



SAFETY AND SECURITY CERTIFICATION OF ELECTRIC BUS FLEETS - INDUSTRY BEST PRACTICES

Background

This research report was produced as part of the Federal Transit Administration's (FTA's) effort to promote continuous safety and operational improvements in the public transit industry. The research was conducted to give bus transit agencies helpful information on how to use a safety and security certification (SSC) program to identify the unique risks that are introduced when transitioning to a battery electric bus (BEB) fleet. With FTA's adoption of the safety management system (SMS) framework, which shifts from a reactive to a proactive approach, change management programs such as SSC are critical to ensuring that risk is identified and mitigated proactively.

In addition, a supplementary report, *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. The report offers a summary of industry reports highlighting the challenges and opportunities encountered during 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. 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

This report recommends minimum SSC program practices and protocols for transit agencies that are actively procuring or planning to procure BEBs or associated charging infrastructure. The report contains information for agencies on how to use an SSC program to effectively identify and mitigate the unique risks of BEBs and their associated facilities, systems, and equipment.

Findings and Conclusions

The safety and security certification of electric bus fleets is a necessary risk-based approach to recognize and plan to mitigate hazards, and manage gaps that are recognized in the Safety Risk Management processes. SSC is a risk-based process paralleling the project's schedule and life cycle. While the process is often misunderstood, SSC acts in the best interest of the bus agency to ensure all hazards and vulnerabilities are appropriately mitigated and that any calculated risk is reduced to the lowest practical level. As such, the rapidly evolving dynamics of the battery electric market demand that agencies implement a robust verification process through SSC to identify and mitigate BEB-specific hazards. While most BEB components are similar to conventional fuel alternatives, new considerations must be made for the unique items and hazards inherent to BEBs and the associated infrastructure procurement processes.

To effectively implement FTA's 10-Step SSC process for BEBs, agencies should, at a minimum, develop or update the following:

- Manual of design criteria
- Agency specifications
- Standard operations procedures
- BEB and charger preliminary hazard lists
- Committee and working group membership

Managing the recognized gaps in the safety risk management (SRM) processes of SSC requires agencies to employ several operational strategies to mitigate unwanted risks. Notable gaps or issues in the certification process for BEBs include:

- Late coordination with the electric company
- Absence of specific codes and standards
- Some BEB certifiable items may change during assembly
- Parts availability issues hamper BEB operation
- Specific BEB fleet fire protection code requirements
- Most agencies do not utilize a complete safety certification process for BEBs
- Many agencies have not developed safety and security design criteria
- Missing input/coordination from all agency departments and local first responders
- No coordination with other agencies to identify issues and lessons learned
- Acquisition of any new personal protective equipment (PPE) and tools

Benefits

Safety and Security Certification of Electric Bus Fleets - Industry Best Practices provides an approach that public transit agencies can take to develop their comprehensive SSC programs based on FTA's *Handbook for Transit Safety and Security Certification* and tailor to their unique operating environments, the complexity of their operations, and the transit modes they provide.

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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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