

The Regional Municipality of York

Committee of the Whole
Transportation Services
June 11, 2020

Report of the Commissioner of Transportation Services

Greening the Region's Transportation Services Fleets

1. Recommendations

1. Council endorse the plan documented in this report for York Region Transit to transition the bus fleet from diesel to a greenhouse gas emission-free electric propulsion system by 2051. The Plan implementation would be subject to ongoing monitoring of the electric bus technical performance, long-term cost implications and future Council budget approval.
2. Council endorse the development of a greening strategy for the non-transit fleet with staff reporting the details of the strategy in fall 2020.
3. Council endorse revisions to Transit's procurement strategy for 2021 bus replacements to include six electric buses with associated charging infrastructure using capital dollars currently allocated to the bus replacement program.

2. Summary

Transit buses create 60% of the Region's overall corporate greenhouse gas emissions. To help meet the Region's goal of net-zero greenhouse gas (GHG) emissions by 2051, York Region Transit (YRT) must plan now for the conversion of the bus fleet from diesel to electric.

Transportation's non-transit fleet creates 3% of the Region's overall greenhouse gas emissions. The transition to battery-electric and hybrid light-duty vehicles has begun. Research on emerging technologies which support the electrification of the Region's medium and heavy-duty vehicles is underway.

Key Points:

- Transit staff have identified a plan to achieve a GHG free bus fleet by 2051, which aligns with the Energy Conservation and Demand Management Plan and Vision 2051
- COVID-19 impact on transit ridership has caused staff to reassess its 2021 fleet requirements. Six battery-electric buses can be purchased for delivery in 2021 within the Council approved capital budget

- The six battery-electric buses will be procured under an existing contract (T-17-52) with New Flyer Industries, awarded in compliance with the Region's Purchasing Bylaw. The procurement would include three depot chargers to support the six buses.
- A report focused on Transportation Services non-transit fleet will be provided to Council in fall 2020

3. Background

Region's Corporate Energy Conservation and Demand Management Plan encourages initiatives to move towards net-zero greenhouse gas emissions by 2051

This corporate-wide plan, approved by Council in [April 2019](#), encourages initiatives which move towards net-zero carbon by 2051, including providing for the necessary infrastructure to support a low-carbon transportation system.

The Energy Conservation and Demand Management Plan has led to three specific initiatives in Transportation Services:

- Electric bus pilot
- Transit bus electrification strategy
- Non-transit strategy

These three initiatives support five of the eight principles identified in Vision 2051.

4. Analysis

June 2020, Transit began its electric bus pilot in the Town of Newmarket

In [January 2019](#), Council approved the purchase of six, 40-foot battery-electric buses and associated charging infrastructure.

These six electric buses will operate on routes 55 Davis and 44 Bristol in the Town of Newmarket as part of the Pan Canadian Electric Bus Demonstration and Integration Trial. The trial will provide a better understanding of how YRT can further expand the transit fleet to include more emission-free vehicles.

It is anticipated this controlled deployment of battery-electric buses will provide the practical, hands-on experience required for future fleet and facility planning exercises. Some of the benefits include:

- Identification of actual operating and maintenance costs associated with the elimination of engine, transmission, exhaust and emission systems
- Hands-on experience and training for fleet technicians including oversight and support from the bus manufacturers during the demonstration period
- New employment opportunities for skilled trade persons and the development of new certification training programs with post-secondary institutions
- Experience with current and future facility requirements to support battery-electric buses
- Opportunity to validate the information from the 2015 and 2017 YRT fuel studies

Staff completed an Asset Electrification Feasibility Study and System Implementation Plan

The Asset Electrification Feasibility Study and System Implementation Plan (Study) outlined costs, details and recommendations to transition YRT buses from diesel fuel to battery-electric technology and included:

- Review of the current state of the YRT system
- Overview of the battery-electric bus market in Canada, including case studies of other transit agencies currently operating battery-electric buses
- Assessment of existing and planned infrastructure
- Operational goals and scenarios development
- Impact of battery-electric bus deployments on operations and infrastructure: case studies
- Operational requirements for YRT
- Bus route, range and charge modelling
- Identification of utility and infrastructure improvements required to support the conversion
- Capital and operating cost analysis

A summary of the Study is included with this report as Attachment 1.

