APPrO
ASSOCIATION OF POWER PRODUCERS OF ONTARIO

May 14, 2023

Submitted via Environmental Registry of Ontario (ERO) Posting

RE: ERO Number: 019-6647
IESO Pathways to Decarbonization Study
Association of Power Producers in Ontario (APPrO) Submission

I. Introduction

The Association of Power Producers of Ontario (APPrO) is pleased to offer our recommendations on the IESO's *Pathways to Decarbonization Study* (P2D) in response to ERO Posting 019-6647. APPrO is proud to have established itself as a leader in the industry, representing various power producers across Ontario. Founded in 1986, our member companies build, own, and operate power projects across Canada, and produce most of Ontario's electricity from clean and renewable resources, including nuclear, hydroelectric, natural gas, biomass, wind, and solar energy.

APPrO's goal is the achievement of an economically and environmentally sustainable electricity sector in Ontario that supports the business interests of electricity suppliers, ratepayers, and the provincial economy. APPrO plays a leadership role in the formation of energy policy and rules to facilitate investment in sustainable supply and efficient pricing of electricity in Ontario.

APPrO welcomed the Independent Electricity System Operator's (IESO) "Pathways to Decarbonization" ("P2D") report when it was released in December 2022. We called it an important milestone in understanding the challenges of meeting the province's coming power needs, and supporting the transition to net-zero, while keeping reliability and affordability firmly in mind.

We believe that ambitious net-zero goals have the potential to transform Ontario's economy, and the way Ontario families and businesses use electricity. The costs of meeting targets will be significant, if not historic, and so it is critical that investment be directed toward productive technologies that support the energy transition without unnecessarily constraining economic growth and innovation. That being said, "policy beyond capability[1]" is in no one's interest.

APPrO has consistently noted that Ontario's electricity system is already cleaner than California or Germany, representing only about 3 per cent of the province's greenhouse gas (GHG) emissions. This Made-in-Ontario clean energy advantage is a powerful tool in the battle against climate change and means we have a power grid that is net-zero ready. Yet, Ontario's electricity system will need to expand and transform as transportation, building heating and industrial sectors decarbonize through

[1] Clean Air: The Policies and Politics of Pollution Control, Charles O. Jones. June 1978

electrification. This underscores the need to leverage existing infrastructure required to maintain system reliability while managing costs and retaining public support for Ontario's' net-zero journey.

P2D, together with other initiatives to help Ontario's economy prepare for electrification, such as the leadership of the province in launching the *Electrification and Energy Transition Panel*[2], will provide a foundation for Ontario to lay out broad, longer-term objectives and guiding principles for power system planning to maintain Ontario's clean energy advantage, manage future growth, and support decarbonization affordably and reliably. The next steps beyond this phase, as we transition into detailed development of a plan and the approach to its implementation, will be critical in ensuring we achieve the end state objectives that we are seeking as a society.

To this end, our submission is organized into the following sections:

Executive Summary
A Collective Target
Answering the Questions
Unifying the Policy Streams
Planning is Critical
Governance is Needed
New Resources are Necessary
Conclusion

[2] https://www.ontario.ca/orders-in-council/oc-6982022

II. Executive Summary

"A thoughtfully laid out blueprint crafted in partnership with all stakeholders is a much more prudent approach to a successful energy transition than unilateral, short-term decisions … Without an appropriate strategy, we will collectively fail to reach our climate goals or risk making an essential service unaffordable for many consumers."[3]

Electricity is key to Ontario's prosperity, human welfare, and net-zero objectives:

- System reliability, affordability, and sustainability will underpin policy decisions that shape the electricity grid of tomorrow.

Ontario needs a reliable and affordable grid to remain attractive for business development and ensure future growth:

- This will require unprecedented expansion of supply resources over the next 25 years, while continuing to extract the maximum value from the operation and renewal of existing resources.
- Developers and owners need clarity, stability, and line of sight in electricity policy both to build new assets and maintain current ones.
- A decisive and orderly plan is necessary as electrification and the energy transition continue to intensify. Equally, the transition to net-zero must err on the side of caution: i.e., planning well in advance and evaluating or assessing risk-weighted consequence of various options for electricity system evolution to avoid serious or irreversible consequences to critical system requirements including reliability, flexibility, and affordability.

