

2018 YEAR IN REVIEW

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with Local Experts**

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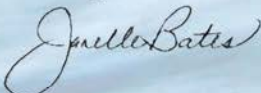
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Janelle Bates
Director, Membership Relations and Events
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For more information, contact

Janelle Bates, Director, Membership Relations and Events
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Bracebridge Generation Ltd. Celebrates the Completion of the Cascade Street Project Expansion

Bryan Ingram, Operations Manager, Bracebridge Generation

The 1.2 megawatt (MW) Cascade Falls Generating Station located on the Seguin River in Parry Sound, owned by Bracebridge Generation Ltd., underwent a redevelopment this year to 3.3 MW. The station's upgrade has been in the planning stages since 2003 under the former Parry Sound PowerGen which merged into Bracebridge Generation on July 1, 2014.

During the process, Bracebridge Generation utilized a local Aesthetic Advisory Committee of residents from Parry Sound which resulted in a contemporary style station being built. Bracebridge Generation Ltd. operates 11 control structures and dams throughout this watershed under the Seguin River Simplified Water Management Plan. The newly upgraded plant, at a cost of \$17 million, supplies approximately 1,100 homes with their electrical energy demands. In October 2017, the Cascade Falls Generating Station was recommissioned and became commercially operable. This new facility is the fifth facility to utilize the power of water below the Cascade Street Dam with original development being a grist mill followed by four hydroelectric facilities.

Upgrades included replacement of the intake, penstock, turbine, generator, switchgear, controls and powerhouse. The new Norcan double regulated Kaplan turbine is capable of producing 4750 horsepower. The TES generator is connected to Lakeland Power Distribution Ltd.'s system through all new switchgear and substation infrastructure including fiberoptic and radio transfer trip to the distribution and transformer stations.

The powerhouse includes a new emergency backup generator to supply the facility and dam with power in outages or emergencies and was architecturally designed to suit the site and local area.

The expansion was constructed by Maple Reinders and included: switchgear by Eaton, controls by Alfatar Hydro, a standby generator and a new automated sluice gate panel. Remnants of the previous powerhouse are integrated into the new approach and access bridge. The project also included fisheries work below the new GS and dam safety improvements.

On May 11, 2018, Bracebridge Generation staff alongside contractors, Wasauksing First Nation, government representatives and Lakeland Holding team members, celebrated this tremendous accomplishment. This was an extremely satisfying achievement for Bracebridge Generation Ltd. since they were able to work with the community on the aesthetics, invest millions of dollars locally, and generate green power for the local community.

Bracebridge Generation Ltd. is a subsidiary company of Lakeland Holding Ltd. It is wholly owned by the Municipalities of Bracebridge, Burk's Falls, Huntsville, Magnetawan, Parry Sound and Sundridge. With an extensive history dating back to 1894, Bracebridge Generation Ltd. is proud of its 9 generating facilities on 5 Watersheds in Ontario: Seguin, Muskoka, Magnetawan, Haliburton and Madawaska (York River). These facilities result in a combined installed capacity of 14.5 megawatts (MW).



Redevelopment at Smooth Rock Falls GS

Stefan Kohnen, MBA, P.Eng. – KGS Consulting Engineers

Smooth Rock Falls Generating Station is a two unit vertical Francis powerhouse built on the Mattagami River in 1917 with a capacity of 7.4 megawatts (MW). The generating station was formerly part of a pulp mill that ceased operations in 2006. Gemini-SRF Power Corp. owns and operates the hydro generating facility and completed a refurbishment of the generating equipment that had reached the end of its operating life. The project was to increase the output of the station to 9.2 MW and comply with the Market Rules for stations connected to transmission line voltages (115kV). Some of the challenges and solutions are described in this article and would not have been possible without the ingenuity and resourcefulness of the team at Gemini-SRF and all involved.



The overall refurbishment project was faced with a need for upgrades after many years of low investment. After the demolition of the pulp mill the plant was reconnected from the local distribution line to a 115 kilovolt (kV) transmission line. For interconnection purposes the change in output constituted a change in the nameplate capacity of the plant. This triggered the justification to upgrade the protection

systems at the plant and at two Hydro One (HONI) sites and meet the current requirements for transmission line interconnections. This included teleprotection upgrades at the plant and HONI facilities at Hunta and Kapuskasing, the inclusion of Generation Rejection and Transfer Trip and increasing the inertia of the equipment to achieve a minimum inertia constant (H) of 1.2. Gemini-SRF was successful in reaching approval with the Independent Electricity System Operator (IESO) to maintain brushless exciters and avoid the cost of static exciters.

