

CUTA Zero-Emission Bus Member Survey – Summary & Analysis



MARCH 4, 2020

Canadian Urban Transit Association

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Executive summary

The federal government has set a target to increase the number of zero-emission vehicles in the public transit industry. Commitments were included in the mandate letter provided to the federal Minister of Infrastructure and Communities, the Honourable Catherine McKenna, on December 13, 2019 to:

- Introduce new funding to help school boards and municipalities purchase 5,000 zero-emission school and transit buses over the next five years, and;
- Ensure that new federal investments in public transit are used to support zero-emission buses and rail systems starting in 2023 and work with municipalities to address any exceptional circumstances.

Additional federal commitments were made to support the development and manufacturing of zero-emission technologies in the mandate letter provided to the Minister of Finance, the Honourable Bill Morneau.

Bus manufacturers and component suppliers that are members of CUTA are already producing innovative new zero-emission buses (ZEBs) and technologies. Our transit system members are at different stages in their preparations for zero-emission fleets.

To support the federal government's policy objectives, and to assist Infrastructure Canada in the development of policy programs to meet these objectives, CUTA conducted a survey of its transit system members and private transportation operators in January 2020 to gauge their readiness for the transition to zero-emission fleets. 53 transit systems and private operators responded to CUTA's ZEB survey. The transit system respondents account for 87.4% of CUTA's total ridership (2018).

This report provides a summary and analysis of CUTA's ZEB survey responses. Key findings from our survey include:

- Between 2020 and 2024, survey respondents plan on procuring 5,610 total new buses.
- Of this total, survey respondents would plan to procure 2,045 battery-electric buses (BEB), and 1,416 hybrid-electric buses (HEB) if funding for rolling stock and associated charging infrastructure was made available.
- Between 2025 and 2029, survey respondents plan on procuring 6,400 total new buses.
- Of this total, survey respondents would plan to procure 5,535 BEBs and 224 HEBs if funding for rolling stock and associated charging infrastructure was made available.
- The larger the transit system, the more likely it is to be better prepared to transition to zero-emission fleets, with the smallest systems being largely unprepared.

CUTA is developing policy and funding recommendations based on what our survey found. We will share these recommendations with Infrastructure Canada and other relevant departments to help support the federal government's efforts to meet its zero-emission fleet targets.



1. Survey responses

More than half of CUTA's members - 53 out of 104 systems – participated in our survey. The larger the transit system, the more likely it was to respond. Participants account for 87.4% of CUTA's total 2018 ridership.

The survey respondents form a regionally representative sample of CUTA members.

