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Federal government announces Canada's hydrogen strategy

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Introduction

On December 16, 2020, Canada's federal government released its much-anticipated *Hydrogen Strategy for Canada* (the Strategy). The Strategy sets an ambitious framework to cement hydrogen as a key part of Canada's path to net-zero carbon emissions by 2050 and make Canada a global leader in hydrogen technologies.

The Strategy follows announcements by several other countries and Canadian provinces regarding hydrogen development. Since 2019, hydrogen strategies have been published by Japan, South Korea, Australia, New Zealand, Germany, France, Portugal and the Netherlands, among others.[1] In Canada, provincial hydrogen announcements have included the following:

- **British Columbia –** Hydrogen development was promoted in the 2018 *CleanBC*plan and the 2019 *Hydrogen Study*, with an emphasis on transportation fuels including fuel cells and zero-emissions vehicles.
- **Alberta –** A general hydrogen strategy was included in the 2020 *Natural Gas Vision and Strategy*, with a focus on producing hydrogen using natural gas and carbon capture, utilization and storage (CCUS) and exporting hydrogen.
- **Ontario –** In November 2020, the Ontario government published the *Ontario Low-Carbon Hydrogen Strategy – Discussion Paper*. This discussion paper emphasizes producing hydrogen through electrolysis, using hydrogen for electricity storage and blending hydrogen with natural gas to make Ontario's natural gas cleaner.
- **Québec –** Québec's public electric utility, Hydro-Québec, published its *Strategic Plan 2020-2024* in December 2019. The plan emphasizes supporting the development of hydrogen through research and development and using hydroelectricity to produce hydrogen through electrolysis.

Hydrogen 101

Hydrogen can be used as a fuel alternative for transportation, including light- and heavy-duty vehicles, transit buses and trains. It can also be used in power generation and can be burned on its own or blended with natural gas to heat residential and commercial buildings or provide high-grade heat for industrial processes. It is commonly used as feedstock for industrial processes such as petroleum refining, bitumen upgrading and the production of ammonia, methanol and steel.

What makes hydrogen so advantageous as a fuel source is its energy density (having the highest energy level per unit of mass of any fuel), its safety and versatility as an energy carrier and its combustion by-products (being electricity, heat and water). Hydrogen combustion does not produce any carbon emissions or pollutants at point of use.

The Strategy explains that Canada can produce hydrogen using various feedstocks, including water and electricity (i.e., electrolysis), fossil fuels, biomass and as a by-product from industrial processes. Colours are often used to represent the different hydrogen production pathways, based on the input feedstocks and the estimated carbon intensity. The Strategy emphasizes Canada's opportunities to capitalize on blue hydrogen, which is produced from fossil fuels using CCUS to minimize carbon intensity. Canada is also well positioned to produce green hydrogen, which is produced from water by electrolysis using renewable electricity. Canada already produces an estimated 3 million tonnes of grey hydrogen annually via steam methane reformation of natural gas (without CCUS), making it one of the world's top 10 hydrogen producers.

Strategy objectives

The Strategy intends to achieve emission reductions while at the same time creating domestic and international economic opportunities.

Goals

The Strategy's short-term goal (between now and 2025) is to lay the foundation for the hydrogen economy. This will involve extensive planning for the development of new hydrogen supply and the distribution of infrastructure, which will support the development and growth of early deployment "HUBs" (areas/clusters with extensive expertise in a certain sector) in mature hydrogen applications, and will also focus on supporting emerging hydrogen applications.

During this early stage, the focus will mainly be on proponents of relatively mature hydrogen applications that are near commercial market readiness. Other pre-commercial applications will be introduced as pilot projects in regional HUBs. There are several geographic areas identified in the Strategy that have the ability to create self-sustaining hydrogen economies more quickly. One of the areas identified is the Alberta Industrial Heartland, near Edmonton, which has the ability to become one of Canada's first hydrogen HUBs due to its existing infrastructure.

Between 2025 and 2030, the Strategy's focus shifts to stimulating growth and diversification of the hydrogen sector. Industrial clusters will be able to support the expansion of hydrogen technologies into other sectors and regions. This could include extending production facilities and infrastructure already built for industrial applications to things such as residential heating, hydrogen refuelling stations or dispatchable power generation. As the technologies advance, hydrogen use during this period will be focused on applications that are able to provide the best value proposition relative to other zero-emission technologies.

The long-term goal of the Strategy (between 2030 and 2050) is market expansion. By then new transportation applications should be ready for commercial use and the sector should expand rapidly during this period. The Strategy suggests that at this time, Canada should start to realize the full benefits of the hydrogen economy and can focus on increasing its supply and distribution infrastructure.

Economic opportunities

The hydrogen sector has the potential to create domestic market revenue of up to $50 billion per year by 2050, based on modelling scenarios discussed in the Strategy. This does not take into account the economic benefits that hydrogen will have on other markets that indirectly benefit from the energy sector, such as industries that can use hydrogen to reduce their carbon emissions.

The Strategy estimates that its implementation could generate more than 350,000 domestic jobs. Indigenous communities are expected to be well positioned to take advantage of the employment opportunities and new business creation using existing infrastructure, skills and expertise accumulated through involvement in the energy sector. The Strategy notes that the energy sector is already one of the largest employers of Indigenous peoples in Canada.

Internationally, the demand for hydrogen continues to increase and is expected to reach $2.5 trillion by 2050. Canada is already recognized around the world as a global leader in the hydrogen sector and is well positioned to become a hydrogen exporter. As demand continues to increase, there is an opportunity for Canada to supply hydrogen as a carbon-free energy commodity. Because Canada could potentially produce large amounts of low-cost, low-carbon intensity hydrogen in excess of domestic demand, this is very plausible.

