

## HYDROGEN BUS INITIATIVE UPDATE

### RECOMMENDATION

1. That a single source agreement for the purchase of two hydrogen buses, up to a maximum of \$3.5 million, be approved as revised, and that the agreement be in a form and content acceptable to the City Manager.
2. That the budget of capital profile CM-66-3600 - Bus Fleet & Equipment Rehab and Replacement be increased by \$2,700,000 in 2021, with funding from partnership contributions.
3. That the scope of capital profile CM-66-3600 - Bus Fleet & Equipment Rehab and Replacement be expanded to include capital funding as required for related infrastructure and specialized tooling, with funds previously intended to be spent on diesel bus replacements repurposed for the hydrogen bus initiative.

### Report Purpose

#### Council decision required

Council is being asked to approve Administrative changes to the hydrogen bus initiative.

### Executive Summary

- In order to proceed with the hydrogen bus pilot, changes are required to the funding and single source provision.
- There is no additional budget required from the City of Edmonton, the structure of the agreement has changed at the request of the Alberta Zero Emission Hydrogen Transit steering committee. These changes are required to enter into a contractual agreement with the bus vendor.
- In the initial approval, Emissions Reduction Alberta would have arranged for the purchase of the two hydrogen electric buses and the City of Edmonton would have contributed \$1.26 million to Emissions Reduction Alberta.
- The final agreement enables the City of Edmonton to purchase two hydrogen buses directly from the manufacturer at an approximate value of \$1.6 million per vehicle. The value of one

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hydrogen electric bus would then be reimbursed to the City by Strathcona County and Emissions Reduction Alberta.

- Based on a refined analysis with Emissions Reduction Alberta, Administration recommends the following changes to the hydrogen bus initiative:
  - Total maximum capital budget to be spent on buses to equal \$3.5 million. The City's contribution to this amount will not exceed \$0.8 million, after receiving reimbursement from Strathcona County and Emissions Reduction Alberta.
  - The City of Edmonton intends to purchase two buses directly from the manufacturer, with partial reimbursement via partnership funding (approximately \$2.7 million). \$3.5 million is the estimated figure required for the initial purchase, including contingency.
  - Capital funding may be required for infrastructure to support the hydrogen initiative that includes, but is not limited to, a defueling system, fueling support, specialized tooling and inspections which will be funded within the existing budget.
  - Total maximum value of single source agreement direct with vendor to not exceed \$3.5 million
  - Budget of capital profile "CM-66-3600 - Bus Fleet & Equipment Rehab and Replacement" be increased to include partnership contributions.

## REPORT

### Overview

Electric buses contribute to the City of Edmonton's shift toward more sustainable transportation, a lower carbon footprint and high-quality transit service for Edmontonians. Edmonton Transit Service (ETS) has a current fleet of 40 electric buses and an additional order for 20 vehicles using funding support from the Federal zero-emissions bus (ZEB) program. Existing charging infrastructure will be maximized with a fleet of 60 electric vehicles.

Similar to an electric bus, a hydrogen bus is powered by a battery. Instead of charging the battery with electricity via an overhead pantograph system, hydrogen bus batteries are charged using a hydrogen fuel cell. The fuel cell produces electricity from the chemical reaction of the hydrogen with oxygen from the air.

Administration is requesting changes to the approved Alberta Zero Emission Hydrogen Transit (AZEHT) initiative. In the initial approval, Emissions Reduction Alberta would have arranged for the purchase of the two hydrogen electric buses and the City of Edmonton would have contributed \$1.26 million to Emissions Reduction Alberta. The final agreement enables the City of Edmonton to purchase two hydrogen buses directly from the manufacturer at an approximate value of \$1.6 million per vehicle. The value of one hydrogen electric bus would then be reimbursed to the City by Strathcona County and Emissions Reduction Alberta. The City will contribute \$620k to its own bus, with the remainder provided by partnership funding from Emissions Reduction Alberta. As the City is now purchasing both buses directly from the manufacturer, single source approval for the full value of two buses plus contingency is required, to a maximum value of \$3.5 million.

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Administration is seeking approval for the scope of capital profile “CM-66-3600 - Bus Fleet & Equipment Rehab and Replacement” be changed to include the purchase of two hydrogen buses, to a maximum value of \$1.26 million. No additional funding is required. Funds previously intended to be spent on diesel bus replacements will be repurposed for the hydrogen bus initiative. Further, Administration is seeking that single source agreements for the purchase of two hydrogen buses, up to a maximum of \$1.26 million, be approved and that the agreements be in a form and content acceptable to the City Manager

On delivery, ownership of one bus will be transferred to Strathcona County and the City of Edmonton will take delivery and ownership of one hydrogen bus. Additional capital funding is also required to support the hydrogen initiative that includes, but is not limited to, a defueling system, fueling support, specialized tooling and inspections. Funding for this additional capital will be provided within the existing approved budget.