Bold leadership is needed to ensure we get the right balance:

- Ontario needs to articulate its views on an integrated long-term plan that includes supply and the network infrastructure required to connect this supply.
- This would include establishing clear and transparent objectives, technological options, and the roles, responsibilities, and expectations of participants in the sector in achieving those objectives.
- By launching the *Electrification and Energy Transition Panel*, the province has made a key first step.

III. A Collaborative Target

"Electrifying technologies across various sectors, particularly transportation, manufacturing, and industry, could mean real progress in reducing overall provincial greenhouse gas emissions. Projections for just two elements of the Annual Planning Outlook's (APO) electrification forecast – electric vehicles and a single steel plant furnace upgrade - estimate savings of more than 18 Mt by

[3] *Keeping Power Affordable Throughout the Energy Transition*; David Dal Bello, Managing Director and Global Co-Head of the Power, Utilities, and Infrastructure Group at RBC; February 10, 2023

2040. Though just a small piece of the broader decarbonization picture, this is more than enough to offset emissions from the electricity sector itself."[4]

The IESO describes the pathway to decarbonization as a "significant and complex undertaking that will require an extensive and collaborative effort to achieve."[5] While this is partially true, a focus on eliminating "all emissions" from the power system seems unrealistic.

The Canadian target for both economy-wide and electricity grid emissions is net-zero, not zero.

Net-zero allows for the careful balance between the amount of carbon that is produced and the amount that is removed from the atmosphere. Carbon offsets will play an important role as they will provide the necessary compliance flexibilities to help achieve a net-zero grid while balancing the need to maintain system reliability and affordability, with the pressures on the sector to support and enable broader economy-wide decarbonization. Ontario has one of the cleanest systems in the world when it comes to carbon emissions per kilowatt-hour. These emissions represent slightly more than 3% of Ontario's total annual emissions[6]. Therefore, the effort and costs to reduce the final few percentage points of GHG emissions from electricity generation in Ontario may be much higher than necessary to achieve net-zero objectives.

Reaching net-zero even by 2035 will require solving several large challenges. In this respect, P2D presents the need for two scenarios: integrated supply, and transmission system plans. The promise of future innovation must not come at the cost of narrowing existing policy options that can address our nearer-term challenges.

These points underscore the importance of a "Made-in-Ontario" plan for net-zero in electricity. The work of the *Electrification and Energy Transition Panel*, in concert with energy sector participants and governments, will be a critical input into this approach.

This said, APPrO agrees with the general direction of the study, particularly the need for unprecedented growth in supply resources over the next 25 years, while simultaneously extracting the maximum value from existing resources over that period to balance reliability and affordability, consistent with policy and other considerations. Thorough planning from source of energy, to point of consumption, will be a critical element to any credible plan for economy-wide decarbonization. Comprehensive engagement with all stakeholders and agencies is paramount to ensure success.

APPrO agrees with the IESO's assessment of risks that could de-rail a successful conclusion to the pathways process over time, and we recommend ramping up current efforts to provide sufficient options for long-lead time generation and transmission assets. A heightened sense of urgency is required to ensure that regulatory and permitting processes are not unreasonable barriers to success, and to ensure that capital, supply chain and labour resource challenges can be overcome. This will require cooperation within and between all levels of government, while working closely with all stakeholders and Indigenous communities.

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[4] IESO: The 2021 APO in 7 Graphs, December 10, 2021

[5] *Pathways to Decarbonization*; Ontario Independent Electricity System Operator (IESO), December 2022; p1.

[6] Environment and Climate Change Canada: National GHG Inventory

With respect to IESO scenario assumptions, APPrO is in general agreement with those laid out. We do question the assumption with respect to hydrogen (H_2) manufacturing in Ontario, based on our current understanding of pilot projects now underway. Unlike the IESO's view on H_2 production, APPrO believes Ontario can eventually provide a robust H_2 supply to meet the needs of the province.

Finally, solving the conundrum of early-stage development costs for long-lead time supply projects requires more thoughtful consideration. As the IESO notes in P2D, to enable this work "the Ministry should work with the Ontario Energy Board (OEB) and the IESO to develop a process to recover pre-development costs for OEB-regulated and IESO-contracted projects respectively, as applicable."[7]

IV. Answering the Questions

It is nevertheless imperative that Ontario leads the way toward answers by articulating its vision for the sector. Without such direction, options will quickly narrow and produce unpredictable outcomes.