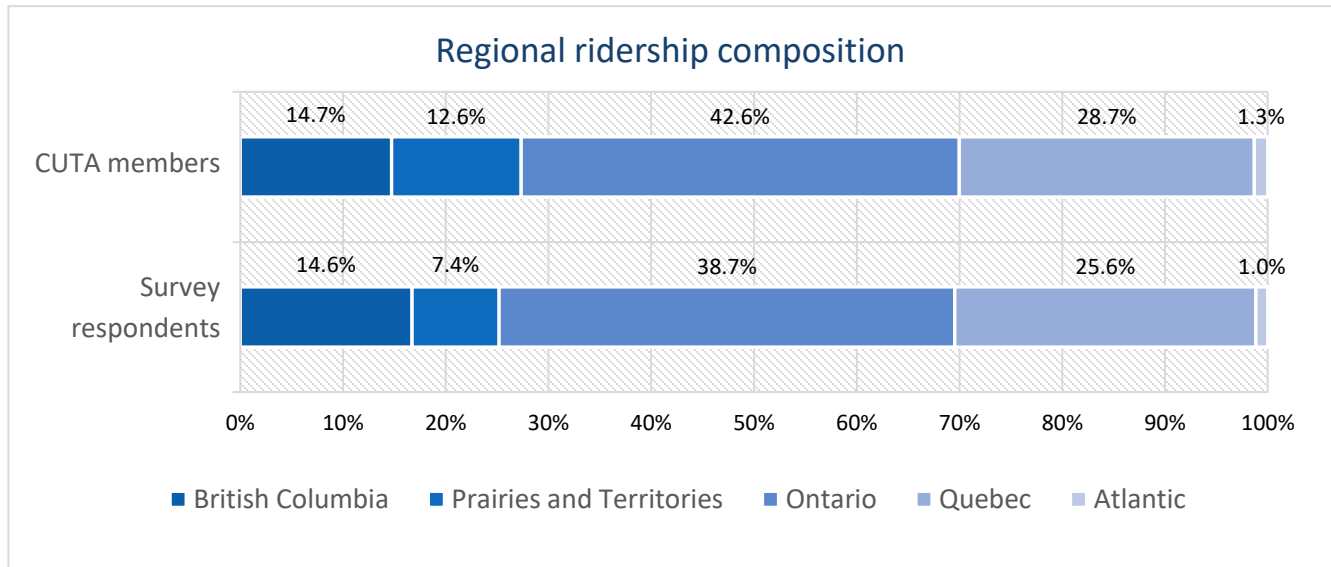


Figure 1

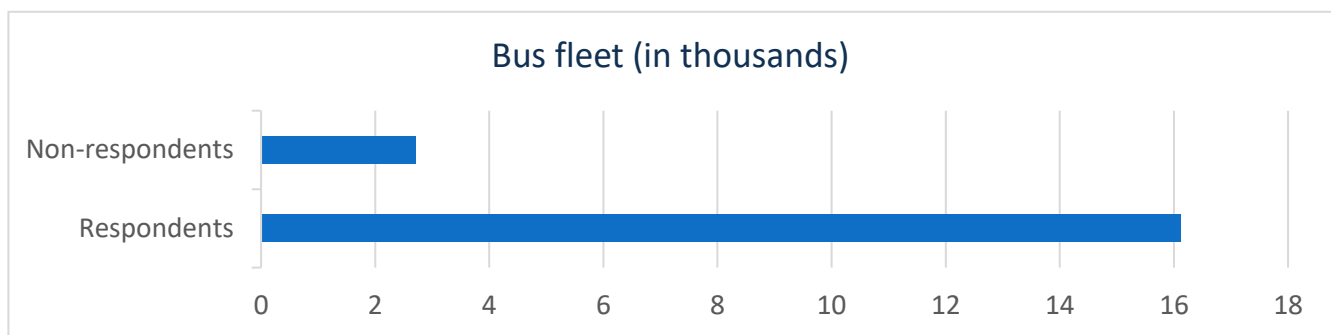


Figure 2

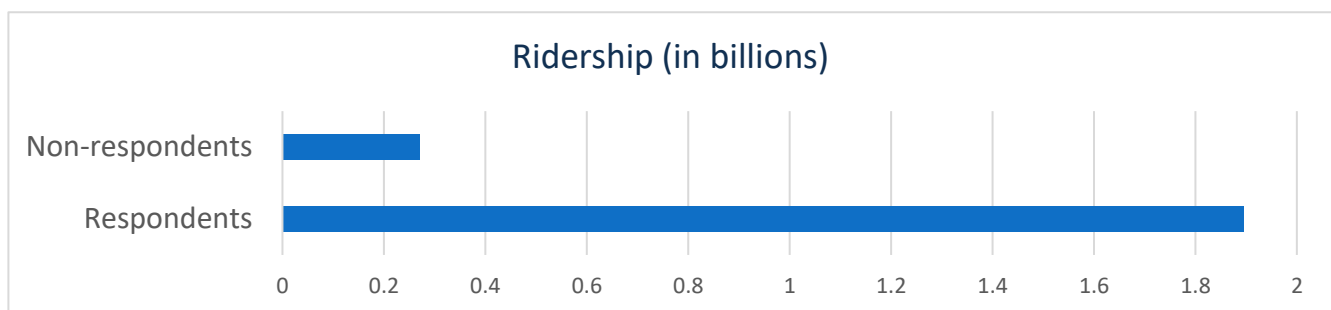


Figure 3



Overall

More than half of transit systems (59%) surveyed, have concrete or partial plans to buy ZEBs between 2022 and 2026. This distinction between a 'concrete' and 'partial' plan was whether the transit system had set a date to procure ZEB's-only. This indicates that the transit industry is aware of the need to transition to zero-emission fleets, and the majority are moving in that direction.

However, 41% have no plans at all, and the smaller the system the more likely it is to be included in this category.

All respondents are included in this report, which provides insight on the level of readiness in Canada to move to zero-emission fleets.

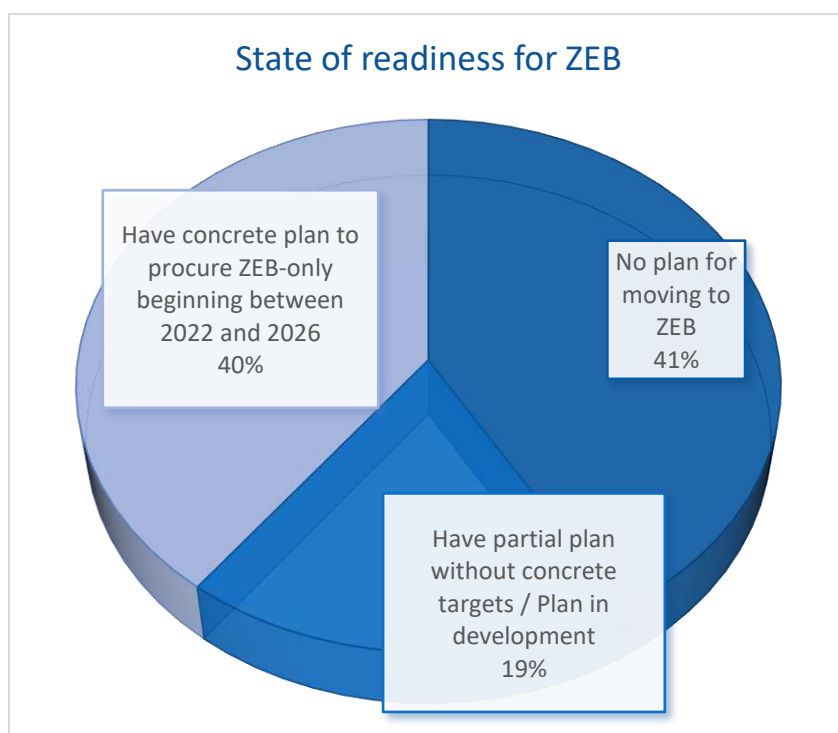


Figure 4

** The time frame of 2022-2026 in figure 4 represents the period in which some respondents indicated that they would begin ZEB-only procurement for their fleets.*



By transit system size

83% of respondents have green fleet strategies or plans in development. Large transit systems have a mix of targets based on start dates and outcomes, while medium-sized systems tend to have long-term targets based on outcomes. Small transit systems are the largest group of respondents, but only 37% of these systems are working towards a green fleet strategy, indicating barriers that these systems face such as cost and expertise gaps.

