



U.S. Department of Transportation  
Federal Transit Administration



# FTA Bus Efficiency Enhancements Research and Demonstration: Thermoelectric Generation Demonstration at LYNX

## Background

FTA's Bus Efficiency Enhancements Research and Demonstration (BEERD) program was developed to promote the development and demonstration of energy efficiency-enhancing technologies for buses used in public transportation; the Federal Transit Administration (FTA) sponsored this project as part of the BEERD program. This report summarizes the experience and results from the development, testing, and demonstration of a thermoelectric generator (TEG) and presents a narrative description of the development and demonstration of the thermoelectric generator.

## Objectives

The objective of this project was to develop a TEG to capture the heat from the exhaust of a diesel bus and convert that heat into electrical energy and to conduct a technical and economic feasibility assessment. The Center for Transportation and the Environment (CTE) managed the design, build, testing, and demonstration of the TEG, which was demonstrated in Orlando, Florida, by LYNX Transit.

## Findings and Conclusions

*This project demonstrated that a TEG can be successfully operated on a transit bus in service and developed a framework for future demonstrations.*

The TEG was designed, built, tested, and installed on a diesel bus by Hi-Z Technologies, Inc. The Central Florida Regional Transit Authority dba LYNX in Orlando provided a 2007 diesel bus for the demonstration. The University of Central Florida's Florida Solar Energy Center (FSEC) developed a data collection system and conducted a thorough analysis of the data. International Trade Bridge (ITB) supported the installation and testing of the TEG and worked with the Kennedy Space Center to provide access to private roads for testing. Energy Florida used the results to develop a commercialization plan for the TEG.

The maximum power output of the TEG on the bus was 1122W, which was achieved during testing, with the bus on a high speed route and traveling at 56 miles per hour. During transit service, the TEG produced 300–430 W of power and TEG consumed approximately 100W during operation, so the net power output was 200–330 W. This translated to a projected savings of approximately 180 gallons of diesel, or \$600, annually.

Lessons learned from this project have laid the groundwork for future efforts. One finding was that CNG buses have much higher exhaust temperatures than diesel buses, so CNG vehicles may be a better application for TEG technology. The next step in developing this technology will be to connect the electrical output of the TEG to a bus electrical system.

## Benefits

The report contains data results, lessons learned, advancements made, and recommendations for future research and will serve as a source of information for industry organizations for future projects. This report documents that a TEG can meet the needs of U.S. transit agencies and can be successfully operated on a transit bus in service.

## Project Information

### FTA Report No. 0142

This research project was conducted by Alison Smyth and Erik Bigelow of CTE. For more information, contact FTA Project Manager Samuel Yimer at [Samuel.Yimer@dot.gov](mailto:Samuel.Yimer@dot.gov) or 202-366-1321. All research reports can be found at <https://www.transit.dot.gov/about/research-innovation>.