Ontario Waterpower Association

DECEMBER 2024
OWA.CA

YEAR IN 2024 REVIEW

ACCELERATING ONTARIO'S ELECTRIFICATION

OWA RELEASES THREE-YEAR STRATEGIC PLAN

In This Issue

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THORDON BEARINGS INC.

ONTARIO POWER GENERATION

INDEPENDENT ELECTRICITY SYSTEM OPERATOR

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COVER PHOTO:
SMOKY FALLS GENERATING STATION (GS)
PHOTO CREDIT:
ONTARIO POWER GENERATION (OPG)

WHAT'S INSIDE

In Every Issue

Featured

OWA WELCOME *from the President*

In like a Dragon, Out like a Lion.

2024 has gone down as one of the busiest and arguably best years for Made-in-Ontario waterpower – befitting of the Chinese lunar year of the Dragon. Kicking off with the launch of the Small Hydro Program (SHP) which will result in the re-contracting of more than one hundred (100) hydroelectric facilities with an installed capacity of 10MW or less, the industry at large has been bolstered with new confidence after an extended period of uncertainty. And coupled with Ontario Power Generation's unprecedented investments in refurbishing facilities of all sizes across the province, product and service providers are rebounding from the impacts of the COVID-19 pandemic.

On the heels of these initiatives came the May direction from the Minister of Energy to the IESO to develop a Northern Hydro Program (NHP) to recontract hydroelectric facilities with an installed capacity of >10MW, the outcome of which should mean that the owners of all the province's more than two hundred (200) heritage hydro facilities will be secure for at least the next two decades.

Importantly, it is increasingly clear that the provincial government realizes and values both the electricity and broader societal values that our industry provides to citizens and communities. This is particularly evident in the Minister's direction on both the SHP and the NHP:

> **"Ontario's hydroelectric fleet plays an important role, both in generating electricity and providing benefits such as flood control, irrigation and supporting local employment and economic development. Our government is committed to ensuring the province is making the best use of these non-emitting assets."**

This recognition was further evidenced in the IESO's proposed approach to procuring new generation, separating "long lead time" resources such as hydroelectricity and long-duration storage projects into a distinct procurement lane with specific design characteristics (e.g. forty (40) year contracts). While this procurement, targeted for between 500-1000MW, is still under development, it is being informed by the IESO's Request for Information at a project level. Additionally, all of the upcoming procurements of new generation will favour projects located in northern Ontario and with Indigenous partners – a strategic advantage for hydroelectricity. Finally, the IESO's proposed "cadenced" approach to iterative procurements will provide a predictable path for developers and suppliers as we meet the emergent and enduring challenge of demand growth – now estimated to be an increase of seventy-five percent (75%) by 2050.

> **IN 2025 AND THE YEARS AND DECADES TO COME, OUR INDUSTRY IS POISED TO RETAIN AND GROW ITS RIGHTFUL SIGNIFICANCE IN POWERING THE NEXT GENERATION'S ECONOMIC PROSPERITY.**
>
> Paul Norris, PRESIDENT
> ONTARIO WATERPOWER ASSOCIATION

As the year approached its calendar end, the government released its bold new long-term vision for the electricity and energy sectors in: "Ontario's Affordable Energy Future: The Pressing Case for More Power," to guide the build out of an affordable, reliable and clean energy system to meet the exceptional growth needs of Ontario. This new planning framework is to be enabled through legislative amendments brought forward through Bill 214, The Affordable Energy Act, 2024. Of particular importance is the statement in the government's vision:

Baseload Nuclear and Hydroelectricity: The Backbone of Ontario's Clean Electricity System

"Ontario's plan will prioritize clean and reliable baseload electricity from nuclear and hydroelectricity. These resources have provided more than 75 per cent of the province's electricity over the last 20 years. Ontario will continue to advance work on new nuclear and hydroelectric generation, which requires much longer lead times and long-term certainty than other resources but could serve the province well into the next century."

Clearly, then, Made in Ontario waterpower goes out of 2024 with the roar of a lion. In 2025 and the years and decades to come, our industry is poised to retain and grow its rightful significance in powering the next generation's economic prosperity. The future is indeed ours to shape.

Paul Norris, PRESIDENT
ONTARIO WATERPOWER ASSOCIATION

ACCELERATING
Ontario's Electrification

OWA Releases Three-Year Strategic Plan

BY **Ontario Waterpower Association**

Earlier this year, the Ontario Waterpower Association released its Strategic Plan for 2025-2027, entitled "Accelerating Ontario's Electrification". The plan underscores a new urgency for the organization, and the industry as a whole, to act on a new era of opportunity for waterpower to accelerate Ontario's electrification. New, Made-in-Ontario waterpower is positioned to help the province meet decarbonization, electrification, and economic development goals. By some estimates, Ontario will need to double its installed capacity of electricity generation by 2050 – equivalent to building as much generation and transmission in the next three decades as was built in the last century.

The strategic advantages of waterpower are that it lasts forever, moderates electricity prices, provides all essential reliability services, and investments in waterpower stay in the province. It is the OWA's vision for the industry that waterpower will be at the heart of Ontario's electrification for another century. The Strategic Plan is built on three main pillars—Strategic Alliances, Responsible Advocacy, and Community Support—which, collectively, deliver value to our membership.

Strategic Alliances

The OWA aims to strengthen partnerships across the energy sector, collaborating with the government, industry stakeholders, and Indigenous communities to foster a supportive environment for sustainable waterpower development. These alliances are crucial for identifying and realizing collective opportunities and mutual benefits.

Responsible Advocacy

The OWA recognizes the importance of advocating for policies that support the growth of the industry and sustaining the assets that are already in the ground. The association will be the collective voice of the waterpower industry, advocating for meaningful opportunities for all members.

