REPORT SUMMARY

FTA Report No. 0253
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FTA RESEARCH
FEDERAL TRANSIT ADMINISTRATION

PROCURING AND MAINTAINING BATTERY ELECTRIC BUSES AND CHARGING SYSTEMS – BEST PRACTICES

Background

As part of FTA's effort to promote continuous safety and operational improvements in the public transit industry, *Procuring and Maintaining Battery Electric Buses and Charging Systems – Best Practices* was developed to provide bus transit agencies with leading transit industry practices for performing these activities. This research is a resource for the industry that offers a summary of industry reports highlighting the challenges and opportunities encountered during battery electric bus (BEB) deployments. It also discusses the outcomes of federally sponsored deployments, existing standards from the American Public Transportation Association (APTA) and the Society of Automotive Engineers (SAE), and lessons learned through case studies. Also included are findings associated with BEB and charging station procurements, system efficiency and interoperability considerations, and maintenance standards and guidelines.

Additionally, the *Safety and Security Certification of Electric Bus Fleets - Industry Best Practices* supporting research was conducted to give bus transit agencies helpful information on the requirements of a Safety and Security Certification (SSC) program to verify the unique identified risks associated with a BEB fleet transition. With FTA's adoption of the Safety Management System (SMS) framework, shifting from a reactive to a proactive approach, change management programs such as SSC are critical to ensuring risk is identified and mitigated proactively. Finally, the *Guidebook for Deploying Battery Electric Buses* was developed to support transit agencies as they implement BEB deployments through an integrated Safety Management System (SMS) process.

Objectives

The primary objective of this project was to identify the best practices for procuring and maintaining battery electric buses and charging systems to support the transition of the nation's transportation systems to electric vehicles and other zero-carbon technologies.

Findings and Conclusions

The findings serve as tools to identify likely challenges that transit agencies should consider prior to embarking on the journey to transition bus fleets to electrification, and when considered together, the findings provide a compilation of best practices in terms of procurement language, training, interoperability, resiliency, and variable charging management approaches.

Through the literature review, a survey of 25 transit agencies that have procured BEBs, case study follow-up interviews with 8 transit agencies, and feedback from the CUTR Transit Standards Working Group, the research team developed these significant findings.

- Agencies that include OEM parts availability expectations in contract negotiations/procurement language may reduce associated challenges with the unavailability of replacement parts.
- Regional or state procurement coordination could provide agencies with an opportunity to leverage the benefits of economies of scale, negotiated procurement language, and pooled funding when available.

- Requesting clear language in the battery warranty that dictates whether it applies to the battery system versus the individual battery packs, cells, and/or battery management systems reduces the ambiguity of the warranty.
- It is beneficial to include battery storage, disposal, and/or recycling details in procurement language to reduce unexpected issues associated with repurposing or disposal.
- Depending upon fleet conversion goals, it may be necessary to redesign routes and/or operating parameters to accommodate BEB performance capabilities or on-route charging.
- Standardized training is beneficial for operators, technicians, route planners, and first responders.
- Whether planning for the first BEB procurement or a BEB fleet expansion, facilities require charging infrastructure installation, lifts that are rated for the weight of a BEB, fire suppression systems, and storage space for batteries and spare parts.
- As agencies begin to mix fleets during their second and third BEB procurements, the need for interoperability regardless of the make/manufacturer of the vehicle or charging system will be more pronounced.
- Fuel diversification and availability of backup power may be beneficial when power is unavailable for extended periods of time, such as during hurricane events or other natural disasters, to ensure that an agency can provide the necessary transportation.
- Higher power ultra-fast charging systems are entering the market with the promise of reducing dwell time for charging, possibly allowing BEBs to serve longer routes.
- Agencies may have limited negotiating powers with utility providers and should therefore consider the variations in utility rates by time of day.
- Transit agencies may feel more confident initiating the decarbonization of their bus fleets with the understanding that there are often options to lease charging equipment from utility companies.

Benefits

Procuring and Maintaining Battery Electric Buses and Charging Systems – Best Practices identifies key challenges transit agencies should expect as they initiate the transition to battery electric bus fleets. The summarized findings offer insight and considerations that will be most valuable for transit agencies that are not yet mature in their BEB fleet transition.

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Project Information

This research project was conducted by USF Center for Urban Transportation Research (CUTR). For more information, contact FTA Project Manager Raj Wagley at (202) 366-5386 or Raj.Wagley@dot.gov.

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