



Eaton delivers seamless, integrated approach to modernize aging hydroelectric facility

Location:
Village of Potsdam, N.Y.

Segment:
Utility

Problem:
An aging hydroelectric facility required an integrated approach to modernize a pair of turbine generators and upgrade its overall infrastructure to achieve efficient, reliable operation

Solution:
Generator, turbine and gear box upgrades; switchgear; battery systems; modern digital AVR's; comprehensive HMI; metering; modern low voltage generator switchgear; energy efficient LED station lighting; and protective relaying and auto synchronizing

Results:
The turnkey hydroelectric modernization project facilitated the complete rehabilitation of the plant's turbine generators, along with upgrading the facility's electrical and control systems — resulting in the long-term, reliable solution desired by the customer

"It is the opinion of the Village of Potsdam that Eaton went above and beyond to address our concerns and RFP requirements. Eaton made themselves available both on site, through email and by phone. The knowledge that was brought to the table by the Eaton corporation was truly second to none and it was presented in a manner that was very understandable."

Greg Thompson, Potsdam Village Administrator

Background
The Village of Potsdam operates two hydroelectric facilities located on the Raquette River. Originally constructed in the early 1900s, the facilities underwent a rehabilitation in the 1980s, which included the installation of new turbines and generators. However, over the years the units experienced decreased reliability and routinely failed. After unsuccessful attempts to repair them, the Village of Potsdam ultimately approved a comprehensive rehabilitation project for its East Dam Hydroelectric Station.

Through the bid process, the Village of Potsdam sought a company capable of executing a complete control system modernization and turbine generator reconditioning, including excitation and protection, for its two existing 500kVA units. The plant also required that a range of additional equipment be modernized or replaced, including switchgear, battery systems, voltage regulators, programmable logic controllers (PLCs), meters and hydraulic systems.

Challenge
Among the most significant issues that the Village of Potsdam faced in upgrading the aging hydroelectric station was addressing the facility's two gear boxes. While most plants feature a direct drive setup in which the turbine is directly coupled to the generator, the Village of Potsdam's East Dam had paired a slow-speed turbine with a high-speed generator, which necessitated the addition of a speed-increasing gear box. Although the existing gear boxes had gone through several reconditioning and repair attempts over the years, they continued to experience multiple failures. In addition, the plant's control system had become obsolete and was contributing to operating inefficiencies. Even more, limited OEM documentation existed for the plant's systems, which would make it challenging for the company who was awarded the project.



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"Our East Dam Hydro facility suffered a catastrophic gear box failure and was left unusable for several years. Eaton was able to come on site, verbally walk us through what would take place in the rehab process and completely fulfill all our needs in getting our hydro dam back up and running."

Greg Thompson

In its bid, Eaton's turnkey projects team recommended an approach that would improve reliability, decrease plant outages and downtime, and address other system enhancements needed within the hydroelectric facility. In addition, due to some highly specific requirements within the RFQ, Eaton brought in several other companies to collaborate on delivering the overall solution. "We went in with key partners to provide specific scope items that are not in our traditional hydro wheelhouse," explains Kevin Quirion, the engineering lead for Eaton's generator protection and control group.

The proposed team approach, coupled with Eaton's overall understanding of hydro systems, prompted the Village of Potsdam to award the company the upgrade project in January 2020.



Refurbished turbine



Gear box ready for install



Control system interface

Solution

With more than 50 years of experience modernizing government, utility and privately owned hydroelectric facilities, Eaton's turnkey hydroelectric power services team offered the Village of Potsdam the solution and the flexibility to provide additional enhancements throughout the project duration. In addition to serving as a one-stop shop during the entire upgrade and modernization process — from the design phase through commissioning — Eaton was able to deliver proven, dependable products in a cost-effective solution.

The core of the project centered around refurbishing the pair of turbine generators and upgrading the gear boxes. Eaton conducted a unit rehabilitation and control system replacement, which included fully automating and protecting both units, as well as the station and adjacent distribution equipment. PLC programming and logic development for both units and station automation was also completed. The overall strategy provided an automation solution that incorporates modern intelligent devices with updated, fail-safe manual controls into a seamless package.