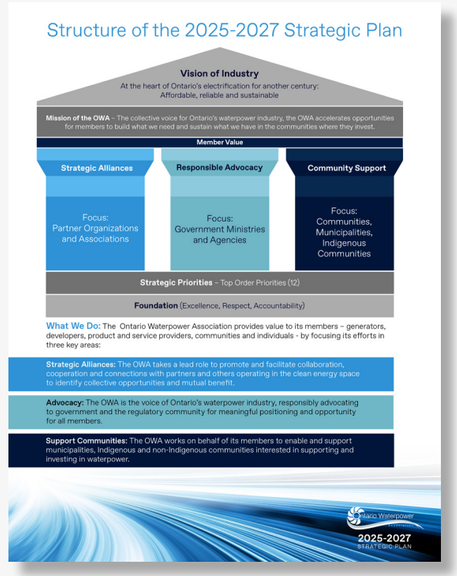
Community Support

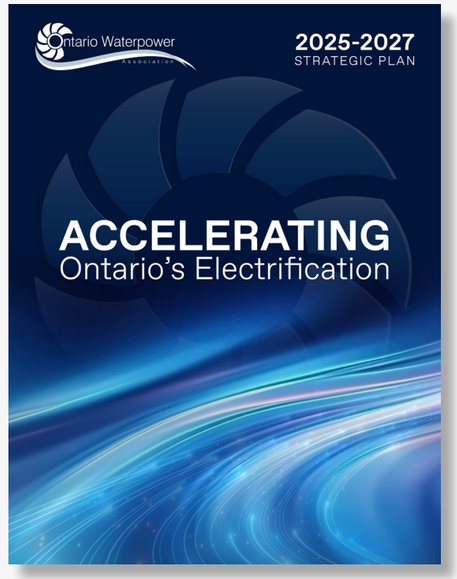
Municipalities and Indigenous communities across Ontario will play a key role in shaping the province's energy future, and the OWA is committed to ensuring that willing host communities benefit from waterpower development through job creation, economic growth, and environmental stewardship. Further, the OWA is committed to advancing economic reconciliation with Indigenous communities through respectful partnerships in new developments.

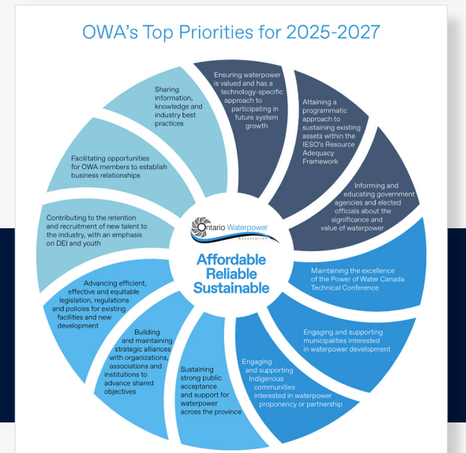
The path to accelerating Ontario's electrification is a collective effort. The OWA's Strategic Plan is not just a roadmap for the association but a call to action for its members and partners. The plan emphasizes the need for a united front in tackling challenges and seizing the opportunities ahead. In the coming years, the OWA will also prioritize the recruitment and retention of new talent in the industry, with an emphasis on diversity, equity, and inclusion (DEI) and youth. A diverse and skilled workforce will be key to driving the innovation and growth needed to meet Ontario's electrification goals.

With support from its membership, the OWA will implement this Strategic Plan into action with a commitment to working together to leave a powerful legacy that will benefit future generations.

VIEW THE STRATEGIC PLAN:
Accelerating Ontario's Electrification







TAKING SHAPE

Iconic Sir Adam Beck I gets an upgrade

BY **Ontario Power Generation**

In Niagara Falls, work has been completed on an important upgrade at one of Canada's most iconic hydroelectric stations.

For close to a century, the 180-metre-long tailrace deck spanning the lower façade of OPG's Sir Adam Beck I Generating Station (GS) served as an essential runway for workers to maintain the station's 10 units.

The laneway and its arches also played a large part in the overall aesthetic of the powerhouse.

The upgrades to this critical component of the 446-megawatt station are now complete, ensuring over 50 years of reliable operation while enabling the safe passage of trucks, cranes, and personnel supporting the facility.

"This new tailrace deck gives our workers much more space and maneuverability to access and isolate Sir Adam Beck I's units during maintenance outages," said Andre Friedmann, a Project Leader with OPG. "This new structure will be safer, more functional, and last for many more decades."

The new tailrace deck is much wider – 5.87 metres compared to the original's 4.11 metres. It's also higher by 0.8 metres to provide increased clearance above maximum tailwater levels.

At a glance

- *A new tailrace deck has been completed at the Sir Adam Beck I hydro facility.*
- *The structure, which spans the lower façade of the powerhouse just above the water, is important to facilitate maintenance work for the station's units and provide access to the north end of the station.*
- *The new tailrace deck and related upgrades provide more space to work while maintaining the traditional look of the original century-old deck.*

> "THIS NEW STRUCTURE WILL BE SAFER, MORE FUNCTIONAL, AND LAST FOR MANY MORE DECADES.
>
> Andre Friedmann, PROJECT LEADER

Using a sectional barge, workers dismantled the old tailrace deck at OPG's Sir Adam Beck I hydro station before constructing a new, wider deck and related upgrades.

In addition to the deck upgrades, a permanent access platform was built at the south end of the tailrace. The 20-metre by 12-metre platform will benefit OPG's operations by providing a staging and parking area at river level.

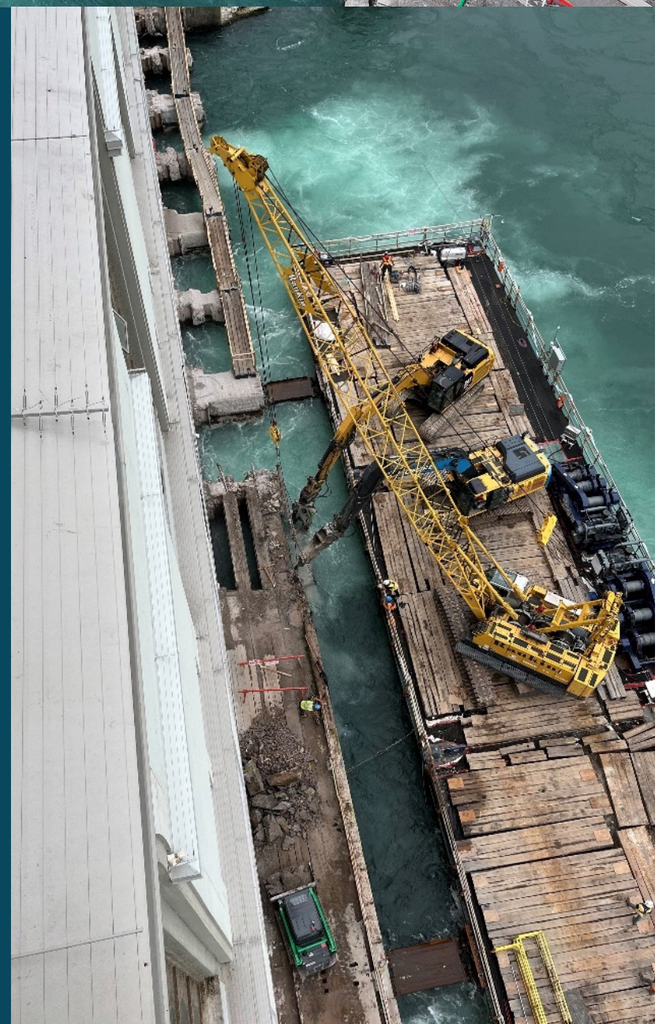
The new design is also preserving the heritage of the original tailrace deck by replicating its unique arches.

