The Regional Municipality of York

Committee of the Whole
Transportation Services
January 10, 2019

Report of the Commissioner of Transportation Services

Purchase of Six Battery Electric Buses

1. Recommendations

1. Council authorize the purchase of six forty-foot battery electric buses from two current York Region Transit suppliers:

    a) Four buses from New Flyer Industries at a cost of $4.8 million, excluding HST

    b) Two buses from Nova Bus at a cost of $2.4 million, excluding HST

2. Council authorize the use of $7,742,000 from Vehicle Replacement reserves including interim appropriation spending in order to complete the purchase.

3. The Commissioner of Transportation Services be authorized to execute the necessary agreements required to procure the buses and associated infrastructure.

2. Summary

This report seeks Council authorization to purchase six battery electric buses and associated infrastructure, without a competitive procurement, to support the Region's initiative to research and test an electric bus fleet. Section 3.3 of the Purchasing Bylaw provides that Council may authorize any purchase, or method of procurement, where doing so would be in the best interests of the Region.

Key Points:

- Electric bus technology has now progressed to the point where life cycle costs for an electric bus can reasonably be expected to be less than a comparable conventional diesel bus

- This purchase would allow the Region to gain practical hands-on experience with electric buses in a controlled deployment with minimal impact to the base fleet of vehicles and supporting facilities

- This purchase would allow the Region to continue participating in the Electric Bus Demonstration and Integration Trial (Trial) lead by the Canadian Urban Transit Research and Innovation Consortium (CUTRIC)
- This purchase would allow the Region to validate industry electric bus performance in a Southern Ontario climate and would assist staff in the process of developing the plan to transition to a greenhouse gas-free transit fleet

3. Background

March 2017, Council authorized the purchase of six electric buses as part of the Pan Canadian Electric Bus Demonstration and Integration Trial

In 2017, York Region Transit (YRT) partnered with the CUTRIC and other public and private agencies to participate in the Trial. The Trial supports a strategic shift to zero-emission propulsion technologies and the standardization of battery electric buses and overhead charging systems for interoperability in Canada.

Funding commitments for the Trial were secured from the Federal and Provincial governments, York Region, Newmarket-Tay Power Distribution Ltd, Siemens, ABB, New Flyer Industries and Nova Bus. At the end of the Trial period, YRT would retain ownership of the buses and associated infrastructure.

The Trial would consist of testing and evaluating electric bus technology from two known bus manufacturers, New Flyer Industries and Nova Bus, who were selected, in part, because the majority of YRT's fleet consists of New Flyer and Nova buses and therefore, parts suppliers, warranty management and technical support are well established. The Region also recently issued an open procurement for the supply and delivery of sixty-foot diesel buses, and New Flyer Industries and Nova Bus were the only vendors who submitted bids.

The trial will take place in the Town of Newmarket on Route 55, which provides service on Davis Drive, and Route 44, which provides local service on Yonge Street, north of Davis Drive.0

The bus purchase was conditional upon funding from the Ministry of Transportation

May 3, 2018, the Region received a letter from the Ministry of Transportation of Ontario (MTO) confirming a contribution of up to $4.5 million for the purchase of six, forty-foot electric buses and associated project management, data collection and analysis.

At that time, staff was in the process of finalizing the terms and conditions of the Transfer Payment Agreement, which was the final approval step with the MTO.

July 9, 2018, YRT received a letter from the MTO stating the Trial would no longer be funded due to the cancellation of the Provincial Cap-and-Trade Program.

In preparation for the Trial, York Region Transit staff invested a significant amount of time preparing agreements and technical documents

In order to move the project forward, Trial participants completed the following activities:

- Developed vehicle specifications to prepare for procurement agreements and contract execution with the bus manufacturers
- Completed preliminary economic modeling and analysis on the electric buses specific to YRT routes
- Developed and signed a Memorandum of Understanding outlining the Trial goals and overall roles and responsibilities
- Developed preliminary drawings for charging infrastructure at the Newmarket GO Bus Terminal
- Reviewed 18110 Yonge Street facility requirements based on depot charging equipment and infrastructure
- YRT staff supported Newmarket-Tay Power in finalizing the funding with Natural Resources Canada when developing the agreement for procurement of the electric charger

