The Evolving Grid
Update on the State of Transmission

April 27, 2023

Virtual Only
BPA Infrastructure
Workshop Agenda: Why are we here?
Uncertainties

With new funding, Washington State Ferries ramps up electric ferry plans

Ukraine pleads for help to fix energy grid hit by Russian bomb raids

Oregon lawmakers approve ambitious carbon-reduction goals for state energy grid

Facebook announces 10th and 11th data centers at Prineville, Oregon campus amid renewable energy fight

Apple Quietly Builds Its Prineville Data Center

Innovative Renewable Energy Project in Oregon Combines Wind, Solar and Battery Storage

Oregon's Obsidian Renewables unveils $10B PNW proposal in 'Hydrogen Hub' competition

Insurance companies are dropping home coverage in Oregon due to wildfire risk

US government launches US$350 million long-duration energy storage demonstration funding

Are We Saying Goodbye to the Gas Stove?

Crypto mine in Usk gets conditional use permit from Pend Oreille County; opponents appeal

The fight for a national clean energy transmission system emerges on three fronts

Google investing $50M in Oregon data centers, offices

DOE Opens Applications for $6B in Grid Funding

Federal auction jumpstarts floating, offshore wind power off California with Oregon slated for next year

The Powerful Policy Ripples of Washington State's CETA

Pre-decisional, for discussion purposes only
Key Influences and Drivers
WA & OR Regional Clean Energy Targets & Policies

2030
- **National:** Net greenhouse gas emissions to 50-52% below 2005 levels in 2030
- **Washington:** All electric utilities greenhouse gas neutral
- **Oregon:** 80% below baseline

2035
- **Washington:** 100% clean electricity by 2035
- **Oregon:** 95% below baseline

2040
- **Oregon:** 100% below baseline

2045
- **Washington:** All electric utilities 100% clean resources

2050
- **National:** Net-zero greenhouse gas emissions by no later than 2050
Pacific Northwest has more than 7 GW of wind and solar generation interconnected today. Additional 10+ GW of new resources are expected to be interconnected in the next decade.
Electrification and Resiliency

Studies show that impacts of full electrification adoption could be significant for load service – up to 75% increase in summer, 260% increase in winter.

Source: EPRI - SCL Electrification Assessment

As sectors electrify, dependence on reliable and quality service increases, especially during extreme weather events.

WA AG Calls for Banning Power Shut-offs\(^1\) during heat waves

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1 – Shut-offs refer to actions taken against delinquent accounts
BPA administers three Queues as a part of the Planning process:

- Line/Load Interconnection
- Transmission Service
- Generator Interconnection
Generation Interconnection

• Traditionally, 10-15% of Generation interconnection requests follow through to energization

• BPA has a proven track record and successfully integrated 7 GW of wind and 525 MWs of Solar, in part through successful builds of Coulee-Bell, Kangley-Echo Lake, Schultz-Wautoma, Big Eddy-Knight, McNary-John Day, Central Ferry – Lomo

• BPA’s Generation Interconnection Queue is experiencing a significant increase in requests with no signs of easing
  - Majority of the requests are in the Central Oregon, Tri-Cities, Mid-C and Umatilla areas

• Washington CETA, Oregon HB2021, BIL and IRA likely to keep demand high for sometime

• FERC issued a Noticed of Proposed Rulemaking that takes aim at this nationwide problem.
BPA Generation Interconnection Queue

**Photovoltaic**

Total 49.4 Gigawatts

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<th>GW</th>
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**Wind Turbine**

Total 21.4 Gigawatts

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**Energy Storage**

Total 51.5 Gigawatts

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Transmission Service Requests

- WA & OR Clean Energy policies are driving an increase in TSR submittals
  - Since 2019, BPA has studied over 17,000 MW of requested transmission service primarily delivering to the Portland metro area or the Seattle/Puget Sound area
  - According to recent IRP data, the clean resource need to serve these regions is expected to be around 6,000 MW in total by 2030
  - The 2022 Cluster Study had more requested demand (~11.1 GW) than the 2020 and 2021 studies combined (~10 GW).
  - The 2023 Cluster Study will include ~17 GW of requests.
  - The requested transmission service is far outpacing the regional demand

Pre-decisional, for discussion purposes only
2023 Cluster Study Transmission Queue Details

- Generator/Point of Receipt (POR)
  - PACIFIC DC INTERTIE: 3,100
  - UMATILLA: 3,053
  - CALIFORNIA-OREGON INTERTIE: 2,688
  - SOUTH OREGON COAST: 2,580
  - TRI CITIES: 2,528
  - WILAMETTE VALLEY: 2,040
  - LOWER COLUMBIA: 1,766
  - MID-COLUMBIA AREA: 1,382
  - BC_US BORDER: 1,059
  - MONTANA: 1,040
  - CENTRAL OREGON: 990
  - SW WA COAST: 940
  - NORTHERN CALIFORNIA: 231
  - PORTLAND AREA: 150
  - SEATTLE/PUGET: 150
  - NORTH OF SPOKANE: 10

