Planning for the future transmission system

2023

Transmission Plan

Open Access Transmission Tariff Attachment K Planning Process

December 2023

B O N N E V I L L E   P O W E R   A D M I N I S T R A T I O N

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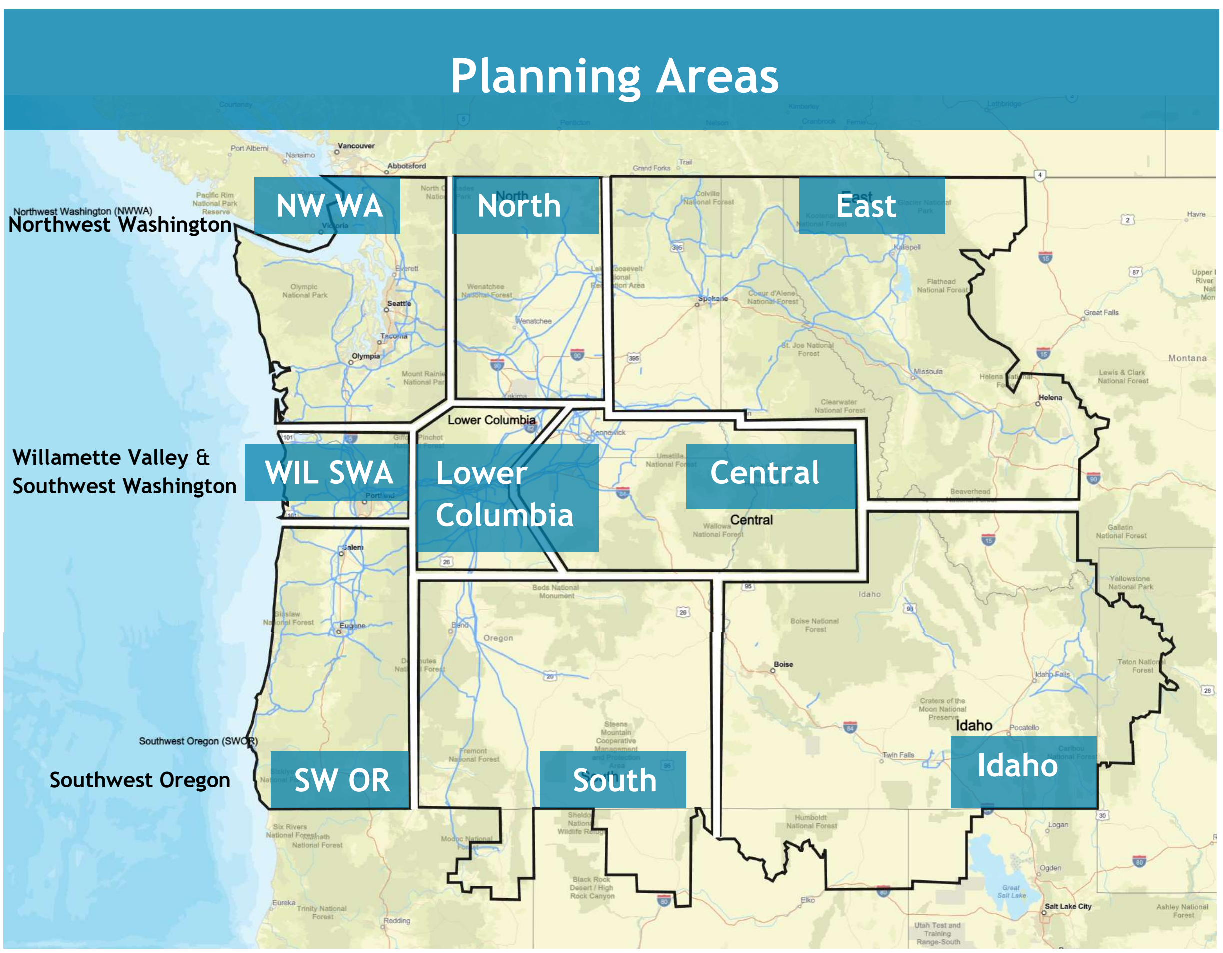
About this Transmission Plan

This BPA Transmission Plan (T-Plan) is produced in accordance with the requirements of BPA's Open Access Transmission Tariff Attachment K (Attachment K) Planning Process. The planning process is conducted in an open, coordinated, and transparent manner through a series of open planning meetings. The planning process occurs on an annual basis and results in a public posting of this Transmission Plan. The Open Access Transmission Tariff (OATT) Attachment K Planning Process section provides a diagram of the planning cycle, public meetings and posting timeline.

BPA plans the transmission system to serve expected loads and load growth for at least the next ten years based on forecasts. The forecasted peak loads, plus existing long-term firm transmission service obligations, are used to determine the system reinforcement requirements for reliability. BPA plans the system in accordance with the NERC Planning Standards and WECC Regional Criterion to maintain system reliability. Plans of Service are identified based on three broad categories: system assessment, customer requests for transmission service, and generator and line and load interconnection customer requests.

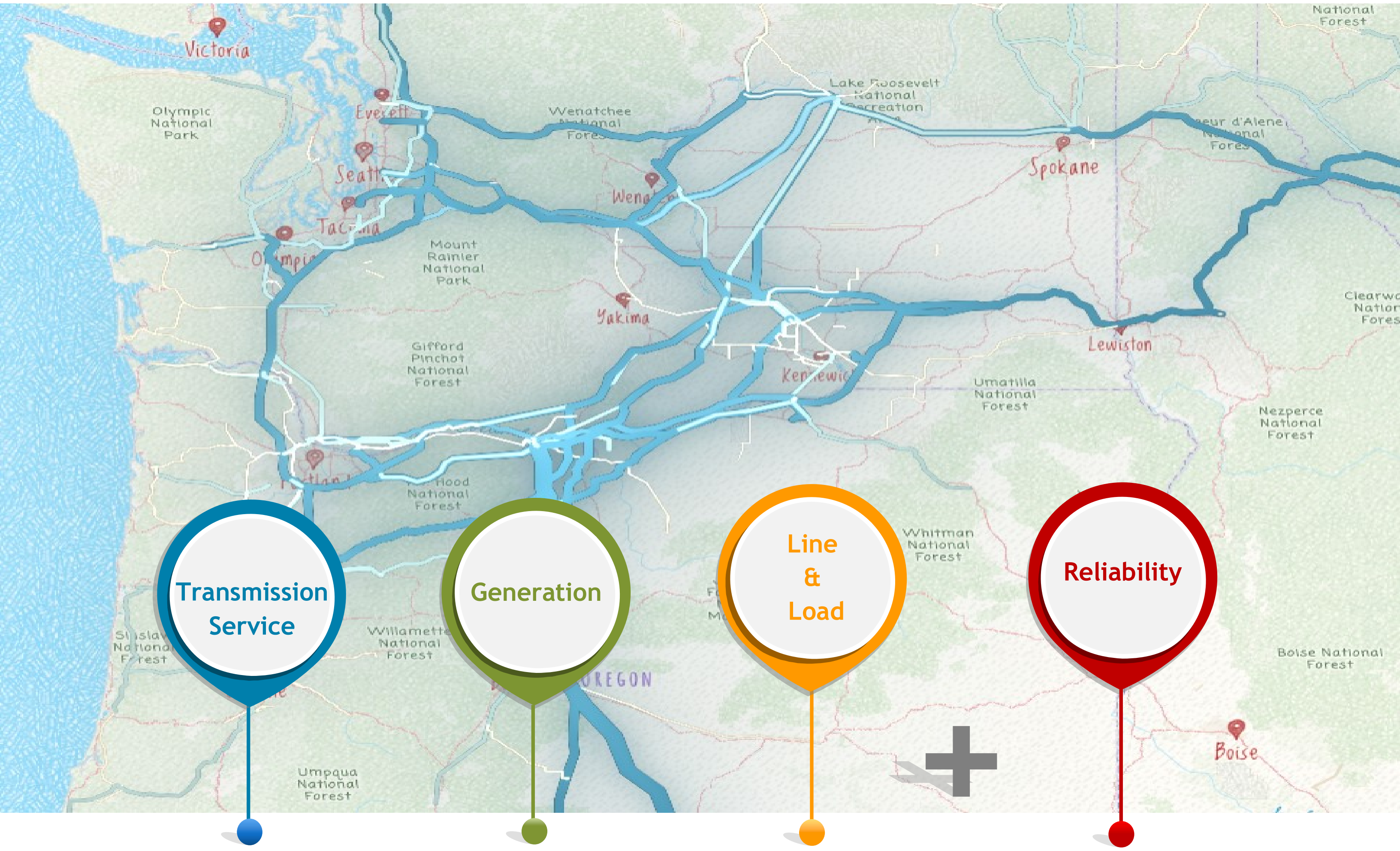
This report is divided into three main sections. The first portion summarizes the current transmission expansion scenario. The second section consists of process information and the third section provides plans of service information by planning areas, paths and interties.



1. State of Transmission Expansion

Bonneville Power Administration Transmission Services is in an era of transformation driven by national and regional decarbonization objectives, electrification of transportation and appliances, and other factors by enabling fundamental changes in power supply and demand. These changes come as the region has begun retirement of carbon-emitting resources, primarily coal. A substantial number of renewable resources are being proposed on the east side of BPA's service territory to serve growing needs in load centers on the west-side, such as the Portland-metro area and the Puget Sound region.

BPA operates three distinct queues as part of its planning processes. BPA's customers have submitted unprecedented requests seeking to meet growing energy demand and to deliver energy from the source to where it is needed. All three queues are experiencing significant growth and are showing no signs of slowing down. The following information in this section highlights the state of the queues, the new corrective action plans proposed this year and the top active transmission expansion projects.



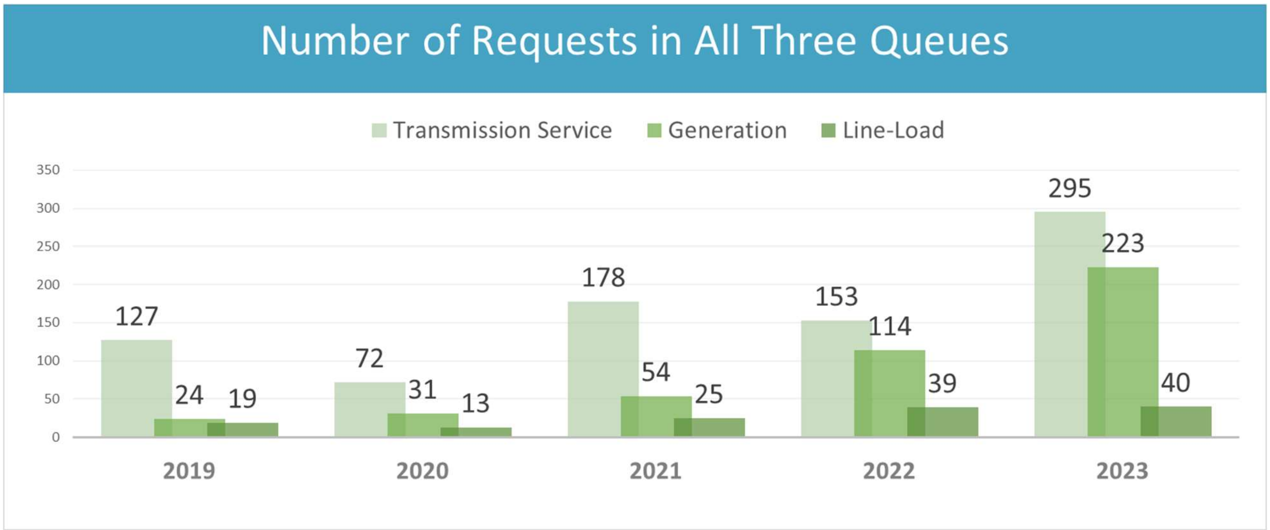
Transmission Service Requests to get energy from the source to where it is needed.

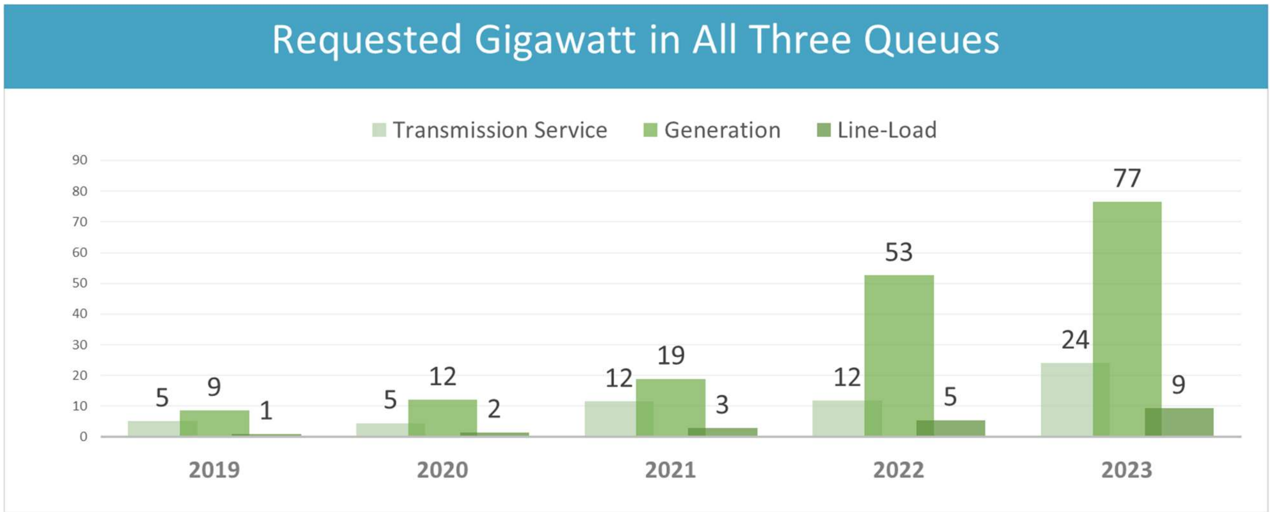
Generator Interconnection Requests to connect new resources to the grid.

Line and Load Requests to serve new load growth.

Corrective Actions Plans

The charts below show the number of customer requests and the associated gigawatt for transmission service versus generation and line-load interconnection requests. All three customer requests queues have increased in the number of requests and the associated megawatts in recent years. Renewable mandates such as Oregon House Bill 2021 and Washington's Clean Energy Transformation Act drive the influx of requests from new generation developers.



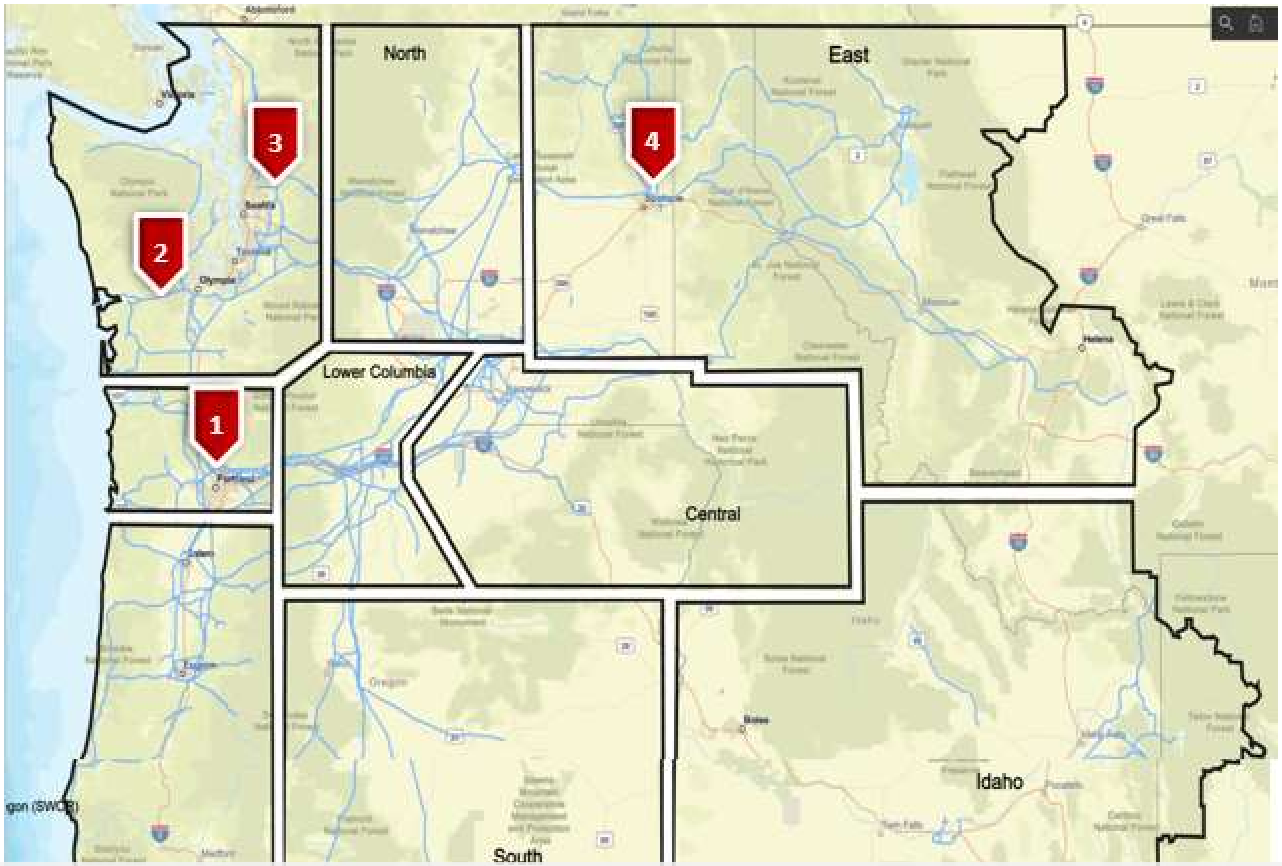


The interconnection data is as of December 27, 2023.

*The gigawatt value for the generation and line-load interconnection requests is the sum of the maximum summer megawatt values for each request divided by 1000.

1.1 New Reliability Corrective Action Plans

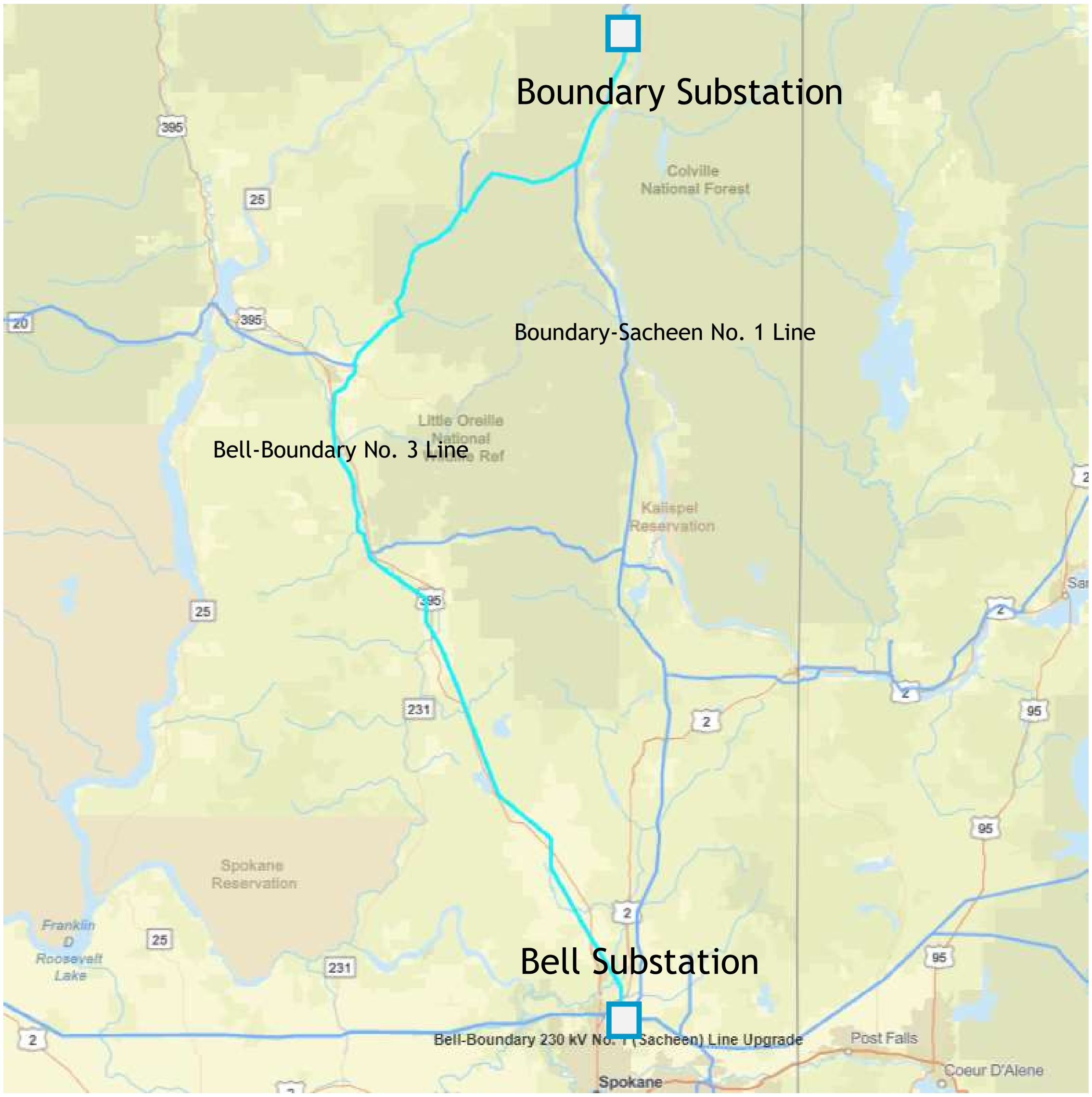
BPA plans the transmission system to serve expected loads and load growth for at least the next ten years based on forecasts. The forecasted peak loads, plus existing long-term firm transmission service obligations, are used to determine the system reinforcement requirements for reliability. BPA plans the system in accordance with the NERC Planning Standards and WECC Regional Criterion to maintain system reliability. The 2023 System Assessment identified four new corrective action plans (CAP) in the Seattle, Spokane, Portland, and Southwest Washington Load Areas. The CAPs identified are as follows.



No.	Name	Expected Energization
1	ST. JOHNS 230/115 KV LOW-SIDE LINE SECTION (REMOVE IMPAIRMENTS)	2026
2	SOUTH ELMA-SATSOP PARK NO. 1 LINE (REMOVE IMPAIRMENTS)	2027
3	MONROE-NOVELTY NILL NO. 1 230 KV LINE (REMOVE IMPAIRMENTS)	2026
4	BELL- BOUNDARY 239 KV LINE NO. 3 UPGRADE (BOUNDARY-SACHEEN 230 KV NO. 1 LINE)	2027

1.2.1 Bell-Boundary 230 kV Line No. 3 Upgrade (Boundary-Sacheen 230 kV No.1 Line)

The Bell-Boundary 230 kV Line No. 3 Upgrade **is** in the Spokane/Colville/Boundary Load Service Area. The expected in-service date is 2027. The Boundary-Sacheen No. 1 230 kV line has been de-rated from 80˚C to 60˚C MOT. The line will be restored to 80˚C MOT and eventually increase it to 100˚C MOT. This project is needed to meet NERC TPL-001-5.



1.2.2 St. Johns 230/115 kV Low-Side Line Section (Remove Impairments)

The **St. Johns 230/115 kV Low-Side Line Section (Remove Impairments)** in the Portland Load Area. The expected in-service date is 2026. This project will upgrade a recently discovered line section impairment on the low side St. Johns 230/115 kV transformer tie-line. This impairment resulted in de-rating the tie line conductor. This project will upgrade several hundred feet of line section where it goes from the 115 kV side of the transformer to the 115 kV bus.

1.2.3 South Elma - Satsop Park No. 1 Line (Remove Impairments)

The **South Elma - Satsop Park No. 1 Line (Remove Impairments)** in the Southwest Washington Coast Load Service Area. The expected in-service date is 2027. This project will upgrade the line to increase the rating to 430 A (30°C) and 530 A (-5°C) with a maximum operating temperature (MOT) of 100°C. This project is required to meet NERC TPL-001-5.

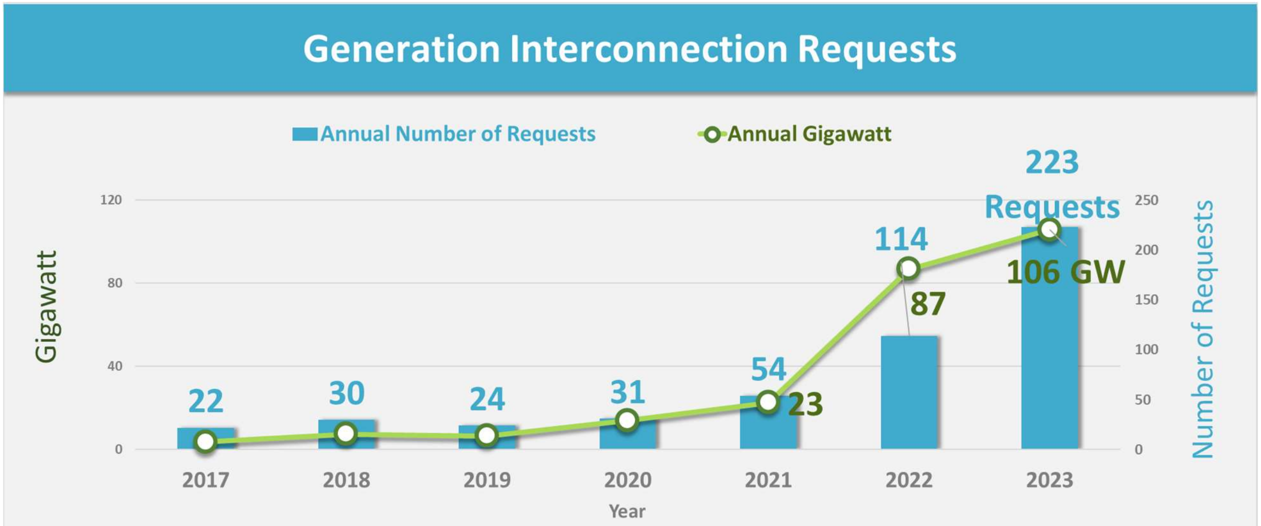
1.2.4 Monroe-Novelty Hill No. 1 230 kV Line (Remove Impairments)

The **Monroe-Novelty Hill 230 kV No. 1 Line (Remove Impairments)** in the Seattle/Tacoma Load Service Area. The expected in-service date is 2026. This project will upgrade the line to increase the rating. This project is required to meet NERC TPL-001-5.

1.2 Generation Interconnection Requests

1.2.1 Number and Status of Generation Interconnection Requests

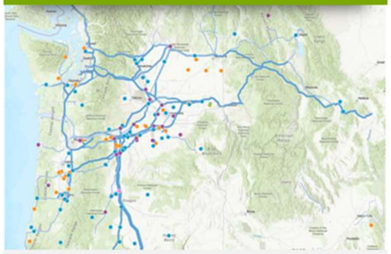
The generation interconnection process is a vital component of open access transmission service and is intended to expedite the development of new generation while ensuring reliability and reasonable rates. New resources seeking to interconnect to the transmission system submit a request and then enter the queue. As of late December 2023, 223 generation interconnection requests were received for approximately 106 gigawatts. There has been a robust increase in the number of requests in the past several years.



- Gigawatt is the sum of all generation sources in megawatt divided by 1000.
- An individual request could have 100 megawatts of photovoltaic and 100 megawatts of energy storage totaling 200 Megawatt.

1.2.2 Project Status of Generation Interconnection Requests by Fuel Type

In Progress
~206 Gigawatt

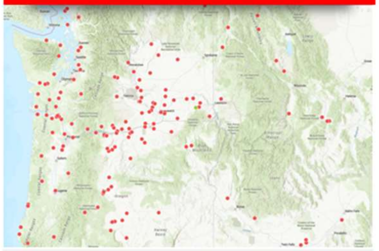


Fuel Source	Megawatt
Battery	88,224
Biofuel	2
Geothermal	10
Natural Gas	4,030
Nuclear	3,590
Other	10
Pumped-Storage Hydro	1,100
Solar	77,826
Water	876
Wind Turbine	30,530

Completed
~7 Gigawatt

Fuel Source	Megawatt
Battery	10
Biofuel	111
Natural Gas	2,275
Other	81
Solar	401
Water	135
Wind Turbine	3,819

Withdrawn
~120 Gigawatt



Fuel Source	Megawatt
Battery	15,943
Biofuel	716
Geothermal	1,160
Natural Gas	35,797
Other	651
Pumped-Storage Hydro	2,400
Solar	22,871
Water	1,440
Wind Turbine	39,029

1.2.3 Generation Interconnection Requests In Progress by Study Phase

Feasibility Study
In Progress
~97 Gigawatt

Fuel Type	MW
Battery	40,872
Solar	36,912
Wind Turbine	14,397
Natural Gas	3,150

System Impact Study
In Progress
~13 Gigawatt

Fuel Type	MW
Battery	6,918
Solar	5,863
Natural Gas	500
Wind Turbine	300

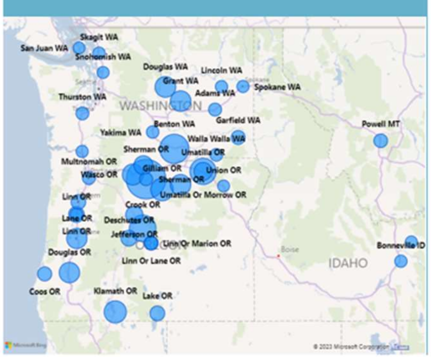
Facilities Study
In Progress
~26 Gigawatt

Fuel Type	MW
Battery	9,879
Biofuel	2
Geothermal	10
Natural Gas	85
Other	10
Pumped-Storage Hydro	500
Solar	11,386
Water	646
Wind Turbine	3,860

1.2.4 Potential Renewable Resources in the Generation Interconnection Queue

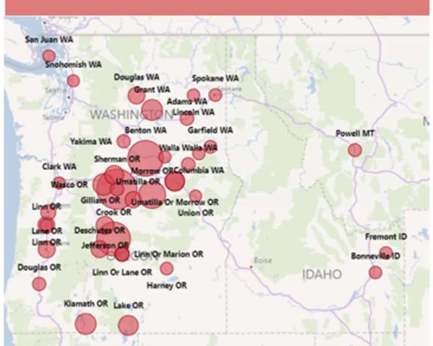
Battery
~88 Gigawatts

Study Phase	MW
b - Feasibility Study	40,872
c - Interconnection System Impact Study	6,918
d - Facility Study	9,879



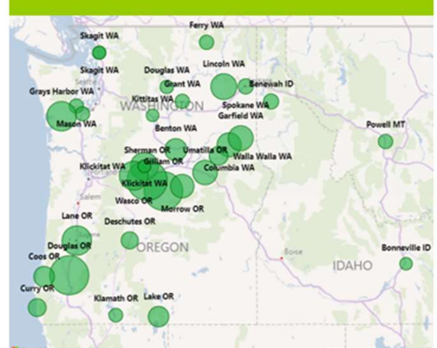
Solar
~78 Gigawatts

Study Phase	MW
b - Feasibility Study	36,912
c - Interconnection System Impact Study	5,863
d - Facility Study	11,386



Wind
~30 Gigawatts

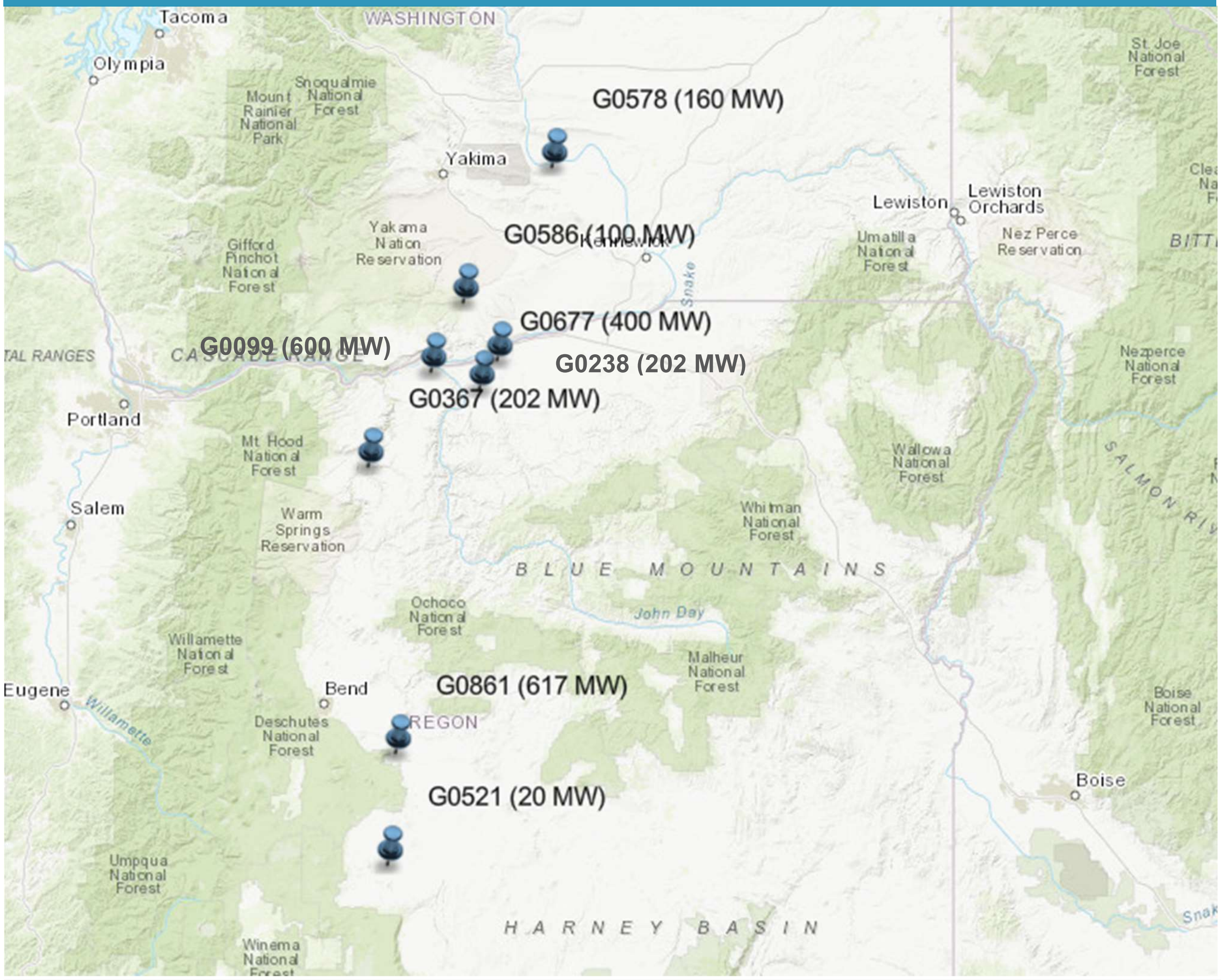
Study Phase	MW
b - Feasibility Study	14,397
c – Interconnection System Impact Study	300
d - Facility Study	3,860



1.2.5 Generation Interconnection Requests in Construction Phase

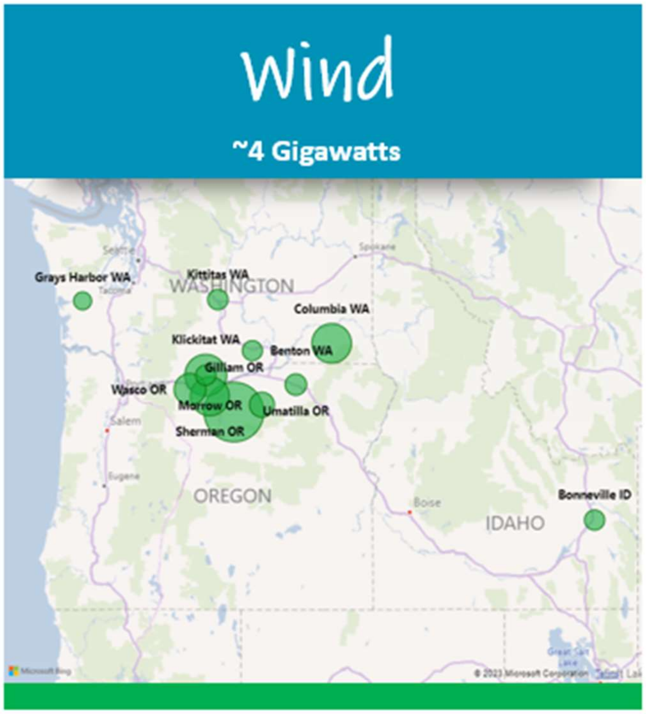
As of November 2023, there are approximately 8 generation interconnection requests in the construction and completion phase totaling approximately 2.3 gigawatts. The generation types include wind turbine, photovoltaic, and photovoltaic + energy storage. The customer or project name is deemed protected information. Therefore, the map below shows the general locations of each request for the associated megawatt and generation type.

