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XCG Consulting Ltd.

**Derek Webb**  
BIOREM Technologies

**Agnes Wiertzynski**  
Accuworx

**ONEIA**  
192 Spadina Avenue  
Suite 306  
Toronto, ON M5T 2C2

Executive Director  
**Alex Gill**

Operations Manager  
**Janelle Yanishewski**

Tel: (416) 531-7884  
info@oneia.ca  
[www.oneia.ca](http://www.oneia.ca)

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Ministry of the Environment, Conservation and Parks (MECP)  
Climate Change and Resiliency Division, Climate Change Programs and Partnerships Branch  
Climate Change Program Development  
135 St Clair Avenue West, 6<sup>th</sup> Floor  
Toronto, ON, M4V 1P5  
Attn: Michael Bishop, Policy Advisor

**RE: ERO posting # 019-2709: Ontario Low-Carbon Hydrogen Strategy - Discussion Paper**

Dear Mr. Bishop,

On behalf of Ontario's more than 3,000 environment and cleantech firms, the Ontario Environment Industry Association (ONEIA) is pleased to provide our comments on the Ministry of the Environment, Conservation and Parks (MECP) discussion paper on Ontario's low-carbon hydrogen strategy.

Ontario is home to Canada's largest group of environment and cleantech companies. The most recent statistics from the federal government show that Ontario's environment sector employs more than 65,000 people across a range of sub-sectors. This includes firms working in such diverse areas as materials collection and transfer, resource recovery, composting and recycling solutions, alternative energy systems, environmental consulting, brownfield remediation, and water treatment – to name just a few. These companies contribute more than \$8-billion to the provincial economy, with approximately \$1-billion of this amount coming from export earnings.

Members of ONEIA are committed to engaging with the Province as it develops policies and regulations that are consistent with our principles of sound science, sound environment and a sound economy. To that end, we convened a working group of members drawn from across various sectors to review the Province's discussion paper on a low-carbon hydrogen strategy.

### **Executive Summary**

ONEIA has provided responses to the discussion paper questions in the following pages. First, we would like to highlight our top recommendations as these are the high priority items that we believe are necessary to facilitate a strong low-carbon hydrogen and renewable gases economy in Ontario.

#### **1. Renewable Gases Mandate**

Our members were pleased to see the steps that the MECP is considering regarding low-carbon hydrogen and would request that the MECP look to broaden the hydrogen strategy to include all forms of renewable energy from various sources including agriculture, wastewater treatment plants, food waste anaerobic digestion, municipal solid waste (MSW) and landfills, in particular the use of renewable natural gas (RNG).

We responded to a similar discussion paper in March 2017 on a renewable fuel standard (RFS) for ethanol and biodiesel that the Province recently enacted (November 2020), in which we outlined this request. The enacted policy related to the use of renewable fuels in Ontario, which focused on gradually phasing in the renewable content from the existing 10 per cent requirement to 11 percent in 2025, 13 percent in 2028 and 15 percent in 2030. The phasing ensures that the renewable fuels industry and other stakeholders have a chance to adjust to the new requirements. Low-carbon hydrogen, RNG, and other renewable gases can play an instrumental role in reducing Ontario's greenhouse gas (GHG) emissions. We believe that a similar mandate of 5% by 2025 and 10% by 2030 for renewable gases is required.

In Quebec (QC) and British Columbia (BC), similar policies are already in place and driving investment. ONEIA is also seeing similar policy mechanisms being used in the United States with advocacy coming from the natural gas utilities and the renewable gases industry together. This concept is inline with the Ontario Energy Board's (OEB) recent approval of the voluntary RNG program in the Province. The OEB noted in its approval that RNG is a renewable energy source that reduces GHG emissions relative to conventional natural gas, and should be explored as a means of diversifying the gas supply portfolio.

## **2. New Electricity Rate Class**

The Province should establish a new electricity rate class for low-carbon hydrogen projects. This new rate class should allow participants to minimize the impact of the Global Adjustment (GA) charges which have the potential to discourage investments in this space. In exchange, these facilities could operate in a curtailable load arrangement by reducing demand during peak hours. The former Industrial Electricity Incentive (IEI) Program offers a good starting point to develop such a rate class. Electrolytic low-carbon hydrogen projects require affordable and long-term, contractible renewable electricity to be financially viable.

The Province should also evaluate 'underutilized' electricity sources for small scale (<5MW) for developing hydrogen supply and demand in the industrial, commercial, and institutional (ICI) sector. The underutilized energy sources could include co-generation operations that could accommodate additional electricity production. Preferably, these sources would use renewable fuels such as biomass or solid waste. This supply should be linked to an ICI demand in the public or private sector such as warehousing applications and/or transit to produce a consistent and reliable market that would be a catalyst for future growth.

