CLEAN ENERGY CANADA

The Electrification and Energy Transition Panel - Written Submission

Date: June 23, 2023 | **Prepared by:** Evan Pivnick - Program Manager, Clean Energy and Rachel Doran - Director of Policy & Strategy

Clean Energy Canada is a climate and clean energy program within the Morris J. Wosk Centre for Dialogue at Simon Fraser University. Thank you for the opportunity to provide this submission in response to the Electrification and Energy Transition Panel's Open Call for Written Submission 2023.

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Summary of Recommendations

This submission focuses on four of the themes identified by the panel — Facilitating Economic Growth, Energy Planning, Governance and Accountability, and Emerging Technologies. The detailed submission outlines our broader perspective on each issue, but short answers to the panel's key questions are below:

Theme One: Energy Planning

Achieving Integrated, Long-term Energy Planning

Response to Question #3

The most important fuel to integrate into Ontario's long-term energy planning framework is natural gas. Because of the historic use of natural gas in Ontario for home heating and power generation, comprehensive planning of Ontario's energy needs will not be possible without the capacity to review, plan for and regulate both electricity and natural gas.

- *See section* ***Renew energy governance roles and integrate energy planning processes, including those for electricity and gas*** *for further detail.*

Response to Question #7

The Ministry of Energy should articulate the vision and objectives for their energy system. This provides a critical foundation for the development of policy, the modernization of regulation and governance and the communication with the public about the government's actions. IESO should be responsible for the development of a detailed resource plan that outlines how it plans to deliver on the objectives and direction laid out in the long term energy plan put forward by the government.

- *See section* ***Renew energy governance roles and integrate energy planning processes, including those for electricity and gas*** *for further detail*

Response to Question #10

A growing number of jurisdictions have developed comprehensive energy plans that complement their climate plans, including Quebec, the State of Washington and the State of Western Australia. Lessons learned from these jurisdictions include:

- The importance of explicitly centering net zero as an energy system objective;
- The opportunity to increase participation and transparency in energy planning;

- And, the need to renew energy governance roles and integrate energy planning processes, including those for electricity and gas.

- See section ***Part II - Energy Planning, Governance and Accountability*** for further detail

Improving the Long-term Planning Process and Outcomes

Response to Question #2

The three most critical outcomes for long-term energy planning are:

1) Supports net zero/decarbonization goals (e.g., GHG emission reductions). The global energy transition is what necessitates a change in energy planning processes. A clear net zero mandate is the most critical element to guide planning.
2) Enables effective decision-making. All actors need to both understand their role, and have a clear understanding of where the energy system is heading to guide their investments and actions.
3) Enables economically competitive industry (e.g., investment attraction). Business is looking for jurisdictions with abundant and available clean electricity. Planning for clean supply today will enable Ontario to be successful in the low-carbon economy.

- See section ***Part II - Energy Planning, Governance and Accountability*** for more detail.

Response to Question #6

Clean Energy Canada just completed a convening of experts on the electrification of Medium and Heavy-duty vehicles (MHDV) in British Columbia in spring 2023. While these recommendations are specific to B.C.'s energy landscape, they specifically identified the need to re-balance the risk and cost burden of infrastructure development and offset the costs of infrastructure upgrades for businesses looking to install charging infrastructure. Ontario could look to replicate what California has done, to use government funding to offset all grid-to-site costs and ensure individual ratepayers seeking to install charging infrastructure for electric vehicles are only charged for on-site costs.

Theme Two: Governance and Accountability

Governance and Oversight

Response to Question #1

IESO's mandate should be changed to enable a greater role in coordinating integrated energy planning between electricity and natural gas systems and expanded to include climate change mitigation. The OEB's mandate should be expanded to include climate change mitigation.

- *See section* ***Renew energy governance roles and integrate energy planning processes, including those for electricity and gas*** *for further detail*

Response to Question #2

The most important greenhouse gas emissions targets to include in energy planning are:

- An economy-wide net zero by 2050 target;
- A net-zero for the electricity sector by 2035.

These targets are widely held by other G7 nations and trading partners and will provide useful clarity to all actors interacting with the Ontario energy system.

- *See section* ***Explicitly center net-zero as an energy system objective*** *for further detail*

Theme Three: Emerging Technologies

The potential of emerging technologies in the short, medium, and long term

Response to Question #1

Renewable energy, specifically wind and solar, supports the decarbonization of the electricity sector and economic sectors more generally, and helps position clean electricity as a key, long term competitive advantage. In Ontario, wind can now produce electricity at a lower LCOE than a combined cycle natural gas power plant, with more cost reductions on the horizon. When paired with storage, variable renewables have more flexibility to target output during high-cost periods in the electricity market, and four- or eight-hour battery storage is a very cost-competitive way to address daily load management needs and contribute to the reliability of the system overall.

