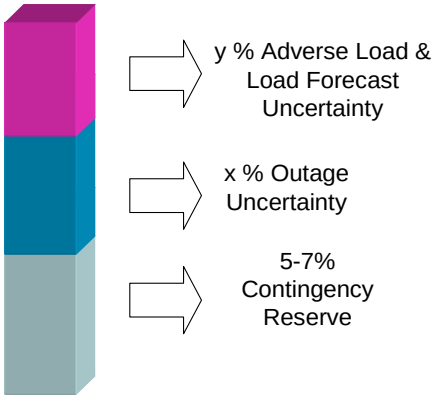
Comparison of FCRPS Sustained Peaking Capacity under Emergency vs. Normal Operating Conditions

Early on in the PNW Resource Adequacy Forum's effort to develop a capacity standard, the Steering Committee decided that the capacity metric should be in the form of a planning reserve margin with capacity defined as sustained peaking capacity available over a number of peak hours and possibly a number of days to meet loads over the same timeframe. This definition recognizes that in a hydro-dominated region, the peak hour resource capability to meet peak hour load is not likely to be the pertinent way to measure capacity sufficiency. Rather in a region like the PNW, it is important to have sufficient capacity to allow the region to meet its loads reliably over an extreme weather event such as a cold snap. The planning reserve margin needs to be sufficient to cover contingency reserves needed for short-term operations as well as to provide resources to cover the possibility of forced outages and/or increased load due to adverse temperatures. Figure 1 depicts this form of the capacity metric.

Figure 1: Steering Committee Adopted Form of Capacity Metric and Target

- Metric = Planning Reserve Margin Using 1 in 2 Loads
- Contingencies such as cold snap loads reflected in reserve margin



WORST CASE COLD SNAP STUDY:

The Technical Committee performed a pilot study to evaluate the Region's sustained peaking capability to meet extreme weather loads under a number of durations. The assumptions for this study are:

- Current level of loads (2006 or 2007) are increased to reflect loads under February 1989 temperatures;

- Hydro capability is based on critical hydro, i.e. 1937 water;
- Although no Power Emergency under the Biological Opinion is assumed, the TMT is assumed to approve cold snap emergency protocols.

Eric King, in close coordination with other BPA staff and assistance from Mid-C parties, performed the FCRPS and Mid-C evaluations of sustained hydro peaking capability for this pilot study. The results of the FCRPS evaluation are as follows for the study over a 5 day, 10 hour per day duration:

- The FCRPS is operated to its full hydraulic capability-- Libby, Hungry Horse and Dworshak are operated to their full unit availability; Grand Coulee is drafted at 2 ft/day;
- Snake and Lower Columbia projects operate within their full normal operating range;
- It is assumed that B.C. Hydro will release an additional 10 kcfs over Treaty flows because they are also experiencing the cold snap;
- Over 5 days:
    - Libby is drafted 5.5 feet
    - HGH is drafted 3.5 feet
    - DWR is drafted 7 feet
    - GCL is drafted 8 feet;
- This type of operation constitutes a sustained drawn down of the FCRPS below the fish refill curves;
- Significant energy purchases are likely to be required to allow the FCRPS to recover sufficiently to meet its April target elevations under the Biological Opinion;
- Some of the Headwater projects may not have the ability to fully recover to their refill targets;
- The table below shows the results of this study:

FCRPS + Mid-Cs Sustained Hydro Peaking Capacity under Worst Case Cold Snap and Critical Hydro				
SUSTAINED HYDRO CAP. (MWs)	DURATION			
	1 hour	2 hour	4 hour	10 hours over 5 days
FCRPS	17,200	17,200	17,100	15,700
Mid-Cs	4,220	4,200	4,190	4,100
TOTAL	21,500	21,400	21,300	19,800

- The table on the next page compares the bottom-up analysis of the Region's maximum sustained hydro peaking capacity [1] available under emergency protocols to meet the loads during a worst case cold snap to

[1] This analysis reflects the hydro capability of the FCRPS and Mid-C's and the hydro plants owned by Puget, Seattle, Avista, Tacoma, Idaho Power and Portland General; it does not reflect the hydro capability of EWEB or Snohomish hydro plants because these entities did not respond to the Technical Committee's informational request.

the Council's top-down analysis of the Region's sustained hydro peaking capacity using the trapezoidal approximation and 1937 water under normal operating conditions:

Regional Sustained Hydro Peaking Capacity under Normal & Emergency Ops				
SUSTAINED HYDRO CAP. (MWs)	DURATION			
	1 hour	2 hour	4 hour	10 hours over 5 days
Emergency Protocols	27,100	26,900	26,800	24,500
Normal Op.	26,800	21,100	20,500	18,700
Difference	230	5,730	6,250	5,840

TYPICAL COLD SNAP STUDY:

The Technical Committee decided that a capacity metric and target should revolve around normal operating conditions rather than extraordinary ones. Thus Eric was tasked to take a look at the FCRPS and Mid-Cs for a less severe cold snap situation, i.e. one with perhaps a 10 degree rather than 20 degree deviation from normal. Following are the results of that study:

- TMT Cold Snap Protocols are not assumed; although limited flexibility to draft below the fish refill curves is assumed;
- Columbia River Hydro System is operated to meet the Vernita Bar and Chum flow requirements;
- Grand Coulee draft is limited to 1.5 feet per day;
- Libby, HGH and DWR are assumed to operate at minimum discharge;
- B.C. Hydro releases Treaty flows;
- Draft over and above normal operations for the 5 days:
    - GCL is drafted additional 6 feet;
- This operation constitutes a drawn down of Grand Coulee below the fish refill curves;
- Significant energy purchases are likely to be required to allow Grand Coulee to recover sufficiently to meet its April target elevations under the Biological Opinion; [2]
- The table on the next page shows the results of this study: [3]

[2] While recovering Grand Coulee to fish refill curves, the sustained hydro peaking capacity of the FCRPS to meet adverse loads, if a second cold snap were to occur, is severely impacted.

[3] This study was only performed for the 10 hours per day over 5 days duration.

FCRPS and Mid-Cs Sustained Hydro Peaking Capacity under Typical Cold Snap and Critical Hydro	
SUSTAINED HYDRO CAP. (MWs)	DURATION = 10 hours over 5 days
FCRPS	13,500
Mid-Cs	3,900
TOTAL	17,400

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