BONNEVILLE POWER ADMINISTRATION

2021

TRANSMISSION PLAN

OPEN ACCESS TRANSMISSION TARIFF ATTACHMENT K PLANNING PROCESS

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1. Executive Summary

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 2)** 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. Transmission Planning identifies plans of service based on three broad categories: system assessment, customer requests for transmission service, and generator and line and load interconnection customer requests. **Section 3 provides descriptions, timelines, diagrams and maps of these processes.**

1.1 System Assessment

The **2021 System Assessment (Section 4)** provides a map of the planning areas, description of planning assumptions, and methodology. The 2021 System Assessment identified a corrective action plan to add a 230 kV Bus Sectionalizing Breaker at the Keeler substation in the Portland load service area. With execution of this corrective action plan, BPA's system performance will be acceptable and meet the requirements of the NERC TPL-001-4 Standard. The Keeler 230 kV Bus Sectionalizing Breaker in the Portland load area has a need date of 2026.

The **Transmission Needs (Sections 8, 9 and 10)** lists the transmission needs identified over the 10-year planning horizon by load areas, paths and interties. This section of information meets the Attachment K requirement to provide a brief narrative description of each transmission need, the preferred solution, an estimated cost, and proposed energization date. The Transmission Needs section is divided into four subsections: major projects, and projects by planning area, path and intertie. This year the 27 load service areas were grouped under eight new planning areas. There are 14 paths and four interties.

The **Major Projects (Section 7)** lists projects that are currently under development. Each project includes a project requirements diagram, a detailed description of the plan of service, expected energization date, and estimated costs. There are four major projects as follows:

- The **South Tri-Cities Reinforcement** addresses near-term operations, reliability, and maintenance issues in the Tri-Cities area of Washington. 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. Energization is expected in 2025.

- The **Raver 500/230 kV Transformer Addition** has been studied as part of the sub-regional Puget Sound Area study team through ColumbiaGrid. The transformer and the Raver-Covington 230 kV line #3 were energized in August 2021 and the remainder of the project will be completed in 2024.

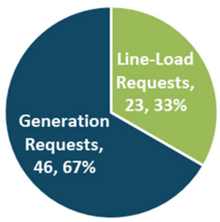
- The **Longview Area 230/115 kV Transformer Addition** is needed to maintain reliable load service in the area. The project was energized in 2021.

- The **Schultz-Wautoma 500 kV Series Capacitor Addition** is necessary to increase the South of Allston available transfer capability and improve operations and maintain flexibility for the South of Allston and I-5 paths. The project will add an 1152 MVAR, 24 Ohm series capacitor (rated 4000A at 500 kV) on the Schultz-Wautoma 500 kV line at the Wautoma substation. Energization is expected in 2023.

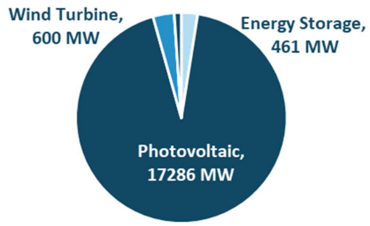
1.2 Generation and Line-Load Interconnection Requests

For calendar year 2021, as of early December 46 generation interconnection requests were received for approximately 18,553 maximum summer megawatts (MW). Of those requests, 93 percent are photovoltaic (17,286 MW), three percent are wind turbine (600 MW) and two percent are energy storage (461 MW). A considerable portion (86%) of the megawatts associated with the generation interconnection requests are located in Crook county (9,500 MW), Sherman (1,648), Morrow county (1,574 MW), and Marion county (1,000 MW) in Oregon and Benton county (2,188 MW) in Washington.

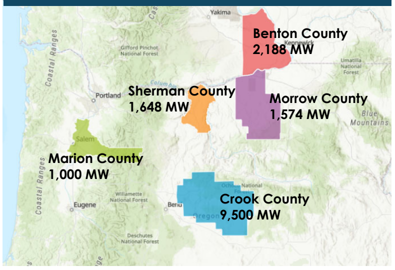
Interconnection Requests
January - December 2, 2021
Number of Requests



Generation Interconnection Requests
January - December 2, 2021
Maximum Summer Megawatt



Generation Interconnection Requests
January – December 2, 2021
Maximum Summer Megawatt by County



1.3 Transmission Service Requests

The 2021 Transmission Service Request 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. Major Cluster Study findings show BPA evaluated 116 new transmission service requests (TSRs), representing 5,842 MW of transmission demand. Eleven TSRs (305 MW) were awardable without transmission upgrades. Twenty-eight TSRs (2,008 MW) require an upgrade on the BPA system to enable firm service. Seventy-seven TSRs (3,529 MW) require an upgrade and resolution of impacts to third-party transmission providers. Seventy-four TSRs (3,677 MW) were determined to be eligible for conditional firm service. The majority of the point of receipts include North Central Oregon, Mid-Columbia area, Central Oregon and Central Washington. The points of delivery are primarily to the larger metropolitan areas of the northwest in the Portland–Salem Oregon, and the Seattle–Puget area. There is a large amount of requests from solar resources that are driving system injections in the central area of Oregon and Washington.

2021 Transmission Service Requests
Major Cluster Study Findings

TSRs	MW	Findings
11	305	Awardable without transmission upgrades.
28	2,008	Require an upgrade on the BPA system to enable firm service.
77	3,529	Require an upgrade AND resolution of impacts to third-party Transmission Providers.
74	3,677	Eligible for Conditional-Firm Service for a total of 3,677 MW.

2021 Transmission Service Requests
TSEP Customer Actions

TSRs	MW	Findings
9	220	Accepted Long-Term Firm offer.
2	85	Rejected Long-Term Firm offer.
24	2,011	Withdrawn by customer.
51	1,341	Sent Conditional-Firm Service offer.
75	2,824	Sent next stage agreements to support upgrades. These activities are customer funded.

Plans of Service include Cross Cascades North Reinforcement (Schultz-Raver No. 3 and 4 500 kV Series Compensation), Portland Area Reinforcement (Pearl-Sherwood McLoughlin Reinforcement), and the Satsop Area Project (Aberdeen Tap to Satsop Park-Cosmopolis No. 1 115 kV Line Upgrade). Withdrawn plans of service are the Raver-Paul Reinforcement (500 kV Substation Coulee-Olympia Line Upgrade and Olympia substation expansion), Fort Rock Reinforcement (Grizzly-Captain Jack 500 kV Line Upgrade), and the Grandview Sub-Grid Area (Grandview-Red Mountain 115 kV Line Rebuild). A list of active TSEP Projects are provided in the Appendix.

1.4 Planning Landscape

BPA Transmission Planners stays abreast of the broader **Transmission Planning Landscape (Section 6)** where there are significant industry factors at play and several regional entities that affect the manner in which the transmission system is planned. The Power Council published the 2021 Northwest Power Draft Plan in September 2021. The Council expects that in the near term change will be modest and in the long term a more substantial change toward cleaner sources of generation is expected. The potential impact of climate change on electricity use and generation in the region was an area of uncertainty for the Council. The draft plan does however estimate the impacts of climate change on demand for electricity. The Council also explored policies to reduce emissions. The Council focuses on three main topics which include energy efficiency, demand response, and regional collaboration.

Also, the Pacific Northwest Utilities Conference Committee (PNUCC) produces a forecast that serves as a gauge for how much power will be needed and how utilities are meeting those needs. The 2021 Northwest Regional Forecast released in April 2021 for year 2021-2031 states the region is actively navigating large thermal unit retirements and acquiring significant amounts of renewable generation in an effort to reduce carbon emissions. In recent years over 2,000 MW of coal plants have retired in the Northwest, and another 2000 MW are in line to retire. With this changing resource mix and forecasted load growth, a growing peak capacity need is emerging and this is elevating system adequacy concerns.

