Hydrogen Ontario

Integrated Energy Resource Plan Consultation

December 2024

1. About Hydrogen Ontario

Hydrogen Ontario ("H2ON") is a provincial affiliate of the Canadian Hydrogen Association ("CHA"), representing over 100 companies across the hydrogen value chain from production to transportation and storage to end-use.

2. Context

Hydrogen is a promising tool to decarbonize hard-to-abate sectors such as petrochemicals, steel and cement production, as well as transportation and transit.

Global policies, like the EU's Carbon Border Adjustment Mechanism (CBAM), emphasize the need for decarbonization to remain competitive in the global clean economy, which also presents a tremendous economic and job creation opportunity for our province. A failure to decarbonize will drive up prices for Ontarians, including for housing.[1]

Ontario's hydrogen sector has significant economic potential. The Low-Carbon Hydrogen Strategy estimates the creation of 100,000 jobs by 2050 under a moderate growth scenario. Additionally, a report by H2GO Canada projects that the sector could generate up to 70,000 jobs by 2030.[2] H2ON is collaborating with its members to further validate these projections.

Currently available pathways to produce low-carbon hydrogen in Ontario are electrolysis and methane pyrolysis which is an emerging technology. By tabling the *Resource Management and Safety Act* , the Ontario government is also taking steps to allow companies that produce hydrogen through Steam Methane Reforming (SMR) to capture and store the CO2 that is generated in the process (CCS), thus making it a low-carbon hydrogen production pathway. This pathway is dominant in jurisdictions like Alberta where CCS is possible.

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[1] CRU Group, Commodity markets will be transformed by high carbon prices, April 2023, access at URL: https://www.crugroup.com/en/communities/thought-leadership/sustainability/commodity-markets-will-be-transformed-by-high-carbon-prices/?utm_source=chatgpt.com

[2] Ontario's Low-Carbon Hydrogen Strategy: A path forward, 04/2022. access at URL: https://www.ontario.ca/files/2022-04/energy-ontarios-low-carbon-hydrogen-strategy-en-2022-04-11.pdf

The fact that electrolysis is the dominant pathway at the moment in Ontario seems to lead to concerns about the electricity demand generated by electrolytic hydrogen producers. This submission will demonstrate that electrolytic hydrogen production can be an asset for Ontario's electricity system and that the demand it will generate in the next 5-10 years is rather low.

3. Key Recommendations

- **Direct the IESO to start consultations on a fixed electricity rate** for low-cost, low-carbon hydrogen production or a hedging contract mechanism modelled on CfDs in the power sector. From a practicality standpoint, a **revamped Interruptible Rate Pilot (IRP)** might be a good option. Electrolytic hydrogen production projects can peak shave and provide grid services.

- Direct the IESO to amend its **Indigenous Energy Support Program** to **include hydrogen production projects** as well as those **helping to reduce diesel dependency and build integrated energy systems** in indigenous communities.
- Request that the Ministry of Transportation **mandate Metrolinx' new leadership to reinvestigate the transition of the GoTransit system to hydrogen trains and buses** - switching to hydrogen will alleviate the burden on the Ontario grid since hydrogen is a flexible resource.

4. Hydrogen and Ontario's Electricity Grid

4.1. The impact of hydrogen on Ontario's grid

Hydrogen Ontario expects minimal impact of electrolytic hydrogen projects on the province's electricity system for a number of reasons.

The electrolytic hydrogen production projects that are expected to become operational in the next 5 years will draw a **combined capacity of less than 500 MW** with **50% becoming operational in the 2028-30 time span**. Developing a hydrogen production project takes between 3-5 years. So even if supply side policies were put in place in 2025, there won't be a significant number of electrolytic hydrogen production projects added to the Ontario landscape before 2030. Meanwhile we will also see a**lternative production pathways such as methane pyrolysis commercialize**. Given the recent introduction of the *Resource Management and Safety Act* **we may also see first CCS projects in Ontario allowing for the production of low-carbon hydrogen through steam methane reforming** (SMR), for example. **These pathways take minimal grid electricity**. Also, given that Ontario's nuclear refurbishments have been proclaimed to be completed on if not ahead of schedule, there is a lot less strain on the Ontario grid to be expected in the 2030s when we may see more electrolytic hydrogen projects become operational. In addition, **electrolytic hydrogen production projects are flexible resources which can peak shave and thus minimize grid load**. The H2GO Canada Report assumes that the full potential of Ontario's hydrogen sector is leveraged, states the following:

"The Base *Case scenario projects total production of low-carbon hydrogen in Ontario are negligible until the late 2020s, and then rapidly increasing to roughly 600 megatonnes, annually, by the mid-2030s, relying mainly on grid-powered electrolysis and steam methane reforming."*

