Northwest **Power** and **Conservation** Council

March 3, 2015

MEMORANDUM

TO: **Power Committee members**

FROM: **Ben Kujala**

SUBJECT: **Approach to Capacity for the Draft Plan**

BACKGROUND:

Presenter: Ben Kujala

Summary The redeveloped Regional Portfolio Model (RPM) tests each resource strategy to determine whether it meets both energy and capacity adequacy requirements. That is, it ensures that the power supply is sufficiently surplus in energy and capacity generating capability to meet the predefined adequacy reserve margins (ARMs). The capacity and energy ARMs are derived from the GENESYS model, which is used by the Council to annually assess resource adequacy. The surplus generating capability thresholds represented in the ARMs provide sufficient margins to account for variations in water supply, thermal outages, temperature variation and wind generation. Council staff will describe its proposed approach to using the GENESYS adequacy modeling results to establish capacity and energy ARMs for use in the RPM.

Relevance In order legitimately compare alternative resource strategies, these strategies must provide comparable levels of reliability/adequacy.

Workplan: 1.D. Prepare for Seventh Power Plan and maintain analytical capability
1.E. Redevelopment of Regional Portfolio Model

Background: The Regional Portfolio model is used to examine the cost and risk of regional resource strategies. GENESYS is the software used by the Council and the Resource Adequacy Advisory Committee to assess regional power supply adequacy. The RPM is used to identify successful (i.e., lower cost and lower risk) resource strategies. The GENESYS model is used to assess whether the region has adequate energy and capacity resources. Using criteria for energy and capacity adequacy derived from the GENESYS model in the RPM assures that the successful resource strategies identified provide comparable levels of reliability/adequacy.

More Info: Summary information and updates are available at http://www.nwcouncil.org/energy/rpm/home/.

Proposed Approach to Capacity in RPM for the 7th Plan

Disclaimer

- Draft inputs for RPM are not expected to be finalized until March 27th
- RPM is still within the Council's 30-day evaluation period and may have further improvements based on this evaluation

Resource Adequacy in RPM and GENESYS

- GENESYS is designed for adequacy assessment
- GENESYS is usually run for a single future year
- RPM forecast resource builds for adequacy, economics and RPS
- RPM futures have different loads and resources including conservation than the RAAC adequacy assessment

Adequacy Reserve Margin

- How much generation is needed to maintain the Council's 5 percent LOLP standard relative to load?
  - How should IPPs (Independent Power Producers) be treated for adequacy purposes?
  - How should the extra-regional market be treated?

IPPs in RPM

- Power produced at market price, value is not credited to the region in NPV formulation
- No barriers or limits on IPP availability, which differs from GENESYS

External Market in RPM

- Quarterly transfer limits determine market depth
- RPM dispatch ties strongly to the external market price
- GENESYS limitations on market dependence would likely not work for RPM

Adequacy Reserve Margin Proposal

- Take rate-based non-hydro generation capacity and energy from an GENESYS run meeting the Council's adequacy standard over regional capacity and energy needs for the winter quarter
- For hydro generation take 1937 (critical hydro) energy and capacity
- This implicitly uses the IPP reliance and external market reliance assumptions from GENESYS **for resource adequacy** in RPM

GENESYS Run Winter Rate-Based Resource Capacity

Resource Type	Adequacy Reserve Calc	Winter Quarter Value (Q1)
Rate-based Thermal	Capacity * (1 – FOR)	12,427
Rate-based Wind	5%	227
Critical Hydro	10-hr Sustained Peak	16,490
Firm contracts	1-hr Peak	-167
TOTAL CRITICAL RESOURCE		**28,997**

GENESYS Run Winter Capacity Needed (Peak-Load) Example

- If the 1-hour peak weather normalized load for 2020 is projected to be 29,202 then rate based resources are 99.2% of the projected load
- Given the RAAC assumptions of 2500 MW capacity from the extra-regional market and 3021 MW capacity from in-region IPPs then we have 28,997+2,500+3,021=34,499 MW of resource **under critical hydro** for 29,202 of load or a 118% ratio of resource to load
- Under average hydro this is about a 138% ratio of resource to load

Adequacy Reserve Margin Calculation

Component	Winter Quarter Value (Q1)
Total Critical Resource Capacity	28,997
Forecast Weather-normalized Peak Load	29,202
Surplus / Deficit Rate-based Capacity	28,997 – 29,202 = -205
ARMc (Adequacy Reserve Margin for Capacity)	-205 / 29,202 = -0.8%

Note: This implicity assumes that in addition to "rate based" resources an external market availability of 2500 MW and IPP availability of 3,021 MW

RPM Adequacy Reserve Margin Example

- Taking a single future and a single year from that future the following slides show how RPM applies the Adequacy Reserve Margin for Capacity

RPM Capacity Resource Example

RPM Resource Future Example	Winter Quarter Value (Q1)
Rate-based Thermal	12,271
Rate-based Wind	244
Critical Hydro	16,490
Firm contracts	-297
TOTAL CRITICAL RESOURCE	**28,654**

RPM Capacity Need Example

RPM Need Future Example	Winter Quarter Value (Q1)
Peak-load Forecast	30,954
Cumulative Conservation Purchased	469
RPM Peak Capacity Need	30,954 – 469 = 30,485

RPM Adequacy Reserve Margin Example

RPM Need Future Example	Winter Quarter Value (Q1)
RPM Total Rate-based Critical Resource	28,654
RPM Peak Capacity Needed	30,485
RPM Surplus / Deficit Rate-based Capacity	28,654 – 30,485 = -1,831
Implied Rate-based Adequacy Reserve	-1,831 / 30,485 = -6.0%
Required Rate-based Resource	30,485 * (1 + -0.8%) = 30,241
RPM Rate-based Capacity Surplus / Deficit	28,654 – 30,241 = -1,587

RPM Adequacy Reserve Margin Retirement Example

RPM Need Future Example	Winter Quarter Value (Q1)
RPM Total Rate-based Critical Resource	28,654 – **541** = 28,113
RPM Peak Capacity Needed	30,485
RPM Surplus / Deficit Rate-based Capacity	28,113 – 30,485 = -2,372
Implied Rate-based Adequacy Reserve	-2,372 / 30,485 = -7.8%
Required Rate-based Resource	30,485 * (1 + -0.8%) = 30,241
RPM Rate-based Capacity Surplus / Deficit	28,113 – 30,241 = -2,128