Electric School Bus Demonstration

Electric School Bus in Sacramento

- Actual performance and cost data from a deployment of electric school buses
- Information and analysis to understand and plan for electric school bus fleets and related charging

Background, Objectives, and New Learnings

Transportation is the last significant sector of the economy to be electrified. Compared to other alternative fuels, electricity is abundant and ubiquitous. In addition, Transportation Electrification infrastructure can typically be built economically, because it leverages the existing electrical system and can be installed incrementally as needed. Finally, transportation electrification currently provides comparatively much lower operating costs at about $1 per gasoline gallon equivalent (gge).

The utility industry is facing the transformative challenge of integrating a wave of customer technologies into the grid – including electric transportation, renewable generation, energy storage, and energy management controls. While these technologies may enable customers to reduce or shift their energy usage for economic benefit, their dependence on the electrical grid for reliability and transactive value remains. This places increased responsibility and complexity on utility systems and planning.

It is anticipated that the prevalence of plug-in electric vehicles will continue to increase as will their energy demands on the electricity grid. School districts are beginning to become aware of electric school buses for operational reasons as well as emissions and safety around children. For utilities, this potentially represents a challenge to both traditional load growth planning and load management. Furthermore, the capability of fully electric vehicles is evolving with greater affordability and improved performance, especially electric range.

A full understanding of the impacts of these transformative technologies is necessary to meet utility operations and planning needs. EPRI research strives to provide that understanding through demonstration and analysis of specific technology deployments.

This project focuses on demonstrating electric school buses to seek a greater understanding of the factors to be considered when implementing school bus electrification as well as the infrastructure and financial impact of bus charging. This program is expected to be a limited pilot program to provide learnings followed with modeling of an expanded system.

In pursuing these objectives, this project intends to facilitate and advance the adoption of electric school buses which may provide benefits to the public including:

- Demonstrating plug-in electric school buses in the field
- Understanding the control strategies
- Electrical service impact
- Local grid impact
- Possibilities for control and integration of bus charging so that utilities may understand and plan for a scaling of electric buses and related charging
- Improved public health due to emissions reductions from the replacement of diesel school buses
- Reduced noise from operations
- Lower environmental impact including carbon emission reduction
- Actual performance and cost data from a deployment of plug-in electric school buses in multiple jurisdictions in various climate zones and seasons

- Information and analysis to understand and plan for scaling of electric school bus fleets and related charging
- Analysis of potential to integrate electric school bus charging with excess supply, e.g., mid-day solar generation
- Grid impacts of school bus charging
- Optional: testing of bus-to-load (V2L)

Benefits

This research is intended to increase the understanding of plug-in electric school bus charging and the current technology on the market. These learnings are important now so that the factors can be understood as the industry grows.

Public benefits of this work may include:

- Increased public health due to emissions reductions from the replacement of liquid-fueled buses with plug-in electric school buses
- Reduced noise from operations
- Lower environmental impact including carbon reduction.

Funder benefits can include:

- Increased understanding of options and risks of electric buses
- Helping to define the research question
- Helping to manage institutional knowledge
- Increasing operational efficiency
- Reducing costs
- Complying with regulations and laws

Project Approach and Tasks

EPRI proposes to undertake the following tasks:

1. Summarize project and key learnings from existing electric school bus project(s).
2. Capture costs and key learnings from charging infrastructure installation for the electric school bus.
3. Collect operational data (e.g., kWh/mile, load shape, SOC over a work day, $ saved, etc.) and feedback over 2 years as a working school bus.
4. Also collect data on rural, urban, and suburban routes.
5. Adjust charging for mid-day spikes in supply (due to solar) and see how that met operational requirements.
6. Model grid impacts of charging and compare to reality.
7. For points 2-7 above, collect for each host participating utility, analyze any similarities/differences.
8. Optional: set up interconnect for vehicle-to-load, e.g. supply a building, campus, military base, and/or emergency power.
9. Optional: Lease electric bus and each utility would work with its customers (schools/districts) to rotate it through its service territory.
10. Produce briefings and technical report of findings

Deliverables

- Periodic updates
- Regular webcasts
- Final Technical report of results and lessons learned

The non-proprietary results of this work will be incorporated into EPRI Program 18, Electric Transportation, and made available to funding members of that program and to the public, for purchase or otherwise.

Price of Project

Funding for this project can be divided over the three-year life of the project.

- Site Hosts
  - Minimum of $50,000/year (who already have or plan to deploy an electric school bus) = $150,000 total. Additional scope may be added per the host.
- Collaborators
  - $25,000/year for (who will not deploy an electric school bus) = $75,000 total
- Investigating lease options at additional cost

This project qualifies for tailored collaboration (TC) or self-directed funding (SDF).

Project Status and Schedule

EPRI expects to commence the project in August 2018. The project is expected to continue for 36 months following project initiation.

Who Should Join

Utilities with school districts that have an interest in electric school buses in their service territory.

Contact Information

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com).

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Product ID: 3002014385 Project ID: 1-110918 April 2023

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