



COLUMBIA RIVER OPERATIONS SUMMARY

NOVEMBER 2009

The purpose of this publication is to provide an overview of BC Hydro's operations on the Columbia River. The 2000 km Columbia River is the fourth largest in North America. It is also the most "powerful".

Canada has 15 per cent of the Columbia River basin. The Canadian basin is mountainous and receives a lot of snow. It produces, on average, 30–35 per cent of the runoff for the entire basin.

The river's heavy flow and relatively steep gradient gives it tremendous potential for the generation of electricity. The 14 hydroelectric dams on the

Columbia's main stem and many more on its tributaries produce more hydroelectric power than those of any other North American river.

BC Hydro's facilities in the Columbia basin include 11 generating plants, 14 storage dams, and a system of reservoirs. These are operated according to the Columbia River Treaty and other agreements signed between Canada and the United States.

GOVERNING BC HYDRO'S OPERATIONS

COLUMBIA RIVER TREATY

The Columbia River Treaty between Canada and the United States was ratified in 1964. The Treaty resulted in the construction of three dams in British Columbia (the Duncan, Keenleyside and Mica dams) for flood control and to increase hydroelectric generating potential in both countries. The Treaty also gave the U.S. the right to build Libby Dam.

Canada's share (one-half) of the extra power produced in the U.S. as a result of the Canadian projects is called the Canadian Entitlement to downstream benefits and is owned by the Province of BC. The Canadian Entitlement varies from year to year, but is currently about 5000 gigawatt hours (GWh) per year and about 1350 megawatts (MW) of capacity.

The earliest termination date for the Columbia River Treaty is September 16, 2024, subject to either country giving at least 10 years notice of its intent to terminate the Treaty.

OTHER AGREEMENTS

The Treaty Operating Committee negotiated and signed several agreements to improve reservoir and river operations in Canada and the U.S. during 2008/2009:

- The 2009 **Non-Power Uses Agreement** allowed Arrow Treaty releases to be reshaped between January and July 2009 to protect whitefish and rainbow trout eggs in the Canadian Columbia River reach downstream of Hugh Keenleyside Dam.

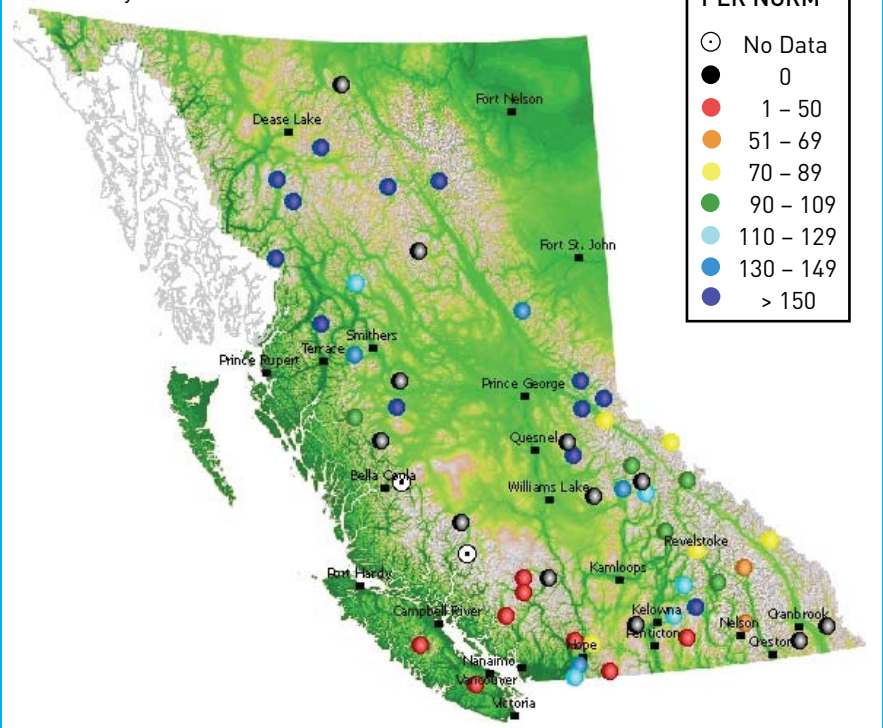
- The 2008/09 **Fall Storage Agreement**, signed by the Treaty entities in September 2008, allowed Arrow Treaty releases to be reduced in late September through early December and provided Canadian fisheries and energy benefits. A similar agreement was signed for the 2009/10 operating year.
- A **Flow Shaping Agreement**, signed by the Treaty entities in January 2009, allowed Arrow Treaty releases to be reshaped between January and April 2009. Canadian benefits were primarily enhanced whitefish spawning and incubation protection.
- A **Summer Storage Agreement**, signed in June 2009, helped to increase Arrow levels and provided additional Canadian energy benefits.
- The storage release provisions of the **Non-Treaty Storage Agreement (NTSA)** between BC Hydro and the Bonneville Power Administration (BPA) expired at the end of June 2004. Storage refill provisions of the agreement remain in effect until all NTSA storage is refilled, no later than the end of June 2011. Good progress has been made so far in refilling NTSA storage, with the storage space now being 88 per cent full.
- **Replacement Coordination Agreement:** For the foreseeable future, BC Hydro and BPA will coordinate any use of Non-Treaty storage under mutually agreed short-term operating agreements (one year or less). For any potential longer-term agreements, BC Hydro is committed to working with interested stakeholders to carry out impact assessments of potential agreement options as they become apparent.

