

Regional PNW Capacity Metric – ONE OPTION

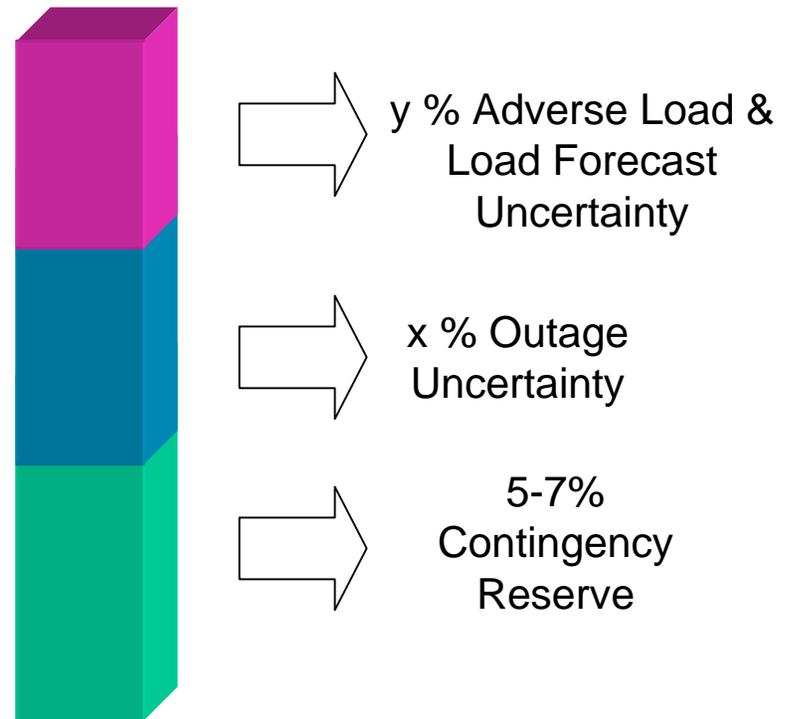
Mary Johannis

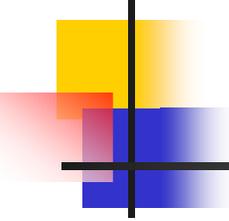
PNW Resource Adequacy

Technical Committee Meeting, 01-12-06

Possible Capacity Metric

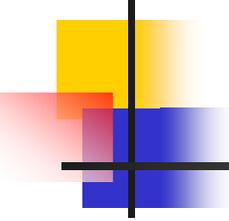
- Suggested Metric = Planning Reserve Margin (similar to CA)
- Use 1 in 2 Loads
- Contingencies such as cold snap loads reflected in reserve margin





Evaluation of Aggregate Capacity to Meet Aggregate Load

- Utility Resource Planning Documents and IRPs evaluate LSE (Capacity+Contracts) to meet LSE Load
 - Both old and new versions of BPA White Book evaluate sustained hydro available to meet load; maximum sustained hydro not evaluated
 - Avista's Sustained Capacity PowerPoint Presentation = Evaluation of Avista's ability to meet Loads during Cold Snap
- Avista's method = Starting Point for Proposed Capacity Metric, except Capacity Evaluation not tied to individual LSE's Ability to Meet its Own Load
- Rather Aggregate Sustained Capacity compared to Aggregate Load to determine if Planning Margin Met

