full and complete agreement between you and the Company on this term. Although your job duties, title, compensation and benefits, as well as the Company's personnel policies and procedures, may change from time to time, the "at will" nature of your employment may only be changed in an express written agreement signed by you and the Company's Board of Directors.

9. **Withholdings.** All forms of compensation paid to you as an employee of the Company shall be less all applicable withholdings.

10. Section 409A. It is intended that all of the severance benefits and other payments payable under this letter agreement satisfy, to the greatest extent possible, the exemptions from the application of Section 409A of the Internal Revenue Code of 1986, as amended (the "Code" and "Section 409A") provided under Treasury Regulations 1.409A-1(b)(4), 1.409A-1(b)(5) and 1.409A-1(b)(9), and this letter agreement will be construed to the greatest extent possible as consistent with those provisions, and to the extent not so exempt, this letter agreement (and any definitions hereunder) will be construed in a manner that complies with Section 409A. All payments and benefits that are payable upon a termination of employment hereunder shall be paid or provided only upon your "separation from service" from the Company (within the meaning of Section 409A).

[SIGNATURE PAGE FOLLOWS]

This letter agreement supersedes and replaces any prior understandings or agreements, whether oral, written or implied, between you and the Company regarding the matters described in this letter (other than the Severance Agreement and Participation Letter), including, without limitation, the Prior Agreement. This letter will be governed by the laws of California, without regard to its conflict of laws provisions.

Very truly yours,
PROTERRA INC.
/s/ Kelly Scheib

By: Kelly Scheib
Title: Vice President of Human
Resources

ACCEPTED AND AGREED:

/s/ Josh Ensign

By: Josh Ensign
Date: 03/24/2021

SEVERANCE AGREEMENT

This Severance Agreement (the “**Agreement**”) is entered into as of September 11, 2018 (the “**Effective Date**”) by and between Josh Ensign (the “**Executive**”) and Proterra Inc, a Delaware corporation (the “**Company**”).

1. Term of Agreement.

This Agreement shall terminate on the date the Executive’s employment with the Company or its subsidiary, as applicable, terminates for a reason other than a Qualifying Termination or CIC Qualifying Termination (the “**Expiration Date**”); provided however, if a definitive agreement relating to a Change in Control has been signed by the Company on or before the Expiration Date, then this Agreement shall remain in effect through the earlier of:

- The date the Executive’s employment with the Company terminates for a reason other than a Qualifying Termination or CIC Qualifying Termination, or
- The date the Company has met all of its obligations under this Agreement following a termination of the Executive’s employment with the Company due to a Qualifying Termination or CIC Qualifying Termination.

2. Qualifying Termination. If the Executive is subject to a Qualifying Termination, then, subject to Sections 4, 9, and 10 below, Executive will be entitled to the following benefits:

(a) **Severance Benefits.** The Company or its subsidiaries shall pay the Executive 6 months of Executive’s monthly base salary (at the rate in effect immediately prior to the actions that resulted in the Qualifying Termination). The severance benefits shall be paid through salary continuation in equal installments in accordance with the Company’s or its subsidiary’s, as applicable, standard payroll procedures, with the initial payment to occur on the first payroll date following the sixtieth (60th) day following the Separation, with the first installment to include a catchup payment for amounts covering the period from the date of Separation through the first payment date, *provided that* the Release Conditions have been satisfied. However, if the period comprising the sum of the sixty (60)-day period described in the preceding sentence and the ten (10)-day period described in clause (3) of the second sentence of Section 7(e) below spans two calendar years, then the payments which constitute deferred compensation subject to Section 409A will not in any case commence in the first calendar year. The number of months of severance set forth in the first sentence of this subsection (a) shall be referred to herein as the “**Severance Period.**”

(b) **Continued Employee Benefits.** If Executive timely elects continued coverage under the Consolidated Omnibus Budget Reconciliation Act (“**COBRA**”), the Company or its subsidiary shall pay the full amount of Executive’s COBRA premiums on behalf of the Executive for the Executive’s continued coverage under the Company’s or its subsidiary’s, as applicable, health, dental and vision plans, including coverage for the Executive’s eligible dependents, for the Severance Period. Notwithstanding the foregoing, if the Company, in its sole discretion, determines that it cannot provide the foregoing subsidy of COBRA coverage without potentially violating or causing the Company or its subsidiary to incur additional expense as a result of noncompliance with applicable law (including, without limitation, Section 2716 of the Public Health Service Act), the Company or its subsidiary instead shall provide to Executive a taxable monthly payment in an amount equal to the monthly COBRA premium that Executive would be required to pay to continue the group health coverage in effect on the date of the Separation (which amount shall be based on the premium for the first month of COBRA coverage), which payments shall be made regardless of whether Executive elects COBRA continuation coverage and shall commence on the later of (i) the first day of the month following the month in which Executive experiences a Separation and (ii) the effective date of the Company’s determination of violation of applicable law, and shall end on the earlier of (x) the effective date on which Executive becomes covered by a

health, dental or vision insurance plan of a subsequent employer, and (y) the last day of the Severance Period, *provided that*, any taxable payments under this Section 2(b) will not be paid before the first business day occurring after the sixtieth (60th) day following the Separation and, once they commence, will include any unpaid amounts accrued from the date of Executive's Separation (to the extent not otherwise satisfied with continuation coverage). However, if the period comprising the sum of the sixty (60)-day period described in the preceding sentence and the ten (10)-day period described in clause (3) of the second sentence of Section 7(e) below spans two calendar years, then the payments which constitute deferred compensation subject to Section 409A will not in any case be paid in the first calendar year. Executive shall have no right to an additional gross-up payment to account for the fact that such COBRA premium amounts are paid on an after-tax basis.

3. CIC Qualifying Termination. If the Executive is subject to a CIC Qualifying Termination, then, subject to Sections 4, 9, and 10 below, Executive will be entitled to the following benefits:

(a)**Severance Benefits.** The Company or its subsidiaries shall pay the Executive 12 months of Executive's monthly base salary and then-current target bonus opportunity (at the rates in effect immediately prior to the actions that resulted in the Separation). The severance benefits shall be paid through salary continuation in equal installments in accordance with the Company's or its subsidiary's, as applicable, standard payroll procedures, with the initial payment to occur on the first payroll date following the sixtieth (60th) day following the Separation, with the first installment to include a catchup payment for amounts covering the period from the date of Separation through the first payment date, *provided that* the Release Conditions have been satisfied. However, if the period comprising the sum of the sixty (60)-day period described in the preceding sentence and the ten (10)-day period described in clause (3) of the second sentence of Section 7(e) below spans two calendar years, then the payments which constitute deferred compensation subject to Section 409A will not in any case commence in the first calendar year.

(b)**Continued Employee Benefits.** The Company or its subsidiary shall pay the Executive the continued employee benefits set forth in Section 2(b) above for the same period that the Executive is paid severance benefits pursuant to Section 3(a) following the Executive's Separation or, if earlier, until Executive becomes covered by a health, dental or vision insurance plan of a subsequent employer or until Executive is no longer eligible for COBRA benefits.

(c)**Equity.** Each of Executive's then outstanding Equity Awards, including awards that would otherwise vest only upon satisfaction of performance criteria, shall accelerate and become vested and exercisable as to 100% of the then unvested shares underlying the Equity Award. For awards that would otherwise vest only upon satisfaction of performance criteria, the foregoing acceleration shall be based on achievement of performance criteria at target, except to the extent otherwise provided in the award agreement evidencing such award. "**Equity Awards**" means all options to purchase shares of Company common stock as well as any and all other stock-based awards granted to the Executive, including but not limited to stock bonus awards, restricted stock, restricted stock units or stock appreciation rights. Subject to Section 4, the accelerated vesting described above shall be effective as of the Separation.

4. General Release. Any other provision of this Agreement notwithstanding, the benefits under Section 2 and 3 shall not apply unless the Executive (i) has executed a general release (in a form prescribed by the Company) of all known and unknown claims that Executive may then have against the Company or entities or persons affiliated with the Company and such release has become effective and (ii) has agreed not to prosecute any legal action or other proceeding based upon any of such claims. The release must be in the form prescribed by the Company, without alterations (this document effecting the foregoing, the "**Release**"). The Company or its subsidiary will deliver the form of Release to the Executive within thirty (30) days after the Executive's Separation. The Executive must execute and return the Release within the time period specified in the form.

5. Accrued Compensation and Benefits. Notwithstanding anything to the contrary in Section 2 and 3 above, in connection with any termination of employment upon or following a Change in Control (whether or not a Qualifying Termination or CIC Qualifying Termination), the Company or its subsidiary shall pay Executive's earned but unpaid base salary and other vested but unpaid cash entitlements for the period through and including the termination of employment, including unused earned vacation pay and unreimbursed documented business expenses incurred by Executive prior to the date of termination (collectively "**Accrued Compensation and Expenses**"), as required by law and the applicable Company or its subsidiary, as applicable, plan or policy.

In addition, Executive shall be entitled to any other vested benefits earned by Executive for the period through and including the termination date of Executive's employment under any other employee benefit plans and arrangements maintained by the Company or its subsidiary, as applicable, in accordance with the terms of such plans and arrangements, except as modified herein (collectively "**Accrued Benefits**"). Any Accrued Compensation and Expenses to which the Executive is entitled shall be paid to the Executive in cash as soon as administratively practicable after the termination, and, in any event, no later than two and one-half (2-1/2) months after the end of the taxable year of the Executive in which the termination occurs or at such earlier time as may be required by applicable law or Section 10 below, and to such lesser extent as may be mandated by Section 9 below. Any Accrued Benefits to which the Executive is entitled shall be paid to the Executive as provided in the relevant plans and arrangements.

6. Covenants.

(a) **Non-Competition.** The Executive agrees that, during Executive's employment with the Company, Executive shall not engage in any other employment, consulting or other business activity (whether full-time or part-time) that would create a conflict of interest with the Company.

(b) **Cooperation and Non-Disparagement.** The Executive agrees that, during the Severance Period, he or she shall cooperate with the Company or its subsidiary in every reasonable respect and shall use Executive's best efforts to assist the Company or its subsidiary with the transition of Executive's duties to Executive's successor. The Executive further agrees that following the date of Separation, Executive shall not in any way or by any means disparage the Company, its subsidiaries, or the members of their Board of Directors or their officers and employees.

7. Definitions.

(a) "**Cause**" means (i) an unauthorized use or disclosure by Executive of the Company's or its subsidiaries' confidential information or trade secrets, which use or disclosure causes or is reasonably likely to cause material harm to the Company or its subsidiaries, (ii) a material breach of any agreement between Executive and the Company or its subsidiaries, (iii) a material failure to comply with the Company's or its subsidiaries' written policies or rules that has caused or is reasonably likely to cause material injury to the Company, its successor, or its affiliates, or any of their business, (iv) conviction of, or plea of "guilty" or "no contest" to, a felony under the laws of the United States or any state thereof, (v) willful misconduct that has caused or is reasonably likely to cause material injury to the Company, its successor, or its affiliates, or any of their business, (vi) embezzlement, (vii) failure to cooperate with the Company or its subsidiaries in any investigation or formal proceeding if the Company or its subsidiary, as applicable, has requested Executive's reasonable cooperation, (viii) violation of any applicable federal, state or foreign statutes, laws or regulations or (ix) a continued failure to perform assigned duties after receiving written notification of such failure from the Company's or its subsidiaries', as applicable, Chief Executive Officer; *provided that* Executive must be provided with written notice of Executive's termination for "Cause" and Executive must be provided with a thirty (30) day period following Executive's receipt of such notice to cure the event(s) that trigger "Cause," with the Company's or its subsidiaries', as applicable, Board of Directors making the final determination whether Executive has cured any Cause.

(b) "**Code**" means the Internal Revenue Code of 1986, as amended.

(c) "**Change in Control.**" For all purposes under this Agreement, a Change in Control shall mean a "Change in Control," as such term is defined in the Company's 2010 Equity Incentive Plan, as may be amended from time to time, *provided that* the transaction (including any series of transactions) also qualifies as a change in control under U.S. Treasury Regulation 1.409A-3(i)(5)(v) or 1.409A-3(i)(5)(vii).

(d) "**CIC Qualifying Termination**" means a Separation (A) within twelve (12) months following a Change in Control or (B) within three (3) months preceding a Change in Control (but as to part (B), only if the Separation occurs after a Potential Change in Control) resulting, in either case (A) or (B), from (i) the Company or its subsidiary, as applicable, terminating the Executive's employment for any reason other than Cause or (ii) the Executive voluntarily resigning Executive's employment for Good Reason. A termination or resignation due to the Executive's death or disability shall not constitute a CIC Qualifying Termination. A "**Potential Change in Control**" means the date of execution of a legally binding and definitive agreement for a corporate transaction

which, if consummated, would constitute the applicable Change in Control (which for the avoidance of doubt, would include a merger agreement, but not a term sheet for a merger agreement). In the case of a termination following a Potential Change in Control and before a Change in Control, solely for purposes of benefits under this Agreement, the date of Separation will be deemed the date the Change in Control is consummated.

(e) **“Good Reason”** means, without the Executive’s consent, (i) a material reduction in the Executive’s level of responsibility and/or scope of authority, (ii) a reduction by more than 10% in Executive’s base salary (other than a reduction generally applicable to executive officers of the Company or its subsidiary, as applicable, and in generally the same proportion as for the Executive), or (iii) relocation of the Executive’s principal workplace by more than thirty-five (35) miles from Executive’s then current place of employment. For the purpose of clause (i), a change in responsibility shall not be deemed to occur (A) solely because Executive is part of a larger organization or (B) solely because of a change in title. For the Executive to receive the benefits under this Agreement as a result of a voluntary resignation under this subsection (e), all of the following requirements must be satisfied: (1) the Executive must provide notice to the Company or its subsidiary, as applicable, of Executive’s intent to assert Good Reason within sixty (60) days of the initial existence of one or more of the conditions set forth in subclauses (i) through (iii); (2) the Company or its subsidiary, as applicable, will have thirty (30) days (the **“Company Cure Period”**) from the date of such notice to remedy the condition and, if it does so, the Executive may withdraw Executive’s resignation or may resign with no benefits; and (3) any termination of employment under this provision must occur within ten (10) days of the earlier of expiration of the Company Cure Period or written notice from the Company or one of its subsidiaries, as applicable, that it will not undertake to cure the condition set forth in subclauses (i) through (iii). Should the Company or one of its subsidiaries, as applicable, remedy the condition as set forth above and then one or more of the conditions arises again within twelve months following the occurrence of a Change in Control, the Executive may assert Good Reason again subject to all of the conditions set forth herein.

(f) **“Release Conditions”** mean the following conditions: (i) Company has received the Executive’s executed Release and (ii) any rescission period applicable to the Executive’s executed Release has expired.

(g) **“Qualifying Termination”** means a Separation that is not a CIC Qualifying Termination, but which results from (i) the Company or one of its subsidiaries, as applicable, terminating the Executive’s employment for any reason other than Cause or (ii) the Executive voluntarily resigning his or her employment for Good Reason. A termination or resignation due to the Executive’s death or disability shall not constitute a Qualifying Termination.

(h) **“Separation”** means a “separation from service,” as defined in the regulations under Section 409A of the Code.

8. Successors.

(a) **Company’s Successors.** The Company shall require any successor (whether direct or indirect and whether by purchase, lease, merger, consolidation, liquidation or otherwise) to all or substantially all of the Company’s business and/or assets, by an agreement in substance and form satisfactory to the Executive, to assume this Agreement and to agree expressly to perform

this Agreement in the same manner and to the same extent as the Company would be required to perform it in the absence of a succession. For all purposes under this Agreement, the term “Company” shall include any successor to the Company’s business and/or assets or which becomes bound by this Agreement by operation of law.

(b) **Executive’s Successors.** This Agreement and all rights of the Executive hereunder shall inure to the benefit of, and be enforceable by, the Executive’s personal or legal representatives, executors, administrators, successors, heirs, distributees, devisees and legatees.

9. Golden Parachute Taxes.

(a) **Best After-Tax Result.** In the event that any payment or benefit received or to be received by Executive pursuant to this Agreement or otherwise (**“Payments”**) would (i) constitute a “parachute payment” within the meaning of Section 280G of the Code and (ii) but for this subsection (a), be subject to the excise tax imposed

by Section 4999 of the Code, any successor provisions, or any comparable federal, state, local or foreign excise tax ("**Excise Tax**"), then, subject to the provisions of Section 10, such Payments shall be either (A) provided in full pursuant to the terms of this Agreement or any other applicable agreement, or (B) provided as to such lesser extent which would result in the Payments being \$1.00 less than the amount at which any portion of the Payments would be subject to the Excise Tax ("**Reduced Amount**"), whichever of the foregoing amounts, taking into account the applicable federal, state, local and foreign income, employment and other taxes and the Excise Tax (including, without limitation, any interest or penalties on such taxes), results in the receipt by Executive, on an after-tax basis, of the greatest amount of payments and benefits provided for hereunder or otherwise, notwithstanding that all or some portion of such Payments may be subject to the Excise Tax. Unless the Company and Executive otherwise agree in writing, any determination required under this Section shall be made by independent tax counsel designated by the Company and reasonably acceptable to Executive ("**Independent Tax Counsel**"), whose determination shall be conclusive and binding upon Executive and the Company for all purposes. For purposes of making the calculations required under this Section, Independent Tax Counsel may make reasonable assumptions and approximations concerning applicable taxes and may rely on reasonable, good faith interpretations concerning the application of Sections 280G and 4999 of the Code; *provided that* Independent Tax Counsel shall assume that Executive pays all taxes at the highest marginal rate. The Company and Executive shall furnish to Independent Tax Counsel such information and documents as Independent Tax Counsel may reasonably request in order to make a determination under this Section. The Company shall bear all costs that Independent Tax Counsel may reasonably incur in connection with any calculations contemplated by this Section. In the event that Section 9(a)(ii)(B) above applies, then based on the information provided to Executive and the Company by Independent Tax Counsel, the cutback described hereunder will apply as to compensation not subject to Section 409A of the Code prior to compensation subject to Section 409A of the Code and will otherwise apply on a reverse chronological basis from payments latest in time. If the Internal Revenue Service (the "**IRS**") determines that any Payment is subject to the Excise Tax, then Section 9(b) hereof shall apply, and the enforcement of Section 9(b) shall be the exclusive remedy to the Company.

(b)**Adjustments.** If, notwithstanding any reduction described in Section 9(a) hereof (or in the absence of any such reduction), the IRS determines that Executive is liable for the Excise

Tax as a result of the receipt of one or more Payments, then Executive shall be obligated to surrender or pay back to the Company or its subsidiary, as applicable, within one-hundred twenty

(120) days after a final IRS determination, an amount of such payments or benefits equal to the "**Repayment Amount.**" The Repayment Amount with respect to such Payments shall be the smallest such amount, if any, as shall be required to be surrendered or paid to the Company or its subsidiary, as applicable, so that Executive's net proceeds with respect to such Payments (after taking into account the payment of the Excise Tax imposed on such Payments) shall be maximized. Notwithstanding the foregoing, the Repayment Amount with respect to such Payments shall be zero (0) if a Repayment Amount of more than zero (0) would not eliminate the Excise Tax imposed on such Payments or if a Repayment Amount of more than zero would not maximize the net amount received by Executive from the Payments. If the Excise Tax is not eliminated pursuant to this Section 9(b), Executive shall pay the Excise Tax.

10. Miscellaneous Provisions.

(a)**Section 409A.** To the extent (i) any payments to which Executive becomes entitled under this Agreement, or any agreement or plan referenced herein, in connection with Executive's termination of employment with the Company or its subsidiary, as applicable, constitute deferred compensation subject to Section 409A of the Code and (ii) Executive is deemed at the time of such termination of employment to be a "specified" employee under Section 409A of the Code, then such payment or payments shall not be made or commence until the earlier of (i) the expiration of the six (6)-month period measured from the Executive's Separation; or (ii) the date of Executive's death following such Separation; *provided, however,* that such deferral shall only be effected to the extent required to avoid adverse tax treatment to Executive, including (without limitation) the additional twenty percent (20%) tax for which Executive would otherwise be liable under Section 409A(a)(1)(B) of the Code in the absence of such deferral. Upon the expiration of the applicable deferral period, any payments which would have otherwise been made during that period (whether in a single sum or in installments) in the absence of this paragraph shall be paid to Executive or Executive's beneficiary in one lump sum (without interest). Except as otherwise expressly provided herein, to the extent any expense

reimbursement or the provision of any in-kind benefit under this Agreement (or otherwise referenced herein) is determined to be subject to (and not exempt from) Section 409A of the Code, the amount of any such expenses eligible for reimbursement, or the provision of any in-kind benefit, in one calendar year shall not affect the expenses eligible for reimbursement or in kind benefits to be provided in any other calendar year, in no event shall any expenses be reimbursed after the last day of the calendar year following the calendar year in which Executive incurred such expenses, and in no event shall any right to reimbursement or the provision of any in-kind benefit be subject to liquidation or exchange for another benefit. To the extent that any provision of this Agreement is ambiguous as to its exemption or compliance with Section 409A, the provision will be read in such a manner so that all payments hereunder are exempt from Section 409A to the maximum permissible extent, and for any payments where such construction is not tenable, that those payments comply with Section 409A to the maximum permissible extent. To the extent any payment under this Agreement may be classified as a "short-term deferral" within the meaning of Section 409A, such payment shall be deemed a short-term deferral, even if it may also qualify for an exemption from Section 409A under another provision of Section 409A. Payments pursuant to this Agreement (or referenced in this Agreement) are intended to constitute separate payments for purposes of Section 1.409A-2(b)(2) of the regulations under Section 409A.

(b) **Other Arrangements.** This Agreement supersedes severance arrangements in Executive's prior offer letter by and between the Company and Executive, dated August 29, 2016. This Agreement also supersedes any and all cash severance arrangements and vesting acceleration arrangements on change in control under any agreement governing Equity Awards, severance and salary continuation arrangements, programs and plans which were previously offered, or may be offered on the Effective Date or thereafter, by the Company or its subsidiary, as applicable, to the Executive, including change in control severance arrangements and vesting acceleration arrangements pursuant to an agreement governing Equity Awards, employment agreement or offer letter, and Executive hereby waives Executive's rights to such other benefits. In no event shall any individual receive cash severance benefits under both this Agreement and any other severance pay or salary continuation program, plan or other arrangement with the Company or its subsidiaries. For the avoidance of doubt, in no event shall Executive receive payment under both Section 2 and Section 3 with respect to Executive's Separation.

(c) **Dispute Resolution.** To ensure rapid and economical resolution of any and all disputes that might arise in connection with this Agreement, Executive and the Company agree that any and all disputes, claims, and causes of action, in law or equity, arising from or relating to this Agreement or its enforcement, performance, breach, or interpretation, will be resolved solely and exclusively by final, binding, and confidential arbitration, by a single arbitrator, in San Mateo County, and conducted by Judicial Arbitration & Mediation Services, Inc. ("**JAMS**") under its then-existing employment rules and procedures. Nothing in this section, however, is intended to prevent either party from obtaining injunctive relief in court to prevent irreparable harm pending the conclusion of any such arbitration. Each party to an arbitration or litigation hereunder shall be responsible for the payment of its own attorneys' fees.

(d) **Notice.** Notices and all other communications contemplated by this Agreement shall be in writing and shall be deemed to have been duly given when personally delivered or when mailed by U.S. registered or certified mail, return receipt requested and postage prepaid or deposited with Federal Express Corporation, with shipping charges prepaid. In the case of the Executive, mailed notices shall be addressed to him or her at the home address which he or she most recently communicated to the Company in writing. In the case of the Company, mailed notices shall be addressed to its corporate headquarters, and all notices shall be directed to the attention of its Secretary.

(e) **Waiver.** No provision of this Agreement shall be modified, waived or discharged unless the modification, waiver or discharge is agreed to in writing and signed by the Executive and by an authorized officer of the Company (other than the Executive). No waiver by either party of any breach of, or of compliance with, any condition or provision of this Agreement by the other party shall be considered a waiver of any other condition or provision or of the same condition or provision at another time.

(f) **Withholding Taxes.** All payments made under this Agreement shall be subject to reduction to reflect taxes or other charges required to be withheld by law.

(g) **Severability.** The invalidity or unenforceability of any provision or provisions of this Agreement shall not affect the validity or enforceability of any other provision hereof, which shall remain in full force and effect.

(h) **No Retention Rights.** Nothing in this Agreement shall confer upon the Executive any right to continue in service for any period of specific duration or interfere with or otherwise restrict in any way the rights of the Company or any subsidiary of the Company or of the Executive, which rights are hereby expressly reserved by each, to terminate his or her service at any time and for any reason, with or without Cause.

(i) **Choice of Law.** The validity, interpretation, construction and performance of this Agreement shall be governed by the laws of the State of California (other than its choice-of-law provisions).

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, each of the parties has executed this Agreement, in the case of the Company by its duly authorized officer, as of the day and year first above written.

PROTERRA INC

/s/ Ryan Popple

By: Ryan Popple

Title: On behalf of the Board of Directors

/s/ Josh Ensign

By: Josh Ensign

RETENTION AGREEMENT

Proterra Inc
September 15, 2021

Dear Josh Ensign:

Proterra Inc, a Delaware corporation (the "**Company**") is very pleased to offer you the opportunity to receive the retention benefit described below.

Retention Bonus. Subject to your continued employment with the Company or its subsidiaries through to September 13, 2022 (the "**Retention Date**"), the Company will pay you a cash bonus in the total amount of \$250,000, less applicable withholding taxes and deductions (the "**Retention Bonus**"). The Retention Bonus shall be paid within thirty (30) days from the Retention Date.

Notwithstanding the foregoing, in the event that your employment is terminated by the Company or its subsidiaries without Cause (as defined below) prior to the Retention Date, you will remain eligible to receive the Retention Bonus (which shall be paid within thirty (30) days from your last day of work). You will not be eligible for a retention bonus if you resign from employment with the Company or its subsidiaries for any reason or the Company or its subsidiaries terminates your employment for Cause before the Retention Date.

For purposes of this letter, "**Cause**" means (i) an unauthorized use or disclosure by you of the Company's or its subsidiaries' confidential information or trade secrets, which use or disclosure causes or is reasonably likely to cause material harm to the Company or its subsidiaries, (ii) a material breach of any agreement between you and the Company or its subsidiaries, (iii) a material failure to comply with the Company's or its subsidiaries' written policies or rules that has caused or is reasonably likely to cause material injury to the Company, its successor, or its affiliates, or any of their business, (iv) conviction of, or plea of "guilty" or "no contest" to, a felony under the laws of the United States or any state thereof, (v) willful misconduct that has caused or is reasonably likely to cause material injury to the Company, its successor, or its affiliates, or any of their business, (vi) embezzlement, (vii) failure to cooperate with the Company or its subsidiaries in any investigation or formal proceeding if the Company or its subsidiary, as applicable, has requested your reasonable cooperation, (viii) violation of any applicable federal, state or foreign statutes, laws or regulations or (ix) a continued failure to perform assigned duties after receiving written notification of such failure from the Company's or its subsidiaries', as applicable, Chief Executive Officer provided that you must be provided with written notice of your termination for "Cause" and you must be provided with a thirty (30) day period following your receipt of such notice to cure the event(s) that trigger "Cause," with the Company's or its subsidiaries', as applicable, Board of Directors making the final determination whether you have cured any Cause.

The obligation to pay the benefits hereunder shall at all times be an unfunded and unsecured obligation of the Company or its subsidiaries and be paid out of the general assets of the Company or its subsidiaries.

Confidential. We request that you keep this letter agreement confidential. You agree that you will not disclose to others the existence or terms of this letter agreement, except that you may disclose such information to your spouse, attorney or tax adviser.

At Will Employment. You remain an at-will employee of the Company or its subsidiaries, which means the employment relationship can be terminated by either of us for any reason, at any time, with or without prior notice and with or without cause. Nothing in this Agreement changes the nature of that relationship.

Choice of Law. The validity, interpretation, construction and performance of this Agreement shall be governed by the laws of the State of California (other than their choice-of-law provisions).

Entire Agreement. This letter agreement supersedes any and all prior understandings and agreements, whether oral or written, between or among the parties hereto with respect to the specific subject matter hereof.

Please sign below to acknowledge the terms of this letter agreement.

Very truly yours,

/s/ John J. Allen
John J. Allen, Chief Executive Officer

I hereby acknowledge, accept and agree to the terms as set forth above.

/s/ Josh Ensign Date signed: 9/15/2021

RETENTION AGREEMENT

Proterra Inc
September 15, 2021

Dear JoAnn Covington:

Proterra Inc, a Delaware corporation (the "**Company**") is very pleased to offer you the opportunity to receive the retention benefit described below.

Retention Bonus. Subject to your continued employment with the Company or its subsidiaries through to September 13, 2022 (the "**Retention Date**"), the Company will pay you a cash bonus in the total amount of \$250,000, less applicable withholding taxes and deductions (the "**Retention Bonus**"). The Retention Bonus shall be paid within thirty (30) days from the Retention Date.

Notwithstanding the foregoing, in the event that your employment is terminated by the Company or its subsidiaries without Cause (as defined below) prior to the Retention Date, you will remain eligible to receive the Retention Bonus (which shall be paid within thirty (30) days from your last day of work). You will not be eligible for a retention bonus if you resign from employment with the Company or its subsidiaries for any reason or the Company or its subsidiaries terminates your employment for Cause before the Retention Date.

For purposes of this letter, "**Cause**" means (i) an unauthorized use or disclosure by you of the Company's or its subsidiaries' confidential information or trade secrets, which use or disclosure causes or is reasonably likely to cause material harm to the Company or its subsidiaries, (ii) a material breach of any agreement between you and the Company or its subsidiaries, (iii) a material failure to comply with the Company's or its subsidiaries' written policies or rules that has caused or is reasonably likely to cause material injury to the Company, its successor, or its affiliates, or any of their business, (iv) conviction of, or plea of "guilty" or "no contest" to, a felony under the laws of the United States or any state thereof, (v) willful misconduct that has caused or is reasonably likely to cause material injury to the Company, its successor, or its affiliates, or any of their business, (vi) embezzlement, (vii) failure to cooperate with the Company or its subsidiaries in any investigation or formal proceeding if the Company or its subsidiary, as applicable, has requested your reasonable cooperation, (viii) violation of any applicable federal, state or foreign statutes, laws or regulations or (ix) a continued failure to perform assigned duties after receiving written notification of such failure from the Company's or its subsidiaries', as applicable, Chief Executive Officer provided that you must be provided with written notice of your termination for "Cause" and you must be provided with a thirty (30) day period following your receipt of such notice to cure the event(s) that trigger "Cause," with the Company's or its subsidiaries', as applicable, Board of Directors making the final determination whether you have cured any Cause.

The obligation to pay the benefits hereunder shall at all times be an unfunded and unsecured obligation of the Company or its subsidiaries and be paid out of the general assets of the Company or its subsidiaries.

Confidential. We request that you keep this letter agreement confidential. You agree that you will not disclose to others the existence or terms of this letter agreement, except that you may disclose such information to your spouse, attorney or tax adviser.

At Will Employment. You remain an at-will employee of the Company or its subsidiaries, which means the employment relationship can be terminated by either of us for any reason, at any time, with or without prior notice and with or without cause. Nothing in this Agreement changes the nature of that relationship.

Choice of Law. The validity, interpretation, construction and performance of this Agreement shall be governed by the laws of the State of California (other than their choice-of-law provisions).

Entire Agreement. This letter agreement supersedes any and all prior understandings and agreements, whether oral or written, between or among the parties hereto with respect to the specific subject matter hereof.

Please sign below to acknowledge the terms of this letter agreement.

Very truly yours,

/s/ John J. Allen
John J. Allen, Chief Executive Officer

I hereby acknowledge, accept and agree to the terms as set forth above.

/s/ JoAnn C. Covington Date signed: 9/15/2021

SUBSIDIARY OF PROTERRA INC

Name of Subsidiary

Jurisdiction

Proterra Operating Company, Inc.

Delaware

Consent of Independent Registered Public Accounting Firm

We consent to the incorporation by reference in the registration statement No. 333-258827 on Form S-8 of our report dated March 14, 2022, with respect to the consolidated financial statements of Proterra Inc.

/s/ KPMG LLP

Santa Clara, California
March 14, 2022

CERTIFICATION

I, Gareth T. Joyce, certify that:

1. I have reviewed this report on Form 10-K for the year ended December 31, 2021 of Proterra Inc;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officers and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
 - a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 14, 2022

By: /s/ Gareth T. Joyce

Gareth T. Joyce

Chief Executive Officer

CERTIFICATION

I, Karina F. Padilla, certify that:

1. I have reviewed this report on Form 10-K for the year ended December 31, 2021 of Proterra Inc;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officers and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
 - a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 14, 2022

By: /s/ Karina F. Padilla

Karina F. Padilla

Chief Financial Officer

**CERTIFICATION PURSUANT TO
RULE 13a-14(b) OF THE SECURITIES EXCHANGE ACT OF 1934
AND 18 U.S.C. SECTION 1350**

In connection with the Annual Report of Proterra Inc (the "Company") on Form 10-K for the year ended December 31, 2021, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I certify, pursuant to Rule 13a-14(b) of the Securities Exchange Act of 1934 and 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to the best of my knowledge:

- (1) the Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
- (2) the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: March 14, 2022

By: /s/ Gareth T. Joyce

Gareth T. Joyce

Chief Executive Officer

**CERTIFICATION PURSUANT TO
RULE 13a-14(b) OF THE SECURITIES EXCHANGE ACT OF 1934
AND 18 U.S.C. SECTION 1350**

In connection with the Annual Report of Proterra Inc (the "Company") on Form 10-K for the year ended December 31, 2021, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I certify, pursuant to Rule 13a-14(b) of the Securities Exchange Act of 1934 and 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to the best of my knowledge:

- (1) the Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
- (2) the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: March 14, 2022

By: /s/ Karina F. Padilla

Karina F. Padilla

Chief Financial Officer

Request for Proposal

IFB# 6447

August 2, 2022

CER 8. Federal Certifications

CER 8.1 Buy America Certification

This form is to be submitted with an offer exceeding the small purchase threshold for federal assistance programs, currently set at \$100,000.

Certificate of Compliance

The Proposer hereby certifies that it will comply with the requirements of 49 USC Section 5323(j)(2)(C), Section 165(b)(3) of the Surface Transportation Assistance Act of 1982, as amended, and the regulations of 49 CFR 661.11:

Name and title: John Walsh, Chief Commercial Officer

Company: Proterra Operating Company, Inc.

DocuSigned by:
John Walsh
190E3GD36916412...

Authorized signature

9/7/2022

Date

Certificate of Non-Compliance

The Proposer hereby certifies that it cannot comply with the requirements of 49 USC Section 5323(j)(2)(C) and Section 165(b)(3) of the Surface Transportation Assistance Act of 1982, as amended, but may qualify for an exception to the requirements consistent with 49 USC Sections 5323(j)(2)(B) or (j)(2)(D), Sections 165(b)(2) or (b)(4) of the Surface Transportation Assistance Act, as amended, and regulations in 49 CFR 661.7.

Name and title:

Company:

Authorized signature

Date

Request for Proposal

IFB# 6447

August 2, 2022

CER 8.2 Debarment and Suspension Certification for Prospective Contractor

Primary covered transactions must be completed by Proposer for contract value over \$25,000.

Choose one alternative:

The Proposer, Proterra Operating Company, Inc., certifies to the best of its knowledge and belief that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or agency;
2. Have not within a three-year period preceding this Proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state or local) transaction or Contract under a public transaction; violation of federal or state antitrust statutes or commission or embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in Paragraph 2 of this certification; and
4. Have not within a three-year period preceding this Proposal had one or more public transactions (federal, state or local) terminated for cause or default.

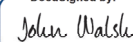
OR

The Proposer is unable to certify to all of the statements in this certification, and attaches its explanation to this certification. (In explanation, certify to those statements that can be certified to and explain those that cannot.)

The Proposer certifies or affirms the truthfulness and accuracy of the contents of the statements submitted on or with this certification and understands that the provisions of Title 31 USC § Sections 3801 are applicable thereto.

Executed in Greenville, SC.

Name: John Walsh, Chief Commercial Officer

DocuSigned by:

 190F3CD36916412

9/7/2022

Authorized signature

Date

Request for Proposal

IFB# 6447

August 2, 2022

CER 8.3 Debarment and Suspension Certification (Lower-Tier Covered Transaction)

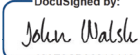
This form is to be submitted by each Subcontractor receiving an amount exceeding \$25,000.

The prospective lower-tier participant (Proposer) certifies, by submission of this Proposal, that neither it nor its "principals" as defined at 49 CFR § 29.105(p) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency.

If the prospective Proposer is unable to certify to the statement above, it shall attach an explanation, and indicate that it has done so by placing an "X" in the following space: _____

THE PROPOSER, Proterra Operating Company, Inc., CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF EACH STATEMENT OF ITS CERTIFICATION AND EXPLANATION, IF ANY. IN ADDITION, THE PROPOSER UNDERSTANDS AND AGREES THAT THE PROVISIONS OF 31 USC §§ 3801 ET SEQ. APPLY TO THIS CERTIFICATION AND EXPLANATION, IF ANY.

Name and title of the Proposer's authorized official: John Walsh, Chief Commercial Officer

DocuSigned by:

160E3CD36016412

9/7/2022

Authorized signature

Date

Request for Proposal
[insert date of solicitation]
[insert Proposal number]

CER 8.4 Non-Collusion Affidavit

This affidavit is to be filled out and executed by the Proposer; if a corporation makes the bid, then by its properly executed agent. The name of the individual swearing to the affidavit should appear on the line marked "Name of Affiant." The affiant's capacity, when a partner or officer of a corporation, should be inserted on the line marked "Capacity." The representative of the Proposer should sign his or her individual name at the end, not a partnership or corporation name, and swear to this affidavit before a notary public, who must attach his or her seal.

State of South Carolina, County of Greenville

I, John Walsh, being first duly sworn, do hereby state that
(Name of Affiant)

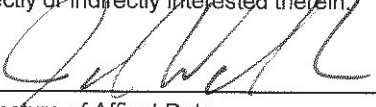
I am Chief Commercial Officer of Proterra Operating Company, Inc.
Capacity) (Name of Firm, Partnership or Corporation)

whose business is
battery-electric manufacturing and clean energy solutions

and who resides at
1815 Rollins Rd. Burlingame, CA 94010

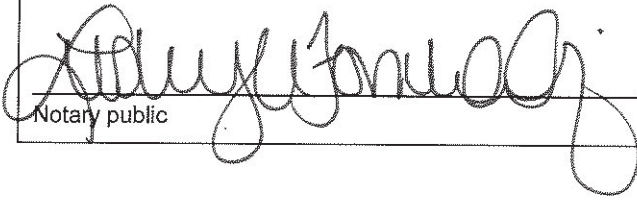
and that
Proterra Operating Company, Inc.
(Give names of all persons, firms, or corporations interested in the bid)

is/are the only person(s) with me in the profits of the herein contained Contract; that the Contract is made without any connection or interest in the profits thereof with any persons making any bid or Proposal for said Work; that the said Contract is on my part, in all respects, fair and without collusion or fraud, and also that no members of the Board of Trustees, head of any department or bureau, or employee therein, or any employee of the Authority, is directly or indirectly interested therein.


Signature of Affiant Date August 25, 2022

Sworn to before me this 25th day of August, 2022

Lesley M. Fonokalafi Notary Public, State of South Carolina My Commission Expires June 30, 2025


Notary public June 30, 2025
My commission expires

Seal

Request for Proposal

IFB# 6447

August 2, 2022

CER 8.5 Lobbying Certification

This form is to be submitted with an offer exceeding \$100,000.

The Proposer certifies, to the best its knowledge and belief, that:

1. No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of a federal department or agency, a member of the U.S. Congress, an officer or employee of the U.S. Congress, or an employee of a member of the U.S. Congress in connection with the awarding of any federal Contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification thereof.
2. If any funds other than federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this federal Contract, grant, loan or cooperative agreement, the undersigned shall complete and submit Standard Form LLL, "Disclosure Form to Report Lobbying," in accordance with its instruction, as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96).
3. The undersigned shall require that the language of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, sub grants and contracts under grants, loans and cooperative agreements) and that all sub recipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, USC § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

THE PROPOSER, Proterra Operating Company, Inc., CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF EACH STATEMENT OF ITS CERTIFICATION AND DISCLOSURE, IF ANY. IN ADDITION, THE PROPOSER UNDERSTANDS AND AGREES THAT THE PROVISIONS OF 31 USC §§ 3801 ET SEQ. APPLY TO THIS CERTIFICATION AND DISCLOSURE, IF ANY.

Name of the bidder or Proposer's authorized official: John Walsh

Title: Chief Commercial Officer

DocuSigned by:
John Walsh
190E3CD38918412...

Signature

9/7/2022

Date

Per paragraph 2 of the included form Lobbying Certification, add Standard Form–LLL, "Disclosure Form to Report Lobbying," if applicable.

Request for Proposal

IFB# 6447

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CER 8.6 Certificate of Compliance with Bus Testing Requirement

The undersigned certifies that the vehicle offered in this procurement complies and will, when delivered, comply with 49 USC § 5323(c) and FTA’s implementing regulation at 49 CFR Part 665 according to the indicated one of the following three alternatives.

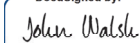
Mark one and only one of the three blank spaces with an “X.”

- 1. The buses offered herewith have been tested in accordance with 49 CFR Part 665 on August 2022 (date). If multiple buses are being proposed, provide additional bus testing information below or on attached sheet. The vehicles being sold should have the identical configuration and major components as the vehicle in the test report, which must be submitted with this Proposal. If the configuration or components are not identical, then the manufacturer shall provide with its Proposal a description of the change and the manufacturer’s basis for concluding that it is not a major change requiring additional testing. If multiple buses are being proposed, testing data on additional buses shall be listed on the bottom of this page.
- 2. The manufacturer represents that the vehicle is “grandfathered” (has been used in mass transit service in the United States before October 1, 1988, and is currently being produced without a major change in configuration or components), and submits with this Proposal the name and address of the recipient of such a vehicle and the details of that vehicle’s configuration and major components.
- 3. The vehicle is a new model and will be tested and the results will be submitted to the Agency prior to acceptance of the first bus.

The undersigned understands that misrepresenting the testing status of a vehicle acquired with federal financial assistance may subject the undersigned to civil penalties as outlined in the Department of Transportation’s regulation on Program Fraud Civil Remedies, 49 CFR Part 31. In addition, the undersigned understands that FTA may suspend or debar a manufacturer under the procedures in 49 CFR Part 29.

Company name: Proterra Operating Company, Inc.

Name and title of the Proposer’s authorized official: John Walsh, Chief Commercial Officer

DocuSigned by:

 190E3CD366916412
 Authorized signature

9/7/2022

Date

Request for Proposal

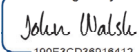
IFB# 6447

August 2, 2022

CER 8.7 DBE Approval Certification

I hereby certify that the Proposer has complied with the requirements of 49 CFR 26, Participation by Disadvantaged Business Enterprises in DOT Programs, and that its goals have not been disapproved by the Federal Transit Administration.

Name and title of the Proposer's authorized official: John Walsh, Chief Commercial Officer

DocuSigned by:

190E3CD36916412...

Authorized signature

9/7/2022

Date

Request for Proposal

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CER 8.8 Federal Motor Vehicle Safety Standards

The Proposer and (if selected) Contractor shall submit (1) manufacturer's FMVSS self-certification sticker information that the vehicle complies with relevant FMVSS or (2) manufacturer's certified statement that the contracted buses will not be subject to FMVSS regulations.

Company name: Proterra Operating Company, Inc.

Name of signer: John Walsh

Title: Chief Commercial Officer

DocuSigned by:
John Walsh
190E3CD36916412

9/7/2022

Authorized signature

Date

CER 9. Other Certifications

CER 9.1 Proposal Form

NOTE: The following is an example of a Proposal form to be modified as appropriate by the Agency and included in the RFP.

Proposer shall complete the following form and include it in the price Proposal.

PROPOSAL

By execution below by a duly authorized representative(s) of the Proposer, the Proposer hereby offers to furnish equipment and services as specified in its Proposal submitted to VA - DGS in response to Request for Proposal No. IFB# 6447 in its entirety.

Proposer: Proterra Operating Company, Inc.

Street address: 1815 Rollins Rd.

City, state, ZIP: Burlingame, CA

Name and title of Authorized Signer(s): John Walsh, Chief Commercial Officer

Name and title of Authorized Signer(s): _____

Phone: (864) 438-0000

	9/7/2022
Authorized signature	Date

_____ Authorized signature	_____ Date
-------------------------------	---------------

CER 9.3 Certification of Compliance with Standards, Certifications and Regulations

CER 9.3 identifies the specifications, standards, regulations, and references used within this RFP. This form must be completed and included in the Technical Proposal and requires an indication of the state of compliance and an opportunity for listing other pertinent references. Please indicate “compliance” as, full, partial or N/A (not applicable). If “partial” or “N/A,” please describe.

Standard	Title	Compliance	If “partial” or “N/A,” please describe
SAE J10	Automotive and Off-Highway Air Brake Reservoir Performance and Identification Requirements - Truck and Bus J10_201312	Comply	
SAE J211a	Instrumentation for Impact Test J211A_197112	N/A	Cancelled Oct 1988
SAE J287	Driver Hand Control Reach J287_201603	N/A	Not applicable to Class B vehicles.
SAE J366	Exterior Sound Level for Heavy Trucks and Buses (STABILIZED Sep 2011) J366_201109	Comply	
SAE J382	Windshield Defrosting Systems Performance Requirements-- Trucks, Buses, and Multipurpose Vehicles (Cancelled Sep 2000) J382_200009	N/A	Meet FMVSS 103
SAE J534	Lubrication Fittings J534_201508	Comply	
SAE J537	Storage Batteries J537_201604	N/A	EV excluded
SAE J541	Voltage Drop for Starting Motor Circuits (Cancelled Jul 2013) J541_201307	N/A	EV excluded
SAE J587	License Plate Illumination Devices (Rear Registration Plate Illumination Devices) J587_201711	Comply	
SAE J593	Backup Lamp (Reversing Lamp) J593_201606	Comply	
SAE J673	Automotive Safety Glazing Materials J673_201506	Comply	
SAE J680	Location and Operation of Air Brake Controls in Motor Truck Cabs J680_201508	N/A	Not applicable to Transit buses
SAE J686	Motor Vehicle License Plates (STABILIZED Jul 2012) J686_201207	Comply	
SAE J689	Curbstone Clearance, Approach, Departure, and Ramp Breakover Angles—Passenger Car and Light Truck (Cancelled Aug 2009) J689_200908	N/A	Not applicable to Transit buses
SAE J833	Human Physical Dimensions	N/A	Not applicable to Transit buses
SAE J844	Nonmetallic Air Brake System Tubing (STABILIZED Dec 2012) J844_201212	Comply	
SAE J941	Motor Vehicle Drivers’ Eye Locations J941_201003	N/A	Not applicable to Transit buses
SAE J994	Alarm—Backup—Electric Laboratory Performance Testing J994_201409	N/A	Not applicable to Transit buses
SAE J1050	Describing and Measuring the Driver’s Field of View J1050_200902	Comply	

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Standard	Title	Compliance	If “partial” or “N/A,” please describe
SAE J1113	Electromagnetic Compatibility Measurement Procedures and Limits for Components of Vehicles, Boats (up to 15 m), and Machines (Except Aircraft) (16.6 Hz to 18 GHz) J1113/1_201810	Comply	
SAE J1127	Low Voltage Battery Cable J1127_201512	Comply	
SAE J1128	Low Voltage Primary Cable J1128_201512	Comply	
SAE J1149	Metallic Air Brake System Tubing and Pipe (STABILIZED Oct 2015) J1149_201510	N/A	Not applicable to Transit buses
SAE J1292	Automobile and Motor Coach Wiring(STABILIZED Apr 2016) J1292_201604	N/A	Not applicable to Transit buses
SAE J1308	Fan Guard for Off-Road Machines J1308_201312	N/A	Not applicable to Transit buses
SAE J1455	Recommended Environmental Practices for Electronic Equipment Design in Heavy-Duty Vehicle Applications J1455_201703	N/A	Not applicable to Transit buses
SAE J1587	Electronic Data Interchange Between Microcomputer Systems in Heavy-Duty Vehicle Applications (STABILIZED Jan 2013) J1587_201301	Comply	
SAE J1654	Unshielded High Voltage Primary Cable J1654_201609	Comply	
SAE J1708	Serial Data Communications Between Microcomputer Systems in Heavy-Duty Vehicle Applications (STABILIZED Sep 2016) J1708_201609	Comply	
SAE J1763	A Conceptual Its Architecture: An Atis Perspective (Cancelled May 2003) J1763_200304	N/A	Cancelled
SAE J1772	SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler J1772_201710	Comply	
SAE J1939	Serial Control and Communications Heavy Duty Vehicle Network - Top Level Document J1939_201808	Comply	
SAE J1986	Balance Weight and Rim Flange Design Specifications, Test Procedures, and Performance Recommendations J1986_201603	N/A	Not for HD Vehicles
SAE J1995	Engine Power Test Code - Spark Ignition and Compression Ignition - Gross Power and Torque Rating J1995_201401	N/A	Not applicable to Electric Vehicles
SAE J2344	Guidelines for Electric Vehicle Safety J2344_201003	Comply	
SAE J2402	Road Vehicles—Symbols for Controls, Indicators, and Tell-tales J2402_201001	Comply	
SAE J2464	Electric and Hybrid Electric Vehicle Rechargeable Energy Storage System (RESS) Safety and Abuse Testing J2464_200911	Comply	
SAE J2711	Recommended Practice for Measuring Fuel Economy and Emissions of Hybrid-Electric and Conventional Heavy-Duty Vehicles(STABILIZED Jul 2018) J2711_201807	N/A	Not applicable to Electric Vehicles
SAE J2910	Recommended Practice for the Design and Test of Hybrid Electric and Electric Trucks and Buses for Electrical Safety J2910_201404	Comply	

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Standard	Title	Compliance	If “partial” or “N/A,” please describe
SAE J3068	Electric Vehicle Power Transfer System Using a Three-Phase Capable Coupler J3068_201804	N/A	Comply with J1772
FMVSS 105	Hydraulic and Electric Brake Systems	Comply	
FMVSS 121	Air Brake Systems	Comply	
FMVSS 207	Seating Systems	Comply	
FMVSS 210	Seat Belt Assembly Anchorages	Comply	
FMVSS 217	Bus Emergency Exits and Window Retention and Release	Comply	
FMVSS 301	Fuel System Integrity	Comply	
FMVSS 302	Flammability of Interior Materials	Comply	
FMVSS 403	Platform Lift Systems for Motor Vehicles	Comply	
FMVSS 404	Platform Lift Installations in Motor Vehicles	Comply	
ANSI/IAS NGV2 (1998)	Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers	N/A	Not applicable to Electric Vehicles
ANSI/IAS PRD1 (1998)	Pressure Relief Devices For Natural Gas Vehicle (NGV) Fuel Containers	N/A	Not applicable to Electric Vehicles
ANSI Z26.1	Safety Glazing Materials for Glazing Motor Vehicles and Motor Vehicle Equipment Operating on Land Highways - Safety Standard	Comply	
ANSI/ASHR AE 52.1	Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size	N/A	
ASTM A240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications	N/A	
ASTM A269	Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service	N/A	Not Applicable, Composite Body
ASTM B117	Standard Practice for Operating Salt Spray (Fog) Apparatus	Comply	
ASTM D1003	Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics	Comply	
ASTM D4541-85	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers	N/A	
ASTM E162-90	Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source	Comply	FMVSS 302
ASTM E424	Standard Test Methods for Solar Energy Transmittance and Reflectance (Terrestrial) of Sheet Materials	N/A	See FMVS 104
ECE R100 Rev 2	Uniform provisions concerning the approval of vehicles with regard to specific requirements for the electric power train	Comply	
FTA Docket 90A	Recommended Fire Safety Practices for Transit Bus and Van Materials Selection	N/A	FMVSS 302 approved via RFA in place of Docket 90A
CGA C-6.4	Methods for External Visual Inspection of Natural Gas Vehicle (NGV) Fuel Containers and Their Installation	N/A	Not applicable to Electric Vehicles

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Standard	Title	Compliance	If “partial” or “N/A,” please describe
NGV-3.1/ CGA-12.3	Fuel system components for compressed natural gas powered vehicles	N/A	
CARB 2292.5	Specifications for Compressed Natural Gas	N/A	
UL 935	Standard for Fluorescent-Lamp Ballasts	N/A	Not Applicable, bus designed with LEDs.
ISO 5128	Acoustics – Measurement of noise inside motor vehicles	Comply	
ISO 26262	Road Vehicles – Functional Safety	Partial	Our battery management system is certified to Automotive Safety Integrity Level C per ISO 26262 Road vehicles - Functional Safety
NFPA-52	Vehicular Natural Gas Fuel Systems Code	N/A	
PS 1-95	Construction and Industrial Plywood	N/A	
UN/DOT 38.3	UN Transportation Testing for Lithium Batteries	Comply	
UNECE Council Directive 95/54(R10)	Adapting to technical progress Council Directive 72/245/EEC on the approximation of the laws of the Member States relating to the suppression of radio interference produced by spark-ignition engines fitted to motor vehicles and amending Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers	N/A	Not applicable to Electric Vehicles

CER 10. Vehicle Technical Information

NOTE: This is a sample form. The Agency should customize it to comply with its proposed requirements.

This form must be completed and included in the Technical Proposal.

GENERAL COACH DATA SHEET
 35 Foot ZX5+

Bus manufacturer:	Proterra Inc
Bus model:	ZX5+
Understructure manufacturer:	Proterra Inc
Model number:	ZX5+

Basic Body Construction

Type:	Composite Monocoque
-------	---------------------

Tubing or frame member thickness and dimensions

Overstructure	N/A
Understructure	N/A

Skin thickness and material

Roof	1.38 inch, Composite Laminate
Sidewall	0.94 inch, Composite Laminate
Skirt panel	1.00 inch, Composite Laminate
Front end	1.30 inch, Composite Laminate
Rear end	0.90 inch, Composite Laminate

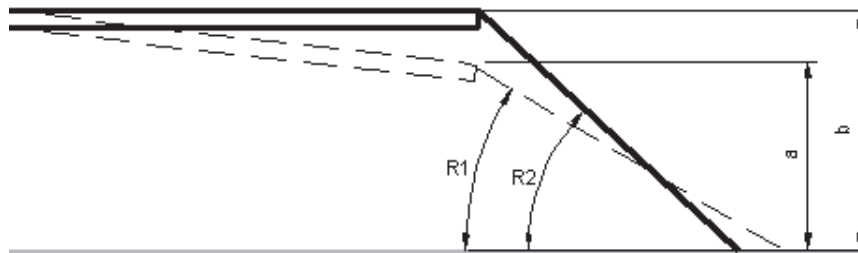
Dimensions

Overall length	Over bumpers	36	ft	11	in.
	Over body	35	ft	10	in.
Overall width	Over body excluding mirrors	8	ft	6	in.
	Over body including mirrors—driving position	10	ft	0	in.
	Over tires front axles	8	ft	3	in.
	Over tires center axle	N/A	ft	N/A	in.
	Over tires rear axles	8	ft	3	in.
Overall height (maximum)		10	ft	9	in.
Overall height (main roof line)		10	ft	9	in.

Angle of approach	9.3	deg
Breakover angle	9.4	deg
Breakover angle (rear)	N/A	deg
Angle of departure	9.3	deg

Doorway Dimensions	Front		Rear	
Width between door posts	44.5	in.	50.4	in.
Door width between panels	33.7	in.	49.1	in.
Clear door width	33.7	in.	38.9	in.
Doorway height	75	in.	75	in.
Knuckle clearance	1.87	in.	2.67	in.