OPERATING CONDITIONS

Much of the region's generating potential depends on snowpack levels. Snowpack levels varied throughout the Canadian Columbia region in 2009, but were generally below average. The resulting runoff conditions for the Columbia/Kootenay basin within Canada were quite low, at about 77 per cent of average (February–September 2009). Overall, U.S. Columbia runoff conditions this year were also low. Isolated areas of above-normal precipitation were experienced in parts of Idaho and Montana, giving higher than average flows at some U.S. headwater locations. More broadly, however, precipitation was below normal. This resulted in the overall seasonal runoff volume for the Columbia basin [Canada and U.S. combined] coming in well below normal at 84 per cent of average.

Snow Water Equivalent (SWE) at Automated Snow Pillow Locations

As of early June 2009.



BC HYDRO'S OPERATIONS

KINBASKET (MICA) RESERVOIR

Kinbasket Reservoir stores water for both Mica and Revelstoke Generating Stations as well as for powerplants further downstream. As is normal, the Kinbasket (Mica) reservoir was drawn down during the fall and winter to meet electrical demands. However, system loads in 2008/09 were lower than expected due, in part, to the slower economic conditions. This resulted in reduced generation requirements from Mica and Revelstoke Generating Stations and a much reduced draft from the Kinbasket Reservoir this year. The Kinbasket Reservoir reached a minimum level of 730.4 m (2396.2 ft) on May 5, 2009, 12.2 m (40 ft) higher than the 2008 minimum level of 718.1 m (2356.1 ft).

From late May through early July, Mica generation was reduced to near minimum flows as system loads declined and inexpensive market energy was available. This condition, combined with freshet inflows, caused Kinbasket reservoir to refill quickly in May through July. The reservoir continued to fill gradually through late September to reach a maximum level of 752.15 m (2467.7 ft) on September 25, 2009, 2.23 m (7.3 ft) from full. The reservoir began to draft slowly during the early fall.

The maximum and minimum licensed levels for Kinbasket Reservoir are 754.4 m (2475 ft) and 707.1 m (2320 ft) respectively.



Revelstoke Generating Station.

ARROW LAKES RESERVOIR

Arrow Lakes Reservoir is created by the Hugh Keenleyside Dam. The Arrow Lakes Reservoir reached its minimum level for the year at 429.34 m (1408.6 ft) on March 30, 2009, about 1.4 m (4.7 ft) below the minimum level recorded in 2008.

As basin inflows increased from snowmelt runoff during May through early July, the reservoir filled quite rapidly. It refilled up to its Treaty flood control level (maximum possible level) in May and proceeded to fill across June to reach a maximum level of 437.8 m (1435.6 ft), or 2.5 m (8.4 ft) from full, on June 30, 2009.

The reservoir drafted gradually across the summer months (July–September) reaching about 435.9 m (1430 ft) on August 31, 2009 and 434.3 m (1425 ft) on September 30, 2009. Overall, the Arrow summer levels this year were lower than last year. This is primarily due to significantly below normal runoff in 2009 and less generation from Mica. While higher summer levels (437.4 to 438.9 m, or 1435 to 1440 ft) are preferred for recreation, lower levels are preferred for vegetation and nesting birds based on stakeholder input to the Columbia Water Use Plan (WUP).

From mid July through early August, with the snowpack depleted and low precipitation, Columbia Basin inflows slowed to well below normal levels. With

dry conditions experienced across the entire Columbia basin, U.S. and Canadian Treaty projects on the Columbia system operated in “proportional draft” mode during the late summer and fall. In proportional draft, Canada is required by the Treaty to release more water. Treaty projects are expected to remain in “proportional draft” until December 2009 unless inflow conditions improve for the overall Columbia basin.

The maximum and minimum licensed levels for Arrow Lakes Reservoir are 440.1 m [1444 ft.] and 420.0 m [1378 ft.] respectively.



Arrow Lakes Reservoir.

Arrow Lakes Reservoir Soft Constraints

Under the Columbia Water Use Plan (WUP), the Consultative Committee developed a set of soft constraints for the Arrow Lakes Reservoir to help guide operational decisions each year to balance the different stakeholder objectives. These soft constraints also depend on the weather, runoff, Treaty/Non-Treaty obligations, and system requirements.