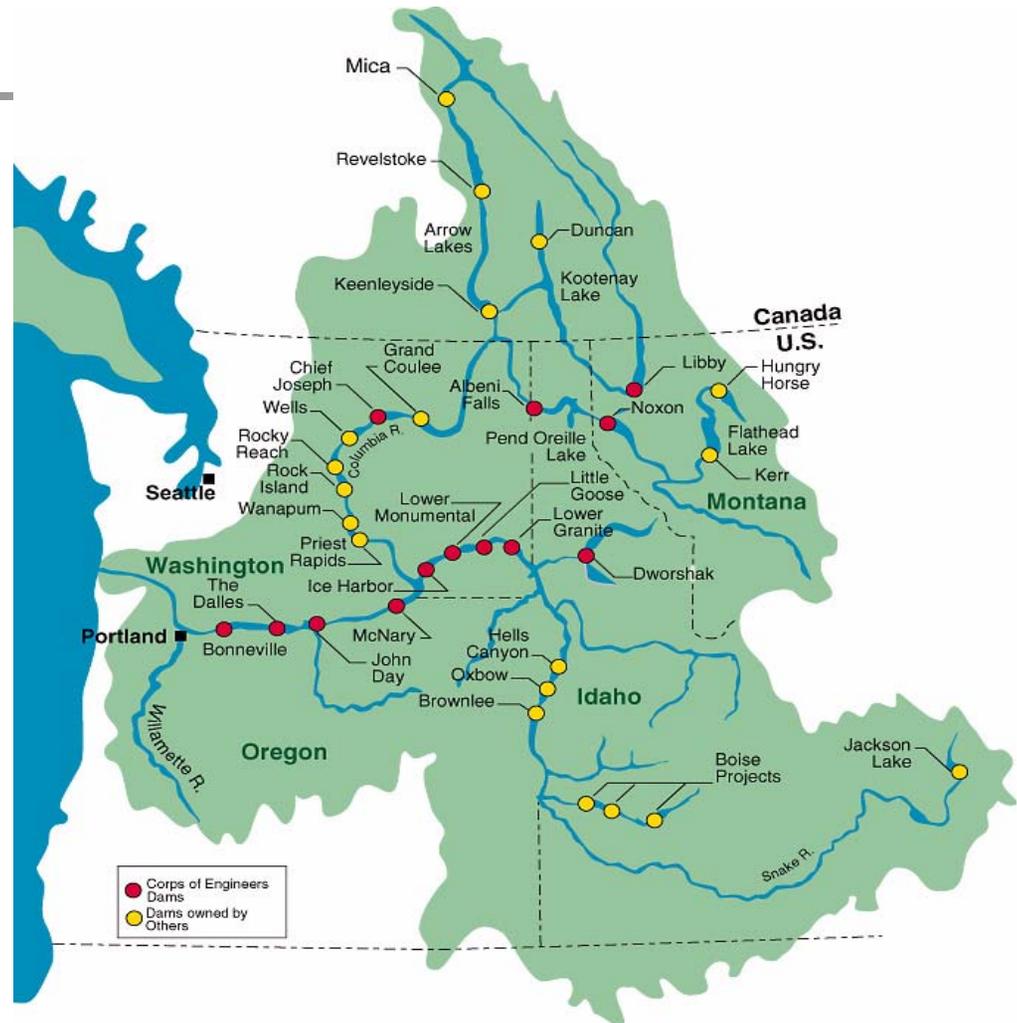


Definition of Capacity

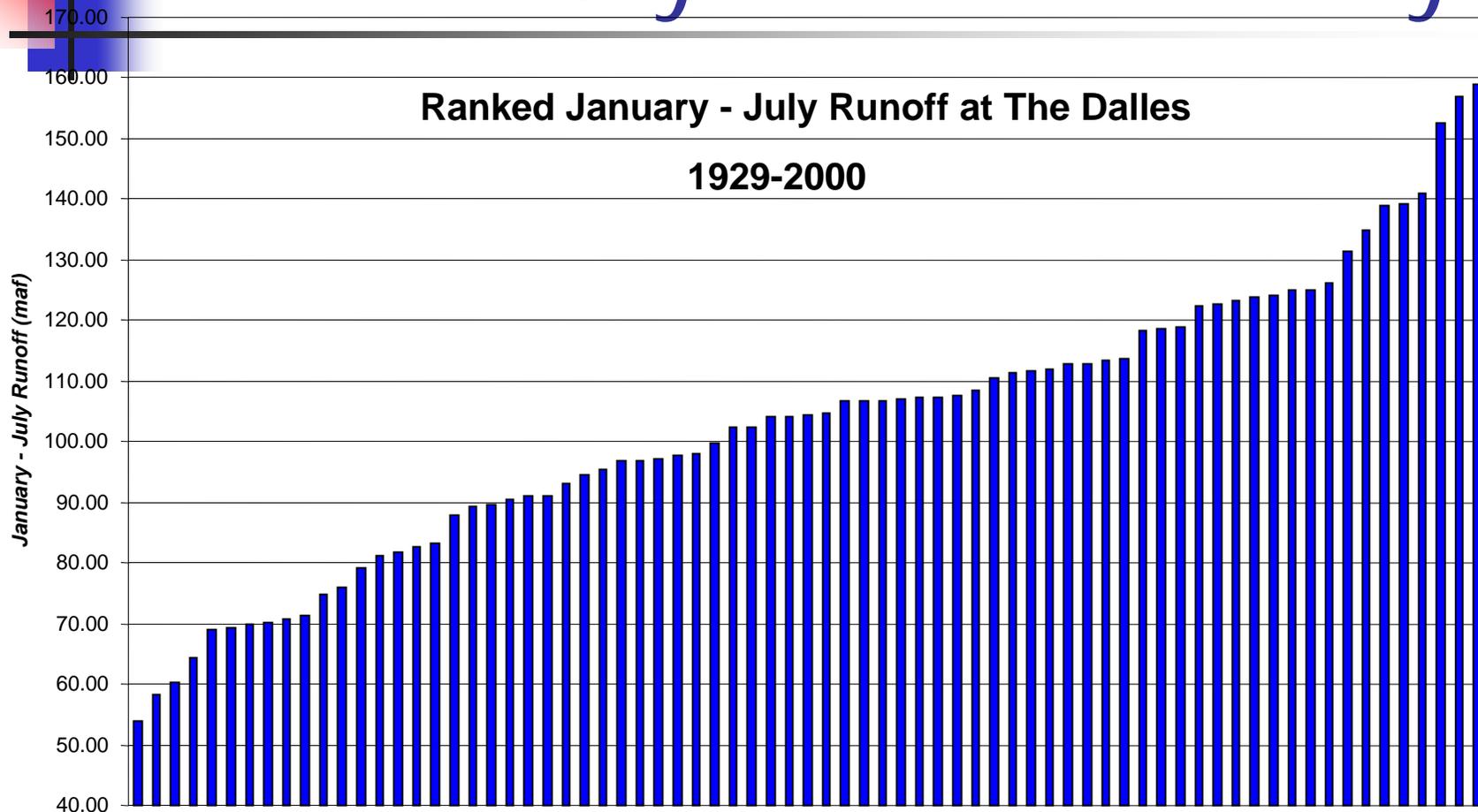
- Monthly Capacity or Seasonal Capacity Analysis
- Thermal Capacity is assumed to be available on sustained basis, except Maintenance Outages should be reflected
- Sustained Hydro—see next slides
- Contract Capacity = ?
- Wind = ?

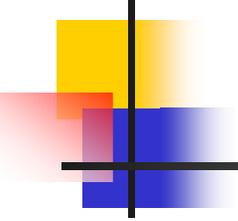
Columbia River Hydro System

- 134 million acre feet (maf) is the average annual flow at The Dalles
- 31 Federal Dams in Watershed with an installed capacity of 22,500 MW. The Region has over 30,000 MW of installed capacity, which on average results in 100,000 GWH of annual generation.



