

## OVERVIEW OF CITY HYDROGEN ACTIVITIES

### RECOMMENDATION

That the May 2, 2023, Urban Planning and Economy report UPE01799, be received for information.

<b>Requested Council Action</b>	Information Only		
<b>ConnectEdmonton's Guiding Principle</b>	<b>ConnectEdmonton Strategic Goals</b>		
<b>CONNECTED</b> This unifies our work to achieve our strategic goals.	<b>Climate Resilience</b>		
<b>City Plan Values</b>	THRIVE		
<b>City Plan Big City Move(s)</b>	Greener as we Grow	<b>Relationship to Council's Strategic Priorities</b>	Climate Adaptation and Energy Transition
<b>Corporate Business Plan</b>	Transforming for the Future		
<b>Council Policy, Program or Project Relationships</b>	<ul style="list-style-type: none"> <li>● Edmonton's Community Energy Transition Strategy and Action Plan                             <ul style="list-style-type: none"> <li>○ Pathway #1 - Renewable and Resilient Energy Transition</li> <li>○ Pathway #2 - Emission Neutral Buildings</li> <li>○ Pathway #3 - Low Carbon City and Transportation</li> </ul> </li> </ul>		
<b>Related Council Discussions</b>	N/A		

### Executive Summary

- This report provides an overview of the City's involvement in advancing work related to the hydrogen economy and a summary of two upcoming City initiatives.
- The report also offers a brief summary of some of the major initiatives being undertaken regionally related to development of a complete hydrogen value chain.

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### REPORT

Hydrogen presents a significant economic opportunity for the Edmonton Region, Alberta and Canada. From an economic growth perspective, the Government of Canada Hydrogen Strategy<sup>1</sup> and the Government of Alberta's Hydrogen Roadmap<sup>2</sup> have acknowledged that hydrogen will diversify Alberta's economy, helping the Edmonton Region, Alberta and Canada sustain their roles as energy leaders. This transformation has the potential to provide next generation clean energy jobs and help attract equipment manufacturers, as well as hydrogen production and technology companies to the region.

Centralized clean hydrogen produced in a large scale plant offers the lowest cost per kilogram. However, once produced, the hydrogen must be moved to a destination where it will be used as a fuel for heavy/long distant transport, or as a source for building or industrial heating. In the long term, this could result in a network of pipelines with the possibility to repurpose existing lines. In the interim, there are other transportation options such as truck delivery that can fill the gap until economics are in place to support permanent transportation networks. The development of this combined production and distribution network would support the transition to a clean energy economy.

The Edmonton Region has produced hydrogen at a large scale for decades for use in refining and is well-positioned to deliver a new form of this proven fuel. The production of clean hydrogen at the scale required for fueling, heating and power is achievable due to the region's geology and prior investment in Carbon Capture and Utilization Storage (CCUS) technologies, as well as technical expertise and experience already in place. The final report from Alberta's Industrial Heartland Hydrogen Task Force<sup>3</sup> found that heavy transport (fleets of trucks, buses, trains) and heating are essential to building demand for hydrogen in the region. The key is solidifying demand through action.

Action 14 of the City's Economic Action Plan supports emerging off-shoots of the energy sector. This action capitalizes on Edmonton's proximity to heavy industrial areas including the Alberta Industrial Heartland and Alberta's oil sands to support emerging energy sector development, including the hydrogen sector. There are opportunities to leverage the City's geographical competitive advantage and capitalize on emerging innovation within the traditional energy sector. This can be accomplished in collaboration with other orders of government, industry, post-secondary institutions, through programs and support for emerging technologies related to this sector.

### The Hydrogen HUB

In 2021 a "Hydrogen Node" approach emerged, now known as the Edmonton Region Hydrogen HUB, the HUB. The approach is led at the political level by Edmonton and Sturgeon County, a collection of industry associations and three levels of government, and supported by a research-based non-profit

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<sup>1</sup> [natural-resources.canada.ca/climate-change/hydrogen-opportunities-key-findings/23104](https://natural-resources.canada.ca/climate-change/hydrogen-opportunities-key-findings/23104)

<sup>2</sup> [alberta.ca/hydrogen-roadmap.aspx](https://alberta.ca/hydrogen-roadmap.aspx)

<sup>3</sup> Layzell DB, Lof J, Young C, and Leary J. 2020. Building a Transition Pathway to a Vibrant Hydrogen Economy in the Alberta Industrial Heartland. Transition Accelerator Reports. Volume 2, Issue 4. Pp 1-59.

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agency, the Transition Accelerator. Its primary focus has been to leverage municipal and private sector opportunities to create both demand and supply at scale to meet future needs. This will help to demonstrate an economically sustainable value chain for a “hydrogen as fuel” economy.

