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

August 8, 2023

MEMORANDUM

TO: **Council Members**

FROM: **John Ollis**

SUBJECT: **Bonneville's Evolving Grid Effort and 2023 Cluster Study**

BACKGROUND:

Presenter: Jeff Cook, VP of Transmission Planning and Asset Management, BPA

Summary: Acknowledging that national and regional de-carbonization objectives, changing load and resource locations, electrification and other factors will impact the way BPA Transmission does its business over the next two decades, BPA is embarking on a strategy to meet its customers' needs. This presentation will discuss that strategy.

Relevance: The resource strategy in the Council's power plan is to give priority to conservation and generation resources that are "cost-effective." To be "cost-effective" under the Northwest Power Act, a resource not only has to meet or reduce load at a cost less than other resources, it also has "to be reliable and available within the time it is needed." Section 3(4)(A)(i).

One of the key pieces of a resource being deemed available is access to transmission. Certain resources in past plans have been limited not by the technical potential, but by transmission and siting limitations. Increasing transmission capability and access within the region can increase the resources available for plan consideration.

Workplan: 4.3.3 Track market efforts, including day-ahead market offerings, and transmission planning to infirm Council analysis.

Background: BPA administers three queues as part of the planning process: line/load interconnection, transmission service and generator interconnection. The line/load interconnection considers point of delivery to load, transmission service relates to point of receipt to point of delivery, and the generator interconnection considers the lines from the generator to the point of receipt. Historically, 10 to 15% of the generator interconnection requests end up resulting in successful builds. Rapidly increasing interconnection queue requests, and transmission service requests are in response to regional clean energy policies and electrification. In areas of load growth in eastern and central OR/WA and Hillsboro/Forest Grove area, there are significant line and load interconnection requests. BPA has plans to build significant transmission infrastructure in response to this growth per the conclusions of the 2023 cluster study, but also is updating its organizational strategy to be more responsive to the fast changes in customer needs and then its transmission business model to align with that strategy.

More Info: https://www.bpa.gov/-/media/Aep/about/publications/fact-sheets/fs-20230609-bpa-evolving-grid-update-on-the-State-of-Transmission.pdf

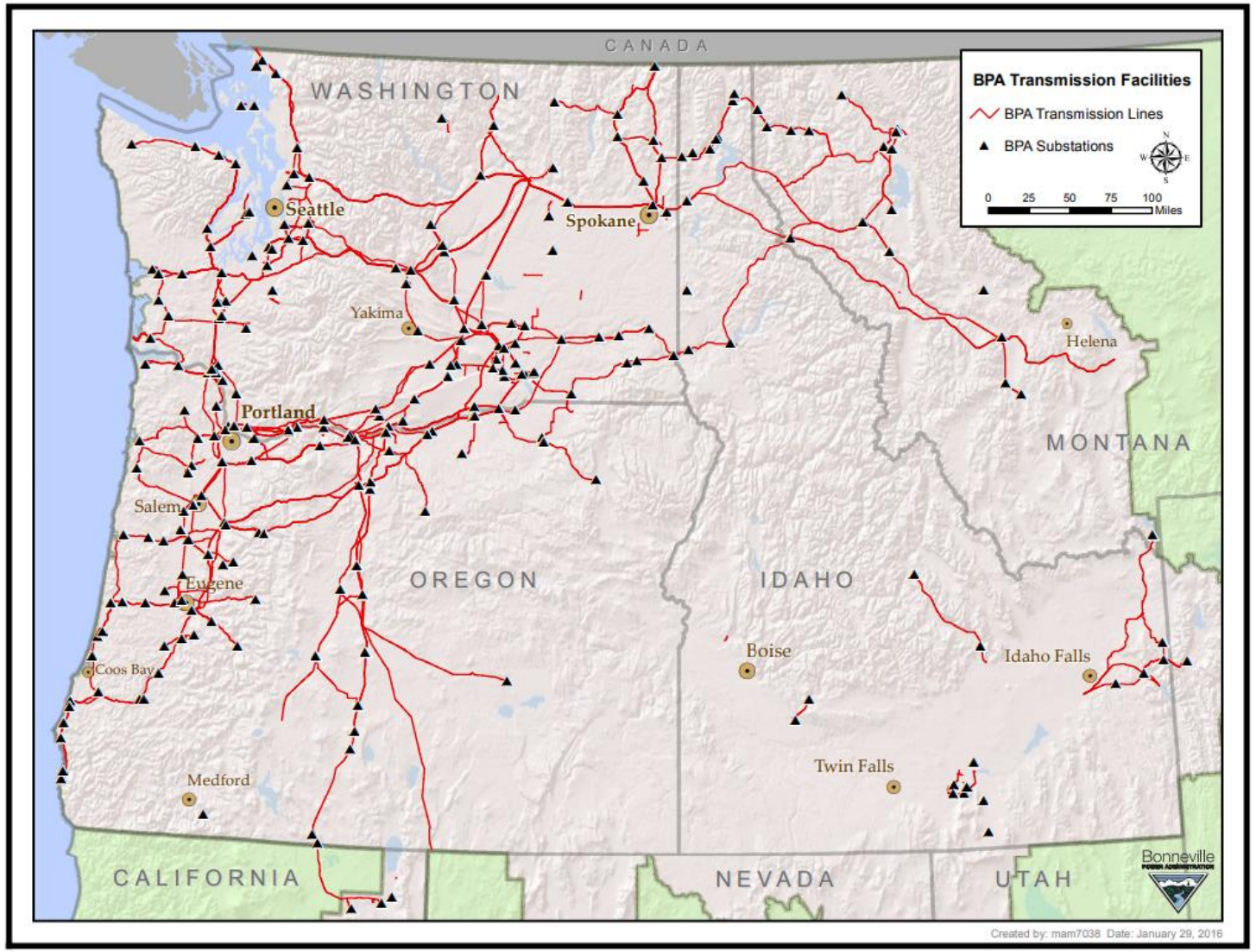
The Evolving Grid

Update on the State of Transmission

Northwest Power and Conservation Council

August 16 2023

BPA Infrastructure



Key Influences and Drivers of Change

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

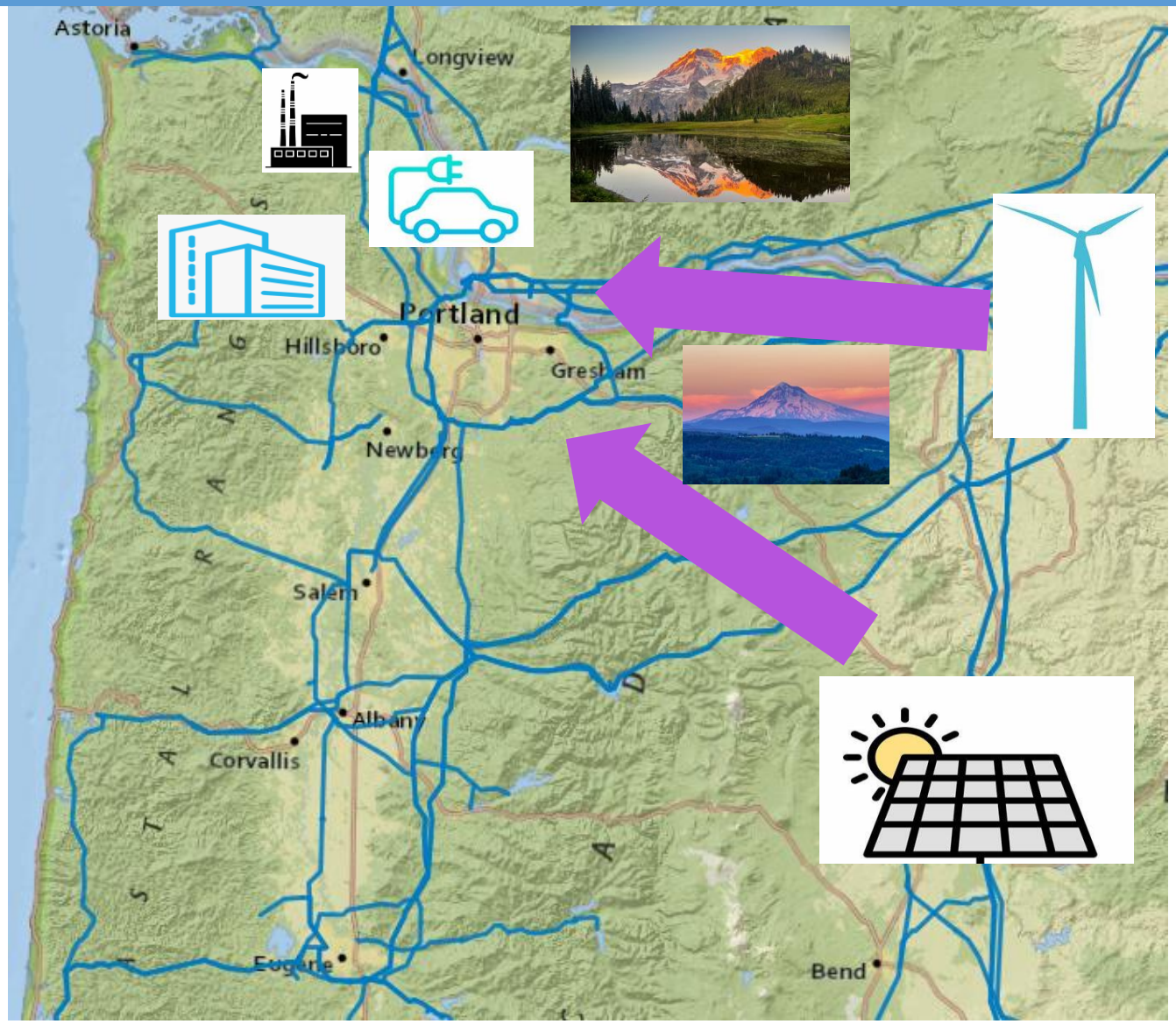
2045

Washington: All electric utilities 100% clean resources

2050

National: Net-zero greenhouse gas emissions by no later than 2050

PNW Landscape

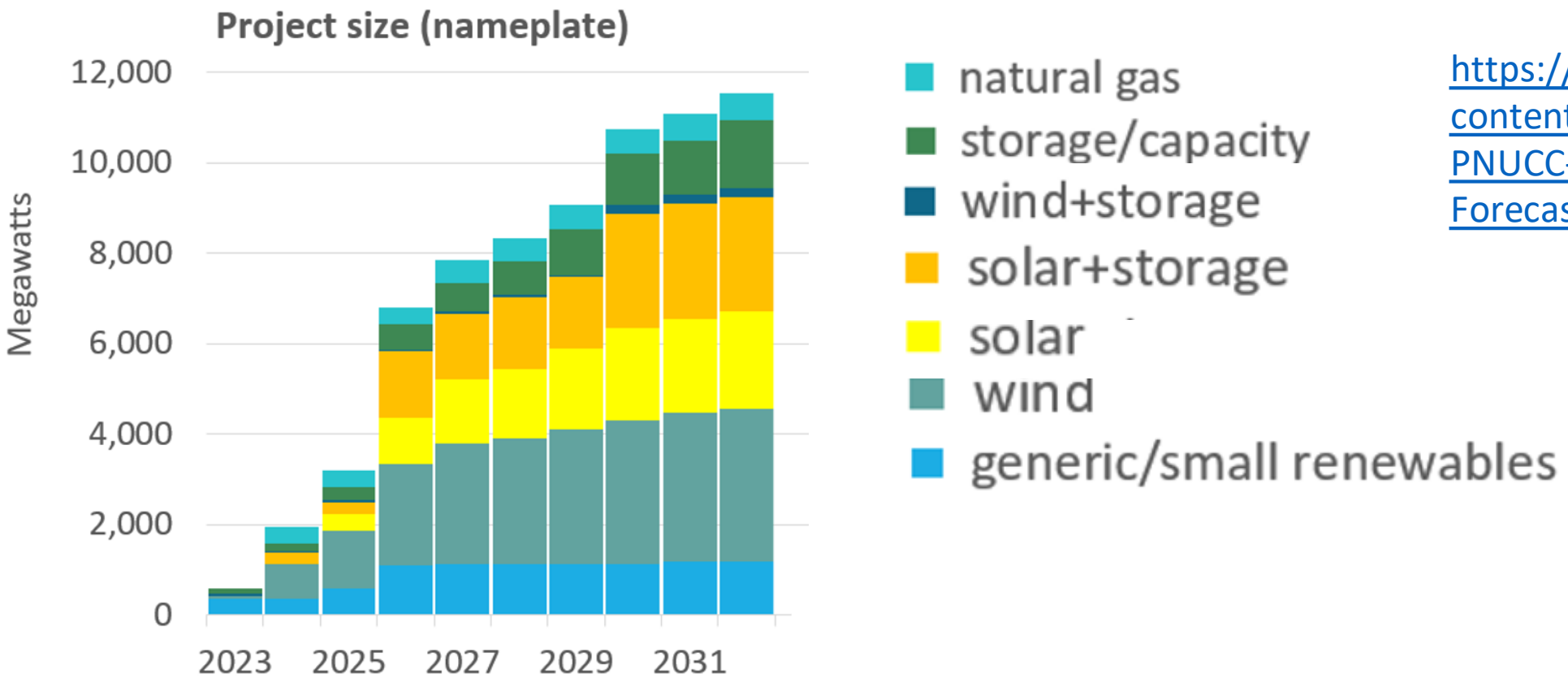


Drivers:

