RULE CURVE DEFINITIONS

Rule Curves used by HYSSR in reservoir regulation are defined in the Pacific Northwest Coordination Agreement (PNCA) and the Columbia River Treaty Principles and Procedures.

Critical Rule Curves (CRC). CRC's are determined annually by the Northwest Power Pool (NWPP) Coordinating Group based on the annual estimates of system loads and resources provided by project owners. The CRC's developed by the NWPP are used in PNCA studies and the PNCA Actual Energy Regulation. CRC's are also determined by BPA during the AOP study process and are used in Treaty studies and in the Treaty Storage Regulation. These CRC's are the yearly schedule for the operation of each reservoir so that the system firm load is met during the critical period. The critical period is the multi-month period of record, which generates the least amount of electricity with the release of all reservoir storage to serve the firm load requirements of the coordinated system. For example, using historical water sequence years 1928 - 1978 and depending upon loads and resources the critical period may be 9 months with a 1936-37 historical water sequence, or it may be 42 months long with 1928-1932 as the historical water sequence. One to four CRC's are developed depending on the length of the critical period.

Assured Refill Curve (ARC). The ARC defines the reservoir elevations necessary to refill the reservoir by 31 July. The natural flow available for computing the ARC is the water from the third lowest water year, which for projects upstream of Bonneville Dam is August 1930 through July 1931. The natural flow at a reservoir is reduced by the power discharge requirement (PDR), any non-power requirements at site, and by the water required for refill at upstream reservoirs.

Base Energy Content Curve (BECC). The BECC is the higher of the CRC1 (first year critical rule curve) or the ARC.

Variable Refill Curves (VRC). The VRC, also called the Variable Energy Content Curve (VECC) in PNCA terminology, defines reservoir elevations necessary to refill the reservoirs and is used to limit the amount of secondary (surplus) energy produced. The VRC is determined by reducing each year's inflow volume forecast by a forecast error such that there is a 95 percent probability that the reduced forecast will be equaled or exceeded. The VRC is developed to refill the reservoir by the end of July if the forecast is within the 95 percent tolerance and a normal shape.

Variable Refill Curve Lower Limit (VRCLL). The VRCLL is the lower limit to the VRC, which is used in determining VRCs for AOP studies.

Mandatory Rule Curve (MRC). The MRC, also called the Upper Rule Curve (URC) is set by flood control requirements and represents a minimum reservoir draft to provide for flood control.

Lower Limit Variable Energy Content Curve. A lower limit to the VECC, and terminology used by the PNCA. The minimum reservoir contents to ensure the coordinated system will not be drafted empty prior to the start of the annual runoff, which could result in the inability of the system to meet Firm Load Carrying Capability during Jan 1 through Apr 15.

Operating Rule Curve (ORC). The ORC is determined as follows:

During the **1 August through 31 December** period, the ORC is the higher of the ARC and the CRC1, unless the MRC is lower, then it controls.

During **1 January through 16 April** period, the ORC is the higher of the ARC and the CRC1, unless the VRC is lower, then the VRC controls, but no lower than the ORCLL and no higher than the MRC.

During the **16 April through 31 July** period, the ORC is determined in the same way as during 1 January through 31 March except that the ORCLL is no longer a limit.

The ORC defines the levels to which a reservoir may be drafted to serve secondary loads. During years of low runoff, power drafts to serve firm loads may cause reservoirs to be drafted below their ORC.

Operating Rule Curve Lower Limit (ORCLL). The minimum month-end storage contents which must be maintainted to provide a high probability of maintaining the system firm energy load carrying capability from 1 Jan to 15 Apr, in the event that the Variable Refill Curve permits storage to be emptied prior to the start of the freshet.