There remain significant unanswered questions that are delaying progress in Ontario's electricity sector.

The "Big Questions" to unleash Ontario's Energy Advantage are:

- What do we mean by a net-zero electricity grid and what role do offsets play in achieving the objective?
- What is the medium (up to 2040) and longer-term (after 2040) role of natural gas in supporting home heating and economic development, generating bulk system electricity, and the importance of support for clean fuels innovation and adoption?
- What do we mean when we talk about "reliability", "affordability" and "sustainability"?
- What will be Ontario's emissions targets within electricity generation?
- What might be a reasonable supply mix that will produce the desired balance of reliability, affordability, and sustainability over the next 20 years?
- Who pays, and how do we establish the framework to ensure that costs are responsibly incurred, especially for long-lead time infrastructure within a governance framework that can support investment from the private sector and leverage competitive capital investment in the province?
- What is the role of the Government of Canada in policy and funding, and how do we align different federal/provincial/municipal frameworks for decarbonization?
- What changes are necessary to the roles and responsibilities for the province and its energy agencies, and what are the opportunities and challenges to improve energy sector governance?
- How will we source the capital and skilled labour required for the transition?
- How does Ontario balance these questions while also facilitating economic growth?

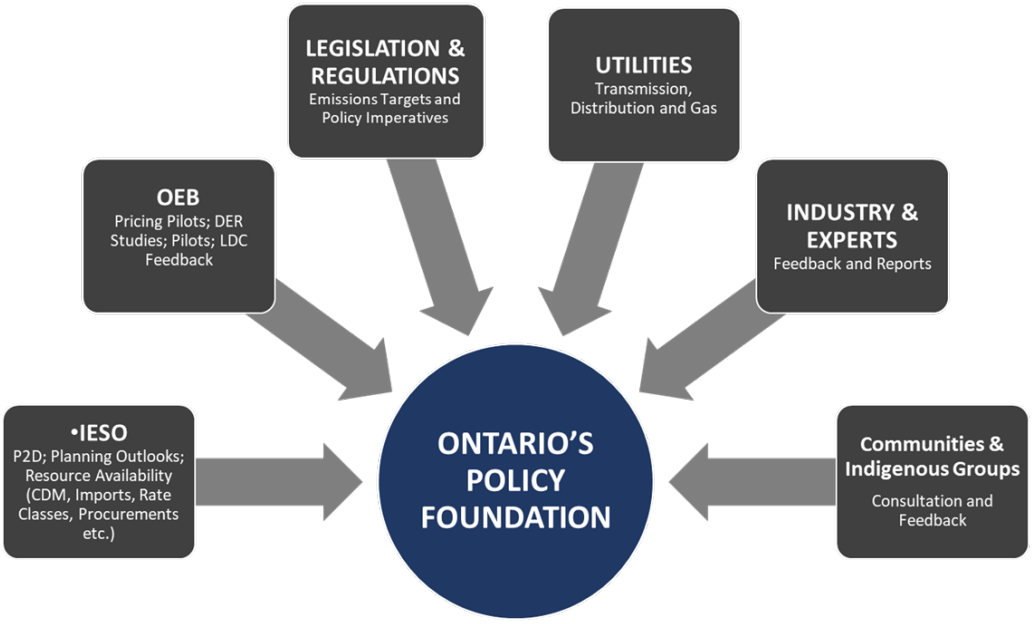
While many of these questions require collaborative answers - including different levels of government and many sector participants and stakeholders - it is nevertheless imperative that Ontario leads the way toward answers by articulating its vision for the sector. Without such direction, options will quickly narrow and produce unpredictable outcomes. The work of the *Electrification and Energy Transition Panel* will be critical in this respect.

[7] Pathways to Decarbonization, p. 38

V. Unifying the Policy Streams

"The challenges across jurisdictions are roughly similar – how to fundamentally transform one of the most critical parts of societal and economic infrastructure with unprecedented speed, and in a way that ensures coordination between policy and regulation, among different levels of government, and among the various public, private and civil society organizations involved in energy delivery."8

Much work has been done already on considerations for energy system planning and pathway improvement by the Government of Ontario, IESO, OEB and others. This knowledge now needs to be integrated into a foundational base to guide the sector through the step-change that is underway.