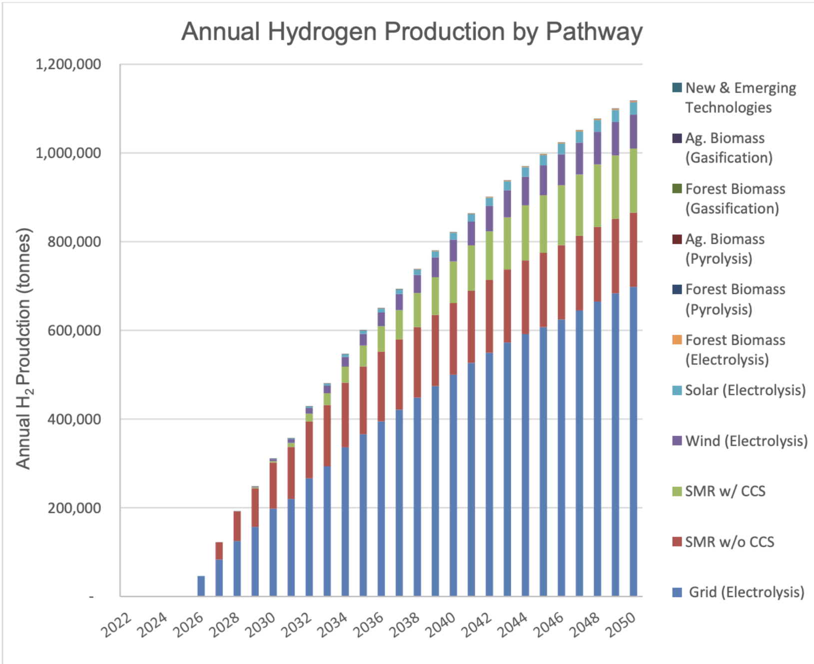

Figure 16: Annual Hydrogen Production by Pathway

"Recognizing the competing demands for energy in Ontario, especially for electricity", the (H2GO) model generates "appropriately conservative estimates of hydrogen production. Electrification is central to the decarbonization plans of many energy end-uses, such as the transition from gasoline to plug-in power for electric vehicles. The study team endeavoured to reflect these constraints when assessing the availability of energy feedstocks in the production module. For example, the Base Case assumes that any hydrogen production pathways requiring grid-supplied power would make use of no more than 50 per cent of the unutilized generation capacity (i.e., the difference between the grid supply potential and actual electricity consumption) by 2050."[3]

However, especially if production pathways such as methane pyrolysis or alternative, non-electrolytic hydrogen production pathways (e.g. waste products

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[3] Forecasting Low-Carbon Hydrogen Market Characteristics in Ontario to 2050, p.29, H2GO Canada, September 2023. Accessed at URL on 4/12/2024: https://static1.squarespace.com/static/6224c1708b4b4c7cd6823f2e/t/653acab920619c36bd8b8301/1698351811244/H2GO+Canada+OHFS+Report+2+-+Forecasting+Low-Carbon+H2+Markets+in+Ontario+to+2050.pdf

to hydrogen) as well as SMR with CCS or off-grid renewables to hydrogen projects were to be developed more rapidly, e.g. through targeted government support, the predicted grid electricity need may not align with the H2GO Canada forecasting. In fact, it might be off already since the current environment is not ideal for the full economic potential of the hydrogen sector to unfold. So the hydrogen production projects the report foresees may become operational a lot later than the report predicts. In other cases, **hydrogen may turn out to be the more viable option and merely replace electric solutions instead of adding to the forecasted electricity demand,** e.g. in municipal and regional transit, in commercial fleets and industrial processes.

4.2. Benefits of hydrogen for the grid and energy supply

Electrolytic hydrogen facilities are flexible resources. Depending on the technology, the **facilities can respond to market signals very quickly** - an **electrolyzer can react within seconds** - and they have the ability to address grid reliability needs. In addition, **during times of peak demand**, these facilities can **curtail consumption for 4, 8, or even over 12 hours in duration.** This is a**kin to other resources that provide premium value to the Ontario grid** such as lo**ng-duration storage**, **hydroelectric power** and **natural gas generating facilities**.

Contrary to Battery Electric Vehicles (BEV), Fuel-Cell Electric Vehicles don't have a need for constant, immediate power supply. **Hydrogen is earmarked as the preferred fuel to decarbonize the trucking industry** where active time in transit drives earnings. Fuel Cell Electric Vehicles (FCEV) are **much lighter and provide longer driving ranges** compared to their battery electric equivalents. This means **more freight, less trucks**. In addition, **refueling times are much shorter**, and the **state of charge is not affected by a decrease in temperature**. This is why hydrogen also makes sense for return-to-base vehicles that can't afford long charging times. Moreover, in cases where hydrogen infrastructure is already available for other applications, it creates efficiencies. For FCEVs, **less charging stations and space** are needed given the shorter dwell times required for refueling as described by the National Academies Press: "Hydrogen refueling of light- and medium-duty FCEVs takes minutes, while even fast-charging of BEVs takes hours. Therefore, an order of magnitude more FCEVs can be refueled at a hydrogen station."[4] In addition, there may not be enough electricity to power the BEV charging stations that would be required to decarbonize Ontario's transportation sector in the immediate future, during peak energy demand scenarios.

In addition, Ontario's remote First Nations communities, currently dependent on diesel fuel, could also benefit from clean hydrogen solutions. These solutions can provide affordable energy for electricity, heating, and cooling. Achieving this requires strategic partnerships and incentives to encourage industry involvement in these initiatives. To that end, IESO's Indigenous Energy Support Program could also be amended to include hydrogen production projects as well as those helping to reduce diesel dependency and build integrated energy systems in indigenous communities[5].

[4]National Academies Press: Assessment of Technologies for Improving Light-Duty Vehicle Fuel Economy—2025-2035 (2021), Chapter: 6 Fuel Cell Electric Vehicles, National Academies of Sciences, Engineering, and Medicine. 2021.Washington, DC: The National Academies Press at URL: https://nap.nationalacademies.org/read/26092/chapter/8#180 (access: 2/12/2024).

[5]https://www.ieso.ca/Get-Involved/Indigenous-Relations/Indigenous-Energy-Support-Program/IESP-Overview