Why do an Integrated Resource Plan

Chapter 19.280 RCW

- Washington legislature intends to encourage development of new safe, clean, and reliable energy resources...for affordable and reliable electricity.

- Utilities with more than twenty-five thousand customers...shall develop or update an integrated resource plan
  - progress reports every two years
  - updated plan at least every four years

- Consumer-owned utility governing body shall encourage participation of consumers in development of plans/progress reports
  - approve plans and progress reports after providing public notice and hearing
2018 IRP Project Timeline

Start Feb 7
Commission April 10
Commission Progress Report June 26

Commission 2018 IRP Draft Report July 24
Final Public Comment Possible Commission Approval Aug 14
2018 IRP to State Before September 1

IRP Contents

1) Executive Summary
2) Load Forecast
3) Current Resources
4) Policy & Regulation
5) Supply Side Resource Costs
6) Macro Utility Environment
7) Capacity Requirements
8) Market Simulation
9) Risk Analysis and Portfolio Selection
10) Action Plan Summary
2018 IRP Starting Point

- District's 2016 IRP identified a long resource position with seasonal capacity deficits
  - Not pursuing purchase of additional firm resources
  - Relying on wholesale market
    - Sell surplus energy
    - Cover seasonal energy and capacity deficits

- Anti Fossil-Fuel Ideology
  - Retirement of baseload coal-fired generation
  - Carbon legislation and Initiatives
  - Increasing regional capacity deficits

- Increasing popularity of solar and continued federal subsidies for solar and wind
  - "Belief" in batteries

- Evolving Western Power Markets
  - Expanding Western Energy Imbalance Market (EIM)
  - Momentum towards Enhanced Day Ahead Market (EDAM)
  - Momentum towards west wide Regional Transmission Organization (RTO)
Energy Position

Load/Resource Balance
Annual – Critical Water

* Retail Load Forecast plus distribution & transmission issues
Capacity Position

Current Load/Resource Balance

Action Plan

- Long energy position with seasonal capacity deficits
- Relying on market/Frederickson to cover seasonal energy and capacity deficits
Load/Resource Balance
Peak Hour Net Position with Frederickson

- 2013
- 2014
- 2015
- 2016
- 2017
- 2018

Load/Resource Balance
Peak Hour Net Position without Frederickson

- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
Market Purchases

2017 Purchases by Resource

Peak Load Resource Planning

- **Hourly Peak**
  - Largest 60 minute load

- **HLH Peak**
  - Heavy Load Hour Peak
  - Largest average load during period from 6 am to 10 pm
Peak Load Resource Planning

Utilities in BPA Balancing Area
- No requirement to demonstrate Resource Sufficiency on a forecast basis
- Only required to enter hour of delivery with scheduled resources sufficient to meet forecasted load
- No required methodology for forecasting hourly load

BPA Slice Customers
- Give up share of slice capacity for within hour services
- Purchase these services from BPA: regulation, imbalance & reserves

Summer 2018 Deficits
July HLH = 39 MW
July Peak = 45 MW

Resource Assumptions
BPA Block w/ Typical Peak Slice and Frederickson

Summer & Winter 2025 Deficits
July Peak = 107 MW
January Peak = 38 MW

Resource Assumptions
BPA Block w/ Typical Peak Slice
Regional Capacity Planning

- Retirement of NWPP baseload generation

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Capacity (MW)</th>
<th>Retirement Year</th>
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<tbody>
<tr>
<td>Centralia Generation (1)</td>
<td>670</td>
<td>2020</td>
</tr>
<tr>
<td>Boardman</td>
<td>585</td>
<td>2021</td>
</tr>
<tr>
<td>Colstrip (1)</td>
<td>307</td>
<td>2022</td>
</tr>
<tr>
<td>Colstrip (2)</td>
<td>307</td>
<td>2022</td>
</tr>
<tr>
<td>Centralia Generation (2)</td>
<td>670</td>
<td>2025</td>
</tr>
<tr>
<td>Various Coal, NG, Hydro</td>
<td>1,769</td>
<td>2018-2025</td>
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<td><strong>TOTAL</strong></td>
<td><strong>4,308</strong></td>
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Utilities at a Crossroads

- The gap between peak power supply and demand is narrowing in the winter, but growing in the summer.

- There are few power plants expected to be built in the coming years and available generation is expected to shrink as coal-fired power plants are taken offline.
Regional Capacity Planning

Source: PNUCC Northwest Regional Forecast of Power Loads and Resources 2019 through 2028
Assumptions: Low water, normal weather; includes only generation resources owned and contracted by utilities and firm long-term contracts.