Step height from ground measured at center of doorway



	Front doorway, empty		Ramp angle		Rear Doorway, empty				
Kneeled	a.	13	in.	R1	10	deg	a.	14.4	in.
Unkneeled	b.	15.7	in.	R2	15	deg	b.	17.1	in.

Interior head room (center of aisle)

Front axle location	90	in.
Center axle location	N/A	in.
Rear axle location	75	in.

Aisle width between transverse seats 25.8 in.

Floor height above ground (centerline of bus)

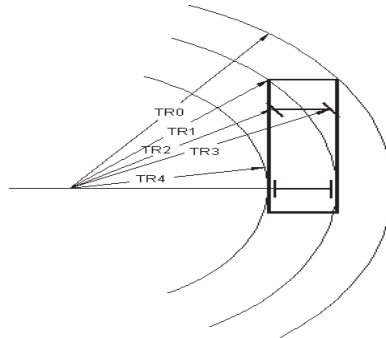
At front door	15.7	in.
At front axle	18.1	in.
At drive axle	18.1	in.
At rear door	17.1	in.

Minimum ground clearance (between bus and ground, with bus unkneeled)

Excluding axles	9	in.
Including axles	6	in.

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper)	35	ft	0	in.
Front inner corner radius, TR1	30	ft	7.2	in.
Front wheel inner turning radius, TR2	24	ft	6	in.
Front wheel outer turning radius, TR3	29	ft	4.8	in.
Inside Body Turning Radius innermost point, TR4 (including bumper)	14	ft	1.2	in.



Wheel base

Front	243	in.
Rear	N/A	in.

Overhang, centerline of axle over bumper

Front	104	in.
Rear	96	in.

Floor

Interior length	32	ft	0	in.
Interior width (excluding coving)	7	ft	9	in.
Total standee area (approximately)	33.4	sq ft		
Minimum distance between wheelhouses:	Front		35.3	in.
	Rear		23.6	in.
	Center		N/A	in.
Maximum interior floor slope (from horizontal)	1.5	deg		

Passenger capacity provided

Total maximum seating	29	
Standee capacity	22	
Minimum hip to knee room	26	in.
Minimum foot room	14	in.

Weight

	No. of people	Front axle			Center axle			Rear axle			Total bus
		Left	Right	Total	Left	Right	Total	Left	Right	Total	
Empty bus, full fuel and farebox	0	6,680	6,680	13,360	N/A	N/A	N/A	8,625	8,625	17,250	30,610
Fully seated, full fuel and farebox	29 + Driver	7,467	7,468	14,935	N/A	N/A	N/A	10,087	10,088	20,175	35,110
Fully loaded standee and fully seated, full fuel and farebox	52	8,292	8,293	16,585	N/A	N/A	N/A	10,912	10,913	21,825	38,410
Crush load (1.5x fully loaded)	78	9,268	9,267	18,535	N/A	N/A	N/A	11,887	11,888	23,775	42,310
GVWR					N/A	N/A	N/A				43,650
GAWR				18,078	N/A	N/A	N/A			28,660	

Engine, main

Manufacturer	N/A			
Type and weight rating	N/A			
Model number	N/A			
Bore	N/A	in.		
Stroke	N/A	in.		
Displacement	N/A	cu in.		
Compression ratio	N/A			
Injector type and size	N/A			
Net SAE horsepower	N/A	hp	at	N/A
Net SAE torque	N/A	lb/ft	at	N/A
Crankcase oil capacity				
New engine, dry	N/A	gal		
New engine, wet	N/A	gal		
Turbocharger make and model	N/A			
Maximum speed, no load	N/A	RPM		
Maximum speed, full load	N/A	RPM		
Speed at idle	N/A	RPM		
Speed at fast idle	N/A	RPM		

Engine information/graphs to be attached with this form: N/A

- Engine speed vs. road speed
- Torque vs. engine speed
- Horsepower vs. engine speed
- Fuel consumption vs. engine speed
- Vehicle speed vs. time (both loaded and unloaded)
- Vehicle speed vs. grade (both loaded and unloaded)
- Acceleration vs. time
- Change of acceleration vs. time

Traction Motor

Manufacturer	Parker	
Model Number	GVM310	
Type	Brushless, permanent magnet synchronous motor	
Max Power at Speed	240 @ 3000	kW @ rpm
Max Torque at Speed	850 @ 3000	N-m @ rpm
Continuous rated power	205	kW
Average efficiency	95 %	% (motor + inverter system efficiency)
Max motor speed	6,000	rpm
Cooling Type	Liquid-Cooled, Glycol/water 50/50%	

Attach torque-speed curve and efficiency maps

Hybrid drive or transmission

Manufacturer	Eaton		
Type	EV Transmission		
Speeds	4		
Gear ratios	Forward: Competition Sensitive	Reverse:	Competition Sensitive
Shift speeds			
1st–2nd	20	mph	
2nd–3rd	33	mph	
3rd–4th	57	mph	
4th–5th (if applicable)	N/A	mph	
5th–6th (if applicable)	N/A	mph	
Fuel capacity (including heat exchanger and filters)	8 qrts		

Voltage regulator

Manufacturer	N/A
Model	N/A

Voltage equalizer

Manufacturer	N/A
Model	N/A

Alternator

Manufacturer	N/A	
Type	N/A	
Model	N/A	
Output at idle	N/A	amps
Output at maximum speed	N/A	amps
Maximum warranted speed	N/A	rpm
Speed at idle (approximately)	N/A	rpm
Drive type	N/A	

Auxiliary Inverter(s)

Manufacturer(s)	Lenze
Model Number(s)	EMDDAG23003303U00000
Output voltage(s)	220 V

DC-DC Converter(s)

Manufacturer(s)	John Deere
Model Number(s)	PD400
Output voltage(s)	24 V

Auxiliary (Hotel) Loads as Installed

List of Accessories, excluding HVAC

Accessory	Average Power Consumption on Agency Design Operating Profile (kW)	Max Power Consumption (kW)
Power Steering Inverter	TBD	TBD
Air Compressor Inverter	TBD	TBD
DC-DC Converter	TBD	TBD

Starter motor

Manufacturer Type	N/A
Model	N/A
	N/A

Air compressor

Manufacturer	Hydrovane		
Type	Rotary Vane		
Rated capacity	8.96	CFM	
Capacity at idle (approximately)	N/A	CFM	
Capacity at maximum speed (engine)	N/A	CFM	
Maximum warranted speed	2800	rpm	
Speed idle	Electric	rpm	
Drive type	N/A		
Governor:			
Cut-in pressure	110	psi	
Cut-out pressure	130	psi	

Axles

First

Manufacturer	ZF		
Type	Independent, double A-arm		
Model number	RL-82EC		
Gross axle weight rating	18,078	lb	
Axle load	16,585	lb	

Second

Manufacturer	ZF		
Type	Drop Portal		
Model number	AV-133/90		
Gross axle weight rating	28,660	lb	
Axle load	21,825	lb	

Third

Manufacturer	N/A		
Type	N/A		
Model number	N/A		
Gross axle weight rating	N/A	lb	
Axle load	N/A	lb	
Axle ratio	N/A		

Suspension system

Manufacturer	ZF		
Type:	First:	Heavy-duty Independent Front Suspension (IFS), Model RL-82EC	
	Second:	H-Frame Beam Rear, Model AV-133/90	
	Third:	N/A	

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Springs:	First:	Firestone, Model 1T1SL-4
	Second:	Firestone, Model 1T1SL-4
	Third:	N/A

Joint

Manufacturer	N/A
Type	N/A
Model number	N/A

Wheels and tires

Wheels

Make	Alcoa
Size	22.5 x 9"
Capacity	9,090 lbs
Material	Aluminum

Tires

Manufacturer	Michelin
Type	X InCity Energy Z LR L
Size	315/80R22.5

Load range/air pressure psi ** 9,370 lbs (Single Rating) / 8,820 lbs (Dual Rating)

Steering, power

Pump

Manufacturer and model number	Eaton, Vickers V10
Type	Hydraulic Vane Pump
Relief pressure	<input type="text" value="2100"/> psi

Booster/gear box

Manufacturer and model number	TRW, TAS85153A
Type	Fully integral, recirculating ball
Ratio	21:01

Power steering fluid capacity	<input type="text" value="2"/> gal
Maximum effort at steering wheel	<input type="text" value="20"/> lb (unloaded stationary coach on dry asphalt pavement)
Steering wheel diameter	<input type="text" value="18"/> in.

Brakes

Make of fundamental brake system	Knorr-Bremse
Brake chambers vendor size and part number:	First: Type 24
	Second: Type 24
	Third: N/A

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Brake operation effort 75 lbs

Slack adjuster's vendor's type and part numbers

First:	Right:	N/A
	Left:	N/A
Second:	Right:	N/A
	Left:	N/A
Third:	Right:	N/A
	Left:	N/A
Length:	First take-up:	N/A
	Second take-up:	N/A
	Third take-up:	N/A

Brake drums/discs

First:	Manufacturer	Knorr-Bremse	
	Part number	0501.316.953	
	Diameter	17	in.
Second:	Manufacturer	Knorr-Bremse	
	Part number	0501.316.953	
	Diameter	17	in.
Third:	Manufacturer	N/A	
	Part number	N/A	
	Diameter	N/A	in.

Brake lining manufacturer	MAT Holdings
Type	Premium Long Life

Brake lining identification

First:	Forward	MAT 6900
	Reverse	MAT 6900
Second:	Forward	MAT 6900
	Reverse	MAT 6900
Third:	Forward	N/A
	Reverse	N/A

Brake linings per shoe

First	N/A
Second	N/A
Third	N/A

Brake lining widths

First	3.23	in.
Second	3.23	in.
Third	N/A	in.

Brake lining lengths

First	4.72	in.
Second	4.72	in.
Third	N/A	in.

Brake lining thickness 0.83 in.

Brake lining per axle

First	61	sq. in.
Second	61	sq. in.
Third	N/A	sq. in.

Cooling system

Radiator/charge air cooler

Manufacturer	Modine		
Type	Liquid to air heat exchanger		
Model number	1A021730		
Number of tubes	68		
Tubes outer diameter	0.75	in./	N/A
Fins per inch	18	fins	
Fin thickness	0.004	in.	
Total cooling and heating system capacity	*	gal *12 gal in power electronics loop; 13 gal in battery loop	
Radiator fan speed control	Electric		
Surge tank capacity	14.8	qt	
Engine thermostat temperature setting:	Initial opening (fully closed)	N/A	°F
	Fully open	N/A	°F
Overheat alarm temperature sending unit setting	*	°F *55 F for PE, 85 F for BTMS	
Shutdown temperature setting	N/A	°F (shutdown at component level)	

Air reservoir capacity

Supply reservoir	300	cu in.
Primary reservoir	1,848	cu in.
Secondary reservoir	1,848	cu in.
Packing reservoir	577.5	cu in.
Accessory reservoir	2 x 1,848	cu in.

Other reservoir type

N/A

 cu in.

Heating, ventilation and air conditioning equipment

Heating system capacity	PTC: 68,000 BTU ; Heat Pump: 65,000 BTU	BTU/hr
Electrical load at maximum heating capacity	18	kW
Air conditioning capacity	102,000	BTU
Electrical load at maximum cooling capacity	13	kW
Ventilating capacity	4,100	CFM

Compressor

Manufacturer	Panasonic		
Model	C-SWS225H00A		
Number of cylinders	N/A		
Drive ratio	1:1 (Direct)		
Maximum warranted speed	5,400 RPM		rpm
Operating speed	*		rpm (recommended) *Variable, depends on set temperature and load
Weight	99		lb
Oil capacity	Dry	0.5	gal
	Wet	N/A	gal
Refrigerant:	Type	R407C	11.44 lb

Condenser

Manufacturer	Kayer		
Model	Custom-built		
Number of fins/in.	14		
Outer diameter of tube	0.375		in.
Fin thickness	0.008		in.

Condenser fan

Manufacturer	Spal		
Model	VA, Series		
Fan diameter	12		in.
Speed maximum	4,100		rpm
Flow rate (maximum)	2,200		CFM

Receiver

Manufacturer	Valeo		
Model	Custom-built		
Capacity	0.5		lb

Condenser fan drive motors

Manufacturer	Spal	
Model	VA, integrated fan and drive package	
Type	Centrifugal	
Horsepower	0.268	hp
Operating speed	TBD	rpm

Evaporator fan drive motors

Manufacturer	Spa	
Model	FLS Series	
Type	Centrifugal	
Horsepower	0.402	hp
Operating speed	4,000	rpm

Evaporator(s)

Manufacturer	Kayer	
Model	Custom-built	
Number of rows	4	
Number of fins/in.	14	
Outer diameter of tube	0.375	in.
Fin thickness	0.008	in.
Number of evaporators	2	

Expansion valve

Manufacturer	Honeywell (Resideo)	
Model	TOEX Series	

Filter-drier

Manufacturer	Valeo, integrated with receiver	
Model	Custom-built	

Heater cores

Manufacturer	PTC Heater	
Model	TBD	
Capacity	68,000	Btu/hr
Number of rows	N/A	
Number of fins/in.	N/A	
Outer diameter of tube	N/A	in.
Fin thickness	N/A	in.
Number of heater cores	N/A	

Floor heater blowers

Front	N/A
Rear	N/A

Controls

Manufacturer	Valeo
Model	SC600, CAN-controlled

Driver's heater

Manufacturer	MCC	
Model	T12-60114	
Capacity	40,994	Btu/hr

Ventilation system

Type	In HVAC
------	---------

Coolant heater

Make	TBD	
Model	TBD	
Capacity	TBD	Btu

Interior lighting

Manufacturer	SIS
Type	LED
Number of fixtures	6
Size of fixtures	S12' (x4), 6.5' (x2)
Power pack	LEDs

Doors

Front

Manufacturer of operating equipment	Ventura
Type of door	In-swinging
Type of operating equipment	Pneumatic

Rear

Manufacturer of operating equipment	Ventura
Type of door	In-swinging
Type of operating equipment	Pneumatic

Passenger windows

Front

Manufacturer	Arow		
Model	Storm-Tite		
Type	Flush mount, Tip-in (From Supplier Quote)		
Number:	Side	12	
	Rear	1	
Sizes:	9 x 46W x 39H	2 x 36.15W x 39H	
	1 x 58W x 39H		
Glazing:	Type	Tempered	
	Thickness	5mm	
	Color of tint	Gray	
	Light transmission	50%	

Mirrors

	Size	Type	Manufacturer	Part no.	Model no.
Right side exterior	9 x 13"	Tube Style / Cast Steel	SafeFleet	M15CS001-TS	M15CS001-TS
Left side exterior	9 x 13"	Tube Style / Cast Steel	SafeFleet	PR01024-TS	PR01024-TS
Center rearview	16 x 8-1/4"	Flat	Hadley	A1706-1	A1706-1
Front entrance area	N/A	N/A	N/A	N/A	N/A
Upper-right corner	8.5"	Flat	Hadley	A1708NF	A1708NF
Rear exit area	12"	Convex	Hadley	A1712NF-1	A1712NF-1

Seats

Passenger

Manufacturer	USSC
Model	Gemini
Type	Cantilever

Operator

Manufacturer	Recaro
Model and part number	Ergo Metro P/N 8H0.21.591.VV11
Type	Vinyl

Paint

Manufacturer	Base bus gel coat in white (high-gloss finish)
Type	Base bus gel coat in white (high-gloss finish)

Wheelchair ramp equipment

Manufacturer	Lift-U	
Model number	LU18	
Capacity	1,000	lb
Width of platform	30	in.
Length of platform	48	in.
System fluid capacity	N/A	qt
Type of fluid used	N/A (Electrically operated and controlled)	
Operating hydraulic pressure	N/A	psi
Hydraulic cylinders:	Size	N/A
	Number	N/A

Wheelchair securement equipment

Manufacturer	USSC
Model number	4pt – Floor Mounted

Destination signs

Manufacturer	Hanover
Type	Amber

Character length

Front destination	5.1	in.
Front route	N/A	in.
Curbside destination	2.4	in.
Rear route	4.7	in.

Character height

Front destination	8	in.
Front route	N/A	in.
Curbside destination	2.8	in.
Rear route	6.1	in.

Number of characters

Front destination	TBD
Front route	TBD
Curbside destination	TBD
Rear route	TBD

Message width

Front destination	160x17	in.
Front route	N/A	in.
Curbside destination	112x15	in.
Rear route	48x15	in.

Electrical

Multiplex system

Manufacturer	Continental
Model number	ZR5

Energy Storage

Low Voltage

Manufacturer	X2Power
Model number	SLI31AGMDPM
Type	Group 31 AGM
Cold cranking amps	1150

High Voltage

Type/chemistry	Lithium Ion
Manufacturer (cell)	Proterra
Model (cell)	Proterra Cell
Nominal cell voltage	3.69 V
Minimum cell voltage	2.5 V
Maximum cell voltage	4.2 V
Cell capacity (Ah)	5.15 Ah
Manufacturer/supplier (pack or smallest removable unit)	Proterra
Model name (pack or smallest removable unit)	Proterra HV Pack

Weight of pack (smallest removable unit)	1,100	lbs
Gross energy capacity of each pack (smallest removable unit)	82	kWh
Total number of packs in ESS	6	
Gross energy capacity of ESS when new	492	kWh
Usable energy capacity of ESS when new	443	kWh
Gross energy capacity of ESS at warrantable end of life	See warranty	kWh
Usable energy capacity of ESS at warrantable end of life	See warranty	kWh
Nominal voltage of ESS	664	V
Minimum allowable operating SoC	0	%
Maximum allowable operating SoC	100	%
Tested cycle until warrantable end of life	See warranty	

Average ESS operating efficiency	> 98	%
Operating temperature range	-4 to 131	°F
Energy storage cooling system	See below	
Manufacturer	Valeo	
Model number	RevoE Globa	
Type (e.g., forced air, liquid)	Liquid	
Average power consumption	2	kW
Max power consumption	4	kW
Battery management system	See below	
Manufacturer	Proterra	
Model number	Proterra BMS	

Charging Compatibility

Charger inlet type	CCS Type 1
Charging standards/compatibility	SAE J1772

Communication system

GPS

Manufacturer	N/A
Model number	N/A

PA system

	Manufacturer	Model number	Number
Amplifier	REI	700890	1
Microphone	REI	480286 (with on/off switch on mic)	1
Internal speakers	ASA/JENSEN	1103050	8
External speaker	REI	220010	1

Security camera system

Manufacturer	N/A	
Model number	N/A	
Number of cameras	N/A	
Storage capacity	N/A	

Bike racks

Manufacturer	N/A
Model number	N/A

Fire detection system

Manufacturer	N/A	
Model number	N/A	
Fire detectors	N/A	
Type (thermal or optical)	N/A	
Number of detectors	N/A	

Automatic voice annunciator system

Manufacturer	N/A
Model and part number	N/A

Annunciator LED sign

Number of signs	N/A	
Housing dimensions	N/A	
Character length	N/A	in.
Character height	N/A	in.
Character width	N/A	in.

GPS antenna

Manufacturer	N/A
Model and part number	N/A

Automatic passenger counter

Manufacturer	N/A	
Model and part number	a.	N/A
	b.	N/A
	c.	N/A
Sensor type	N/A	

Real-time bus arrival prediction system

	Manufacturer	Model number
Router	N/A	N/A
Cellular modem	N/A	N/A
Charge protection	N/A	N/A

Electronic tire pressure monitoring system

Manufacturer	N/A
Model number	N/A

Electronic brake stroke/wear indicator system

Manufacturer	Knorr-Bremse
Model number	Part of braking system

NOTE: All information above is accurate to the timeframe upon submission. The Agency reserves the right to update above data if changes occur, upon consultation with the customer.

CER 10. Vehicle Technical Information

NOTE: This is a sample form. The Agency should customize it to comply with its proposed requirements.

This form must be completed and included in the Technical Proposal.

GENERAL COACH DATA SHEET 40 Foot ZX5+

Bus manufacturer:	Proterra Inc
Bus model:	ZX5+
Understructure manufacturer:	Proterra Inc
Model number:	ZX5+

Basic Body Construction

Type:	Composite Monocoque
-------	---------------------

Tubing or frame member thickness and dimensions

Overstructure	N/A
Understructure	N/A

Skin thickness and material

Roof	1.38 inch, Composite Laminate
Sidewall	0.94 inch, Composite Laminate
Skirt panel	1.00 inch, Composite Laminate
Front end	1.30 inch, Composite Laminate
Rear end	0.90 inch, Composite Laminate

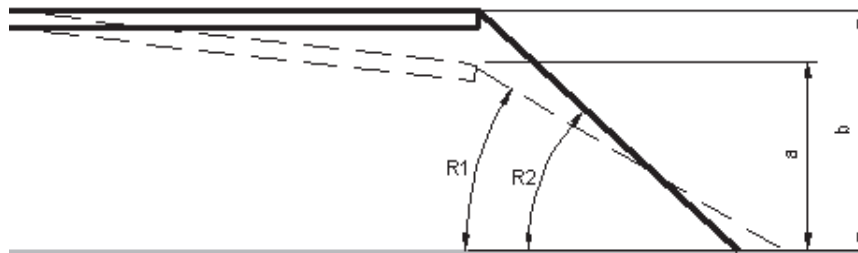
Dimensions

Overall length	Over bumpers	42	ft	6	in.
	Over body	41	ft	5	in.
Overall width	Over body excluding mirrors	8	ft	6	in.
	Over body including mirrors—driving position	9	ft	8	in.
	Over tires front axles	8	ft	3	in.
	Over tires center axle	N/A	ft	N/A	in.
	Over tires rear axles	8	ft	3	in.
Overall height (maximum)		10	ft	9	in.
Overall height (main roof line)		10	ft	9	in.

Angle of approach	9.3	deg
Breakover angle	7.8	deg
Breakover angle (rear)	N/A	deg
Angle of departure	9.3	deg

Doorway Dimensions	Front		Rear	
Width between door posts	44.5	in.	50.4	in.
Door width between panels	33.7	in.	49.1	in.
Clear door width	33.7	in.	38.9	in.
Doorway height	75	in.	75	in.
Knuckle clearance	1.87	in.	2.67	in.

Step height from ground measured at center of doorway



	Front doorway, empty		Ramp angle		Rear Doorway, empty
Kneeled	a. 13 in.		R1 10 deg		a. 14.4 in.
Unkneeled	b. 15.7 in.		R2 15 deg		b. 17.1 in.

Interior head room (center of aisle)

Front axle location	90	in.
Center axle location	N/A	in.
Rear axle location	75	in.

Aisle width between transverse seats 25.8 in.

Floor height above ground (centerline of bus)

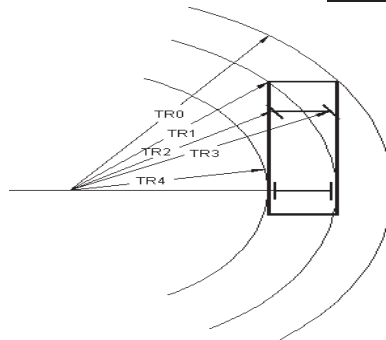
At front door	15.7	in.
At front axle	18.1	in.
At drive axle	18.1	in.
At rear door	17.1	in.

Minimum ground clearance (between bus and ground, with bus unkneeled)

Excluding axles	9	in.
Including axles	6	in.

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper)	43	ft	0	in.
Front inner corner radius, TR1	36	ft	6	in.
Front wheel inner turning radius, TR2	31	ft	6	in.
Front wheel outer turning radius, TR3	36	ft	8.4	in.
Inside Body Turning Radius innermost point, TR4 (including bumper)	21	ft	0	in.



Wheel base

Front	296	in.
Rear	N/A	in.

Overhang, centerline of axle over bumper

Front	104	in.
Rear	111	in.

Floor

Interior length	32	ft	7.2	in.
Interior width (excluding coving)	7	ft	9.6	in.
Total standee area (approximately)	47.3	sq ft		
Minimum distance between wheelhouses:	Front		35.3	in.
	Rear		23.6	in.
	Center		N/A	in.
Maximum interior floor slope (from horizontal)	1.5	deg		

Passenger capacity provided

Total maximum seating	40	
Standee capacity	31	
Minimum hip to knee room	26	in.
Minimum foot room	14	in.

Weight

	No. of people	Front axle			Center axle			Rear axle			Total bus
		Left	Right	Total	Left	Right	Total	Left	Right	Total	
Empty bus, full fuel and farebox	0	6,981	6,981	13,962	N/A	N/A	N/A	8,195	8,195	16,390	30,352
Fully seated, full fuel and farebox	41	7,903	7,904	15,807	N/A	N/A	N/A	10,347	10,348	20,695	36,502
Fully loaded standee and fully seated, full fuel and farebox	72	8,950	8,950	17,899	N/A	N/A	N/A	11,626	11,626	23,253	41,152
Crush load (1.5x fully loaded)	102	9,962	9,962	19,924	N/A	N/A	N/A	12,864	12,864	25,728	45,652
GVWR					N/A	N/A	N/A				43,650
GAWR				18,078	N/A	N/A	N/A			28,660	

Engine, main

Manufacturer	N/A				
Type and weight rating	N/A				
Model number	N/A				
Bore	N/A	in.			
Stroke	N/A	in.			
Displacement	N/A	cu in.			
Compression ratio	N/A				
Injector type and size	N/A				
Net SAE horsepower	N/A	hp	at	N/A	RPM
Net SAE torque	N/A	lb/ft	at	N/A	RPM
Crankcase oil capacity					
New engine, dry	N/A	gal			
New engine, wet	N/A	gal			
Turbocharger make and model	N/A				
Maximum speed, no load	N/A	RPM			
Maximum speed, full load	N/A	RPM			
Speed at idle	N/A	RPM			
Speed at fast idle	N/A	RPM			

Engine information/graphs to be attached with this form: N/A

- Engine speed vs. road speed
- Torque vs. engine speed
- Horsepower vs. engine speed
- Fuel consumption vs. engine speed
- Vehicle speed vs. time (both loaded and unloaded)
- Vehicle speed vs. grade (both loaded and unloaded)
- Acceleration vs. time
- Change of acceleration vs. time

Traction Motor

Manufacturer	Parker	
Model Number	GVM310	
Type	Brushless, permanent magnet synchronous motor	
Max Power at Speed	240 @ 3000	kW @ rpm
Max Torque at Speed	850 @ 3000	N-m @ rpm
Continuous rated power	205	kW
Average efficiency	95 %	% (motor + inverter system efficiency)
Max motor speed	6,000	rpm
Cooling Type	Liquid-Cooled, Glycol/water 50/50%	

Attach torque-speed curve and efficiency maps

Hybrid drive or transmission

Manufacturer	Eaton		
Type	EV Transmission		
Speeds	4		
Gear ratios	Forward: Competition Sensitive	Reverse:	Competition Sensitive
Shift speeds			
1st–2nd	20	mph	
2nd–3rd	33	mph	
3rd–4th	57	mph	
4th–5th (if applicable)	N/A	mph	
5th–6th (if applicable)	N/A	mph	
Fuel capacity (including heat exchanger and filters)	8 qrts		

Voltage regulator

Manufacturer	N/A
Model	N/A

Voltage equalizer

Manufacturer	N/A
Model	N/A

Alternator

Manufacturer	N/A	
Type	N/A	
Model	N/A	
Output at idle	N/A	amps
Output at maximum speed	N/A	amps
Maximum warranted speed	N/A	rpm
Speed at idle (approximately)	N/A	rpm
Drive type	N/A	

Auxiliary Inverter(s)

Manufacturer(s)	Lenze
Model Number(s)	EMDDAG23003303U00000
Output voltage(s)	220 V

DC-DC Converter(s)

Manufacturer(s)	John Deere
Model Number(s)	PD400
Output voltage(s)	24 V

Auxiliary (Hotel) Loads as Installed

List of Accessories, excluding HVAC

Accessory	Average Power Consumption on Agency Design Operating Profile (kW)	Max Power Consumption (kW)
Power Steering Inverter	TBD	TBD
Air Compressor Inverter	TBD	TBD
DC-DC Converter	TBD	TBD

Starter motor

Manufacturer Type	N/A
Model	N/A
	N/A

Air compressor

Manufacturer	Hydrovane		
Type	Rotary Vane		
Rated capacity	8.96	CFM	
Capacity at idle (approximately)	N/A	CFM	
Capacity at maximum speed (engine)	N/A	CFM	
Maximum warranted speed	2800	rpm	
Speed idle	Electric	rpm	
Drive type	N/A		
Governor:			
Cut-in pressure	110	psi	
Cut-out pressure	130	psi	

Axles

First

Manufacturer	ZF		
Type	Independent, double A-arm		
Model number	RL-82EC		
Gross axle weight rating	18,078	lb	
Axle load	17,899	lb	

Second

Manufacturer	ZF		
Type	Drop Portal		
Model number	AV-133/90		
Gross axle weight rating	28,660	lb	
Axle load	23,253	lb	

Third

Manufacturer	N/A		
Type	N/A		
Model number	N/A		
Gross axle weight rating	N/A	lb	
Axle load	N/A	lb	
Axle ratio	N/A		

Suspension system

Manufacturer	ZF		
Type:	First:	Heavy-duty Independent Front Suspension (IFS), Model RL-82EC	
	Second:	H-Frame Beam Rear, Model AV-133/90	
	Third:	N/A	

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Springs:	First:	Firestone, Model 1T1SL-4
	Second:	Firestone, Model 1T1SL-4
	Third:	N/A

Joint

Manufacturer	N/A
Type	N/A
Model number	N/A

Wheels and tires

Wheels

Make	Alcoa
Size	22.5 x 9"
Capacity	9,090 lbs
Material	Aluminum

Tires

Manufacturer	Michelin
Type	X InCity Energy Z LR L
Size	315/80R22.5

Load range/air pressure psi ** 9,370 lbs (Single Rating) / 8,820 lbs (Dual Rating)

Steering, power

Pump

Manufacturer and model number	Eaton, Vickers V10
Type	Hydraulic Vane Pump
Relief pressure	<input type="text" value="2100"/> psi

Booster/gear box

Manufacturer and model number	TRW, TAS85153A
Type	Fully integral, recirculating ball
Ratio	21:01

Power steering fluid capacity	<input type="text" value="2"/> gal
Maximum effort at steering wheel	<input type="text" value="20"/> lb (unloaded stationary coach on dry asphalt pavement)
Steering wheel diameter	<input type="text" value="18"/> in.

Brakes

Make of fundamental brake system	Knorr-Bremse	
Brake chambers vendor size and part number:	First:	Type 24
	Second:	Type 24
	Third:	N/A

Request for Proposal
August 2, 2022
IFB 6447

Brake operation effort 75 lbs

Slack adjuster's vendor's type and part numbers

First:	Right:	N/A
	Left:	N/A
Second:	Right:	N/A
	Left:	N/A
Third:	Right:	N/A
	Left:	N/A
Length:	First take-up:	N/A
	Second take-up:	N/A
	Third take-up:	N/A

Brake drums/discs

First:	Manufacturer	Knorr-Bremse	
	Part number	0501.316.953	
	Diameter	17	in.
Second:	Manufacturer	Knorr-Bremse	
	Part number	0501.316.953	
	Diameter	17	in.
Third:	Manufacturer	N/A	
	Part number	N/A	
	Diameter	N/A	in.

Brake lining manufacturer	MAT Holdings
Type	Premium Long Life

Brake lining identification

First:	Forward	MAT 6900
	Reverse	MAT 6900
Second:	Forward	MAT 6900
	Reverse	MAT 6900
Third:	Forward	N/A
	Reverse	N/A

Brake linings per shoe

First	N/A
Second	N/A
Third	N/A

Brake lining widths

First	3.23	in.
Second	3.23	in.
Third	N/A	in.

Brake lining lengths

First	4.72	in.
Second	4.72	in.
Third	N/A	in.

Brake lining thickness 0.83 in.

Brake lining per axle

First	61	sq. in.
Second	61	sq. in.
Third	N/A	sq. in.

Cooling system

Radiator/charge air cooler

Manufacturer	Modine		
Type	Liquid to air heat exchanger		
Model number	1A021730		
Number of tubes	68		
Tubes outer diameter	0.75	in./	N/A
Fins per inch	18	fins	
Fin thickness	0.004	in.	
Total cooling and heating system capacity	*	gal *12 gal in power electronics loop; 13 gal in battery loop	
Radiator fan speed control	Electric		
Surge tank capacity	14.8	qt	
Engine thermostat temperature setting:	Initial opening (fully closed)	N/A	°F
	Fully open	N/A	°F
Overheat alarm temperature sending unit setting	*	°F	*55 F for PE, 85 F for BTMS
Shutdown temperature setting	N/A	°F (shutdown at component level)	

Air reservoir capacity

Supply reservoir	300	cu in.
Primary reservoir	1,848	cu in.
Secondary reservoir	1,848	cu in.
Packing reservoir	577.5	cu in.
Accessory reservoir	2 x 1,848	cu in.

Other reservoir type

N/A

 cu in.

Heating, ventilation and air conditioning equipment

Heating system capacity	PTC: 68,000 BTU ; Heat Pump: 65,000 BTU	BTU/hr
Electrical load at maximum heating capacity	18	kW
Air conditioning capacity	102,000	BTU
Electrical load at maximum cooling capacity	13	kW
Ventilating capacity	4,100	CFM

Compressor

Manufacturer	Panasonic		
Model	C-SWS225H00A		
Number of cylinders	N/A		
Drive ratio	1:1 (Direct)		
Maximum warranted speed	5,400 RPM		rpm
Operating speed	*		rpm (recommended) *Variable, depends on set temperature and load
Weight	99		lb
Oil capacity	Dry	0.5	gal
	Wet	N/A	gal
Refrigerant:	Type	R407C	11.44 lb

Condenser

Manufacturer	Kayer		
Model	Custom-built		
Number of fins/in.	14		
Outer diameter of tube	0.375		in.
Fin thickness	0.008		in.

Condenser fan

Manufacturer	Spal		
Model	VA, Series		
Fan diameter	12		in.
Speed maximum	4,100		rpm
Flow rate (maximum)	2,200		CFM

Receiver

Manufacturer	Valeo		
Model	Custom-built		
Capacity	0.5		lb

Condenser fan drive motors

Manufacturer	Spal	
Model	VA, integrated fan and drive package	
Type	Centrifugal	
Horsepower	0.268	hp
Operating speed	TBD	rpm

Evaporator fan drive motors

Manufacturer	Spa	
Model	FLS Series	
Type	Centrifugal	
Horsepower	0.402	hp
Operating speed	4,000	rpm

Evaporator(s)

Manufacturer	Kayer	
Model	Custom-built	
Number of rows	4	
Number of fins/in.	14	
Outer diameter of tube	0.375	in.
Fin thickness	0.008	in.
Number of evaporators	2	

Expansion valve

Manufacturer	Honeywell (Resideo)	
Model	TOEX Series	

Filter-drier

Manufacturer	Valeo, integrated with receiver	
Model	Custom-built	

Heater cores

Manufacturer	PTC Heater	
Model	TBD	
Capacity	68,000	Btu/hr
Number of rows	N/A	
Number of fins/in.	N/A	
Outer diameter of tube	N/A	in.
Fin thickness	N/A	in.
Number of heater cores	N/A	

Floor heater blowers

Front	N/A
Rear	N/A

Controls

Manufacturer	Valeo
Model	SC600, CAN-controlled

Driver's heater

Manufacturer	MCC	
Model	T12-60114	
Capacity	40,994	Btu/hr

Ventilation system

Type	In HVAC
------	---------

Coolant heater

Make	TBD	
Model	TBD	
Capacity	TBD	Btu

Interior lighting

Manufacturer	SIS
Type	LED
Number of fixtures	6
Size of fixtures	S12' (x4), 6.5' (x2)
Power pack	LEDs

Doors

Front

Manufacturer of operating equipment	Ventura
Type of door	In-swinging
Type of operating equipment	Pneumatic

Rear

Manufacturer of operating equipment	Ventura
Type of door	In-swinging
Type of operating equipment	Pneumatic

Passenger windows

Front

Manufacturer	Arow		
Model	Storm-Tite		
Type	Flush mount, Tip-in (From Supplier Quote)		
Number:	Side	14	
	Rear	1	
Sizes:	13 x 46W x 39H		
	1 x 58W x 39H		
Glazing:	Type	Tempered	
	Thickness	5mm	
	Color of tint	Gray	
	Light transmission	50%	

Mirrors

	Size	Type	Manufacturer	Part no.	Model no.
Right side exterior	9 x 13"	Tube Style / Cast Steel	SafeFleet	M15CS001-TS	M15CS001-TS
Left side exterior	9 x 13"	Tube Style / Cast Steel	SafeFleet	PR01024-TS	PR01024-TS
Center rearview	16 x 8-1/4"	Flat	Hadley	A1706-1	A1706-1
Front entrance area	N/A	N/A	N/A	N/A	N/A
Upper-right corner	8.5"	Flat	Hadley	A1708NF	A1708NF
Rear exit area	12"	Convex	Hadley	A1712NF-1	A1712NF-1

Seats

Passenger

Manufacturer	USSC
Model	Gemini
Type	Cantilever

Operator

Manufacturer	Recaro
Model and part number	Ergo Metro P/N 8H0.21.591.VV11
Type	Vinyl

Paint

Manufacturer	Base bus gel coat in white (high-gloss finish)
Type	Base bus gel coat in white (high-gloss finish)

Wheelchair ramp equipment

Manufacturer	Lift-U	
Model number	LU18	
Capacity	1,000	lb
Width of platform	30	in.
Length of platform	48	in.
System fluid capacity	N/A	qt
Type of fluid used	N/A (Electrically operated and controlled)	
Operating hydraulic pressure	N/A	psi
Hydraulic cylinders:	Size	N/A
	Number	N/A

Wheelchair securement equipment

Manufacturer	USSC
Model number	4pt – Floor Mounted

Destination signs

Manufacturer	Hanover
Type	Amber

Character length

Front destination	5.1	in.
Front route	N/A	in.
Curbside destination	2.4	in.
Rear route	4.7	in.

Character height

Front destination	8	in.
Front route	N/A	in.
Curbside destination	2.8	in.
Rear route	6.1	in.

Number of characters

Front destination	TBD
Front route	TBD
Curbside destination	TBD
Rear route	TBD

Message width

Front destination	160x17	in.
Front route	N/A	in.
Curbside destination	112x15	in.
Rear route	48x15	in.

Electrical

Multiplex system

Manufacturer	Continental
Model number	ZR5

Energy Storage

Low Voltage

Manufacturer	X2Power
Model number	SLI31AGMDPM
Type	Group 31 AGM
Cold cranking amps	1150

High Voltage

Type/chemistry	Lithium Ion
Manufacturer (cell)	Proterra
Model (cell)	Proterra Cell
Nominal cell voltage	3.69 V
Minimum cell voltage	2.5 V
Maximum cell voltage	4.2 V
Cell capacity (Ah)	5.15 Ah
Manufacturer/supplier (pack or smallest removable unit)	Proterra
Model name (pack or smallest removable unit)	Proterra HV Pack

Weight of pack (smallest removable unit)	1,600	lbs
Gross energy capacity of each pack (smallest removable unit)	123	kWh
Total number of packs in ESS	4	
Gross energy capacity of ESS when new	492	kWh
Usable energy capacity of ESS when new	443	kWh
Gross energy capacity of ESS at warrantable end of life	See warranty	kWh
Usable energy capacity of ESS at warrantable end of life	See warranty	kWh
Nominal voltage of ESS	664	V
Minimum allowable operating SoC	0	%
Maximum allowable operating SoC	100	%
Tested cycle until warrantable end of life	See warranty	

Average ESS operating efficiency	> 98	%
Operating temperature range	-4 to 131	°F
Energy storage cooling system	See below	
Manufacturer	Valeo	
Model number	RevoE Globa	
Type (e.g., forced air, liquid)	Liquid	
Average power consumption	2	kW
Max power consumption	4	kW
Battery management system	See below	
Manufacturer	Proterra	
Model number	Proterra BMS	

Charging Compatibility

Charger inlet type	CCS Type 1
Charging standards/compatibility	SAE J1772

Communication system

GPS

Manufacturer	N/A
Model number	N/A

PA system

	Manufacturer	Model number	Number
Amplifier	REI	700890	1
Microphone	REI	480286 (with on/off switch on mic)	1
Internal speakers	ASA/JENSEN	1103050	8
External speaker	REI	220010	1

Security camera system

Manufacturer	N/A	
Model number	N/A	
Number of cameras	N/A	
Storage capacity	N/A	

Bike racks

Manufacturer	N/A
Model number	N/A

Fire detection system

Manufacturer	N/A	
Model number	N/A	
Fire detectors	N/A	
Type (thermal or optical)	N/A	
Number of detectors	N/A	

Automatic voice annunciator system

Manufacturer	N/A
Model and part number	N/A

Annunciator LED sign

Number of signs	N/A	
Housing dimensions	N/A	
Character length	N/A	in.
Character height	N/A	in.
Character width	N/A	in.

GPS antenna

Manufacturer	N/A
Model and part number	N/A

Automatic passenger counter

Manufacturer	N/A	
Model and part number	a.	N/A
	b.	N/A
	c.	N/A
Sensor type	N/A	

Real-time bus arrival prediction system

	Manufacturer	Model number
Router	N/A	N/A
Cellular modem	N/A	N/A
Charge protection	N/A	N/A

Electronic tire pressure monitoring system

Manufacturer	N/A
Model number	N/A

Electronic brake stroke/wear indicator system

Manufacturer	Knorr-Bremse
Model number	Part of braking system

NOTE: All information above is accurate to the timeframe upon submission. The Agency reserves the right to update above data if changes occur, upon consultation with the customer.



Certificate of Registration

This certifies that the Quality Management System of

Proterra Operating Company, Inc.

1815 Rollins Road
Burlingame, California, 94010, United States

has been assessed by NSF-ISR and found to be in conformance to the following standard(s):

ISO 9001:2015

Scope of Registration:

Design, and assembly of batteries and supporting power and charging systems.

Certificate Number:	C0525087-IS2
Certificate Issue Date:	29-JUL-2022
Registration Date:	01-SEP-2020
Expiration Date *:	31-AUG-2023

Jennifer Morecraft,
Senior Managing Director

Page 1 of 2



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*Authorized Registration and /or Accreditation Marks. This certificate is property of NSF-ISR and must be returned upon request.
*Company is audited for conformance at regular intervals. To verify registrations call (888) NSF-9000 or visit our web site at www.nsf-isr.org



**ANNEX PAGE FOR CERTIFICATE REGISTRATION NUMBER
C0525087-IS2**

CERTIFICATE ISSUE DATE: 29-JUL-2022
CERTIFICATE EXPIRATION DATE: 31-AUG-2023

Proterra Operating Company, Inc.
1815 Rollins Road
Burlingame, California, 94010, United States

Remote Location: Proterra Operating Company, Inc.- C0525088 383 Cheryl Lane City of Industry, California, 91789, United States	Scope: Design and Assembly of electrical buses.
Remote Location: Proterra Operating Company, Inc.- C0525089 1 Whitlee Court Greenville, South Carolina, 29607, United States	Scope: Design and Assembly of electrical buses.

NSF International Strategic Registrations

789 North Dixboro Road, Ann Arbor, Michigan 48105 | (888) NSF-9000 | www.nsf-isr.org

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Certificate of Registration

This certifies that the Environmental Management System of

Proterra Operating Company, Inc.

1815 Rollins Road
Burlingame, California, 94010, United States

has been assessed by NSF-ISR and found to be in conformance to the following standard(s):

ISO 14001:2015

Scope of Registration:

The Design, Development, Assembly, test and delivery of Electric Buses and supporting power and charging systems.

Certificate Number:	C0525087-EM3
Certificate Issue Date:	29-JUL-2022
Registration Date:	31-AUG-2020
Expiration Date *:	30-AUG-2023

Jennifer Morecraft,
Senior Managing Director

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**ANNEX PAGE FOR CERTIFICATE REGISTRATION NUMBER
C0525087-EM3**

CERTIFICATE ISSUE DATE: 29-JUL-2022
CERTIFICATE EXPIRATION DATE: 30-AUG-2023

Proterra Operating Company, Inc.
1815 Rollins Road
Burlingame, California, 94010, United States

Remote Location: Proterra Operating Company, Inc.- C0525088 383 Cheryl Lane City of Industry, California, 91789, United States	Scope: The Design, Development, Assembly, test and delivery of Electric Buses and supporting power and charging systems.
Remote Location: Proterra Operating Company, Inc.- C0525089 1 Whitlee Court Greenville, South Carolina, 29607, United States	Scope: The Design, Development, Assembly, test and delivery of Electric Buses and supporting power and charging systems.

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PROTERRA

Commonwealth of Virginia

11. Altoona Test Reports

FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration U.S. DOT
In accordance with 49 CFR, Part 665

**Manufacturer: Proterra
Model: CAT40DP**

**Tested in Service-Life Category
12 Year / 500,000 Miles**

September 2020

Report Number: LTI-BT-R1906

The Thomas D. Larson
Pennsylvania Transportation Institute
201 Transportation Research Building
The Pennsylvania State University
University Park, PA 16802
(814) 865-1891

Bus Testing and Research Center
2237 Plank Road
Duncansville, PA 16635
(814) 695-3404



PennState
College of Engineering

**LTI BUS RESEARCH
AND TESTING CENTER**

FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration, U.S. DOT
1200 New Jersey Avenue, SE
Washington, DC 20590

In accordance with 49 CFR Part, 665

Manufacturer: Proterra
Manufacturer's address: 1815 Rollins Road
Burlingame, CA 94010

Model: CAT40DP

Tested in Service-Life Category
12 Year / 500,000 Miles

Report Number: LTI-BT-R1906



David Klinikowski
Quality Authorization

Director, Bus Research
and Testing Center
Title

09/23/2020
Date

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EXECUTIVE SUMMARY

TEST HIGHLIGHTS

The information in this report pertains only to this specific bus, as received from the manufacturer for testing.

The Check-In section of the report provides a description of the bus and specifies its major components. The following table gives the salient specifications.

Manufacturer	Proterra
Model	CAT40DP
Chassis Make/Model	Proterra / Catalyst
Chassis Modified	No
Length	42 feet, 5 inches
Fuel	Battery Electric
Service Life	12 Years / 500,000 miles
Number of Seats (including driver)	39 or 33 and 2 wheelchairs
Manufacturer-Designated Standing Passenger Capacity	38
Gross Vehicle Weight used for testing	43,640
Gross Vehicle Weight Rating	43,650 (Manufacturer Specified)
Mileage at Delivery	2,330
Test Start Date	March 28, 2019
Test Completion Date	September 10, 2020*

*Due to the COVID-19 pandemic, all bus testing activities were suspended during the period of March 26, 2020 through July 16, 2020.

The measured curb weight was 14,490 lb. for the front axle and 18,870 lb. for the rear axle. These combined weights provided a total measured curb weight of 33,360 lb. There are 39 seats including the driver and free floor space for 49 standing passengers bringing the potential total passenger capacity to 88. However, a placard limits the maximum number of standing passengers to 29. Therefore, the gross load represents 39 seated passengers and 29 standees for a total of 68 passengers. Gross load is calculated as 150 lb. x 68 = 10,200 lb. At full declared capacity, the measured gross vehicle weight was 43,640 lb. There is a potential to overload this bus with the available floor space for standing passengers.

For the Performance and Energy Economy Tests, ballast weight equivalent of the roof mount battery packs was removed to represent the four-pack battery configuration per the Federal Transit Administration determination letter. Therefore, the seated load weight used was 36,960 lbs. for those tests.

During the Structural Durability testing the bus experienced periodic instances of mileage loss by the odometer. The issues appeared to be resolved after a software update. Mileage accumulation was tracked secondarily on a hub-odometer to ensure accuracy. Late in the test, the bus developed an intermittent shifting problem in the rear axle. The manufacturer traced a contributor to the problem to be contamination in the air

line actuating the pneumatic shift valves. The manufacturer stated that the contamination was caused by a degradation of the grease used during the shifter mechanism assembly and the issue would be resolved in the production process.

BUS TESTING BACKGROUND

On August 1, 2016, FTA announced a final rule for bus testing for improving the process of ensuring the safety and reliability of new transit buses. The rule satisfies requirements in MAP-21 to establish minimum performance standards, a standardized scoring system, and a pass-fail threshold based on the score.

FTA's Bus Testing Program (often referred to as "Altoona Testing" due to the location of the main testing center) tests new transit bus models for:

- Maintainability
- Reliability
- Safety
- Performance (including Braking Performance)
- Structural Integrity (including Structural Durability)
- Fuel Economy (Energy Efficiency and Range, for electric buses)
- Noise
- Emissions

Bus models that fail to meet one or more minimum performance standards will "fail" their test and thus be ineligible for purchase with FTA funds until the failures are resolved and validated through further testing. FTA will use this authority to make sure defects are corrected before a bus model can be acquired with FTA funding.

In each application to FTA for the purchase or lease of any new bus model, or any bus model with a major change in configuration or components to be acquired or leased with funds obligated by the FTA, the recipient shall certify that it has received the appropriate full Bus Testing Report and any applicable partial testing report(s) before final acceptance of the first vehicle. In dealing with a bus manufacturer or dealer, the recipient shall be responsible for determining whether a vehicle to be acquired requires full testing or partial testing or has already satisfied the requirements of this part. A bus manufacturer or recipient may request guidance from FTA in making these determinations.

The purpose of the testing is intended set a "Pass/Fail" standard and grade the performance of the buses in order to provide performance information to the transit authorities that can be used in their purchase or lease decisions. The intent of this report is to provide the grantee a relative measure of the performance of a particular model of transit bus against a standard of performance. The passing of this test should ensure a vehicle has a high probability of meeting its service life in the category it was tested.

The data included in this test report and other applicable reports should be reviewed to choose the most suitable bus for a grantee's operation. A higher scoring bus is not necessarily the best bus for a given application. For example, a bus with a

powerful engine may score well because of its performance and gradeability, but another bus with a smaller and more fuel-efficient engine could be a better choice for applications in mostly flat areas. It is the responsibility of the grantee to ensure the proper test report or applicable partial report is in their possession and has been thoroughly reviewed.

The score sheet for the subject vehicle of this test report is provided below. **This bus passed the Altoona test, with an aggregate score of 79.9**

Bus 1906 Proterra							Score	FAIL
Test category	Standard	Base Pts.	Bonus Pts.	Range	Range	Test Data	Score	FAIL
1. Maintainability	Unscheduled maint.	2	14	0	125	94.6	5.40	
2. Reliability	# Class 2 failures	2	6	0	2	0	8.00	
	Hazards	10	0	P	F	P	10.00	
	Stability	2.5	0	P	F	P	2.50	
3. Safety	< 158 feet at 45mph	0.5	2	80	158	139.3	0.98	
	Holds Lane, Split coefficient	2.5	0	P	F	P	2.50	
	Parking brake, 20% grade	2.5	0	P	F	P	2.50	
	less than 30 sec	1.5	0	P	F	P	1.50	
4. Performance	Acceleration 0-30 mph	1.5	0	P	F	P	1.50	
	Gradeability 2.5%	2	0	P	F	P	2.00	
	Gradeability 10%	1	0	P	F	P	1.00	
	Distortion	1	0	P	F	P	1.00	
	Static Towing	1	0	P	F	P	1.00	
	Dynamic Towing	1	0	P	F	P	1.00	
5. Structural Integrity	Towable with std. wrecker	1	0	P	F	P	1.00	
	Liftable with std. jack	1	0	P	F	P	1.00	
	Stable on jacks	1	0	P	F	P	1.00	
	No uncorrected failures	13	0	P	F	P	13.00	
	No uncorrected failures	12	0	P	F	P	12.00	
	1-13mpg			1	13	NA	0.00	
6. Fuel Economy	CNG	1	6	10	50	NA	0.00	
	Hydrogen			15	98	NA	0.00	
	Electric			1	3	2.23	3.31	
	Int. Noise (0-35 mph)	0.5	3	30	80	74	0.86	
7. Noise	Ext. Noise (0-35 mph)	0.5	3	50	83	68.6	1.81	
	CO ₂		4	0	4000	0	5.00	
	CO		0.4	0	20	0	0.40	
8. Emissions	Total hydrocarbon	1	0.4	0	3	0	0.40	
	NMHC		0.4	0	3	0	0.40	
	Nitrogen oxides		0.4	0	2	0	0.40	
	Particulates		0.4	0	0.1	0	0.40	
Total		60	40				79.9	

Note: The use of the scoring system is not mandatory for procurement. It is only necessary that the bus being procured has received a passing score.

ABBREVIATIONS AND ACRONYMS

- ABS - anti-skid braking system
- ABTC - Altoona Bus Test Center
- A/C - air conditioner, or air conditioning
- AC - alternating current
- ADA - American Disability Act
- CDCTS - chassis dynamometer test control system
- CVS - constant volume sampling
- CW - curb weight (bus weight including maximum fuel, oil, and coolant; but without passengers or driver)
- dB(A) - decibels with reference to 0.0002 microbar as measured on the "A" scale
- DC - direct current
- DIR - test director
- DR - bus driver
- EPA - Environmental Protection Agency
- GAWR - gross axle weight rating
- GVL - gross vehicle load (150 lb. for every designed passenger seating position, for the driver, and for each 1.5 sq ft of free floor space)
- GVW - gross vehicle weight (curb weight plus gross vehicle load)
- GVWR - gross vehicle weight rating
- HD-UDDS - Heavy Duty-Urban Dynamometer Driving Schedule
- LTI - Larson Transportation Institute
- mpg - miles per gallon
- mph - miles per hour
- PM - Preventive maintenance
- PSTT - Penn State Test Track
- rpm - revolutions per minute
- SAE - Society of Automotive Engineers
- SCF - Standard cubic foot
- SCH - test scheduler
- SA - staff assistant
- SLW - seated load weight (curb weight plus 150 lb. for every designed passenger seating position and for the driver)
- TD - test driver
- TECH - test technician
- TM - track manager
- TP - test personnel
- Wh - Watt hour

TEST BUS CHECK-IN

I. OBJECTIVE

The objective of this task is to log in the test bus, assign a bus number, complete the vehicle data form, and perform a safety check.

II. TEST DESCRIPTION

The test consisted of assigning a bus test number to the bus, cleaning the bus, completing the vehicle data form, obtaining any special information and tools from the manufacturer, determining a testing schedule, performing an initial safety check, and performing the manufacturer's recommended preventive maintenance. The bus manufacturer certified that the bus meets all Federal regulations.

III. DISCUSSION

The check-in procedure is used to identify in detail the major components and configuration of the bus.

The test bus consisted of a Proterra CAT40DP bus model. The bus has a front passenger door with a fold out Ricon ADA accessible ramp forward of the front axle, and a rear passenger door forward of the rear axle. Power is provided by a battery electric, Proterra DuoPower Control System and a pair of Parker GVM310-125 traction motors.

The measured curb weight was 14,490 lb. for the front axle and 18,870 lb. for the rear axle. These combined weights provided a total measured curb weight of 33,360 lb. There are 39 seats including the driver and free floor space for 49 standing passengers bringing the potential total passenger capacity to 88. However, a placard limits the maximum number of standing passengers to 29. Therefore, the gross load represents 39 seated passengers and 29 standees for a total of 68 passengers. Gross load is calculated as $150 \text{ lb.} \times 68 = 10,200 \text{ lb.}$ At full declared capacity, the measured gross vehicle weight was 43,640 lb. There is a potential to overload this bus with the available floor space for standing passengers.