The Study identified the path required to achieve a greenhouse gas emissions-free bus fleet by 2051, using a phased procurement approach

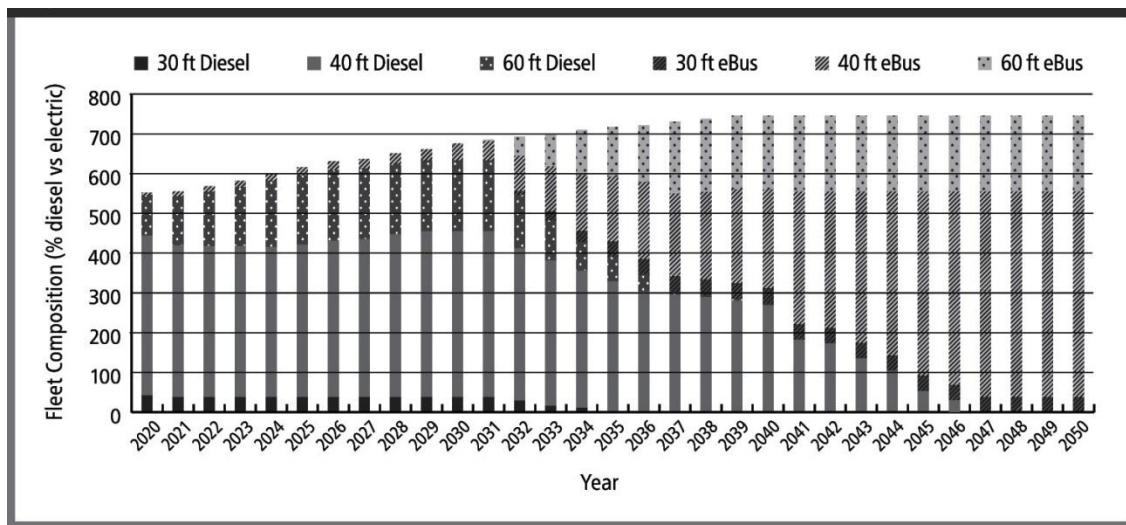
Infrastructure upgrades are needed to support a fleet of battery-electric buses at YRT bus garages and terminals; this also includes charging stations placed throughout the Region. Upgrades include electrical improvements to Region and utility-owned infrastructure to address the increased electrical demand associated with a fleet of battery-electric buses.

Staff worked directly with utility partners to determine the scope of work and costs included in the Study. Improvements will be phased and directly linked to the requirements of the electric bus fleet.

A complete lifecycle review of the YRT fleet was conducted to determine when to begin replacing the existing diesel fleet with battery-electric. Council approved transit fleet lifecycle programs and requirements of Vision 2051 were included in the review. A complete shift to battery-electric procurement is required by 2030.

Figure 1 shows the phased approach to electrification including bus types, a minimum purchase of two battery-electric buses per year until 2030, and purchasing only electric after 2030

Figure 1
Phased Approach to Electrification



This phased approach would see the purchase of six electric buses in 2021 with two additional electric buses purchased each year from 2022 to 2029. This approach allows battery-electric bus technology to develop further and the bus price to reduce to a cost closer to a diesel bus. It also permits time for both the Region and hydro utilities to gain operational and maintenance experience, develop regulations, execute applicable agreements, and construct needed infrastructure.

Transportation’s Corporate Fleet Services continues to work towards Green Fleet objectives as per the Energy Conservation and Demand Management Plan

In [November 2019](#), Transportation Services presented a memo on Greening of the Regional Fleet outlining the current state of emissions and greenhouse gas reduction objectives.

The fleet currently includes 21 hybrid vehicles, with two additional purchases planned in 2020. Annual vehicle replacement budgets are also being reviewed and adjusted to maximize future electric options as they are made available in the market. Staff continues to

research electrified options as well as infrastructure costs required to facilitate electric vehicles.

In the fall, staff will report on a strategy moving forward on the current state of all fleet vehicles, future replacement options and corresponding budgets. The strategy will also include electrification options and overall lifecycle costing to better understand the total cost of ownership including supporting infrastructure and training.

5. Financial

The Study includes a cost analysis identifying capital and operating impacts associated with transitioning from diesel to electric buses

A financial modelling tool was developed to determine the capital and operating impacts related to the transition to electric buses. Modelling includes fleet and infrastructure requirements and parameters for modelling and:

- Was completed using 2020 dollars only and does not include inflation
- Does not include anticipated price reductions and preferred utility rates

The Study forecasts capital transition costs and compares them with the Transit 20-year capital plan

The Study included the development of scenarios for transitioning the fleet from diesel to electric and compares them with the 20-year capital plan.

