Hon. Jeff Yurek
Minister of the Environment, Conservation and Parks Climate Change
C/o Programs and Partnerships Branch
6th Floor, 135 St Clair Ave W,
Toronto, ON M4V 1P5

Dear Minister Yurek,

Bruce Power is pleased to have this opportunity to respond to *Ontario's Low-Carbon Hydrogen Strategy – discussion paper.* We are committed to taking a leadership role when it comes to decarbonizing our economy and enabling the transition to a low carbon future.

Bruce Power generates 30 per cent of Ontario's electricity at 30 per cent less than the average cost to produce residential power. We are Ontario's supplier of reliable electricity and medical isotopes and home to Canada's largest private-sector infrastructure project.

Through partnerships with our vast Ontario-based supply chain, Bruce Power helps support more than 22,000 direct and indirect high-quality jobs in the areas such as STEM, and skilled labour each year while also generating $9-11 billion of economic activity across Canada.

At Bruce Power, we take our responsibility to provide clean energy very seriously, especially at such a pivotal time for our climate. That is why in February 2020, Bruce Power established a Green Ribbon Panel (GRP), which consisted of a collection of environmental and economic leaders from across Canada. The primary goal of this panel was to advance practical and executable solutions including the role that nuclear and Canada's other clean energy technologies can play in the fight against climate change while growing our economy.

A major theme that emerged from that project was the potential of hydrogen and its opportunity to deliver economic benefits to Ontarians and Canadians alike; especially when coupled with Ontario's already clean electricity grid — anchored by nuclear power.

The final report released by the GRP highlighted key potential advantages for Ontario when it comes to hydrogen, quantified the electrification challenges ahead and provided several key recommendations for government.

Of particular note from the GRP report is its demonstration of how nuclear power will be a critical component in unlocking hydrogen's potential. Ontario's nuclear generation operates 24/7 and it is this consistency that enables the high-capacity factor electrolyser operations needed for hydrogen production.

Nuclear power is a reliable, flexible, and low-cost source of low carbon electricity and the backbone of Ontario's electricity system. The current $26-billion infrastructure investment that will extend the operating lives of both the Darlington Nuclear Reactor and Bruce Power Generating Station to 2055 and 2064 respectively will also provide GHG emissions free electricity for decades.

Just as the Ontario and federal governments have identified hydrogen's potential, Bruce Power also believes that hydrogen represents an attractive energy source with considerable opportunity for economic benefits as well as significant GHG emissions reductions.

As revealed by the analysis of the GRP, a smartly integrated nuclear, hydrogen, storage, and wires-and-pipes energy solution would directly deliver economic benefits to all regions of Ontario with the possibility of these home grown energy innovations enabling almost 50,000 jobs across multiple sectors with an as many as 23,000 high-quality jobs in Ontario annually directly linked to a hydrogen. The report also revealed that the transportation and trucking sector is arguably the most primed sector for hydrogen adoption. Trucking is an energy and GHG emissions intensive, and is a source of other air pollutants. Across Canada, on-road freight produced 60 Mt of GHG emissions in 2017, accounting for 34% of all GHG emissions from transportation.

Lowering GHG emissions from trucking would reduce supply chain GHG emissions for other sectors, and conversion to FCEVs would reduce the need for imported fossil fuels. Leveraging Ontario's low-cost, low-emission electricity capitalizes on Ontario's existing advantages in nuclear, hydrogen, and vehicle manufacturing which can in turn be used to support leadership positions in cutting edge fields like next generation reactors, SMRs, fusion, storage, electrolyzers, biomass, and ZEV manufacturing. Innovating and moving first can mean long-term competitive advantages in export markets, and can give rise to tech hubs that foster ongoing innovation, providing platforms for business networking, skilled immigration, and innovative financing. Spillover benefits can be created that would be felt by other industries.

Using hydrogen to reduce to carbon emissions in the transportation sector holds serious potential, however to realize the potential of hydrogen as a viable alternative fuel the how to of physical transportation of hydrogen itself must be considered. In regions with natural gas infrastructure, hydrogen can be exported through pipelines, blended into the natural gas system for direct use or transport, or liquefied at ports and shipped overseas.

Utilizing existing infrastructure in this way as well as likely expanding current transportation pathways necessitates a holistic perspective when it comes to the development and potential implementation of a hydrogen strategy. This holistic perspective needs to account for all inputs of potential hydrogen implementation, including how it is made, how much it costs, how it is shipped, and how it will be used as an energy resource.

Hydrogen can also allow Canadians to develop harmonized energy policies that allow regions to exploit their different strengths in developing paths to a decarbonization, such as Ontario's nuclear advantage. It can also provide a hopeful alternative to the frustrations and impediments that have stymied our decarbonization efforts so far.