- Load/Point of Delivery (POD)
  - MID-COLUMBIA AREA: 7,867
  - SEATTLE/PUGET AREA: 6,226
  - PORTLAND AREA: 5,416
  - UMATILLA: 1,860
  - MONTANA: 879
  - CALIFORNIA-OREGON INTERTIE: 840
  - PACIFIC_DC_INTERTIE: 250
  - NORTHERN_CALIFORNIA: 231
  - IDAHO: 110
  - TRI_CITIES: 40
Largest demand for growth around the system include Central Oregon, Umatilla, Pend Oreille, Hillsboro/Forest Grove, Longview/Cowlitz, Tri-Cities
Load & Queue Growth

• Based on NT customer load forecasts growth is heavily concentrated in a few areas
  • 5 customers are forecasting 10-year load growth between 100% - 375%
  • Data center development is driving most of this growth
  • The majority of NT customers are forecasting slow or no load growth
Bonneville Transmission Build Out
Bonneville Transmission Build Out
PNW Transmission Build Out

BPA 500 kV Circuit Miles per Decade

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<td>2010s</td>
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<td>2020s</td>
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The following factors:

1. Load growth in Portland and Seattle – driven by high tech industry, transportation and building electrification
2. Reduced operation of 4.5 GW of carbon emitting generators on the west side along the I5 corridor
3. Replacement wind and solar resources are located east of the Cascades

*Will increase flows on cross-Cascades transmission paths and throughout the load centers*
The following projects are needed in many future scenarios for reliability, expanded load service, and as renewable resources seek delivery to load:

1. Portland Area Reinforcement
2. Cross-Cascades South (Big Eddy-Chemawa 500 kV Rebuild)
3. Chehalis-Cowlitz Tap 230 kV Rebuild
4. Cross-Cascades North Reinforcement
5. Ross – Rivergate 230 kV Rebuild
6. Rock Creek-John Day 500 kV Rebuild
Portland Area

- Description:
  - Add second 500/230-kV transformer at Keeler substation
  - Develop Keeler 500-kV bus into breaker and half configuration
  - Re-termination and upgrades to Pearl – Sherwood 230-kV lines
- Estimated Cost: TBD
- Drivers:
  - TPL-001 Reliability Compliance
  - Rapid Load growth in Hillsboro
  - Enabling delivery of renewable resources to Portland
- Status:
  - Identified in 2021 and 2022 System Assessments
  - Preliminary Scoping
Cross-Cascades South Reinforcement

- **Description:**
  - Rebuild existing Big Eddy-Chemawa 230kV line as Big Eddy-Ostrander 500kV (70 mi), Ostrander-Pearl 500kV (20 mi), re-terminate the Pearl – Chemawa 230kV
- **Estimated Cost:** $233M (Direct)
- **Drivers:**
  - Enabling delivery of renewable resources to Portland
  - Resiliency of load service in Portland Area
- **Status:**
  - Identified by 2022 Transmission Service Expansion Process
Raver-Paul Reinforcement

- **Description:**
  - Rebuild 53 miles of Cowlitz-Chehalis section of Covington-Chehalis 230kV line

- **Estimated Cost:** $35M (Direct)

- **Drivers:**
  - Enabling delivery of renewable resources to Portland
  - Mitigate impact of I5 gas generation retirement

- **Status:**
  - Identified by 2022 Transmission Service Expansion Process
Cross-Cascades North Reinforcement

- Description:
  - Reconductor Schultz-Raver 3 & 4 500kV lines (100 mi total)
  - Schultz-Raver #4 500kV series capacitor upgrade (Phase 2)
  - Olympia 230kV 350 MVAR Statcom addition
  - Paul 500kV 221MVAR shunt capacitor addition
- Estimated Cost: $196M (Direct)
- Drivers:
  - Enabling delivery of renewable resources to Puget Sound
  - Resiliency of load service in Puget Sound and Olympic Peninsula
- Status:
  - Identified by 2022 Transmission Service Expansion Process
Ross-Rivergate

- **Description:**
  - Rebuild Ross – Rivergate / Ross – St. Johns 230kV line (7.5 mi)
- **Estimated Cost:** $149M (Direct)
- **Drivers:**
  - Enabling delivery of renewable resources to Portland
  - Resiliency of load service in Portland
- **Status:**
  - First identified in 2017 SOA no-build ADF
  - Identified by 2022 Transmission Service Expansion Process
South of Rock Creek Reinforcement

