

## The Move to Zero Emission, Battery Electric Buses

Zero-emission transportation promises a healthier future for our communities and our world. Greater Bridgeport Transit (GBT) is excited to deploy its first two battery electric buses to **reduce carbon emissions, improve air quality,** and **save money.**

The transportation sector is responsible for nearly 30% of greenhouse gas emissions in the United States; a significant portion of that is tied to medium- and heavy-duty vehicles, including transit buses. By deploying buses with zero emissions at the tailpipe, we are doing our part to mitigate the impacts of climate change while reducing local air pollution. Beyond that, the transition to battery electric buses is expected to save money in fuel and maintenance costs compared to a traditional diesel-powered bus.

*This is a new beginning for GBT, and we look forward to leading the charge to a cleaner, healthier way to keep our communities moving.*



# The Project - Overview

The first two phases of the project include the purchase of up to five, forty-foot battery electric buses and the associated charging infrastructure. The buses and chargers are housed at GBT's maintenance facility in Bridgeport and the buses will be placed in service throughout the Bridgeport region. The components of the project include:

## Phase 1

- 2 Proterra Catalyst 440 kWh Battery Electric Buses
- 2 Proterra 125 kW Electric Bus Chargers

## Phase 2

- 3 Proterra ZX5 660 kWh Battery Electric Buses
- 3 Proterra 125 kW Electric Bus Chargers

## Additionally:

This project includes a charging Infrastructure suitable for up to 11 Battery Electric Buses in the future – 19% of the fleet.



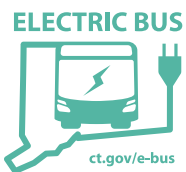
Proterra electric buses are designed and built in the United States by American workers in Proterra's manufacturing facilities in California and South Carolina. More than 70% of the materials that make up Proterra vehicles are sourced right here in the United States. Proterra is committed to strengthening the U.S. transit industry and creating jobs here at home through domestic manufacturing.

## Project Partners

This project is made possible through a partnership of agencies which includes:

**Federal Transit Administration (FTA)** – Funding and Technical Support

**The Connecticut Department of Transportation (CTDOT)** – Funding, Technical Support, and Project Management



**The Connecticut Department of Transportation e-Bus Initiative**

Learn more at [ct.gov/e-bus](https://ct.gov/e-bus)

**CTtransit** - A division of The Connecticut Department of Transportation.

**Connecticut Department of Energy and Environmental Protection (CT DEEP)** – Technical Support

**Connecticut Public Utilities Regulatory Authority (PURA)** – Technical Support

**Center for Transportation and the Environment (CTE)** – Technical Support and Project Management – CTE is a member-supported 501(c)(3) nonprofit organization that develops, promotes, and implements

advanced transportation technologies, vehicles, and fuels that reduce environmental pollution and fossil fuel dependency. Learn more about CTE: <https://cte.tv/about-us>

**Proterra** – Manufacturer of Battery Electric Buses, Greenville, South Carolina - Proterra is a leader in the design and manufacture of zero-emission electric transit vehicles and Proterra Powered electric vehicle technology solutions for heavy-duty applications. Since 2004, Proterra technology has been proven through more than 14 million miles on the road in our purpose-built electric transit buses. Proterra has sold more than 950 electric buses to 120 communities across 43 U.S. states and Canadian provinces. Learn more about Proterra: <https://www.proterra.com/company>

**Wendel** – Technical Support, Infrastructure Design Services - Wendel provided engineering feasibility and design support to GBT on their fleet conversion to battery electric buses including electric rate analysis, charger sizing, electric utility design coordination and detailed design for electric upgrades and charger installations as well as upgrades to fire protection and other mechanical systems. Wendel is a national Architectural, Engineering, Construction Management, and Energy Efficiency firm that delivers customized solutions and turnkey projects in innovative ways. Learn more about Wendel: <https://wendelcompanies.com>

# Funding

This project includes funding from two sources and several programs:

**Federal Transit Administration Low or No Emission Grant (Low-No Grant)** – The Low or No Emission competitive program provides funding to state and local governmental authorities for the purchase or lease of zero-emission and low-emission transit buses as well as acquisition, construction, and leasing of required supporting facilities.

Learn more about Low-No: <https://www.transit.dot.gov/funding/grants/lowno>

**Federal Transit Administration – 5307 Formula Funding** – The Urbanized Area Formula Funding program (49 U.S.C. 5307) makes federal resources available to urbanized areas for transit capital and operating

assistance in urbanized areas and for transportation-related planning.

