DRISI
Caltrans Division of Research,
Innovation and System Information

Research Notes

Fuel Cell Electric Bus, Battery Electric Bus, and Battery Electric Train Infrastructure

Understanding the key issues in fuel cell electric bus, battery electric bus, and battery electric train infrastructure

Modal

MAY 2020

Project Title:
ZEV Center of Excellence

Task Number: 3299

Start Date: February 1, 2019

Completion Date: July 31, 2020

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WHAT IS THE NEED?

The California Air Resources Board (CARB) is developing strategies to transition the heavy-duty mobile source sector to zero and near-zero emission technologies to meet air quality, climate, and public health protection goals. The long-term vision of the Innovative Clean Transit effort is to achieve a zero-emission transit system by 2040.

Transit agencies have often been leaders in facilitating the introductions of new technologies. They have been partners in addressing air quality by continuing to be instrumental in leading to the adoption of low nitrogen oxide engines, zero emission technology deployment in heavy duty vehicle applications, and in addressing barriers.

To meet this ambitious goal, it is important that not only electric buses and trains, but also supportive infrastructure be in place. Mapping and cataloging the infrastructure supports the overall goal and policy of increasing Zero-Emission Buses (ZEBs) and Battery Electric Trains (BETs).

This research project provides an opportunity to learn about charging buses and electric trains that operate all day on battery and re-charge at night at the depot. As electric bus ranges increase, this could be an option to keep buses in service during the day and allow them to charge at night at lower utility rates, but this could have impacts in terms of bus storage needs. Most diesel buses are maintained at night, and therefore additional storage or charging space would be needed as agencies transition to electric fleets. Ultimately, the research team will attempt to analyze the infrastructure needed for a complete transition of public transit fleets to zero emission.

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WHAT ARE WE DOING?

The researchers are planning to investigate existing infrastructure for ZEBs and BETS, mapping and categorizing the existing ZEB and BET infrastructure in California, determining the optimal infrastructure conditions based on ZEB and BET technology's specifications and anticipated use, and identifying the deficiencies between the existing infrastructure and optimal infrastructure. The research team will prepare a report to document these findings; and include maps, technical specifications, and other materials.

WHAT IS OUR GOAL?

The goal of this effort is to assess and document the infrastructure deficiencies that hinder the adoption of ZEBs and BETs in California. The research team will develop a report that catalogs, describes, and analyzes the current locations of ZEB- and BET-supporting infrastructure.

WHAT IS THE BENEFIT?

The deployable product will be a final report that identifies ZEB and BET infrastructure needs and current conditions. These needs could be met by theoretical applications that are currently in development and examined by this research, which will provide guidance on where such infrastructure should be located.

Moreover, the research findings can be a foundation for future research to assess the effectiveness and use of ZEB and BET infrastructure. It will also provide costs and benefits analysis for the infrastructure; and pinpoints the types of projects that are most effective as a source of power for ZEB and BET vehicles.

WHAT IS THE PROGRESS TO DATE?

Task 1: Project Administration
Project administration is progressing as expected.

Task 2: Catalogue Current Infrastructure
This task is nearly complete, and the researchers are refining the information submitted in prior progress reports for inclusion in the final Task 2 Infrastructure Report.

Task 3: Determine the Infrastructure Gaps
The researchers continue to evaluate the gaps in infrastructure based on the future fleet numbers expected in 2030 of Battery Electric and Fuel Cell Electric Buses, as well as Zero Emission Multi-Unit trains.

Task 4: Determine the Infrastructure Needs
The researchers are adding General Transit Feed Specification data to build an improved model of infrastructure needs to charge or refuel the expected 2030 fleet of electrified buses and trains.