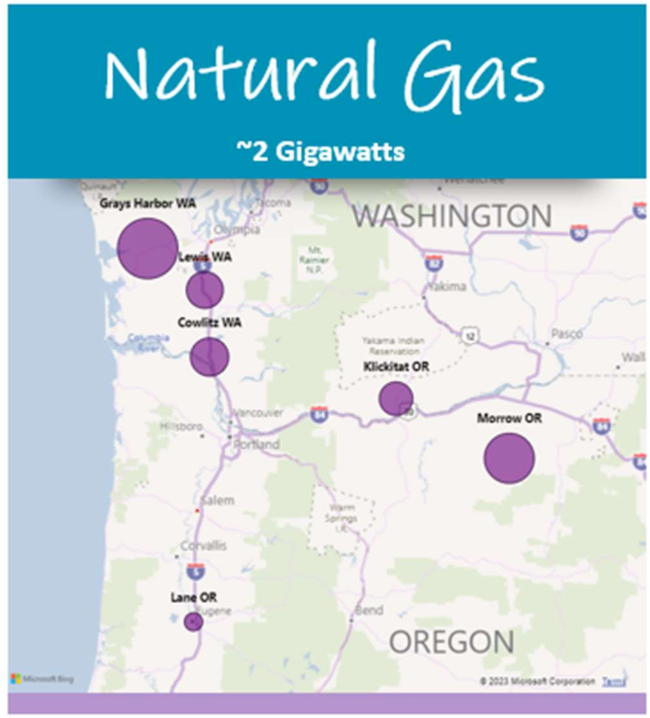
8 Requests -> 2.3 Gigawatts

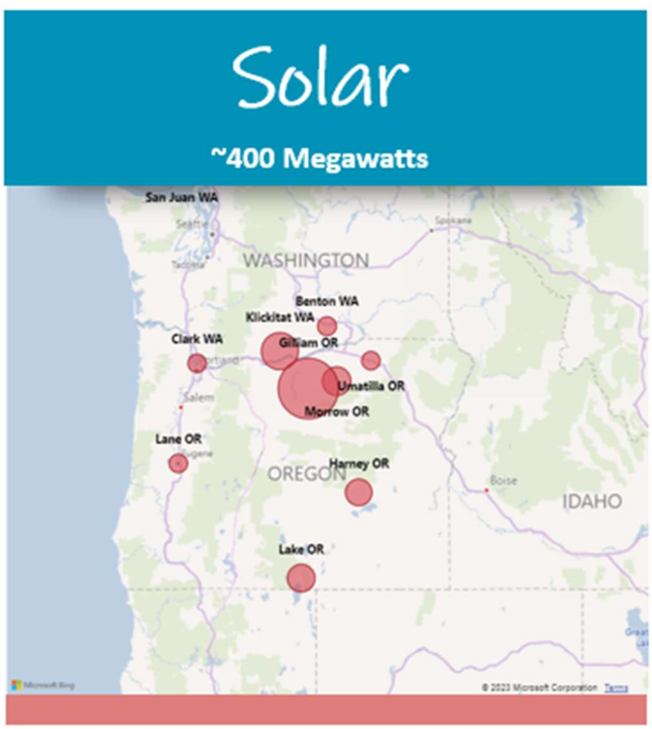


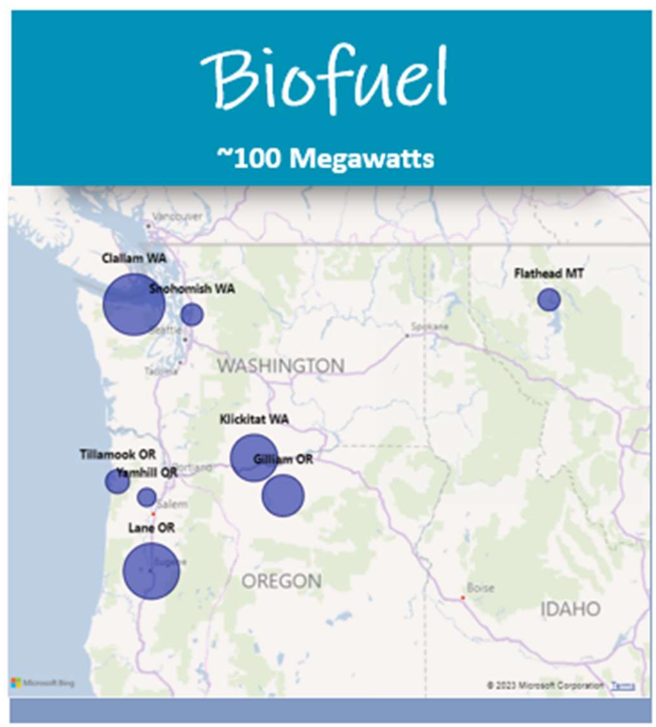
Queue Number	Bundle Status	Generator Type (Inc. Hybrids)	Megawatt Total
G0099	CONSTRUCTION	Wind Turbine	600
G0238	COMPLETION IN PROCESS	Wind Turbine	202
G0367	CONSTRUCTION	Photovoltaic	202
G0521	COMPLETION IN PROCESS	Photovoltaic	20
G0578	CONSTRUCTION	Photovoltaic Energy Storage	160
G0586	CONSTRUCTION	Photovoltaic	100
G0677	COMPLETION IN PROCESS	Photovoltaic Energy Storage	400
G0861	COMPLETION IN PROCESS	Wind Turbine	617

1.2.6 Generation Interconnection Requests in Completion Phase





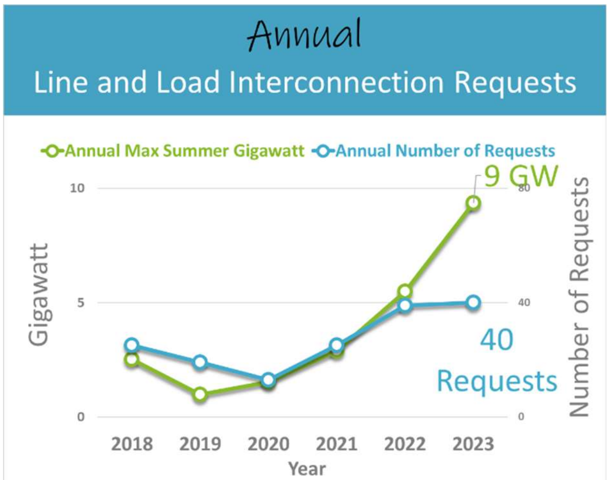


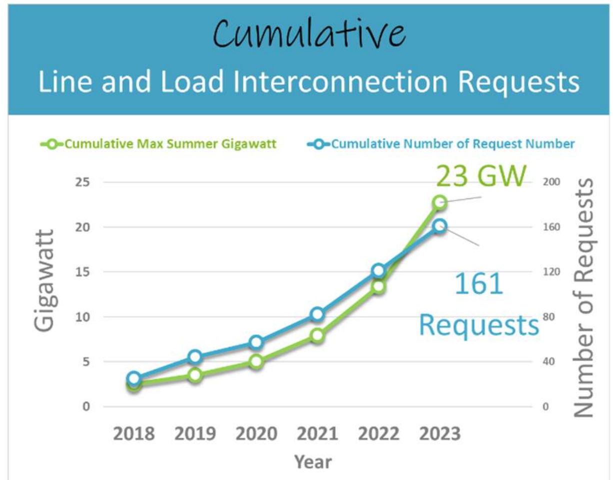


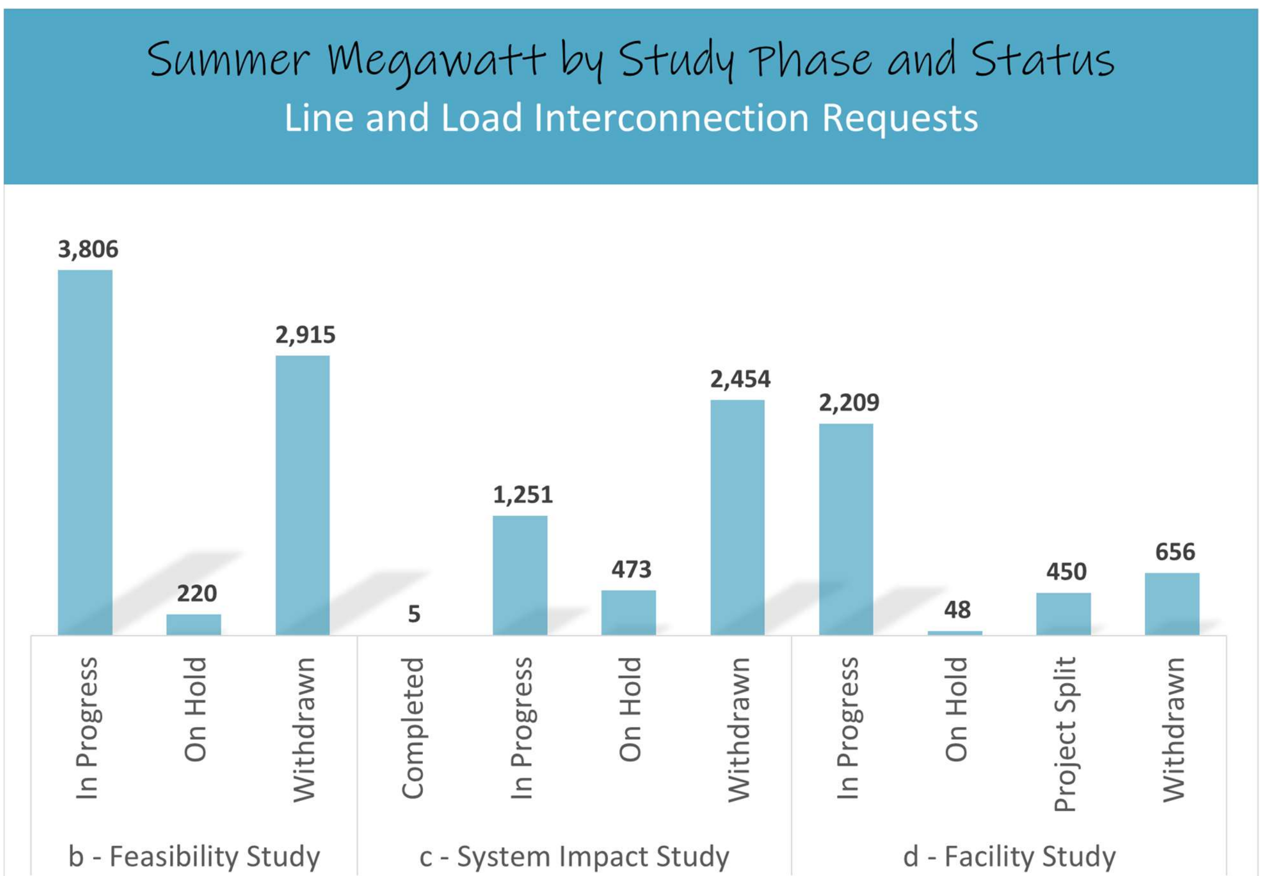
1.3 Line and Load Interconnection Requests

1.3.1 Number and Status of Line-Load Interconnection Requests

BPA operates two transmission interconnection request queues. Generation interconnection requests are to connect new resources to the grid. Line and load interconnection requests are to serve ***new load growth***. In recent years BPA has experienced substantial growth in the line and load queue as customers submit requests. As of late December, in 2023 BPA received 40 requests with an associated nine gigawatts. Requests that are in the study phase (and exclude withdrawn requests) there are 4 gigawatts in the feasibility study phase, 1.7 gigawatts in the system impact study phase, and 2.7 gigawatts in the facility study phase.

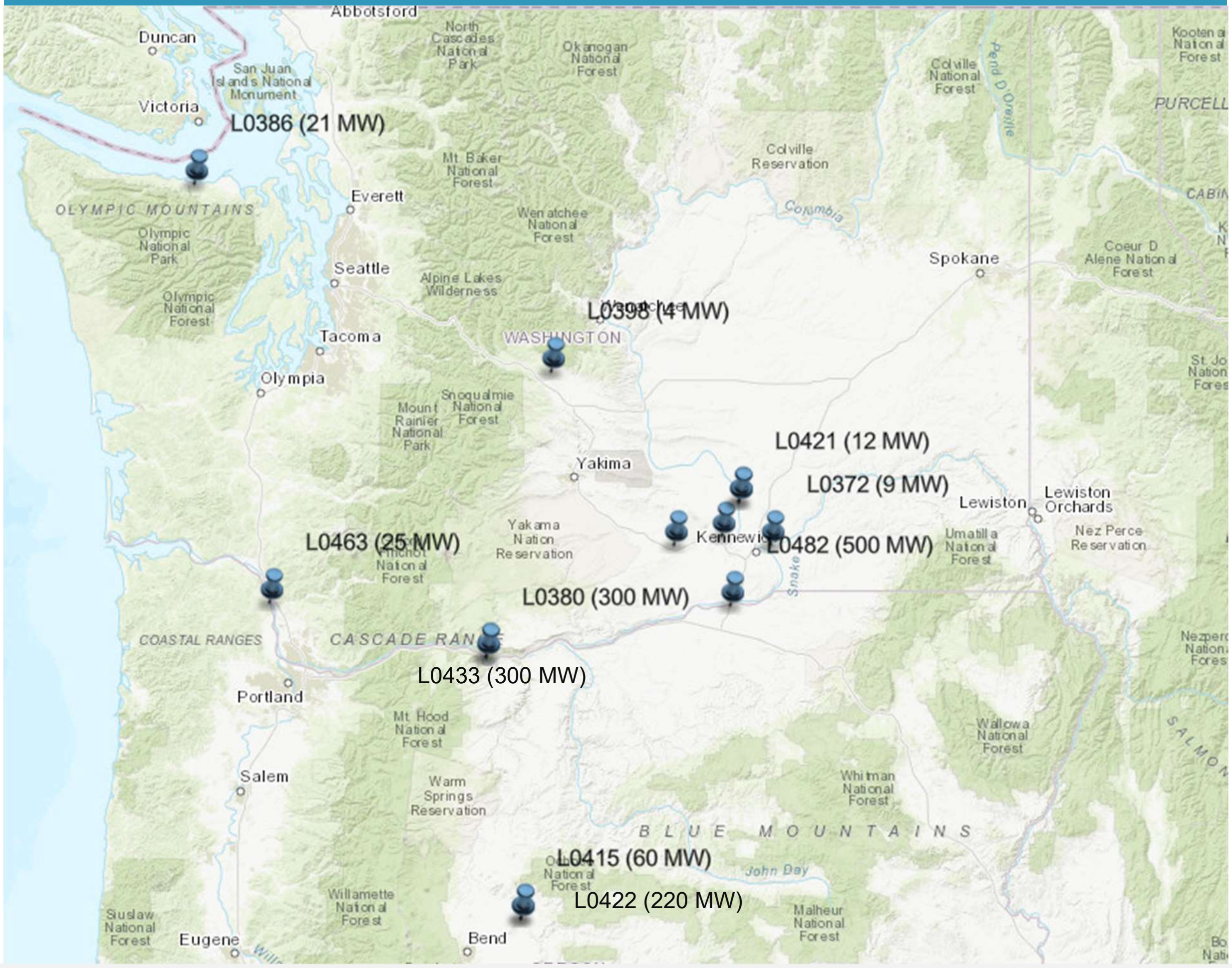






1.3.2 Line-Load Interconnection Requests in Construction or Completion Phase

13 Requests -> 1.5 Gigawatts



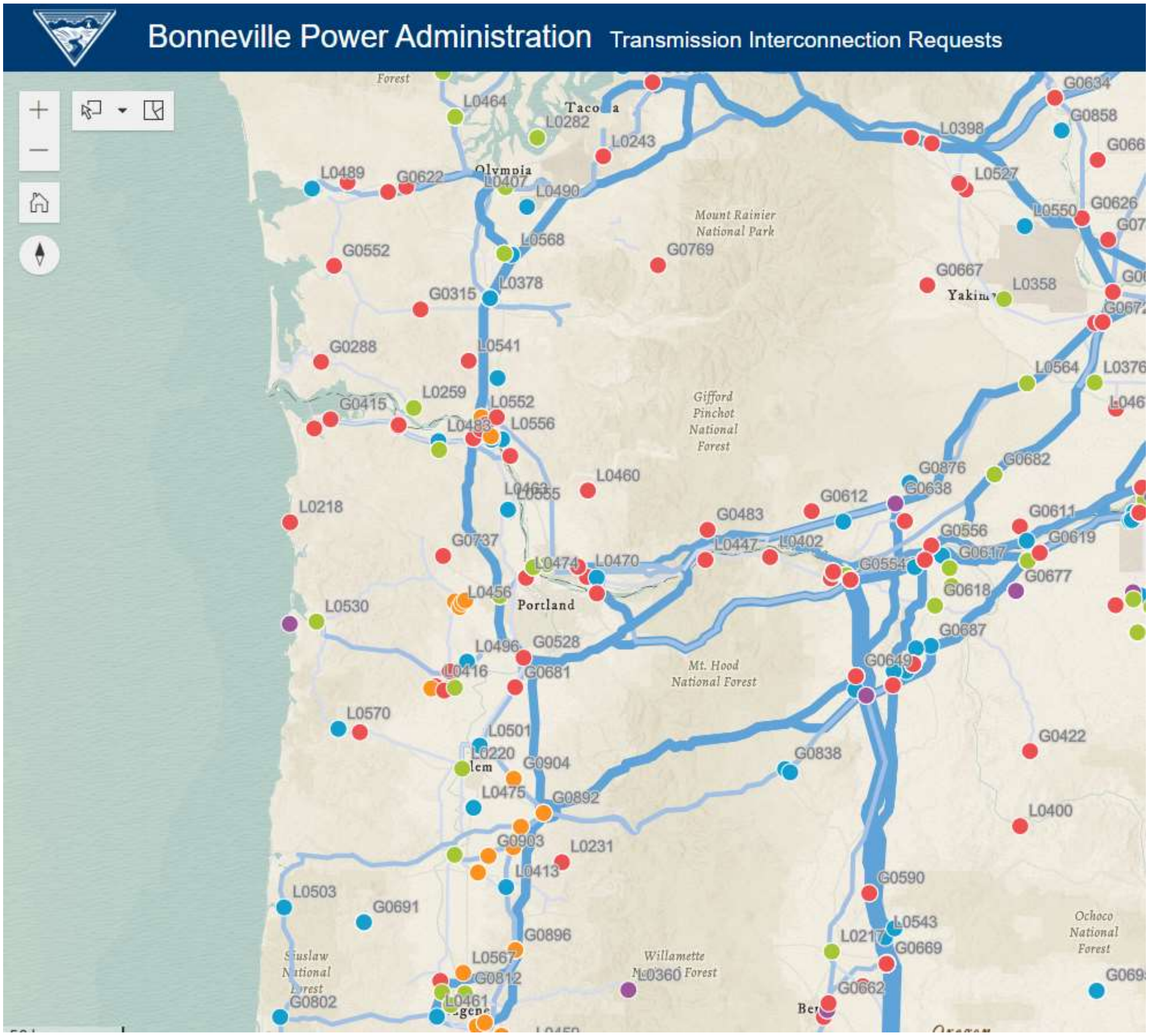
Queue Number	Bundle Status	Maximum Summer Megawatt
L0372	COMPLETION IN PROCESS	9
L0380	CONSTRUCTION	300
L0386	CONSTRUCTION	21
L0398	COMPLETION IN PROCESS	4
L0409	CONSTRUCTION	31
L0415	COMPLETION IN PROCESS	60
L0421	COMPLETION IN PROCESS	12
L0422	CONSTRUCTION	220
L0433	CONSTRUCTION	300
L0455	CONSTRUCTION	7
L0463	CONSTRUCTION	25
L0467	CONSTRUCTION	10
L0482	CONSTRUCTION	500

1.4 New Interconnection Request Map Tool

The information provided in the Interconnection Request Map tool serves as a guide on where interconnection requests are located. It is for informational purposes only. Interconnection status and study information is available for each request. The tool provides map overlays for Bonneville transmission lines, natural gas pipelines, NREL wind capacity factor, and solar irradiance in conjunction with interconnection requests.

For users, clicking on an interconnection dot will provide a pop-up menu of request details and transmission line information. Hyperlinks to completed studies are available in the data menu that can be viewed by clicking on the arrow at the bottom of the map. The Legend, Layers, Filter, and Search functions are available in the upper right-hand corner of the map. The user can also select a specific base map from a menu of options including terrain, streets, topographic, and imagery.

[Generation Interconnection Request Viewer (arcgis.com)]

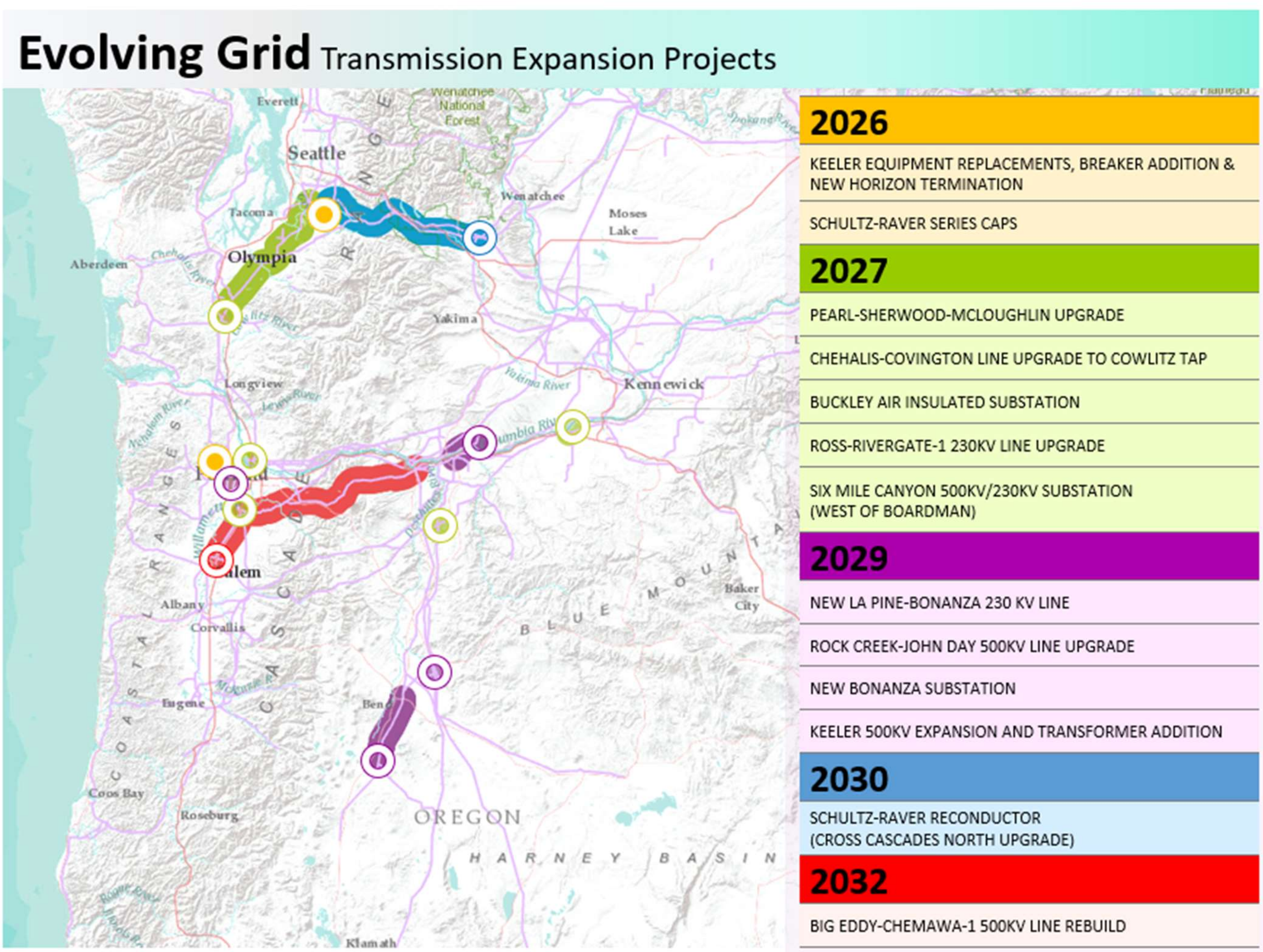


1.5 Transmission Service Requests Cluster Study Update

The Transmission Service Requests Study and Expansion Process (TSEP), which includes the Cluster Study, is the process where BPA responds to eligible requests for transmission service on the BPA network and determines where there is insufficient long-term firm (LTF) capacity. Where existing system capability is not adequate to accommodate the requested service, BPA identifies system reinforcements, or projects, that allow BPA to accommodate the incremental requests for service. Results from the ongoing TSEP Process and Cluster Study will be available at the end of 2023 or early 2024.

1.6 Evolving Grid Project Map

Due to progressive de-carbonization policies in the states of Washington and Oregon, accelerated need for carbon-free resources, load growth accelerating due to high-tech industries, climate change challenges due to extreme temperatures and wildfires are creating a rapidly evolving Northwest landscape. The following Evolving Grid transmission expansion projects are in development to address these challenges.



2. OATT Attachment K Overview

2.1 Responsibilities

The planning processes described in BPA Open Access Transmission Tariff (OATT) Attachment K are intended to result in plans for the Transmission Provider's Transmission System which is updated annually. This planning process supports the responsibilities of BPA under other provisions of its OATT to provide transmission and interconnection service on its transmission system.

Attachment K describes the process by which BPA intends to coordinate with its transmission customers, neighboring transmission providers, affected state authorities, and other stakeholders. Neither Attachment K, nor the BPA Plan, dictates or establishes which investments identified in a BPA Plan should be made, or how costs of such investments should be recovered. BPA decides which of such identified investments it will make taking into consideration information gathered in the planning process described in Attachment K, and any process required by the National Environmental Policy Act but retains the discretion to make such decisions in accordance with applicable statutes and policies.

Attachment K describes a planning process that contemplates actions by not only the Transmission Provider and its customers under this OATT, but also others that may not be bound to comply with this Attachment K, such as other transmission providers (and their transmission or interconnection customers), States, Tribes, WECC, sub-regional planning groups, and other stakeholders and Interested Persons.

BPA is obligated as specified in Attachment K to participate in planning activities, including providing data and notices of its activities, and soliciting and considering written comments of stakeholders and Interested Persons. However, Attachment K contemplates cooperation and activities by entities that may not be bound by contract or regulation to perform the activities described for them. Failure by any entity or Person other than the Transmission Provider to cooperate or perform as contemplated under this Attachment K, may impede, or prevent performance by the Transmission Provider of activities as described in this Attachment K.

BPA uses reasonable efforts to secure the performance of other entities with respect to the planning activities described in Attachment K, but is not obligated for ensuring the cooperation or performance by any other entity described by Attachment K. For example, if and to the extent any Transmission Customer or other entity fails to provide suitable data or other information as required or contemplated by Attachment K, the Transmission Provider cannot effectively include such customer and its needs in the Transmission Provider's planning.

2.2 Planning Cycle

BPA Transmission Services conducts system planning meetings in accordance with its Open Access Transmission Tariff Attachment K. One of the primary objectives of Attachment K, outlined under FERC Order 890, is the development of a transmission expansion plan that covers a ten-year planning horizon. This plan identifies projected transmission reinforcements based on forecasted load growth, projected firm transmission service commitments, interconnection requests, and system reliability assessments. The objective of the assessment is to test the reliability of the transmission system under a variety of system conditions.

Attachment K is an annual cycle that spans the calendar year - January to December. Below is a diagram depicting the overall Attachment K Planning cycle. The process begins with area planning which is conducted by the Planning Engineers. The engineers use the power flow model of the transmission system and conduct technical studies. Once that process is completed, the next stage is developing draft plans of service and producing the System Assessment Summary Report. The purpose of this report is to document BPA's Annual System Assessment and provide evidence of compliance with the NERC Planning Standard TPL-001-4. The NERC Standard TPL-001-4 requires that BPA conduct an annual assessment to ensure that the BPA transmission system is planned to meet the required performance for the system conditions specified in the Standard. Finally, the Transmission Plan is developed and published by year's end. The purpose of the Transmission Plan is to document the projected transmission projects in BPA's service territory for the next ten years. It includes transmission needs identified from the annual reliability system assessment, transmission service requests and new generation and line and load interconnection requests. At least two public meetings and postings occur during the Attachment K Planning cycle to share transmission planning information with customers and stakeholders.

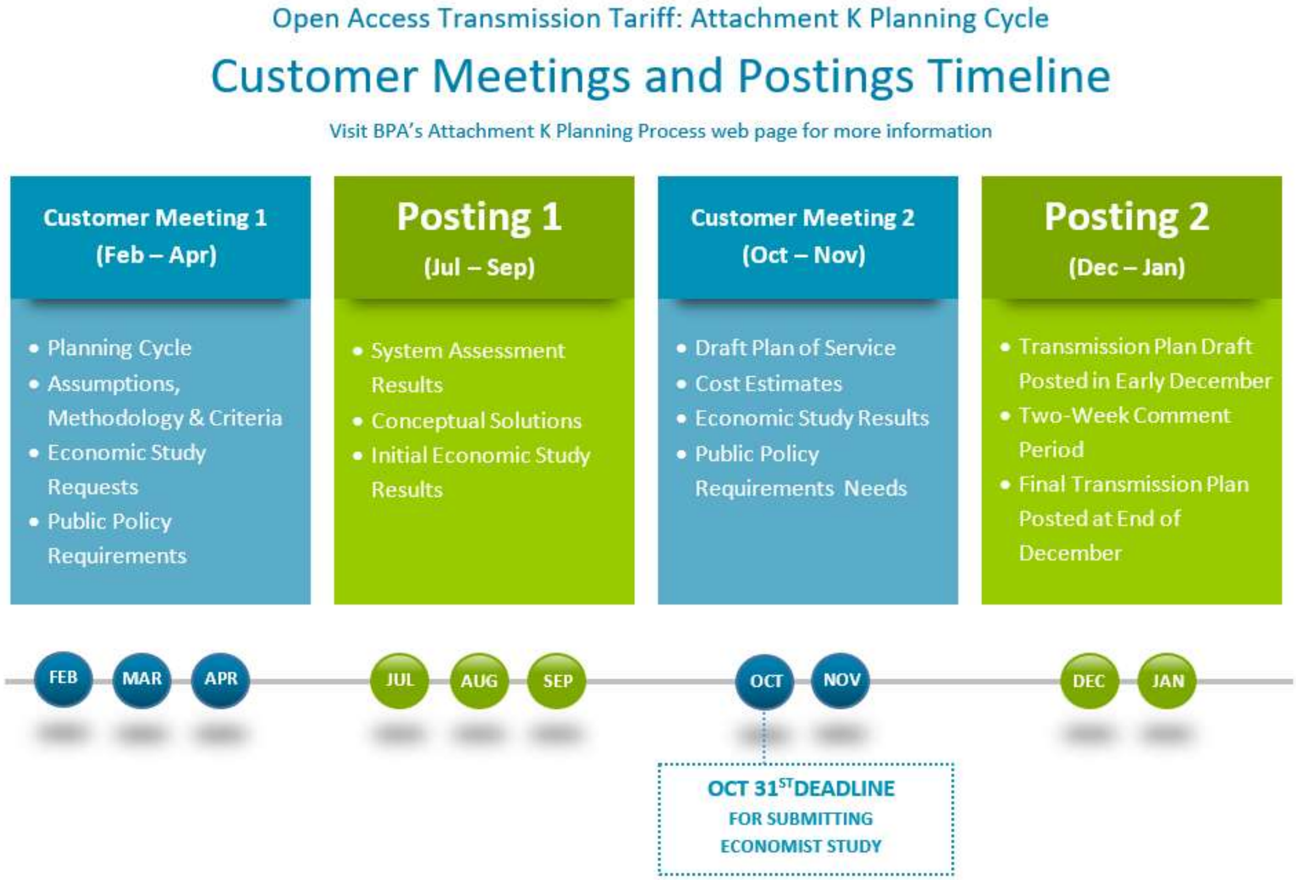


Figure 1 Attachment K Planning Cycle

2.3 Public Meetings and Postings Cycle

Transmission Planning conducts system planning meetings in accordance with Attachment K of the BPA Open Access Transmission Tariff (OATT). These meetings provide customers and interested parties the opportunity to discuss and provide input to the studies and development of the plans of service.

BPA provides information about the Transmission Services Attachment K process including notifications of meetings, results of planning studies, plans of service and other reference information on its web site. To request participation in the Planning Process, complete and email the Participation Request form.

2.4 Economic Study Requests

As part of BPA's Attachment K Planning process economic studies may be requested by customers to address congestion issues or the integration of new resources and loads. BPA will complete up to two economic studies per year at its expense. A customer may make a request for an economic study by submitting a request to PlanningEconomicStudyRequest@bpa.gov. A request may be submitted at any time. A request submitted after October 31 will be considered in the next annual prioritization process.

The Transmission Provider will hold a public meeting to review each request that has been received for an Economic Study and to receive input on such requests from interested persons. The Transmission Provider may review Economic Study Requests as part of its regularly scheduled Planning Meetings as outlined in in Attachment K.

After consideration of such review and input, a determination will be made as to whether, and to what extent, a requested Economic Study should be clustered with other Economic Study requests and whether a study is considered a high priority. BPA funds high-priority economic studies. Any studies determined not to be high priority will not be performed by BPA, but BPA may assist in finding an alternate source for performing the studies.

3. Transmission Planning Processes

3.1 Planning Process Overview

The main purpose of Transmission Planning is to identify solutions and develop plans of service to meet the future needs of the BPA transmission system. Transmission Planning identifies transmission projects based on three broad categories: system assessment, customer requests for transmission service on BPA's system, and generator and line and load interconnection customer requests.

Figure 2 Planning Key Drivers Diagram

3.1.1 System Planning

BPA plans the transmission system to serve expected loads and load growth for at least the next ten years based on forecasts. The forecasted peak loads, plus existing long-term firm transmission service obligations, are used to determine the system reinforcement requirements for reliability. BPA plans the system in accordance with the NERC Planning Standards and WECC Regional Criterion to maintain system reliability. BPA has divided its service area into load service areas grouped by either electrical or geographical proximity. The load areas in the Transmission Needs section are listed in order from largest to smallest, based on total estimated load served in each area.

3.1.2 Transmission Service Requests

Qualified customers may request long-term firm transmission service on BPA's transmission system. This service is requested through Transmission Service Requests (TSR) according to the terms of the BPA OATT. TSRs are one of the drivers for system expansion projects. BPA manages these customer requests for transmission service through the Transmission Service Request and Expansion Process (TSEP).

