Feedback Form

2025 Annual Planning Outlook – May 21, 2025

Feedback Provided by:

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Date: 30 May 2025

To promote transparency, feedback submitted will be posted on the 2025 Annual Planning Outlook engagement page unless otherwise requested by the sender.

☐ **Yes – there is confidential information, do not post**

X **No – comfortable to publish to the IESO web page**

Following the May 21 engagement webinar, the Independent Electricity System Operator (IESO) is seeking feedback from stakeholders on the items discussed. The presentation and recording can be accessed from the 2025 Annual Planning Outlook.

Note: The IESO will accept additional materials where it may be required to support your rationale provided below. When sending additional materials please indicate if they are confidential.

Please submit feedback to engagement@ieso.ca **by June 4.**

General Comments/Feedback

Do you have any general comments or feedback regarding the information shared or recommendations for the IESO to consider regarding future outlooks?

RISKS & UNCERTAINTIES

Why is the IESO even considering procuring new hydropower when the IESO and Ontario government's own reports provide an abundance of powerful reasons why it would be unwise?

IESO's Annual Planning Outlook (APO) is a 25-year outlook, from 2026 to 2050[1]. It is essential to keep this in mind as you read through this submission.

Hydropower's Climate Vulnerability:

Credible risk projections and assessments are crucial in determining whether hydropower projects will remain a viable and reliable resource over the short and long term, and in understanding their environmental and socio-economic impacts throughout the full life cycle of the dam, which proponents claim to be approximately 100 years.

In January 2023, Ontario commissioned a Provincial Climate Change Impact Assessment and Technical Report (the Report), which utilized historical and projected future climate data as fundamental components to assess the risks and consequences of extreme weather events, as well as projections of future climate risks.[2]

The Report warns that "*changes in Ontario's climate are expected to continue at unprecedented rates… and it will pose indirect threats to things like water availability and water quality.*" [2] In addition, *"by the 2080s, northern Ontario, which experiences on average four extreme heat days annually, is projected to see upwards of 35 such days each year. Whereas "southern, central and eastern Ontario will average 55 to 60 such extreme heat days per year—a fourfold increase from the current annual average of about 16 days."* [2] This will have serious negative impacts on the intermittent and unreliable nature of hydropower generation; however, it also will have devastating effects on water quality, water quantity, aquatic life, riverine ecosystem sustainability and communities that rely on those freshwater resources.

"Climate change poses risks to water sources, which affect supply and quality. Dry conditions and extreme hot temperatures change water balances and cause disruptions to the water flow regulation service, leading to reduced surface and groundwater levels, changes in intra-annual patterns of water availability, loss of available freshwater supplies for human use, wetland drying and loss, changes in distribution and abundance of animal and fish species and altered ecosystem function over a long term…" [2]

In fact, the Report warns that, *"Electrical power generation can be impacted in a variety of ways from climate change, and in part depends on the energy sources. For example, low water flows due to drought conditions can reduce hydroelectricity generation efficiency or outputs. Extreme precipitation events can lead to water damage and damage from objects carried by overland flow and flooding damaging equipment and decreasing the useful life of the infrastructure."* [2] This could also have huge negative impacts on Ontario's economy.

"This Level 2 category was evaluated against high and extreme temperatures (e.g. Extreme Hot Days and Cooling Degree Days) and extreme precipitation events (e.g. longer-term accumulated precipitation). Extreme precipitation was found to be the greatest driver of risk for this Level 2 category. Water damage and impacts from overland flows and flooding may cause severe damage to equipment and shorten the useful life of electrical power generation infrastructure." [2] Flooding, overland flows and dam failure can also place life and property at severe risk, and again, bring a huge financial burden on Ontario's economy.

The extremes of climate change are reported to be a high risk in all regions of Ontario; however, *"The highest risks across all sub-categories of the Report were found to be for electrical power generation infrastructure. Risks are 'high' now and expected to remain 'high' for all future time periods. Electrical power generation can be impacted by climate change in a variety of ways, and in part, depends on energy sources. For example, low water flow due to drought conditions can reduce hydroelectricity generation efficiency or outputs."* [2]

For instance, "*drought conditions took a toll on Manitoba's hydroelectric reserves in 2024, prompting the utility to import electricity as well as running its backup thermal generators… Dry conditions in Manitoba over the past year had already left the utility with $160 million in net negative income by the end of the third quarter as hydraulic generation dropped 25 percent below projected levels and the utility was forced to import energy…"*[3]

