



Office of the Commissioner
Transportation Services Department

MEMORANDUM

To: Members of Committee of the Whole

From: Paul Jankowski
Commissioner of Transportation Services

Date: October 25, 2019

Re: Greening of Regional Fleet

This memorandum provides Council with information about the ongoing planning and implementation of technology to reduce greenhouse gas emissions (GHG) from Regional transit and other fleet vehicles. Staff will provide a future report with a more comprehensive go-forward plan including financial implications.

Transportation Services is responsible for the purchase and maintenance of the Regional transit and non-transit fleet, including Transportation Services, Environmental Services and Corporate Services.

Reducing fleet greenhouse gas emissions is critical to achieving the Region's overall goal of zero greenhouse gas emissions by 2051

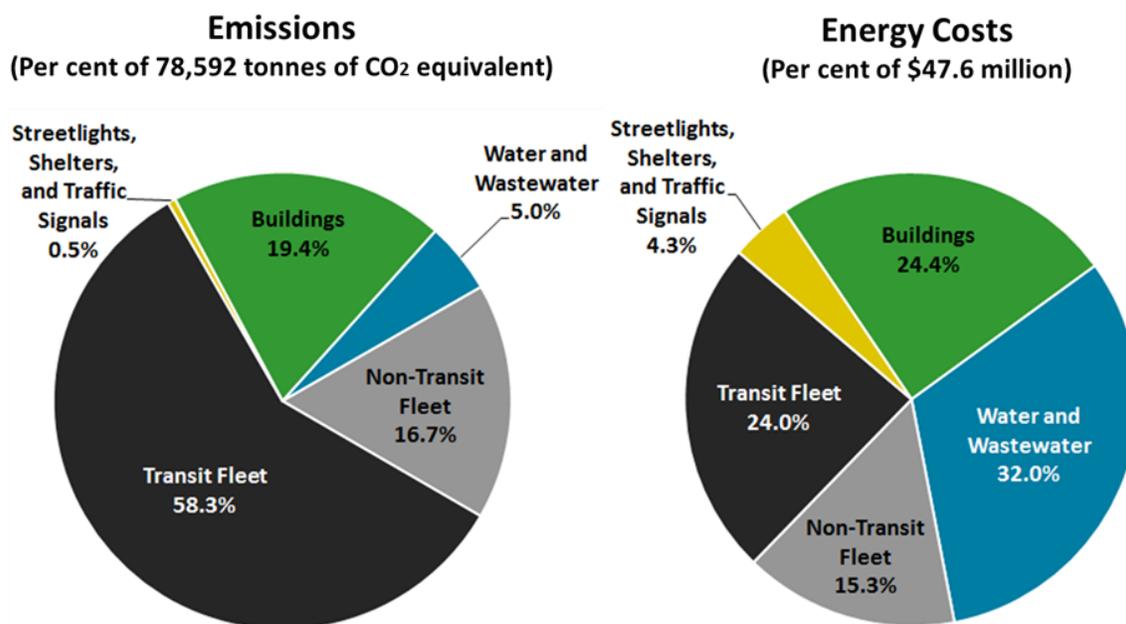
The Regional Official Plan contains numerous policies relating to GHG emission reductions. Council-approved strategic plans and documents commit the Region to reducing these emissions. The Regional fleet accounts for 75% of total GHG emissions created by delivery of all Regional services. Transitioning fleet to energy alternatives is critical to achieving the Region's zero emissions target. Although vehicle technology continues to evolve, much of it is still in the trial and development stage, and comes at a premium cost.

The Region's Energy Conservation and Demand Management plan identified greenhouse gas emissions of various departments

During 2017, bus and vehicle fleets accounted for more than 75% of the Region's corporate emissions but only 39% of the total energy cost.

The Region's 2017 corporate greenhouse gas emissions and energy costs by source are summarized in Figure 1.

Figure 1
2017 Regional Emissions and Energy Costs



The Region has a large and diverse fleet of vehicles and equipment

The Region-owned fleet includes passenger vehicles and numerous specialized vehicles. A summary of the Regional fleet by service area along with the overall percentage of the Region's total emissions (Energy Conservation and Demand Management 2017) is shown in Table 1.

Table 1
Fleet Size and Percentage of Emissions

Vehicle Type	Vehicles	Annual kms Driven (000's)	GHG Emission (kg)	GHG Emissions (%)
Transportation Services (Transit)	560	30,000	46,974.19	58.3
Transportation Services	195	2,700	1,576.41	2.0

Vehicle Type	Vehicles	Annual kms Driven (000's)	GHG Emission (kg)	GHG Emissions (%)
(non-transit)				
Community & Health Services	130	4,000	2,892.26	3.6
Corporate Services	20	160	57.84	0.1
Environmental Services	115	1,300	576.87	0.7
Police	740	12,900	7,510.98	9.3
Business travel using personal vehicles	N/A	4,100	938.41	1.2
Total		55,160	60,526.96	75.0

Ongoing improvements to the Regional fleet have resulted in a reduction of fuel consumption, greenhouse gas emissions and costs

The transit fleet continues to be updated with new technology, such as operator behaviour monitoring systems, electrification of hydraulic components and software updates to improve performance and efficiency of mechanical components. Operating procedures limit the duration an operator may idle a bus while out of service to three minutes. In addition to on-street monitoring by staff, technology has been introduced to monitor operator compliance.