## **3. Access to Clean Electricity**

As noted in the discussion paper, Ontario's electricity grid is largely carbon-free. However, the small proportion that requires natural gas generation results in an average carbon intensity that remains above zero. This carbon intensity will be magnified in hydrogen production due to efficiency losses through the conversion of electricity to low-carbon hydrogen. For this reason, market mechanisms that allow hydrogen producers to purchase renewable electricity rather than at the grid average carbon intensity are necessary.

The Province should make renewable electricity available for low-carbon hydrogen projects. The carbon intensity of electricity is another critical component for low-carbon hydrogen projects. Buyers of hydrogen or fuels derived from hydrogen will require the lowest carbon intensity possible and we need to ensure that the Province is competitive with QC as Canada unlocks the economic opportunities and federal funding under the recently released “National Hydrogen Strategy”.

#### **4. Aim for 1,000 MW (1 GW) of Electrolysis Capacity by 2030**

The Province should set aggressive goals with respect to low-carbon hydrogen production capacity. We need to move forward as many low-carbon hydrogen projects as possible to build the system capacity, workforce, and expertise required to seize future renewable gases opportunities. Establishing a specific goal on the amount of installed electrolyzer capacity would provide the right signal to the market. It would also provide a measure to track progress and correct course, as needed. It should be noted that many other hydrogen strategies are including capacity goals such as the EU, which is targeting 40 gigawatts (GW) of hydrogen electrolyzers by 2030.

#### **Response to Discussion Paper Questions**

As requested in the discussion paper, the following paragraphs offer our direct responses to the various questions that were asked in the low-carbon hydrogen discussion paper.

#### ***Vision***

##### *1. Do you support Ontario's efforts to create a hydrogen strategy?*

ONEIA supports the Province in the development of a hydrogen strategy as it supports the Made in Ontario Environment Plan and the overall reduction of GHG emissions. The Province has already taken important steps towards making this a reality and we are supportive of these efforts. However, the development of the strategy requires engagement across many ministries including, but not limited to:

- Ministry of Energy, Northern Development and Mines;
- Ministry of the Environment, Conservation and Parks;
- Ministry of Economic Development, Job Creation and Trade;
- Ministry of Municipal Affairs and Housing;
- Ministry of Infrastructure;
- Ministry of Labour, Training and Skills Development;
- Ministry of Natural Resources and Forestry;
- Ministry of Agriculture, Food and Rural Affairs; and
- Ministry of Transportation

ONEIA believes that, if the system is set up correctly, the production of low-carbon hydrogen and other renewable gases (i.e., RNG) can assist in the reduction of GHG emissions in Ontario to levels that are up to 30 percent below 2005 levels by 2030, which is in line with Canada's 2030 target and the recently released federal Climate Plan.

As outlined in the provincial discussion paper, many other countries are driving the growth of this industry. Ontario can either be a leader in the development of this technology and infrastructure, which will stimulate jobs and economic development, or it can be a follower

that imports the know-how as the development of the low-carbon economy progresses. ONEIA believes that the Province should be a leader in the space.

Regarding RNG, ONEIA members have led the development of this infrastructure in Ontario and throughout North America. Therefore, we believe that we have the right ingredients in the Province, including:

- i) relatively low cost wholesale rate of electricity that could be turned to a new rate class that would unlock this technology;
- ii) industrial carbon dioxide (CO<sub>2</sub>) emitters that could capture their process emissions to utilize them as building blocks for chemical carriers for low-carbon hydrogen;
- iii) knowledge-based resources (human capital) in the Province that would facilitate us being a leader in the space; and
- iv) existing policies such as the Food and Organic Waste Policy Statement that can drive the growth of RNG.

## 2. *How would you refine the vision statement?*

As outlined in the discussion paper, the vision is to leverage the existing strengths in the Province to develop Ontario's hydrogen economy, creating local jobs and attracting investment while reducing GHG emissions. We support this vision along with the key principles, including:

- **Reducing GHG emissions:** ONEIA encourages the Province to continue to drive down GHG emissions through the use of low-carbon hydrogen and other renewable gases (i.e., RNG). **ONEIA would recommend that the Province do this by:**
  - i) providing a new rate class for purchasing renewable electricity from the Independent Electricity System Operator (IESO) for the production of low-carbon hydrogen;
  - ii) outlining industrial sites throughout the Province that have the required electrical grid and natural gas infrastructure to facilitate low-carbon hydrogen and RNG infrastructure development;
  - iii) providing guidance to municipalities on the zoning/siting for the development of low-carbon hydrogen and waste processing infrastructure that will produce RNG;
  - iv) inventorying the major hydrogen users in the Province that could have interest in purchasing low-carbon hydrogen/renewable gases or allowing the development of low-carbon infrastructure to facilitate the production of renewable thermal credits (RTCs) that could be purchased by ICI stakeholders throughout North America that are seeking to reduce or eliminate their GHG emissions;
  - v) streamlining the IESO system impact assessment process to reduce the development timeframes;
  - vi) streamlining the environmental compliance approval (ECA) process, including exempting this infrastructure from requiring any environmental assessments (EA), where appropriate;
  - vii) modifying the RNG Enabling Program that the OEB approved for Enbridge to facilitate the interconnection process as it is currently a

significant impediment to the growth of the renewable gases industry; and

- viii) continuing research into the hydrogen blending opportunities into the natural gas infrastructure in the Province, similar to the OEB's recent approval for Enbridge to commence a trial in Markham.

