

Zero-Emission Bus Member Survey Summary & Analysis

April 22, 2024

Table of Contents

- Executive summary 2
- 1. Survey responses 3
- 2. Procurement of battery electric and hybrid buses 2027-2029 6
- 3. Obstacles to electrification 8
- 4. Status of discussions with local utilities 11
- 5. Federal government assistance 12
- 6. System state of readiness 13
- 7. Next steps 14

Executive summary

The federal government 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 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.

Bus manufacturers and component suppliers are already producing innovative new zero-emission buses (ZEBs) and technologies. Transit agencies 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 developing programs to meet these objectives, the Canadian Urban Transit Association (CUTA) and the Ontario Public Transit Association (OPTA) conducted a survey of transit agencies and private transportation operators in March 2024 to gauge their readiness for the transition to zero-emission fleets. The survey had 43 respondents. It is worth noting that the respondents represent nearly 80 per cent of Canada's total transit ridership (2024).

This report provides a summary and analysis of survey responses. Key findings from include:

- By the end of 2029, survey respondents plan on procuring 5,656 new buses.
- Of this total, survey respondents would plan to procure 3,614 battery-electric buses (BEB), and 412 hybrid-electric buses (HEB) if funding for rolling stock and associated charging infrastructure is made available.
- Between 2027 and 2029, survey respondents plan on procuring 2,670 new buses.
- Of this total, survey respondents would plan to procure 2,015 BEBs and 17 HEBs if funding for rolling stock and associated charging infrastructure is made available.
- Larger transit systems are more likely to be better prepared to transition to zero-emission fleets, with the smallest systems being largely unprepared.

CUTA and OPTA are developing policy and funding recommendations based on survey results. Recommendations will be shared with Infrastructure Canada and other relevant departments to help support the federal government's efforts to meet its zero-emission targets.

1. Survey responses

The 43 survey respondents form a regionally representative sample of transit agencies.