Learn more about the FTA Formula Funding Program: <https://www.transit.dot.gov/funding/grants/urbanized-area-formula-grants-5307>

## Connecticut Department of Transportation – Match Funding for Low-No and Formula Grant




### General Costs – Buses and Chargers

- Buses (Base) \$770,000 Per Unit
- Configurables \$165,226 Per Unit
- Total Cost Per Unit \$935,226
- Chargers Cost Per Unit \$60,000
- Project Management \$400,000 (Three Years)
- Workforce Development \$207,300

# Phase 1 Impacts & Costs


## Project Impacts (First Two Buses)

In this first phase, the operation of the battery electric buses is expected to reduce GBTs annual diesel fuel consumption by approximately 24,000 gallons. This translates to an approximate 560,000 pound annual reduction in greenhouse gas emissions from the tailpipe of the buses. When the emissions produced by power generation are taken into consideration, the net reduction of carbon dioxide emissions is estimated at approximately 450,000 pounds. This reduction is the equivalent of removing approximately 45 passenger vehicles from the road for a year.

|         |  ANNUAL MILEAGE |  DIESEL CONSUMPTION REDUCED BY |  NET CO <sub>2</sub> EMISSIONS REDUCED BY |
|---------|--|---|--|
| Phase 1 | 85,264 mi  | 24,361 gal  | 455,492 lbs  |
| Phase 2 | 276,889 mi   | 79,111 gal  | 1,479,179 lbs  |
| Phase 3 | 660,139 mi   | 188,611 gal   | 3,526,551 lbs  |

## Phase 1 Operating Costs

Cost savings from operating battery electric buses are expected from fuel and maintenance. The electricity costs to operate the two electric buses is estimated at approximately \$36,000 annually while annual diesel fuel costs for the same number of miles is estimated at approximately \$58,000, or a \$22,000 annual cost savings (38%). Beyond fuel savings, electric buses have fewer moving parts than traditional diesel buses, fewer lubricants to change, and there will be improvements in brake life as a result of regenerative braking. It is estimated that annual maintenance costs will be reduced by approximately 30% as compared to the diesel buses.





GBT is projected to save at least

**\$4,322 per year** with 5 year low cost diesel,

**\$22,305 per year** with 5 year average cost diesel, or

**\$36,723 per year** with 5 year high cost diesel.

|  |            |   |
|--|------------|---|
| <b>BATTERY ELECTRIC</b>  |            | <b>AVERAGE DIESEL</b>   |
|  |            |  |
| <b>\$0.42</b>  | <b>vs.</b> | <b>\$0.68</b>   |
| <b>cents per mile</b>  |            | <b>cents per mile</b>   |

**That saves approximately \$11,153 per year compared to an average diesel bus.**

# The Technology – Proterra Catalyst

**Zero Tailpipe Emissions** – The Proterra Catalyst bus is 100% electric, with no tailpipe emissions – and no tailpipe! Each time an electric bus replaces a diesel bus, about 230,000 pounds of CO<sub>2</sub> are avoided each year, equivalent to planting 5,000 trees.

**Expected Lower Operating Costs** – With approximately 30% fewer parts than a combustion engine, Proterra electric drivetrains simplify maintenance and lower operating costs.

**Quiet** – Without a combustion engine on board, riders can enjoy a quieter experience aboard the Proterra electric bus, and the wider community benefits from reduced noise pollution.

**Unique Bus Body** – The Proterra electric bus is made with an advanced carbon-fiber-reinforced composite body which is non-conductive, lightweight, and outperforms traditional buses in terms of impact and corrosion resistance. Similar material is used in marine applications, aviation, and wind turbine blades.

**Designed for Battery Safety** – The purpose-built design of the Catalyst enables the best placement of battery packs for safety and stability. Battery packs are located underneath and outside of the passenger compartment, separated by a sealed bulkhead beneath the floor, creating a lower center of gravity.

**Range** – The Catalyst electric bus has the best efficiency of any electric bus in its class. Combined with industry-leading energy density and 440 kWh of energy on board, the Catalyst is designed to provide the longest range. For context, 440 kWh is enough energy to power an average American home for more **than two weeks!**

**Standardizing Charging** – Proterra charging systems take advantage of standardized connectors to enable interoperability, so they can also be used to charge other electric vehicles at GBT.

## Schedule

The first two buses have arrived in Bridgeport and, along with the chargers, are being commissioned. Commissioning includes tests throughout the region prior to their deployment in bus service. It is anticipated that these buses will begin regular service in Bridgeport neighborhoods and throughout the region in October.

## Live Tracking

When the buses are placed into service, GBT will also activate a web page which will allow for the real time display of the operating statistics of the buses through ViriCiti (Monitoring solutions for electric vehicles). The ViriCiti platform provides data and information on Key Performance Indicators like the State of Charge (SOC), distance driven, energy consumptions, net emission reductions (CO<sub>2</sub>, NO<sub>x</sub>, PM) and will help monitor the buses to increase range and keep the buses healthy.

Learn more about ViriCiti: <https://viriciti.com/>

## Gallery & Resources

An image gallery and resources related to this project are available online at [gogbt.com/ZEB2020](http://gogbt.com/ZEB2020)

## Leave a Comment

You may send us a comment online at [gogbt.com/ZEB2020](http://gogbt.com/ZEB2020)

## Contact Us

To learn more about this project, please contact:

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