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Building what matters

Jimmie Creek Hydroelectric Project

Toba Valley North of Powell River, BC

Year Completed: 2016

Project Category: E. Natural Resources, Mining, Industry & Energy

Canadian Consulting Engineer

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Toronto, Ontario M3B 2S9
Attention: Mr. Doug Picklyk

Submitted by Prime Consultant:

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The Jimmie Creek 62 MW Hydropower Project is a run-of-river development located in the Toba Valley within the traditional territory of Klahoose First Nation. Jimmie Creek is an EPCM project that was commissioned ahead of schedule in July 2016 and under budget. The Jimmie Creek facility is connected to an existing 230 kV transmission line which runs from Toba Valley to the BC Hydro Transmission system at Saltery Bay.

1. Innovation

Project Innovation

The project's unique features include a sluiceway channel that reduces sediment entering the intake, as the invert is lowered in front of the intake openings. The intake structure was designed to minimize velocity and turbulence for smooth transition of flow into the penstock. In addition, a sediment trough was installed inside the intake structure to remove suspended sediment that enters the intake structure before entering the penstock. The design process for the intake involved the construction of a 1 in 16 physical model at the Northwest Hydraulic laboratory in North Vancouver (refer to Photo 9). This enabled the team to test and adjust sediment excluding features throughout the headworks.

The penstock constructability was challenging and complex as the alignment passes through very rough and steep terrain. A long section of the buried penstock is constructed on a 42% gradient, which made it extremely challenging to transport heavy pieces of penstock to install in such an inclined trench. An exposed section of the penstock is installed above the creek to cross over to the right bank. Its installation required multiple cranes and careful planning to launch safely. The powerhouse is built on an elevated rock platform at the junction of Jimmie Creek and Toba River. The powerhouse and surroundings is compact to accommodate the shortage of space and allow discharge above the natural fish barrier. The unique tailrace was built within a waterfall and with two outlets to help modulate flow distribution and make sure that fish downstream of the powerhouse are not affected by the project.

Unique Materials and Equipment

The spillway for the diversion of flow features a free overflow spillway and a 20 m long inflatable rubber dam that deflates in a flood event (refer to Photo 6). This feature reduces the height of the structure and ensures minimal sedimentation above the natural river bed.

The tailrace design features a rock excavated trench and an embedded corrugated steel pipe that respects natural flow distribution into two arms of the creek. Flow is distributed without mechanical means to each of the two branches of the fish barrier creek.

2. Complexity

There were several areas of complexity that the project needed to address. From location and steep terrain to construction in remote areas, all challenges were overcome with positive outcomes. These areas included:

Avalanches – Risk of avalanches posed health and safety concerns on the project team.

Transportation – Materials had to be transported to site by sea or air freight. The majority of large or bulk materials were transported via barges managed by Klahoose First Nation, which were then transferred 34 km further by road to the work site.

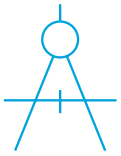
Construction in Remote Site Area – Managing construction, material shipment, and staff rotations in such a remote site required meticulous planning and coordination (refer to Photo 2 and Photo 3). Before starting construction, SNC-Lavalin and Alterra worked together over two years in carefully planning the project. During construction, the team detailed this planning to optimize logistics and mitigate the impact of unexpected events. The project team built new roads and upgraded existing roads required.

Steep Terrain – Site planning over 3 km in length and over 450 m of elevation in a steep and remote valley required extensive slope stabilization measures and constant monitoring. Building a penstock over slopes of over 40% required careful planning, experienced operators and careful oversight (refer to Photo 4).

3. Social and/or Economic Benefits

The project is located within Klahoose First Nation traditional territory, which provided a unique opportunity to work closely with the local community and create jobs and business opportunities. Five local community contracts were issued to Klahoose First Nation, including camp build, camp O&M, and barging for a total approx. value of $30M. There was a commitment to prioritize local community employment. The camp installation and camp O&M contracts were awarded to a Klahoose First Nation company that employed over 80% First Nations workforce. Other key contracts were also awarded to Klahoose First Nation companies, namely fuel supply, boat transportation, and barging services.

Creating jobs for local communities
in Powell River and Campbell River



Early Contractor Involvement began in 2012

4. Environmental Benefits

The Jimmie Creek hydroelectric project is a sustainable run-of-river project that provides clean energy to local communities— 159,000 MWh of renewable energy to the grid annually and providing enough power for approximately 14,500 homes. Due to the environmental sensitivity of the project, SNC-L took care to locate components upstream of natural fish barriers to minimize impact. The completed project complied with stringent Ministry of Environment standards. The unique tailrace design allowed for restitution of the water within a waterfall. The two tailrace outlets allow for the water to be modulated which ensures the fish downstream of the plant are not impacted by the project. SNC-Lavalin's environmental specialist were on-site during the whole project duration to work with the various small contractors. This was to ensure thorough compliance with the environmental management plan, and requirements of the Ministry of Environment, represented by the environmental monitor.