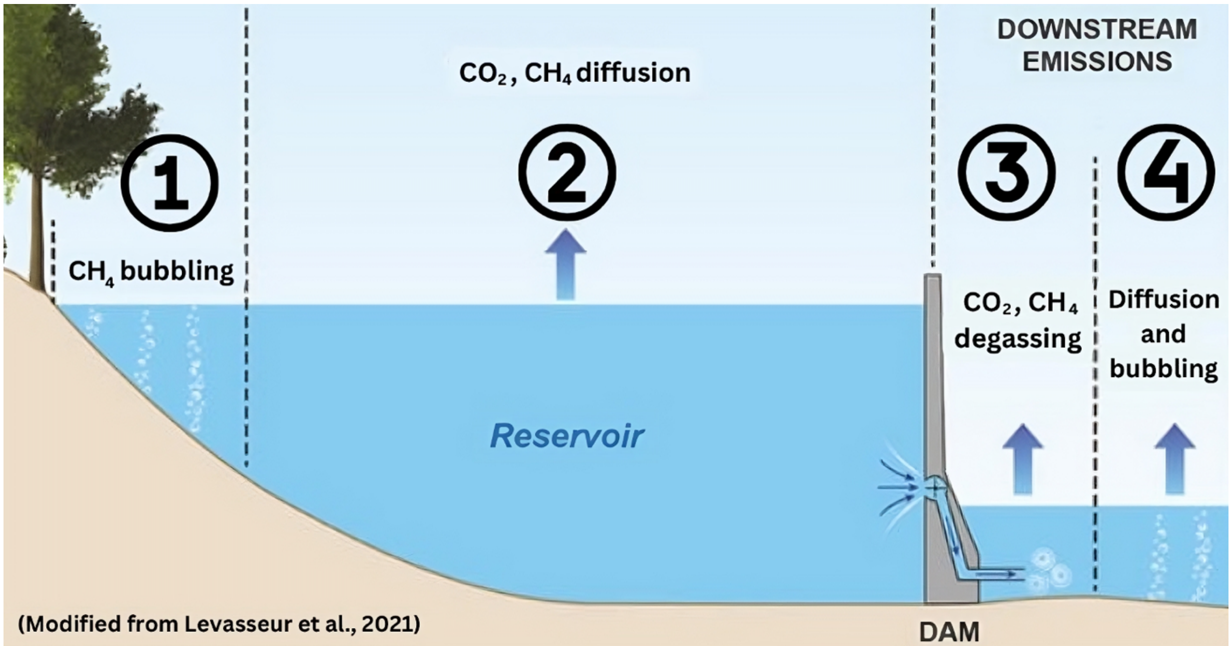
The World Meteorology Organization (WMO) reported that 2024 was the hottest year on record, and "*Every additional fraction of a degree of warming drives more harmful heatwaves, extreme rainfall events, intense droughts, melting of ice sheets, sea ice, and glaciers, heating of the ocean, and rising sea levels."*[4]

Instead of procuring new, climate-risky hydropower, we should focus on authentic, non-emitting, zero-emission sources, such as conservation, wind, solar, geothermal and new transmission.

Methane: Hydropower's Dirty Secret

When a dam is built and land is flooded to create a reservoir, microbes decompose submerged organic matter. Throughout the dam's life, sediment and biomass accumulate behind it, in a process that leads to the emission of methane, carbon dioxide and nitrous oxide.

Methane is a potent greenhouse gas with a heat-trapping capacity 28 to 34 times greater than that of carbon dioxide on a 100-year time scale, and measured over a 20-year time period, that ratio grows to 84 to 86 times.[5] Methane is generated in reservoirs by bacteria living in oxygen-starved environments. These microbes feast on rotting organic matter from plants for energy, just like people and other animals, but instead of breathing out carbon dioxide, they breathe out methane.



A 2004 Environment Canada report states:

> *"Largely because of the climate-change driven pursuit of "clean" energy sources, attention has also focused on the role of water storage in affecting production and emission of greenhouse gases (GHG). In contrast to the widespread assumption (e.g., in Intergovernmental Panel on Climate Change [IPCC] scenarios) that GHGs emitted from reservoirs are negligible, measurements made in boreal and tropical regions indicate they can be substantial."* [6]

The Intergovernmental Panel on Climate Change (IPCC) guidelines report on several key factors to consider when evaluating hydroelectric projects with flooded lands (reservoirs).

