Feedback Form

Long Lead-Time RFP – June 5, 2025

Feedback Provided by:

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Title: Chair

Organization: Ontario Rivers Alliance

Email: [redacted]

Date: 17 June 2025

To promote transparency, feedback submitted will be posted on the LLT RFP 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 LLT RFP June 5, 2025, 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 LLT engagement web page.

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 17, 2025.**

Resource Eligibility and Rated Criteria

Hydro Resources - Redevelopments

Do you have any information to share in support of expanding eligibility to include hydro redevelopments, expansions or upgrades?

See ORA comments below.

LDES Resources

Do you have any comments on the eligibility of LDES technologies?

We encourage stakeholders to submit recommendations on any other LDES technologies that you believe should be eligible along with supporting documentation (a) outlining why the suggested technology requires a long lead-time for development, and (b) demonstrating that it can operate reliably over the term of the LLT contract.

ORA: Hydropower has traditionally been known to take approximately 10 years from planning to full operation, longer than 5 to 8 years. See supporting comments below:

Storage Duration & Rated Criteria

Do you have any comments or information to share regarding storage duration or rated criteria that the IESO should consider when evaluating projects under the LLT RFP?

See ORA comments below:

RFP Design Considerations

Proposal & Completion and Performance Security

Do you have comments on the proposed approach and security amounts?

ORA: No

Interdependent Hydro Facilities (Energy Only)

Do you have any comments or additional information to share with the IESO?

Specific project details may be shared in a separate document. Please include the following: list of individual facilities, including the capacity of each (in MW), that are looking to be considered under a single proposal, proposed project location/related river systems; and any other information you think would be helpful.

See ORA comments below:

Deliverability

Do you have any information to share to support the IESO in determining the approach to offering a project specific consultation (or assessment)? Specifically, the IESO is interested in better understanding what information proponents require, and when this is needed, prior to submitting a proposal.

ORA: A 40-year contract for hydropower is likely to be a disappointment for IESO, but particularly for hydropower proponents. Ontario's Climate Change Risk Assessment paints a bleak picture for the future of hydropower, particularly regarding water availability – see ORA comments below.

Long-Term Outages

Do you have any comments on the proposed approach to allowing suppliers to take one long-term outage for major maintenance activities during the contract term?

Specific details may also be shared in a separate document outlining the following: the nature of the work required as part of the long-term outage; the maximum duration of the outage (e.g., 6 months); and when the outage is expected to occur over the course of the contract term (e.g., year 20).

ORA: Hydroelectric proponents should be extremely concerned about the future of hydropower, both in the short and long term. It is a risky investment for both the proponent and Ontario ratepayers. Climate change has introduced significant uncertainty into a decision to enter into a contract that requires deliverability and a minimum output. Ontario's own Climate Change Impact Assessment report provides a crystal-clear window into what is in store for water availability in northern and southern Ontario. Hydropower has already begun to fall out of favour in many parts of Canada and the world because of a shortage of stream flow. Many municipalities across Canada have had to resort to fossil fuels to provide power when hydro turbines are dry. Drought periods are becoming more frequent and extreme in both duration and intensity, to the point where hydropower facilities have had to shut down for months and, in some cases, for years due to ongoing drought conditions. For more information, please see my comments below:

Contract Price Escalation

Do you have feedback for the IESO to consider when establishing the contract price escalation for contracted long lead time resources?

N/A

General Comments/Feedback

Please include any other feedback that you think may be relevant to inform the IESO's report back to the Minister of Energy and Mines.

1. Hydropower's Dirty Secret:

The hydropower industry has intensified its lobbying for a new renaissance in hydropower because capacity additions of hydropower have been declining since 2013. This is due not only to the falling costs of competing technologies but also to a broader set of challenges, including high-profile cancellations, growing hydrological risks, cost and schedule overruns, technical challenges, and increasing social resistance – now you can add GHG emissions.

The Intergovernmental Panel on Climate Change (IPCC) 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).*[1] Reliance on hydropower in times of drought also accelerates GHG emissions when depleted reservoirs necessitate the use of fossil fuels, particularly natural gas, to fill the gap.