The project, which started in 2022 in partnership with Hatch Ltd., Rankin Construction Inc., and Ellis Engineering, involved the complete demolition of the old tailrace deck, which wrapped up in September 2023.

Proceeding from south to north, the reconstruction phase of the project began shortly after, in October 2023, with the new tailrace deck quickly taking shape over the next year.

The project team had to think outside the box to ensure hydroelectric generation from Sir Adam Beck I remained unaffected by demolition and construction.

"That was our biggest challenge," said Friedmann. "In the end, we came up with an innovative solution – and that was to set up a barge in front of the station from which we could do all the demolition and reconstruction work."



The tailrace deck spans the lower façade of Sir Adam Beck I's powerhouse.

The large sectional barge, roughly 49 metres long and 12 metres wide, safely accommodated an 85-ton crawler crane and two 35.5-ton excavators, among other required equipment.

Due to the fast flowing and turbulent waters of the Niagara River, traditional methods of using spuds and tugboats to respectively anchor and move the barge was not practical.

> THAT WAS OUR BIGGEST CHALLENGE. IN THE END, WE CAME UP WITH AN INNOVATIVE SOLUTION – AND THAT WAS TO SET UP A BARGE IN FRONT OF THE STATION FROM WHICH WE COULD DO ALL THE DEMOLITION AND RECONSTRUCTION WORK.
>
> Andre Friedmann, PROJECT LEADER

Instead, the project team came up with a temporary mooring system, which included heavy cables and winches connected to anchor points on shore. This system allowed the barge to be shuttled along the entire length of the tailrace while providing a stable platform for workers.

Ultimately, this solution allowed Beck I to keep producing clean power unhindered throughout the project and the station played a major role in OPG's Niagara hydro operations achieving its highest electricity output in over 40 years in 2023.

"Were it not for this barge, the new deck would have taken significantly longer to construct and we likely would have had to shut down some generating units to accommodate the work," said Friedmann.

This is one of the latest projects at OPG's Sir Adam Beck hydro complex, which includes Sir Adam Beck I and II GS, as well as the Sir Adam Beck Pump GS.

This April, OPG announced its Niagara hydro fleet, which includes the Sir Adam Beck complex, will soon be undergoing a multi-year refurbishment.

A look at the new tailrace deck at the Sir Adam Beck I hydro station in Niagara Falls.

Last November, OPG successfully completed a high-voltage line replacement at the Sir Adam Beck II GS, Ontario's largest hydro station.

And in 2022, Sir Adam Beck I GS completed the replacement of two historic generating units, the first full unit replacements in its long history.

All of this work will ensure these important stations can continue to generate clean, reliable power to support Ontario's electrification and economic growth.

All told, OPG's Niagara hydro stations meet about 9% of Ontario's energy needs each year.

Harmonizing Power+Nature

Successful Fish Passage Strategies

BY **Kleinschmidt**

Hydroelectric generating stations are incredibly diverse in Canada. Their size, lay-out, and design are adapted to the unique landscapes and hydrology of Canada's waterways. Fish species in Canada are also quite diverse - many species have complex life histories that depend on successful upstream and downstream migration to important aquatic habitats. Migratory fish species often encounter hydroelectric facilities at key points in their lifecycles.

Adult salmon and herring species swim upstream past hydropower generating stations to spawn, with juveniles migrating downstream annually to the ocean. American eels, a unique and imperiled species, migrate as juveniles into freshwater, and years later, return downstream as large adults to spawn in the Sargasso Sea. The American eel is of particular concern in Canada, with declining populations throughout their range. The Species at Risk Act, Canadian Fisheries Act, and provincial regulations impose requirements for their protection.

Fish can swim upstream past hydroelectric generating stations through engineered ladders, nature-like fishways, or fish lifts. Fish can also pass downstream through spill gates, over spillways, or through dedicated fish bypasses. Another downstream passage route is through hydro turbines (i.e., entrainment) though, depending on fish size and shape and the speed and size of the turbine, some fish may not survive. To address this, newer turbine designs that focus on safer fish passage are being tested and implemented.

Milford Fish Lift, Penobscot River, ME

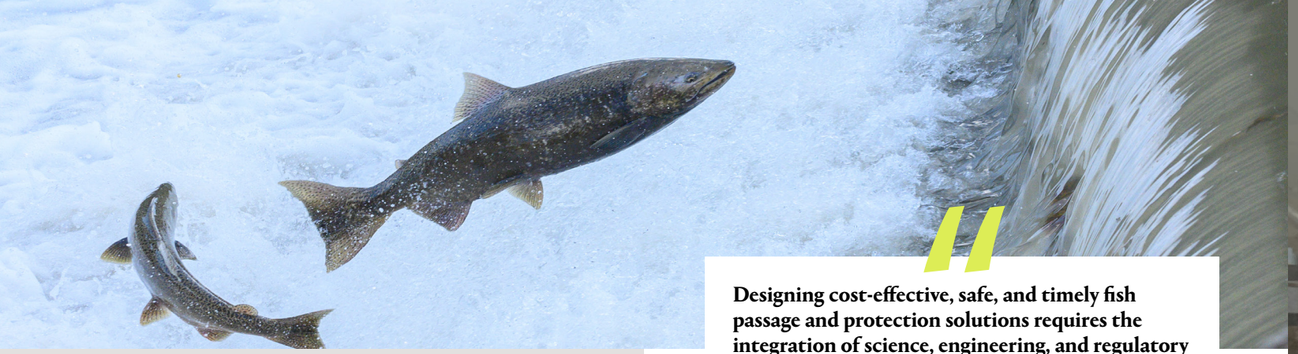
Hydroelectric generating stations are incredibly diverse in Canada. Fish species in Canada are also quite diverse - many species have complex life histories that depend on successful upstream and downstream migration to important aquatic habitats.

Designing cost-effective, safe, and timely fish passage and protection solutions requires the integration of science, engineering, and regulatory expertise. Kleinschmidt has extensive experience in fish passage engineering and environmental consulting, with a dedicated team of engineers and scientists. Our team has designed hundreds of upstream and downstream fish passage systems at hydroelectric facilities across North America. Kleinschmidt has also provided engineering and consulting services on more than 70 entrainment and impingement studies. Our biologists are skilled at assessing fish passage system effectiveness, understanding entrainment risk, and evaluating fish movements using state-of-the-art technologies such as radio and acoustic telemetry, 2D and 3D modeling, and netting methods. Our expertise in designing effective passage solutions for American eels helps our clients meet their regulatory requirements and environmental stewardship goals.