- Description:
  - Rebuild Rock Creek – John Day 500kV line (20 mi)
- Estimated Cost: $39M (Direct)
- Drivers:
  - Enabling integration of renewable resources in Central Washington
  - Economical upgrade to the heart of the 500kV system, enabling overall capacity.
- Status:
  - Identified by 2022 Transmission Service Expansion Process
### Service Enabled by Projects - Cumulative

<table>
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<tr>
<th>Projects as a Portfolio</th>
<th>Upgrade</th>
<th>MW Enabled</th>
<th>Est. Project Cost (Direct)</th>
<th>Revenue Estimate (Annual) @ Current Rates ($000)</th>
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- Revenue based on subscription of 2022 TSEP participants who executed PEAs
- TSRs tied with 3rd party project and 3rd party impacts are not included in the numbers above.
Emerging Technologies
Off-Shore Floating Wind Power

*NREL estimates 1,300 meters is the current cost-effective depth limit. Bottom-fixed offshore wind projects are limited to water depths less than 60 meters.
1) Roughly **1 GW** of off-shore wind can be interconnected in **Coos Bay Area** at Wendson and Fairview substations with relatively modest system upgrades (no new lines)

2) **Brookings Area** has superior wind power density, but exporting generation from Brookings’ wind will require major transmission reinforcements, likely a 500-kV build directly to the I5 corridor

3) Coastal transmission was designed for load service. Additional system upgrades are required around Eugene and Roseburg, as well as along the I5 corridor to deliver power to load centers

4) Oregon Department of Energy goal is **3GW**
Integrating Offshore Wind

- The costal transmission system was designed for load service, and there has been limited load growth
- The transmission system will require **major** upgrades to integrate GWs of off-shore wind
- Several reliability studies are either completed recently or in progress
  - BPA internal validation of NREL publication
  - BPA transmission service and generation interconnection requests by developers
  - PacifiCorp studies (requested by Oregon PUC)
  - Northern Grid for 3 GW off-shore wind integration (requested by Oregon PUC and DOE)
  - Pacific Northwest National Labs study
Transmission Policy in Flight
Generator Interconnection – TC-25 Process

- **Apr 21**: Customer-led Workshop
- **May 18**: Customer-led Workshop
- **Jul 11**: FRN Published
- **Apr 19**: Final ROD

**Procedural Schedule dates are draft only**

**Pre-Decisional. For Discussion Purposes Only.**
Transmission Services Request Queue

- Successful Implementation of Data Exhibit Requirements for Long-term TSRs.
- Enables BPA to run higher quality, actionable Cluster Studies and future LARP commercial power flow studies.
- Allows for future sustainable, robust, repeatable TSEP Cluster Study cycles
- Requests validated up front
Line Load Queue

• **TC-24 Settlement Obligation:**
  • Before the TC-26 proceeding, BPA will hold a stakeholder workshop to discuss BPA’s line and load interconnection procedures and potential reforms to the load interconnection queue.

• **Streamlined Interconnection Facilities Study (FAS) Process**
  • Consulting with Engineering to provide right size scoping
  • Anticipate significant reduction in FAS duration
NT Policies & Projects in Flight

• NITS on OASIS (automated processes, industry standards)
• Education on Load Growth planned in June 2023
• Increased focus on forecasting in order to plan for future load
  • BPA needs to know both resources and load to effectively plan
  • Customers should communicate changes to 10-year forecasts early and often
  • Evaluation of market purchase resource forecasting policy
  • Evaluation of current Designation of Network Resource timing requirements
    • “NT Customers must make a long-term designation of Network Resources, including a designation of a forecasted Network Resource for which the customer has a CONFIRMED FTSR, no later than 60 Calendar Days prior to service commencement date.” (NITS BP E.4)
Where Transmission is Heading
Evolving Markets
Deliberate Strategy

• The agency will be sharing its updated strategy refresh in the coming months.
• Transmission will be updating its Transmission Business Model to align with the agency’s update
• Customer and Stakeholder input will be vital to ensuring Transmission’s strategic development is representative of and responsive to the region.
On the Horizon

- GI queue reform via TC-25 and resulting implementation updating BPA tariff, policies, business practices and further markets evaluation
- Customer/Stakeholder Collaborating with the region on refreshing the Transmission Business Model
  - The transmission lead team is currently working on an update to the Transmission Business Model in alignment with the Agency Strategy and expects to release this update in the coming months.
Helpful BPA Links


Transmission Availability: https://www.bpa.gov/energy-and-services/transmission/transmission-availability

Becoming a BPA Customer: https://www.bpa.gov/energy-and-services/transmission/becoming-a-transmission-services-customer

• For assistance in the BPA application process, call BPA Transmission Sales (360) 619-6016 and request the assignment of a BPA Transmission Services Account Executive.

Interconnection: https://www.bpa.gov/energy-and-services/transmission/interconnection

Transmission Service Request Study: https://www.bpa.gov/energy-and-services/transmission/acquiring-transmission/tsep