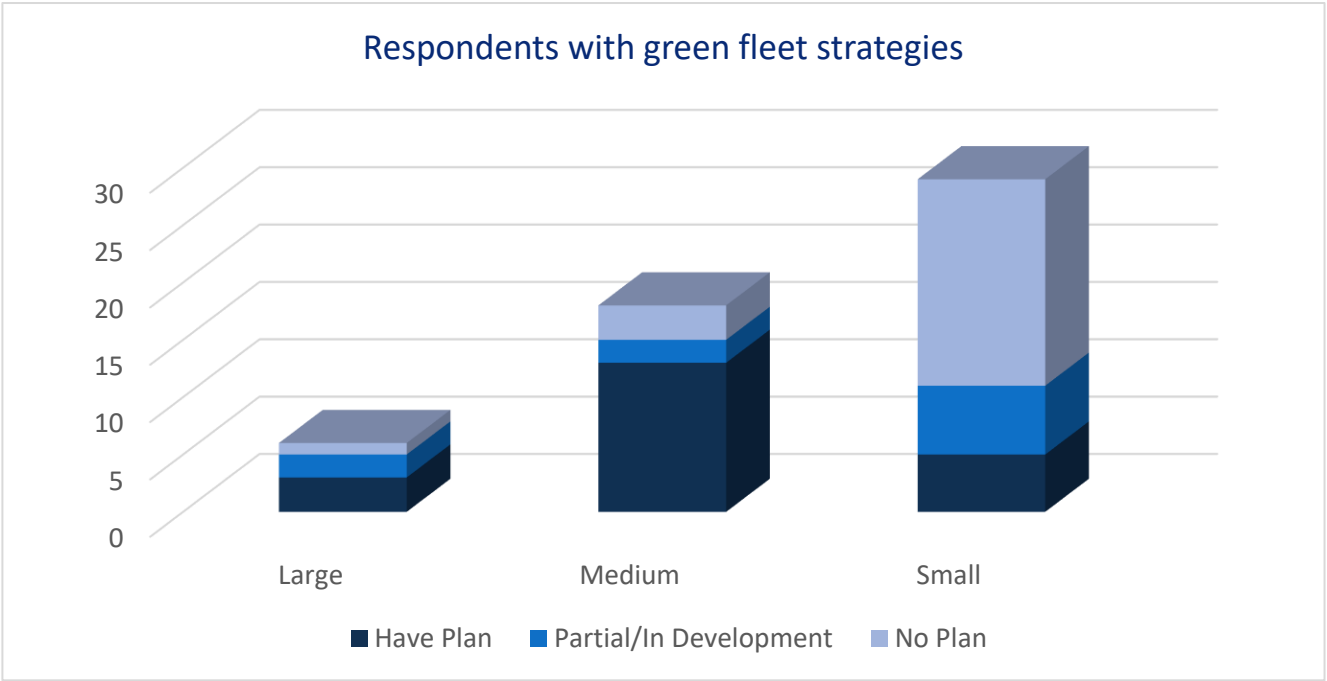


Figure 5



3. Procurement of battery electric and hybrid buses 2020-2029

CUTA transit system members were asked how many total buses they intend to procure between 2020-2024 and 2025-2029. They were then asked how many of these buses would be battery electric buses (BEBs) and/or hybrid electric buses (HEBs) if the government provided funding for rolling stock and associated charging infrastructure.