Much of the concern centers on the disappearing coal fleet in the Northwest and greater Western Interconnection, along with the uncertainty regarding the characteristics, timing and magnitude of planned resources. The Northwest Power Pool (NWPP) has recently embarked on a mission related to a comprehensive review of resource adequacy in the region. The NWPP released its Resource Adequacy Program – Detailed Design Report in July 2021. NWPP states that while there are many ways to improve reliability and many forms of resource adequacy (capacity, flexibility, energy) their program will focus on creating a capacity program with a demonstration of deliverability. The program will have two components – a forward showing program and an operational program – that seeks to achieve a balance between planning in a reasonably conservative manner but also to provide flexibility in order to protect customers from unreasonable costs.

Finally, BPA made its final decision to join the EIM on Sept. 27, 2021, when it released the Final EIM Close-out Letter. This letter concludes the extensive assessment and public process conducted through all five phases of the EIM decision process. BPA remains committed to working with customers and constituents as it prepares for market participation and after Go Live.

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 outlined under FERC Order 890, Attachment K 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 forecast of 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.

Attachment K Planning Cycle
Customer Meetings and Postings Timeline
Visit BPA's Attachment K Planning Process web page for more information.

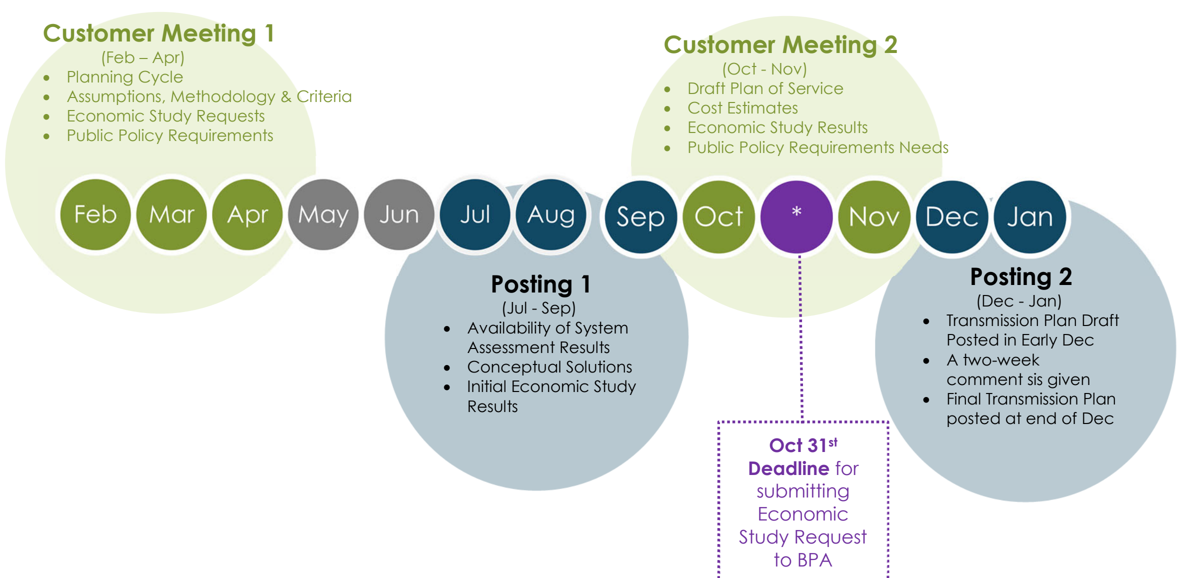


Figure 1 Attachment K Planning Cycle

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.

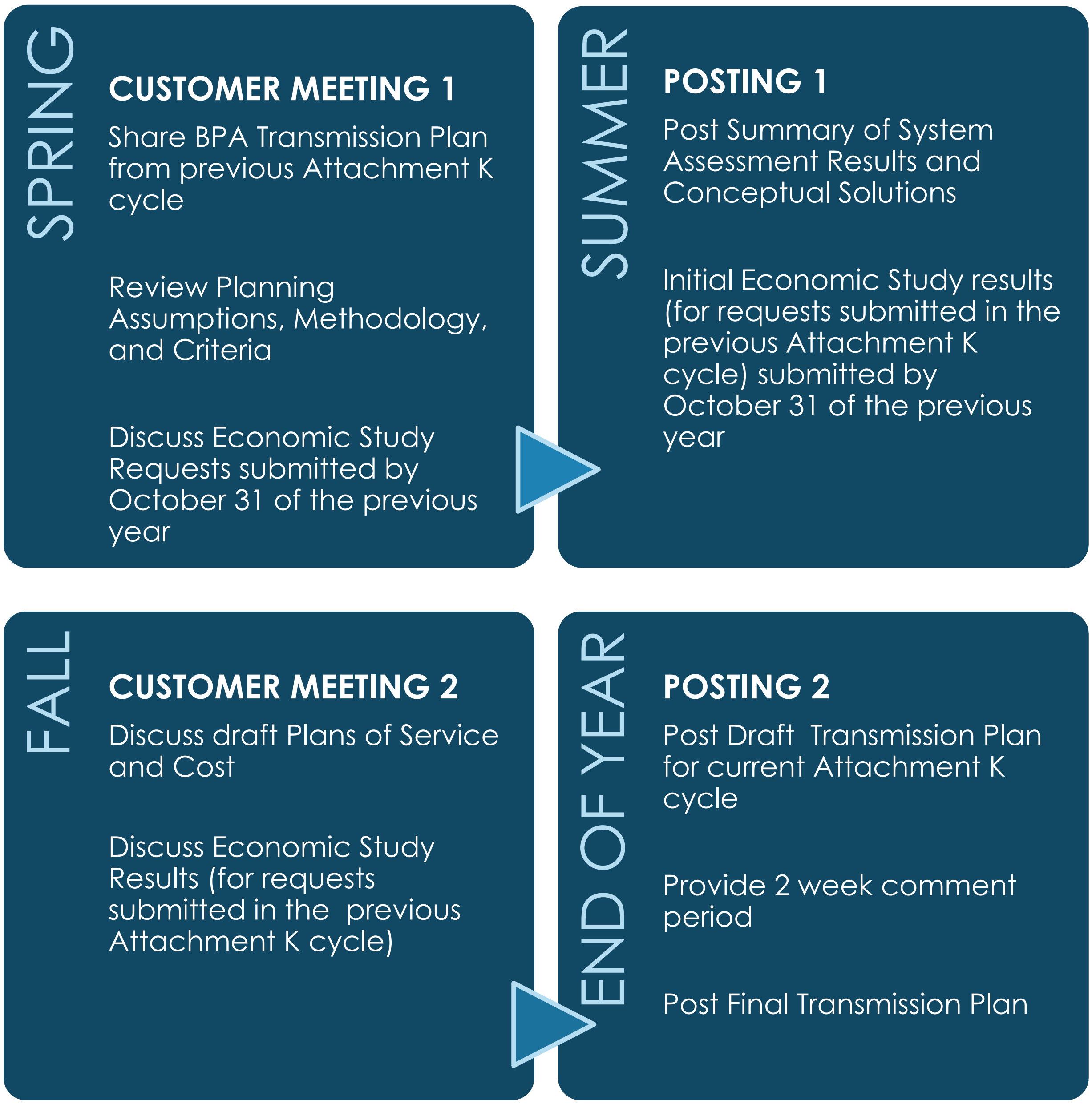


Figure 2 Attachment K Public Meetings and Postings Cycle Diagram

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. High-priority economic studies are funded by BPA. 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 3 Planning Key Drivers Diagram

3.1.1 Reliability and Load Service

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. Within the BPA service area, load growth occurs at different rates depending on the specific geographic area. 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 roughly 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. Similar to the generator interconnection projects, only larger projects which have an executed construction agreement are included in this T-Plan. The LLI process is very similar to the generation interconnection process.

3.2 Load Area, Path and Intertie Description

The role of BPA's Transmission Services is to provide open access transmission service for customers, utilities, generators, and power marketers consistent with applicable regulatory requirements. In fulfilling this role, Transmission Planning is responsible for analyzing the changing load and resource trends and patterns and planning a transmission system that will meet the needs of the Pacific Northwest for the future consistent with our mission and vision. From the transmission planning standpoint, the power system can be viewed in three basic components – loads, paths and interties.