Hydro Operations: Variability and Uncertainty

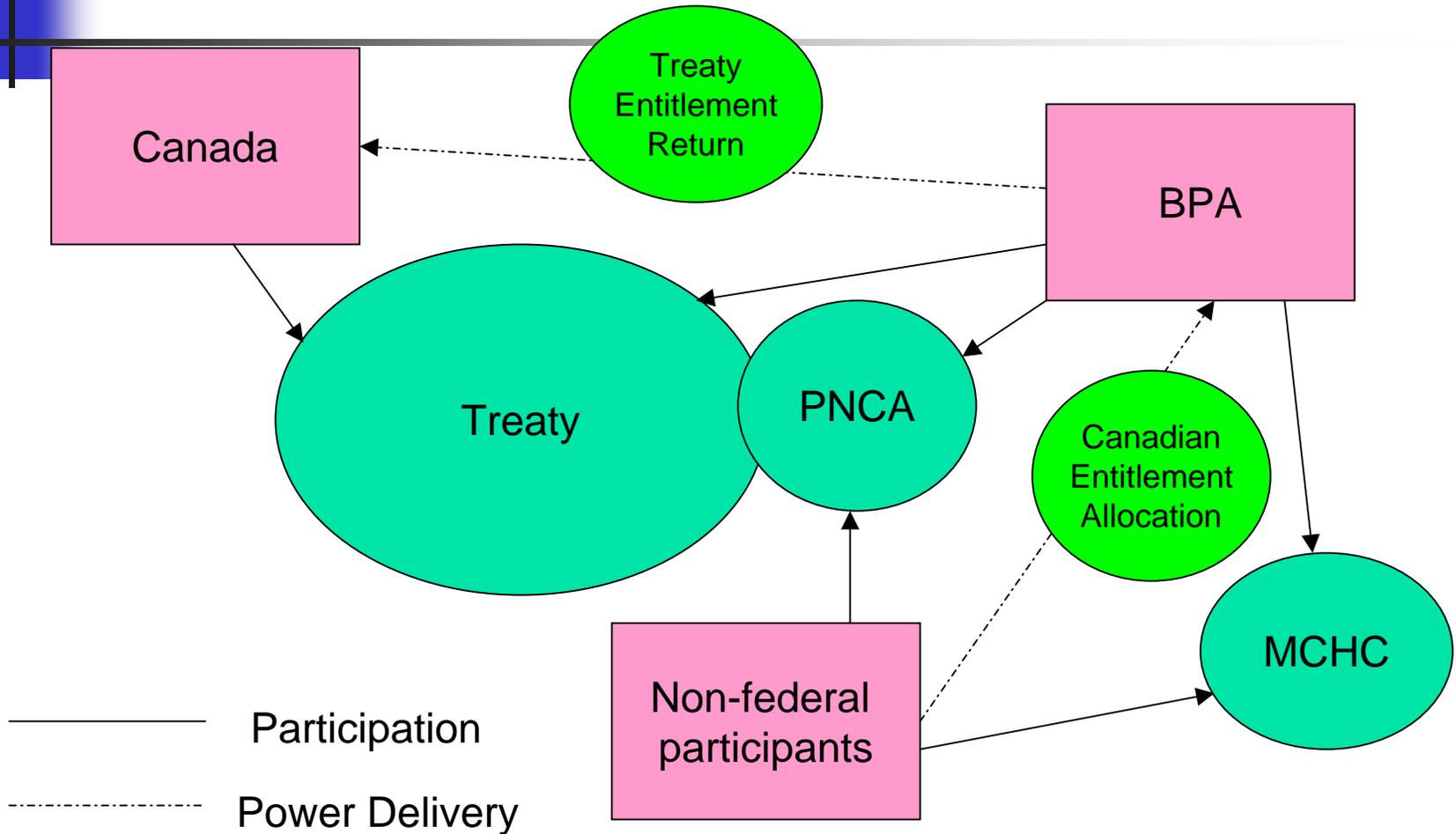




Hydro Operations: Constraints & Coordination

- BPA does not own Federal Dams—Corps and Reclamation own and operate facilities
- Non-power constraints such as flood control, irrigation and BiOp dictate the range of possible power operations
- Agreements that provide for Coordination of Operations include:
 - Columbia River Treaty
 - Pacific Northwest Coordination Agreement
 - Hourly Coordination Agreement

