

***Written Submission for the Pre-Budget
Consultation in Advance of the Upcoming Federal
Budget***

***By: The Canadian Hydrogen and Fuel Cell
Association***

List of Recommendations

CHFCA recommends that the government:

1. Implement the recommendation of NRCan's Hydrogen Strategy for Canada and clearly highlight the importance of hydrogen energy for Canada.
2. Implement policies that support clean fuels:
 - a. The Clean Fuel Standard
 - b. Support for deployment of Zero Emission Vehicles, including hydrogen fuel cell electric vehicles.
3. Develop "hydrogen nodes" at key locations across the country that link multiple hydrogen energy applications with low cost production to provide scale and a positive business case. Support development through regional blueprints and regional associations to foster communications and project development.
4. Support hydrogen demand at such nodes through:
 - a. National sector task forces (e.g.: urban transit; trucking; ports; mining) that communicate the opportunity for hydrogen energy, provide information; address barriers (e.g. codes and standards; training; maintenance) and reinforce drivers (e.g. local mandates)
 - b. Incentives for the procurement of ZEV that build on the 5,000 ZEV urban bus program of Infrastructure Canada to cover all types of light and heavy-duty vehicles
 - c. Consolidated purchases of key fuel cell electric vehicles to bring down the cost and encourage new entrants to the Canadian market
 - d. Support for commercialization of hydrogen blending in natural gas
5. Support hydrogen infrastructure (production, distribution, fueling) through
 - a. The tax, procurement, loan guarantee and capital cost allowance incentives
 - b. Direct funding support
 - c. Demand guarantees
6. Increased research, development and demonstration, through:
 - a. Modernizing SRED, IRAP and SDTC, with targeted amounts for hydrogen and fuel cell research
 - b. A new program to directly support H₂/FC research at Canadian private sector companies (similar to the DOE programs)
 - c. Targeted research at universities and institutions, with increased international cooperation
7. Provide funding of \$3.0 billion to support the above initiatives program

Body of Submission

Why Hydrogen?

Hydrogen is Essential

Studies around the world confirm that hydrogen is essential to decarbonize the economy and achieve the Paris Agreement target of net zero CO₂ emissions by 2050.

- Electrification is needed, and hydrogen provides load management, energy storage and a low-cost path to market that will enable the growth of clean power production
- Hydrogen can decarbonize challenging economic sectors such as light & heavy-duty transportation; steel, chemical & fertilizer production; and industrial, commercial & residential heating
- Hydrogen is estimated to contribute 20 to 30% of the GHG reductions to achieve net-zero, requiring Canada to increase hydrogen production 8-10 fold

Hydrogen is Inclusive

Hydrogen energy provides opportunity and choice for all Canadians, because low cost, low carbon intensity hydrogen can be generated from all of Canada's energy resources, and with hydrogen available for their heating and transportation needs, Canadians can choose the best option to decarbonize their lives: simply, efficiently and cost effectively.

- The oil and gas sector will export Canada's fossil fuel energy as the carbon free heating and transportation fuel of the future
- First Nations and independent power producers will develop renewable power to hydrogen projects
- Canadians can choose safe, reliable gaseous fuel to heat their homes and power their industry – and be net zero
- Fuel cell electric vehicles will deliver the performance, range and fast-fueling capability needed for efficient zero-emission transportation of people and goods

Hydrogen is Canadian

Canada has led the world in hydrogen and fuel cells technology for over a century, generating a vibrant domestic sector comprising dozens of world leading companies and organizations.

- Canada is a top-10 hydrogen producer and the largest producer of clean hydrogen. Hydrogen production and distribution generates 100's of jobs and many 1,000's more depend on a safe, reliable supply of hydrogen.
- In 2017, the fuel cell and hydrogen technology sector generated revenues of over \$200 million CAD and contributed 2,000+ jobs to Canada's economy.
- The sector has attracted \$100's of million in investment recently. Deployment of hydrogen and fuel cells in Canadian communities and industries will allow them

to transform and thrive in a low carbon environment, while generating Canadian jobs, investment and exportable products and technology.

Canada has lagged far behind the rest of the world in the past decade in investment and deployment of hydrogen and fuel cell technology. Foreign countries are investing billions in hydrogen energy because they realize it is essential, an enormous business opportunity and that leadership will position their industries with a long-term competitive advantage in a low-carbon world. While Canadian companies are benefiting from this activity, they are also being acquired, their talent is being lured away, their technology leadership is being eroded and their ties to Canada are being eroded. Many are facing tough decisions where to invest in production and research.

Reversing this decline and re-establishing Canada as a leader in H₂/FC will take a significant commitment. Canada can leverage its investment with its advantages in energy resources, existing infrastructure and technology leadership. In addition, with careful policy and leadership, Canada can stimulate the essential private sector investment that will be needed to build our hydrogen infrastructure and transform entire sectors to hydrogen energy applications and product. But a significant federal government investment is needed to demonstrate commitment. Without this, the energy sector will not commit to build hydrogen production; OEMs will not commit to produce and make available in Canada the necessary hydrogen and fuel cell products; and end users will not commit to transform their operations to hydrogen energy.

And Canadians and Canadian industry, from steel to mining to logistics, will be severely disadvantaged by not having access to the best choice for decarbonization.

Conversely, ensuring access to low-cost hydrogen and hydrogen/fuel cell products will position Canadian industry with a strong competitive advantage, similar to the advantage Canada's low-cost electrical power has provided for decades, thanks to the long-term vision of past political leaders.

What is Needed?

- Hydrogen can be used safely: this has been demonstrated by decades of industrial use and the leadership of Canada in testing and developing standards.
- Fuel cells are ready for commercial deployment: this has been demonstrated by the 1,000's of commercial products around the world that are efficient, reliable, durable and cost-effective.