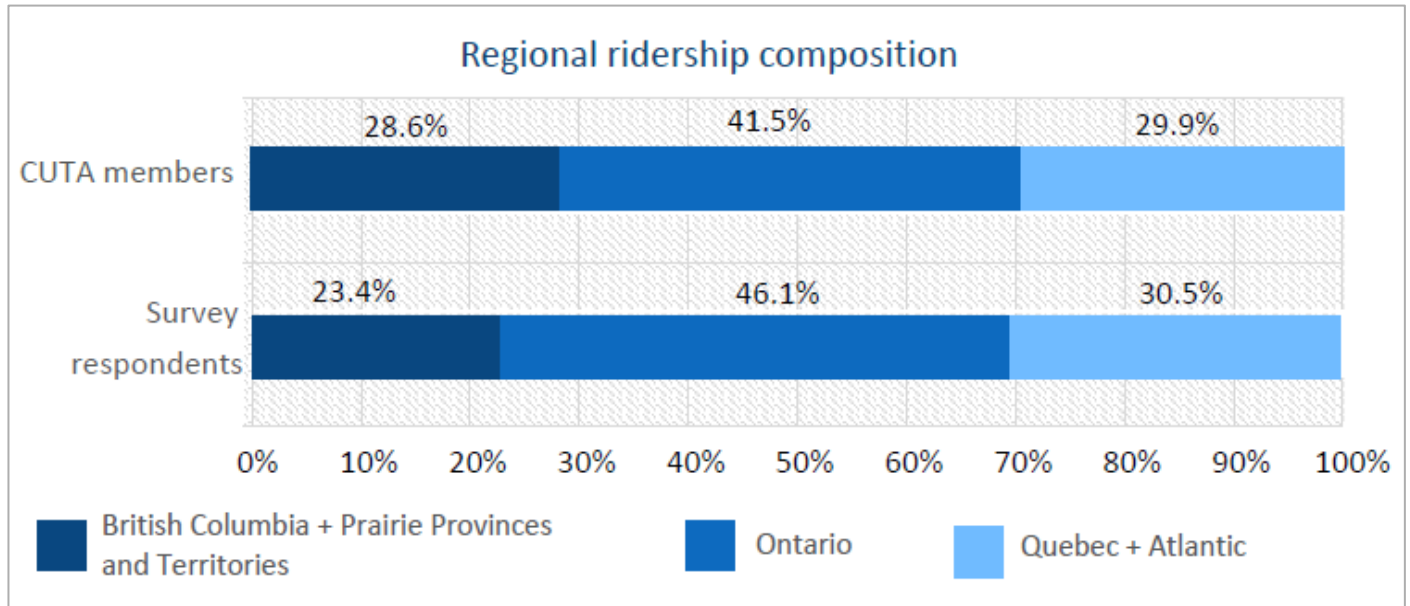


Figure 1

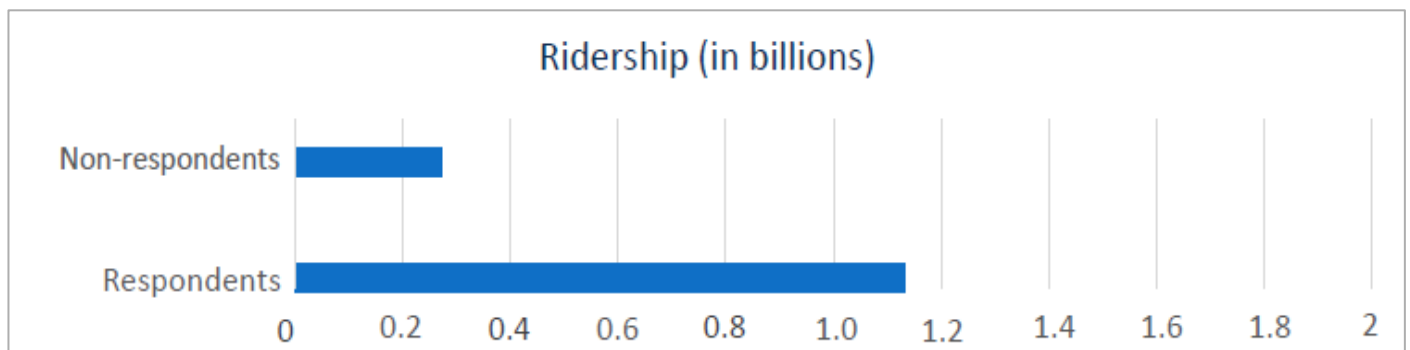


Figure 2

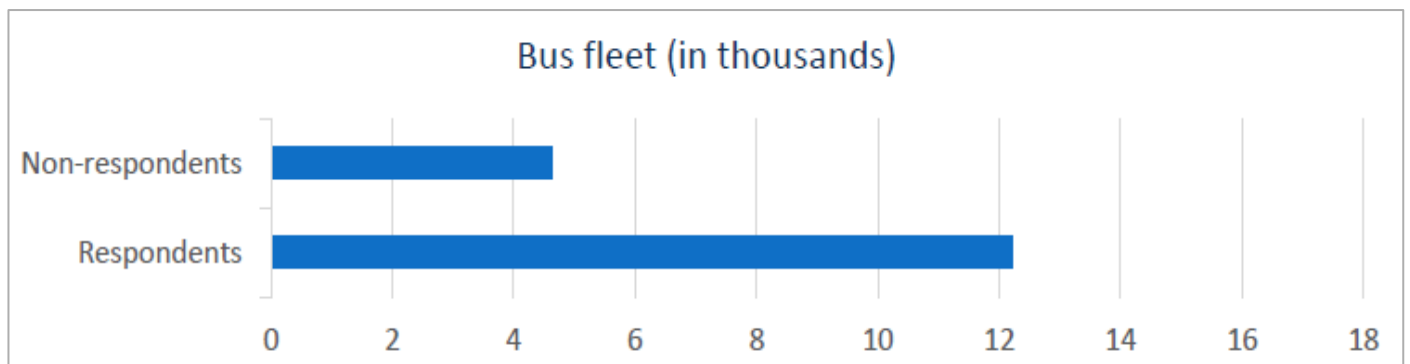


Figure 3

Overall

Sixty per cent of transit agencies surveyed have conducted initial research and analysis of BEBs/ZEBs. No respondents (0 per cent) stated that their Council does not believe there is an economic case for electrification. These facts demonstrate that the transit industry and municipalities are aware of the need to transition to zero-emission fleets, and the majority are open to moving in that direction.

This is an encouraging trend, given that in the previous survey 41 per cent of respondents indicated that they had no fleet transition plans at all, with smaller system being more likely to have answered in this way.