Resource Coordination

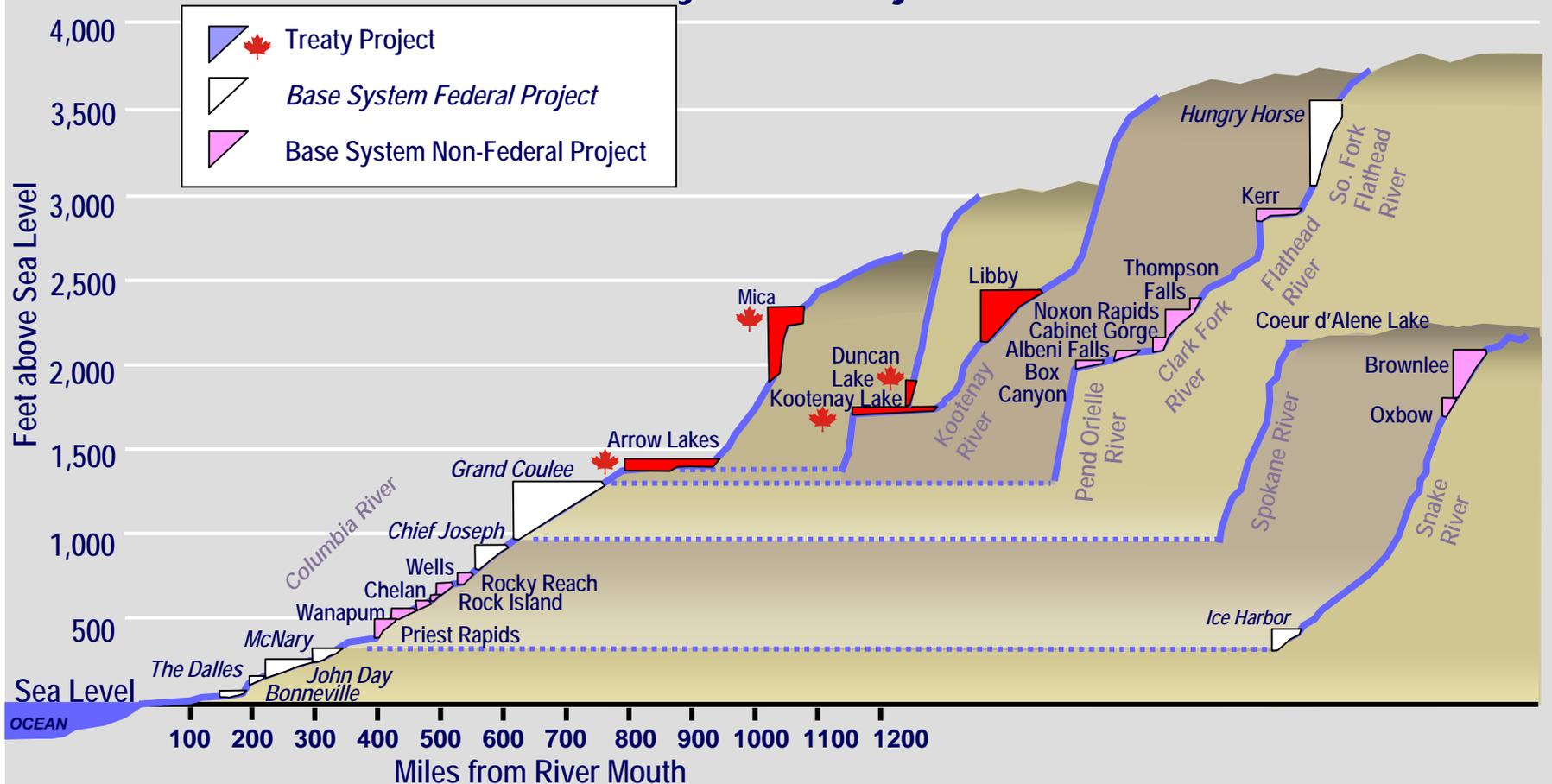


PNW Hydro Characteristics

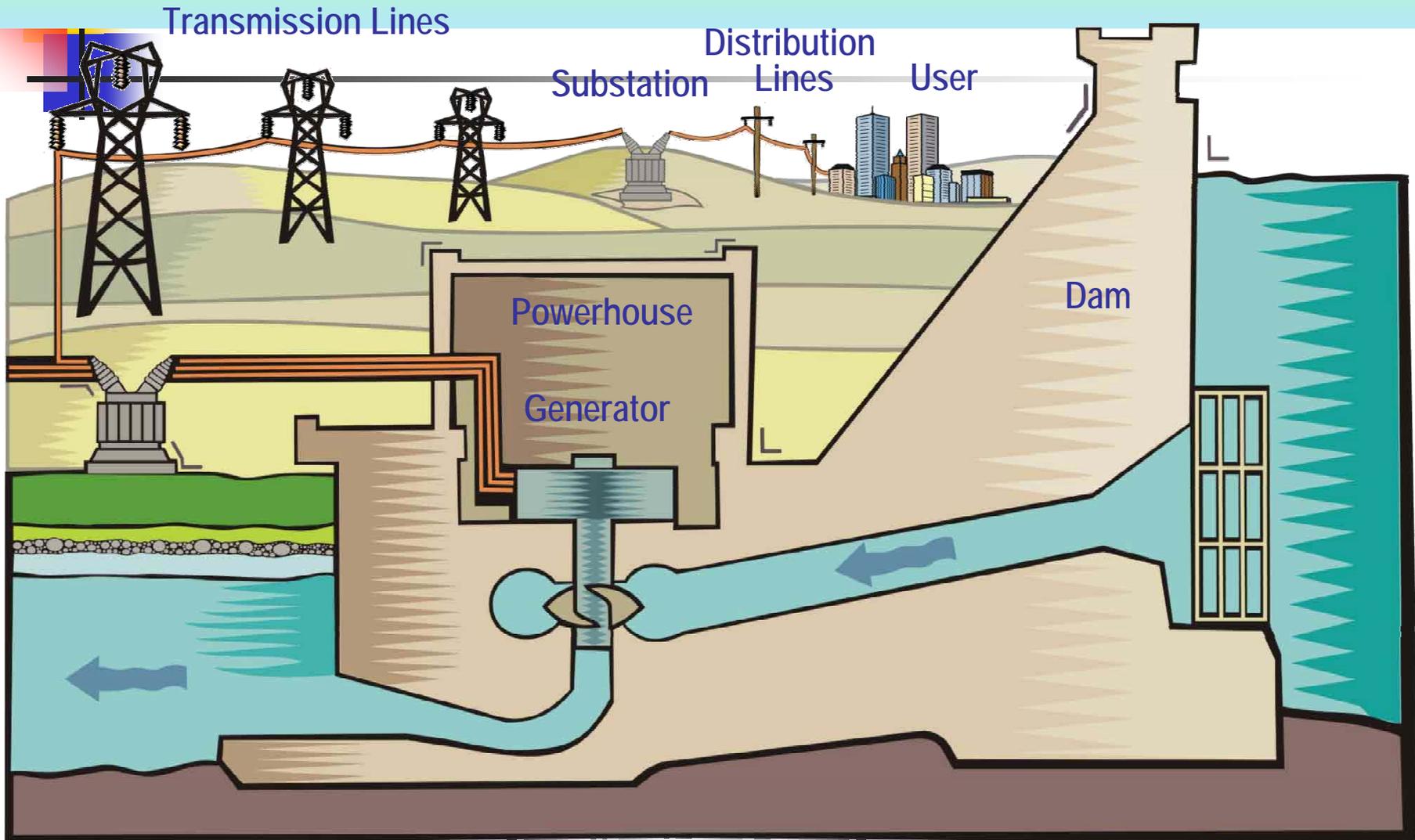
- Common fuel supply, affected by non-power constraints
- Hydro operations have consequence, either immediately or in the future
- Hydro is used for regulation and load-following while thermal tends to be base loaded



