

Introduction

The Atmospheric Fund would first like to commend the Independent Electricity System Operator (IESO) on completing the Pathways to Decarbonization (P2D) study. This report represents an important first step in the transition to a clean, reliable, and affordable grid and is a valuable resource in considering the future of Ontario's electricity system. We recognize that decarbonization requires a transformational shift to grid planning and operations, but swift action is critical to meeting our climate objectives and aligning with forthcoming federal regulations. Taking decisive action now will also be more cost-effective in the long run and will allow greater flexibility in implementing Ontario's long-term plan.

There are various pathways to decarbonizing the grid, many of which include proven and cost-effective solutions that we can prioritize and action today, such as energy efficiency and distributed energy resources (DERs). We should optimize our use of electricity and utilization of the grid prior to looking to new bulk supply. At the same time, we should be laying the groundwork for longer lead-time investments, including strategic upgrades to our transmission system, to enable the deployment of cost-effective, non-emitting resources like utility-scale wind, solar, and storage.

While innovation is important, and emerging technologies should continue to be explored in parallel, there is little need to rely so heavily on nascent resources such as hydrogen when we can prioritize the most cost-effective and proven solutions instead. By making strategic investments in low-carbon solutions now, it will buy us time to see which technologies scale best, prove to be economically viable, and can be implemented by the end of the decade.

Summary of Main Topics

The IESO's "No-Regret" Recommendations

As stated above, the P2D study is a comprehensive report with several prudent "no regret" actions, many of which are consistent with a net-zero future. It is especially encouraging to see recommendations to accelerate investments in conservation and demand management, as well as the need to start the work on long lead-time investments, such as transmission. We also support breaking down regulatory barriers to ensure Ontario's energy planning process is conducive to the scale and pace of the investments needed. Given the expected pace of electrification over the next two decades, long-term planning of Ontario's natural gas and electricity systems must be coordinated to ensure ratepayers are not left paying for stranded assets. Finally, investing in a labour force that can build and operate the infrastructure needed over the next four decades is essential to the success of our energy transition. ***While the study identifies important steps and priorities toward decarbonization, the province and the IESO should address remaining gaps during the forthcoming long-term energy planning process.***

Demand-Side Optimization Needs to Play a More Central Role

Despite being the most cost-effective strategy at our disposal, demand-side optimization through energy efficiency and demand-responsive DERs was not adequately explored in the IESO's report. [Ontario is well behind](#) many other North American jurisdictions in energy efficiency, an approach that improves health outcomes and avoids over-building of generation assets. The IESO's own [Conservation and Demand Management \(CDM\) mid-term review](#), released in December 2022, indicates that Ontario has fallen behind [comparable jurisdictions](#) not only in spending on energy efficiency, but also in leveraging the corresponding savings. The most cost-effective megawatt is usually the one avoided in the first place, as supported by the IESO's [Achievable Potential Study](#) in 2019 and subsequent update in 2022.

A successful energy transition will also rely on our ability to produce, store, and manage clean electricity close to where it is needed through DERs. This includes optimizing the use of demand-responsive loads (e.g. smart electric vehicle charging, space heating and cooling paired with smart thermostats, etc.), and enabling investments in local generation and storage, such as distributed solar and batteries. The IESO recently published [a study on the potential of DERs](#), showing that DERs have a vital and cost-effective role to play in meeting our upcoming energy needs. The study shows economic potential for DERs to meet 100% of Ontario's incremental capacity needs over the next decade, with up to seven dollars in economic benefits for every dollar invested.

In pursuing an expanded role for CDM and/or DER programming to achieve its resource adequacy needs, the IESO should also collaborate more closely with Local Distribution Companies (LDCs) and municipalities. The Ministry and the IESO have encouraged LDCs to [develop their own](#) local, rate-based CDM or DER programs based on avoided distribution infrastructure costs, and the Minister has [previously recognized](#) the value that leveraging those existing relationships with customers can provide to both ratepayers and the grid itself. The ability for LDCs and local communities to contract directly with DER and CDM activities is critical to realizing energy and cost savings both in the short and long term, and supporting innovation and growth in the province. ***Ontario should immediately prioritize demand-side optimization through energy efficiency and demand-responsive DERs, with an expanded role for LDCs and municipalities, a cost-effective strategy that should form a central pillar of its energy transition.***