Project Successes:

Generating Station, Confidential Client, Ontario

The client reconstructed their generating station in southern Ontario and, to comply with the Fisheries Act, assessed fish losses associated with operations. Kleinschmidt conducted a comprehensive desktop evaluation of potential fish impingement, entrainment, and turbine mortality. Using empirical data from the GS impoundment and comparable hydroelectric stations, the number and species of fish entrained was estimated. By analyzing the parameters of the new hydro turbines, Kleinschmidt calculated size-specific turbine passage survival rates which were applied to entrainment estimates to estimate potential fish losses. This scientific methodology provided the client with the information needed to develop appropriate mitigation measures to meet regulatory requirements while optimizing operational efficiency and minimizing unnecessary costs.



Chaudière Falls Generating Station, Energy Ottawa, Ontario

Kleinschmidt assisted Energy Ottawa by providing biological and engineering support to meet the requirements of the Fisheries Act Authorization. Acoustic imaging technology was used to investigate occurrences of entrainment and fish behavior at the newly installed intake rack and fish bypass system. Kleinschmidt also provided engineering services in the planning and design of a required American eel ladder, collaborating with MILIEU Inc. to develop a design that avoided interference with year-round ice sluice operations and minimized the number of turn pools. The design included a steel deflector plate to prevent water, ice, and debris from spilling onto the eel ladder entrance. Kleinschmidt worked to minimize modifications to existing infrastructure to reduce costs and avoid triggering other legislative requirements.

Kleinschmidt also designed and implemented a video surveillance monitoring system for fish passing through the downstream fish bypass facility, designing and implementing a system that minimized the effort needed to quantify downstream fish passage. The facility included two pipes (one from each of the two bypass entrances) that passed through an observation room. A single camera system monitored both pipes and included a high-resolution video camera, control computer, external hard drive, and lighting system. An uninterrupted power supply was used to mitigate potential power outages. Motion sensing software captured video files containing objects in motion (targets). The system recorded continuously but archived only those files containing targets. Data were recorded to an external hard drive and were routinely downloaded. Data were reviewed to identify targets and enumerate fishes that used the system.

Designing cost-effective, safe, and timely fish passage and protection solutions requires the integration of science, engineering, and regulatory expertise. Kleinschmidt has extensive experience in fish passage engineering and environmental consulting, with a dedicated team of engineers and scientists.

Howland Nature-Like Fishway, Penobscot River, ME

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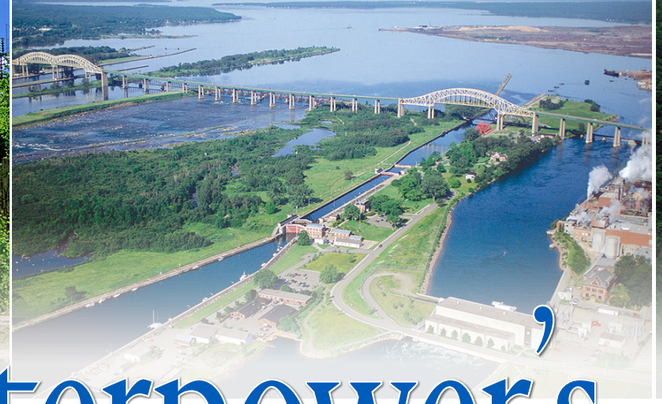
ABOUT KLEINSCHMIDT

Kleinschmidt can help you develop effective and innovative fish passage solutions and implement studies that minimize fishway design and construction costs, reduce impacts to operations, and determine if migratory fish are successfully passing generating stations unharmed. If you need to site or design a fishway or monitor fish passage, our biologists, engineers, and regulatory specialists are here to help.

Contact Kleinschmidt to learn more about our fisheries solutions.
kleinschmidtgroup.com | solutions@kleinschmidtgroup.com



Waterpower's Future in Meeting Ontario's Growing Electricity Needs

BY **The Independent Electricity System Operator (IESO)**
PHOTOGRAPHY **Brookfield Renewable Energy Group**

In October of this year, the IESO released its latest demand forecast, signalling that demand for electricity in Ontario is expected to increase by roughly 75 per cent by 2050. This significant projected growth in demand is driven by population and economic growth, the increasing electrification of the broader economy, and the emergence of new industrial opportunities and data centres looking to connect to the grid.

To help meet these future needs, the IESO's Resource Adequacy Framework uses a multi-pronged approach to acquire resources in a manner that fosters competition while providing certainty, balancing risk between ratepayers and investors. There are several mechanisms within the Framework that taken together provide the IESO with the flexibility to address evolving system needs, while also recognizing the unique characteristics of different suppliers and resource types. This includes waterpower.

Under the Framework, the IESO launched the Small Hydro Program (SHP) at the end of 2023 to re-contract hydroelectric facilities with capacities up to 10 MW, providing revenue certainty through 2043 to nearly 90 distribution-connected hydro facilities. Building on that success, we are currently working on the design of a Northern Hydro Program (NHP) to re-contract larger hydroelectric facilities (greater than 10 MW) by leveraging established elements, best practices and lessons learned from the SHP, as well as other recent IESO procurements.

As the IESO considers the design of the NHP, we will continue to work with the Ontario Waterpower Association (OWA) and relevant facility owners to create a program that provides value for ratepayers and a reasonable revenue stream to large hydro facilities to ensure their continued success in support of growth in Ontario.

Complementing this work on existing hydroelectric resources, the IESO has also successfully completed both the Expedited (E-LT1) and Long-Term 1 (LT1) procurement processes, representing substantial investments in new resources to meet Ontario's growing needs. Together, these recent procurements have secured approximately 3,500 MW of new storage and generation, demonstrating the benefits of competitive approaches to resource acquisition in providing value for ratepayers and balancing the needs of developers and communities. As a case in point, the weighted average price for storage resources in the LT1 RFP represented a 24 per cent decrease from storage acquired in the E-LT1 RFP.

The results of the LT1 RFP are also evidence of the growing trend of strong municipal and Indigenous support for energy infrastructure development across the province. Eighty per cent of project bids that were submitted to the IESO had already received a municipal council support resolution, while nine of the 10 battery storage projects selected in the RFP had significant Indigenous equity participation.

Most importantly, these outcomes demonstrate the power of Ontario's electricity sector working together to meet the province's growing needs while ensuring system reliability, affordability and sustainability into the future.