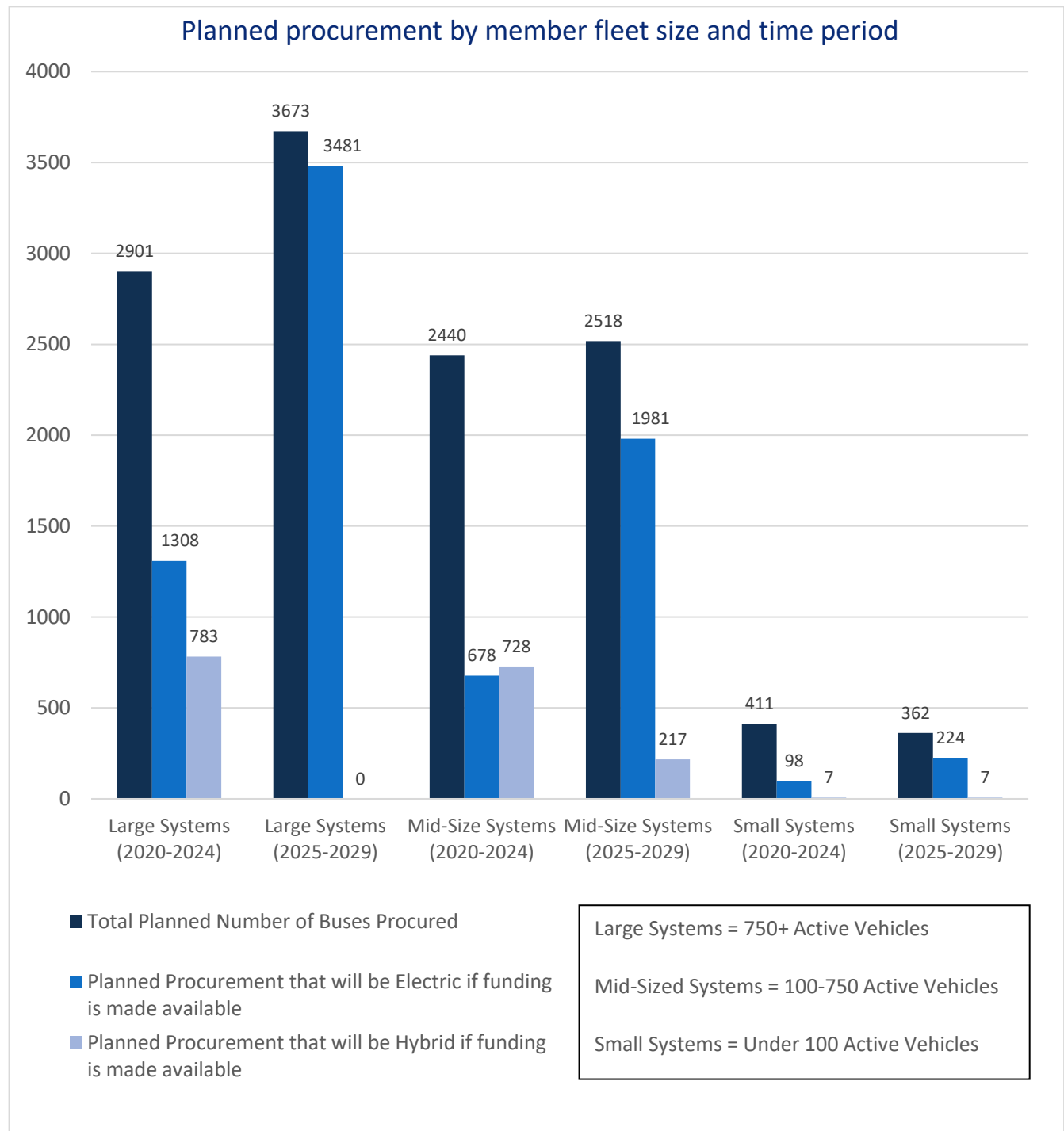


Figure 6



Observations

A clear pattern emerges in Figure 6 when factoring in a transit system's size to its planned procurement. Large-sized systems, with more than 750 vehicles, have more resources available and tend to have more ambitious political mandates to green their fleets. Should the necessary funding be made available, they are prepared to procure zero-emission buses for about 45% of new purchases over the next five years. Between 2025-2029, this rises to 95% ZEB procurements.

The medium-sized category are systems with between 100 to 750 vehicles. Their responses show a large gap between current total planned procurement and the procurement of ZEBs, even when taking into consideration the new federal government target to prioritize funding for ZEB procurement as of 2023. This indicates that the additional cost differential for ZEBs and charging infrastructure is a significant barrier for mid-sized transit systems. This fact was further substantiated in the qualitative survey responses. Mid-sized cities have less resources than larger ones and may have less ambitious political targets towards ZEV fleets. At present, mid-sized transit systems are using or plan to use ICIP Public Transit Stream funding to procure buses for fleet renewal and expansion. If these systems were required in future to fund electric charging infrastructure for new ZEBs via ICIP, they would not have the funding necessary to continue to expand their fleets.

The survey responses for the third fleet size, which represents CUTA's smallest transit systems, shows that a very small number of their planned procurement is ZEB-focused, even if funding was made available. There may be larger hurdles for these systems regarding the lack of expertise on ZEB route planning and maintenance, the costs associated with feasibility studies for switching to electric and information gaps in terms of what electrification will mean for transit operations in smaller communities. Many members reported that staff retraining would be needed to learn how to plan/dispatch electric routes, as well as service the maintenance of charging stations. These systems will also face a considerable barrier to electrification as their overall budgets are small. As a result, the costs of ZEB procurement and the additional costs of charging infrastructure and facility refits could be prohibitive.

An unexpected trend amongst all fleet sizes is the relatively small and declining role of hybrid technology, even given funding availability. This is likely due to hybrid buses being more expensive than battery electric buses. Based on CUTA's 2018 data, the average price of a HEB is \$1,005,106, while a battery-electric model comes to \$923,590.

Digging deeper:

Some estimates¹ point towards cost parity between battery-electric and diesel buses over the next ten years as battery prices fall. This timeline could be cut in half owing to government-induced demand. The price of a battery-electric bus at present is just under double the cost of a diesel bus. Battery electric buses will remain more expensive to procure than diesel equivalents for the near future. As a result, large transit systems will feel cost pressures when it comes to procuring zero-emission buses over the next five years, which is also the time frame in which the federal government wants to procure 5,000 ZEBs. This does not take into consideration the high costs of charging infrastructure, transit facility refits and the necessary training of route planning and maintenance personnel.

