

245 Consumers Road
Suite 400
Toronto, ON M2J 1R3
Canada
T +1.416.499.9000
www.jacobs.com

Subject Ontario Low-Carbon Hydrogen Strategy

Attention Tom North and Fatima Abdulrasul
Climate Change Programs and Partnerships Branch
Ministry of the Environment, Conservation and Parks

From Ian Sutherland – Senior Project Manager
(ian.sutherland@jacobs.com)

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Dear Tom and Fatima,

Thank you for giving Jacobs the opportunity to comment on the Ontario Low-Carbon Hydrogen Strategy Discussion Paper and also to participate in the Consultation Session on January 6. Our comments on the paper are below.

As I mentioned during the Consultation Session, I was the Project Manager of the team that produced the Metrolinx Hydrail Feasibility Study. Many of the comments below relate to lessons that we learnt from undertaking that project. In addition, Jacobs has a strong presence in hydrogen projects in Australia and the views of my Australian colleagues are also reflected in the comments.

We would welcome the opportunity to discuss our hydrogen experience with you in more detail and to participate in any initiatives that you plan to take the hydrogen strategy forward.

Vision

1) Do you support Ontario's efforts to create a hydrogen strategy?

Yes. Having a hydrogen strategy is an essential policy component to achieve the decarbonization goals of Ontario and Canada.

2) How would you refine the vision statement?

- The vision statement is *“Leverage our existing strengths to develop Ontario’s hydrogen economy, creating local jobs and attracting investment while reducing greenhouse gas emissions.”*
- I think that this needs to be a far more definitive statement. Examples from other hydrogen strategy documents are:
 - *“By 2030, Queensland is at the forefront of renewable hydrogen production in Australia, supplying an established domestic market and export partners with a safe, sustainable and reliable supply of hydrogen.”*
 - *“Our goal is to have electrolyzing capacity of around 2 GW installed in Germany. If necessary, we will also provide financial support for this.”*

- 3) What should be the key outcomes of Ontario's hydrogen strategy?
 - To develop and implement a clear Provincial Hydrogen plan that would:
 1. Set clear milestones and targets to 2050
 2. Provide high levels of investment and promote investor confidence
 3. Set regulatory imperatives – e.g. phasing out petrol and diesel vehicles by a set date, mandating a % H2 in gas networks by certain dates, providing tax concessions/exemptions, etc.
 4. Engage participation from all sectors of the economy
 5. Set priorities and an action plan for each sector (power generation, transport, industrial users, gas network, export, R&D, banking/commerce, etc.)
- 4) How should the hydrogen strategy define and measure success?
 - The amount of renewable hydrogen produced and consumed within Ontario based on production and sales data
 - Generating economic development and jobs
 - Reduction in air pollutants (VOC, NOx, PM, etc.)
 - Reduction in noise from heavy road vehicles and trains
 - Bolstering energy independence and security

Reducing greenhouse gas emissions

- 5) What are Ontario's key technology, regulatory and business opportunities in developing low-carbon hydrogen?
 - Technology opportunities – research into more cost-efficient fuel cells and electrolyzers at universities in Ontario;
 - Regulatory – collaborate with the federal government and other provinces to ensure that there is a consistent and comprehensive set of codes, standards and regulations for the use of hydrogen technologies in a wide range of applications;
 - Business opportunities – growth of existing businesses such as Cummins and NextHydrogen. Small startup businesses related to the service and maintenance of hydrogen equipment;
- 6) What is the potential for hydrogen to contribute to Ontario's 2030 greenhouse gas emission reduction target?
 - Decarbonization of:
 - Public transport – buses, trains (commuter and freight)
 - Logistics – heavy haul and urban delivery
 - Natural gas network – blend with hydrogen
 - Heavy industry – hydrogen for heat and feedstock
 - Oil refining and chemical industry – hydrogen feedstock
 - Mining facilities – specialist equipment

- Remote communities – hydrogen storage from renewal energy sources
- Specialist mobility equipment – garbage trucks, ground support equipment at the airport
- Back-up power to hospitals, data centres and important facilities

7) What additional environmental benefits should be considered in the development of the strategy (for example during hydrogen production)?

- In relation to the electrification of the GO Transit network, the use of hydrogen fuel cell powered trains avoids the requirement to rebuild over-bridges, divert utilities, clear the vegetation either side of the alignment and close the rail corridor for long periods;
- In relation to replacing diesel powered vehicles and assets there is a reduction in air pollutants and noise.

Generating economic development and jobs

8) What role can hydrogen play in various regions and sectors?

- Production and storage of hydrogen at nuclear power stations and hydro facilities
- Export of hydrogen
- Decarbonization of industrial processes with low carbon hydrogen
- Replacement for diesel power generation in remote communities
- Reduction in volume of natural gas consumed by blending with hydrogen

9) What actions can Ontario take to help Ontario companies get ready to meet expected international demand (for example research and development, innovation, procurement)?

- Funding of demonstration projects in Ontario
- Support a collaboration network for companies to create integrated hydrogen solutions

10) What are the training needs for the workforce to support the economy across Ontario?