3.2.1 Loads

The loads tend to be clustered into geographical areas. For planning purposes, Transmission Planning has defined over 20 load areas. Examples include the Portland load area, the Seattle load area, the Spokane load area, etc. In the Transmission Needs section of this T-Plan projected loads are shown for each load service area. Forecasted summer and winter loads in megawatts are shown five and ten years out for each area. A list of potential projects is identified by load service, paths, flow gates and interties in the Transmission Needs section.

3.2.2 Paths

The paths represent the transmission system that moves energy between the loads, generation, and external interconnections described above.

3.2.3 Interties

BPA is part of the western interconnection that includes the whole western United States and Canada. There are four interconnected external areas, British Columbia, Montana, Idaho, and California. Bonneville has four high capacity interties that interconnect the Bonneville service area to British Columbia, Montana, and California and a 230 kV and 115 kV line connecting Bonneville to Idaho.

3.3 Area Planning & System Assessment

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 deficiencies. 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.

Area Planning Process Overview

* Transmission Planning uses the WECC base cases as the starting point for its system assessment. However, considerable effort is applied outside Transmission Planning associated with BPA load forecasting prior to the forecast being submitted to WECC.

Figure 4 Area Planning Process Overview Diagram

3.3.1 Area Planning Process

Data collection and modeling occurs at the forefront of the area planning process. Comprehensive computer models are developed to test the reliability of the transmission system under a wide variety of future system conditions. 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.

3.3.2 Verification of Study Need

The NERC TPL-001-4 Standard allows system assessments to be based on the results of qualified past studies if they are still valid. A determination is made as to whether a past study shows an adequate transmission plan based on the latest information and is a qualified past study, or if a new study is needed for a load area or path. If a new study is required, the result of the assessment process is a new study report dated for the current year's assessment. If it is determined that a previous study is a qualified past study, the process results in a verification report documenting the verification checks that support the conclusion that a new study is not required, and reference to the previous study report. At a minimum, a thorough validation of the load forecast and topology used in studies for each load area is done annually to verify the timing of corrective action plans.

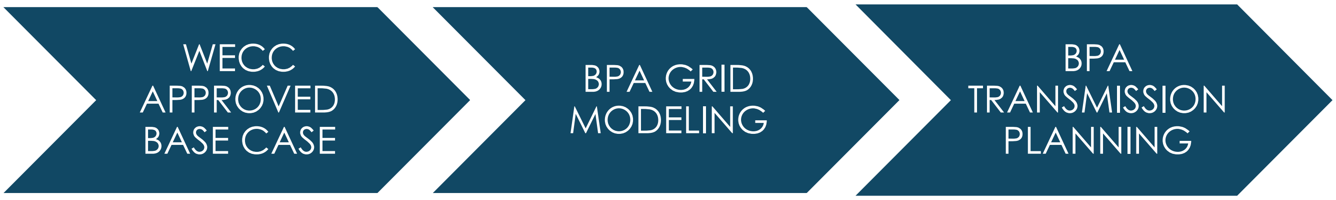
3.3.3 Base Cases

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-001-4 and others. The NERC TPL-001-4 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.



WECC produces approved base cases.

Considerable work is completed on base cases outside of Transmission Planning and prior to the planning process.

TPMG reviews and updates WECC approved base cases with the latest information available. These are known as the seed cases which are generic initial base cases. These generic cases have global assumptions. There are seven cases defined by the standard.

Transmission Planning works with Grid Modeling to determine which cases are needed for area planning purposes and the annual system assessment.

Transmission Planning gets updated WECC approved base cases with the latest information from the Grid Modeling group

A small team determines how cases need to be tuned. Additional cases may be created.

Final base cases are distributed to individual teams. Those teams adjust the base case to meet the area needs. Again, additional cases may be created.

Each area study team will perform studies using these final base cases in the power flow model.

Figure 5 Power Flow Base Case Diagram

3.3.4 Technical Studies

Base Case Review and Modification
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.

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. Below is a list of the different types of analysis Transmission Planning performs in the System Assessment:

- Steady State (Power Flow) Contingency Analysis
- Voltage Stability Analysis (PV and QV studies)
- Transient Stability Analysis
- Short Circuit Analysis (performed by BPA High Voltage Engineering group)

3.3.5 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.

3.3.6 Technical Study Findings

After the study process is complete the findings are documented in detailed area and path study reports. In the event that 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.

3.3.7 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. These are generally the TPs and PCs that are adjacent to or interconnected with the BPA transmission system. If individual areas or paths are adjacent to particular 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.

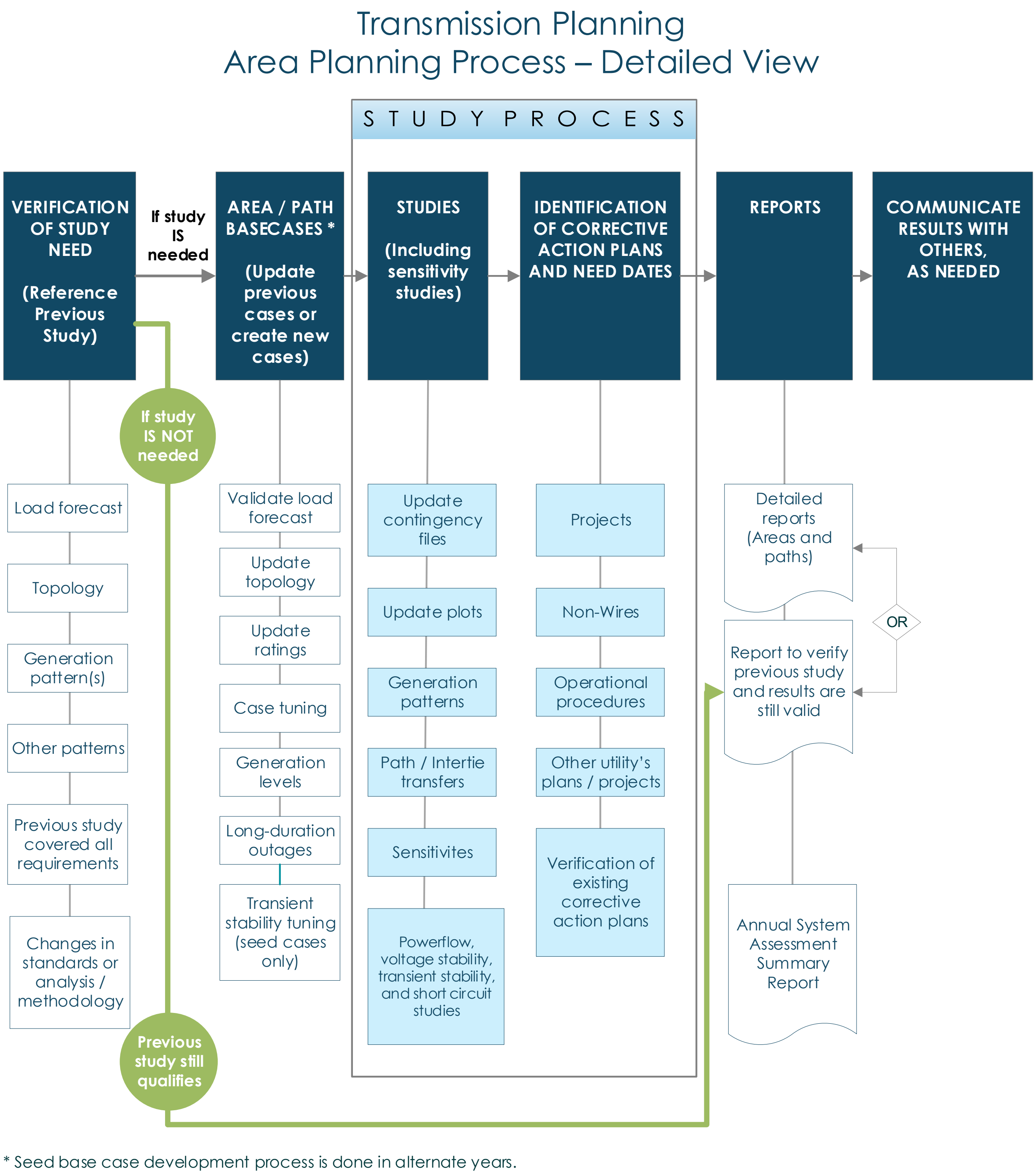


Figure 6 Area Planning Process Diagram

3.4 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.