159,000 MWh
of clean renewable energy
to the grid annually

5. Meeting the Client's Needs

The client's objective and main project goal was to build a third clean hydro energy plant in Toba Valley. Despite the remote conditions, delivering the project on time, on budget, and with minimal risk to health and safety was vital. Minimizing environmental impacts and meeting and exceeding the commitments made to the Province of BC and the Ministry of Environment were also critical. The project team led by SNC-Lavalin successfully delivered ahead of schedule and under budget. The project was scheduled to begin commercial operations on August 2, 2016 and was commissioned on July 1, 2016. The team actively engaged with Klahoose First Nation creating employment opportunities through approximately $30m of contracted work through direct contracts and partnerships. Klahoose First Nation was a significant part of the execution team. Our team applied proper planning, coordination, and alignment with contractors and sub-consultants, and an ultimate win-win procurement approach. In early April 2017, the project was a proud recipient of the Award of Excellence by the Association of Consulting Engineers – British Columbia at their recent awards ceremony on April 8th, 2017, and in November 2016, the Jimmie Creek project was also the recipient of Clean Energy BC's Project Excellence Award. Both awards are a testament to the project's outstanding achievements.

Over 15% of total project costs
were contracted through
partnership with Klahoose First Nation

748,316 hours performed with
ZERO Lost Time Injuries

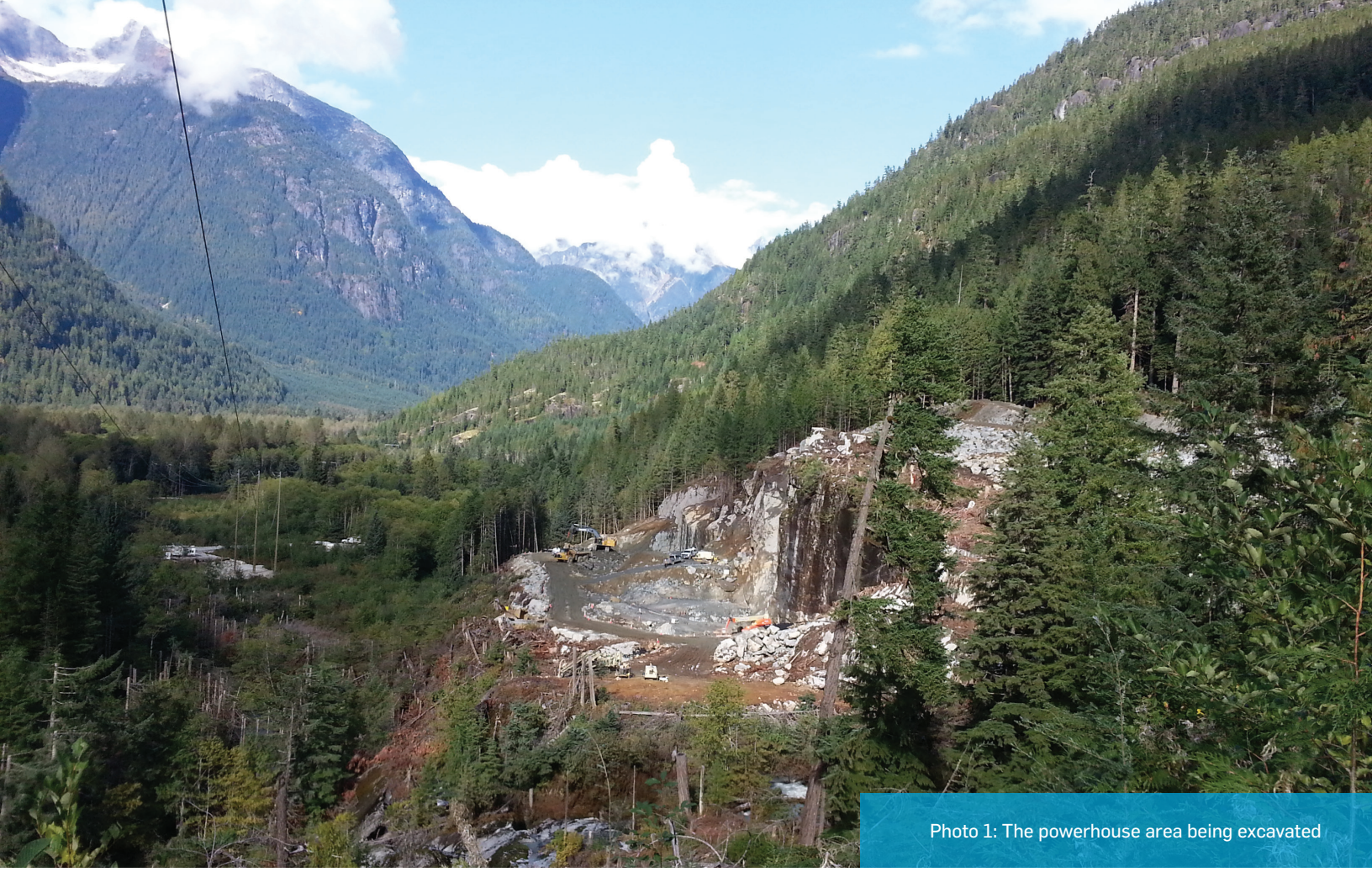


Photo 1: The powerhouse area being excavated

Photo 2: Intake construction, optimization of logistics and strong detailed planning over two years resulted in successful construction occurring ahead of schedule

Photo 3: The power station is constructed in a compact area to minimize the project footprint

Photo 4: Built on a small elevated rock platform: A surface power station housing two vertical axis pelton turbines

Photo 5: Unique tailrace built within a waterfall with two outlets

Photo 6: Diversion weir with 20 m long inflatable rubber dam that deflates in a flood event

Photo 7: A drone captures the headworks view of the Jimmie Creek Project

Photo 8: Another angle of the diversion weir involved a 20 m long inflatable rubber dam which could deflate in a flood event

Photo 9: A 1 in 16 physical model to test and adjust sediment excluding features throughout the headworks