Bruce Power explicitly highlighted these opportunities in November, when we outlined the five pillars of our Net-Zero 2050 strategy. Within our pillars, we highlighted the pan-Canadian opportunity for hydrogen and announced our Hydrogen Unity Project, which will see the Nuclear Innovation Institute evaluate the opportunity for mass production of hydrogen using nuclear technology and evaluate opportunities for alignment with the oil and gas, transportation and electricity generation sectors. .

For Ontario, it is an opportunity to develop a made-at-home solution to powering its industrial sectors and transportation, leveraging its existing strength in clean energy from nuclear power. Nuclear can provide the shoulders upon which Ontario can develop the innovations, technologies and expertise to transition to the next generation of energy systems.

At a time when there are divisions in Canada on energy issues, we need solutions that can be a win for all provinces; a national unity tool if you will, one that provides opportunities for all provinces and territories across Canada to play a role in with hydrogen. This sentiment was also echoed in the recently released Federal Government's *Hydrogen Strategy for Canada*.

Hydrogen holds the potential for rare agreement among Canada's regions, a low-emission source that can be produced in different ways in different locations. It can unite all our energy sources — nuclear, hydroelectricity, renewables and fossil fuels. The development of a pan-Canadian Hydrogen solution that includes integration with Canada's oil and gas sector, further deployment of hydrogen as a transportation fuel, and leveraging of Canada's clean electricity assets will be critical to the success of hydrogen deployment.

While the mathematical realities of a decarbonized energy future account for the renewed interest in hydrogen as an energy source, it is imperative that this not be seen as a silver bullet. Our path to a decarbonized future will require smart government policy and multiple energy resources working in tandem to support this transition.

That is why our Net-Zero Strategy also detailed the importance of investing in our existing infrastructure, supporting next generation nuclear, enabling clean fuels and clean transportation, creating green jobs and leading the energy sector. We must leverage our clean infrastructure, build on the solid foundation we have set and seek to do more. Bruce Power is proud to be a trailblazer in innovative advancements and an inspiring example of corporate social responsibility, engaging partners and stakeholders in the fight for safe and flourishing future.

When it comes to the development of a hydrogen strategy for Ontario, it must reflect the realities of Ontario's electricity system and acknowledge that climate change policy is a complex challenge for all governments, often requiring private sector support in policy development and execution. Based on current calculations, Ontario must achieve 22 megatonnes (Mt) of GHG emissions reductions in order to achieve its targets set out in Ontario's climate plan for 2030.

It is well known that emission-reduction policies have implications on electricity demand**.** As was revealed by the GRP and supported by numerous global studies, about 1.66 TWh of electricity is required to achieve one megatonne (Mt) of emissions reductions. This means that 37 TWh is needed to achieve the 22 Mt GHG emissions reductions targeted in Ontario's climate plan for 2030.

Ontario has done much to reduce GHG emissions from its electricity sector, but much more must be done to eliminate emissions from our economy and improve air quality, and the development of a hydrogen strategy is key part in achieving this.

The adoption of a hydrogen strategy will require long term planning and direct coordination between the Ministries of Environment, Conservation and Parks and Energy, Northern Development and Mines. Planning must consider how Ontario will achieve its 2030 emissions targets as well as respect the interests of the customer. Only through a coordinated effort can we hope to avoid some of the system challenges of the past which don't need to be repeated.

This can be achieved by focusing on leveraging Ontario's unique clean energy technologies and existing assets to reduce GHG emissions and lower energy costs. Ensuring that policy objectives are focused on clear, short-term, tangible actions that prioritize targeted, proven, executable solutions and focus on enhancing the competitiveness of trade-exposed sectors will be critical to success. These objectives must also, embrace the diversity of Ontario's regions and consider how future public revenue from carbon pricing policy schemes should be revenue neutral to government.

Ontario energy and climate policy cannot once again try to pick winning and losing companies or technologies by providing extensive government subsidies. This approach has contributed to increased costs for customers and an increased debt load for the province of Ontario. Decisions must reflect the ability of Ontario to achieve its climate change objectives without sacrificing the well-being of Ontarians.

A careful balancing of costs with the potential to reduce GHG emissions is important, but it is also imperative to account for the total net effect of hydrogen in terms of creating job opportunities and increasing export opportunities when it comes to measuring the success of a hydrogen strategy. Positive job growth and increased export opportunities can lead to positive returns on our domestic GDP and help grow our economy. Much like the holistic approach required on the input side of developing a hydrogen strategy the outputs must also be viewed with a similar lens recognizing all potential outcomes. The total net effect should account for GHG reductions, job creation and export growth which could help to counter the direct argument of input costs.