3.4.1 The Transmission Service Requests Study and Expansion Process

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 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.

3.4.2 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.

3.4.3 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.

3.4.4 TSEP Cluster Study Cycle

Below is a brief description and diagram of the Commercial Assessment proposed timeline. The Commercial Assessment takes into consideration all known information about each TSR such as status of generator interconnection and/or historical generation patterns, association with rapid load growth or new load, and duplicative requests that may be present in the queue.

This study-based approach can result in some offers of transmission service made possible by maximizing the use of existing transmission system without infrastructure upgrades. Any such offers of transmission service will be made between August and December. Also, any TSRs that are not offered service through the Commercial Assessment by October will be offered Cluster Study Agreements, to identify Plan(s) of Service necessary to offer service.

The upcoming Cluster Study is expected to begin in January and conclude in May at which time a Cluster Study Report is finalized. Transmission Planning produces a Cluster Study Technical Report which provides the findings of the analysis and power flow modeling that is conducted. A Cluster Study determines what transmission expansion, if any, is required to accommodate customer requests for long-term firm transmission service over the Bonneville network. Results of the Cluster Study will be made available in a similar manner as past studies.

TSEP Cluster Study Cycle

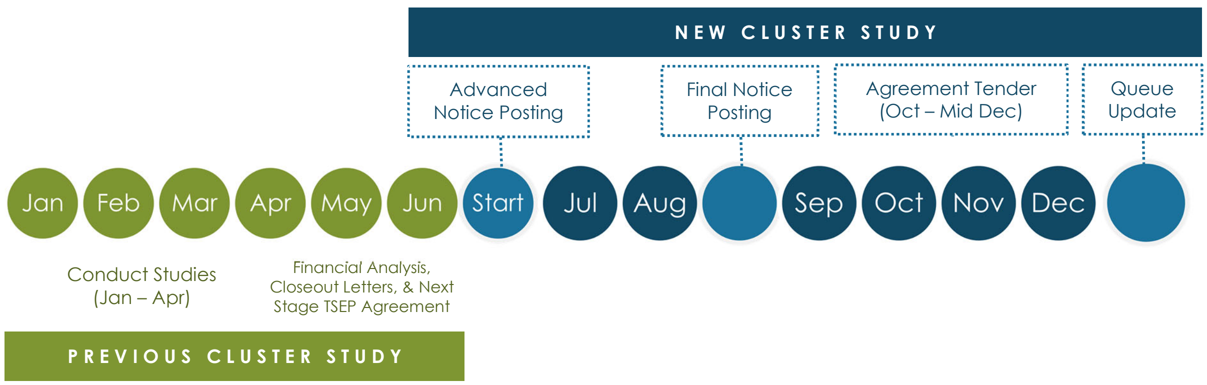


Figure 7 TSEP Cluster Study Cycle Diagram

3.4.5 Cluster Study Process

The diagram below depicts the current Cluster Study process from Transmission Planning's perspective. It is provided for informational purposes only. BPA customers who request transmission service may do so during a limited-time submission window (a.k.a. open season). 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 LT ATC (as informed by the LT ATC Update) 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 is able to 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.

Transmission Planning
Cluster Study Process

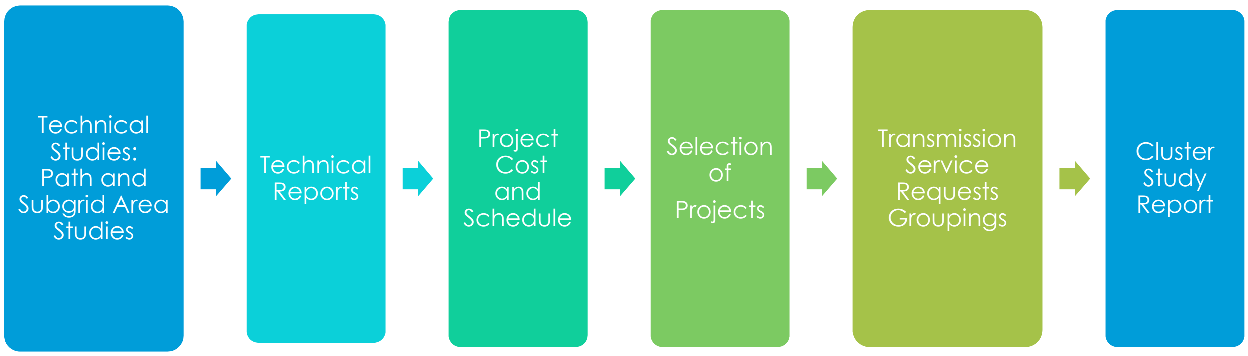


Figure 8 Cluster Study Process Diagram

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, is able to accommodate the requested service.

3.4.6 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 possible authorization. If a TSR has non-*de minimis* impacts that exceed the ATC for any flowrate or has an adverse sub-grid impact, the CS further evaluates the TSR in order to identify the transmission expansion necessary to provide the requested service.

3.4.7 Determination of Cluster Study Areas

For all TSRs that require further evaluation to determine 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.

3.5 Interconnection Requests

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.

3.5.1 Interconnection Requests Process & Timeline

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.

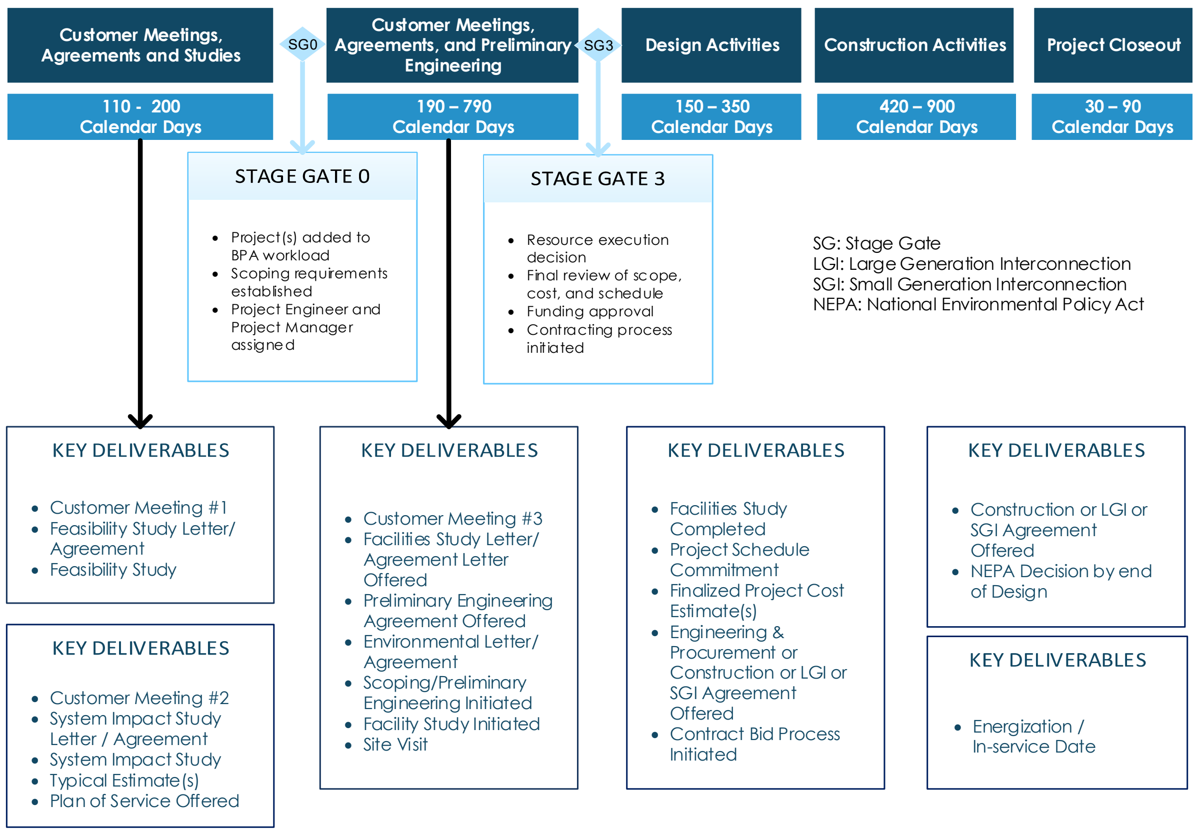


Figure 9 Interconnection Requests Process and Timeline Diagram

3.5.2 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 [ISIS]
- Interconnection Facilities Study [FAS]

3.5.3 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.