- Industrial load growth in Silicone Forest
- Electrification (transportation and buildings)
- Clean Energy Policies

- Transmission to enable electric load growth (industrial and electrification)
- Transmission to deliver remote, clean resources to Load Centers
- Transmission to meet resiliency need

Expected NW Resource Additions (PNUCC)



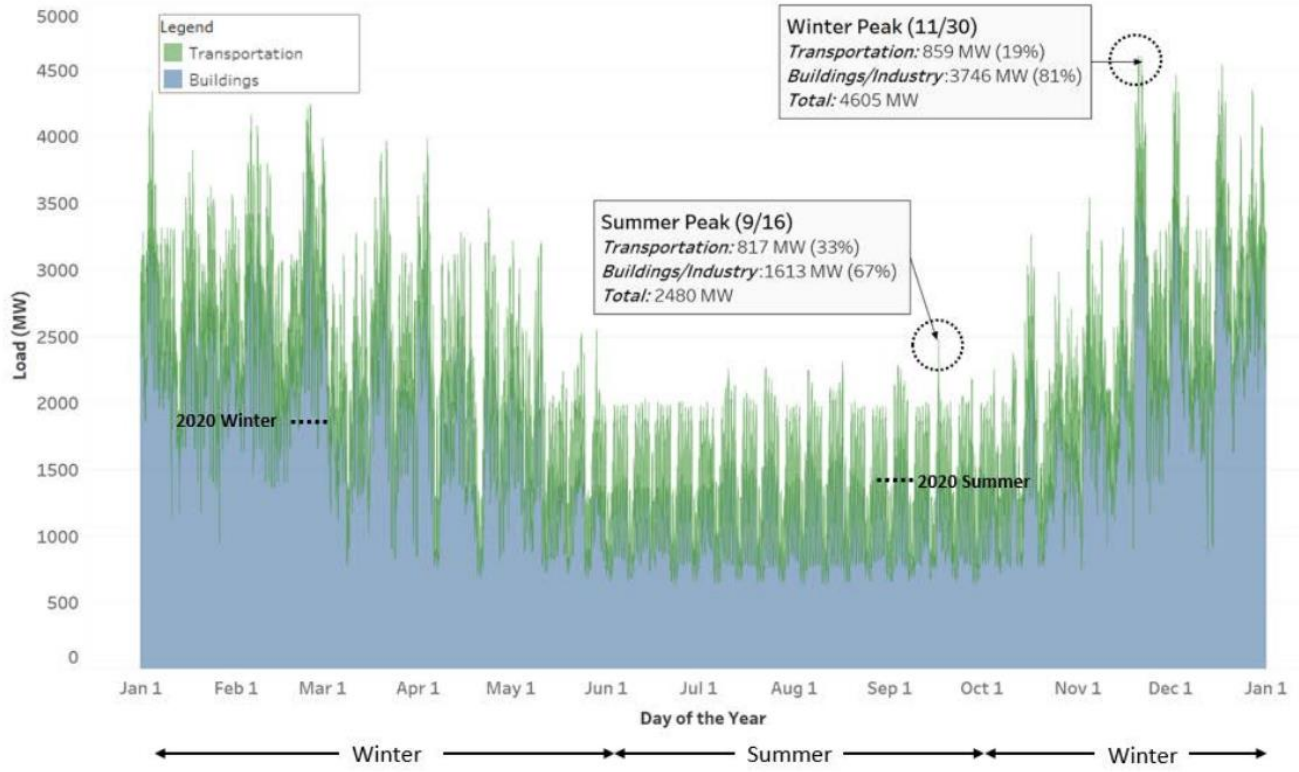
https://www.pnucc.org/wp-content/uploads/2022-PNUCC-Northwest-Regional-Forecast-final.pdf

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

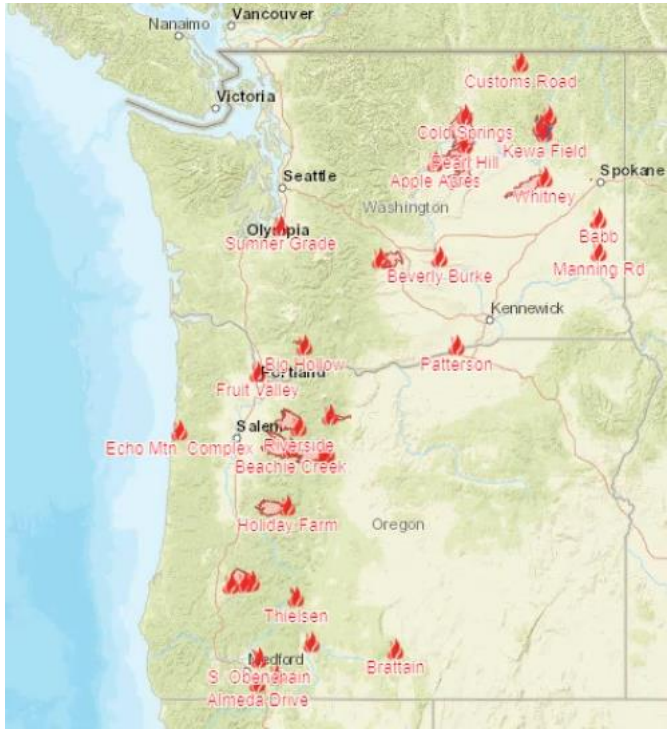
Studies show that impacts of full electrification adoption could be significant for load service – up to 75% increase in summer, 260% increase in winter

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

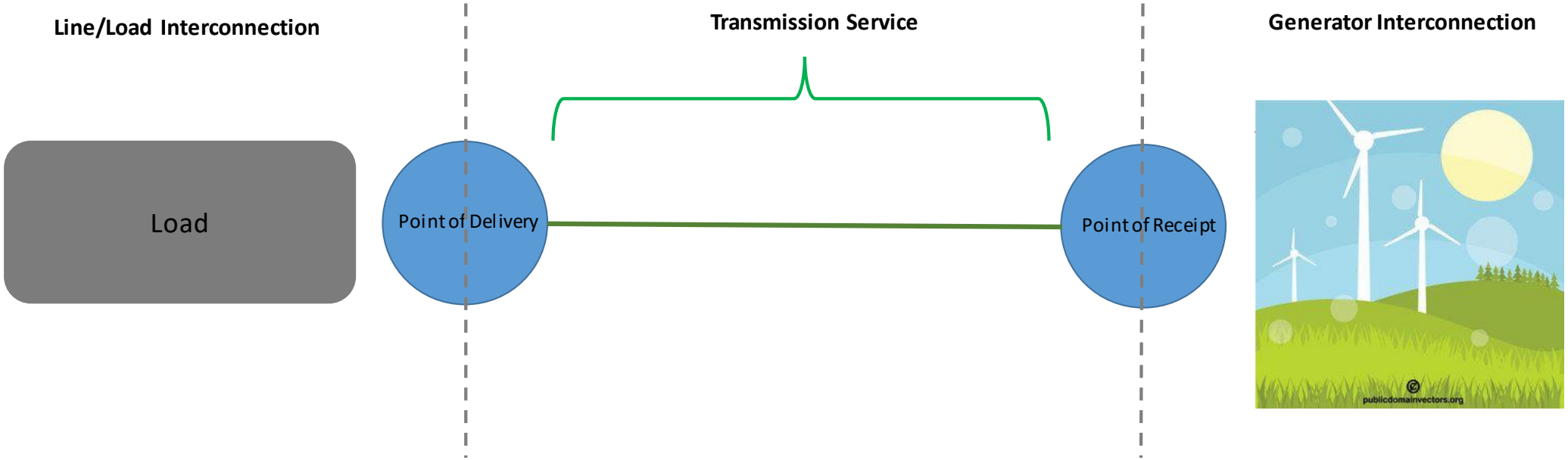


1 – Shut-offs refer to actions taken against delinquent accounts

Transmission Picture and Requests

BPA administers three Queues as a part of the Planning process:

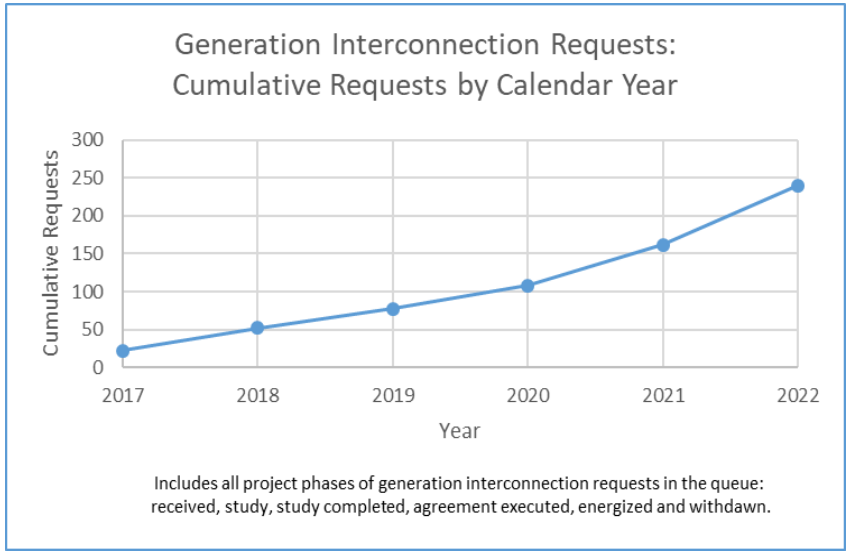
- Line/Load Interconnection
- Transmission Service
- Generator Interconnection

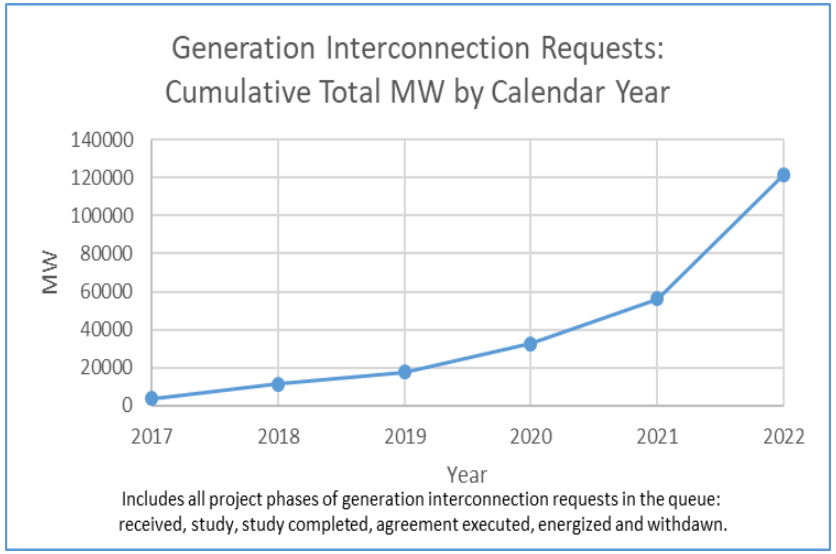


Pre-decisional, for discussion purposes only

Generation Interconnection

- Traditionally, 10-15% of Generation interconnection requests follow through to energization
- BPA has a proven track record and successfully integrated approx. 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.