- Fuel cell electric vehicles provide excellent performance: they are fully electric vehicles that offer torque, acceleration, reliability and low-maintenance – plus zero-emission!
- Low-cost, clean hydrogen can be produced economically from many energy sources: this has been demonstrated in Alberta's oil patch and in Quebec from renewable hydropower and by numerous Canadian technology companies.
- Hydrogen can be transported economically in pipelines: this has been demonstrated in Edmonton, Sarnia and over 2000 miles of hydrogen pipelines in North America.

However, barriers remain that must be addressed:

1. Canadians and Canadian industry are not aware of the benefits of hydrogen energy and unsure that it is truly a long-term choice

The federal government must clearly state its commitment to hydrogen (and back it with meaningful funding.) Effective communications coordinated through sector task forces are needed to get the message out.

2. The business case for hydrogen energy must be strengthened

Effective, long-term policy is needed to provide business certainty. This has been demonstrated in California, Europe, China, Japan and Korea, who lead in H₂/FC deployment due to consistent policy.

Incentives for capital investment and product purchases will be needed.

3. More and cheaper fuel cell electric products are needed

The most effective tool is end-user pull. Customers must be provided with verifiable information about the benefits of H₂/FC, so they demand FCEV from their suppliers.

Support for demonstrations through SDTC, NRCan and TC funding is needed to help OEMs develop commercial hydrogen and FCEV product offerings. These demonstrations should be aligned with activities around the world to ensure they are meaningful and do not duplicate existing work.

The federal government should consolidate demand and place volume purchase orders with OEMs for both hydrogen and fuel cell products, to provide meaningful production runs that allow manufacturers to offer competitive pricing. Examples include FCEV buses; trucks and hydrogen fueling stations.

4. Hydrogen cost must be reduced

The existing hydrogen industry will be disrupted over the next 30 years due to the need to produce and distribute at least 8X current production volumes to meet Canada's growing needs, plus much more to supply export markets.

Hydrogen must transition from a chemical feedstock to a fuel and its price reduced to less than \$2/kg delivered via pipeline; less than \$5/kg as a high-pressured dispensed gas from on-site/pipeline supply; and less than \$8/kg as a dispensed liquid or high pressure gas from distributed liquid.

While existing technologies can produce in the volumes and at the price needed, these must be further improved and scaled up. Billions of dollars in private sector investment is needed. In the short term, producers will not take the risk to scale up production and distribution in absence of assured demand. The federal government must step in to de-risk investment.

Financing incentives, as required for other clean technologies, are needed for hydrogen infrastructure. The CHFCA endorses the CanadaCeantech Alliance recommendations for support for clean technology investments:

- De-risk cleantech investment by providing tax-deductions to corporate, institutional and individual investors. Use mechanisms such as flow-through shares, angel investor tax credits, or capital gains exemptions.
- Implement green public procurement programs through integration of life-cycle assessment methodologies that fast-track piloting and deployment of cleantech and SME technologies.
- Expand the 100% accelerated capital cost allowance beyond clean energy generation and energy conservation equipment to all cleantech investments.
- Provide a federal loan guarantees program for cleantech projects tied to deploying novel Canadian innovation.

Public-private partnerships will be needed for early infrastructure such as pipelines and liquefiers.

Demand guarantees provide a powerful tool to unlock private capital, as has been successfully demonstrated with clean power and first-generation biofuels. Hydrogen demand guarantees for producers and fuel station operators are needed.

5. Hydrogen fueling stations are expensive

HFS currently cost between \$2 and \$6 million and must be built before the hydrogen demand is in place. This makes for a very challenging business case.

Technology development, volume purchases and scale are needed to get the cost per station down.

Federal/provincial funding should be aligned, simplified and stable to allow long term planning. Funding should move from a per-station basis to a network basis.

The Clean Fuel Standard should include bankable, capacity-based credits for fueling stations as modelled in California

6. End users will need help transforming

Converting to hydrogen energy will be a significant change for each industry sector, forcing them to deal with new suppliers, new technology, maintenance and operations procedures. Each sector will need help in this, which can be provided through the sector-specific transformation task forces. They will be focused on addressing specific needs of the sector, whether that be better product and hydrogen supply, training, procurement, safety procedures or codes and standards.

7. On-going research is needed

Although hydrogen and fuel cell technology is ready for commercialization, there remain many avenues for further improvement. Canadian companies are competing around the world and their leadership is being eroded. Plus there are many opportunities for new businesses and products. This requires a complete ecosystem, including support for:

- Basic research at universities and institutions
- Applied research at private companies
- Pilot and demonstration projects
- Skills and talent development
- Venture financing and support for start-up companies

Cost

A major investment is required to restore Canadian leadership in the hydrogen and fuel cell sector and to position Canada to benefit from commercialization. An investment of ~\$3 B is commensurate with Germany's \$8 B investment.

Support	Description	Federal Support	Estimated Private Sector
Communications, coordination, management, marketing	Steering committee, task forces, nodes, international marketing, FEED studies	\$100 M	\$50 M
Vehicle purchase incentives		\$500 M	\$2 B
Hydrogen infrastructure	Hydrogen production, liquefiers, pipelines, fueling stations, demand/price guarantees	\$1.5 B	\$1.5 B
Hydrogen for heating	Blending in NG, pure hydrogen combustion	\$400 M	\$400 M
Research, development, demonstration	Hydrogen production, compression, liquefaction, storage, CO ₂ management, fuel cells, materials, hydrogen products	\$300 M	\$100 M
Total		\$2.8 B	\$4.0 B