In addition to the generator, turbine and gear box upgrades, an extensive range of complementary equipment was integrated into the East Dam Hydroelectric Station to further enhance reliability and modernization. This included the installation of battery systems; modern digital automatic voltage regulators (AVRs); a comprehensive human machine interface (HMI) for station and unit control and monitoring; metering; energy efficient LED station lighting; and protective relaying and auto synchronizing.

"We also completed a power systems evaluation and rehabilitation, which included replacing one panel board and the entire low-voltage generator switchgear," notes Quirion. "This reconfiguration better utilized the electrical infrastructure and helped make the plant more reliable."

Eaton's services encompassed the design of all systems and subsystems; project and construction management and oversight; startup, testing and commissioning; and assurance of complete system integration. For some electrical installation services, and to disassemble and reassemble the turbine generators, Eaton contracted with the partners it had specified during the bid review period. "This partnership strategy allows for a true turnkey approach that was absolutely seamless for the customer," Quirion points out.

In fact, the positive results achieved from the Village of Potsdam project helped Eaton gain the experience and trust to continue undertaking new ventures. "We now have this experience and have since been awarded other generator rehabilitation projects," notes Quirion.

During the process of carrying out the East Dam Hydroelectric Station upgrade, the Eaton team uncovered several opportunities to improve the facility's reliability that had not been identified in the original scope of work. Through Eaton's flexible and creative design process, the Village of Potsdam was able to make the recommended improvements and ultimately gain a solution that fully enhanced the station beyond the original specification.

For decades, power generation clients have relied on Eaton to provide comprehensive system modernizations for their hydroelectric facilities, including utility-hardened equipment and design/build solutions. The Village of Potsdam project proved no different — even with its requirements for work outside of Eaton's traditional hydroelectric modernization approach and the issues that were uncovered mid-project and had to be addressed on-the-fly.

"We have achieved a level of reliability that enables us to operate confidently and efficiently in varying conditions," reveals Greg Thompson. "Since commissioning, the plant has been operating without concern. If there is any potential issue detected, the system sends us an alarm and we have been able to very easily troubleshoot it. We could not be happier with the Eaton solution."

"The one thing that stood out to us the most about Eaton was their willingness to not only take care of our dam with an incredibly high level of professionalism and knowledge but also how we were treated. The representatives from Eaton were always willing to answer our questions and educate us as to what was taking place with our hydro facility. It was truly enjoyable working with Eaton" Greg Thompson

Results

The relationship between the Village of Potsdam and Eaton to upgrade and modernize the East Dam Hydroelectric Station is a testament to Eaton's expertise in the hydro market. In terms of services and systems, the value-add Eaton provided can be summarized as follows:

Safety, reliability and uptime

With Eaton's design and project management, the East Dam Hydroelectric Station project was completed to meet all industry standards for safety and quality assurance. The solution incorporates proven components to provide the facility with a long lasting, exceptionally reliable and cost-effective solution.

Highly flexible and adaptable to meet customer needs

The Village of Potsdam was extremely satisfied with Eaton's comprehensive approach, which extended beyond their expectations. The project not only expanded on the original specifications but was able to incorporate work beyond the traditional scope of expertise — exceeding the customer's needs for reliable, efficient operations.

Complete, turnkey solution

Eaton's hydroelectric plant solutions provided turnkey engineering support that included project management, procurement, engineering and system knowledge. The dedicated, skilled project team enabled the Village of Potsdam to gain quality power while improving the reliability and functionality of hydro generation. In addition, the project helped the customer to achieve efficiency and sustainability goals, offset their electrical usage and further their vision for system modernization.

For more information contact your local Eaton representative or visit [Eaton.com/hydroservices](https://www.eaton.com/hydroservices)

Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
[Eaton.com](https://www.eaton.com)

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