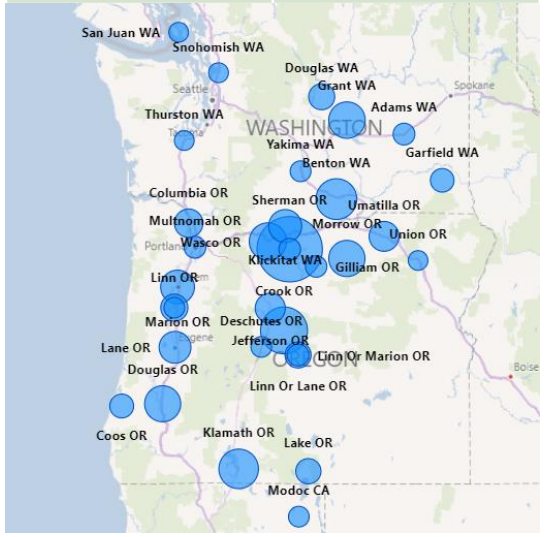




GI Requests *in Progress* by Study Phase

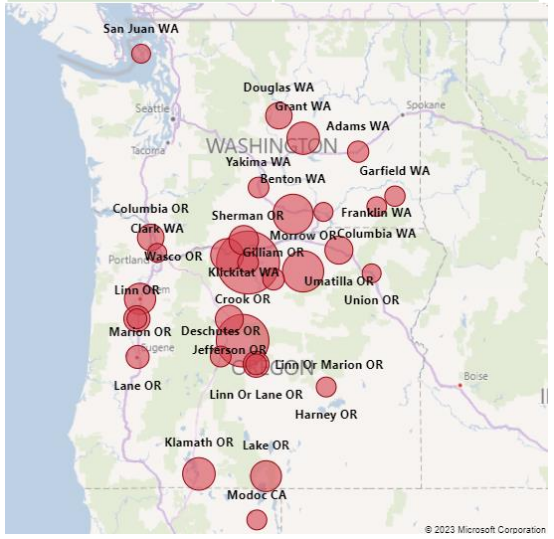
Battery
~50 gigawatt

Study Phase	MW
b - Feasibility Study	34,965
c - Interconnection System Impact Study	6,675
d - Facility Study	8,726



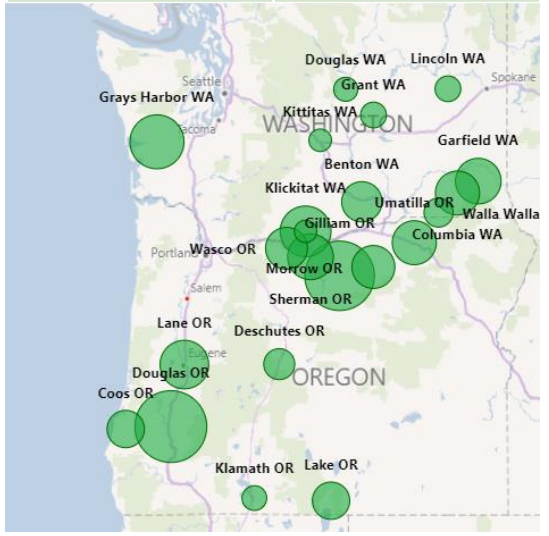
Solar
~49 gigawatt

Study Phase	MW
b - Feasibility Study	31,692
c - Interconnection System Impact Study	8,013
d - Facility Study	9,716

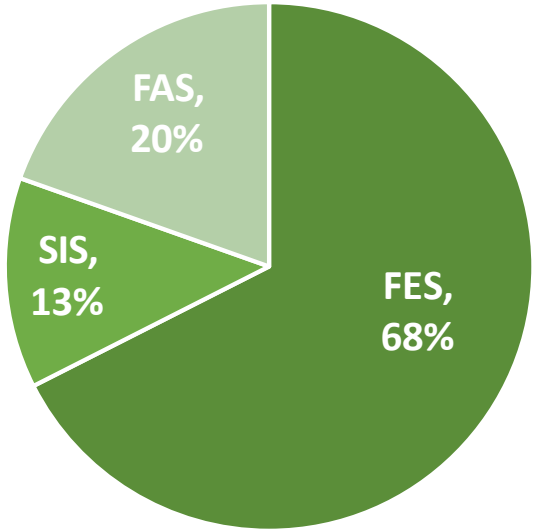


Wind
~14 gigawatt

Study Phase	MW
b - Feasibility Study	10,260
d - Facility Study	3,849

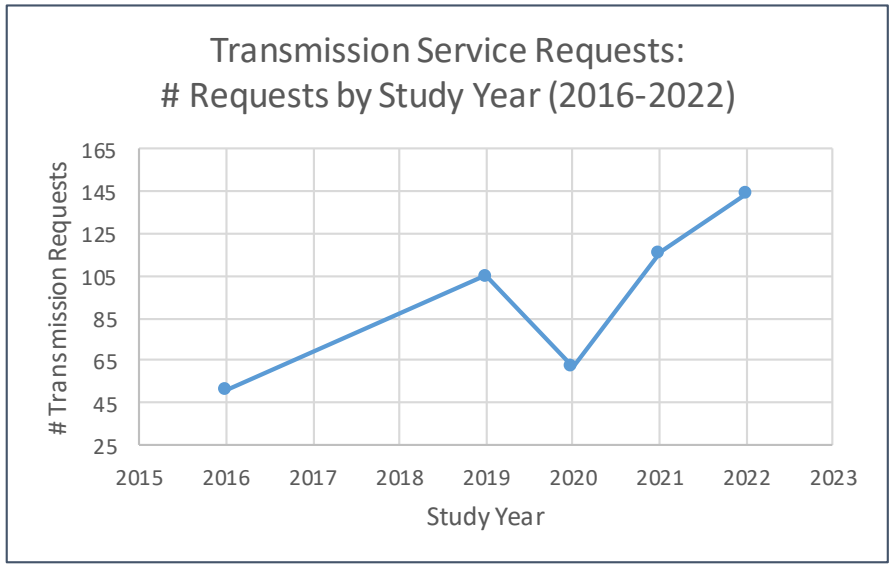


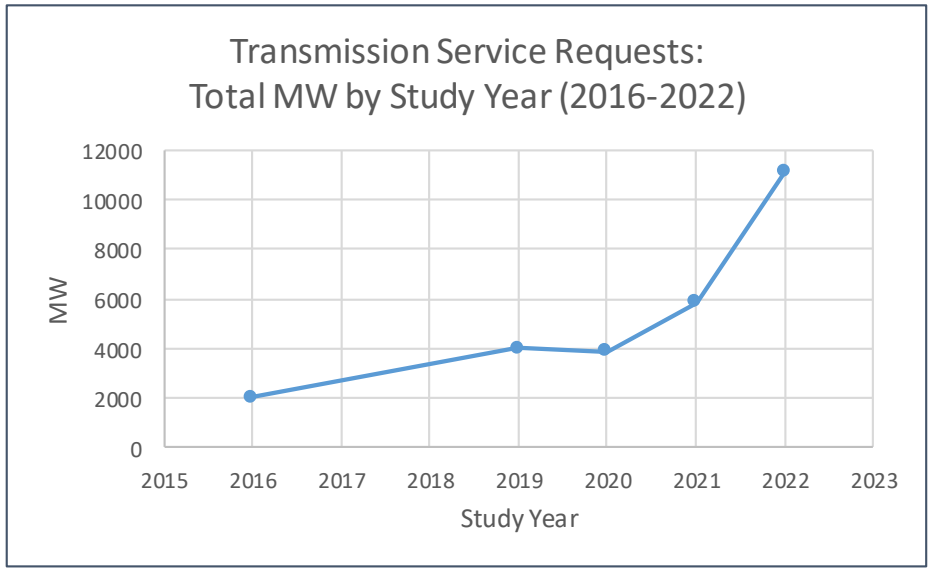
Generation Interconnection Requests
Percentage in Progress and in Study Phase



Transmission Service Requests

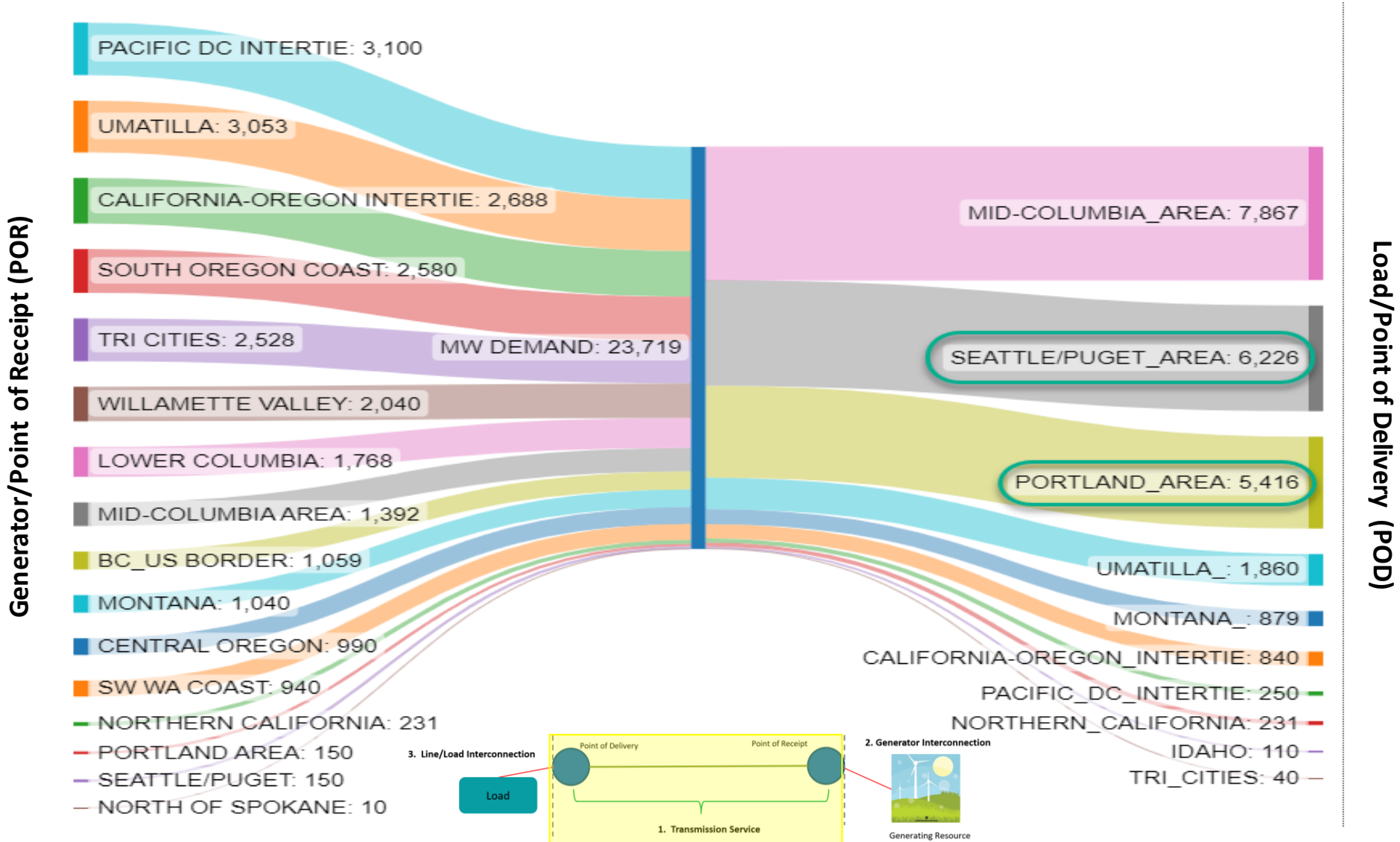
- WA & OR Clean Energy policies are driving an increase in TSR submittals
  - Since 2019, BPA has studied over 17,000 MW of requested transmission service primarily delivering to the Portland metro area or the Seattle/Puget Sound area
  - According to recent IRP data, the clean resource need to serve 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





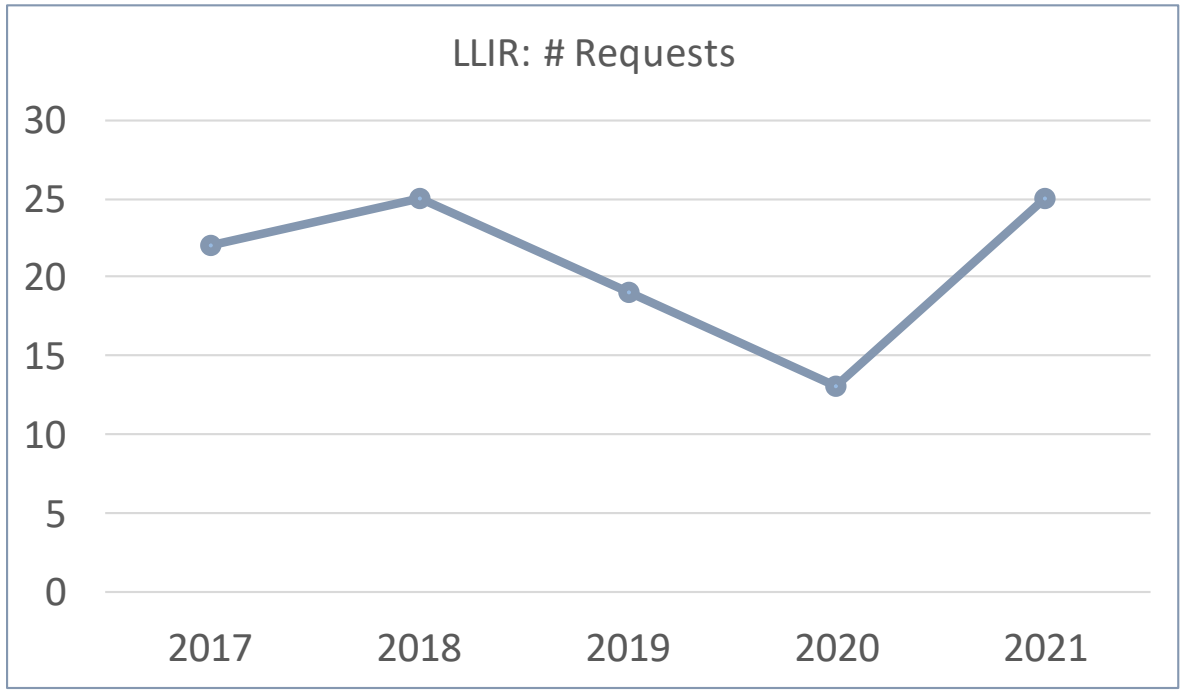
Pre-decisional, for discussion purposes only

