Agenda – Standing Policy Committee on Innovation and Economic Development – September 12, 2022

REPORTS

Item No. 3 Electric Vehicles Pilot Demonstration

WINNIPEG PUBLIC SERVICE RECOMMENDATION:

1. That this report be received as information.

ADMINISTRATIVE REPORT

Title: Electric Vehicles Pilot Demonstration

Critical Path: Standing Policy Committee on Innovation and Economic Development

AUTHORIZATION

Author	Department Head	CFO	CAO
D. Konowich	D. Patman, on behalf of J. Berezowsky	N/A	M. Jack

EXECUTIVE SUMMARY

Winnipeg Fleet Management Agency's pilot demonstration of electric vehicles and charging infrastructure for use by the Public Service shows that all-electric vehicles can be operationally feasible for many light-duty operations.

RECOMMENDATIONS

1. That this report be received as information.

REASON FOR THE REPORT

On October 13, 2017, the Standing Policy Committee on Innovation concurred in the Winnipeg Public Service recommendation and approved $197,200 from the Innovation Capital Fund for the Electric Vehicles and Charging Infrastructure project. The Public Service is providing an update now that results from the pilot are available.

IMPLICATIONS OF THE RECOMMENDATIONS

As this report is for information only, there are no implications.

HISTORY/DISCUSSION

On October 13, 2017, the Standing Policy Committee on Innovation approved a project within the Innovation Capital Fund providing a budget for two (2) electric vehicles and two (2) level 3 charging stations to be used by the Public Service.

Two FLO SmartDC-V2 50kW charging stations were purchased and placed at the North End Water Pollution Control Centre and Millennium Library parkade. Two all-electric Chevrolet Bolts were purchased for use by the Water and Waste Department (WWD) and Winnipeg Parking Authority (WPA). The pilot demonstration took place from January 1, 2020, to December 31, 2021.

Results of Pilot Demonstration

The results of the pilot demonstration, displayed in Table 1, show the operational efficiency of the all-electric vehicles. Over the course of two years, the vehicles were driven a total of 73,888 km with an operating cost of $0.03 per km; significantly lower than the $0.19 per km for an equivalent gasoline or hybrid vehicle. In addition to operating cost savings, it is estimated the need for 4,803 L of gasoline was avoided, thus preventing the release of 10,993 kg of carbon dioxide (CO_2).

Table 1 – Results of Pilot Demonstration

January 1, 2020 - December 31, 2021			
	Vehicle 1 WWD	**Vehicle 2 WPA**	**Total**
Kilometres driven	21,785	52,103	73,888
Number of charging sessions	167	464	631
Total charging time	224 hours	601 hours	825 hours
Total charging kWh	4,724	10,685	15,409
Electricity cost	$431	$975	$1,406
Maintenance cost	$0	$491	$491
Operating Cost per km	$0.02	$0.03	$0.03
Est. fuel saved	1,416 L	3,387 L	4,803 L
Est. CO_2 saved	3,241 kg	7,752 kg	10,993 kg

*Avg Operating Cost per km of equivalent (gas/hybrid) $0.19

As shown in Table 2, despite having a lower operating cost during the two-year demonstration, each all-electric vehicle averaged a total net cost of $1,801 more than an equivalent hybrid vehicle. During this period, the average price of gasoline was $1.025 per litre. Projecting costs and savings over the entire seven-year lifecycle of a light-duty sedan, assuming rising gasoline prices and all other variables constant, each all-electric vehicle is expected to have a total incremental cost of $4,195. This incremental cost excludes the cost of charging stations, which are expected to last 10 years and can be used by multiple vehicles.

