

OVERVIEW OF OPERATIONS AT PRIEST RAPIDS PROJECT

Mid-Columbia Hourly Coordination

The Priest Rapids Project (PRP) operates as part of the coordinated Mid-Columbia hydroelectric power system. This coordination occurs under the Hourly Coordination Bridge Agreement between Grant PUD and Chelan PUD. Hourly coordination attempts to optimize useable power and energy for each PUD through centralized system dispatch of the four projects included in the agreement. A party's rights and obligations from or to the coordinated system are based upon their project shares within each project.

Non Power Requirements

The area of the Columbia River below Priest Rapids Dam is referred to as the Hanford Reach. This area is the only free flowing part of the Columbia River below Grand Coulee Dam and is a spawning ground for salmon. In order to facilitate the spawning, rearing, and migration of these salmon in the Hanford Reach, PRP must comply with Non Power Requirements (NPRs) during various times of the year that affect project operations at both Priest and Wanapum. Most of the NPRs impact the capacity and energy numbers computed in the PNCA process. Below is a brief description of each of the NPRs that affect PRP throughout the year.

Fish Spill/Fish Mode: Historically, spill quantities from Priest Rapids and Wanapum Dams have varied from 39% to 61% of the total project discharge during the Spring and Summer spill season (historically between April 15 and August 20). With the construction and operation of the Wanapum Fish Bypass (in 2008) and Priest Rapids Fish Bypass (in 2014) as alternative fish passage measures, the expected fish spill requirements are now 22.7 kcfs and 28.8 kcfs, respectively. In addition, during the spill season, both Wanapum and Priest Rapid dams run in "Fish Mode". Fish Mode is a reduction in the amount of water (kcfs) that can pass through the turbine to improve fish passage through the turbine. This reduction in turbine flow reduces capacity at Wanapum by approximately 25% and at Priest by approximately 12%.

Reverse Load Factoring: Beginning on October 15th and continuing for approximately 5 weeks, the daytime capacity at Priest Rapids Dam is restricted to manage Fall Chinook salmon spawning elevations in the Hanford Reach. Assuming average daily flows, this mode of operation tends to require higher generation levels during the nighttime hours. This mode of operation is often referred to as Reverse Load Factoring (RLF), as it is opposite to the generally desired Load Factoring of storing water at night during off-peak hours for generation during the peak hours.

RLF is done because it is generally believed that Fall Chinook salmon spawn primarily during the daylight hours. Therefore, in order to maximize the survival of Fall Chinook Redds in the Hanford Reach, measures are taken to encourage salmon to spawn at lower

elevations. During the daylight hours of the spawning period, flows are held as low as practically possible, between the 55 kcfs to 70 kcfs range. Since average daily flows generally exceed these amounts, substantially higher discharges occur at night when the fish are less likely to spawn. This is done in order to maximize the probability of having enough flow during the incubation period to keep the Redds covered with water at all times.

During RLF, PRP's maximum generating capacity during daylight hours is held to about 800 MW. Non-daylight limits on generation capacity are generally not required. A minimum generation amount may be placed on participants if Total Dissolved Gas (TDG) issues arise. Pond use limits will likely be necessary during Reverse Load Factoring to ensure the project can be properly staged. Specific pond use limits are dependent on actual flows.

A count of the Redds is done on the first, second and last Sunday during RLF. These counts logs the number of Redds found at each kcfs flow elevation. Additional Sunday counts may be required based on results from previous counts. During these Sunday daytime counts, the flow out of Priest Rapids Dam is limited to 40 kcfs. On the last Sunday of RLF, the number of Redds at each kcfs elevation will be counted and a Protection Level Flow will be established.

Protection Level Flows

Following RLF, the discharge requirement at Priest Rapids Dam is set to the Protection Level Flow (PLF) which are generally between 60 – 70 kcfs. PLF are required throughout the incubation period, which generally lasts until mid-June.

Rearing Period Operations

Once the salmon hatch on the Hanford Reach, Priest Rapids Dam will conduct Rearing Period Operations while the fish are in the river. The Rearing Period generally lasts from mid-March until late June.

During the rearing period, the discharge flow from Priest Rapids Dam is set in a daily flow band in order to prevent temporary pools of water from forming along the banks of the river, which can cause small salmon to be stranded and possibly die from lack of oxygen. This mode of operation is often referred to as Anti-Stranding Bands or Stranding Bands. Stranding Bands are set each day (24 hour period) and are a function of the prior day's Wanapum inflow. The difference between the Band's maximum and minimum discharge is limited to a difference of 20 kcfs to 60 kcfs. Under very high flow conditions, Wanapum day average inflow above 170 kcfs/D, the daily restriction is set at a minimum Priest Rapids Dam discharge of 150 kcfs. The impacts of Stranding Bands are daily maximum and minimum PRP discharge flows, lower capacities, and restrictions on pond usage.

Total Dissolved Gas Limitations

Throughout the year, PRP is subject to limitations on total dissolved gas levels, measured as a percent of saturation level. During the high flow / fish migration periods (spring and summer), a waiver allowing for increased TDG maximum levels is in place to support fish passage programs. TDG concentrations are a function of spill volume, ambient air temperature, and water temperature. The interaction of these three variables makes forecasting of TDG difficult. Maximum allowed TDG levels place an upper limit on the amount of water that can be spilled at PRP. TDG limits do not usually affect operations during most of the year. But during the warmer and higher flow months, late spring and summer, it can become a factor in PRP operations. TDG restrictions can result in a limit to the amount of water spilled at each dam and therefore can raise the required minimum generation at the PRP. A historical overview to PRP TDG limits and historical data can be found at:

<http://grantpud.org/environment/water-quality/monitoring-data>

Ad Hoc Requirements

Additional Ad Hoc non-power requirements include such things as maintaining particular flows for downstream activities such as barge transportation, recreation requirements or maintenance. Construction projects can also limit operations by requiring certain flows and forebay elevations. In particular, pond use limits for recreation will be in place from 8:00 AM the Friday prior to each of Memorial Day and Labor Day through 8:00 AM the Tuesday after each of these holidays. Also, for Independence Day, pond limits will usually be in place for up to 4 days near the 4th depending on the day the 4th falls. The recreation pond limits require Priest Rapids' forebay elevation to remain at or above 485.5' and Wanapum's forebay elevation to remain at or above 565.0'. No other known pond limits are known at this time.