- **Generating economic development and jobs:** The private sector is keen to invest in this space. However, it requires government support in relation to siting, streamlining interconnections and approvals to remove project bottlenecks and provide a new rate class for the purchase of renewable electricity to allow for the production of low-carbon hydrogen. This could facilitate the development of hundreds of megawatts (MW) of connected electrolyzers in the Province, which will lead to billions of dollars of investment in the Province and create well-paying jobs for the construction and operation of the infrastructure. This type of policy goes hand-in-hand with other provincial policies such as the Food and Organic Waste Policy Statement that will allow for RNG production and stimulate the deployment of \$500M to \$1B of investment in the Province. The Province is competing with other jurisdictions (i.e., QC, BC, New York) for investment from local companies and foreign investors. It needs to continue to show that the Province is "Open for Business."
- **Promoting energy resilience:** ONEIA believes that the Province is taking a prudent approach by aiming to minimize the impact on the taxpayers of Ontario. However, **ONEIA recommends the development of a renewable gas mandate similar to the renewable fuels' requirements to help the Province meet its 2030 GHG emissions targets.** Based on this concept, we believe that the Province is enabling the development of the infrastructure but allowing an outcomes-based approach whereby Industry, Commercial and Institutional (ICI) entities can choose how and when they want to purchase energy. It should be noted that this may be impacted by federal carbon policies such as the Clean Fuel Standard (CFS) and Output Performance Standards (OPS). However, obligated parties can choose to purchase this type of energy or others depending on the market conditions. The use of these technologies also allows the IESO to utilize the low-carbon hydrogen infrastructure as an energy storage tool, thus providing ancillary services to the electrical grid and positively impacting the electrical grid's resilience.
- **Reducing barriers and enabling action:** ONEIA has outlined above a number of the barriers that need to be addressed and will enable the development of the low-carbon hydrogen and renewable gases infrastructure. **The development cycle from initial concept to construction to operation is currently 4-5 years per project. ONEIA wants to work with the Province to cut this time in half** as such a lengthy time period limits Ontario's ability to attract investment sector relative to other jurisdictions and impacts our ability to reduce GHGs and drive economic development.
- **Using hydrogen where and when it makes sense:** ONEIA agrees with the Province that low-carbon hydrogen should be used where it is cost competitive to do so, such as transportation (i.e., Class 8 heavy duty vehicles). However, the production of hydrogen can then be used to make other products such as RNG, methanol, ammonia, and other products that could be used domestically or in export markets.

3. *What should be the key outcomes of Ontario's strategy?*

From an outcomes-based approach, the primary outcome would be for the Province to be producing 5% by 2025 and 10% by 2030 of renewable gases utilized in the Province from in-Province resources, which could be a combination of RNG, low-carbon hydrogen; hydrogen converted to RNG, etc.

As it relates specifically to low-carbon hydrogen, **ONEIA recommends that the Province should set a sub-goal related to the connected load of electrolyzers that are producing green hydrogen at a capacity of 1,000 MW by 2030.** This will provide long-term certainty to investors and engage the supply chain in driving down the infrastructure's cost.

Low-carbon hydrogen could be utilized by emissions-intensive trade-exposed (EITE) sectors or enabled by oil refineries, ethanol plants, ammonia plants, etc. in the creation of RTCs or the production of RNG that could be sold to ICI stakeholders in Ontario and other jurisdictions across North America.

4. *How should the hydrogen strategy define and measure success?*

**ONEIA would recommend that the Province focus on the following few key performance indicators:**

- 5% renewable gases by 2025;
- 10% renewable gases by 2030;
- 1,000 MWs of connected load electrolyzers;
- The elimination of the Province having to curtail or sell surplus electricity by 2030 and support the IESO with operating reserve, demand response, etc.;
- All "return to base" Class 8 heavy duty vehicles in the Province converted to renewable gases by 2030; and,
- Full implementation of the Food and Organic Waste Policy Statement including municipal and ICI waste generators.

***Reducing GHG Emissions***

5. *What are Ontario's key technology, regulatory and business opportunities in developing low-carbon hydrogen?*

ONEIA believes that Ontario has many opportunities related to low-carbon hydrogen and other renewable gases (i.e., RNG) related to technology, regulatory, and business. These include:

**a. Technology**

The Province can utilize its extensive resources from the private sector to drive innovation through its knowledge around electrolyzers as well as knowledge on the production of other renewable gases (i.e., RNG). Ontario is a leader in the conversion of organic waste to RNG in North America and can support the development of new infrastructure that converts biomass/waste into renewable gases as well as the conversion of renewable electricity into low-carbon hydrogen and the products that can be produced from it.