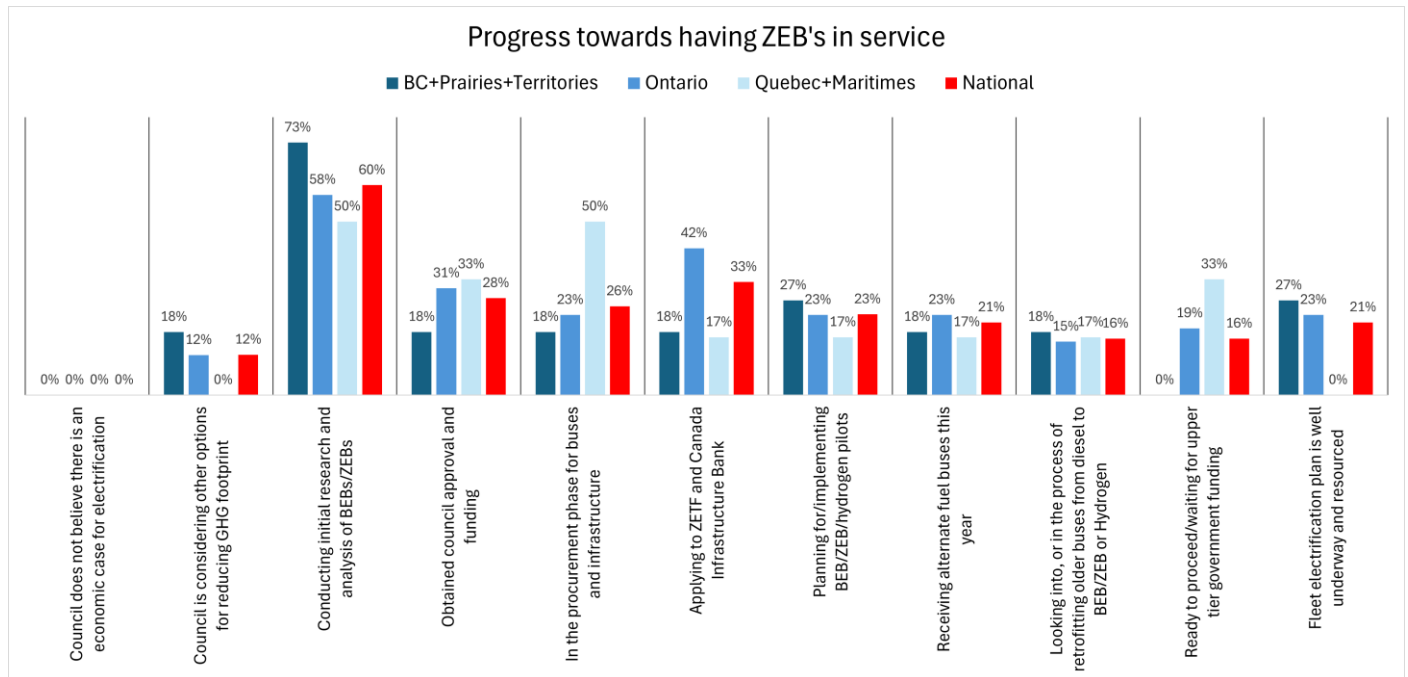


Figure 4

Upon evaluating the preparedness of systems for fleet transitions on a scale from 1 to 10 – where 10 signifies full readiness – only 23 per cent of respondents reported a readiness level above 5, which provides insight on the level of readiness in Canada to move to a zero-emission fleet.

By transit system size

73 per cent of respondents have green fleet strategies or plans in development. Large transit agencies have a mix of targets based on start dates and outcomes, while medium-sized agencies tend to have long term targets based on outcomes. Small transit agencies are the largest group of respondents, but only 40 per cent of these agencies are working toward green fleet strategies, indicating barriers such as cost and gaps in expertise.

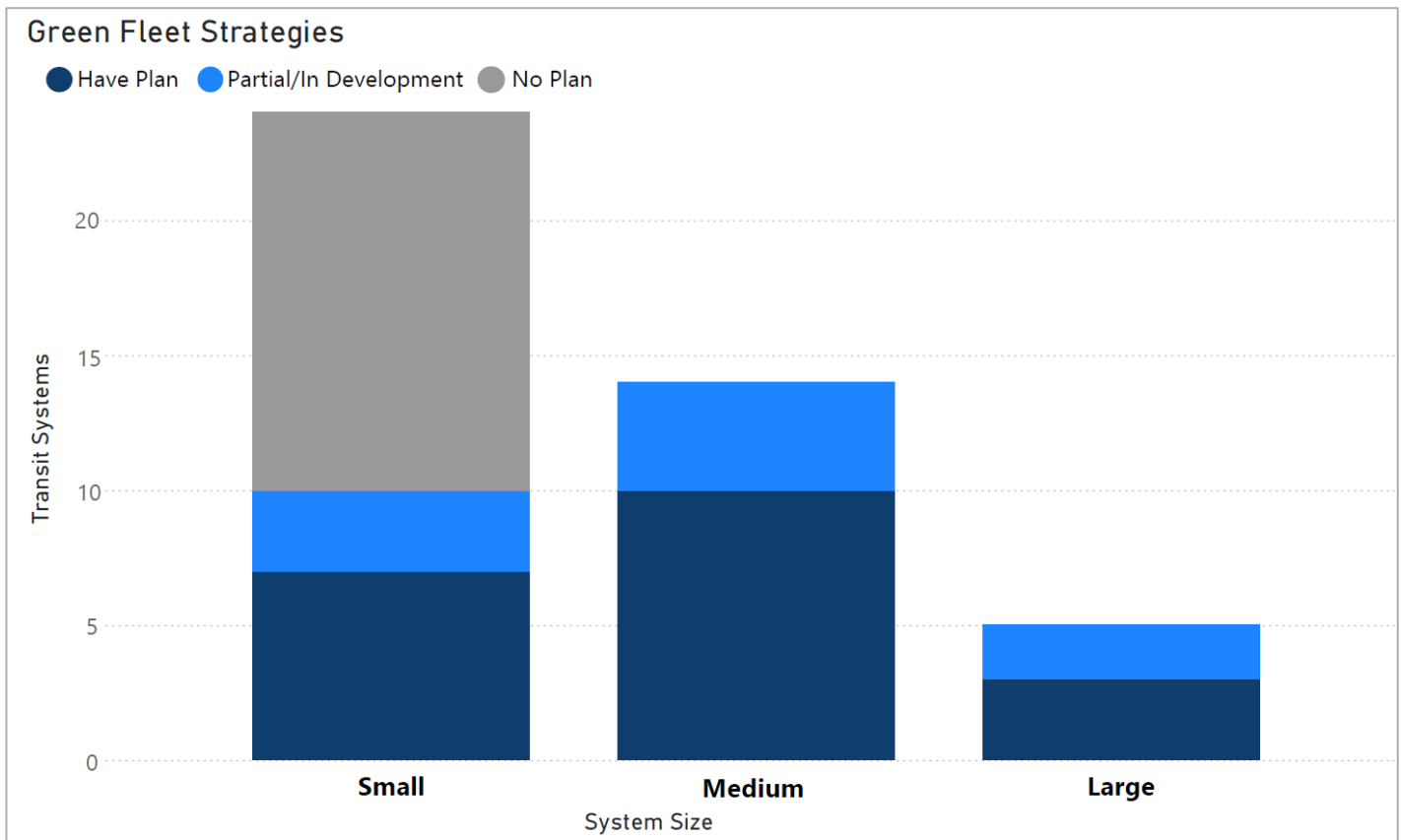


Figure 5

2. Procurement of battery electric and hybrid buses 2027-2029

Respondents were asked how many buses they intend to procure between 2027-2029. 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.