> "*Flooded Land emits CO_2, CH_4 and N_2O in significant quantities, depending on a variety of characteristics such as age, land-use prior to flooding, climate, upstream catchment characteristics and management practices. Emissions vary spatially and over time*."[7]

> "*Flooded Land is defined as: water bodies where human activities have caused changes in the amount of surface area covered by water, typically through water level regulation. Examples of Flooded Land includes reservoirs for the production of hydroelectricity, irrigation, and navigation*."[8]

> *"Emissions of CH_4 from Flooded Land are primarily the result of CH_4 production induced by anoxic conditions in the sediment (see Annex 7.1). Methane can be emitted from small lakes or reservoirs via diffusive, ebullitive, and downstream emissions. Downstream CH_4 emissions are subdivided into degassing emissions (see Glossary) and diffusive emissions, which occur downstream from the flooded land. Methane emissions are generally higher in waterbodies with high organic matter loading and/or high internal biomass production, and low oxygen status. Due to their high emission rates and large numbers, small ponds of area < 0.1 ha have been estimated to generate 40 percent of diffusive CH_4 emissions from open waters globally (Holgerson & Raymond 2016). Whilst*

emissions from natural ponds can (at least in part) be considered natural, those from small constructed waterbodies are the result of anthropogenic activity." [9]

For instance, the 2019 IPCC Refinement of the 2006 Guidelines for National Greenhouse Gas Inventories informs that:

The range of Flooded Land considered in this chapter are listed in Table 7.7."[10]

TABLE 7.7 (NEW)
TYPES OF FLOODED LAND, THEIR HUMAN USES AND GREENHOUSE GAS EMISSIONS CONSIDERED IN THIS CHAPTER

Flooded Land types	Human Uses	Greenhouse gas emissions for which guidance is provided in this Chapter
Reservoirs (including open water, drawdown zones, and degassing/downstream areas)	Hydroelectric Energy Production, Flood Control, Water Supply, Agriculture, Recreation, Navigation, Aquaculture	CO_2, CH_4
Canals	Water Supply, Navigation	CH_4
Ditches	Agriculture (e.g. irrigation, drainage, and livestock watering)	CH_4
Ponds (Freshwater or Saline)	Agriculture, aquaculture, recreation	CH_4

A Swiss study of a temperate hydropower reservoir indicates that "*the total methane emissions coming from Lake Wohlen, was on average > 150 mg CH_4 m^{-2} d^{-1}, which is the highest ever documented for a midlatitude reservoir. The substantial temperature-dependent methane emissions discovered in this 90-year-old reservoir indicate that temperate water bodies in older headponds can be an important but overlooked methane source*". [11]

Numerous other independent, peer-reviewed studies indicate that significant amounts of GHG emissions, primarily methane, carbon dioxide, and nitrous oxide, are generated in hydroelectric reservoirs and can reach the volume of a gas-fired facility.

The APO reports that actions to date are projected to meet Ontario's capacity and energy needs until 2029 through upgrades to hydroelectric, and that process is already well underway.

ORA strongly recommends that no new hydroelectric projects be procured.

Mercury Contamination of Fish:

Several studies have shown that the same process through which microbes break down submerged plants and organic material to release GHGs also leads to the methylation of mercury already present in the system.[12,13]

Mercury is present as a natural component of soil in its inorganic form (Hg) in trace amounts through natural processes.[14] However, in its organic and methylated form, it is one of the most potent environmental neurotoxins in the world. After the construction of a dam, the methylmercury (MeHg) formed via microbial breakdown persists in riverine soils for decades due to its high affinity for organic matter.[15,16]

Studies have shown that while methylmercury is only produced in reservoirs during the first 10 years after construction, its levels can remain elevated in the water for several decades afterwards because of its adherence to the sediment.[17,18,19]

One of the central mechanisms behind methylmercury's toxicity is its ability to concentrate in organisms rather than being excreted, which leads to its magnification as we progress up the aquatic food chain.[20] Multiple studies have shown that large predatory fish such as Northern Pike in the vicinity of newly constructed dams and reservoirs contain methylmercury levels 3 to 9 times higher than the maximum acceptable level in fish for sale in Canada.[21,22]

New reservoir flooding accelerates the bioaccumulation of methylmercury in fish tissue, and these effects can persist for decades.[23],[24] This can remove fish as a primary source of food from Indigenous and other stakeholder communities.