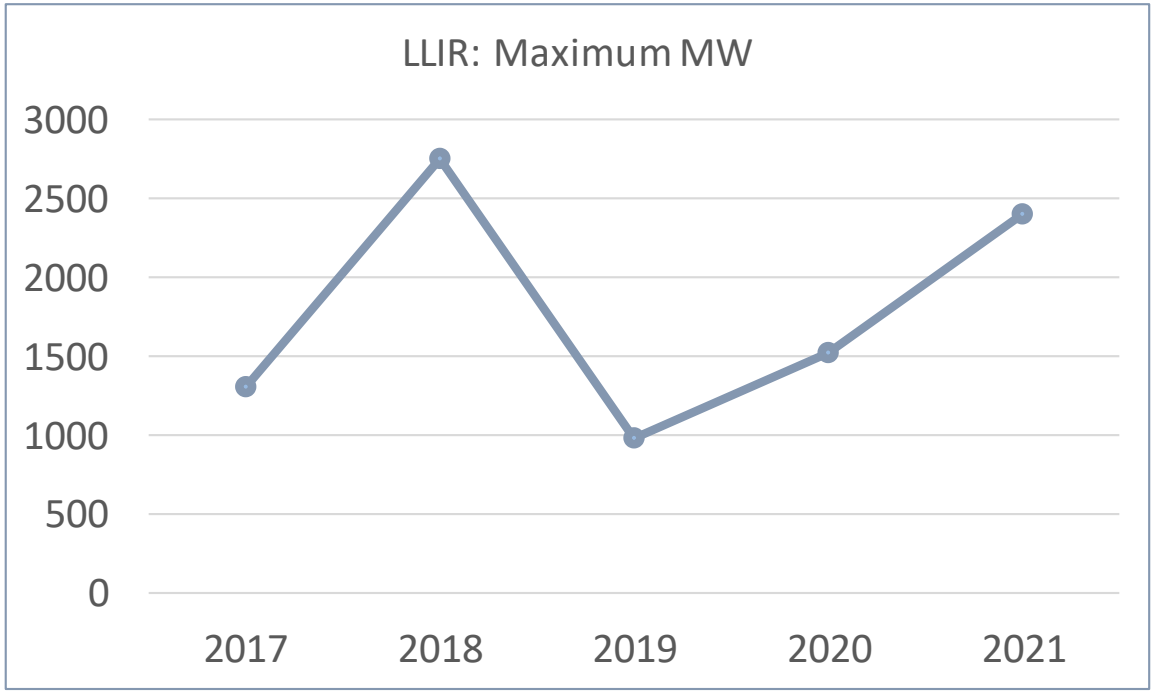
2023 Cluster Study Transmission Queue Details

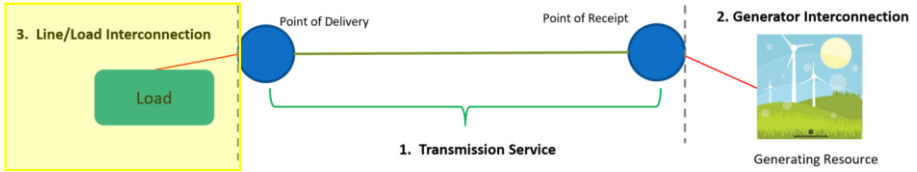


Line & Load Interconnection Queue Activity

- Largest demand for growth around the system include Central Oregon, Umatilla, Pend Oreille, Hillsboro/Forest Grove, Longview/Cowlitz, Tri-Cities