Staff has reviewed opportunities to replace the withdrawn $4.5 million funding in order to move the project forward

Staff has reviewed other potential funding opportunities that could be used to replace or offset the funding withdrawn by the MTO. These range from external funding to reductions in scope that could impact the effectiveness of the Trial and include:

- The Public Transit Stream of the “Investing in Canada Plan” - Included in the projects identified for optimizing Regional transit initiatives are transit bus replacement and expansion activities.
- The Federation of Canadian Municipalities “Green Municipal Fund” – This would provide a grant of approximately $675,000; the balance would be a 10-year, low-interest loan at a rate less than one per cent. Repayment of the loan would be included in the annual operating budget.
- A reduction in the number of buses in the Trial purchased through the available YRT capital budget - Reducing the number of buses would limit the Trial’s effectiveness and would prevent the identified routes from being operated exclusively with electric buses.
- Seek private sector partnership opportunities.

Currently, no additional funding has been secured through the above opportunities.

4. Analysis

Electric bus technology has continued to advance and is being deployed in various scales throughout North America

In 2017, YRT completed phase two of an alternative fuel study that focused on diesel-electric hybrid and fully electric buses. The study notes a rapid growth of electric vehicle technology in North America and the rest of the world. This growth has transitioned into the transit industry with diesel bus manufacturers developing all-electric bus models and new bus manufacturers offering purpose-built battery electric buses.

There are currently over 230 battery electric, public transit buses in service across North America. These buses have been deployed in various locations including Alberta, Quebec, Chicago, Minnesota, California, Colorado, New York, and Pennsylvania. Transit agencies and various levels of government have also established varying commitments for implementing battery electric bus fleets, some for full electrification as early as 2030. These commitments currently identify an expansion of over 900 battery electric buses being deployed in North America (Attachment 1).

A reduction in maintenance and fueling costs has been demonstrated when comparing an electric bus to a conventional diesel bus

Phase two of the YRT alternative fuel study also identified reductions in maintenance costs when comparing an electric bus to a conventional diesel bus. The main contributors are:

- No engine - All engine maintenance, fluids, tune-ups and failures are eliminated
- No exhaust after treatments - Diesel particulate filters and associated maintenance or diesel exhaust fluid refills are not needed
- Reduced brake wear - Brake service life increase of up to 75 per cent due to regenerative braking systems, which use electric motors to assist in slowing down the vehicle, reducing wear on brake components
- No transmission - All transmission maintenance, fluids, and failures are eliminated
- Overall - Reduction in fluid use, fluid disposal costs and potential contamination issues

Since the original analysis on maintenance costs, additional data has indicated a reduction in these costs ranging from 30 to 50 per cent. Savings amount is dependent on bus type and overall service requirements. Detailed analysis is included in Attachment 1.

A reduction in fueling costs from 30 to 50 per cent has also been identified through modelling of YRT routes selected for battery electric bus deployment. The modeling included service requirements and schedules, route profiles and fueling costs for diesel/hydro (Newmarket/Tay Power Distribution). These findings also align with industry analysis and vary depending on bus type, service requirements and electricity and diesel rates.

A controlled deployment of battery electric buses would provide the practical hands-on experience to inform future fleet and facility planning exercises

Through the bus deployment and participation in the Pan-Canadian Electric Bus Demonstration and Integration Trial, the following benefits would be gained:

- Experience in the electrification of heavy-duty transit vehicles
- A reduction in operating and maintenance costs associated with the elimination of engine, transmission, exhaust and emission systems
- Hands-on experience and training to YRT Fleet Technicians including oversite and support from the bus manufacturers for the demonstration period
- New employment opportunities for skilled trade persons and development of new certification training programs with post-secondary institutions
- Experience with current and future facility requirements to support battery electric buses

This would allow staff to build on and validate information gained from alternative fuel studies, analysis and peer transit agencies. Practical hands-on experience will also help staff to make more informed decisions and recommendations for future fleet and facility planning exercises, bus operations and maintenance contracts and greenhouse gas reduction opportunities.

