



– Sturgeon Falls Hydro Redevelopment

Canadian Consulting Engineering Awards
Project Entry - Energy



Our success at a glance

- Installation of 3 X 2 MW vertical axial flow turbines and generators
- New innovative roof design for mobile crane access
- Turnkey assembly for plant automation
- Upgrades to civil engineering structures (dewatering, flood protection and structural reinforcement)
- Fast track mode to minimize interruption of operations
- 13 months timeline (+1 month for commissioning) / 2 months early completion
- Achieve and exceed the guaranteed power of 2MW per unit
- 33% annual increase in the plant's electricity production
- Cost of CAD 3.2 million/MW, or less than CAD 3 million/MW including revenues from early delivery
- Open-book project management in EPC structure with active customer participation

Project Information

Title

Sturgeon Falls Hydro Redevelopment

Location

Sturgeon Falls, West Nipissing, Ontario

Year completed

2019

Client

West Nipissing Power Generation

Entering firm

FNX-INNOV

Collaborators

AXC Construction, EnerAxion, Canadian Hydro Components

Project Summary

The community of West Nipissing in Ontario has mandated FNX-INNOV and its collaborators to refurbish its Sturgeon Falls hydroelectric generating station. This century-old structure required major work to meet the client's profitability objectives. Our teams provided a solution of great technical, environmental and economic efficiency, replacing the horizontal turbines at the end of their service life with three vertical turbines. The work was carried out in an innovative EPC structure, surpassing the client's objectives.

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Innovation

Background

In 2018, AXC Construction, a subsidiary of FNX-INNOV, was mandated to renovate the Sturgeon Falls hydroelectric generating station owned by the community of West Nipissing in Ontario. This power station, built in 1912, operated with 6 horizontal turbines (camelback or Francis type), 3 of which were at the end of their life when the project started. The client's objectives included increasing energy production capacity, reducing operations and maintenance, reducing environmental impact and effectively controlling expenses.

This plant is an important source of revenue for the municipality and its residents, especially since the closure of the pulp and paper mill that operated the facilities until 2002. We had to develop a project that would be efficient from an investment standpoint and that would generate significant value for the community over the long term, with minimal impact on the current operation of the plant. In a context where Canadian hydroelectric projects face competition from other sources of renewable energy, we also had to propose a project that was technically, economically and environmentally competitive.

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A custom-made solution

Our solution therefore took the form of an overhaul of the installations with minimal impact on the civil engineering structures and the surrounding environment. Our project team developed a strategy that optimized the existing structure by decommissioning the 3 end-of-life turbines and installing 3 new vertical «Saxo» type turbines. In addition to providing better energy performance, these new 1850 mm dual-regulation turbines make it easier to solve operational maintenance problems, offer protection of the electrical components against flooding, and benefit from a high-performance automated control system.

The innovative nature of the project also lies in the entire organizational strategy that enabled our solution to meet the client's specific constraints. Our engineering-procurement-construction (EPC) model made it possible to intervene quickly and efficiently to guarantee minimal impact on the operation of the power plant (without shutting down). Our open-book, matrix management contributed to the success of a project where the turbine production, design and construction teams worked closely together, as did the client's knowledge of the facilities. We delivered a solution of high technical quality, ahead of schedule and on budget.



The generators of the new turbines generate more electricity and are protected from flooding

Our project management structure greatly facilitated rapid adaptation to the constraints and allowed our teams to deliver to the client within the budget and on time.



A work area has been set up on the roof of the power plant

Complexity

We must recall the great complexity encountered and the many challenges resolved to achieve a final result that exceeds the client's expectations. The context in which our teams took charge of this project was in itself a challenge. We had to propose a complete solution for the rehabilitation of a hydroelectric structure more than a century old. Indeed, the original installations required us to use creativity to optimize energy performance while delivering minimal impact on civil engineering and the natural environment.

We were forced to develop a work area on the roof of the main building to allow the installation of the new turbines. These new installations also allowed the turbines to be handled by a heavy lift mobile crane. Another aspect related to the work site was the lack of the original plans of the structure and geological data to plan the excavation. Our teams discovered several elements as the work progressed and had to adapt the solution to these realities. The draft tubes for the new turbines required new excavations in a partly unknown environment, where we had to adopt safety measures. Because the original structure was not solidly supported on rock, we were forced to carry out underpinning work to reinforce the structure and allow the draft tubes to be installed.

Our project management structure greatly facilitated rapid adaptation to the constraints and allowed our teams to deliver to the client within budget and on time.