With the E-LT1 and LT1 RFPs completed, the IESO is now developing the Second Long-Term (LT2) RFP to address electricity needs emerging in the early 2030s. The LT2 RFP, which is expected to be technology-agnostic and offer a regular cadence of submission windows, aims to provide project developers of different technologies the long-term certainty necessary to make appropriate investments. This includes hydroelectric generators that are seeking opportunities in the future.

Elsewhere, we are working with the OWA to consider how long lead-time resources, in particular new hydroelectric generation, can participate in current and future IESO procurements. To this end, the IESO is looking to develop a separate procurement to acquire long lead-time resources that can be in service by 2035. Our engagement on this process began in late summer, when we initiated a Request for Information (RFI) with a focus on new-build hydroelectric generation and long-duration energy storage. The IESO is currently reviewing RFI submissions and working with the waterpower community to better understand how these technologies can be integrated into Ontario's energy landscape via future competitive procurements.

The combination of mechanisms under the IESO's Resource Adequacy Framework are working as intended to help incentivize investment in new resources and to maximize the efficiency and contributions of existing assets already connected to the grid. Through effective and well-designed program offerings and long-term procurements, the IESO intends to support the crucial role that waterpower plays in the economic and social well-being of Ontario communities. Hydroelectricity has historically been critical to Ontario's success, and it will continue to play an important role as we shift to more non-emitting resources and look to decarbonize Ontario's electricity in the coming decades. By providing multiple avenues for hydroelectric resources of all types and sizes to participate, the IESO is opening the door for further long-term investment opportunities.

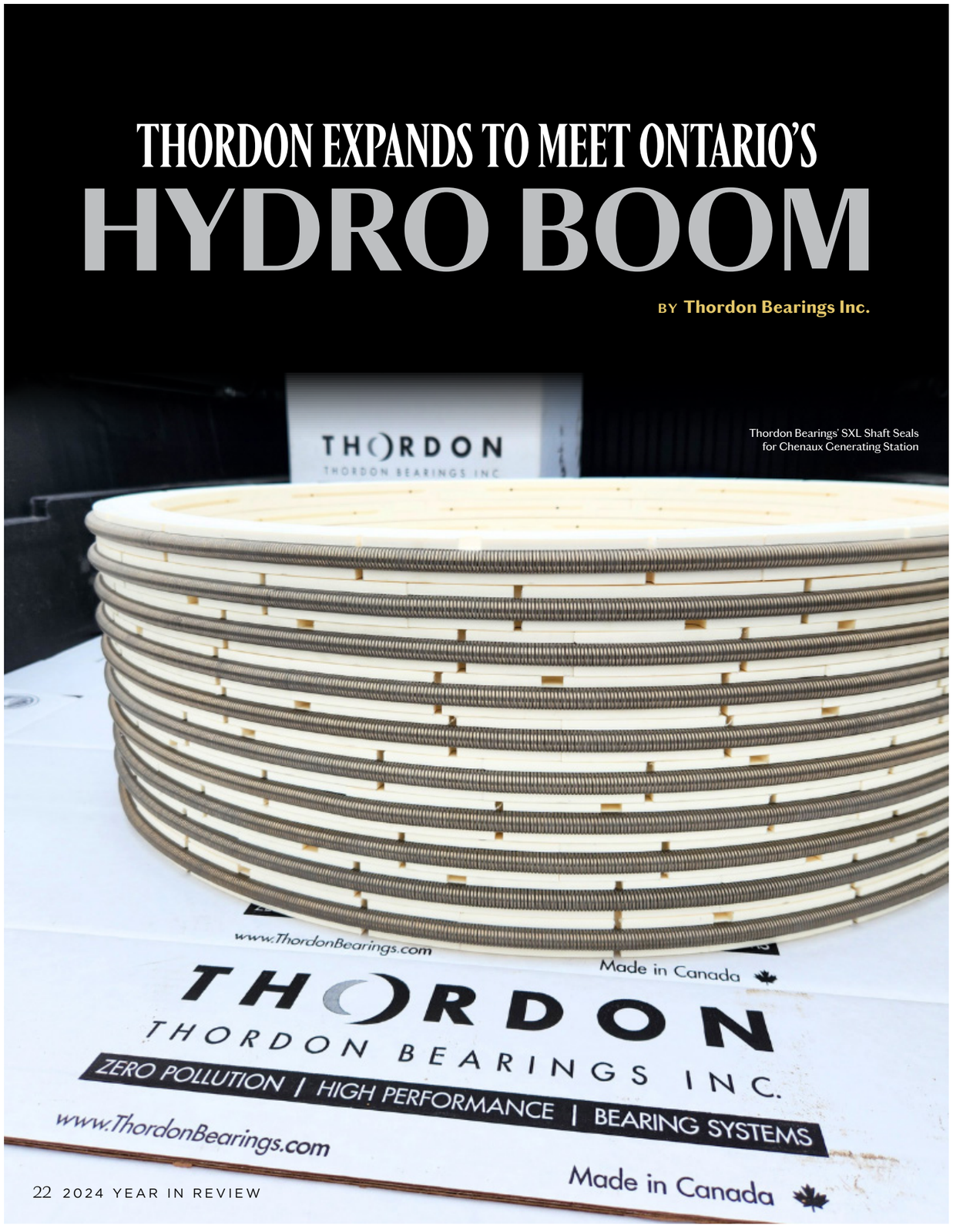
Ongoing collaboration and partnerships between the IESO and the community of hydroelectric producers across the province will be key as we look ahead to 2025. We look forward to continuing to work with the OWA and the wider sector to enable Ontario's energy transition and to secure our shared electricity future.

2025 Industry Events Listing

January 19 – 21	**Rural Ontario Municipal Association Conference**	Toronto, Ontario, Canada
February 11 – 13	**POWERGEN International**	Dallas, Texas, USA
March 25 – 26	**CEATI International's Hydropower Conference**	Palm Springs, California, USA
March 26	**OWA's Queen's Park Advocacy Day**	Toronto, Ontario, Canada
March 31 – April 2	**NHA's Waterpower Week in Washington**	Washington, D.C., USA
April 23 – 25	**Northwestern Ontario Municipal Association Conference**	Thunder Bay, Ontario, Canada
May 5 – 7	**Federation of Northern Ontario Municipalities Conference**	North Bay, Ontario, Canada
May 7 – 9	**Power of Water Canada Conference**	Niagara-on-the-Lake, Ontario, Canada
August 17 – 20	**Association of Municipalities of Ontario Conference**	Ottawa, Ontario, Canada
September 28 – October 1	**Canadian Dam Association Conference**	Saskatoon, Saskatchewan, Canada
October 1 – 3	**Canadian Waterpower Week (Waterpower Canada)**	Ottawa, Ontario, Canada
October 14 – 17	**NHA's Clean Currents Conference**	Pittsburgh, Pennsylvania, USA

THORDON EXPANDS TO MEET ONTARIO'S HYDRO BOOM

BY **Thordon Bearings Inc.**



Thordon Bearings' SXL Shaft Seals for Chenaux Generating Station

Thordon Bearings' SXL Main Guide Bearing Shells for Portage Power Hull #2

Burlington-based Thordon Bearings is preparing for the modernization of Ontario's hydropower infrastructure with key investments in new production capacity and technologies capable of meeting market demand for more efficient, more reliable turbine solutions.

