

Appendix B – BEB Trial – Phase I: Successes, Challenges

Successes

- Through the Phase I CUTRIC Trial, the project partners have achieved the main goal of the trial, which was to work in collaboration with industry leading bus and charger OEMs to develop the full interoperability required to support the open procurement of non-proprietary systems in the future – this was a global first of its kind project.
- Developed a globally unique project/program governance structure through the CUTRIC Program Steering Committee, and various Subcommittees through execution of a joint Memorandum of Understanding (MOU).
- Delivered the project on time and on budget, in the midst of one of the worst pandemics in history.
- Achieved the desired results in terms of substantiating the BEB predictive modelling completed by CUTRIC against real service metrics collected by the bus and charger telematics.
- Zero tail pipe emissions / exhaust on route and in the storage garage when leaving for service.

Challenges

- Transitioning from the safe, simple, and steady supply of diesel fuel today to reliance on local electrical service distributors to provide our new “electric” fuel causes anxiety.
- The need for suppliers and contractors to understand that Transit’s core business requirements – maintaining a convenient and reliable service - must always continue to be the priority. Zero emission technologies need to be adjusted to work ensure public schedule is not affected.
- Malfunctions can be very complex technical issues. In many cases, the root cause of system issues (BEB vs. eCharger) continue to be challenging for vendors to diagnose and communicate back to staff. Post-mortems are needed to ensure no repeat issues.
- Software configurations between the BEBs and chargers need fast resolution to ensure maximum performance.
- Unscheduled/unplanned hardware malfunctions have caused, in some cases, Transit to revert to the use of diesel buses until issues were repaired.
- Alignment of the chargers; difficult aligning the BEBs to the eChargers when visibility is decreased due to inclement weather (snow or rain).
- For the Trial, staff have found that two routes are manageable; on-street opportunity charging system-wide will need further studying to determine cost ownership model. For example, currently Transit is paying about \$0.14c per kWh in-depot vs. \$0.29c per kWh for on-street locations due to lower overall consumption, higher demand and global adjustment charges.

Appendix B – BEB Trial – Phase I: Operations & Maintenance, Future Considerations

Operations and Maintenance

- Heavy emphasis placed on training. To ensure safety, Transit has delivered training to our operations and maintenance staff with full reliance from the manufacturers.
- Work procedures and codes of practice related to High Voltage Work Permits, Lock-Out/Tag-Out, Personal Protective Equipment, etc. have been amended.
- To date, Transit has trained in excess of 8,000 hours including:
 - Over 600 Operators (with another 400+ to go)
 - 95 Maintenance Personnel – Familiarization & Charging Training
 - 46 Technicians – High Voltage Safety Training
 - Fire Dept and Towing Services
- Staff continue to research and develop our full training program, which will continue through to the conclusion of the Trial in December 2023.
- Multiple pieces of equipment must work in unison for this system to function properly (BEB, Chargers, Operator).
- If running the BEB in “all-electric” mode, without the use of the self-contained diesel-fired auxiliary heaters, the battery state-of-charge and depletion rate will change throughout the season based on outside temperatures and sub components running on the bus (heaters, etc.).
- eCharger operations has been inconsistent with charge session with faults occurring on a regular basis; inclement/damp weather appears to be affecting performance.
- Based on charger reliance, the BEBs are tethered to their dedicated route, and cannot be used across the City as a traditional diesel or diesel-hybrid bus can.
- BEBs still require scheduled maintenance and can break down. Additional space BEBs are required in order to maintain in service levels.
- Response times and communication from charger OEM's has been challenging.
- Training to maintenance staff is only available from bus OEM's – trade colleges have not added this technology to the mandatory training required for a coach tech license.

Future considerations

- Procuring buses that can service both on-street and in-depot charging.
- Working with organizations such as Skilled Trades Ontario to advocate for electrical vehicle training available through trade schools and interprovincial coach tech license.
- Plan for retrofits required to Sandalwood facility.
- Pilot other technologies including fuel cell buses.
- Automate in-depot charging system for automatic charging and top offs.