VEHICLE DATA FORM

Page 1 of 7

Bus Number: 1906	Date of Check-In: 03/28/19
Bus Manufacturer: Proterra	Vehicle Identification Number (VIN): 1M9TH16J0JS816351
Model Number: CAT40DP	Chassis Mfr./Mod. #: Proterra / Catalyst
Personnel: T.S., E.D., E.L. & S.R.	Starting Odometer Reading: 2330

WEIGHT:

Individual Wheel Reactions:

Weights (lb.)	Front Axle		Middle Axle		Rear Axle	
	Curb	Street	Curb	Street	Curb	Street
CW	7,230	7,260	N/A	N/A	9,370	9,500
SLW	8,450	8,410	N/A	N/A	10,950	11,740
GVW	9,050	9,010	N/A	N/A	12,550	13,030

Total Weight Details:

Weight (lb.)	CW	SLW	GVW	GAWR
Front Axle	14,490	16,860	18,060	18,078
Middle Axle	N/A	N/A	N/A	N/A
Rear Axle	18,870	22,690	25,580	28,660
Total	33,360	39,550	43,640	Manufacturer Specified GVWR: 43,650

Dimensions:

Length (ft/in)	42/5 (+ 5 ½" for bike rack mount brackets)
Width (in)	102
Height (in)	126 ¾
Front Overhang (in)	102 ¼
Rear Overhang (in)	110 ½
Wheelbase (in)	296 ¼
Wheel Track (in)	Front: 86.1
	Middle: N/A
	Rear: 76.2

VEHICLE DATA FORM

Page 2 of 7

Bus Number: 1906	Date: 03/28/19
------------------	----------------

CLEARANCES:

Lowest Point Outside Front Axle	Location: skid plate	Clearance(in): 6.3
Lowest Point Outside Rear Axle	Location: door	Clearance(in): 9.0
Lowest Point between Axles	Location: frame	Clearance(in): 8.7
Ground Clearance at the center (in)	8.7	
Front Approach Angle (deg)*	8.5	
Rear Approach Angle (deg)*	9.2	
Ramp Clearance Angle (deg)	3.3	
Aisle Width (in)	Front: 24	Rear: 22.2
Inside Standing Height at Center Aisle (in)	Front: 90.7	Rear: 73.9

*measurements used to calculate approach and departure angles are taken from the centerline of the axles.

BODY DETAILS:

Body Structural Type	Monocoque		
Frame Material	Composite / Laminate Construction		
Body Material	Composite / Laminate Construction		
Floor Material	Composite / Laminate Construction		
Roof Material	Composite / Laminate Construction		
Windows Type	<input checked="" type="checkbox"/> Fixed	<input type="checkbox"/> Movable	
Window Mfg./Model No.	Arow / AS3 DOT 411		
Number of Doors	_1_ Front	_1_ Rear	
Mfr. / Model No.	Front: Ventura / IGE 1100	Rear: Ventura / PSE 1250	
Dimension of Each Door (in)	Front: 75.3 x 33.8	Rear: 76.9 x 43.3	
Passenger Seat Type	<input checked="" type="checkbox"/> Cantilever (Front)	<input checked="" type="checkbox"/> Pedestal (Rear)	<input type="checkbox"/> Other
Driver Seat Type	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	Recaro / Ergo Metro (AM80)		
Number of Seats (including Driver)	39 or 33 & 2 wheelchair positions		

VEHICLE DATA FORM

Page 3 of 7

Bus Number: 1906	Date: 03/28/19
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BODY DETAILS (Contd.)

Free Floor Space (ft ²)	76.4
Height of Each Step at Normal Position (in)	Front 1. <u>15.2</u> 2. <u>N/A</u> 3. <u>N/A</u> 4. <u>N/A</u>
	Middle 1. <u>N/A</u> 2. <u>N/A</u> 3. <u>N/A</u> 4. <u>N/A</u>
	Rear 1. <u>17.2</u> 2. <u>N/A</u> 3. <u>N/A</u> 4. <u>N/A</u>
Step Elevation Change - Kneeling (in)	Front: 2.1 Rear: 0.4

ENGINE

Type	<input type="checkbox"/> C.I.	<input type="checkbox"/> Alternate Fuel	
	<input type="checkbox"/> S.I.	<input checked="" type="checkbox"/> Other (Battery Electric)	
Air Compressor Mfr. / Model No.	Hydrovane / 0009-0010-07		
Maximum Capacity (ft ³ / min)	8.96		
Starter Type – N/A	<input type="checkbox"/> Electrical	<input type="checkbox"/> Pneumatic	<input type="checkbox"/> Other (explain)
Starter Mfr. / Model No.	N/A		

BATTERY SYSTEM

Maximum Rated Capacity (kWh)	440
Usable Capacity (kWh)	391
Nominal Voltage (Vdc)	326

PROPULSION CONTROL SYSTEM (Rear Axle)

Propulsion Control System Mfr. / Model No.	Proterra / DuoPower Control System
Traction Motor - Mfr. / Model No.	Parker / GVM310-125
Traction Motor Power rating (kW)	190 kW per motor / 2 motors within DuoPower Axle

OTHERS

DCDC Converter Mfr. / Model No.	TDI Power / T100103677-LF
HV Distribution Box Mfr. / Model No.	Proterra / 034640
PTC Mfr./ Model No.	ThermaTech / 074020004

VEHICLE DATA FORM

Page 4 of 7

Bus Number: 1906	Date: 03/28/19
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SUSPENSION

Number of Axles	2		
Front Axle Type	<input checked="" type="checkbox"/> Independent	<input type="checkbox"/> Beam Axle	
Mfr. / Model No.	ZF / RL75EC		
Axle Ratio (if driven)	N/A		
Suspension Type	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Sachs / 481700004723 (Start of Test) Replaced with: Koni / 5414 (June 13, 2019)		
Middle Axle Type	<input type="checkbox"/> Independent	<input type="checkbox"/> Beam Axle	
Mfr. / Model No.	N/A		
Axle Ratio (if driven)	N/A		
Suspension Type	<input type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
No. of Shock Absorbers	N/A		
Mfr. / Model No.	N/A		
Rear Axle Type	<input type="checkbox"/> Independent	<input checked="" type="checkbox"/> Beam Axle	
Mfr. / Model No.	Proterra / DuoPower		
Axle Ratio (if driven)	3.31:1		
Suspension Type	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
No. of Shock Absorbers	4		
Mfr. / Model No.	Sachs / 47 1700 006 149 (Start of Test) Replaced with: Koni / 5415 (June 13, 2019)		

VEHICLE DATA FORM

Page 5 of 7

Bus Number: 1906	Date: 03/28/19
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WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Alcoa / LVLone 22.5 x 9.00-176
	Tire Mfr./ Model No.	Michelin / Xlncity 315/80R22.5
Rear	Wheel Mfr./ Model No.	Alcoa / LVLone 22.5 x 9.00-176
	Tire Mfr./ Model No.	Michelin / Xlncity 315/80R22.5

BRAKES

Front Axle Brakes Type	<input type="checkbox"/> Cam	<input checked="" type="checkbox"/> Disc	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	Knorr / SN7		
Middle Axle Brakes Type	<input type="checkbox"/> Cam	<input type="checkbox"/> Disc	<input type="checkbox"/> Other
Mfr. / Model No.	N/A		
Rear Axle Brakes Type	<input type="checkbox"/> Cam	<input checked="" type="checkbox"/> Disc	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	Knorr / SB7		

HVAC

Heating System Type	<input type="checkbox"/> Air	<input type="checkbox"/> Water	<input type="checkbox"/> Other
Capacity (Btu/hr.)	54,594		
Mfr. / Model No.	Eberspaecher / AC136 model 88-50-26-00755-00		
Air Conditioner	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Location	Roof		
Capacity (Btu/hr.)	102,363		
A/C Compressor Mfr. / Model No.	Eberspaecher / HGX34e / 380-4SA (Boch / GEA compressor)		

STEERING

Steering Gear Box Type	Hydraulic gear		
Mfr. / Model No.	Ross / TRW model TAS85		
Steering Wheel Diameter	19.9		
Number of turns (lock to lock)	4 ½		
Control Type	<input type="checkbox"/> Electric	<input checked="" type="checkbox"/> Hydraulic	<input type="checkbox"/> Other (explain)

VEHICLE DATA FORM

Page 6 of 7

Bus Number: 1906	Date: 03/28/19
------------------	----------------

OTHERS

Wheelchair Ramps	Location: Front	Type: Fold out
Wheelchair Lifts	Location: N/A	Type: N/A
Mfr. / Model No.	Ricon / RISSR-OC27301B00	
Emergency Exit	Location: Window Door Roof hatch	Number: 4 2 2

CAPACITIES

Fuel Tank Capacity	N/A
Engine Crankcase Capacity	N/A
Transmission Capacity	4.5 L per Transmission / 2 Transmissions within DuoPower axle
Differential Capacity	2.8 L per wheel end / 2 wheel ends within DuoPower axle
Cooling System Capacity	Battery Thermal Loop: 12.8 g Power Electronics Thermal Loop: 11.8 g
Power Steering Fluid Capacity	11 quarts

COMPONENT/SUBSYSTEM INSPECTION FORM

Page 1 of 1

Bus Number: 1906	Date: 03/28/19
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Subsystem	Checked	Initials	Comments
Air Conditioning Heating and Ventilation	✓	E.D.	None noted.
Body and Sheet Metal	✓	E.D.	None noted.
Frame	✓	E.D.	None noted.
Steering	✓	E.D.	None noted.
Suspension	✓	E.D.	None noted.
Interior/Seating	✓	E.D.	None noted.
Axles	✓	E.D.	None noted.
Brakes	✓	E.D.	None noted.
Tires/Wheels	✓	E.D.	None noted.
Exhaust	N/A	E.D.	None noted.
Fuel System	✓	E.D.	Battery Electric
Power Plant	✓	E.D.	Battery Electric
Accessories	✓	E.D.	None noted.
ADA Accessible Lift System	N/A	E.D.	None noted.
ADA Accessible Ramp System	✓	E.D.	None noted.
Interior Fasteners	✓	E.D.	None noted.
Batteries	✓	E.D.	None noted.

CHECK - IN



PROTERRA CAT40DP



CHECK - IN CONT.



**PROTERRA
CAT40DP**



CHECK - IN CONT.

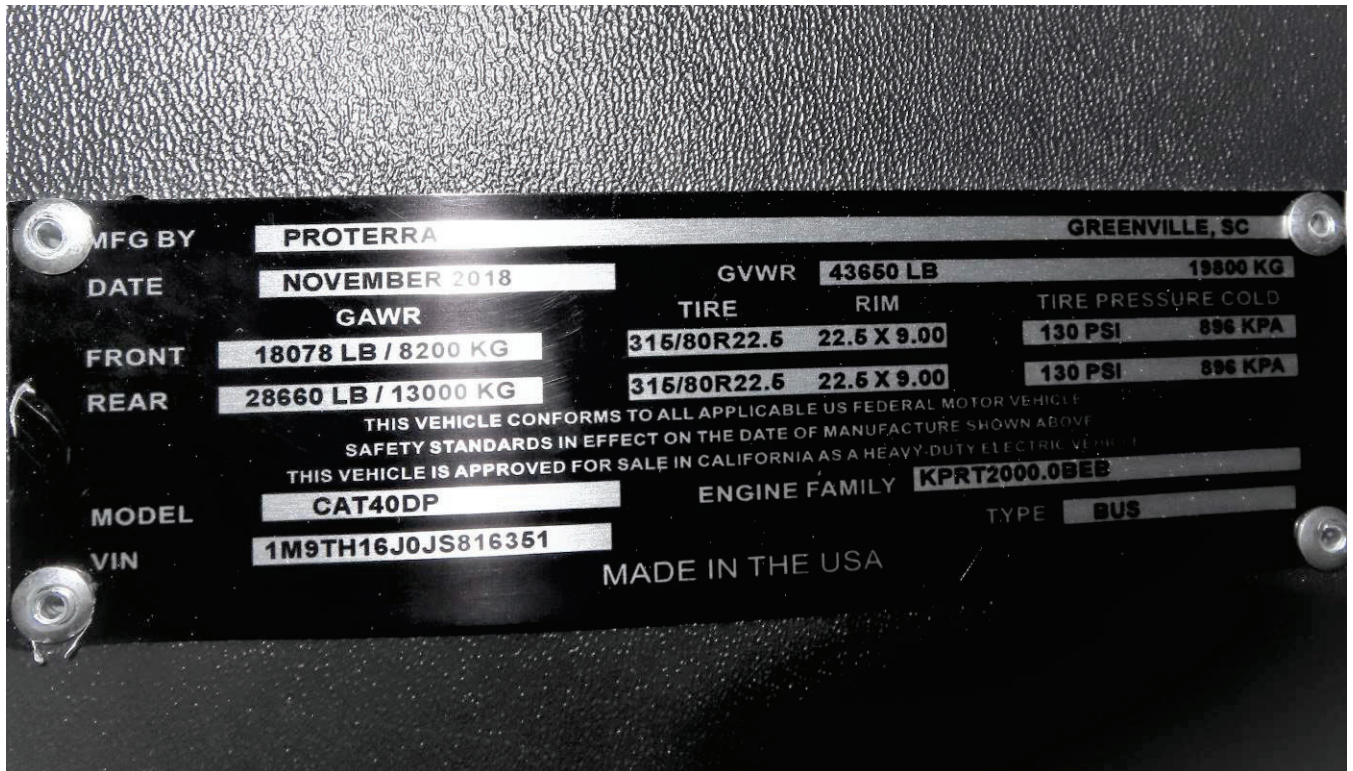


OPERATOR'S AREA



INTERIOR FROM FRONT

CHECK - IN CONT.

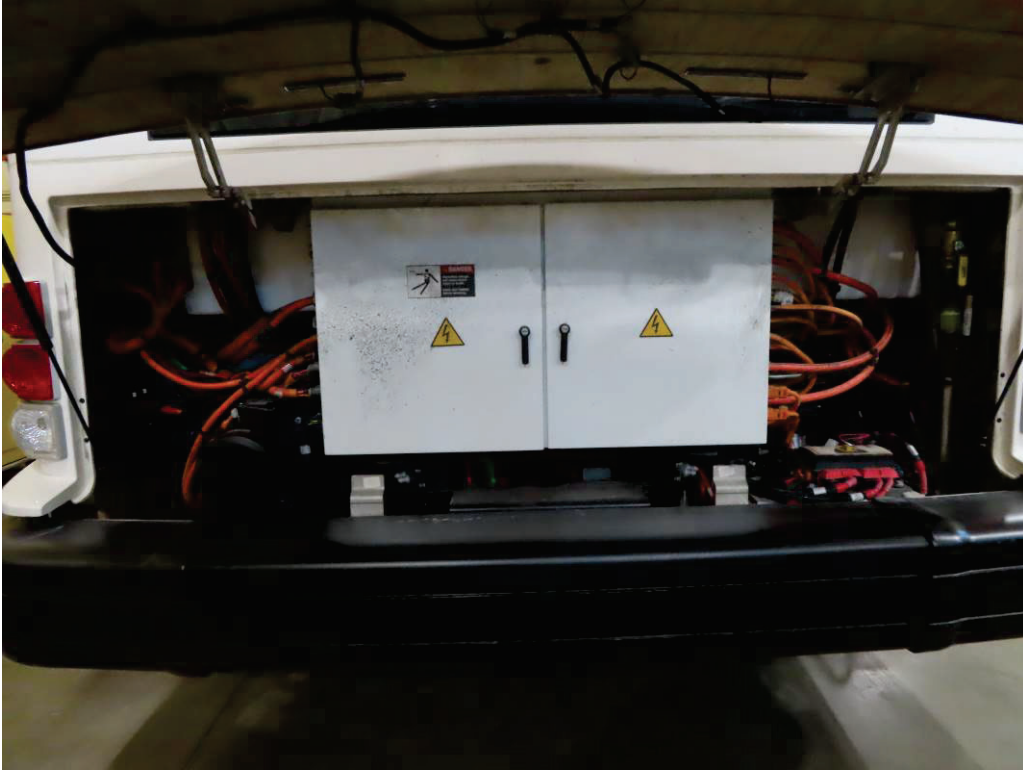


VIN TAG



PLACARD SHOWING MAXIMUM STANDEES

CHECK - IN CONT.



REAR COMPARTMENT

1. MAINTAINABILITY

1.1 ACCESSIBILITY OF COMPONENTS AND SUBSYSTEMS

1.1-I. TEST OBJECTIVE

The objective of this test is to check the accessibility of components and subsystems.

1.1-II. TEST DESCRIPTION

Accessibility of components and subsystems was checked, and where accessibility was restricted the subsystem was noted along with the reason for the restriction.

1.1-III. DISCUSSION

Accessibility, in general, was adequate. Components covered in Section 1.3 (repair and/or replacement of selected subsystems), along with all other components encountered during testing, were found to be readily accessible and no restrictions were noted, with the exception of the windshield wiper motor. Both dash panels inside the bus needed to be removed to access this component.

ACCESSIBILITY DATA FORM

Page 1 of 2

Bus Number: 1906	Date: 08/20/2020
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Component	Checked	Comments
ENGINE:		
Oil Dipstick	N/A	N/A
Oil Filler Hole	N/A	N/A
Oil Drain Plug	N/A	N/A
Oil Filter	N/A	N/A
Fuel Filter	N/A	N/A
Air Filter	N/A	N/A
Belts	N/A	N/A
Coolant Level	✓	Drive Motors
Coolant Filler Hole	✓	Drive Motors
Coolant Drain	✓	Drive Motors
Spark / Glow Plugs	N/A	N/A
Alternator	N/A	N/A
Diagnostic Interface Connector	✓	None noted.
TRANSMISSION:		
Fluid Dipstick	N/A	N/A
Filler Hole	N/A	N/A
Drain Plug	N/A	N/A
SUSPENSION:		
Bushings	✓	None noted.
Shock Absorbers	✓	None noted.
Air Springs	✓	None noted.
Leveling Valves	✓	None noted.
Grease Fittings	✓	None noted.

ACCESSIBILITY DATA FORM

Page 2 of 2

Bus Number: 1906	Date: 08/20/2020
------------------	------------------

Component	Checked	Comments
HVAC:		
A/C Compressor	✓	None noted.
Filters	✓	None noted.
Fans	✓	None noted.
ELECTRICAL SYSTEM:		
Fuses	✓	None noted.
Batteries	✓	None noted.
Voltage regulator	✓	None noted.
Voltage Converters	✓	None noted.
Lighting	✓	None noted.
MISCELLANEOUS:		
Brakes	✓	None noted.
ADA Accessible Lifts/Ramps	✓	None noted.
Instruments	✓	None noted.
Axles	✓	None noted.
Exhaust	N/A	N/A
Fuel System	N/A	Battery Electric
OTHERS:		
Wiper Motor	✓	Both dash pieces need to be removed to access motor

1.1 ACCESSIBILITY OF COMPONENTS AND SUBSYSTEMS



DASH PIECES REMOVED TO ACCESS WIPER MOTOR

1.2 SERVICING, PREVENTIVE MAINTENANCE, AND REPAIR AND MAINTENANCE DURING TESTING

1.2-I. TEST OBJECTIVE

The objective of this test is to collect maintenance data about the servicing, preventive maintenance, and repair.

1.2.-II. TEST DESCRIPTION

The test was conducted by operating the bus and collecting the following data on work order forms and a driver log.

1. Scheduled Maintenance
 - a. Bus number
 - b. Date
 - c. Mileage
 - d. Results of scheduled inspections
 - e. Description of malfunction (if any)
 - f. Repair action and parts used (if any)
 - g. Man-hours required

2. Unscheduled Maintenance
 - a. Bus number
 - b. Date
 - c. Mileage
 - d. Description of malfunction
 - e. Place and time of malfunction (e.g., in service or undergoing inspection)
 - f. Repair action and parts used
 - g. Man-hours required

The bus was operated in accelerated durability service. While typical items are given below, the specific service schedule was that specified by the manufacturer.

- A. Service
 1. Fueling
 2. Consumable checks
 3. Interior cleaning

- B. Preventive Maintenance
 1. Brake adjustments
 2. Lubrication
 3. 3,000 mi (or manufacturer recommended) inspection

4. Oil and filter change inspection
5. Major inspection
6. Tune-up

C. Periodic Repairs

1. Brake reline*
2. Transmission change
3. Engine change*
4. Windshield wiper motor change
5. Stoplight bulb change*
6. Towing operations
7. Hoisting operations

*These items are attended to if found necessary, while the others in the list are removed/replaced/tested for all buses undergoing a full test.

1.2-III. DISCUSSION

Servicing and preventive maintenance were performed at manufacturer-specified intervals. The following Scheduled Maintenance Form lists the mileage, items serviced, the service interval, and amount of time required to perform the maintenance.

The Unscheduled Maintenance List along with related photographs is included in Section 5.7, Structural Durability. This list supplies information related to failures that occurred during the durability portion of testing. The Unscheduled Maintenance List includes the date and mileage at which the malfunction was detected, a description of the malfunction and repair, and the time required to perform the repair.

(Page 1 of 2)
SCHEDULED MAINTENANCE
 Proterra Bus# 1906

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	LABOR HOURS
05/17/19	1,220	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
06/24/19	2,711	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
07/31/19	3,910	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
08/04/19	4,094	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
08/15/19	4,532	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
10/13/19	7,851	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00

(Page 2 of 2)
SCHEDULED MAINTENANCE
 Proterra Bus# 1906

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	LABOR HOURS
11/05/19	8,976	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
11/26/19	10,163	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
12/17/19	11,573	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
02/08/20	14,388	P.M./Inspection Energy Economy Prep	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	8.00	8.00
02/20/20	14,584	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS

1.3-I. TEST OBJECTIVE

The objective of this test is to establish the time required to replace and/or repair selected subsystems.

1.3-II. TEST DESCRIPTION

The test involved components that may be expected to fail or require replacement during the service life of the bus. In addition, any component that failed during testing of the bus was added to this list. Components to be included are:

1. Transmission
2. Alternator
3. Starter
4. Batteries
5. Windshield wiper motor

1.3-III. DISCUSSION

At the end of the test, the items on the list were removed and replaced. The DuoPower axle assembly took 4.00 labor-hours (2 persons @ 2.00 hrs.) to remove and replace. The time required for repair/replacement of the other four components is given on the following Repair and/or Replacement Form.

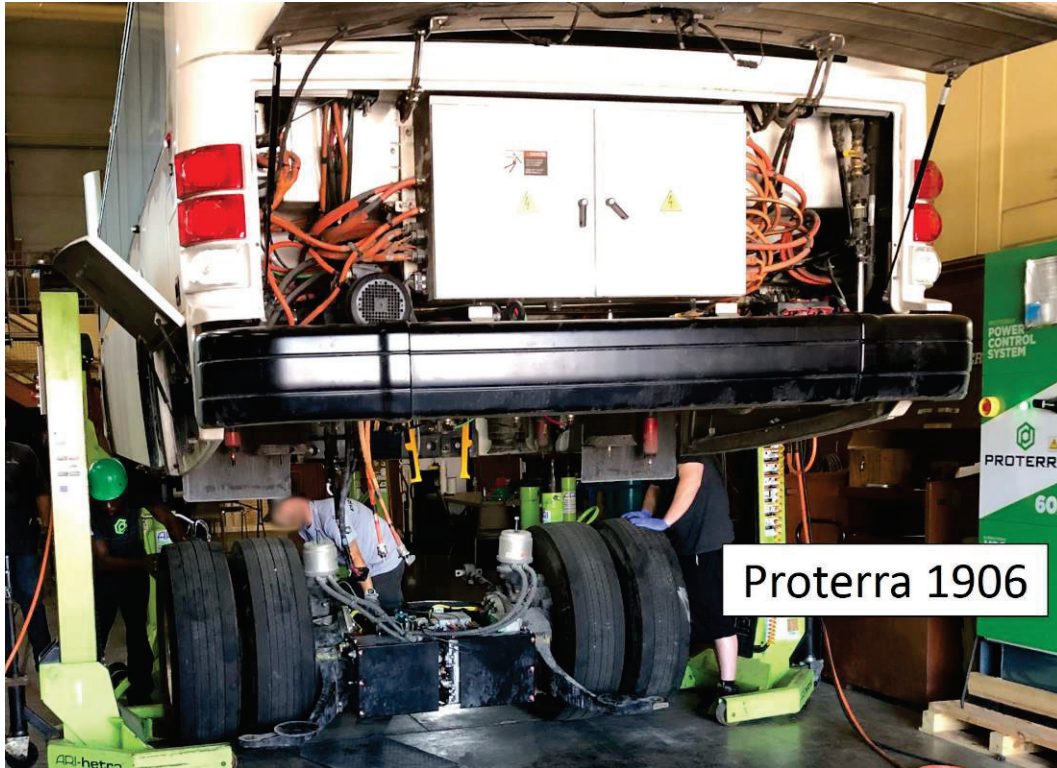
REPLACEMENT AND/OR REPAIR FORM

Subsystem	Replacement Time
DuoPower Axle	4.00 labor hours
Wiper Motor	2.00 labor hours
DC-DC Converter	1.00 labor hours
ESS Battery Pack (Streetside)	2.00 labor hours
Batteries (12 volt)	1.00 labor hours

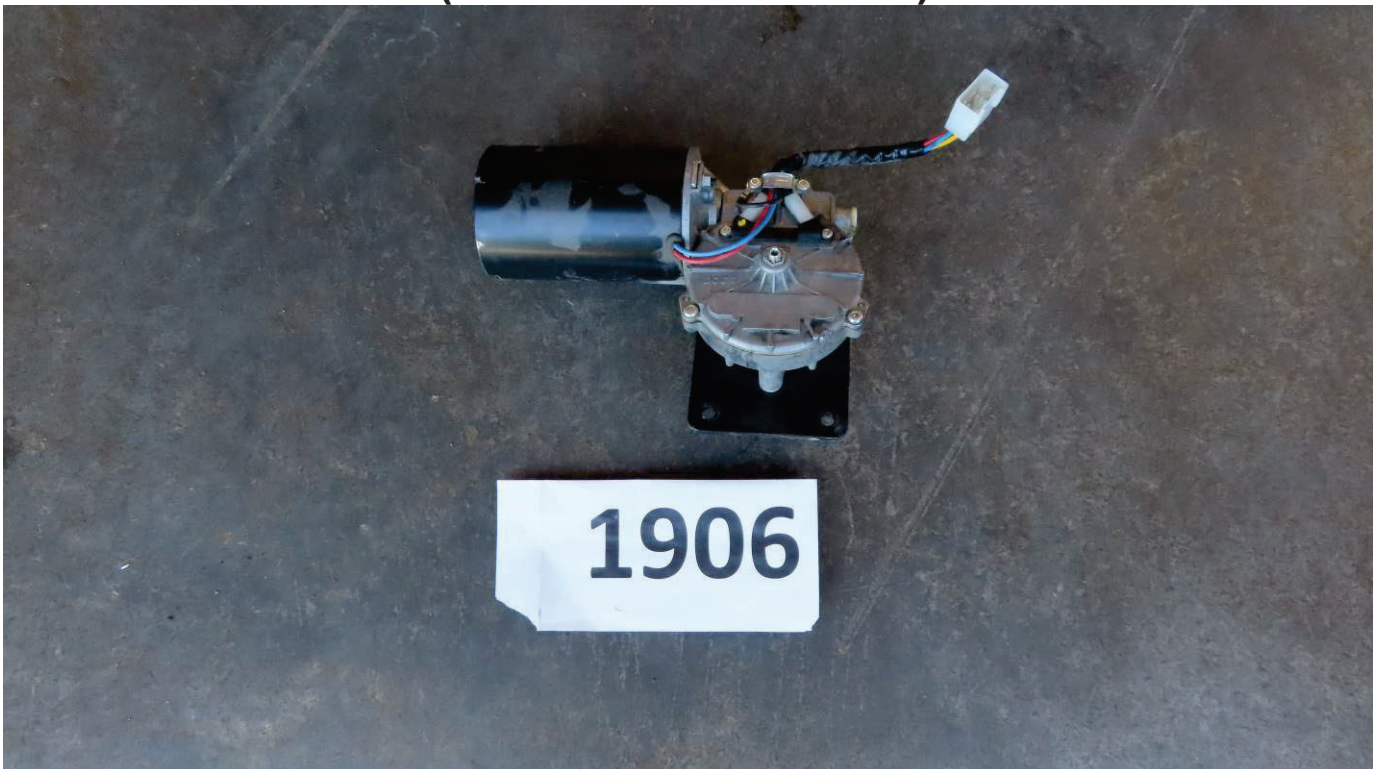
During removal and replacement of the windshield wiper motor, it is noted that the dash of the bus had to be removed to access the motor.

During the test, additional components were removed for repair or replacement and the details are available in Section 5.7 in *Unscheduled Maintenance*.

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS



**DUOPOWER AXLE REMOVAL AND REPLACEMENT
(4.00 LABOR HOURS)**



**WIPER MOTOR REMOVAL AND REPLACEMENT
(2.00 LABOR HOURS)**

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS CONT.



**DC-DC CONVERTER REMOVAL AND REPLACEMENT
(1.00 LABOR HOURS)**



**HIGH VOLTAGE ESS BATTERY PACK REMOVAL AND
REPLACEMENT (2.00 LABOR HOURS)**

2. RELIABILITY - DOCUMENTATION OF BREAKDOWN AND REPAIR TIMES DURING TESTING

2-I. TEST OBJECTIVE

The objective of this test is to document unscheduled breakdowns, repairs, down time, and repair time that occur during testing.

2-II. TEST DESCRIPTION

Using the driver log and unscheduled work order forms, all significant breakdowns, repairs, labor-hours to repair, and hours out of service were recorded on the Reliability Data Form.

CLASS OF FAILURES

Classes of failures are described below:

- (a) Class 1: Physical Safety. A failure that could lead directly to Injury, a crash and/or significant physical damage.
- (b) Class 2: Road Call. A failure resulting in an en-route interruption of revenue service. Service is discontinued until the bus is replaced or repaired at the point of failure.
- (c) Class 3: Bus Change. A failure that requires removal of the bus from service during its assignments. The bus is operable to a rendezvous point with a replacement bus.
- (d) Class 4: Bad Order. A failure that does not require removal of the bus from service during its assignments but does degrade coach operation. The failure shall be reported by driver, inspector, or hostler.

2-III. DISCUSSION

A listing of breakdowns and unscheduled repairs was accumulated during the Structural Durability Test. The following Reliability Data Form lists all unscheduled repairs under classes as defined above.

The classification of repairs according to subsystem is intended to emphasize those systems which had persistent minor or more serious problems. There was a total of 80 failures throughout various subsystems. There was one Class One failure that affected the ADA Ramp. There were six Class Two failures, 67 Class Three failures and six Class Four failures. These failures are available for review in the Unscheduled Maintenance List, located in Section 5.7 Structural Durability.

This bus passed the Structural and Powertrain Durability sections of the test.

RELIABILITY DATA FORMS

Bus Number: 1906	Date: 09/22/2020
Personnel: B.L. & D.K.	

Subsystems	Failure Type				Labor Hours	Down Time
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Electrical			239		1.25	1.25
		381			1.00	1.00
		992			1.00	1.00
			1,087		2.50	2.50
		1,517			0.75	0.75
		1,652			1.00	1.00
		1,744			1.50	1.50
		2,049			0.08	0.08
		2,049			1.00	1.00
		2,359			0.50	0.50
		2,669			2.00	2.00
		2,957			0.50	0.50
		3,682			0.25	0.25
		3,874			0.25	0.25
		4,292			0.50	0.50
		4,529			0.10	0.10
		5,581			0.08	0.08
		6,446			0.50	0.50
		6,511			0.20	0.20
			6,615		2.85	2.85
	9,461			---	---	
		10,783		0.08	0.08	

RELIABILITY DATA FORMS

Bus Number: 1906	Date: 09/22/2020
Personnel: B.L. & D.K.	

	Failure Type				Labor Hours	Down Time
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Subsystems	Mileage	Mileage	Mileage	Mileage		
Electrical (Cont.)		10,783			1.25	1.25
	11,595				---	---
		12,044			0.25	0.25
		12,999			0.50	0.50
		12,999			1.00	1.00
		13,267			0.25	0.25
		14,930			1.00	1.00
Body		381			0.50	0.50
		681			0.25	0.25
		681			0.75	0.75
		1,220			1.00	1.00
		1,648			2.50	2.50
	1,744				0.08	0.08
		2,593			1.00	1.00
		3,437			0.50	0.50
		4,094			0.25	0.25
		4,592			0.20	0.20
		5,581			0.08	0.08
		6,446			3.25	3.25
		6,446			1.00	1.00
		8,754			0.25	0.25
	9,098			0.75	0.75	

RELIABILITY DATA FORMS

Bus Number: 1906	Date: 09/22/2020
Personnel: B.L. & D.K.	

Subsystems	Failure Type				Labor Hours	Down Time
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Body (Cont.)	Mileage	10,510			0.08	0.08
		10,783			0.50	0.50
		11,803			2.50	2.50
		12,598			2.50	2.50
		12,999			7.50	7.50
		13,267			0.25	0.25
	14,587				0.25	0.25
		14,782			1.50	1.50
Coolant (Motor & Battery)		381			0.25	0.25
		12,044			0.50	0.50
Software/Electrical			381		0.25	0.25
		7,132			2.00	2.00
		10,103			0.25	0.25
Electrical/Body		681			2.50	2.50
			2,285		1.00	1.00
			9,334		3.00	3.00
Drivetrain		755			2.00	2.00
		992			4.50	4.50
		2,085			2.00	2.00
		3,612			0.50	0.50
		6,911			0.50	0.50

RELIABILITY DATA FORMS

Bus Number: 1906	Date: 09/22/2020
Personnel: B.L. & D.K.	

Subsystems	Failure Type				Labor Hours	Down Time
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Drivetrain (Cont.)		12,999			---	---
Suspension		1,220			0.50	0.50
		2,285			0.50	0.50
		2,285			0.50	0.50
		2,302			0.50	0.50
		2,421			1.00	1.00
		7,302			0.50	0.50
		9,398			12.00	12.00
Hardware		1,231			4.00	4.00
HVAC	2,757				2.00	2.00
Electrical / Motor and Battery Cooling		3,437			0.75	0.75
Coach Air Compressor	5,180				1.00	1.00
Software		6,265			0.10	0.10
Compressed Air System		6,511			0.25	0.25
Door		12,999			1.00	1.00
ADA Ramp				13,644	1.25	1.25

3.1 SAFETY - A DOUBLE-LANE CHANGE (OBSTACLE AVOIDANCE)

3.1-I. TEST OBJECTIVE

The objective of this test is to determine handling and stability of the bus by measuring speed through a double lane change test.

3.1-II. TEST DESCRIPTION

The Safety Test consisted of an obstacle avoidance maneuver to evaluate the handling and stability of the bus. The test was conducted at the LTI test track on the vehicle dynamics pad. The bus was driven through a double-lane change course at increasing speeds until the test was determined to be unsafe or a speed of 45 mph is reached. The test is determined unsafe if vehicle handling becomes unstable or if any of the tires lose contact with the pavement.

The layout of the test course was defined by placing pylons along painted guidelines that delineated the course. The guidelines marked off two 12-foot center-to-center lanes. Each lane had two 100 foot long gates with a spacing distance of 100 feet between them. The bus entered the test course in one lane, crossed over to the other lane within the 100 foot gate, traveled for 100 feet, and then returned back into the original lane within the next 100 foot gate. This maneuver was repeated from 20 mph with speed increasing in increments of 5 mph. The test was performed starting from both the right and left lanes.

A test run is considered valid if the bus is able to perform the maneuver at a constant speed without deviating from the test course or striking pylons. If the bus is not able to successfully complete the maneuver due to vehicle instability, the test will be terminated. The highest speed at which the maneuver can be successfully performed up to a maximum speed of 45 mph is recorded on the Safety Data Form.

3.1-III. DISCUSSION

The double-lane change was performed in both right-hand and left-hand directions. The bus was able to safely negotiate the test course in both the right-hand and left-hand directions up to the maximum test speed of 45 mph, and therefore, passed this portion of the test.

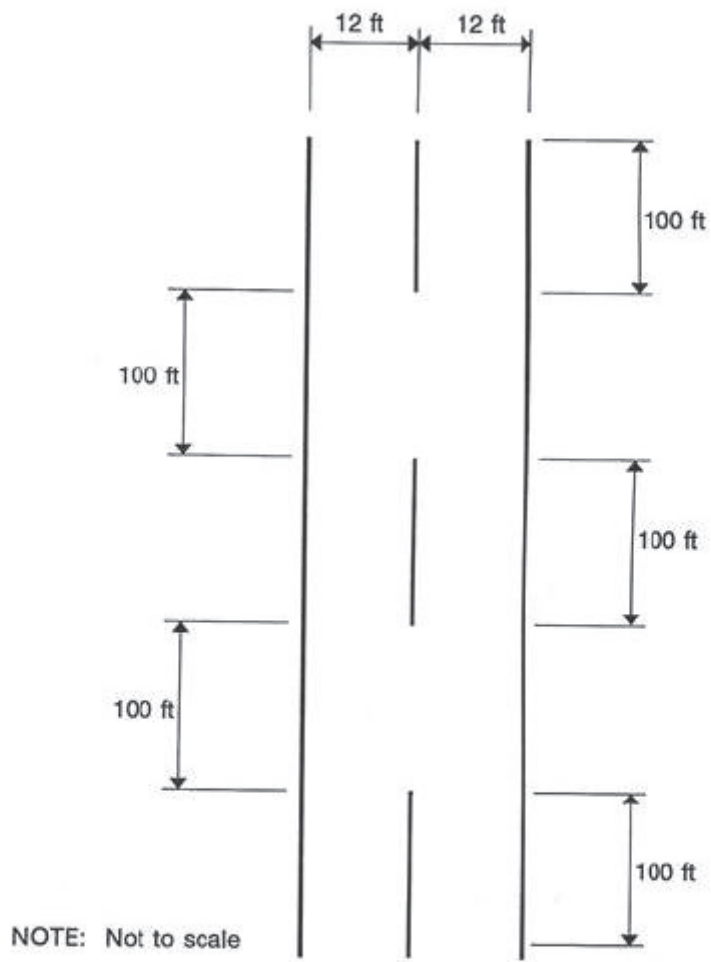


Figure 3.1. Double lane change test course

SAFETY DATA FORM

Page 1 of 1

Bus Number: 1906	Date: 08/30/19
Personnel: E.D., E.L., S.R. & J.S.	

Temperature (°F): 73	Humidity (%): 65
Wind Direction: SW	Wind Speed (mph): Steady at 3, gusts to 10
Barometric Pressure (inHg): 30.06	

SAFETY TEST: DOUBLE LANE CHANGE	
Maximum safe speed tested for double-lane change to left	45 mph
Maximum safe speed tested for double-lane change to right	45 mph
Comments of the position of the bus during the lane change:	
The bus maintained a safe profile through all portions of testing.	
Comments of the tire/ground contact patch:	
The bus maintained the tire/ground patch throughout the test.	

3.1 SAFETY



RIGHT - HAND APPROACH



LEFT - HAND APPROACH

3.2 Safety - Braking

3.2 I. TEST OBJECTIVE

The objective of this test is to provide, for comparison purposes, braking performance data on transit buses produced by different manufacturers.

3.2 II. TEST DESCRIPTION

The testing was conducted at the LTI Test Track skid pad area. Brake tests were conducted after completion of the GVW portion of the vehicle durability test. At this point in testing the brakes have been subjected to a large number of braking snubs and will be considered well burnished. For buses that have not completed Durability Testing, the brakes will be burnished according to the test procedure. Testing was performed when the bus was fully loaded at its GVW. All tires on each bus were representative of the tires on the production model vehicle and inflated to the bus manufacturer's specified pressures.

The brake testing procedure is comprised of three phases:

1. Stopping distance tests
 - i. Dry surface (high-friction, Skid Number within the range of 70-76)
 - ii. Wet surface (low-friction, Skid Number within the range of 30-36)
2. Stability tests
3. Parking brake test

3.2-III. DISCUSSION

The results of the Stopping Distance phase of the Brake Test are available in table 3.2-2. There was no deviation from the test lane during the performance of the Stopping Distance phase. The bus passed this portion of the test.

During the Stability phase of Brake Testing the test bus experienced no deviation from the test lane during both approaches to the Split Friction Road surface.

The Parking Brake phase was completed with the test bus maintaining the parked position for the full five-minute period with no slip or roll observed in both the uphill and downhill positions.

This bus passed all three phases of the Safety –Braking Test.

Table 3.2-1. Braking Test Data Forms

Page 1 of 3

Bus Number: 1906	Date: 04/29/19
Personnel: S.R., T.S. & E.D.	
Amb. Temperature (°F): 56	Wind Speed (mph): 9
Wind Direction: SE	Pavement Temp (°F) Start:79 End: 86

TIRE INFLATION PRESSURE (psi):				
Tire Type: Front and Rear: Michelin X Incity				
	Left Tire(s)		Right Tire(s)	
Front	130		130	
	Inner	Outer	Inner	Outer
Middle	N/A	N/A	N/A	N/A
Rear	130	130	130	130

AXLE LOADS (lb.)		
	Left	Right
Front	9,010	9,050
Middle	N/A	N/A
Rear	13,030	12,550

**Table 3.2-2. Stopping Distance Test Results Form
(longest stopping distance in each test condition in bold)**

Stopping Distance (ft)					
Vehicle Direction	CW	CW	CCW	CCW	
Speed (mph)	Stop 1	Stop 2	Stop 3	Stop 4	Average
20 (dry)	29.22	26.40	29.88	28.20	28.42
30 (dry)	60.94	60.64	57.59	53.85	58.25
40 (dry)	101.84	112.86	104.14	102.33	105.29
45 (dry)	145.07	148.94	133.10	130.05	139.29
20 (wet)	28.33	27.28	33.65	27.84	29.27

Table 3.2-3. Stability Test Results Form

Stability Test Results (Split Friction Road surface)			
Vehicle Direction	Attempt	Did test bus stay in 12' lane? (Yes/No)	Comments
Driver side on high friction	1	Yes	None noted.
	2	Yes	None noted.
Driver side on low friction	1	Yes	None noted.
	2	Yes	None noted.

Table 3.2-4. Parking Brake Test Form

PARKING BRAKE (GVW) – GRADE HOLDING						
Vehicle Direction	Attempt	Hold Time (min)	Slide (in)	Roll (in)	Did Hold	No Hold
Front up	1	5:00	0	0	✓	
	2	N/A	N/A	N/A	N/A	N/A
	3	N/A	N/A	N/A	N/A	N/A
Front down	1	5:00	0	0	✓	
	2	N/A	N/A	N/A	N/A	N/A
	3	N/A	N/A	N/A	N/A	N/A

Table 3.2-5. Record of All Braking System Faults/Repairs.

Date	Fault/Repair	Description
04/29/19	None noted.	None noted.

3.2 Safety - Bus Braking



**PARKING BRAKE TEST
PARKING BRAKE HELD FOR 5 MINUTES IN
BOTH 20% UP AND 20% DOWN POSITIONS**



4. PERFORMANCE - AN ACCELERATION, GRADEABILITY, AND TOP SPEED TEST

4-I. TEST OBJECTIVE

The objective of this test is to determine the acceleration, gradeability, and top speed capabilities of the bus.

4-II. TEST DESCRIPTION

In this test, the bus was operated at SLW on a chassis dynamometer. The procedure dictates that the test bus be accelerated to a maximum “power-limited”/”governed” or maximum “safe” speed not exceeding 80 mph. The maximum power-limited/governed speed, if applicable, is the top speed as limited by the engine control system. The maximum safe speed is defined as the maximum speed that the dynamometer, the tires or other bus components are limited to. The test vehicle speed was measured using a speed encoder built in the chassis dynamometer. The time intervals between 10 mph increments were recorded using a Data Acquisitions System. Time-speed data and the top speed attained were recorded on the Performance Data Form. The recorded data was used to generate a percent grade versus speed table and a speed versus time curve. All the above are available in the following pages.

4-III. DISCUSSION

This test consisted of three runs from standstill to full throttle on the chassis dynamometer. Speed versus time data was obtained for each run and results are averaged to minimize test variability. The test was performed up to a maximum safe speed of 64.2 mph. The calculated gradeability results are attached. The average time to reach 30 mph was 4.2 seconds. The maximum gradeability at 10 mph was 45.3% and at 40 mph was 10.4%. This bus passed this section of the test.

For the Performance test, ballast weight equivalent of the roof mount battery packs was removed to represent the four-pack battery configuration per the Federal Transit Administration determination letter. Therefore, the seated load weight used was 36,960 lbs. for this Performance tests.

PERFORMANCE DATA FORM

Page 1 of 1

Bus Number: 1906		Date: 09/10/2020	
Personnel: J.S. & S.I.			
Temperature (°F): 75.7		Humidity (%): 85	
Barometric Pressure (inHg): 29.0			
		INITIALS:	
Air Conditioning - OFF	✓Checked	J.S.	
Ventilation fans - ON HIGH	N/A	N/A	
Heater pump motor - OFF	N/A	N/A	
Defroster - OFF	✓ Checked	J.S.	
Exterior and interior lights - ON	✓ Checked	J.S.	
Windows and doors - CLOSED	✓ Checked	J.S.	
ACCELERATION, GRADEABILITY, TOP SPEED			
Recorded Interval Times			
Speed	Run 1	Run 2	Run 3
10 mph	1.9	0.9	2.2
20 mph	2.7	1.7	3.1
30 mph	4.3	3.3	4.7
40 mph	9.4	8.4	7.7
50 mph	15.9	15.0	16.2
60 mph	25.9	25.0	26.4
70 mph	N/A	N/A	N/A

Maximum Speed (mph): 64.2 (maximum governed speed reached)

PERFORMANCE SUMMARY SHEET

Bus Number: 1906	Date: 09/10/2020
Personnel: J.S. & S.I.	

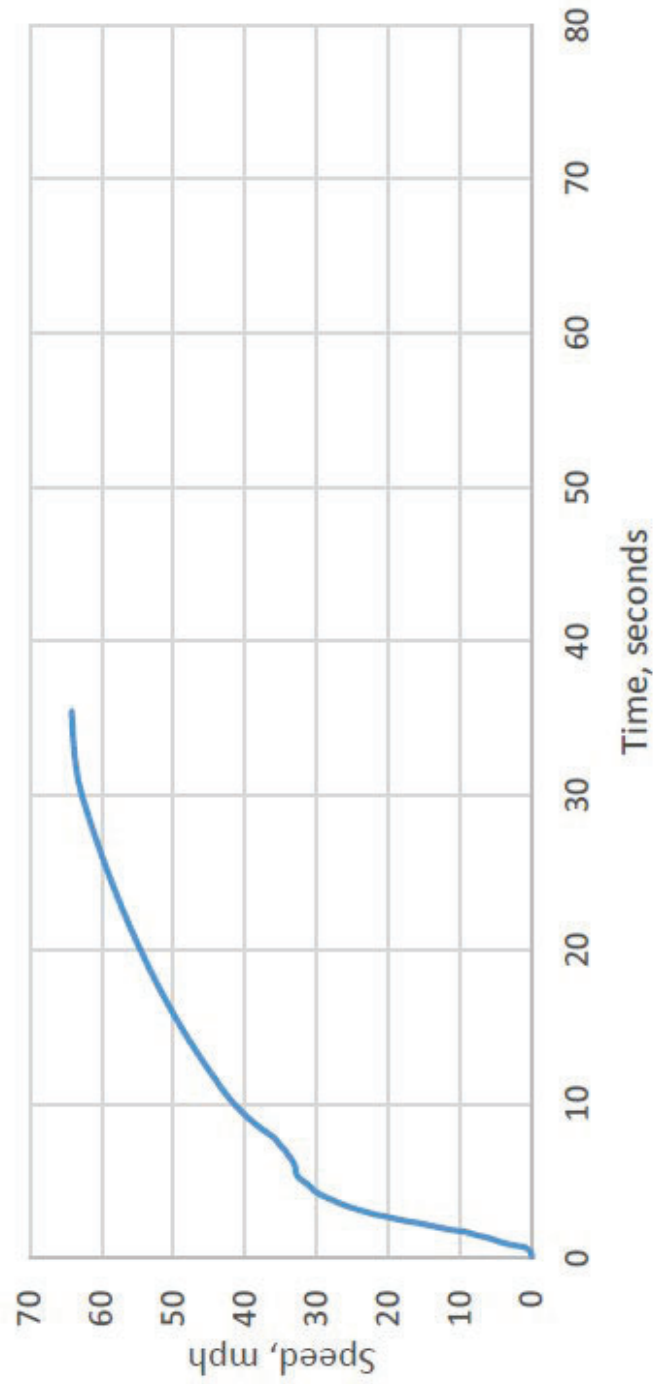
Test Conditions:

Temperature (°F): 75.7	Humidity (%): 85
Barometric Pressure (inHg): 29.0	

Test Results:

Vehicle Speed (MPH)	Time (SEC)	Acceleration (FT/SEC^2)	Max. Grade (%)
1.0	0.6	7.57	23.5
5.0	1.1	11.57	35.9
10.0	1.7	14.60	45.3
15.0	2.1	15.17	47.1
20.0	2.6	13.61	42.3
25.0	3.2	9.92	30.8
30.0	4.2	5.09	15.8
35.0	7.2	2.86	8.9
40.0	9.2	3.35	10.4
45.0	12.1	2.18	6.8
50.0	15.8	1.79	5.6
55.0	20.3	1.44	4.5
60.0	26.0	1.14	3.4
64.2	35.5	Maximum Speed	

Protterra Bus 1906



5.2 STRUCTURAL STRENGTH AND DISTORTION TESTS - STRUCTURAL DISTORTION

5.2-I. TEST OBJECTIVE

The objective of this test is to observe the operation of the bus subsystems when the bus is placed in a longitudinal twist simulating operation over a curb or through a pothole.

5.2-II. TEST DESCRIPTION

With the bus loaded to GVW, each wheel of the bus was raised (one at a time) to simulate operation over a curb and the following were inspected:

1. Body
2. Windows
3. Doors
4. Roof vents
5. Special seating
6. Undercarriage
7. Engine
8. Service doors
9. Escape hatches
10. Steering mechanism

Each wheel was then lowered (one at a time) to simulate operation through a pothole and the same items inspected.

5.2-III. DISCUSSION

The test sequence was repeated ten times. The first and last test is with all wheels level. The other eight tests are with each wheel 6 inches higher and 6 inches lower than the other three wheels.

All doors, windows, escape mechanisms, engine, steering and ADA accessible devices operated normally throughout the test. The undercarriage and body indicated no deficiencies. No water leakage was observed during the test. The results of this test are indicated on the following data forms. This bus passed this section of the test.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 1 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input checked="" type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 2 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input checked="" type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM
 (Note: Ten copies of this data sheet are required)
 Page 3 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input checked="" type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 4 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input checked="" type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 5 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input checked="" type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM
 (Note: Ten copies of this data sheet are required)
 Page 6 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input checked="" type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 7 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input checked="" type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 8 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input checked="" type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 9 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input checked="" type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 10 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input checked="" type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

5.2 STRUCTURAL DISTORTION TEST



RIGHT REAR WHEEL SIX INCHES HIGHER



LEFT FRONT WHEEL SIX INCHES LOWER

5.3 STRUCTURAL STRENGTH AND DISTORTION TESTS - STATIC TOWING TEST

5.3-I. TEST OBJECTIVE

The objective of this test is to determine the characteristics of the bus towing mechanisms under static loading conditions.

5.3-II. TEST DESCRIPTION

Utilizing a load-distributing yoke, a hydraulic cylinder was used to apply a static tension load equal to 1.2 times the bus curb weight. The load was applied to both the front and rear, if applicable, towing fixtures at an angle of 20 degrees with the longitudinal axis of the bus, first to one side then the other in the horizontal plane, and then upward and downward in the vertical plane. Any permanent deformation or damage to the tow eyes or adjoining structure was recorded.

5.3-III. DISCUSSION

The load-distributing yoke was incorporated as the interface between the Static Tow apparatus and the test bus tow hook/eyes. The test was performed to the full target test weight of 40,032 lb. (1.2 x 33,360 lb. CW). No damage or deformation was observed during all four pulls of the test.

STATIC TOWING TEST DATA FORM

Page 1 of 1

Bus Number: 1906	Date: 08/14/2020
Personnel: S.R., E.L. & P.D.	Temperature (°F): 84

Inspect right front tow eye and adjoining structure.
Comments: No damage or deformation.
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: None noted.
Inspect left front tow eye and adjoining structure.
Comments: No damage or deformation.
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: None noted.
Inspect right rear tow eye and adjoining structure.
Comments: N/A
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: N/A
Inspect left rear tow eye and adjoining structure.
Comments: N/A
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: N/A
General comments of any other structure deformation or failure:
Per manufacturer's recommendation no rear pull was performed.
No damage, deformation or failure noted at any point during each of the four, front pulls.

5.3 STATIC TOWING TEST



20° UPWARD PULL



20° DOWNWARD PULL

5.4 STRUCTURAL STRENGTH AND DISTORTION TESTS - DYNAMIC TOWING TEST

5.4-I. TEST OBJECTIVE

The objective of this test is to verify the integrity of the towing fixtures and determine the feasibility of towing the bus under manufacturer specified procedures.

5.4-II. TEST DESCRIPTION

This test required the bus to be towed at curb weight using the specified equipment and instructions provided by the manufacturer and a heavy-duty wrecker. The bus was towed for 5 miles at a speed of 20 mph for each recommended towing configuration. After releasing the bus from the wrecker, the bus was visually inspected for any structural damage or permanent deformation. All doors, windows and passenger escape mechanisms were inspected for proper operation.

5.4-III. DISCUSSION

The bus was towed using a heavy-duty wrecker. The towing interface was accomplished by incorporating a hydraulic under-lift. A front lift tow was performed. No problems, deformation, or damage was noted during testing. This bus passed this section of the test.

DYNAMIC TOWING TEST DATA FORM

Page 1 of 1

Bus Number: 1906	Date: 10/30/19
Personnel: T.S. & E.D.	

Temperature (°F): 60	
Wind Direction: calm	Wind Speed (mph): 0

Inspect tow equipment-bus interface.
Comments: No problems encountered.
Inspect tow equipment-wrecker interface.
Comments: No problems encountered.
Towing Comments: The towing test was performed successfully using a
Hydraulic underlift wrecker.
Description and location of any structural damage:
None noted.
General Comments:
None noted.

5.4 DYNAMIC TOWING TEST



TOWING INTERFACE



TEST BUS IN TOW

5.5 STRUCTURAL STRENGTH AND DISTORTION TESTS – JACKING TEST

5.5-I. TEST OBJECTIVE

The objective of this test is to inspect for damage due to the deflated tire and determine the feasibility of jacking the bus with a portable hydraulic jack to a height sufficient to replace a deflated tire.

5.5-II. TEST DESCRIPTION

With the bus at curb weight, the tire(s) at one corner of the bus were replaced with deflated tire(s) of the appropriate type. A portable hydraulic floor jack was then positioned in a manner and location specified by the manufacturer and used to raise the bus to a height sufficient to provide 3-in clearance between the floor and an inflated tire. The deflated tire(s) were replaced with the original tire(s) and the jack was lowered. Any structural damage or permanent deformation was recorded on the test data sheet. This procedure was repeated for each corner of the bus.

5.5-III. DISCUSSION

With the tires deflated during the test, the jacking point clearances ranged from 4.0 inches to 9.2 inches. No deformation or damage was observed during testing. A complete listing of jacking point clearances is provided in the Jacking Test Data Form. This bus passed this section of the test.

JACKING CLEARANCE SUMMARY

Condition	Frame Point Clearance
Front axle – one tire flat	5.3
Rear axle – one tire flat	8.2
Rear axle – two tires flat	5.1

JACKING TEST DATA FORM

Page 1 of 1

Bus Number: 1906	Date: 04/11/19
Personnel: E.D., E.L. & S.R.	Temperature (°F):

Record any permanent deformation or damage to bus as well as any difficulty encountered during jacking procedure.