¹ [Bloomberg NEF \(2018\) "Electric Buses in Cities Driving Towards Cleaner Air and Lower CO2" \(p.30\)](#)



4. Obstacles to electrification

CUTA transit system members were asked to identify barriers to plans for battery electric and hybrid electric bus fleets

Overall

Members identified several problems in making the switch to ZEB fleets. By far, the largest was cost. Others cited technological concerns over the range of ZEBs, as well as issues such as current infrastructure being unable to support ZEBs due to grid capacity. Some systems also have a standing commitment to compressed natural gas (CNG) fleets. Many also identified a gap in knowledge and expertise around ZEB fleets. There's a need for maintenance and fleet staff to be trained on how to maintain charging infrastructure, and route planners who need training on the functioning of ZEBs in on-road conditions.

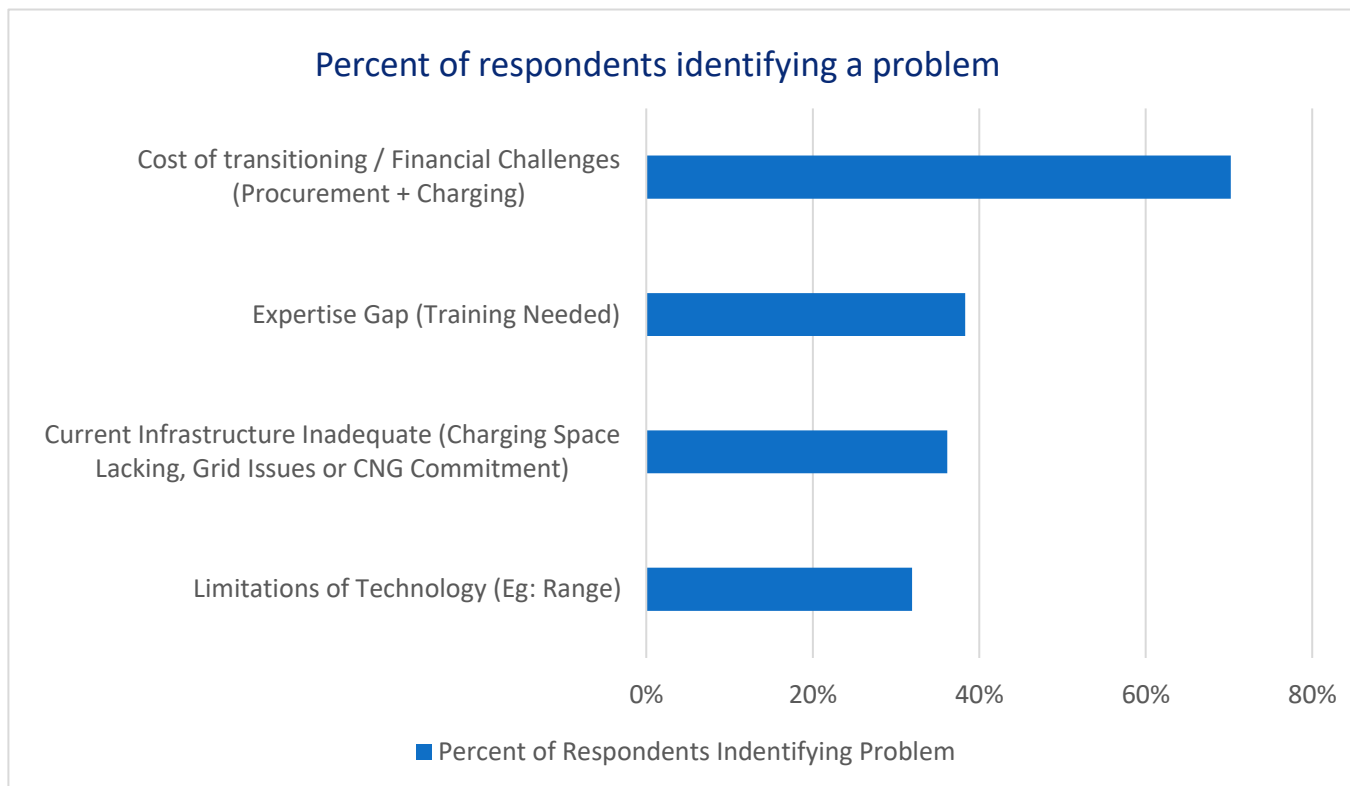


Figure 7



By transit system size – selected quotes

CUTA members were asked to identify the largest obstacles for their future procurement of electric and hybrid buses. Here's what they said:

Large transit system

"There are a lot of unknowns right now regarding the (ZEB) scope required and the charging options that are available. We need greater clarity on the infrastructure upgrades required to support both initial deployments in the near term and to support much greater deployments of electric buses in the years leading up to 2030. Utility power, onsite power distribution, backup power systems, chargers, and IT hardware are all major infrastructure items. It is expected that infrastructure costs will be very significant to support these large deployments, for which funding will need to be secured. The concern is that if large incremental funding is not made fully available, this will greatly constrain the future deployments of electric buses. We need some certainty of this funding and we need to make the facilities ready in advance of deployments."

