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**File #:** IR-26-005, **Version:** 1

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**TAMRMS#:** B05

## **INFORMATION REQUEST (IR) - Bus Comparison**

Requested by: Councillor Hughes

Date of Request: February 3, 2026

Date Response Due: March 3, 2026

Confidential Response: No

### **QUESTION**

Please provide an update on the costs comparing electric buses to diesel buses, including capital, and operating, including maintenance and repairs and expected lifespan, and lifespan costs, and any other considerations, such as winter performance and distance traveling before requiring to be charged/refueled, now that we have more experience and data for the electric buses.

### **RESPONSE**

In 2017, St. Albert became the first municipality in Canada to introduce electric buses into its fleet. The City implemented a phased approach to assess the technology, initially placing three 40-foot electric buses into service in spring 2017 and adding four more in 2018, for a total of seven. Customer feedback noted the benefits of a quieter ride and zero tailpipe emissions.

Electric bus technology has advanced over the past decade, and agencies across Canada continue to assess how it compares with diesel propulsion in terms of cost, performance, and lifecycle considerations. St. Albert Transit now has eight years of operational data from its electric fleet, which informs the City's understanding of performance, maintenance requirements, and lifespan expectations.

### **BACKGROUND INFORMATION**

Traditional diesel buses in St. Albert have historically achieved a lifespan of approximately 18-20 years. Based on the operational data collected to date, St. Albert Transit's electric buses, purchased in 2017-2018, are expected to reach a service life in the range of 12-15 years, with the inaugural buses of the electric fleet requiring lifecycle replacement in approximately 2030 and 2031.

Key challenges observed industry-wide and within St. Albert's experience include:

- Manufacturing and supply-chain variability currently exists in the transit industry for both diesel and electric buses. The limited number of manufacturers in North America, and in particular Canada, create long lead times and potentially limited equipment variability at any given time.
- Electric bus battery and operating-range limitations in extreme temperatures creates

constraints in service allocation relative to diesel buses. This is compounded with the high variability of temperatures in our climate.

- Higher capital purchase costs for electric buses relative to diesel buses.
- Replacement needs for major propulsion components varies in timing and availability between electric and diesel buses (motors, gearboxes, hubs, high-voltage equipment).
- Cost escalation for specialized parts exists for both bus types, however, electric buses have more specialized components with more limited availability from suppliers.
- Difficulty acquiring components due to rapid technological changes exist with advancements in electric bus technology.

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## **CAPITAL COST COMPARISONS**

Like many sectors, bus procurement costs have increased since the pandemic.

### **Diesel Bus (per 40-foot bus)**

- **2018** = \$500,000
- **2026** = \$1,000,000 (current estimate)

### **Electric Bus (per 40-foot bus)**

- **2017** = \$972,600 (primarily funded by GreenTRIP grant funding)
- **2018** = \$906,801 (primarily funded by GreenTRIP/Public Transit Infrastructure grant funding)
- **2026** = \$2,000,000 (current estimate)

## **OPERATING COSTS**

Operating costs include fuel or electricity, maintenance costs, and all associated operating expenses.

Data from 2018-2025, the first eight years of data available for the City's electric fleet, demonstrates that electric buses have a slightly lower cost per kilometer; however, diesel buses operate significantly more hours and kilometers annually, approximately 49.6% more, due to differences in range, charging requirements, and scheduling flexibility.

For the years 2018-2025, the electric bus fleet had been operated a total of 1,393,275km with a total operating cost of \$1,015,367. This translates to an eight-year average of \$0.73 per km.

To provide a representative comparison related to diesel buses over this timeframe, the City received seven 40' diesel buses in 2014 and 2015 and the information related to these buses has been compiled over the same 2018-2025 timeframe. While these buses are on the order of three years old in 2018, the usage over the same service timeframe and unit costs of maintenance are fixed. For the years 2018-2025, these seven diesel buses operated 2,792,160km with a total operating cost of \$2,584,805. This translates to an eight-year average of \$0.93 per km.