3.1.3 Generator Interconnection Service Requests

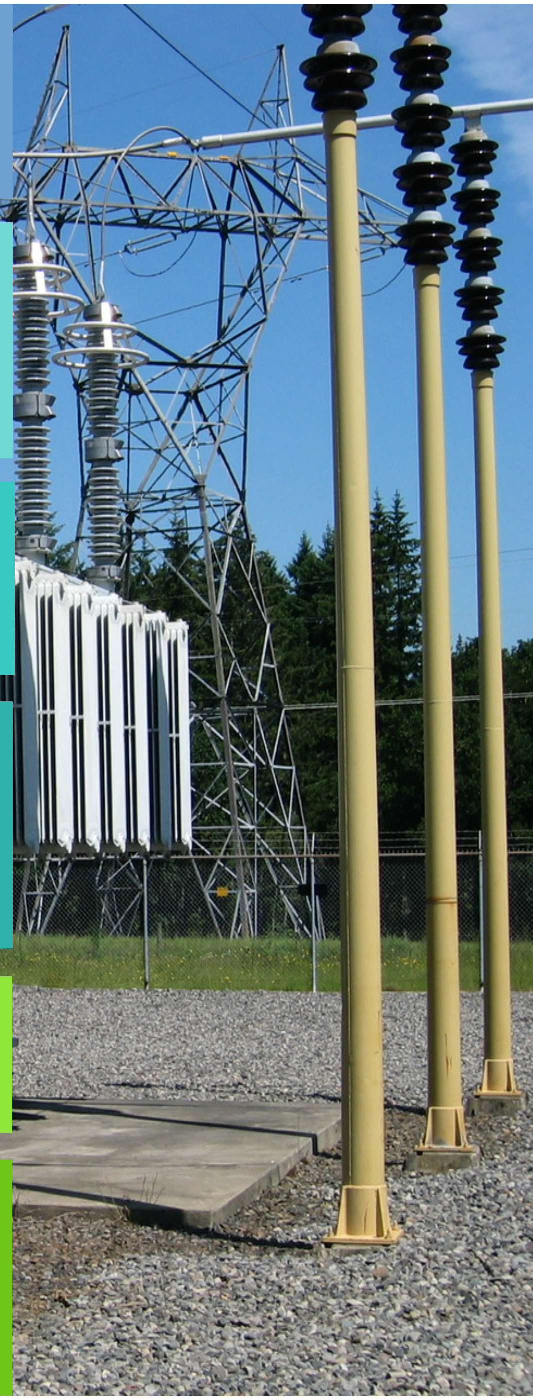
Qualified customers may request interconnection to BPA's system for interconnecting new generation. BPA receives Generator Interconnection (GI) Requests according to the Attachment L (Large Generator Interconnection Process) and Attachment N (Small Generator Interconnection Process) of the BPA OATT. The Generator Interconnection projects listed in this T-Plan include projects over 20 MW (Large Generator Projects) which have an executed Large Generator Interconnection Agreement (LGIA).

3.1.4 Line and Load Interconnection Service Requests

Qualified customers may request new points of interconnection on BPA's transmission system. These Line or Load Interconnections (LLI) are typically for new load service or to allow the Customer to build or shift the delivery of service to different points on their system. This service is requested according to BPA's Line and Load Interconnection Procedures Business Practice.

Reliability Study Process

System Planning



Verification of Study Need

The NERC TPL-001-5 Standard allows system assessments to be based on the results of qualified past studies if they are still valid.

Base Cases

Transmission Planning's assessment includes the creation of study base cases starting with WECC approved base cases from the latest WECC Study Program. Additional base cases are created as necessary to cover other conditions that may need to be studied.

Technical Studies

The study process ensures all load areas and paths are evaluated to meet all applicable NERC Planning Standards and WECC Criterion.

Corrective Action Plans

If transmission system performance is not adequate to meet NERC and WECC performance requirements, the study process includes the development of corrective action plans as required. These include system additions and upgrades or remedial action schemes, or operating procedures.

Findings

Findings are documented in detailed planning area and path study reports.

Results

The System Assessment Summary Report is shared with adjacent Transmission Planners and Planning Coordinators after the technical studies are completed, detailed reports are finalized, and the System Assessment Summary report is completed.

Figure 3 Reliability Study Process – System Planning Diagram

3.2 System Planning

Each year, Transmission Planning conducts a comprehensive assessment of BPA's transmission system to ensure compliance with applicable North American Electric Reliability Coordination (NERC) Planning Standards and Western Electricity Coordinating Council (WECC) Regional Criteria. (WECC is the Regional Reliability Organization for NERC.) The NERC Standards TPL-001-4 require that BPA conduct an annual assessment to ensure that the BPA network is planned such that it can operate reliably over a broad spectrum of system conditions following a wide range of probable contingencies over the near-term (one to five years) and long-term (six to ten years) planning horizon while meeting the established reliability standards. The assessment covers a 10-year planning horizon. To meet NERC Planning Standard TPL-001-4, Corrective Action Plans are developed if studies identify potential performance deficiences. These corrective action plans are required in order to provide acceptable performance for contingency events as well as all lines in-service conditions. With these corrective action plans, BPA's system performance is acceptable and meets the requirements of the TPL-001-4 Standard. Deficiencies in meeting these standards are noted and addressed in the System Assessment Summary Report.

3.2.1 Verification of Study Need

For each load area and path, either new studies were conducted or qualified past studies were used to ensure that existing and forecast load is served, and transmission system reliability is maintained over a broad spectrum of system conditions throughout the planning horizon and that existing or newly identified corrective action plans, such as system reinforcements, are adequate. The NERC TPL-001-5 Requirement 2.6 states that qualified past studies may be used to support the Planning Assessment if the study is 5 years old or less and no material modifications have occurred to the System represented in the study. Those load areas or paths that relied on qualified past studies include a technical rationale to describe why the past studies can be relied upon for the 2023 System Assessment.

For each load area and path, the following are reviewed to determine if the previous studies are still valid:

1. Topology
2. Historic load peaks
3. Path firm transmission service obligations below TTC in the Planning Horizon
4. Load forecast and generation patterns
5. New or retired generation or loads interconnected to the transmission system.
6. Known transmission or generator outages.

3.2.2 Base Cases

The purpose of base case development is to provide sufficient base cases that can be used as the starting point for the technical studies that are required by applicable reliability standards such as Transmission Planning Standard TPL-001-5 and others. The NERC TPL-001-5 Standard outlines a minimum of seven cases.

Transmission Planning's assessment includes the creation of study base cases starting with WECC approved base cases from the latest WECC Study Program. Additional base cases are created as necessary to cover other conditions that may need to be studied. If there is not an appropriate WECC approved base case in the latest WECC Study Program, the latest WECC approved base case from the previous WECC Study Program or from the previous year's assessment, whichever is later, are modified to reflect the corresponding year and season. For the years when new cases are not developed, the previous year's cases are updated for any study needs identified.

Transmission Planning works with BPA's Transmission Grid Modeling (TPMG) group to determine which cases are needed for area planning purposes and the annual System Assessment. Considerable work is completed on base cases outside of Transmission Planning and prior to the planning process. WECC produces approved cases and TPMG reviews and updates those approved base cases (known as seed cases) with the latest information available, including updates to topology, ratings, impedances, and loads.

BPA's Load Forecasting and Analysis group is responsible for activities related to forecasting customer load and resource planning including coordinating, managing, overseeing, and directing research into customer loads. These activities result in forecasts of average and peak loads for BPA transmission long-term planning and power needs.

The base cases are reviewed in more detail and then modified based on individual load areas and paths as follows.

- Stressing paths to appropriate limits for the area of study,
- Verifying generation patterns that affect the area of study,
- Verifying load forecast based on expected conditions and historical data for the load area,
- Verify system additions and/or modifications in the area of study,
- Verify generation additions or changes in the area of study.

3.2.3 Technical Studies

The study process ensures all load areas and paths are evaluated to meet all applicable NERC Planning Standards and WECC Criterion. The study process also includes establishment and annual maintenance for standardizing tools, parameters, and assumptions, and continuing improvement of the process. Short circuit analysis is conducted in BPA's High Voltage Engineering group on an annual basis. Transmission Planning provides assumptions to the High Voltage group of projects to include in the analysis for the next five years. Results of the short circuit analysis and any corrective action plans that result from that study (such as circuit breaker replacements) are included in the System Assessment.

3.2.4 Corrective Action Plans

If transmission system performance is not adequate to meet NERC and WECC performance requirements, the study process includes the development of corrective action plans as required. These include system additions and upgrades or remedial action schemes. These plans take into consideration non-wire solutions, existing remedial action schemes, and operating procedures. The corrective action plans are studied to ensure they provide adequate system performance. If there are multiple alternatives, the best overall plan is recommended. If a non-wires solution is identified it is coordinated with the non-wires team to determine feasibility of the solutions.

3.2.5 Technical Study Findings

After the study process is complete the findings are documented in detailed area and path study reports. If a previous year's detailed report is still valid, a validation report is completed. This type of report includes the verification checks that support the conclusion that a new study is not required, and reference to the previous study report.

3.2.6 BPA Communicates System Assessment Results

The System Assessment Summary Report is shared with adjacent Transmission Planners (TPs) and Planning Coordinators (PCs) after the technical studies are completed, detailed reports are finalized, and the System Assessment Summary report is completed. If individual areas or paths are adjacent to TPs and PCs and problems are identified, the respective planners for those areas and paths coordinate with those TPs and PCs to resolve common issues.

3.2.7 System Planning Cycle

System Planning is performed annually. Data collection and modeling occurs at the forefront of the system planning process. Detailed technical studies are performed to gauge the performance of the transmission system with respect to NERC standards and WECC criteria. These studies eventually result in identifying and testing new transmission reinforcements (corrective action plans), where required. When the detailed technical studies are completed, the results are used to develop the System Assessment Summary Report, and the Summary Report is used to document compliance.

Cluster Study Process
Transmission Service Requests

The purpose of the Cluster Study is to determine how much available transfer capability can be offered and which new facilities, if any, will be required to accommodate customer requests for transmission service.

Determination of Areas

Requests with similar points of receipt that are close enough to cause similar impacts on the transmission system are combined. Similarly, requests with similar points of delivery that are close enough to cause similar impacts on the transmission system are combined. These combinations result in forming Cluster Study areas that are studied together in more detail to identify plans of service that can accommodate the requested service.

Technical Studies

Detailed technical studies are performed on each of the study areas to define the actual reinforcements needed. These studies consider a combination of firm and non-firm uses of the system including load growth, interconnection projects, and projects on adjacent systems that are included in traditional planning methods.

Sub-Grid Check

Following the assessment of Available Transfer Capability (ATC), BPA performs a sub-grid check on each request to consider impacts on other facilities that are not part of the monitored flow gates. The sub-grid checks rely on operational experience and previous studies (such as Generation Interconnection studies) to identify where reliability concerns exist.

Selection of Projects

Based on the study's results potential projects are identified. Plans of service are developed for requests that require system reinforcement.

Cluster Study Report

The Cluster Study report summarizes the findings of the analysis and power flow modeling that is conducted and includes a list of projects.

3.3 Transmission Service Requests

BPA customers may submit long-term transmission service (TSR) requests. Transmission Planning's tariff obligations for TSRs include Sections 19 and 32 of the BPA Open Access Transmission Tariff (OATT). Section 19 pertains to additional study procedures for firm point-to-point (PTP) and Section 32 pertains to network integration (NT) transmission service requests. Specifically, Sections 19.1 through 19.6 of the OATT address the System Impact Study (SIS) and Facilities Study (FAS) procedures for firm point-to-point customers. Sections 19.10 and 32.6 address the Cluster Study (CS) procedures. Transmission Planning conducts the additional studies as prescribed in the OATT.

3.3.1 The Transmission Service Requests Study and Expansion Process (TSEP)

The Transmission Service Requests Study and Expansion Process (TSEP) is BPA's process to manage and respond to Long-Term Firm TSRs on the BPA network. The TSEP is a process to plan for and grant transmission service to Network (NT) customers consistent with BPA's statutory authorities and BPA's tariff obligations while granting timely service to those customers seeking point-to-point (PTP) service. It is intended to be a repetitive and effective process that provides a balance in serving different customer classes (PTP and NT) on a non-discriminatory basis.

3.3.2 Determination of Cluster Study Areas

For all TSRs that require further evaluation TPP determines transmission reinforcements to accommodate the requested service, BPA-TS combines TSRs with similar PORs (i.e., those PORs that are close enough to cause similar impacts on the transmission system); similarly, BPA-TS combines TSRs with similar PODs (i.e. those PODs that are close enough to cause similar impacts on the transmission system). These combinations result in forming Cluster Study areas that are studied together in more detail to identify plans of service that can accommodate the requested service.

Detailed technical studies are performed on each of the study areas to define the actual reinforcements needed. These studies consider a combination of firm and non-firm uses of the system including load growth, interconnection projects, and projects on adjacent systems that are included in traditional planning methods. The result is a more robust transmission expansion plan to meet the expected, as well as requested, obligations of the system.

3.3.3 TSEP Cluster Study

Transmission Planning conducts the Cluster Study analysis of TSRs and determines the transmission reinforcement requirements to accommodate the TSRs. The purpose of the Cluster Study is to determine how much available transfer capability can be offered and which new facilities, if any, will be required to accommodate customer requests for transmission service. A Cluster Study simultaneously evaluates, by aggregating multiple TSRs into a cluster, all customer requests for long-term firm transmission service and evaluates total demand across its network paths.

3.3.4 Cluster Study Process

BPA customers who request transmission service may do so during a limited-time submission window. After the request for transmission service window closes, agreements are offered to all eligible customers who made a TSR. This agreement obligates the customer to pay for its pro-rata share of the Cluster Study costs.

The transmission queue is first restacked by removing TSRs for which customers failed to return an executed agreement including sufficient data exhibits. The remaining TSRs are evaluated to see if existing long-term available transfer capability (LT ACT) can accommodate any potential offers of service. TSRs with cumulative material impacts that exceed the LT ATC for any impacted flow gate are included in the Cluster Study. BPA then determines if it can make offers of service based on existing LT ATC to any of the TSRs that remain in the queue.

Transmission Planning performs a Cluster Study to determine additional facilities, if any, required to accommodate service to TSRs for which there is insufficient LT ATC. Transmission Planning proceeds with detailed technical studies and flow-based studies. Based on the study's results, potential projects are identified.

The Cluster Study includes the following fundamental elements:

- Determine which requests could be accommodated by the existing system.
- Determine which requests require system reinforcement.
- Develop plans of service for requests that require system reinforcement.
- Demonstrate that the interconnected transmission system, together with the identified reinforcements, can accommodate the requested service.

3.3.5 ATC and Sub-Grid Assessment

BPA performs an Available Transfer Capability (ATC) assessment for each TSR – paired with a sub-grid check – to determine which TSRs can be served by the existing system or which TSRs would need reinforcements to provide the requested service.

The assessment considers BPA's pending queue for long-term firm transmission service after all TSRs are removed for customers that elected not to sign a Customer Service Agreement. Remaining TSRs are evaluated to see if any potential offers of service based on the impacts from requested Points of Receipt (POR) and Points of Delivery (POD) on BPA's Network can be made.

Following the assessment of ATC, BPA performs a sub-grid check on each TSR to consider impacts on other facilities that are not part of the monitored flow gates. The sub-grid checks rely, to the maximum extent possible, on operational experience and previous studies (such as Generation Interconnection studies) to identify where reliability concerns exist.

If the combined ATC assessment and the sub-grid check confirm that the existing system can accommodate the requested service, the TSR is considered for authorization. If a TSR has non-*de minimis* impacts that exceed the ATC for any flowrate or has an adverse sub-grid impact, the Cluster Study further evaluates the TSR to identify the transmission expansion necessary to provide the requested service.

3.3.6 TSEP Cluster Study Report

The Cluster Study report summarizes the findings of the analysis and power flow modeling that is conducted and includes a list of projects. It also provides information about the methodology employed for the current Cluster Study, including study areas, generation scenarios, and generation sensitivities. It may also provide background on projects completed outside TSEP and projects from the previous TSEP, and other reliability or load service projects.

3.3.7 TSEP Cluster Study Cycle

2023 TSEP Cluster Study Cycle

The 2023 Cluster Study was delayed due to the high volume and complexity of requests for service and BPA's customer collaborative approach to address 2023 Cluster Study Data Exhibit deficiencies. While the original plan was to complete the 2023 Cluster Study in early May, BPA Transmission expects to provide study results to the 2023 Cluster Study participants in January of 2024.

2024 TSEP Cluster Study Cycle

The additional time required to complete the 2023 Cluster Study has impacted the time available for the 2024 Cluster Study. BPA believes it is a better use of resources to skip 2024 and commence the yearly Cluster Study schedule starting with the 2025 Cluster Study.

2024 TSEP Cluster Study Cycle Update

The Bonneville Power Administration announced that it will not run a 2024 TSEP Cluster Study and expects to run the 2025 TSEP Cluster Study next summer 2024. The primary reasons for this action are the complexity and magnitude of the 2023 TSEP Cluster Study and reallocation of resources to other transmission study priorities between now and summer 2024.

Each of the past three years, cluster studies have grown in volume and complexity due to the impact of clean energy requirements in Northwest states, incentives to produce renewable resources, electrification, and other factors. In addition to the increased study participation, the impacts on neighboring Balancing Authorities and customer systems are an additional factor that adds complexity and time. This growth in transmission cluster study participation mirrors the exponential growth of our interconnection queues.

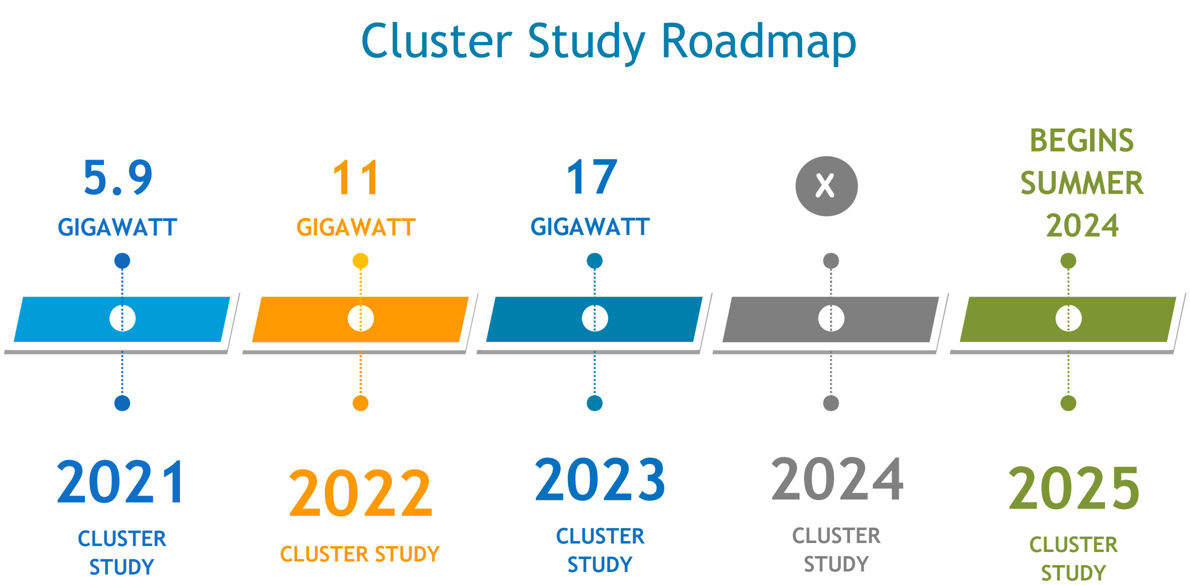


Figure 5 Cluster Study Roadmap

2025 Cluster Study Cycle

BPA plans to start the transmission cluster study process again in summer 2024 with the 2025 TSEP Cluster Study. BPA will continue to evaluate requests between now and the next cluster study and requests that do not require study will continue to be offered service. BPA is committed to being responsive to customer needs and keeping customers informed as BPA and the region move forward.

TSEP Phases Diagram

More information about the Transmission Service Requests Study and Expansion Process (TSEP) Business Practice is available on the BPA website at [TSR Study and Expansion Process (TSEP) (bpa.gov)](). The Business Practice document describes the BPA TSEP and provides information regarding requirements for customer requests for individual study of services requests.

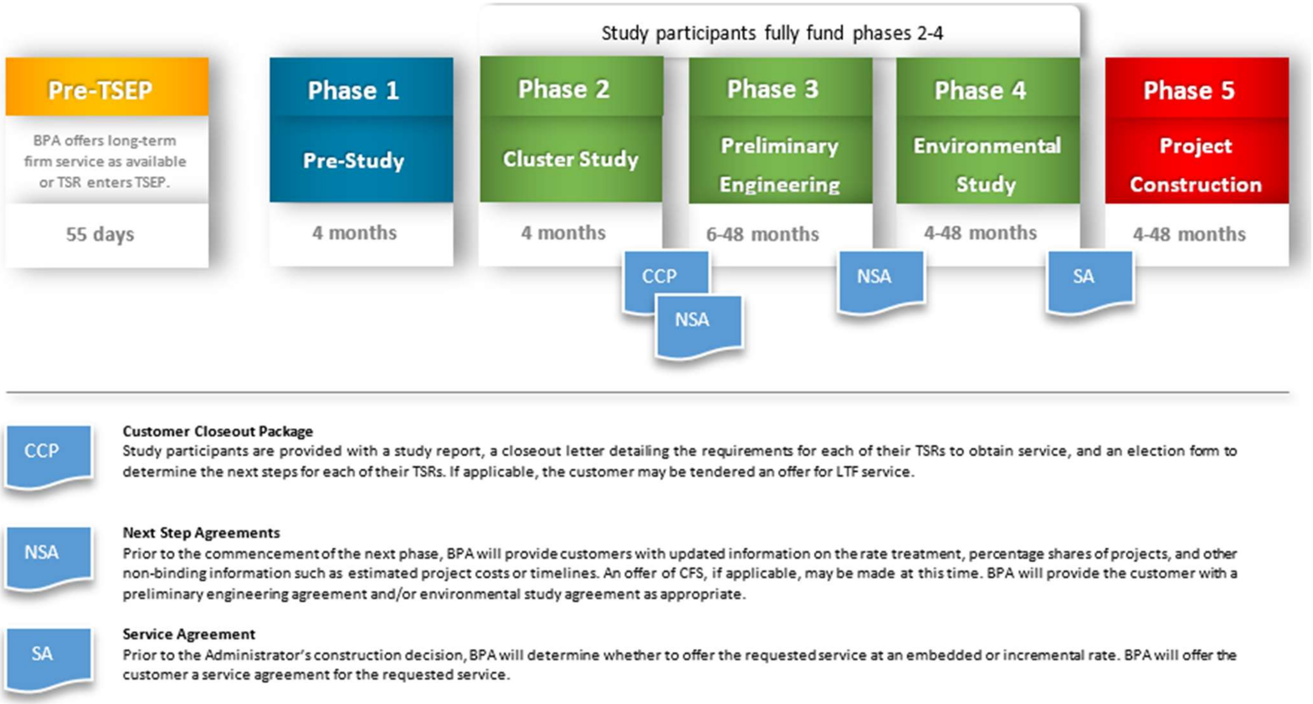


Figure 6 TSEP Phases Diagram

Interconnection Study Process
Interconnection Service Requests

Interconnection Request

When a customer makes a request for a generator or line and load interconnection, Transmission Planning conducts and supports a series of up to three studies which are performed after a customer has signed an agreement for each study:

- Interconnection Feasibility Study [FES]
- Interconnection System Impact Study [ISIS]
- Interconnection Facilities Study [FAS]

Feasibility Study

The scope of the FES is to provide a high-level preliminary evaluation of the feasibility of the proposed interconnection to the transmission system. Execution of the FES Agreement is optional if BPA and the customer agree. If a FES is needed, Transmission Planning performs power flow steady state analysis, produces a sketch or draft project requirement diagram of the project, and determines typical costs and a schedule.

System Impact Study

Transmission Planning performs the ISIS to evaluate the impacts of the proposed interconnection to the reliability of the transmission system. A draft project requirements diagram is developed and a typical cost and schedule are determined.

Facilities Study

Transmission Planning provides a cost estimate to implement the conclusion of the Interconnection System Impact study including costs of equipment, engineering, procurement, and construction. The Facilities study also identifies the electrical switching configuration of the connection equipment, including transformers, switchgear, meters and other station equipment. This information is relayed in the form of a Project Requirements Diagram.

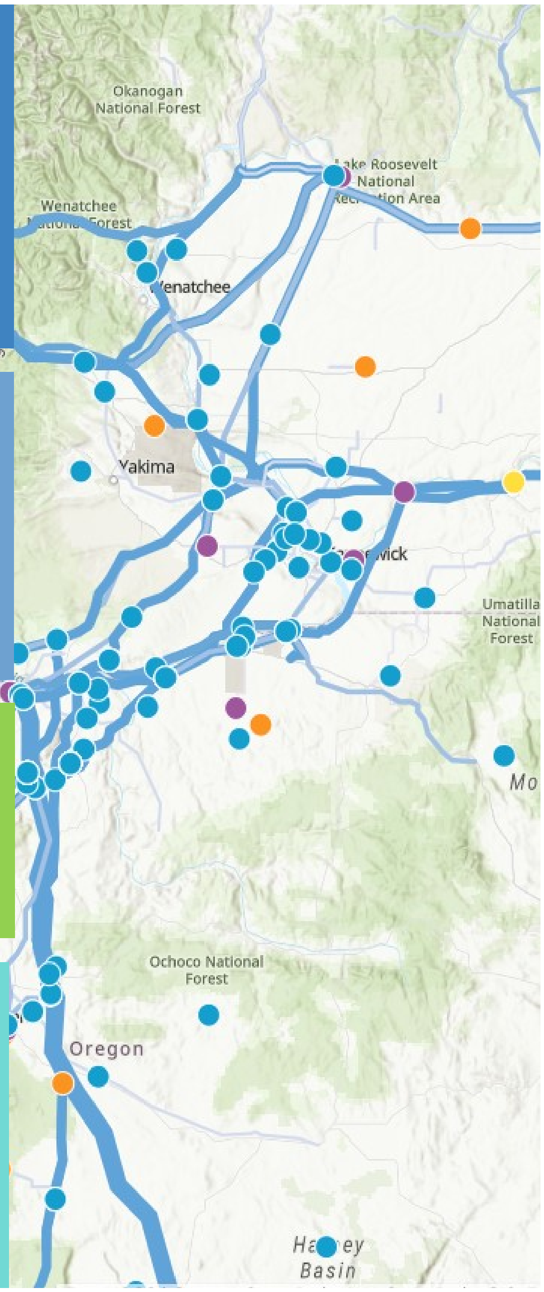


Figure 7 Interconnection Study Process Diagram

3.4 Interconnection Requests

Customers may request new points of interconnection on BPA's transmission system. Customers can also interconnect to existing points of interconnection such as an existing substation. Line or load interconnections (LLI) are typically for new load additions or to allow the customer to shift existing load to different points on their system. BPA customers may also request interconnection service to connect to BPA's system for new generation. Below, the customer driven projects process shows typical or expected timelines for each of the phases of project development process.

BPA Transmission Services provides services for interconnection to the Federal Columbia River Transmission System. BPA receives Generator Interconnection (GI) requests according to Attachment L Large Standard Generator Interconnection Procedures (LGIP) and Attachment N Standard Small Generator Interconnection Procedures (SGIP) of the BPA Open Access Transmission Tariff. The GI projects listed in this T-Plan include large (greater than 20 megawatts) generator interconnection projects.

3.4.1 Interconnection Requests Studies

When a customer makes a request for a generator or line and load interconnection, Transmission Planning conducts and supports a series of up to three studies which are performed after a customer has signed an agreement for each study:

- Interconnection Feasibility Study (FES)
- Interconnection System Impact Study (SIS)
- Interconnection Facilities Study (FAS)

3.4.2 Feasibility Study and Report

The scope of the FES is to provide a high-level preliminary evaulation of the feasibility of the proposed interconnection to the transmission system. Execution of the FES Agreement is optional if BPA and the customer agree. If a FES is needed, Transmission Planning performs power flow steady state analysis, produces a sketch or draft project requirement diagram of the project, and determines typical costs and a schedule. A feasiblity study report provides preliminary identification of any thermal or steady state voltage deficiencies; any circuit breaker short circuit capability limits exceeded as a result of the interconnection; and a non-binding estimated cost and a non-binding good faith estimated time to construct facilities required to interconnect to the transmission system and to address the identified short circuit and power flow issues. The customer pays a study deposit for the FES. The LGIP specifies 45 days for BPA Transmission Services to provide the FES report. The FES is followed up with a FES results review meeting conducted by BPA Customer Service Engineering.

3.4.3 System Impact Study and Report

Transmission Planning performs the ISIS to evaluate the impacts of the proposed interconnection to the reliability of the transmission system. In addition to steady state thermal and voltage analysis, voltage stability and transient stability analysis is performed, as well as analysis of short circuit capability limits. A draft project requirements diagram is developed and a typical cost and schedule are determined. The customer pays the study deposit for the ISIS. The ISIS report provides the identification of any thermal overload or voltage limit violations resulting from the interconnection; identification of any instability or inadequately damped response to system disturbances resulting from the interconnection; identification of any circuit breaker short circuit capability limits that could potentially be exceeded as result of the interconnection; and a description and non-binding, good-faith estimated cost and a non-binding, good faith estimated time to construct facilities required to interconnect the project to the transmission system and to address the identified short circuit, instability, and power flow issues. The LGIP specifies 90 days for BPA Transmission Services to provide the SIS report. The ISIS is followed up by a results review meeting with the customer.

3.4.4 Facilities Study and Report

Transmission Planning provides a cost estimate to implement the conclusion of the Interconnection System Impact study including costs of equipment, engineering, procurement, and construction. The Facilities study also identifies the electrical switching configuration of the connection equipment, including transformers, switchgear, meters and other station equipment. This information is relayed in the form of a Project Requirements Diagram. The FAS report provides a description, estimated cost, and schedule for required facilities to interconnect the project to the transmission system, and addresses any short circuit, stability, and power flow issues identified in the ISIS. The LGIP specifies 90 days for BPA Transmission Services to provide the FAS report with a +/- 20% cost estimate, or 180 days to provide a FAS report with a +/- 10% cost estimate. The BPA scoping process is now conducted during the facilities study phase and may extend the time to complete the study. The FAS report is followed up with a FAS results review meeting with the customer.

3.4.5 Generation Interconnection Request Reform

Section 9 of the Bonneville Power Administration's (Bonneville) Open Access Transmission Tariff (Tariff) provides that Bonneville's Administrator may use the procedures set forth in Section 212(i)(2)(A) of the Federal Power Act to modify terms and conditions of the Tariff.

In 2023, BPA engaged customers and stakeholders through a series of workshops to discuss potential reforms to its tariff to develop and implement a regional solution to improve BPA's Standard Large Generator Interconnection Procedures (LGIP). As a result, BPA conducted a TC-25 Terms and Conditions Tariff Proceeding to adopt reforms to BPA's LGIP.

BPA's TC-25 Settlement Proceedings provide a draft Attachment L and Attachment R to the Open Access Transmission Tariff. The proposed document is for settlement purposes only. Attachment L is for Standard Large Generator Interconnection Procedures including Standard Large Generator Interconnection Agreement. Attachment R is for the Large Generator Interconnection Transition Process.

The Transition Request Window shall open the date of the issuance of the Administrator's Final Decision of Record (ROD) in the TC-25 Tariff Proceeding and close 90 days calendar days after the issuance of the ROD in the TC-25 Tariff proceeding. The proposed effective date for the tariff is the date the ROD is issued.

Refer to the following BPA web pages for updates.

- BPA TC-25 Tariff Proceeding
- LGIP Study Process
- Large Generator Interconnection Procedures

4. 2023 System Assessment

The System Assessment demonstrates that Bonneville Power Administration (BPA) has met the North American Electric Reliability Corporation (NERC) Planning Standard TPL-001-5. The NERC Standard TPL-001-5 requires that BPA conduct an annual assessment to ensure that the BPA transmission system is planned to meet the required performance for the system conditions specified in the Standard. At times “the Standard” may be used interchangeably with “NERC Standard TPL-001-5”.

Bonneville’s 2023 Annual System Assessment was conducted to meet NERC Standard TPL-001-5. Although Standard TPL-001-4 WAS in effect until July 1, 2023, the effective date of TPL-001-5. Requirements in Standard TPL-001-5 are inclusive of the requirements in Standard TPL-001-4.

The assessment includes BPA’s load service areas as well as major network paths and interties across the transmission system. In accordance with the requirements of the Standard, BPA’s transmission system was evaluated for the near-term (year two and year five) and the long-term (year ten) planning horizons to determine whether system performance requirements are met. If the studies identify any potential system performance deficiencies, then corrective action plans are developed, as necessary, to address such potential deficiencies.

In accordance with requirement R8 of TPL-001-5, BPA distributes the Planning Assessment results to adjacent Planning Coordinators and adjacent Transmission Planners within ninety calendar days of completing the Assessment, and to any functional entity that has a reliability related need and submits a written request for the information within 30 days of such a request. If a recipient of the Planning Assessment results provides documented comments on the results, BPA provides a documented response to that recipient within ninety calendar days of receipt of those comments.

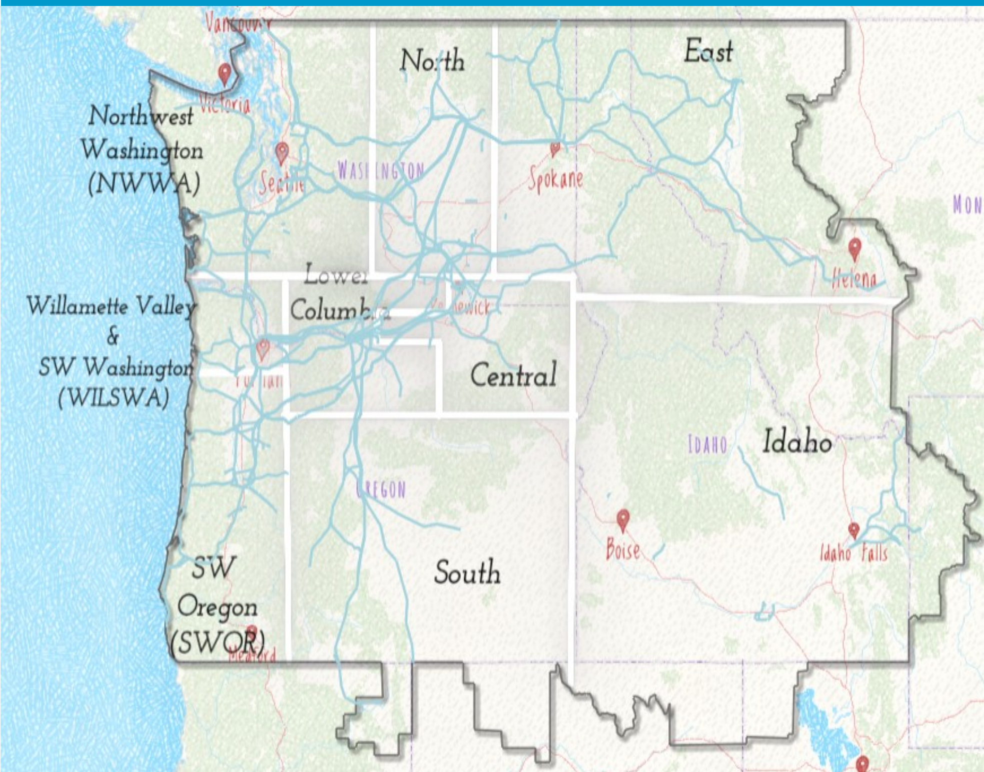
The NERC Standard FAC-014-2 requires that BPA establish System Operating Limits (SOLs), including Interconnection Reliability Operating Limits (IROLs), consistent with its SOL Methodology. BPA establishes SOLs, including IROLs, consistent with its SOL Methodology for the planning horizon.