While the appropriate amount of government intervention versus free market dynamics is a careful balancing act, the only way to achieve a decarbonized future will be through a stable policy environment. Much like the stable policy environment that the nuclear industry has enjoyed in Ontario for the past number of years which has solidified Ontario as a clean energy jurisdiction; moving forward it is critical that the policy environment is adaptive

to innovation, supports Ontario businesses, and continues to recognize the important role of nuclear power will enable us to meet our climate change objectives.

Thanks largely to our nuclear generating stations, Ontario's electricity system accounts for merely two per cent of our GHG emissions and with a wide variety of clean energy options at its disposal, Ontario is in a strong position to meet the coming challenges. Our system enables the opportunity to develop a hydrogen strategy that achieves environmental progress and delivers economic benefits to Ontarians. Ontario's decarbonized electricity system sector presents the opportunity to brand the province as a clean jurisdiction known for sustainable products. This will incent investments allowing firms based here the ability to declare their operations in the province as 'clean'.

To build off this focus, policymakers should look to further leverage these relationships with the private sector and encourage P3 partnerships to create the environment necessary to attract additional capital into Canada and unlock investment opportunities in our domestic energy solutions and manufacturing sector.

Bruce Power looks forward to working alongside government in the development and implementation of its Ontario Low-Carbon Hydrogen Strategy. We would welcome the opportunity to meet with your office to discuss this letter and its contents.

Sincerely,

Pat Dalzell
Head of Corporate Affairs– Bruce Power

Appendix A – Discussion Questions and Responses

Topic 1: The Vision for Ontario's hydrogen strategy

Question	Response
1. Do you support Ontario's efforts to create a hydrogen strategy?	Yes. We believe that nuclear has the potential to support the advancement of these opportunities through the provision of clean, reliable, low-cost power for the production of low-carbon hydrogen.
2. How would you refine the vision statement?	We support the vision of leveraging Ontario's existing strengths and its largely decarbonized electricity system, anchored by nuclear power. Bruce Power is one of the primary employers in the Bruce County region and continues to actively engage with the local communities create local jobs and attract regional investment. Through our regional economic development activities, Bruce Power has created thousands of local jobs while seeing more than 60 new businesses moving to the area to support our Life-Extension Program.
3. What should be the key outcomes of Ontario's hydrogen strategy?	Ontario's climate objective is to reduce its emissions by 30 per cent below 2005 levels. With current emissions projections and actuals, this means a reduction of 22 Mt by 2030.Therefore the objectives must be to balance the government's climate change objectives with the well-being of Ontario consumers.
4. How should the hydrogen strategy define and measure success?	Success would be demonstrated through a measureable reduction in Ontario's GHG output and achieving of its 2030 climate change targets without sacrificing costs and customer focus. A careful balancing of costs with the potential to reduce GHG emissions is important, but it is also imperative to account for the total net effect of hydrogen in terms of creating job opportunities and increasing export opportunities when it comes to measuring the success of a hydrogen strategy.. The total net effect should account for GHG reductions, job creation and export growth which could help to counter the direct argument of input costs. A careful balancing of the environment and economic goals is possible and must remain a key focus when developing the hydrogen strategy.

Topic 2: Supporting the Environment Plan by reducing greenhouse gas emissions through low-carbon hydrogen

Question	Response
5. What are Ontario's key	Leveraging Ontario's low-cost, low-emission electricity capitalizes on Ontario's

technology, regulatory and business opportunities in developing low-carbon hydrogen?	existing advantages in nuclear, hydrogen, and vehicle manufacturing which can in turn be used to support leadership positions in cutting edge fields like next generation reactors, SMRs, fusion, storage, electrolyzers, biomass, and ZEV manufacturing Our resources include zero-emitting nuclear and hydro facilities that provide us with flexible baseload supplies that meet our needs through all four seasons. We also have non-hydro-renewables in the form of solar, wind, and biomass that help thin out the use of natural gas to help reduce emissions. Hydrogen also performs best when matched with a reliable baseload supply for electrolysis, such as nuclear power.
6. What is the potential for hydrogen to contribute to Ontario's 2030 greenhouse gas emission reduction target?	Due to its many advantages and applications, some estimates suggest hydrogen could be used to eliminate up to 25 per cent of GHG emissions in Ontario We believe that nuclear can play a role in producing affordable hydrogen as we shift to a clean fuel based economy. We see the potential for the nuclear industry to advance the hydrogen economy through: i) cogeneration with hydrogen and renewables; ii) displacement of fossil fuels, commercially and in remote communities; and iii) storage for the purpose of improving grid resilience. As revealed by the analysis of the GRP, the hydrogen economy may support as many as 23,000 high-quality jobs in Ontario annually.
7. What additional environmental benefits should be considered in the development of the strategy (for example during hydrogen production)?	Reducing Ontario's GHG emissions and other pollutants from the atmosphere will have additional benefits to human health. In the past decade, Ontario successfully reduced the number of smog days in the province from 53 in 2005 to zero in 2015 by displacing coal thanks in large part to nuclear power. Investments in policy-enabled, Made-in-Ontario energy, manufacturing and infrastructure solutions for the emerging low GHG emission economy can deliver direct economic benefits while combatting climate change and cleaning our air.