VI. Planning is Critical

The Government of Ontario must provide a clear energy roadmap that emphasizes maximizing our existing energy resources and demonstrates bold leadership to develop policy that clearly outlines long-term energy planning, including objectives, technological options, and the roles, responsibilities and expectations of industry and communities in achieving those objectives so that we can confidently accelerate our energy transition efforts.

This is a critical time for Ontario's electricity sector.

Not only do we have long-term objectives and decisions that need to be considered, but we have near-term needs that are equally critical in support of setting the foundation for a net-zero future. We need

[8] Net Zero: An International Review of Energy Delivery System Policy and Regulations for Canadian Energy Decision Makers. Final Report April 4, 2022. Prepared by Michael Cleland and Monica Gattinger for Gattinger and Associates

to continue to procure the resources that the IESO has identified in its short-term resource adequacy plans, and thoroughly consider those which will be identified in its upcoming resource planning documents.

Ontario faces a significant near-term, growing, and enduring supply gap to meet increased demand that will continue with electrification of the broader economy. At the same time, contracts for some existing resources will expire within the next decade, in most cases, well prior to the end of the useful life of the assets. This challenge requires a timely and appropriate solution for new and re-contracted resources to be in a position to help fill the gap and solve the supply shortfall.

Because a reliable, affordable, and sustainable energy system requires ongoing investment to maintain existing assets, and to build new assets as they are required, effective planning is a critical issue in electricity system investment and operation. The planning tools of the recent past were perhaps suitable based on the relatively modest scope and challenges that faced the electricity system; however, the current suite of planning tools is inadequate for the much more significant expansion of the future system that will be required.

At the same time, the Government of Canada is developing a Clean Electricity Regulation to enable its own vision of a net-zero pan-Canadian electricity grid by 2035, as well as developing a variety of financial instruments[9] to support its vision.

Canada is a large and diverse country; energy is produced and consumed differently across its distinct regions. The provinces and territories differ in terms of energy resource availability, infrastructure, industries, energy and environmental policies and regulations, energy market structures, consumer preferences, and weather conditions. These differences greatly influence current and projected energy trends.

The Ontario electricity context is unique and must be both well understood and accommodated in the design and implementation of any federal policy. Federal-provincial discussions will have to take into consideration the unique challenges, and opportunities Ontario (or any other province) faces, with the ultimate goals of affordability, reliability and GHG reductions, consistent with Ontario's constitutional jurisdiction over electricity, to ensure that Ontario is not treated in a discriminatory manner because of inconsistencies.

Over the last 20 years, billions of dollars of capital have been invested into Ontario's electricity system. These investments have led to the development of flexible natural gas-fired generation, nuclear facilities, and renewable power supplies at scale, while also phasing out coal-fired generation in the province. The costs associated with these investments continue to be recovered by customers across rate classes, as well as from the provincial tax base.

The 2023 Federal Budget proposes an Investment Tax Credit (ITC) to support the accelerated build-out of clean electricity projects. However, this is only available to provinces which make a "commitment by a competent authority that the federal funding will be used to lower electricity bills, and a commitment to achieve a net-zero electricity sector by 2035." While the federal government will seek feedback on these

[9] The March 28, 2023, federal Budget ("A Made-in-Canada Plan: Affordable Energy, Good Jobs, and a Growing Clean Economy") contains several targeted proposals for investing significant sums to support clean energy and electrification projects.

two commitments in the upcoming consultation on the clean electricity ITCs, no timeline yet for the consultation has been signaled.

This provides the province with the opportunity to take the lead on defining what it believes should be Ontario's "net-zero" plan in federal-provincial discussions.

Without a "Made-in-Ontario" plan to rely on, we risk a clash of competing views, and mandates which cannot be an efficient outcome when reliability and affordability are table stakes for customers and governments alike. Imprudent decisions with respect to the future supply mix risks constraining the balance sheets of both households and businesses, and potentially weakening public support for the energy transition.

Ontario needs to articulate its views on coordinated long-term energy planning, including objectives, technological options, and the roles, responsibilities, and expectations of participants in the sector in achieving those objectives. Currently, there is no specific requirement or process for the Government of Ontario to set broad objectives for the sector before the planning process starts.

Planning processes that are robust, fact-based, open, and transparent, publicly contestable, and stable over time will contribute to the availability of information, and the fostering of competition that will help to encourage cost-efficiency over the longer-term. Planning mechanisms must recognize that some technologies have extensive lead times, and therefore to maximize resource optionality to meet Ontario's needs, the identification of needs should occur earlier so that as many technologies as possible can effectively compete to provide affordable, reliable, and sustainable electricity.