Distributed Energy Resources (DER) should also play a vital role in Ontario's future energy supply mix. In a study completed for IESO, across a range of scenarios that assumed different levels of both electricity demand and carbon price increases, sufficient, cost effective DER capacity was found to meet or exceed all incremental system needs.

- *See sections* ***Maximize the role of renewable energy and energy storage technologies*** and ***Maximize the role of distributed energy resources***

Role of the Province

Response to Question #8

In your recommendations, the panel can make an important contribution to addressing the barriers that limit DER deployment, including:

- Expanding opportunities for DERs to compete in future capacity procurements;
- Allowing further access to wholesale markets to increase revenue opportunities;
- Establishing a compensation framework for avoided transmission and distribution costs;
- Launching a process to consider and address other market barriers such as eligibility rules, building code and zoning barriers.

- *See section* ***Maximize the role of distributed energy resources*** *for further detail*

Theme Five: Facilitating Economic Growth

Response to Question #1

Ontario has the potential to be the clean manufacturing heartland of Canada, but needs a clear commitment to a fully decarbonized grid by 2035 to capitalize on existing competitive advantage. Specific existing Ontario sectors that can take advantage of a clean grid to meet global emerging demand for low-carbon products in the short-term include: the steel industry, EV manufacturing, the battery supply chain. In the medium to long term, hydrogen production, cement kiln heating and electrification of mining are all areas with electrification pathways.

- See section ***Leveraging clean electricity to secure Ontario economic competitiveness*** for further detail

Response to Question #2

Explicitly centering net zero as an objective and committing to decarbonization of the grid help provide a supportive investment environment for clean industry. In conjunction with direct investment, industries in Ontario will be well-positioned to take advantage of

emerging demand for low-carbon products (ie. battery supply chain, low-carbon building materials, etc.)

- See section ***Leveraging clean electricity to secure Ontario economic competitiveness*** for further detail

Detailed Submission

Part I - Economic Growth and Clean Electricity

Leveraging clean electricity to secure Ontario economic competitiveness

Previous decarbonization efforts emphasized emissions reductions, however, the past two years have seen an increased focus on securing the economic opportunities that come with the energy transition.

As of 2021, one-third of global market capitalization was covered by science-based net zero targets. As companies increasingly look to reduce their own risk exposure through sustainable finance accounting practices, they must disclose the emissions used in the consumption of purchased or acquired electricity, heat or steam (Scope 2 emissions) . Companies with robust net zero objectives then must either produce clean electricity, procure it by way of contract or obtain it directly through the grid in which they operate. Some studies have questioned the emissions reduction value of purchasing clean energy through renewable energy certificates, providing even more value for obtaining clean electricity directly from jurisdictions with cleaner grids. That means jurisdictions with cleaner grids are at a comparative advantage.

Major international companies looking to site their own facilities and along their own supply chains are measuring their Scope 2 energy emissions. Companies like General Motors (GM) and Volkswagen (VW) have already fully embraced net zero targets, with GM planning to source 100 percent renewable energy to power its canadian facilities by 2035, and VW targeting 2030.

The First Movers Coalition, a group of 55 corporate buyers including Apple, Ford, Volvo, and Vestas, have pledged to purchase a portion of their materials from suppliers using near-zero or zero-emission technologies, despite the premium cost. Similarly, a group of construction companies, developers, architects, and other businesses—including Orsted, Siemens Gamesa, and Maersk— have made "ConcreteZero" and "SteelZero" pledges to only

use net-zero concrete and steel by 2050. These commitments will require clean energy upstream to produce the zero-emission products required.

Ontario, as Canada's largest regional economy, with deep connections to numerous North American supply chains, has a unique opportunity to leverage the decarbonization of its electricity grid in order to secure new investments and enhance the competitiveness of key industries.

Ontario manufacturing industries are currently well placed to compete globally in the new market for low-carbon products, but are seeking to capitalize on this head start. For example, imported steel from the U.S., EU, and China is between 16% and 200% more carbon-intensive than steel made in Canada, depending on the production method. Investments in Ontario already announced by Algoma Steel Inc. and ArcelorMittal Dofasco in partnership with the provincial and federal governments demonstrate the desire to double down on this advantage to produce the low-carbon products of the future.