5. System Overview: Planning Areas, Paths, & Interties

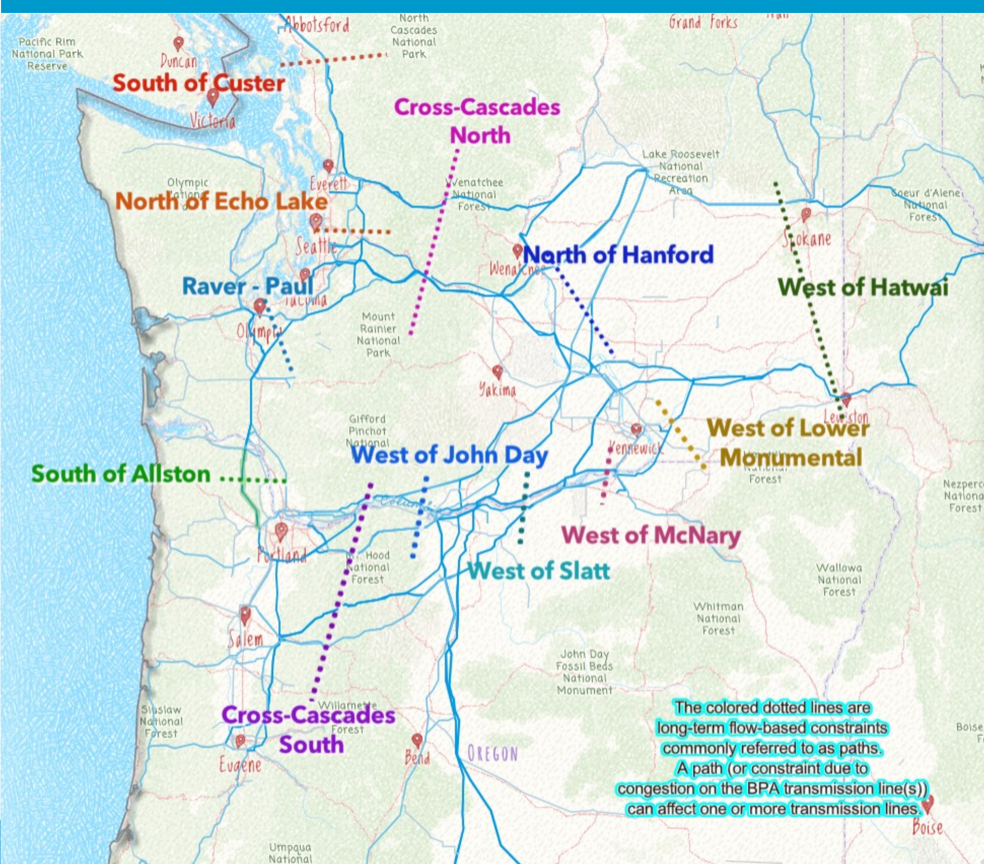
The BPA transmission system covers the states of Washington and Oregon, and portions of Idaho, Montana, Wyoming, and Northern California. The system is characterized by hydro generation on the main stem Columbia and lower Snake Rivers, remote from load centers. Generation is run-of-the-river hydro except for Grand Coulee, Hungry Horse, and Dworshak. In addition, there are thermal generators located along the I-5 corridor between Seattle and Portland, and in the lower Columbia River basin between Pendleton and Portland. Wind generation is connected to the system along the lower Columbia River basin in southern Washington, northern Oregon, and the lower Snake River in Washington. Solar resources are connected to the system primarily in central Oregon. The major load centers in the Pacific Northwest are located west of the Cascade Mountains including Seattle and Portland.

For study purposes, the transmission system is divided into planning areas and load service areas. The planning and load service areas are based on geographic and electrical proximity. To effectively study the transmission system BPA’s main grid is also divided into internal paths and interties for the system assessment. The function of these paths and interties is to transmit bulk power across the system. The distinction between them is that paths are internal to BPA’s network and the interties connect BPA’s network with other sub-regional systems in the Western Electricity Coordinating Council (WECC) region including British Columbia, Montana, and both northern and southern California.

Planning Areas



Paths & Interties



B O N N E V I L L E P O W E R A D

Planning & Load Areas

1. **Northwest Washington (NWWA)**
   - Chehalis - Centralia
   - Olympic Peninsula
   - Seattle – Tacoma
   - Southwest Washington Coast
2. **Willamette Valley Southwest Washington (WILSWA)**
   - North Oregon Coast
   - Longview
   - Portland
   - Vancouver
3. **Southwest Oregon (SWOR)**
   - South Oregon Coast
   - Salem – Albany
   - Eugene
4. **Lower Columbia**
   - Hood River – The Dalles
   - Klickitat
   - De Moss – Fossil
5. **North**
   - Mid-Columbia
   - Okanogan
6. **Central**
   - Pendleton – La Grande
   - Tri-Cities
   - Walla Walla
   - Umatilla – Boardman
7. **South**
   - Central Oregon
   - Northern California
8. **East**
   - Spokane – Colville – Boundary
   - North Idaho
   - Northwest Montana
9. **Idaho**
   - Burley
   - SE Idaho – NW Wyoming

Paths

South of Custer
South of Allston
North of Echo Lake
North of Hanford
Raver Paul
Cross Cascades North
Cross Cascades South
West of John Day
West of Slatt
West of McNary
West of Lower Monumental
West of Hatwai

Interties

Montana to Northwest Intertie
Pacific DC Intertie
California Oregon Intertie
Northern Intertie

5.1 Methodology

Each of the load areas were assessed under the limiting system conditions for that area. Each area was then evaluated to identify any potential performance deficiencies and determine possible corrective action plans or confirm existing corrective action plans to meet applicable standards and criteria and ensure system reliability and cost-effectiveness. BPA also assessed the performance of the paths and interties over the Planning Horizon. This includes an evaluation of the total transfer capability (TTC) of the path or intertie. This evaluation confirms that the TTC is sufficient to meet existing obligations over the Planning Horizon or identifies any potential corrective action plans needed to meet applicable standards and criteria to ensure system reliability. The studies conducted for each load area and path include steady state, voltage stability, and transient stability studies. Short circuit analysis is also conducted annually as part of BPA's Switchgear Replacement Program.

5.1.1 Validation of Past Studies

For each load area and transfer path, a new study or past study was used to ensure that existing and forecast load and expected firm transmission service can be served throughout the planning horizon and that existing or newly identified corrective action plans, such as system reinforcements, are adequate. The NERC TPL-001-5 Requirement 2.6 states that qualified past studies may be used to support the Planning Assessment if the study is 5 years old or less and no material modifications have occurred to the System represented in the study.

5.1.2 Criteria

The BPA transmission system is planned to meet applicable NERC Transmission Planning System Performance Standard TPL-001-5. Contingency events and the required performance for those events are established in Table 1 of the NERC TPL-001-5 Standard. The following table includes the Categories of Contingency Events from the NERC Standard.

TPL-001-5 Category Events		
Normal System	P0	No Contingency
Single Contingency	P1	Single contingency of an element* or DC mono-pole
Single Contingency	P2	Bus section or internal breaker fault, or line section with no fault
Multiple Contingency	P3	Loss of generator plus an element* with system adjustment in between
Multiple Contingency	P4	Multiple elements* caused by stuck breaker
Multiple Contingency	P5	Multiple elements due to non-redundant relay failure
Multiple Contingency	P6	Loss of two single elements* with system adjustment in between
Multiple Contingency	P7	Loss of two circuits on common structure, or DC bi-pole

Note: Element refers to: a generator, transformer, transmission circuit, or shunt device.

Figure 8 NERC TPL-001-5 Category Events List

Category P3 and P6 multiple contingencies both involve loss of an element, followed by system adjustment, followed by loss of a second element. Category P3 is specifically for loss of a generator followed by a second contingency of a transmission element, whereas Category P6 is loss of a transmission element followed by a second contingency of another transmission element. For most load areas, federal generation is located remotely from the load area and is delivered across transmission facilities into the areas. For those load areas that do have generation sources internal to the area, the external transmission facilities that also feed those areas are larger than the local generation. Therefore, the transmission outages under P6 are normally more severe than generation outages under P3. For load areas that do have a large single generator unit internal to the area, base case sensitivities with that generator offline were evaluated. For paths, major generation tends to be on the sending end of the major transmission paths where loss of a generator reduces power flow across the paths and therefore P3 contingencies produce less severe impacts than P6. Category P6 contingencies produce more stressed conditions for paths, which produce more severe results for the BPA transmission system. Therefore, the path studies focused on Category P6 contingencies.

5.2 Assumptions

This section describes the general assumptions for the studies conducted to support the 2023 System Assessment. The 2023 System Assessment relied on the results of current studies for the load areas. For the paths, the 2023 System Assessment relied partly on current studies and partly on qualified past studies.

5.2.1 Base Cases

The NERC Planning Standard TPL-001-5 requires that the steady-state portion of the assessment be conducted for the following base cases (R2):

- System peak Load for year one or year two (R2.1.1)
- System peak Load for year five (R2.1.1)
- System Off-Peak Load for one of the five years in the Near-Term Planning Horizon (R2.1.2)
- System peak Load for one of the years in the Long-Term Planning Horizon (R2.2.1)

The base cases used for the 2023 System Assessment adequately covered these scenarios and required sensitivities. The base cases used for the steady state portion of the 2023 System Assessment originated from the latest available WECC approved base cases for the Near Term and Long-Term Planning horizons, covering both peak and off-peak loads. Load forecasts and topology for those WECC cases were then modified to represent the following study cases:

2023 System Assessment Steady State Base Cases					
Starting WECC Case	Study Year	Modified Study Case	Season	Load Level	Notes
22 HSP 1-OP	2023	24LSP	Spring	Off-Peak	Near term (2-year) expected light spring
22-23HW2	2023	24HW	Winter	Peak	Near term (2-year) expected winter peak
22HS3	2023	24HS	Summer	Peak	Near term (2-year) expected summer peak
2026-27HW2	2027	28HW	Winter	Peak	Near term (5 year) expected winter peak
27HS2	2028	28HS	Summer	Peak	Near term (5 year) expected summer peak
31-32HW1	2032	32HW	Winter	Peak	Long-term (6-10 year) expected winter peak
32HS1	2032	32HS	Summer	Peak	Long term (6-10 year) expected summer peak

Figure 9 Steady State Base Case Assumptions Table

5.2.2 Loads and Transfers

As required by the NERC Reliability Standards, the transmission system is planned for expected load conditions over the range of forecasted system demands. Normal summer and winter peak loads were based on a 50% probability of exceedance. Light Spring load reflected the Off-peak loading condition. Historical load levels for peak and off-peak load conditions were also examined to make sure the loads represented in the base cases were reasonable.

Also, as required by the NERC Reliability Standards, the transmission system is planned to meet known commitments for long-term firm transmission services. At a minimum, the expected long-term firm transmission service commitments were modeled in the studies. For the path studies, system transfers beyond the long-term firm transmission obligations were modeled to determine system total transfer capability limits in the planning horizon for each path.

5.2.3 Resources

The base cases modeled, at a minimum, those resources with firm transmission service. Beyond that, other resources were modeled as needed to meet the forecast customer demands (load forecast) and expected firm transmission service.

There is over 7,000 MW of wind generation interconnected and less than 500 MW of solar generation interconnected throughout the northwest. This is reflected in the WECC base case models. However, the peak load reference cases used for the load area assessment assumed minimal renewable generation on-line. This assumption was made because of the intermittent nature of wind and lack of significant solar resources. This is consistent with historical data which shows that the output of wind generators has no definite correlation with load levels and is often quite low during peak load periods, which typically creates more limiting conditions for the load areas. For load areas and transmission paths which are affected by renewable generation, sensitivities are conducted with wind or solar generation at full output.

5.2.4 Topology and Future Projects

At the start of the Assessment, the transmission system topology was reviewed and updated with the latest available information for the near term (one to five years out) and long term (six to ten years out) planning horizons. The topology includes both existing and planned facilities. For the individual load areas, local utilities were coordinated to acquire the latest information about their proposed projects, including schedules and level of commitment whenever possible. Since adding conceptual projects to the assessment could mask future system problems, which is the focus of the studies, most future proposed projects were not included in the near-term base cases. The only future projects that were included in the near term were those where the sponsoring companies have made firm commitments to build the project within the next five years. These are typically projects that are currently under construction or, at a minimum, which have budget approval. In the longer-term base cases, a limited number of future projects were modeled which may not have budget approval but were considered likely to proceed. By including projects that utilities are actively pursuing, the next level of reinforcement needs can be identified and prioritized. The assessment includes reactive power resources to ensure that adequate reactive resources are available to meet system performance. The assessment also includes the effects of existing and planned protection systems and control devices.

5.2.5 Remedial Action Schemes

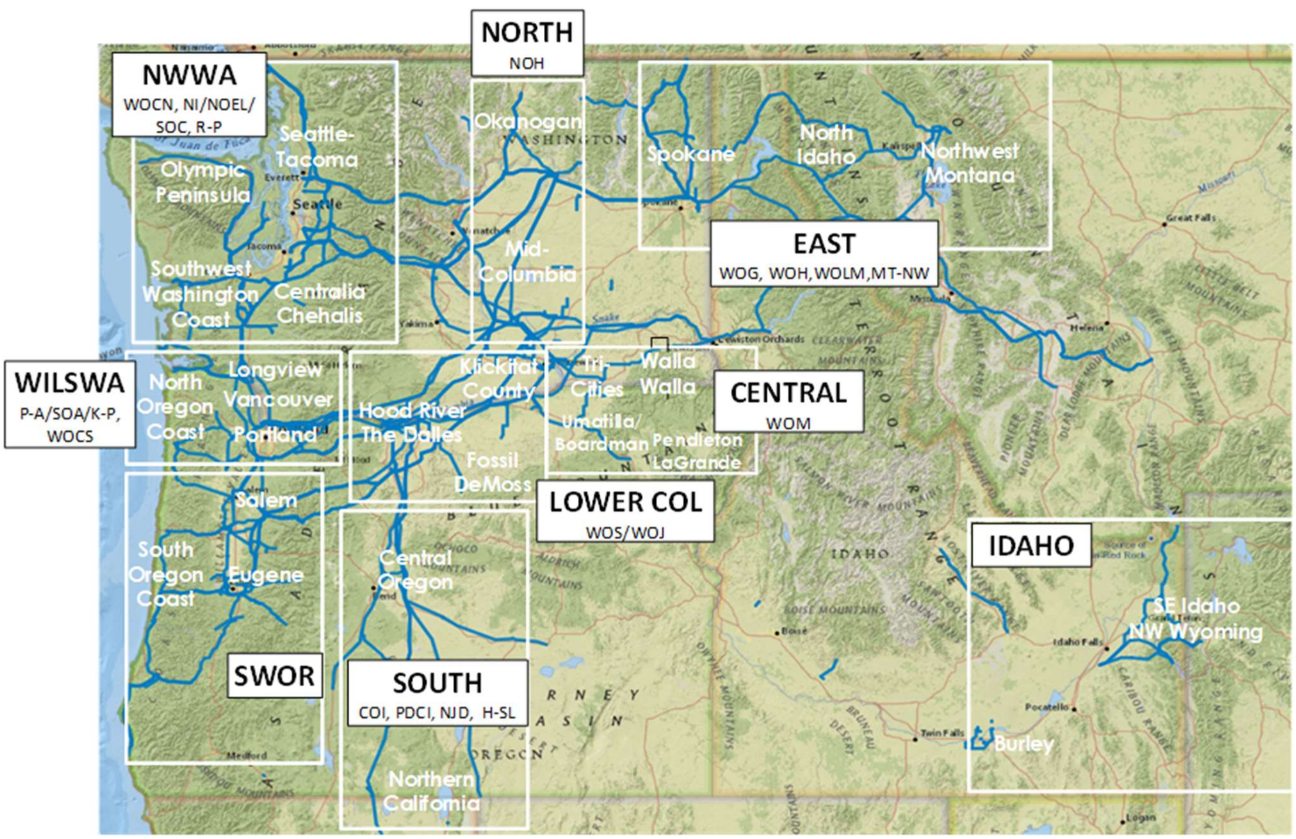
At the transfer levels modeled in the base cases, remedial action schemes (RAS) may be used to ensure reliable operation of the transmission system. These RAS may trip or ramp generation or load for specific contingencies. For the system assessment, RAS was modeled as appropriate based on the specific contingencies and system transfer levels.

6. Transmission Needs by Planning Areas

On an annual basis, Transmission Planning provides a ten-year plan for reinforcements to BPA's transmission system, and this is provided in accordance with Attachment K of the BPA Open Access Transmission Tariff. This section provides a narrative description of the transmission needs identified through the transmission planning process, the preferred alternative, an estimated cost, and estimated schedule for completion of the preferred alternative. It also reflects plans for facilities needed to provide requested interconnection or long-term firm transmission service on BPA's system. The objective of this section is to identify and describe reinforcement projects for the transmission system. It contains proposed projects identified to meet the forecast requirements of BPA and other customers over the 10-year planning horizon. This section provides the proposed new facilities organized by type of project. The types of projects include the following.

- Projects required to provide load service and meet Planning Reliability Standards,
- Projects to improve operational or maintenance flexibility,
- Projects required to meet requests for transmission service,
- Projects required to meet requests for Generator Interconnection service, and
- Projects required to meet requests for Line and Load Interconnection service.

In addition to proposed projects, this section includes a listing of Recently Completed Projects for each load area or path. This category includes projects which have been completed since the previous update to the BPA Plan and includes assessment findings. Estimated Project Costs are direct costs (overheads are not included). Where official cost estimates have not been developed, the indicated project cost reflects the best information available, based on typical costs of similar projects. For study purposes, the load service areas are grouped into nine planning areas based on geographic and electrical proximity.



6.1 Northwest Washington Planning Area (NWWA)

Planning Area Description

The Northwest Washington (NWWA) Planning Area contains four load service areas, one intertie, and four internal transmission paths. The load areas include Seattle-Tacoma, Olympic Peninsula, Southwest Washington Coast, and Centralia-Chehalis. The five paths included in the NWWA planning area are the Northern Intertie (NI), North of Echo Lake (NOEL), South of Custer (SOC), Raver-Paul (R-P), and West of Cascades North (WOCN). The planning area extends north to the Canadian border, west to the Pacific coast, east to the Cascades Mountain range, and south to the Longview and North Oregon coast areas.

6.1.1 Chehalis / Centralia Area

The Chehalis/Centralia area includes the cities of Chehalis and Centralia, Washington, and the communities within Lewis County in Washington. It consists of a 69 kV transmission loop served out of Chehalis Substation. Chehalis Substation also provides service to Lewis County PUD's Corkins 69 kV Substation and provides support to Raymond and Naselle Substations on the southwest Washington coast.

The customers in this area include:

- Centralia City Light
- Lewis County PUD

The load area is served by the following major transmission paths or lines:

- Chehalis- Olympia 230 kV line 1
- Chehalis- Covington 230 kV line 1
- Chehalis-Raymond 115 kV line 1

Local Generation and Load

Local generation serving the load area includes:

Generation	Fuel	Maximum MW	Owner
Mossy Rock	Hydro	378	Tacoma Power
Mayfield	Hydro	182	Tacoma Power
Cowlitz	Hydro	70	Lewis County PUD
Packwood	Hydro	28	Energy Northwest
Yelm	Hydro	10	City of Centralia

Centralia - Chehalis Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
172	283	191	275	191	275

Proposed Plans of Service

Silver Creek Substation Reinforcements

- Description: This project adds a 230 kV breaker to separate the east and west 230 kV busses and adds a 69 kV circuit breaker on the low side of the 230/69 kV transformer.
- Purpose: This project increases reliability and facilitates maintenance of the station.
- Estimated Cost: $11,300,000
- Expected Energization: 2025

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.1.2 Olympic Peninsula Area

The Olympic Peninsula in Washington State is a long radial system extending about 110 miles from BPA's Olympia Substation northwest to BPA's Port Angeles substation. This area includes the Olympic Peninsula north and west of Olympia. Included within this area are Clallam, Mason, Kitsap, and the western portion of Jefferson counties. The primary communities served include Shelton, Bremerton, and Port Angeles, as well as the US Navy in the Bremerton area. The smaller communities include Potlatch, Hoodsport, Quilcene, Fairmount, Duckabush, and Sequim.

The customers in this area include:

- Puget Sound Energy
- City of Port Angeles
- Clallam County Public Utility District
- Mason Public Utility District 1 and 3
- US Navy

The load area is served by the following major transmission paths or lines:

- Satsop-Shelton 230 kV line
- Three Olympia-Shelton 230 kV lines
- Two Olympia-Shelton 115 kV lines

Local Generation and Load

There is no generation connected directly to the load area, although there is generation at Mason that serves the Tacoma area and the Grays Harbor plant located south of the load area.

The Olympic Peninsula area load forecast is:

Olympic Peninsula Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
724	1284	743	1241	782	1284

Proposed Plans of Service

There are no proposed plans of service in this planning cycle.

Recently Completed Plans of Service

Kitsap 115 kV Shunt Capacitor Relocation

- Description: This project moves one group of 115 kV shunt capacitors from the south bus to the north bus section at Kitsap substation.
- Purpose: This project is required to maintain voltage schedules on the Kitsap Peninsula transmission system.
- Estimated Cost: $4,000,000
- Expected Energization: 2026

6.1.3 Seattle/Tacoma/Olympia Area

The Seattle/Tacoma/Olympia area is in northwestern Washington State and has a large footprint, spanning from Bellingham and the Canadian border, all the way south to the Tacoma/Olympia metro area, and spans east from the Puget Sound to the foothills of the Cascade Mountains. The Seattle/Tacoma load area can be divided into two sub-areas: Seattle/Bellingham/Everett and Tacoma/Olympia. It is the largest load area in the entire Pacific Northwest and one of the largest load areas in the entire WECC Interconnected System. It includes major metropolitan areas surrounding North Tacoma, Greater Seattle Metro Area, Everett, and Bellingham. The area includes Pierce, Thurston, North Lewis, and South King counties. It is bordered on the north by Canada and on the south by Olympia. It is bordered on the east by the Cascade Mountains and on the west by the Puget Sound. To the north, the Seattle metropolitan area includes Blaine, Bellingham, Sedro Woolley, and Mount Vernon and to the south the Seattle metropolitan area includes Puyallup and Olympia.

The customers in this area include:

- Whatcom County Public Utility District (WPUD)
- Puget Sound Energy (PSE)
- Seattle City Light (SCL)
- Snohomish County Public Utility District (SPUD)
- Tacoma Power Utilities (TPU)
- Alder Mutual Light Co. (Alder)
- City of Eatonville (COE)
- City of Milton (Milton)
- City of Steilacoom (COS)
- Elmhurst Light and Power (EL&P)
- Lakeview Light and Power (LL&P)
- Ohop Mutual Light (OML)
- Parkland Light and Power (PL&P)
- Peninsula Light (Pl)

The load area is served by the following major transmission paths or lines:

- From the north by the Northwest-British Columbia path (or Northern Intertie)
- From the east by the West of Cascades North path
- From the south by the Raver-Paul path
- From the west by the Satsop-Olympia 230 kV and Satsop-Paul 500 kV lines

Local Generation and Load

Major customers served in this area include Puget Sound Energy (PSE), Seattle City Light (SCL), Snohomish County PUD (SNPD), Tacoma Power Utilities, and Whatcom County PUD. This area has a large amount of local generation including thermal plants (over 1,400 MW) and hydro plants (approximately 975 MW) with a combined total of more than 2,300 MW. The Seattle/Bellingham area has over 2500 MW of local generation which consists primarily of hydro and thermal (coal and gas-fired) generators. The Tacoma/Olympia area has approximately 750 MW of local generation.

Seattle - Tacoma - Olympia Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
7729	9363	7663	9491	7962	9652

Proposed Plans of Service

Monroe-Novelty 230 kV Line Upgrade

- Description: This project upgrades the Monroe-Novelty 230 kV line from 60 to at least 80-degree Celsius.
- Purpose: This project improves reliability for the Puget Sound load area.
- Estimated Cost: $2,500,000
- Expected Energization: 2026

Maple Valley 230 kV Shunt Reactor

- Description: This project adds a 180 MVAR 230 kV reactor with an associated circuit breaker Disconnect Switch and Arrester at the Maple Valley Substation.
- Purpose: This project improves reliability for the Puget Sound load area.
- Estimated Cost: Cost will be estimated once scoping is underway.
- Expected Energization: 2025

Recently Completed Plans of Service

Raver 500/230 kV Transformer (PSANI)

- Description: This project added a 1300 MVA, 500/230 kV transformer at Raver Substation. This project was part of the overall Puget Sound Area/Northern Intertie (PSANI) Regional Reinforcement Plan. This was a joint project between participating utilities in the Puget Sound area.
- Purpose: This project is required to support load growth in the Puget Sound area.
- Estimated Cost: $100,000,000
- Energization: The transformer was energized in 2021 and the rest of the project is expected to be energized in 2024.

6.1.4 Southwest Washington Coast Area

The Southwest Washington Coast Load Area includes all lines and substations from the I-5 corridor west to the Pacific Ocean and north of Chehalis to Aberdeen and Olympia substations. The area is comprised of Wahkiakum County, Pacific County, western Lewis County, and southern Grays Harbor County in Washington. It is bordered on the east by Interstate 5 and the west by the Pacific Ocean. It is bordered on the north by the Olympic National Forest and on the south by the Columbia River. The main communities served include Aberdeen, the Raymond/South Bend area, and the communities on the Long Beach Peninsula. Smaller communities include Cosmopolis, Pe Ell, and Naselle.

The customers in this area include:

- Grays Harbor Public Utility District (including industrial load)
- Pacific County Public Utility District No. 2
- Wahkiakum County Public Utility District
- Lewis County Public Utility District

The load area is served by the following major transmission paths or lines:

- Aberdeen-Satsop 230 kV lines 2 and 3
- Olympia-South Elma 115 kV line
- Chehalis-Raymond 115 kV line 1
- Naselle Tap to the Allston-Astoria 115 kV line 1

Local Generation and Load

Local generation serving the load area includes:

- Wynooche (18.7 MW)
- Weyerhaeuser (15.8 MW)
- Sierra (7.9 MW)

Southwest Washington Coast Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
231	375	199	324	199	325

Proposed Plans of Service

Aberdeen Tap to Satsop Park – Cosmopolis 115 KV Line Upgrade

- Description: Rebuild the section between Aberdeen Tap and Structure 1/3 (0.06 mi) to increase the line's capacity.
- Purpose: This project is required to maintain reliable load service to the Southwest Washington Coast area.
- Estimated Cost: $551,000
- Expected Energization: 2027

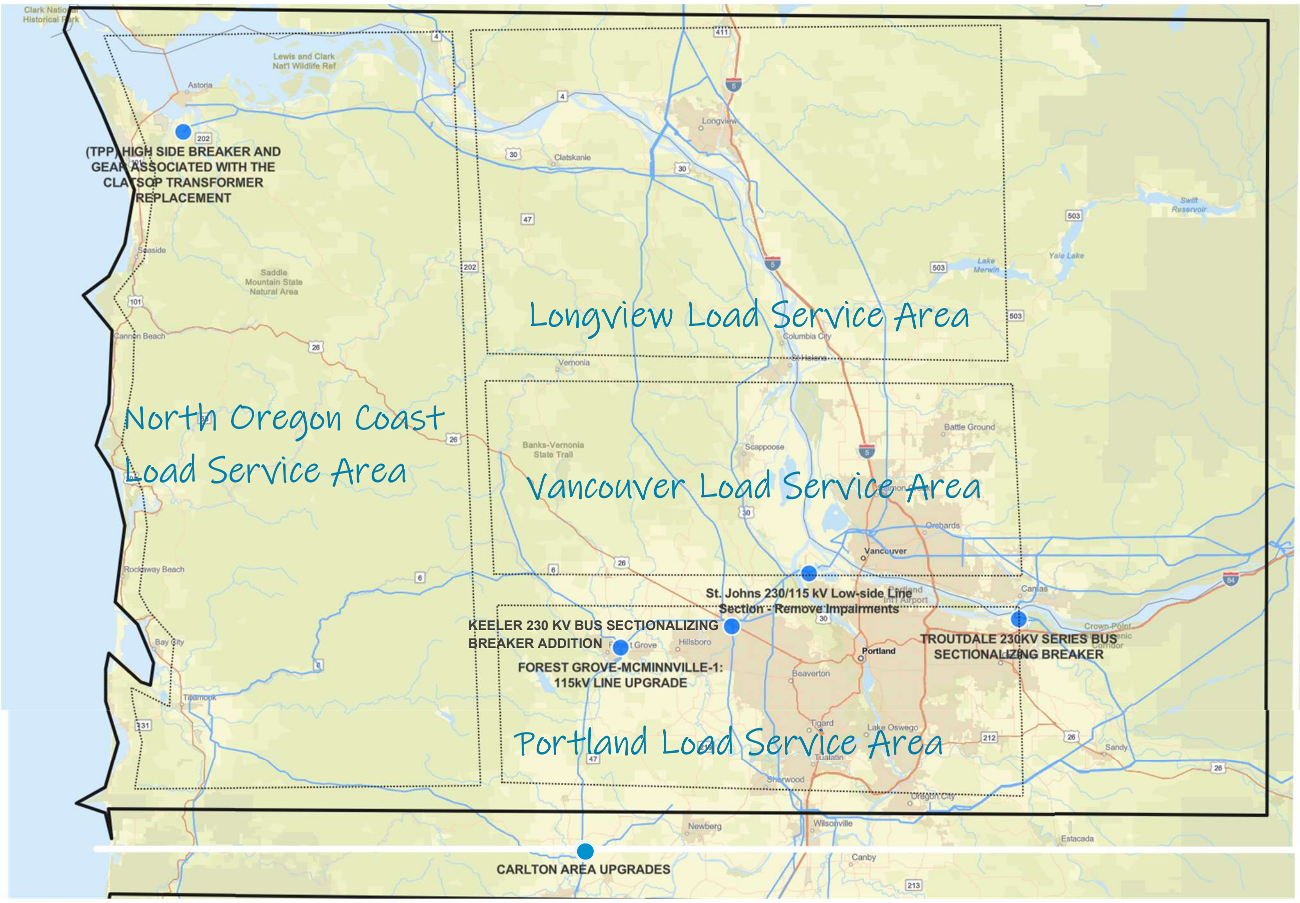
South Elma-Satsop Park No. 1 Line (Remove Impairments)

- Description: This project will upgrade the line to increase the rating to a maximum operating temperature (MOT) of 100°C.
- Purpose: This project is required to maintain reliable load service to the Southwest Washington Coast area.
- Estimated Cost: Cost will be estimated once scoping is underway.
- Expected Energization: 2027

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.2 Willamette Valley & Southwest Washington Planning Area



Planning Area Description

The Willamette Valley Southwest Washington (WILSWA) Planning Area spans western Washington from Longview to Vancouver, and western Oregon from Astoria to Salem. WILSWA contains 5 load areas (Hood River/The Dalles, Longview, North Oregon Coast, Portland, and Vancouver). Customers include Portland General Electric (PGE), PacifiCorp (PAC), Cowlitz County PUD, Clark County PUD, North Pacific Paper Company (NORPAC), Columbia River PUD (CRPUD), Tillamook PUD (TPUD), City of McMinnville, City of Forest Grove, and Klickitat PUD.

Note: Hood River / The Dalles
The Hood River/The Dalles load area is now part of the Lower Columbia Planning area, and those projects are described in section 6.9.

6.2.1 Longview Area

This area includes Cowlitz County in Washington State. The major population areas include Longview, Washington as well as the communities of Kelso, Kalama, Castle Rock, and Woodland, Washington. The loads in this area include residential, commercial and a large industrial component.

The customers in this area include:

- Cowlitz Public Utility District
- PacifiCorp (PAC)

The load area is served by the following major transmission paths or lines.

- Longview-Allston 230 kV lines 1, 2 and 3
- Longview-Allston 115 kV line 4
- The Chehalis-Longview 230 kV lines 1 and 2
- Ross-Lexington 230 kV line
- PAC Merwin-Cardwell 115 kV line

Local Generation and Load

The local generation that supports the area load includes:

- Mint Farm (270 MW)
- PAC and Cowlitz Swift Hydro (280 MW)
- PAC Merwin and Yale Hydro (235 MW)
- Weyerhauser Company (80MW)
- Longview Fiber (55MW)

Longview Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
665	773	562	731	562	731

Proposed Plans of Service

There are no proposed projects for this area.

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.2.2 North Oregon Coast Area

The North Oregon Coast area includes Tillamook and Clatsop counties along the Oregon Coast. It is bounded by the Clatsop and Tillamook State Forests in the east, the Pacific Ocean in the west, the Columbia River to the north, and Pacific City to the south. The population areas include Astoria, Seaside, Cannon Beach, Manzanita, Tillamook, Oceanside, Hebo, and Pacific City.

The customers in this area include:

- PacifiCorp
- Portland General Electric
- Tillamook Public Utility District
- West Oregon Electrical Coop
- Wahkiukum Public Utility District
- Clatskanie Public Utility District

The load area is served by the following major transmission paths or lines:

- Allston-Driscoll #2 115 kV line
- Clatsop 230/115 kV transformer
- Astoria-Driscoll #1 115 kV line
- Forest Grove-Tillamook #1 115 kV line

- Carlton-Tillamook #1 115 kV line
- Grand Ronde-Boyer #1 115 kV line

Local Generation and Load

Local generation serving the load area includes:

- Clatskanie Public Utility District Wauna Generation at James River Mill (27 MW)

North Oregon Coast Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
173	274	183	267	187	270

Proposed Plans of Service

High-Side Breaker and Switchgear Associated with the Clatsop Transformer Replacement

- Description: This project adds a 230 kV 3000-amp breaker, BFR and three 2000 amp disconnect switches at Clatsop substation.
- Purpose: This project will improve operations and maintenance flexibility at Clatsop.
- Estimated Cost: $1,600,000
- Expected Energization: 2027

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.2.3 Portland Area

The Portland Load Area is in northwestern Oregon and covers loads in the counties of Clackamas, Columbia, Multnomah, and Washington. It includes major metropolitan communities surrounding the greater Portland Metro area, including Troutdale, Gresham, Sandy, Beaverton, Hillsboro, Tigard, Tualatin, Oregon City, and Wilsonville. The Portland area extends north to the Columbia River and south to Salem, Oregon. It extends west to Tigard, Oregon and east to the Cascade Mountain range. Loads are primarily residential and commercial with a smaller industrial component. Recent history of loads in this area has become dual peaking seasons (winter loads are slightly higher than summer); however, the summer peak is forecast to surpass the winter peak within the 10-year Planning Horizon.

The Portland area transmission system serves PacifiCorp (PAC) in North and East Portland and Portland General Electric (PGE) customers located in Multnomah, Clackamas, and Washington counties in Northern Oregon. The Portland load service areas are served via four major flow gates in Southwest Washington and Northwest Oregon: Keeler-Pearl, South of Allston (SOA), Paul-Allston, and West of Cascades South (WOCS).