A new vertical turbine positioned with the help of a crane

Social and economic benefits

Social and economic benefits were a central aspect in meeting the client's needs. As mentioned earlier, the community of West Nipissing relied on our expertise to deliver a project with minimal impact on the normal operation of the plant, while ensuring tight control over expenditures. We were able to meet this need for financial performance while exceeding the client's expectations. Despite the unforeseen work, the plant returned to full operation several weeks before the initial delivery date, providing additional revenue for the community.

From a job creation perspective, we encouraged the hiring of local labour, a philosophy that accompanied our procurement approach throughout the project. From design in Montréal, to turbine production in the Ottawa area, to on-site construction of the plant, more than 50 employees contributed to the project. A local architectural firm as well as several workers and technicians from the Sturgeon Falls area were also part of the adventure. In addition, we implemented major health and safety measures and assigned a full-time health and safety officer to the construction site, which allowed us to deliver the project without any major incidents or accidents.

In its current configuration, the Sturgeon Falls generating station will be able to remain an important source of revenue for the community of West Nipissing for several decades to come.



The project employed more than 50 workers, many of whom were hired locally

Environmental benefits

The optimization of a small hydroelectric power plant such as Sturgeon Falls is in itself a project with significant environmental value. Unlike our U.S. neighbours, who generally do not opt for the refurbishment of assets at the end of their life, our Canadian facilities regularly benefit from refurbishment plans that generate much less environmental impact. In this case, the community of West Nipissing mandated us with a clear objective to deliver a solution with the least possible impact on the local ecology, while improving the plant's clean energy performance.

Several elements helped us successfully achieve this objective. First, although our solution required excavation work, we managed to avoid encroaching outside the walls of the original structure, which would have generated a release of sediment downstream of the river. At the same time, we secured the facility by providing renewed strength to the structure bearing on the riverbed.

In addition to limiting the impact on the plant's immediate environment, our work method made it possible to recover all the materials that could be recycled. Copper, steel and concrete, we responsibly managed the materials resulting from the demolition work.

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The original building and the external environment were preserved and secured

Meeting client's needs

We can say without any doubt that the client is very satisfied with the result obtained. West Nipissing Power Generation has become an ambassador for our firm and our partners, opening the doors of its facility to several operators who wish to proceed with similar refurbishments. We were able to meet and exceed the financial, technical and environmental objectives mandated by the client.

Our solution allowed the plant to benefit from more powerful vertical turbines, surpassing the 2MW per unit that had been promised to the client. It also provided an efficient automation system, in addition to reducing and facilitating the operations and maintenance required for its operation. From an environmental standpoint, it met the client's request to have a minimum impact on the plant's natural ecosystem. Finally, we were able to transparently manage a project that proved to be a winning formula for all stakeholders from a financial point of view.

We can be proud of this project, which generated value for the community of West Nipissing while demonstrating the many benefits of a well-crafted plan to refurbish hydroelectric assets in a small generating station like Sturgeon Falls.



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The new vertical turbines (left) alongside the old horizontal turbines (right)





Annex



FNX-INNOV is a Canadian engineering firm that innovates through the creativity of its specialists and the know-how of its multidisciplinary teams to carry out large-scale projects that meet the challenges of today and tomorrow.

FNX-INNOV is the result of the acquisition, in 2018, of the engineering firm Le Groupe S.M. inc. and the integration, in 2019, of the engineering firm AXOR Experts-Conseils, both established in Quebec since 1972. With this merger, FNX-INNOV becomes a major player in Quebec and Eastern Canada. FNX-INNOV has thus been able to maintain and consolidate the expertise developed by its teams and now has more than 1000 professionals and experts who combine engineering, project management, environmental protection and systems integration to offer global solutions that meet the most complex demands of its clients, from design to implementation.

FNX-INNOV relies on the strength and dynamism of a seasoned engineering and construction team to offer a complete range of services in environment, planning, energy, infrastructure, water treatment, building, energy efficiency, industrial engineering, mining engineering, telecommunications, earth sciences and materials engineering.

Recognized for its innovation, the quality of its technical and technological performance and the efficiency of its customer service, FNX-INNOV deploys its know-how in Canada and on the international scene, in both public and private markets. FNX-INNOV distinguishes itself as a responsible company, dedicated to its clients, concerned about the environment and inhabited by professional rigour.



**Innovative solutions and
integrated services from
design to implementation.**





**Together,
let's redefine
engineering
without any
barriers.**

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