Specific existing Ontario sectors who can take advantage of a clean grid to meet global emerging demand for low-carbon products in the short-term include: the steel industry, EV manufacturing, the battery supply chain. In the medium to long term, hydrogen production, electrical chemical cracking, inert anode aluminum production, cement kiln heating and electrification of mining are all areas with electrification pathways.[1]

While Ontario's electricity system currently has a very competitive generation intensity, the IESO has forecast that electricity-related emissions may increase by 375% by 2030 relative to 2017—and 600% by 2040—largely due to the ramp-up of natural-gas-fired generating facilities to replace aging nuclear facilities.[2] Given that these power plants typically operate for decades, building new natural-gas-fired power plants means locking in emissions—and costs—for many years to come. Furthermore, we must take into account that as emissions increase, the emissions intensity of the grid - a competitive advantage today - will also rise, weakening our ability to leverage it to secure new investments. **Instead Ontario should be prioritizing the decarbonization of its grid, and emphasizing the role that clean electricity will play in positioning Ontario as the heartland of clean manufacturing for the North American energy transition.**

Clean Energy Canada convened experts along the battery supply chain to produce recommendations for increasing Canada's competitiveness in 2022. One of the group's key recommendations was to:

[1] See IEA Technology Perspectives 2023 for current TRL
[2] According to the Government of Canada's National Inventory Report (NIR) 2021, Ontario's electricity system has a generation intensity of 28g Co2e/kWh.

> *Ensure Canada maintains its clean battery advantage by working with industry, provinces, and electric utilities to assess the battery industry's power needs and immediately deploy affordable, reliable, clean energy resources and related transmission infrastructure to serve all parts of the battery supply chain, including off-grid mines.*

In the preparation of this submission, Clean Energy Canada undertook interviews[3] with companies along the EV battery supply chain and Ontario manufacturing sectors. Participants consistently referenced the availability of clean power as a key factor in their companies site selection processes:

> *"The availability of affordable and green electricity is of paramount importance in our investment decisions for the coming decade. The "clean" aspect of electricity plays a significant role in shaping our strategic choices. As a company committed to sustainability and environmental responsibility, we prioritize powering our factories with green energy sources. It not only helps us reduce our carbon footprint but also aligns with our values and the expectations of our stakeholders".*
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> ...
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> *"(We have) a full net zero commitment by 2050, by 2035 we have a facilities requirement for carbon-neutral footprint. We have done a lot of site assessments to understand what is happening in the environment we're in to make sure we make our targets. In many jurisdictions we won't make the targets if we rely on the grid... (When) we're looking at assessing sites across North America for future projects - we have an entire team looking at how we power our facilities and clean electricity is key to site selection".*

Federally, the Canadian government has set a target of achieving a net-zero grid by 2035. However, Canada is not alone in its recognition of 2035 as a key timeline in the electricity sector. G7 countries all committed in 2021 to achieve "predominantly decarbonised electricity sectors by 2035". As part of its G7 presidency, the UK requested an IEA assessment of the pathways to achieve this objective. The IEA concluded there was a "comprehensive and cost-effective route to achieve net zero electricity in the G7 without compromising energy security".

[3] Clean Energy Canada conducted interviews with the Steel Producers Association of Canada, General Motors of Canada, Volkswagen Canada, the Ontario Clean Technology Industry Association. Participants agreed to be quoted anonymously in "Chatham House Rules".

The United States, Canada's largest trading parter, has also set a goal of 100% carbon pollution-free[4] electricity by 2035. Clean generation—nuclear, hydropower, wind, solar, and more—is currently responsible for approximately 40% of the nation's electricity supply. However, significant investments in the Inflation Reduction Act and Bipartisan Infrastructure Law have made progress towards this goal, with the U.S. predicting that grid emissions could decline to 68%–78% below 2005 levels by 2030 as a result of these investments.

Securing federal funding to support electricity system investments

The federal government announced a suite of new investment tax credits in Budget 2023 which included a 15% refundable Clean Electricity Investment Tax Credit for "eligible investments in technologies that are required for the generation and storage of clean electricity and its transmission between provinces and territories, which is available to taxable and tax-exempt entities." This funding can help to both accelerate the deployment of clean electricity, as well as ensure that these grid investments do not fall on ratepayers alone, supporting the affordability of electricity.

In their recent paper, the Canadian Climate Institute estimates that the funding in budget 2023 may be worth at least $13.4 billion in funding support to Ontario specifically for clean electricity. However, the funding associated with the Clean Electricity Investment Tax Credit is only available if certain conditions are met, including "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". The details of these commitments are subject to consultation with provinces.