3.5.4 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.

3.5.5 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.

3.5.6 Interconnection Study Process Diagram

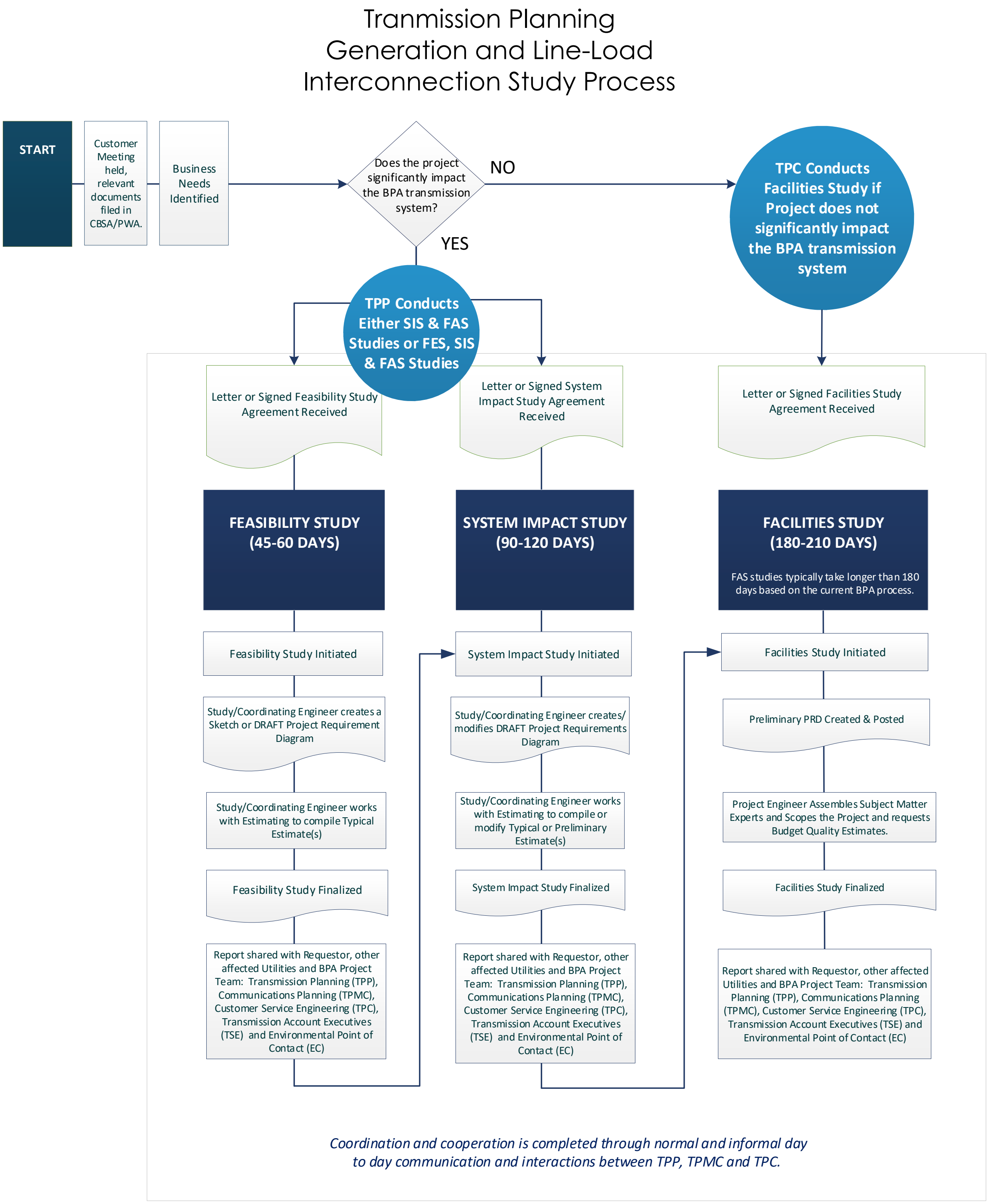


Figure 10 Interconnection Study Process Diagram

3.6 Non-Wires Assessment

3.6.1 Purpose of Non-Wires Alternatives

Transmission Planning along with the BPA Cross-Agency Non-Wires team explores possible non-wires solutions that include a broad array of alternatives such as demand response, distributed generation, and energy-efficiency measures that can individually or in combination delay or eliminate a need for reinforcements to the transmission system. A brief summary of the non-wires assessment for each of the 27 load areas is provided in the Transmission Needs section.

3.6.2 Area Planning Non-Wires Assessment

Each year a qualitative analysis of potential non-wires alternatives is included for each load area which has identified potential projects. This analysis is documented in the load area technical report during the annual area planning process. For areas that have performance deficiencies and a corrective action plan is identified within the near or long-term planning horizon, the potential for non-wires alternatives to correct the deficiency or defer the date when a project is required to comply with the NERC Standards is described. Alternatively, for those areas with no recommended projects, the potential for non-wires measures to slow or flatten the load growth in the area is considered, which may defer the need for future reinforcements.

3.6.3 Non-Wires Summary and Prioritization Reports

Transmission Planning produces an internal Non-Wires Summary Report that provides information about non-wires potential. This internal report is used to help identify those areas which appear to have the greatest potential for non-wires measures. If feasible non-wires alternatives are identified, typically the top three to five candidates are selected as the highest priority for further non-wires evaluation. This prioritization is based on a number of factors as well as collaboration with the cross-agency non-wires team. This prioritization is based on a number of factors as well as collaboration with the BPA Cross-Agency Non-Wires team. Following the prioritization process, one or more of the candidate areas are selected for more detailed non-wires analysis and possible implementation measures.