Bold leadership will ensure the energy sector has the best chance at balancing both the near- and long-term needs, while ensuring a decisive and orderly transition in a time where evolving and emerging technologies will no doubt challenge and test Ontario's longer-term objectives. This emphasizes the importance of long-term planning and IESO's resource adequacy framework. However, as certain resources do not fit into the existing procurement structure and timelines, alternate mechanisms are required to enable these critical resources. Specifically large, clean electricity infrastructure that has long development timelines and is likely to be employed irrespective of the final pathway to decarbonization, should be advanced and committed to in the near term.

VII. Governance Improvements are Needed

"The long-term energy planning process is lacking independent oversight. Proper long-term energy planning is essential to ensure the province has an adequate supply of energy that is also affordable to customers, especially with increasing electricity demand.[10]"

APPrO recommended an improved approach to electricity planning in its 2021 *Achieving Excellence in Electricity Planning – a Roadmap for Ontario*.

[10] Office of the Auditor General of Ontario. Ontario Energy Board: Electricity Oversight and Consumer Protection, November 2022

We commend it to the government for further consideration[11]. In this respect, amendments to the *Electricity Act* regarding the role of the OEB and IESO in energy planning would themselves provide an important signal of the government's aims and ambitions for the Ontario electricity sector, and hence also to investors and operators.

Transparency, stakeholder engagement, accountability and effectiveness should be the foremost objectives in the planning framework. Also, the government must be clear in setting broad objectives for the sector before the planning process starts. Unfortunately, the current planning framework lacks comprehensive and objective standards, as well as criteria against which the IESO's planning activities are measured.

Further, there is no specific requirement or process for government to set broad objectives for the sector before the planning process starts.

This lack of objective standards also undermines efforts to improve regulatory oversight. As the Auditor General of Ontario notes: "The long-term energy planning process is lacking independent oversight. Proper long-term energy planning is essential to ensure the province has an adequate supply of energy that is also affordable to customers, especially with increasing electricity demand.[12]"

APPrO's proposed framework was based on the premise that the individual, short-term decisions of the IESO support Ontario's long-term energy planning strategy and goals. Consequently, APPrO recommended an OEB review of the IESO's proposed Implementation Plan (for example, as part of its 3-year expenditures, revenue requirement and fees submissions) to ensure that it is consistent with the goals and objectives explicitly listed in the government's long-term energy policy and subsequent directions to agencies.

APPrO looks forward to the *Electrification and Energy Transition Panel*'s recommendations on oversight mechanisms as part of its review of the policy framework.

VIII. New Resources are Necessary

A significant challenge is planning for and investing in long-term asset development. For example, both nuclear power and hydroelectric resources require extensive permitting and regulatory approval timeline even to attain the option of constructing. These can often take the better part of a decade, or more.

There is not one solution to achieve the desired objective of net-zero in an electricity system.

A combination of clean energy technologies including nuclear, large hydroelectric, conventional renewables and clean fuel-derived generation, complemented by system balancing resources such as short- and long- duration storage assets will all be needed.

Some basic observations however can be made:

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[11] Achieving Excellence in Electricity Planning – a Roadmap for Ontario. A Submission to the Ministry of Energy, Northern Development and Mines, Re: ERO 019-3007 Review of Ontario's Long-term Energy Planning Framework, 2021

[12] Office of the Auditor General of Ontario. Ontario Energy Board: Electricity Oversight and Consumer Protection, November 2022

- Continue to leverage Ontario's existing, diverse supply mix.
- Nuclear power and hydroelectricity will remain the foundation though play an increasingly important role.
- Clean distributed energy resources will play an important role in reducing the investment and disruption associated with reinforcing electrical delivery systems – both transmission and distribution.
- Natural gas remains a critical resource to support the flexible and reliable operation of Ontario's clean electricity system and is well positioned to transition to clean fuels when economic conditions support the transition.

To this end, there is increasing interest in upstream clean fuels (i.e., H_2, RNG, ethanol, etc.), and integrating these more broadly as individual economics warrant would be a more effective solution and could potentially be more cost-effective than managing and storing the end carbon product (i.e., CCUS). However, a preliminary study by the Ontario Ministry of Natural Resources showed that up to 730 megatonnes of CO2 could potentially be stored in a deep saline aquifer located in southern Ontario. Incumbent utilities (e.g., Enbridge and TC Energy) should be encouraged to accelerate the integration of clean fuels and made-in-Ontario CCS solutions into existing infrastructure.

