

Subject: Zero Emission Bus (ZEB) Pilot Performance and Evaluation

File Number: ACS2023-TSD-TS-0006

Report to Transit Commission on 11 May 2023

**Submitted on May 2, 2023 by Renée Amilcar, General Manager, Transit Services
Department**

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Ward: Citywide

Objet : Évaluation et rendement du projet pilote d'autobus non polluants

Numéro de dossier : ACS2023-TSD-TS-0006

Rapport présenté au Commission du transport en commun

le 11 mai 2023

**Soumis le 2 mai 2023 par Renée Amilcar, Directrice générale, Services de
transport en commun**

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Quartier : À l'échelle de la ville

REPORT RECOMMENDATION

That the Transit Commission receive this report for information.

RECOMMANDATION DU RAPPORT

**Que la Commission du transport en commun prenne connaissance du present
rapport.**

BACKGROUND

In April 2019, Council declared a climate emergency and directed staff to establish new

2030 midterm corporate and community GHG emissions reduction targets, review and update long-term GHG emissions targets and, identify concrete actions and resource implications to achieve new targets ([ACS2019-CCS-ENV-0005](#)).

In January 2020, Council approved the Climate Change Master Plan. Council committed to reducing 100 per cent of City's corporate GHG emissions by 2040. The OC Transpo fleet was identified as a major contributor of the City's corporate GHG emissions ([ACS2019-PIE-EDP-0053](#)).

In June 2021, Council approved the purchase of zero-emission conventional buses for all future fleet needs, provided they meet operational requirements and subject to funding and financial agreements ([ACS2021-TSD-TS-0009](#)).

The Zero Emission Bus (ZEB) Pilot Project was initiated as part of the City of Ottawa's plan to be zero emission by 2030. The pilot fleet consists of four New Flyer XE40 electric buses, with Generation III fully enclosed battery boxes and a capacity of 525 kWh. The buses began to arrive in Ottawa on September 17, 2021, and were placed into revenue service February 7, 2022.

The General Manager of Transit Services committed to providing key performance updates to Transit Commission as part of the ZEB Pilot Program.

DISCUSSION

Funding

The June 2021 report to Transit Commission and Council approved the purchase of zero-emission buses for all future transit bus fleet needs, as long as financing was secured, and the City did not spend more than planned in the Transit Long Range Financial Plan for the purchase of diesel buses ([ACS2021-TSD-TS-0009](#)).

Since the cost of ZEBs is approximately twice the cost of diesel buses and requires an upfront investment for the charging infrastructure, facilities upgrades and fit-ups, equipment and other transition costs, the conversion to zero emission buses would not be possible without the loan from the Canada Infrastructure Bank (CIB) and Infrastructure Canada grant.

The City's funding comes from the capital envelope for diesel bus replacements currently planned for the next four years that will be put towards the cost of the ZEBs and the CIB loan will cover the difference.

Table 1: ZEB Funding Contributions

City's contribution is aligned with LRFP planned spending on bus replacement cost for diesel buses:

Funding Source	Amount (in millions \$)	Estimated % Share of Funding
CIB Loan	289	29%
INFC Funding Grant (ZETF)	350	36%
City Funding from GHG Capital Envelope (per LRFP \$348.1 million planned)	335	35%
Total Funding	974	100%

Rollout

The E-Buses began arriving in September 2021. OC Transpo performed a Pre-Delivery Inspection (PDI), which was completed by December 2021 for all buses. Charging infrastructure commissioning was completed in conjunction with the PDI process. Upon completion of PDI, a series of tests began to determine the baseline capabilities of the E-Bus: range testing, inclement weather testing, and hill testing. The E-Buses performed well in testing, as outlined in the technical report (Document 1).

Training, documentation, and infrastructure were all reviewed and updated in preparation for the rollout of the E-Buses. A lane in the South Garage of 1500 St. Laurent Blvd. was outfitted with pantograph and plug-in chargers, and a maintenance bay was renovated to prepare for E-Bus maintenance. At the writing of this report, training has been provided to the following groups: 520 operators, 20 mechanics, 65 garage attendants, 8 body shop mechanics, and 36 operations and support staff. Training will continue to ramp up as the electrification of the fleet grows.

Results

In February 2022, the E-Buses began revenue service. Key Performance Indicators (KPI) were gathered, including Mean Distance Between Failure (MDBF), availability (E-Buses and Charger Infrastructure), mileage, efficiency, diesel savings and GHG emission reductions and, maintenance and operations costs. The KPI's have shown favorable results for 2022 and will be continuously monitored throughout the life of the E-Buses.