Gemini-SRF had completed a number of studies before the project began to determine the extent of redevelopment of the site possible including a replacement of the facility with a significant increase in capacity given the amount of water spilled at the site. Ultimately, the IESO determined that the transmission line capacity could only accommodate 9200kW from this site. Gemini-SRF secured a power purchase agreement for the additional capacity and the project was initiated in early 2015. During 2015 the team developed specifications and bid packages then bids were secured from vendors. In late 2015, after the bids had been received, the fees



for interconnection costs from HONI and IESO became known and were large enough to threaten the economics of the project.

The team quickly re-assessed the project priorities and negotiated with the preferred vendors for a scope and cost that maintained the project budgets and outcomes. In March of 2016 the contracts were issued to begin design and manufacturing. The scope included new runners and turbine overhaul services from Norcan Hydraulic Turbine Inc., two new generators from Voith Hydro and manufactured by TES Electric Machines in the Czech Republic, new teleprotection panels from ABB, a new protection system by KGS Group, new controls by JA Engineering and governor upgrades from American Governor. The redevelopment also eliminated the 2300V system in the plant and modified the station service and switchgear.

The first challenge was triggered by the interconnection costs. The original plan was to replace the entire protection and control system. To accommodate a large reduction in budget, the team had to determine what could be kept and what had to be replaced. This required more time to

define a clear scope for any vendor than was available. To move forward KGS Group chose to self perform the design and construction of the new protection system and integrate it with the existing controls. This allowed work to proceed and keep the scope flexible as the assessment of the existing system proceeded and a demolition plan could be established.

The team chose to re-use the existing switchgear and make a modification to one of the cells to accommodate the station service breaker in an effort to reduce cost. While this was completed successfully, the difficulties encountered frequently challenged the wisdom of that decision.

Another challenge was access to the site and equipment handling. The main access door constructed in 1917 had been blocked by other buildings over the years and was no longer large enough to remove the old equipment and bring in a new one. Gemini-SRF had to partially demolish some portions of the buildings and make improvements to the access road. The final arrangement dictated that the generator stators, the largest components, had to be split in two halves.



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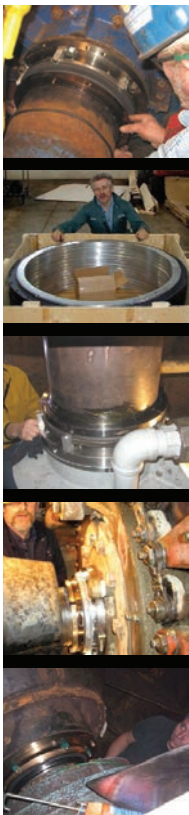
The powerhouse crane was in good condition and was certified for 25 tons. The new generators had to be much heavier than the original units to satisfy the minimum inertia requirements. The rotor and shaft fully assembled was expected to weigh 40 tons. The designers at Voith Hydro and TES developed an assembly sequence that was based on the limit of the crane capacity. This created more site work and more complex assembly procedures than would have been ideal but the generators were installed successfully by Norcan with supervision from Voith Hydro and TES.

The sole plates of the old generators were not accessible and the drawings available did not have all the information available to confirm the hole patterns to be manufactured in the stator frame and ensure the length of the stator shafts would be adequate. The team, with help from Norcan staff, performed a number of measurements but the actual elevation of the sole plate, whether it was level and actual anchor bolts holes pattern, would not be confirmed until the first generator was removed. The team ultimately selected a set of dimensions for machining the

stator frame in the factory, made allowances for shimming and then made plans for the possible need to change the hole sizes beneath the stator frames in the field. Ultimately, while there were some minor adjustments there was no need to perform significant re-machining at site.

Another challenge was the station grounding. The regulators required Gemini-SRF to prove that the existing station grounding was adequate without the skywire being attached. The main challenge was that this requirement had not been anticipated. The testing of the grounding proved to be inconclusive and raised more questions than it answered and created uncertainty with the engineers at HONI and the Electrical Safety Authority (ESA). The team chose to proceed with the replacement of the grounding bed in the substation to overcome the uncertainty while maintaining the timelines for approvals to backfeed.

The facility upgrades were installed and commissioned by December 2017 with the invaluable participation of Gemini SRF staff, NORCAN Hydro, Voith Hydro, TES, American Governor and Accel Electric.



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