From the outset, the HUB’s role has been to:

- Assemble key stakeholders including industry, academic, government and Indigenous to raise general awareness of hydrogen economic and environmental potential.
- Catalyze critical business and strategy linkages among stakeholders along the full hydrogen value chain.
- Support effective public and private sector decision-making by creating and publishing valuable, standardized aggregate infrastructure and market data including:
  - Market opportunities for various parts of the hydrogen value chain in the Hydrogen Node jurisdictions.
  - Mapping existing and potential supply and demand infrastructure where hydrogen fueling infrastructure could service demands.
  - Assisting Hydrogen Node jurisdictions with feasibility analysis and/or evaluation of different sub-regional options and opportunities.
  - Ensuring all of this information is in the public domain, allowing the private sector to develop solutions and compete to deliver efficient, low-cost production and distribution.

Much of the HUB’s work is achieved through Action Teams focused on:

- Low Carbon Hydrogen Supply (e.g. Alberta’s Industrial Heartland)
- Private Fleets (e.g. large transportation companies and the Alberta Motor Transport Association are engaged)
- Hydrogen for Heat and Power
- Municipal Fleets - City of Edmonton’s primary involvement at this time

### **The Alberta Zero Emissions Hydrogen Transit Project (AZEHT)**

Recognizing the City’s own fleet as a contributor to the City’s carbon footprint, an impactful initial path to hydrogen transition is through an evolution of the City of Edmonton’s heavy fleet vehicles, especially buses. Edmonton’s involvement and leadership in this initiative has initially focused on a funding application to Emissions Reduction Alberta (ERA) for a demonstration project with hydrogen fuel cell buses and fueling systems. This became known as the AZEHT.

To promote familiarity and confidence in fuel cell electric bus technology, Edmonton (project lead), and four partners - Strathcona County, Calgary, Roam Transit (Banff/Bow Valley) and Suncor - were successful in a joint project funding application to Emissions Reduction Alberta. Edmonton is the lead applicant for this work, responsible for equipment procurement, bus demonstration, data collection and reporting.

A number of elements are being studied through this exercise:

- For two years these vehicles will be put into everyday service by Edmonton Transit and Strathcona Transit (with an ultimate demonstration of an extension to Calgary) to test their suitability in real

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world conditions. This will include during winter to confirm effectiveness in Alberta's climate.

- The extended length of this project will build an understanding of the total cost of ownership for these vehicles to ensure there is a viable pathway to transitioning both heavy fleets (through some related work with the Alberta Motor Transport Association) and zero-emission buses.
- The practical regulations, codes, standards and practices needed to accommodate the fueling and deployment of buses, as well as the facilities required for their ongoing maintenance. This knowledge will provide evidence for change with regulators at other levels of government.

The final testing, training and delivery inspection phase of the project is currently underway, and it is expected that two buses will go into regular day-to-day service in the City fleet in spring 2023, with an expected project conclusion in spring 2025. The buses will continue in use as part of the City's (and Strathcona's) transit fleet after the project ends.

Early indications from the testing process are that this initiative will confirm the suitability of the vehicles and inform a realistic demand projection for hydrogen as a transportation fuel. This is anticipated to support the deployment of economically viable fueling stations and distribution systems necessary in a transition to a hydrogen economy. In turn, this has the potential to achieve emission reductions, economic growth and job creation. The next action will be to set out a path to transition to this technology, and the first step is a permanent fueling solution.

### Fueling Stations

The Alberta Zero Emission Hydrogen Transit Project has the benefit of fuel supplied to the project by Suncor. While the two-year trial is in progress, Administration has an opportunity to seek a permanent fueling solution, opening the door for a wider transition of the City's fleet. Public transit is where the City can advance decarbonisation on the largest scale in the shortest time. The detailed supply chain and emissions calculations that formed part of the funding application for the AZEHT project suggest an 80 to 85 per cent reduction in greenhouse gas emissions (or a reduction in the order of over 3,600 tonnes of carbon dioxide) over the 15-year life of a single bus. Edmonton currently has a fleet of approximately 1,000 buses. A fueling station is key to decreasing costs and developing the hydrogen economy by providing fuel to the City's fleet and to private sector vehicles.

In fall 2022, the City issued a public Expression of Interest (EOI) soliciting responses from firms to provide information and express interest to develop hydrogen fueling stations needed to (a) serve City vehicles at the conclusion of the AZEHT project and (b) meet some of the needs of the transport industry. The intent was two-fold: first, to determine the level of interest and experience in industry and second, to give possible bidders advance notice that the City would seek full proposals in the near future. A strong response to this preliminary notice led to the development of a full Request for Proposals (RFP) that will be issued to coincide with the Canadian Hydrogen Convention (April 25-27, 2023) being held at the Edmonton Convention Centre.