Hydropower as a Baseload:

There are already many rivers in Canada experiencing these extreme drought issues. A July 2024 article by Forbes, reported that *"a drought has forced Canada, which traditionally relies on hydroelectric energy for 60% of its total electricity, had to reverse its energy trading relationship with the United States. Not only has Canada cut the amount of energy it sends to the US, but U.S. energy exports to Canada have outpaced its imports… With the rivers and streams that supply Canada's hydroelectric capacity drying up across the country, authorities have been forced to cut back exports."* [25]

"Canada's increasing struggle with hydropower is an ill omen representing a wider global problem. Climate change and droughts are threatening hydropower supplies worldwide, and as severe weather events become increasingly common due to climate change, the future of the world's leading renewable energy source is vulnerable. The greatest problem is not just the severity of any drought but the persistence of drought conditions over an extended period of time. The Yale Climate Connection argues that the link between climate change and increasing drought conditions worldwide is demonstrable, and the situation is worsen-ing. Global hydropower generation dropped significantly in the first half of 2023, resulting in an overall increase in fossil-fuel power production to make up for the deficit." [25]

For instance, *"the Canadian province of Quebec has big plans of becoming the "battery of the U.S. northeast" by feeding power generated from its dams and other hydro plants to millions of people in Vermont, Massachusetts and New York state. But dry conditions that*

producers to cut exports. There wasn't enough snow or rain in the regions where we needed it," said Michael Sabia, chief executive of Hydro-Québec, the provincial utility. We can't make it rain, as much as we'd like to. About 70% of the country is suffering from abnormally dry or drought conditions, forcing it to start up old gas-fired power plants". [26]

In fact, "*Total electricity generated in Canada fell 3.9% year over year to 615.3 million megawatt-hours (MWh) in 2023. Overall, 2023 marked the lowest level of electricity generation since changes were introduced to this data series in 2016, which is notable considering that additional generating capacity comes online every year. Nearly all of the decline in electricity* *generation in 2023 was weather-related. In 2023, three of Canada's largest hydroelectricity generators, that is, Quebec (-9.3%), British Columbia (-21.5%) and Manitoba (-12.1%), were afflicted by drought or abnormally dry conditions and saw electricity generation drop as a result*."[27] Ontario Power Generation reported: *"Electricity generation from the Contracted Hydroelectric and Other Generation business segment decreased by 0.3 TWh in 2023 compared to 2022, primarily due to lower water flows in northeastern Ontario."*[28]

In 2024, Canada experienced dry weather again, which reduced hydroelectric generation, resulting in the country briefly becoming a net electricity importer during February, March, and April. This was one of the most notable electricity stories of the year. This was the first time that imports outweighed exports since the data series was redesigned in 2016, and it happened as many provinces struggled with low hydroelectricity generation due to dry conditions.[29]

The IPCC also reports that "*hydropower plants without or with small storage may be susceptible to climate variability, especially droughts, when the amount of water may not be sufficient to generate electricity (Premalatha et al. 2014) (Section 6.5).*[30]

Consequently, the role of hydropower in helping to provide reliable base power, system balance and stability in the future will be severely affected by climate-related events, which have reduced water availability in many regions in Canada over the last few years, straining power grids, having to resort to burning diesel to fill the gap[31], costing millions, and raising questions about the resilience and reliability of hydroelectric generation.[32]

IESO Reports that Northern Hydro is Intermittent & Unreliable:

A 27 January 2015, IESO/Ontario Power Authority North of Dryden Integrated Regional Resource Plan (NDIRRP) determined that building a run-of-river facility is often not cost-effective on smaller rivers because of the high cost of construction and the small amount of power that would be produced as a result of low and unreliable flows, as low as 15 to 30% of Installed Capacity. [33]

The daily, seasonal and annual flow variations of small hydro operations are intermittent and therefore unreliable. The electricity produced by small hydro is unreliable because it peaks during the high flows of spring, when power is in low demand, and produces at its lowest during the hot summer months, when consumption and demand are highest. During the low-flow season of summer or during drought conditions, many run-of-river and some peaking facilities, especially on smaller rivers, cannot operate efficiently and often have to be shut down.

To further highlight this point, the same analysis determined that *"Northern hydroelectric generation is an energy-limited resource known to have significantly reduced output and availability during drought conditions of the river system supplying these generating units."* [33]

In fact, the NDIRRP recommended that the best means of connecting remote First Nation communities and enabling forecasted growth to the Ring of Fire was to build new and upgraded transmission lines. New hydropower was rejected because of its intermittent and unreliable nature during drought conditions. *"These recommendations are the most cost-effective options that can be implemented in a timely manner and provide flexibility for meeting a broad range of long-term forecast scenarios."* [33]

A cost/benefit analysis should be required to determine whether these types of projects are environmentally and/or economically sustainable and viable.