**ONEIA recommends that the Province foster research and development (R&D) through use cases, technology development, and development pathways. It also needs to utilize our position from a manufacturing and supply chain perspective. We**

have strength in the domestic production of energy storage technologies (i.e., electrolyzers). However, we need to accelerate the scale-up of these innovations. Therefore, a focus on lowering the cost of manufacturing energy storage technologies and decreasing reliance on foreign sources of critical materials is crucial.

From a development pathway perspective, a focus on producing RNG from low-carbon hydrogen (i.e., Power to Gas, also known as P2G) would benefit Ontario in many ways. It would allow the Province to utilize the existing energy infrastructure better while reducing GHG emissions. It would show that Ontario is "Open for Business" and supports innovation by encouraging investment from next-generation industries and would create quality jobs for the people of Ontario. To provide more clarity, a P2G project would allow the Province to realize more value from the existing energy infrastructure in a shorter timeframe by using Ontario's extensive natural gas infrastructure. One aspect of this is the storage of excess energy from Ontario's electricity generation base, including curtailed wind power. A P2G operation is capable of balancing Ontario's power grid by reducing load during peak demand hours and supplying additional energy to Ontario's natural gas pipeline infrastructure for potential export or use by the Province entities. These projects would be a made-in-Ontario solution that addresses climate change and creates value for the Province's existing infrastructure.

**b. Regulatory**

As outlined above, **ONEIA recommends that the Province should continue to focus on reducing red tape across all ministries to ensure that it can compete for private sector investments.** The Federal Government and the Province compete against many other jurisdictions for investment dollars. We believe that both levels of government need to be aggressive in removing barriers to the development of low-carbon hydrogen and renewable gas infrastructure. ONEIA has outlined a number of regulatory barriers or initiatives above and **the specific opportunities we have identified to develop the low-carbon hydrogen sector include:**

- New rate class for the purchase of renewable electricity for the production of low-carbon hydrogen;
- Outlining industrial sites throughout the Province that have the required electrical grid and natural gas infrastructure to facilitate the low-carbon hydrogen and RNG infrastructure development;
- Clarifying critical infrastructure in the Province from a zoning/siting perspective to ensure that municipalities include zoning that would enable low-carbon hydrogen and waste infrastructure to produce RNG;
- Inventorying the major hydrogen users in the Province that could have interest in purchasing low-carbon hydrogen/renewable gases or allowing the development of low-carbon infrastructure development to facilitate the production of RTCs that could be purchased by ICI stakeholders that are seeking to reduce or eliminate their GHG emissions across North America;
- Streamlining System Connection Assessments by IESO to reduce the development timeframes;
- Reducing ECA permitting timeframes and ensuring that Environmental Assessments (EAs) are not required for this infrastructure, where appropriate;

- Modifying the RNG Enabling Program that the OEB approved for Enbridge to facilitate the interconnection process as it is currently a significant impediment to the growth of the renewable gases industry; and
- Continuing research into the hydrogen blending opportunities into the natural gas infrastructure in the Province.

**c. Business**

ONEIA believes that the Province should investigate the deployment at Ontario's hydrogen users today, including oil and gas (O&G) sectors, steel, and fertilizer plants. The Province should also investigate the use of RTCs, which could be used by natural gas utilities/corporations to reduce carbon emissions throughout North America.

ONEIA believes that the Province has an opportunity given the electricity grid is relatively low from a grid carbon intensity perspective. However, the electrical grid's carbon intensity is trending in the wrong direction. Therefore, **ONEIA would recommend a new rate class to facilitate the sourcing of renewable electricity.** We believe that the Province should utilize the low-carbon hydrogen/P2G infrastructure as interruptible load. It supports the electricity grid from a price and stability perspective. However, **we need a rate class that will allow the infrastructure to be financeable (1 to 1.5 cents per kWh)**. Compared to other provinces, QC/MB/BC have lower carbon intensities but electricity costs are higher except in QC which is already seeing projects being announced.

For reference purposes, based on information from IESO, Ontario generates electricity during periods of low demand and this generation needs to be curtailed. Curtailment also occurs when there is congestion in the transmission network. An impact on this is the intermittent nature of renewable electricity sources such as wind and solar. In the Province, in 2019, 18% of wind and solar generation was curtailed to manage surplus baseload generation (2,581 GWh). Nuclear also suffers from curtailment (604 GWh). This leads to electricity being frequently exported from Ontario. In 2019, 19,779 GWh of energy were exported while 6,613 GWh were imported. Exports can increase revenue from electricity providers. However, exports can also cause unfavourable rates. Exports and curtailment contribute to the GA charges, which increases the amount paid by consumers in Ontario. Several factors lead to the growth in surplus electricity including the rising number of electricity suppliers, falling market prices, and increasing electricity demand. Increasing exports is inevitable because electricity suppliers have maintained the level of their production even at the low electricity price and declining demand.