Ontario is home to a vast network of 224 hydropower stations, accounting for a large proportion of the province's total energy generation. However, much of this infrastructure is aging, with some units dating back to the early 1900s.

"Compared to modern plants that can achieve efficiencies well above 90%, studies have shown that older hydropower plants operate with less than 80% efficiency, requiring substantially more maintenance due largely to outdated technology," says Ryan Edmonds, Thordon's Business Development Manager - Hydro & Industrial.

The modernization of Ontario's hydropower plants over the next decade or so is expected to increase generation capacity without expanding water flow or dam structures.

> OUR SOLUTIONS AND HYDRO EXPERTISE ARE PERFECTLY SUITED TO HELPING ENERGY PROVIDERS ACHIEVE THEIR SUSTAINABILITY AND COST EFFICIENCY GOALS.

For example, replacing older turbines at Ontario Power Generation's Sir Adam Beck Hydroelectric Station will result in a 15% increase in output, adding an additional 150MW to its capacity.

Ontario Power generation (OPG), in particular, is turning to Thordon Bearings for advanced wicket gate bearings, turbine guide bearings, and shaft seals that utilise the company's innovative self-lubricating or water-lubricated polymer bearings.

"OPG is a key customer we're proud to be working closely with to upgrade 66 hydropower stations across the province," says Edmonds. "Our solutions and hydro expertise are perfectly suited to helping energy providers achieve their sustainability and cost efficiency goals."

Thordon's relationship with OPG has been steadily growing over recent years, with the manufacturer securing several high-profile projects across the company's portfolio.

One of the most notable successes was the refurbishment of OPG's 144MW, 1950-built Chenaux Generating Station, in Eastern Ontario, for which Thordon fitted eight new shaft seals.

2024 was a continuation of the mid-life refurbishment at OPC's 243MW Otto Holden Generating Station, on the Ottawa River with 3 Units supplied to date. Each turbine retrofit involved the replacement of 262 wicket gate bearings and seals with Thordon's self-lubricating ThorPlas-Blue material, SXL operating ring wear pads, and Thorseal wicket gate seals. By 2029, all eight of the station's turbine units will have been 'Thordonized'.

OPC also returned to Thordon when competitor bearings failed earlier this year at the 274MW Lower Notch Generating Station on the Montreal River, near North Cobalt. The phenolic laminate bearings, installed in 2014, were quickly replaced with ThorPlas-Blue wicket gate thrust bearings and SXL operating rings to prevent any further downtime.

Thordon's success with OPC has not gone unnoticed by other utility companies in Canada, with the manufacturer securing major contracts from other key players in the Canadian hydropower market.

"What we're seeing is that once a hydropower plant has 'Thordonized', operators quickly realize the advantages," explains Edmonds. "Thordon shaft seals can reduce the leakage typical of carbon graphite-based seals by up to 70%, extending maintenance intervals exponentially. This not only saves them time but also money."

To keep its seals and the plant running at peak performance year-on-year, Thordon has recently introduced a new seal specific filtration package, designed to ensure a continuous supply of clean, abrasive-free lubricating water.

"This a real game-changer for the industry," explains Edmonds. "It solves a problem that every hydropower plant has – how to keep shaft seals running at peak efficiency. We already have major customers lining up to buy these packages."

> WHAT WE'RE SEEING IS THAT ONCE A HYDROPOWER PLANT HAS 'THORDONIZED', OPERATORS QUICKLY REALIZE THE ADVANTAGES.

Ontario is an incredibly important market for Thordon and indeed its distributor Millstream Engineering. "We are based in Ontario, and we're seeing a lot of exciting things happening in this market. Utility companies don't simply want to replace bearings and seals like for like, but actively seek out the best technologies and solutions to make their plants more efficient, more reliable, and more environmentally friendly," says Greg Auger, Co-founder & Commercial Director of Millstream Engineering Inc.

To meet anticipated demand for greater power generation efficiency, Thordon has made significant investment in its operations, having recently purchased another building close to its Burlington headquarters, expanding its footprint and production capabilities.

"We're seeing a real explosion of activity in the hydro market, and we need to be prepared for it. That's why we're investing in our people, our facilities, and our technology. We want to be the go-to hydro partner for utilities in Ontario as they work to modernize their infrastructure," he says.

As Thordon continues to expand its presence, the company is also looking to strengthen its partnerships with original equipment manufacturers (OEMs), such as Andritz, Voith, Toshiba, GE and American Hydro.

"Compared to oil-lubricated bearings, for instance, turbine manufacturers themselves are opting for water-lubrication. They find turbines with a water-lubricated bearing and seal system are not only more reliable and efficient, but also less expensive to build," says Edmonds.

Collaboration with all the turbine manufacturers is deemed crucial in ensuring that Thordon's hydro solution are integrated into the next generation of hydropower turbines, further solidifying the company's position as the leading supplier of water-lubricated and grease-free bearings and seals to the sector.

The Central Hidroeléctrica 3 de Febrero Project

BY **Ian Ainslie,** SENIOR PROJECT MANAGER, HYDROPOWER & DAMS, *HATCH*

The Central Hidroeléctrica 3 de Febrero in El Salvador was a project once on the verge of abandonment. Today, the 67-MW hydroelectric power plant is a symbol of perseverance.

In 1998, the government of El Salvador initiated surveys to construct a dam and hydroelectric power plant—a project that promised a significant boost to the region's electrical capacity and dramatically improve local roads and bridges. Following initial assessments, construction kicked off in 2008 when the first stone was laid. Before long the project encountered a major setback when tropical storm Agatha hit in 2010.

The resulting flooding exposed several weaknesses in the design; the location of the facility's dam the most significant. By the end of that wet season, survey monuments at the dam site recorded land movements up to several hundred millimeters and cumulative slope movements of up to one meter. This raised stability concerns of the entire massif and, as a result, it was decided to move the dam 600 meters upstream—delaying construction and costing the local economy more than US$100 million in overruns and redesigns.