3.6.4 Non-Wires Planning Process Diagram

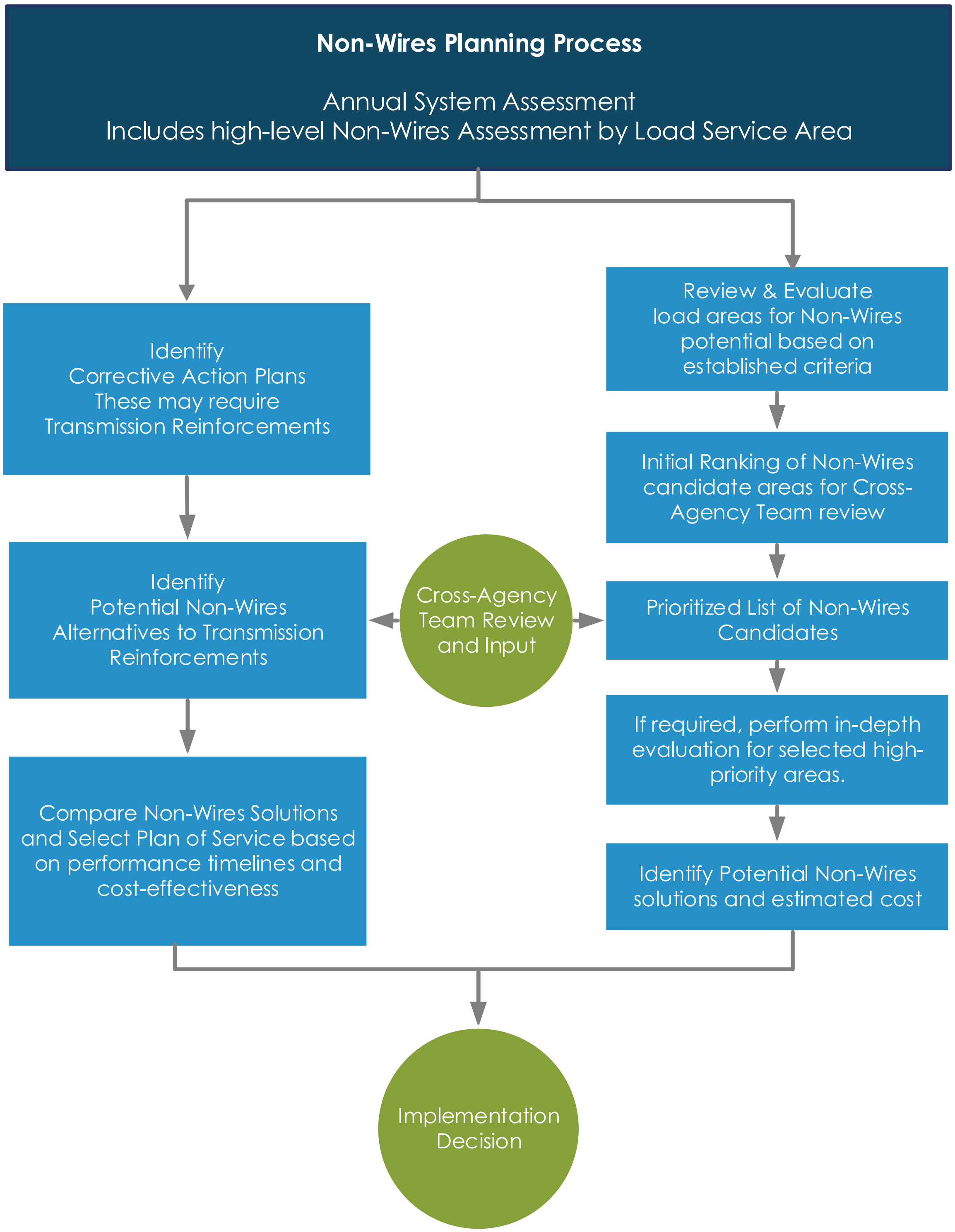


Figure 11 Non-Wires Planning Process Diagram

4. 2021 System Assessment

The purpose of the System Assessment is to provide evidence of BPA's compliance with the NERC Reliability Standard TPL-001-4. BPA operates under NERC's mandatory and reliability standards. BPA adheres to these mandatory standards when planning, operating, and maintaining its transmission system. Specifically, NERC's Standard TPL-001-4 which is referred to as the Transmission System Planning Performance Requirements is applicable to Transmission Planning. The TPL standard establishes transmission system planning performance requirements within the planning horizon to develop a bulk electric system that will operate reliably over a broad spectrum of system conditions and following a wide range of potential contingencies.

BPA also plans the transmission system to meet the WECC system performance criteria where applicable. The System Performance Regional Criterion adopted by the WECC establishes technical criteria for acceptable impacts that disturbances can have on the Transmission system.

BPA has also developed a Reliability Criteria for system planning. The purpose of BPA's Reliability Criteria for System Planning is to provide guidance to supplement the NERC and WECC Transmission Planning Performance Requirements, and provide a guideline for making assumptions when planning the transmission system. The BPA Reliability Criteria also provides guidance where sensitivity studies are specified within the NERC planning standards. These criteria are intended to provide firm guidance but not absolute standards for transmission planning.

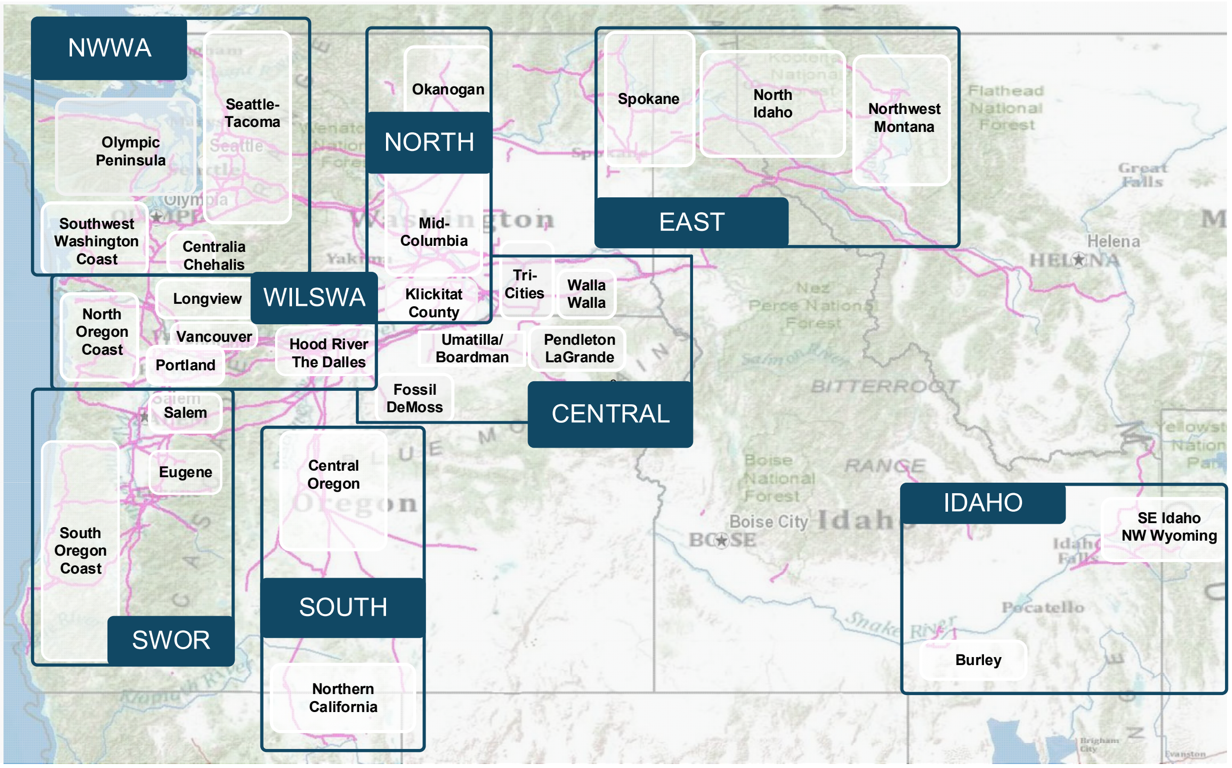
The design of BPA's transmission system is intended to meet the reliability performance requirements of all applicable NERC, WECC and BPA planning standards and criteria.

In accordance with requirement R8 of TPL-001-4, BPA will distribute the Planning Assessment results to adjacent Planning Coordinators and adjacent Transmission Planners within 90 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 will provide a documented response to that recipient within 90 calendar days of receipt of those comments.

4.1 Planning and Load Service Areas

The BPA transmission system is located in the Pacific Northwest and covers the states of Washington and Oregon, and portions of Idaho, Montana, Wyoming, and Northern California. The BPA transmission system is characterized by mainly hydro generation on the main stem Columbia and lower Snake Rivers remote from load centers. Most of the generation is run-of-the-river hydro with the exception of Grand Coulee, Hungry Horse, and Dworshak. In addition, there are several thermal generators located along the I-5 corridor between Seattle and Portland; and in the lower Columbia River basin between Pendleton and Portland.

The major load centers in the Pacific Northwest are located west of the Cascade Mountains including Seattle and Portland. For study purposes, prior system assessments have divided the transmission system into 27 load service areas. For the 2021 system assessment, these load service areas were grouped into 8 "Planning Areas" based on geographic and electrical proximity.