Topic 3: Generating economic development and jobs by building a hydrogen industry involving all regions of Ontario to create jobs and facilitate economic recovery, seek strategic partnerships and support innovation

Question	Response
8. What role can hydrogen play in various regions and	Hydrogen is an abundant fuel that emits no carbon, with the potential to replace fossil fuels in long-haul transportation, heavy industries and electricity markets. It can lower the carbon emissions used to heat buildings, or its power can be

sectors?	stored for later use. Many Ontario companies have pioneered hydrogen production and fuel cell technology, meaning it is a solution that supports both our climate change objectives and the local economy. Hydrogen can also be produced from many sources, including nuclear power and renewables.
9. What actions can Ontario take to help Ontario companies get ready to meet expected international demand (for example research and development, innovation, procurement)?	With over 100 Canadian companies in the hydrogen and fuel cell sector, Canada is already among the world's top-ten hydrogen technology providers. Ontario can build on this expertise, and develop a hydrogen economy that can reduce GHG emissions by serving many applications. Ensuring that policy objectives on clear, short-term, tangible actions that prioritize targeted, proven, executable solutions and that embrace the diversity of Ontario regions and consider how future public revenue from carbon pricing policy schemes should be revenue neutral to government and target enhancing the competitiveness of trade-exposed sectors.
10. What are the training needs for the workforce to support the economy across Ontario?	STEM Skilled labour and trades

Topic 4: Promoting energy resilience by considering the value of domestic hydrogen for Ontario's energy bills and evolving energy system

Question	Response
11. How can hydrogen support a reliable and affordable energy system, including energy storage?	Ontario is one of the best places in North America to store hydrogen underground, and the colder climate means households here use twice as much natural gas for home heating as the world average. Hydrogen could be added to existing natural gas storage caverns in the summer, and the blended fuel could then be delivered to homes in the winter through the natural gas distribution network.
12. What are the barriers and opportunities for hydrogen in the energy system?	High Cost – development of hydrogen must continue to deliver value for the Ontario customer Long Term Policy Stability - an environment that is adaptive to innovation, supports Ontario businesses, and continues to recognize the important role of nuclear power will enable us to meet our climate change objectives.

Topic 5: Reducing barriers and enabling action in order to attract investment and create a level playing field between technology options

Question	Response
13. How can the provincial government best support partnerships with the private sector, academia and other government / levels of government?	A stable policy environment, that is adaptive to innovation, supports Ontario businesses, and continues to recognize the important role of nuclear power will enable us to meet our climate change objectives.
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.	Ontario energy and climate policy has been full of its own challenges that don't need to be repeated. Policy should not create a regime where we pick winners or losers, and the considerable impact on cost and the consumer must remain at the forefront.
15. What are the best opportunities to cost-effectively support hydrogen across Ontario while respecting tax payers?	Investments in strategic industries would develop a skilled workforce, facilitate new products and enable growth, catalyzing a lasting competitive advantage for Ontario.

Topic 6: Using hydrogen where and when it makes sense, focusing on areas that are most likely to become cost-effective

Question	Response
16. What potential feedstock's 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?	There are many opportunities for low-carbon hydrogen production, including: increasing generation and storage for improved load following; using hydrogen as a clean fuel for transportation; and cleaning commercial technologies that are reliant on fossil fuels. Enhanced load following through energy storage, where hydrogen is reconverted to electricity during high demand, can improve grid resiliency.

17. What are the main risks of hydrogen use in Ontario and are there opportunities for the government to decrease these risks?	Increased costs. Decisions must reflect the ability of Ontario to achieve its climate change objectives without sacrificing the well-being of Ontarians. Ontario energy and climate policy cannot again create a regime that picks winning and losing companies and/or technologies by providing extensive government subsidies.
18. Considering that low-carbon hydrogen is expected to be more competitive over time, what should be the timeframe for Ontario's hydrogen strategy?	Ontario's hydrogen strategy should align with other provinces and the federal government's timeline in order to capitalize on the national unity opportunity of hydrogen. The development of a pan-Canadian Hydrogen solution that includes integration with Canada's oil and gas sector, further deployment of hydrogen as a transportation fuel, and leveraging of Canada's clean electricity assets will be critical to the success of hydrogen deployment.