The customers in this area include:

- Portland General Electric (PGE)
- PacifiCorp (PAC)
- City of Forest Grove
- Western Oregon Electric Coop.
- Columbia River Public Utility District
- McMinnville Water and Light

The load area is served by the following major transmission paths or lines:

- From the north by the Paul-Allston path
- From the south by the Pearl-Ostrander and Pearl-Marion 500 kV lines
- From the east by the West of Cascades South path

Local Generation and Load

The Portland area has approximately 700 MW of local generation. The Portland load service area is both summer and winter peaking with high levels of residential, commercial, and industrial loads. The peak summer loads are due to air conditioning load. The peak winter loads are due to base board electric heating load. The Portland area load forecast is:

Portland Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
5201	4914	5645	5403	6068	5890

Proposed Plans of Service

Carlton Upgrades

- Description: This project adds four additional circuit breakers at Carlton substation: two each at the 115 and 230 kV buses. The Forest Grove–McMinnville 115kV line will be looped into the Carlton 115 kV bus creating the Forest Grove–Carlton and Carlton–McMinnville 115 kV lines.
- Purpose: This project improves operations and maintenance flexibility.
- Estimated Cost: $15,500,000
- Expected Energization: 2024

Forest Grove – McMinnville 115 kV Line Upgrade

- Description: This project upgrades the Forest Grove – McMinnville 115 kV line.
- Purpose: This project improves operations and maintenance flexibility.
- Estimated Cost: $1,000,000
- Expected Energization: 2024

Troutdale 230 kV Series Bus Sectionalizing Breaker Addition

- Description: This project adds a new 230 kV bus sectionalizing breaker at Troutdale Substation in series with the existing sectionalizing breaker.
- Purpose: This project is required to maintain reliable load service to the area.
- Estimated Cost: $3,490,000
- Expected Energization: 2025

Keeler 230 kV Bus Sectionalizing Breaker Addition (L0452)

- Description: This project adds a 230 kV bus sectionalizing breaker at Keeler Substation.
- Purpose: This project is required to maintain reliable load service to the area.
- Estimated Cost: $11,530,000 (This estimate includes other sustain work which is being coordinated with the bus sectionalizing breaker addition.)
- Expected Energization: 2026

St. Johns 230/115 kV Low-Side Line Section (Remove Impairments)

- Description: This project will upgrade a recently discovered line section impairment on the low side St. Johns 230/115 kV transformer tie-line. This project will upgrade a few hundred feet of line section where it goes from the 115 kV side of the transformer to the 115 kV bus.

- Purpose: This project is required to maintain reliable load service to the area.
- Estimated Cost: Cost will be estimated once scoping is underway.
- Expected Energization: 2026

Also Listed in the West of Cascades South Path Section
Pearl-Sherwood 230 kV Corridor Reconfiguration and Series Bus Sectionalizing Breaker Addition

- Description: This will be a joint project with PGE. It includes splitting the existing BPA/PGE Pearl-Sherwood #1 and #2 230 kV jumpered circuits and terminates them into separate bays at Pearl and Sherwood. It also splits the existing BPA/PGE Pearl-McLoughlin-Sherwood 230 kV 3-terminal line into a new Pearl-Sherwood #3 230 kV line and a new Pearl-McLoughlin-Sherwood 230 kV three terminal line. This project will also add a new 230 kV series bus sectionalizing breaker at Pearl Substation.
- Purpose: This project is required to maintain reliable load service to the Portland Area.
- Estimated Cost: $10,000,000
- Expected Energization: 2027

Also listed in the South of Allston Path Section
Keeler 500 kV Expansion and Transformer Addition

- Description: This project will add 500 kV breakers at Keeler substation to reconfigure the Keeler 500 kV bus layout into a double-breaker-double-bus arrangement. This project also adds a second 500/230 kV Transformer bank at Keeler substation.
- Purpose: This project will maintain reliable load service in the Portland area and improve operations and maintenance flexibility for the South of Allston path.
- Estimated Cost: $41,300,000
- Expected Energization: 2029

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.2.4 Vancouver Area

The Vancouver area transmission system serves customers in Clark County in Southwest Washington. This area extends north to the border of the Longview load service area and east to the Cascade Mountain Range. It is bordered on the south and west by the Columbia River. This includes the greater Vancouver, Washington area and the communities of Washougal, Camas, Ridgefield, La Center, and Battleground. Loads are primarily residential and commercial with a smaller industrial component.

The customers in this area include:

- Clark Public Utilities (Clark)
- PacifiCorp (PAC)

The lines serving the area include:

- North Bonneville Ross 230 kV lines 1 and 2
- McNary-Ross 345 kV line
- Longview-Lexington-Ross 230 kV line
- Bonneville-Alcoa 115 kV line
- Bonneville-Sifton-Ross 115 kV line
- PAC Merwin-Cherry Grove-Hazel Dell-St Johns 115 kV line
- PAC/Clark Troutdale-Runyan-Sifton 115 kV line

Local Generation and Load

The local generation that supports the area load includes:

Portland/I-5 Area	Nameplate MW	Fuel Type	Owner
Bonneville Dam	1,310	Hydro	BPA/USACE
Beaver	490	Gas	Portland General Electric
Centralia	1,400	Coal	TransAlta
Chehalis	520	Gas	PacifiCorp
Grays Harbor	650	Gas	Invenergy LLC
Mint Farm	320	Gas	Puget Sound Energy
Port Westward 1	380	Gas	Portland General Electric
Port Westward 2	230	Gas	Portland General Electric
River Road	260	Gas	Clark PUD
Mayfield	182	Hydro	Tacoma Power
Mossy Rock	378	Hydro	Tacoma Power
Merwin	135	Hydro	PacifiCorp
Swift	305	Hydro	PacifiCorp
Yale	145	Hydro	PacifiCorp

Vancouver Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
1018	1075	786	1017	804	1040

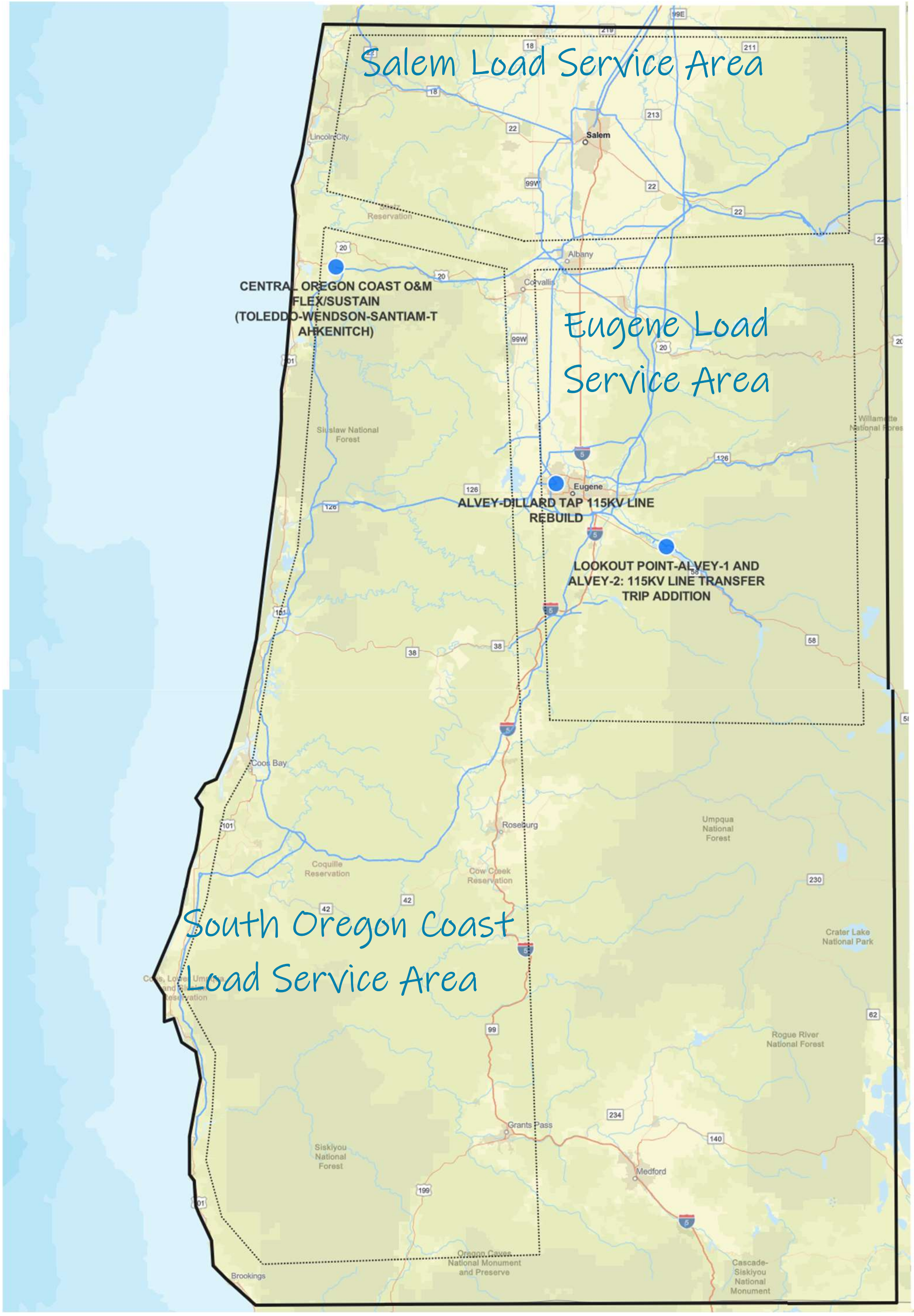
Proposed Plans of Service

There are no proposed plans of service for this area.

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.3 Southwest Oregon Planning Area (SWOR)



Planning Area Description

The Southwest Oregon (SWOR) Planning Area covers the Eugene, the Salem/Albany, and the South Oregon Coast load areas. All load areas within this Planning Area are historically winter peaking. The historical peak winter loads for Eugene, Salem/Albany, and the South Oregon Coast load areas are 881MW, 895MW, and 471 MW respectively. Local generation in the area includes hydroelectric facilities along the eastern Willamette Valley and cogeneration plants.

6.3.1 Eugene Area

The Eugene Area includes the cities of Eugene and Springfield in western Oregon as well as the surrounding communities. This load area includes the Central Willamette Valley in Oregon's Lane County. The boundary runs by the Willamette National Forest in the east, the coast range in the west, the Salem/Albany load area to the north, and the South Oregon Coast area to the south and west of Eugene. The major population areas include cities of Eugene and Springfield, and the communities of Cheshire, Junction City, Harrisburg, Walterville, Pleasant Hill and Oakridge. The Eugene area load is winter peaking, primarily driven by residential and commercial heating loads, though industrial loads also exist in the area such as wood product mills.

The customers in this area include:

- PacifiCorp (PAC)
- Eugene Water and Electric Board (EWEB)
- Springfield Utility Board (SUB)
- Emerald Public Utility District (Emerald)
- Blachly-Lane, Lane Electric, Douglas Electric, Coos-Curry, and Consumers Power serving the rural areas.

The load area is served by the following major transmission paths or lines:

- From the Marion-Alvey 500 kV line and Marion-Lane 500 kV line
- From the south by the Alvey-Dixonville 500 kV line

Local Generation and Load

The local generation in this area includes hydroelectric generation on the McKenzie and Willamette Rivers and other generation as follows:

- EWEB Carmen/Trailbridge (93.3 MW)
- USACE Cougar (28 MW)
- EWEB Weyco (37.7 MW)
- EWEB Seneca (19.8 MW)
- EWEB Leaburg (13.8 MW)
- EWEB Walterville (9.7 MW)
- USACE Lookout Point (138 MW)
- USACE Hills Creek (34 MW)
- USACE Dexter (16 MW)

The Eugene area load forecast is:

Eugene Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
632	896	713	948	724	953

Proposed Plans of Service

Lookout Point – Alvey No. 1 and 2 Transfer Trip Addition

- Description: Installation of a Transfer Trip on the Alvey – Lookup 115 kV Lines 1 and 2 is needed to maintain stability for the local generation in the event of faults near the Alvey Substation.
- Purpose: This project is required to maintain reliable load service to the Eugene load area.
- Estimated Cost: $3,000,000
- Expected Energization: 2026

Alvey – Dillard Tap 115 kV Line Rebuild

- Description: This project rebuilds the first 3.3 miles of the Alvey-Eugene 115 kV line.
- Purpose: This project is required to maintain reliable load service to the Eugene load area.
- Estimated Cost: $1,300,000
- Expected Energization: 2028

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.3.2 Salem / Albany Area

The Salem/Albany load area serves the Central Willamette Valley between the Portland and Eugene areas to the north and south, respectively. The area includes the cities Salem, Albany, and Corvallis, and the smaller communities of Monmouth, Independence, Silverton, Stayton, and Lebanon. Customers served include Portland General Electric (PGE), PacifiCorp (PAC), Salem Electric Cooperative (SEC), Consumers Power Inc. (CPI), Emerald PUD (EPUD), City of Monmouth (COM), and the U.S. Bureau of Mines located in Albany (DOE).

The customers in this area include:

- Portland General Electric in the Salem Area
- PacifiCorp in the Albany, Corvallis, Lebanon Areas
- City of Monmouth
- U.S. Bureau of Mines located in Albany, Oregon
- Western Oregon, Salem Electric, and Consumers Power Inc. Emerald PUC serving the rural areas.

The load area is served by the following major transmission paths or lines:

- From the east by the Big Eddy-Chemawa 230 kV line
- From the north by the (PGE) McLoughlin-Bethel 230 kV line and the Pearl-Marion 500 kV line 1

Local Generation and Load

The local generation is mostly hydroelectric generation on the north and south forks of the Santiam River.

Generation internal to the Salem/Albany area includes:

- Foster Generator Units 1 & 2 (22 MW) – USACE
- Green Peter Generator Units 1 & 2 (92 MW) – USACE
- Adair Generator Unit 1 (5.5 MW) – Power Resources Co-op's
- Evergreen Bio (10 MW) – PAC

Other local generation includes:

- Detroit Generator Units 1 & 2 (120 MW) – USACE
- Big Cliff Generator Unit 1 (22 MW) – USACE
- Covanta (15 MW) – PGE (Near Chemawa 57 kV and Monitor 57 kV

Salem - Albany Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
861	895	933	905	980	950

Proposed Plans of Service

There are no proposed plans of service for this area.

Recently Completed Plans of Service

There are no projects that have been completed in the area since the previous planning cycle.

6.3.3 South Oregon Coast Area

The South Oregon Coast load area includes the communities of Newport, Waldport, Florence, Reedsport, Coos Bay, Coquille, Bandon, Myrtle Point, Gold Beach, Port Orford, and south to Brookings. The load area is bounded by the north Oregon Coast to the north and the Salem-Albany and Eugene areas to the east and north.

The customers in this area include:

- PacifiCorp (PAC)
- Coos Curry Cooperative
- City of Bandon
- Douglas Electric Coop
- Central Lincoln Public Utility District

The load area is served by the following major transmission paths or lines:

- Lane-Wendson 230 kV line 2
- Alvey-Fairview 230 kV line 1
- Reston-Fairview 230 kV line 2
- Fairview-Rogue 230 kV line 1
- PAC Fairview-Isthmus 230 kV line 2
- Santiam-Toledo 230 kV line 1

Local Generation and Load

There is no local generation in this area.

South Oregon Coast Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
252	471	265	449	282	470

Proposed Plans of Service

Toledo 69 kV and 230 kV Bus Tie Breaker Additions (Combined with the project below.)

- Description: This project adds a 69 kV bus tie breaker and a 230 kV bus tie breaker at Toledo Substation.
- Purpose: This project improves operations and maintenance flexibility at Toledo.
- Estimated Cost: $33,000,000
- Expected Energization: 2024

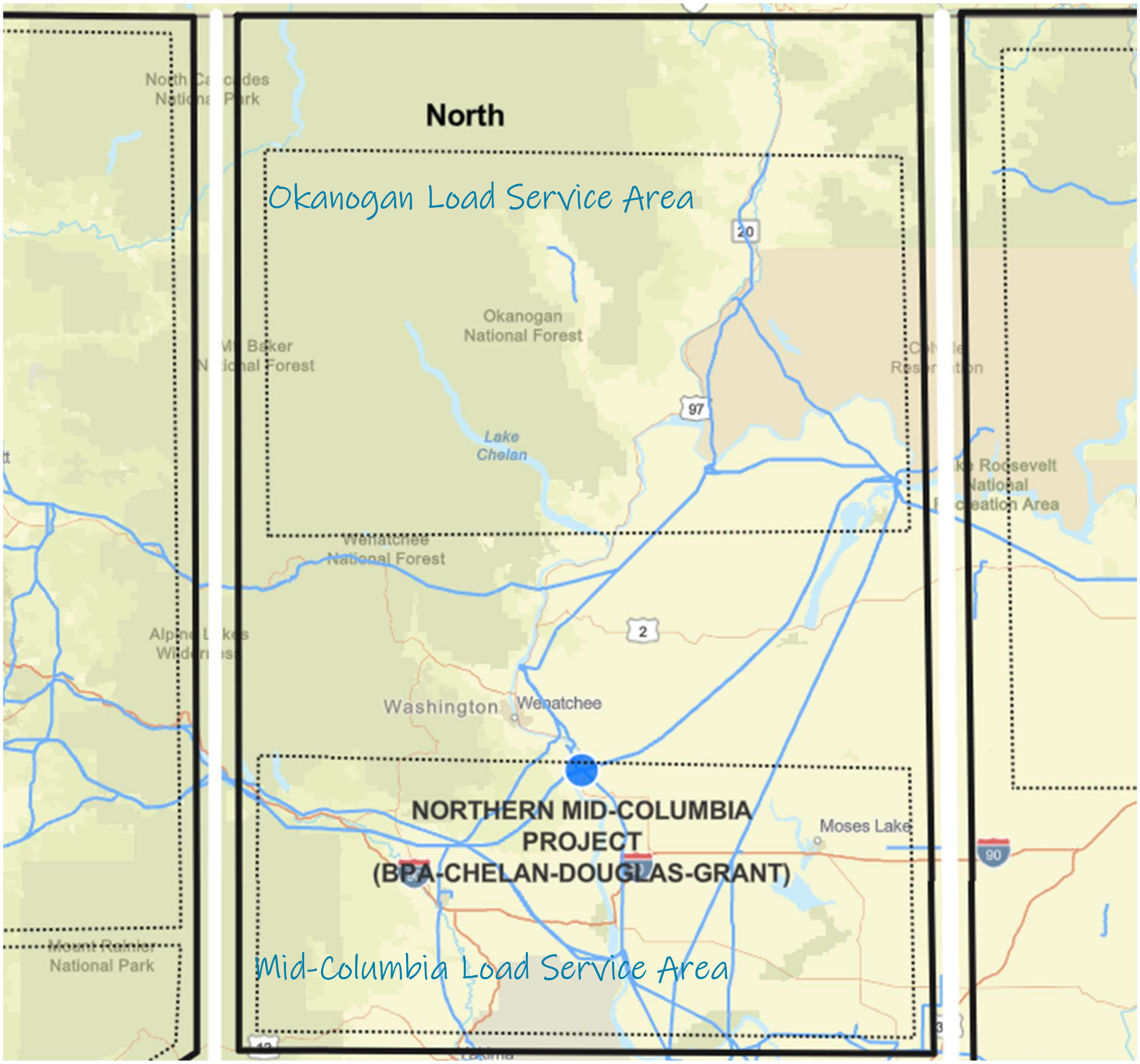
Wendson 115 kV Bus Tie Breaker Addition (Combined with the project above.)

- Description: This project adds a 115 kV bus tie breaker at Wendson Substation.
- Purpose: This project improves operations and maintenance flexibility at Wendson.
- Estimated Cost: See Toledo's estimated cost above.
- Expected Energization: 2024

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.4 Northern Planning Area



Planning Area Description

The Northern Planning Area contains three load areas and one internal transmission path. The load areas are Klickitat County, Mid-Columbia, and Okanagan. The internal path is North of Hanford (NOH). The NOH path is bi-directional (north to south and south to north) and is adjacent to the Northern area 230 kV sub-grid system. The planning area extends north to the Canadian border, west to the Cascade Mountains, east to the Spokane area, and south to the Tri-Cities area. Customers in the Planning area include Chelan County PUD, Douglas County PUD, Grant County PUD, PacifiCorp, Avista, Puget Sound Energy, Okanagan PUD, Okanagan Cooperative, Nespelem Valley Electric, and Ferry County PUD.

Note: the Klickitat area was moved to the new Lower Columbia Planning area.

6.4.1 Mid-Columbia Area

The Mid-Columbia (Mid-C) Load Area stretches over 100 miles along the Columbia River in Central Washington, from Chelan and Douglas County in the north to Grant County in the east and Yakima County in the west. The Mid-C load area is divided into three sub-areas: west, north, and east. To the west is the Yakima County load served by PacifiCorp, and load served by BPA customers in the Ellensburg and surrounding area (load served by the Columbia-Ellensburg, Ellensburg-Moxee, and Moxee-Midway 115 kV lines). To the north is load served by Douglas and Chelan County PUD. To the east is load served by Grant County PUD and a pocket of Avista load located in Central Washington connected to Chelan and Grant PUD.

The customers in this area include:

- Chelan County PUD (Chelan)
- Grant County PUD (Grant)
- Douglas County PUD (Douglas)
- Avista energy (Avista)
- Kittitas County PUD (Kittitas)
- City of Ellensburg
- Benton REA (BREA)
- PacifiCorp (PAC)

The load area is served by the following major transmission paths or lines:

- From the northeast by two Grand Coulee-Columbia 230 kV lines, a Grand Coulee-Rocky Ford-Midway 230 kV line and a Grand Coulee-Midway 230 kV line
- From the south by the Midway-Big Eddy and the Midway-North Bonneville 230 kV lines

Local Generation and Load

The Mid-C area has five Columbia River hydroelectric facilities, two wind farms and five local generation plants with a combined maximum output of 5,560 MW. This generation plays a significant role in serving the regional as well as local load since the Mid-C area generation has significantly more capacity than area load. The Mid-C generation in conjunction with Upper Columbia generation is coordinated hourly to optimize the use of the Columbia River.

The local generation that supports the area load includes three classes:

Hydroelectric generation – There are five major hydroelectric plants on the Columbia River, including:

- Douglas Wells Dam (840 MW)
- Chelan Rocky Reach Dam (1287 MW)
- Chelan Rock Island Dam (660 MW)
- Grant Wanapum Dam (1038 MW)
- Grant Priest Rapids Dam (955 MW)

Wind generation – There are two wind farms; these include:

- Puget Sound Energy Wild Horse (273 MW)
- Horizon Kittitas Valley Wind (101 MW)

Other Generation – The other local generation includes:

- Chelan Falls Hydroelectric Project (59 MW)
- Grant Quincy Chute Hydroelectric (9.4 MW)
- SCL Summer Falls Power Plant (92 MW)
- USBR Roza Power Plant Yakima Project (13 MW)
- Grant Potholes East Canal (6.5 MW)

Mid-Columbia Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
2347	2556	2469	2768	2631	2901

Proposed Plans of Service

There are no proposed plans of service for this area.

Recently Completed Plans of Service

Northern Mid-Columbia Area Reinforcement

- Description: This is a joint project between BPA, Grant PUD, Douglas PUD, and Chelan PUD. This project will result in a new Columbia-Rapids 230 kV line.
- Purpose: This project is required to maintain reliable load service to the Northern Mid-Columbia area.
- Estimated Cost: $15,000,000
- Energization: 2023

Columbia 230 kV Bus Tie and Bus Sectionalizing Breaker Addition (Combined with project above.)

- Description: This project adds a new 230 kV bus tie breaker and 230 kV bus sectionalizing breaker at Columbia Substation.
- Purpose: This project improves operational and maintenance flexibility at Columbia Substation.
- Estimated Cost: See above.
- Energization: 2023

6.4.2 Okanogan Area

This area includes the Okanogan Valley area of north central Washington including the communities of Omak, Brewster, Bridgeport, Winthrop, Twisp, Pateros, Tonasket, and Okanogan.

The customers in this area include:

- Okanogan Public Utility District
- Okanogan Cooperative
- Douglas Public Utility District (Douglas)
- Nespelem Valley Electric
- Ferry County Public Utility District

The load area is served by the following major transmission paths or lines:

- Chief Joseph-East Omak #1 230 kV line
- Grand Coulee-Okanogan #2 115 kV line
- Grand Coulee-Foster Creek #1 115 kV line
- Wells-Foster Creek 115 kV line (Douglas)

Local Generation and Load

Generation serving this load area includes:

- Chief Joseph Dam (2,614 MW)
- Grand Coulee Dam (7,079 MW)
- Wells Dam (851 MW)

Okanogan Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
169	237	178	229	180	232

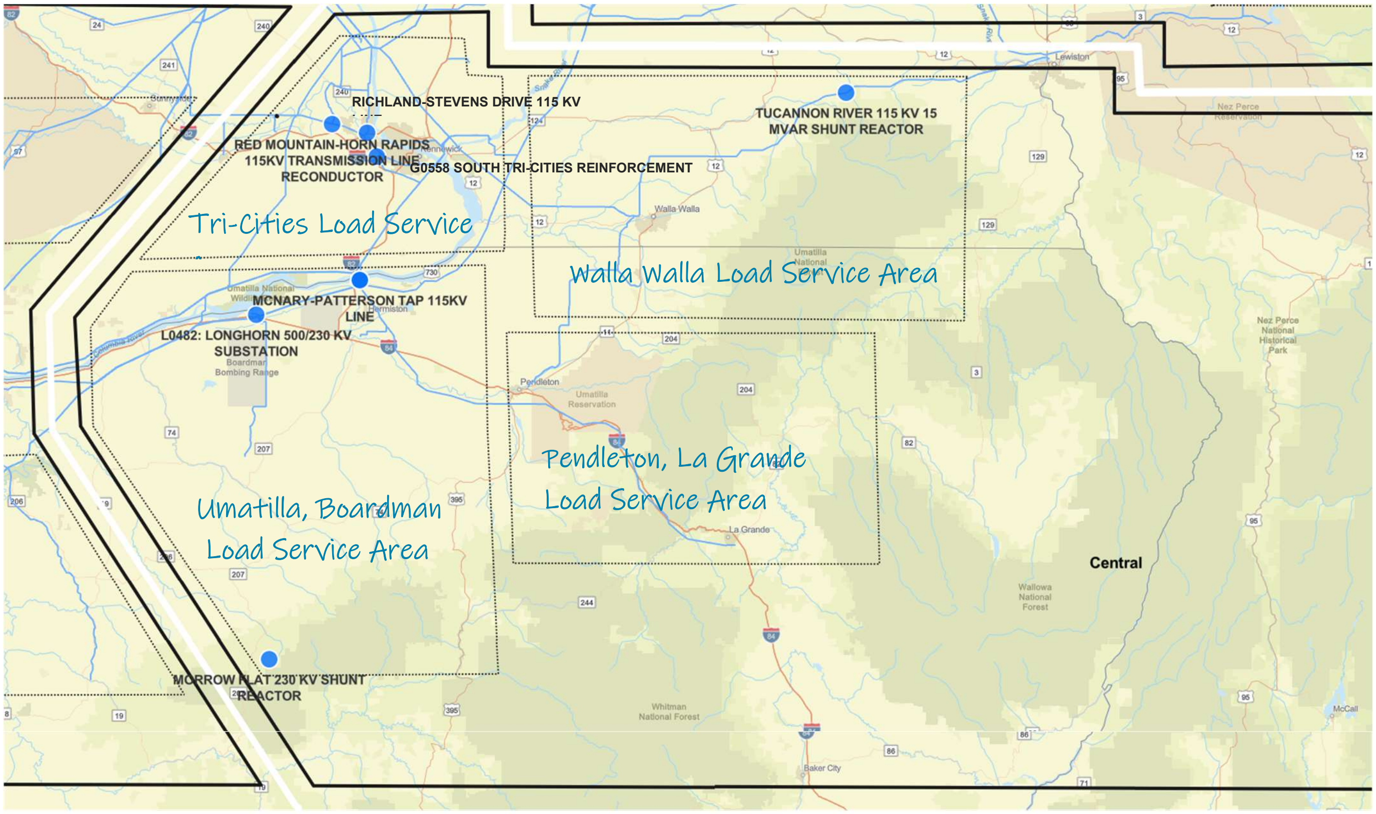
Proposed Plans of Service

There are no proposed projects for this area.

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.5 Central Planning Area



Planning Area Description

The Central Planning Area covers south central and southeast Washington, north central and northeast Oregon, and adjacent areas in western Idaho. This includes the major cities of Richland, Kennewick, Pasco, Pullman, and Walla Walla in Washington, and Pendleton, Hermiston, La Grande, and Umatilla in Oregon, and Lewiston and Moscow in Idaho along with the surrounding areas.

6.5.1 Pendleton / La Grande Area

This area includes the eastern Oregon communities of Pendleton and La Grande. The Pendleton/La Grande load area is in northeastern Oregon and extends east to the Idaho border and north to the Columbia River.

The customers in this area include:

- Oregon Trail Electric Cooperative
- PacifiCorp
- Umatilla Electric Cooperative
- Columbia Power Cooperative Association
- Columbia Basin Electric Cooperative

The load area is served by the following major transmission paths or lines:

- From the east by the LaGrande-(IPC) North Powder 230 kV line
- From the west by the McNary-Roundup 230 kV line

Local Generation and Load

There is no generation inside the Pendleton/La Grande cut plane. Horizon Wind Energy's Elkhorn Wind Power Project is adjacent to BPA's Pendleton/La Grande study area.

The local generation includes:

- Horizon's Elkhorn Valley Wind Project (110 MW)

Pendleton - La Grande Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
151	138	150	140	148	141

Proposed Plans of Service

There are no proposed projects for this area.

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.5.2 Tri-Cities Area

The Tri-Cities/Boardman Load Area study covers loads in the Benton and Franklin counties of Washington State, and the western portion of Walla Walla County. It includes the cities of Pasco, Kennewick, Richland, Boardman, and surrounding communities. The customers served in this area include Benton County PUD, Benton REA, Big Bend Electric Co-Op, City of Richland, Columbia REA, Franklin County PUD, South Columbia Basin Irrigation District, and DOE Richland.

The customers in this area include:

- Benton County Public Utility District
- Benton Rural Electric Association
- Big Bend Electric Cooperative

- City of Richland
- Columbia Rural Electric Association
- Franklin County Public Utility District
- U.S. Bureau of Reclamation (South Columbia Basin Irrigation District)
- U.S. Department of Energy (Richland Operations)

The load area is served by the following major transmission paths or lines:

- From the east by:
    - the Lower Monumental-McNary 500 kV line tapped at Sacajawea with a 500/115 kV transformer.
- From the north by:
    - the Midway-Benton 230 kV line and Benton 230/115 kV transformer
    - the Midway-Benton 115 kV line
    - the Midway-Ashe 230 kV lines through Hanford, the Ashe-White Bluffs 230 kV line, and White Bluffs 230/115 kV transformer
- From the south by:
    - the McNary-Franklin 230 kV line and Franklin 230/115 kV transformer
    - the McNary-Badger Canyon 115 kV line
    - the Horse Heaven 230/115 kV transformer
- From the west by:
    - the Grandview-Red Mountain 115 kV line

Local Generation and Load

The local generation is hydroelectric and wind generation. The nuclear Columbia Generating Station (1100 MW) is physically located in the Tri-Cities area, but is not electrically connected to the local load area. Therefore, it is not considered part of the local generation.

- USACE Ice Harbor Hydro (Snake River; 700 MW)
- USBR Chandler Hydro (Yakima River; 12 MW)
- Scooteney, Glade & Ringold Hydro (Irrigation system; 11 MW total)
- NextEra Energy Resources Stateline Wind (90 MW)
- Energy NW Nine Canyon Wind (90 MW)

Tri-Cities Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
1331	1078	1431	1093	1485	1118

Proposed Plans of Service

McNary-Paterson Tap 115 kV Line.

- Description: This project adds a new 115 kV PCB at McNary 115 kV substation and adds approximately two miles of new 115 kV line.
- Purpose: This upgrade is needed to provide reliable load service to the Tri-Cities area.
- Estimated Cost: $12,900,000
- Expected Energization: 2024

Red Mountain – Horn Rapids 115 kV Line Reconductor

- Description: This project is to reconductor the Red Mountain – Horn Rapids 115 kV section of BPA's Red Mountain – White Bluffs 115 kV transmission line to mitigate a bottleneck and maintain reliability load service.
- Purpose: This upgrade is needed to provide reliable load service to the Tri-Cities area.
- Estimated Cost: $3,600,000
- Expected Energization: 2025

Richland-Stevens Drive 115 kV Line

- Description: This project adds a new 115 kV line terminal and three miles of new 115 kV line.
- Purpose: This upgrade is needed to provide reliable load service to the Tri-Cities area.
- Estimated Cost: $12,500,000
- Expected Energization: 2027

G0558 South Tri-Cities Reinforcement Webber Canyon

- Description: The plan of service loops the Ashe-Marion 500 kV line into a new Webber Canyon substation. A new Webber Canyon 500/115 kV transformer then connects 17 miles of 115 kV line to Badger Canyon substation.
- Purpose: This upgrade is needed to provide reliable load service to the Tri-Cities area.
- Estimated Cost: $106,000,000
- Expected Energization: 2027

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.5.3 Umatilla - Boardman Area

The Umatilla Load Area covers loads in the Umatilla and Morrow Counties of Oregon State. It includes the cities of Hermiston, Umatilla, Boardman, and surrounding communities.

The customers served in this area include the Umatilla Electric Co-Op, Columbia Basin Electric Co-Op, and PacifiCorp. Significant generating resources in the Hermiston/Boardman area include the Hermiston Generating Plant, Horn Butte Wind Farm, and Echo Wind Farm.

The Umatilla load area is comprised of load served from McNary, Boardman, Morrow Flat, Dalreed, Hat Rock, and Cold Springs substations.

Local Generation and Load

Umatilla - Boardman Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
974	806	2032	1887	2146	2003

* The Umatilla/Boardman forecast peak load depends on how much of the requested load interconnection moves forward. Load interconnection requests are being studied as part of the Interconnection Process.

Proposed Plans of Service

L0481 McNary Terminal Addition

- Description: This project adds a new 230 kV line terminal at McNary substation for a new UEC connection.
- Purpose: This project is associated with interconnection L0481McNary 230 kV Bay Addition.
- Estimated Cost: $4,800,000
- Expected Energization: 2025

L0482 Boardman Area Reinforcement – Longhorn 500/230 kV Substation Addition

- Description: This project adds a 230 kV source to the Boardman area by looping the McNary – Coyote Springs 500 kV line into a new 500/230 kV substation, with UEC connections to the 230 kV yard.
- Purpose: This project is associated with interconnection L0482 Longhorn 500/230 kV substation.
- Estimated Cost: $206,300,000
- Expected Energization: 2025
-

Morrow Flat 230 kV Shunt Reactor Addition

- Description: This project adds a 230 kV shunt reactor (40 MVAR) at Morrow Flat Substation.
- Purpose: This Project is required to compensate for high voltages at Morrow Flat caused by the Morrow Flat-Blue Ridge line as well as the collector system capacitance when the output of wind generation is low.
- Estimated Cost: $2,900,000
- Expected Energization: 2025

Recently Completed Plans of Service

Jones Canyon 230 kV Shunt Reactor Addition

- Description: This project adds a 230 kV shunt reactor (40 MVAR) at Jones Canyon Substation.
- Purpose: This project is required to maintain voltage schedules in the area during light load conditions.
- Estimated Cost: $13,000,000
- Energization: 2023

6.5.4 Walla Walla Area

The Walla Walla load area is in southeastern Washington and northeastern Oregon. This area includes the Washington city of Walla Walla and the Oregon community of Milton-Freewater to the south.