The Electric Bus Trial supports York Region's goal of zero greenhouse gas emissions across all services by 2051

The Electric Bus Trial supports Council-approved strategic plans and documents, including Vision 2051, YRT/Viva 2016 to 2020 Strategic Plan, York Region Official Plan, Transportation Master Plan and the Energy Conservation and Demand Management Plan (ECDM).

The Council-endorsed ECDM Plan commits the Region to reduce its greenhouse gas emissions to 47 per cent below 2014 emission levels by 2051. Almost half of the reductions committed to by the ECDM Plan will come from converting YRT diesel buses to a greenhouse gas-free alternative.

5. Financial

March 2017, Council authorized the purchase of six battery electric buses at a total cost of $7.2 million ($1.2 million per bus). The Provincial government and the Region were each to contribute $4.5 million and $2.7 million dollars respectively, towards the procurement.

The Provincial Cap-and-Trade cancellation and subsequent funding withdrawal by the Provincial government has created an unfunded project cost of $4.5 million dollars.

Reduced maintenance and fueling costs can offset the increased capital expenditure for an electric bus

A combined reduction in maintenance costs and fuel savings can offset the estimated $600,000 increase in capital expenditures over the lifecycle of an electric bus. Table 1 identifies operations and maintenance costs for YRT Route 55, which have been modeled for battery electric bus deployment. These costs do not include charging infrastructure, which can be used for multiple buses.

Table 1

Operating and Maintenance Costs
Battery Electric vs Diesel Bus

Operating and Maintenance Cost	Electricity Cost (per bus)	Diesel Cost (per bus)	Total Savings (per bus)
Energy/Fueling	$19,269	$38,080	
Maintenance	15,000	36,715	
Capital Programs	21,667	15,556	
Total over lifecycle (18 years)	$1,006,842	$1,626,310	38%

A 38 per cent reduction in operating and maintenance costs results in a savings of approximately $619,468 over the 18-year life of a bus.

Staff has developed a revised financial contribution structure that considers the current available funding for this initiative

Table 2 identifies a revised funding structure summary comparing current and that reported to Council in 2017, and includes the withdrawal of provincial funding, an increase in federal funding, and an increase in contribution from the Region, which has been included in the draft 2019 Capital Business Plan and Budget.

Table 2

Electric Bus Financial Contributions

Funding Source	Electric Bus		Charging Infrastructure	
	March 2017	Current	March 2017	Current
Federal Government			$500,000	$1,190,000[1]
Provincial Government	$4,500,000	$0	$250,000	$0
York Region	$2,700,000	$7,200,000	$0	$542,000[2]
Newmarket-Tay Power			$250,000	$210,000
New Flyer and Nova Bus[3]	$2,160,000	$2,160,000		
Siemens[3]			$320,000	$320,000

[1] Now covering the cost of the bus charging infrastructure. This funding has been secured by Newmarket-Tay Power
[2] Unknown cost in 2017 for in garage bus charging system[3] In-kind services in the form of maintenance, support, and training on the system for the duration of the trial.

Staff will continue to explore potential Federal and Provincial funding opportunities to support this initiative that could be used to offset or reduce the Region's overall contribution towards the purchase of battery electric buses, if secured, pending Council approval.

Staff will also continue to support Newmarket-Tay Power with their ongoing procurement of charging infrastructure that was awarded to Siemens in May of 2018.

The purchase of six electric buses represents good value to the Region

Pricing for the electric buses is in-line with market rates and also includes additional value through in-kind services that will be provided directly to the Region in the form of maintenance, diagnostics, support and training by New Flyer and Nova Bus. The estimated value of these in-kind services is $2,160,000 over the duration of the Trial.

Additionally, participating in the Trial gives the Region direct access to the data collection and analysis resources that will be dedicated to the Trial. These resources include CUTRIC, University of Windsor and industry partners who will be analyzing trial data and performance for all participating transit agencies.

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 recommends that Council authorize the purchase of six, forty-foot battery electric buses and associated infrastructure at a total project value of $7,742,000.

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

December 13, 2018
Attachment (1)
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