

BALANCING INTERESTS ALONG THE STAVE RIVER

By Charlotte Bernister

BC Hydro, the provincial utility in British Columbia, is in the process of developing individual water use plans for each of its 34 hydroelectric stations. These plans are to be submitted to the province's Comptroller of Water Rights for approval. The plans will recommend allocation, and possibly reallocation, of water license to reflect the full range of uses and resources values.

Development of the plans involve identifying, analyzing, and considering many different and, at times, competing uses for the water at each facility. Water is a shared resource, and BC Hydro's operations may affect fish, flood control, ecological health, recreation, tourism, forestry, cultural sites, irrigation, navigation, and power production. Although priorities may be different at each facility, key throughout the plan development is the involvement of regulatory agencies, the public, and First Nations. Development of water use plans does not mean that conflict over various water uses is avoided or eliminated. Instead, it provides a tool for finding an acceptable balance between supplying reliable and competitively priced power to British Columbians and incorporating critical water resource priorities into hydro plant operating decisions and maintenance activities. BC Hydro's goal is to ensure that hydroelectric operations are aligned with public values and priorities throughout the province.

A water use plan recently was developed for the Stave River watershed. Understanding how this plan was developed, via a committee of water resource stakeholders, provides insight into the benefits of this water management tool.

Developing the Stave River Water Use Plan

Beginning in September 1997 and ending in August 1999, a "consultative committee" made up of individuals representing highly diverse interests reached consensus on a water use plan for the Stave River watershed in British Columbia. A final draft of that plan will be used by BC Hydro, a Canadian provincial utility, for the day-to-day operation of two of its three hydroelectric facilities on the river, the Stave Falls and Ruskin power plants. In 1996, a separate water use plan was completed for the connected

Alouette Powerplant and Alouette River.

The 166.1-MW Alouette-Stave Falls-Ruskin Generating Complex, built between 1909 and 1930, is located on the Stave River 65 kilometers east of Vancouver. The Stave Falls Powerplant is being replaced. When the new plant is operational, expected in March 2000, the total capacity of the complex will rise to 203.6 MW.

While additional electric power was the primary reason for the original development of the Stave River hydro plants between 1909 and 1930, current philosophy holds that water is a shared provincial resource, and must be used for the greatest overall benefit. Specifically, the goal of the Stave River water use plan was to balance the need for hydroelectric generation with the interests of all of the other competing demands for water in the watershed: industry, recreation, fish, wildlife, flood control, and the heritage and culture of the local Kwantlen First Nation.

The water use plan is being created as part of BC Hydro's Stave Falls Powerplant Replacement Project, the CDN\$157 million development of a modern, two-unit 90-MW power plant to replace the aging and deteriorating five-unit 52.5-MW Stave Falls Powerplant. A provision of the Energy Project Certificate issued in June 1995 by the provincial government allowing construction of the new Stave Falls power plant required development of the water use plan.

The consultative committee approved provisions of its recommended water use plan in June 1999, and issued a draft report in August 1999. During September 1999, the committee worked to finalize the report, which includes a detailed review of the consultative process and the way in which consensus was reached. Using the committee's recommendations, BC Hydro wrote a formal water use plan that provides power station managers and operations planners with the operating parameters required to manage reservoir levels and water flows.

Both the committee report and BC Hydro's operating plan will be submitted to the Comptroller of Water Rights for the province of British Columbia. The comptroller, who reviews and issues all water licenses, can approve or disapprove the plan or request additional information or clarification. Approval of the plan is expected in early 2000.

Describing the Watershed

The hydroelectric system begins at Alouette Reservoir, which is formed by a dam on the Alouette River. A 1,070-meter-long tunnel carries water from Alouette Reservoir through the 8-MW Alouette Powerplant and into Stave Reservoir, a natural lake on the Stave River that was raised by Stave Falls Dam. Water from Stave Reservoir flows through Stave Falls Powerplant into Hayward Reservoir, which was formed by Ruskin Dam. Water then flows through the 105.3-MW Ruskin Powerplant and into the Fraser River at sea level. The Fraser River, which is subject to tides, flows into the Pacific Ocean on the south side of Vancouver.

The reaches of the river and reservoirs are quite different. Stave Reservoir supports a resident population of kokanee (landlocked sockeye salmon). However, the natural 24-meter-high Stave Falls was a dead end for the anadromous salmon migration. Additionally, Stave Reservoir is nutrient poor, and is occupied primarily by non-sport or "coarse" fish, such as northern squawfish, reddsides shiners, and large-scale suckers. Hayward Reservoir, a man-made impoundment, contains hatchery-released trout, which usually are fished out by the end of the season.

Further, Stave Reservoir does not have a permanent "littoral zone" - a band around the shoreline where aquatic life flourishes. The absence of a littoral zone is the result, studies indicate, of highly variable reservoir levels and generally poor substrate conditions. Hayward Reservoir does have a permanent littoral zone, probably a reflection of its more stable water levels.

The primary fishery is located below Ruskin Dam. In the early 1900s, BC Hydro and Department of Fisheries and Oceans built channels below the dam designated to maximize salmon spawning habitat. Since the channels were built, spawners have rebounded from about 30,000 chum salmon and 30 coho salmon in the late 1980s to about 200,000 chum and 1,600 coho in 1997.