I= Inflated D= Deflated

Deflated Tire	Jacking Pad Clearance Body/Frame (in)	Jacking Pad Clearance Axle/Suspension (in)	Comments
Right front	8.2" I 5.5" D	8.7" I 4.0" D	Body & Suspension
Left front	8.8" I 5.3" D	7.3" I 4.9" D	Body & Suspension
Right rear—outside	8.9" I 8.4" D	9.8" I 9.2" D	Body & Suspension
Right rear—both	8.9" I 5.1" D	9.8" I 5.6" D	Body & Suspension
Left rear—outside	9.0" I 8.2" D	9.9" I 9.1" D	Body & Suspension
Left rear—both	9.0" I 5.2" D	9.9" I 5.6" D	Body & Suspension
Right middle or tag—outside	N/A	N/A	N/A
Right middle or tag—both	N/A	N/A	N/A
Left middle or tag—outside	N/A	N/A	N/A
Left middle or tag—both	N/A	N/A	N/A

Additional comments of any deformation or difficulty during jacking:

None noted.

5.5 JACKING TEST



JACK IN PLACE – FRONT



JACK IN PLACE – REAR

5.6 STRUCTURAL STRENGTH AND DISTORTION TESTS - HOISTING TEST

5.6-I. TEST OBJECTIVE

The objective of this test is to determine possible damage or deformation caused by the jack/stands.

5.6-II. TEST DESCRIPTION

With the bus at curb weight, the front end of the bus was raised to a height sufficient to allow manufacturer-specified placement of jack stands under the axles or jacking pads independent of the hoist system. The bus was checked for stability on the jack stands and for any damage to the jacking pads or bulkheads. The procedure was repeated for the tag/middle axles (if equipped), and rear end of the bus. The procedure was then repeated for the front, tag/middle (if equipped) axles, and rear simultaneously.

5.6-III. DISCUSSION

The test was conducted using four posts of a six-post electric lift and 19-inch jack stands. The bus was hoisted from the front wheels and then from the rear wheels, and then from the front and rear wheels simultaneously and placed on jack stands.

The bus accommodated the placement of the vehicle lifts and jack stands and the procedure was performed without any instability noted. This bus passed this section of the test.

HOISTING TEST DATA FORM

Page 1 of 1

Bus Number: 1906	Date: 04/11/19
Personnel: E.D. & S.R.	Temperature (°F): 70

Comments of any structural damage to the jacking pads or axles while both the front wheels are supported by the jack stands:
None noted.
Comments of any structural damage to the jacking pads or axles while both the rear wheels are supported by the jack stands:
None noted.
Comments of any structural damage to the jacking pads or axles while both the tag axle wheels are supported by the jack stands:
N/A
Comments of any structural damage to the jacking pads or axles while the front, tag axle and rear wheels are supported by the jack stands:
None noted.
Comments of any problems or interference placing wheel hoists under wheels:
None noted.

5.6 HOISTING TEST



REAR JACK STANDS IN PLACE



FRONT AND REAR JACK STANDS IN PLACE

5.7 STRUCTURAL DURABILITY TEST

5.7-I. TEST OBJECTIVE

The objective of this test is to perform an accelerated durability test that approximates 25 percent of the service life of the vehicle.

5.7-II. TEST DESCRIPTION

The test vehicle was driven a total of 15,069 miles; approximately 12,500 miles on the LTI Durability Test Track and approximately 2,500 miscellaneous other miles. The test was conducted with the bus operated under three different loading conditions. The first segment consisted of approximately 6,250 miles with the bus operated at GVW. The second segment consisted of approximately 2,500 miles with the bus operated at SLW. The remainder of the test, approximately 6,250 miles, was conducted with the bus loaded to CW. The loads on both axles and GVW were within their ratings with the bus loaded as specified by the manufacturer. All subsystems were running during these tests in their normal operating modes. All manufacturer-recommended servicing was followed and noted on the vehicle maintainability log. Servicing items accelerated by the durability tests were compressed by 10:1; all others were done on a 1:1 mi/mi basis. Unscheduled breakdowns and repairs were recorded on the same log as are any unusual occurrences as noted by the driver. Once a week the test vehicle was washed down and thoroughly inspected for any signs of failure.

5.7-III. DISCUSSION

The Structural Durability Test was started on April 16, 2019 and was conducted until August 03, 2020. The first 6,250 miles were performed at a GVW of 43,640 lb. and completed on August 28, 2019. The next 2,500-mile SLW segment was performed at 39,550 lb. and completed on October 28, 2019 and the final 6,250-mile segment was performed at a CW of 33,360 lb. and completed on August 03, 2020.

The following mileage summary presents the accumulation of miles during the Structural Durability Test. The driving schedule is included, showing the operating duty cycle. A detailed plan view of the LTI Test Track Facility and Durability Test Track are attached for reference. Also, a durability element profile detail shows all the measurements of the different conditions. Finally, photographs illustrating some of the failures that were encountered during the Structural Durability Test are included. This bus passed this section of the test, as there were no uncorrected Class 1 or Class 2 failures and the unscheduled maintenance of 94.6 hours was less than 125 hours.

During the Structural Durability testing the bus experienced periodic instances of mileage loss by the odometer. The issues appeared to be resolved after a software update. Mileage accumulation was tracked secondarily on a hub-odometer to ensure accuracy. Late in the test, the bus developed an intermittent shifting problem in the rear axle. The manufacturer traced a contributor to the problem to be contamination in the air line actuating the pneumatic shift valves. The manufacturer stated that the contamination was caused by a degradation of the grease used during the shifter mechanism assembly and the issue would be resolved in the production process.

Proterra Bus # 1906

MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
04/15/19 TO 04/21/19	179.00	60.00	239.00
04/22/19 TO 04/28/19	136.00	6.00	142.00
04/29/19 TO 05/05/19	262.00	41.00	303.00
05/06/19 TO 05/12/19	292.00	16.00	308.00
05/13/19 TO 05/19/19	218.00	10.00	228.00
05/20/19 TO 05/26/19	113.00	5.00	118.00
05/27/19 TO 06/02/19 TO	297.00	13.00	310.00
06/03/19 TO 06/09/19	197.00	14.00	211.00
06/10/19 TO 06/16/19	319.00	16.00	335.00
06/17/19 TO 06/23/19	450.00	25.00	475.00
06/24/19 TO 06/30/19	294.00	14.00	308.00
07/01/19 TO 07/07/19	438.00	22.00	460.00
07/08/19 TO 07/14/19	0.00	0.00	0.00
07/15/19 TO 07/21/19	0.00	0.00	0.00
07/22/19 TO 07/28/19	222.00	11.00	233.00

Proterra Bus # 1906

MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
07/29/19 TO 08/04/19	406.00	18.00	424.00
08/05/19 TO 08/11/19	257.00	11.00	268.00
08/12/19 TO 08/18/19	526.00	26.00	552.00
08/19/19 TO 08/25/19	640.00	27.00	667.00
08/26/19 TO 09/01/19	344.00	42.00	386.00
09/02/19 TO 09/08/19	369.00	110.00	479.00
09/09/19 TO 09/15/19	161.00	8.00	169.00
09/16/19 TO 09/22/19	284.00	12.00	296.00
09/23/19 TO 09/29/19	376.00	685.00	1061.00
09/30/19 TO 10/06/19	15.00	62.00	77.00
10/07/19 TO 10/13/19	0.00	0.00	0.00
10/14/19 TO 10/20/19	127.00	11.00	138.00
10/21/19 TO 10/27/19	328.00	68.00	396.00
10/28/19 TO 11/03/19	437.00	122.00	559.00
11/04/19 TO 11/10/19	185.00	7.00	192.00

Proterra Bus # 1906

MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
11/11/19 TO 11/17/19	61.00	3.00	64.00
11/18/19 TO 11/24/19	676.00	29.00	705.00
11/25/19 TO 12/01/19	390.00	17.00	407.00
12/02/19 TO 12/08/19	487.00	23.00	510.00
12/09/19 TO 12/15/19	551.00	24.00	575.00
12/16/2019 TO 12/22/19	429.00	20.00	449.00
12/23/19 TO 12/29/19	0.00	0.00	0.00
12/30/19 TO 01/05/20	0.00	0.00	0.00
01/06/20 TO 01/12/20	252.00	12.00	264.00
01/13/20 TO 01/19/20	558.00	26.00	584.00
01/20/20 TO 01/26/20	102.00	15.00	117.00
01/27/20 TO 02/02/20	518.00	25.00	543.00
02/03/20 TO 02/09/20	604.00	430.00	1034.00
02/10/20 TO 02/16/20	0.00	196.00	196.00
02/17/20 TO 02/23/20	0.00	0.00	0.00

Proterra Bus # 1906

MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
02/24/20 TO 03/01/20	0.00	0.00	0.00
03/02/20 TO 03/08/20	0.00	31.00	31.00
03/09/20 TO 03/15/20	0.00	0.00	0.00
03/16/20 TO 03/22/20	0.00	117.00	117.00
ALL TESTING AT THE ALTOONA BUS TESTING CENTER WAS SUSPENDED FROM 03/26/20 TO 07/21/20 DUE TO THE COVID-19 PANDEMIC			
07/20/20 TO 07/26/20	0.00	0.00	0.00
07/27/20 TO 08/02/20	0.00	54.00	54.00
08/03/20 TO 08/09/20	0.00	85.00	85.00
Total	12500.00	2569.00	15069.00

Driving Schedule for Bus Operation on the Durability Test Track.

STANDARD OPERATING SCHEDULE

Monday through Friday

	HOUR	ACTION	
Shift 1	midnight	D	
	1:40 am	C	
	1:50 am	B	
	2:00 am	D	
	3:35 am	C	
	3:45 am	B	
	4:05 am	D	
	5:40 am	C	
	5:50 am	B	
	6:00 am	D	
	7:40 am	C	
	7:50 am	F	
	Shift 2	8:00 am	D
		9:40 am	C
9:50 am		B	
10:00 am		D	
11:35 am		C	
11:45 am		B	
12:05 pm		D	
1:40 pm		C	
1:50 pm		B	
2:00 pm		D	
Shift 3	3:40 pm	C	
	3:50 pm	F	
	4:00 pm	D	
	5:40 pm	C	
	5:50 pm	B	
	6:00 pm	D	
	7:40 pm	C	
	7:50 pm	B	
	8:05 pm	D	
	9:40 pm	C	
9:50 pm	B		
10:00 pm	D		
11:40 pm	C		
11:50 pm	F		

B—Break

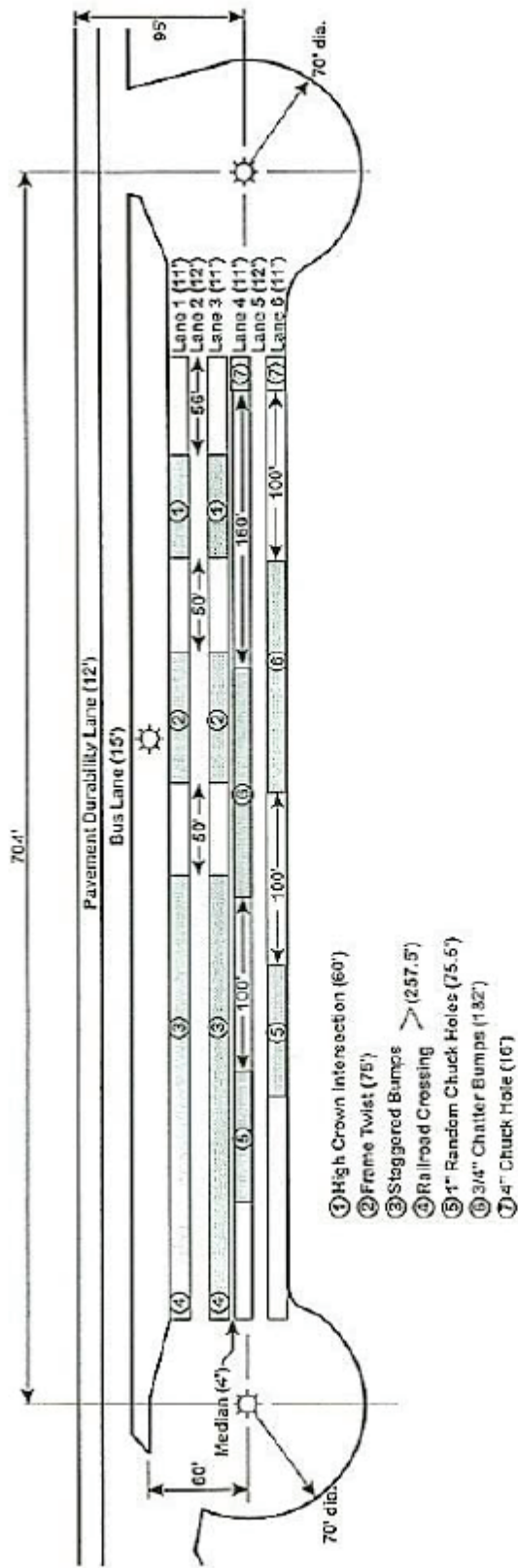
C---Cycle all systems five times, visual inspection, driver's log entries

D—Drive bus as specified by procedure

F---Fuel bus, complete driver's log shift entries



**Full-Scale Research Facilities at
the Pennsylvania Transportation Institute**



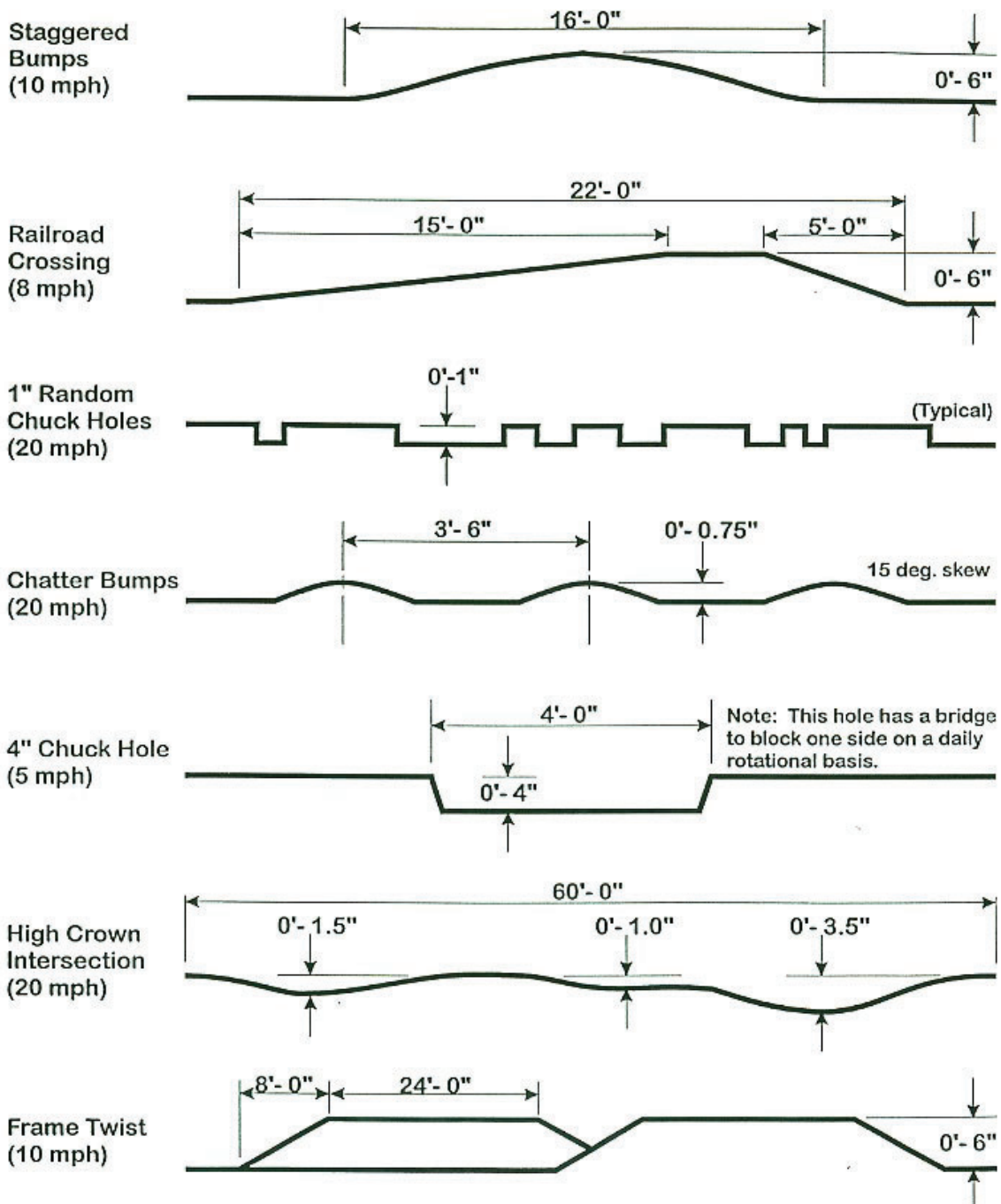
Plan View

Vehicle Durability Test Track

Track 1 (Track 2 has similar layout)

The Larson Transportation Institute

Penn State



Durability Element Profiles

The Pennsylvania Transportation Institute
 Penn State

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 1 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
04/17/19	239	Bus stopped/shut down on durability track. Red "stop" light came on. Cycled 24V batteries. Bus will start to boot up but powers off as soon as boot up is complete. Bus is stopped on the track.	Ground wire repair included powertrain cover removal, wiring troubleshooting, wire repair/zip tie addition, systems check and power train cover installation.	1.25	Electrical	2
04/25/19	381	Trunk latch is broken.	Trunk latch was replaced and bracket was adjusted.	0.50	Body	3
04/25/19	381	Coolant is leaking from bus.	Replaced coolant line clamps on DCDC unit.	0.25	Coolant (Motor and Battery)	3
04/25/19	381	Bus stalled during brake testing and had to be towed from point of failure.	New software installed. This software improved the ability to interpret sensor data under certain fault conditions.	0.25	Software/ Electrical	2
04/26/19	381	Fault code from bus stalling during brake test did not clear after update and low voltage power reset.	Further investigation found water in the Vehicle Electrical Center (VEC) at the rear of the bus. A small leak path was found in one of the plugs. The original VEC was removed and a new VEC was installed.	1.00	Electrical	3
05/02/19	681	Worn air compressor isolator bolt found during inspection.	A new air compressor isolator bolt was installed.	0.25	Body	3
05/03/19	681	The low voltage (LV) battery tray slides broken due to loose retaining bolt.	A new LV battery tray and slides were installed.	2.50	Electrical / Body	3
05/03/19	681	Curbside mirror bolts loose. Mirror broke at pivot arm.	A new mirror was installed.	0.75	Body	3

**Unscheduled Maintenance
Bus Proferra Bus# 1906
(Page 2 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
05/06/19 To 05/15/19	755 To 1,087	Loose cover on rear axle. Rear, streetside bulkhead cover for rear drive motors is broken. The welds broke on both ends of rear front cover crossmember.	Drivetrain covers were removed and replaced with modified 2-piece covers.	2.00	Drivetrain	3
05/10/19	992	Oil pump bolts are loose. Original oil pump installation did not have isolators installed.	The rear inspection cover and skid plate were removed and wire harness and hoses were disassembled. The oil pump was removed and reinstalled with new bolts and isolators. Reconnection of wiring harness and hoses and reinstallation of rear inspection covers and skid plate.	4.50	Drivetrain	3
05/10/15	992	While on the durability course the driver noted that the speedometer and odometer were no longer working and that a yellow light had illuminated.	Tachograph mounting bracket found loose. Replaced tachograph.	1.00	Electrical	3
05/15/19 To 07/05/19	1,087	After crossing the chatter bumps, the bus had a red gear symbol light come on and it lost drive power. The batteries were cycled and the bus restarted but shut down again as it exited the chatter bumps. Bus would not restart and had to be towed to garage.	Inspected drivetrain harness and found broken wire. Repaired drivetrain harness assembly and installed updated harness securements.	2.50	Electrical	2
05/20/19	1,220	The drivers noted that the front destination sign was making noise.	Destination sign bracket bolts were loose. Tightened bolts.	1.00	Body	3
05/20/19	1,220	Bus will not level and is leaning to the streetside. Bus hitting on 10 mph frame twists.	Worn shocks causing rear streetside leveling sensor linkage to invert. Corrected linkage. Shocks were replaced as part of scheduled maintenance.	0.50	Suspension	3

**Unscheduled Maintenance
Bus Proferra Bus# 1906
(Page 3 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
05/22/19	1,231	Drivetrain oil pump manifold bolts broken.	The bolt and isolator combination installed on May 10 was modified with the addition of a larger bushing and additional snub washer. The bolt class was also changed from a 12.9 to a 10.9.	4.00	Hardware	3
05/29/19 To 05/30/19	1,517 To 1,609	Bus shut off on durability track. Had a symbol of bus with a slash through it. A yellow caution light and a red gear light also came on.	Tightened grounding strap for drive axle.	0.75	Electrical	3
06/03/19	1,648	Air compressor bracket is broken.	Missing bolt on air compressor vertical support bracket caused the isolator bracket to fatigue and crack. Replaced bolt and air compressor bracket.	2.50	Body	3
06/05/19	1,652	Curbside transmission thermistor is unresponsive.	Replaced curbside transmission thermistor.	1.00	Electrical	3
06/06/19	1,744	Red caution light and red "gear" light came on on dash.	Fixed two shift position sensor connectors.	1.50	Electrical	3
06/06/19	1,744	Curbside mirror is loose and will not stay adjusted.	Mirror bolts were tightened.	0.08	Body	4
06/11/19	2,049	Bus had yellow caution light and yellow gear symbol light on.	Bus manufacturer's representative looked at the codes, cycled 24V batteries and cleared codes.	0.08	Electrical	3
06/11/19	2,049	Yellow caution and yellow temperature light came on to indicate that there is an issue with the power electronics coolant loop temperature sensor.	Discovered broken wires at sensor. Drained coolant, replaced sensor refilled coolant	1.00	Electrical	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 4 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
06/12/19	2,085	The hub seal on the rear, streetside wheel was found to be leaking.	The vendor arrived on site to investigate and fix the issue. The root cause was found to be loose mounting hardware for the interior gearset. A new hub seal was installed. The vendor is working to correct the issue for future axles.	2.00	Drivetrain	3
06/17/19	2,285	Bus is leaning hard to the curbside and will not level.	The curbside, rear leveling arm was found inverted. The inverted linkage was corrected.	0.50	Suspension	3
06/17/19	2,285	Bus is leaning hard to the curbside and will not level.	The curbside, rear leveling arm was found inverted. The inverted linkage was corrected.	0.50	Suspension	3
06/17/19	2,285	The rear door is coming open while on the durability track, causing the bus to stop.	Rear door hardware is worn out. Hardware was replaced.	1.00	Electrical/ Body	2
06/18/19	2,302	Bus is leaning hard to the curbside and will not level.	The curbside, rear leveling arm was found inverted. The inverted linkage was corrected. Recalibration of ride height.	0.50	Suspension	3
06/18/19	2,359	Bus stopped running on durability track two times. Symbol of bus on hill came on. Red caution light came on.	The CAN-H wire to the inverter was found to be broken and intermittently connecting. This was driving a red level fault on the vehicle that required a reset. The wire was corrected with a splice.	0.50	Electrical	3
06/19/19	2,421	The streetside, rear of bus is making contact on frame twist obstacle.	Rear leveling arm found inverted. Corrected linkage length/alignment to be within specification. Recalibrated ride height.	1.00	Suspension	3
06/21/19	2,593	The wheel well box on the curbside is coming loose.	The mounting screws were tightened and the wheel well box was reinstalled.	1.00	Body	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 5 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
06/21/19	2,669	Bus will not charge.	DC cable going to the DuoPower rear axle was damaged at the support clamp where it is secured to the top of the axle. Power cable and cable support clamps were replaced.	2.00	Electrical	3
07/02/19	2,957	Yellow "air compressor" light on dash.	Replaced air compressor thermistor.	0.50	Electrical	3
06/26/19 To 10/18/19	2,757 To 8,187	HVAC not working.	The root cause was found to be that the high-pressure refrigerant line had cracked/failed. On 10/18/19 the HVAC vendor installed updated flex line which is an implemented design change.	2.00	HVAC	4
07/08/19 To 07/19/19	3,437	Coolant was leaking under rear, streetside of bus. Checked coolant level, but could not see coolant in one sight glass.	Replaced both power electronic coolant pumps.	0.75	Electrical / Motor & Battery Cooling	3
07/19/19	3,437	Rear hatch hinge and rear hatch latch are broken.	Replaced rear hatch hinge and rear latch with new assembly.	0.50	Body	3
07/25/19	3,612	Bolts are loose on axle cover.	Cover was redesigned to split the support bar in the middle so that it did not span the width of the axle. Added thread locking compound on bolts for inspection plate cover.	0.50	Drivetrain	3
07/29/19	3,682	Vehicle will not charge on Port A.	The root cause was a broken wire with a ring terminal. The ring terminal was replaced and additional securement added to the new wire.	0.25	Electrical	3
08/02/19	4,094	Rear passenger door keeps opening while running durability.	Adjusted rear door actuator. Tightened door actuator joint in order to prevent movement causing door to trigger an "open" sensor.	0.25	Body	3

**Unscheduled Maintenance
Bus Proferra Bus# 1906
(Page 6 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
07/31/19 To 08/05/19	3,874 To 4,130	Battery tray retaining bar and left side battery hold down mount is broken.	Installed a new restraining bracket on the LV battery tray box.	0.25	Electrical	3
08/06/19 To 08/12/19	4,292 To 4,392	Red caution light and red gear symbol light came on and bus lost throttle. When bus was restarted lights would go out and bus would run. This happened multiple times.	Drivetrain LV harness had an improperly installed zip tie which caused a connector to unlock. This cause an intermittent connection in the harness. Zip tie was moved.	0.50	Electrical	3
08/13/19	4,529	Curbside mirror is loose.	Mirror was tightened.	0.20	Body	3
08/13/19 To 08/15/19	4,529 To 4,730	Caution light and HV light flashing.	Turned bus off and back on from driver's area. Lights went out.	0.10	Electrical	3
08/20/19	5,180	Air filter support mount on air compressor is broken.	Repaired broken air filter support mount on air compressor.	1.00	Coach Air Compressor	4
08/23/19	5,581	Red caution light and red gear symbol came on and bus lost throttle.	Cycled batteries.	0.08	Electrical	3
09/04/19	6,265	Incorrect mileage on odometer.	Bus manufacturer's representative updated software to correct odometer mileage. Continued monitoring vehicle to determine root cause.	0.10	Software	3
09/06/19 To 09/10/19	6,446 To 6,494	Fiberglass is starting to delaminate at two different points above the front door.	The area was repaired by installing a new mounting bracket.	3.25	Body	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 7 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
09/06/19 To 09/10/19	6,446 To 6,494	ADA ramp is non-functioning. One of the mounting brackets has become de-bonded.	The ADA ramp bracket was re-bonded to the vehicle.	1.00	Body	3
09/06/19 To 09/10/19	6,446	ADA ramp is non-functioning.	ADA ramp controller ground wire found chaffed on interior panel screw. Replaced instrument panel harness.	0.50	Electrical	3
09/11/19	6,511	Rear door is intermittently tripping its circuit breaker.	Low voltage wiring to door found damaged due to contact with door actuator. Repaired wiring and routed harness properly.	0.20	Electrical	3
09/11/19	6,511	Drivers noted that there was an air leak.	Leaking airline for front door found chaffing on interior panel screw. Air line replaced and routed to prevent reoccurrence	0.25	Compressed Air System	3
09/12/19	6,615	Red caution light came on after disconnecting from charger and would not engage into gear. The bus displayed yellow faults on dash.	Power cables for DuoPower axle were chaffing where they were secured. Damaged cables were replaced. At the location of damage, water was able to leak into the drivetrain inverter.	2.85	Electrical	2
09/20/19	6,911	Rear axle inspection cover under rear of bus is loose and rattling due to missing bolts.	Bolts were replaced and tightened.	0.50	Drivetrain	3
09/24/19 To 10/16/19	7,132 To 8,187	Yellow caution and "gear" symbols came on dashboard. On 09/30/19, the red caution light came on and throttle went into de-rate. Once the bus slowed to below 15 mph the throttle started working again.	Motor resolver had intermittent connection. Bracket added to prevent intermittent wiring connection with inverter.	2.00	Software/ Electrical	3
09/25/19 To 09/26/19	7,302 To 7,527	Bus leaned hard to the curbside and the bus would not relevel. Bus lost ride height, all airbags.	Inverted leveling arm was corrected and ride height sensor was adjusted.	0.50	Suspension	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 8 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
10/29/19	8,754	Red "Door" light and caution light came on while running durability. Used interlock override to drive bus back to the garage.	Rear door actuator hardware became loose causing actuation mechanism to disconnect. Re-positioned bracket and tightened hardware.	0.25	Body	3
10/31/19 To 11/06/19	9,098 To 9,305	Rear door is coming open while running durability.	Rear door actuator hardware became loose causing actuation mechanism to disconnect. Additional bolt was added and mechanism was replaced to prevent problem.	0.75	Body	3
11/07/19	9,334	While exiting the 4" pothole, the 24V battery box broke and fell onto the track.	Per the manufacturer, the root cause was determined to be an improper torque spec and hardware combination which lead to a loss of clamp load on the fasteners. Battery box was reinstalled with updated hardware.	3.00	Electrical/ Body	2
11/15/19	9,398	The bushings in the front suspension upper arms are worn out.	Both front-upper arm assemblies were replaced. Both front air bags had wear from contacting the inner wheel well. Both air bags replaced.	12.00	Suspension	3
11/18/19	9,461	Yellow caution light and "gear" light came on in 1" chatter bump area of the durability track.	Intermittent electrical issue. Not resolved. Will continue to monitor problem.	---	Electrical	4
11/18/19 to 12/05/19	10,103 To 10,901	Yellow caution light and "gear" light came on in 1" chatter bump area of the durability track. Had to stop multiple times to reset regenerative braking.	Issue was monitored until software update. Bus manufacturer's representative updated SOC software on 12/05/19. Software update to address earlier issues with caution lights, "gear" lights, regen and SOC.	0.25	Software/ Electrical	3
11/27/19	10,510	Streetside mirror will not stay adjusted.	Bolts were tightened.	0.08	Body	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 9 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
12/04/19	10,783	Symbol of yellow bus and up and down arrows and yellow caution lights are coming on.	Cycled bus, but lights are still on. Fault was cleared. Will continue to monitor.	0.08	Electrical	3
12/04/19	10,783	Side mount for the air compressor and power steering variable frequency drive (VFD) was broken.	Repaired broken mount.	1.25	Electrical	3
12/04/19	10,783	The two latches retaining the rear hatch on the bus are worn.	Replaced broken latches.	0.50	Body	3
12/13/19 To 01/30/20	11,595 To 13,267	The "drive" and "neutral" indicator lights are not working in the driver's gear selection.	Situation being monitored. See repairs on 01/30/2020.	---	Electrical	4
12/17/19	11,803	The bracket isolating the air compressor from the frame of the vehicle was found to have fractures.	The air compressor bracket was replaced.	2.50	Body	3
01/02/20	12,044	Red caution light came on.	Faulty lock motor on the Port-A charge port failed. Replaced lock motor.	0.25	Electrical	3
01/08/20	12,044	The Battery Thermal Management System (BTMS) pump #2 stopped functioning.	Replaced pump and worn isolators.	0.50	Battery Coolant	3
01/15/20	12,598	Air compressor bracket is cracked.	Replaced air compressor and air compressor bracket.	2.50	Body	3
01/20/20	12,999	Transmission is not shifting properly. Bus is losing power to a drive motor when exceeding 25 mph in second gear.	This is being monitored. See repair on 01/23/2020.	---	Drivetrain	3
01/20/20 To 01/22/20	12,999	Rear door interlock light came on. Driver had to use interlock override to drive bus back to the garage.	Rear door actuator bracket found worn. Replaced component.	1.00	Door	3

Unscheduled Maintenance
 Bus Proterra Bus# 1906
 (Page 10 of 11)

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
01/20/20	12,999	Loss of CAN communication to power electronics coolant loop (PECL) #2.	Replaced power electronics coolant loop pump.	0.50	Electrical	3
01/22/20 To 01/28/20	12,999 To 13,079	Cracks and delamination were noticed around rear door and rear door mounting bracket.	Rear door mounting bracket area was repaired and rear door mounting bracket was replaced and re-bonded to vehicle.	7.50	Body	3
01/23/20	12,999	Drivers noted that the transmission caution light showed on the dash when the vehicle shifted from 2 nd to 1 st gear.	The curbside shift solenoid was found with contamination in the exhaust ports and corrosion on electrical connections. Solenoid was replaced.	1.00	Electrical	3
01/30/20	13,267	The latch for the rear hatch was found broken.	Replaced latch.	0.25	Body	3
01/30/20	13,267	Front passenger entry door will not open/close when using door switch in driver's area.	Wire connection to the door request button found broken. Wires for gear selection button lights also found broken. Wires were repaired. Replaced all buttons.	0.25	Electrical	3
02/03/20	13,644	The ADA ramp became unsecured from the vehicle on the durability course.	The root cause was determined to be missing hardware which secures the ADA ramp assembly to the vehicle brackets. Some mounting bolts came loose and some were sheared off. Required thread locking compound was not used in the ADA ramp repair performed on 09/10. The ramp was reinstalled per installation procedure.	1.25	ADA Ramp	1
02/07/20 To 08/03/20	14,587 To 15,151	Front passenger entry door will not open. Driver must enter and exit through the rear door.	Missing screw in air sweep causing door to jam when opening. Screw was replaced.	0.25	Body	4
02/10/20	14,782	Left side of 12/24V battery box and left side flange for the battery box is broken.	Battery box was replaced.	1.50	Body	3

Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 11 of 11)

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
ALL TESTING AT THE ALTOONA BUS TESTING CENTER WAS SUSPENDED FROM 03/26/20 TO 07/16/20 DUE TO THE COVID-19 PANDEMIC						
07/21/20	14,930	Transmission is not shifting properly.	Replaced both the streetside and curbside shift solenoids.	1.00	Electrical	3

UNSCHEDULED MAINTENANCE

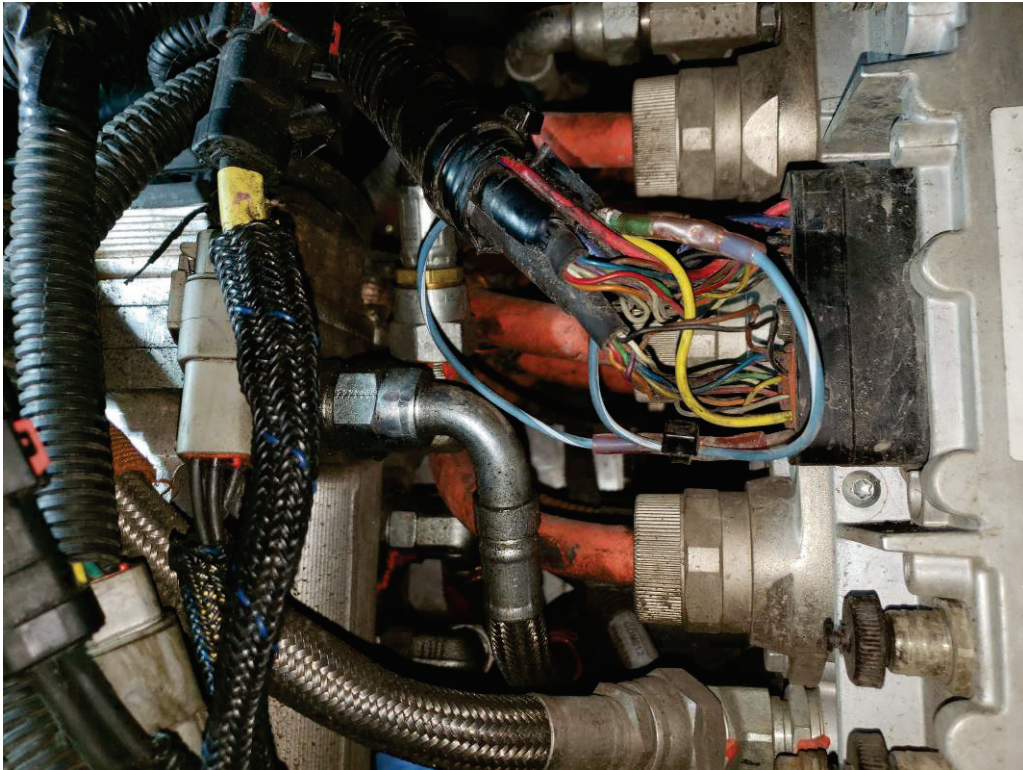


**CURBSIDE MIRROR ARM SNAPPED
(681 TEST MILES)**

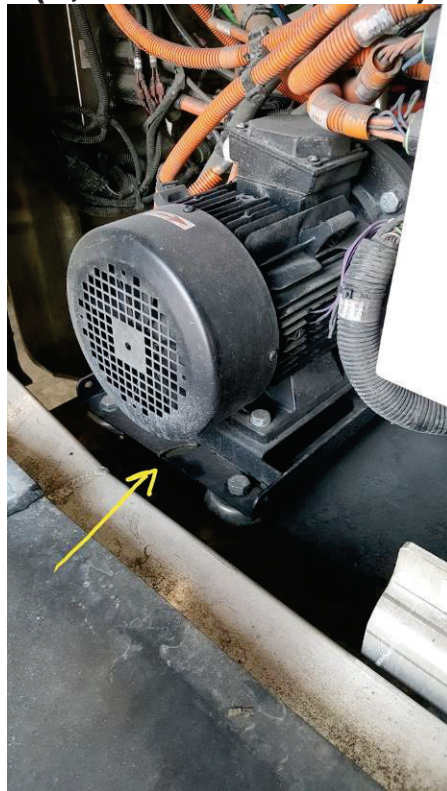


**BOLTS LOOSE ON REAR AXLE COVER
(755 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CAN-L WIRE TO DUOPOWER INVERTER IS BROKEN
(1,087 TEST MILES)**

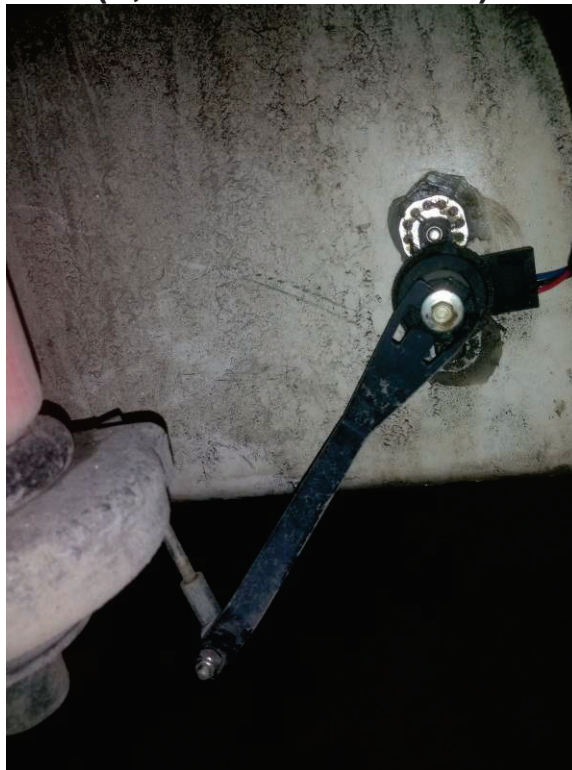


**AIR COMPRESSOR BRACKET IS BROKEN
(1,648 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**SHIFT POSITION SENSOR WIRE IS BROKEN
(1,648 TEST MILES)**



**CURBSIDE REAR LEVELING ARM IS INVERTED
(2,285 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**DAMAGED DC CABLE GOING TO DUOPOWER AXLE
(2,669 TEST MILES)**

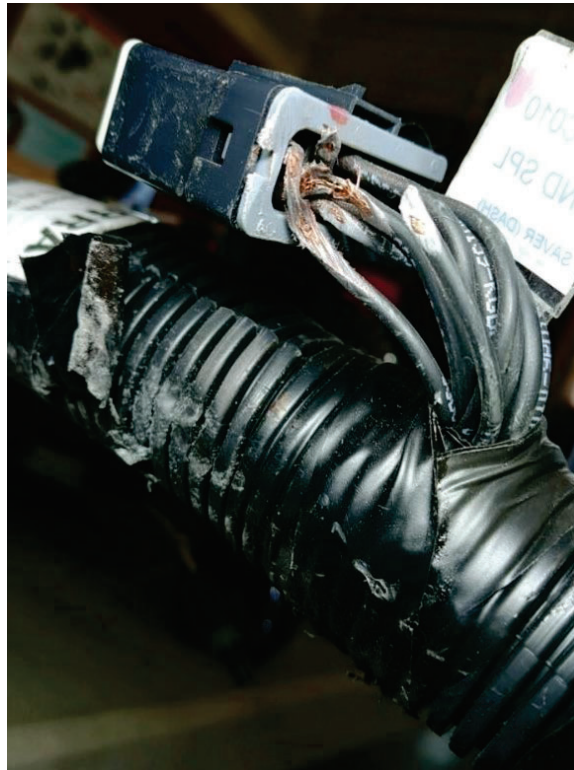


**DAMAGED FRONT DOOR HAT BRACKET
(6,494 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.

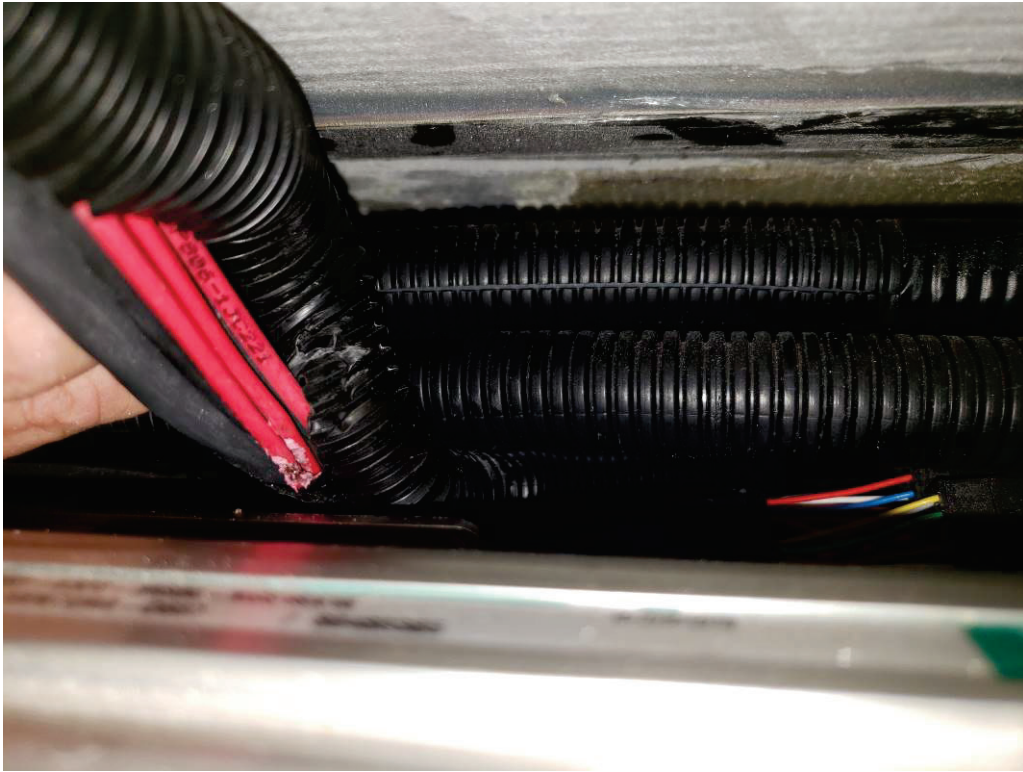


**FRONT DOOR HAT BRACKET REPAIR
(6,494 TEST MILES)**

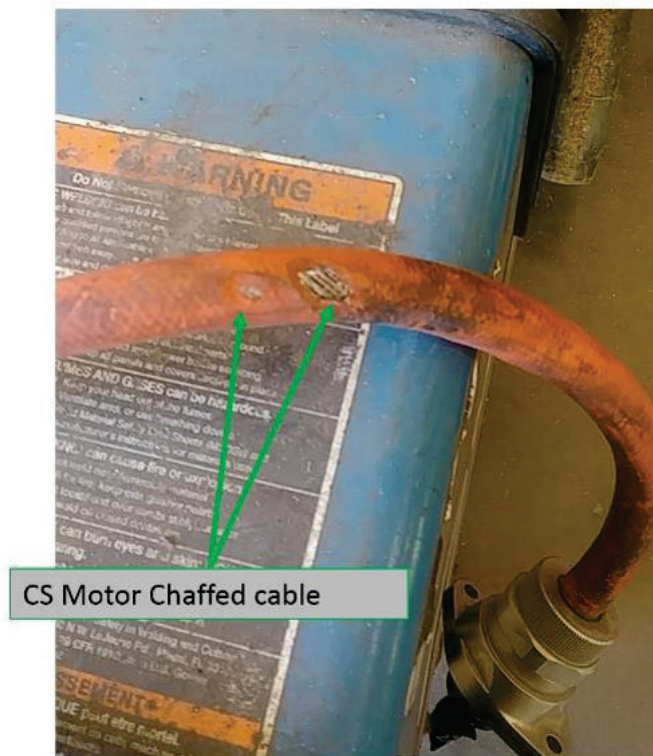


**WIRES BEHIND DASH FOR ADA RAMP ARE WORN
(6,494 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**REAR DOOR LOW VOLTAGE HARNESS IS CHAFFING
(6,511 TEST MILES)**



**PHASE CABLE FOR CURBSIDE MOTOR IS CHAFFING
(6,615 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**24 VOLT BATTERY BOX FELL OUT
(9,334 TEST MILES)**



**AIR COMPRESSOR BRACKET IS CRACKED
(12,598 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.

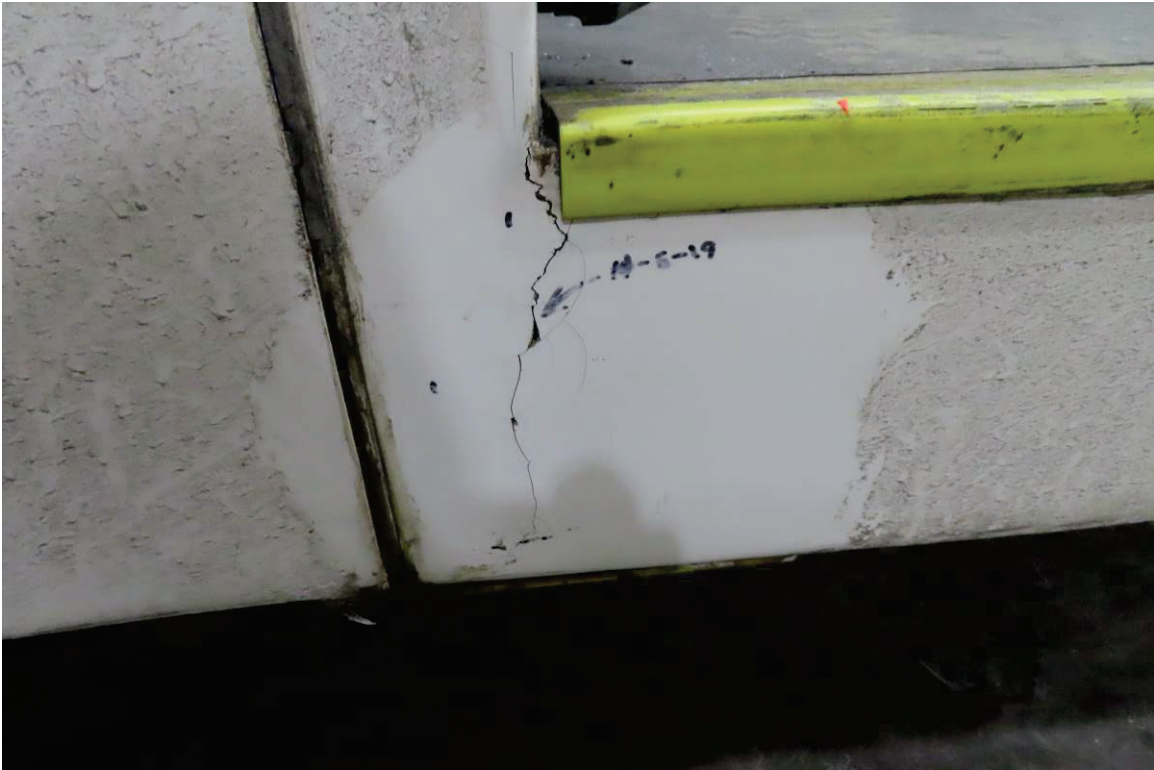


**CRACKS AROUND REAR DOOR
(12,999 TEST MILES)**



**CRACKS AROUND REAR DOOR
(12,999 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**ADDITIONAL CRACKS AROUND REAR DOOR
(12,999 TEST MILES)**



**REAR DOOR HAT BRACKET REPAIR
(12,999 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**ADA RAMP BECAME UNSECURED FROM BUS
(13,644 TEST MILES)**



**ADA RAMP BECAME UNSECURED FROM BUS
(13,644 TEST MILES)**

6. ENERGY ECONOMY AND RANGE TEST – AN ENERGY CONSUMPTION AND RANGE TEST FOR BATTERY ELECTRIC BUSES USING APPROPRIATE OPERATING CYCLES

6-I. TEST OBJECTIVE

The objective of this test is to provide accurate comparable energy consumption data on battery electric transit buses produced by different manufacturers. This energy economy test bears no relation to the calculations done by the Environmental Protection Agency (EPA) to determine levels for the Corporate Average Fuel Economy Program. EPA's calculations are based on tests conducted under laboratory conditions intended to simulate city and highway driving. This energy economy test, as designated here, is a measurement of the energy consumed by a vehicle traveling a specified test operating profile, under specified operating conditions that are typical of transit bus operation. The results of this test will not represent actual energy usage but will provide data that can be used by FTA Grantees to compare buses tested using this procedure.

6-II. TEST DESCRIPTION

This test is performed in the emissions bay of the LTI Vehicle Testing Laboratory. The Laboratory is equipped with a Schenk Pegasus 300 HP, large-roll (72 inch diameter) chassis dynamometer suitable for heavy-vehicle emissions testing. The driving cycles are the Manhattan cycle, a low average speed, highly transient urban cycle (Figure 1), the Orange County Bus Cycle which consists of urban and highway driving segments (Figure 2), and the EPA HD-UDDS Cycle (Figure 3). This test is conducted at seated load weight.

This test is conducted generally as per the methods described in the SAE standard J 1634-2017. The light-duty test cycles specified in this standard are replaced by transit bus test cycles mentioned above.

The Multi-Cycle test (MCT) procedure is adopted for this bus. The end of test is determined when the bus cannot keep up with the speed trace of the test cycle, as recommended by the bus manufacturer. The battery system is recharged to full SOC at the end of the test, following procedures specified in SAE J 1634-2017. During the recharge, the DC energy (into the battery system) and the AC energy (into the charger) are recorded. From these data, the average AC energy consumption, the charger efficiency (DC Energy, kWh/AC Energy, kWh) and range (miles) for each test cycle is calculated.

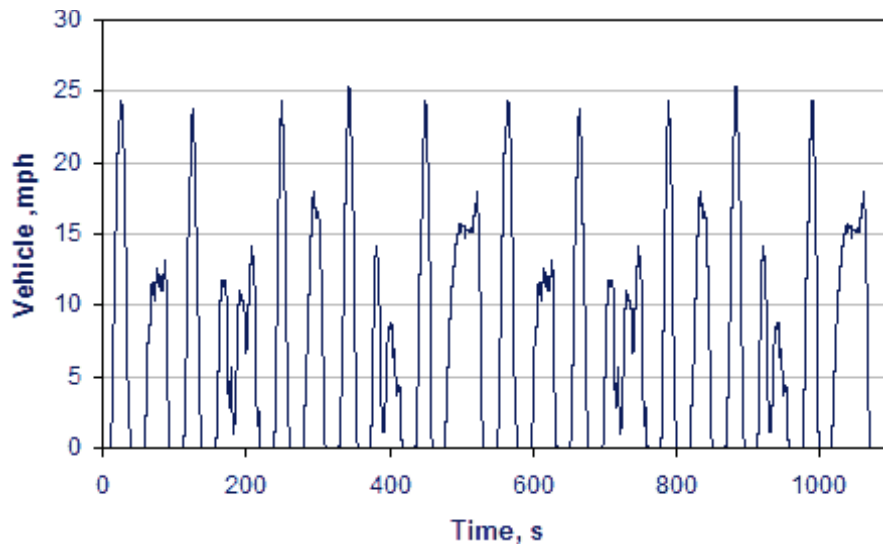


Figure 1. Manhattan Driving Cycle (duration 1089 sec, Maximum speed 25.4 mph, average speed 6.8 mph)

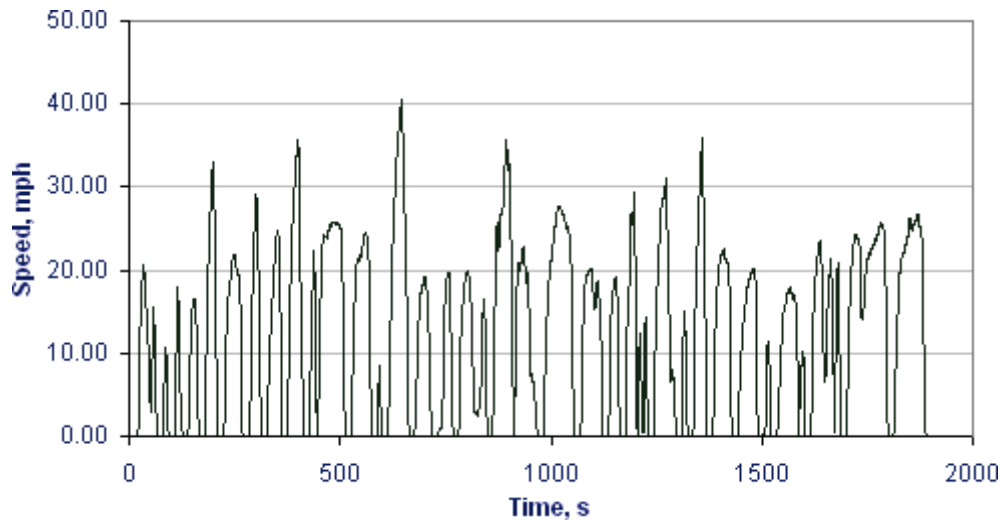


Figure 2. Orange County Bus Cycle (Duration 1909 Sec, Maximum Speed 41 mph, Average Speed 12 mph).

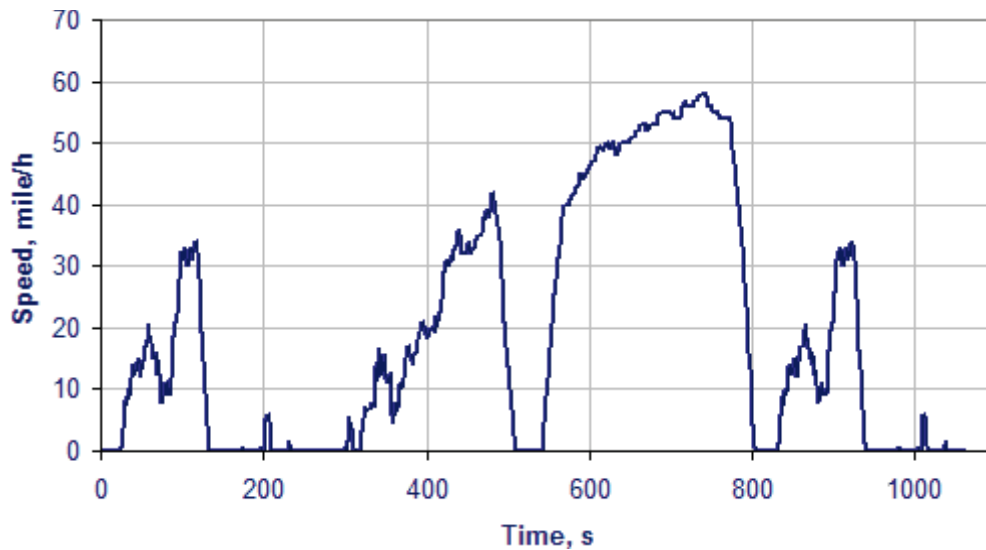


Figure 3. HD-UDDS Cycle (duration 1060 seconds, Maximum Speed 58 mph, Average Speed 18.86 mph).