- Installation technician skills development
- Maintenance technician skills development
- Operator technician skills development
- Development and delivery of certified training courses at technical colleges

Promoting energy resilience

11) How can hydrogen support a reliable and affordable energy system, including energy storage?

- Any surplus renewable energy can be utilised to generate and store vast amounts of hydrogen that can then be used in a fuel cell or turbine to generate power when it is required for transportation, chemical manufacture, gas substitution and power generation;
- You can store energy in the form of gaseous hydrogen at any scale (salt caverns and reservoirs) and for an infinite period cf. batteries.

12) 12. What are the barriers and opportunities for hydrogen in the energy system?

- Barriers

- **The supply cost of surplus electricity for the production of hydrogen should be reduced to a level where the levelized cost of hydrogen is lower than the alternative fossil fuel power source;**
- It is difficult for potential users of hydrogen systems to access unbiased advice on the assessment and development of integrated hydrogen solutions.
- Opportunities
 - Provincial and Federal government hydrogen industry planning supported by firm unambiguous emissions and vehicle phase out targets.
 - Provincial government, cross-ministry support to the master planning of a hydrogen hub in Toronto, potentially located close to Pearson Airport, with government grants are available for businesses to transition to using hydrogen for business logistics and back-up power.
 - Provincial government grants for R&D of new H2 materials (catalysts, membranes, compressors, storage vessels).
 - Mandate the use of hydrogen fuel cell systems for back-up power to government buildings.
 - Government procurement specifications for mobility and static power applications should be open to hydrogen solutions.
 - **Government procurement protocols could include decarbonization and sustainability objectives in the evaluation of proposed solutions.**
 - **Government rules should allow agencies to develop hydrogen solutions for their own use in combination with the generation commercial revenue. For example, Metrolinx could generate hydrogen to power its trains and buses, and in addition they could offset the capital and operating costs of these systems by selling hydrogen on the open market to other users.**

Reducing barriers and enabling action

- 13) How can the provincial government best support partnerships with the private sector, academia, and other government/levels of government?
- Ensure that this is a whole of government initiative. All government departments and associated agencies (i.e. Metrolinx) need to be involved and supportive.
 - Facilitate the integration of power generator, transmission grid and distribution grid operators into a cooperative network to supply low cost electricity for the production of hydrogen.
 - Run an Ontario Hydrogen Conference.
 - Convince public and private sector participants that Ontario has unique natural and other advantages.
 - Support H2 centres of excellence at universities and ensure researchers are collaborating.
 - Encourage and provide incentives for the establishment of H2 investment funds.
- 14) Are you aware of regulatory barriers that need to be addressed or regulatory enabling mechanisms that need to be put in place? Please explain.
- The addition of Global Adjustment, Regulatory Fees and Distribution Fees onto the Hourly Ontario Electricity Price for hydrogen production using surplus electricity needs to be addressed
 - Carbon taxation or an emissions trading scheme should be introduced to penalize polluters

- Taxation – All FCEVs should be exempt from taxation and levies
 - Cost of R&D should be relieved with R&D concessions
 - Investor and small business concessions
- 15) What are the best opportunities to cost-effectively support hydrogen across Ontario while respecting tax payers?
- Coordinating between potential public sector and private sector users of hydrogen so that at-scale hydrogen solutions can be identified, developed and implemented
 - Coordinating with potential hydrogen producers to provide them with assurance that the demand within Ontario will be there for their product
 - Coordinating with potential hydrogen producers in relation to export opportunities from Ontario
 - Support the training of certified hydrogen technicians so that a lack of maintenance technicians doesn't become a barrier in the implementation of hydrogen solutions in Ontario

Using hydrogen where and when it makes sense

- 16) What potential feedstocks and stages of the hydrogen supply chain (production, storage and distribution, and end-use) do you think Ontario is best-positioned to develop and lead in and which uses have the greatest potential for cost reduction?
- Use of low-carbon hydrogen as an industrial feedstock or for heat in industrial processes
 - The storage of large volumes of hydrogen in underground caverns
 - The export of bulk hydrogen through the manufacture of ammonia and methanol
- 17) What are the main risks of hydrogen use in Ontario and are there opportunities for the government to decrease these risks?
- Key risks are:
 - Insufficient knowledge in businesses and agencies of the benefits of hydrogen systems and how to take forward their implementation
 - Insufficient incentives for businesses and agencies to fully decarbonize their operations
 - Insufficient numbers of certified technicians to maintain hydrogen systems
 - Resistance to change from organizations whose operations are currently based on using fossil fuels
 - Opportunities to decrease the risks:
 - Mandate targets for decarbonization for businesses set on a 5-yearly time horizon
 - Support to certified hydrogen technician training courses
 - Public acknowledgment to organizations that meet decarbonization targets through awards and publicity
- 18) Considering that low-carbon hydrogen is expected to be more competitive over time, what should be the timeframe for Ontario's hydrogen strategy?
- There should be incremental targets between now and 2041. Twenty years should be sufficient to create a full hydrogen economy in Ontario.