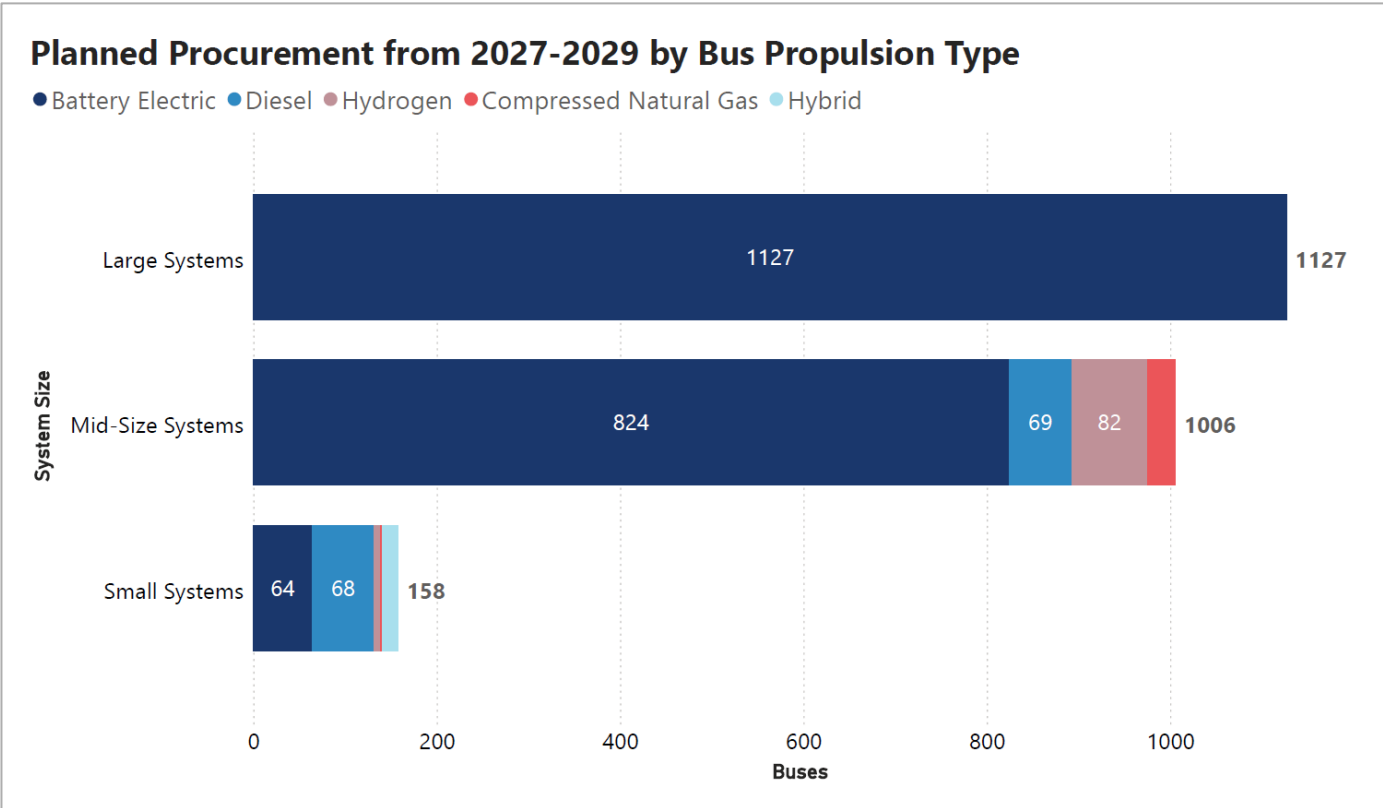


Figure 6

Observations

A clear pattern emerges in Figure 6 when factoring in geography as it relates to planned procurement. Regions with large municipalities and transit agencies that also possess extensive electric and hydro electric capabilities like Ontario and Quebec have more resources available and tend to have more ambitious political mandates to green their fleets. Additionally, should the necessary funding be made available, these regions are prepared to procure zero-emission buses amounting to roughly 75 per cent of new purchases and 94 per cent of total planned ZEB procurements through 2029.

Regarding ZEB procurements for transit agencies in BC and the Prairie Provinces and Territories, there is a noticeably different state of readiness and planned procurement. Their responses show a large gap between current total planned procurement and the procurement of ZEBs, even when taking into consideration the federal government target to prioritize ZEB procurement since 2023. There is also a relatively strong commitment for procuring hydrogen buses, as this region will account for almost 60 per cent of planned procurement of these vehicles over the next five years. As this region consists of many small and medium sized systems from provinces who lack the same electrical power networks as their eastern counterparts, this finding indicates that the additional cost differential for ZEBs and charging infrastructure is a significant barrier for mid-sized transit systems. This fact is further reinforced by the trends in energy and infrastructure investments by provincial governments across western Canada, that focused on hydrogen-based innovations.

The data show that large transit agencies are supporting a significant amount of ZEB procurement. The smallest transit agencies note that a very small number of their planned procurement is ZEB-focused, even if funding is 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 respondents reported that staff retraining would be needed to learn how to plan/dispatch electric routes, as well as maintain charging stations. These agencies 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.