6-III. DISCUSSION

The driving cycle consists of three simulated transit driving cycles: Manhattan, Orange County Bus Cycle and the HD-UDDS, as described in 6-II.

An extensive pretest maintenance check is conducted including the replacement of all lubrication fluids, if applicable. The details of the pretest maintenance are given in the first three Pretest Maintenance Forms. The fourth sheet shows the Pretest Inspection Form. Finally, the summary sheet provides the average energy consumption and range of bus for the three test cycles. The test was conducted at a seated load weight of 36,960 lbs. The average AC energy consumption for the Manhattan, OCBC and the HD-UDDS were 2,582 Wh/mile, 2,155 Wh/mile and 1,955 Wh/mile respectively. The average DC energy consumption for the Manhattan, OCBC and the HD-UDDS were 2,217 Wh/mile, 1,850 Wh/mile and 1,678 Wh/mile respectively. The range for the three driving cycles were 142 miles, 170 miles and 187 miles respectively.

This bus was tested using the Manhattan, Orange County and UDDS driving cycles. The energy economy and range results for buses tested using these cycles are not directly comparable to buses tested under the earlier protocol that uses the CBD, Arterial and Commuter driving cycles.

For the Energy Economy Tests, ballast weight equivalent of the roof mount battery packs was removed to represent the four-pack battery configuration per the Federal Transit Administration determination letter. Therefore, the seated load weight used was 36,960 lbs. for this Fuel Economy test.

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 1 of 3

Bus Number: 1906	Date: 02/08/2020	SLW (lb.): 36,960
Personnel: T.S., S.R. & E.D.		

ENERGY SYSTEM	OK
Install fuel measurement system	✓
Remarks: None noted.	
BRAKES/TIRES	OK
Inspect hoses	✓
Inspect brakes	✓
Check tire inflation pressures (mfg. specs.)	✓
Check tire wear (less than 50%)	✓
Remarks: None noted.	
BATTERY COOLING SYSTEM	OK
Check hoses and connections	✓
Check system for coolant leaks	✓
Remarks: None noted.	

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 2 of 3

Bus Number: 1906	Date: 02/08/2020
Personnel: T.S., S.R. & E.D.	
ELECTRICAL SYSTEM	OK
Check battery	✓
Inspect wiring	✓
Inspect terminals	✓
Check lighting	✓
Remarks: None noted.	
DRIVE SYSTEM	OK
Drain transmission fluid – Drive Motor	✓
Replace filter/gasket	Done by MFG
Check hoses and connections	✓
Replace transmission fluid	Done by MFG
Check for fluid leaks	✓
Remarks: Done by manufacturer to specs	
LUBRICATION	OK
Lube all chassis grease fittings	✓
Lube universal joints	✓
Replace differential lube including axles	N/A
Remarks: None noted.	

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 3 of 3

Bus Number: 1906	Date: 02/08/2020
Personnel: T.S., S.R. & E.D.	
OTHER ITEMS	OK
Replace air filter	N/A
Inspect air compressor and air system	✓
Inspect vacuum system, if applicable	N/A
Check and adjust all drive belts	N/A
Remarks: None noted	
STEERING SYSTEM	OK
Check power steering hoses and connectors	✓
Service fluid level	✓
Check power steering operation	✓
Remarks: None noted	
	OK
Ballast bus to seated load weight*	✓
*see note on weight in discussion	
TEST DRIVE	OK
Check brake operation	✓
Check transmission operation – Drive Motor	✓
Remarks: None noted.	

ENERGY ECONOMY PRE-TEST INSPECTION FORM

Page 1 of 1

Bus Number: 1906	Date: 02/08/2020
Personnel: T.S., S.R. & E.D.	
PRE-WARM-UP	If OK, Initial
Energy Economy Pre-Test Maintenance Form is complete	E.D.
Cold tire pressure (psi): Front <u>130</u> Middle <u>N/A</u> Rear <u>130</u>	E.D.
Energy economy instrumentation installed and working properly.	T.S.
Bus is loaded to SLW during coast down	E.D.
WARM-UP	If OK, Initial
Interior and exterior lights on	J.S.
Air conditioner off	J.S.
Defroster off	J.S.
Windows and doors closed	J.S.
Do not drive with left foot on brake	J.S.

ENERGY ECONOMY DATA FORM (Battery Electric Buses)

Page 1 of 1

Bus Number: 1906	Manufacturer: Proterra	Date: 09/10/2020
Fuel Type: Electric	Personnel: J.S. & S.I.	
Temperature (°F): 84.9	Humidity (%): 84.8	Barometric Pressure (inHg): 29.0
SLW (lb.): 36,960	Charger: Proterra 60kW	

	Manhattan	Orange County	UDDS
DC Energy (Wh/mile)	2,217	1,850	1,678
AC Energy (Wh/mile)	2,582	2,155	1,955
Range (miles)	142	170	187

Comments: Bus lost drive to one wheel motor twice during the test. Manufacturer's representative resolved the problem and the test continued.

ENERGY ECONOMY TEST CONT.



BUS TESTED ON CHASSIS DYNAMOMETER FOR PERFORMANCE AND ENERGY ECONOMY

7. NOISE

7.1 INTERIOR NOISE AND VIBRATION TESTS

7.1-I. TEST OBJECTIVE

The objective of these tests is to measure and record interior noise levels and check for audible vibration under various operating conditions.

7.1-II. TEST DESCRIPTION

During this series of tests, the interior noise level was measured at several locations with the bus operating under the following three conditions:

1. With the bus stationary, a white noise generating system provided a uniform sound pressure level equal to 80 dB(A) on the left, exterior side of the bus. The engine and all accessories were switched off and all openings including doors and windows were closed. This test was performed at the LTI Test Track Facility.
2. The bus was accelerated at full throttle from a standing start to 35 mph on a level pavement. All openings were closed and all accessories were operating during the test. This test was performed on the track at the LTI Test Track Facility.
3. The bus was operated at various speeds from 0 to 55 mph with and without the air conditioning and accessories on. Any audible vibration or rattles were noted. This test was performed on the test segment between the LTI Test Track and the Bus Testing Center.

All tests were performed in an area free from extraneous sound-making sources or reflecting surfaces. The ambient sound level as well as the surrounding weather conditions were recorded in the test data.

7.1-III. DISCUSSION

For the first part, the overall average of the six measurements was 49.4 dB(A); ranging from 48.6 dB(A) in line with the front speaker to 50.2 dB(A) in line with the rear speaker. The interior ambient noise level for this test was less than 30 dB(A).

For the second part, the interior noise level ranged from 71.1 dB(A) at the driver's seat to 74.0 dB(A) at the middle passenger seats. The overall average was 72.6 dB(A). The interior ambient noise level for this test was less than 30 dB(A).

No vibrations or rattles were noted during the third part of this test. This bus passed this section of the test.

INTERIOR NOISE TEST DATA FORM
Test Condition 1: 80 dB(A) Stationary White Noise

Page 1 of 3

Bus Number: 1906	Date: 10/29/19
Personnel: T.S. & E.D.	
Temperature (°F): 58	Humidity (%): 72
Wind Speed (mph): 6	Wind Direction: S
Barometric Pressure (inHg): 30.24	
Interior Ambient Noise Level dB(A): less than 30	Exterior Ambient Noise Level dB(A): 43.1
Microphone Height During Testing (in): 46.4	

Reading Location	Measured Sound Level dB(A)
Driver's Seat	49.4
Front Passenger Seats	49.1
In Line with Front Speaker	48.6
In Line with Middle Speaker	48.8
In Line with Rear Speaker	50.2
Rear Passenger Seats	50.0

Comments: None noted.

INTERIOR NOISE TEST DATA FORM
Test Condition 2: 0 to 35 mph Acceleration Test

Page 2 of 3

Bus Number: 1906	Date: 08/30/19
Personnel: S.R., E.D., E.L. & J.S.	
Temperature (°F): 75	Humidity (%): 64
Wind Speed (mph): Steady at 6; gust to 11	Wind Direction: SW
Barometric Pressure (inHg): 30.01	
Interior Ambient Noise Level dB(A): less than 30	Exterior Ambient Noise Level dB(A): 42.6
Microphone Height During Testing (in): 46.4	

Reading Location	Measured Sound Level dB(A)
Driver's Seat	71.1
Front Passenger Seats	71.8
Middle Passenger Seats	74.0
Rear Passenger Seats	73.4

Comments: None noted.

INTERIOR NOISE TEST DATA FORM
Test Condition 3: Audible Vibration Test

Page 3 of 3

Bus Number: 1906	Date: 09/03/19
Personnel: T.S., E.L. & M.R.	
Temperature (°F): 75	

Describe the following possible sources of noise and give the relative location on the bus.

Source of Noise	Location	Description of Noise
Engine and Accessories	N/A	N/A
Windows and Doors	None noted.	None noted.
Seats and Wheelchair lifts	None noted.	None noted.
Other	None noted.	None noted.

Comment on any other vibration or noise source which may have occurred that is not described above: None noted.
Comments: None noted.

7.1 INTERIOR NOISE TEST



**TEST BUS SET-UP FOR 80 dB(A)
INTERIOR NOISE TEST**

7.2 EXTERIOR NOISE TESTS

7.2-I. TEST OBJECTIVE

The objective of this test is to record exterior noise levels when a bus is operated under various conditions.

7.2-II. TEST DESCRIPTION

In the exterior noise tests, the bus was operated at a SLW in three different conditions using a smooth, straight and level roadway:

1. Accelerating at full throttle from a constant speed starting from 35 mph.
2. Accelerating at full throttle from standstill.
3. Stationary, with the engine at low idle, high idle, and wide-open throttle, where applicable. In addition, the bus was tested with and without the air conditioning operating.

The test site is at the Larson Transportation Institute Test Track and the test procedures were performed in accordance with SAE Standards SAE J366b, Exterior Sound Level for Heavy Trucks and Buses. The test site is an open space free of large reflecting surfaces. A noise meter placed at a specified location outside the bus was used to measure the noise level.

During the test, special attention was paid to:

1. The test site characteristics regarding parked vehicles, signboards, buildings, or other sound-reflecting surfaces
2. Proper usage of all test equipment including set-up and calibration
3. The ambient sound level

7.2-III. DISCUSSION

The Exterior Noise Test determines the noise level generated by the vehicle under different driving conditions, and at stationary with and without air conditioning and accessories operating. The test site is a large, level, bituminous paved area with no reflecting surfaces nearby.

With an outside ambient noise level of 49.2 dB(A), the average of the two highest readings obtained while accelerating from a constant speed was 70.0 dB(A) on the right side and 69.0 dB(A) on the left side.

When accelerating from a standstill with an exterior ambient noise level of 49.2 dB(A), the average of the two highest readings obtained were 68.2 dB(A) on the right side and 68.6 dB(A) on the left side.

With the vehicle stationary and the engine, accessories, and air conditioning on, the measurements averaged 50.2 dB(A). With the accessories and air conditioning off, the readings averaged 49.0 dB(A). The exterior ambient noise level measured during this test was 49.2 dB(A). This bus passed this section of the test.

EXTERIOR NOISE TEST DATA FORM

Accelerating from Constant Speed

Page 1 of 3

Bus Number: 1906		Date: 09/03/19	
Personnel: T.S., E.L. & E.D.			
Temperature (°F): 68		Humidity (%): 76	
Wind Speed (mph): 0		Wind Direction: Calm	
Barometric Pressure (inHg): 30			
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ✓			
Initial Sound Level Meter Calibration: 94.0 dB(A)			
Exterior Ambient Noise Level: 49.2 dB(A)			
Accelerating from Constant Speed Curb (Right) Side		Accelerating from Constant Speed Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	70.6	1	69.9
2	67.7	2	67.0
3	69.4	3	68.0
4	68.5	4	68.0
5	69.1	5	68.1
6	N/A	6	N/A
7	N/A	7	N/A
8	N/A	8	N/A
9	N/A	9	N/A
10	N/A	10	N/A
Average of two highest actual noise levels = 70.0 dB(A)		Average of two highest actual noise levels = 69.0 dB(A)	
Final Sound Level Meter Calibration Check: 94.0 dB(A)			
Comments: None noted.			

EXTERIOR NOISE TEST DATA FORM Accelerating from Standstill

Page 2 of 3

Bus Number: 1906		Date: 09/03/19	
Personnel: E.D. & E.L.			
Temperature (°F): 73		Humidity (%): 65	
Wind Speed (mph): 0		Wind Direction: calm	
Barometric Pressure (inHg):			
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ✓			
Initial Sound Level Meter Calibration: 94.0 dB(A)			
Exterior Ambient Noise Level: 49.2 dB(A)			
Accelerating from Standstill Curb (Right) Side		Accelerating from Standstill Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	68.1	1	67.9
2	67.8	2	67.0
3	68.2	3	67.8
4	67.9	4	69.2
5	67.9	5	66.9
6	N/A	6	N/A
7	N/A	7	N/A
8	N/A	8	N/A
9	N/A	9	N/A
10	N/A	10	N/A
Average of two highest actual noise levels = 68.2 dB(A)		Average of two highest actual noise levels = 68.6 dB(A)	
Final Sound Level Meter Calibration Check: 94.0 dB(A)			
Comments: None noted.			

EXTERIOR NOISE TEST DATA FORM

Stationary

Page 3 of 3

Bus Number: 1906		Date: 09/03/19	
Personnel: E.D. & E.L.			
Temperature (°F): 73		Humidity (%): 65	
Wind Speed (mph): 0		Wind Direction: Calm	
Barometric Pressure (inHg): 30.10			
Initial Sound Level Meter Calibration: 94.0 dB(A)			
Exterior Ambient Noise Level: 49.2 dB(A)			
Air Conditioning ON			
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	N/A	49.3	51.1
High Idle	N/A	N/A	N/A
Wide Open Throttle	N/A	N/A	N/A
Air Conditioning OFF			
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	N/A	48.1	49.8
High Idle	N/A	N/A	N/A
Wide Open Throttle	N/A	N/A	N/A
Final Sound Level Meter Calibration Check: 94.0 dB(A)			
Comments: Electric bus – no high idle or full throttle			

7.2 EXTERIOR NOISE TESTS



TEST BUS UNDERGOING EXTERIOR NOISE TESTING

FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration U.S. DOT
In accordance with 49 CFR, Part 665

Manufacturer: Proterra
Model: CAT40DP (800V six-pack)

Partial Test

October 2020

Report Number: LTI-BT-R2020-06-P

The Thomas D. Larson
Pennsylvania Transportation Institute
201 Transportation Research Building
The Pennsylvania State University
University Park, PA 16802
(814) 865-1891

Bus Testing and Research Center
2237 Plank Road
Duncansville, PA 16635
(814) 695-3404



PennState
College of Engineering

**LTI BUS RESEARCH
AND TESTING CENTER**

FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration, U.S. DOT
1200 New Jersey Avenue, SE
Washington, DC 20590

In accordance with 49 CFR Part, 665

Manufacturer: Proterra, Inc.
Manufacturer's address: 1815 Rollins Road
Burlingame, CA 94010

Model: CAT40DP (800V six-pack)

Partial Test

Report Number: LTI-BT-R2020-06-P



David Klinikowski

Quality Authorization

Director, Bus Research
and Testing Center

Title

10/27/2020

Date

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ABBREVIATIONS AND ACRONYMS	5
BUS CHECK-IN	6
4. PERFORMANCE	21
6. ENERGY ECONOMY	25

EXECUTIVE SUMMARY

TEST HIGHLIGHTS

The information in this report pertains only to this specific bus, as received from the manufacturer for testing.

The Check-In section of the report provides a description of the bus and specifies its major components. The following table gives the salient specifications.

Manufacturer	Proterra, Inc.
Model	CAT40DP (800V six-pack)
Chassis Make/Model	Proterra / Catalyst
Chassis Modified	No
Length	42 feet, 4 inches
Fuel	Battery Electric
Service Life	12 Years / 500,000 miles - Partial
Number of Seats (including driver)	37 or 31 and 2 wheelchairs
Manufacturer-Designated Standing Passenger Capacity	20 Standees
Gross Vehicle Weight used for testing	43,640
Manufacturer Specified Gross Vehicle Weight Rating	43,650
Mileage at Delivery	1,616
Test Start Date	August 24, 2020
Test Completion Date	September 17, 2020

The measured curb weight was 13,960 lb. for the front axle and 20,800 lb. for the rear axle. These combined weights provided a total measured curb weight of 34,760 lb. There are 37 seats including the driver (6 seats fold away for two wheelchair positions) and free floor space for 41 standing passengers bringing the potential total passenger capacity to 78. However, a placard shows the maximum number of standing passengers as 20. The maximum gross load is represented as 31 seated passengers, including the driver, 2 wheelchairs and 20 standees, for a total of 53 passengers. Gross load is calculated as $(150 \text{ lb.} \times 51) + (600 \text{ lb.} \times 2) = 8,850 \text{ lb.}$ At full declared capacity, the measured gross vehicle weight was 43,640 lb. There is a potential to overload this bus with the additional available floor space for standing passengers.

The FTA determined that this bus be tested for performance and energy economy. The baseline full Bus Testing report for this partial test is LTI-BT-R1906.

Prior to the publication of this report the manufacturer, Proterra, rebranded the "Catalyst" name from the "Catalyst" platform and model "CAT40DP" to the "ZX5" platform and model "ZX5_DP."

ABBREVIATIONS AND ACRONYMS

- ABS - anti-skid braking system
- ABTC - Altoona Bus Test Center
- A/C - air conditioner, or air conditioning
- AC - alternating current
- ADA - American Disability Act
- CDCTS - chassis dynamometer test control system
- CVS - constant volume sampling
- CW - curb weight (bus weight including maximum fuel, oil, and coolant; but without passengers or driver)
- dB(A) - decibels with reference to 0.0002 microbar as measured on the "A" scale
- DC - direct current
- DIR - test director
- DR - bus driver
- EPA - Environmental Protection Agency
- GAWR - gross axle weight rating
- GVL - gross vehicle load (150 lb. for every designed passenger seating position, for the driver, and for each 1.5 sq ft of free floor space)
- GVW - gross vehicle weight (curb weight plus gross vehicle load)
- GVWR - gross vehicle weight rating
- HD-UDDS - Heavy Duty-Urban Dynamometer Driving Schedule
- LTI - Larson Transportation Institute
- mpg - miles per gallon
- mph - miles per hour
- PM - Preventive maintenance
- PSTT - Penn State Test Track
- rpm - revolutions per minute
- SAE - Society of Automotive Engineers
- SCF - Standard cubic foot
- SCH - test scheduler
- SA - staff assistant
- SLW - seated load weight (curb weight plus 150 lb. for every designed passenger seating position and for the driver)
- TD - test driver
- TECH - test technician
- TM - track manager
- TP - test personnel
- Wh - Watt hour

TEST BUS CHECK-IN

I. OBJECTIVE

The objective of this task is to log in the test bus, assign a bus number, complete the vehicle data form, and perform a safety check.

II. TEST DESCRIPTION

The test consisted of assigning a bus test number to the bus, cleaning the bus, completing the vehicle data form, obtaining any special information and tools from the manufacturer, determining a testing schedule, performing an initial safety check, and performing the manufacturer's recommended preventive maintenance. The bus manufacturer certified that the bus meets all Federal regulations.

III. DISCUSSION

The check-in procedure is used to identify in detail the major components and configuration of the bus.

The test bus consisted of a Proterra, Inc. CAT40DP (800V six-pack) bus model. Prior to the publication of this report the manufacturer, Proterra, rebranded the "Catalyst" name from the "Catalyst" platform and model "CAT40DP" to the "ZX5" platform and model "ZX5_DP."

The bus has a front passenger door forward of the front axle and a rear passenger door forward of the rear axle. The front passenger door is equipped with a Ricon ADA accessible fold out ramp. Power is provided by a battery electric, Proterra DuoPower Control System and a pair of Parker GVM310-125 traction motors.

The measured curb weight was 13,960 lb. for the front axle and 20,800 lb. for the rear axle. These combined weights provided a total measured curb weight of 34,760 lb. There are 37 seats including the driver (6 seats fold away for two wheelchair positions) and free floor space for 41 standing passengers bringing the potential total passenger capacity to 78. However, a placard shows the maximum number of standing passengers as 20. The maximum gross load is represented as 31 seated passengers, including the driver, 2 wheelchairs and 20 standees, for a total of 53 passengers. Gross load is calculated as $(150 \text{ lb.} \times 51) + (600 \text{ lb.} \times 2) = 8,850 \text{ lb.}$ At full declared capacity, the measured gross vehicle weight was 43,640 lb. There is a potential to overload this bus with the available floor space for standing passengers.

VEHICLE DATA FORM

Page 1 of 7

Bus Number: 2020-06-P	Date of Check-In: 08/24/2020
Bus Manufacturer: Proterra Inc.	Vehicle Identification Number (VIN): 7JZTH13J8KS000191
Model Number: CAT40DP(800V)	Chassis Mfr./Mod. #: Proterra / Catalyst
Personnel: T.S. & E.D.	Starting Odometer Reading: 1,616

WEIGHT:

Individual Wheel Reactions:

Weights (lb.)	Front Axle		Middle Axle		Rear Axle	
	Curb	Street	Curb	Street	Curb	Street
CW	7,260	6,700	N/A	N/A	10,100	10,700
SLW	7,980	7,850	N/A	N/A	12,050	12,750
GVW	8,970	8,830	N/A	N/A	12,600	13,240

Total Weight Details:

Weight (lb.)	CW	SLW	GVW	GAWR
Front Axle	13,960	15,830	17,800	18,078
Middle Axle	N/A	N/A	N/A	N/A
Rear Axle	20,800	24,800	25,840	28,660
Total	34,760	40,630	43,640	GVWR: 43,650 (Declared by Manufacturer)

Dimensions:

Length (ft/in)	42 / 4
Width (in)	101
Height (in)	128
Front Overhang (in)	101.75
Rear Overhang (in)	109.5
Wheelbase (in)	296.75
Wheel Track (in)	Front: 85.8
	Middle: N/A
	Rear: 76.0

VEHICLE DATA FORM

Page 2 of 7

Bus Number: 2020-06-P	Date: 08/24/2020
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CLEARANCES:

Lowest Point Outside Front Axle	Location: Body under front door Clearance(in): 9.3
Lowest Point Outside Rear Axle	Location: Body behind rear axle Clearance(in): 9.9
Lowest Point between Axles	Location: Battery pack Clearance(in): 9.5
Ground Clearance at the center (in)	9.5
Front Approach Angle (deg)*	9.0
Rear Approach Angle (deg)*	9.2
Ramp Clearance Angle (deg)	3.7
Aisle Width (in)	Front: 24.0 Rear: 23.9
Inside Standing Height at Center Aisle (in)	Front: 91.3 Rear: 74.8

*measurements used to calculate approach and departure angles are taken from the centerline of the axles.

BODY DETAILS:

Body Structural Type	Monocoque		
Frame Material	Steel (partial, behind rear axle)		
Body Material	Composite / Fiberglass		
Floor Material	Composite / Fiberglass		
Roof Material	Composite / Fiberglass		
Windows Type	<input checked="" type="checkbox"/> Fixed	<input type="checkbox"/> Movable	
Window Mfg./Model No.	Arow / DOT 1071 AS3M3		
Number of Doors	<u> 1 </u> Front	<u> 1 </u> Rear	
Mfr. / Model No.	Front: Ventura / IGE1100	Rear: Ventura / PSE1250	
Dimension of Each Door (in)	Front: 32.8 x 74.9		Rear: 39.6 x 75.4
Passenger Seat Type	<input checked="" type="checkbox"/> Cantilever	<input checked="" type="checkbox"/> Pedestal	<input type="checkbox"/> Other (explain)
Driver Seat Type	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	USSC / 9100 ALX3		
Number of Seats (including Driver)	37 or 31 & 2 wheelchair positions		

VEHICLE DATA FORM

Page 3 of 7

Bus Number: 2020-06-P	Date: 08/24/2020
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BODY DETAILS (Contd.)

Free Floor Space (ft ²)	66.1				
Height of Each Step at Normal Position (in)	Front	1. <u>16.0</u>	2. <u>N/A</u>	3. <u>N/A</u>	4. <u>N/A</u>
	Middle	1. <u>N/A</u>	2. <u>N/A</u>	3. <u>N/A</u>	4. <u>N/A</u>
	Rear	1. <u>18.0</u>	2. <u>N/A</u>	3. <u>N/A</u>	4. <u>N/A</u>
Step Elevation Change - Kneeling (in)	Front: 2.6		Rear: 2.7		

ENGINE

Type	<input type="checkbox"/> C.I.	<input type="checkbox"/> Alternate Fuel	
	<input type="checkbox"/> S.I.	<input checked="" type="checkbox"/> Other (Battery Electric)	
Air Compressor Mfr. / Model No.	Hydrovane / 0009-0010-07		
Maximum Capacity (ft ³ / min)	8.96		
Starter Type – N/A	<input type="checkbox"/> Electrical	<input type="checkbox"/> Pneumatic	<input type="checkbox"/> Other (explain)
Starter Mfr. / Model No.	N/A		

BATTERY SYSTEM

Maximum Rated Capacity (kWh)	660
Usable Capacity (kWh)	587
Nominal Voltage (Vdc)	652

PROPULSION CONTROL SYSTEM (Rear Axle)

Propulsion Control System Mfr. / Model No.	Proterra / DuoPower Control System
Traction Motor - Mfr. / Model No.	Parker / GVM310-125
Traction Motor Power rating (kW)	205 kW Peak per motor / 2 motors within DuoPower axle

OTHERS

DCDC Converter Mfr. / Model No.	Inmotion / DCC2
HV Distribution Box Mfr. / Model No.	Proterra / 039449
PTC Mfr./ Model No.	Therma-Tech Engineering / 074080002

VEHICLE DATA FORM

Page 4 of 7

Bus Number: 2020-06-P	Date: 08/24/2020
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SUSPENSION

Number of Axles	2		
Front Axle Type	<input checked="" type="checkbox"/> Independent	<input type="checkbox"/> Beam Axle	
Mfr. / Model No.	ZF Friedrichshafen AG / RL82EC		
Axle Ratio (if driven)	N/A		
Suspension Type	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Koni / 9905 1017		
Middle Axle Type	<input type="checkbox"/> Independent	<input type="checkbox"/> Beam Axle	
Mfr. / Model No.	N/A		
Axle Ratio (if driven)	N/A		
Suspension Type	<input type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
No. of Shock Absorbers	N/A		
Mfr. / Model No.	N/A		
Rear Axle Type	<input type="checkbox"/> Independent	<input checked="" type="checkbox"/> Beam Axle	
Mfr. / Model No.	Proterra / DuoPower		
Axle Ratio (if driven)	3.31:1		
Suspension Type	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
No. of Shock Absorbers	4		
Mfr. / Model No.	Koni / 9905 1018		

VEHICLE DATA FORM

Page 5 of 7

Bus Number: 2020-06-P	Date: 08/24/2020
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WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Alcoa / 22.5 x 9.00
	Tire Mfr./ Model No.	Michelin Incity / 315/80R22.5
Rear	Wheel Mfr./ Model No.	Alcoa / 22.5 x 9.00
	Tire Mfr./ Model No.	Michelin Incity / 315/80R22.5

BRAKES

Front Axle Brakes Type	<input type="checkbox"/> Cam	<input checked="" type="checkbox"/> Disc	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	Knorr / SN7		
Middle Axle Brakes Type	<input type="checkbox"/> Cam	<input type="checkbox"/> Disc	<input type="checkbox"/> Other
Mfr. / Model No.	N/A		
Rear Axle Brakes Type	<input type="checkbox"/> Cam	<input checked="" type="checkbox"/> Disc	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	Knorr / SB7		

HVAC

Heating System Type	<input type="checkbox"/> Air	<input type="checkbox"/> Water	<input checked="" type="checkbox"/> Other (Electric)
Capacity (Btu/hr)	54,594		
Mfr. / Model No.	800V Eberspaecher 88-50-72-01178-00		
Air Conditioner	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Location	Roof		
Capacity (Btu/hr)	102,363		
A/C Compressor Mfr. / Model No.	Eberspaecher / HGX34e / 380-4SA (Back Compressor)		

STEERING

Steering Gear Box Type	Hydraulic gear		
Mfr. / Model No.	Ross / Hydropower		
Steering Wheel Diameter	18"		
Number of turns (lock to lock)	4		
Control Type	<input checked="" type="checkbox"/> Electric	<input type="checkbox"/> Hydraulic	<input type="checkbox"/> Other (explain)

VEHICLE DATA FORM

Page 6 of 7

Bus Number: 2020-06-P	Date: 08/24/2020
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OTHERS

Wheelchair Ramps	Location: Front	Type: Fold out
Wheelchair Lifts	Location: N/A	Type: N/A
Mfr. / Model No.	Ricon / RISSR-OC27611Y00	
Emergency Exit	Location: Window Door Roof hatch	Number: 5 2 2

CAPACITIES

Fuel Tank Capacity (gallons)	N/A
Engine Crankcase Capacity (gallons)	N/A
Transmission Capacity (litres)	4.8 L / transmission (2 transmissions within DuoPower Axle)
Differential Capacity (litres)	2.8L / wheel end (2 wheel ends within DuoPower Axle)
Cooling System Capacity (gallons)	Battery Thermal Loop – 17 gallons Power Electronics loop – 11.8 gallons
Power Steering Fluid Capacity (quarts)	11 quarts

COMPONENT/SUBSYSTEM INSPECTION FORM

Page 1 of 1

Bus Number: 2020-06-P	Date: 08/24/2020
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Subsystem	Checked	Initials	Comments
Air Conditioning Heating and Ventilation	✓	E.D.	Provision for diesel fuel heater, however no diesel fueled heater was installed.
Body and Sheet Metal	✓	E.D.	None noted.
Frame	N/A	E.D.	None noted.
Steering	✓	E.D.	None noted.
Suspension	✓	E.D.	None noted.
Interior/Seating	✓	E.D.	None noted.
Axles	✓	E.D.	None noted.
Brakes	✓	E.D.	None noted.
Tires/Wheels	✓	E.D.	None noted.
Exhaust	N/A	E.D.	None noted.
Fuel System	✓	E.D.	6 Battery Packs
Power Plant	✓	E.D.	Battery Electric
Accessories	✓	E.D.	None noted.
ADA Accessible Lift System	N/A	E.D.	None noted.
ADA Accessible Ramp System	✓	E.D.	None noted.
Interior Fasteners	✓	E.D.	None noted.
Batteries	✓	E.D.	None noted.

CHECK - IN



PROTERRA, INC. CAT40DP (800V SIX-PACK)



CHECK - IN CONT.



**PROTERRA, INC.
CAT40DP (800V SIX-PACK)**



CHECK - IN CONT.



RICON FOLD-OUT RAMP

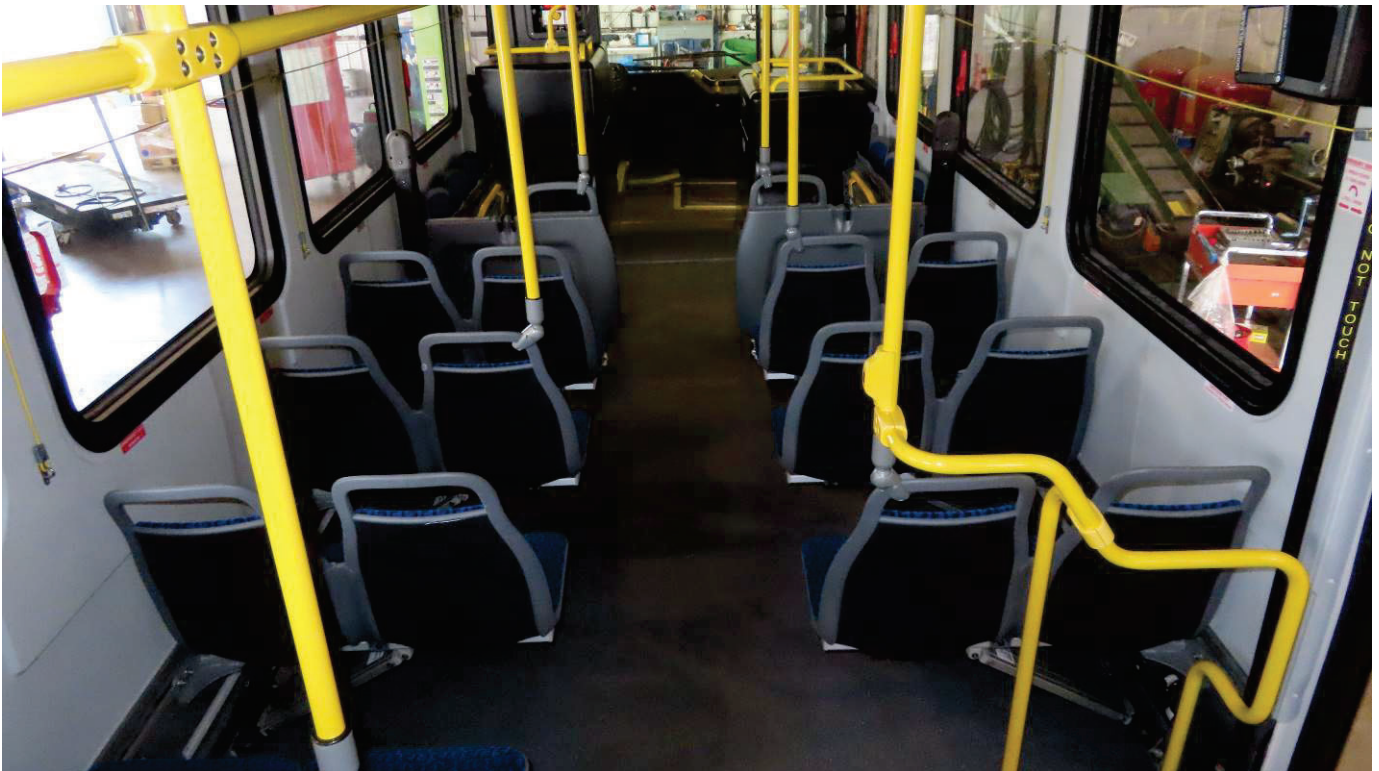


OPERATOR'S AREA

CHECK - IN CONT.

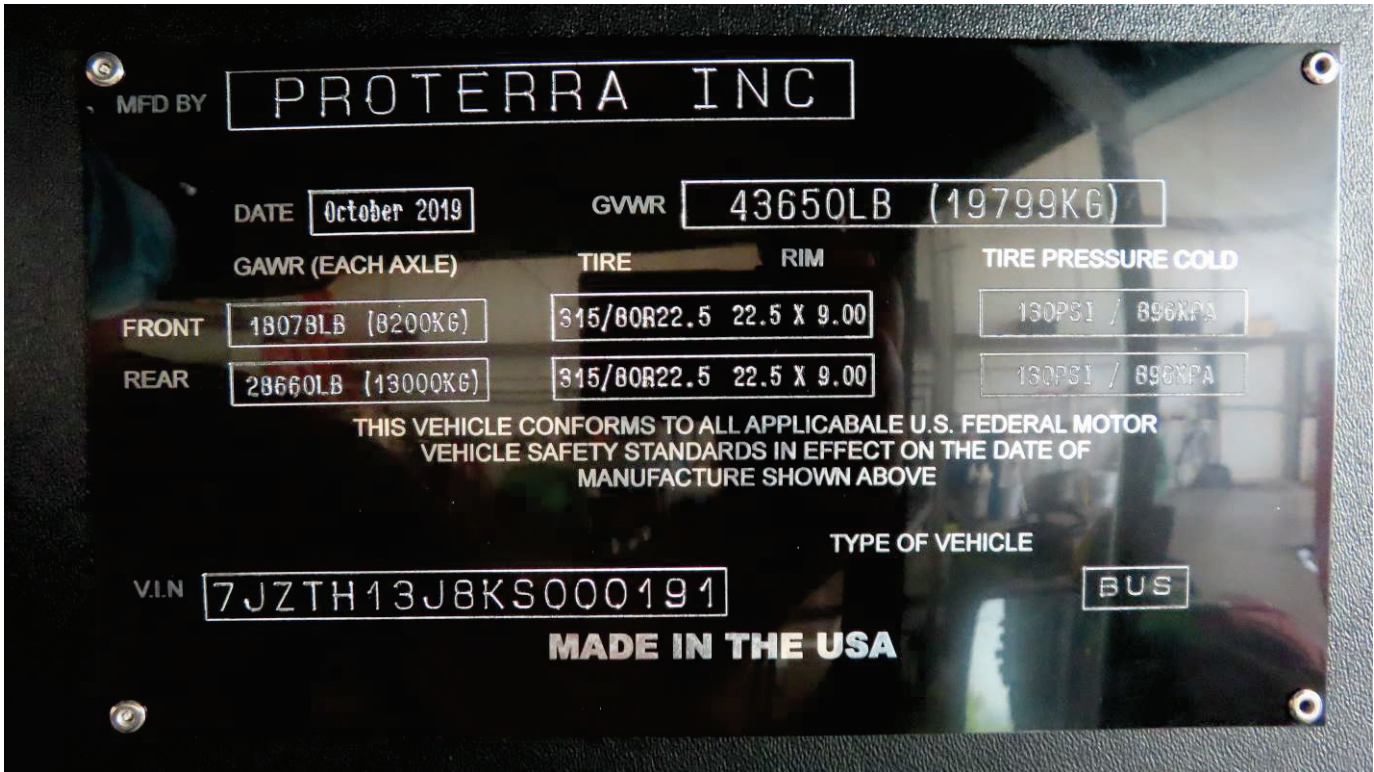


INTERIOR FROM FRONT



INTERIOR FROM REAR

CHECK - IN CONT.



VIN TAG



PLACARD SHOWING MAXIMUM STANDING PASSENGERS

CHECK - IN CONT.



REAR COMPARTMENT

4. PERFORMANCE - AN ACCELERATION, GRADEABILITY, AND TOP SPEED TEST

4-I. TEST OBJECTIVE

The objective of this test is to determine the acceleration, gradeability, and top speed capabilities of the bus.

4-II. TEST DESCRIPTION

In this test, the bus was operated at SLW on a chassis dynamometer. The procedure dictates that the test bus be accelerated to a maximum “power-limited”/”governed” or maximum “safe” speed not exceeding 80 mph. The maximum power-limited/governed speed, if applicable, is the top speed as limited by the engine control system. The maximum safe speed is defined as the maximum speed that the dynamometer, the tires or other bus components are limited to. The test vehicle speed was measured using a speed encoder built in the chassis dynamometer. The time intervals between 10 mph increments were recorded using a Data Acquisitions System. Time-speed data and the top speed attained were recorded on the Performance Data Form. The recorded data was used to generate a percent grade versus speed table and a speed versus time curve. All the above are available in the following pages.

4-III. DISCUSSION

This test consisted of three runs from standstill to full throttle on the chassis dynamometer. Speed versus time data was obtained for each run and results are averaged to minimize test variability. The test was performed up to a maximum governed speed of 65.3 mph. The calculated gradeability results are attached. The average time to reach 30 mph 8.0 seconds. The maximum gradeability at 10 mph was 18.20% and at 40 mph was 14.66%.

PERFORMANCE DATA FORM

Page 1 of 1

Bus Number: 2020-06-P		Date: 09/17/2020	
Personnel: S.I. & M.H.			
Temperature (°F): 73		Humidity (%): 60.2	
Barometric Pressure (inHg): 28.8			
		INITIALS:	
Air Conditioning - OFF	✓Checked	M.H.	
Heater pump motor - OFF	✓Checked	M.H.	
Defroster - OFF	✓Checked	M.H.	
Exterior and interior lights - ON	✓Checked	M.H.	
Windows and doors - CLOSED	✓Checked	M.H.	
ACCELERATION, GRADEABILITY, TOP SPEED			
Recorded Interval Times			
Speed	Run 1	Run 2	Run 3
10 mph	2.4	2.4	2.6
20 mph	4.8	5.0	5.1
30 mph	7.8	8.0	8.1
40 mph	13.8	13.4	13.5
50 mph	16.7	17.1	16.7
60 mph	20.7	21.2	20.8
70 mph	N/A	N/A	N/A

Maximum Speed (mph): 65.3 (maximum governed speed reached)

PERFORMANCE SUMMARY SHEET

Bus Number: 2020-06-P	Date: 09/17/2020
Personnel: S.I. & M.H.	

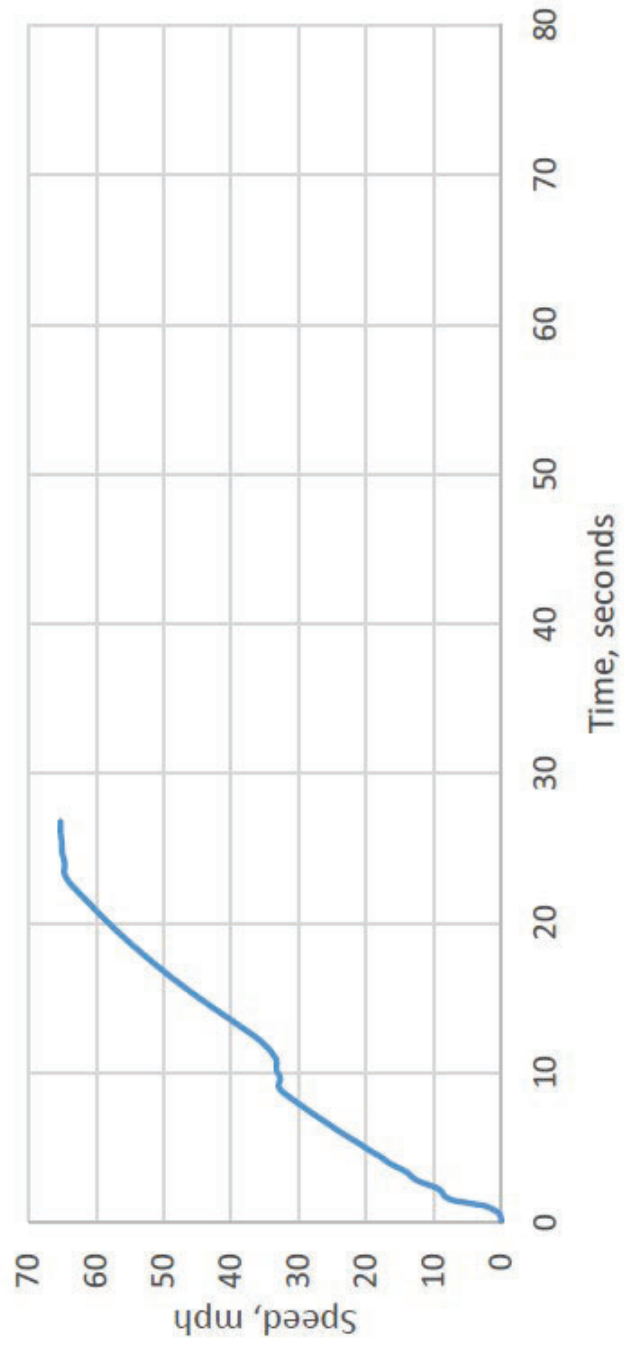
Test Conditions:

Temperature (°F): 73	Humidity (%): 60.2
Barometric Pressure (inHg): 28.8	

Test Results:

Vehicle Speed (MPH)	Time (SEC)	Acceleration (FT/SEC^2)	Max. Grade (%)
1.0	0.8	7.14	22.17
5.0	1.3	9.55	29.66
10.0	2.4	5.86	18.20
15.0	3.7	5.37	16.68
20.0	5.0	5.18	16.09
25.0	6.4	4.91	15.25
30.0	8.0	4.46	13.85
35.0	11.9	3.49	10.84
40.0	13.5	4.72	14.66
45.0	15.1	4.54	14.10
50.0	16.8	4.03	12.52
55.0	18.7	3.65	11.34
60.0	20.9	3.21	9.97
65.0	24.7	0.43	1.34
65.3	26.8	Maximum Speed	

Proterra Bus# 2020-06-P



6. ENERGY ECONOMY AND RANGE TEST – AN ENERGY CONSUMPTION AND RANGE TEST FOR BATTERY ELECTRIC BUSES USING APPROPRIATE OPERATING CYCLES

6-I. TEST OBJECTIVE

The objective of this test is to provide accurate comparable energy consumption data on battery electric transit buses produced by different manufacturers. This energy economy test bears no relation to the calculations done by the Environmental Protection Agency (EPA) to determine levels for the Corporate Average Fuel Economy Program. EPA's calculations are based on tests conducted under laboratory conditions intended to simulate city and highway driving. This energy economy test, as designated here, is a measurement of the energy consumed by a vehicle traveling a specified test operating profile, under specified operating conditions that are typical of transit bus operation. The results of this test will not represent actual energy usage but will provide data that can be used by FTA Grantees to compare buses tested using this procedure.

6-II. TEST DESCRIPTION

This test is performed in the emissions bay of the LTI Vehicle Testing Laboratory. The Laboratory is equipped with a Schenk Pegasus 300 HP, large-roll (72 inch diameter) chassis dynamometer suitable for heavy-vehicle emissions testing. The driving cycles are the Manhattan cycle, a low average speed, highly transient urban cycle (Figure 1), the Orange County Bus Cycle which consists of urban and highway driving segments (Figure 2), and the EPA HD-UDDS Cycle (Figure 3). This test is conducted at seated load weight.

This test is conducted generally as per the methods described in the SAE standard J 1634-2017. The light-duty test cycles specified in this standard are replaced by transit bus test cycles mentioned above.

The Multi-Cycle test (MCT) procedure is adopted for this bus. The end of test is determined when the bus cannot keep up with the speed trace of the test cycle, as recommended by the bus manufacturer. The battery system is recharged to full SOC at the end of the test, following procedures specified in SAE J 1634-2017. During the recharge, the DC energy (into the battery system) and the AC energy (into the charger) are recorded. From these data, the average AC energy consumption, the charger efficiency (DC Energy, kWh/AC Energy, kWh) and range (miles) for each test cycle is calculated.

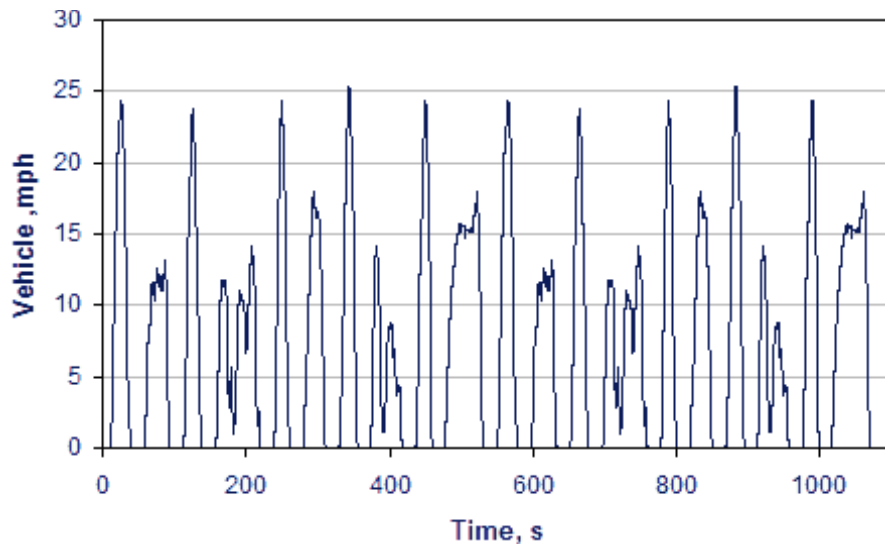


Figure 1. Manhattan Driving Cycle (duration 1089 sec, Maximum speed 25.4 mph, average speed 6.8 mph)

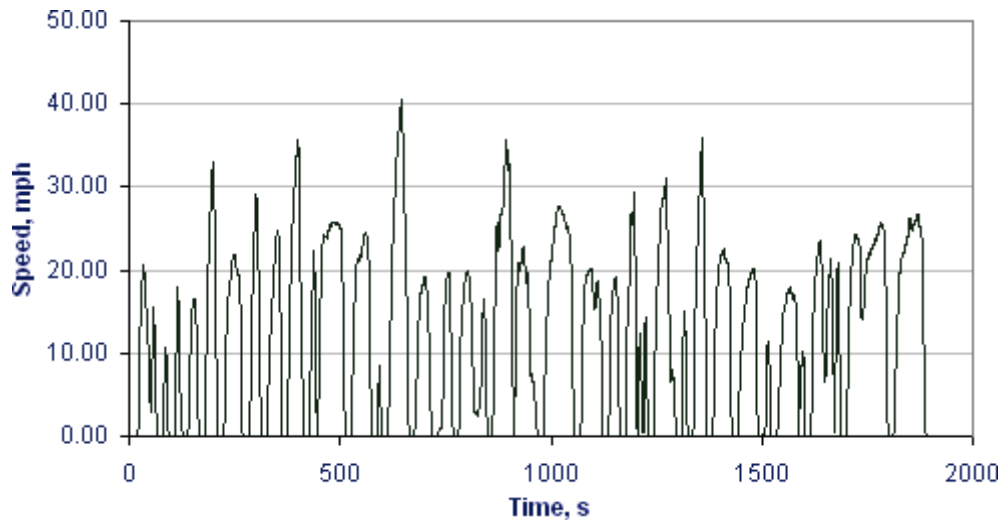


Figure 2. Orange County Bus Cycle (Duration 1909 Sec, Maximum Speed 41 mph, Average Speed 12 mph).

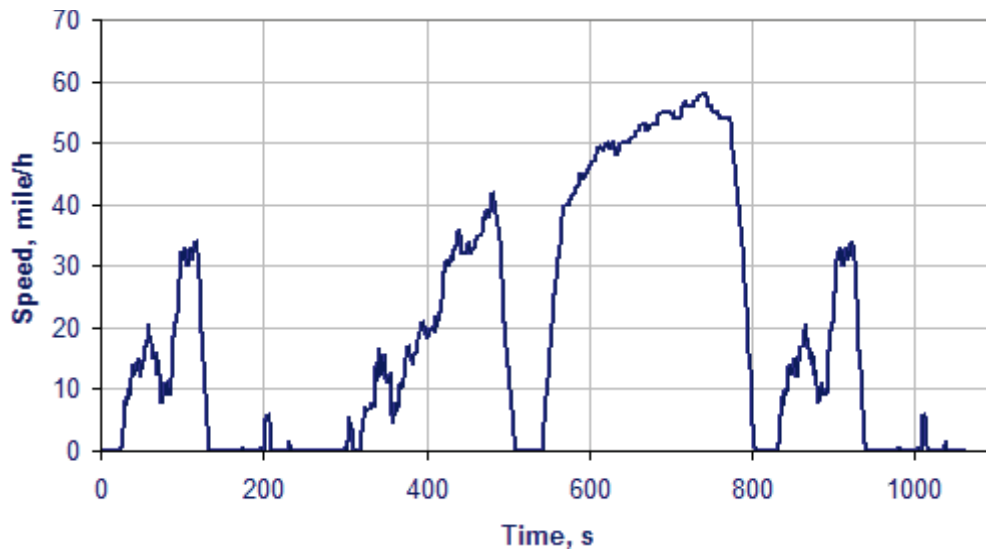


Figure 3. HD-UDDS Cycle (duration 1060 seconds, Maximum Speed 58 mph, Average Speed 18.86 mph).

6-III. DISCUSSION

The driving cycle consists of three simulated transit driving cycles: Manhattan, Orange County Bus Cycle and the HD-UDDS, as described in 6-II.

An extensive pretest maintenance check is conducted including the replacement of all lubrication fluids, if applicable. The details of the pretest maintenance are given in the first three Pretest Maintenance Forms. The fourth sheet shows the Pretest Inspection Form. Finally, the summary sheet provides the average energy consumption and range of bus for the three test cycles. The test was conducted at a seated load weight of 40,630 lbs. The average AC energy consumption for the Manhattan, OCBC and the HD-UDDS were 2,279 Wh/mile, 2,204 Wh/mile and 2,213 Wh/mile respectively. The range for the three driving cycles were 276 miles, 285 miles and 296 miles respectively.

This bus was tested using the Manhattan, Orange County and UDDS driving cycles. The energy economy and range results for buses tested using these cycles are not directly comparable to buses tested under the earlier protocol that uses the CBD, Arterial and Commuter driving cycles.

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 1 of 3

Bus Number: 2020-06-P	Date: 08/24/2020	SLW (lb.): 40,630
Personnel: T.S. & E.D.		

ENERGY SYSTEM	OK
Install fuel measurement system	✓
Remarks: None noted.	
BRAKES/TIRES	OK
Inspect hoses	✓
Inspect brakes	✓
Check tire inflation pressures (mfg. specs.)	✓
Check tire wear (less than 50%)	✓
Remarks: 130 psi front/rear	
BATTERY COOLING SYSTEM	OK
Check hoses and connections	✓
Check system for coolant leaks	✓
Remarks: None noted.	

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 2 of 3

Bus Number: 2020-06-P	Date: 08/24/2020
Personnel: T.S. & E.D.	
ELECTRICAL SYSTEM	OK
Check battery	✓
Inspect wiring	✓
Inspect terminals	✓
Check lighting	✓
Remarks: None noted.	
DRIVE SYSTEM	OK
Drain transmission fluid	N/A
Replace filter/gasket	N/A
Check hoses and connections	N/A
Replace transmission fluid	N/A
Check for fluid leaks	N/A
Remarks: Transmission is an electrically controlled component that's coolant cooled.	
LUBRICATION	OK
Lube all chassis grease fittings	✓
Lube universal joints	N/A
Replace differential lube including axles	N/A
Remarks: None noted.	

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 3 of 3

Bus Number: 2020-06-P	Date: 08/24/2020
Personnel: T.S. & E.D.	
OTHER ITEMS	OK
Replace air filter	N/A
Inspect air compressor and air system	✓
Inspect vacuum system, if applicable	N/A
Check and adjust all drive belts	N/A
Remarks: None noted	
STEERING SYSTEM	OK
Check power steering hoses and connectors	✓
Service fluid level	N/A
Check power steering operation	✓
Remarks: None noted	
	OK
Ballast bus to seated load weight	✓
TEST DRIVE	OK
Check brake operation	✓
Check transmission operation	✓
Remarks: None noted	

ENERGY ECONOMY PRE-TEST INSPECTION FORM

Page 1 of 1

Bus Number: 2020-06-P	Date: 08/24/2020 & 09/17/2020
Personnel: S.I. & M.H.	
PRE WARM-UP	If OK, Initial
Energy Economy Pre-Test Maintenance Form is complete	T.S.
Cold tire pressure (psi): Front <u>130</u> Middle <u>N/A</u> Rear <u>130</u>	T.S.
Energy economy instrumentation installed and working properly.	T.S.
Bus is loaded to SLW during coast down	T.S.
WARM-UP & TESTING	If OK, Initial
Interior and exterior lights on, evaporator fan on	M.H.
Air conditioner off	M.H.
Defroster off	M.H.
Windows and doors closed	M.H.
Do not drive with left foot on brake	M.H.