United States – Canada Treaty and Columbia River Base System Projects



Hydroelectric Power System



January - March



- System draft, first snow survey, flood control
- Columbia Falls min flow – bull trout habitat
- Bonneville and Vernita Bar operations
- Arrow Lakes whitefish operation to hold flows for low spawning level for whitefish
- March install fish screens
- mid-March pumping starts at Coulee

Grand Coulee Dam



January 12, 2006

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PNW Resource Adequacy Forum

12-Jan-05

Possible Approach to Capacity Metric

Grand Coulee Hydro Power Plant:

Installed Capacity = 6809 MW

WECC Winter Capacity = 5596 MW

Max Elevation = 1290 ft

Min Elevation = 1208 ft

Max Usable Storage = 2,614.3 kcfs-days

RESERVOIR CONTENT--First foot = 40.5 kcfs-day; Last foot = 23.6 kcfs-day

Max H/K = 25.2 MW/kcfs

Dry Yr H/K = 22.2 MW/kcfs

Max daily draft = 1.5 ft/day (in Feb, 1989, approved draft increased to 2 ft/day)

Sustained Hydro Capacity Available for February, 1973 (an adverse hydro year):

HYDSIM RESULTS:

SUSTAINED PEAK CAPACITY TEST

Weighted Avg Capacity (MW)	Monthly Generation (aMW)	Monthly Outflow (kcfs-days)	Daily Avg Outflow (kcfs-day)	1-Hour Cap (MW)	1-Hour Q (kcfs-day)	O.K.?	4-Hour Cap (MW)	4-Hour Q (kcfs-day)	O.K.?	8-Hour Cap (MW)	8-Hour Q (kcfs-day)	O.K.?
4711	1379	1739.3	62.1	4711	8.8	Yes	4711	35.4	Yes	4711	70.7	Yes?

Ice Harbor Dam



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Ice Harbor Hydro Power Plant:

Installed Capacity = 693 MW

WECC Winter Capacity = 693 MW

Max Elevation = 440 ft

Min Elevation = 437 ft

Max Usable Storage: This is a run-of-river plant, so no usable storage assumed

RESERVOIR CONTENT--4.0 kcfs-day

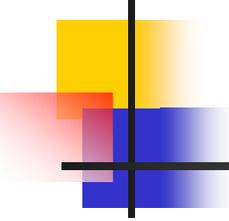
Max H/K = 7.4 MW/kcfs

Sustained Hydro Capacity Available for February, 1973 (an adverse hydro year):

HYDSIM RESULTS:

SUSTAINED PEAK CAPACITY TEST

Weighted Avg Capacity (MW)	Monthly Generation (aMW)	Monthly Outflow (kcfs-days)	Daily Avg Outflow (kcfs-day)	1-Hour Cap (MW)	1-Hour Q (kcfs-day)	O.K.?	4-Hour Cap (MW)	4-Hour Q kcfs-day)	O.K.?	8-Hour Cap (MW)	8-Hour Q kcfs-day)	O.K.?
520	218	824.9	29.5	520	2.9	Yes	520.0	11.7	Yes	520.0	23.4	No



Sustained Hydro Capacity

- Should Hydro Capacity be sustainable over 1 hour, 4 hours, 8 hours?
- For what type of water condition, should hydro capacity be reported?
- Should sustained hydro capacity definition be linked to LOLP analysis?
- Other options