Digging deeper

Some estimates point toward 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 retrofits and the necessary training of route planning and maintenance personnel.

3. Obstacles to electrification

Transit agencies were asked to identify barriers to plans for battery electric and hybrid electric bus fleets.

Overall

Respondents identified several problems in making the switch to ZEB fleets. The largest was cost. Some 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 on how ZEBs function in different conditions.

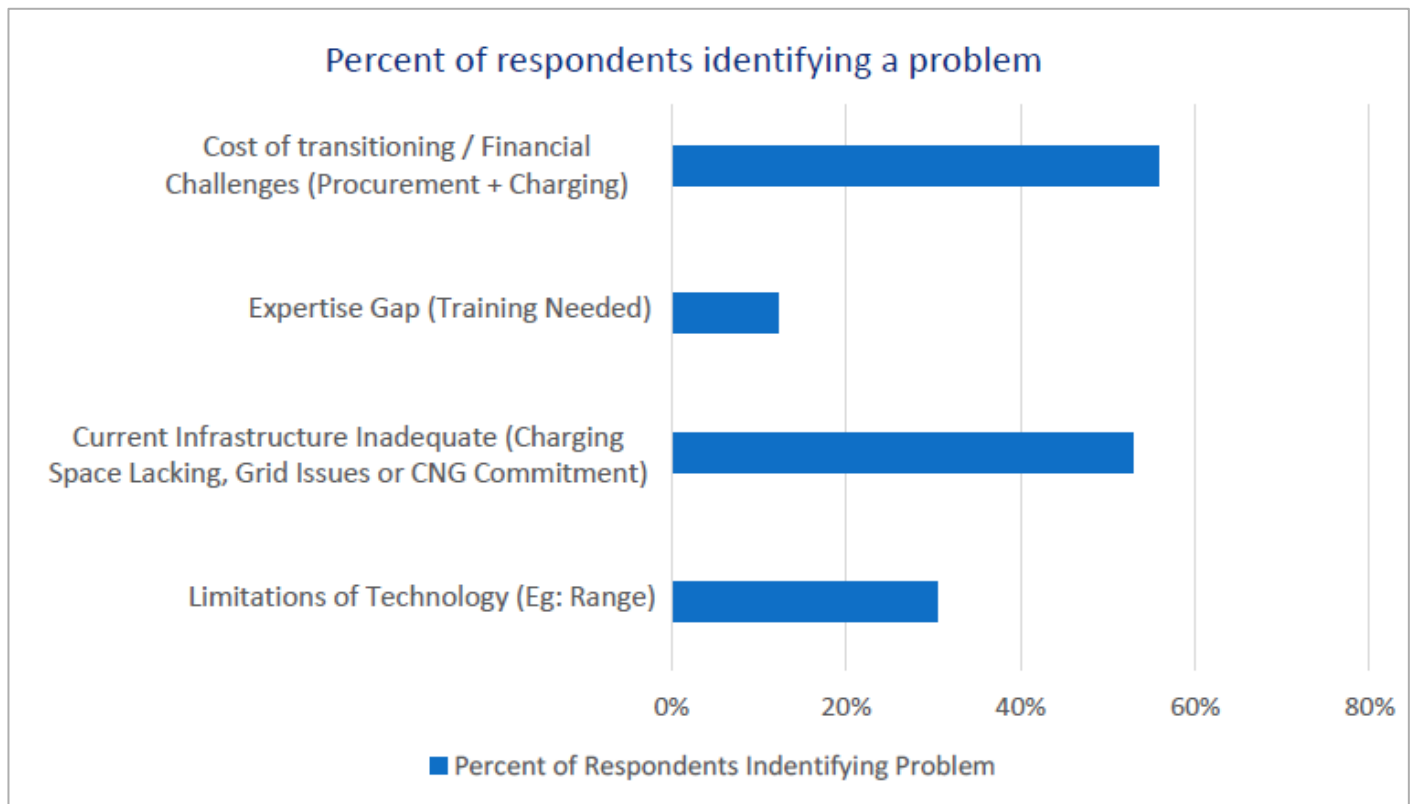


Figure 7

By transit system region – selected quotes and comments

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

BC, Prairie Provinces and Territories

- Funding/cost, utility readiness, lack of resiliency.
- Costs for both electric and hydrogen vehicles, the EV range, and the effects on EVs in a northern Canadian climate.
- Lack of reliability in electric fleets - BYD, Proterra and recently Lion.
- High cost to procure - *"even though there may be funding to help with procurement it doesn't offset the reliability issues and requirement of a backup fleet or additional buses to meet bookouts."*
- *"We are a very small system, and the initial capital expense could likely be cost prohibitive. Also, shared experiences from other agencies are that electric buses are not reliable and do not have the required battery life for a northern climate."*

Ontario

- *"One obstacle is funding - Being a small / medium transit system it is better for us to purchase hybrid buses to familiarize ourselves and to get the most of our ICIP funding. If we were to purchase BEB we would only be able to purchase 2 or 3 buses instead of 7. Second obstacle is infrastructure - When we did our feasibility study, we found out that due to the length of our routes we could not have a BEB out all day and bus changes would be required. On route chargers could be installed but the cost would be great, we will be conducting a Master Plan in 2024, with this plan we hope to realign our routes and service areas we currently don't. This Master Plan will help shape the future of our Transit and hope to also use our feasibility study to help our transition to be fully electric by 2050."*