The Strategy suggests that if Canada can capitalize on the opportunities available for hydrogen production and use, by 2050 it could realize the following benefits, among others:

- It will be one of the top global clean hydrogen producers.
- It will have an established supply base of low-carbon intensity hydrogen.
- Up to 30% of its energy will be delivered in the form of hydrogen.
- Up to 350,000 jobs will be created in the hydrogen sector.
- It will have an established and competitive export hydrogen market.

Strategy recommendations

The Strategy includes 32 recommendations aimed at achieving its objectives and the opportunities that it identifies for hydrogen development in Canada. These recommendations are organized under the following eight pillars, which provide a general sense of the recommendations:

- **Pillar 1: Strategic partnerships** – using partnerships (intergovernmental, public-private, and international) strategically to collaborate and map out the future of hydrogen in Canada
- **Pillar 2: De-risking of investments** – establishing funding programs, long-term policies and business models to encourage industry and governments to invest in the hydrogen economy
- **Pillar 3: Innovation** – taking action to support research and development and foster collaboration between stakeholders to maintain Canada's competitive edge and leadership in hydrogen and fuel cell technologies
- **Pillar 4: Codes and standards** – modernizing existing codes and standards to keep pace with the rapidly changing hydrogen industry and removing barriers to deployment, domestically and internationally

- **Pillar 5: Enabling policies and regulation** – ensuring hydrogen is integrated into clean energy road maps and strategies at all levels of government to incentivize its application
- **Pillar 6: Awareness** – leading at the national level to ensure individuals and communities are aware of hydrogen's safety, uses and benefits during a time of rapidly expanding technologies
- **Pillar 7: Regional blueprints** – implementing a multi-level, collaborative government effort to facilitate the development of regional hydrogen blueprints to identify specific opportunities and plans for hydrogen production and end use
- **Pillar 8: International markets** – working with international partners to ensure the global push for clean fuels includes hydrogen so Canadian industries thrive in Canada and abroad

Regulations and policy

The Strategy is intended to complement existing and proposed legal and policy measures aimed at reducing greenhouse gas emissions. The Strategy anticipates that further regulatory and policy development will be needed at all levels for it to achieve its stated objectives.

The Strategy notes that the use of hydrogen technologies is supported by measures such as carbon pollution pricing, low-carbon fuel regulations, vehicle emissions regulations, zero-emission vehicle mandates and mechanisms to help de-risk investments for end users. The federal government has already implemented or announced several such measures, including the following:

- the proposed *Canadian Net-Zero Emissions Accountability Act*, introduced in November 2020, to formalize Canada's target to achieve net-zero emissions by 2050 and establish a series of interim emissions reduction targets at five-year milestones;
- carbon pricing under the *Greenhouse Gas Pollution Pricing Act*, which is also enacted under various provincial and territorial statutes;
- Canada's new climate plan, *A Healthy Environment and a Healthy Economy* (Climate Plan), released in December 2020, which includes, among a large number of federal policies and programs, the plan to increase the carbon price by $15 per year, starting in 2023, to reach $170 per tonne of CO_2e in 2030;
- the federal government's announcement of a $1.5-billion Low-carbon and Zero-emissions Fuels Fund to increase the production and use of low-carbon fuels;
- the federal Incentives for Zero-Emission Vehicles program, which is to receive an additional investment of $287 million over two years;
- the federal government's commitment to invest an additional $150 million over the next three years in vehicle charging and refueling stations across Canada; and
- the proposed federal *Clean Fuel Regulations* (*CFR*), which will require liquid fossil fuel suppliers to reduce the carbon intensity of the fuels used in Canada from 2016 levels by 2.4 g CO_2e/MJ in 2022, increasing to a 12 g CO_2e/MJ reduction in 2030 (representing a decrease of about 13% below 2016 levels in liquid fuels carbon intensity by 2030). The *CFR* will also establish a credit market to give suppliers flexibility in meeting their annual reduction requirements, and it will retain the volumetric requirements for low-carbon intensity fuel

content currently found in the *Renewable Fuels Regulations*. The proposed *CFR* was published in the *Canada Gazette*, Part I on December 19, 2020, and a final version is expected to be published in late 2021.

The Strategy states that further policy and regulations will have to be developed to meet its hydrogen objectives, as there is currently no comprehensive and cohesive national framework for hydrogen in Canada.

Looking ahead

Many of the federal government's measures aimed at implementing or complementing aspects of the Strategy are proposed to begin in 2021. We expect several provinces to announce their own hydrogen plans and funding for hydrogen-related projects in the coming months. For instance, the Alberta government is expected to release its provincial hydrogen plan in the spring of 2021 and has already said its plan aligns with the federal Strategy. Alberta's *Natural Gas Vision and Strategy* — published in October 2020 — includes objectives for achieving large-scale hydrogen production with CCUS by 2030 and exporting clean hydrogen and hydrogen-derived products across Canada, North America and globally by 2040.

As the momentum for hydrogen continues to build, we expect the Strategy — in conjunction with similar provincial strategies and expected government funding — will lead to new business opportunities across Canada in 2021 and beyond. Companies looking to capitalize on these new opportunities should closely monitor how the Strategy is implemented in the coming months to ensure that their business plans align with the federal government's (and applicable provincial governments') objectives and can take advantage of the associated incentives.

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[1] See Canada, *Hydrogen Strategy for Canada*, December 2020, p 18, Figure 10, online: https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/environment/hydrogen/NRCan_Hydrogen-Strategy-Canada-na-en-v3.pdf.