The hydrogen bus initiative is intended as a pilot project to test new technology. This project is in coordination with the Transition Accelerator, a national organization with a mandate to collaborate across the country to solve major business or social challenges where significant GHG reductions can be built into the solutions. The Canadian Energy Systems Analysis Research (CESAR) initiative at the University of Calgary has been an early catalyst for the Transition Accelerator's work, contributing to the development of its methodology. Transition Accelerator has teamed up with an external consultant (Zen Energy) for this initiative.

Hydrogen buses will be obtained for testing purposes, to prove viability. The estimated testing period is 23 months, however the buses may be shared with other municipalities via leasing agreements for an agreed upon timeframe. Bus delivery is expected in Summer 2022. If testing of this new technology is successful, infrastructure cost savings may be achieved in the future. The cost of installing infrastructure for hydrogen buses is potentially less compared to electric buses powered by overhead pantographs.

### **Strategic Alignment**

Low carbon hydrogen buses can allow the City of Edmonton to improve the transit customer experience and help the City meet its climate resilience goals. Adding hydrogen bus capacity to the bus fleet will support The City Plan and ConnectEdmonton's strategic goal of climate resilience by examining the feasibility of hydrogen fueling infrastructure and play a meaningful role in lowering the City's greenhouse gas (GHG) emissions in the future. Both the City Plan and the Edmonton Metropolitan Regional Board's Metropolitan Region Growth Plan acknowledge that transit is essential to Edmonton's future. To grow responsibly by shifting transportation modes to a higher use of transit, Edmonton must at the same time reduce its reliance on diesel urban bus technology that makes up 1/3 of the buses in the province yet contributes over 3/4 of the bus emissions.

There is an acknowledgement in these plans that the City of Edmonton must assume a leadership role in climate change adaptation. For example, Goal 1, ACTION 3 of Climate Resilient Edmonton - Adaptation Strategy and Action Plan states “the City of Edmonton will lead by example by continuing to pilot, evaluate, share results and implement science-based adaptations”.

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Edmonton has made a major commitment to battery electric bus technology. Fuel cell electric propulsion adds an alternative to this commitment, offering flexibility for the future of fleets and the significant supporting infrastructure required.

Greening the transit fleet is a major factor to contribute to a broader net-zero emissions target when combined with the demands of commercial transport and space heating for buildings - developing a value chain that can support a new energy economy.

Edmonton's Energy Transition Strategy re-imagines the city and the energy markets that will require transformational change at an unprecedented rate.

Four interconnected pathways will help Edmonton reach its goals:

- A Renewable and Resilient Energy Transition - attracts the next generation of energy innovators to the region while transitioning Edmonton to 100% decarbonized energy.
- A Low Carbon City and transportation system that builds on the city building efforts outlined in The City Plan
- Emission Neutral Buildings that are highly energy-efficient, powered by renewable energy and create a thriving energy efficiency industry.
- Carbon Capture Solutions that catalyze technology and efforts to make a greener and healthier city.

### **Budget/Financial Implications**

Edmonton Transit Service has dedicated capital funding within capital profile CM-66-3600 for end-of-life bus replacement and mid-life refurbishment of its existing fleet, as approved by Council in the 2019-2022 budget cycle. Bus replacement is scheduled based on expected useful life of the asset and is necessary to maintain the integrity and reliability of the bus fleet. The current scope of this capital profile includes diesel, electric and hydrogen bus purchases.

The cost of a hydrogen bus, while significantly higher than a diesel bus, is similar in cost to an electric bus. To assist in the funding gap and to provide municipalities with the ability to test this new technology, the City of Edmonton has entered into an agreement with Emissions Reduction Alberta to access available grant funding for a portion of the cost of acquisition of hydrogen buses and some of the related infrastructure.

Administration has committed to purchasing two hydrogen buses in total, one for the City of Edmonton and one purchased on behalf of Strathcona County. The City will purchase both buses directly from the manufacturer for the full value of both vehicles, with a portion of that expense to be reimbursed by ERA and Strathcona County. The City and Strathcona County will contribute the equivalent cost of one diesel bus each and any related infrastructure required that arises. Funds previously intended to be spent on diesel bus replacements will be repurposed for the hydrogen bus initiative.