With billions in funding available, **it is essential that Ontario align its approach to energy planning with the requirements that will be established for accessing this funding.** This funding offers a unique opportunity for the costs of enhancing Ontario's energy security and economic competitiveness to be shared with the federal government.

Part II - Energy Planning, Governance and Accountability

Ontario currently relies on policy, governance and regulatory structures that are designed to manage and maintain the reliability of the existing grid and address the risk to society arising from economic monopolies. These structures are not properly equipped to lead the province through a transformation of our energy systems, enhance the economic

[4] The U.S. defines "clean energy" as including wind, solar, geothermal, hydropower, nuclear, biomass with and without carbon capture and sequestration, and fossil energy with carbon capture and sequestration.

competitiveness of key sectors or ensure Ontarians enjoy enhanced energy security through the transition.

To re-tool Ontario's long term energy planning to successfully navigate the energy transition, it will need to reform planning and operational governance structures and a more comprehensive approach to energy planning.. This work is complex but requires urgency. However, Ontario can manage the risks and opportunities through interjurisdictional learning.

Over the past several years, a growing number of jurisdictions have developed comprehensive energy plans that complement their climate plans, including Quebec, the State of Washington and the State of Western Australia. Comprehensive energy plans typically serve a number of functions:

- First, each of these plans provides a comprehensive framework for how the jurisdiction can cost-effectively navigate the energy transition, seize economic opportunities and ensure energy governance and regulation is fit for purpose.
- Second, they provide clear and timely guidance to all actors on the strategic actions that the jurisdiction is prioritizing in the short term. The decarbonization of the energy system is a long term project, but these plans can help identify urgent, or no-regrets steps to begin to make progress..
- Finally, these plans have been used as a vehicle to clearly identify and state the government's visions and objectives for all actors in the energy sector. Providing this direction is critical to address uncertainty, and ensure that energy reforms can be advanced across all of government and the economy.

While these energy plans are typically non-binding and serve as a vision document, they are written in such a way as to translate government priorities into actionable guidance for utilities and provide the legislative, regulatory or policy direction to ensure informed and aligned decision-making by regulators.

A review of both the processes used to develop these strategies, as well as a broader literature review suggests at least three best practices that will help guide the reform of Ontario's energy governance structures in a manner that supports the energy transition[5]: **Explicitly center net-zero as an energy system objective, improve participation and transparency, and renew energy governance roles.**

[5] This includes the International Renewable Energy Agency's (IRENA) *RE-organising power systems for the transition*, Gattinger and Associates' *Net Zero: An International Review of Energy Delivery System Policy and Regulation for Canadian Energy Decision Makers* and Electricity Canada's *Back to Bonbright: Economic Regulation Fundamentals can Enable Net Zero*.

Explicitly center net-zero as an energy system objective

Perhaps the most important action that the government must take in order to align a renewed long-term energy planning process with the ongoing energy transition is to clearly articulate the greenhouse gas emission reduction targets that it is seeking to accomplish, and embed this target in the mandates of relevant energy actors.

This missing signal is having a significant impact on the ability of the Independent Electricity System Operator ("IESO"), the Ontario Energy Board ("OEB"), utilities, industries and other stakeholders to plan and deploy cost effective resources and policies. In the Pathways to Decarbonization, IESO highlights clarity on emission targets as a critical piece of establishing the policy certainty needed to guide grid investments, effectively integrate new technologies and support the decarbonization of other stakeholders.

In establishing clear emissions-reduction targets of:

- Achieving a net-zero emissions economy wide by 2050
- Achieving net-zero emissions from the electricity sector by 2035

the Ontario government would be aligning with its trading partners and major economic actors. To ensure these targets are translated into concrete actions in the energy sector, it will also be important that these targets are embedded in the mandates of key government energy stakeholders — particularly the IESO and the OEB. Currently, both the Ontario Energy Board Act and the Electricity Act lack meaningful reference to the achievement of net-zero or climate targets.

Improve participation and transparency

As part of the energy transition, a variety of actors will move from passive consumers to a more active role, with perspectives on the design, planning and operation of the power system. These include:

- Businesses offering new utility-scale services (e.g. flexibility offered via storage resources),
- Smaller stakeholders interacting with distribution grids in new ways (e.g. households using distributed energy resources such as electric vehicles or roof-top solar to both draw and provide power to the grid);
- New, larger actors interacting indirectly with the energy system (e.g. industry coupling leading to a company both drawing electricity and providing other energy services to the grid).