Quebec and Maritimes

- **Government Requirements vs. Market Readiness:** Alignment between government regulations and market availability poses challenges. Transit agencies may face delays in program implementation due to smaller size and difficulties in securing support from councils.
- **Expertise and Support:** Limited expertise in selecting the right solution and securing buy-in from stakeholders can hinder progress. Dependence on external decisions, such as provincial service providers' ability to support electric or hydrogen vehicles, further complicates the situation.
- **Funding Constraints:** High capital costs remain a significant barrier to electric bus procurement. Limited funding availability may hinder agencies' ability to invest in zero-emission alternatives.
- **Infrastructure and Range Concerns:** Infrastructure readiness, including charging infrastructure, is crucial for electric buses. Concerns about range limitations of existing technology add complexity to the decision-making process.
- **Government Approvals:** Government approvals and regulatory compliance can add bureaucratic hurdles to the procurement process, potentially causing delays or complications.

Status of charging infrastructure

Respondents were asked if they had any charging infrastructure in place, including on a pilot basis.

Overall

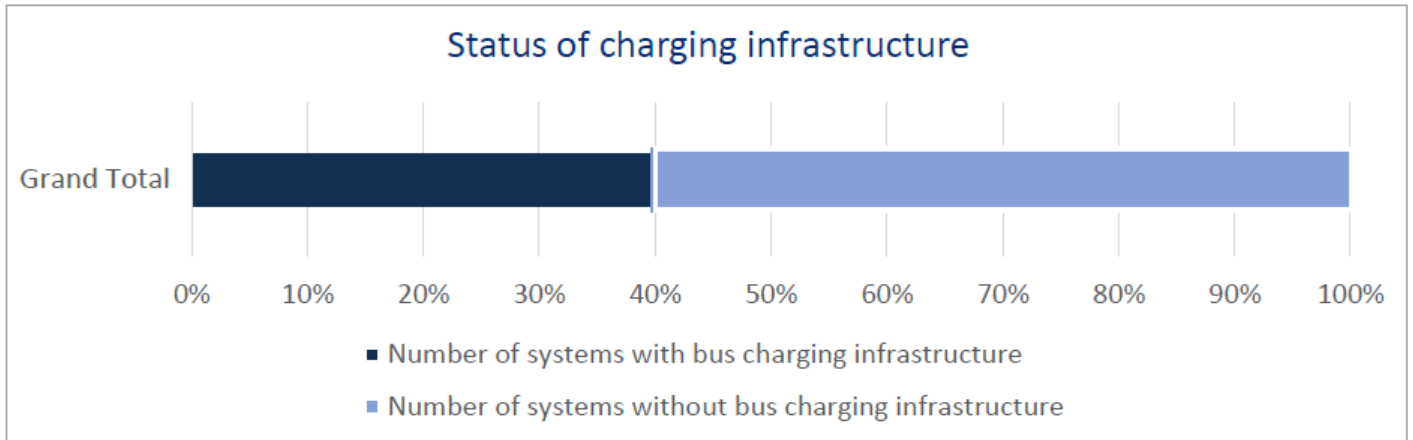


Figure 8

By Transit System Size