It is also important to consider that creating a hydroelectric reservoir on a previously untamed riverine ecosystem can transform a healthy ecosystem from a GHG sink into a relatively large source of emissions into the atmosphere.[2]

A recent study out of Quebec quantified the long-term historical and future evolution of GHG emissions from 1900 to 2060, examining the cumulative global surface area of 9,195 reservoirs in four different climate zones (boreal, temperate, subtropical, and tropical) around the world. It reported:

> *"reservoir-induced radiative forcing continues to rise due to ongoing increases in reservoir methane emissions, which accounted for 5.2% of global anthropogenic methane emissions in 2020. We estimate that, in the future, methane ebullition and degassing flux will make up >75% of the reservoir-induced radiative forcing, making these flux pathways key targets for improved understanding and mitigation.*
>
> *While CO_2 and CH_4 diffusion are modelled as decreasing with reservoir age, ebullition and degassing remain constant, such that these two latter emission pathways grow increasingly important with time. Thus, while CO_2 diffusion was the dominant flux pathway in the twentieth century, C–CH_4 emissions, mainly via ebullition and degassing, are expected to surpass C–CO_2 around 2032 and account for 75% of reservoir C emissions by 2060. In addition, the higher greenhouse warming potential of CH_4, relative to CO_2, amplifies the climate impact of CH_4 emissions. Furthermore, estimated fluxes do not account for future global temperature increases or water eutrophication changes, both of which would probably stimulate CH_4 emissions more strongly than CO_2. Methane emissions, and especially CH_4 ebullition and degassing are expected to dominate future reservoir C-GHG release (39% and 32% in 2060, respectively; (Fig. 2 - below), implying that mitigation efforts aimed at reducing CH_4 fluxes via pathways could be quite effective."*[3]

The study clearly indicates that carbon dioxide and methane diffusion decrease within the first 20 or more years of a new reservoir being created; however, methane emissions through ebullition and degassing persist and can increase over time. Measurements made at hydroelectric facilities in boreal and temperate regions indicate that GHG emissions can be substantial,[4],[5] and in some instances can rise to the level of a gas-fired facility. [6]

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*".[7]

You can turn off a gas-fired facility when a cleaner form of electricity comes along; however, a hydroelectric reservoir will continue to emit methane until the dam is removed. You cannot just turn off emissions coming from a reservoir when biomass will continue to collect behind the dam. The problem is consequential because these facilities will be in place for a century or more, and upfront dam decommissioning funds are not required by the province. This is a huge problem because dam removal

has proven to be cost-prohibitive, as it can add up to $millions, and there is little to no funding available for decommissioning.

2. Hydropower as Baseload Power in a Warming Climate:

Over the last several years, there have been increasing reports of extended droughts reducing hydroelectric generation in Canada, and municipalities and cities have had to rely on natural gas, coal, and diesel to fill the gap.

"Canada's increasing struggle with hydropower is an ill omen representing a wider global problem. Climate change and droughts are threatening hydropower supplies everywhere, 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 things are getting worse. 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." [8]

The Intergovernmental Panel on Climate Change (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).*[9]

Doug Prendergast, a spokesperson for the NWT Power Corporation, on December 21, 2023, reported that a combination of diesel and hydro had been providing power to Yellowknife, Ndılǫ, Dettah and Behchokǫ̀ since the fall of 2022. While roughly 95 to 98 percent of electricity in the North Slave typically comes from hydro sources, as of the end of November, around 45 percent of power was being generated by diesel. Over the next several months, as demand for electricity increases in Yellowknife and the other communities supported by Snare, he expected that percentage will change somewhat, and the percentage of diesel generation will increase. "*It is obviously a challenging situation,*" Prendergast said. "*Now this looks like it could extend into a third year so, obviously, we'll be hoping for lots of snow in the area of the Snare basin."* [10]

In addition, "*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…*"[11]

In November of 2024, Parks Canada's water management team reported that an extended trend of below-average precipitation impacted watersheds across the Trent-Severn Waterway, including reservoir lakes.

