

SUSTAINABLE HYDROELECTRIC ENERGY

BRILLIANT DAM REDEVELOPMENT



Large scale sustainable energy generation is best illustrated in Canada by hydroelectric power - a clean, renewable form of energy that generates 65% of our electricity, with no significant production of greenhouse gases or other forms of atmospheric pollution. If the energy generated in Canada by hydroelectric facilities were generated by coal-fired thermal power plants, our total annual greenhouse gas emissions would be 60% higher than they are today.

Conventional design practice assumes that the economic life of a hydro plant is 50 years. The challenge for owners, operators and engineers is to operate, maintain and periodically renew hydro plants to extend the lives of their facilities indefinitely.

The 55 year old, 129 MW Brilliant Generating Station in British Columbia's Columbia River basin provides an excellent example of the application of the principles of sustainability. The Brilliant Redevelopment Project employed modern engineering design methods and construction techniques to extend the station's useful life. The project also incorporated modern dam safety criteria, and has increased energy generation with net positive environmental impacts by upgrading hydraulic turbines and renewing and modernizing generation and protection and control equipment.

The Brilliant Generating Station was constructed by Cominco Ltd. in the early 1940's and was commissioned in 1944. Cominco sold the dam, which was and continues to be operated under contract by West Kootenay Power Ltd., to a joint venture of Columbia Power Corporation (CPC - a British Columbia Crown Corporation), and the Columbia Basin Trust (the Trust - a regional corporation established by the provincial government in 1995). The new owners embarked upon a program to extend the station's useful life, and to enhance the value of power generation. The program incorporated six components:

Turbine Upgrades

- new turbine runners generate additional low cost energy

Generating Equipment Life Extension

- generator rewinds, new transformers and protection and control equipment add value, increase reliability

New Switchyard

- 69 kV switchyard meets modern safety and environmental protection standards

Concrete Repairs

- repair and renewal of concrete surfaces damaged by freeze-thaw action extend useful life

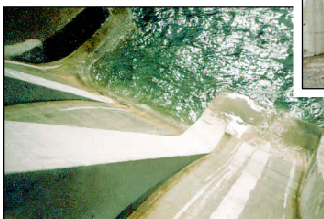
Spillway Bridge

- new vehicle bridge improves access

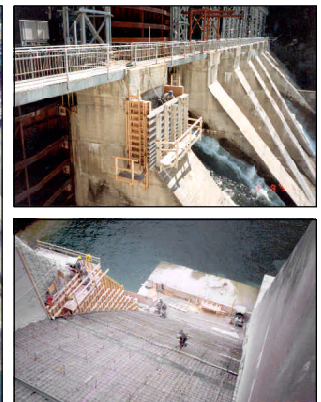
Dam Stabilization

- post-tensioned anchors allow the dam to meet current dam safety criteria

Deteriorated concrete due to freeze-thaw action



Resurfaced concrete spillway bays



CONCRETE REPAIRS: preventative measures and environmental monitoring minimized potential for wet concrete contaminating the Kootenay River

The Brilliant Redevelopment Project was conceived as a sustainable development project, illustrating APEGBC Guideline 2, which states that professional engineers and geoscientists should "Take into account the individual and cumulative social, environmental and economic implications." As the first investment of CPC and the Trust, the purchase of Brilliant was intended to generate a sustainable long term investment stream to benefit the Province and the Columbia Basin. The Trust's investment income funds its regional programs to foster sustainable development in the areas that were adversely affected by construction of Columbia River Treaty dams in the 1960's and 1970's.

Planning and implementation of the project incorporated numerous features to enhance sustainability and positive environmental impacts, including:

- comprehensive environmental and social impact assessment, meeting the requirements of the British Columbia Water Act and the Canadian Environmental Assessment Act;
- enhancement of positive environmental effects through reduced entrainment of dissolved gas by spill flows;
- compensation through fish habitat enhancement for possible increases in fish mortality through the upgraded turbines;
- reduced chance of accidental oil spills through measures incorporated into the design of the new switchyard and transformers;
- strict measures to prevent wet concrete from contaminating the Kootenay River during construction.



POST-TENSIONED ANCHORS: Enhance dam stability, allow new dam safety criteria to be met



NEW SWITCHYARD: modern design, increased reliability, reduced losses & improved environmental protection

NEW TURBINE RUNNERS: higher power output, more effective use of flows



GENERATOR REWIND: accommodates higher turbine output



Engineering services were provided to Columbia Power Corporation, the managing partner of the joint venture, by Acres International Limited. Specialized services in fisheries biology and aquatic impact assessment were provided by R.L.&L. Environmental Services Ltd. of Castlegar, BC. Team members included:

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