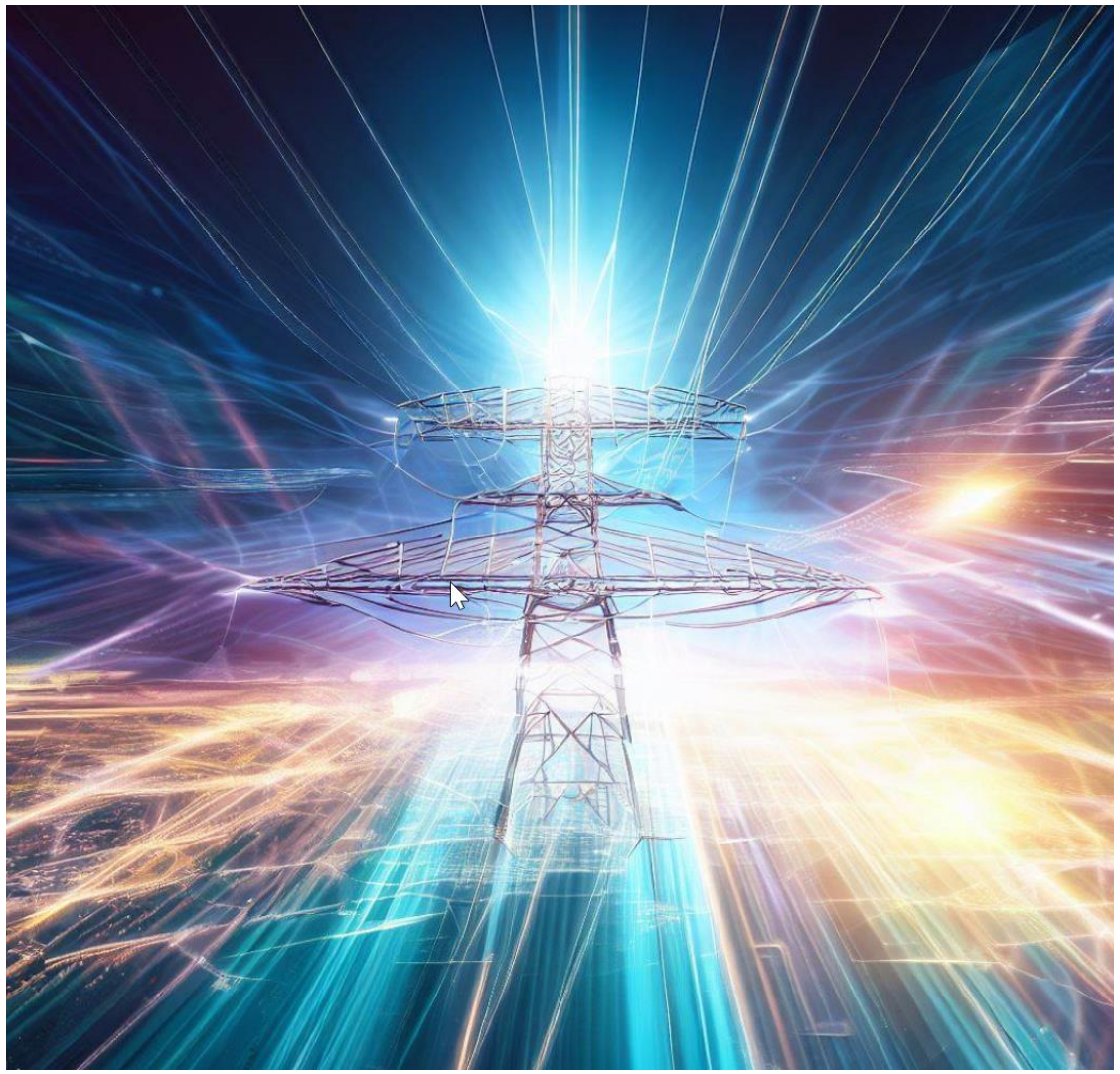




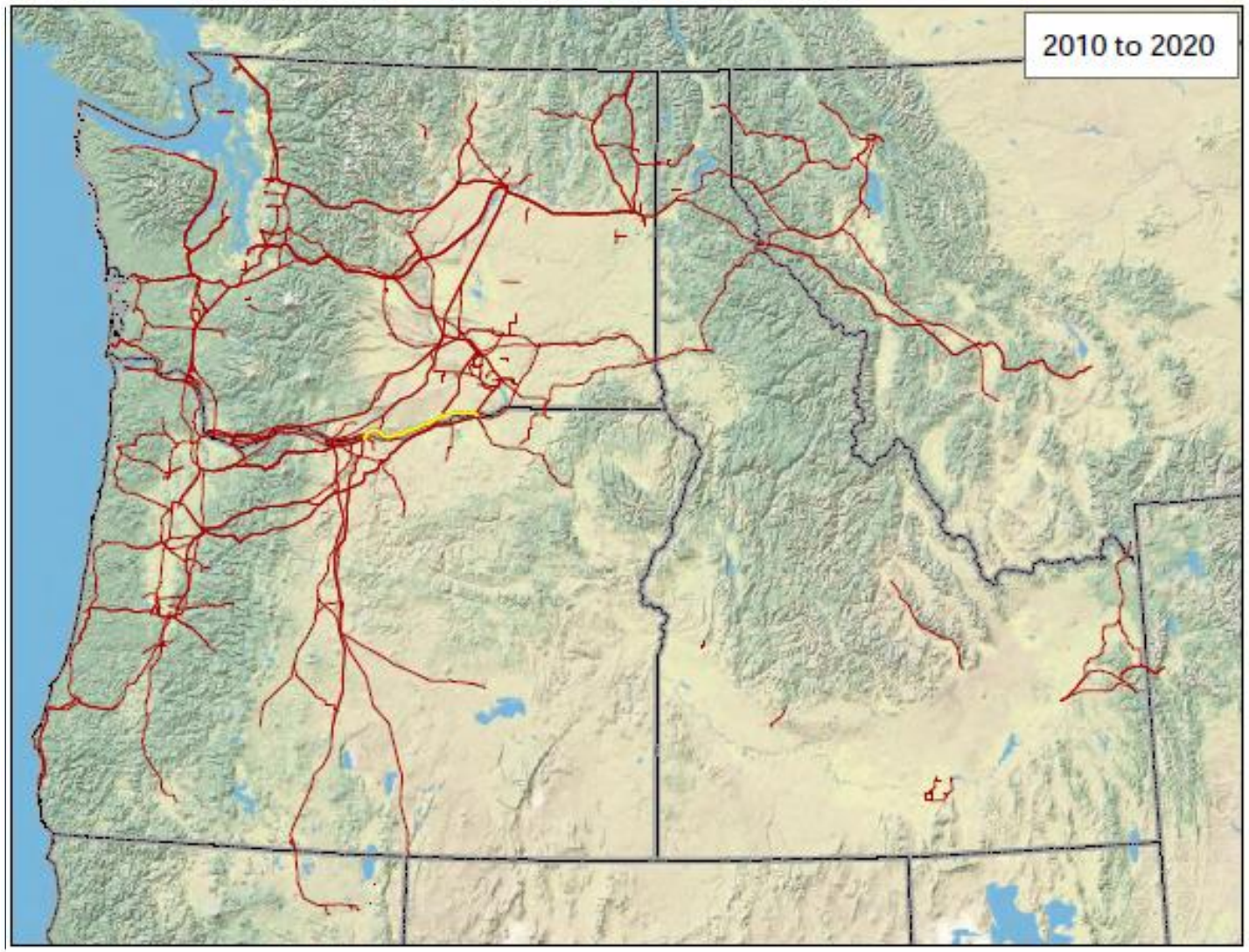
Load & Queue Growth

- 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

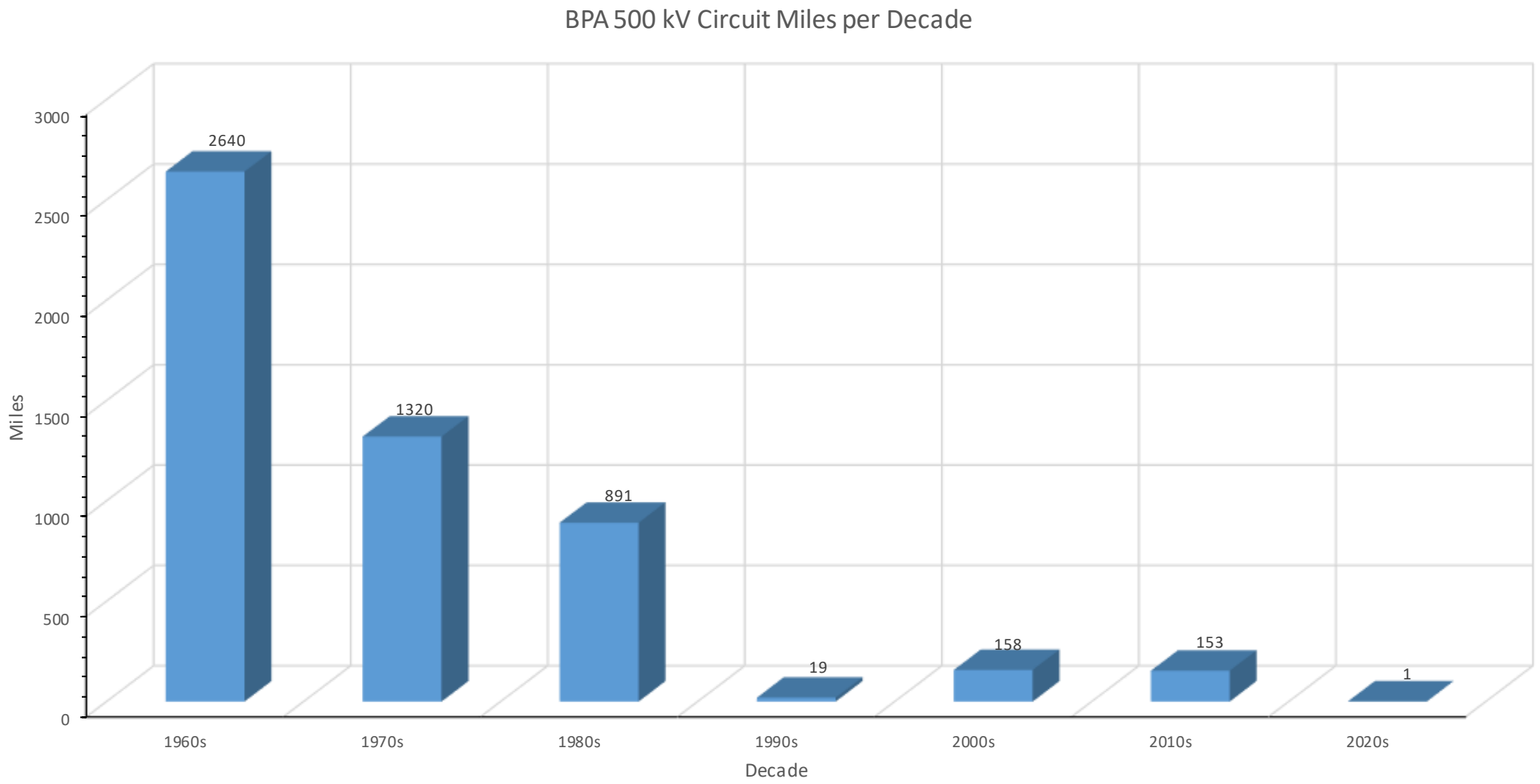
The Evolving Grid



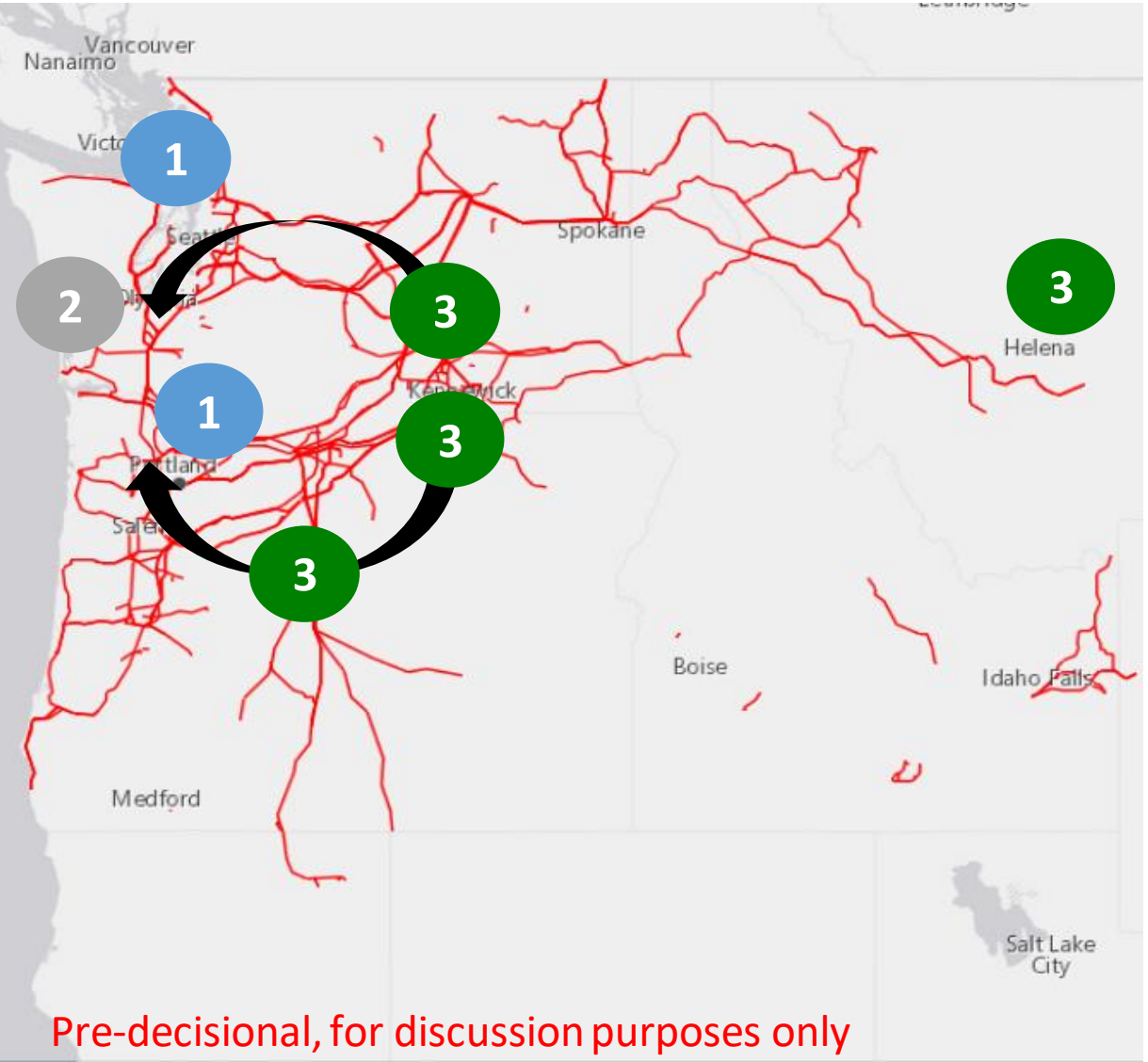
Bonneville Transmission Build Out



PNW Transmission Build Out



Landscape Overview

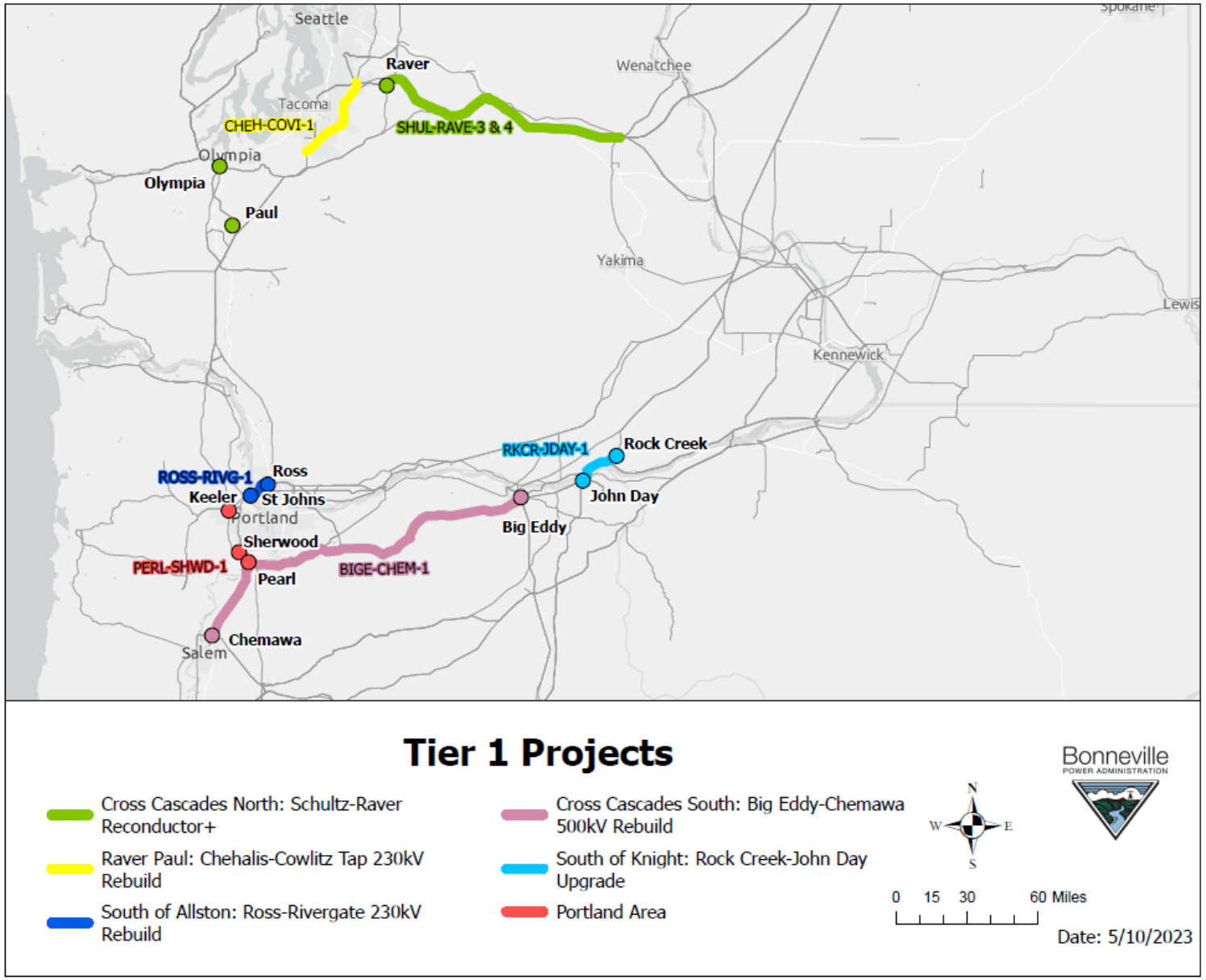


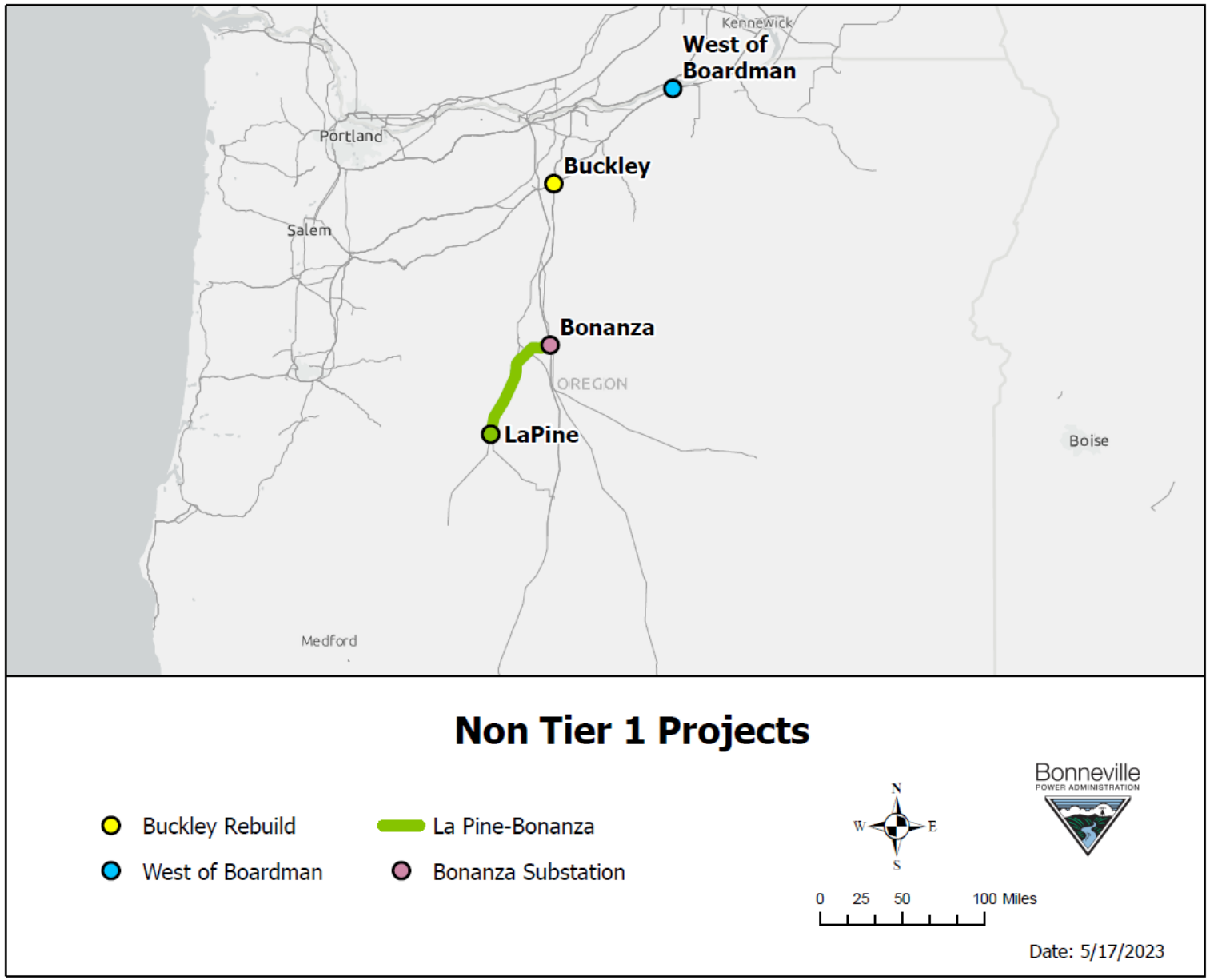
The following factors:

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

Pre-decisional, for discussion purposes only


Seattle
Raver
Wenatchee
Tacoma
CHEH-COVI-1
SHUL-RAVE-3 & 4
Olympia
Olympia
Paul
Yakima
Kennewick
RKCR-JDAY-1
Rock Creek
ROSS-RIVG-1
Ross
Keeler
St Johns
John Day
Portland
Big Eddy
Sherwood
PERL-SHWD-1
BIGE-CHEM-1
Pearl
Chemawa
Salem
Tier 1 Projects
Cross Cascades North: Schultz-Raver Reconductor+
Raver Paul: Chehalis-Cowlitz Tap 230kV Rebuild
South of Allston: Ross-Rivergate 230kV Rebuild
Cross Cascades South: Big Eddy-Chemawa 500kV Rebuild
South of Knight: Rock Creek-John Day Upgrade
Portland Area
N
W
E
S
0 15 30 60 Miles
Bonneville
POWER ADMINISTRATION
Date: 5/10/2023


Kennewick
West of Boardman
Portland
Buckley
Salem
Bonanza
OREGON
LaPine
Boise
Medford
Non Tier 1 Projects
Buckley Rebuild
West of Boardman
La Pine-Bonanza
Bonanza Substation
N
W
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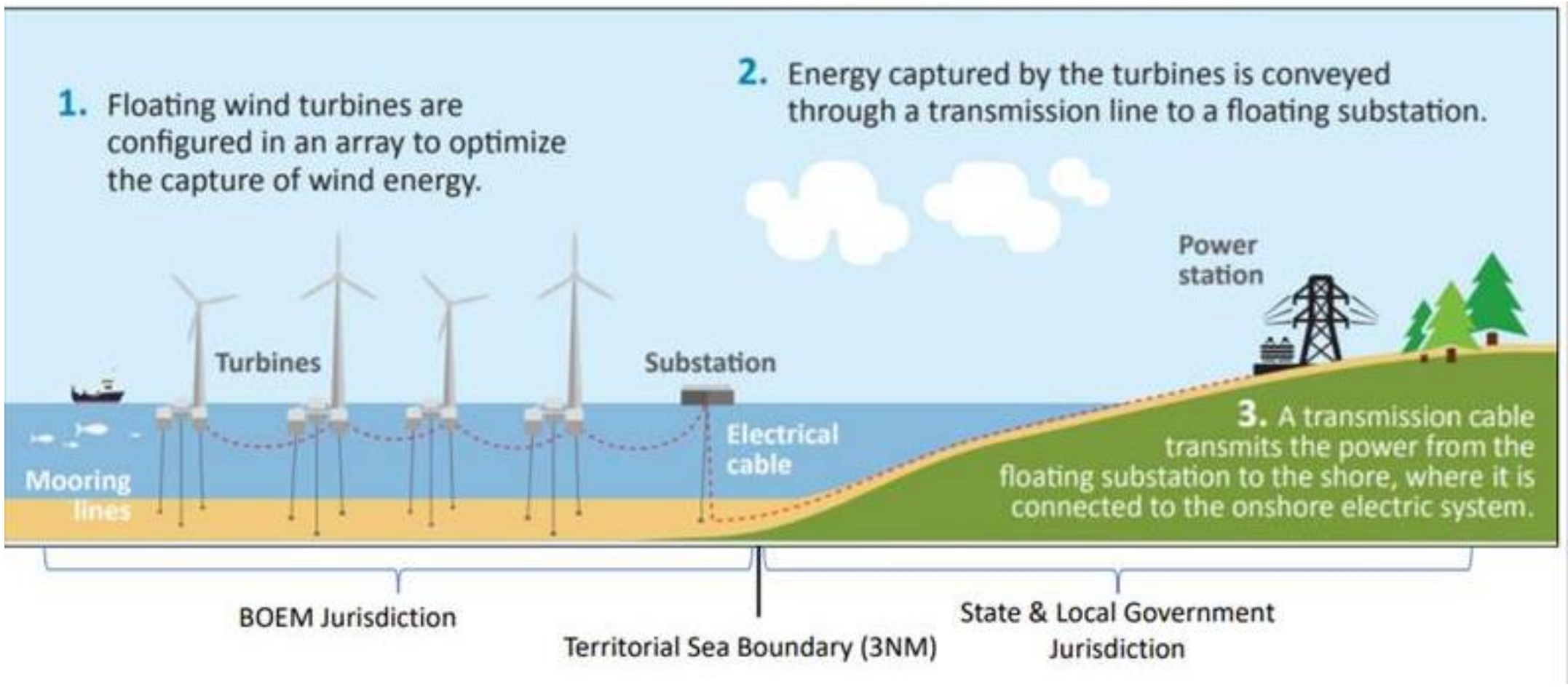
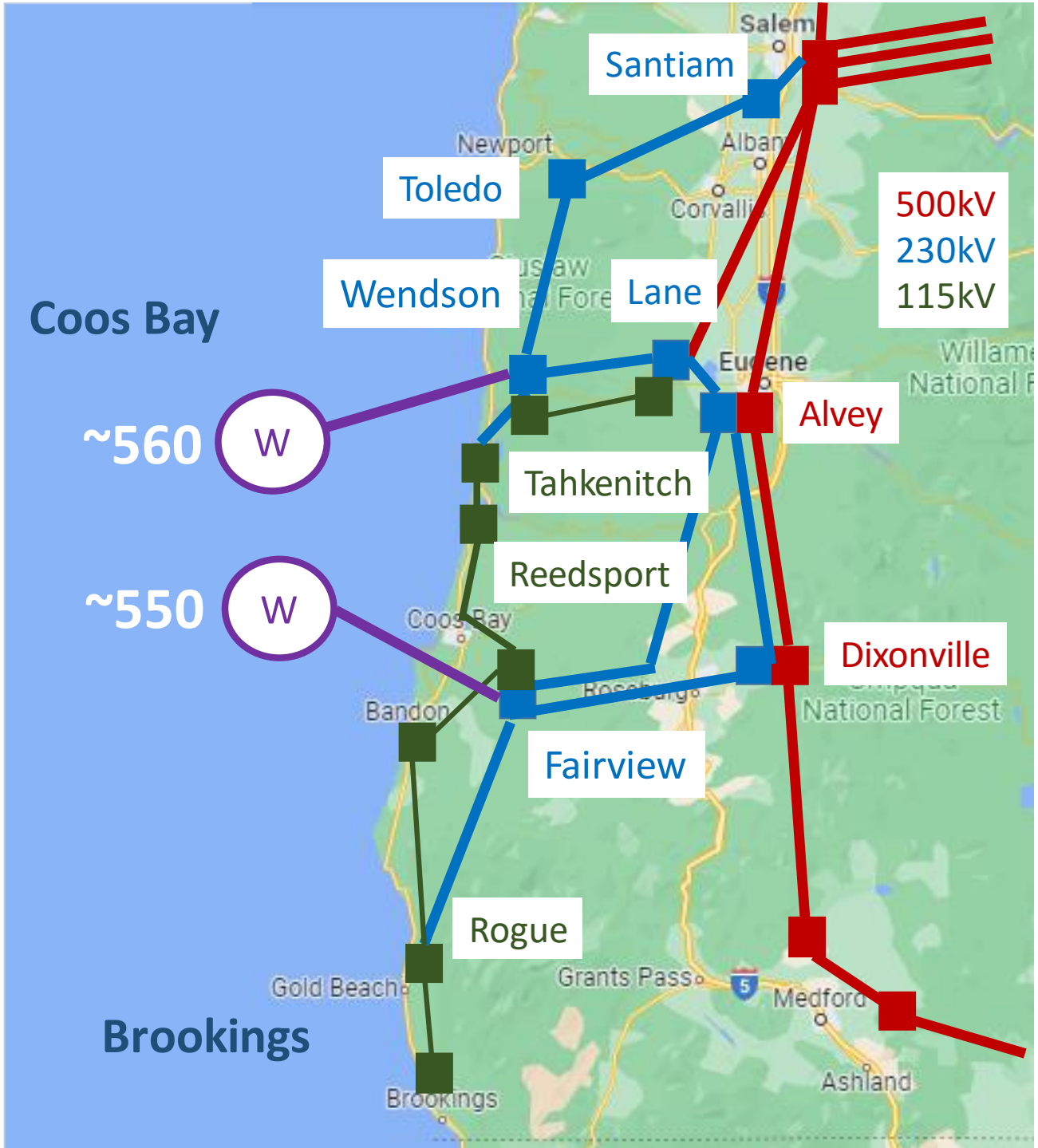
0 25 50 100 Miles
Bonneville
POWER ADMINISTRATION
Date: 5/17/2023

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.



Offshore Wind Capabilities

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

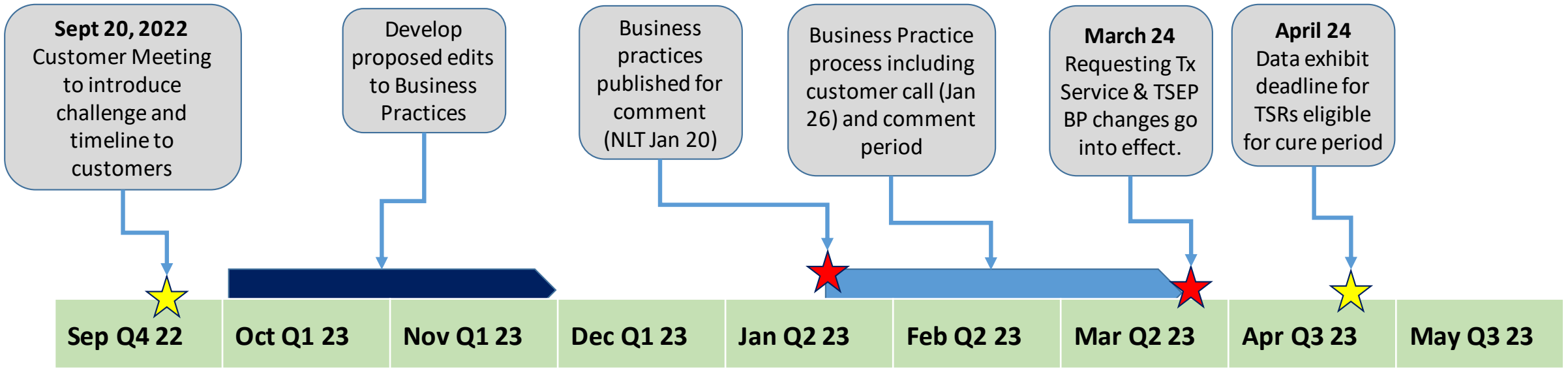
- The costal transmission system was designed for load service, and there has been limited load growth
- The transmission system will require **major** upgrades to integrate GWs of off-shore wind
- Several reliability studies are either completed recently or in progress
  - BPA internal validation of 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
GI Settlement Schedule

- **Week of August 14:** OGC hosts meeting to share BPA's final position on settlement and distributes the final settlement package: Term Sheet, Settlement Agreement and LGIP to settlement participants.
- **No later than August 17:** BPA opens window for customers to indicate whether they will contest settlement.
- **August 31:** BPA closes window for settlement participants to indicate whether they will contest settlement.
- **September 8:**
    - Bonneville will send settlement participants an email indicating our decision to move forward or not with the adoption of the proposed settlement in the TC-25 tariff proceeding.
    - Bonneville will also hold a call to explain this decision and share next steps.
- If BPA cannot get to settlement, BPA will need to pivot and will move to FRN date towards the end of Sept or early Oct in order to run the full 212 proceeding process

