Northwest Power and Conservation Council

Presentation to University of Washington Engineering Students

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Power Planning Division Director

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The Council is a Unique Entity

- **Interstate Compact**
  - Idaho, Montana, Oregon, Washington
  - Members appointed by State Governors

- **Formed by Congress in 1980**
  - Northwest Power Act

- **Three primary responsibilities**
  - Develop a regional power plan
  - Develop a fish and wildlife program
  - Involve the public
Pacific Northwest Installed Generating *Capacity* in 2017
Committed to Serving Northwest Utility Loads

<table>
<thead>
<tr>
<th>Type</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
<td>34,364</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>8,113</td>
</tr>
<tr>
<td>Wind</td>
<td>6,565</td>
</tr>
<tr>
<td>Coal</td>
<td>6,185</td>
</tr>
<tr>
<td>Nuclear</td>
<td>1,200</td>
</tr>
<tr>
<td>Biomass</td>
<td>1,115</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>58,026</strong></td>
</tr>
</tbody>
</table>

*Not Included in Chart*

- Independent power producers not contracted to NW loads **3,451**
- NW wind contracted for sale to SW **3,164**

Source: Council's NW Power System Database.
Based on Council's 2017 Adequacy Assessment.
Includes planned resources that are sited and licensed.
Annual Energy Dispatch of Pacific NW Generation in 2017 (average hydro year conditions)

<table>
<thead>
<tr>
<th>Type</th>
<th>Average MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm Hydro</td>
<td>11,800</td>
</tr>
<tr>
<td>Add'l Hydro in Avg Yr</td>
<td>4,275</td>
</tr>
<tr>
<td>Coal</td>
<td>2,835</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,436</td>
</tr>
<tr>
<td>Wind</td>
<td>1,260</td>
</tr>
<tr>
<td>Nuclear</td>
<td>849</td>
</tr>
<tr>
<td>IPP + Imports*</td>
<td>614</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23,069</strong></td>
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</tbody>
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Source: Council's 2017 Adequacy Assessment.
*IPP = NW independent power producers
Imports = Short-term purchases from the SW
Why Was the Council Formed?

- Massive power planning failure in the 1970s
  - Forecasts of seven percent load growth
  - Program to build five nuclear power plants
- Resulted in the largest municipal bond default in U.S. history at the time
- Movement to integrate environmental considerations in energy decisions
Key Aspects of the Power Plans

- Provide formal guidance to the Bonneville Power Administration
  - Criteria: adequate, efficient, economical, and reliable power supply
  - Cost-effective energy efficiency identified as the first priority resource
Interdisciplinary Approach

- Policy objectives
- Forecasts of electricity demand, fuel prices, etc.
- Capabilities, constraints of existing system
  - Incorporate fish and wildlife program
- Engineering, economic and environmental characteristics of new resources
  - Generation
  - Conservation
Interdisciplinary Approach

- Integrated analysis of resource strategies to meet regional needs
  - Energy
  - Capacity
  - Balancing

- Outreach and collaboration to build understanding, consensus and support
  - Symposiums
  - Advisory committees
High Level Analytical Framework

- Regional Portfolio Model (RPM)
- Least Cost/Risk Resource Strategy

**Inputs:**
- Electric Demand
- Wholesale Electric Prices
- Fuel Costs
- Existing Resources
- New Generating Resources

**Output:**
- RPM Study Parameters
- Conservation Resources Analysis

Specific Conservation Measures and ramp rates (recycled back to demand and price forecasts).
Uncertainty and Risk

- The power system is highly complex, multi-dimensional
- Accurate, reliable forecasts are not possible
- Bad decisions lead to negative outcomes (e.g., WPPSS, Enron)
- Northwest Power Act recognizes uncertainty and risk, requires power plans to address them
Sixth Northwest Power Plan

- **Resource strategy**
  - 85 percent of new demand can be met with conservation resources
  - Renewable generation to meet state-mandated targets
  - Natural gas-fired combustion turbines as needed
Resource Additions in the Sixth Northwest Power Plan

Cumulative Resource Additions (Average Megawatts) from 2009 to 2024:
- Demand Response
- Simple-Cycle Gas
- Combined-Cycle Gas
- Renewables
- Energy Efficiency

Graph shows the cumulative resource additions for various categories over the years 2009 to 2024.
Energy Efficiency

- Pacific Northwest is a leader in energy efficiency
- It’s about to become our second largest resource
- Along with hydropower, it constitutes 70 percent of the region’s resources
Conservation is a Low-Cost Resource

Cost of Energy in $/MWh

- Average Mid-C 2006$
- Levelized Conservation Cost 2006$

Jan-1997 to Jul-2011
5,100 Average Megawatts Acquired

- The region has achieved enough energy efficiency to power Idaho and Montana
- Saving to consumers were nearly $3.1 billion in 2011
- Lowered 2011 carbon emissions by about 19.8 million tons
Annual **Energy** Dispatch of **Pacific NW** Generation in 2017 (average hydro year conditions)

- **Firm Hydro**: 52%
- **Add'l Hydro in Avg Year**: 19%
- **Natural gas**: 6%
- **Wind**: 5%
- **Nuclear**: 4%
- **IPPS + Imports**: 3%
- **Coal**: 12%

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Source: Council's 2017 Adequacy Assessment.
Annual Energy Dispatch of Pacific NW Generation in 2017 plus Energy Efficiency Savings (average hydro year conditions)

- Firm Hydro: 40%
- Add'l Hydro in Avg Year: 14%
- EE Savings: 23%
- Coal: 9%
- Natural Gas: 5%
- Nuclear: 3%
- Wind: 4%
- IPP + Imports: 2%

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Source: Council's 2017 Adequacy Assessment.
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Northwest Power System is Low-Carbon

Pounds of CO2 Per kWh

- Northwest
- Rest of West
- U.S.
Existing Sources of CO2 Emissions

- Existing coal
  - Bridger: 33%
  - Colstrip: 35%
  - Centralia: 19%
  - Boardman: 8%
  - Others: 5%

- Existing gas
- Other
Power Planning Issues

- Development of renewable resources and resulting challenges for system balancing
  - Over 8,000 megawatts of wind developed
  - Need capacity that can be quickly ramped up and down; also need new operating and market regimes

- Prospect for low growth in electricity loads
  - Energy efficiency, distributed renewables
  - Pressures on utility economic business model

- Economic and environmental pressures leading to coal plant retirements
Preparations to Develop the Seventh Power Plan

- Symposiums on energy storage technology, greenhouse gas and the power system, changing power markets in California and the Northwest
- Primers on carbon emissions, generating resources, power system capacity and flexibility
- Advisory committee meetings
Thank You

www.nwcouncil.org