

## **Electric Transit User Group Forum Meeting Summary**

**Topic:** Charging and Hydrogen Refueling Infrastructure

**Dates:** February 13 and 23, 2024

The Electric Transit User Group (ETUG) regularly gathers to inform the National Renewable Energy Laboratory's (NREL) strategic direction to help address pressing needs associated with electrifying transit fleets, including technical challenges, workforce development, operations and maintenance, procurement, and other hurdles. Information collected through ETUG listening sessions generates key insights that could inform future research, technical assistance needs, and funding opportunities.

The following is a summary of the discussion and key takeaways from the February 2024 sessions on electric vehicle (EV) charging and hydrogen refueling infrastructure. NREL will use participant input and insights into fleet concerns to tailor its resources. NREL also plans to continue hosting listening sessions throughout FY24 on various topics to help address ongoing challenges and identify further resource gaps.

### **Participant Discussion Summary**

#### **Infrastructure-Related Advantages of Hydrogen and Electric Fueling Systems**

- Electricity is widely available, offers predictable pricing, and largely avoids safety and environmental concerns from fuel leaks and spills.
- Hydrogen fueling allows for zero-emission buses (ZEBs) to approximate conventional fueling practices due to short fueling times and a small dispenser footprint.

#### **System Design**

- Participants stressed that a lack of utility service capacity or a lack of depot space were common obstacles for large-scale battery electric bus (BEB) charging projects, and that both factors need to be evaluated early in the planning process. A 1:1 ratio of depot chargers to vehicles is considered by many fleets to be ideal, and any EV charging depot should be designed with future expansion in mind.
- On-route charging needs to be protected from vandalism and inclement weather. On-route charging is well-suited for facilities where equipment or power can be shared, such as transit hubs and passenger rail facilities, but cost allocation is a challenge for shared infrastructure. System design must accommodate future schedule changes.
- A single central hydrogen fueling location to serve multiple depots is cost-effective to build and maintain but requires operational adjustments to bring vehicles to the fuel. Locating separate hydrogen fueling facilities at each depot can minimize operational changes but building and maintaining several separate fueling systems is more costly than the centralized approach.

## Installation

- Pandemic disruptions caused extended lead times for electrical equipment (chargers, switchgear, transformers). Participants recommend adapting by using fewer chargers or limiting charging power initially. Working with experienced hydrogen engineers and installers is critical for success, but hydrogen fueling expertise is still uncommon.

## Operation

- Currently, compatibility between vehicles and chargers must be verified before purchase, but participants called upon the industry and standards bodies to do better to make charging interoperability universal. Participants cited turnkey charging service providers as a good option to minimize finger-pointing between vendors when charging problems occur. The realistic service life of depot DC fast charging may be as little as 5 years.
- Hydrogen fueling is still uncommon and finding experienced technicians is difficult. Dispensers can be glitchy, but quick fueling times provide flexibility to continue operations even if one dispenser is inoperable.
- Participants saw most on-route charging as very challenging to maintain due to its operational criticality coupled with difficulty in monitoring and securing systems located away from the depot. Participants expressed concern with the continued absence of a standard for wireless inductive charging.

## Fuel Supply

- Grid upgrades are a barrier. Participants discussed early engagement with the local utility, as well as the possibility for on-site power generation to supplement or replace utility service.
- Hydrogen, particularly green hydrogen, can be impossible or prohibitively expensive to procure. On-site production via electrolysis can be viable on a small scale, but not for a full fleet conversion.

## Key Takeaways

NREL identified the following key takeaways from the ETUG listening sessions on EV charging and hydrogen refueling infrastructure. NREL will seek opportunities to help address these takeaways through the lab's technical assistance offerings.

- **Interoperability** between battery electric buses (BEBs) and electric vehicle charging infrastructure continues to be a major barrier to BEB adoption.
- **Depot space constraints** hinder large-scale BEB adoption.
- **EV charging resiliency** is a looming concern as fleets move beyond the pilot stage and start relying heavily upon BEBs.
- **Hydrogen may offer a range of advantages in cold climates**, but little real-world data are presently available.