The customers in this area include:

- City of Milton-Freewater
- PacifiCorp (PAC)
- Clearwater Power Co.
- Columbia Rural Electric Association
- Inland Power and Light
- Umatilla Electric Cooperative

The load area is served by the following major transmission paths or lines:

- PAC Wanapum-Walla Walla 230 kV line
- PAC Wallula-Walla Walla 230 kV line
- IPC Walla Walla- Hurricane 230 kV line
- PAC Talbot-Walla Walla 230 kV line
- Franklin-Walla Walla 115 kV line
- Walla Walla-Tucannon River 115 kV line

The area has the following wind generating resources in the area:

- NextEra Energy Resources Stateline Wind (92 MW)
- Vansycle Ridge Wind (25 MW)
- Puget Sound Energy Hopkins Ridge Wind (157 MW)
- Infigen Combine Hills II Wind (63 MW)

Local Generation and Load

The local generation in this area includes:

- NextEra Energy Resources Stateline Wind (92 MW)
- Vansycle Ridge Wind (25 MW)
- Puget Sound Energy Hopkins Ridge Wind (157 MW)
- Infigen Combine Hills II Wind (63 MW)

Walla Walla Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
105	72	130	106	133	110

Proposed Plans of Service

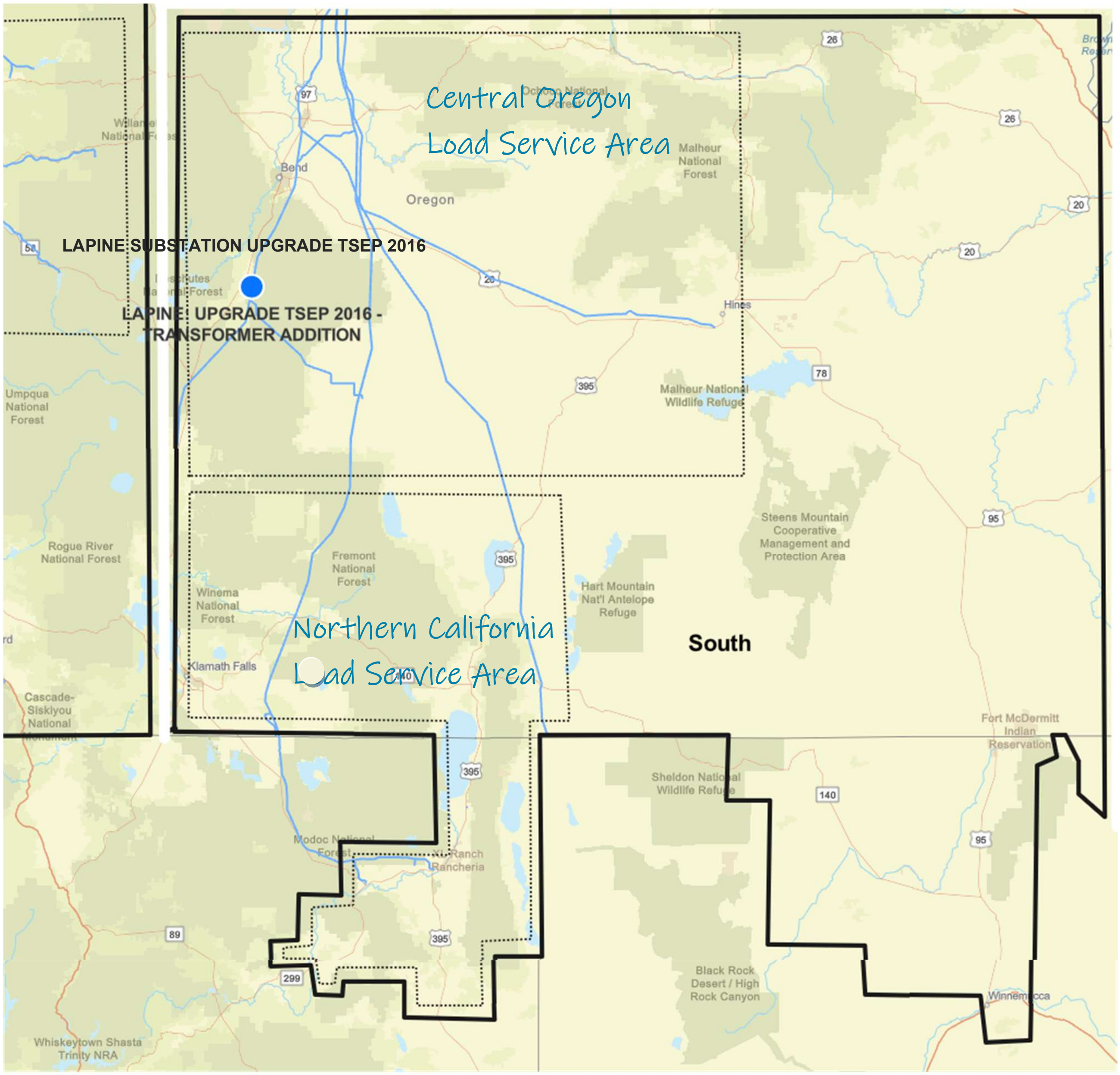
Tucannon River 115 kV MVAR Shunt Reactor

- Description: A 15 MVAR shunt reactor will be added at Tucannon River 115 kV substation.
- Purpose: This project is required to provide voltage control for multiple contingencies involving the Tucannon River-North Lewiston 115 kV line.
- Estimated Cost: $11,700,000
- Expected Energization: 2025

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.6 Southern Planning Area



Planning Area Description

The Southern Planning Area contains two load service areas and two interties. The load areas are Central Oregon (COR) and Northern California (NCA). The interties are the California Oregon Intertie (COI) and the Pacific Direct Current Intertie (PDCI).

6.6.1 Central Oregon Area

The Central Oregon Area is located east of the Cascade Mountains and includes Redmond (to the west), Prineville (to the east), and Bend, La Pine, and Sun River (to the south).

The customers in the Central Oregon area include:

- PacifiCorp
- Central Electric Cooperative
- Midstate Electric Cooperative

The Central Oregon load area is served by the following major BPA transmission path or lines:

- Big Eddy-Redmond 230 kV line
- Two 500/230 kV transformers at Ponderosa and the BPA Ponderosa-Pilot Butte 230 kV line
- Pilot Butte – La Pine 230 kV line

Local Generation and Load

The largest resources in the area are PGE's hydroelectric plants: Round Butte Dam, Pelton Dam, and the Pelton Reregulating Dam, for a combined total of approximately 470 MW. In addition, PacifiCorp has recently energized various solar generation projects in the area for a combined total of approximately 100 MW. PAC also owns smaller generation projects in the area (each less than 5 MW).

Central Oregon Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
728	807	740	883	772	917

Proposed Plans of Service

La Pine Substation Upgrade TSEP 2016

- Description: This project will provide adequate voltage support to meet NERC Planning Criteria to mitigate losses on the Fort Rock - La Pine 115 kV line due to substantial amounts of generation being added at Fort Rock.
- Purpose: The project will accommodate new generation in the La Pine, Oregon area that is associated with transmission service requests in the 2016 TSEP.
- Estimated Cost: $7,100,000
- Expected Energization: 2024

La Pine Transformer Addition TSEP 2016

- Description: This project will replace and relocate transformer bank no. 2. La Pine's existing 230/115 kV 100 MVA transformer will be replaced with a new 230/115 kV 300 MVA transformer.
- Purpose: The project will accommodate new generation in the La Pine, Oregon area that is associated with transmission service requests in the 2016 TSEP.
- Estimated Cost: $11,600,000
- Expected Energization: 2025

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.6.2 Northern California Area

The Northern California (NC) load area is geographically situated on both sides of the California-Oregon border. In previous assessments it was sometimes referred to as Southern Oregon or Alturas, and it was studied as part of the Central Oregon load area. The area is a mix of BPA and PacifiCorp (PAC) owned facilities and loads. The major sources into the area can be traced to Malin, Chiloquin, and Hilltop Substations. The NC area is summer peaking with historical peak load of 112 MW. The load owners in the area include PacifiCorp and Surprise Valley Electric Cooperative. The northern end of Path 76, part of the Northwest AC Intertie, crosses the NCA cut plane.

Local Generation and Load

Northern California Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
118	87	112	81	113	81

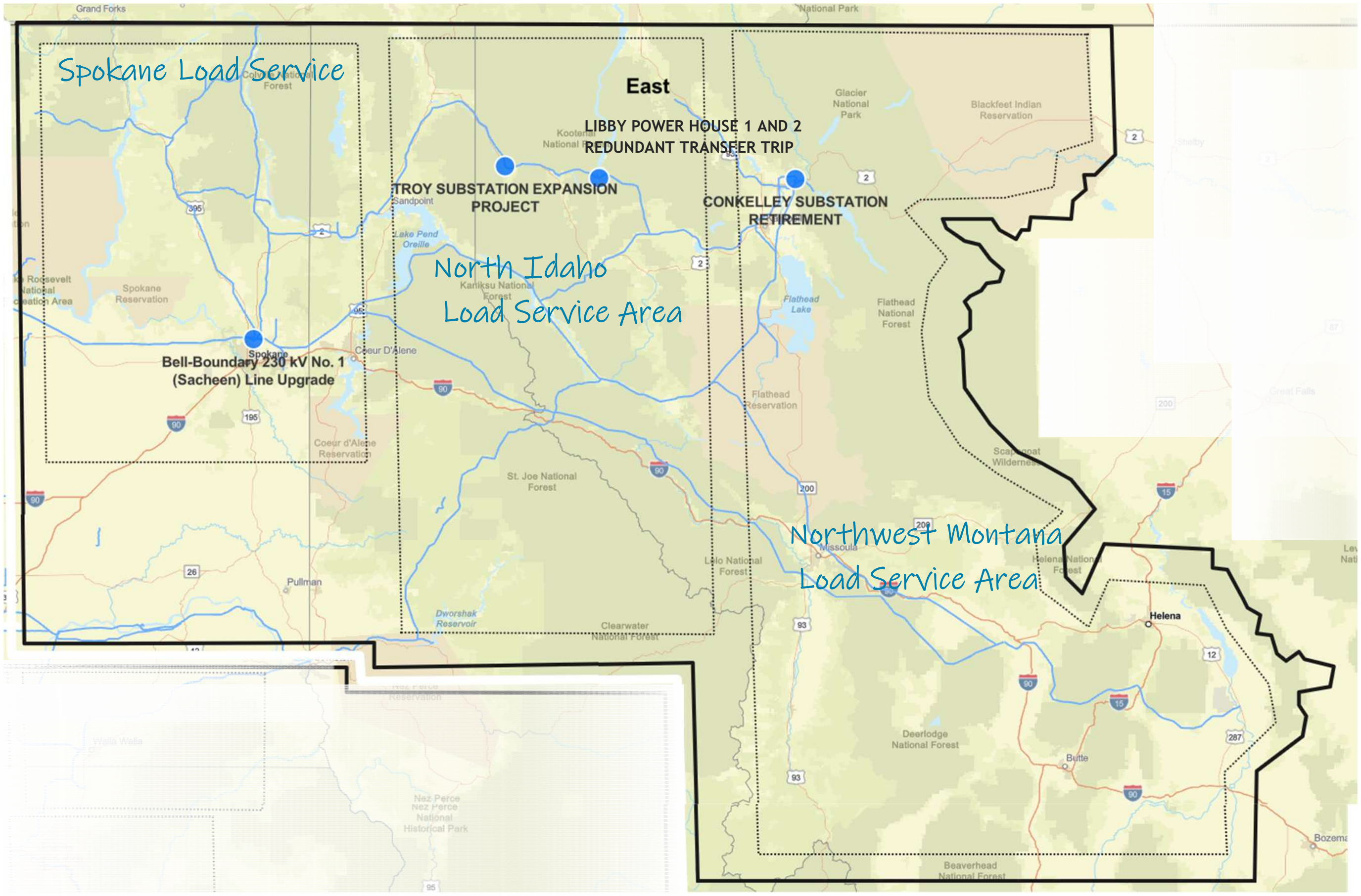
Proposed Plans of Service

There are no proposed projects for this area.

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.7 Eastern Planning Area



Planning Area Description

The Eastern Planning Area covers portions of northwest Montana including Kalispell and Missoula, north Idaho, and eastern Washington from Spokane to the Canadian border. The load areas within the Planning area are historically winter peaking, although the Spokane area summer loads are forecast to approach winter values in the future. Generation in this area includes hydroelectric facilities in northwest Montana, north Idaho, and northeastern Washington along with thermal generation around Spokane.

6.7.1 North Idaho Area

The North Idaho area encompasses northeast Bonner County and Boundary County in Idaho and western Lincoln County in Montana. The main communities are in the Sandpoint, Idaho vicinity. This area includes Newport, Washington and Priest River, Idaho to the west, Bonners Ferry and Moyie Springs to the north, Troy and Libby, Montana to the east, and the communities along the Clark Fork River in Idaho to the south.

The customers in this area include:

- Avista
- Northern Lights Electric Cooperative (NLI)
- City of Bonners Ferry (CBF)
- City of Troy
- Flathead Electric Cooperative (FEC)

The load area is served by the following major transmission paths or lines:

- Libby-Bonners Ferry 115 kV line 1
- Sand Creek-Bonners Ferry 115 kV lines 1 and 2 (currently operated as a single circuit)
- Albeni Falls-Sand Creek 115 kV line 1
- Avista Cabinet Gorge-Bronx-Sand Creek 115 kV line 1

The local generation in the area includes.

- USACE Libby (605MW)
- USACE Albeni Falls (48 MW)
- EWEB Smith Falls (36 MW)
- Avista Cabinet Gorge (287 MW)
- Avista Noxon (586 MW)
- NLI Lake Creek (3 MW)
- CBF Moyie (2 MW)

To a lesser extent the following hydroelectric generation can impact the North Idaho load area:

- USBR Hungry Horse (428 MW)
- Cogentrix Energy Lancaster (301 MW)
- Avista Boulder (25 MW)
- Seattle City Light Boundary (1040 MW)

North Idaho Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
122	206	128	182	133	190

Proposed Plans of Service

Troy 115 kV Shunt Capacitor Addition (12.6 MVAR)

- Description: This project installs a shut capacitor at the Troy Substation. The capacitor size will be 12.6 MVAR.
- Purpose: This project will maintain reliable load service to the North Idaho area.
- Estimated Cost: $11,000,000
- Expected Energization: 2027

Libby Power House 1 and 2 Redundant Transfer Trip

- Description: This project installs redundant transfer trip equipment to the Libby PH-Libby #1 and #2 lines.
- Purpose: Having redundant transfer trip equipment will help protect the transformers and generators at the Libby Power Houses and provide operations and maintenance flexibility.
- Estimated Cost: $500,000
- Expected Energization: 2024

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.7.2 Northwest Montana Area

This area covers loads in Flathead and Lincoln counties in Montana. It includes the Flathead Valley area of northwest Montana including the communities of Kalispell and Columbia Falls.

The customers in this area include:

- Flathead Electric Cooperative
- Northwestern Energy
- Lincoln Electric Cooperative
- U.S. Bureau of Reclamation (USBR)

The Northwest Montana load area is served by the following major transmission paths or lines:

- Hungry Horse – Columbia Falls 230 kV line 1
- Hungry Horse – Conkelley 230 kV line 1
- Columbia Falls – Kalispell 115 kV line 1
- Columbia Falls – Trego 115 kV line 1
- Columbia Falls – Conkelley 230 kV line 1
- Columbia Falls – Flathead 230 kV line 1
- Libby-Conkelley 230 kV line 1

Local Generation and Load

Local generation serving the load area includes:

- Avista Rathdrum (154 MW)
- Avista Cabinet Gorge (263 MW)
- Cogentrix Energy Lancaster (270 MW)
- PPL Global Kerr (194 MW)
- PPL Global Colstrip (2094 MW)
- USACE Noxon (488 MW)
- USACE Libby (600 MW)

Northwest Montana Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
261	411	303	415	326	440

Proposed Plans of Service

Conkelley Substation Retirement

- Description: This project will accommodate the retirement of Conkelley substation. When the substation is retired, all substation facilities will be removed. The existing Libby-Conkelley, Hungry Horse-Conkelley, and Columbia Falls-Conkelley 230 kV lines will be tied together at Conkelley. Also, the existing Libby-Conkelley line will be looped into the Flathead 230 kV substation and a sectionalizing breaker will be added at Flathead. These changes will eliminate the existing Libby-Conkelley and Conkelley-Hungry Horse lines and create a new Libby-Flathead 230 kV line and a new three terminal Flathead-Columbia Falls-Hungry Horse 230 kV line.
- Purpose: This project is needed to accommodate the retirement of Conkelley substation.
- Estimated Costs: $30,000,000
- Expected Energization: 2025

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.7.3 Spokane / Colville / Boundary Area

This area includes Pend Oreille, Stevens, and Spokane County. This area is in eastern Washington State. It extends north to include the Colville Valley and east to include Newport, Washington. This load area includes the greater Spokane, Washington area as well as Colville Valley to the north including the communities of Colville and Chewelah. This area also includes Newport, Washington to the east, as well as Pend Oreille, Stevens, and Spokane Counties.

The customers in this area include:

- Avista
- Inland Power and Light
- West Kootenai Power and Light
- Pend Oreille PUD
- Ponderay Newsprint Company

The load area is served by the following major transmission paths or lines:

- Bell-Boundary 230 kV lines 1 and 2
- Usk-Boundary 230 kV line
- Taft Bell 500-kV line
- Bell-Lancaster 230 kV line
- Avista Lancaster-Boulder 230 kV line
- Avista Benewah-Boulder 230 kV line
- Avista Rathdrum-Boulder 230 kV line
- Grand Coulee-Bell 500 kV line
- Three Grand Coulee-Bell 230 kV lines
- Grand Coulee-Westside 230 kV line

Local Generation and Load

Local generation serving the load area includes:

Spokane/Colville Generation	Fuel	Maximum MW	Owner
Boundary	Hydro	1040	Seattle City Light
Box Canyon	Hydro	90	Pend Oreille
Albeni Falls	Hydro	48	USACE
Long Lake	Hydro	88	Avista
Little Falls	Hydro	32	Avista
Dworshak	Hydro	458	USACE
Boulder	Hydro	25	Avista
Post Street	Hydro	10	Avista
Monroe	Hydro	16	Avista
Spokane Waste	Steam Turbine	22	City of Spokane
Northeast	Gas Turbine	68	Avista
Up River	Hydro	18	City of Spokane
Nine Mile	Hydro	24	Avista
Post Falls	Hydro	18	Avista
Kettle Falls	Steam Turbine	52	Avista

Spokane - Colville - Boundary Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
1004	924	820	822	829	847

Proposed Plans of Service

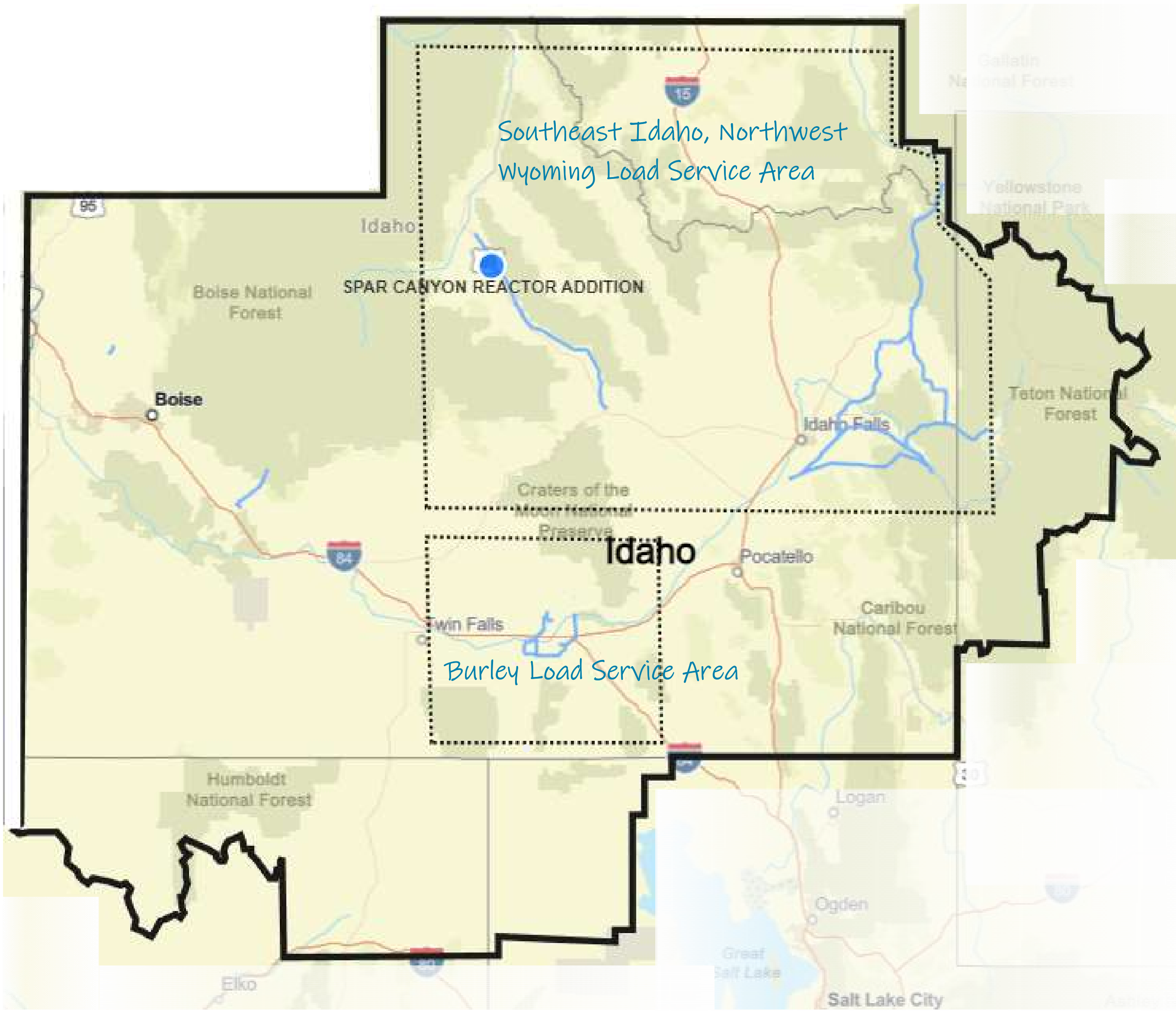
Bell-Boundary 230 kV No. (Sacheen) Line Upgrade (Remove Impairments)

- Description: The Boundary-Sacheen No. 1 230 kV line has been de-rated from 80°C to 60°C MOT. The line will be restored to 80°C MOT and eventually increase it to 100°C MOT
- Purpose: This project is needed to maintain reliable load service to this area.
- Estimated Costs: Cost will be estimated once scoping is underway.
- Expected Energization: 2027

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.8 Idaho Planning Area



Planning Area Description

The Idaho Planning Area covers Twin Falls, Pocatello, and Idaho Falls in Idaho and Jackson in Northwest Wyoming. There are two load service areas – Burley Area and Southeast Idaho and Northwest Wyoming Area. The planning area is surrounded by the Caribou National Forest, Sawtooth National Forest, and the Boise National Forest.

6.8.1 Burley Area

The Burley area is in Minidoka and Cassia counties in south central Idaho. This area includes the communities of Burley, West Burley, Riverton, Minidoka, Rupert, and Heyburn. The area load is mostly residential and irrigation. Loads peak during the summer due to the irrigation load component.

The customers in this area include:

- Idaho Power
- Raft River Electric Coop
- Riverside Electric
- South Side Electric
- United Electric Coop
- Wells Rural Electric
- U.S. Bureau of Reclamation
- Burley Irrigation District
- East End Mutual
- Farmers Electric
- The Cities of Albion, Burley, Declo, Heyburn, Rupert, and Minidoka
- This load area is served primarily by Idaho Power transmission facilities.

Local Generation and Load

Local generation in this load service area includes Minidoka Power House (28 MW), Milner Power Plant (58 MW), and Bridge Geothermal (13 MW).

Burley Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
207	153	225	165	234	177

Proposed Plans of Service

There are no proposed projects for this area.

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.8.2 Southeast Idaho / Northwest Wyoming Area

This load area includes southeast Idaho from Idaho Falls south to Soda Springs and east to Jackson, Wyoming. This area is served by Lower Valley Energy. It also includes the area from West Yellowstone, Montana south to Afton, Wyoming which is served by Fall River Electric Cooperative. This area includes the communities of Jackson, Wyoming and Driggs, Idaho.

The customers in this area include:

- Lower Valley Energy
- Fall River Electric Cooperative (FEC)
- U.S. Bureau of Reclamation (USBR)
- Utah Associated Municipal Power Systems (UAMPS)

The load area is served by the following major transmission paths or lines:

- Goshen-Drummond 161 kV line
- Goshen-Swan Valley 161 kV line
- Goshen-Palisades 115 kV line

Local Generation and Load

Local generation serving the load area includes:

- USBR Palisades Dam (160 MW) (limited to about 8 MW in winter)
- Horse Butte Wind Project (60 MW in summer)

Southeast Idaho - Northwest Wyoming Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
171	311	185	305	192	322

Proposed Plans of Service

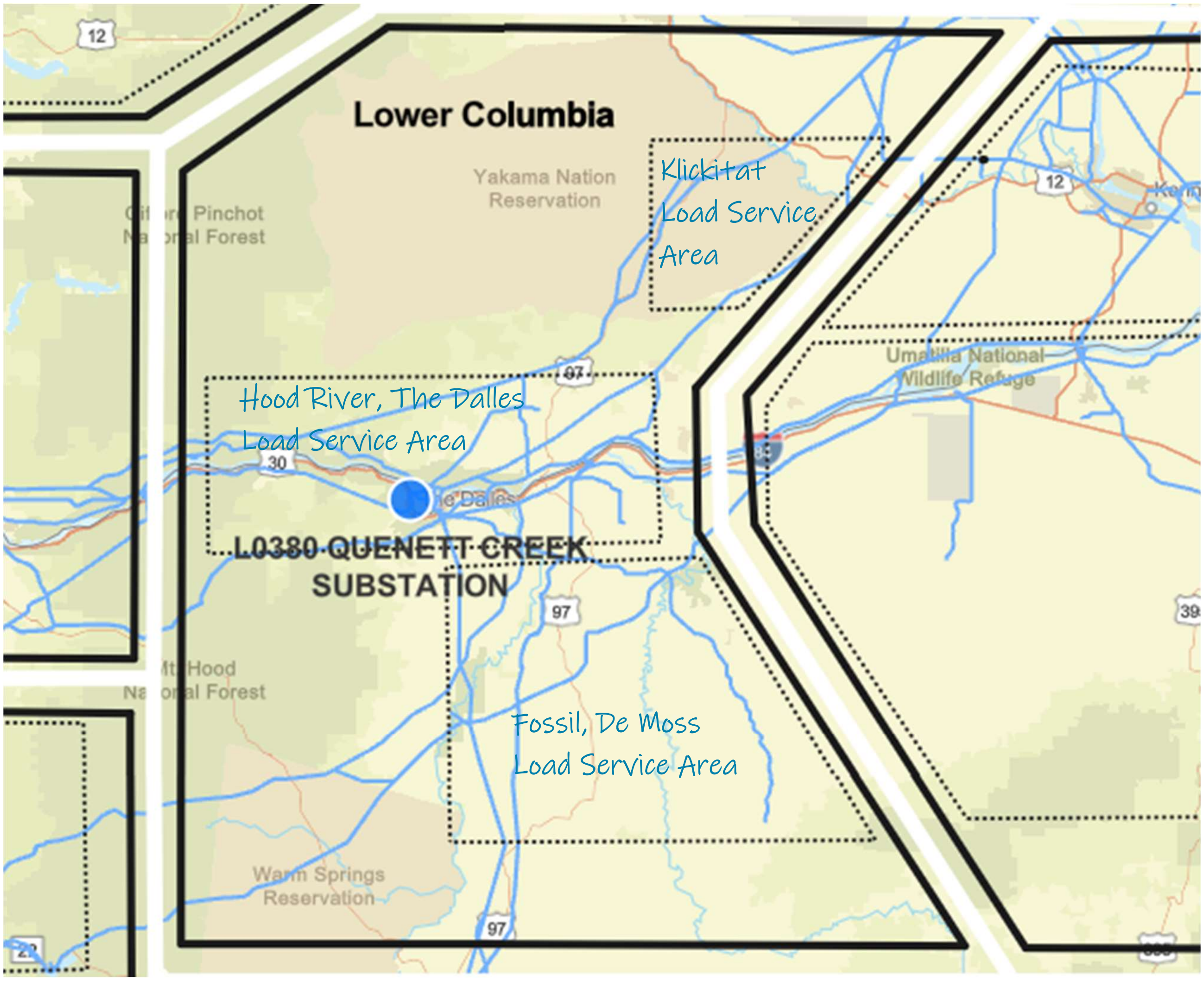
Spar Canyon 230 kV Reactor Addition

- Description: This project adds a 230 kV 25 Mvar shunt reactor at Spar Canyon Substation.
- Purpose: This project improves the ability to maintain voltage schedules and increases operations and maintenance flexibility at Spar Canyon.
- Estimated Cost: $8,500,000
- Expected Energization: 2024

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.9 Lower Columbia Planning Area



Planning Area Description

The Lower Columbia Planning Area spans the Columbia River Gorge, from Hood River to Boardman. The Lower Columbia Area contains three load areas, Hood River/The Dalles, Fossil/De Moss, and Klickitat County PUD. Customers include PacifiCorp (PAC), Hood River Electric Co-Op, Northern Wasco County PUD (NWCPUD), Klickitat County PUD, Skamania County PUD and Wasco Electric Co-Op.

Generation in this area includes large hydro on the Federal Columbia River Power System; Bonneville, The Dalles, and John Day dams. Local wind generation in the area is primarily owned by PGE (Bigelow, Klondike) or merchant power providers (Rock Creek, PAtu, and De Moss).

Lower Columbia load areas are primarily served by the West of Slatt (WOS) path to the east; or by the Pacific DC Intertie (PDCI) and NW AC Intertie (NWACI) paths from the south. The adjacent Willamette Valley/Southwest Washington (WILSWA) planning area borders to the west, and the Boardman/Umatilla Planning area borders to the east.

6.9.1 Hood River / The Dalles Area

The Hood River/The Dalles area includes portions of northern Oregon and southern Washington along the Columbia River Gorge. The area spans from Bonneville Dam to the west, to The Dalles Dam to the east. It includes the communities of Cascade Locks, Hood River and The Dalles in Oregon and Stevenson, Carson, White Salmon, and Bingen in Washington.

Note: The Hood River / The Dalles Area was reported as part of the WILSWA Planning Area in previous annual Transmission Plans.

The customers in this area (and the communities they serve) include:

- Klickitat County Public Utility District in White Salmon and Bingen
- Skamania County Public Utility District in Stevenson and Carson
- City of Cascade Locks in Cascade Locks
- PacifiCorp in Hood River
- Hood River Electric Coop in Hood River
- Northern Wasco Public Utility District in The Dalles
- USBR in The Dalles
- Wasco Electric Cooperative

The load area is served by the following major transmission paths or lines:

- Bonneville Powerhouse 1 – Alcoa 115 kV line
- Bonneville Powerhouse 1 – North Camas 115 kV line
- Bonneville Powerhouse 1 – Hood River 115 kV line
- Chenoweth 230/115 kV transformer
- Big Eddy – Quenett Creek 1 and 2 230 KV lines
- Big Eddy – The Dalles 115 kV line

Local Generation and Load

Generation serving this area includes:

- USACE Bonneville Powerhouse (224 MW)
- USACE The Dalles Powerhouse (2080 MW)
- SDS Lumber Generation (10 MW)
- Farmers Irrigation District Plant 2 (1.8 MW)

Hood River - The Dalles Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
283	306	474	471	515	526

Proposed Plans of Service

L0380 Quenett Creek Substation Addition

- Description: This project adds a new Quenett substation to accommodate new industrial load in the area.
- Purpose: This project is associated with interconnection L0380.
- Estimated Cost: $60,000,000
- Expected Energization: 2025

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.9.2 De Moss / Fossil Area

This De Moss/Fossil load area spans a portion of north central Oregon, including the communities of Maupin, Tygh Valley, and Grass Valley. It encompasses Wasco and Sherman counties in Oregon.

Note: The De Moss / Fossil area was reported as part of the Central Planning area in previous annual Transmission Plans.

The customers in this area include:

- Wasco Electric Cooperative (WEC)
- Columbia Basin Electric Cooperative
- Columbia Power Cooperative Association
- PacifiCorp

The DeMoss/Fossil load area is served by the following major transmission paths or lines:

- From the north by the Big Eddy-DeMoss 115 kV line
- From the west by the Big Eddy-Redmond 230 kV line (via WEC's Maupin-Fossil 69 kV line)

Local Generation and Load

The local generation includes The Dalles Dam (2084 MW), Seawest's Condon Wind (50 MW) and PaTu Wind (10 MW).

De Moss - Fossil Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
29	37	26	34	26	34

Proposed Plans of Service

There are no proposed projects for this area.

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

6.9.3 Klickitat County Area

The Klickitat County area is in south central Washington and is comprised of Klickitat County PUD and various generation projects interconnected to their transmission system.

The Klickitat County PUD BES system contains two distinct regions with a normally open emergency tie line between Linden and Dooley substations. The first region interconnects generation radially to BPA's Rock Creek 500/230 kV substation. BPA's Wautoma-John Day 500 kV line is looped into Rock Creek 500 kV substation. Klickitat County PUD owns 230 kV lines from Rock Creek to Dooley, Rock Creek to White Creek, and Rock Creek to the Juniper Canyon 1 wind project that interconnects wind generation radially to Rock Creek substation.

Note: The Klickitat load area was reported as part of the Northern Planning Area in previous Transmission Plans.

Generation sources include the Windy Point, Tuolmne Wind, Dooley, Juniper Canyon, Goodnoe Hills, White Creek, and Harvest wind projects.

The second region is interconnected radially to BPA's Harvalum 230 kV substation. Harvalum substation is connected to BPA's 230 kV line that runs from McNary to Big Eddy substation. Klickitat County PUD owns the 230 kV line from Harvalum to their EE Clouse 230/115 kV substation that interconnects generation at 230 kV and serves their load at 115 kV.

Generation sources include the 303 MW Goldendale Energy Project and 50 MW Linden Wind project. Additional load is served at Lyle and Spearfish substations at 69 kV and is fed from BPA's Chenoweth 115 kV substation.

Local Generation and Load

Klickitat County Area Load					
Historical Peak Load (MW)		Five-Year Load (MW), 2028		Ten-Year Load (MW), 2032	
Summer	Winter	Summer	Winter	Summer	Winter
63	81	90	106	91	108

Proposed Plans of Service

There are no proposed projects for this area.

Recently Completed Plans of Service

There are no projects that have been completed in this area since the previous planning cycle.

7. Transmission Needs by Path

The Bonneville Power Administration is a nonprofit federal power marketing administration based in the Pacific Northwest. BPA markets wholesale electrical power from 31 federal hydroelectric projects in the Northwest, one nonfederal nuclear plant and several small nonfederal power plants. The dams are operated by the U.S. Army Corps of Engineers and the Bureau of Reclamation. The nonfederal nuclear plant, Columbia Generating Station, is owned and operated by Energy Northwest, a joint operating agency of the state of Washington.

BPA also operates and maintains about three-fourths of the high-voltage transmission in its service territory. BPA's territory includes Idaho, Oregon, Washington, western Montana and small parts of eastern Montana, California, Nevada, Utah, and Wyoming.