During construction of the new Stave Falls Powerplant, BC Hydro designers added features to enhance fisheries in Hayward Reservoir. These included construction of a side channel off of the new tailrace channel and creation of a new island in the

reservoir, both designated to provide habitat for fish and waterfowl.

Water Use Plan Process Begins

In September 1997, BC Hydro announced the beginning of the process toward formation of the Stave River water use plan, and requested information and participation from interested parties. In the spring of 1998 following several public meetings to identify issues and concerns, BC Hydro hired Compass Resource Management Ltd. to facilitate the consultative committee meetings. The committee was made up of 32 members, including representatives from municipal, federal, and provincial government agencies, First Nations, private companies such as tackle shops and timber companies, environmental groups such as Ducks Unlimited and the Stave Valley Salmonid Enhancement Society, real estate companies, and local residents.

By the summer of 1998, the committee had agreed on the basic objectives of the water use plan. The objectives included:

- Avoiding disrupting industrial operations (primarily timber companies) through rapid water level increases or decreases;
- Supporting recreational opportunities on Stave and Hayward reservoirs and downstream of Ruskin Dam;
- Protecting and preserving Kwantlen First Nation's heritage sites and artifacts in the watershed;
- Avoiding cost increases for electricity production;
- Gaining knowledge about the system; and
- Maximizing flexibility to respond to change.

The committee produced 12 preliminary operating alternatives designed to meet the objectives. The preliminary alternatives were then refined into a number of combination strategies. Eventually, two very distinct operational strategies -Combo 4 and Combo 5 -were evaluated in detail. On June 24, 1999, the committee reached a consensus agreement on Combo 6, a refinement of Combo 5.

The specific water use recommendations from the consultative committee will change the way BC Hydro operates its Stave River hydro plants. However, the objectives specifically sought, as much as possible, to avoid "constraining" power

production at BC Hydro, a crown corporation.

"The objective from a cost perspective," the draft report said, "is to meet non-power needs at the lowest possible cost in terms of power values".

The report also cited the value of ancillary services provided by the hydro projects, such as spinning reserve, voltage support for the transmission system, and load following.

During the consultation process, BC Hydro funded a number of environmental studies, most pointed toward protecting and enhancing fisheries issues and improving "nutrient poor" Stave Falls Reservoir.

The new recommendations for plant operations were based on variations from requirements implemented in 1994 in an Electric System Operations Review conducted by BC Hydro for all of its hydroelectric facilities. That review, slightly modified in 1995, provided increased protection for fish downstream of Ruskin Powerplant during the spawning period establishing a maximum flow of 130 cubic meters per second (cms) at Ruskin and weekly block loading (i.e., changing the load - and, therefore, the flow - of the plant only once a week); those constraints eliminated peaking generation during the spawning period.

The committee's recommendations included elimination of the 130 cms maximum limit at Ruskin to allow partial peaking generation (above 100 cms flow) during spring and fall. (There are no limits for the other seasons of the year.) A complex procedure of flow regimes was recommended that would stabilize the Stave Reservoir water level at a target of 80 to 81.4 meters above sea level, the optimum level during the prime recreational season, and a target of 77 to 79 meters year around. The higher levels will contribute to development of an improved littoral zone and fishery. Both target levels are "soft," meaning they can be violated to provide needed downstream flows to protect fish.

In response to protecting the Kwantlen heritage, the recommendations call for Stave Reservoir to be drawn down substantially once every three years, on average, to allow archeological studies of the reservoir for artifacts and heritage sites (such as former camp sites).

For industry, their concerns were resolved relatively simply through the promise of appropriate notification of changes in water levels. For example, BC Hydro agreed to institute a commercial "fax-out system" that

would provide sufficient prior notice of water spills, low reservoir levels, and rapid drawdowns.

The water use plan, based on the committee's recommendation, will result in an average annual gain in the power value of the watershed-compared to the 1995 procedures-of CDN\$440,000.

Members of the committee who had preferred more restrictive flow regimes shifted their support to the final version with the addition of a significant investment by BC Hydro in a ten-year "management plan" designed to address key uncertainties affecting the quality of decision-making. Costs of the management plan vary from year to year, but the annual average in about CDN\$390,000.

The plan begins with an extensive monitoring program of the river and both reservoirs designed to improve understanding of reservoir productivity. Another monitoring program focuses on the effects of the introduction of partial peaking generation during the salmon spawn. A third (much smaller) component involves monitoring of water quality at the intake of a small community water supply system to ensure there are no unexpected negative effects. The management plan also includes funding for mitigation of negative results, should they occur.

Another component of the plan involves heritage. Initially developed by Kwantlen and refined through negotiations with BC Hydro, the Heritage Plan will provide a blueprint for further investigation and discovery of archeological sites, artifacts, and inventory work.

The final component of the management plan is establishment of an administrative committee comprised of Department of Fisheries and Ocean, Ministry of Environment, Lands and Parks, BC Hydro, Kwantlen First Nation, and the District of Mission (a nearby city). The committee will prepare an annual report, an interim review after five years, and a full review of the Stave River water use plan after ten years. The committee is responsible for making any management decisions necessary as a result of unusual conditions, and for identifying and prioritizing additional monitoring or mitigation works.

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