*6. What is the potential for hydrogen to contribute to Ontario's 2030 GHG emission reduction target?*

ONEIA believes that low-carbon hydrogen and other renewable gases (i.e., RNG) can significantly impact the Province's ability to meet this target; however, time is of the essence. We think that these gases have a role to play for EITE companies in having a competitive advantage as more governments are contemplating carbon adjustment tariffs.

Given the recent release of the proposed CFS and the credit creation opportunities for hydrogen, we believe that the Province can be at the forefront of the value creation in this space. The Province can be home for the infrastructure that facilitates low-carbon hydrogen and renewable gas production to provide fuel or as a feedstock to industrial processes. We

would also like to see the Province investigate the concept of RTCs for use by the ICI sector across North America to lower their GHG emissions.

Given the recent release of the federal hydrogen strategy called "Hydrogen Strategy for Canada: Seizing the opportunities for Hydrogen – A Call to Action", ONEIA sees synergies including, but not limited to:

- Commitments to implement a \$1.5B zero-emission Fuels Fund and we would like to see as much of this deployed in the Province as possible.
- ONEIA believes that the Province can be a leader by focusing on public-private partnerships and the private sector's role in terms of knowledge-transfer and implementation. This would allow the Province to play a role in driving down the price of low-carbon hydrogen.

ONEIA does not see many opportunities for carbon sequestration in Ontario as most of the geologic formations that will allow it are in Western Canada, including BC, Alberta, Saskatchewan, Manitoba, and the Northwest Territories. Our salt caverns are used as critical natural gas storage infrastructure.

*7. What additional environmental benefits should be considered in the development of the strategy?*

ONEIA believes that the renewable gases strategy can have a significant number of environmental benefits, including:

- Production of oxygen for use in industrial and other fields;
- Production of steam that can be utilized by other industries;
- Production of other products such as RNG, methanol, and green ammonia;
- Supporting industries with compliance related to OPS and CFS requirements; and
- Creation of RTCs that can be used by ICI entities to offset their GHG emissions.

***Generating economic development and jobs***

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

ONEIA believes that renewable gases, including low-carbon hydrogen, can play a significant role across various regions in the Province given the relevant ICI sectors in those areas. In regard to sectors and end uses:

- **Fuel for Transportation:** ONEIA believes that low-carbon hydrogen and renewable gases are expected to play a significant role in medium and heavy-duty trucks, rail, and marine applications where operations have high power demand, coupled with energy-intensive and long duty cycles. They could also play a role in the mining sector, where electrification is not practical.
- **Fuel for Electricity Generation:** ONEIA believes that low-carbon hydrogen and renewable gases could play a role in electricity generation; however, turbines will require advancement to allow for low-carbon hydrogen to play a significant role. On

the other hand, RNG can be used as a drop-in replacement for natural gas, which could be used as a low-carbon alternative to natural gas for electricity generation.

- **Heat for Industry:** ONEIA believes that low-carbon hydrogen and renewable gases can substitute for fossil fuels where high-grade heat is needed and where electric heating is not technical or economically feasible. It can also be used in cement, and steel manufacturing, the pulp and paper sector, and industrial processes that rely on steam.
- **Heat for Buildings:** ONEIA believes that low-carbon hydrogen and renewables gases can play a role in reducing emissions in heating applications in the built environment. However, the conveyance of hydrogen will remain challenging until projects such as the Enbridge hydrogen injection pilot provide more information on how much the natural gas infrastructure can handle. However, natural gas utilities are looking to decarbonize the natural gas grid by using RNG, this could occur now. The implementation of a renewable gases mandate would support the Province in meeting its 2030 GHG emissions targets.
- **Feedstock for Industry:** ONEIA believes that a significant focus area should be the use of low-carbon hydrogen and renewable gases (i.e., RNG) is for a feedstock in several industrial processes today, including:
  - Petroleum refining including the various refineries in Ontario:
    - Nanticoke Refinery Imperial Oil in Nanticoke, ON - 112,000 barrels per day (bbd)
    - Sarnia Refinery Imperial Oil in Sarnia, ON - 121,000 bbd
    - Corunna Refinery Shell Canada in St. Clair, ON - 75,000 bbd
    - Clarkson Refinery 2 HollyFrontier in Mississauga, ON - 15,600 bbd
    - Sarnia Refinery Suncor Energy in Sarnia, ON - 85,000 bbd
  - Bitumen upgrading
  - Fertilizer production
  - Methanol production
  - Steel production including:
    - Essar Steel Algoma
    - Dofasco
    - Gerdau
    - Stelco
  - Cement production including the various kilns in Ontario:
    - Leigh Cement – Picton
    - LafargeHolcim – Bath
    - St Mary's Cement – St Mary's
    - Federal White Cement – Embro