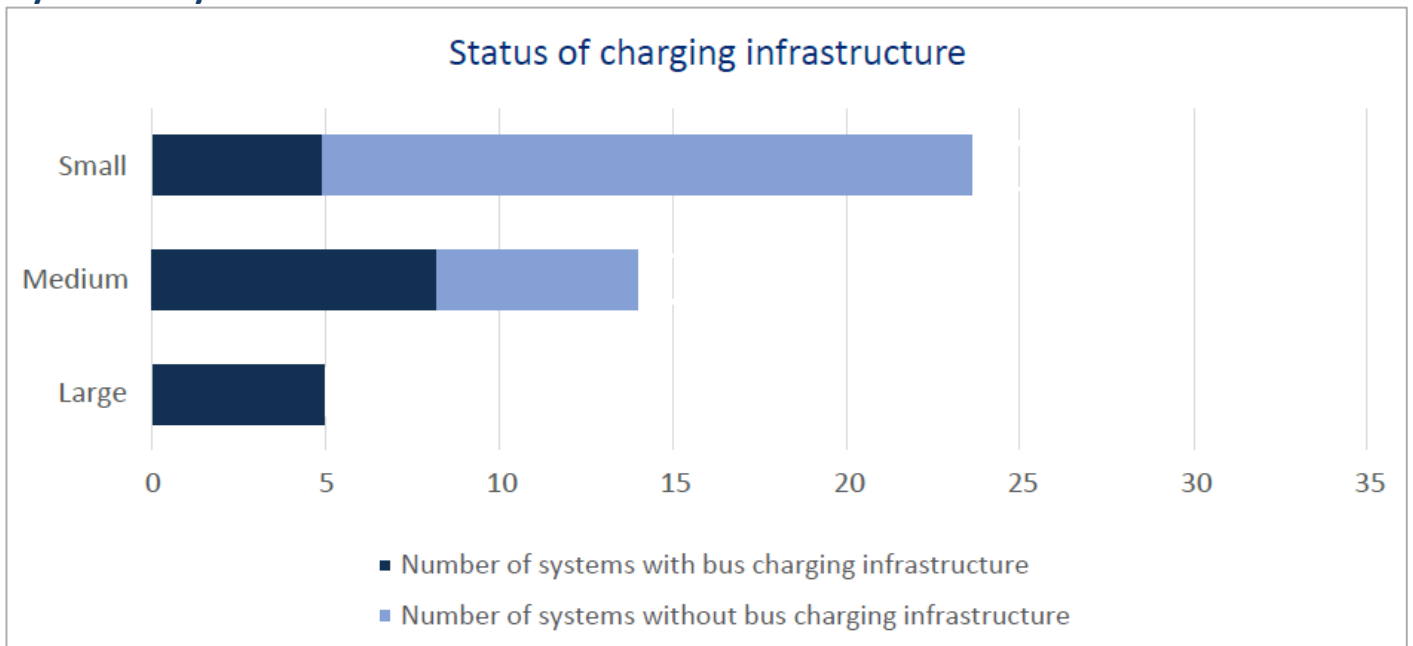


Figure 9

4. Status of discussions with local utilities

Respondents were asked how advanced their discussions were with their local electric utility provider on the costs of powering their future electric fleet.

Overall

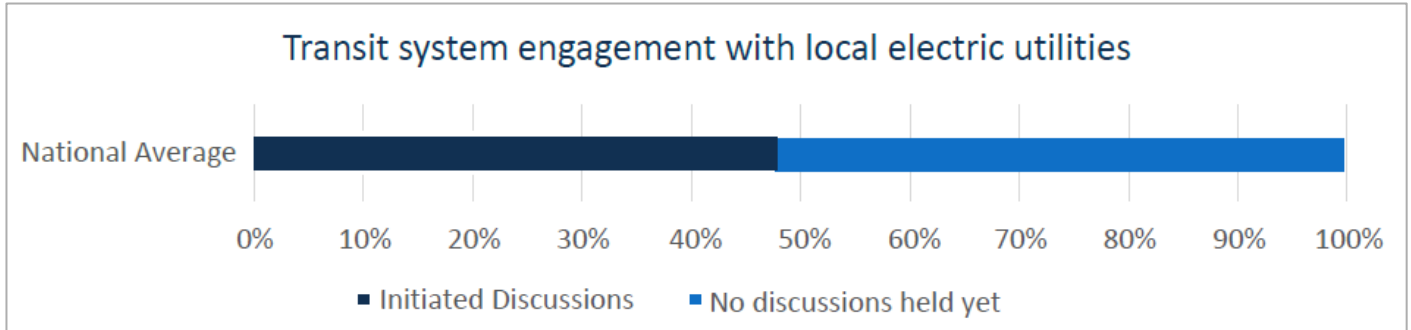


Figure 10

By Transit System Size

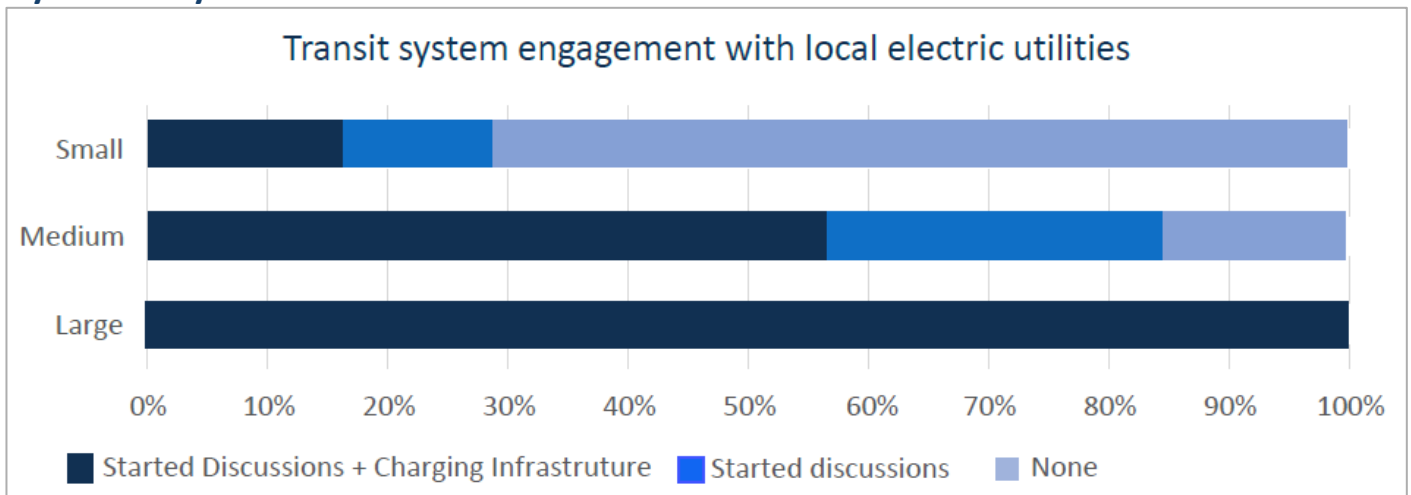


Figure 11

5. Federal government assistance

Respondents were asked how federal government funding would support their shift toward a zero-emission fleet. They were asked to estimate the cost considering the following factors:

- Charging infrastructure
- Capital and operating costs
- Workforce development
- Costs associated with power utilities and access to the grid
- 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 and the levels of government funding needed to support fleet transitions:

BC, Prairie Provinces and Territories

- *"This program is between \$1 Billion and \$2 Billion for the City of Edmonton alone. The performance of battery electric buses has not met service or performance expectations + agencies need to purchase an additional 40% buses to replace the same amount of service as a diesel bus."*
- *"Current estimated capital cost to transition our fleet is between 1.7-2.2 Billion but could be higher depending on added cost of resiliency."*
- *"Funding of approximately \$1.5M to \$2M"*