Figure 3  Winter Peak Need for Power

Figure 4  Summer Peak Need for Power

Source: PNUCC Northwest Regional Forecast of Power Loads and Resources 2019 through 2028
Assumptions: Low water, normal weather; includes only generation resources owned and contracted by utilities and firm long-term contracts.
Regional Capacity Planning

Figure 8: Generating Resource Changes by 2025

Source: PNUCC Northwest Regional Forecast of Power Loads and Resources 2019 through 2028

“...Northwest power supply is likely to become inadequate by 2021, primarily due to the retirement of the Centralia 1 and Boardman coal plants...The loss-of-load probability (LOLP) for that year is estimated to be over 6 percent, which exceeds the Council’s standard of 5 percent.”

“By 2022 the LOLP is projected to rise to about 7 percent, due to the additional retirements of the North Valmy 1 coal plant, the Colstrip 1 and 2 coal plants...”

“While it appears that regional utilities are well positioned to face the anticipated shortfall beginning in 2021, different manifestations of future uncertainties could significantly alter the outcome.”

Regional Capacity Planning
Resource Adequacy

Natural gas generation will still be needed for reliability and is a good complement to hydro/wind/solar

- Most challenging conditions for the Northwest power system are multi-day cold snaps that occur during drought years
- Wind and solar production tends to be very low during these conditions

Absent a technology breakthrough, gas generation will continue to be needed for reliability
Regional planning reserve sharing mechanism could happen even without a full Regional System Operator

- Relying on "front office transactions" to meet capacity needs only works if there is someone to transact with
  - Looming capacity deficit due to thermal resource retirements
- Regional planning reserve sharing system could provide benefits
  - Ensures sufficient capacity is available
  - Reduces the total amount of capacity required
  - Certified, tradable capacity product could provide an efficient means to monetize capacity surpluses

### Potential Benefits

<table>
<thead>
<tr>
<th></th>
<th>BPA+ Area</th>
<th>NWPP (US)</th>
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<tbody>
<tr>
<td>Individual Utility Peak + 15% PRM</td>
<td>33,574</td>
<td>46,398</td>
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<tr>
<td>Regional Peak + 12%</td>
<td>31,977</td>
<td>41,777</td>
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<tr>
<td>Reduction (MW)</td>
<td>1,597</td>
<td>4,621</td>
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<tr>
<td>Savings ($MM/Year)</td>
<td>$192</td>
<td>$555</td>
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- Diff. btw. coincident and non-coincident peaks, 2006-2012
- Assumes capacity cost of $120/kW-yr.

It may be time to formalize the current practice of relying on the market for Resource Adequacy capacity

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Regional Capacity Planning

- Decisions to build and/or fund construction of power generation plants are made by utilities…and maybe investors; not regional planning entities or politicians.

- Reliance on the market for capacity shortfalls is the theme of the region.
  - There is no resource adequacy enforcement mechanism to guarantee load/resource balance under extreme conditions

- Musical chairs (or a game of chicken) seems to be underway
Market Simulation

Aurora Model

Stochastic definition:
Having a random probability distribution or pattern that may be analyzed statistically but may not be predicted precisely.

Stochastic inputs:
1. Natural gas prices
2. Hydro generation
3. Wind/solar generation
Future Wholesale Market Prices

Mid-Columbia Average Price Forecast

By end of study period; LLH heat rates and power prices are higher than HLH heat rates and power prices.

Attributable to decreasing loads, low natural gas prices, and the continued increase in solar generation through the entire WECC region.
Risk Analysis
And
Portfolio Selection

Portfolios Analyzed

Portfolio 1
Rely on Market Purchases

Portfolio 3
50 MW natural gas engines

Portfolio 2
50 MW natural gas engines

Portfolio 3
25 MW CCCT & Market Purchases

Portfolio 4
20 MW Solar & 30 MW Wind

Portfolio 5
Portfolios 2 & 4
Portfolio – Cost vs. Risk

Increasing Risk

Action Plan
Action Plan Summary – Short Term

Peak Hour Net Position with Frederickson

1. Continue to make purchases from the market
2. Closely monitor summer capacity deficits as region’s coal plants are retired
3. Develop tactical plan for future purchase of capacity products
4. Monitor regional LOLP; if >5% consider 3 to 5 year capacity products

Action Plan Summary – Longer Term

Peak Hour Net Position without Frederickson

1. Purchase 5 year forward electricity call option tied to a physical power plant to cover the District’s winter HLH shortfall.
2. Budget and plan to purchase Q3 electricity call options to cover the District’s summer HLH capacity deficit.
Questions