Investment in Low-Cost Renewables Well Below Comparable Studies

For a study that emphasizes decarbonization and affordability, it is surprising the limited role that wind and solar play in both the Moratorium and Pathways scenarios modelled by the IESO. Both are inexpensive and proven technologies that together made up [75% of new installed capacity globally](#) in 2021. Less than a gigawatt of wind is added to the system by 2035 in the IESO's Moratorium scenario, and wind, solar, and storage make up less than 30% of total capacity in Ontario by 2050 in the Pathways scenario (compared to [57-67%](#) and [over 90%](#) in similar studies recently published by Enbridge Gas and the David Suzuki Foundation, respectively).

While we understand that renewables present unique challenges when it comes to grid integration, they are by far the cheapest sources of new supply. The cost of wind and solar have dropped by [66% and 84%](#), respectively, since 2009. New capacity can be brought online at unit costs significantly lower than existing supply referenced in the Resource Table attached to the ERO posting. The economic case for wind and solar only further improves when accounting for the recently announced [federal refundable tax credits](#). If these proven low-carbon solutions are not pursued, Ontario would be leaving federal money on the table, when instead these tax credits could be used to both stabilize investments and safeguard affordability for all Ontarians. **Ontario should leverage the low cost of renewables and related federal refundable tax credits to make strategic investments in wind and solar, the cheapest sources of new supply, supported by current and future procurements of utility-scale storage.**

Overreliance on Transmission-Connected Supply Over Local Solutions

While the IESO's P2D study acknowledges that DERs can play a critical role in the future, the lack of consideration and investment directed towards distribution-connected resources will lead to a massive build out of transmission-connected supply instead. Among other things, this would necessitate significant investments in new transmission in already space-constrained corridors. As noted above, the IESO's own [DER Potential Study](#) communicated the enormous potential for local generation, storage, and demand-responsive loads to significantly offset the need for new bulk energy supply. Compared to large-scale, centralized energy infrastructure, local generation and other DERs are faster and easier to site and build, require less investment in enabling transmission and distribution infrastructure, and provide direct economic benefits to the businesses, households, and communities that host them. The regulatory framework governing DERs must evolve in the coming months to ensure LDCs can receive appropriate remuneration for contracts offered to DERs. These resources should, in turn, be fully compensated for the services they provide to the grid. Failure to compensate local, distributed solutions will create significant market inefficiencies, increase the burden on ratepayers and taxpayers, and will leave Ontario behind comparable jurisdictions in North America. **Ontario should support the development of local and distributed solutions to limit the need for additional bulk supply and the expansion of transmission and distribution grids, at a positive rate of return when accounting for overall system benefits and costs.**

A Large Bet on Hydrogen, Despite the Lack of a Mature and Proven Market

Hydrogen can be a useful resource as long-term/seasonal storage, and a valuable tool in integrating renewables and providing reliability. Long-term storage is a critical gap in the electricity system that will likely be filled with an emerging technology or resource, green hydrogen being a promising candidate. However, it should not be relied upon to meet baseload or intermediate demand, given the more proven and cost-effective alternatives available. The scale of hydrogen expansion contemplated in the Pathways scenario reflects a 15,000 MW bet on hydrogen without addressing where and how it will be produced. This ignores the potential lifecycle emissions resulting from the production of hydrogen, a gap that [we hope will be addressed by the Federal government](#) in their forthcoming Clean Electricity Regulations (CER).

If produced from natural gas (i.e. “grey or blue hydrogen”), the resulting fugitive methane emissions might result in a net increase in lifecycle emissions, even if the carbon dioxide produced during the steam reformation process was fully captured. If produced via electrolysis from nuclear power or wind and solar (i.e. “pink or green hydrogen”), this would require additional electricity generation capacity. This type of hydrogen would effectively be a form of energy storage with low roundtrip efficiency. Again, there is no need to rely so heavily on a resource that has yet to demonstrate technical and economic feasibility when we have proven and cost-effective solutions we can prioritize instead. **Ontario should not rely so heavily on hydrogen given the deep uncertainties around the future availability of hydrogen supplies and transportation infrastructure, and the associated carbon intensity of those supplies.**