ENERGY ECONOMY DATA FORM (Battery Electric Buses)

Page 1 of 1

Bus Number: 2020-06-P	Manufacturer: Proterra	Date: 09/16/2020
Fuel Type: Electric	Personnel: S.I. & M.H.	
Temperature (°F): 28.9	Humidity (%): 43.6	Barometric Pressure (inHg): 66.5
SLW (lb.): 40,630	Charger: Proterra	

	Manhattan	Orange County	UDDS
AC Energy (Wh/mile)	2,279	2,204	2,123
Range (miles)	276	285	296

Comments: "End of Test" was when bus could not maintain 65 mph on the dynamometer.

6.0 ENERGY ECONOMY



BUS TESTED ON CHASSIS DYNAMOMETER FOR PERFORMANCE AND ENERGY ECONOMY

FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration U.S. DOT
In accordance with 49 CFR, Part 665

Manufacturer: Proterra Operating Company, Inc.
Model: ZX5 PD2

Partial Test

August 2022

Report Number: LTI-BT-R2022-07-P

The Thomas D. Larson
Pennsylvania Transportation Institute
201 Transportation Research Building
The Pennsylvania State University
University Park, PA 16802
(814) 865-1891

Bus Testing and Research Center
2237 Plank Road
Duncansville, PA 16635
(814) 695-3404



PennState
College of Engineering

**LTI BUS RESEARCH
AND TESTING CENTER**

FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration, U.S. DOT
1200 New Jersey Avenue, SE
Washington, DC 20590

In accordance with 49 CFR Part, 665

Manufacturer: Proterra Operating Company, Inc.
Manufacturer's address: 1815 Rollins Rd.
Burlingame, CA 94010

Model: ZX5 PD2

Partial Test

Report Number: LTI-BT-R2022-07-P



David Klinikowski
Quality Authorization

Director, Bus Research
and Testing Center
Title

August 4th, 2022
Date

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ABBREVIATIONS AND ACRONYMS	5
BUS CHECK-IN	6
4. PERFORMANCE	22
6. ENERGY ECONOMY	26

EXECUTIVE SUMMARY

TEST HIGHLIGHTS

The information in this report pertains only to this specific bus, as received from the manufacturer for testing.

The Check-In section of the report provides a description of the bus and specifies its major components. The following table gives the salient specifications.

Manufacturer	Proterra Operating Company, Inc.
Model	ZX5 PD2
Chassis Make/Model	Proterra / ZX5
Chassis Modified	No
Length	42 feet, 5 ¾ inches
Fuel	Battery-Electric
Service Life	12 Year / 500,000 Miles – Partial Test
Number of Seats (including driver)	37 or 31 with 2 wheelchairs
Manufacturer-Designated Standing Passenger Capacity	19
Gross Vehicle Weight used for testing	43,600 lb.
Gross Vehicle Weight Rating	43,650 lb.
Mileage at Delivery	5,663 miles
Test Start Date	May 18, 2022
Test Completion Date	June 22, 2022
Report Issuance Date	August 4, 2022

The measured curb weight was 13,990 lb. for the front axle and 20,890 lb. for the rear axle. These combined weights provided a total measured curb weight of 34,880 lb. There are 37 seats including the driver (six seats stow away for two wheelchair positions) and free floor space for 43 standing passengers bringing the potential total passenger capacity to 80. However, a placard shows the maximum number of standing passengers as 19. Therefore, the gross load represents 31 seated passengers (including driver), two wheelchairs and 19 standees for a total of 52 passengers. Gross load is calculated as $(150 \text{ lb.} \times 50) + (600 \text{ lb.} \times 2) = 8,700 \text{ lb.}$ At full declared capacity, the measured gross vehicle weight was 43,600 lb. There is a potential to overload this bus with the available floor space for standing passengers.

This bus has provisions for a diesel fueled auxiliary heater, however no diesel fueled heater was installed.

The FTA determined that this bus be tested for Check-in, Performance and Gradeability and Energy Economy and Range; the baseline full Bus Testing report for this test is LTI-BT-R1906.

ABBREVIATIONS AND ACRONYMS

ABS	- anti-skid braking system
ABTC	- Altoona Bus Test Center
A/C	- air conditioner, or air conditioning
AC	- alternating current
ADA	- American Disability Act
Ah	- Ampere hours
CDCTS	- chassis dynamometer test control system
CVS	- constant volume sampling
CW	- curb weight (bus weight including maximum fuel, oil, and coolant; but without passengers or driver)
dB(A)	- decibels with reference to 0.0002 microbar as measured on the "A" scale
DC	- direct current
DIR	- test director
DR	- bus driver
EPA	- Environmental Protection Agency
GAWR	- gross axle weight rating
GVL	- gross vehicle load (150 lb. for every designed passenger seating position, for the driver, and for each 1.5 sq ft of free floor space)
GVW	- gross vehicle weight (curb weight plus gross vehicle load)
GVWR	- gross vehicle weight rating
HD-UDDS	- Heavy Duty-Urban Dynamometer Driving Schedule
LTI	- Larson Transportation Institute
mpg	- miles per gallon
mph	- miles per hour
PM	- Preventive maintenance
PSTT	- Penn State Test Track
rpm	- revolutions per minute
SAE	- Society of Automotive Engineers
SCF	- Standard cubic foot
SCH	- test scheduler
SA	- staff assistant
SLW	- seated load weight (curb weight plus 150 lb. for every designed passenger seating position and for the driver)
TD	- test driver
TECH	- test technician
TM	- track manager
TP	- test personnel
Wh	- Watt hour

TEST BUS CHECK-IN

I. OBJECTIVE

The objective of this task is to log in the test bus, assign a bus number, complete the vehicle data form, and perform a safety check.

II. TEST DESCRIPTION

The test consisted of assigning a bus test number to the bus, cleaning the bus, completing the vehicle data form, obtaining any special information and tools from the manufacturer, determining a testing schedule, performing an initial safety check, and performing the manufacturer's recommended preventive maintenance. The bus manufacturer certified that the bus meets all Federal regulations.

III. DISCUSSION

The check-in procedure is used to identify in detail the major components and configuration of the bus.

The test bus consisted of a Proterra Operating Company, Inc. ZX5 PD2 model bus. The bus has a curbside, front passenger door forward of the front axle and a curbside, rear passenger door forward of the rear axle. The front passenger door is equipped with a Ricon / RISSR OC27611T00 fold out ramp. Power is provided by a Parker / GVM310-200 traction motor with a four-speed transmission and six lithium-ion battery packs totaling 660 kWh of energy.

This bus has provisions for a diesel fueled auxiliary heater, however no diesel fueled heater was installed.

The measured curb weight was 13,990 lb. for the front axle and 20,890 lb. for the rear axle. These combined weights provided a total measured curb weight of 34,880 lb. There are 37 seats including the driver (six seats stow away for two wheelchair positions) and free floor space for 43 standing passengers bringing the potential total passenger capacity to 80. However, a placard shows the maximum number of standing passengers as 19. Therefore, the gross load represents 31 seated passengers (including driver), two wheelchairs and 19 standees for a total of 52 passengers. Gross load is calculated as $(150 \text{ lb.} \times 50) + (600 \text{ lb.} \times 2) = 8,700 \text{ lb.}$ At full declared capacity, the measured gross vehicle weight was 43,600 lb. There is a potential to overload this bus with the available floor space for standing passengers.

VEHICLE DATA FORM

Page 1 of 7

Bus Number: 2022-07-P	Date of Check-In: 05/18/22
Bus Manufacturer: Proterra Operating Company, Inc.	Vehicle Identification Number (VIN): 7JZTH13J3LS000262
Model Number: ZX5-PD2	Chassis Mfr./Mod. #: Proterra / ZX5
Personnel: E.D., P.D., S.R., R.M., J.M., T.G. & F.T.	Starting Odometer Reading: 5,663

WEIGHT:

Individual Wheel Reactions:

Weights (lb.)	Front Axle		Middle Axle		Rear Axle	
	Curb	Street	Curb	Street	Curb	Street
CW	7,010	6,980	N/A	N/A	10,630	10,260
SLW	7,940	7,920	N/A	N/A	12,370	12,520
GVW	9,060	8,860	N/A	N/A	12,760	12,920

Total Weight Details:

Weight (lb.)	CW	SLW	GVW	GAWR
Front Axle	13,990	15,860	17,920	18,078
Middle Axle	N/A	N/A	N/A	N/A
Rear Axle	20,890	24,890	25,680	28,660
Total	34,880	40,750	43,600	GVWR: 43,650 (Declared by Manufacturer)

Dimensions:

Length (ft/in)	41 / 8 ½
Length Over Bumpers (ft/in)	42 / 5 ¾
Width (in)	124 ¼ (with mirrors) 101 ½ (without mirrors)
Height of bus (in)	108 ½
Overall Height (in)	127 ½
Front Overhang (in)	103 ¼
Rear Overhang (in)	109 ½
Wheelbase (in)	297
Wheel Track (in)	Front: 86.0
	Middle: N/A
	Rear: 77.3

VEHICLE DATA FORM

Page 2 of 7

Bus Number: 2022-07-P	Date: 05/18/22
-----------------------	----------------

CLEARANCES:

Lowest Point Outside Front Axle	Location: Curb guard	Clearance(in): 7.5
Lowest Point Outside Rear Axle	Location: Transmission	Clearance(in): 8.7
Lowest Point between Axles	Location: Battery framework	Clearance(in): 8.9
Front Bumper Height (in)	16.6	
Rear Bumper Height (in)	16.0	
Ground Clearance at the center (in)	8.9	
Front Approach Angle (deg)*	9.3	
Rear Approach Angle (deg)*	8.3	
Ramp Clearance Angle (deg)	3.4	
Aisle Width (in)	Front: 23.8	Rear: 23.5
Inside Standing Height at Center Aisle (in)	Front: 90.4	Rear: 74.9

*measurements used to calculate approach and departure angles are taken from the centerline of the axles.

BODY DETAILS:

Body Structural Type	Unibody		
Frame Material	Steel (Partial, behind rear axle)		
Body Material	Composite / Fiberglass		
Floor Material	Composite / Fiberglass		
Roof Material	Composite / Fiberglass		
Windows Type	<input checked="" type="checkbox"/> Fixed (Bottom)	<input checked="" type="checkbox"/> Movable (Top)	
Window Mfg./Model No.	Arow / AS3 Dot 411		
Number of Doors	<input type="checkbox"/> Front - Curbside <input type="checkbox"/> Rear - Curbside		
Mfr. / Model No.	Front- Ventura / IGE 1100 Rear- Ventura / PSE 1250		
Dimension of Each Door (in)	Front- 75.1 x 33.9	Rear- 75.4 x 46.1	
Passenger Seat Type	<input checked="" type="checkbox"/> Cantilever (Front)	<input checked="" type="checkbox"/> Pedestal (Rear)	<input type="checkbox"/> Other
Passenger Seat Mfg./ Model No.	American Seating / Insight Passenger Seat		
Driver Seat Type	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other
Mfr. / Model No.	USSC / 9100 ALX3		
Number of Seats (including Driver)	37 or 31 and 2 wheelchairs		

VEHICLE DATA FORM

Page 3 of 7

Bus Number: 2022-07-P	Date: 05/18/22
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BODY DETAILS (Contd.)

Free Floor Space (ft ²)	65.8 (with seats) 60.7 (with wheelchairs)
Height of Each Step at Normal Position (in)	Front 1. <u>16.0</u> 2. <u>N/A</u> 3. <u>N/A</u> 4. <u>N/A</u>
	Middle 1. <u>N/A</u> 2. <u>N/A</u> 3. <u>N/A</u> 4. <u>N/A</u>
	Rear 1. <u>15.0</u> 2. <u>N/A</u> 3. <u>N/A</u> 4. <u>N/A</u>
Step Elevation Change - Kneeling (in)	Front: 2.6 Rear: 0.5

ELECTRIC DRIVE SYSTEM

Type	<input checked="" type="checkbox"/> Series Battery Electric	<input type="checkbox"/> Parallel Electric Hybrid
Number of Traction Motors	1	
Mfr. / Model No.	Parker / GVM310-200	
Location of Traction Motors	Rear	
Type	Permanent Magnet AC Motor	
Motor Control System Mfr./Model No.	John Deere / PD400 Single	
Location	Rear	
Max Rated Power Output (kW)	240	
Nominal Voltage (volts)	750	
Drive Battery Mfr./ Model No.	Proterra / SN: 2000004156 / PN: 052228	
Number of Battery Packs	6	
Location of Battery Packs	4 under bus, 2 on roof	
Individual Battery Capacity (kWh)	112.8	
Total Nominal Battery Capacity (kWh)	660	
Total Usable Battery Capacity (kWh)	600	
Total Nominal Battery Capacity (Ah)	1,026	
Battery Type (Chemistry)	Lithium - Ion	
Low Voltage Battery	<input type="checkbox"/> 12 Volt <input checked="" type="checkbox"/> 24 Volt* *Two 12 Volt batteries hooked as a 24 Volt system	
Low Voltage Battery Mfr./Model No.	X2 Power / SLI31AGMDP	

VEHICLE DATA FORM

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Bus Number: 2022-07-P	Date: 05/18/22
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OTHERS

Air Compressor Mfr. / Model No.	Hydrovane / 0009-0010-07
Maximum Capacity (ft ³ / min)	8.96

TRANSMISSION

Transmission Type	<input type="checkbox"/> Manual	<input checked="" type="checkbox"/> Automatic	
Mfr. / Model No.	Eaton / EMA-12N0304C		
Control Type	<input type="checkbox"/> Mechanical	<input checked="" type="checkbox"/> Electrical	<input type="checkbox"/> Other
Integral Retarder Mfr. / Model No.	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	

SUSPENSION

Number of Axles	2		
Front Axle Type	<input checked="" type="checkbox"/> Independent	<input type="checkbox"/> Beam Axle	
Mfr. / Model No.	ZF / RL82EC		
GAWR (lb.)	18,078		
Axle Ratio (if driven)	N/A		
Suspension Type	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other
No. of Shock Absorbers	2		
Mfr. / Model No.	Koni / 99B-5414 SP2		
Sway Bar Equipped	<input type="checkbox"/> Front	<input type="checkbox"/> Rear	N/A
Rear Axle Type	<input type="checkbox"/> Independent	<input checked="" type="checkbox"/> Beam Axle	
Mfr. / Model No.	ZF / AV 133/90		
GAWR (lb.)	28,660		
Axle Ratio (if driven)	6.19		
Suspension Type	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other
No. of Shock Absorbers	4		
Mfr. / Model No.	Koni Holland / 998 5415		

VEHICLE DATA FORM

Page 5 of 7

Bus Number: 2022-07-P	Date: 05/18/22
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WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Alcoa / Dura-bright EVO 22.5 x 9.00-176
	Wheel Weight Rating (lb.)	9,090
	Tire Mfr./ Model No.	Michelin / X-Incity 315 / 80R 22.5
	Tire Weight Rating (lb.)	9,370 for single tire
Rear	Wheel Mfr./ Model No.	Alcoa / Dura-bright EVO 22.5 x 9.00-176
	Wheel Weight Rating (lb.)	9,090
	Tire Mfr./ Model No.	Michelin / X-Incity 315 / 80R 22.5
	Tire Weight Rating (lb.)	8,820 for dual tires

BRAKES

Front Axle Brakes Type	<input type="checkbox"/> Cam	<input checked="" type="checkbox"/> Disc	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	Knorr / SN7		
Middle Axle Brakes Type	<input type="checkbox"/> Cam	<input type="checkbox"/> Disc	<input type="checkbox"/> Other
Mfr. / Model No.	N/A		
Rear Axle Brakes Type	<input type="checkbox"/> Cam	<input checked="" type="checkbox"/> Disc	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	Knorr / SB7		
External Parking Brake Mfr. / Model No.	N/A		

HVAC

Driver Heating System Type	<input type="checkbox"/> Engine Coolant	<input checked="" type="checkbox"/> Electric (Battery Coolant)	<input type="checkbox"/> Other
Capacity (Btu/hr)	Not available - Tied to passenger heating system		
Mfr./Model No.	See passenger heating system		
Passenger Heating System Type	<input type="checkbox"/> Engine Coolant	<input checked="" type="checkbox"/> Electric (Battery Coolant)	<input type="checkbox"/> Other
Capacity (Btu/hr)	68,000		
Mfr./Model No.	Valeo / 11140546A		
Auxiliary Heater	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
Mfr./Model No.	N/A		
Driver Air Conditioner	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Location	Tied to passenger air conditioning system		
Capacity (Btu/hr)	Not available – Tied to passenger air conditioning system		
A/C Compressor Mfr./Model Number	See passenger air conditioning system		
Passenger Air Conditioner	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	

VEHICLE DATA FORM

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Bus Number: 2022-07-P	Date: 05/18/22
-----------------------	----------------

HVAC (cont.)

Passenger Air Conditioner	<input type="checkbox"/> Engine Driven <input checked="" type="checkbox"/> Electric <input type="checkbox"/> Other
Location	Roof
Capacity (Btu/hr)	65,000
A/C Compressor Mfr./Model No.	Panasonic / C-SWS225H00C

STEERING

Steering Gear Box Type	Electric / Hydraulic		
Mfr. / Model No.	Ross / Hydrapower		
Steering Wheel Diameter	18"		
Number of turns (lock to lock)	4 1/8		
Control Type	<input type="checkbox"/> Electric	<input checked="" type="checkbox"/> Hydraulic	<input type="checkbox"/> Other (explain)

OTHERS

ADA Ramps	Location: Front	Type: Fold out
ADA Lifts	Location: N/A	Type: N/A
Mfr. / Model No.	Ricon / RISSR-OC27611T00	
Emergency Exit	Location: Windows	Number: 4
	Doors	2
	Roof hatch	2
Fire Suppression System Type	Not provided	
Mfr./Model No.	N/A	

CAPACITIES

Fuel Tank Capacity (gallons)	N/A
Engine Crankcase Capacity (gallons)	N/A
Transmission Capacity (gallons)	2.1
Differential Capacity (gallons)	4.4
Engine Cooling System Capacity (gallons)	N/A
Battery Cooling System Capacity (gallons)	17
Electronics Cooling System Capacity (gallons)	11.8
Drive Motor Cooling System (gallons)	N/A – part of electronics cooling system
Power Steering Fluid Capacity (quarts)	11

COMPONENT/SUBSYSTEM INSPECTION FORM

Page 1 of 1

Bus Number: 2022-07-P	Date: 05/18/22
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Subsystem	Checked	Initials	Comments
Air Conditioning Heating and Ventilation	✓	E.D.	Provision for auxiliary diesel-fueled heater, however no diesel-fueled heater was installed.
Body and Sheet Metal	✓	E.D.	No sheet metal.
Frame	✓	E.D.	Unibody-composite (fiberglass)
Steering	✓	E.D.	None noted.
Suspension	✓	E.D.	None noted.
Interior/Seating	✓	E.D.	None noted.
Axles	✓	E.D.	None noted.
Brakes	✓	E.D.	None noted.
Tires/Wheels	✓	E.D.	None noted.
Exhaust	N/A	E.D.	None noted.
Fuel System	N/A	E.D.	Battery Electric.
Transmission	✓	E.D.	None noted.
Drive Motors/Axle	✓	E.D.	None noted.
Engine	N/A	E.D.	N/A
Accessories	✓	E.D.	N/A
ADA Accessible Lift System	N/A	E.D.	N/A
ADA Accessible Ramp System	✓	E.D.	None noted.
Interior Fasteners	✓	E.D.	None noted.
Batteries	✓	E.D.	None noted.
Emergency Exits	✓	E.D.	None noted.
Fire Suppression System	N/A	E.D.	Not provided.

CHECK - IN



**Proterra Operating Company, Inc.
ZX5 PD2**



CHECK - IN CONT.



**Proterra Operating Company, Inc.
ZX5 PD2**



CHECK - IN CONT.



RICON / RISSR-OC 27611Y00 FOLD-OUT RAMP



OPERATOR'S AREA

CHECK - IN CONT.

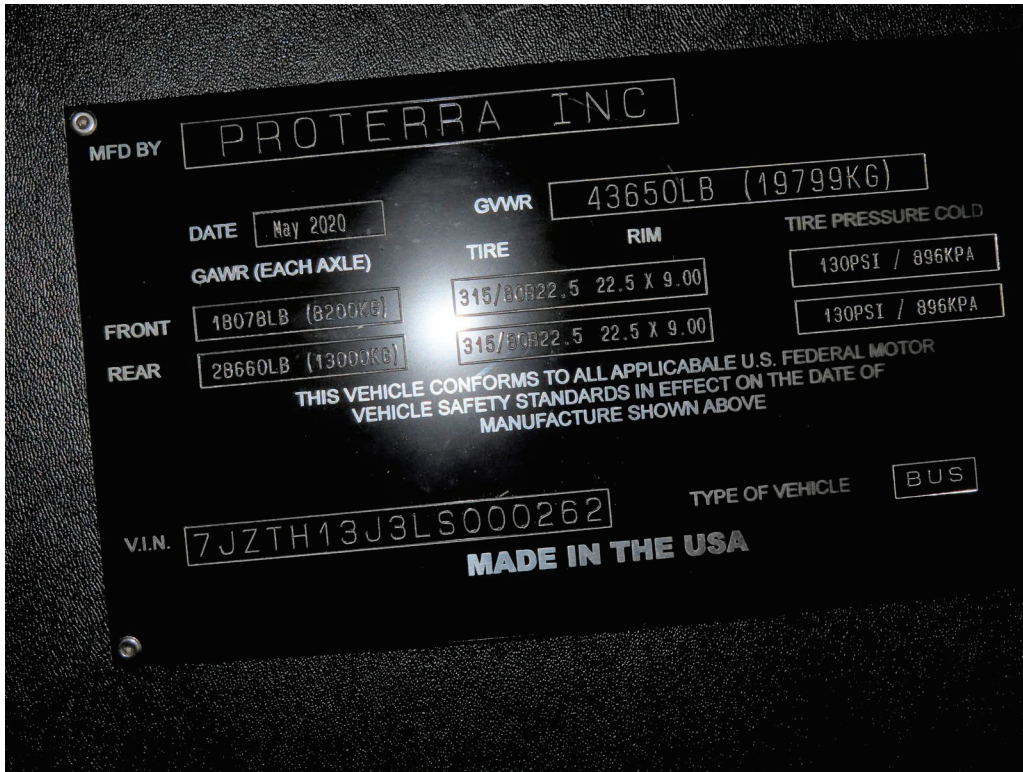


INTERIOR FROM FRONT



INTERIOR FROM REAR

CHECK - IN CONT.



VIN TAG



PLACARD SHOWING MAXIMUM STANDING PASSENGERS

CHECK - IN CONT.

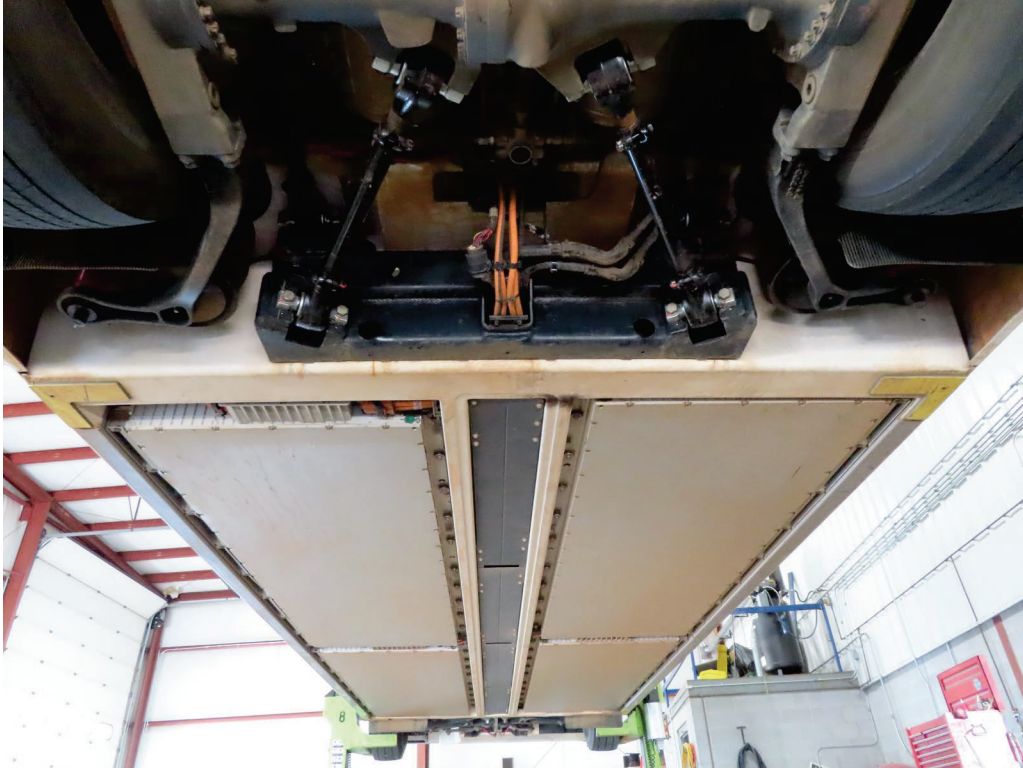


REAR COMPARTMENT



UNDERSIDE OF BUS – FRONT TO REAR

CHECK - IN CONT.



UNDERSIDE OF BUS – REAR TO FRONT

4. PERFORMANCE - AN ACCELERATION, GRADEABILITY, AND TOP SPEED TEST

4-I. TEST OBJECTIVE

The objective of this test is to determine the acceleration, gradeability, and top speed capabilities of the bus.

4-II. TEST DESCRIPTION

In this test, the bus was operated at SLW on a chassis dynamometer. The procedure dictates that the test bus be accelerated to a maximum “power-limited”/“governed” or maximum “safe” speed not exceeding 80 mph. The maximum power-limited/governed speed, if applicable, is the top speed as limited by the engine control system. The maximum safe speed is defined as the maximum speed that the dynamometer, the tires or other bus components are limited to. The test vehicle speed was measured using a speed encoder built in the chassis dynamometer. The time intervals between 10 mph increments were recorded using a Data Acquisitions System. Time-speed data and the top speed attained were recorded on the Performance Data Form. The recorded data was used to generate a percent grade versus speed table and a speed versus time curve. All the above are available in the following pages.

4-III. DISCUSSION

This test consisted of three runs from standstill to full throttle on the chassis dynamometer. Speed versus time data was obtained for each run and results are averaged to minimize test variability. The test was performed up to a maximum governed speed of 65.0 mph. The calculated gradeability results are attached. The average time to reach 30 mph was 12.0 seconds. The maximum gradeability at 10 mph was 18.48% and at 40 mph was 5.31%.

PERFORMANCE DATA FORM

Page 1 of 1

Bus Number: 2022-07-P		Date: 06/22/22	
Personnel: G.C. & S.I.			
Temperature (°F): 75		Humidity (%): 52	
Barometric Pressure (inHg): 28.8			
		INITIALS:	
Air Conditioning - OFF	✓Checked	G.C.	
Heater pump motor - OFF	✓Checked	G.C.	
Defroster - OFF	✓Checked	G.C.	
Exterior and interior lights - ON	✓Checked	G.C.	
Windows and doors - CLOSED	✓Checked	G.C.	
ACCELERATION, GRADEABILITY, TOP SPEED			
Recorded Interval Times			
Speed	Run 1	Run 2	Run 3
10 mph	3.0	2.8	3.0
20 mph	7.2	7.1	7.3
30 mph	12.0	11.9	12.1
40 mph	20.3	20.2	20.6
50 mph	30.6	30.8	31.3
60 mph	48.3	49.1	49.9
70 mph	N/A	N/A	N/A

Maximum Speed (mph): 65.0 (maximum governed speed reached)

PERFORMANCE SUMMARY SHEET

Bus Number: 2022-07-P	Date: 06/22/22
Personnel: G.C. & S.I.	

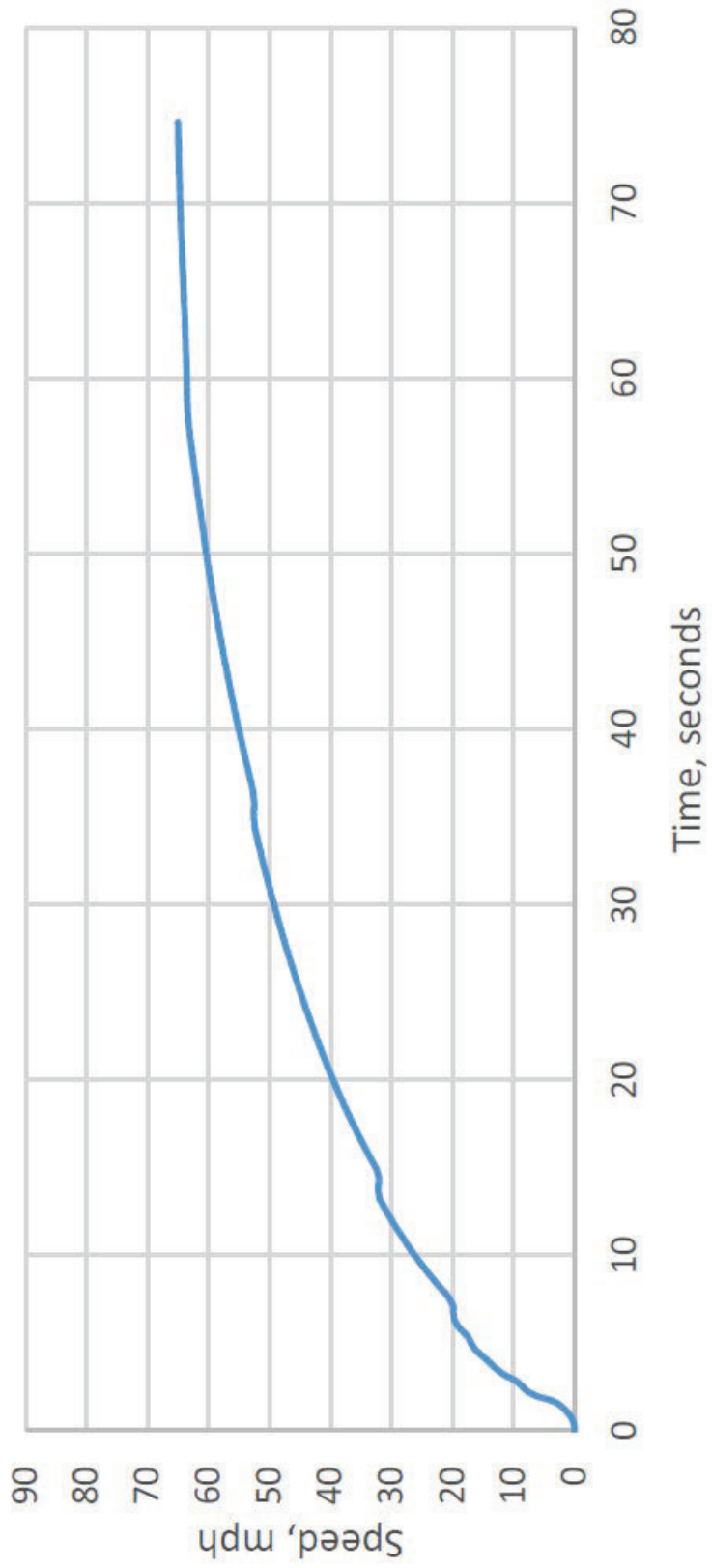
Test Conditions:

Temperature (°F): 75	Humidity (%): 52
Barometric Pressure (inHg): 28.8	

Test Results:

Vehicle Speed (MPH)	Time (SEC)	Acceleration (FT/SEC^2)	Max. Grade (%)
1.0	1.0	3.53	10.96
5.0	1.9	8.45	26.24
10.0	2.9	5.95	18.48
15.0	4.2	4.44	13.79
20.0	7.2	1.49	4.63
25.0	9.4	3.22	10.00
30.0	12.0	2.49	7.73
35.0	16.6	2.14	6.65
40.0	20.7	1.71	5.31
45.0	25.1	1.38	4.29
50.0	31.0	1.12	3.48
55.0	39.9	0.96	2.98
60.0	49.1	0.68	2.11
65.0	74.6	Maximum Speed	

Proterra Operating Company, Inc. Bus# 2022-07-P



6. ENERGY ECONOMY AND RANGE TEST – AN ENERGY CONSUMPTION AND RANGE TEST FOR BATTERY ELECTRIC BUSES USING APPROPRIATE OPERATING CYCLES

6-I. TEST OBJECTIVE

The objective of this test is to provide accurate comparable energy consumption data on battery electric transit buses produced by different manufacturers. This energy economy test bears no relation to the calculations done by the Environmental Protection Agency (EPA) to determine levels for the Corporate Average Fuel Economy Program. EPA's calculations are based on tests conducted under laboratory conditions intended to simulate city and highway driving. This energy economy test, as designated here, is a measurement of the energy consumed by a vehicle traveling a specified test operating profile, under specified operating conditions that are typical of transit bus operation. The results of this test will not represent actual energy usage but will provide data that can be used by FTA Grantees to compare buses tested using this procedure.

6-II. TEST DESCRIPTION

This test is performed in the emissions bay of the LTI Vehicle Testing Laboratory. The Laboratory is equipped with a Schenk Pegasus 300 HP, large-roll (72 inch diameter) chassis dynamometer suitable for heavy-vehicle emissions testing. The driving cycles are the Manhattan cycle, a low average speed, highly transient urban cycle (Figure 1), the Orange County Bus Cycle which consists of urban and highway driving segments (Figure 2), and the EPA HD-UDDS Cycle (Figure 3). This test is conducted at seated load weight.

This test is conducted generally as per the methods described in the SAE standard J 1634-2017. The light-duty test cycles specified in this standard are replaced by transit bus test cycles mentioned above.

The Multi-Cycle test (MCT) procedure is adopted for this bus. The end of test is determined when the bus cannot maintain 50 miles per hour or earlier, as recommended by the bus manufacturer. The battery system is recharged to full SOC at the end of the test, following procedures specified in SAE J 1634-2017. During the recharge, the DC energy (into the battery system) and the AC energy (into the charger) are recorded. From these data, the average AC energy consumption, the range (miles) and the charger efficiency for each test cycle are reported.

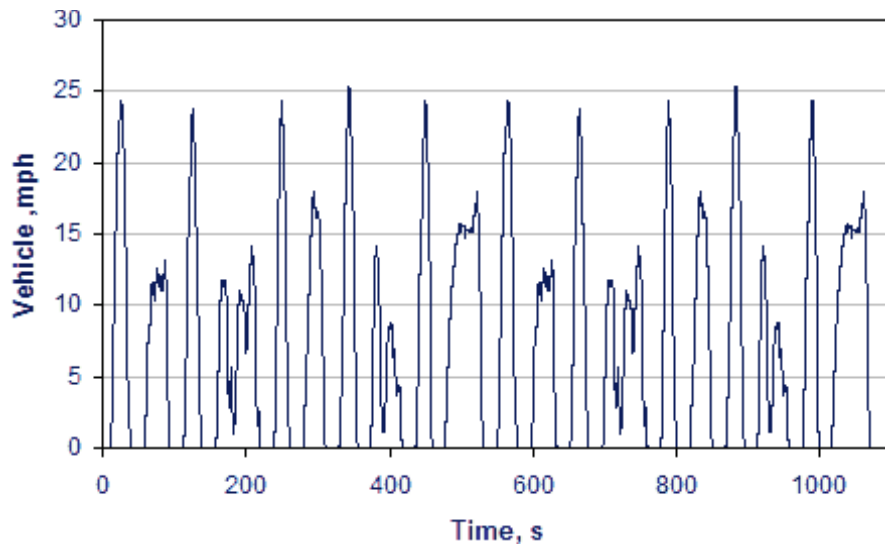


Figure 1. Manhattan Driving Cycle (duration 1089 sec, Maximum speed 25.4 mph, average speed 6.8 mph)

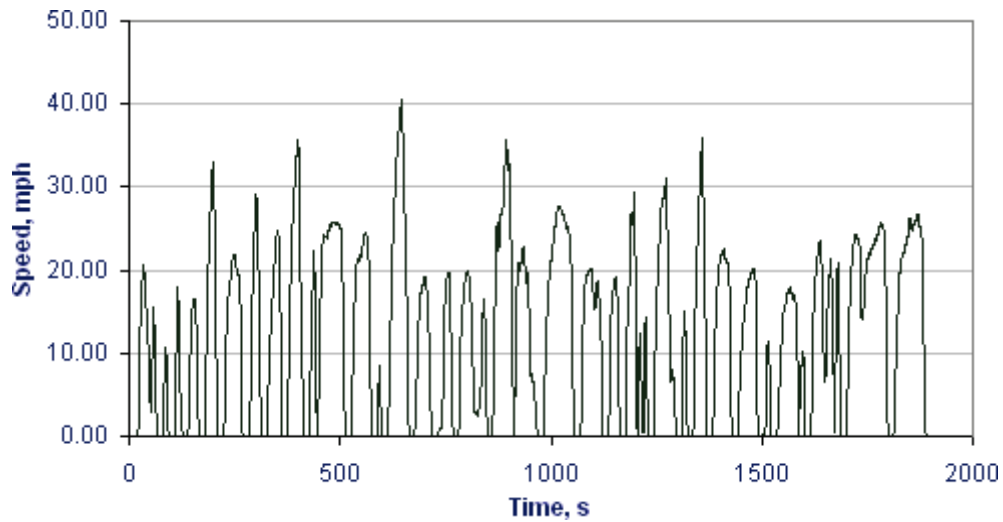


Figure 2. Orange County Bus Cycle (Duration 1909 Sec, Maximum Speed 41 mph, Average Speed 12 mph).

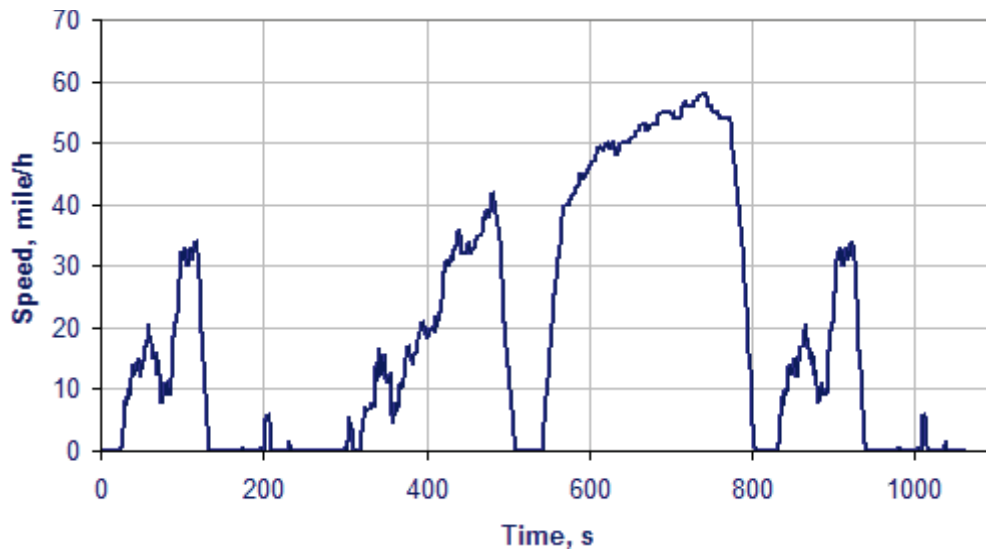


Figure 3. HD-UDDS Cycle (duration 1060 seconds, Maximum Speed 58 mph, Average Speed 18.86 mph).

6-III. DISCUSSION

The driving cycle consists of three simulated transit driving cycles: Manhattan, Orange County Bus Cycle and the HD-UDDS, as described in 6-II.

An extensive pretest maintenance check is conducted including the replacement of all lubrication fluids, if applicable. The details of the pretest maintenance are given in the first three Pretest Maintenance Forms. The fourth sheet shows the Pretest Inspection Form. Finally, the summary sheet provides the average energy consumption and range of bus for the three test cycles. The test was conducted at a seated load weight of 40,750 lbs. The average AC energy consumption for the Manhattan, OCBC and the HD-UDDS were 2,295 Wh/mile, 2,173 Wh/mile and 2,167 Wh/mile respectively. The range for the three driving cycles were 288 miles, 304 miles and 305 miles respectively. The charger efficiency was 92.1%.

This bus was tested using the Manhattan, Orange County and UDDS driving cycles. The energy economy and range results for buses tested using these cycles are not directly comparable to buses tested under the earlier protocol that uses the CBD, Arterial and Commuter driving cycles.

During the pre-test maintenance, a leak was discovered in the HVAC/Battery Cooling system unit. A representative from Valeo (HVAC vendor) discovered a brazed joint in the refrigeration unit was leaking. The joint was cleaned and brazed again.

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 1 of 3

Bus Number: 2022-07-P	Date: 06/20/22	SLW (lb.): 40,750
Personnel: R.M., F.T. & E.L.		

ENERGY SYSTEM	OK
Install fuel measurement system	✓
Remarks:	
BRAKES/TIRES	OK
Inspect hoses	✓
Inspect brakes	✓
Check tire inflation pressures (mfg. specs.)	✓
Check tire wear (less than 50%)	✓
Remarks: No issues with brakes and tires.	
BATTERY COOLING SYSTEM	OK
Check hoses and connections	✓
Check system for coolant leaks	✓
Remarks: A/C system had a leak and it had to be repaired by the manufacturer.	
Had a chiller for the batteries.	

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 2 of 3

Bus Number: 2022-07-P	Date: 06/20/22
Personnel: R.M., F.T. & E.L.	
ELECTRICAL SYSTEM	OK
Check battery	✓
Inspect wiring	✓
Inspect terminals	✓
Check lighting	✓
Remarks: No issues with the electrical system.	
DRIVE SYSTEM	OK
Drain transmission fluid	N/A
Replace filter/gasket	N/A
Check hoses and connections	✓
Replace transmission fluid	N/A
Check for fluid leaks	✓
Remarks: This bus has a four-speed transmission with fluid, but no filter.	
LUBRICATION	OK
Lube all chassis grease fittings	✓
Lube universal joints	✓
Replace differential lube including axles	N/A
Remarks: No issues on lubrication.	

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 3 of 3

Bus Number: 2022-07-P	Date: 06/20/22
Personnel: R.M., F.T. & E.L.	
OTHER ITEMS	OK
Replace air filter	N/A
Inspect air compressor and air system	✓
Inspect vacuum system, if applicable	N/A
Check and adjust all drive belts	N/A
Remarks: Electric bus has no air filter, vacuum system or drive belts.	
STEERING SYSTEM	OK
Check power steering hoses and connectors	✓
Service fluid level	✓
Check power steering operation	✓
Remarks: No issues with steering system.	
	OK
Ballast bus to seated load weight during coast down	✓
TEST DRIVE	OK
Check brake operation	✓
Check transmission operation	✓
Remarks: Brakes were good.	

ENERGY ECONOMY PRE-TEST INSPECTION FORM

Page 1 of 1

Bus Number: 2022-07-P	Date: 06/20/22
Personnel: G.C., S.I., R.M., F.T. & E.L.	
PRE WARM-UP	If OK, Initial
Energy Economy Pre-Test Maintenance Form is complete	R.M.
Cold tire pressure (psi): Front 130 Middle <u>N/A</u> Rear 130	R.M.
Energy economy instrumentation installed and working properly.	S.I.
Bus is loaded to SLW during coast down	R.M.
WARM-UP	If OK, Initial
Interior and exterior lights on, evaporator fan on	G.C.
Air conditioner off	G.C.
Defroster off	G.C.
Windows and doors closed	G.C.
Do not drive with left foot on brake	G.C.

ENERGY ECONOMY DATA FORM (Battery Electric Buses)

Page 1 of 1

Bus Number: 2022-07-P	Manufacturer: Proterra	Date: 06/21/22
Fuel Type: Electric	Personnel: G.C. & S.I.	
Temperature (°F): 80	Humidity (%): 52	Barometric Pressure (inHg): 28.7
SLW (lb.): 40,750	Charger: Proterra	

	Manhattan	Orange County	UDDS
AC Energy (Wh/mile)	2,295	2,173	2,167
Range (miles)	288	304	305
Charger Efficiency (%)	92.1		

Comments: None noted

6.0 ENERGY ECONOMY



BUS TESTED ON CHASSIS DYNAMOMETER FOR PERFORMANCE AND ENERGY ECONOMY



PROTERRA CHARGER



PROTERRA

Commonwealth of Virginia

11. Base Bus Floor Plan



VIRGINIA DGS TRANSIT BUS (35')

PROPOSED SEATING LAYOUT

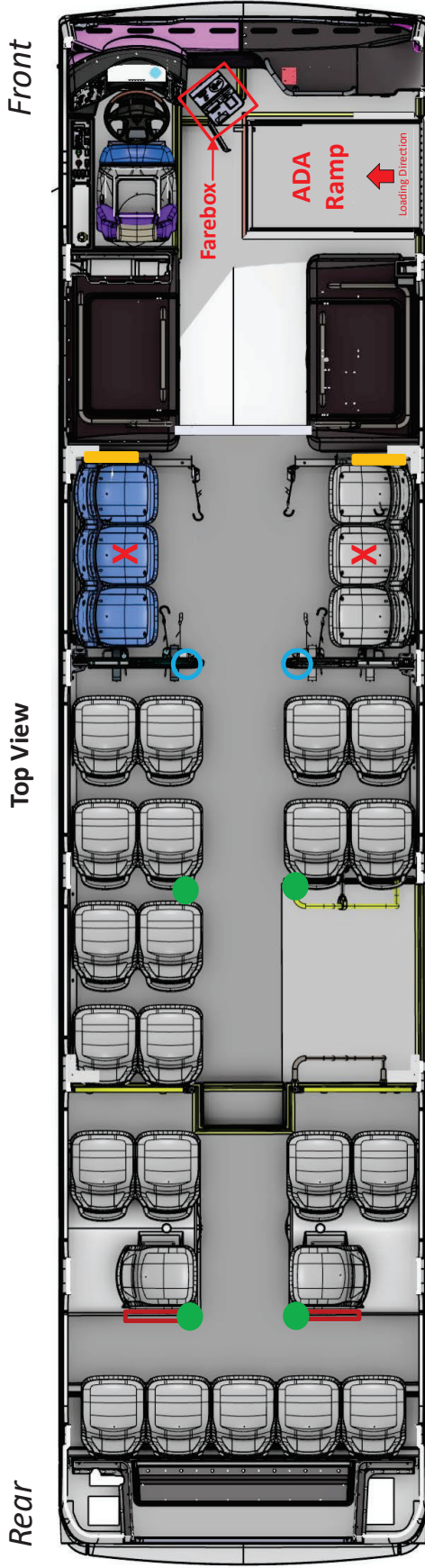
REVISION 00
SEPTEMBER 7TH, 2022

PLATFORM: 35' ZX5

AGENCY APPROVAL:

NAME:

VIRGINIA DGS - PROPOSED SEATING LAYOUT (PRO TERRA 35' ZX5)



Misc Options

- Docket 90A: No
- Aisle Facing Flip Armrest: 2
- Aisle Facing Fixed Armrest: 2 (To Be Determined)
- Stanchion Cups: 4
- USB Hubs (optional): No
- Special Instructions: Single passenger rear longitudinal seats without clips
ADA flip-up seat wiring harness routing "P-clamps"
- Auxiliary Heating Clearance: No

Restraint Options

- C/S Type:
- S/S Type:
- Signaling Device:
- Instruction Language: English / Spanish
- Stanchion Cups: 2 (x1 per barrier, indicated by **o**)

Passenger Seating

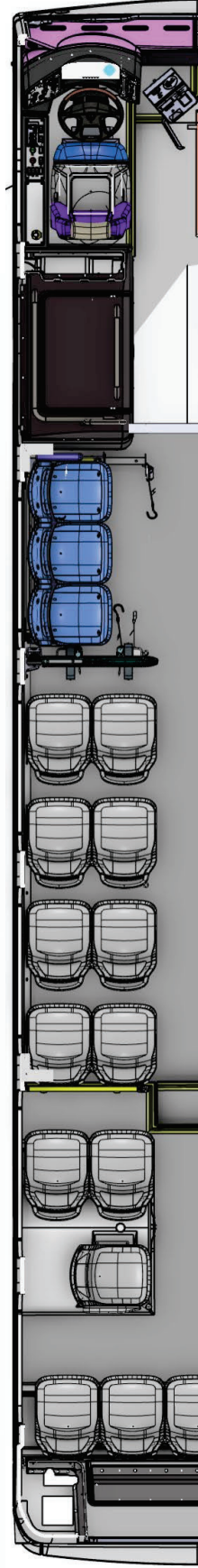
Model: USSC Gemini

Number of Seats: 29

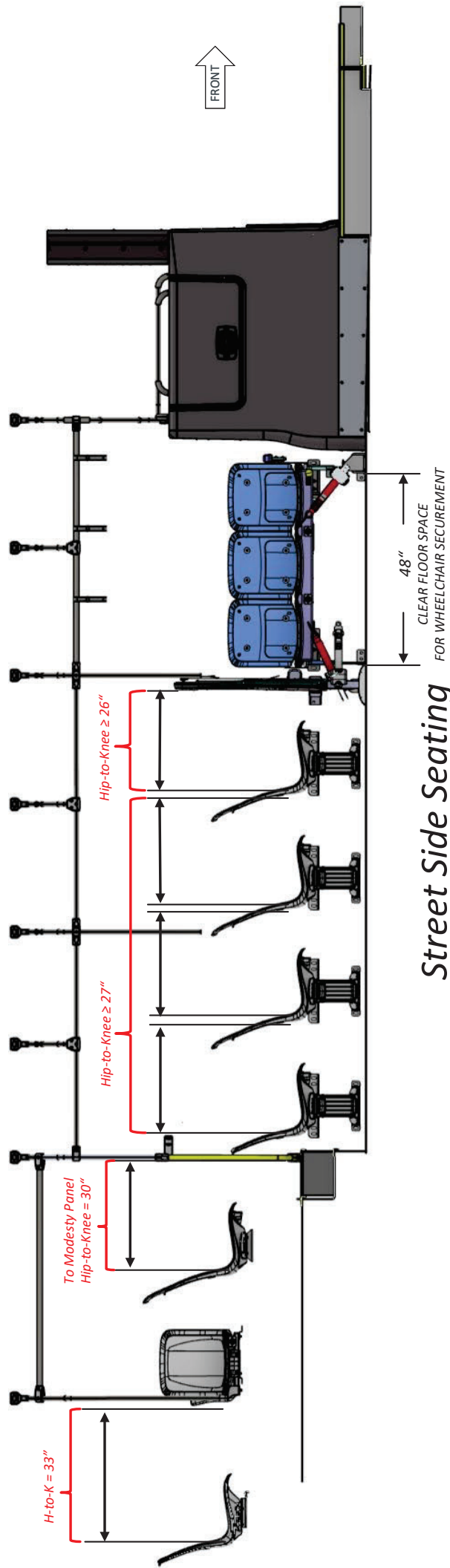
VIRGINIA DGS - PROPOSED SEATING LAYOUT (PRO TERRA 35' ZX5)



PRO TERRA
1 Whitlee Court | Greenville, SC 29607



Bus Centerline Section



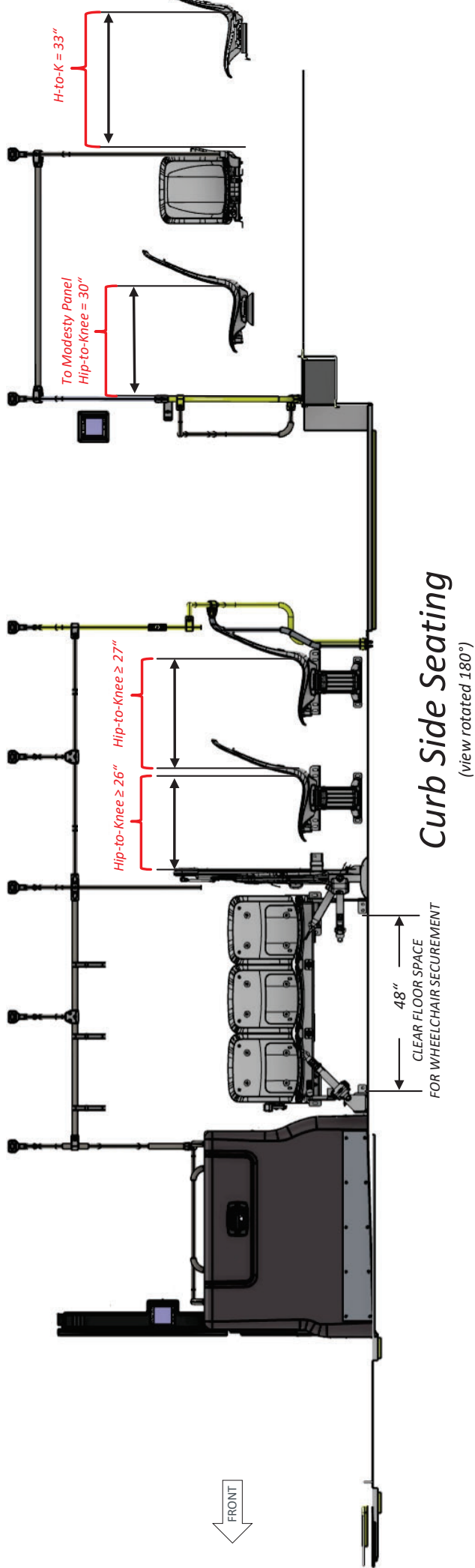
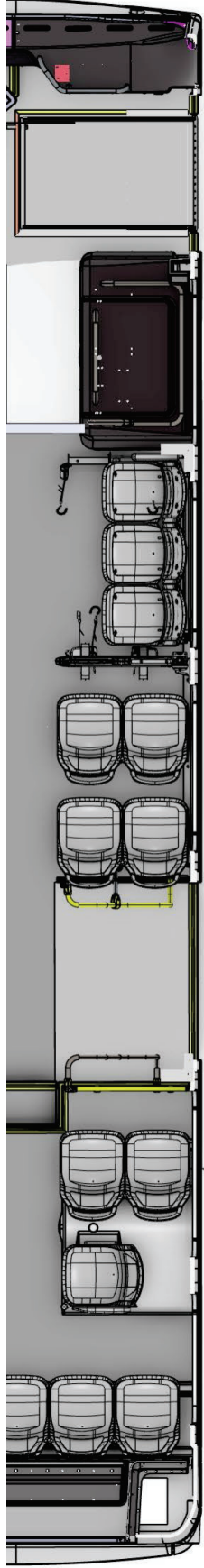
Street Side Seating



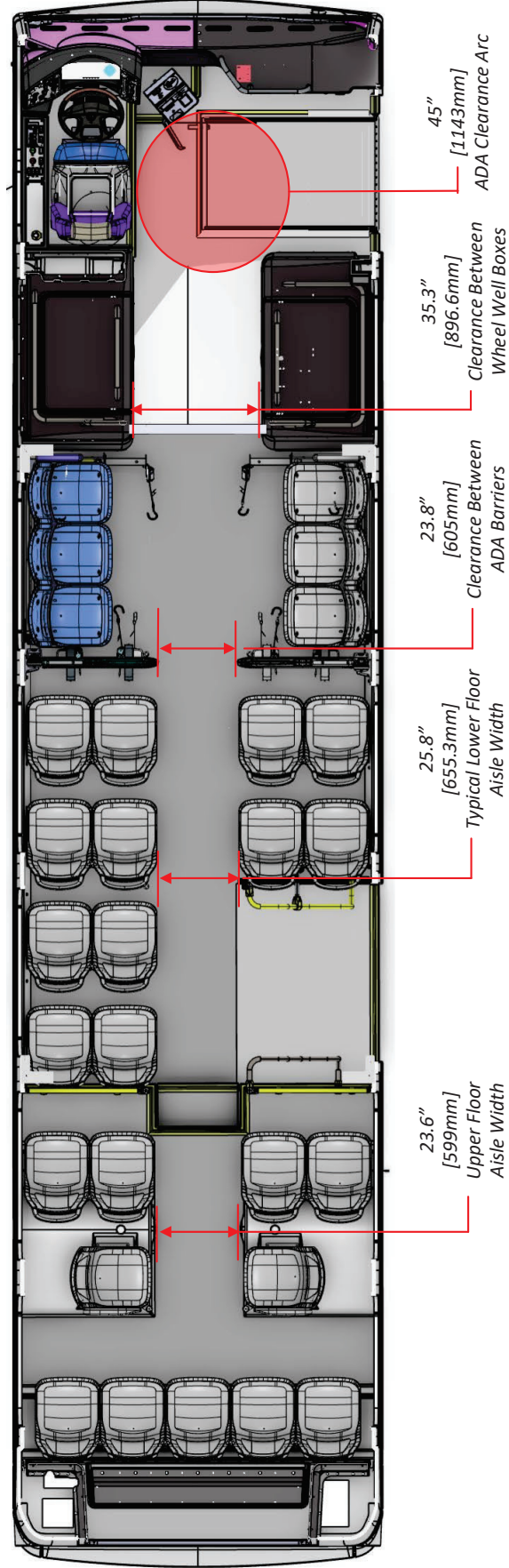
PROTERRA
1 Whitlee Court | Greenville, SC 29607

VIRGINIA DGS - PROPOSED SEATING LAYOUT (PROTERRA 35' ZX5)

Bus Centerline Section



VIRGINIA DGS - PROPOSED SEATING LAYOUT (PROTERRA 35' ZX5)



Interior Circulation Clearances

VIRGINIA DGS - PROPOSED SEATING LAYOUT (PROTERRA 35' ZX5)

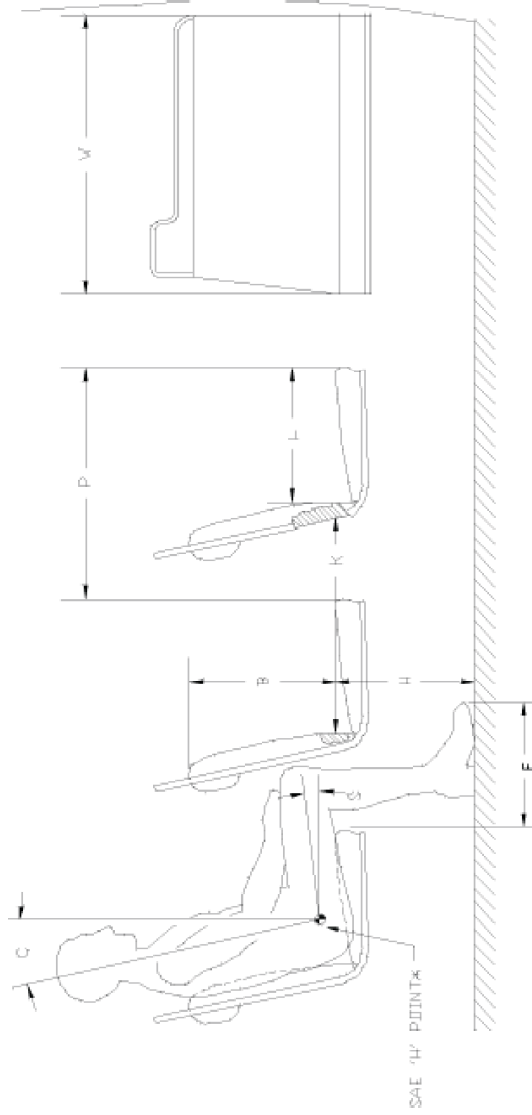


$$3103400\text{mm}^2 = 3.1\text{m}^2 = 33.4\text{ft}^2 / 1.5 = 22 \text{ passengers}$$

Free Floor Space Calculation

VIRGINIA DGS - PROPOSED SEATING LAYOUT (PRO TERRA 35' ZX5)

Required Dimensions Per APTA (TS 78)



Width:

→ $W \geq 35\text{in}$

Length:

→ $L = 17\text{in} \pm 1\text{in}$

Seat Back Height:

→ $B \geq 15\text{in}$

Seat Height:

→ $H = 17\text{in} \pm 1\text{in}$

Foot Room:

→ $F \geq 14\text{in}$

Seat Cushion Slope:

→ $S = 5^\circ \text{ to } 11^\circ$

Seat Back Slope:

→ $C = 8^\circ \text{ to } 17^\circ$

Hip-to-Knee Room:

→ $K \geq 27''$ (seat-to-seat)

→ $K \geq 26''$ (to vertical surface)

Aisle Width (per TS 78.10):

→ Between seats $\geq 20\text{in}$

→ At 32in above floor $\geq 24\text{in}$

VIRGINIA DGS - PROPOSED SEATING LAYOUT (PROTERRA 35' ZX5)

REVISION HISTORY:

REV00...