- LafargeHolcim – Stoney Creek
- CRH – Mississauga

9. *What actions can Ontario take to help Ontario companies get ready to meet expected international demand (i.e., R&D, innovation, procurement)?*

ONEIA believes that the Province can take a number of actions to support Ontario companies in the growing international demand for low-carbon hydrogen and other renewable gases (i.e., RNG). Ontario companies are already actively engaged in these spaces and we need to stay at the forefront from an R&D and innovation perspective. ONEIA believes that the Province needs to implement a renewable gas mandate that will act as a procurement mechanism and drive infrastructure development in the Province. The best way to achieve this is through long-term certainty for the purchase of renewable electricity to support low-carbon hydrogen production and the implementation of the renewable gas mandate.

**ONEIA would recommend a number of other actions to support Ontario companies as they get ready to meet international demand. These recommendations include, but are not limited to:**

- Sale of hydrogen and other fuels (RNG, methanol, ammonia, etc.) for export through the development of a new industrial rate class for low-cost, renewable electricity;
- Identification of available industrial sites with the correct supporting infrastructure;
- Reducing ECA permitting timeframes and ensuring that EAs are not required for this infrastructure, where appropriate;
- Streamlining System Connection Assessments by IESO to reduce development timeframes;
- Clarifying critical infrastructure in the Province from a zoning/siting perspective to ensure that municipalities permit this infrastructure to be developed;
- Continued research into the hydrogen blending opportunities into the natural gas infrastructure;
- Exploration of a RTC program that could support Ontario-based companies in meeting their GHG emissions targets and providing a means for the EITE sector to lower their emissions profile and allow them to compete on a global level; and
- Development of gasification technologies to manage wood waste, MSW and agricultural residues.

The implementation of these actions will enable the commercialization of the low-carbon and renewables gases infrastructure and facilitate private sector financing in the Province.

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

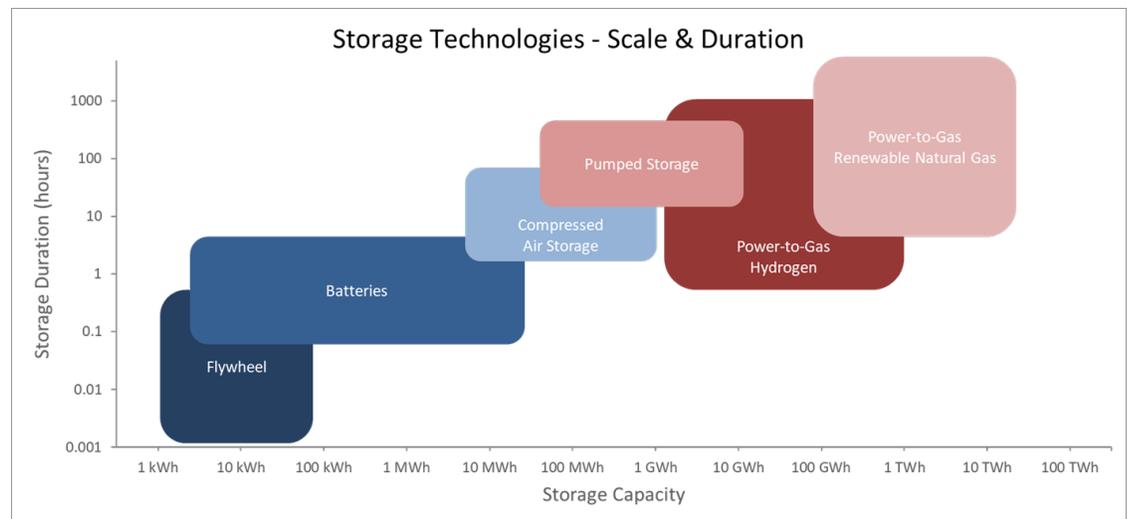
ONEIA believes that the training needs for the workforce to support the low-carbon hydrogen and renewable gases economy across Ontario include:

- Education and training with Technical Safety Standards Authority (TSSA) including industrial maintenance technician (IMT) certifications;
- Hydrogen safety guidance from the various relevant ministries and safety authorities; and
- Development of technical education and workforce development programs to leverage existing resources to train and educate the workforce including trade colleges.

**Promoting energy resilience**

*11. How can hydrogen support a reliable and affordable energy system including energy storage?*

Hydrogen can support a reliable, affordable energy system by utilizing off-peak electricity currently available in the Province for the production of low-carbon hydrogen. The technology could be installed as an interruptible load, which would be supportive of IESO for ancillary services (i.e., regulation service, demand response, operating reserve). Regarding the affordability, we believe that the low-carbon hydrogen or products produced by this hydrogen could be exported. Thus, not putting the cost on the ratepayers of Ontario unless required to support the Province meeting its 2030 GHG emissions targets.