Over the next nine years, the project experienced several challenges, resulting in it being put on an indeterminate hold when it was three quarters complete due to setbacks.

Tackling the toughest challenges

Construction finally resumed in 2019 with President Bukele initiating a request through the Comisión Ejecutiva Hidroeléctrica Del Rio Lempa (CEL) to undertake a technical audit of the project to ensure that completion of a partially built facility made economic sense with no significant hidden technical faults.

We were engaged because of our international reputation as a trusted, global firm with deep technical bench strength. Our first order of business: to determine the path forward. CEL needed to understand the costs and risks of completing the project versus decommissioning and restoring the site. Our audit concluded that there were no significant technical flaws and that it was more economic to finish the project than abandoning it, given its advanced construction stage and the need for additional hydropower in the region.

CEL agreed with our recommendation and in October 2020 they requested us on site within three weeks to provide engineering, procurement, construction management, project management, on-site technical support, commissioning, and operational readiness.

“The Central Hidroeléctrica 3 de Febrero in El Salvador was a project once on the verge of abandonment. Today, the 67-MW hydroelectric power plant is a symbol of perseverance.

We launched a full-scale review of 12 years' worth of designs, handovers, relocations, change orders, and more, and in the process uncovered areas of construction and design that were non-compliant with best practices and codes.

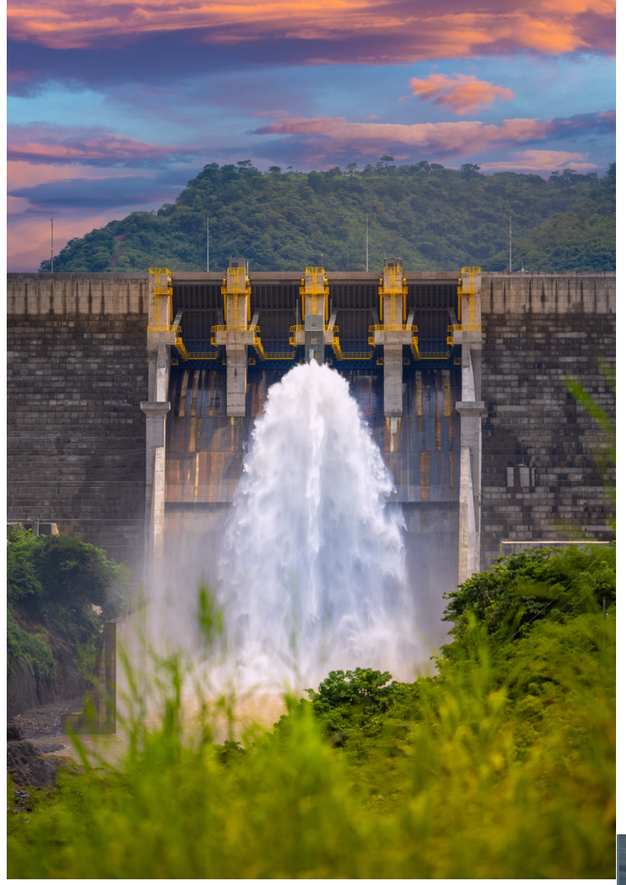
We conducted studies to define the project scope with estimated costs and timelines. We also completed design engineering, which involved detailed plans to address technical and environmental requirements associated with the main facility, and the construction of new roads and two new bridges.

In collaboration with CEL, we provided construction management support for a 10.8-square kilometer surface area annual storage reservoir, including rim stabilization, an 84-meter-high, 325-meter-long roller-compacted concrete (RCC) dam, and an elaborate grout curtain. The scale was massive, with a four-bay reinforced concrete spillway, including large radial gates and stilling basin, and an intake structure with a 750-meter-long, 6.5-meter-diameter conduction tunnel. River stabilization and protection downstream of the stilling basin included a bypass and weirs as well as stabilization of the original dam site area.

A uniquely designed 5,500-square meter surge pond was constructed from gabions to reduce costs, and a 25-meter-high by 500-meter-long earth embankment closure dike was constructed to complete the reservoir.

The closure dike design was reimagined when supply chain challenges during the COVID-19 pandemic made importing traditional clay core materials impractical. We opted for a PVC membrane, combined with a highly compacted sand and gravel embankment, to provide a reliable and cost-effective water barrier.

With a design that ensures uninterrupted ecological flow throughout the river—protecting downstream communities and wildlife—the reservoir created by the project has increased fish populations, supported sustainable fishing practices, and continues to provide a reliable food source for the surrounding communities. Its storage capacity helps mitigate floods, mudslides, and erosion, providing long-term environmental benefits. And by opening new navigation routes within the reservoir, the project also reduces travel distances and carbon emissions. The hydroelectric station's location on the Torola River allows for the reuse of water in electricity production, enhancing overall energy efficiency and sustainability.



Powering positive change

The heart of Central Hidroeléctrica 3 de Febrero lies in its powerhouse. Inside, you'll find two 32.2-megawatt generating units and a smaller 1.42-megawatt minimum flow unit. Two penstocks channel water to the turbines, and upstream, the substation acts as the power plant's nerve center, responsible for stepping up the voltage of the generated electricity for transmission to the grid.

The project was inaugurated in October 2023, with a ceremony where President Bukele celebrated the success of the project, sharing that electricity prices would be reduce by 14%.

What was once a project plagued by delays and cost overruns became a political and economic success. This project has become a legacy, a landmark, and an ongoing source of prosperity.

Watch the project video: **https://youtu.be/q1Y40gil8JU**

Remember when?

Waterpower Key to System Restoration After 2003 Blackout

BY **Ontario Waterpower Association**

In 2003, a widespread power outage left millions of people across Eastern North America, including Ontario in the dark. At the time, this was the world's second-largest blackout in history. Harnessing their unique capabilities, Ontario's waterpower facilities led the charge in bringing the power back online.

In its August 29th 2003 Press Release, the Independent Market Operator (IMO) (now known as the Independent Electricity System Operator (IESO)) observed that "The Sir Adam Beck Generating Station in Niagara Falls and the Saunders Generating Station near Cornwall were two of the few generating stations that were able to remain operational and formed the foundation from which the IMO was able to restore power to the rest of the province." The following is the IMO's chronology of events and focuses on the early stages of restoration. In each significant event, the critical role of waterpower is apparent.