The New Flyer XE40 electric buses, with a capacity of 525 kWh, have met or surpassed the range and efficiency data provided by New Flyer. Revenue service routes longer than 10 hours, and driving distances over 200 kilometres, have been performed on a regular basis.

Table 2: Performance Testing

Temperature & Range Performance Testing		
Temp (°C)	New Flyer Expected Range (km)**	OCT Tested Range (km)
40*	315	
30	342	391
25	357	391
15	322	300
5	262	280
-5	363	365
-15	360	345
-26	316	314
-40*	239	

*Temperature was not reached to test

**Beginning of Life range

Conclusion

The Zero Emission Bus (ZEB) Pilot Program has shown that Battery Electric Buses (BEB) can operate in service, as an alternative to diesel buses.

FINANCIAL IMPLICATIONS

There are no financial implications to this report. We will continue to monitor the cost differences between Zero Emission Buses and diesel buses, particularly in support of the CIB financing that is available for the full life of the ZEB buses (15 years) and only needs to be repaid if savings are achieved. The cost of operating ZEBs versus diesel will be tracked and reported back to Commission and Council on a regular basis with the next tranche of ZEB purchases.

LEGAL IMPLICATIONS

There are no legal impediments to receiving this report for information.

COMMENTS BY THE WARD COUNCILLOR(S)

Citywide

CONSULTATION

TSD has provided a number of updates to Transit Commission and Council. Additionally, the funding for the ZEB program has been approved through the budget process.

ACCESSIBILITY IMPACTS

Accessibility has been integral to the procurement process for zero-emission vehicles. Staff have considered the concerns expressed by the City's Accessibility Advisory Committee and other accessibility stakeholders about the low levels of noise produced by electric vehicles and the increased risk this poses to pedestrians, particularly those who are blind or partially sighted. Staff mitigated this risk by outfitting the City's first four pilot battery-electric buses with an Acoustic Vehicle Alerting System (AVAS).

In 2022, staff also engaged stakeholders in two orientation sessions to familiarize them with the AVAS. These sessions involved testing the AVAS on-street in different locations and under different scenarios, as well as identifying the other accessibility features on board the vehicle. The feedback received was positive. As a result, all future zero-emission buses will be equipped with the equivalent AVAS technology, and the same on-board accessibility features.

OC Transpo continues to monitor new developments in legislation, regulations and emerging AVAS technology, and to monitor and respond to feedback from accessibility stakeholders and customers with disabilities.

CLIMATE IMPLICATIONS

The ZEB Program is part of the City's Climate Change Master Plan. Increasing the ZEB fleet continues to improve TSD's GHG emissions.

RISK MANAGEMENT IMPLICATIONS

TSD has completed the ZEB Pilot Program and is in the process of an audit by the City's Auditor General. TSD has responded to all of the Auditor General's

recommendations and provided Transit Commission with regular updates. Council has approved the budget for the first procurement of zero emission buses.

SUPPORTING DOCUMENTATION

Document 1 - Engineering Findings – Zero Emission Bus (ZEB) Pilot Performance and Evaluation

DISPOSITION

Staff will continue to monitor and provide updates to Transit Commission on the performance of the ZEBs.

Pursuant to the Delegation of Authority By-law (By-law No. 2023-67), Schedule “C”, Section 8, the City Clerk has authorized the correction of the following clerical errors in Document 1 attached to this report. The amendments have been incorporated into the version of Document 1, distributed and published on May 5, 2024.

- Page 8 – Replaced “Error! Reference source not found.” with “Figure 2”
- Page 10 – Replaced “Error! Reference source not found.” with “Table 1”
- Page 11 – Corrected “Figure 44” to “Figure 4”
- Page 12 – Corrected “Figure 55” to “Figure 5”
- Page 12 – Replaced “Error! Reference source not found.” with “Table 2”
- Page 13 – Corrected “Table 21” to “Table 2”
- Page 14 – Corrected “Figure 66” to “Figure 6”
- Page 15 – Corrected “Figure 77” to “Figure 7”
- Page 16 – Corrected “Figure 88” to “Figure 8”
- Page 19 – Corrected “Figure 1111” to “Figure 11”
- Page 20 – Corrected “Figure 1212” to “Figure 12”
- Page 21 – Corrected “Table 32” to “Figure 3”
- Page 22 – Corrected “Figure 1313” to “Figure 13”
- Page 23 – Corrected “Table 43” to “Table 4”

- Page 23 – Corrected “Table 4” to “Table 5”