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

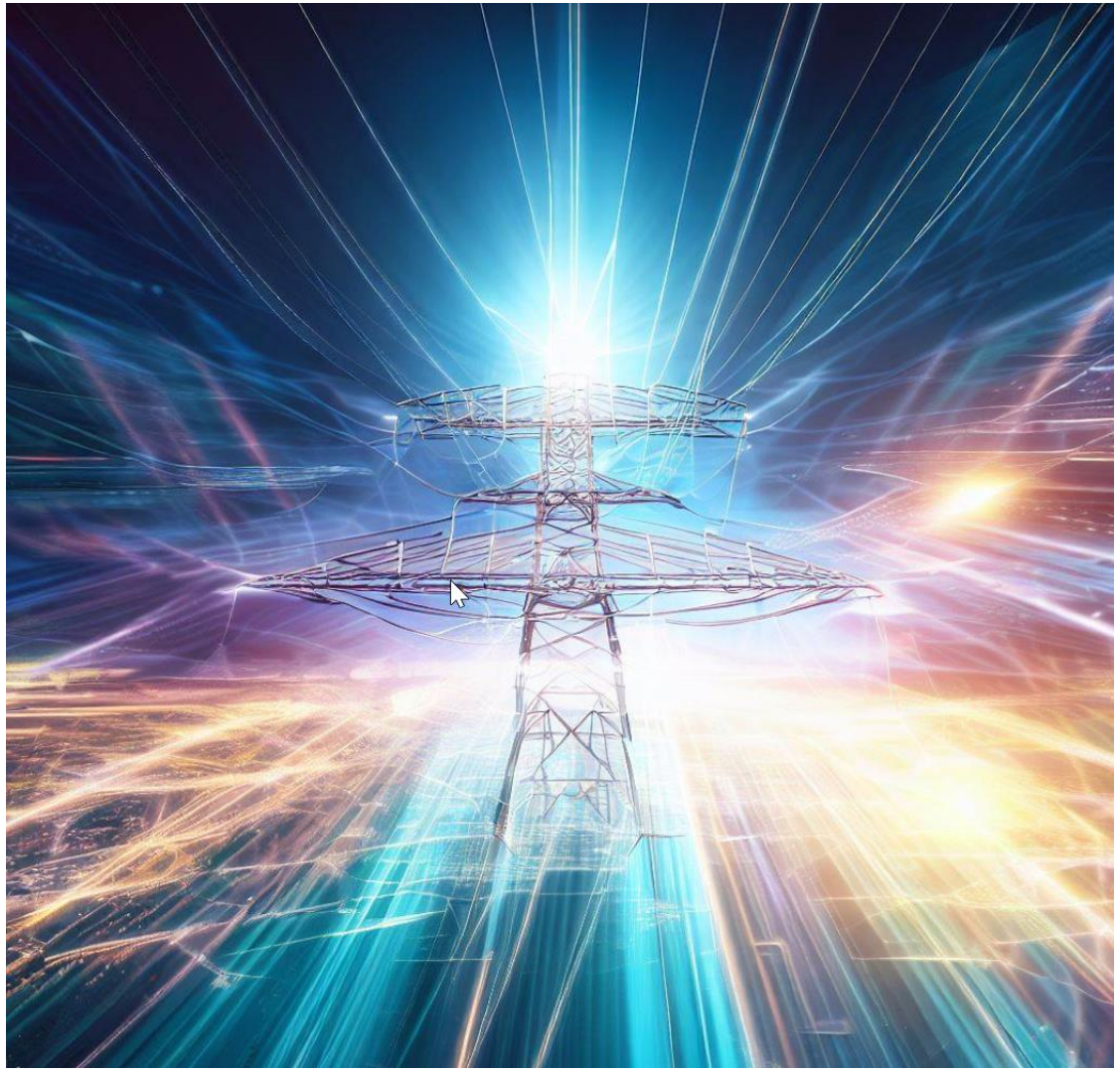
Line Load Queue

- 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
  - Engineering approach to provide right size scoping
  - Anticipate significant reduction in FAS duration