INITIAL RELEASE FOR RFP ACTIVITY

9/7/2021



VIRGINIA DGS TRANSIT BUS (40')

PROPOSED SEATING LAYOUT

REVISION 00
SEPTEMBER 7TH, 2022

PLATFORM: 40' ZX5

AGENCY APPROVAL:

NAME:

VIRGINIA DGS - PROPOSED SEATING LAYOUT (PRO TERRA 40' ZX5)



Rear

Top View

Front



Misc Options

- Docket 90A: No
- Aisle Facing Flip Armrest: 2
- Aisle Facing Fixed Armrest: 2 (To Be Determined)
- Stanchion Cups: 8
- USB Hubs (optional): No
- Special Instructions: Three passenger rear longitudinal seats without clips
ADA flip-up seat wiring harness routing "p-clamps"
- Auxiliary Heating Clearance: No

Restraint Options

- C/S Type: 4pt – Floor Mounted
- S/S Type: 4pt – Floor Mounted
- Signaling Device: Touch Pad (Indicated by X)
- Instruction Language: English / Spanish
- Stanchion Cups: 2 (x1 per barrier, indicated by O)

Passenger Seating

Model: USSC Gemini

Number of Seats: 40

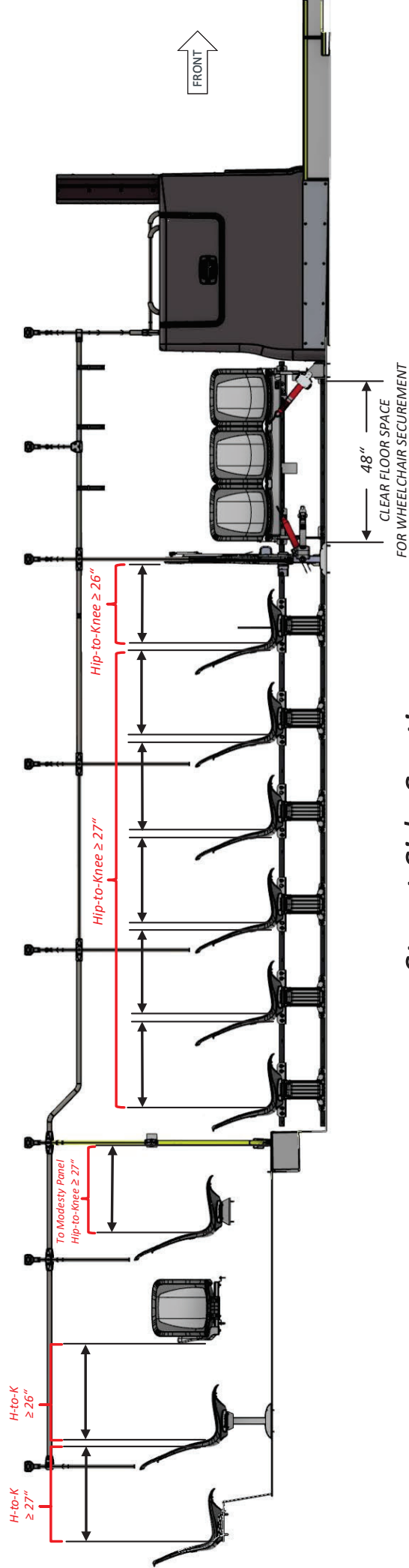
VIRGINIA DGS - PROPOSED SEATING LAYOUT (PRO TERRA 40' ZX5)



PRO TERRA
1 Whitlee Court | Greenville, SC 29607



Bus Centerline Section



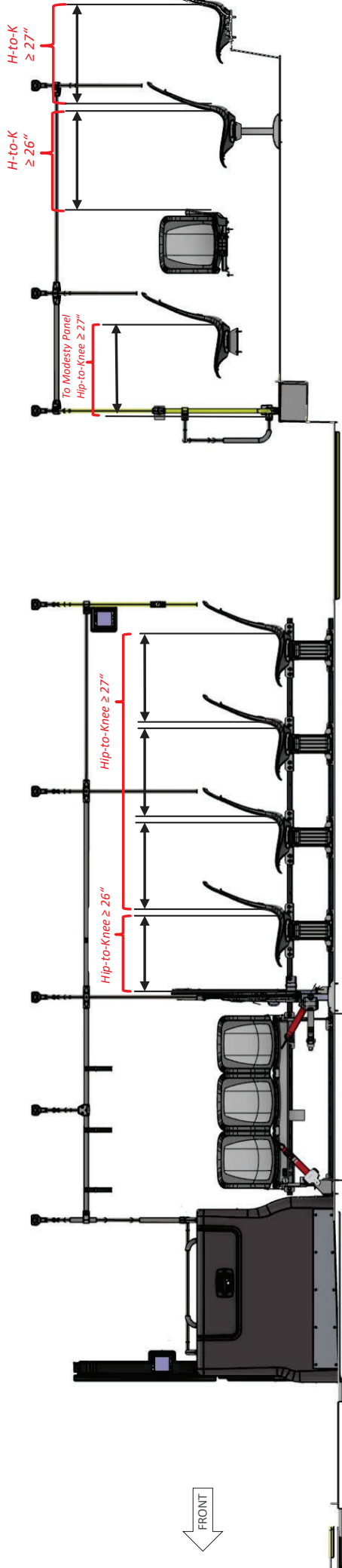
Street Side Seating



PROTERRA
1 Whitlee Court | Greenville, SC 29607

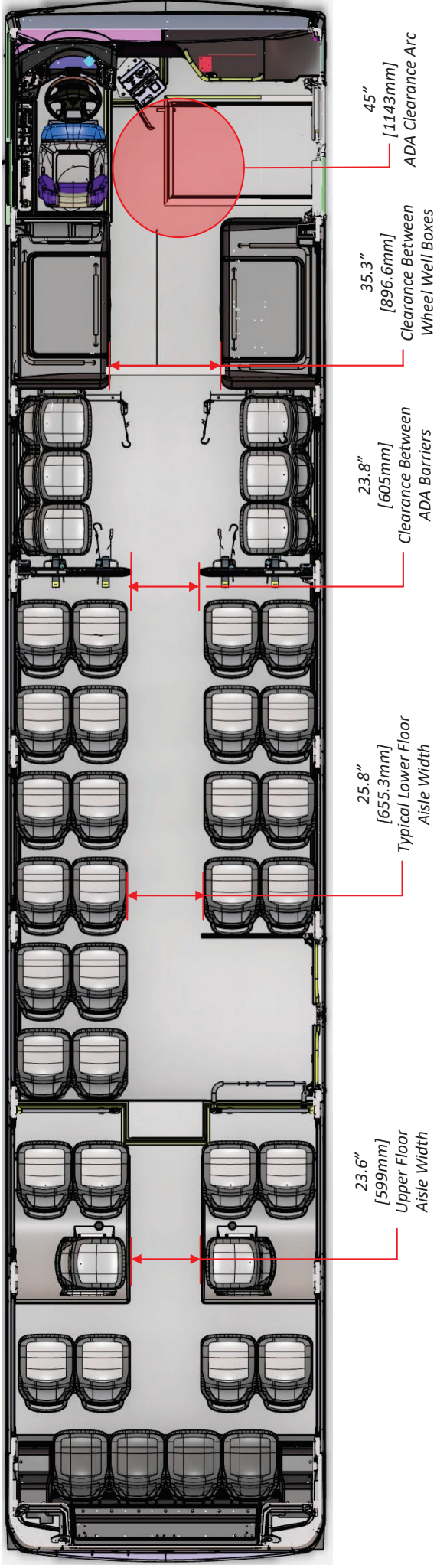
VIRGINIA DGS - PROPOSED SEATING LAYOUT (PROTERRA 40' ZX5)

Bus Centerline Section



Curb Side Seating (view rotated 180°)

VIRGINIA DGS - PROPOSED SEATING LAYOUT (PROTERRA 40' ZX5)

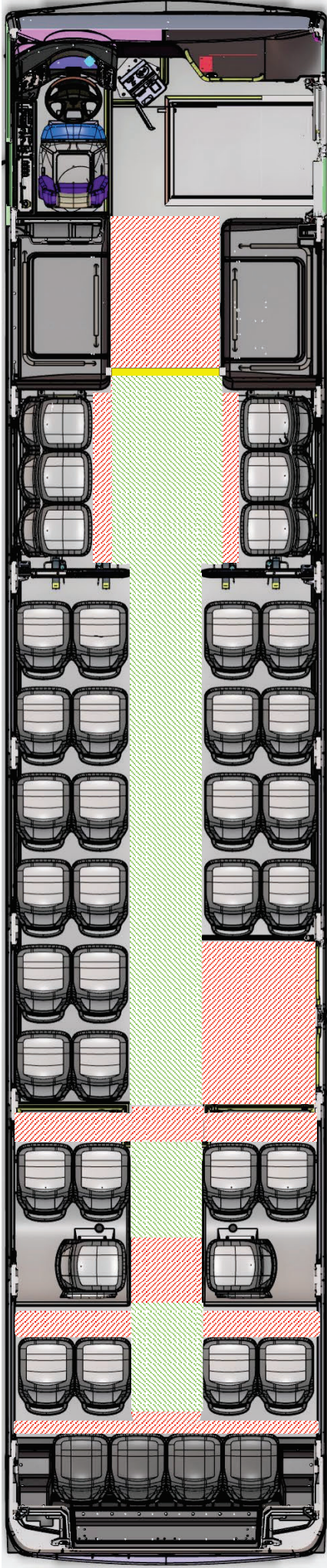


Interior Circulation Clearances

VIRGINIA DGS - PROPOSED SEATING LAYOUT (PROTERRA 40' ZX5)



PROTERRA
1 Whitlee Court | Greenville, SC 29607

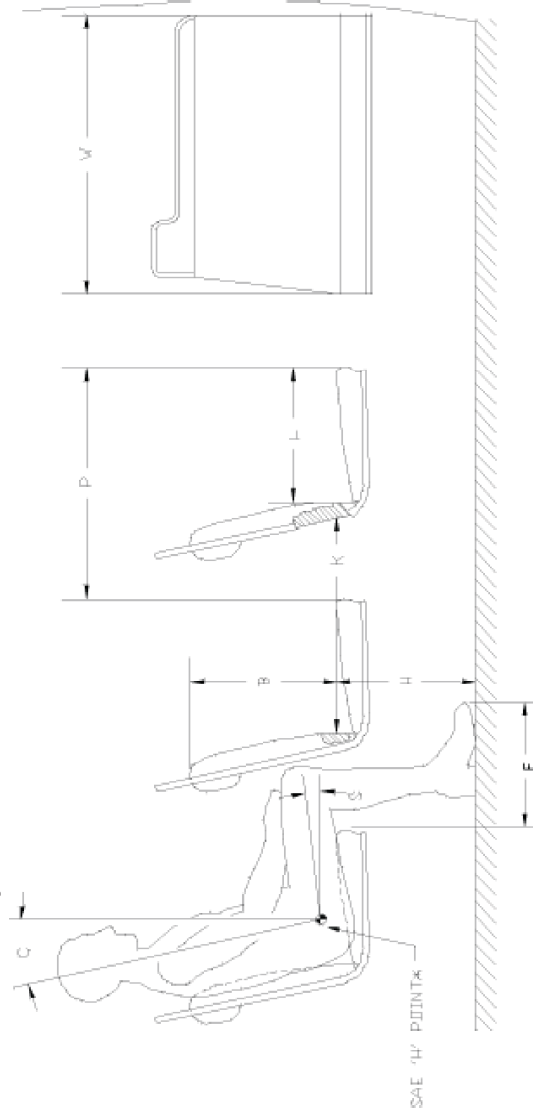


$$4,394,301\text{mm}^2 = 4.39\text{m}^2 = 47.3\text{ft}^2 / 1.5 = 31 \text{ standees}$$

Free Floor Space Calculation

VIRGINIA DGS - PROPOSED SEATING LAYOUT (PROTERRA 40' ZX5)

Required Dimensions Per APTA (TS 78)



Width:

→ $W \geq 35\text{in}$

Length:

→ $L = 17\text{in} \pm 1\text{in}$

Seat Back Height:

→ $B \geq 15\text{in}$

Seat Height:

→ $H = 17\text{in} \pm 1\text{in}$

Foot Room:

→ $F \geq 14\text{in}$

Seat Cushion Slope:

→ $S = 5^\circ \text{ to } 11^\circ$

Seat Back Slope:

→ $C = 8^\circ \text{ to } 17^\circ$

Hip-to-Knee Room:

→ $K \geq 27''$ (seat-to-seat)

→ $K \geq 26''$ (to vertical surface)

Aisle Width (per TS 78.10):

→ Between seats $\geq 20\text{in}$

→ At 32in above floor $\geq 24\text{in}$

VIRGINIA DGS - PROPOSED SEATING LAYOUT (PROTERRA 40' ZX5)

REVISION HISTORY:

REV00...

INITIAL RELEASE FOR RFP ACTIVITY

9/7/2022





PROTERRA

Commonwealth of Virginia

12. ZX5 Specification

PROTERRA
ZX5

35 FOOT
BATTERY-ELECTRIC
TRANSIT BUS
PLATFORM SPECIFICATIONS



	Description	ZX5+
Total Energy	kWh	492
Operating Efficiency*	kWh/mile	1.7-2.5
	MPGe	15-22
Operating Range*	Miles	160-240
Top Speed (Proterra-governed)	mph (per tire rating)	65
Acceleration (at SLW, seconds)	0 to 20 mph	6.2
	20 to 50 mph	21.6
Gradability (top speed at % grade, at SLW, mph)	5%	48
	10%	29
	15%	19
Max Grade (at SLW)		29.5%
Horsepower	Peak	322
	Continuous	275
Motor	Single 240kW permanent magnet drive motor	•
Gearbox	4-speed EV transmission	•
Curb Weight	lbs	30,050
Max Gross Vehicle Weight Rating	lbs	43,650

CHARGING

Max Plug-in Charge Rate at 200A	kW	147
Max Plug-in Charge Rate at 300A	kW	221
Max Overhead Charge Rate at 500A	kW	370
Overhead Charging***	Miles replenished per 10 minutes **	24
	Est. time 0-80% at 450 kW	1.3 hrs
Plug-in Charging***	Est. time 0-80% at 150 kW	2.6 hrs
	Est. time 0-80% at 180 kW	1.9 hrs

VEHICLE DIMENSIONS

Length (over bumpers)	443"
Roof Height	129.5"
Width (without mirrors)	102"
Width (with mirrors)	116"
Wheelbase	243"
Approach Angle	9.3°
Breakover Angle	9.4°
Departure Angle	9.3°
Turning Radius	420"

*Operating range and efficiencies approximated from simulations based on Altoona testing results at SLW, and will vary with route conditions, weather, vehicle configuration and driver behavior.
 ** ProDrive powertrain efficiencies | *** Charge time will vary depending on charger type. Estimated charge time 0-80% as displayed on driver dashboard.

PROTERRA
ZX5

35 FOOT
BATTERY-ELECTRIC
TRANSIT BUS
PLATFORM SPECIFICATIONS



INTERIOR	
Seating Capacity	29
Clear Door Width	Front 33.75", Rear 43.4"
Lighting	LED interior lighting system
Handles	Stainless-steel stanchion system
Stop Request	ADA pull cord or touch tape stop request
Doors	Sensitive edges on both front and rear door
Wipers	Electric wipers and washers
HVAC	Overhead integrated system
EXTERIOR	
Bus Body	Carbon-fiber-reinforced composite material
Tire Size	315/80R22.5
Exterior Lights	LED
BRAKES & SUSPENSION	
Braking System	Front & rear air disk brakes
Regenerative Braking	Standard
Traction	4-wheel ABS with traction control
Suspension	Multi-Link Air Ride rear suspension
ELECTRICAL SYSTEM	
Battery System	Integrated battery management system
Low Voltage	Two, Group 31 700 CCA 12v batteries
Charge Ports	J1772 CCS: One port standard at curb-side rear, 2nd port optional at street-side rear or curb-side front
Plug-in Charging	Universal standard J1772-CCS
Overhead Charging	Optional; Universal standard J3105
ADA	
	Two ADA locations, one on each side of the aisle directly behind the front wheels
	ADA securement system
	Front electrically operated wheelchair ramp (4:1, 6:1 slope)
	Rear door modesty panels
	Aisle width between front wheel wells: 35.7"
WARRANTY	
Vehicle	Complete Bus - 1 year or 50,000 miles Extended warranties and service contracts available upon request
Batteries	Standard: 6 years Extended: 12 years

PROTERRA[®] ZX5

40 FOOT BATTERY-ELECTRIC TRANSIT BUS PLATFORM SPECIFICATIONS



	Description	ZX5+	ZX5 MAX
Total Energy	kWh	492	738
Operating Efficiency*	kWh/mile	1.8-2.5	1.9-2.8
	MPGe	15-21	14-20
Operating Range*	Miles	160-240	220-340
Top Speed (Proterra-governed)	mph (per tire rating)	65	65
Acceleration (at SLW, seconds)	0 to 20 mph	6.2	6.5
	20 to 50 mph	22.8	24.8
Gradability (top speed at % grade, at SLW, mph)	5%	46	43
	10%	28	25
	15%	19	18
Max Grade (at SLW)		28%	25%
Horsepower	Peak	322	322
	Continuous	275	275
Motor	Single 240kW permanent magnet drive motor	•	•
Gearbox	4-speed EV transmission	•	•
Curb Weight	lbs	30,900	35,300
Max Gross Vehicle Weight Rating	lbs	43,650	43,650
CHARGING			
Max Plug-in Charge Rate at 200A	kW	147	147
Max Plug-in Charge Rate at 300A	kW	221	221
Max Overhead Charge Rate at 500A	kW	370	370
Overhead Charging***	Miles replenished per 10 min**	24	21
	Est. time 0-80% at 450 kW	1.3 hrs	1.9 hrs
Plug-in Charging***	Est. time 0-80% at 150 kW	2.6 hrs	3.9 hrs
	Est. time 0-80% at 180 kW	1.9 hrs	2.9 hrs
VEHICLE DIMENSIONS			
Length (over bumpers)		510"	
Roof Height		129.5"	
Width (without mirrors)		102"	
Width (with mirrors)		116"	
Wheelbase		296"	
Approach Angle		9.3°	
Breakover Angle		7.8°	
Departure Angle		9.3°	
Turning Radius		516"	
*Operating range and efficiencies approximated from simulations based on Altoona testing results at SLW, and will vary with route conditions, weather, vehicle configuration and driver behavior. ** ProDrive powertrain efficiencies *** Charge time will vary depending on charger type. Estimated charge time 0-80% as displayed on driver dashboard.			

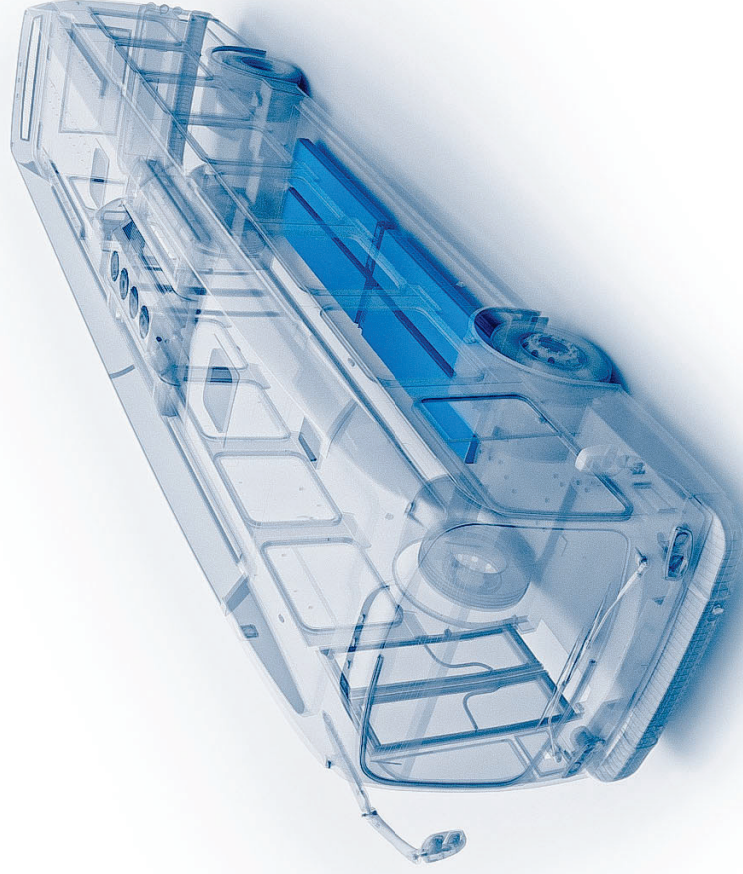
PROTERRA
ZX5

40 FOOT
BATTERY-ELECTRIC
TRANSIT BUS
PLATFORM SPECIFICATIONS



	Description
INTERIOR	
Seating Capacity	40
Clear Door Width	Front 33.75", Rear 43.5"
Lighting	LED interior lighting system
Handles	Stainless-steel stanchion system
Stop Request	ADA pull cord or touch tape stop request
Doors	Sensitive edges on both front and rear door
Wipers	Electric wipers and washers
HVAC	Overhead integrated system
EXTERIOR	
Bus Body	Carbon-fiber-reinforced composite material
Tire Size	315/80R22.5
Exterior Lights	LED
BRAKES & SUSPENSION	
Braking System	Front & rear air disk brakes
Regenerative Braking	Standard
Traction	4-wheel ABS with traction control
Suspension	Multi-Link Air Ride rear suspension
ELECTRICAL SYSTEM	
Battery System	Integrated battery management system
Low Voltage	Two, Group 31 700 CCA 12v batteries
Charge Ports	J1772 CCS: One port standard at curb-side rear, 2nd port optional at street-side rear or curb-side front
Plug-in Charging	Universal standard J1772-CCS
Overhead Charging	Optional; Universal standard J3105
ADA	
	Two ADA locations, one on each side of the aisle directly behind the front wheels
	ADA securement system
	Front electrically operated wheelchair ramp (4:1, 6:1 slope)
	Rear door modesty panels
	Aisle width between front wheel wells: 35.7"
WARRANTY	
Vehicle	Complete Bus - 1 year or 50,000 miles Extended warranties and service contracts available upon request
Batteries	Standard: 6 years Extended: 12 years

Purpose-built design enables best battery placement



Underneath and outside of passenger compartment, **separated by a sealed bulkhead** below the floor of the bus

Avoids placing batteries in a common crash zone

Battery placement creates a lower center of gravity for **greater vehicle stability**



THE PROTERRA® BATTERY

Smart. Safe. Efficient. Proven.



Protective, **ruggedized enclosure** made with ballistic-grade materials

Rigorously tested using criteria validated by a 3rd party

More than **100 sensors** deliver monitoring and diagnostics



Passengers are protected from high voltage components

Liquid cooling for **active thermal management**

A defective cell will be isolated to a small region of the pack



Proterra battery packs are designed for heavy-duty transportation.



EXTENSIVE BATTERY TESTING

Proterra battery packs have undergone extensive testing to meet the highest safety standards.



Tests performed to account for possible incidents such as

Road debris striking the battery pack

Street manhole cover explosion

Defective or failed cell within pack

Overcharge of high voltage system

Coolant flood internal to battery pack

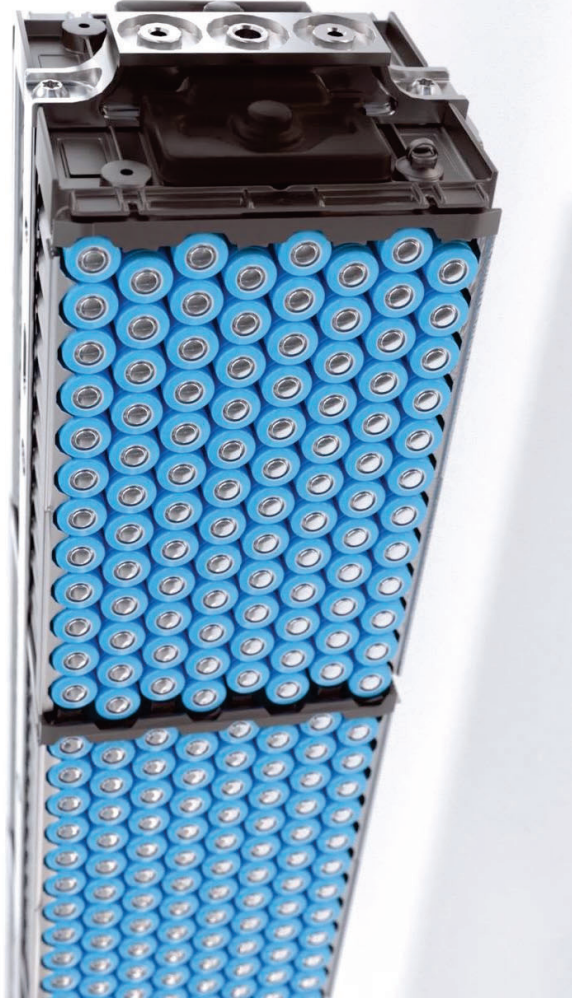
Fuel fire external to the vehicle

Collision with a combustion engine vehicle



Top tier cylindrical battery cells for the highest quality & safety standards

Manufactured by Tier 1 cell supplier, LG Chem, the top lithium-ion battery producer by capacity



Tier 1 cell suppliers have:

- higher quality requirements
- stringent spec tolerances
- rigorous qualification
- high bar for sub-suppliers
- more resources & documentation

Redundancy:

- Thousands of cells in each battery pack

Industry-leading:

- Highest energy density enables maximum battery storage



Proterra battery
design enables
cell-level passive
propagation
resistance (PPR)



Without PPR

- Defective cell can cause cascading failure of adjacent cells



With PPR

- Pack designed such that defective cell will be isolated and mitigate risk of complications throughout entire pack

State-of-the-art battery
safety feature reduces
risk of thermal event



Battery Reliability Tests

Battery system complies with all requirements of SAE J2929 Safety Standard for Electric and Hybrid Vehicle Propulsion Battery Systems Utilizing Lithium-based Rechargeable Cells

Reliability Tests	Conditions	Reference
Vibration	Random, 3 axis, >20hr/axis	Proterra Internal, SAE J2929
Mechanical Shock - Transportation	25G, 15ms, 3 axis, 6/axis	SAE J2464, SAE J2929
Mechanical Shock – Endurance	15G, 6ms, Z-axis, 4000 pulses	IEC 60068-2-27
Thermal Cycling	200 cycles, -30°C to +65°C, 85% RH	Proterra Internal, ECE R100
Combined Heat and Humidity	62 days, 80°C, 75% RH	Proterra Internal, SAE J2929
Low Temperature Operation	96 hr -40°C	IEC 60068-2-1
Ingress Protection	IPX6k, IPX9k	ISO 20653
Salt Water Immersion	2 hour fully submerged	SAE J2464
Cyclic Corrosion	63 cycles	GMW 14872
Thermal Shock	10 cycles -40°C to 70°C	SAE J2929
Electromagnetic Susceptibility	Test Per J2344	SAE J2929

Note: Proterra Internal Reliability Requirements have been developed using specifications such as SAE, ISO, and IEC.



Battery Safety & Abuse Tests

Safety/Abuse Tests	Conditions	Reference
Mechanical Shock - Crash	10G, 100ms, X and Y axis	ECE R100
Impact/Underside Abuse	Manhole Cover, Pyramid, Ballistics	Proterra Internal
Drop	2m drop, concrete floor	SAE J2464
Battery Enclosure Integrity - Crush	100kN of force	SAE J2929, UL 2580, ECE R100
Passive Propagation Resistance	Max Temp, Max SOC	SAE J2464, UL 2580
Forced Thermal Runaway	Confidential	Proterra Internal
Simulated Vehicle Fire	3 min exposure to fire underneath pack	SAE J2929, ECE R100
Short Circuit	5mΩ hard short, 20mΩ soft short	SAE J2929, SAE J2464, UN 38.3, ECE R100
Coolant Flood	Forced cooling system leak internal of pack enclosure	Proterra Internal
UN/DOT Transportation	T.1, T.2, T.3, T.4, T.5	UN 38.3
Single-point and Multi-point Over Charge	Uncontrolled charge	SAE J2929, SAE J2464, ECE R100
Single-point and Multi-point Over Discharge	Uncontrolled discharge	SAE J2929, SAE J2464, ECE R100
Single-point and Multi-point Thermal Control Failure	Charge and Discharge without thermal management	SAE J2929, SAE J2464, ECE R100
Fault Analysis	Fault analysis of battery system	SAE J2929
Protection Against High Voltage Exposure	IP2xB	SAE J2929

Note: Proterra Internal Reliability Requirements have been developed using specifications such as SAE, ISO, and IEC



Third Party and Life Cycle Testing

- Proterra is an industry leader in heavy-duty transit batteries and one of the major players driving new standards
- We have brought in third parties to review our design, manufacturing, and testing processes to ensure they meet or exceed the industry standards.
- In many cases, our testing is more rigorous than industry and regulatory standards
- In addition to the reliability, durability and safety tests, life cycle testing is performed at the battery cell level by our supplier, which is then validated by Proterra in our labs
- Life cycle data is mapped against real-world data from the > 850 buses we've delivered to model cell degradation
- Based on cell, pack and real-life data, Proterra's battery packs are expected to operate up to 12 years in a nominal commercial vehicle duty cycle

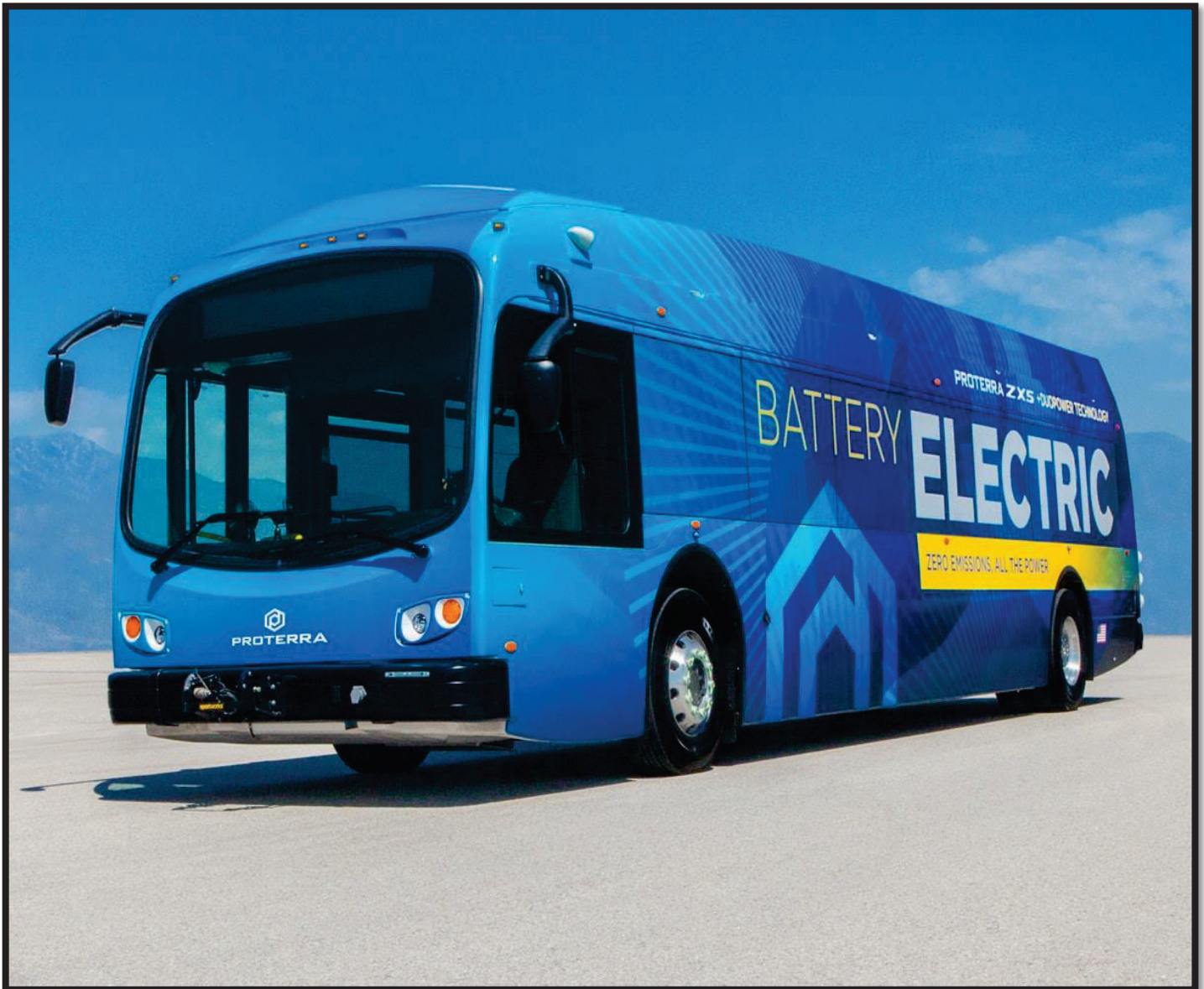




PROTERRA

Commonwealth of Virginia

13. Standard Warranty



Proterra Transit Warranty Manual

Service, Parts and Warranty Policies and Procedures

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DEFINITIONS

Complete Vehicle – All components that make up the Complete Vehicle as delivered within the Bill of Materials (BOM).

Configuration – The items selected as optional content by the Customer making up their Complete Vehicle.

Customer – The original purchaser/lessee.

Parts – Spare parts and materials purchased through Proterra's Parts Operations.

Proterra – Proterra, Inc., manufacturer of Proterra EV Transit Buses, Battery Systems, and Energy Solutions and the guarantor of the Warranty terms herein.

Provider – A business entity that is party to a Proterra Authorized Warranty Provider Agreement or an approved Customer's Service Center.

Warranty – The warranty terms and conditions specified within this document.

Battery Pack Warranty Definitions:

- **"Gross Discharge Throughput"** means the total energy discharged through the Battery Pack during its life, including energy from external chargers and energy recuperated from regenerative braking. The Gross Discharge Throughput will be tracked by the BMS at the Battery Pack level and reported through the onboard vehicle telemetry system.
- **"Nameplate Energy"** means the amount of energy stated in the specifications, bid proposal, and/or contract, divided by the number of Battery Packs (e.g., 4 Battery Packs at 400 kWh would have 100 kWh nameplate energy per Battery Pack).
- **"Available Energy"** means the amount of energy available between 0% state of charge ("SOC") - This information can be obtained using the Proterra diagnostic tool and a snapshot thereof must accompany any battery claims.

Proterra, Inc. (“**Proterra**”) warrants to the original purchaser/lessee (“**Customer**”) that its Proterra Battery Electric Transit Bus will be free from defects in material and workmanship under normal use and when properly serviced. Proterra agrees to repair or replace defective parts with either new, or re-certified parts when available, subject to the terms and conditions set forth herein.

NOTE: This Warranty does not include Proterra High Voltage Battery Packs. Please refer to the [Battery Pack Limited Warranty](#) section.

The final determination of required repairs or parts replacement shall be the sole discretion of Proterra. This Proterra Bus New Vehicle Limited Warranty (“**Warranty**”) is a limited warranty subject to the terms and conditions stated in the sections below.

EXCEPT FOR THE OBLIGATIONS, WARRANTIES AND REPRESENTATIONS SPECIFIED HEREIN, PROTERRA MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AND SPECIFICALLY DISCLAIMS ANY REPRESENTATION OR WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR NON-INFRINGEMENT, AND SPECIFICALLY DISCLAIMS ANY WARRANTY ARISING BY USAGE OF TRADE OR BY COURSE OF DEALING.

This Warranty is comprised of two sections; Section **A** applies to the Complete Vehicle, Unitized Structure, and Structural Systems. **Section B** applies to the Major Components specified within that Section.

Proterra will reimburse the customer for the parts and labor as published in the Proterra Standard Repair Time Guide (“**SRT**”) and shall follow local ordinances as necessary and if applicable in accordance with the terms of this warranty and the purchase/lease agreement, along with associated freight costs to provide required replacement parts during the warranty time period identified below.

Warranty repairs may be performed by the Customer, Provider, or Proterra only and must adhere to the terms and conditions outlined in the following statement of warranty. All components replaced under the warranty are exclusive property of Proterra Inc. and must be returned following the procedures set forth in the “Part Return” section of this manual.

Proterra, at its sole discretion or as part of a Proterra Service Plan, may perform warranty repairs at the Customer location. Costs associated with these repairs will be at the expense of Proterra during standard operating hours. Emergency afterhours warranty support may be performed at the request of the Customer for a fee. See Proterra Service Support Plans for more information.

At Proterra, safety is of the utmost importance for our customers and our employees. Therefore, we require our customers to have and maintain the necessary safety equipment, in accordance with state and local OSHA regulations, for the use of any Proterra employee, or authorized provider, that may be performing or assisting with repairs at the Customer’s location. This includes but is not limited to, fall restraints, proper lifting equipment and jack stands.

Proterra employees will not be permitted to perform any repairs without the necessary safety equipment being provided.

WARRANTY TERMS SECTION A –PROTERRA TRANSIT BUS – STANDARD BASE WARRANTY COVERAGE

This section includes manufactured or assembled components and systems, including some purchased assemblies listed below.

<p>Proterra Complete Vehicle Limited Warranty 1 Year / 50,000 Miles, whichever occurs first. (1 Year / 80,467 Kilometers, whichever occurs first).</p>	<p>Coverage includes all components and workmanship that were provided with the Complete Vehicle from the factory.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Normal maintenance items or wearable items including, but not limited to, brake pads, filters, light bulbs, fuses, circuit breakers, bushings, or any consumable items that are the sole responsibility of the Customer • Provided Customer Equipment, including but not limited to, cameras, fare boxes, counters, and ITS components. • Adjustments, Alignments and/or loose hardware after the first 90 days following vehicle acceptance.
<p>Vehicle Structural Warranty 3 Year / 150,000 Miles, whichever occurs first. (3 Year / 241,401 Kilometers, whichever occurs first).</p>	<p>Includes the structural elements of the following: Suspension, Front & Rear, Powertrain Cradle, Including Support Members.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Physically damaged components due to accidents or other impacts. • Modified/Repaired components that were damaged and repaired after collision.
<p>Body Warranty (Unitized Composite Body) 12 Year / 500,000 Miles, whichever occurs first. (12 Year / 804,672 Kilometers, whichever occurs first).</p>	<p>This warranty covers defects that occur in the structural layers of the bus body, including the laminate and balsa core.</p> <p>This warranty does not cover defects to non-structural members, including without limitation superficial cracks in the gel coat or skin coat surface layers of the bus body.</p> <p>For more information regarding gel coat and skin coat cracks, please refer to the Proterra Gel Coat Crack Inspection Guidelines available from your Service representative.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Non-structural members. • Physical damage due to accidents or other impacts. • Modified/Repaired components that were damaged and repaired after collision.

WARRANTY TERMS SECTION B – PROTERRA TRANSIT BUS – STANDARD MAJOR COMPONENT COVERAGE –2YR/100K

This section includes major components purchased and installed by Proterra and listed below and is guided by the manufacture warranty. Each item listed in Section B is covered for 2 years or 100,000 miles (160,934 Kilometers), whichever occurs first.

<p>Propulsion System Warranty</p>	<p>System Components including but not limited to; Traction Motor, Traction Motor Inverter, Transmission, Drive Shaft, Output Flange, Differential, Gearboxes, Planetary Sets, and Axle shafts, Oil pump(s), and all internally lubricated parts.</p> <p>Excludes: Lack of maintenance and/or physically damaged components</p>
<p>HV Power Electronics and HV Cooling Warranty</p>	<p>System Components including but not limited to, VFD, DC-DC, HV Junction Box, Radiator, and Battery Coolant Pump(s), Contactors, Shunts and Buss Bars.</p> <p>Excludes: Lack of maintenance and/or physically damaged components</p>
<p>HVAC Warranty</p>	<p>System Components including but not limited to, Condenser, Compressor, Controller, HVAC Inverter, Evaporator, Receiver/Drier, Blower Fan, Ducting, Thermostat/Thermistor, VFD, and related Sensors and Switches.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Maintenance items/filters • Debris from external sources (e.g. leaves, dust/dirt) • Routine Recharge/System Tests • Lack of maintenance • Physically damaged components
<p>Control Systems & Driver Convenience Warranty</p>	<p>System Components including but not limited to, ZR Vehicle Controller, Multiplex, Powertrain Controller, D-MUX, Charge Controller, WCCM (Pantograph), Factory Telemetry/Data Logger, Ride Height Controller, Body Controller, Defroster and Blower Motor, Driver Workplace Controls and Switches,</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Modifications to system architecture • Physically damaged components
<p>Chassis System Warranty</p>	<p>System Components including but not limited to, ABS Controller, Air Bags/Shocks, Ride Height Linkage/Sensors, Ride Height Controller, Ride Height Manifold, Air Compressor, Air Dryer, Brake Calipers, Wheel Speed Sensors, Power Steering Motor and Pump, Steering Linkage and Gear.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Air Compressor Filter & Oil Separator Maintenance • Lack of maintenance • Physically damaged components
<p>Auxiliary Heater Warranty</p>	<p>System Components limited to added components within the Auxiliary Heating Option if selected by the Customer. This includes, Auxiliary Heating Unit, Aux. Heat Fuel System Components, Aux. Blower Motor(s), Aux. Ducting, Aux. Thermistor(s), and Aux. Control(s) as equipped per specification.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Maintenance items/filters • Debris from external sources (e.g. leaves, dust/dirt) • Lack of maintenance • Physically damaged components

<p>Configuration Package Warranty</p>	<p>Subsystem Components including but not limited to, Wheelchair Access Ramp(s), Wheelchair Securement System(s), Door System(s), Windows, Destination Signs, Fire Suppression System, and Seating. This includes associated components within each system ordered and identified by the Sales Contract.</p> <p>This is contract-specific coverage based on Customer's selected Options.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Glass breakage, wear and tear • Refilling and/or certification of fire suppression bottles • Seat Covers and Upholstery • Physically damaged components
<p>Proterra Datalogger Limited Warranty</p> <p>12 Years / 500,000 Miles, whichever occurs first.</p>	<p>Coverage is limited to the Datalogger unit and the ability to capture and deliver information used in the troubleshooting of the vehicle.</p>

WHAT IS NOT COVERED

The following conditions are not covered by this Warranty:

- Alteration or modification of any part of the Product with any third-party item,
- Misuse or negligent use of the bus, including but not limited to Customer's, or a third-party's, failure to follow Proterra's Operating Manual,
- Intentional or accidental collision and/or other physical damage.
- Acts of Nature,
- Neglect or Failure to perform the Preventative Maintenance as outlined in the maintenance documentation for the Product,
- Unauthorized use or operation outside of the terms and conditions of the applicable lease contract,
- Improper maintenance and repair, or
- Intentional acts of destruction, tampering or vandalism.
- Adjustments and Alignments past the first 90 days after the bus is delivered to the Customer's site.
- Normal maintenance items or wearable items including, but not limited to, brake pads, filters, lightbulbs, fuses, circuit breakers, bushings, or any consumable items.
- Oil, coolant, refrigerant and other fluids are not covered except when used in conjunction with a covered repair as identified in the Proterra Service Manual.
- Any physical damage to Product while in transit to Customer site. This includes shipping damage by carrier delivering a bus. Any damage incurred while in transit will require a claim being filed to the transportation company.
- Body paint and/or vehicle wraps are not covered by this Warranty. The application of paint or wrap to the Vehicle exterior vary by each purchase agreement. Coverage will be in accordance with the selected options and vendor products. Please refer to the Purchase Agreement for more information.
- Superficial gel or skin coat cracks found in the surface layer of the unitized composite bus body.
- Facility charges to perform repairs. This includes, but is not limited to, shop supply charges, bay rental fees, equipment rental, or any other shop or tool expense.

LOW VOLTAGE BATTERY POLICY

Proterra warrants the original 12/24V low voltage batteries during the first 90-day period upon delivery of the Proterra Bus and is not extendable. No claims for these batteries will be accepted after the original 90-day period.

For approved low voltage battery replacements during the Warranty period, Customer shall acquire battery at their local vendor and submit for reimbursement through the Warranty Claim submission process outlined within this manual. Customer is advised to contact their local battery vendor for replacement low voltage batteries when required. Proterra will not sell nor ship low voltage batteries through its Service Parts Operation.

Any subsequent battery failures will be subject to the warranty terms provided from the local battery vendor.

LIMITED BATTERY SYSTEM WARRANTY

Subject to the terms, conditions and limitations set forth in this Proterra Limited Battery System Warranty (the “**Warranty**”), including, without limitation, the Approved Use Conditions, Proterra Operating Company, Inc. (“**Proterra**”) warrants to the original purchaser (the “**Buyer**”) of the Proterra battery electric bus (the “**Bus**”), that Proterra’s high voltage battery system containing one or more battery packs (the “**Battery System**”) (i) will be free from defects in materials and workmanship, and (ii) will meet the retained energy commitment shown below.

This Warranty covers the parts, labor (if applicable and in accordance with the terms of this Warranty and/or any purchase or lease agreement), and freight costs incurred during the Warranty Period.

This Warranty only applies to Battery Systems installed on Proterra Buses purchased pursuant to an agreement between Proterra and Buyer.

Proterra, or a Proterra-qualified technician, will perform all necessary repairs to the Battery System. The Battery System may be serviced by the Buyer, or a third-party maintenance provider, provided Buyer or such third-party maintenance provider has completed the proper factory training and has been successfully qualified or certified by Proterra to service the Battery System. Any servicing of the Battery System by the Buyer, or any third-party maintenance provider, without having become Proterra qualified or certified will void the Warranty.

It is the Buyer’s sole responsibility to notify any end user of a Proterra Bus of all terms, conditions, and limitations provided for in this Warranty, as well as concerning proper and appropriate use of the vehicle(s). Proterra will not be liable for any damage of any kind (whether direct or indirect) or costs resulting from Buyer’s failure to notify any end user of a Proterra Bus of the terms and conditions of this Warranty.

NOTE: For Low Voltage 12/24V batteries, please see Low Voltage Battery Policy in the previous section within the Proterra Bus New Vehicle Limited Warranty.

BATTERY SYSTEM LIMITED WARRANTY TERMS

As it pertains to this section, the following terms are defined:

“**Gross Discharge Throughput**” or “**GDT**” means the total energy discharged through the Battery System during its life, including energy from external chargers and energy recuperated from regenerative braking. The GDT will be tracked by the Battery Management System at the individual battery pack level and reported through the onboard vehicle telemetry system.

“**Usable Energy**” means the amount of energy available between 0% state of charge (“**SOC**”) and 100% SOC - This information can be obtained using the Proterra diagnostic tool and a snapshot thereof must accompany any battery claims.

“**Warranty Commencement Date**” means the date of Buyer’s acceptance of the Proterra Bus

“**Warranty Period**” means the time period commencing on the Warranty Commencement Date and ending on either (i) the last day of the number of years shown in the table below, or (ii) the date upon which the mileage or GDT limit for the Battery System shown in the table below is reached.

Battery System Material and Workmanship Warranty	6 Years or Unlimited Miles whichever comes first. Coverage includes all materials, components, and workmanship of the Battery Pack to be free of defects.
Retained Energy Requirement 40-foot Bus	80% or higher retention of initial Usable Energy* for 6 years / 200,000 kWh GDT per battery pack, whichever comes first
Retained Energy Requirement 35-foot Bus	80% or higher retention of initial Usable Energy* for 6 years / 133,000 kWh GDT per battery pack, whichever comes first.

*as shown in The Proterra Diagnostic Tool as Battery State of Health (SOH)

COMPONENTS INCLUDED IN THE LIMITED BATTERY SYSTEM WARRANTY

This Warranty applies to the following Battery System components:

- Battery Pack(s)
- Battery Modules
- Battery Management System (BMS)
- Internal Battery System Cooling System
- Battery System Enclosure
- Electrical, mechanical, and thermal interfaces

WARRANTY LIMITATIONS

This Limited Battery System Warranty does not cover any malfunctions, failures or losses directly or indirectly caused by, due to, or resulting from abuse, misuse, negligence, accident, neglect, or improper maintenance, operation, storage or transport, or wear or deterioration arising from, without limitation, any of the following events:

- Alteration or modification of the Battery System or combination of the Battery System with any third-party components, software, or other items, unless expressly agreed to in writing by Proterra.
- Failure to adhere to the Approved Use Conditions set forth below.
- Failure to adhere to the liquid cooling protocol set forth in the Proterra Interface Control Manual, including but not limited to the Buyer's use of a coolant type with a 50/50 volume fraction ethylene glycol.
- Any attempt, including, without limitation, physical alteration, programming, or other methods, to extend or otherwise manipulate the life of the Battery System.
- Any physical or digital unauthorized access to the vehicle or Battery System from any source, including but not limited to non-Proterra parts or accessories, third-party applications, viruses, bugs, malware, or any other form of interference or cyber-attack.
- Accidents, collisions, or objects striking the vehicle.
- Exposure of the Battery System to direct flame.
- Intrusion of water into Battery System due to submersion in a large amount of water (e.g., lakes, rivers, flooding, etc.)
- Acts of nature, including, without limitation, fire, explosion, earthquake, windstorm, lightning, hail, flood or deep water.
- Use of the vehicle as a stationary or secondary power source.
- Failure to properly perform the preventative maintenance set forth in Proterra's standard maintenance and repair documentation.
- Unauthorized access, maintenance or repair by Customer, a third-party maintenance provider, or other individual(s).
- Theft or vandalism.
- Storage of an uninstalled or unmounted Battery System in an outdoor environment, regardless of whether the Battery System is contained in a shipping container or other packaging.
- Violation of the terms of this Warranty.

SUBMITTING A BATTERY STATE-OF-HEALTH CLAIM

When submitting a claim for battery replacement under the battery State-of-Health (SOH) warranty a screenshot from the Proterra Diagnostic tool (like the one below) is required and the “Measured SOH” must be below the percentage stated in the warranty document.

TO OBTAIN THE CURRENT STATE-OF-HEALTH (SOH) FROM YOUR BATTERY PACK FOLLOW THE STEPS BELOW:

1. Connect the Proterra Diagnostic Tool to the vehicle prior to the charger being plugged in, the tool will display “Charger Not Connected”
2. Plug the charger into the vehicle to begin charging. The tool will display “Calculating...” in both the “Measured SOH” and “Available Energy” fields.
3. After charging for some time, a value will be displayed in both the “Measured SOH” and “Available Energy” fields.
4. Once the batteries have been fully charged the “Measured SOH” and “Available Energy” fields will display final values. Capture a screenshot to submit with your warranty claim.

The screenshot shows the Proterra Diagnostics Tool interface. On the left is a navigation menu with options like HOME, VEHICLE OVERVIEW, DIAGNOSTICS, HISTORICAL FAULTS, CAN TABLE, CAN SIGNAL PLOTTER, POWER COOLING, LOW VOLTAGE, HIGH VOLTAGE, HVAC, PNEUMATICS, POWERTRAIN, BATTERY THERMAL, BATTERY PACKS, BATTERY OVERVIEW, RIDE HEIGHT, MUX, CONFIGURATION, and SOFTWARE VERSION. The main display area features a table of battery pack data and a summary of vehicle status.