Performance on the soft constraints for 2009 are reported below based on observed and expected Arrow Lakes reservoir levels:



RECREATION

Target: Reservoir water levels between 1435 ft and 1440 ft from May 24 to September 30.

Performance: Reservoir was within target range about 5% of time between May 24 and September 7.



FISH

Target: Reservoir levels above 1424 ft to ensure tributary access during kokanee spawning period from late August to early November

Performance: Reservoir was above 1424 ft about 48% of the time between August 25 and November 15.



WILDLIFE

Target: Ensure inundation of nesting bird habitat by rising reservoir levels and availability of fall migratory bird habitat is no worse than recent average (1984–1999). Target a reservoir level of 1438 ft or lower by August 7.

Performance: Reservoir was below 1424 ft about 48% of the time between April 30 and July 16 for nesting birds. It was below 1437 ft for the entire time between August 7 and October 31 for fall migratory birds.



VEGETATION

Target: Maintain current (2004) level of vegetation in the drawdown zone by maintaining lower reservoir water levels during the growing season.

Performance: Reservoir was below 1424 ft for about 39% of the time between May 1 and July 31.



CULTURE AND HERITAGE

Target: Reservoir levels at or below 1430 ft for as long as possible to limit impacts to archaeological sites.

Performance: Reservoir expected to be below 1430 ft about 78% of the year.



EROSION

Target: Minimize duration of full pool events and avoid sudden drawdown once full pool has been reached to avoid shoreline slumping. Reservoir water level of 1440 ft is ideal.

Performance: Reservoir did not reach full pool this year due to low inflows. Peak level was 1435.6 ft on June 30 and reservoir drafted gradually to 1432.6 ft on July 31 and 1430.3 ft on August 31.

DUNCAN RESERVOIR

As in most years, the reservoir drafted to near empty in late April or early May. In 2009, the Duncan Reservoir reached its minimum level for the year of 547.1 m (1794.9 ft) on 23 April. By comparison, in 2008 the reservoir reached a minimum elevation of 546.9 m (1794.2 ft) on 28 April.

Reservoir discharges were reduced to the minimum of 3 m³/s (100 cfs) on 25 May 2009 to initiate refill. Duncan reservoir continued to pass the minimum flows until early August when discharges were gradually increased to control the rate of refill and minimize flood levels downstream of the dam. The reservoir refilled to a maximum elevation of 575.86 m (1889.3 ft), 0.15 m (0.5 ft) below full pool on August 21, 2009.

Project outflows were increased above inflows in late August to begin drafting the reservoir. In September, discharges were increased to about 170 m³/s (6 kcs) to facilitate drafting of the reservoir prior to the start of the kokanee and whitefish spawning downstream of Duncan Dam.

The maximum and minimum licensed levels for Duncan Reservoir are 576.7 m (1892 ft) and 546.9 m (1794.2 ft) respectively.

KOOCANUSA (LIBBY) RESERVOIR

The Koocanusa Reservoir reached its minimum level for the year of 732.4 m (2402.8 ft) on April 9, 2009. By comparison, in 2008 the reservoir reached a minimum elevation of 730.0 m (2395.1 ft) on April 14.

The runoff volume this year for the Libby project was 69 per cent of normal (January-August). The reservoir refilled to a maximum elevation of 744.72 m (2443.3 ft) on August 24, 2009, 4.78 m (15.7 ft) below full pool.

Libby was operated under VARQ flood control procedures in 2009. Under VARQ flood control, the U.S. Army Corps of Engineers holds the level of Koocanusa Reservoir higher from January to June in order to provide additional water releases in the spring for sturgeon, and in the summer, for Columbia River salmon and steelhead.

Information regarding the operation of Libby Dam and Koocanusa Reservoir levels are available through the U.S. Army Corps of Engineers.

Website: www.usace.army.mil
Phone: 206 764 3750

KOOTENAY LAKE

For information regarding Kootenay Lake, please contact FortisBC.

Website: www.fortisbc.com
Phone: 1 866 436 7847



BC Hydro Operational Update team in Nakusp.

REGIONAL OPERATIONS UPDATE MEETINGS

BC Hydro hosted its annual Operations Update meetings in Valemount, Trail, Nakusp, Meadow Creek, Revelstoke, Golden, Cranbrook, Jaffray, and Creston in May and June of this year in the communities throughout the Columbia Kootenay region.

These meetings are held to:

- Provide information on the operations of Columbia River Treaty facilities in Canada and other facilities that are operated in a coordinated manner on the Columbia system;
- Provide an update on BC Hydro activities; and
- Listen to, and learn from, the concerns of stakeholders, First Nations and communities who have an interest in the operation of the Columbia River Treaty facilities and BC Hydro facilities in the East Kootenay and Thompson/Okanagan/Columbia regions.

WE WOULD LIKE TO HEAR FROM YOU

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