Medium-sized transit system

"Determining funding and installing charging infrastructure for better electric buses. Capital cost premiums for alternative fuel vehicles which reduces the number of buses that can be purchased with static funding sources (e.g. Ontario Gas Tax). Future proofing investments against technology advancements (e.g. buy now or wait for battery range improvements). Training and tooling for staff to maintain the vehicles."

Small transit system

"On electrical infrastructure, the knowledge and expertise to design and build the required electrical infrastructure to manage power from the grid, store power, build redundancy, etc. Also the incremental capital cost of electrical infrastructure and buses. The lack of physical space to install electrical equipment, transformers, charging depots (or overhead chargers), energy storage, back-up generators. On energy management expertise and experience, challenges related to the management of consumption and storage of electricity to optimize charging, and ensuring the electrical regulatory pricing environment encourages adoption of electric bus fleets."



Status of charging infrastructure

CUTA transit system members were asked to identify if they had any charging infrastructure in place, including on a pilot basis.

Overall

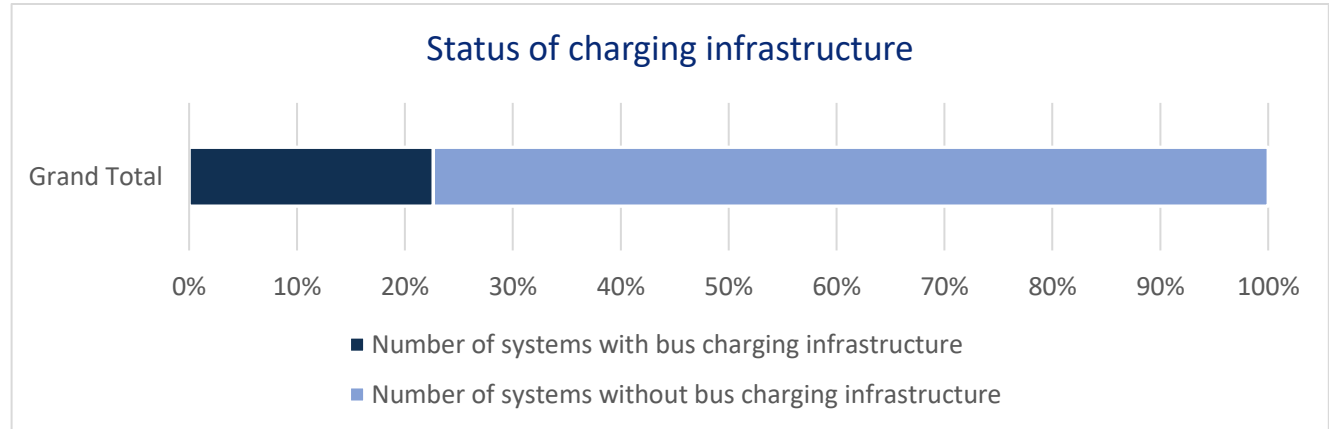


Figure 8

By transit system size

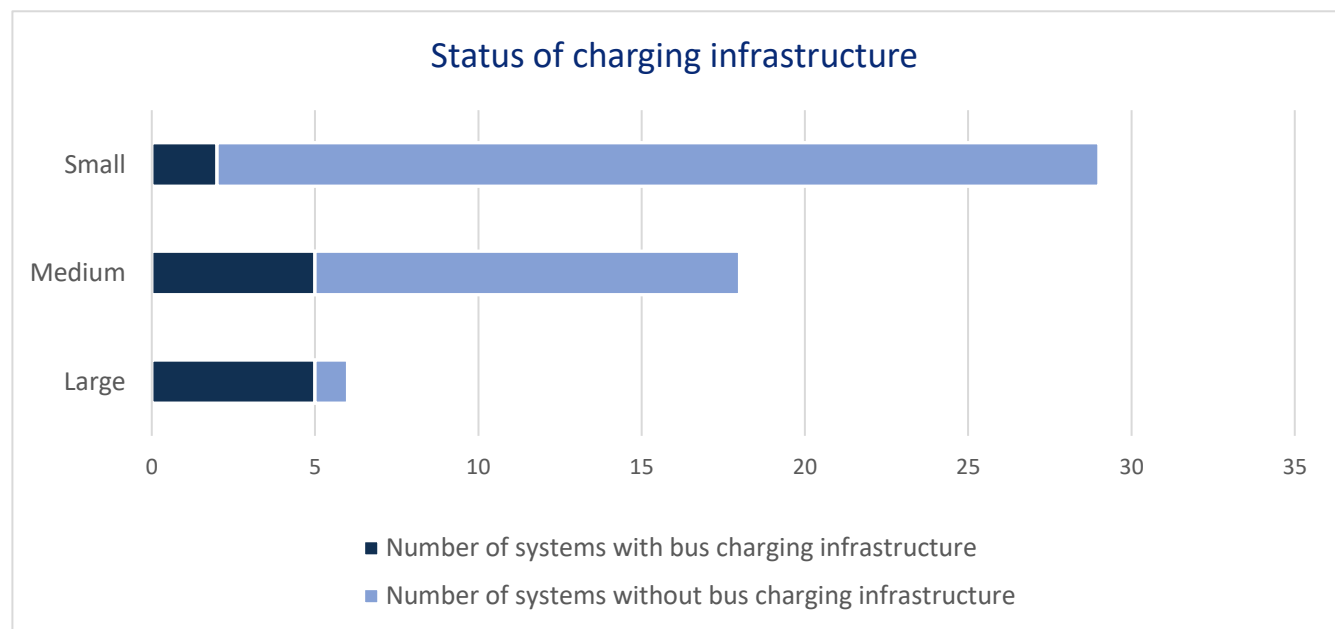


Figure 9



5. Status of discussions with local utilities

CUTA transit system members were asked how advanced their discussions were with their local electric utility provider on the costs of powering their future electric fleet.