To prepare for the advancement of electric vehicles staff need to better understand how current non-transit fleet vehicles are being used. To achieve this, non-transit vehicles have been outfitted with wireless data loggers to analyze overall use and suitability for hybrid or electric alternatives.

In 2018, YRT implemented new on-bus technology on a subset of buses that reduced fuel costs by 7% on these vehicles. This reduction resulted in a total savings of \$250,000 and a reduction in GHG emissions of 608,938 kg. This technology is now standard for all new buses.

Policies are also being developed to support transition to a green fleet. The Electric Vehicle Charging Station Policy, approved by the Chief Administrative Officer on March 5, 2019, governs how the Region establishes and manages non-transit electric vehicle charging infrastructure. Draft Green Fleet Optimization Procedures, now in the final stages of

development, will govern how the Region reduces GHG emissions on non-transit vehicles through anti-idling, rightsizing and electrification.

Transportation Services staff has evaluated opportunities for reducing greenhouse gas emissions based on vehicle type and available market options

Although there are clear paths forward for some of the Region’s diverse fleet, greenhouse gas-free, cost-effective alternatives for all vehicle types are not currently available. Table 2 provides a summary of vehicle types and available GHG-free alternatives.

The ability to transition emergency/specialized and heavy-duty vehicles to GHG-free alternatives will rely on industry and technological advancements and legislative updates governing emergency vehicles. Given the relatively short life cycle (i.e. less than 10 years) for many of these vehicles, replacing the fleet in a cost-effective manner is feasible within a reasonable timeframe.

**Table 2
Vehicle Type and Greenhouse Gas-Free Alternatives**

Vehicle Type	Current Propulsion System	Greenhouse Gas Free Alternative
Transit Fleet	Diesel/Gasoline	Electric Propulsion
Cars	Diesel/Gasoline	Electric Propulsion
SUVs	Diesel/Gasoline	Electric Propulsion
Light Duty Truck	Diesel/Gasoline	Electric Propulsion (2020/2021)
Medium Duty	Diesel/Gasoline	None (in development)
Heavy Duty	Diesel/Gasoline	None (in development)
Off Road Equipment	Diesel/Gasoline	None (in development)
Small Equipment	Gasoline	Electric Propulsion

Staff reviews each vehicle purchase to explore the potential of using a hybrid or electric vehicle

Over the last seven years, Fleet Services has purchased 17 hybrid vehicles for the non-transit fleet that are distributed throughout various departments. As various vehicle lifecycles come to an end and require replacement, staff reviews the potential for using a hybrid or electric vehicle. Although current Regional cars and SUV's are being replaced with hybrid vehicles, electric options are not available at this time for many other fleet vehicles, such as light duty trucks and heavier equipment. Electric vehicle options for use by emergency and police services are limited as they must follow additional regulations; however, a limited quantity of plug-in hybrid interceptor vehicles has been ordered for fall 2019 delivery for York Regional Police and York Region Transit enforcement who will pilot and monitor vehicle performance and GHG savings. The additional costs for hybrid and electric vehicle replacements are being integrated into existing budgets.

Purchasing hybrid vehicles not only reduces GHGs and fuel and maintenance costs, it also provides staff exposure to electric hybrid technology as a precursor to eventual full electric, GHG-free fleet vehicles.

The business case supporting hybrid and electric vehicles over internal combustion vehicles is improving

Maintenance experience with hybrid and electric vehicles in the current Regional fleet indicates lower maintenance costs in addition to fuel cost savings. The purchase of electric vehicles is approximately 15% to 20% more costly than hybrid vehicles with current rebates. Table 3 provides sample lifecycle costs of internal combustion engines (ICE) compared to hybrid, plug in hybrid (PHEV) and zero emission vehicles (ZED).

