

## Hydrogen Bus Initiative

This attachment provides an overview and rationale for the City's involvement in the Hydrogen Bus Initiative. Administration is seeking Council's approval to proceed with the hydrogen bus initiative as outlined in this attachment and is recommending:

- That 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. (Recommendation 3)
- 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. (Recommendation 4)

### 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 anticipated order of 20 more vehicles utilizing anticipated funding support from the Federal zero-emissions bus (ZEB) program. Existing charging infrastructure will be maximized with a fleet of 60 electric vehicles.

Administration is proposing the exploration of new sustainable transportation technology. There is an opportunity for the City of Edmonton to purchase and test new bus technology in hybrid electric vehicles, powered by hydrogen.

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.

### Strategic Alignment

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 metropolitan 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 emissions.

Edmonton already has 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 and Financial Implications (Scope Change Request)

Edmonton Transit Service has dedicated capital funding within CM-66-3600 to utilize towards 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 cycles, and is necessary to maintain the integrity and reliability of the bus fleet. The current scope of this capital profile includes both diesel and electric 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 ERA and NRCan are accepting proposals for a program to access available grant funding for a portion of the cost of acquisition of hydrogen buses.

The City of Edmonton (along with the City of Calgary, Strathcona County and Bow Valley/Town of Banff) have submitted a proposal for two buses as a pilot project

involving new technology, hydrogen buses with the Transition Accelerator, a national organization with a mandate to collaborate across the county 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), who is putting together the submissions. Proposals will be submitted to ERA and NRCan, both of which are expected to have grant funding available for hydrogen bus technology. This is a bid process and the City is required to win the bid before committing to any funding matches.

If testing of this new technology is successful, significant infrastructure cost savings may be achieved in the future. The cost of installing infrastructure for hydrogen buses is potentially cheaper when compared to electric buses powered by overhead pantographs.

Administration would commit to two bus purchases in total, one per agreement. If the City bid is successful, the City would purchase these buses from ERA and NRCan. The buses would be owned by the City upon delivery. The estimated cost of a new hydrogen bus is \$1.4 million per unit. ETS would contribute approximately the equivalent cost of two diesel buses, not to exceed \$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. ETS will also contribute an in-kind operating value of \$1.6 million. It is expected that funding of capital and operating contributions will be matched by the ERA and NRCan. The two buses will be shared with other municipalities via leasing agreements for an agreed upon timeframe. These buses will be obtained for testing purposes, to prove viability. They would be delivered to the City of Edmonton (and paid for) in mid 2022, and once testing is complete the City of Edmonton will own the two buses.

Administration is recommending to expand the scope of this profile, to replace two diesel bus purchases with hydrogen bus technology. If the scope is adjusted it would allow funds from this capital profile that would otherwise have been used for two diesel buses to be used towards the purchase of two hydrogen buses. The purchase of hydrogen buses depends on the City being a successful bidder in funding programs provided through ERA and NRCan, which would provide partial funding support for the purchase of two hydrogen buses. The scope change is required to secure City funding prior to bidding for the grant funds.

### Agreement

If program bids are successful, the City of Edmonton would negotiate project agreements with ERA and NRCan. Details of the agreements are pending and will be finalized in the near future.

### Legal Considerations

As the total value of the agreements to purchase the hydrogen buses will exceed the City Manager's delegated authority, Council approval of the agreements 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 this project, which includes the single source procurement of hydrogen buses may not comply with trade agreements.

### Risks and Mitigation

Adequate ventilation, leak detection and flame detectors would be required if this option were to be pursued for permanent placement within ETS in the future. Although hydrogen is more flammable than other fuels, proper infrastructure can mitigate risks. These risks are offset with some benefits. Hydrogen is non-toxic and is also lighter than air. This allows hydrogen to dissipate rapidly when released. The only waste product from a hydrogen bus is water.

If not pursued in the future, the City of Edmonton would own two buses that would require specialized fueling and maintenance. Canada is in a race globally to realize the economic, social and environmental potential of a hydrogen economy. Alberta is already recognized as an exceptionally low-cost producer of low-carbon hydrogen. Concerted efforts are needed to support the scaling-up of demand for hydrogen as a transportation fuel to ensure Alberta can optimally benefit from the decarbonizing and economic potential of hydrogen. This proposal provides the City of Edmonton with an excellent opportunity to test this new technology in the early stages, thereby positioning itself for Alberta's future.