Administration is recommending expanding the budget of this profile to include partnership funding; to adjust the scope of the profile to include any required infrastructure; and to increase

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the approved single source approval to the full value of 2 hydrogen buses, to a maximum of \$3.5 million. This single source value includes the purchase price of the buses, along with contingency for pricing fluctuation and additional unforeseen costs. While there is no additional budget required from the City of Edmonton, the structure of the agreement has changed at the request of the AZEHT steering committee. These changes are required to enter into a contractual agreement with the bus vendor.

### **Legal Implications**

As the total value of the agreement to purchase the hydrogen buses will exceed the City Manager's delegated authority, Council approval of the agreement is required.

The City is subject to trade agreements that require an open competitive process for procurements of this value, unless a trade agreement exemption applies. There is no applicable trade agreement exemption. As a result, approval of the single source procurement may not comply with trade agreements, though the likelihood of this risk is low.

## **COMMUNITY INSIGHT**

City Council has established ambitious targets for greenhouse gas emissions using a series of integrated strategies and plans. Edmonton's Energy Transition Strategy set out a renewable and resilient energy transition path moving the City towards a low carbon city and transportation. The Greenhouse Gas Management Plan set targets to achieve 50 per cent below 2005 levels by 2030 (a 237,000 tonnes reduction by 2030). To achieve this would require the replacement of up to 440 diesel buses with electric buses resulting in GHG reductions of 169,000 tonnes by 2030 - this transition alone could account for 71 per cent of the City's reduction target. Administration is currently updating this plan to align with the more ambitious targets established in the recently approved Energy Transition Strategy. Hydrogen fuel cell technology being evaluated through this demonstration is an additional approach to electrification that could offer flexibility over the traditional electrical grid-tied approach by avoiding broader grid limitations.

Extensive community outreach combined with a stakeholder and subject matter expert approach to engagement was the main source of advice and expertise used in the creation of the Climate Resilient Edmonton - Adaptation Strategy and Action Plan.

Through piloting and sharing the results of climate change adaptation interventions, the City of Edmonton will lead other community members to take similar actions. This approach is entirely consistent with the underlying philosophy of the fuel cell bus demonstration project - not only is Administration evaluating this technology for use in real life conditions, Administration is also partnering with industry and other municipalities to share findings and approaches to expedite the transformation to this promising technology.

### **GBA+**

Studies have demonstrated that the impacts of climate change are most severely felt by populations already challenged by social, economic and political disadvantage. Inequalities influence where people work, live and play, their access to resources and opportunities and thus their vulnerability to climate-related impacts. In addition, there is an extensive literature on the

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disparities of efforts to manage the impacts of climate change—documenting “acts of commission”, whereby the negative effects of adaptation actions largely impact disadvantaged groups and communities and “acts of omission”, whereby marginalized groups receive fewer adaptation benefits and are underrepresented in decision-making. It is important not to lose sight of the fact that the need for social justice is equally relevant in the context of formulating strategies to prepare for, cope with and recover from the impacts of climate change.

One source of potential injustices of a carbon-neutral transition cited in literature relates to impacts on the availability and affordability of energy, transport services, housing and amenities. The Hydrogen Bus Initiative supports the Energy Transition Strategy and Action Plan goal to support a just and equitable way by contributing to GHG reductions.

Once the hydrogen buses are operational, they will be integrated seamlessly into the existing fleet. From the perspective of an ETS passenger, there will be no price difference or difference in accessibility features associated with boarding a hydrogen fuelled bus as part of a regular ETS trip. These measures ensure that all Edmontonians are able to take part in and enjoy the benefits associated with this low-carbon initiative, at no additional personal expense. The hydrogen fuelled buses being purchased will share all the accessibility features and amenities currently available on ETS’ standard diesel fuelled fleet.

## RISK ASSESSMENT

Risk Element	Risk Description	Likelihood	Impact	Risk Score (with current mitigations)	Current Mitigations	Potential Future Mitigations
<b>If recommendation is approved</b>						
Financial	Insufficient funding available to meet contractual agreement and deliver program, due to unforeseen additional costs.	2 - unlikely	1 - minor	2 - low	Existing funding will be allocated to this initiative, as required. Any overage will be funded within the diesel bus profile.	
<b>If recommendation is not approved</b>						
Financial	Insufficient approval to enter into a single source agreement with vendor to purchase 2 hydrogen buses.	5 - almost certain	3 - major	15 - high		Amend agreement to adjust scope in line with budget approvals, pending agreement with funding partners.