Misalignment with the CER and Ontario’s Clean Energy Advantage

Neither scenario presented by the IESO in this study is in alignment with the forthcoming federal CER. While some gas-fired capacity is needed over the next decade to ensure the reliability of the electricity system, we need a plan that will enable Ontario to have a largely decarbonized grid by 2035. As stated in [Ontario’s 2023 budget](#), “clean energy has become an economic imperative as companies around the world want to invest in jurisdictions with affordable, reliable, and clean energy.” As other North American jurisdictions look to decarbonize rapidly over the next decade, Ontario needs to make the necessary investments now to reinforce the province’s clean energy advantage. Without a pathway towards a net-zero grid by 2035, Ontario will be out of step with federal regulations and risk losing its competitive advantage against other jurisdictions in North America. **Ontario should plan for a net-zero grid by 2035, with the use of gas plants limited to a backup role and total emissions low enough to be offset by a mechanism specified by federal regulations.**

Consultation Questions

#3 – The IESO’s Pathways Study shows that natural gas-fired generation will need to continue to play an important role in the system for reliability in the short to medium term. The IESO’s assessment shows that most of the projected Ontario demand in 2035 can be met with the build out of non-emitting sources, but some natural gas will still be required to address local needs and provide the services necessary to operate the system reliably.

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) as a result of electrification and fuel switching?

We recognize that natural gas will play a strategic reliability role in Ontario over the next decade. However, procuring additional natural gas capacity at this critical time is contrary to planning for future compliance with the CER. This strategy is incompatible with low-carbon strategies adopted by many local governments and risks leaving ratepayers on the hook for potential contractual penalties.

Instead, additional investment in clean energy resources is necessary to ensure affordability as we transition to a net-zero grid that enables economy-wide electrification.

We should be pursuing energy efficiency and optimization of our grid through DERs to limit the need for new bulk supply. In parallel, we should be planning for and pursuing strategic investments in wind and solar, the [cheapest sources](#) of new supply. These resources are further enabled in our system by Ontario's ongoing procurement of 2,500 MW of storage. A [2023 study](#) by Clean Energy Canada found that even when paired with battery storage, wind and solar are cost-competitive with alternatives such as natural gas peaker plants. Recently announced federal [investment tax credits](#) have only contributed to the economic viability of these resources.

The Canadian Climate Institute projects that Canadians will [spend less](#) on total energy costs as a result of widespread electrification. This is in part due to the fact that electric equipment (e.g. electric vehicles, heat pumps) is more efficient than their fossil fuel counterparts. Energy costs will also be more *predictable* as fossil fuel prices have proven to be incredibly volatile and subject to global shocks. Further, the province is nowhere near the point of variable renewable energy (VRE) penetration at which further investment in new VRE resources would raise costs for consumers. There are still significant cost savings opportunities available to Ontario by increasing the share of renewable energy in the system. Wind and solar can meet a substantial amount of the upcoming energy need at much lower unit costs.

#4 - The IESO's Pathways Study highlights emerging investment needs in new electricity infrastructure due to increasing electricity demand over the outlook of the study. The IESO pathway assessment illustrates a system designed to meet projected demand peaks almost three times the size of today by 2050, at an estimated capital cost of \$375 billion to \$425 billion, in addition to the current system and committed procurements. Please see supporting materials for illustrative charts on capacity factor and cost by resource type.

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?

Though the P2D study presented the estimated capital cost at \$375 billion to \$425 billion, we have not yet seen a comparison scenario with business as usual (BAU). Many have conflated the cost of decarbonizing our grid with the cost of BAU, where we ramp up fossil fuels to meet demand. Demand growth due to electrification of transportation, heating, and other end-uses must be seen as part of a BAU scenario, given clear global trends. Investments in the grid are largely a reallocation of capital that would otherwise be invested in other energy systems if we continued to rely on fossil fuels for our energy needs. Whatever Ontario decides to build, unprecedented investments in new electricity infrastructure are needed over the coming decades, with the IESO [projecting demand to almost double](#) (with marginal investments in energy efficiency) by 2050. We look forward to the Ministry's forthcoming Cost-Effective Energy Pathways study and are optimistic it will provide a holistic picture of the overall costs, savings, and benefits of economy-wide electrification and the energy transition.