> "*Most lakes are well below long-term average water levels. Most of the reservoir lakes remain at their respective winter set dam configuration. The Gull River reservoirs are 35 per cent full, and the Burnt River reservoirs are 35 per cent full*," the Trent-Severn Waterway said on Nov. 5. They added that central reservoirs are 40 per cent full and the Gull and Burnt River flows are significantly below average.[12]

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."[13]

In fact, it's already happening in Michigan, where Consumers Energy is looking to sell its fleet of 13 hydropower facilities, spanning five rivers, because they're too expensive to operate. The company is looking for a buyer who will operate the dams, and Consumers will sell them for $1.00 each. The company reported losing over $150 million annually on upkeep and upgrades.[14]

A 2014 analysis was conducted by the IESO to determine the most effective means of electricity connection to remote First Nation communities and to enable forecasted growth in the Ring of Fire mining operations in northern Ontario. The analysis concluded 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.***[15] I

In 2015, the IESO reported that run-of-river efficiency in hydropower generation was only 15 to 30% of Installed Capacity.[16] In fact, the recommendation in their report was to <u>not</u> build any new hydroelectric facilities but to primarily build new transmission lines.

Consequently, the role of hydropower in providing reliable baseload power, system balance and stability 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, and raising questions about the resilience and reliability of hydroelectric generation.[17]

3. Ontario's Own Climate Risk Assessment Spells the Death Knell for Hydropower:

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, as well as in understanding their environmental and socio-economic impacts throughout the full life cycle of the dam, which proponents claim is approximately 100 years.

The *Ontario Provincial Climate Change Impact Assessment (2023)* 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. It reports 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."*[18] The report further indicates that northern Ontario, which experiences on average four extreme heat days annually, is projected to see upwards of 35 such days each year. Southern Ontario will see upwards of 55-60 extreme heat days annually by the 2080s—a fourfold increase from the current annual average of 16 days. These changes threaten stream temperature regimes, species survival, wetland retention, and seasonal flows.

In addition, *"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."*[19]

This assessment confirms that climate change will have severe negative impacts on the intermittent and unreliable nature of hydropower generation; however, it will also have significant effects on water quality, water quantity, aquatic life, riverine ecosystem sustainability, and the communities that rely on these freshwater resources.

Despite perceptions of reliability, hydropower is highly vulnerable to seasonal and long-term hydrological fluctuations**.** According to Statistics Canada, total electricity generated in Canada decreased by 3.9% year-over-year in 2023. It was the hottest summer on record since 1940, according to Environment and Climate Change Canada, and hydropower is susceptible to persistent dry conditions. In 2023, Western and Central Canada received below, or well below-average, amounts of precipitation, putting a strain on hydroelectric generation and exports. In fact, Quebec (-9.3%), British Columbia (-21.5%) and Manitoba (-12.1%) were affected by drought conditions and saw electricity generation drop as a result.[20] In 2024, persistent dry conditions continued to reduce hydroelectric generation, similar to what was experienced in 2023. In fact, during the months of February, March and April 2024, Canada became a net electricity importer, rather than a net electricity exporter.[21]

Building new hydropower facilities now is an investment that won't be operational for another 7 to 10 years. With climate change advancing at such a rapid pace, hydropower poses a significant risk to ratepayers' investments and returns in an increasingly volatile, problematic, and diminishing energy resource.

4. The Twisted Path of Energy Ministers:

Minister Todd Smith:

On October 21, 2022, Todd Smith, Minister of Energy, directed the Chair of the Ontario Energy Board to "… *work with the Ministry of Energy and other partners as needed to ensure proposals reflect current and anticipated future extreme weather impacts and best practices in climate change resilience, including insights from the Ministry of Environment, Conservation and Parks' Provincial Climate Change Impact Assessment. This report may also, as possible, reflect input from the workshops being held on the future of the OEB's approach to sector regulation."* [22]

In June of 2023 the OEB responded with a Report to the Minister of Energy: Improving Distribution Sector Resilience, Responsiveness and Cost Efficiency. The OEB report concurred: *"Climate change means that the likelihood and severity of extreme weather are growing. Some storms are expected to inflict considerably more damage to infrastructure, making resilience expectations warranted. The OEB's view is that a more robust and consistent approach, applied to all distributors, is required in order to better protect Ontario customers and electricity distribution infrastructure."* [23]

Minister Stephen Lecce:

On June 6, 2024, Stephen Lecce was sworn in as Minister of Energy and Mines. In June of 2025 he announced a new path forward by issuing a Minister's Message*, Energy for Generations: Ontario's Integrated Plan to Power the Strongest Economy in the G7".*[24] The report wrongly greenwashes hydropower as clean and non-emitting and is totally void of the words "climate change", or any short or long-term view of planning or risk assessment of its effects on the resilience and longevity of such a water reliant electricity resource as hydropower. The report is also primarily focused on becoming a "*Global Energy Superpower*" and having the "*Strongest Economy in the G7".*

If this new Minister does not take *the Ontario Climate Change Risk Assessment – Technical Report (January 2023)* seriously, Ontario will face numerous **Hydropower Boondoggles, which risk miscalculating its capacity requirements**.

This government is also working to place the planning costs and risks of some of these hydropower projects on the backs of Ontario ratepayers – see my comments on *ERO-025-0449 – Advancing New*

Hydroelectric Generation in Ontario. This would enable Ontario Power Generation to recover risky speculative pre-development costs from electricity ratepayers, regardless of whether a project is ultimately approved, constructed, or ever becomes operational. This represents a fundamental shift in risk from the proponent to the public, eroding accountability and violating the principles of prudent energy regulation. The planning process for one of these projects can cost millions; however, this amendment to the *Ontario Energy Board Act, 1998*, would also open up the same opportunity for other proponents.

As a result of Minister Lecce's desire to become a Global Energy Superpower, the "*IESO's 2025 Annual Planning Outlook forecasts system-level net annual energy demand to grow 75 per cent—to 262 terawatt-hours by 2050—which is a significantly higher increase than the 60 per cent growth forecast in the 2024 Annual Planning Outlook [Minister Smith's] within the same timeframe."*[25] The 2024 Annual Planning Outlook figure would have met our needs up to 2050; however, it appears that an additional 15 percent of capacity pushes us into the Global Energy Superpower category.

Minister Lecce's report and the IESO's documentation failed to address the significant risk of climate change to hydropower electricity generation under its increasingly frequent and intense warming conditions. Consequently, it is highly likely that any new hydropower project will prove to have been technically infeasible, ecologically damaging, and financially disastrous to Ontario ratepayers and hydro proponents.

5. Major Environmental Trade-Offs from Hydropower:

Hydroelectric projects have been greenwashed for more than a century. Proponents and governments promote them as clean, non-emitting, zero-emission, low-emitting, green or renewable, but this overlooks a long list of well-documented and often irreversible environmental harms:

- **Methane Emissions:** Hydropower reservoirs make a significant daily contribution (5%[26] to 7%[27]) to the Earth's accumulation of greenhouse gases in the atmosphere.
- **Habitat fragmentation**: Dams block connectivity and migratory routes, isolating aquatic populations and accelerating the local extirpation of valued species.[28]
- **Biodiversity loss:** Dams act as physical barriers that block longitudinal connectivity and upstream-downstream movement of aquatic species.[29] There are 225 hydroelectric facilities in Ontario, and only two operating fishways.
- **Hydropeaking disruptions**: Sudden changes in flow from turbine operations can cause fish stranding, bank destabilization, and habitat destruction.[30]
- **Sediment trapping**: Reservoirs trap up to 60% of river sediment, which starves downstream ecosystems of nutrients, erodes riverbeds, and damages wetlands.[31]
- **Thermal pollution**: Blocked flow and stratification in reservoirs alter water temperature and oxygen levels, harming aquatic species and the downstream ecosystem.[32]
- **Methylmercury contamination**: Flooded vegetation creates elevated levels of methylmercury in fish, posing health risks to wildlife and humans that can persist for decades.[33]

These are not theoretical risks—they are inherent characteristics of hydroelectric infrastructure.

5. Conclusion:

Turning a blind eye to the significant and ongoing environmental impacts of waterpower, as well as the blatant disinformation and flawed reasoning behind the claims of non-emitting, clean, green, and renewable hydropower, brings to mind the tobacco and oil and gas industries in the 1960s and 1980s.

The tobacco industry knew the dangers of smoking to a person's health, yet despite the dangers, it still misled the public into believing it was safe. The oil and gas industry knew all along that oil and gas emissions would lead civilization off a climate cliff and yet failed to act. Don't let the hydropower industry do the same.