Table 3
ICE versus Hybrid, PHEV and ZEV Cost Savings

Vehicles	MSRP Less Incentive	Cost of Ownership Over 7 Years (Fuel and Maintenance)	Cost Savings Lifecycle vs ICE
Cars			
ICE (2019 Ford Taurus)	\$29,198	\$54,560	baseline
Hybrid (2019 Toyota Camry)	\$31,550	\$45,022	\$9,538
PHEV (2020 Toyota Prius Prime)	\$30,490	\$42,204	\$12,356

Vehicles	MSRP Less Incentive	Cost of Ownership Over 7 Years (Fuel and Maintenance)	Cost Savings Lifecycle vs ICE
ZEV (Nissan Leaf)	\$37,298	\$44,900	\$9,660
SUVs			
ICE (2019 Dodge Journey)	\$26,140	\$50,791	baseline
Hybrid (Toyota RAV4 HEV)	\$32,090	\$47,518	\$3,273
PHEV (2019 Mitsubishi Outlander)	\$40,998	\$61,424	(\$10,632)
ZEV (Hyundai Kona)	\$39,999	\$47,601	\$3,190

While the lifecycle cost savings are generally positive, Table 4 does not include the costs for electric charging infrastructure or the service implications of concerns related to the limited travel range of some of these vehicles. The costs associated with the additional electric charging infrastructure as well as the implications of performance constraints are being documented as part of the future go-forward plan. As the costs for hybrid and electric vehicles continue to decrease with advancements in technology, the business case for these vehicles is expected to improve.

Hybrid or electric options have been identified within the fleet replacement program

As current fleet vehicles are due for replacement, hybrid or electric options are being considered whenever possible. Table 4 shows electric vehicle replacement fleet targets over the next five years, as electrification technology evolves.

Table 4
Electric Vehicle Replacement Targets (Non-Transit)

Year	Fleet Vehicles due for Replacement	Number of New Hybrid /Electric Vehicles	Percentage of Total Annual Replacement
2020	33	3	9%
2021	122	54	44%
2022	50	19	38%
2023	58	21	36%
2024	36	4	11%
2025	28	2	7%

It is expected by 2024 and 2025 most eligible vehicles will already be converted to hybrid/electric as part of this multiyear replacement cycle. This is reflected by smaller replacement percentages in those years. As technology for larger vehicles becomes available, a hybrid/electric replacement program will be developed.

Off-road equipment and medium to heavy duty vehicle electrification options are rapidly maturing, although commercial availability is currently limited. Staff continues to monitor the latest technology for future fleet considerations.

January 2019, Council authorized the purchase of six electric buses as part of the Pan-Canadian Electric Demonstration and Integration Trial

The six electric bus trials will provide the Region with practical hands-on experience. Participating in the Pan-Canadian Electric Bus Demonstration and Integration Trial will give staff access to additional data from other participating agencies including Vancouver’s Translink and Brampton Transit. Toronto Transit Commission staff is engaged in the development and on-going delivery of their own electric bus trial.

Beyond the parameters of the trial, staff is completing a comprehensive analysis to identify the work and associated costs required to successfully implement electric bus technology system-wide. The analysis will look at:

- Current state assessment of the ability to support an electric fleet at Regional bus garages and terminals
- Utility capacity assessment to review distribution, capacity, reliability and required service upgrades at bus garages
- Operational and fleet planning including fleet size and type, operating constraints, transition rates and updates to operation and maintenance contracts
- Route profiles, schedules, bus stops and electric bus and charging solutions that support the transit network
- Cost of transitioning the transit fleet to electric bus technology

Real data generated through the electric bus trial will also be used.

Consideration must also be given to cross-boundary service integration with GO Transit, Toronto Transit Commission and Brampton and Durham Transits.

Transit study findings will be leveraged in a non-transit alternate fuel study

Staff will review the findings of YRT's comprehensive analysis of electric buses along with other current fuel tracking initiatives to develop a multi-year vehicle and infrastructure phase-in program to reduce GHGs for the non-transit fleet. Heavy duty vehicle classes are not yet at a mature state for conversion to electric; however, many light duty vehicles are becoming available for purchase.

Alternative fuel options are already being used by Transportation Services such as bio-diesel for buses and all other heavy duty equipment. Current fuel options at the Region include bio-diesel B5, B10 and B20, which can be used at different times of the year based on temperature.

Although small gas-powered equipment may be very specific, many electric options are becoming more common in the industry

Generally, the lifecycle of small gas-powered tools can range from five to ten years. It is estimated that approximately 10 to 15% (four to five units) of small gas-powered tools that come to the end of their useful lifecycle will be replaced with electric alternatives annually.

Staff will report back to Council with a go-forward plan to green the Regional fleet including financial implications

A future report will outline a fleet greening strategy to develop and manage an integrated system of electric vehicles, charging infrastructure and utilities. Capital and operating budget requirements and options with recommendations to implement a phased approach to transition to a GHG-free fleet will also be provided. Staff will report back to Council by late 2020.

Staff continues to track innovation and seek funding opportunities through both the Federal and Provincial governments. Current opportunities include the Strategic Innovation Fund-Stream 5 for the development of Canadian technology ecosystems and the Green Infrastructure Fund-Phase 2 for electric vehicle infrastructure. Staff will also continue to work with the Canadian Urban Transit Research and Innovation Consortium on development of electric bus programs and funding opportunities that align with the delivery of the go-forward plan.

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