Year	Usage KM Seven 40' Diesel	Opex\$ - Seven 40' Diesel	Cost per KM 7 Diesel	Usage KM Full 40' Diesel	Opex\$ - Full 40' Diesel	Cost per KM 40' Diesel Fleet	KM Electric	\$\$ Electric	Cost per KM Electric
2018	347,797	\$ 236,165	\$ 0.68	1,608,971	\$ 1,599,563	\$ 0.99	167,899	\$ 85,527	\$ 0.51
2019	339,998	\$ 316,751	\$ 0.93	1,618,565	\$ 1,794,725	\$ 1.11	195,683	\$ 99,108	\$ 0.51
2020	327,634	\$ 221,498	\$ 0.68	1,527,233	\$ 1,376,177	\$ 0.90	163,621	\$ 107,804	\$ 0.66
2021	365,300	\$ 262,102	\$ 0.72	1,674,418	\$ 1,606,936	\$ 0.96	161,861	\$ 112,765	\$ 0.70
2022	340,439	\$ 354,951	\$ 1.04	1,684,317	\$ 1,986,174	\$ 1.18	203,377	\$ 146,769	\$ 0.72
2023	337,023	\$ 371,902	\$ 1.10	1,613,194	\$ 1,788,281	\$ 1.11	158,239	\$ 137,248	\$ 0.87
2024	360,532	\$ 442,849	\$ 1.23	1,691,418	\$ 2,234,316	\$ 1.32	151,703	\$ 150,020	\$ 0.99
2025	373,438	\$ 378,587	\$ 1.01	1,691,767	\$ 1,900,602	\$ 1.12	190,894	\$ 176,127	\$ 0.92
<b>Total</b>	<b>2,792,160</b>	<b>\$ 2,584,806</b>		<b>13,109,884</b>	<b>14,286,774</b>		<b>1,393,276</b>	<b>\$ 1,015,367</b>	
		<b>\$ 0.926</b>			<b>\$ 1.090</b>			<b>\$ 0.729</b>	



The figures above include an additional comparison that includes a category including the entire 40' diesel fleet to demonstrate a blended operating cost per kilometer for this portion of the fleet regardless of their age, during the 2018-2025 timeframe.

Total costs of ownership are calculated by combining the purchase, or initial capital costs, and all operating costs throughout the life of the asset. Because the City's electric fleet is first generation, and this fleet type has not completed a full lifecycle, a precise calculation of total cost of ownership would include assumptions we have yet to observe.

## MAINTENANCE AND REPAIRS

Electric bus infrastructure, including batteries, charging systems, and high-voltage components, continues to evolve rapidly. This creates challenges in parts standardization, forward/backward compatibility, and supply-chain stability. Since 2018, parts costs for the electric fleet have increased by up to 40%.

St. Albert Transit has developed a comprehensive maintenance program tailored to electric buses. Maintaining a balanced monthly utilization of approximately 1,800-2,200 km per vehicle has helped support reliability and manage repair costs.

## **WEATHER AND CLIMATE PERFORMANCE**

Temperature affects battery efficiency and range, which has operational implications in both winter and summer conditions.

### **Electric buses**

- In winter, buses are typically scheduled for up to 4.5 hours of service (approximately 110 km) before returning to the garage to recharge.
- Attempting longer service spans or mid-day charging increases the likelihood of buses or chargers becoming temporarily unavailable.
- To meet winter route requirements, it may take up to four electric buses to provide the maximum total service hours as one diesel bus. This situation represents the maximum variability between service requirements based on current route structure and service delivery and does not represent every scenario.
- Similarly in summer, demand typically requires the equivalent of 2.5 electric buses per diesel bus.
- A larger fleet would also lead to increased capital requirements for additional vehicles, storage, maintenance capacity, and charging infrastructure. Electric buses would also require more frequent fleet replacement cycles compared to diesel.

### **Diesel buses**

- Diesel buses routinely achieve 18-22 hours of service per day (approximately 450 km) in winter without range-related limitations.

## **ADDITIONAL OPERATIONAL CONSIDERATIONS**

- Electric buses require movement between charger locations multiple times per day, while diesel buses generally require only a single end-of-day fueling.
- Diesel refueling takes under 5 minutes.
- Full charging for an electric bus can take approximately 3 hours.

## **MEETING SERVICE DEMANDS**

- The seven electric buses currently average 2,200 km per month, compared to 4,300 km for diesel buses. Their use is primarily focused on local routes due to range and charging constraints.
- The reduced capacity of electric buses requires the diesel fleet to assume additional service hours, resulting in extended use of older diesel buses beyond their typical lifespan.

## **ENVIRONMENTAL PERFORMANCE**

- The electric fleet continues to produce approximately 51% less greenhouse gas emissions per

kilometer than the diesel fleet.

- St. Albert's clean-diesel buses also contribute to emissions reductions compared to older diesel models. For example:
  - o The 2020 articulated (60-foot) buses achieve approximately 32 L/100 km, compared to older buses consuming around 50 L/100 km.
  - o New clean-diesel buses arriving in 2025 are expected to further improve emissions efficiency while maintaining full-service range and capacity.

## **SUMMARY**

All seven electric buses remain in service; however, due to range and operational constraints, they currently operate at roughly half the in-service capacity of diesel buses.

Based on eight years of operational experience:

- In winter, up to four electric buses may be required to match the service capacity of one diesel bus.
- In summer, two to three electric buses may be required.
- Additional fleet, maintenance, and charging resources are needed to support electric bus operations.
- Diesel buses continue to support the bulk of service hours and are being procured to ensure service levels keep pace with ridership and community growth.

The findings reflected above represent the first-generation of St Albert electric buses (2017-2018 models). With evolving technology, newer electric buses on the market may have different range, charging, and battery performance characteristics.

Report Date: March 4, 2026

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