Pack	Contactor	Moisture Detected	Max Voltage	Min Voltage	Voltage	Current	Max Temp	Min Temp	Energy Throughput
S1 P1	<input type="radio"/>	<input type="radio"/>	3.46 V	3.46 V	313.44 V	-1.20 A	82°F	82°F	841 kWh
S1 P2	<input type="radio"/>	<input type="radio"/>	3.46 V	3.45 V	312.84 V	-2.40 A	84°F	82°F	837 kWh
S2 P1	<input type="radio"/>	<input type="radio"/>	3.46 V	3.46 V	313.52 V	-1.20 A	82°F	82°F	827 kWh
S2 P2	<input type="radio"/>	<input type="radio"/>	3.46 V	3.45 V	314.24 V	-0.60 A	82°F	82°F	828 kWh

Vehicle State: HV Immobile
 Battery State: STATE_STANDBY
 Range Mode: STATE_STANDBY
 Energy: 82 kWh
 Voltage: 631 V
 Current: -6.60 A

Max Temp: 78°F
 Charge Power: 392 kW
 Discharge Power: 460 kW
 SOC: 26 %
 Isolation Internal: 6554 Ω/V
 Isolation External: 1809 Ω/V

Measured SOH: Charger Not Connected
 Available Energy: Charger Not Connected

*How to measure SOH?
 *Ambient temperature may cause variations in Available Energy calculation

These are the steps to verify the current State of Health of your Battery Pack:

1. Connect the Proterra Diagnostics Tool to the vehicle. Prior to charger being plugged in, it will show “Charger Not Connected”.
2. Plug the charger into vehicle to start charging. You will see “Calculating...” in both Measured SOH and Available Energy fields.
3. After some time, a value will be displayed in both Measured SOH and Available Energy fields.
4. Once batteries are fully charged, Measured SOH and Available Energy fields will show the final values. Record the values before unplugging the charger.

ACTIVATION OF WARRANTY

The Warranty term starts on the Date of Acceptance for each Product in accordance with the terms of the applicable purchasing contract.

Proterra administers the warranty process, and all warranty claim approvals are at the sole and absolute discretion of Proterra.

DELAYED WARRANTY START

A Delayed Warranty Start may be granted for the Customer to ready the Product for revenue service. This Delayed Warranty Start period shall not exceed 30 days after the Date of Acceptance for each Product and must be approved in writing by Proterra, and as part of the purchase agreement.

This period will allow for Customer to install any necessary equipment, have graphics applied, or any other service readiness activities.

For Delayed Warranty Start approval, the Customer must apply for this added time as part of the Purchase Agreement for the Product.

WARRANTY PROCESSING AND CLAIMS MANAGEMENT

In connection with any claim brought under this Warranty, the Customer must submit a completed Proterra Warranty Claim Form along with a copy of their internal work order, showing technician punch times, and any additional applicable documentation.

Proterra may perform an inspection of the failed component and supporting documentation to make a claim determination. Proterra will not provide any compensation, labor, repairs, or replacement part to the Customer without the above documentation.

Proterra reserves the right to adjust the approved amount to align with the current published SRT guide if excess amounts are claimed without prior authorization from Proterra.

NOTE: Towing coverage is only reimbursed during the initial **Complete Vehicle Limited Warranty** for 1 Year/ 50,000 miles, whichever occurs first. All towing claims must be accompanied by the warranty repair order and the towing invoice from the provider. Proterra will not pay mark-up on any sublet claims.

For assistance with any warranty claim transactions, please email warranty@proterra.com for support. Please include vehicle VIN, current odometer, unit number, claim number and/or invoice in your correspondence.

WARRANTY POLICIES

1. Standard Repair Times (SRT) are published within the Proterra Maintenance Manual. For an updated copy, please email your request to warranty@proterra.com.
2. Preventive Maintenance items and consumables are not covered by this Warranty.
3. Loose hardware, fasteners and clamps are only covered for the first 30 days after Warranty Activation.
4. All claims are to be filed with Proterra within 30 days of the completion of the repairs. Claims received after 30 days are subject to a 25% filing penalty and will not be accepted after 90 days.
5. All removed parts and materials during a warranty transaction must be labeled and retained for a minimum of thirty (30) days from the claim approval date.
 - a. Parts will be requested by issuing a Return Material Authorization (RMA) to the repair facility.
 - b. Proterra has the right to request parts at any time within the 30 days.
 - c. Parts and materials not requested after 30 days may be scrapped.
 - d. All parts and materials being returned must follow the Proterra Part Return Process below.

PRIOR AUTHORIZATION CODES (PAC) – HOW TO OBTAIN PRIOR AUTHORIZATION

1. Customer must contact Proterra for approval on any claim that:
 - a. Customer is requesting more time than allowed in the Proterra Standard Repair Time (SRT) Manual.
 - b. Customer is requesting more than the 2.0 hours of diagnostic time.
 - c. Total requested labor reimbursement amount is greater than \$1,000.00 USD. Please note that this empowerment can be revoked without notice by Proterra if a Customer does not follow the policies stated within this Manual.
2. To obtain approvals for additional time, please contact your Proterra Field Service Representative for further information and guidance.
3. Your Proterra Field Service Representative will issue a Prior Authorization Code (PAC) that must be clearly stated on your Warranty Claim form. Claims without PAC's are subject to rejection.

HOW TO FILE WARRANTY CLAIMS TO PROTERRA

To file a warranty claim, follow the link below to our online claim form.

<https://www.proterra.com/customer-support/file-a-warranty-claim-with-proterra/>

All claims are subject to the review and approval by the Proterra Warranty Department. All claims must be in accordance with this Agreement. Allowances for parts and labor are published in the Proterra Standard Repair Time (SRT) Manual. Claims requiring additional parts and labor outside of the allowances must have pre-approval from Proterra.

Each claim must have a completed claim form (Appendix A) and needs to include the following information:

- Supporting documentation for all claimed labor hours allowed per the Standard Repair Times (SRT)
- Provide complete contact information.
- Include the Bus or Charger VIN / Serial Number.
- Provide the failure date and mileage.
- Provide detailed description of the issue.
- Provide a detailed description of the resolution.
- Include all parts and miscellaneous expenses associated with the repair.
- Include a copy of the Shop Work Order and any applicable supporting documentation.
- Return all required parts per Parts Return Process, retain non-return parts for 30 days

REIMBURSEMENT FOR LABOR HOURS FOR APPROVED WARRANTY CLAIMS

Proterra will reimburse the Customer for labor spent conducting approved repairs under this Warranty at Customer's approved Warranty Labor Rate with the following provisions:

NOTE: Customer's Warranty Labor Rate does **NOT** automatically increase with Customer's normal rate increases without prior approval from Proterra.

Customer must provide an initial Warranty Labor Rate Application (refer to Forms Section in the Appendix of this document). Future increases of the Customer Warranty Labor Rate must be justified in writing and a new application submitted. It is at Proterra's sole discretion to allow the increase based on market value of like services in the area.

Reimbursement for all claimed labor hours must be within the specified allowances as published in the Proterra Standard Repair Time (SRT) Manual. This also will include any necessary materials and/or shop supplies used in the conjunction with the Warranty repair.

REIMBURSEMENT FOR WARRANTY PARTS

Proterra reserves the right to provide replacement parts for covered repairs at no charge. Proterra reserves the right to send remanufactured, or recertified, components when available.

For parts pulled from Customers' inventory, Customer will receive a new component in return, unless otherwise specified in the terms and conditions of the Sales Order or Contract. For parts purchased by the Customer that are not part of the Stocking Program, these will be reimbursed at the price paid at purchase from Proterra Parts.

For questions regarding coverage, please email warranty@proterra.com.

FREIGHT CHARGES FOR WARRANTY PARTS

Proterra will provide expedited freight for Parts in conjunction with approved Warranty Repairs only if the part is not included on the Stocking Program Parts List.

If Customer has incurred freight expenses for a covered repair, and the Part is not included in the Stocking Program, Proterra will reimburse the actual cost of the freight as part of the approved Warranty Claim. Copy of the original freight invoice is required.

WARRANTY PARTS RETENTION POLICY

For all approved claims under this Warranty, any components replaced during the repair must be retained for a minimum of 30 days following claim approval. Proterra reserves the right to request parts and materials to be returned during this 30-day period.

If Proterra does not request these parts and materials within 30 days of claim approval, Customer is permitted to self- scrap the parts and materials. The part must be rendered inoperable and ensure that it cannot be reinstalled on a Product.

Customers are expected to follow the Part Return Process listed in the next section.

NOTE: Proterra reserves the right to charge the Customer back for claims where a returned part passed inspection and was deemed as “No Problem Found”.

PARTS WITH CORE RETURN REQUIREMENTS

Customer has thirty (30) days to return any parts that are identified as “Core” parts or will be charged the applicable “Core Charge” to act as a deposit until the removed core is returned for exchange.

STANDARD SERVICE PARTS POLICIES

The following sections address the ordering, stocking, and returning of Proterra Service Parts.

For Service Parts support, you can enter a request from our website. <https://www.proterra.com/customer-support/>,

SPARE PART WARRANTY

Proterra warrants that all Service Parts are free from defects in workmanship and operation for a period of ninety (90) days from the date of receipt, unless otherwise noted.

Certain components carry a twelve (12) month guarantee and are identified at point of sale. These components include, but are not limited to, Pneumatic System Air Compressor, Traction Motors, Traction Motor Inverters, Transmissions, Axles and Planetary Assemblies, etc. This 12-month Warranty will be clearly identified on the Sales Order.

Claims under this Spare Part Warranty provide for Parts-Only coverage. This means that no labor reimbursement is available and Proterra will provide another part at no charge. Proterra will also cover the Standard Freight charges for covered parts.

PROTERRA CUSTOMER SERVICE SUPPORT LINKS

Should you have any questions, access the Proterra Customer Support home page for helpful links to submit warranty claims, quote/order parts, and other support needs. <https://www.proterra.com/customer-support/>, or Customer Service Inquiries: Service@Proterra.com

REQUESTING FIELD SUPPORT FOR NON-WARRANTY REPAIRS

- If repairs required are not covered by this Warranty, and Customer would like to have Proterra conduct the repairs, Proterra will invoice the customer for onsite support at the current labor rate for Non-Warranty repairs and may include applicable travel expenses to Customer's site.
- For questions about services that are not covered by this Warranty, or how to obtain onsite support for Non-Warranty items, please contact your assigned Proterra Field Service Representative.

MICHELIN TIRE WARRANTY INFORMATION

As the original purchaser of a MICHELIN® brand truck tire, you are covered by all the benefits and conditions (subject to the maintenance recommendations and safety warnings) contained in this booklet. To ensure your understanding of and compliance with the terms and conditions of this warranty, please read it carefully. It is essential that you also read and understand the Safety and Maintenance Recommendations for your tires.

WHAT MICHELIN COVERS AND FOR HOW LONG:

WORKMANSHIP AND MATERIALS:

Except as limited below, MICHELIN® Truck Tires bearing the Michelin name and complete serial or identification numbers, used according to the instructions contained in this Operator's Manual, are covered by this limited warranty against defects in workmanship and materials for original tread life or 7 years from the date of purchase, whichever occurs first. If no proof of purchase is available, coverage will be based on the date of manufacture as referenced in Definitions below. At that time, all warranties, express or implied, expire.

DEFINITIONS:

The life of the original usable tread is the original tread down to the level of the tread wear indicators – 2/32nd of an inch (1.6 mm) of tread remaining. * Date of purchase is documented by new vehicle registration or tire sales invoice. If no proof of purchase is available, coverage will be based on the date of manufacture, as molded on the sidewall. (This would be the Proterra Acceptance Date)

The date of manufacture is based on the original Michelin DOT** number molded on the tire sidewall. The mileage received will be based on fleet records. Replacement will be made in accordance with the terms and conditions described under "HOW REPLACEMENT CHARGES ARE CALCULATED".

A Tire Registration Card may be found at www.michelinman.com/US/en/register.html

WHAT IS NOT COVERED BY MICHELIN' S WARRANTY:

Tires which become unserviceable due to:

- Road hazard injury (e.g., a cut, snag, bruise, impact damage or puncture);
- Incorrect mounting of the tire, tire/wheel imbalance, improper retread or improper repair;
- Misapplication, improper maintenance, racing, overload, under inflation, over inflation or other abuse resulting in casing damage or fatigue;
- Accident, fire, chemical corrosion, contamination, tire alteration or vandalism;
- Flat spotting caused by improper storage;
- The addition of liquid, solid or gaseous materials other than air, nitrogen or carbon dioxide;
- Uses other than long haul service for any extended casing guarantee claims;
- Uneven or rapid wear caused by mechanical irregularity in the vehicle, such as wheel misalignment or worn/damaged suspension components, resulting in damage to the under-tread, carcass or steel belts

Contact your local Michelin representative if additional information is needed.



PROTERRA TRANSIT BUS COMPLETE VEHICLE LIMITED WARRANTY

Proterra Operating Company, Inc. (“**Proterra**”) warrants to the original purchaser/lessee (“**Customer**”) that its Proterra ZX5 / ZX5+ / ZX5 Max - Series Battery Electric Transit Bus will be free from defects in material and workmanship under normal use and when properly serviced. Proterra agrees to repair or replace defective parts with either new, or re-certified parts when available, subject to the terms and conditions set forth herein.

NOTE: This Warranty does not include Proterra High Voltage Battery Packs. Please refer to the [Battery Pack Limited Warranty](#) section.

The final determination of required repairs or parts replacement shall be the sole discretion of Proterra. This Proterra Transit Bus Complete Vehicle Limited Warranty (“**Warranty**”) is a limited warranty subject to the terms and conditions stated in the sections below.

EXCEPT FOR THE OBLIGATIONS, WARRANTIES AND REPRESENTATIONS SPECIFIED HEREIN, PROTERRA MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AND SPECIFICALLY DISCLAIMS ANY REPRESENTATION OR WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR NON-INFRINGEMENT, AND SPECIFICALLY DISCLAIMS ANY WARRANTY ARISING BY USAGE OF TRADE OR BY COURSE OF DEALING.

This Warranty is comprised of two sections; Section **A** applies to the Complete Vehicle, Vehicle Structural Warranty, and Body Warranty. Section **B** applies to the Major Components listed below.

Proterra will reimburse the customer for the parts and labor as published in the Proterra Standard Repair Time Guide (“**SRT**”) and shall follow local ordinances as necessary and if applicable in accordance with the terms of this warranty and the purchase/lease agreement, along with associated freight costs to provide required replacement parts during the warranty time period identified below.

Warranty repairs may be performed by the Customer, an authorized warranty provider, or Proterra only and must adhere to the terms and conditions outlined in the following statement of warranty. All components replaced under the warranty are exclusive property of Proterra Inc. and must be returned following the procedures set forth in the “Part Return” section of the warranty manual.

Proterra, at its sole discretion or as part of a Proterra Service Plan, may perform warranty repairs at the Customer location. Costs associated with these repairs will be at the expense of Proterra during standard operating hours. Emergency afterhours warranty support may be performed at the request of the Customer for a fee.

At Proterra, safety is of the utmost importance for our customers and our employees. Therefore, we require our customers to have and maintain the necessary safety equipment, in accordance with state and local OSHA regulations, for the use of any Proterra employee, or authorized provider, that may be performing or assisting with repairs at the Customer’s location. This includes but is not limited to, fall restraints, proper lifting equipment and jack stands. Proterra employees will not be permitted to perform any repairs without the necessary safety equipment being provided.



WARRANTY TERMS SECTION A – PROTERRA TRANSIT BUS – STANDARD BASE WARRANTY COVERAGE

This section includes manufactured or assembled components and systems, including some purchased assemblies listed below.

<p>Proterra Complete Vehicle Limited Warranty 1 Year / 50,000 Miles, whichever occurs first. (1 Year / 80,467 Kilometers, whichever occurs first).</p>	<p>Coverage includes all components and workmanship that were provided with the Complete Vehicle from the factory.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Normal maintenance items or wearable items including, but not limited to, brake pads, filters, light bulbs, fuses, circuit breakers, bushings, or any consumable items that are the sole responsibility of the Customer • Provided Customer Equipment, including but not limited to, cameras, fare boxes, counters, and ITS components. • Adjustments, Alignments and/or loose hardware after the first 90 days following vehicle acceptance.
<p>Vehicle Structural Warranty 3 Year / 150,000 Miles, whichever occurs first. (3 Year / 241,401 Kilometers, whichever occurs first).</p>	<p>Includes the structural elements of the following: Suspension, Front & Rear, Powertrain Cradle, Including Support Members.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Physically damaged components due to accidents or other impacts. • Modified/Repaired components that were damaged and repaired after collision.
<p>Body Warranty (Monocoque Assembly) 12 Year / 500,000 Miles, whichever occurs first. (12 Year / 804,672 Kilometers, whichever occurs first).</p>	<p>This applies to any structural and/or workmanship defects discovered in the Monocoque structure.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Non-structural members.



WARRANTY TERMS SECTION B - PROTERRA TRANSIT BUS – STANDARD MAJOR COMPONENT COVERAGE – 2YR/100K

This section includes major components purchased and installed by Proterra and listed below and is guided by the manufacture warranty. Each item listed in Section B is covered for 2 years or 100,000 miles (160,934 Kilometers), whichever occurs first.

<p>Propulsion System Warranty</p>	<p>System Components including but not limited to; Traction Motor, Traction Motor Inverter, Transmission, Drive Shaft, Output Flange, Differential, Gearboxes, Planetary Sets, and Axle shafts, Oil pump(s), and all internally lubricated parts.</p> <p>Excludes: Lack of maintenance and/or physically damaged components</p>
<p>HV Power Electronics and HV Cooling Warranty</p>	<p>System Components including but not limited to, VFD, DC-DC, HV Junction Box, Radiator, and Battery Coolant Pump(s), Contactors, Shunts and Buss Bars.</p> <p>Excludes: Lack of maintenance and/or physically damaged components</p>
<p>HVAC Warranty</p>	<p>System Components including but not limited to, Condenser, Compressor, Controller, HVAC Inverter, Evaporator, Receiver/Drier, Blower Fan, Ducting, Thermostat/Thermistor, VFD, and related Sensors and Switches.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Maintenance items/filters • Debris from external sources (e.g. leaves, dust/dirt) • Routine Recharge/System Tests • Lack of maintenance • Physically damaged components
<p>Control Systems & Driver Convenience Warranty</p>	<p>System Components including but not limited to, ZR Vehicle Controller, Multiplex, Powertrain Controller, D-MUX, Charge Controller, WCCM (Pantograph), Factory Telemetry/Data Logger, Ride Height Controller, Body Controller, Defroster and Blower Motor, Driver Workplace Controls and Switches,</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Modifications to system architecture • Physically damaged components
<p>Chassis System Warranty</p>	<p>System Components including but not limited to, ABS Controller, Air Bags/Shocks, Ride Height Linkage/Sensors, Ride Height Controller, Ride Height Manifold, Air Compressor, Air Dryer, Brake Calipers, Wheel Speed Sensors, Power Steering Motor and Pump, Steering Linkage and Gear.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Air Compressor Filter & Oil Separator Maintenance • Lack of maintenance • Physically damaged components
<p>Auxiliary Heater Warranty</p>	<p>System Components limited to added components within the Auxiliary Heating Option if selected by the Customer. This includes, Auxiliary Heating Unit, Aux. Heat Fuel System Components, Aux. Blower Motor(s), Aux. Ducting, Aux. Thermistor(s), and Aux. Control(s) as equipped per specification.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Maintenance items/filters • Debris from external sources (e.g. leaves, dust/dirt) • Lack of maintenance • Physically damaged components

<p>Configuration Package Warranty</p>	<p>Subsystem Components including but not limited to, Wheelchair Access Ramp(s), Wheelchair Securement System(s), Door System(s), Windows, Destination Signs, Fire Suppression System, and Seating. This includes associated components within each system ordered and identified by the Sales Contract.</p> <p>This is contract-specific coverage based on Customer's selected Options.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Glass breakage, wear and tear • Refilling and/or certification of fire suppression bottles • Seat Covers and Upholstery • Physically damaged components
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WHAT IS NOT COVERED:

The following conditions are not covered by this Warranty:

- Alteration or modification of any part of the Product with any third-party item,
- Misuse or negligent use of the bus, including but not limited to Customer's, or a third-party's, failure to follow Proterra's Operating Manual,
- Intentional or accidental collision and/or other physical damage.
- Acts of Nature,
- Neglect or Failure to perform the Preventative Maintenance as outlined in the maintenance documentation for the Product,
- Unauthorized use or operation outside of the terms and conditions of the applicable lease contract,
- Improper maintenance and repair, or
- Intentional acts of destruction, tampering or vandalism.
- Adjustments and Alignments past the first 90 days after the bus is delivered to the Customer's site.
- Normal maintenance items or wearable items including, but not limited to, brake pads, filters, light bulbs, fuses, circuit breakers, bushings, or any consumable items.
- Oil, coolant, refrigerant and other fluids are not covered except when used in conjunction with a covered repair as identified in the Proterra Service Manual.
- Any physical damage to Product while in transit to Customer site. This includes shipping damage by carrier delivering a bus. Any damage incurred while in transit will require a claim being filed to the transportation company.
- Body paint and/or vehicle wraps are not covered by this Warranty. Speak to a Proterra representative regarding paint and/or vehicle wrap warranty.

LOW VOLTAGE 12/24 BATTERY POLICY

Proterra warrants the original 12/24V low voltage batteries during the first 90-day period upon delivery of the Proterra Bus and is not extendable. No claims for these batteries will be accepted after the original 90-day period.

For approved low voltage battery replacements during the Warranty period, Customer shall acquire battery at their local vendor and submit for reimbursement through the Warranty Claim submission process outlined within this manual. Customer is advised to contact their local battery vendor for replacement low voltage batteries when required. Proterra will not sell nor ship low voltage batteries through its Service Parts Operation.

Any subsequent battery failures will be subject to the warranty terms provided from the local battery vendor.



ACTIVATION OF WARRANTY

The Warranty term starts on the Date of Acceptance for each Product in accordance with the terms of the applicable purchasing contract.

Proterra administers the warranty process, and all warranty claim approvals are at the sole and absolute discretion of Proterra.

In connection with any claim brought under this Warranty, the Customer must submit a completed Proterra Warranty Claim Form along with a copy of their internal work order, showing technician punch times, and any additional applicable documentation. Customer is required to retain any parts related to a Warranty transaction for thirty (30) days from the date that the claim has been approved. Proterra reserves the right to request any removed parts be returned at any time during the 30-day period.

Customer also has thirty (30) days to return any parts that are identified as "Core" parts or will be charged the applicable "Core Charge". Proterra may perform an inspection of the failed component and supporting documentation to make a claim determination. Proterra will not provide any compensation, labor, repairs, or replacement part to the Customer without the above documentation.

Proterra reserves the right to adjust the approved amount to align with the current published SRT guide if excess amounts are claimed without prior authorization from Proterra.

NOTE: Towing coverage is only reimbursed during the initial *Transit Bus Complete Vehicle Limited Warranty* for 1 Year/ 50,000 miles, whichever occurs first. All towing claims must be accompanied the warranty repair order and the towing invoice from the provider. Proterra will not pay mark-up on any sublet claims.

For assistance with any warranty claim transactions, please email warranty@proterra.com for support. Please include vehicle VIN, current odometer, unit number, claim number and/or invoice in your correspondence.

DELAYED WARRANTY STARTS

A Delayed Warranty Start may be granted for the Customer to ready the Product for revenue service. This Delayed Warranty Start period shall not exceed 30 days after the Date of Acceptance for each Product and must be approved in writing by Proterra.

This period will allow for Customer to install any necessary equipment, have graphics applied, or any other service readiness activities.

For Delayed Warranty Start approval, the Customer must apply for this added time as part of the Purchase Agreement for the Product, or by submitting the Delayed Warranty Start Application included in the Forms Section of the Appendix.

PLEASE SEE THE PROTERRA TRANSIT WARRANTY MANUAL FOR ALL SERVICE, PARTS AND WARRANTY POLICIES AND PROCEDURES



PROTERRA LIMITED BATTERY SYSTEM WARRANTY

LIMITED BATTERY SYSTEM WARRANTY

Subject to the terms, conditions and limitations set forth in this Proterra Limited Battery System Warranty (the “**Warranty**”), including, without limitation, the Approved Use Conditions, Proterra Operating Company, Inc. (“**Proterra**”) warrants to the original purchaser (the “**Buyer**”) of the Proterra battery electric bus (the “**Bus**”), that Proterra’s high voltage battery system containing one or more battery packs (the “**Battery System**”) (i) will be free from defects in materials and workmanship, and (ii) will meet the retained energy commitment shown below.

This Warranty covers the parts, labor (if applicable and in accordance with the terms of this Warranty and/or any purchase or lease agreement), and freight costs incurred during the Warranty Period.

This Warranty only applies to Battery Systems installed on Proterra Buses purchased pursuant to an agreement between Proterra and Buyer.

Proterra, or a Proterra qualified or certified technician, will perform all necessary repairs to the Battery System. The Battery System may be serviced by the Buyer, or a third-party maintenance provider, provided Buyer or such third-party maintenance provider has completed the proper factory training and has been successfully qualified or certified by Proterra to service the Battery System. Any servicing of the Battery System by the Buyer, or any third-party maintenance provider, without having become Proterra qualified or certified will void the Warranty.

It is the Buyer’s sole responsibility to notify any end user of a Proterra Bus of all terms, conditions, and limitations provided for in this Warranty, as well as concerning proper and appropriate use of the vehicle(s). Proterra will not be liable for any damage of any kind (whether direct or indirect) or costs resulting from Buyer’s failure to notify any end user of a Proterra Bus of the terms and conditions of this Warranty.

BATTERY SYSTEM LIMITED WARRANTY TERMS

As it pertains to this section, the following terms are defined:

“**Gross Discharge Throughput**” or “**GDT**” means the total energy discharged through the Battery System during its life, including energy from external chargers and energy recuperated from regenerative braking. The GDT will be tracked by the Battery Management System at the individual battery pack level and reported through the onboard vehicle telemetry system.

“**Usable Energy**” means the amount of energy available between 0% state of charge (“**SOC**”) and 100% SOC - This information can be obtained using the Proterra diagnostic tool and a snapshot thereof must accompany any battery claims.

“**Warranty Commencement Date**” means the date of Buyer’s acceptance of the Proterra Bus.

“**Warranty Period**” means the time period commencing on the Warranty Commencement Date and ending on either (i) the last day of the number of years shown in the table below, or (ii) the date upon which the mileage or GDT limit for the Battery System shown in the table below is reached.



PROTERRA LIMITED BATTERY SYSTEM WARRANTY

Battery System Material and Workmanship Warranty:

6 Years or Unlimited Miles whichever comes first.

Coverage includes all materials, components, and workmanship of the Battery Pack to be free of defects.

Retained Energy Requirement 40-foot Bus:

80% or higher retention of initial Usable Energy* for 6 years / 200,000 kWh GDT per battery pack, whichever comes first.

Retained Energy Requirement 35-foot Bus:

80% or higher retention of initial Usable Energy* for 6 years / 133,000 kWh GDT per battery pack, whichever comes first.

*as shown in The Proterra Diagnostic Tool as Battery State of Health (SOH)

COMPONENTS INCLUDED IN THE LIMITED BATTERY SYSTEM WARRANTY

This Warranty applies to the following Battery System components:

- Battery Pack(s)
- Battery Modules
- Battery Management System (BMS)
- Internal Battery System Cooling System
- Battery System Enclosure
- Electrical, mechanical, and thermal interfaces
- Manual Service Disconnect (MSD)

WARRANTY LIMITATIONS

This Limited Battery System Warranty does not cover any malfunctions, failures or losses directly or indirectly caused by, due to, or resulting from abuse, misuse, negligence, accident, neglect, or improper maintenance, operation, storage or transport, or wear or deterioration arising from, without limitation, any of the following events:

- Alteration or modification of the Battery System or combination of the Battery System with any third-party components, software, or other items, unless expressly agreed to in writing by Proterra.
- Failure to adhere to the Approved Use Conditions set forth below.
- Failure to adhere to the liquid cooling protocol set forth in the Proterra Interface Control Manual, including but not limited to the Buyer's use of a coolant type with a 50/50 volume fraction ethylene glycol.
- Any attempt, including, without limitation, physical alteration, programming, or other methods, to extend or otherwise manipulate the life of the Battery System.
- Any physical or digital unauthorized access to the vehicle or Battery System from any source, including but not limited to non-Proterra parts or accessories, third-party applications, viruses, bugs, malware, or any other form of interference or cyber-attack.
- Accidents, collisions, or objects striking the vehicle.
- Exposure of the Battery System to direct flame.
- Intrusion of water into Battery System due to submersion in a large amount of water (e.g., lakes, rivers, flooding, etc.)



PROTERRA LIMITED BATTERY SYSTEM WARRANTY

WARRANTY LIMITATIONS CONTINUED

- Acts of nature, including, without limitation, fire, explosion, earthquake, windstorm, lightening, hail, flood or deep water.
- Use of the vehicle as a stationary or secondary power source.
- Failure to properly perform the preventative maintenance set forth in Proterra's standard maintenance and repair documentation.
- Unauthorized access, maintenance or repair by Customer, a third-party maintenance provider, or other individual(s).
- Theft or vandalism.
- Storage of an uninstalled or unmounted Battery System in an outdoor environment, regardless of whether the Battery System is contained in a shipping container or other packaging.
- Violation of the terms of this Warranty.

WARRANTY REPAIRS

All warranty claims will be administered and processed in Proterra's sole and absolute discretion. Warrantable defects may be addressed using software updates and/or replacing parts and assemblies with identical or equivalent substitutes, including factory reconditioned components. If a Battery System is replaced due to failure to meet the Retained Energy requirement, Proterra will supply a replacement Battery System with enough Retained Energy to meet the coverage specified in the original Warranty. In its sole discretion, Proterra reserves the right to upgrade parts or assemblies with the latest models of equal or greater performance.

In order to submit a warranty claim, the Buyer must provide information regarding the failed component(s) and submit a warranty claim form. Proterra will inspect the failed component(s) and supporting documentation to determine whether the warranty claim is valid.

Proterra shall own without restriction any Battery System or system components that are removed or replaced under this Warranty.

LIMITATIONS AND DISCLAIMERS

THIS WARRANTY IS THE ONLY EXPRESS WARRANTY MADE IN CONNECTION WITH THE BATTERY SYSTEM. EXCEPT EXPRESSLY AS SET FORTH HEREIN, PROTERRA EXPRESSLY DISCLAIMS ANY OTHER WARRANTIES OR GUARANTEES, EXPRESS OR IMPLIED, AS TO THE QUALITY OR PERFORMANCE OF THE BATTERY SYSTEM, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES AND CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, DURABILITY, OR THOSE ARISING OUT OF A COURSE OF DEALING OR USAGE OF TRADE.



PROTERRA LIMITED BATTERY SYSTEM WARRANTY

APPROVED USE CONDITIONS

THIS WARRANTY IS SUBJECT TO BUYER’S COMPLIANCE IN ALL RESPECTS WITH THE FOLLOWING APPROVED USE CONDITIONS, OR ANY CONDITION IN THE PURCHASE OR LEASE AGREEMENT RELATED TO USE CONDITIONS, DURING THE ENTIRE WARRANTY PERIOD. ANY NON-COMPLIANCE WITH THE APPROVED USE CONDITIONS WILL VOID THIS WARRANTY.

<p>State of Charge (SOC) Conditions for a Battery System while in Storage</p>	<p>While the Battery System is installed in a vehicle which is in storage, the Battery System’s SOC shall be between 5-50% if the storage period exceeds one (1) month.</p> <p>If the Battery System is removed from a vehicle, the Battery System must have a SOC between 5-50% at the time of removal and the Battery System shall not be uninstalled for more than one (1) month.</p> <p>The SOC is the amount of energy in the Battery System, expressed as a percentage of available capacity of the Battery System as stated in the BMS.</p>
<p>Environmental Conditions for Battery System and Vehicle Storage</p>	<p>A climate-controlled facility is recommended to store an uninstalled Battery System or an out-of-service vehicle with an installed Battery System.</p> <p>If a climate-controlled facility is unavailable, the following environmental conditions are required:</p> <ol style="list-style-type: none"> 1) Prior to and/or after installation in a vehicle, the Battery System shall not be subjected to ambient temperatures above +30°C for a total of one-hundred and eighty (180) days or above +40°C for a total of ninety (90) days. This restriction does not apply if the Battery System is being charged and conditioned through the Battery Thermal Management System (BTMS). 2) In no event shall the Battery System or vehicle be subject to temperatures above 60° C or below -30° C for more than twenty-four (24) hours.
<p>Battery Thermal Management System (BTMS)</p>	<p>Following the Battery System’s installation in a vehicle, the Battery System must be conditioned by the BTMS during operation (driving or charging). If the BTMS is not functional for any reason, the vehicle must be removed from service.</p>
<p>Packaging/Plugs</p>	<p>If the Battery System is not installed in or removed from a vehicle, the Battery System must be stored with the plugs intact in the same manner as when the Battery System was delivered.</p>
<p>Minimum Operational SOC</p>	<p>The vehicle shall not access energy below 3% SOC, as measured by the BMS, more than five (5) times in any rolling twelve (12) month period during the Warranty Period.</p>



PROTERRA

Commonwealth of Virginia

14. Technical Service Support



PROTERRA

Service Organization Overview

The procedure to be used by End User requiring repairs.

- In the unfortunate event that one of Proterra's vehicles needs repair, Proterra is readily available help. We encourage the End User to call their Field Service Representative assigned to their area. The End User can also call 864-438-0000 or email service@proterra.com for service or serviceparts@proterra.com.

Typical turn-around time on repairs.

- The typical turn-around time on repairs is determinant on the extent of the repair needed. Proterra is dedicated to keeping the End User's Proterra buses operational and will respond to all requests for repairs within 24 hours of the receipt.

Service Department days and hours of operation

- Proterra's Service Department is operational Monday through Friday from 8:00am to 5:00pm Eastern Standard Time. The Field Service Representative assigned to the particular End User will honor same times, but specific to the time zone associated with the End User.

Number of qualified / factory trained service personnel normally on hand.

- Proterra keeps on hand a team of diversely qualified / factory trained service personnel on hand. These individuals offer a broad range of specialization from Customer Service Engineers, Field Service Representatives, Aftermarket Parts, Material Handling, Training, Software Engineers, and several others to meet the specific need of the End User.

Description of the parts on inventory on hand.

- Proterra maintains an inventory of many of the products for our vehicles and offer a 24-hour turnaround time on those items in stock. Much of the inventory is kept in Proterra's Greenville, S.C location and additional inventory is kept in Proterra's Los Angeles/City of Industry facilities.

Training Services, Facilities, and Personnel Available.

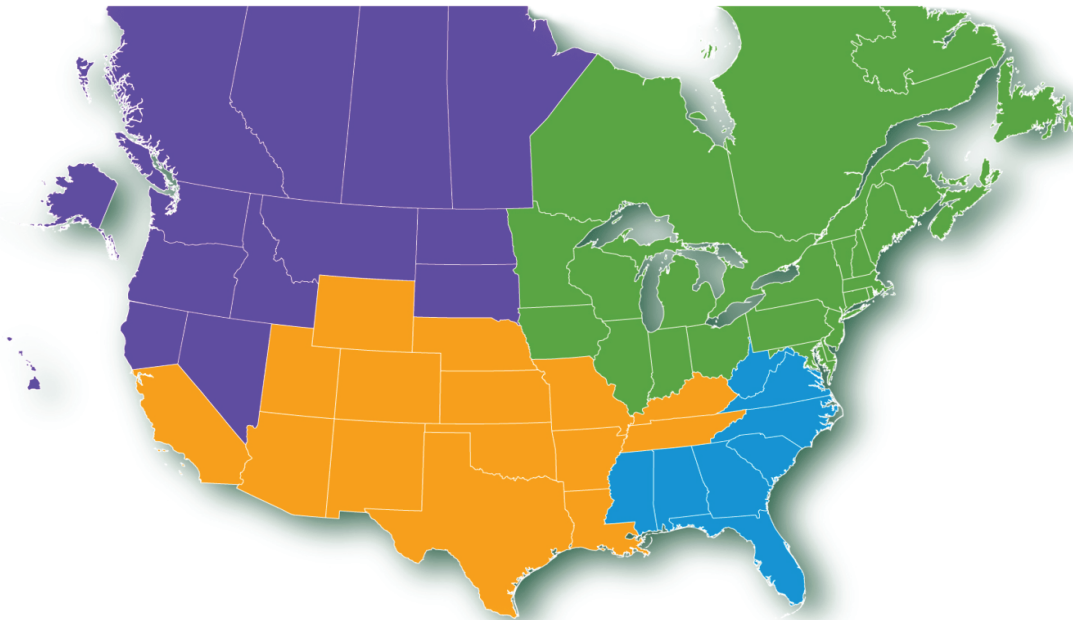
- Proterra provides extensive services related to the preventative maintenance of our vehicles. This includes training to help assist customers to know how to effectively provide general maintenance and repair to their Proterra vehicles. Thirty-two hours of vehicle maintenance training is provided with our base bus, and additional hours are available at an additional charge. Proterra will provide onsite support as required in the warranty period. Proterra also offers service plans that can be purchased for PM service and extended warranties are offered. This would also include onsite service support for warranty and non-warranty service. Please see the following pages for information regarding our facilities and personnel available.



PROTERRA

Field Service

Proterra service representatives are here to help. Whether it's with deployment or operations of our vehicles and the supporting charging infrastructure, call your Proterra representative for expert help on your maintenance and operational needs.



Southeast

William Hall – Greensboro, NC
David Han – Washington, DC
Dennis Stone – Clemson, SC
Ian Schaefer – Athens, GA
Open Req – Miami, FL
Chris Johnson – Greenville, SC
Mario McBride – Greenville, SC

Northeast

David Kirlin – Philly, PA
Lorand Moldovan – New York, NY
Everth Zavala – New York, NY
Jason Patrick – Bridgeport, CT
Justin O'neill – Dover, DE
Thomas McDuffee – Chicago, IL
Robert Galea – Toronto, ON

Midwest

Daniel Brogan – Dallas, TX
Kenneth Adomaitis – Chicago, IL
Juan Ochoa – Bakersfield, CA
Mark Parriott – Pomona, CA
Armando Jimenez – Los Angeles, CA
Ned Funnell – Salt Lake City, UT
Jonathan Egelston – Lexington, KY

Northwest

Joe Goins – Bay Area, CA
Jonathan Thompson – Everett, WA
Ramon Barroso – Reno, NV
William Rogers – Antioch, CA
Enrique Machado – Burlingame, CA
Stefan Srdic – Edmonton, AB

Headquarters

1815 Rollins Road, Burlingame, CA 94010

East Coast Manufacturing

1 Whitlee Court, Greenville, SC 29607

West Coast Manufacturing

383 Cheryl Lane, City of Industry, CA 91789



PROTERRA

East Coast Manufacturing / Vehicle Engineering Facility

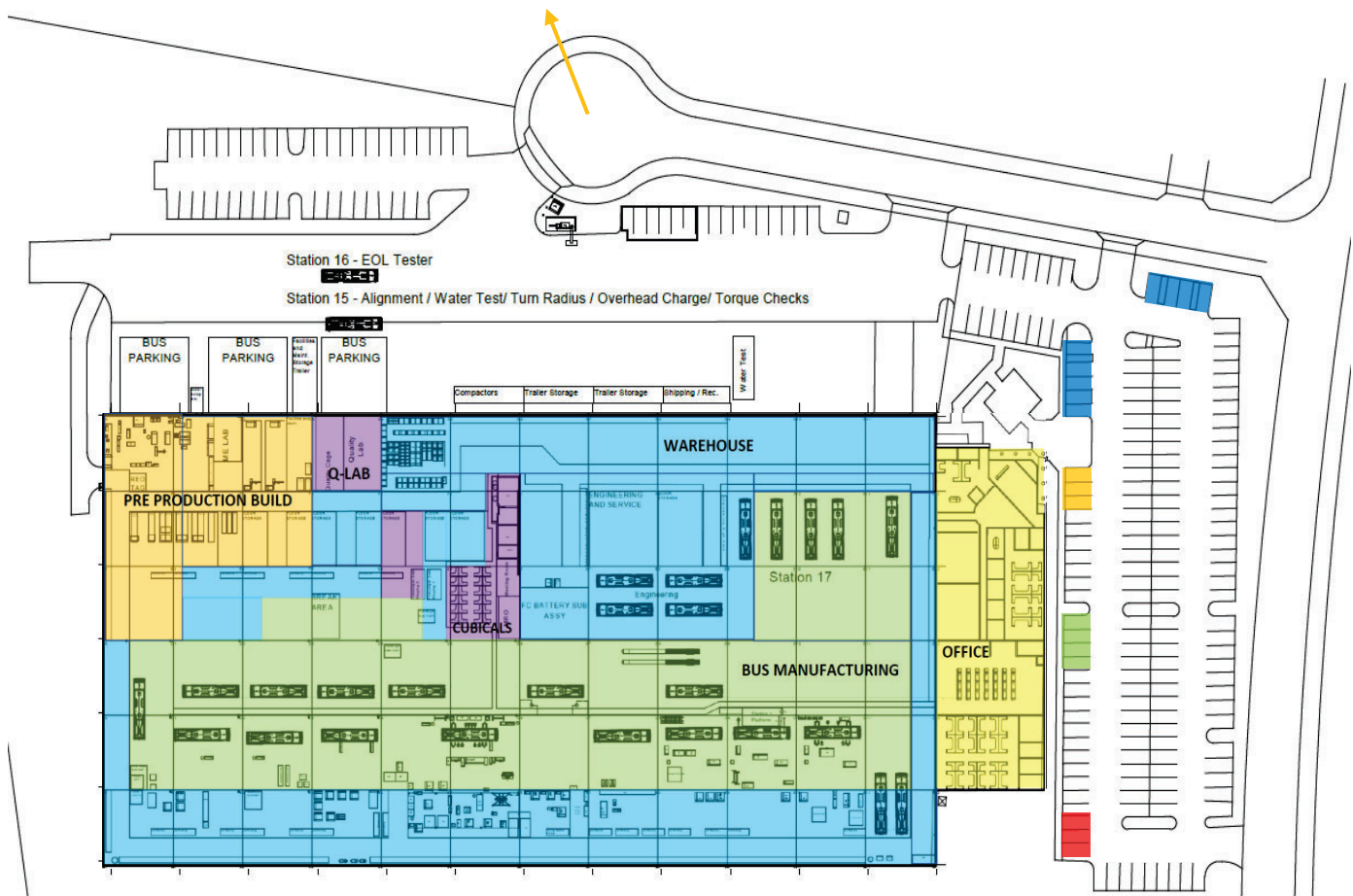
1 Whitlee Court
Greenville, SC 29607

(2 of the employees based out of Canada,
are geolocated in Greenville).

Activities Performed: Supply Chain, Legal, Sales,
Accounting, Audit, Engineering, Battery Electric Bus
Manufacturing, Testing, Inspection, and Validation.



The image above is the outside of our facility and the below image contains an
image representing the double-line manufacturing process in Greenville:



Headquarters
1815 Rollins Road, Burlingame, CA 94010

East Coast Manufacturing
1 Whitlee Court, Greenville, SC 29607

West Coast Manufacturing
383 Cheryl Lane, City of Industry, CA 91789



PROTERRA

West Coast Manufacturing Facility & Service Hub

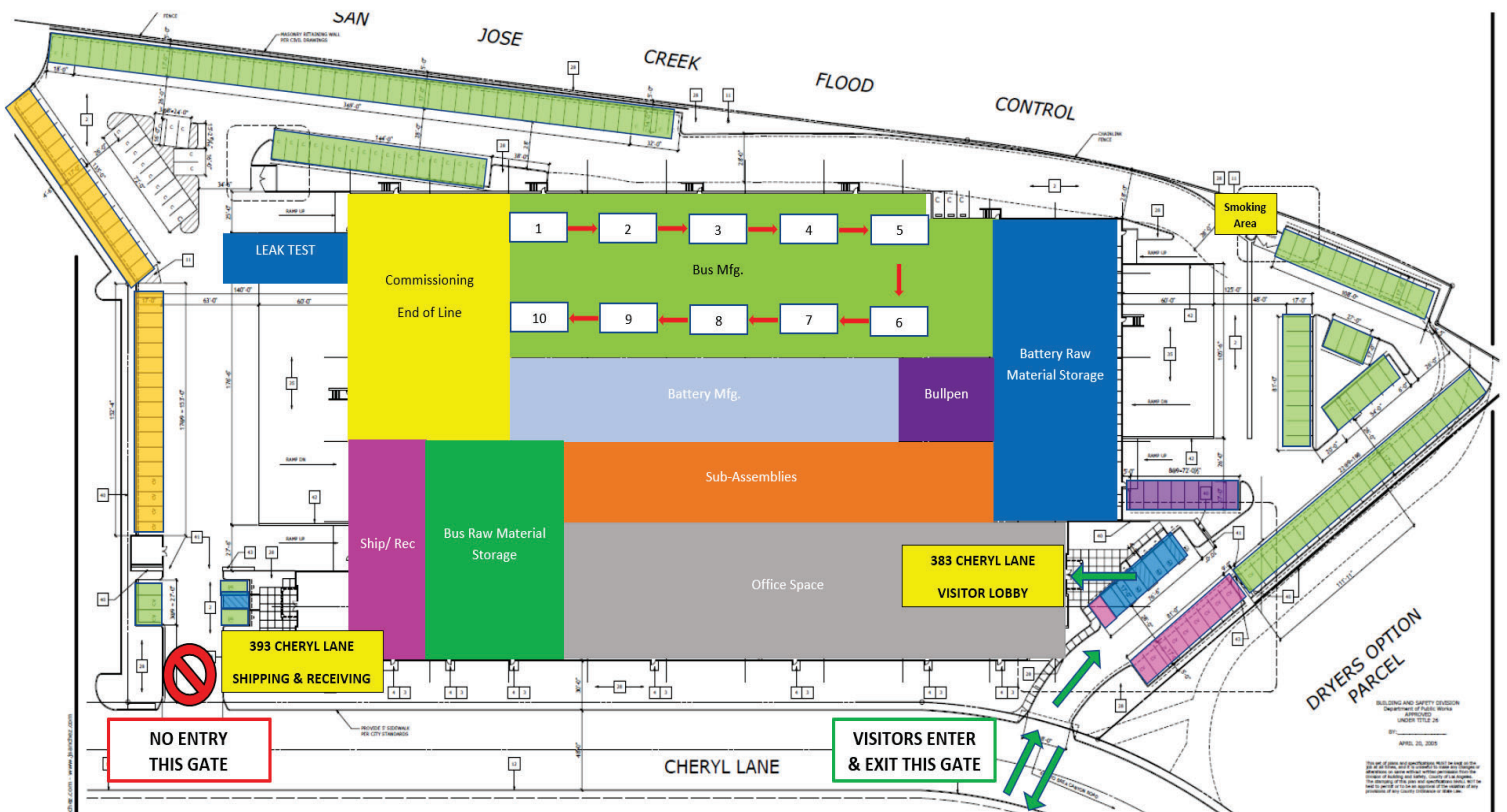
383 Cheryl Lane

City of Industry, CA 91789 (Los Angeles County)

Activities Performed: Legal, Sales, Accounting, Audit, Engineering, Vehicle Testing, Battery Manufacturing, Battery Electric Bus Manufacturing and Validation.



The image to the right is outside of our facility and the below is an image of the Los Angeles facility layout:



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1815 Rollins Road, Burlingame, CA 94010

East Coast Manufacturing
1 Whitlee Court, Greenville, SC 29607

West Coast Manufacturing
383 Cheryl Lane, City of Industry, CA 91789



PROTERRA

Proterra Corporate Headquarters

1815 Rollins Road
Burlingame, CA 94010

Activities Performed: Executive Leadership, Legal, Sales, Accounting, Audit, Engineering, Advanced Battery R&D, Charger Manufacturing and Validation.

The heavy-vehicle industry's most advanced lithium-ion batteries are being designed, tested, validated, and manufacture in Burlingame, CA. Proterra's battery engineering team has extensively tested and validated the E2 battery packs and as a result Proterra offers a 12-year warranty on all high voltage battery packs. The image to the right is the outside of our facility. The high voltage battery pack manufacturing layout is confidential, although we would encourage a team from TRANSLINK to travel to Burlingame to visit the facility during the evaluation processes. It is unrivaled in the North American transit market as no one else designs, validates, and manufactures their own high voltage battery packs in the United States.



Proterra EV Battery Factory

Greer, SC
To begin operation in Q4 2022

Proterra has committed to a minimum investment of at least \$76 million USD, with additional investments planned over the next several years, and expects to create more than 200 new jobs over the next several years at the 327,000 square foot battery system production plant. The factory is expected to launch in the second half of 2022 with multiple gigawatt hours of annual production capacity for Proterra's battery systems. By 2025, the factory is expected to support additional battery system production capacity, as well as the production of ancillary systems incorporated into electric medium- and heavy-duty electric vehicles and equipment.



Headquarters

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East Coast Manufacturing

1 Whitlee Court, Greenville, SC 29607

West Coast Manufacturing

383 Cheryl Lane, City of Industry, CA 91789

Industry-leading

training, service and support

- Proterra's technical training department helps **prepare your maintenance & operations workforce** for the transition to battery-electric vehicles.
 - Classroom & hands-on training
 - Virtual & on-site options
- 24/7 customer support
- Lifetime digital access to technical publications & service manuals
- Regional field service representatives available to help maintain your fleet



EV training

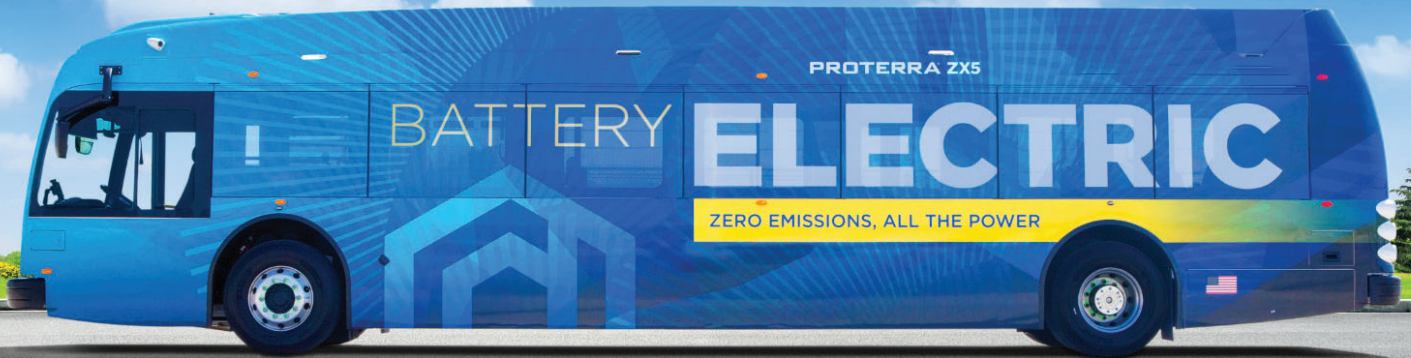
to set your workforce up for success

Standard Training Program

Subject	Introductory Training	Vehicle Operation	Vehicle Maintenance	Charger Maintenance	First Responder
Total Hours	16 hours	16 hours	32 hours	8 hours	4 hours
Sessions	8 sessions (2 hours each)	4 sessions (4 hours each)	4 sessions (8 hours each)	1 session (8 hours)	1 session (4 hours)
Participants	fuelers & personnel involved with vehicle operation	vehicle operators	maintenance technicians	maintenance technicians	local emergency personnel

Customization & additional paid training sessions available - talk to us about tailoring a training program for your agency!





We help you
get your fleet on the road



Data Collection

- GPS tracking
- Route analysis
- Identify layovers
- Operations needs



Vehicle Configuration

- ZX5 bus model
- Energy storage amount & type
- Drivetrain recommendation



Charging Configuration

- Charging opportunities
- Type of charging needed
- Charger system sizing



Services

- Telematics
- Data analytics
- Full fleet transition planning
- Training



Financing

- Purchase & lease options
- Funding opportunities
- Procurement methods



Small Business Subcontracting Plan

It is the goal of the Commonwealth that over 42% of its purchases be made from small businesses. All potential bidders are required to include this document with their bid response in order to be considered responsive.

Small Business: "Small business (including micro)" means a business which holds a certification as such by the Virginia Department of Small Business and Supplier Diversity (DSBSD) on the due date for bids. This shall also include DSBSD-certified women- owned and minority-owned businesses and businesses with DSBSD service disabled veteran owned status when they also hold a DSBSD certification as a small business on the bid due date. Currently, DSBSD offers small business certification and micro business designation to firms that qualify.

Certification applications are available through DSBSD online at www.SBSD.virginia.gov (Customer Service).

Bidder Name: Proterra Operating Company, Inc.

Preparer Name: Mary Reeder **Date:** 9/29/2022

Who will be doing the work: I plan to use subcontractors I plan to complete all work

Instructions

- A. If you are certified by the DSBSD as a micro/small business, complete only Section A of this form.
- B. If you are not a DSBSD-certified small business, complete Section B of this form. For the bid to be considered and the bidder to be declared responsive, the bidder shall identify the portions of the contract that will be subcontracted to DSBSD-certified small business for the initial contract period in relation to the bidder's total price for the initial contract period in Section B.

Section A

If your firm is certified by the DSBSD provide your certification number and the date of certification.

Certification number: N/A Certification Date: N/A

Section B

If the "I plan to use subcontractors box is checked," populate the requested information below, per subcontractor to show your firm's plans for utilization of DSBSD-certified small businesses in the performance of this contract for the initial contract period in relation to the bidder's total price for the initial contract period. Certified small businesses include but are not limited to DSBSD-certified women-owned and minority-owned businesses and businesses with DSBSD service disabled veteran-owned status that have also received the DSBSD small business certification. Include plans to utilize small businesses as part of joint ventures, partnerships, subcontractors, suppliers, etc. It is important to note that these proposed participation will be incorporated into the subsequent contract and will be a requirement of the contract. Failure to obtain the proposed participation dollar value or percentages may result in breach of the contract.

B. Plans for Utilization of DSBSD-Certified Small Businesses for this Procurement

Subcontract #1

Company Name: N/A SBSB Cert #: _____

Contact Name: _____ SBSB Certification: _____

Contact Phone: _____ Contact Email: _____

Value % or \$ (Initial Term): _____ Contact Address: _____

Description of Work: _____

Subcontract #2

Company Name: _____ SBSB Cert #: _____
Contact Name: _____ SBSB Certification: _____
Contact Phone: _____ Contact Email: _____
Value % or \$ (Initial Term): _____ Contact Address: _____
Description of Work: _____

Subcontract #3

Company Name: _____ SBSB Cert #: _____
Contact Name: _____ SBSB Certification: _____
Contact Phone: _____ Contact Email: _____
Value % or \$ (Initial Term): _____ Contact Address: _____
Description of Work: _____

Subcontract #4

Company Name: _____ SBSB Cert #: _____
Contact Name: _____ SBSB Certification: _____
Contact Phone: _____ Contact Email: _____
Value % or \$ (Initial Term): _____ Contact Address: _____
Description of Work: _____

Subcontract #5

Company Name: _____ SBSB Cert #: _____
Contact Name: _____ SBSB Certification: _____
Contact Phone: _____ Contact Email: _____
Value % or \$ (Initial Term): _____ Contact Address: _____
Description of Work: _____

NOTE: This information can be captured using this template or using the sourcing tools available in eVA.