Engaging these new actors will require enhancing the transparency of system planning and operation, as well as increasing public engagement.

A renewed long-term energy plan should be the result of substantive engagement with both traditional and new stakeholders, energy system actors and the general public. The State of Washington used a collaborative development process for its energy strategy, including: the establishment of an Advisory Committee that brought together legislators, government officials and representatives of civic organizations, energy and utility businesses, as well as public interest advocates, forums for public comment and a more formal public hearing to gather input on the draft strategy. .

In their study of Ontario's grid modernization opportunity, the Toronto Atmospheric Fund specifically cited the need for enhancing the transparency and public participation in energy discussions as key feedback from large businesses, rural representatives, Indigenous groups and equity-deserving groups.

Renew energy governance roles and integrate energy planning processes, including those for electricity and gas

Proper regulatory structures are essential to center net-zero objectives within the traditional economic regulation of the energy system. Clean Energy Canada supports the characterization of the three distinct roles as outlined in Electricity Canada's recent publication *Back to Bonbright: Economic regulation fundamentals can enable net zero*:

Elected Government	**Independent Regulators**	**Utilities/System-operators**
Set clear, outcome-based policy to provide regulators and utilities a common understanding of required objectives and outcomes.	Sufficiently resourced and empowered to review, reject, modify, or approve an increased number of novel proposals.	Provided the flexibility to make innovative proposals with respect to investments, rate-setting structures, incentive structures, benefit-cost assessments, and rate design.

This general break-down of roles and responsibilities should be used to guide the new updated long-term planning process. Importantly, the government retains a key role in articulating clear, outcome based policies and objectives that drive the actions of regulators, system-operators and utilities. However, they should leave decisions regarding the procurement of specific resources to the system operator while enhancing the independent oversight via an enhanced role for the OEB in reviewing the resource plans put forward by the IESO.

One key change for Ontario will be to integrate planning processes for natural gas and electricity and empower IESO to plan for both. The integration of planning and regulation between electricity and gas will be essential to avoiding stranded assets, manage consumer costs, etc. As outlined in a March 2023 report by the Building Decarbonization Coalition, without intervention, gas utilities alone are not properly incentivized to provide safe and reliable service at just and reasonable rates over the course of the energy transition.

More specifically, there are additional functions that the government, the OEB and the IESO should all fulfill in a renewed long term energy planning process:

1. **The Government of Ontario should:**
    - Articulate the vision and objectives for their energy system. This provides a critical foundation for the development of policy, the modernization of regulation and governance and the communication with the public about the government's actions.
        - Ontario's objectives should reflect the priorities of economic development including leveraging our own clean energy to attract investment and improve the competitiveness of key economic sectors, affordability, meaningful economic reconciliation with Indigenous communities and emissions reduction. These objectives need to be easily translated into actionable direction for energy system actors.
    - It is important to note that while specific, these "energy plans" are intended to guide - not substitute for- the more detailed work of system planners and utilities.

2. **The OEB should:**
    - Have a clarified role to support net-zero objectives embedded in its mandate. This expanded mandate should:
        - Expanded role providing oversight of a long-term resource plan developed by the IESO, informed by clear objectives set out by the government. This ensures there will be an independent economic assessment of resource planning, while ensuring that the regulator is also considering how to deliver on net-zero objectives.

3. **The IESO should:**
    - Be responsible for the development of a detailed resource plan that outlines how IESO plans to deliver on the objectives and direction laid out in the long term energy plan put forward by the government.

    - This plan should allow for regular, iterative additions as new priorities emerge, informed by an ongoing dialogue between the IESO, the OEB and the government, as well as informed by engagement with external stakeholders..
    - For example, in British Columbia, the Integrated Resource Plan ("IRP"), drafted by B.C. Hydro and subject to approval by the British Columbia Utilities Commission, recently recommended "a new living long-term resource plan cycle" with more regular long term resource plan filings that are better able to match the potential pace of change during the energy transition.
- Have an expanded role overseeing natural gas planning. One of the main benefits of long term energy planning is the ability to address siloed planning across different energy sources (natural gas and electricity in particular) to have a clear understanding of anticipated demand of different energy sources but also to be able to weigh alternatives in various applications.
    - For example, New York State started the process in 2020 to integrate planning for natural gas and electricity. They noted that comprehensive planning helps with affordability, as it ensures that only necessary natural gas infrastructure is built as various end uses move towards electrification.