4.2 Assumptions

The major assumptions that form the basis of the studies are load, generation, internal and external path flows, and transmission system topology. These assumptions are modeled in the WECC approved base cases which are used as the starting point for the assessment studies.

In addition, as part of base case development for the system assessment, base case assumptions for loads and resources are verified based on historical data and against the BPA White Book to ensure federal and regional load and resource obligations are captured. Each year, BPA Power Services publishes the *Pacific Northwest Loads and Resources Study* (White Book) which covers both federal and regional load and resource obligations. In addition, base case assumptions are coordinated with BPA Power Services to identify whether any other generation patterns need to be captured in the studies, and to capture any significant long-term resource outages from the Outage Resource Forecast.

To cover the planning horizon and the critical system conditions as required by the NERC Reliability Standards, BPA develops base cases for the Near-Term Planning Horizon which represents:

- Winter and summer peak load conditions for year one or two of the planning horizon
- Winter and summer peak load conditions for year five of the planning horizon, and
- Spring off-peak load conditions for one of the five years of the planning horizon

BPA also develops base cases for the long-term planning horizon which represents: winter and summer peak load conditions for year nine or ten of the planning horizon.

4.2.1 Base Cases

The NERC Planning Standard TPL-001-4 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 2021 System Assessment adequately covered these scenarios and required sensitivities. The base cases used for the steady state portion of the 2021 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. The load forecasts and network topology in these base cases were validated using the latest forecasts and best available customer information. Load forecasts and topology for those WECC cases were then modified to represent the following study cases:

2021 System Assessment Steady State Base Cases					
Starting WECC Case	**Study Year**	**Modified Study Case**	**Season**	**Load Level**	**Notes**
19LSP1	2022	22LSP	Spring	Off-Peak	Near term (2-year) expected light spring
19HW3	2022	22HW	Winter	Peak	Near term (2-year) expected winter peak
19HS3	2022	22HS	Summer	Peak	Near term (2-year) expected summer peak
24HW2	2025	26HW	Winter	Peak	Near term (5 year) expected winter peak
24HS2	2025	26HS	Summer	Peak	Near term (5 year) expected summer peak
29HW1	2029	30HW	Winter	Peak	Long-term (6-10 year) expected winter peak
29HS1	2029	30HS	Summer	Peak	Long term (6-10 year) expected summer peak

Figure 12 Steady State Base Case Assumptions Table

The 2021 System Assessment was largely based on qualified past studies from the 2020 System Assessment.

The NERC Planning Standard TPL-001-4 requires that the Near-Term Transmission Planning Horizon portion of the Stability analysis include the following base cases (R2.4):

- System peak Load for one of the five years (R2.4.1)
- System Off-Peak Load for one of the five years in the Near-Term Planning Horizon (R2.4.2)

The base cases used for the 2021 System Assessment adequately covered these scenarios and required sensitivities. The base cases used for the stability portion of the 2021 System Assessment included the following because the assessment was largely based on qualified past studies from the 2020 System Assessment.

2020 System Assessment Transient Stability Base Cases					
Starting WECC Case	**Study Year**	**Modified Study Case**	**Season**	**Load Level**	**Notes**
19LSP1	2022	22LSP	Spring	Off-Peak	Near term (2-year) expected light spring
19HW3	2022	22HW	Winter	Peak	Near term (2-year) expected winter peak
19HS3	2022	22HS	Summer	Peak	Near term (2-year) expected summer peak
24HW2	2025	25HW	Winter	Peak	Near term (5 year) expected winter peak
24HS2	2025	25HS	Summer	Peak	Near term (5 year) expected summer peak

Figure 13 Transient Stability Base Case Assumptions Table

4.2.2 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 was modeled in order to determine system total transfer capability limits in the planning horizon for each path.

4.2.3 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.

4.2.4 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 with in order 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, that 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 mainly 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.

4.2.5 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. Some of these RAS will 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.

4.3 Methodology

The BPA transmission system includes 27 distinct load service areas. For the 2021 System Assessment, the 27 load service areas were grouped into 8 Planning Areas for reporting purposes based on geographic and electrical proximity. Each load area was assessed under the limiting system conditions for that area. Each area was then evaluated in order 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 14 paths and 4 interties over the Planning Horizon. This included 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 includes steady state, voltage stability, and transient stability studies. Short circuit analysis is also conducted annually as part of BPA's Switchgear Replacement Program. Provided below is a general description of these items.

4.3.1 Validation of Past Studies

For each load area and transfer path, either new studies were conducted or past studies were 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-001-4 Requirement 1 states that 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. All load areas and most transfer paths in the 2020 System Assessment are based on current studies and did not rely on past studies. Those transfer paths that relied on qualified past studies include a technical rationale to show why the past studies can be relied upon for the 2020 System Assessment.

4.3.2 Criteria

The BPA transmission system is planned to meet applicable NERC Transmission System Planning Performance Requirements in Standard TPL-001-4. System tests and the required performance for those tests are established in the TPL-001-4 Standard. To meet the required performance for system normal and contingency events, BPA plans the transmission system consistent with the planning events and required performance established. These include the following planning events based on the TPL standards.

TPL-001-4 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*
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 14 NERC TPL-001-4 Category Events List

4.3.2.1 Steady State Voltage Limits

Steady state voltage limits are defined in the BPA Reliability Criteria for System Planning. For system normal with no contingencies (Category P0) the BPA transmission system is planned for minimum allowable voltage down to 1.05 per unit for main grid facilities with nominal voltage of 500 kV, and 1.0 per unit for facilities with nominal voltage less than 500 kV. For facilities, with nominal voltage of 300 kV and below, the voltage can be as low as 0.95 per unit for areas at the electrical fringes of the system such as radial systems, local networks, or weakly connected systems.

For contingency events (Categories P1 through P7), the BPA transmission system is planned for minimum allowable voltage down to 1.0 per unit for main grid facilities with nominal voltage of 500 kV, and 0.95 per unit for facilities with nominal voltage less than 500 kV. For facilities, with nominal voltage of 300 kV and below, the voltage can be as low as 0.90 per unit for those areas at the electrical fringes of the system, such as radial systems, local networks, or weakly connected systems.

4.3.2.2 Post Contingency Voltage Deviation

For post-contingency voltage deviation, the BPA system is planned to operate within the steady state voltage limits. The BPA Reliability Criteria also states that voltage changes caused by a single shunt capacitor or reactor device switching event shall normally be limited to 3% of nominal voltage for system normal, and 8% with any line or transformer out of service. Exceptions to the 3% and 8% voltage change guidelines are allowed on an individual basis where either smaller voltage change is required for reliable operation of the system, or investigation shows larger voltage change is not detrimental to end use customers. In addition, the WECC System Performance Regional Criteria TPL-001-WECC-CRT-3.1 specifies allowable post-contingency voltage deviation not to exceed 8% for certain single contingency events (Category P1).

4.3.2.3 Transient Voltage Response

For transient voltage response, the BPA system is planned to meet the WECC Regional Criteria TPL-001-WECC-CRT-3.1. The following performance is specified in the WECC Regional Criteria.

1. Following fault clearing, the voltage shall recover to 80% of the pre-contingency voltage within 20 seconds of the initiating event for all P1 through P7 events, for each applicable BES bus serving load.
2. Following fault clearing and voltage recovery above 80%, voltage at each applicable BES bus serving load shall neither dip below 70% of pre-contingency voltage for more than 30 cycles nor remain below 80% of pre-contingency voltage for more than two seconds, for all P1 through P7 events.
3. For Contingencies without a fault (P2.1 category event), voltage dips at each applicable BES bus serving load shall neither dip below 70% of pre-contingency voltage for more than 30 cycles nor remain below 80% of pre-contingency voltage for more than two seconds.
4. All oscillations that do not show positive damping within 30-seconds after the start of the studied event shall be deemed unstable.