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

**Barriers:** ONEIA believes that the most significant barrier for low-carbon hydrogen is the timeframes related to System Impact Assessment with IESO and the requirement to submit permits to the MECP. This barrier means that we are at 3-4 years before starting the construction of any new infrastructure.

**Opportunities:** The biggest opportunity is the support the development of low-carbon hydrogen infrastructure could play in the utilization of off-peak electricity and the economic development opportunity due to the development of this low-carbon infrastructure.

**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?*

**Private Sector:** The Province can support partnerships with the private sector by identifying sites for the development of the infrastructure, identifying locations on the electrical grid that could support the infrastructure, providing low-cost renewable electricity, and streamlining approvals/permitting with MECP and IESO.

**ONEIA recommends the development of a renewable gas mandate to facilitate the industry's growth and request that the Province modify the RNG Enabling program to address issues impacting the development of RNG infrastructure.** It should be noted that the private sector is willing and able to invest in the hydrogen infrastructure.

**Academia:** Regarding academia, we think the Province should focus on driving conversion efficiency on the electrolyzers or the downstream conversion efficiencies of other products. Academia can also drive innovation on chemical carriers for low-carbon hydrogen and study uses cases such as green ammonia for marine applications.

In terms of other feedstocks, the Province can focus on gasification technologies that could utilize forestry and agricultural residues as well as MSW to produce low-carbon hydrogen and renewable gases.

**Other Levels of Government:** Regarding the federal government, the Province can work with the private sector to capture funding for the deployment in Ontario to reduce the cost of capital and push for a means to monetize the environmental attributes (i.e., RTCs).

Regarding local government, it is increasing their awareness and underscoring the importance of this type of infrastructure to ensure that zoning and local siting issues do not inhibit infrastructure development.

14. *Are you aware of regulatory barriers that need to be addressed or regulatory enabling mechanism that need to be put in place?*

ONEIA is aware of a number of regulatory barriers that need to be addressed and has also suggested a number of enabling policy measures that the Province could take. **Our recommendations to address regulatory issues include, but are not limited to:**

- providing a new rate class for purchasing renewable electricity from the IESO for the production of low-carbon hydrogen;
- outlining industrial sites throughout the Province that have the required electrical grid and natural gas infrastructure to facilitate the low-carbon hydrogen infrastructure development;
- clarifying critical infrastructure in the Province from a zoning/siting perspective to ensure that municipalities permit this infrastructure to be developed;
- inventorying the major hydrogen users in the Province that could have interest in purchasing low-carbon hydrogen/renewable gases or allowing the development of low-carbon infrastructure to facilitate the production of RTCs that could be purchased by ICI stakeholders that are seeking to reduce or eliminate their GHG emissions;
- streamlining the IESO system impact assessment process to reduce the development timeframes;

- streamlining the ECA process, including exempting this infrastructure from requiring any EAs, where appropriate;
- modifying the RNG Enabling Program that the OEB approved for Enbridge to facilitate the interconnection process as it is currently a significant impediment to the growth of the renewable gases industry; and
- continuing research into the hydrogen blending opportunities into the natural gas infrastructure in the Province.

15. *What are the best opportunities to cost-effectively support hydrogen across Ontario while respecting tax payers?*

**ONEIA recommends supporting the transition to low-carbon hydrogen at the Ontario refineries, fertilizer plants, steel facilities, and co-locating with large industrial emitters with relatively pure carbon dioxide available to convert the low-carbon hydrogen into other products.** These operations offer the scale required to support cost-effective low-carbon hydrogen. Some of them are already using large quantities of higher carbon SMR hydrogen. These operations are the most efficient candidates to transition to low-carbon hydrogen.

**ONEIA recommends repurposing decommissioned coal-fired electricity generation facilities.** They are connected to major gas and power transmission infrastructure and could support the cost-effective production of low-carbon hydrogen.

**ONEIA also recommends that the Province establish a new electricity rate class for low-carbon hydrogen projects.** This new rate class should allow participants to avoid GA charges. In exchange, hydrogen facilities could operate as curtailable load by reducing demand during peak hours. The former IEI Program offers a good starting point to develop such as rate class. Electrolytic hydrogen projects required affordable and long-term contractable electricity to be financially viable.

ONEIA would also like to see the Province expand on its position for the production of RNG as the Province is already implementing policies that would drive organic waste into RNG and is a cost-effective approach compared to electrifying the industrial sector.

***Using Hydrogen Where and When it Makes Sense.***

16. *What potential feedstocks and stages of the hydrogen supply chain (production, storage, distribution, end use) do you think Ontario is best positioned to develop and lead in and which uses have the greatest potential for cost reduction?*

ONEIA believes that there are a number of potential feedstocks and stages in the low-carbon hydrogen and renewable gases supply chain that the Province is best positioned to develop and lead in as well as a number of uses that have the greatest potential for cost reduction.