Part III - Emerging Technologies

Preparing Ontario and its energy systems for the energy transition is in large part about shifting from unabated fossil fuels to renewable energy, energy efficiency and enhanced flexibility. As noted above, this will be marked by a shift from a more centralized electricity system to a distributed system with a greater variety of technologies and actors providing services and power to a flexible grid. Without question, this transformation must take place in the context of preserving both grid reliability and affordability for people and businesses. Done correctly, the deployment of renewable energy and other emerging technologies will offer new economic and energy security opportunities.

To best manage this shift in technology, there are a number of key considerations:

Shift from natural gas as a first choice, to a last resort

In order to ensure that new clean technologies can be deployed at the scale required, Ontario must make a shift in how it views and deploys natural gas. Currently, natural gas is leveraged as a versatile resource that offers easy solutions to a variety of energy system

needs. **However, going forward, it is critical that our perspective of natural gas shifts to being seen as a resource of last resort.**

The reality is Ontario already has a lot of information available that points to the province's ability to meet the goal of a net-zero electricity grid by 2035. In late 2022, the Toronto Atmospheric Fund (TAF) commissioned Power Advisory LLC to model a number of scenarios for Ontario's electricity system to achieve net-zero emissions by 2035. This analysis found that there were multiple pathways to achieving net-zero emission by 2035, and that these pathways could be pursued cost-effectively if the right choices were taken. Importantly, all of the scenarios greatly limited the role of natural gas, playing as little as 3% of all generation in 2035 (with the assumption that emerging technologies like carbon capture and storage, or carbon offsets would account from the remaining emissions).

Reducing the role of natural gas to a last resort is also backed up by analysis released by RBC, which highlights that "technology [already] exists that Ontario can use to navigate the looming demand rush and delay committing fully to natural gas-powered generation.

Maximize the role of renewable energy and energy storage technologies

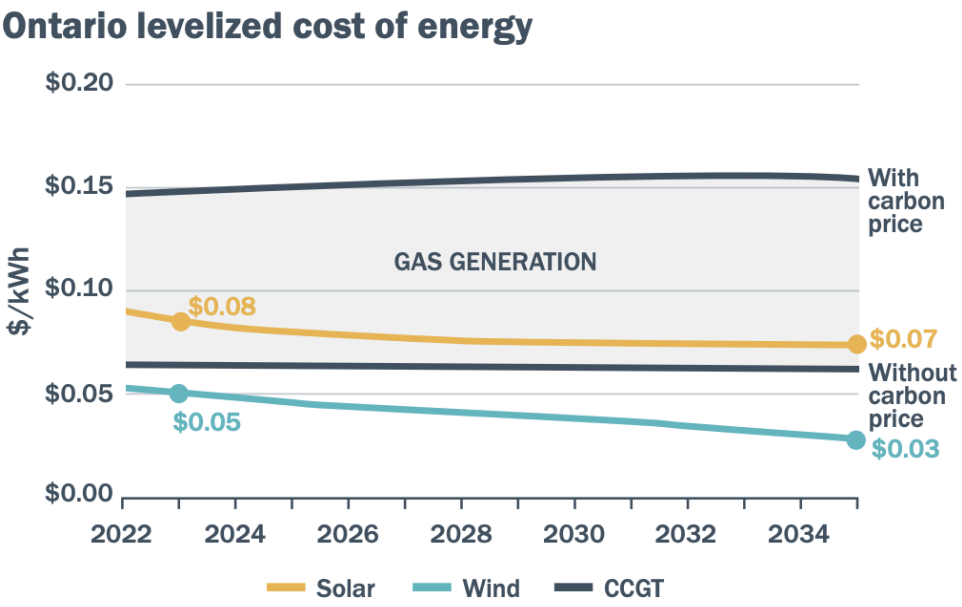
Across both the TAF commissioned scenarios and the IESO's own pathways to decarbonization, renewable energy technologies - specifically wind and solar energy - are shown to play a significant role in meeting Ontario long-term energy needs. While Ontario needs to work to integrate more energy generation from a variety of sources, **Ontario should prioritize the contributions that wind, solar and energy storage technologies can make to meet the province's growing energy needs.** These resources can produce power more cheaply, support the decarbonization of the electricity sector and economic sectors more generally, and help position clean electricity as a key, long term competitive advantage.