The comparison allows staff to identify the incremental increase of bus procurements and additional cost of infrastructure required for the transition. A summary of the total additional capital cost for completing the transition by 2051 is provided in Table 1.

**Table 1
Capital Impact of Electric Bus Transition (2020-2050)**

Description	2020-2029 (\$M)	2030-2039 (\$M)	2020-2050 (\$M)
Fleet Procurement	12.3	193.2	478.0
Fleet Midlife/Overhaul	0.0	31.4	138.8
Infrastructure Upgrade	24.9	0.0	24.9
Charging Stations	2.6	75.8	162.6
Total Capital Costs	39.8	300.4	804.3

Staff will continue to refine the figures in Table 1 through the annual budget process.

Operating savings of approximately \$135M are forecasted over the 30-year transition period

The Study includes a comprehensive analysis of operating impacts resulting from the transition to an electric fleet. The analysis consists of industry available modelling on battery-electric and diesel buses and historical maintenance and operating costs of the YRT fleet.

An electric bus, on average, has 60% less moving parts than a diesel bus. This is projected to reduce maintenance and parts costs by approximately 30%. A reduction in energy costs is also expected to be achieved through electrification. The analysis was completed using current pricing for diesel fuel and in consultation with Regional utility providers for applicable rates. An estimated savings of \$20 million is projected based on this analysis over the 30-years.

Projected cost reductions would align with phasing in of the electric buses into the YRT fleet. Prior to 2030, small quantities of electric buses will be distributed throughout the YRT system with potential savings being offset by the cost of managing a small subset of buses.

Table 2 provides a summary of operating impacts and savings which are not currently included in the 2020-2022 budgets.

Table 2
Operating Impact of Electric Bus Transition (2020-2050)

Description	2020-2029 (\$M)	2030-2039 (\$M)	2020-2050 (\$M)
Fleet Maintenance	0	(19.7)	(91.4)
Fleet Overhaul Program	0	(9.4)	(32.8)
Diesel Fuel	0	(82.0)	(321.8)
Electricity	0	72.8	301.4
Infrastructure Maintenance	0	3.1	9.9
Total Operation Costs	0	(35.2)	(134.7)

Staff will continue to refine the figures in Table 2 through the annual budget process.

As the market continues to mature in Canada, it is anticipated the financial business case for purchasing battery-electric buses and infrastructure will gradually improve as costs reduce. Already, the cost of lithium-ion batteries has decreased on average 20% annually since 2010. This reduction would bring the incremental increases closer in-line with the 20-year capital plan.

It is also anticipated additional savings will be realized through implementation of preferred utility rates for mass transit fleets. Infrastructure maintenance costs will also continue to be reduced as the fleet transitions to fully electric and legacy diesel fueling systems are decommissioned.

The cautious, phased implementation approach staff is planning will help identify up-front and long-term cost implications of introducing an electric bus fleet. Early and thorough analysis will help avoid potential pitfalls caused by the implementation of this new technology.

6. Local Impact

Local municipalities will benefit from the reduction in greenhouse gas emissions, vehicle idling and noise pollution. This process will support York Region's move towards a reliable, sustainable and emission-free transit network that will support local municipal greening strategies.

7. Conclusion

Staff is seeking Council authorization for the purchase of six electric buses from New Flyer, at a cost of \$4.3 million, plus HST, with an expected delivery in 2021. The procurement and construction of needed infrastructure to support the operation and maintenance of buses having electric propulsion systems are planned to take place from 2021 to 2029.

YRT would continue to purchase a limited number of electric buses each year between 2021 and 2029 to move forward with building the electric bus program and support the Region's GHG reduction efforts. Fleet procurements would align with available infrastructure capacity to ensure reliable transit service.

Staff will work with organizations such as the Canadian Urban Transit Association, Canadian Urban Transit Research and Innovation Consortium, the Ontario Public Transit Association and the private sector, to educate the federal and provincial governments on the benefits of converting infrastructure and bus fleets to clean energy and the need for sustainable funding to support this change.

Staff will continue to engage utility partners in developing a reliable network of infrastructure to support the transit industry's transition to electric bus technology.

For more information on this report, please contact Ann-Marie Carroll at 1-877-464-9675 ext. 75677. Accessible formats or communication supports are available upon request.

Recommended by: **Paul Jankowski**
Commissioner of Transportation Services

Approved for Submission: **Bruce Macgregor**
Chief Administrative Officer

June 2, 2020
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