With regards to H_2, it is a low-carbon energy source which has the potential to reduce or offset GHG emissions in a variety of applications. Clean H_2 can allow energy to be effectively and efficiently stored, transported, and used in innovative ways to reduce GHG emissions, and help Canada reach its climate target goals by 2050. H_2 has the potential to reduce carbon emissions in the electricity sector by blending it with natural gas in combustion. Continuing to prudently invest in research and development, as well investing in pilot projects to prove out both its production and interaction with existing infrastructure is a prudent approach to understanding its potential in Ontario's electricity system and to managing cost impacts for customers.

Prominent equipment manufacturers are motivated to prove out and further develop reliable H_2 power production at scale. Pending results, this may prove beneficial to Ontario's decarbonization plans.

When evaluating the cost implications of H_2 and other low-carbon fuels, there are three key considerations:

- Life cycle carbon intensity of the fuel, including transport of the fuel.
- Made-in-Ontario solutions and fuels, including both the fuel production infrastructure and the inputs to produce the fuel itself; and
- The ability of the fuel to be produced off-peak, stored, and used to meet peak power needs.

IX. Conclusion

By "no regrets" APPrO understands this to mean an approach to electricity system management and operations that involves erring on the side of caution and planning well in advance.

In this respect, planning mechanisms should recognize that some technologies have longer lead times, and to maximize resource optionality the identification of needs should occur earlier, and regulatory permitting processes commenced expeditiously. This can be accomplished by robust scenario planning

which is widely shared and tested through consultation with sector participants and stakeholders. As we continue to look to new build assets, and new resources, planning is key.

Additionally, the Government of Ontario should ensure policy clarity (e.g., Long-Term Planning), in particular respecting environmental and socioeconomic goals, to help inform the direction of the sector and establish investor confidence, including providing timely and clear direction to agencies when/where required. Although planning is important, so is reiterating alignment with Ontario's and Canada's policies, as currently resources such as ITCs incentivizing clean energy, technology and fuels is set to expire by 2034, and to ensure greatest benefit to ratepayers, time is of the essence to seize on this opportunity for eligible projects.

As decarbonization will be a collective effort, APPrO and our members, are committed to playing a constructive role in the development and management of an affordable, dependable, and sustainable system for the benefit of all Ontarians. We look forward to working with the Ministry of Energy and IESO as the next steps of P2D are consulted upon and implemented, as well as to engaging with the *Electrification and Energy Transition Panel* as is undertakes its equally important and complimentary work.

Appendix: Our Responses to the ERO Posting Questions

1. *What are your thoughts on the appropriate regulatory requirements to achieve accelerated infrastructure buildout? Do you have specific ideas on how to streamline these processes? What are your expectations for early engagement and public or Indigenous consultations regarding the planning and siting of new generation and storage facilities?*

A significant challenge is planning for and investing in long-term asset development. For example, both nuclear power and hydroelectric resources require significant amounts of permitting and regulatory approvals time. These can often take the better part of a decade, or more.

Accelerated infrastructure construction will require an effective framework for forecasting, resource planning, procurement, permitting, and commissioning.

At the same time, processes to facilitate consultation and stakeholder engagement must include safeguards that preserve opportunities for meaningful participation. These opportunities are critical for hearing stakeholder concerns, establishing public support, and securing social license to operate facilities in communities. To preserve opportunities for participation and engagement, while accelerating infrastructure buildout, policymakers should look to drive efficiencies across and between the IESO, the OEB, the Ministry of Energy, and environmental regulators.

Provided Ontario has a plan for electricity growth and achievement of net-zero on a reasonable trajectory, beginning the planning, siting and environmental assessment work needed now for new nuclear, hydroelectric, and long-duration storage facilities, as well as transmission infrastructure, should allow for faster implementation.

But this also requires that that regulatory, approval and permitting processes are ready to manage future investment at scale.

Solving the conundrum of early-stage development costs requires more thoughtful consideration.

As IESO notes in P2D, to enable this work "the Ministry should work with the OEB and IESO to develop a process to recover pre-development costs for OEB-regulated and IESO-contracted projects respectively, as applicable."