While the IESO limited onshore wind potential to 15,800MW in its Pathways to Decarbonization report due to site quality, regulatory requirements and distance to transmission infrastructure, this does demonstrate that the 7.4-12.7 GW of incremental capacity additions of wind (compared to APO 2022 Case 1) found in TAF's report are feasible. In fact, TAF's scenario found that "[w]ind generation is the single highest contributor across scenarios, with between 27 and 44 TWh of increased output" required by 2035. The IESO saw 5.23 GW of incremental capacity additions of wind (compared to APO 2022 Case 1).

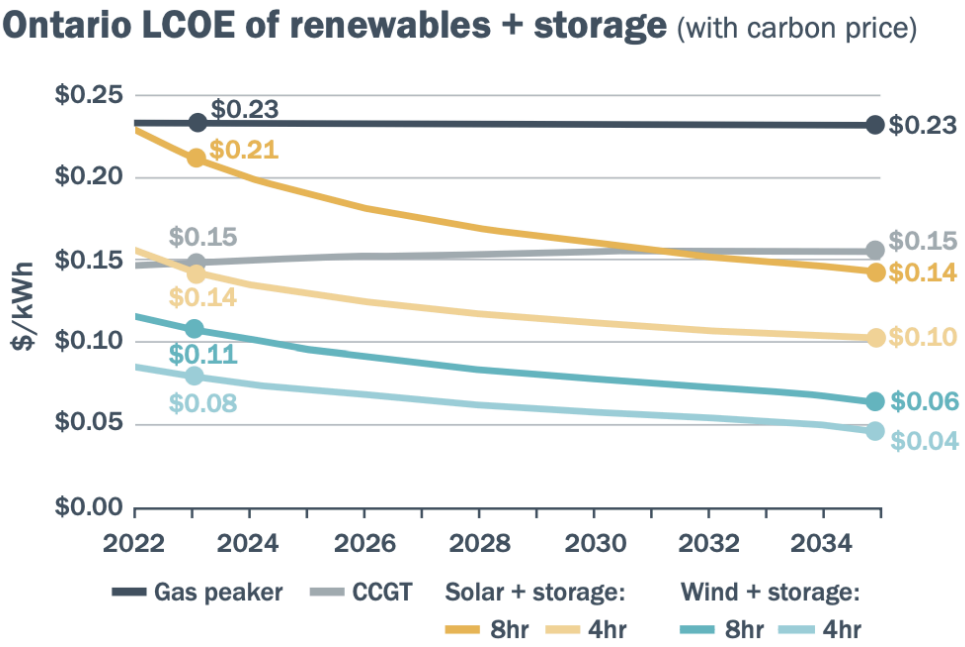
When it comes to solar, TAF's scenarios saw between 3.5-5.5 GW of incremental capacity additions of solar (compared to APO 2022 Case 1), which is consistent with the 5.57 GW of

incremental capacity additions of solar (compared to APO 2022 Case 1) found in IESO Pathways to Decarbonization report natural gas moratorium scenario. Of note, wind demonstrates a higher generation profile in winter, aligning better with the future system requirements as Ontario shifts from summer to winter peaking system, compared to solar which may see more limited deployment in a winter peaking system.

A major driver of wind and solar deployment is the significant cost reductions that these technologies have seen over the previous decade. Clean Energy Canada looked at the cost of key renewable energy technologies earlier this year, and made a number of important findings. First, electricity from wind and solar is already cost-competitive with natural gas in Ontario. When we take into account the carbon price, both wind and solar are significantly cheaper and are expected to decline by as much as 40% by 2035.



While cost is only one consideration, the relative price competitiveness of renewables - especially wind - offers real opportunities to make it a larger share of how Ontario powers its grid. This fact is complimented by our second finding, that when paired with energy storage, wind and solar are able to offer dispatchable power at more competitive prices than natural gas.



By adding energy storage, variable renewables have more flexibility to target output during high-cost periods in the electricity market, irrespective of whether the sun is shining or the wind is blowing. Through the integration of four- or eight-hour battery storage, wind and solar power can be redeployed to address the hour-to-hour and day-to-day energy peaks. While additional energy storage solutions will be needed to help manage seasonal peaks, four- or eight-hour battery storage is a very cost-competitive way to address daily load management needs and contribute to the reliability of the system overall. Like renewables, battery technologies stand to see significant declines in cost, as innovation in battery chemistries increases their effectiveness and we reach economies of scale.