Ontario

- *"The cost of transitioning to a ZEB fleet is getting more expensive due to inflation. The costs that were estimated in 2022 are already outdated."*
- *"\$200 to \$300M"*
- *"...our feasibility study estimated roughly 150M is needed for our transit network for charging infrastructure, facility retrofits, power utilities and access."*
- *"Charging infrastructure in more than 17 municipalities is needed. All considered, more than \$10M to support the work of 20 vehicles."*
- *"In the hundreds of millions"*

Quebec and Maritimes

- *"There is a huge gap between transition to zero-emission and what manufacturers will produce. For those properties that had alternate plans to reduce up to 2030 and then work towards zero is no longer possible due to manufacturers. Political pressure to push to get to zero now has left some transit agencies in a position where they are not ready and may not have buses to provide service due to gaps in funding, buses available to purchase and infrastructure challenges."*

6. System state of readiness

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

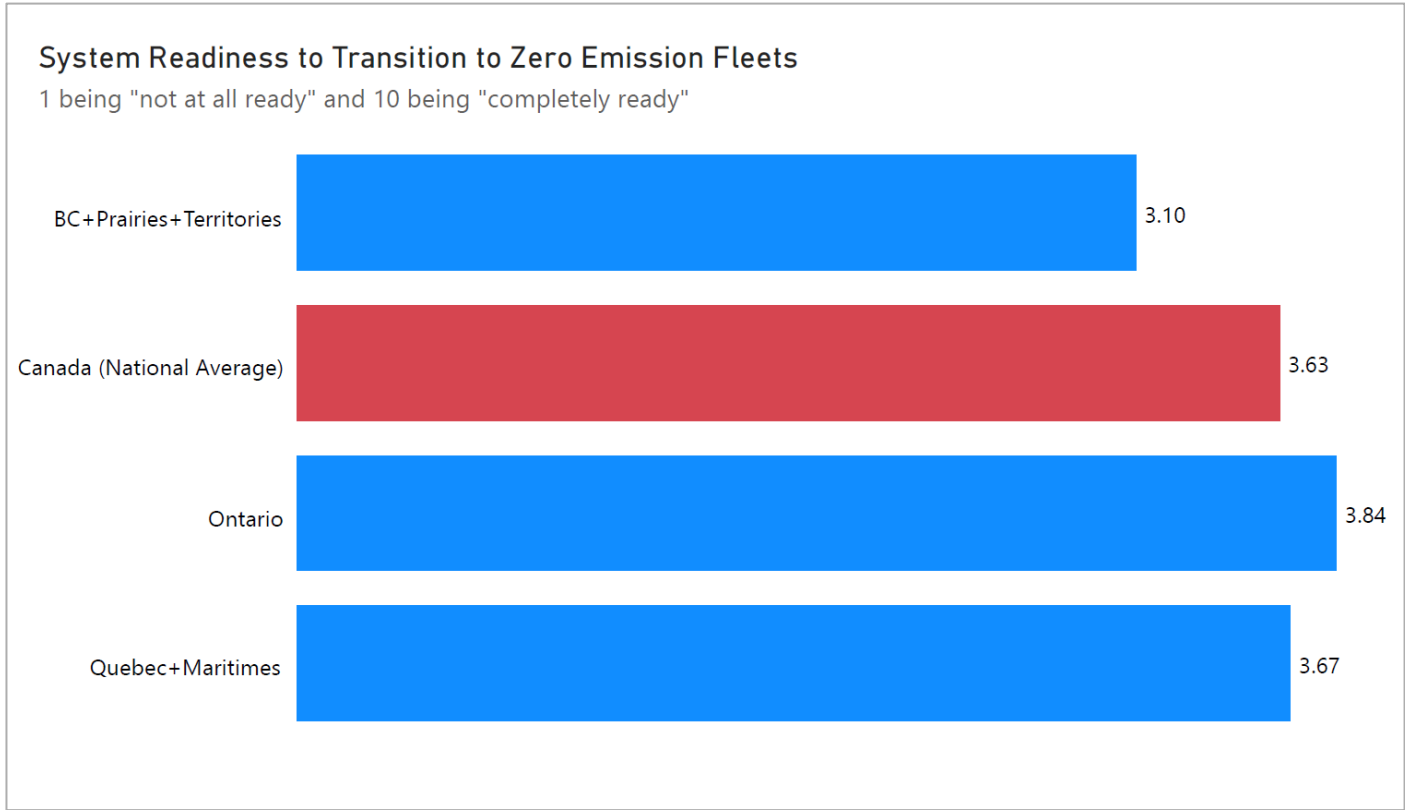


Figure 12

Observations

Without federal funding support, most transit agencies feel very unprepared to shoulder the costs of transitioning to zero-emission fleets on their own based on existing funding programs, regardless of region and/or supplementary provincial assistance.

7. Next steps

CUTA and OPTA will develop policy and funding recommendations based on the survey findings. The organizations will share these recommendations with relevant government agencies and organizations to help advance the public transit industry toward the federal government's zero-emission fleet targets.

Additionally, CUTA and OPTA will convene key stakeholders across the ZEB manufacturing and procurement landscape to enhance understanding and work to ensure government policies recognize and support this sector.