NT Policies & Projects in Flight

- 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

The Evolving Grid

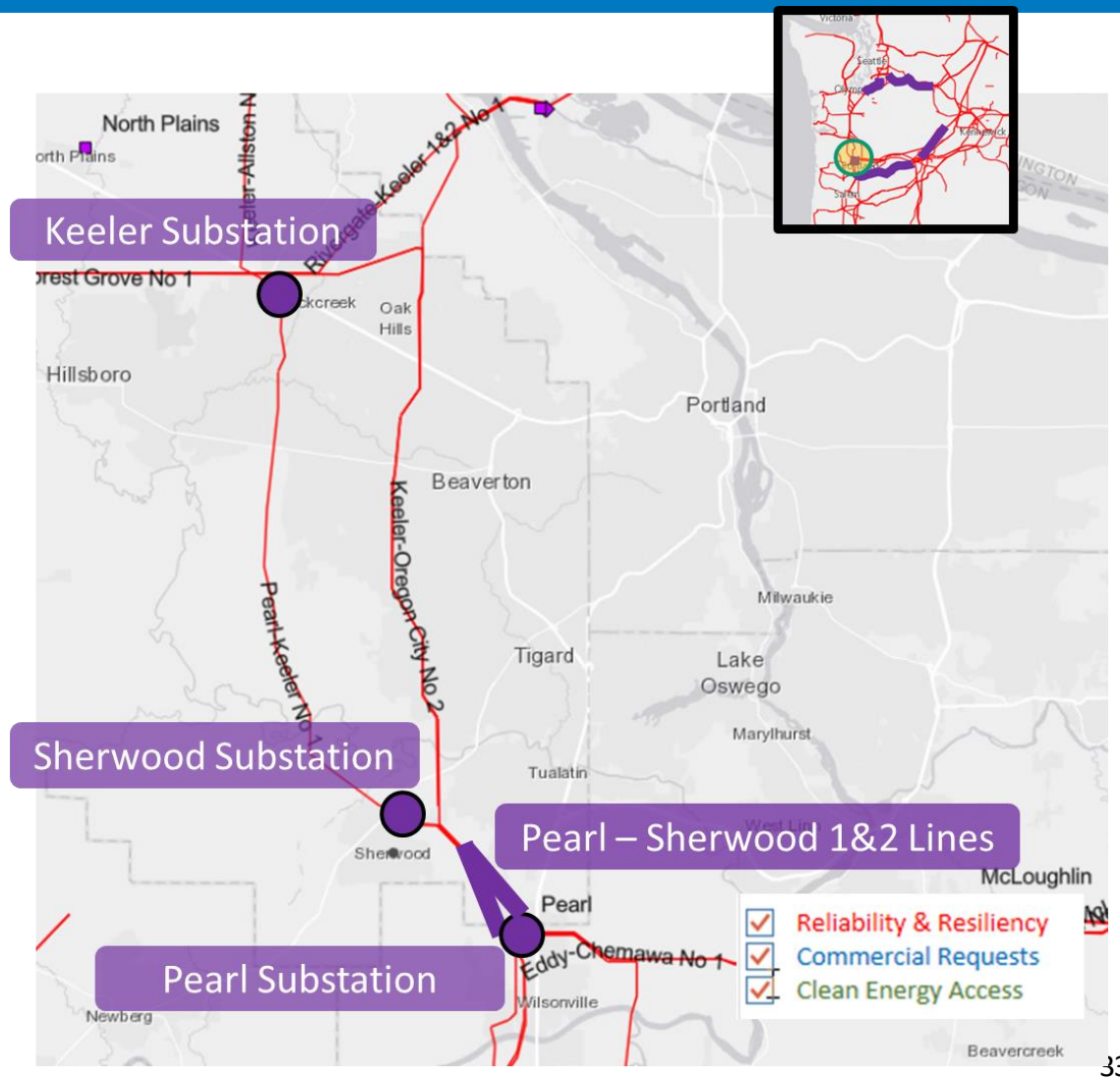



Questions

Appendix

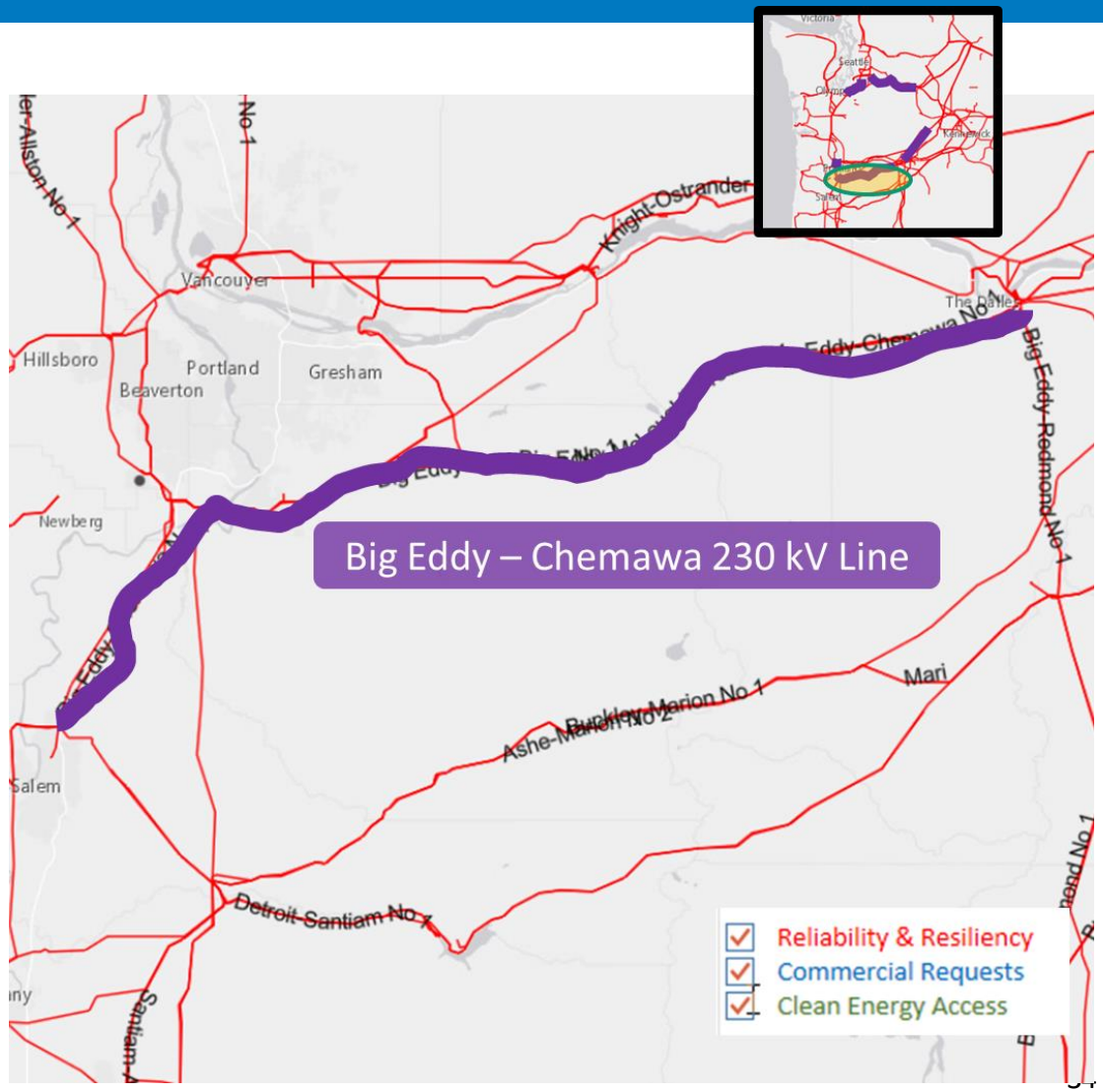
Portland Area

- 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



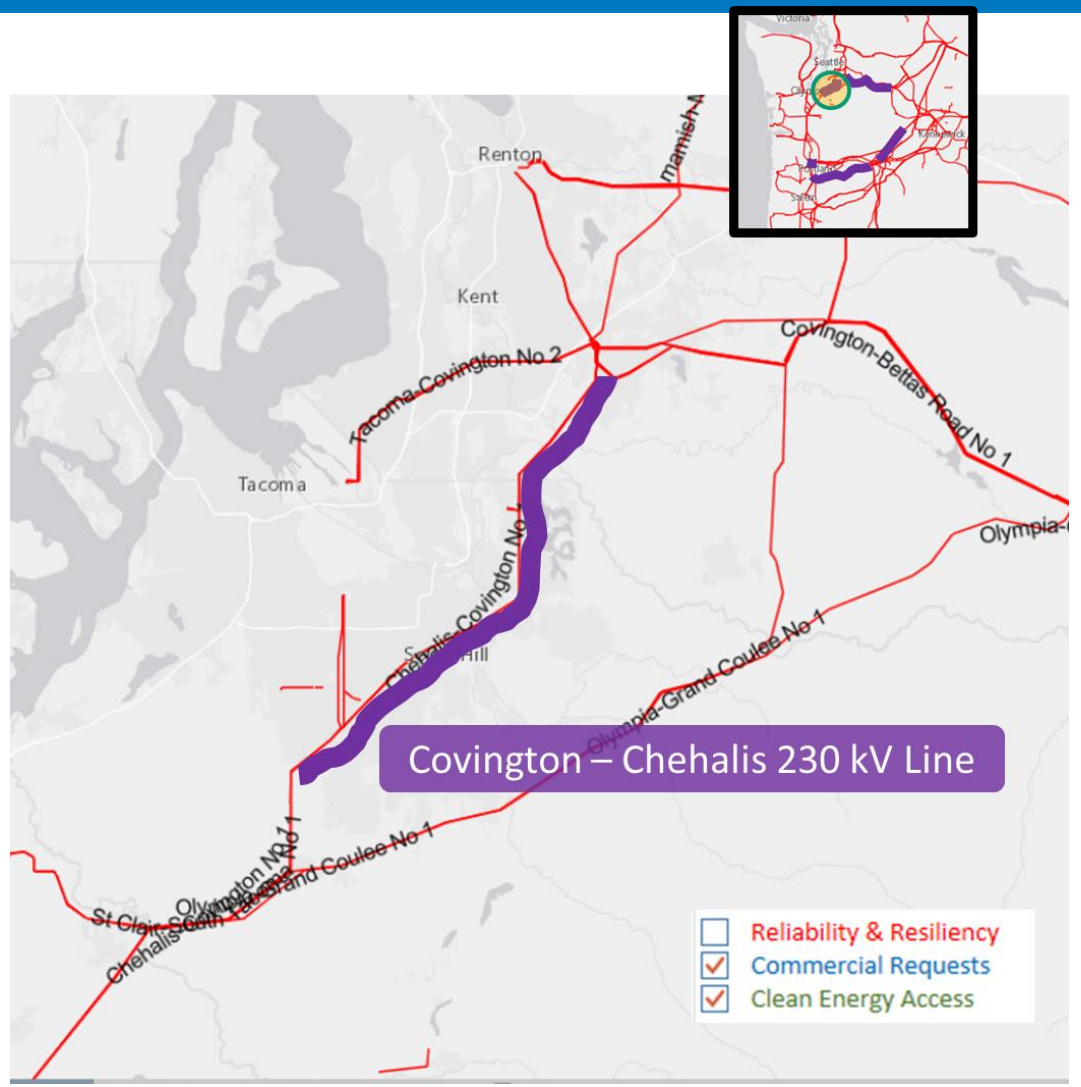
Cross-Cascades South Reinforcement

- 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



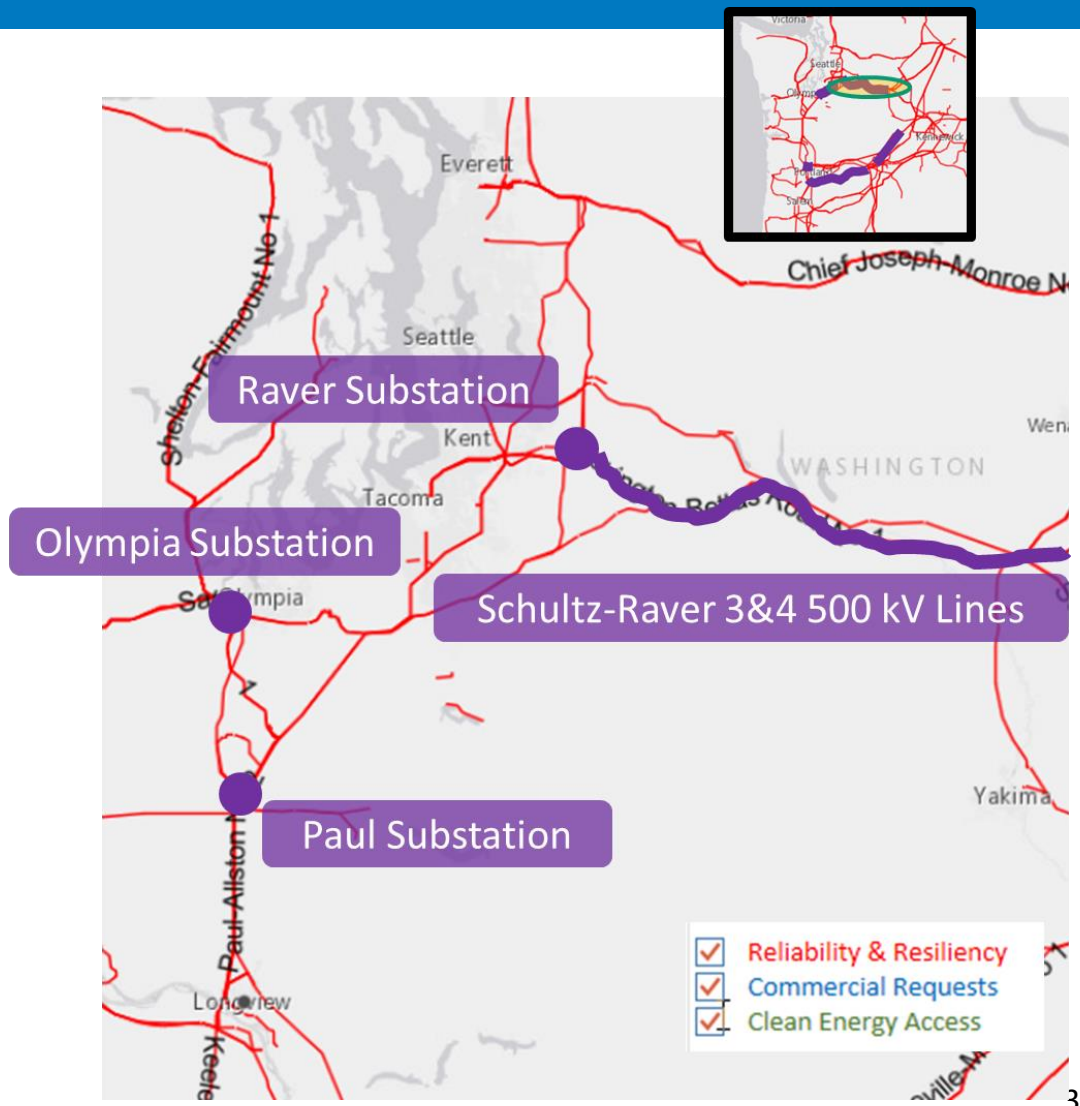
Raver-Paul Reinforcement

- 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



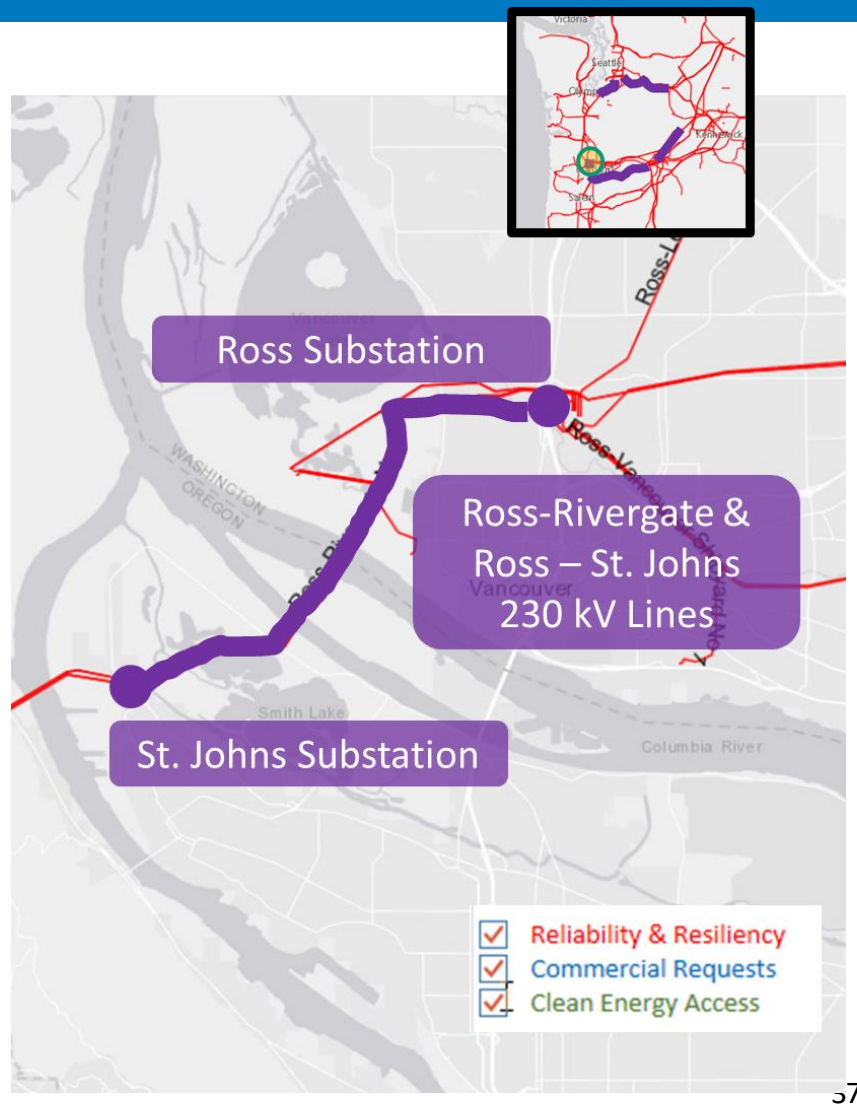
Cross-Cascades North Reinforcement

- 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



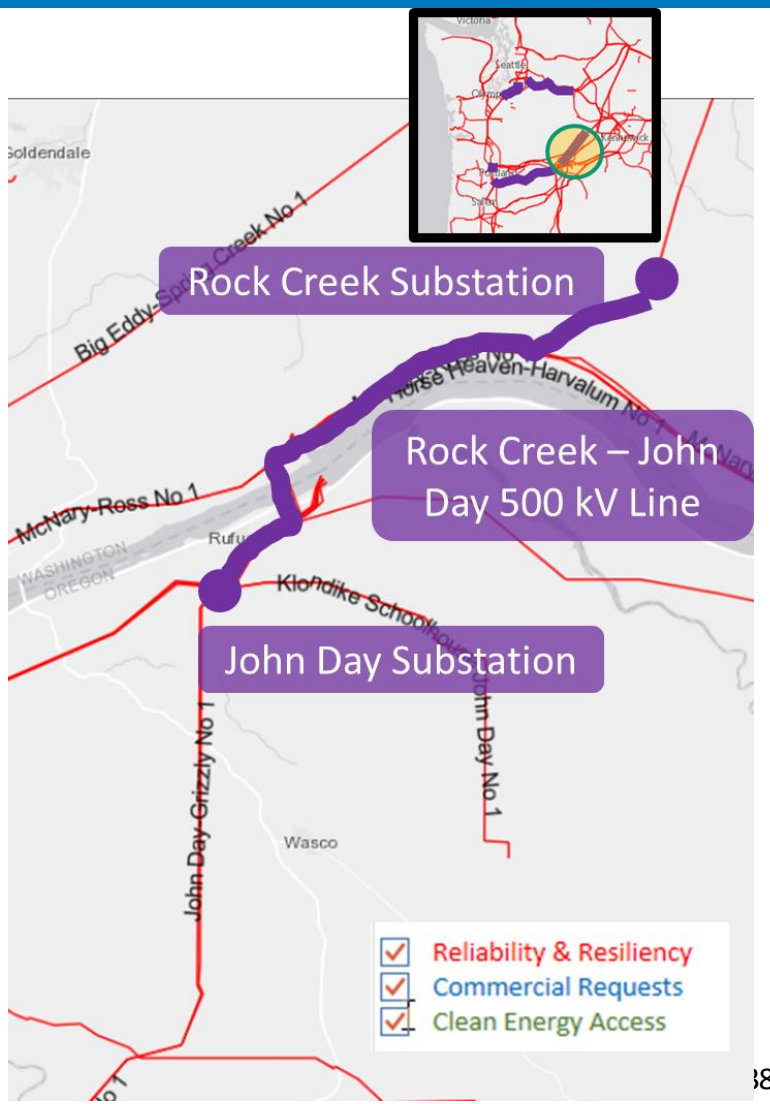
Ross-Rivergate

- 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



Helpful BPA Links

BPA Transmission Plan: https://www.bpa.gov/-/media/Aep/transmission/attachment-k/2022-bpa-transmission-plan.pdf

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