Further, TAF has concerns with the framing around intermittent and renewable sources of electricity and their ability to contribute to an affordable and reliable grid. The leading questions around clean energy resources reflect a bias for a certain set of solutions, a bias that should not

be present in any consultation, especially one central to the future of Ontario's energy system and economy. In addition, the costs for wind and solar presented in the Resource Type table are misleading and well above the current and projected costs of wind and solar. The National Renewable Energy Laboratory's [2022 Annual Technology Baseline](#), the primary resource from which cost assumptions underpinning the IESO's P2D study are drawn from, reflect costs for wind and solar that are 2-9x lower than that presented in the attached Resource Table.

Ontario should enable greater investment in CDM, DERs, and proven, cost-effective solutions like wind, solar, and storage to reduce costs for ratepayers. By optimizing the use of the grid through increased prioritization of energy efficiency and demand-side flexibility and resources, this will limit the need for bulk supply and reduce the burden on ratepayers. Cost-effective investments in energy efficiency and DERs can be acted on immediately and will extend the time horizon in which to lay the groundwork for longer lead-time investments in transmission and utility-scale solar, wind, and storage.

#5 – The IESO's Pathways Study recommends that for a zero-emissions grid by 2050, investment and innovation in hydrogen (or other low-carbon fuels) capacity could be required to replace the flexibility that natural gas currently provides the electricity system.

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 can be a useful resource as long-term/seasonal storage, and a valuable tool in integrating renewables and providing reliability. Long-term storage is a critical gap in the electricity system that will likely be filled with an emerging technology or resource, green hydrogen being a promising candidate. However, it should not be relied upon to meet baseload or intermediate demand, given the more proven and cost-effective alternatives available. The scale of hydrogen expansion contemplated in the Pathways scenario reflects a 15,000 MW bet on hydrogen without addressing where it will be produced. If produced out of province, this ignores the potential lifecycle emissions resulting from the production of hydrogen, a gap that [we hope will be addressed by the Federal government](#) in their forthcoming CER. A significant portion will still likely need to be produced in Ontario and, if green, would require additional electricity generation and capacity. **While hydrogen has shown promise in playing a future but specific role in our energy system, Ontario should not rely so heavily on a resource that has yet to demonstrate technical and economic feasibility over proven and cost-effective solutions.**

#6 – The IESO's Pathways Study recommends greater investment in new non-emitting supply, including energy efficiency programs.

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?

TAF firmly supports the IESO's recommendation to enhance energy efficiency programs in the province. [Ontario is well behind](#) many other North American jurisdictions in energy efficiency, an approach that improves health outcomes and avoids over-building of generation assets. As further outlined in Minister Smith's [April 2022 directive to the IESO](#), "energy efficiency programs can cost-effectively reduce demand and offset the need for additional supply, as economic growth and decarbonization efforts contribute to electricity demand growth across the province."

The IESO's next framework must ensure that all cost-effective investments in energy efficiency are pursued and evaluated against the marginal cost of additional supply, inclusive of the avoided costs of new energy, capacity, and transmission. In line with recommendations in the [2021-2024 CDM Framework Mid-Term Review](#), CDM should be fully integrated in broader planning efforts as a resource that is evaluated alongside new supply. This will address upcoming energy and capacity adequacy needs, while shifting away from time-limited programs dependent on short-term budget allocations.

To ensure the successful uptake of available energy efficiency programs, the IESO and their delivery partners should prioritize sufficient marketing budgets and a seamless user experience. This should include outreach and engagement with low- and moderate-income groups, who stand to benefit the most from incentive programs. These incentives can also be targeted to provide localized relief in constrained areas of the grid, to ensure investments are prioritized where they can offer the largest system benefit.