Overall

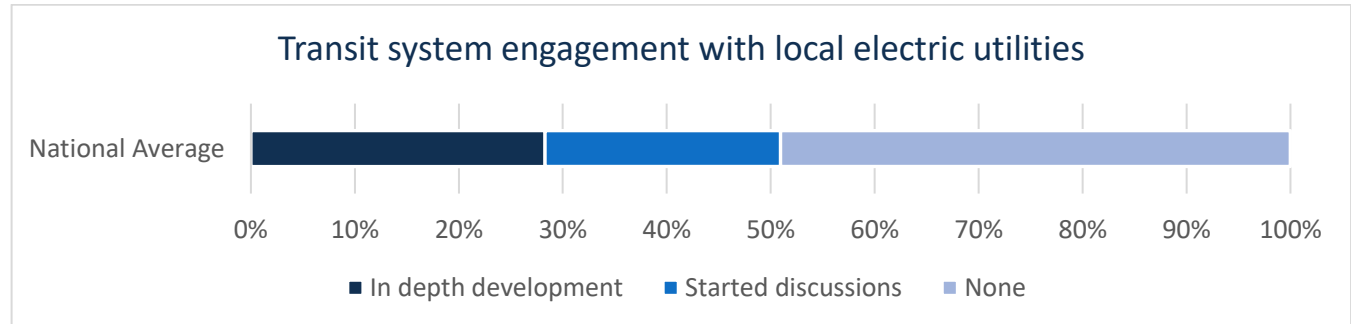


Figure 10

By transit system size

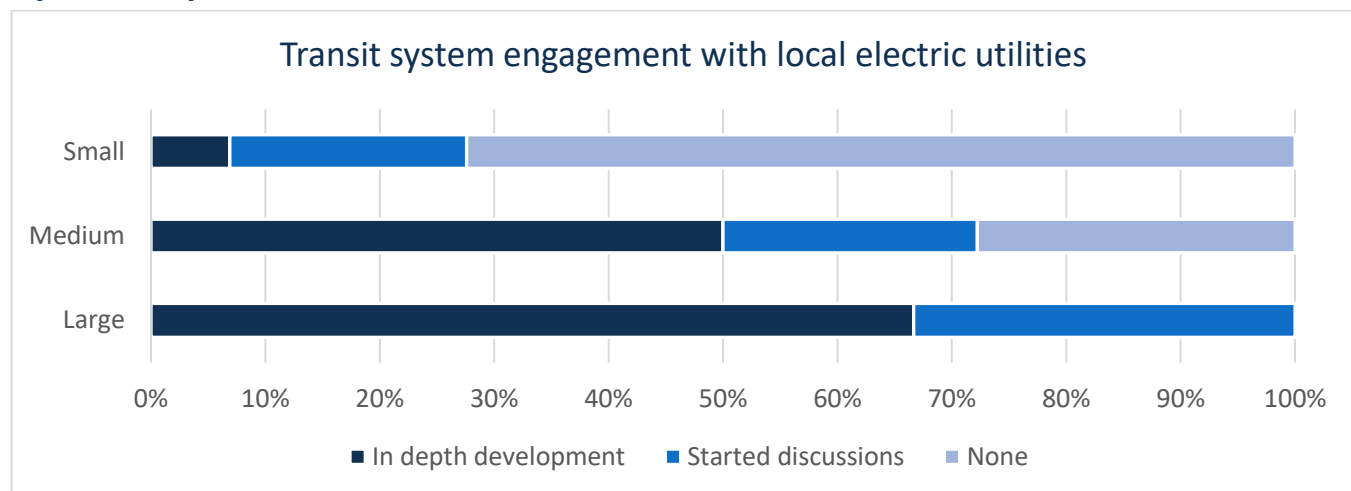


Figure 11



6. Federal government assistance

CUTA transit system members were asked how federal government funding would support their shift towards a zero-emission fleet. Members were asked to estimate the cost considering the following factors:

- Charging infrastructure
- Facility refits
- Costs associated with power utilities and access to the grid
- Maintenance costs
- Considerations linked to route planning and the range of zero-emission buses.

By transit system size – selected examples

Here are some estimates of costs related to moving to zero-emission infrastructure from transit systems across the country:

Large transit system

Charging Infrastructure: - new power feeds to depots is \$1M/km from nearest transmission station Facility Installations: - switch gear, step down transformers, sub-station is \$20M-\$25M/depot - chargers are \$200k/each; can likely do a 2:1 ratio of bus to charger”

“Charging infrastructure – Subsidy for purchases of Level 2 (& Super-chargers) for EV and even more for high-power chargers which go into the transit garage. For EV chargers, subsidy of \$10K per charger and for HEV chargers a subsidy of \$500K per charger.