The intensity and frequency of drought conditions in northern and southern Ontario have increased since 2015, and as mentioned above, indicate that extreme rain and drought conditions will continue to intensify as the climate warms.

Greenwashing Dirty Hydropower:

The promotion of hydropower as "renewable," "clean," and "non-emitting" is one of the more common and serious forms of misinformation being presented to the world during this growing climate crisis, which threatens humanity's very existence on this planet.

Labelling hydropower as a "renewable" energy source is misleading, as a very high environmental and socio-economic price has been paid in the past in terms of losses to valued natural resources due to the installation of dams and hydropower facilities. The socio-economic costs of these losses are generally ignored,[34,35] and rarely revealed to the public.

The collateral environmental damage caused by dams and waterpower facilities has been well documented for decades, including the loss or serious decline in migratory fish species (waterpower facilities are key factors in the listing of some iconic fish species as species at risk in Ontario and elsewhere)[36,37], declining biodiversity[38], impaired water quality (including elevation of mercury concentrations in fish tissue)[39,40,] and are critical threats to imperilled aquatic species.[41]

Significant ecological damage from waterpower has been ongoing for many decades in Ontario and other locations worldwide.[42] In fact, in Ontario, dams are considered to be a major factor in the extirpation of Ontario's Atlantic Salmon stock[43], one of the most important causes of significant anthropogenic mortalities and decline of Ontario's American Eel[44], and a key threat to Ontario's declining Lake Sturgeon populations.[45,46,47]

Stranded Lake Sturgeon in a hydroelectric facility's overflow channel.

The Ontario Waterpower Association and the waterpower industry have proven to be irresponsible and extremely negligent in failing to implement even the most basic mitigation measures to protect fish populations and the health of riverine ecosystems. There are a total of 225 hydroelectric facilities in Ontario (with many more times that number of control dams to contain the reservoirs), including 66 hydropower facilities in Ontario owned by OPG; however, only two facilities in Ontario are fitted with operating fishways.

This APO greenwashes hydroelectric power as a "non-emitting" resource and refers to the Clean Electricity Regulations, which include hydropower as a clean electricity resource.[48]

"Clean" and "non-emitting" energy refers to electricity sources that produce no climate-warming greenhouse gas emissions; however, that is certainly not the case with hydropower. There are almost three decades of independent, peer-reviewed studies refuting these claims, with reports indicating that hydroelectric reservoirs in boreal, temperate, and tropical regions are a significant and ongoing source of biogenic GHG emissions, including methane, which in some instances can reach the same emission rate as gas-fired facilities.[49]

It is no longer acceptable to trade off valued ecosystem resources, such as clean water, fisheries, wetlands, and healthy rivers, for so-called clean, green, non-emitting or renewable energy generation without effective mitigation and without clear and transparent public and First Nation consultation on what these trade-offs would entail.

Conclusion:

Many parts of Canada have been plagued by a growing intensity and frequency of drought for years, and these issues are increasing. So far, Ontario seems to have escaped the worst of it; however, it is only a matter of time before we have the same problem. These climate risks and their environmental effects on communities are crucial in any thoughts of approving new dams, just to become an "Energy Superpower".

So, why is the IESO planning to procure additional hydropower when its future looks so bleak and the resulting stress on riverine ecosystems would have devastating effects on water quality, aquatic life and local communities?

The coming decade will judge whether the Minister of Energy and the IESO acted as climate

ORA is opposed to the IESO procuring new hydropower when we should be doing the opposite. We should be improving the resilience of our lakes and rivers in the face of a warming climate that will bring all the stresses impacting water quality, water quantity, fisheries, and

You can simply turn off a gas-fired facility when a more environmentally friendly electricity source becomes available, but you can't just turn off the methane brewing in a reservoir until the dam is removed.

Unfortunately, Ontario does not require up-front decommissioning provisions from proponents to allow for the removal of these facilities when they are no longer viable. It will then be up to governments to foot the bill for removing these dams and ensuring the restoration of water quality, aquatic habitats, and fisheries.

ORA Recommendations:

1. No procurement of new hydroelectric power generation.
2. Invest in conservation, wind, solar, geothermal and transmission.
3. Increase funding incentives for the removal of old and unsafe dams.

Thank you for this opportunity to comment!

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