Transmission Planning
for a more reliable, clean and affordable electric power system

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The NW Energy Coalition is an alliance of about 100 environmental, civic, and human service organizations, progressive utilities, and businesses in Oregon, Washington, Idaho, Montana and British Columbia. We promote development of renewable energy and energy conservation, consumer protection, low-income energy assistance, and fish and wildlife restoration on the Columbia and Snake rivers.
NWEC Perspective: Transmission Planning

1. Transmission planning is essential and increasingly important to achieving a more reliable, clean and affordable electric system.

2. As currently practiced, transmission planning is a series of somewhat overlapping processes, with time horizons from near-real-time to decades.

3. Transmission modeling must be strengthened to incorporate new developments in technology, policy and markets.

4. The success of utility operation and regulation depends on better alignment of transmission planning, power planning (IRP), and distribution system planning (as it emerges)
What does transmission planning address?

Q1. At a given point in time – with defined loads, resources and system topology – is the grid reliable?

Q2. If not, what elements can be added to make it so?
   • Transmission Expansion – adding new power lines for
     ▪ economics
     ▪ reliability
     ▪ public policy
   • Grid Modernization – upgrading system controls and practices
   • Non-Wires – Optimizing grid operations, markets, and employing demand side resources and storage to reduce need for new transmission and increase reliability of existing system
## Models for Transmission Planning

<table>
<thead>
<tr>
<th>Type</th>
<th>Entity</th>
<th>Time Horizon</th>
<th>Focus</th>
<th>Modeling Framework</th>
<th>Time Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>Balancing Area, Reliability Coordinator</td>
<td>Next hour, day</td>
<td>What risks exist for the system in the next interval, and what actions can be taken?</td>
<td>State Estimator/Real-Time Contingency Analysis (RTCA)</td>
<td>System snapshot</td>
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| Reliability     | Utility or Regional           | 1 to 10 years | *Driven by NERC/WECC reliability standards*  
*Is the system reliable under stable conditions and with credible contingencies?* | Power flow (PowerWorld, Siemens PSS/E, GE PSLF)  
*full “AC modeling”*                                                                 | Single hour                |
| System          | Regional ColumbiaGrid, NTTG, WECC | 10 years     | *Security constrained economic dispatch*  
How can the system be operated over time in the most cost-effective way? | Production cost (ABB GridView, others)  
*less detailed “DC modeling”*                                                        | One year, 8760 hours       |
Drivers for Change

- Technology innovation and cost decline
- Urgent need to reduce GHG emissions
  - Rapid change in generation mix
  - Less large blocky fossil fuel plants
  - More diversification of renewable resources by type (wind, solar, etc.), scale (1 kW to 1000 MW), and location
- Building and transport electrification
- Flexible demand management
- Replacement of conventional grid services with power electronics – opportunities and challenges
- Grid modernization
- Cyber and physical security
- Evolving western power markets
Gap Analysis

• Silos within transmission planning
• Order 1000 not good fit for Western Interconnection
• Regional planning still mostly aggregating utility plans
• Reluctance to address policy-relevant scenario analysis
• Non-wires assessment still considered optional
• Not enough public consultation/review on multi-utility projects
• Need to assess market driven evolution from contract path to flow based system
• Gap between transmission planning and power planning (IRP)
• Timing mismatch between accelerating system change and static planning cycles
• Increasing risk of overshoot/undershoot on resource choice and overall system reliability
Early Stage Innovation

- Oregon PUC IRP guidelines (2007) requiring transmission assessment
- PacifiCorp incorporation of transmission assessment directly in IRP analysis
- Idaho Power assessment of B2H as an IRP resource
- WECC Base Cases, ADS/round trip, development of standard modeling for generation and transmission elements
- ColumbiaGrid powerflow study process
- NTTG power flow/production cost “round trip”
- Formation of Northern Grid: opportunity to solidify good practices, be more intentional about policy-relevant scenario analysis, and more transparent and inclusive
Transmission system planning should:

- Be a rigorous and technically sound exercise
- Combine production cost and power flow modeling more effectively
- Assess grid reliability under a full range of credible alternative futures
- Assess not only existing but potential public policies (NTTG “public policy considerations”)
- Fully incorporate non-wires assessment
- Explicitly model options for market expansion
- Be conducted in better alignment with IRP and DSP
- Provide actionable information for decision makers and the public