2. *Do you believe additional investment in clean energy resources should be made in the short term to reduce the energy production of natural gas plants, even if this will increase costs to the electricity system and ratepayers? What are your expectations for the total cost of energy to customers (i.e., electricity and other fuels) because of electrification and fuel switching?*

The thoughtfully planned introduction of proven technologies should be undertaken commensurate with system operability needs and overall system affordability.

Currently, according to IESO, "Ontario's natural gas fleet can provide continuous, flexible energy year-round and under all weather conditions, and there is currently no like-for-like replacement. This means natural gas will be needed until reliable replacements have been identified, put into service, and have demonstrated their capability."

Nonetheless, the costs of meeting targets will be significant. It is therefore critical that investment be directed toward productive technologies that support the energy transition without unnecessarily constraining economic growth and innovation. "Policy beyond capability" is in no one's interest.

3. *Are you concerned with potential cost impacts associated with the investments needed? Do you have any specific ideas on how to reduce costs of new clean electricity infrastructure?*

Significant variation in policy outlook between political parties has existed in Ontario for decades. Each successive government has translated its general policy priorities into changes of direction in electricity institutions.

While this has often led to significant new generation additions and resulted over time in a very clean electricity system, it has also resulted in major legacy costs to customers, arising from changes in policy direction or hurried initiatives.

There is a universal desire for the electricity system to be as cost-efficient as possible over the long-term. Therefore, planning processes that are robust, fact-based, open, and transparent, publicly contestable, and stable over time will contribute to the availability of information and fostering of competition (where practical) that will help to encourage cost cost-efficiency over the long long-term.

APPrO has not modelled the potential cost impacts associated with the investments needed in Ontario resulting from the energy transition but based on published analysis and findings from other jurisdictions, we understand the costs of replacing natural gas-fired generation in the short-term to be extremely significant.

- In its *Decarbonization and Ontario's Electricity System* study, the IESO's modelling of how to replace gas by 2030 would require more than $27 billion to install new sources of supply and upgrade transmission infrastructure. This translates into a 60 per cent or $100 increase on the average monthly residential bill. High electricity costs may deter consumers from investing in carbon reduction, such as through electric vehicles or new equipment. Further noting that, in reality, there are significant practical reasons why it would not be possible to build substantial amounts of new supply and reorient the system to incorporate it by 2030[13].

- The IESO's most recent work (*Pathways to Decarbonization*) points out that "In all, the bulk system expansion needed to enable decarbonization in this scenario would require an investment in the range of $375 to $425 billion."[14]

- PJM has modelled the expected replacement MWs needed from renewable resources to replace 1 MW of natural gas-fired generation and found the following to be average values: Solar – 5.2 MW; Onshore Wind – 14.0 MW; Offshore Wind – 3.9 MW.

- As renewable penetration increases, the effective load carrying capacity of standalone renewable resources decreases due to portfolio effects of increased intermittent renewable supply on the

[13] Independent Electricity System Operator: Decarbonization and Ontario's Electricity System, October 2021
[14] Pathways to Decarbonization,

system. For an example of how this has been modelled in other markets, see Energy Transition in PJM[15]

4. *Do you have any comments or concerns regarding the development and adoption of hydrogen or other low-carbon fuels for use in electricity generation? What are your thoughts on balancing the need for investments in these emerging technologies and potential cost increases for electricity consumers?*

Hydrogen is a low-carbon energy source which has the potential to reduce or offset emissions in a variety of applications. As the world moves toward net-zero, hydrogen will be a critical tool in the fight against climate change.

Clean hydrogen can allow energy to be effectively and efficiently stored, transported, and used in innovative ways to reduce GHG emissions, and help Canada reach its climate target goals by 2050.

Hydrogen can reduce carbon emissions in the electricity grid by blending it with natural gas in combustion. Continuing to prudently invest in research and development as well investing in pilot projects to prove out this technology is a prudent approach to understanding the potential for hydrogen in Ontario's electricity system and to managing cost impacts for customers.

Investigating hydrogen storage at scale, where hydrogen produced during off-peak times and periods can be stored in sub-surface salt caverns, will be important to ensure hydrogen can achieve its full decarbonization potential, including for use as a fuel in peaking power and dispatchable generation.