Restoration from the Niagara *area*

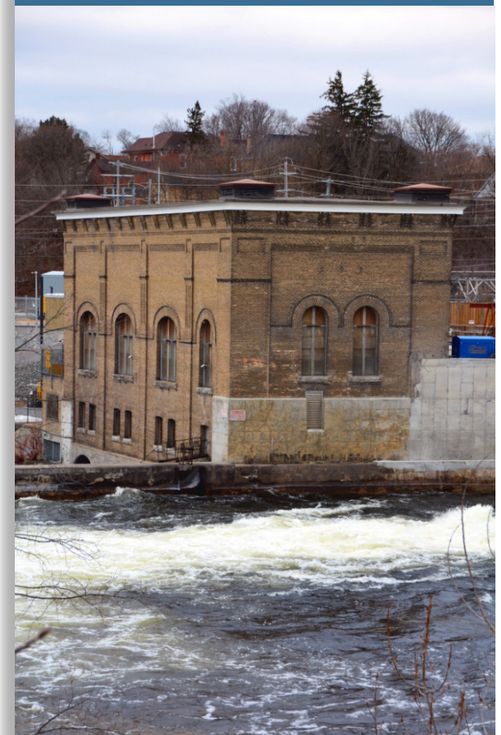
- *The first circuits were energized out of the Niagara island at 4:42 p.m. with a goal of bringing power to the Bruce Nuclear generating units. The three Bruce "B" generating units that were available returned to service between 7:13 p.m. and 9:13 p.m.*
- *Energizing the circuits towards the Bruce Nuclear complex also allowed the IMO to return potential to the Nanticoke generating station.*
- *Restoration came next toward the GTA, Pickering Nuclear Stations, Lambton Generating Station and TransAlta - Sarnia.*
- *The transmission system in the area bounded by London in the west and Toronto in the east had to be reinforced quickly to support the reloading of the Bruce generation. To perform this, customers' power was restored in a controlled manner at many locations throughout the transmission corridor.*

Restoration from the Cornwall *area*

- *The period from 4:11 p.m. to 5:15 p.m. was used to assess the conditions in the area, stabilize available generation, and secure transmission that was operating near its limits.*
- *At 5:15 p.m. the first circuit was energized out from the Cornwall area westward towards Pickering, Darlington and Lennox Generating stations. The Darlington generating unit that was available returned to service at 9:18 p.m.*
- *Generating units from Quebec were synchronized to the system at 8:17 p.m. to add additional stability to the area.*
- *With the transmission system that was restored across the CTA from Niagara supplying power to Pickering, a link between the Cornwall area and the CTA was completed at 10:37 p.m. forming a complete loop around Lake Ontario.*
- *While the transmission system was being restored toward Darlington, another restoration effort from Cornwall towards Ottawa began at 6:40 p.m. in order to restore critical telecommunications facilities.*

Waterpower Workhorse

Peterborough's **London Street Generating Station's** black start capability was put to use on August 14th, at about 7 p.m. after it was concluded that the outage would last for some time. The power was used to help keep the hospital running normally. Waterpower producers across the affected area reported significant contributions to meeting local priorities and helping to restore the system.



Restoration from the Chats Falls *area*

- *Chats Falls generating station units (Northwest of Ottawa) were successfully started from power supplied by Quebec at 5:15 p.m. Restoration from this area was directed to Pickering in an effort to return power to Pickering in an expedient manner.*
- *After considerable switching efforts and with the aid of additional units from Quebec, circuits were energized from Chats Falls towards Pickering at 8:21 p.m.*
- *Power arrived for Pickering from Niagara and Chats Falls at nearly the same time.*
- *Pickering was energized from the Niagara sources at 9:15 p.m.*
- *Chats Falls generation was eventually connected to the remainder of the system early Friday.*

Restoration from the Northeastern *area*

- *Several hydroelectric generators remained spinning but not connected to the island north of Timmins. A number of the generators at various facilities were synchronized together and by 7:41 p.m. the transmission system was energized south to Timmins.*
- *When sufficient Timmins area load was restored, the transmission system was energized south to the Sudbury area.*

This chronology reminds us that only waterpower provides all essential reliability services to the electricity system, the importance and value of which will significantly increase as we expand the grid to meet growing demand. Worth remembering indeed.

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FINAL THOUGHTS:

The BIG Lift
An Opportunity for a Reset

BY **Ontario Waterpower Association**

2025 will mark the official launch of a new era in Ontario's electricity and broader energy history, with the beginning of an unprecedented build out of the generation, transmission, and distribution systems. It will also provide an opportunity – or perhaps demand – that we apply the lessons of the past in building for the future.

Nowhere is this more critical than ensuring that the regulatory and policy framework at a project level enables, rather than frustrates, new development. For waterpower, this is largely the purview of the Ministry of Natural Resources (MNR) through the Public Lands Act (access to Crown land, tenure) and the Lakes and Rivers Improvement Act (facility construction, water management). Put simply, meeting expansion and procurement expectations will be almost entirely premised on a structural and functional approach at MNR that is a considerable improvement over previous operational designs.

> "It's time to be creative, rather than confined by "business as usual." It's time for a reset."

A little history should help inform the required reset. When last the province was expanding electricity generation, the initial procurement framework presumed a five (5) year development timeline (from application to commercial operation). As the deadline approached, the government realized that projects had yet to complete the permitting and approvals process, despite the fact the OWA's Class Environmental Assessment was designed as a "one project, one process" model. As a result, the then Ministry of Energy was forced to intervene and extend the development timelines to eight (8) years. The outcome, of course, was predictable. More time and money spent but few projects commissioned. In fact, only nine (9) of forty-one (41) waterpower projects on provincial Crown land were successfully developed and, under fixed price contracts that assumed a $5.1M/MW cost, actual costs increased to an average of $7.8M/MW. Clearly, we must learn from the past or risk repeating it.

As the sector gears up to participate in the next series of regularly cadenced procurements, individually measured in the 1,000's of MW, through the Long Term 2 and Long Lead Time RFPs, the OWA and other organizations have encouraged innovation in the structural/functional approaches to regulatory ministries and agencies to facilitate expeditious, accountable and measurable project review and permitting and has recommended a move away from the decentralized District/Regional model to a centralized SWAT Team structure, key features of which would include:

- *representation from and accountability to the Ministry of Energy and Electrification;*
- *efficiently resourced to respond to development/ redevelopment in a timely manner with appropriate service delivery commitments;*
- *authority for review and approvals and the ability to determine which information to obtain from a District/Region at a project level; and*
- *transparency to proponents, the IESO and the public with respect to progress against targets.*

Whether or not the government choses this or another service delivery model remains to be seen. But, unlike previous expansions of the grid, which were arguably led by more ideological factors, this time around we are collectively focused on system reliability. We can't afford to get this wrong. We don't have the luxury of time to learn by doing. And we have the lessons of the recent past to illustrate what not to do. It's time to be creative, rather than confined by "business as usual." It's time for a reset.

YEAR IN 2024 REVIEW

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