Through this RFP, the City will seek a private supplier to operate and maintain the first permanent fuelling station, providing fuel-grade hydrogen to both the ETS fleet and the emerging privately operated heavy-duty freight sector in the Edmonton Region. This will offer an opportunity to partner with a company able to supply the fuel and station, but more importantly allow the City to show a functional partnership in which other levels of funding from provincial and federal

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governments can be leveraged. The station will be located on City-owned land at the Centennial Garage site.

The fueling station will:

- Address the City's immediate needs and align with the City of Edmonton's fleet transformation and procurement plan (i.e. ensure adequate hydrogen supply as new hydrogen fuel cell electric buses are purchased and added to the fleet).
- Source hydrogen from a regional production facility (i.e. not on-site) and be designed to serve both day-to-day needs and the opportunity to supply external customers - this will support development of the region's larger hydrogen ecosystem.
- Be maintained by the supplier with bidders providing an "end-to-end" fuelling station solution (e.g. build, operate and maintain) at one monthly cost while the supplier will retain ownership of the fuelling station.

To protect the City's interests in this evolving market, hydrogen use and its transportation to site will be charged separately, based on actual use. The supplier will be responsible to make supply arrangements and will provide a supply and transportation pricing schedule with a price increase threshold as part of their proposal. If the agreed upon price increase threshold is exceeded, Administration will reserve the right to trigger a hydrogen cost review where a new hydrogen supplier may be selected.

The RFP process has significant technical and market-based elements. To address this, Administration is engaging expertise from the Hydrogen HUB/Transition Accelerator and the Alberta Motor Transport Association to provide technical support in the development of the RFP and in the evaluation of the proposals.

### Other Hydrogen Initiatives

Edmonton's involvement in advancing the hydrogen transformation is not limited to singular efforts or projects. The City has varying levels of involvement with a growing number of initiatives described briefly in Attachment 1, most of which have originated with or are connected through the work of the Edmonton Region Hydrogen HUB.

### Next Steps

There is the need for a broader plan to transform the City's transit fleet (and its supporting facilities) and to make use of the knowledge gained by the AZEHT project. In February 2023, a Zero Emission Bus (ZEB) Transformation Business Case Framework was completed. Deliverables completed to date will serve as a roadmap for the completion of the business case, but may also be used as a basis (a templated approach) to develop additional hydrogen strategy documents (e.g. other strategic needs regarding fleet, real estate, City facilities, etc.). When Administration started this work, there was an anticipated need to request additional consulting dollars to complete the transformation plan; however, based on the results of Phase 1, Administration will be able to complete this plan with internal resources.

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Climate initiatives continue to be a priority for the City of Edmonton, and these specific City-led hydrogen actions are important for advancing the Edmonton Region's hydrogen economy while supporting climate goals. To help further enable these goals and hydrogen activities, the City will also be looking at developing an economic strategy to further enable the green and hydrogen economy.

## COMMUNITY INSIGHT

Innovators and early adopters of hydrogen fuel sources are active and interested in building the hydrogen economy, and investing in hydrogen projects. This is demonstrated through growing interest in and attendance at two major hydrogen conferences in Edmonton: 1) the Hydrogen Summit, aimed at Edmonton Region Hydrogen HUB partners and local/regional industry, government, Indigenous and academic stakeholders, and 2) the Canadian National Hydrogen Convention, which attracted over 4,000 people (local, national and international) in its inaugural year in 2022, and which is expected to attract more people this year.

Edmontonians continue to ask for climate action. The 2022 Climate Change and Energy Perception Report<sup>4</sup> found that 75 per cent of respondents agree climate change is a concern, and 75 percent of respondents indicate that Edmontonians want the City to take action on climate change.

Additionally, through The City Plan engagement and the work to update the Energy Transition Strategy, Edmontonians shared their excitement and desires for a low carbon future. Currently, the City lacks research on Edmontonians' perceptions as they specifically relate to hydrogen. Research on this topic is needed, which would serve as benchmark data on Edmontonians' perceptions.

## GBA+

The City of Edmonton recognizes that every purchase can be leveraged to create economic, environmental and social impacts. Administration will identify and integrate environmental and social requirements into the RFP process for the hydrogen fueling station and other acquisitions under City discretion.

## Attachment

1. Other Hydrogen Initiatives

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<sup>4</sup>[edmonton.ca/sites/default/files/public-files/ClimateChangeAndEnergyPerceptionsReport2022.pdf?cb=1669837886](https://edmonton.ca/sites/default/files/public-files/ClimateChangeAndEnergyPerceptionsReport2022.pdf?cb=1669837886)