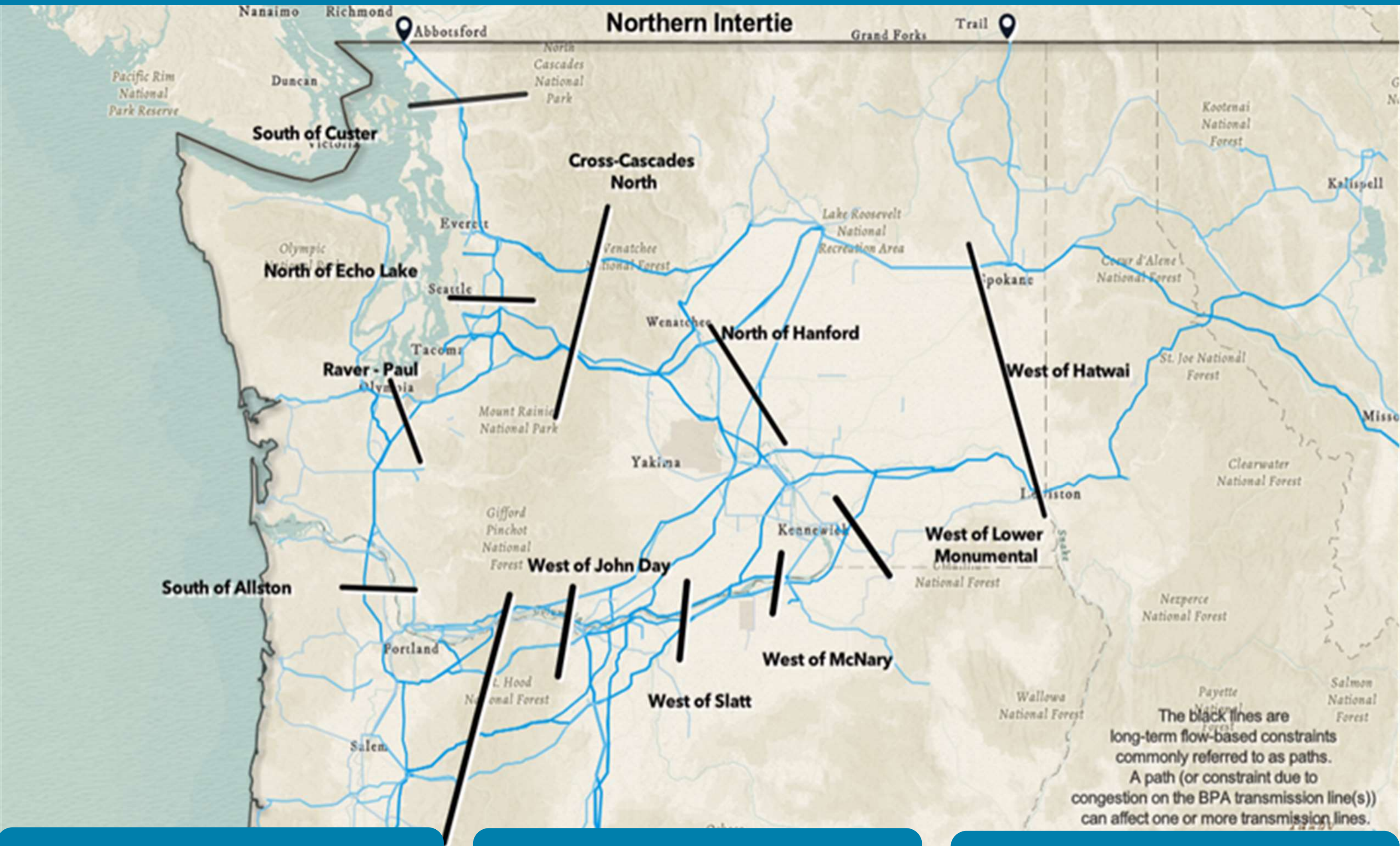
The BPA transmission system is characterized primarily by hydro generation on the main stem Columbia and lower Snake River that are remote from load centers. Most of the generation is run-of-the-river hydro. In addition, there are several thermal generators located along the I-5 corridor from Seattle to Portland.

The paths and interties are studied with a variety of scenarios that reflect seasonal patterns of flows across BPA's main grid network. The following page describes the typical seasonal patterns across the main grid transmission system. Since the various system patterns occur seasonally and are dependent on weather, they do not all occur simultaneously.

Paths	
1	South of Custer
2	South of Allston
3	North of Echo Lake
4	North of Hanford
5	Raver to Paul
6	Cross Cascades North
7	Cross Cascades South
8	West of John Day
9	West of Slatt
10	West of McNary
11	West of Lower Monumental
12	West of Hatwai

Paths

The paths and interties are studied with a variety of scenarios that reflect seasonal patterns of flows across BPA's main grid network. Since the various system patterns occur seasonally and are dependent on weather, they do not all occur simultaneously.



Winter Scenario

In the winter season, hydro and thermal generation is operated to serve peak load. The load in the Pacific Northwest typically peaks in the winter (November-February), although there are areas that also peak in the summer season (mid-June through September). The winter scenario results in high east-to-west flows on the transmission system crossing the Cascade Mountains, to deliver generation from resources located east of the Cascades, to the load centers in western Washington and western Oregon. With thermal generation located in western Washington, transfers between Seattle and Portland are low in the winter.

Spring Scenario

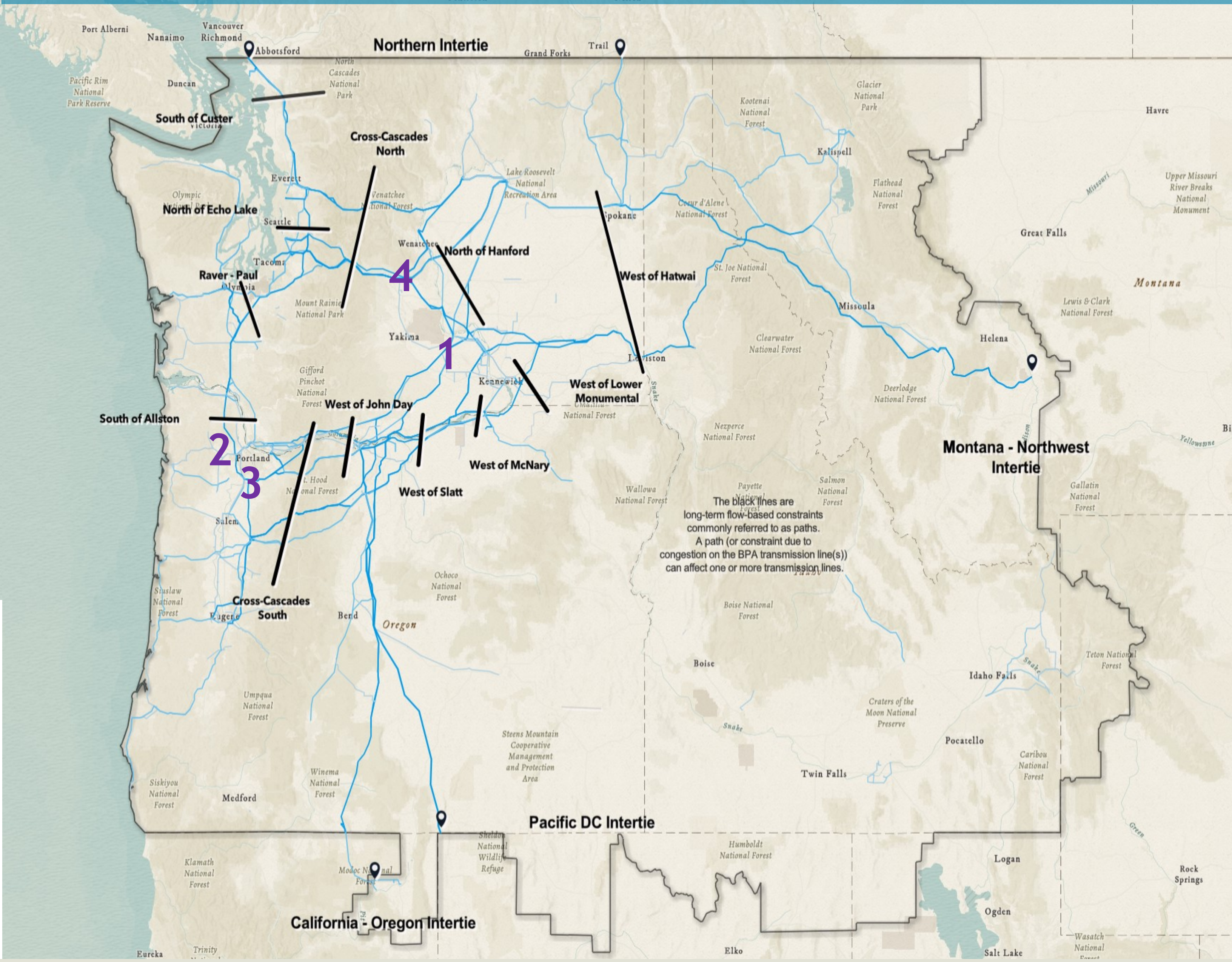
The spring and early summer season (March-June) are when high hydro run-off occurs due to snow melt across the region (spring run-off scenario). During this time, water in the northern Columbia River basin is stored behind Canadian dams, and the hydro generation along the Snake River is peaking.

Combined with moderate spring loads, the run-off scenario results in high flows across the transmission system in an east-to-west direction from northern Idaho and eastern Washington feeding the interties to California. After the spring run-off, generation along the lower Snake River drops off dramatically for the summer.

Summer Scenario

During the latter part of summer (July-September), water that was stored in the spring is released through hydro projects in Canada. The late summer scenario results in high generation levels at hydro plants along the Columbia River. These high generation levels produce high flows across the transmission system in the north-to-south direction from the Upper Columbia and Canada and down through the system to serve load centers in Puget Sound, the Willamette Valley, and California.

Paths – Proposed Plans of Service



No.	Proposed Plan of Service Title	Estimated Costs	Expected Energization Date
	South of Allston		
1	Schultz-Wautoma 500 kV Series Capacitors	$48,000,000	2024
2	Keeler 500 kV Expansion and Transformer	$41,300,000	2029
	West of Cascades South		
3	Pearl-Sherwood-McLoughlin Upgrade	$10,000,000	2027
	West of Cascades North		
4	Cross-Cascades North Upgrade TSEP 2022 (Includes Schultz-Raver 3&4 Reconductor and Series Capacitors)	$400,000,000	2030

7.1 South of Custer Path

Description

South of Custer (SOC) is a north-to-south path that connects the northern Puget Sound Area. This path is located south of Custer Substation in the Bellingham area of Washington State.

This path includes the following lines:

- Monroe-Custer 500 kV lines 1 and 2
- Custer-Bellingham 230 kV line 1
- Custer-Murray 230 kV line 1

Proposed Plans of Service

There are no proposed projects for this path.

Recently Completed Plans of Service

There are no completed plans of service for this path since the last planning cycle.

7.2 North of Echo Lake Path

Description

North of Echo Lake (NOEL) path is a south-to-north path that connects the central Puget Sound Area (PSA).

This path includes the following lines:

- Echo Lake-Maple Valley 500 kV lines 1 and 2
- Echo Lake-Snoking-Monroe 500 kV line
- Covington-Maple Valley 230 kV line 2

Proposed Plans of Service

There are no proposed projects for this path.

Recently Completed Plans of Service

There are no completed plans of service for this path since the last planning cycle.

7.3 Raver to Paul Path

Description

The Raver-Paul (R-P) path is located east of Tacoma, WA and spans from near Covington, WA to Centralia, WA. The critical facilities in the area are the Raver, Paul, Covington, Tacoma, Olympia, and Satsop substations. The generation projects in this area are the Centralia, Frederickson LLP, Frederickson (PSE), Grays Harbor, and Chehalis thermal generation projects. In addition, the Fredonia and Whitehorn generation projects impact the area. The load in this area is a mixture of industrial, commercial, and residential loads in Covington, WA, Tacoma, WA, Olympia, WA, and the Olympic Peninsula.

The R-P path is defined as the Raver-Paul #1 500 kV line. Typically, the R-P path sees its highest loading during late spring and early summer off-peak load hours. During late spring and early summer conditions, substantial amounts of hydro generation on-line in the Northwest and Canada, with moderate loads in the Northwest can occur simultaneously with I-5 Corridor thermal generation off-line due to maintenance schedules and economic factors. This generation pattern results in high flows across the R-P path.

This path includes the following line:

- Raver-Paul 500 kV Line 1

The customers in the area include:

- Puget Sound Energy (PSE)
- Tacoma Power
- Mason County #1 & #3 PUDs
- Jefferson County PUD
- Clallam County PUD
- City of Port Angeles
- Grays Harbor PUD

Proposed Plans of Service

There are no proposed projects for this path.

Recently Completed Plans of Service

Raver 500/230 kV Transformer (PSANI), (Also included in the Seattle, Tacoma, and Olympia area.)

- Description: This project added a 1300 MVA, 500/230 kV transformer at Raver Substation. This project was part of the overall Puget Sound Area/Northern Intertie (PSANI) Regional Reinforcement Plan. This was a joint project between participating utilities in the Puget Sound area.
- Purpose: This project is required to support load growth in the Puget Sound area.
- Estimated Cost: $100,000,000
- Energization: 2021 for the transformer and 2024 for the rest of the PSANI project

7.4 West of Cascades North Path

Description

The West of Cascades North (WOCN) Path spans the northern Cascades Mountain range in Washington State. It connects generation hubs on the Columbia River in eastern Washington to load centers in Puget Sound and western Washington. It is comprised of system elements owned by BPA and PSE, and only flows in the east-to-west direction.

This path consists of the following transmission lines:

- Chief Joseph-Monroe #1 500 kV line (BPA)
- Schultz-Raver #1, #3, and #4 500 kV lines (BPA)
- Schultz-Echo Lake 500 kV line (BPA)
- Chief Joseph-Snohomish #3 and #4 345 kV lines (BPA)
- Rocky Reach-Maple Valley #1 345 kV line (BPA)
- Grand Coulee-Olympia #1 287 kV line (BPA)
- Rocky Reach-Cascade 230 kV line (PSE)
- Bettas Road-Covington #1 230 kV line (BPA)

Proposed Plans of Service

Cross Cascades North Upgrade TSEP 2022

- Description: This project is required to enable additional transmission capacity on West of Cascades North. Both Schultz-Raver #3 and #4 500 kV lines will be re-conductored; the 500 kV series capacitor on the Schultz-Raver #4 500 kV line will be upgraded to its ultimate rating to match the 500 kV series capacitor on the Schultz-Raver #3 500 kV line; a new +350/-300 Mvar STATCOM will be installed at Olympia 230 kV; a new 221 Mvar shunt capacitor bank will be installed at Paul 500 kV.
- Purpose: This project will provide capacity on the West of Cascades North path.
- Estimated Cost: $400,000,000
- Expected Energization: 2030

Recently Completed Plans of Service

There are no completed plans of service for this path since the last planning cycle.

7.5 South of Allston Path

Description

The South of Allston (SOA) path is located along the I-5 Corridor west of the Cascade Mountains and spans from near Alston Oregon to Sherwood Oregon. The main grid facilities located in this area are the Allston, Keeler, and Pearl substations. The Southwest Washington and Northwest Oregon load service area includes the cities of Portland, Oregon and Vancouver, Washington, which include high concentrations of industrial, commercial, and residential load.

The highest flow across the SOA path occurs during peak summer load conditions combined with high north-to-south transfers from Canada through the Northwest to the Puget Sound, Portland, and California load areas. The high north-to-south flows occur due to excess generation in Canada and the Northwest and high energy demands in the Northwest and California.

This path includes the following lines:

- Keeler – Allston 500-kV
- Trojan – St. Marys 230-kV (PGE)
- Trojan – Rivergate 230-kV (PGE)
- Ross – Lexington 230-kV (rev)
- St. Helens – Allston 115-kV
- Merwin – St. Johns 115-kV (PACW)
- Seaside – Astoria 115-kV (PACW)
- Clatsop 230/115 kV (rev)

Proposed Plans of Service

Schultz-Wautoma 500 kV Series Capacitors

- Description: This project is necessary to increase South of Allston (SOA) available transfer capability. The project will add 1152 Mvar, 24 OHM series capacitors (rated 4000A at 500 kV) on the Schultz-Wautoma line at the Wautoma substation.
- Purpose: This project will improve operations and maintenance flexibility for the South of Allston path.
- Estimated Cost: $48,000,000
- Expected Energization: 2024

Keeler 500 kV Expansion and Transformer Addition

- Description: This project will add 500 kV breakers at Keeler substation to reconfigure the Keeler 500 kV bus layout into a double-breaker-double-bus arrangement and a second 500/230 kV Transformer bank at Keeler substation.
- Purpose: This project will improve reliability, operations, and maintenance flexibility for the South of Allston path.
- Estimated Cost: $41,300,000
- Expected Energization: 2029

Recently Completed Plans of Service

There are no completed plans of service for this path since the last planning cycle.

7.6 West of Cascades South Path

Description

The West of Cascades South (WOCS) path spans the Cascade Mountains in southern Washington and Northern Oregon, serving the Willamette Valley and Southwest Washington (WILSWA) area. The main grid facilities for this path include Marion, Ostrander, Knight, John Day, Wautoma, and Big Eddy substations. The WILSWA area includes the cities of Portland, Vancouver, Eugene, and Salem with high concentrations of commercial and residential load. For spring and early summer operation, high flows on the WOCS path typically occur when there is surplus hydro and wind generation east of the Cascades and low thermal generation in the Southwest Washington/Northwest Oregon area. The WOCS path only flows in the east-to-west direction.

This path includes the following lines:

- Big Eddy-Ostrander 500-kV (BPA)
- Knight-Ostrander 500 kV (BPA)
- Ashe-Marion 500 kV (BPA)
- Buckley-Marion 500 kV (BPA)
- John Day-Marion 500 kV (BPA)
- McNary-Ross 345 kV (BPA)
- Jones Canyon-Santiam 230 kV (BPA)
- Big Eddy-Chemawa 230 kV (BPA)
- Big Eddy-McLoughlin 230 kV (BPA)
- Big Eddy-Troutdale 230 kV (BPA)
- Midway-N. Bonneville 230 kV (BPA)
- Round Butte-Bethel 230 kV (PGE)

The highest flows across WOCS occurs during peak summer and winter load conditions in the WILSWA area combined with high generation east of the Cascade Mountains including hydro, wind, and thermal plants.

Proposed Plans of Service

Pearl-Sherwood-McLoughlin Upgrade

- Description: This will be a joint project with PGE. It includes splitting the existing BPA/PGE Pearl-Sherwood #1 and #2 230 kV jumpered circuits and terminates them into separate bays at Pearl and Sherwood. It also splits the existing BPA/PGE Pearl-McLoughlin-Sherwood 230 kV 3-terminal line into a new Pearl-Sherwood #3 230 kV line and a new Pearl-McLoughlin-Sherwood 230 kV three terminal line. This project will also add a new 230 kV series bus sectionalizing breaker at Pearl Substation.
- Purpose: This project is required to maintain reliable load service to the Portland Area.
- Estimated Cost: $10,000,000
- Expected Energization: 2027

Recently Completed Plans of Service

There are no completed plans of service for this path since the last planning cycle.

7.7 West of Slatt Path

Description

The West of Slatt path is an east to west path that transfers power from Northeast Oregon and Southeast Washington, east of Slatt substation to the California-Oregon AC Intertie at the John Day substation, the Pacific DC Intertie at Big Eddy substation, and Northwest load centers west of the Cascade Mountains. Transfers across this path usually peak in spring or summer because of late spring and early summer hydro run off.

This path is located between Slatt and John Day Substations in Oregon. Monitoring West of Slatt (WOS) is designed to protect the Lower Columbia Basin area from high transfers caused by surplus generation of local wind, hydro, and thermal generation. The highest flows on the WOS path are due to surplus generation and are driven by commercial transfers instead of load service. The WOS and West of John Day (WOJ) paths can be impacted by West of McNary (WOM) path flows as well, since all three paths usually peak in spring or summer generation surplus conditions when commercial exports from the Pacific NW are high.

This path includes the following lines:

- Slatt-John Day 500 kV line 1
- Slatt-Buckley 500 kV line 1

Proposed Plans of Service

There are no proposed projects for this path.

Recently Completed Plans of Service

There are no completed plans of service for this path since the last planning cycle.

7.8 West of McNary Path

Description

The West of McNary (WOM) path is an east to west path that transfers power from Northeast Oregon and Southeast Washington, east of Coyote substation, to the California-Oregon (COI) AC Intertie at John Day substation, the Pacific DC Intertie (PDCI) at Big Eddy substation and Northwest (NW) load centers west of the Cascade Mountains. Transfers across the WOM path usually peak in spring or summer because of late spring and early summer hydro run off. Transfers can also peak in winter. The WOM path is directly impacted by hydroelectric generation at the McNary and Lower Snake River dams; thermal plants at Coyote Springs, Hermiston, and Goldendale; wind plants at Jones Canyon, Walla Walla, and Central Ferry, and other renewable energy connected to the 500 kV, 230 kV and 115 kV systems at and east of Coyote substation.

This path includes the following lines:

- Coyote Springs-Slatt 500 kV line 1
- McNary-John Day 500 kV line 2
- McNary-Ross 345 kV line 1
- Jones Canyon-Santiam 230 kV line 1
- Harvalum-Big Eddy 230 kV line 1

Proposed Plans of Service

There are no proposed projects for this path.

Recently Completed Plans of Service

There are no completed plans of service for this path since the last planning cycle.

7.9 West of Hatwai Path

West of Hatwai WECC Path 6 Description

This path is located between northern Idaho (Lewiston area) and eastern Washington. The highest flows on this path typically occur east to west during light load periods in late spring and early summer.

This path includes the following lines:

- BPA Lower Granite – BPA Hatwai 500 kV line
- BPA Grand Coulee – BPA Bell 230 kV lines 3 and 5
- BPA Grand Coulee – BPA Bell 500kV
- BPA Grand Coulee – BPA Westside 230 kV line
- BPA Creston – BPA Bell 115 kV line
- PacifiCorp Dry Creek – Talbot 230 kV line
- Avista North Lewiston – Tucannon River 115 kV line
- Avista Harrington – Odessa 115 kV line
- Avista Lind – Avista Roxboro 115 kV line
- PacifiCorp Dry Gulch 115/69 kV line

Proposed Plans of Service

There are no proposed projects for this path.

Recently Completed Plans of Service

There are no completed plans of service for this path since the last planning cycle.

7.10 West of Lower Monumental Path

Description

This path is between Lower Monumental and McNary Substations. Historically, flow on the West-of-Lower Monumental path (WOLM) peaks during spring hydro run-off for both peak and off-peak hours.

This path includes the following lines:

- Lower Monumental-Ashe 500 kV line
- Lower Monumental-Hanford 500 kV line
- Lower Monumental-McNary 500 kV line

Proposed Plans of Service

There are no proposed projects for this path.

Recently Completed Plans of Service

There are no completed plans of service in this path since the last planning cycle.

7.11 North of Hanford Path

Description

This path is located north of Hanford (NOH) substation between Hanford and Grand Coulee. The NOH path is in central Washington and is a bi-directional path with flows both north-to-south and south-to-north. The NOH path north-to-south peak flow occurs with high Upper Columbia generation, high Mid-Columbia generation, high I-5 Puget thermal generation, and/or high imports from Canada and lower levels on the Lower Snake River and Lower Columbia River hydro generation. High north-to-south flow is typical in the late spring and summer seasons. For thermal limitations the most critical season is summer when facility ratings are lower. The NOH south-to-north flows are dependent on a few factors: low or zero generation at the Upper Columbia hydro plants, Grand Coulee pump loads in service, low Puget Sound area generation, and high south-to-north exports to Canada. The primary season for high south-to-north flows on NOH is the in spring and less often in the winter. Higher south-to-north flows are most common during light load conditions (off peak hours).

This path includes the following lines:

- Grand Coulee-Hanford 500 kV line 1
- Schultz-Wautoma 500 kV line 1
- Vantage-Hanford 500 kV line 1

Proposed Plans of Service

The Schultz-Wautoma series capacitor project is physically located along the North of Hanford path, but it is needed to relieve congestion on the South of Allston path. The project is not intended to reinforce the North of Hanford path but is a notable change for the path. This project is described under the South of Allston Path section.

Recently Completed Plans of Service

There are no projects that have been completed for this path since the previous planning cycle.

7.12 West of John Day Path

Description

The West of John Day path is an east west path that transfers power from Northeast Oregon and Southeast Washington, east of John Day substation to the Pacific DC Intertie at Big Eddy substation and Northwest load centers west of the Cascade Mountains. Transfers across the WOJ path usually peak in spring or summer because of late spring and early summer run off. This path is located between the John Day Substation and The Dalles Substation in Oregon. Monitoring the West of John Day (WOJ) path is designed to protect for high transfers to Western Oregon load centers and to the northern terminal of the Pacific DC Intertie caused by surplus generation of local wind and hydro. The highest flows on the WOJ path are due to surplus generation and are driven by commercial transfers instead of load service. WOS and WOJ can be impacted by West of McNary (WOM) path flows as well, since all three paths usually peak in spring or summer generation surplus conditions when commercial exports from the Pacific NW are high.

This path includes the following lines:

- John Day-Big Eddy 500 kV line 1
- John Day-Big Eddy 500 kV line 2
- John Day-Marion 500 kV line 1

Proposed Plans of Service

There are no proposed projects for this path.

Recently Completed Plans of Service

There are no completed plans of service for this path since the last planning cycle.

8. Transmission Needs by Intertie

Interties – Proposed Plans of Service

8.1 California-Oregon AC Intertie

Description

The California-Oregon intertie (COI), identified as Path 66 by WECC, is the alternating current (AC) Intertie between Oregon and California. It is a corridor of three parallel 500 kV alternating current power lines connecting to the grids in Oregon and California. The combined power transmission capacity is about 4800 megawatts from north to south and 3,675 megawatts from south to north. The critical season for the COI occurs in the summer with high energy demands across the western interconnection and high flows to California due to excess generation in the Northwest and Canada.

The path includes the following lines:

- Malin-Round Mountain 500 kV lines 1 and 2
- Captain Jack-Olinda 500 kV line 1

Proposed Plans of Service

Buckley Air Insulated Substation Addition

- Description: The Buckley 500 kV substation is presently gas insulated and has experienced component failures. These failures have caused prolonged outages of the entire substation resulting in severe transmission constraints that span over six months. The Buckley Gas Insulated Substation (GIS) will run out of the necessary spare parts to continue its operation in the next five years. To address these issues a new conventional Air Insulated Substation (AIS) is required to replace the existing Buckley GIS. The existing Buckley GIS is configured in a ring bus and the replacement AIS will be configured in a double bus, double breaker layout using a breaker and half scheme that will provide opportunities for future system expansion.
- Purpose: This project is needed to maintain reliability in the area.
- Estimated Cost: $50,000,000
- Expected Energization: 2027

Recently Completed Plans of Service

There are no recently completed plans of service for this intertie since the last planning cycle.

8.2 Pacific DC Intertie

PDCI Description

The Pacific DC Intertie, identified as Path 65 by WECC, is the direct current Intertie between Oregon and California and consists of a 500 kV high voltage direct current (HVDC) connection from BPA's Celilo Substation in Oregon to the Los Angeles Department of Water and Power's (LADWP) Sylmar Substation in California. This transmission line transmits electricity from the Pacific Northwest to the Los Angeles area using high-voltage direct current. The Intertie can transmit power in either direction, but power flows mostly from north to south. HVDC lines can help stabilize a power grid against cascading blackouts, since power flow through the line is controllable.

The path includes the following lines:

- 500 kV multi-terminal D.C. system between Celilo and Sylmar

Proposed Plans of Service

No projects are proposed for this intertie.

Recently Completed Plans of Service

There are no projects that have been completed for this intertie since the previous planning cycle.

8.3 Northern Intertie (Canada to Northwest)

Description

The Northwest to British Columbia WECC Path 3, also known as the Northern Intertie (NI), is between the United States and Canada. Bonneville delivers power to Canada over the Northern Intertie, which includes lines and substations from Puget Sound north to the Canadian border. It has a western and an eastern component and is a bi-directional path that is dictated by import and export schedules from Canada. Puget Sound Area/Northern Intertie (PSANI) reinforcements were developed jointly between Seattle City Light, Puget Sound Energy and BPA in 2011 because of the Regional Puget Sound Area Study Team (PSAST).

The Northern Intertie includes the following lines:

Western Component:

- Custer (BPA)-Ingledow (BCTC) 500 kV No. 1
- Custer (BPA)-Ingledow (BCTC) 500 kV No. 2

Eastern Component:

- Boundary (BPA)-Waneta (TECK) 230 kV
- Boundary (BPA)-Nelway (BCTC) 230 kV

Proposed Plans of Service

No projects are proposed for this intertie.

Recently Completed Plans of Service

Raver 500/230 kV Transformer (PSANI), (Also included in the Seattle area.)

- Description: This project added a 1300 MVA, 500/230 kV transformer at Raver Substation. This project was part of the overall Puget Sound Area/Northern Intertie (PSANI) Regional Reinforcement Plan. This was a joint project between participating utilities in the Puget Sound area.
- Purpose: This project is required to support load growth in the Puget Sound area.
- Estimated Cost: $100,000,000
- Energization: The transformer was energized in 2021 and the rest of the project is expected to be energized in 2024.

8.4 Montana to Northwest Intertie

Montana to Northwest WECC Path 8 Description

This intertie is between Montana and the Northwest. It includes Northwestern Energy, Avista and BPA lines. The highest flows on this path typically occur east to west during light load periods.

This path includes the following lines:

- BPA Kerr – BPA Kalispell 115 kV line
- BPA Broadview – BPA Garrison 500 kV line 1
- BPA Broadview – BPA Garrison 500 kV line 2
- BPA Mill Creek – BPA Anaconda 230 kV line
- BPA Placid Lake – BPA Hot Springs 230 kV line
- Northwestern Thompson Falls – Avista Burke 115 kV line
- Northwestern Crow Creek –Avista Burke 115 kV line
- Northwestern Rattlesnake 230/161 kV transformer
- Northwestern Mill Creek – Garrison 230 kV line
- Northwestern Ovando – Garrison 230 kV line

Proposed Plans of Service

No projects are proposed for this intertie.

Recently Completed Plans of Service

There are no completed plans of service for this intertie since the last planning cycle.

9. Transmission Planning Landscape

Transmission Planning's goal is to provide a reliable, flexible, environmentally responsible, and cost-effective transmission system. The planning process is conducted in an open, coordinated, and transparent manner through a series of open planning meetings that allow anyone to provide input into and comment on the development of the ten-year plan. As Transmission Planning strives to have a regionally coordinated system planning experts engage in regular meetings with interconnected utilities for information exchange and joint studies, conduct stakeholder meetings, and participate in regional planning.

9.1 Regulatory

9.1.1 FERC Notice of Proposed Rulemaking – Interconnection Reform to Address Queue Backlogs

FERC NOPR

In 2022, Federal Energy Regulatory Commission (FERC) issued a proposed rule focused on expediting the current process for connecting new electric generation facilities to the grid. The notice of proposed rulemaking (NOPR) Docket No. RM22-14 aims to address significant current backlogs in the interconnection queues. The NOPR reforms have three broad goals: implement a first-ready, first-served cluster study process; increase the speed of interconnection queue processing; and incorporate technological advancements into the interconnection process. Comments were due October 13th, 2022 and reply comments were due November 14, 2022. BPA provided comments in the docket. This Interconnection Reform NOPR builds on Commission Order Nos. 2003 and 2006 where it first required public utility transmission providers to adopt its standard procedures and agreements for interconnecting large and small generating facilities, and Order No. 845 that revised those procedures and agreements. The electricity sector has transformed significantly since the issuance of Order Nos. 2003 and 2006. The growth of new resources seeking to interconnect to the transmission system and the differing characteristics of those resources have created new challenges for the generator interconnection process. These new challenges are creating large interconnection queue backlogs and uncertainty regarding the cost and timing of interconnecting to the transmission system.

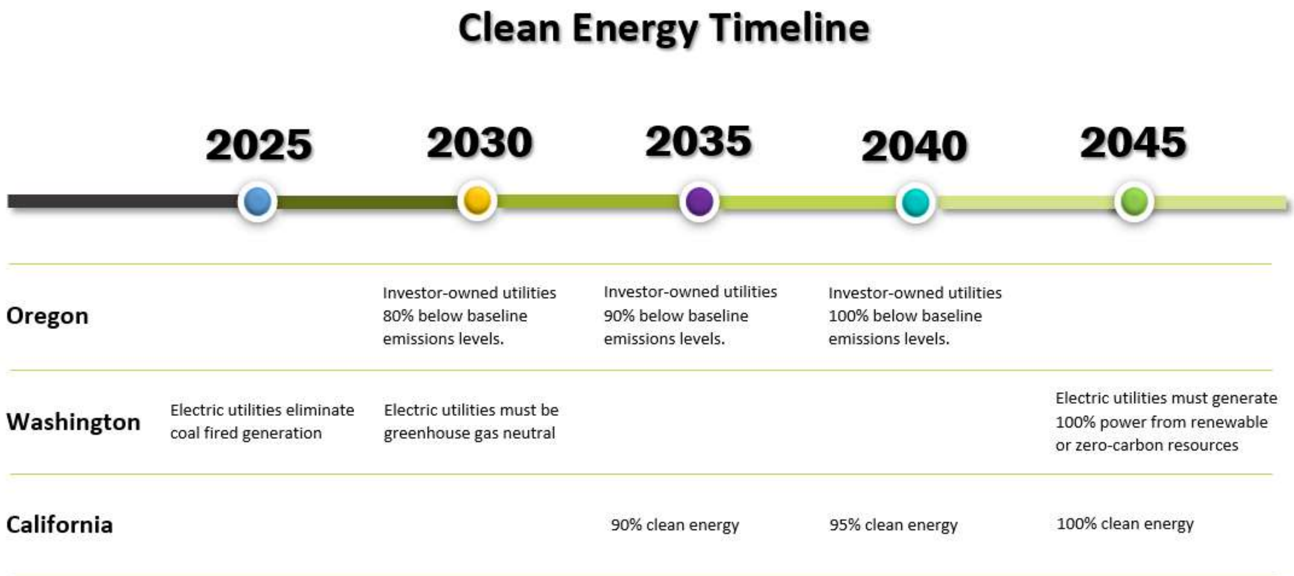
FERC Final Order

In 2023 FERC issued its final rule in Docket No. RM22-14-000 Order No. 2023 Improvements to Generator Interconnection Procedures and Agreements. The final rule requires all public utility transmission providers to adopt revised *pro forma* Large Generation Interconnection Procedures (LGIP), *pro forma* Large Generator Interconnection Agreements (LGIA), *pro forma* Small Generator Interconnection Procedures (SGIP), and *pro forma* Small Generator Interconnection Agreements (SGIA). The reforms to the Commission's pro forma LGIP and LGIA implement a first-ready, first-served cluster study process; increase the speed of interconnection queue processing; and incorporate technological advancements into the interconnection process.

BPA Response

In 2023, BPA engaged customers and stakeholders through a series of workshops to discuss potential reforms to its tariff to develop and implement a regional solution to improve BPA's Standard Large Generator Interconnection Procedures. As a result, BPA conducted a TC-25 Terms and Conditions Tariff Proceeding to adopt reforms to BPA's LGIP. BPA's TC-25 Settlement Proceedings provide a draft Attachment L and Attachment R to the Open Access Transmission Tariff. The proposed document is for settlement purposes only. Attachment L is for Standard Large Generator Interconnection Procedures including Standard Large Generator Interconnection Agreement. Attachment R is for the Large Generator Interconnection Transition Process. The Transition Request Window shall open the date of the issuance of the Administrator's Final Decision of Record (ROD) in the TC-25 Tariff Proceeding and close 90 days calendar days after the issuance of the ROD in the TC-25 Tariff proceeding. The proposed effective date for the tariff is the date the ROD is issued.

9.2 State Legislation



9.2.1 State's Clean Energy Bills

Oregon Clean Energy House Bill 2021

Electric companies are required to develop clean energy plans and electricity service suppliers to report information for meeting clean energy targets. This bill requires retail electricity providers to reduce greenhouse gas emissions associated with electricity sold to Oregon consumers.

- **2030** – Reduce greenhouse gas emissions to 80 percent below baseline emissions levels.
- **2035** – Reduce greenhouse gas emissions to 90 percent below baseline emissions.
- **2040** – Reduce greenhouse gas emissions to 100 percent below baseline emissions levels.