Table 2 - Return on Investment

	Capital Cost	**2 Year Actuals**	**Proj. 7 year Cost**
Cost of Charging Station	$69,613	$16,173	$62,229
Net Cost of Electric Vehicle	$49,619	$14,177	$49,619
Net Cost of Hybrid Vehicle	$22,626	$6,465	$22,626
Incremental Cost of Electric Vehicle	$26,993	$7,712	$26,993
Less: Incremental Operating Cost Savings		($5,911)	($22,798)
Net Cost/(Savings)		$1,801	$4,195
Electric Vehicle Return on Investment		-13%	-8%

Return on investment is a financial metric calculated by dividing the return by the purchase price. It is used to evaluate and compare the financial efficiency of investments. Based on the net cost of the all-electric vehicle, there was a negative return on investment of -13% during the two-year demonstration. Over the seven-year lifecycle of the vehicle, the return on investment is projected to be -8%.

In the near future, several factors may change which will enable an all-electric vehicle to achieve positive financial savings relative to a hybrid vehicle. Possible variables include a decrease in the net cost of an all-electric vehicle by a minimum of $4,195 through a combination of lower cost, purchase rebates, and increased residual value. In addition, positive savings are expected to occur at an annual usage of 22,200 km or gasoline prices exceeding $1.74 per litre.

Operational Feasibility

In general, the all-electric vehicles were able to meet the operational needs for a light-duty sedan during a typical eight-hour shift. Most users had a positive experience driving the vehicle, feeling it performed as expected and drove similarly to a gasoline vehicle. User concerns with cargo space and vehicle height were specific to that make and model. Feedback from the departments and users of the all-electric vehicles was collected and is summarized in Table 3.

Table 3 – Driver Comments

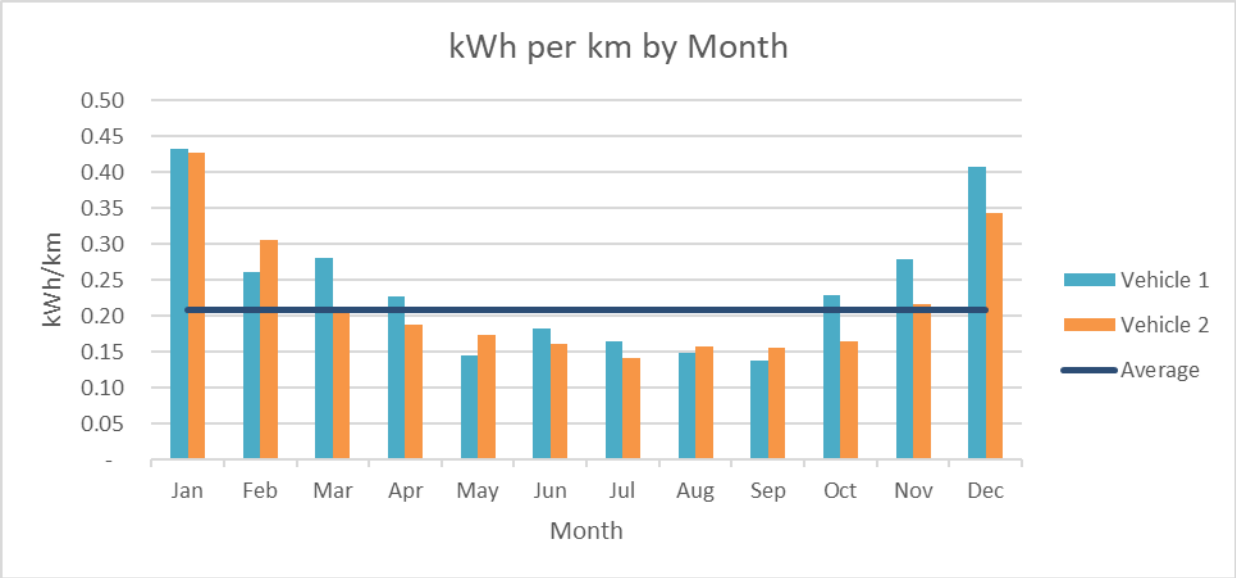
Positive Comments	Negative Comments
Fuel savings	Recharging requires time and planning
Good power and response	Reduced range on cold days
Excellent handling on flat and smooth surfaces	Winter tires would improve performance in extreme icy/snowy conditions
Vehicle smart functions	Small cargo space
Comfortable	Low height is not sufficient for WPA enforcement cameras