**Production:** Concerning the production of low-carbon hydrogen, the primary focus on cost reduction needs to be on the cost for the electrolyzers (\$/kW installed) and the conversion efficiency from electricity to hydrogen. Ontario is home to a number of companies that work in this space. It should continue to support them in the innovation and development of the manufacturing supply chain to drive out these costs and increase the efficiency of the technology.

Another focus area is cost reduction and potential feedstocks, as outlined earlier, is the use of low-cost renewable electricity available in the Province at off-peak times. We believe that the Province should implement a new rate class that would facilitate the growth of electrolytic low-carbon hydrogen.

As it relates to other feedstocks to produce low-carbon hydrogen, the Province should explore the economics and complexity of converting wood waste, municipal solid waste (MSW), and agricultural residues through gasification. ONEIA believes that these feedstocks may not be cost-effective at this time, or the technologies are not currently at a technology readiness that would allow their deployment at a significant scale.

**Storage:** Concerning the storage of hydrogen, ONEIA believes that the use of organic carriers is an area to focus on as well as the conversion of the hydrogen to RNG and other chemical carriers such as green ammonia, which can be utilized in their current form or as a storage of the hydrogen. This complements the existing supply chains such as the natural gas transmission/storage/distribution infrastructure.

**Distribution:** Concerning the distribution of hydrogen, ONEIA believes that the supply chain will require the following:

- Injection of hydrogen into the natural gas pipeline has limitations and should continue to be monitored through the Enbridge trial in Markham.
- Use in the transportation sector via compressed/liquefaction of the low-carbon hydrogen requires further commercialization.

**End Uses:** In terms of end uses that could see the most significant cost reduction, ONEIA believes that the Province should focus on the end uses that we outlined in Question 8.

*17. What are the main risks of hydrogen use in Ontario and are there opportunities for the government to decrease these risks?*

The main risks of hydrogen use in Ontario relate to on-site safety as well as the ability to inject hydrogen directly into the natural gas infrastructure. There is a particular safety risk associated with new activities related to hydrogen since safety best practices and standards have not yet been well established.

Regarding direct injection of hydrogen into the natural gas infrastructure, the OEB has approved a pilot injection program in Markham. ONEIA would suggest that the Province monitor this pilot and address any safety standards requiring revision based on the pilot.

Hydrogen is already used safely in Ontario's refining and chemical industries. Therefore, as the Province sees a roll out the new low-carbon hydrogen infrastructure and renewable gases, we should utilize protocols from these existing industries as a blueprint.

*18. Considering that low-carbon hydrogen is expected to be more competitive over time, what should be the timeframe for Ontario's hydrogen strategy?*

ONEIA believes that the Province needs to work with the private sector to begin developing low-carbon hydrogen infrastructure in 2021, as time is of the essence based on the global competition for private capital. We believe that these projects will currently take 2-3 years to commence construction and would likely come online 1-2 years later based on interconnections and permitting. Therefore, we are looking at an initial project development

of 3 to 5 years, which will significantly – and negatively – impact investment in Ontario prospects. Thus, we should be aiming for 1,000 MW of installed electrolyzer capacity by 2030, which will facilitate the low-carbon hydrogen becoming more competitive over time.

As it relates to other renewable gases in the Province, **we would recommend that the Province can act now as the MECP has the Food and Organic Waste Policy Statement that can drive RNG production.** However, we require clarity on the disposal ban and compliance timeframes for various generators in the ICI and municipal sectors. Other relevant ministries can play a role, including the Ministry of Energy, Northern Development and Mines, which can modify the RNG Enabling Program to facilitate the development of RNG infrastructure better and implement a new rate class that will unlock private capital.

### Summary

ONEIA appreciates the opportunity to provide its comments and suggestions and stands ready to work with the MECP and other ministries in the development of a low-carbon hydrogen and renewable gases strategy.

Should you have any questions about the information contained herein, please do not hesitate to contact the co-chairs of our working group, Brandon Moffatt and/or Randy Cluff or feel free to contact the ONEIA office directly at 416-531-7884.

Yours truly,



Alex Gill  
Executive Director, ONEIA

- cc. Jeff Yurek, Minister of the Environment, Conservation and Parks  
Greg Rickford, Ministry of Energy, Northern Development and Mines  
Victor Fedeli, Ministry of Economic Development, Job Creation and Trade  
Laurie Scott, Ministry of Infrastructure  
Monte McNaughton, Ministry of Labour, Training and Skills Development  
John Yakabuski, Ministry of Natural Resources and Forestry  
Ernie Hardeman, Ministry of Agriculture, Food and Rural Affairs  
Caroline Mulroney, Ministry of Transportation