There will be a cost to investigate the role of hydrogen and develop the pilots and subsequently commercial scale projects that will support the long-term requirements of the electricity system, and support for decarbonizing (which will relieve the demand for grid power) the industrial sector as well as transportation and mobility. That cost will either be borne by the ratepayer or the taxpayer.

There will be a premium for cleaner fuels development and implementation until such fuels (hydrogen or other low carbon fuels) reach economic parity with those they seek to displace. To be successful in developing these low carbon fuels, there are two options. The first is government subsidization (much like what occurs with diesel in remote regions), or the second option is there should be a regulatory or market-based mechanism implemented that allows for a pass through, to a certain extent (incentivizing competition) to the ratepayer (e.g., B.C. GGRR).

5. *Following the end of the current 2021-2024 energy efficiency framework how could energy efficiency programs be enhanced to help meet electricity system needs and how should this programming be targeted to better address changing system needs as Ontario's demand forecast and electrification levels grow?*

Increased energy efficiency, as well as conservation and demand management (CDM) should continue to be promoted. However, none of these can by themselves address the demand growth picture unfolding with respect to total economy decarbonization where electricity is required to increasingly displace fossil fuels.

[15] Energy Transition in PJM page 14

6. *A recently released assessment estimates that there may be potential to develop 3,000 to 4,000 megawatts of new hydroelectric generation capacity in northern Ontario and 1,000 megawatts in southern Ontario. What are your thoughts on the potential for development of new hydroelectric generation in Ontario by private-, Indigenous- and government-owned developers?*

Unlocking potential hydroelectric generation can be a clean and reliable "Made-in-Ontario" solution to help meet the province's growing electricity needs.

IESO has detailed inventories of waterpower potential across this province, and the Ministry of Natural Resources and Forestry (MNRF) needs to update and streamline its "Crown Land Access" Policy to make Crown land available for new applications.

APPrO endorses P2D's recommendation that planning and siting work to identify potential new hydroelectric projects should begin now, and that a process should be established to recover pre-development costs for these long-lead time projects.

Mechanisms must be put in place to enable new waterpower development proponents to recover reasonable pre-development/pre-construction costs. As it currently stands, it will most likely take 7-10 years to permit, engineer and build a new hydroelectric facility, and Ontario currently does not have a standardized mechanism to pay for the early-stage development (permitting, planning, Indigenous engagement, etc.)

There are two ways to do incentivize developers to act – either undertake a series of RFEIs, RFPs or utilize grants/subsidies. In the case of RFPs, a good "cadence" of them is required, spaced out at regular intervals so that developers will continue to invest in their projects.

A partnership role for Indigenous communities is a prerequisite: Simply consulting Indigenous communities on planned system developments has never been a sufficient approach to electricity system planning: these communities expect to be full partners in the transition to a decarbonized future, and rightfully so.

As most of the new hydroelectric development will be done in Northern Ontario, First Nations will either be the proponent, or a key part of the development team and meaningful early consultation is essential.

7. *While the capital costs for hydroelectric generation may be higher than nuclear, wind, solar, and natural gas, do you support investing in large scale hydroelectric assets that may operate for over a hundred years?*

For the electricity system to be as cost-efficient as possible over the long-term, multi-generational consideration is critical. Short-term outlooks do not capture the full potential of assets that are built to serve the province for 50-100 years.

This applies equally to the question of capital costs: over the long-term, even very high capital costs may be amortized economically, for example, hydroelectric developments at Niagara Falls. More than a century after coming into service, Sir Adam Beck I GS is still powering Ontario's economy and net-zero efforts at a very low cost.

Every development opportunity should be considered based on its own electricity characteristics, as well economic, environmental, social merits, and Indigenous participation. Should a particular project be considered worthy on careful analysis, the size of its capital cost should not be a barrier.

8. *Transmission will also be required to balance intermittent supply with dispatchable supply (such as natural gas and energy storage) and meet demand in regions with retiring assets. What steps should be taken to ensure that transmission corridors can be preserved, and lines can be built as quickly and cost effectively as possible?*

As noted above, provided Ontario has a plan for electricity growth and decarbonization management, beginning the planning, siting and environmental assessment work needed now for new transmission infrastructure, could allow for faster implementation of the supply required to achieve net-zero.

APPrO supports P2D's recommendation that IESO "should work with government and system transmitters to identify new, and protect existing, corridors of land as well as rights of way that will likely be needed for future transmission lines."