The Minister of Energy is misleading the public and Indigenous communities about the environmental impacts of hydropower reservoirs, including methane emissions that can reach the intensity of those from gas-fired facilities. He has also ignored the province's own Climate Change Risk Assessment.

ORA strongly recommends no new hydroelectric procurement! Ontario needs real climate solutions—not more outdated infrastructure that compromises rivers, the environment, and public trust. We must build resilience into our lakes and rivers by removing dams and restoring riverine ecosystems--not erect more barriers to the health of our freshwater ecosystems.

Thank you for this opportunity to comment!

Linda Heron,
Chair, Ontario Rivers Alliance
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https://ontarioriversalliance.ca/blog

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[1] *Clarke, L.,Y.-M.Wei,A. De La Vega Navarro,A. Garg,A.N. Hahmann, S. Khennas, I.M.L.Azevedo,A. Löschel,A.K. Singh, L. Steg, G. Strbac, K.Wada, 2022: Energy Systems. In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA. doi: 10.1017/9781009157926.008. Chapter 6, 6.4.2.3 Hydroelectric Power. P-753/2258 Online: https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_FullReport.pdf*

[2] *St. Louis, V.L., Kelly, C.A., Duchemin, E., Rudd, J.W.M., Rosenberg, D.M. 2000. Reservoir Surfaces as sources of greenhouse gases to the atmosphere: a global estimate. BioScience 50(9): 766-775. Online: https://academic.oup.com/bioscience/article/50/9/766/269391*

[3] *Soued, C., Harrison, J.A., Mercier-Blais, S. et al. Reservoir CO_2 and CH_4 emissions and their climate impact over the period 1900–2060. Nat. Geosci. **15**, 700–705 (2022). https://doi.org/10.1038/s41561-022-01004-2*

[4] *St. Louis, V.L., Kelly, C.A., Duchemin, E., Rudd, J.W.M., Rosenberg, D.M. 2000. Reservoir Surfaces as sources of greenhouse gases to the atmosphere: a global estimate. BioScience 50(9) : 766-775. Online: https://academic.oup.com/bioscience/article/50/9/766/269391*

[5] *World Commission on Dams. 2000. Introduction to Global Change, Working Paper of the World Commission on Dams, Secretariat of the World Commission on Dams, Cape Town, South Africa.*

[6] *Scherer, L., & Pfister, S. (2016). Hydropower's Biogenic Carbon Footprint. PLOS ONE, 11(9), e0161947. https://doi.org/10.1371/journal.pone.0161947*

[7] *DelSontro, Tonya, McGinnis, Daniel F., Sobek, Sebastian, Ostrovsky, Ilia, Wehrli, Bernhard, 2010, Extreme Methane Emissions from a Swiss Hydropower Reservoir: Contribution from Bubbling Sediments. Online: https://pubs.acs.org/doi/full/10.1021/es9031369*

[8] *Is Hydropower's Potential Drying Up? By Ariel Cohen, 5 July 2024*

[9] *Clarke, L.Y.-M.Wei,A. De La Vega Navarro,A. Garg,A.N. Hahmann, S. Khennas, I.M.L.Azevedo,A. Löschel,A.K. Singh, L. Steg, G. Strbac, K.Wada, 2022: Energy Systems. In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley,*

(eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA. doi: 10.1017/9781009157926.008. Chapter 6, 6.4.2.3 Hydroelectric Power. P-753/2258 Online: https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_FullReport.pdf

[10] Power corp says low water levels could extend into third year. Emily Blake, Cabin Radio, 21 December 2023.

[11] The demand for power might make one of Canada's cleanest grids dirtier. By Julia-Simone Rutgers, March 28, 2024, The Narwhal. Online: https://thenarwhal.ca/manitoba-electricity-grid-natural-gas-reliance/

[12] Low water levels continuing on reservoir lakes, by Lisa Gervais, November 7, 2024

[13] Forecast for the next 5 years? Record breakingly hot, UN weather agency says. By Thomson Reuters, CBCC, May 28, 2025.

[14] Consumers looking to offload Hydroelectric Dams. By Ashley Smith, June 6, 2025. NewsTalk.