Medium-sized transit system

Facility expansion - \$1,000,000 Transformer/power source - \$2,000,000 Facility rebuild - \$150,000,000 Conventional Bus Incremental cost- \$180,000,000 Chargers - \$60,000,000 Access-A-bus fleet incremental costs - \$13,800,000 AAB infrastructure - \$690,000”

“Bus premium is \$300-500K per bus, Infrastructure is \$100K per bus or \$15-20M per garage.

Small transit system

Capital support is always welcomed as is a long-term, predictable funding envelope. Our challenges are locally and provincially where there is no desire/support to incentivize alternatively-powered vehicles. Without that support, this would be a futile battle.”

“Retrofitting the facility with solar panels \$1,650,000. Charging stations at terminals estimated at \$125,000 per station. Maintenance costs, training, route changes - Costs unknown at this time.



7. System state of readiness

CUTA members were asked about their perceived state of readiness of transitioning to ZEB fleets.

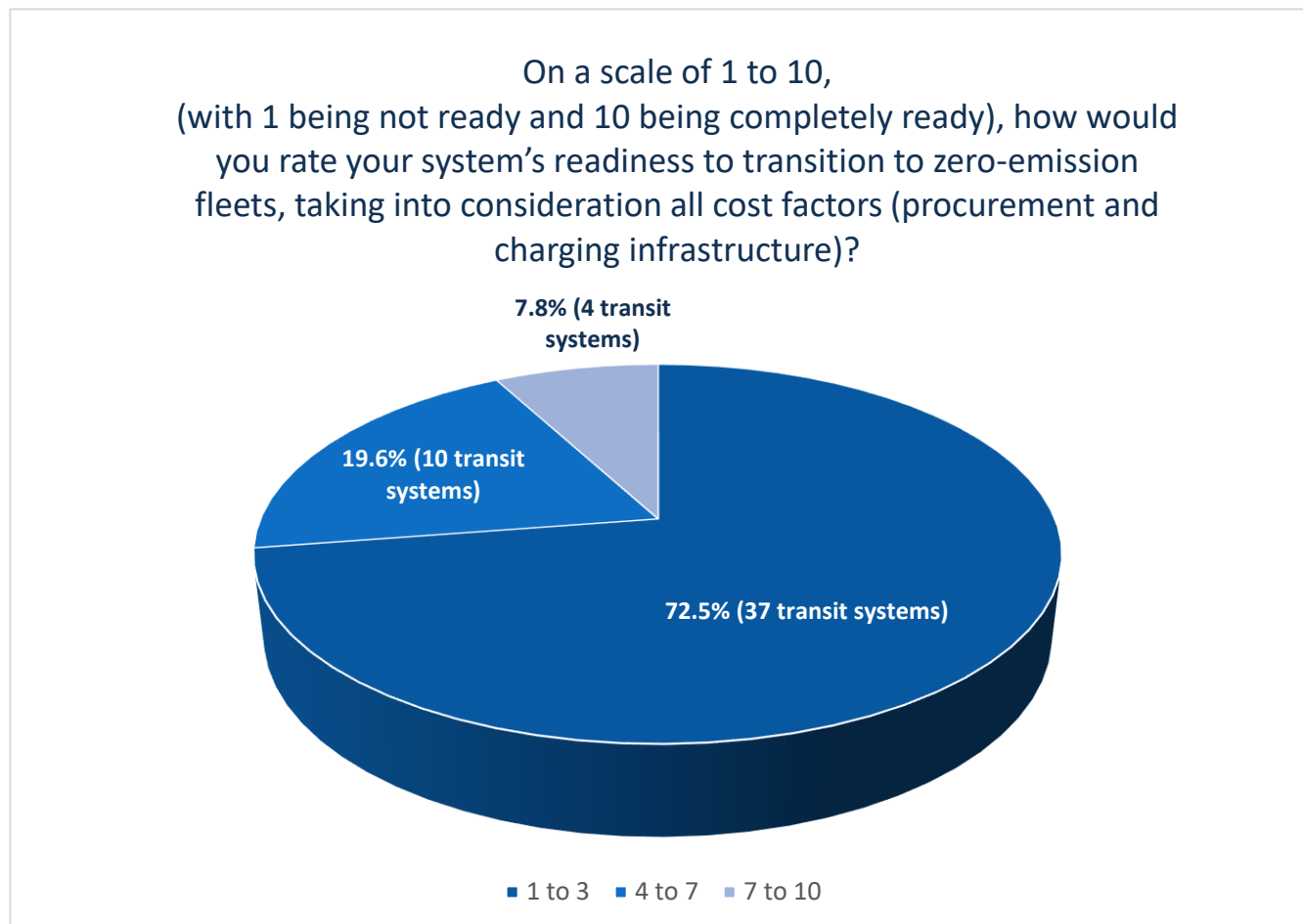


Figure 12

* Some respondents did not answer this question.

Observations

Without federal funding support, over 72% of survey respondents feel very unprepared to shoulder the costs of transitioning to zero-emission fleets on their own based on existing funding programs.



8. Next steps

CUTA will develop policy and funding recommendations based on the results of our survey findings. We will share these recommendations with Infrastructure Canada and other relevant departments to help the federal government achieve its zero-emission fleet targets.