Washington's Clean Energy Transformation Act (CETA)

In 2019 the Washington State Legislature passed a set of bills creating an ambitious, multi-decade agenda that changes how electric and natural gas utilities acquire resources and provides energy services to Washington business and consumers. CETA requires the state's electric utilities to fully transition to clean, renewable, and non-emitting resources by 2045. Washington's investor-owned utilities must develop and implement plans. The law provides safeguards to maintain affordable rates and reliable service. It also requires an equitable distribution of the benefits from the transition to clean energy for all utility customers and adds and expands energy assistance programs for low-income customers.

The act sets the following mandatory targets:

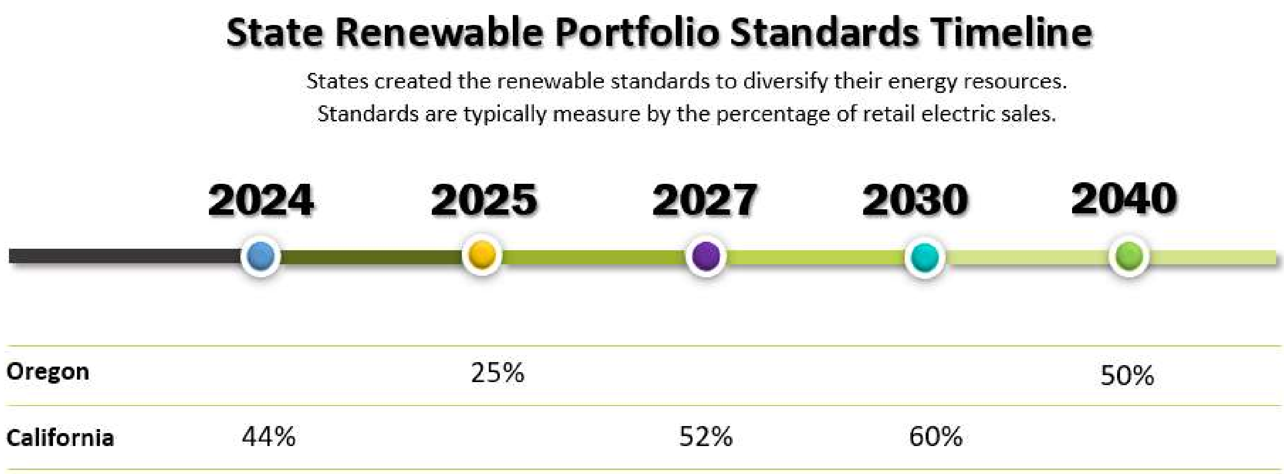
- **2025 –** All electric utilities must eliminate coal-fired generation serving Washington state customers.
- **2030 –** All electric utilities must be greenhouse gas neutral
- **2045 –** All electric utilities must generate 100% of their power from renewable or zero-carbon resources.

California's Clean Energy Bill

As California faces severe drought conditions and risk of wildfires, California lawmakers passed legislation that codifies new benchmarks to get California to 90 percent clean electricity by 2035 and 95 percent by 2040, which is a stepping stone toward its already established goal of 100 percent clean electricity by 2045. The $54 billion is to be spent over five years on electric vehicles, public transit, climate, and drought resistance programs, and to decarbonize the state's electrical grid. The closure of California's Diablo Canyon nuclear plant is postponed helping stabilize the state's grid as the plant provides an estimated 6-9 percent of the state's electricity and was set to close in 2025. Previous laws called for the use of 60 percent renewable energy by 2030.

- **2035** – 90 percent clean electricity
- **2040** – 95 percent clean electricity
- **2045** – 100 percent clean electricity

9.2.2 State's Renewable Portfolio Standards



A Renewable Portfolio Standard (RPS) is a regulatory mandate to increase production of energy from renewable sources such as wind, solar, biomass and other alternatives to fossil and nuclear electric generation. States created these standards to diversify their energy resources, promote domestic energy production and reduce emissions. This RPS mechanism places an obligation on regulated utilities to produce a specified fraction of electricity from renewable energy sources. Standards are typically measured by the percentage of retail electric sales. Below are general requirements by select states.

- California's requirement is 44 percent by 2024, 52 percent by 2027, and 60 percent by 2030 for investor-owned and municipal utilities. Finally requiring 100 percent clean energy by 2045.
- Washington's requirement is 15 percent by 2020 for investor-owned utilities and retail suppliers. The Clean Energy Act of 2019, a new clean energy electricity standard, requires utilities eliminate coal-fired generation by 2025, be greenhouse gas neutral by 2030, and generate 100 percent of power from renewable or zero-carbon resources by 2045.
- Oregon's requirement is 25 percent by 2025 and 50 percent by 2040 for utilities with 3 percent or more of the state's load; 10 percent by 2025 for utilities with 1.5-3 percent of the state's load; and 5 percent by 2025 for utilities with less than 1.5 percent of the state's load.
- Montana's requirement is 15 percent by 2015.
- Idaho and Wyoming have no standard.

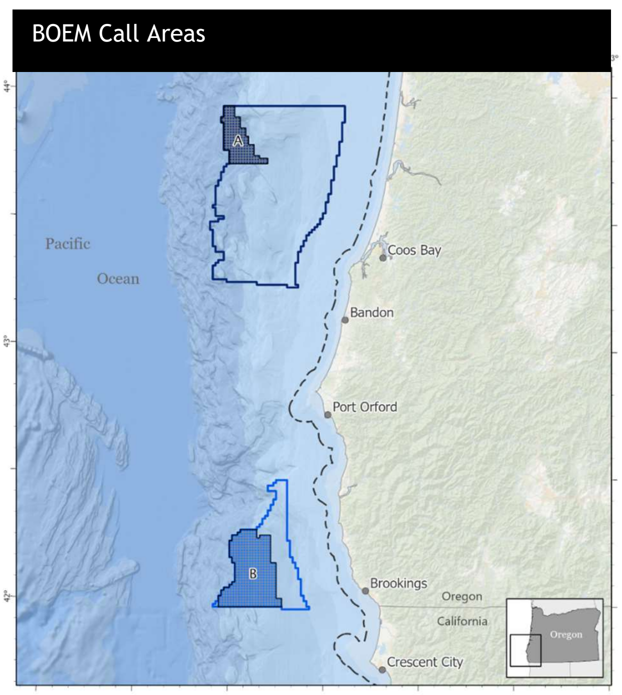
9.3 Offshore Wind Policy

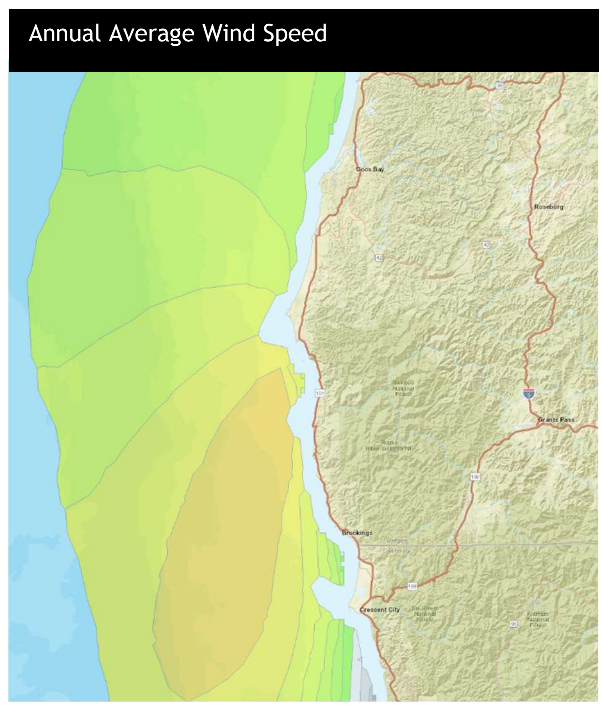
9.3.1 Oregon Offshore Wind Policy

Through adoption of House Bill 3375 in 2021, the Oregon Legislature established a state policy to plan for the development of three gigawatt of floating offshore wind energy projects within federal water off the Oregon coast by 2030. The policy goal is for Oregon's state agencies to consider the potential impacts of offshore wind and is not a commitment to developing offshore wind.

9.3.2 Bureau of Ocean Energy Management Offshore Wind Call Areas

In 2022, the federal Bureau of Ocean Energy Management (BOEM) identified two Call Areas near the Southern Oregon Coast: One near Coos Bay, Oregon and the other near Brookings, Oregon. BOEM estimates the Coos Bay Call Area may accommodate 10.6 gigawatt of offshore wind capacity and the Brookings Call Area may accommodate about 3.5 gigawatt. In 2023, BOEM finalized call areas for Southern Oregon Coast https://www.boem.gov/renewable-energy/state-activities/Oregon.





Source: Bureau of Ocean Energy Management, www.boem.gov

9.3.3 Bonneville Independent Studies and Participation Timeline

	2021	2022	2023	2024
Regional	Adoption of **Oregon House Bill 3375** in 2021; Plan for 3 GW of floating offshore wind.	**BOEM** identified two call areas near the Southern Oregon. **OPUC & ODOE** submitted request to NorthernGrid for analysis of offshore wind; 1.8 GW at Fairview Substation and 1.2 GW at Wendson Substation. **NorthernGrid** publishes report responding to the OPUC & ODOE request for analysis. **BPA** contributes to NorthernGrid report and conducts independent studies for offshore wind.	BOEM finalized call areas for Southern Oregon Coast. **BPA** participates in **DoD** coordination meetings. **BPA** participates as technical advisors in the Schatz Energy Research Center to study interconnection of offshore wind generation.	BOEM is expected to conduct lease auction for offshore wind development on Southern Oregon Coast.
National			**BPA** participates in DOE Floating Offshore Wind Shot Summit. **BPA** presented its assessment of transmission system capabilities to interconnect offshore wind. **BPA** is participating in the **US DOE** West Coast Offshore Wind transmission study, a 20-month analysis examining how the country can expand transmission to harness power from floating offshore wind for West Coast communities. The study is led by the DOE National labs – PNNL and NREL.	

9.3.4 Bonneville Regional and National Efforts

Regional Efforts

BPA conducted independent studies to access transmission capabilities in Southern Oregon. BPA studies found about one gigawatt of offshore wind could be interconnected between two existing 230-kV substations in Southern Oregon with moderate upgrades to the existing 230-kV and 115-kV infrastructure. The individual amounts are location specific. Interconnecting three gigawatts of floating offshore wind in Southern Oregon will require a major transmission build from the coast to the I5 corridor.

- BPA Transmission Planning was a key contributor to the regional study conducted by NorthernGrid in response to Oregon DOE and Oregon PUC's request to perform a reliability and economic assessment of integrating 3 GW of floating offshore wind in Southern Oregon. (https://www.northerngrid.net/private-media/documents/2022_ESR_OSW_Approved.pdf).

- BPA Transmission Planning participates in Department of Defense coordination meetings – Northwest Department of Defense (DoD) Joint Agency Regional Coordination Team Working Sessions, where BPA participated, collaborated, and presented on transmission-related topics with various state and federal stakeholders. (https://www.boem.gov/renewable-energy/state-activities/Oregon)

- BPA Transmission Planning participated as a technical adviser in the Schatz Energy Research Center study of transmission alternatives to interconnect offshore wind generation in Southern Oregon and Northern California (https://schatzcenter.org/wind/).

National Efforts

- BPA Transmission Planning shared existing system capabilities in a presentation at the DOE Floating Offshore Wind Shot Summit in February 2023. (https://www.energy.gov/eere/wind/events/floating-offshore-wind-shottm-summit)

- BPA Transmission Planning presented its assessment of transmission system capabilities to interconnect offshore wind in the state of Oregon at the DOE Floating Offshore Wind Shot Summit in March 2023 (https://www.energy.gov/eere/wind/events/floating-offshore-wind-shottm-summit).

- BPA Transmission Planning is participating in the US DOE West Coast Offshore Wind transmission study, a 20-month analysis examining how the country can expand transmission to harness power from floating offshore wind for West Coast communities (https://www.energy.gov/gdo/west-coast-offshore-wind-transmission-planning). The study is led by the DOE National labs – PNNL and NREL. BPA Transmission Planning serves on the West Coast Offshore Wind Transmission Study Advisory Committee, Planning Working Group, and Technology Working Group.

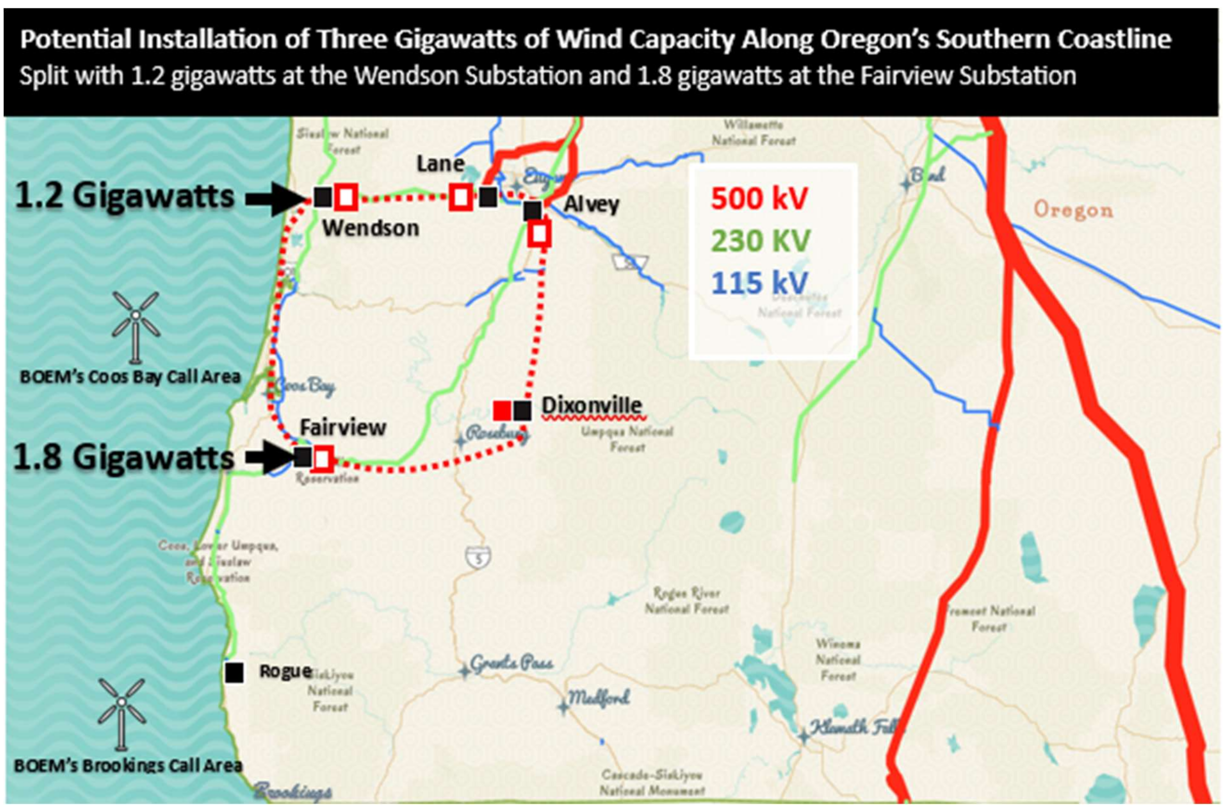
9.3.5 NorthernGrid Economic Study Request, Offshore Wind in Oregon

In 2022, the Oregon Public Utility Commission and the Oregon Department of Energy jointly submitted to the NorthernGrid planning region a request for economic and reliability analysis of the regional impacts to the transmission system of three-gigawatt capacity along Oregon's southern coastline.

Specifically, the requests asked for analysis of 1,800 megawatt interconnected at the Fairview substation near Coos Bay, Oregon and 1,200 megawatts at the Wendson substation near Florence, Oregon. The evaluation includes identification of transmission system upgrades necessary to accommodate the power flow capacities of key existing transmission corridors and paths to enable the full deliverability of power to load with minimal curtailment of generation due to transmission constraints.

NorthernGrid conducted the analysis and highlights are as follows.

- Offshore wind in Oregon modified the flows on the WECC paths.
- Natural gas and coal generators were dispatched less when offshore wind was modeled.
- Interconnection at the 230 kV level requires all upgrades listed in Table 1. Offshore wind generators experienced congestion due to the transmission system limitations between the coast and the I-5 corridor.
- Interconnection at the 500 kV level requires all updates listed in Table 1. A new 500 kV Loop that connects the I-5 corridor with wind facilities can be constructed in phases with the installation of additional wind generators. Output from offshore wind generators was delivered to the I-5 corridor congestion free. The 500 kV loop allows for other potential interconnection points along the Oregon coast. The 500 kV Loop reinforces the existing transmission system in Oregon.



10. Supplemental Information

10.1 List of Projects by Planning Area

Area	Project Title	Project Number	Expected In-Service Date	Estimated Cost
1. Northwest Washington Planning Area (NWWA)				
Chehalis – Centralia Load Area				
	Silver Creek Substation Reinforcements	P01092	2025	$11,300,000
Olympic Peninsula Load Area				
	Kitsap 115 kV Shunt Capacitor Modification	P01443	2026	$4,000,000
Seattle – Tacoma – Olympia Load Area				
	Raver 500/230 kV Transformer (PSANI)	P00094	2021 (Transformer)*, 2024 (Entire Project)	$100,000,000
	Monroe-Novelty 230 kV Line Upgrade	P02367	2026	$2,500,000
	Maple Valley 230 kV Shunt Reactor	P06244	2025	$7,800,000
Southwest Washington Coast Load Area				
	Aberdeen Tap to Satsop Park – Cosmopolis 115 kV Line Upgrade	P03506	2027	$551,000
	South Elma – Satsop Park No. 1 Line – Remove Impairments	P05918	2027	TBD
West of Cascades North Path (WOCN)				
	Cross-Cascades North Upgrade TSEP 2022	P05470	2030	$400,000,000
South of Custer Path (SOC)				
Raver-Paul Path				
Northern Intertie				
	Raver 500/230 kV Transformer (PSANI)	P00094	2021 (Transformer)*, 2024 (Entire Project)	$100,000,000
2. Willamette Valley Southwest Washington Planning (WILSWA)				
Longview Load Area				
North Oregon Coast Load Area				
	High-Side Breaker and Switchgear Associated with the Clatsop Transformer Replacement	P05435	2027	$1,600,000
Portland Load Area				
	Carlton Upgrades	P01367	2024	$15,500,000

Forest Grove – McMinnville 115 kV Line Upgrade	P03469	2024	$1,000,000
Troutdale 230 KV Series Bus Sectionalizing Breaker	P04401	2025	$3,490,000
Keeler 230 kV Bus Sectionalizing Breaker Addition (L0452)	P04632	2026	$11,530,000
St. Johns 230/115 kV Low-Side Line Section (Remove Impairments)	TBD	2026	TBD
Vancouver Load Area			
West of Cascades South Path (WOCS)			
Pearl-Sherwood-McLoughlin Upgrade	P04974	2027	$10,000,000
South of Allston Path (SOA)			
Schultz-Wautoma 500 kV Line Series Capacitor	P03259	2024	$48,000,000
Keeler 500 kV Expansion and Transformer Addition	P05449	2029	$41,300,000
3. Southwest Oregon Planning Area (SWOR)			
Eugene Load Area			
Lookout Point – Alvey No. 1 and 2 Transfer Trip Addition	P03258	2026	$3,000,000
Alvey-Dillard Tap 115 KV Line Rebuild	P04286	2028	$1,300,000
Salem – Albany Load Area			
South Oregon Coast Load Area			
Central Oregon Coast O&M Flex (Toledo, Wendson, Santiam, Tahkenitch)	P02230	2024	$33,000,000
4. Northern Planning Area			
Mid-Columbia Load Area			
Columbia 230 kV Bus Tie and Sectionalizing Breaker Addition and Northern Mid-Columbia Area Reinforcement (Joint Utility) & Northern Mid-Columbia Area Reinforcement	P00076	2023	$15,000,000
Okanogan Load Area			
North of Hanford Path (NOH)			
5. Central Planning Area			
Pendleton – La Grande Load Area			
Tri-Cities Load Area			
McNary-Patterson Tap 115 kV Line	P02364	2024	$12,900,000

Red-Mountain – Horn Rapids 115 kV Line Reconductor	P03102	2025	$3,600,000
Richland-Stevens Drive 115 kV Line	P02365	2027	$12,500,000
G0558 South Tri-Cities Reinforcement Webber Canyon	P04691	2027	$106,000,000
Umatilla – Boardman Load Area			
Jones Canyon 230 kV Shunt Reactor	P03491	2023	$13,000,000
L0481 McNary 230 kV Bay Addition	P04246	2025	$4,800,000
L0482 Longhorn 500/230 kV Substation	P04342	2025	$206,300,000
Morrow Flat 230 KV Shunt Reactor	P04423	2025	$2,900,000
Walla Walla Load Area			
Tucannon River 115 KV 15 MVAR Shunt Reactor	P04438	2025	$11,700,000
West of McNary Path (WOM)			
6. Southern Planning Area			
Central Oregon Load Area			
La Pine 115 Substation Upgrade TSEP 2016	P03443	2024	$7,100,000
La Pine Upgrade Transformer Addition TSEP 2016	P05322	2025	$11,600,000
Northern California Load Area			
California to Oregon AC Intertie			
Buckley Air Insulated Substation	P03999	2027	$50,000,000
North of John Day Path (NJD)			
California to Oregon Intertie (COI)			
Pacific DC Intertie (PDCI)			
7. Eastern Planning Area			
North Idaho Load Area			
Libby Power House 1 AND 2 Redundant Transfer Trip	P04231	2024	$500,000
Troy 115 kV Shunt Capacitor Addition (12.6 MVAR)	P01106	2027	$11,000,000
Northwest Montana Load Area			
Conkelley Substation Retirement	P02259	2025	$30,000,000
Spokane – Colville – Boundary Load Area			
Bell-Boundary 230 kV No. 1 (Sacheen) Line Upgrade	TBD	2027	TBD

West of Garrison Path (WOG)			
West of Hatwai Path (WOH)			
West of Lower Monumental Path (WOLM)			
Montana to Northwest Intertie (MT-MW))			
8. Idaho Planning Area			
Burley Load Area			
Southeast Idaho – Northwest Wyoming Load Area			
Spar Canyon 230 kV Reactor Addition	P02306	2024	$8,500,000
9. Lower Columbia Planning Area			
Hood River –The Dalles Load Area			
L0380 Quenett Creek Substation Addition	P02256	2025	$60,000,000
DeMoss - Fossil			
Klickitat County			

* Project or a component of the project is expected to be energized. A project’s expected in-service date may be revised during the development of this report or after it is published. Therefore, a project’s expected in-service date may be revised reflecting a later in-service date.

10.2 List of Projects by Path

No.	Project Title	Bundle No.	Expected In-Service Date	Estimated Cost
1	North of Hanford			
2	West of McNary			
3	West of Slatt			
4	West of John Day			
5	Raver to Paul			
Raver 500/230 kV Transformer (PSANI)		P00094	See Seattle Area	
6	South of Allston			
Schultz-Wautoma 500 kV Line Series Capacitor		P03259	2024	$48,000,000
Keeler 500 kV Expansion and Transformer Addition		P05449	2029	$41,300,000
7	West of Cascades South			
Pearl – Sherwood 230 kV Corridor Reconfiguration		P04974	2027	$10,000,000
8	North of Echo Lake			
9	South of Custer			
10	West of Cascades North			
Cross-Cascades North Upgrade TSEP 2022 (Includes Schultz-Raver Series Caps and No. 3 and 4 Reconductor)		P5470	2030	$400,000,000
11	West of Hatwai			
12	West of Lower Monumental			

10.3 List of Projects by Intertie

No.	Project Title	Bundle No.	Expected In-Service Date	Estimated Cost
1	California to Oregon AC Intertie			
	Buckley Air Insulated Substation	P03999	2027	$50,000,000
2	Pacific DC Intertie			
3	Northern Intertie			
	Raver 500/230 kV Transformer (PSANI)	P00094	See Seattle Area	
4	Montana to Northwest			

10.5 List of Generation Interconnection Projects in Construction

Project ID	Queue Number	Status	Megawatt Total	Generator Type (Including Hybrids)
P01110	G0099	CONSTRUCTION	600	Wind Turbine
P02286	G0238	COMPLETION IN PROGRESS	202	Wind Turbine
P03399	G0367	CONSTRUCTION	202	Photovoltaic
P02624	G0521	COMPLETION IN PROGRESS	20	Photovoltaic
P03588	G0578	CONSTRUCTION	160	Photovoltaic Energy Storage
P03486	G0586	CONSTRUCTION	100	Photovoltaic
P04789	G0677	COMPLETION IN PROGRESS	400	Photovoltaic Energy Storage
P05976	G0861	COMPLETION IN PROGRESS	617	Wind Turbine

The list of interconnection projects provided above include only those projects where the plan of service is well-defined, have a project schedule, and are in the construction or completion is in process phase.

10.6 List of Line and Load Interconnection Projects in Construction and Completion Phases

Project ID	Queue Number and Project Title	Status
P03367	L0372: SOUTHRIDGE SUBSTATION LINE TAP AND METER SET	COMPLETION IN PROCESS
P02256	L0380: QUENETT CREEK SUBSTATION	CONSTRUCTION
P02304	L0386: CLALLAM PORT ANGELES INTERCONNECTION	CONSTRUCTION
P03037	L0398: KPUD BETTAS ROAD	COMPLETION IN PROCESS
P03285	L0409: RED MOUNTAIN SUBSTATION	CONSTRUCTION
P02991	L0415: PACIFICORP PROJECT VITESSE PONDEROSA SUBSTATION - PHASE 1	COMPLETION IN PROCESS
P03449	L0421: RADAR HILL SUBSTATION	COMPLETION IN PROCESS
P03509	L0422: PACIFICORP PROJECT VITESSE 2 PONDEROSA SUBSTATION	CONSTRUCTION
P03695	L0433: NORTHERN WASCO INDUSTRIAL LOAD 4	CONSTRUCTION
P03640	L0455: LA PORTE SUBSTATION TAP AND METER	CONSTRUCTION
P04861	L0463: CRPUD DEER ISLAND SUBSTATION	CONSTRUCTION
P04381	L0467: BENTON REA HUARD ROAD	CONSTRUCTION
P04342	L0482: LONGHORN 500/230KV SUBSTATION	CONSTRUCTION

The list of interconnection projects provided above include only those projects where the plan of service is well-defined, have a project schedule, and are in the construction or completion is in process phase.

10.7 2022 & 2023 System Assessment: Historical and Forecast Peak Load Level

The following table lists the load areas in the 2023 System Assessment along with their actual historical peak loads for both the summer and winter seasons. In addition, for each load area, there is a comparison of the load forecasts between the 2022 and 2023 System Assessments. The 2022 System Assessment used the forecasts shown for the years 2023 (1-2 years near term), 2027 (5 years near term), and 2031 (long term). The 2023 System Assessment used the forecasts shown for the years 2024 (1-2-year near term), 2028 (5-year near term), and 2032 (long term). This table indicates how the area load forecasts changed between the 2022 and 2023 System Assessments and how each of these forecasts compares with historical peak load data. For the historical peak values, **bold text** indicates the **season** with the highest peak load for that area. A load area may have a higher historical peak than the forecasted load being planned for. This is due to either a) the historical peak was reached in a year that had extreme weather or temperature that is not an expected condition, or b) the load forecast in the area is trending downward due to lower expected load growth. Also reference the footnotes to the table which are shown on the following page.

		Historical		2022 Assessment Near Term (2 yr)			2023 Assessment Near Term (2 yr)			2022 Assessment Near Term (5 yr)		2023 Assessment Near Term (5 yr)		2022 Assessment Long Term (10 yr)		2023 Assessment Long Term (10 yr)	
No.	LOAD AREAS	Historical Peak Load (MW)		2023 Peak Load Forecast (MW)			2024 Peak Load Forecast (MW)			2027 Peak Load Forecast (MW)		2028 Peak Load Forecast (MW)		2031 Peak Load Forecast (MW)		2032 Peak Load Forecast (MW)	
		Summer	Winter	Lt.Spring	Summer	Winter	Lt.Spring	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
1	Seattle-Tacoma-Olympia	7729	**9363**	3757	6732	9054	5353	7386	9329	6956	9007	7663	9491	7057	8954	7962	9652
2	Portland	**5201**	4914	2258	4692	4432	2995	5225	5074	5269	5017	5645	5403	5670	5368	6068	5890
3	Vancouver	1018	**1075**	488	755	976	357	761	984	776	1004	786	1017	803	1039	804	1040
4	Salem - Albany	861	**895**	486	895	911	396	920	886	929	936	933	905	958	958	980	950
5	Eugene	632	**896**	356	677	935	271	681	942	710	944	713	948	721	954	724	953
6	Olympic Peninsula	724	**1284**	512	765	1268	546	726	1250	786	1266	743	1241	788	1292	782	1284
7	Tri-Cities	**1331**	1078	770	1357	1027	498	1407	1055	1403	1131	1431	1093	1478	1200	1485	1118
8	Longview	665	**773**	488	566	731	488	566	732	562	731	562	731	562	731	562	731
9	Mid-Columbia	2347	**2556**	1290	2115	2451	1110	2362	2635	2237	2617	2469	2768	2384	2708	2631	2901
10	Central Oregon	728	**807**	498	703	832	458	710	853	737	864	740	883	767	891	772	917
11	SW Washington Coast	231	**375**	156	203	329	116	198	323	203	329	199	324	202	329	199	325
12	Spokane	**1004**	924	389	893	858	155	784	795	901	886	820	822	913	900	829	847
13	Centralia / Chehalis	172	**283**	143	185	266	107	191	274	177	266	191	275	181	267	191	275
14	NW Montana	261	**411**	179	249	374	147	294	389	252	378	303	415	255	382	326	440
15	SE Idaho - NW Wyoming	171	**311**	101	202	310	136	179	292	219	329	185	305	236	349	192	322
16	North Idaho	122	**206**	89	122	183	68	123	177	128	186	128	182	130	187	133	190
17	North Oregon Coast	173	**274**	116	174	263	88	182	266	177	267	183	267	180	271	187	270
18	South Oregon Coast	252	**471**	154	245	436	144	262	444	280	468	265	449	284	472	282	470
19	De Moss - Fossil	29	**37**	N/A	24	36	N/A	26	33	26	34	26	34	24	38	26	34
20	Okanogan	169	**237**	132	183	283	101	172	229	188	285	178	229	196	291	180	232
21	Hood River - The Dalles	283	**306**	188	294	281	152	297	305	493	473	474	471	653	641	515	526
22	Pendleton / La Grande	**151**	138	71	150	139	51	147	140	153	141	150	140	158	146	148	141
23	Walla Walla	**105**	72	NA	122	105	53	126	103	134	109	130	106	137	112	133	110
24	Burley	**207**	153	142	222	161	124	218	161	227	164	225	165	232	169	234	177
25	Norhern California	**118**	87	53	110	78	42	112	81	109	77	112	81	109	78	113	81
26	Klickitat	**63**	81	37	66	83	33	77	82	87	104	90	106	90	108	91	108
27	Umatilla / Boardman	**974**	806	NA	Note 1	Note 1	1226	1933	1791	788	648	2032	1887	828	702	2146	2003

Historic numbers in **Bold** font indicate which season has a higher peak load for that area

10.8 List of Acronyms

Acronym	Title
Alder	Alder Mutual Light Company
AC	Alternating Current
ARM	Alternative Review Meeting
ATC	Available Transfer Capability
AVA	Avista Corp
BCTC	British Columbia Transmission Corporation
BPA	Bonneville Power Administration
BPUD	Benton Public Utility District
BREA	Benton Rural Electric Association
CS	Cluster Study
CAA	Clean Air Act
CAISO	California Independent System Operator
CBF	City of Bonners Ferry
CCCT	Combined-Cycle Combustion Turbine
CEC	Central Electric Coop
Chelan	Chelan County Public Utility District
CIFP	Commercial Infrastructure Financing Proposal
CIP	Capital Investment Portfolio
Clark	Clark Public Utilities
COE	City of Eatonville
COI	California Oregon Intertie
COS	City of Steilacoom
CPP	Clean Power Plan
Cowlitz	Cowlitz Public Utility District
DOE	Department of Energy
Douglas	Douglas County Public Utility District
EIM	Energy Imbalance Market
EL&P	Elmhurst Light and Power
Emerald	Emerald Public Utility District

EPA	Energy Protection Agency
ETC	Existing Transfer Commitments
EWEB	Eugene Water and Electric Board
FAS	Interconnection Facilities Study
FCRPS	Federal Columbia River Power System
FCRTS	Federal Columbia River Transmission System
FEC	Flathead Electric Cooperative
FERC	Federal Energy Regulatory Commission
FES	Interconnection Feasibility Study
GI	Generator Interconnection
HVDC	High Voltage Direct Current
IPC	Idaho Power Company
ISIS	Interconnection System Impact Study
LADWP	Los Angeles Department of Water and Power
LGI	Large Generator Interconnection
LGIA	Large Generator Interconnection Agreement
LGIP	Large Generator Interconnection Procedure
LL&P	Lakeview Light and Power
LLI	Line and/or Load Interconnection
LT ACT	Long-Term Available Transfer Capability
LTF	Long-term Firm
LVE	Lower Valley Energy
M2W	Montana to Washington
MEC	Midstate Electric Cooperative
Milton	City of Milton
MT-NW	Montana-Northwest
Mvar	Mega Volt-Amphere reactive
NEPA	National Environmental Policy Act
NERC	North America Electric Reliability Corporation
NWE	Northwestern Energy
NITS or NT	Network Integration Transmission Service
NI-W	Northern Intertie West

NLI	Northern Lights, Inc.
NOEL	North of Echo Lake
NOS	Network Open Season
NPCC	Northwest Power and Conservation Council
NW-CA	Northwest to California
OATT	Open Access Transmission Tariff
OML	Ohop Mutual Light
PA	Paul-Allston
PAC	PacifiCorp
PC	Planning Coordinator
PCM	Project Coordination Meeting
PDI	Project Delivery Information
PDCI	Pacific Direct Current Intertie
PDT	Project Definition Team
PEFA	Planning and Expansion Functional Agreement
PGE	Portland General Electric
PI	Peninsula Light
PL&P	Parkland Light and Power
PMU	Phasor Measurement Unit
PNW	Pacific Northwest
PNUCC	Pacific Northwest Utilities Conference Committee
POD	Point of Delivery
POR	Point of Receipt
POS	Plan of Service
PPOS	Proposed Plan of Service
PRD	Project Requirement Diagram
PSA	Puget Sound Area
PSE	Puget Sound Energy
PSM	Project Strategy Meeting
PTC	Production Tax Credit
PTP	Point-to-Point
PTDF	Power Flow Distribution Factor

RAS	Remedial Action Scheme
RP	Raver-Paul
RRO	Regional Reliability Organization
SCL	Seattle City Light
7^{th} Plan	Northwest Power and Planning Council's Seventh Power Plan
SIS	System Impact Study
SMI	Small Generator Interconnection
SOA	South of Allston
SOB	South of Boundary
SGIP	Small Generator Interconnection Process
SPUD	Snohomish County Public Utility District
SVEC	Surprise Valley Electrification Corporation
TI	Technology Innovation
TIP	Technology Innovation Project
TLS	Transmission Load Service
TP	Transmission Planners
TPL	Transmission Planning Standard
T-Plan	Transmission Plan
TPU	Tacoma Power Utilities
TS	Transmission Service
TSEP	Transmission Service Requests and Expansion Process
TSR	Transmission Service Request
TTC	Total Transfer Capability
UEC	Umatilla Electric Co-op
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
WEC	Wasco Electric Cooperative
WECC	Western Electricity Coordinating Council
WOCN	West of Cascades North
WOCS	West of Cascades South
WOH	West of Hatwai
WOJ	West of John Day

WOLM	West of Lower Monumental
WOM	West of McNary
WOS	West of Slatt
WPUD	Whatcom Public Utility District