[15] North of Dryden Integrated Regional Resource Plan – January 27, 2015, by OPA/IESO. P-56 & 124. Online: http://www.noma.on.ca/upload/documents/north-of-dryden-report-2015-01-27.pdf

[16] North of Dryden Integrated Regional Resource Plan – January 27, 2015, by OPA/IESO. P-56 & 124. Online: http://www.noma.on.ca/upload/documents/north-of-dryden-report-2015-01-27.pdf

[17] World Energy Outlook 2022, International Energy Agency. P-293/524 Online: https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf

[18] Ontario Provincial Climate Change Impact Assessment, Technical Report, January 2023. Online: https://www.ontario.ca/files/2023-11/mecp-ontario-provincial-climate-change-impact-assessment-en-2023-11-21.pdf

[19] Ibid.

[20] Hydroelectricity generation dries up amid low precipitation and record high temperatures: Electricity year in review 2023. StatsCan. March 5, 2024. https://www.statcan.gc.ca/o1/en/plus/5776-hydroelectricity-generation-dries-amid-low-precipitation-and-record-high-temperatures

[21] Dry weather dampens overall generation: Electricity year in review, 2024. StatsCan. May 15, 2025. https://www.statcan.gc.ca/o1/en/plus/8076-dry-weather-dampens-overall-generation-electricity-year-review-2024

[22] Letter dated October 21, 2022, from Todd Smith, Minister of Energy, to Mr. Richard Dicerni, Chair, Ontario Energy Board.

[23] Ontario Energy Board, Report to the Minister of Energy, Improving Distribution Sector Resilience, Responsiveness and Cost Efficiency, June 29, 2023.

[24] Energy for Generations, Ontario's Integrated Plan to Power the Strongest Economy in the G7. June 2025.

[25] Annual Planning Outlook, Ontario's electricity system needs: 2026-2050, April 2025.

[26] DelSontro, Tonya, McGinnis, Daniel F., Sobek, Sebastian, Ostrovsky, Ilia, Wehrli, Bernhard, 2010, Extreme Methane Emissions from a Swiss Hydropower Reservoir: Contribution from Bubbling Sediments. Online: https://pubs.acs.org/doi/full/10.1021/es9031369

[27] Maeck, A., DelSontro, T., McGinnis, D.F, Fischer, H., Flury, S., Schmidt, M., Fietzek, P. and Lorke, A., 2013. Sediment Trapping by Dams Creates Methane Emission Hot Spots, Environmental Science and Technology, 8130-8137, Online: http://www.dx.doi.org/10.1021/es4003907

[28] Catherine M. Pringle, Mary C. Freeman, Byron J. Freeman, Regional Effects of Hydrologic Alterations on Riverine Macrobiota in the New World. BioScience, Volume 50, Issue 9, September 2000, Pages 807-823. https://doi.org/10.1641/0006-3568(2000)050[0807:REOHAO]2.0.CO;2

*[29] He, F., Zarfl, C., Tockner, K. et al. Hydropower impacts on riverine biodiversity. Nat Rev Earth Environ **5**, 755–772 (2024). https://doi.org/10.1038/s43017-024-00596-0*

[30] Glowa, S. et al, 2022. Evaluating the risk of fish stranding due to hydropeaking in a large continental. river. https://harvest.usask.ca/items/8d5a76b4-bc0e-488f-9916-7bb7596bff19

[31] Maavara T, et al. River dam impacts on biogeochemical cycling. Nature Reviews Earth & Environment. 2020;1:127–142. https://eprints.whiterose.ac.uk/id/eprint/156411/8/NATREVEARTHENVIRON-19-043%20Maavara%20-%20for%20Lee.pdf

[32] Schmutz S, Moog O, eds. Riverine Ecosystem Management. Springer; 2018. https://www.researchgate.net/publication/325032930_Riverine_Ecosystem_Management_Science_for_Governing_Towards_a_Sustainable_Future

[33] St. Louis VL, et al. The Rise and Fall of Mercury Methylation in an Experimental Reservoir. Environmental Science & Technology. 2004;38(8):2559–2566. https://www.sfei.org/sites/default/files/events/St.Louis_et_al_2004.ES%26T.pdf