

Electric Transit User Group (ETUG) Forum

Meeting Summary

September 21, 2022

Anaheim Convention Center, Anaheim, California

Meeting Welcome/Introductions: Margo Melendez from the National Renewable Energy Laboratory (NREL) welcomed the participants and outlined the vision for the newly formed ETUG group and the afternoon's discussion. Dan Raudebaugh from the Center for Transportation and the Environment (CTE) also provided welcoming remarks and spoke about the role of other CTE-led working groups. Participants introduced themselves.

Government Agency Presentations: The U.S. Department of Energy's (DOE) Vehicle Technologies Office (VTO), Federal Transit Administration (FTA), and the U.S. Department of Transportation's (DOT) Volpe Center all provided short presentations about past and ongoing activities related to EV transit. These presentations are available on the ETUG webpage (<https://www.nrel.gov/transportation/electric-transit-user-group-forum.html>).

EV Bus Deployment Lessons Learned: Facilitated Panel Discussion: Representatives from Mountain Line, the National Park Service, Alexandria Transit Company's DASH Bus, and Denver's Regional Transportation District (RTD) provided short presentations on their experiences integrating zero emission buses (ZEB) into their fleets and future ZEB planning. Presentations were followed by a roundtable discussion.

- **Corey Aldridge—Mountain Line, Missoula, Montana:** Mountain Line has committed to a zero tailpipe emissions fleet by 2035 and currently 40% of its fleet is all-electric. Highlighted challenges include facility space considerations for buses and infrastructure, as well as the effect of cold climate on range.
- **Jim Donovan—National Park Service, Yosemite National Park, California:** Yosemite currently has two battery electric buses (BEB). They are currently the only National Park using BEBs. They are looking to expand their BEB fleet but must first resolve challenges with inadequate electric capacity at their facilities.
- **Raymond Mui—DASH, Alexandria, Virginia:** DASH has a fleet of 100 buses and a goal of going 100% ZEB by 2035. They currently have a fleet of 14 BEBs. DASH is currently exploring their options to increase electric capacity at their facility through alternative sources of energy and partnerships with their utility.
- **Fred Worthen—RTD, Denver, Colorado:** RTD has a 2,400 square mile service area that includes massive elevation changes. They stressed the need for good data and modeling that can drive decisions to electrify. RTD worked closely with the utility Xcel Energy to develop a special rate structure that reduced operating costs by 35%.

EV Bus Deployment Roundtable Discussion:

- **Engaging with Your Utility—**Long-term plans and projections are important to share with utilities. Find out what your utility needs as soon as possible in the process.

- **Technical Assistance**—Partnering with local resources (i.e., municipal energy office) can be a big help. On-site electrical and engineering experts may be needed. Transition plans can be beneficial.
- **Facility Considerations**—Fleets should consider facility space needs and constraints when purchasing BEBs and associated electric vehicle supply equipment (EVSE). One key question discussed was how to determine the optimal ratio of chargers to vehicles.
- **Resilience**—Work with your utility early so they can plan for expanded capacity where needed. Utilize power from multiple grids when possible. Include hydrogen buses in ZEB planning to assist with flexibility and resilience.
- **Charger O&M**—Interoperability between chargers and vehicles is an issue. Different charger manufacturers provide different levels of support. May be better to separate EVSE procurement from bus procurements. Fleets need to ensure they have access to EVSE data, bus data, and training on EVSE maintenance to diagnose and correct issues.

Charging Strategies for ZEV Buses: Facilitated Panel Discussion: Representatives from New Flyer and Proterra provided short presentations on the charging platforms and options offered by their companies. Presentations were followed by a roundtable discussion.

- **Mike McDonald—New Flyer:** Discussed NFI Infrastructure Solutions, which is their project management service for electric infrastructure. They stressed the importance of considering an infrastructure procurement plan in parallel with bus procurement and talked about the role hydrogen fuel cell vehicles can play with respect to fleet-wide planning.
- **Tony DeLuca—Proterra Energy:** Discussed the need for transition planning, including factors to consider when doing worst case scenario modeling for fleets. They advised that while depot charging is the lowest cost for operations, fleets need to examine where/when on-route charging makes sense.

ZEV Bus Roundtable Discussion:

- Expected lifetime of a charger is currently unknown. Participants noted that parts for charging stations need to remain standard so fleets can keep them operational throughout their life.
- Important for EVSE industry to identify maintenance processes and share these with fleets.
- For charging stations, power electronics are not likely to be the issue (from a failure/maintenance standpoint) but user interface parts (touchscreens, connectors, etc.) will likely see failures. The impact of heat/hot temperatures on charging stations needs to be considered.
- Good standards lead to interoperability; need adherence to the standards and regular software updates.

Open Discussion and Next Steps: Attendees shared their most pressing needs or questions in the industry, as well as products they would like to see.

- **Batteries:** Degradation is being addressed through chemical and organic additives, but it cannot be stopped. Solid state batteries are likely five years away.
- **Hydrogen:** Need government help to reduce the cost of hydrogen and more focus on hydrogen fuel cells within this group

- **Infrastructure:** How do we support infrastructure in each state and ensure the utilities/grid is prepared?
- **Products:** Need best practices or case studies that can be shared with local stakeholders.
- **Group Format:** Face-to-face discussions are preferred. Organizers should consider whether ETUG should remain as a standalone group or if it makes sense to coordinate with other groups with similar stakeholders/attendees.

Attendee List

Attendee Name	Organization
Corey Aldridge	Mountain Line
Cecil Blandon	AC Transit
Abby Brown	NREL
Sarah Cardinali	NREL
David Cooke	The Ohio State University
Tony Deluca	Proterra Energy
Jim Donovan	National Park Service
Walt Dudek	The Ohio State University
Ryan Frasier	NREL
Karl Gnad	Champaign-Urbana Mass Transit District
John Gonzales	NREL
Jeff Hiott	CapMetro
Patricia Happ	FTA
Michael Laughlin	DOE
Ramiro Lepe	Southern California Edison
Scott Lian	U.S. DOT, Volpe Center
Salvador Llamas	AC Transit
Michael McDonald	New Flyer
Margo Melendez	NREL
Raymond Mui	Alexandria Transit Company
Dan Raudebaugh	CTE
Fred Worthen	Denver RTD
Taylor York	Western Riverside Clean Cities

Observer Name	Organization
Leslie Eudy	CTE
Matt Jeffers	NREL
Lauren Justice	CTE
Unknown Representative Name	BYD