Maximize the role of distributed energy resources

RBC has estimated that DERs integrated into smart homes could save Ontario ratepayers $500 million annually. The IESO also commissioned Dunksy to examine the types and volumes of distributed energy resources (DERs) that could emerge over the next decade (2023-2032), and the ability these DERs had to contribute to the province's emerging system needs. The findings of this report demonstrate that **DERs hold an immense technical potential to play a vital role in the future energy supply mix. Addressing the barriers that limit their deployment and shrinking the gap between the economic potential and achievable potential should be a priority.**

Across a range of scenarios that assumed different levels of both electricity demand and carbon price increases, sufficient, cost effective DER capacity was found to meet or exceed

all incremental system needs. This corresponded to meeting 146-273% of the incremental summer peak and 106-311% of the incremental winter peaks in 2032.

Importantly, the achievable potential (which factored in the real-world conditions and constraints) was found to be modestly lower, meeting 39%-62% of the expected incremental summer demand and 27%-100% of expected incremental winter demand.[6] This gap is caused by a variety of factors and barriers that currently limit DERs from playing the full role they could in addressing the vast majority of Ontario incremental energy needs. Clean Energy Canada would support the panel making recommendations to address some of the barriers specified, including:

- Expanding opportunities for DERs to compete in future capacity procurements;
- Allowing further access to wholesale markets to increase revenue opportunities
- Establishing a compensation framework for avoided T&D costs
- Launching a process to consider and address other market barriers such as eligibility rules, building code and zoning barriers.

To help guide the panel's consideration of short-term and long-term priorities to advance DERs, Dunsky specified that:

> *In the short-term, under all scenarios, the largest cost-effective DER opportunities are found in large commercial and industrial lighting, HVAC, water heating and other load segment-specific load flexibility opportunities. Over time, FTM battery storage and solar PV deployments become increasingly cost-effective, due to technology cost reductions and increases in wholesale energy prices (driven by increased demand and higher carbon prices and carbon price exposure). Similarly, larger BTM storage deployments in the commercial and industrial sectors (that benefit from economies of scale) offer notable economic potential. Passenger and fleet EV smart charging and V2B/G measures offer cost-effective DER opportunities, with limited volumes of potential in the early years of the study, but growing dramatically as EV adoption increases in the latter years of the study period.*

Build a culture of innovation

The transformation of the energy system will require the ability to deal with considerable uncertainty, including the unknowns regarding the cost effectiveness and long term costs declines of different technologies as well as the benefits and challenges that a more decentralized and diverse mix of resources will represent. Jurisdictions that are moving

[6] The high potential to meet winter demand is largely due to the "business-as-usual scenario", where only 0.9GW of incremental system needs in winter 2032 were identified, compared to 1.0GW of achievable potential from DERs. If only the BAU+ and Accelerated scenarios are considered, the DER achievable potential represents 27%-28% of incremental system need.

quickly to decarbonize their electricity systems share an important characteristic - they have established mechanisms and a culture that embraces innovation. **It will be essential that Ontario's energy actors embrace new approaches that foster innovation, experimentation and the integration of new technologies, in order to identify the optimal, cost effective pathways to achieving its energy system objectives.**

Innovation will be needed right across the energy system. As Electricity Canada points out, this includes both utility innovation in proposals for meeting energy demand, as well as regulator innovation in reviewing and approving proposals. In Western Australia, Technology trials and pilot projects have played a critical role in informing their energy transformation strategy, with more than 20 trials of new technologies undertaken across hundreds of sites as of 2021.

Parts of Ontario have already started to embrace the need for greater innovation and a willingness to try new approaches. Powershare, the first fully Integrated Distribution System Operator Project in North America, is a project that will see Essex Powerlines transition from a poles-and-wires utility model to an energy management services model. Supported by IESO and the OEB, this type of experimentation is critical, and should be expanded to include the integration of new technologies, especially energy storage and DERs, both of which can face structural barriers despite significant benefits to the Ontario grid.

Employ independent pathway assessments as a recurring and ongoing tool

The Ontario government has already taken a crucial first step in commissioning an independent assessment of the cost-effective energy pathways to support the province's energy transition.

It will be important to make this independent assessment an ongoing process, with a regular update occurring not less than every 5 years. The energy transition is marked by considerable uncertainty regarding the pace of innovation, cost declines, technological advancement and interjurisdictional learning. Regular updates will ensure that the latest costs, data and assumptions can provide the best available information for greater certainty.

It will also be important that the government take the opportunity to consult broadly with stakeholders regarding the findings of the independent pathway assessments. Enhancing participation and transparency will be critical in achieving the cost-effective and timely decarbonization of the economy. Engagement also offers a critical opportunity for the government to test outcomes and see the real time choices that economic actors are making. Applying this real world filter will ensure that government decision making isn't solely reliant on modelling, and that future pathway assessments can leverage real time information.