With an estimated 383 km driving range, the Chevrolet Bolt has sufficient range to meet the daily needs of most City of Winnipeg light-duty operations. However, the larger battery leads to a longer charging time, which on the 50kW charger averaged one hour and 18 minutes to go from 50% charge to 91% charge. The time required to charge from 20% to 90% was approximately two hours. For most departments, the time to charge is of little concern as battery charging can occur after work hours. However, for the few City of Winnipeg operations that run their vehicles for longer shifts, or for 24 hours, the time to charge may make an all-electric vehicle not feasible without additional investment in detailed route/shift planning, higher speed chargers, or spare vehicles.

Battery Performance

One of the greatest concerns expressed on the feasibility of all-electric vehicles in Winnipeg's climate is the performance of the battery and the effect extreme weather can have on driving range. Table 4, below, provides a visual representation of the additional charging kilowatt-hours (kWh) required in winter months compared to summer months.

Table 4 – Battery Performance by Month



From October to March, there was an average range reduction of 37% compared to the other months of the year. On the coldest days, the all-electric vehicles experienced a decrease in range of 60%. The reduced winter range does not preclude all-electric vehicles as feasible for City of Winnipeg operations, rather it is another factor to consider when determining departmental needs. Advancements in technology, such as heated and insulated batteries, will reduce potential range loss due to extreme weather.

Future of Electrification with Winnipeg Fleet Management Agency

In 2022, Winnipeg Fleet Management Agency (WFMA) will commission a study of the City of Winnipeg's electrical infrastructure to determine the feasibility and cost of upgrades in preparation for the future inclusion of all-electric vehicles.

Based on current situations, additional funding of $3.2 million per lifecycle is needed to expand electrification to 768 light-duty vehicles. Additional borrowing authority of $20.7 million is required per lifecycle, which is partly offset by operating cost savings of $17.5 million. This expansion will result in reduced CO_2 emissions of approximately 2.1 million kg annually. The cost to install charging infrastructure will be determined by the electrical infrastructure study.

WFMA will continue to monitor the cost and performance of the two all-electric vehicles in its fleet and respond to changes in return on investment and break-even point. WFMA will continue to monitor developments in technology pertaining to all-electric vehicles and charging station infrastructure.

FINANCIAL IMPACT

Financial Impact Statement Date: August 8, 2022

Project Name:

Electric Vehicles Pilot Demonstration

COMMENTS:

This report is for information only and has no financial impact.

Joseph Chammartin Aug 8, 2022
Joseph Chammartin, CPA, CGA
Manager of Finance
Winnipeg Fleet Management Agency

CONSULTATION

This Report has been prepared in consultation with:

- Water and Waste Department
- Winnipeg Parking Authority
- Legal Services (as to legal issues)

OURWINNIPEG POLICY ALIGNMENT

Policy 2.3: Climate Action Leadership

- Demonstrate municipal environmental leadership through an integrated, proactive organizational culture that applies innovative practices, including piloting new initiatives and evaluating and sharing results to eliminate the use of fossil fuels and enhance climate resilience in the built and natural environment.

Policy 2.11: Eliminate Fossil Fuel Dependence

- Pursue an increase in the use of alternative fuels, electric and zero-emission vehicles and charging infrastructure as part of a sustainable transportation system and green fleet.

WINNIPEG CLIMATE ACTION PLAN ALIGNMENT

Key Direction 1.4: Encourage Sustainable Transportation Options

- Conduct a comprehensive business case evaluation of the City electric vehicle pilot project and look to accelerate the electrification of the City's fleet.

WINNIPEG POVERTY REDUCTION STRATEGY ALIGNMENT

N/A

SUBMITTED BY

Department: Public Works
Division: Winnipeg Fleet Management Agency
Prepared by: Randy Bernard
Date: August 10, 2022
File No: Electric Vehicles Pilot Demonstration