In expanding CDM programming, the IESO should give consideration to collaborating more closely with LDCs and municipalities. The Ministry and the IESO have encouraged LDCs to [develop their own](#) local, rate-based CDM or DER programs based on avoided distribution infrastructure costs. There is extensive overlap between CDM/DER measures that can avoid local distribution costs, and those that can avoid system-wide supply, capacity, and transmission-related costs. Given the proven benefits of single-window access to efficiency incentives, it would make sense to encourage integration (e.g. local adders and LDC marketing) rather than having LDCs to operate separate programs limited to gaps in province-wide IESO programming. As the [Minister has stated](#), "by the IESO working together with local distribution companies, which can leverage their close customer connections, there are opportunities to provide value for ratepayers and support both local and system reliability."

It is notable that based on the IESO's P2D assumptions, the single biggest driver of incremental capacity and energy needs is increasing winter peak demand, resulting from electrification of heating. Over the next 15 years, the IESO has projected that this increase in demand will primarily result from the use of electric heating in new homes and buildings. This highlights a major gap in CDM programming – there is currently no CDM program for new construction. Given that heating loads in new homes and buildings is the biggest driver of mid-term energy and capacity needs in a decarbonization scenario, the next conservation framework should include programs to support thermal efficiency in new construction. Key measures should include above-code levels of insulation and airtightness, as well as ground-source heat pumps (GSHPs). While both air-source heat pumps and GSHPs are highly efficient, the peak electrical load of a building heated with GSHP is [approximately 58% lower](#) than one heated with ASHPs.

Considering that the most expensive component of a GSHP (the ground loop) has a 50+ year lifespan, the value proposition in avoided capacity, energy, and transmission costs is clear. With Ontario targeting construction of 1.5 million homes over the next decade, there is a one-time opportunity to make these homes as thermally efficient as possible.

#8 – The IESO’s Pathways Study suggest that significant transmission capacity will be needed to help balance intermittent sources of electricity (e.g., wind and solar) and to ensure cost-effective supply can be delivered to meet growing demands from electrification and economic growth.

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?

Ontario’s grid will look substantially different than the one that exists today, both due to load growth resulting from widespread electrification, as well as increased reliance on low-cost and intermittent resources. ***The IESO should prioritize the development of a net-zero transmission study and subsequent action plan to identify and prioritize transmission facilities that are critical to this future transmission network and explore potential streamlining for regulatory and permitting approvals.*** Any study, long-term plan, or project related to transmission expansion must be developed in consideration of and in collaboration with municipalities and Indigenous communities to identify and mitigate potential impacts, and to ensure benefits from these future projects can be realized by these communities.

#9 - Do you have any additional feedback on the IESO’s “no-regret” recommendations?

As stated above, the P2D study is a comprehensive report with several prudent “no regret” actions, many of which are consistent with a net-zero future. It is especially encouraging to see recommendations to accelerate investments in conservation and demand management, as well as the need to start the work on long lead-time investments, such as transmission. We also support breaking down regulatory barriers to ensure Ontario’s energy planning process is conducive to the scale and pace of the investments ahead. Furthermore, investing in a labour force that can build and operate the infrastructure needed over the next four decades is essential to the success of our energy transition.

While we recognize that the emergence of new technologies and resources is likely to play a role in the future of Ontario’s electricity grid, and that continued investment in innovation is key to enabling the participation of those resources, we believe that a strategy heavily dependent on new hydrogen capacity is misguided. The infrastructure needed to both generate and transport hydrogen has yet to prove economically or technologically viable, and there are likely better opportunities for targeted innovation funding. For example, thermal storage and demand response carry at least as much promise as hydrogen and are resources that are well-aligned with a winter-peaking system largely driven by electric heating, such as the one that the IESO expects to materialize here in Ontario.

Sincerely yours,

A handwritten signature in blue ink, appearing to read 'Bryan Purcell', written in a cursive style.

Bryan Purcell
VP Policy & Programs, The Atmospheric Fund

About The Atmospheric Fund

The Atmospheric Fund (TAF) is a regional climate agency that invests in low-carbon solutions for the Greater Toronto and Hamilton Area (GTHA) and helps scale them up for broad implementation. We are experienced leaders and collaborate with stakeholders in the private, public, and non-profit sectors who have ideas and opportunities for reducing carbon emissions. Supported by endowment funds, we advance the most promising concepts by investing, providing grants, influencing policies, and running programs. We're particularly interested in ideas that offer benefits in addition to carbon reduction such as improving people's health, creating local jobs, boosting urban resiliency, and contributing to a fair society.