4.3.2.4 Voltage Instability

Transmission system performance to maintain voltage stability is planned in accordance with WECC Regional Criteria TPL-001-WECC-CRT-3.1. Voltage support and control equipment is assumed to operate as expected within the timeframe being studied. Voltage instability is identified when studies show there is no positive reactive power margin. Performance requirements specified in the WECC Regional Criteria include:

1. For P0-P1 Contingency Events, load areas and transfer paths are planned for a minimum of 105% of either the forecasted peak load or transfer path flow.
2. For P2-P7 Contingency Events, load areas and transfer paths are planned for a minimum of 102.5% of either the forecasted peak load or transfer path flow.

4.3.2.5 Cascades or Uncontrolled Islanding

For evaluating the potential for cascading or uncontrolled islanding, the WECC Regional Criteria provides the following guidance:

1. Post-contingency loading on a facility exceeds at least 125% of the facility's highest seasonal rating.
2. Transient stability performance does not meet the applicable WECC Regional Criteria requirements for transient voltage performance.
3. No positive reactive power margin within a local area.

If any of these thresholds are met, BPA will conduct further studies to determine if successive loss of load or generation is contained within the predefined area of study. It is assumed the limit for successive loss of load is 1,000 MW, which is consistent with BPA's System Operating Limits (SOL) Methodology for the Planning Horizon. If loss of load or generation is contained and load loss is below 1,000 MW, it is concluded that there is no cascading outside an area pre-determined by studies.

Thresholds used in the 2020 System Assessment studies for evaluating cascading and uncontrolled islanding were more conservative than the WECC regional Criteria guidance.

4.3.3 Assessment

4.3.3.1 Steady State

The steady state timeframe is the period of time, generally greater than 30-minutes after a disturbance occurs, after all transients have settled out and the system has reached steady state equilibrium. Studies in this timeframe identify performance deficiencies in substation voltages or facility ratings. As required by the NERC Standard (R3.3.1), analysis simulates the removal of all elements expected to be disconnected automatically by the Protection System. The response of other automatic controls, such as static VAR compensators and discrete shunt reactive devices with automatic voltage control relays are also simulated. For this analysis, transformer tap changers are allowed to move, and shunt reactive devices were allowed to switch, in order to support and control voltages within acceptable limits. These actions are appropriate since these devices would have adequate time to respond in the steady state timeframe. For steady state post-contingency analysis, governor response power flow is modeled. All BPA transmission facility ratings included in the studies are based on the latest information available in BPA's Transmission System Electrical Data and BPA's Transformer Loading Guides. Ratings for non-BPA facilities were determined by the owner of the facility.

For system normal with no contingencies (Category P0), BPA ensures all equipment is at or below 100% of its applicable continuous or normal seasonal rating. After a contingency event (Category P1-P7), BPA ensures all equipment is within its applicable emergency rating. For contingency events (Category P2-P7) where non-consequential load loss is allowed, applicable facility ratings apply after assumed non-consequential load loss occurs.

4.3.3.2 Voltage Stability

Voltage Stability is assessed in the post-transient timeframe. This is the interval from one to several minutes following a disturbance after the transient response settles down. Voltage instability is a system state in which an increase in load, a disturbance, or a system change causes voltage to decay quickly or drift downward, and any automatic or manual system controls that would operate in the timeframe of the voltage decrease are unable to halt the decay. Voltage decay may take anywhere from a few seconds to tens of minutes. Unabated voltage decay can result in angular instability or voltage collapse depending on where it occurs.

4.3.3.3 Transient Stability

Transient stability is assessed for the timeframe from 0 to tens of seconds. This timeframe assesses the dynamic performance of the transmission system during and immediately after a contingency event occurs, usually initiated by a fault on the system. Studies in this timeframe identify performance deficiencies including generator synchronism, transient voltage response, and ensuring the system is stable and damped. In lighter load cases, exporting higher amounts of generation out of an area exhibits less damping (more oscillatory) and less angular stability whereas peak load cases can result in longer voltage recovery and possibly lower voltage dips.

4.3.3.4 Cascading and Uncontrolled Islanding

Cascading is defined as the uncontrolled successive loss of system elements triggered by an incident at any location. Cascading results in widespread electric service interruption that cannot be restrained from sequentially spreading beyond an area predetermined by studies. Each load area was analyzed for cascading for multiple contingencies and extreme events which cause the loss of multiple facilities in a load area. If an element overload is severe enough or the local voltages in an area are low enough and occur only within a confined area electrically, it can be determined by inspection that an event will not cascade outside the area.

4.3.3.5 Extreme Events

Requirement R4.5 of the NERC Standard requires that extreme events that are "expected to produce more severe System impacts" shall be identified and evaluated for cascading. If cascading is identified, there must be an evaluation of possible actions designed to reduce the likelihood or alleviate the consequences of such an event.

For BPA's transmission system, the Extreme Event contingencies that are expected to produce the most severe system impacts are the following: loss of an entire substation, simultaneous loss of multiple circuits in a common corridor (or right-of-way), or loss of two independent sources to an area without system adjustment between outages. In general, the BPA system either transfers power over long distances through the system, or provides transmission sources to serve load areas. When transfers occur that stress the transmission system, generation is high at the sending end of the transfer paths. Also, the transmission sources feeding load centers served by the BPA system are typically larger than resources contained within the load areas. Therefore, loss of an entire substation, simultaneous loss of multiple circuits in a right-of-way, or simultaneous loss of two independent sources to an area is more severe than other Extreme Events contingencies.

4.3.3.6 Short-Circuit Analysis

A short circuit analysis is conducted annually as part of BPA's Switchgear Replacement Program to determine whether circuit breakers have interrupting capability for faults they are expected to interrupt. The short circuit analysis is conducted for a 5 year timeframe which covers the Near-Term Planning Horizon.

In general, short circuit current is higher when more sources of current are modeled. Assumptions in the studies include modeling all grounding sources associated with buses serving load, and assuming all generation sources modeled on line. The worst case fault current through substation breakers is calculated looking at the case with all facilities in service and then removing each line one at a time to determine the impact to individual breakers.

In general, System Fault studies are calculated for single-phase and three phase bus fault currents. To determine the circuit breaker interrupting requirements, the maximum short-circuit current duty must be determined. The maximum short-circuit current is higher than the symmetrical short-circuit current calculated by sequence networks (i.e., Aspen program) due to the AC and DC component offsets which are defined by the inductance of the network at the node of interest. BPA determines the maximum values by applying ANSI/IEEE Standard C37.010. Based on a symmetrical short-circuit study the Standard specifies that when the short-circuit current reaches 80% of a breaker's short-circuit rating (70% within two transformations of a generator), a more exact method such as the E/X Method with Adjustment for AC and DC Decrements should be used. BPA applies this method based on X/R ratio and adjusts the short circuit current ratings of power circuit breakers accordingly.

4.3.4 Coordination of Contingencies

Requirements R3.4.1 and R4.4.1 of the NERC Standard requires the Planning Coordinator (PC) and Transmission Planner (TP) to coordinate Contingencies with Adjacent PC's and TP's. For the 2020 System Assessment all of the BPA Contingencies were shared with the adjacent PC's and TP's to solicit any additional contingencies that may need to be studied. Any contingencies identified were studied in addition to BPA contingency events.

4.3.5 Study Tools Used

Steady state and voltage stability analysis were conducted using Power World Simulator version 20 or 21. Transient stability analysis was conducted with either Power World Simulator version 20 or 21, or GE PSLF version 21.

5. Bonneville Maps and Areas

5.1 Service Territory, Transmission Lines, Service Areas and Federal Dams

The Bonneville Power Administration is a nonprofit federal power marketing administration based in the Pacific Northwest. Although BPA is part of the U.S. Department of Energy, it is self-funding and covers its costs by selling its products and services. 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 provides about 28 percent of the electric power used in the Northwest and its resources — primarily hydroelectric — make BPA power nearly carbon free.

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.

Below are maps of the Bonneville service territory, transmission lines, customer services area, load service areas, paths and interties.

Figure 15 BPA Service Territory Map

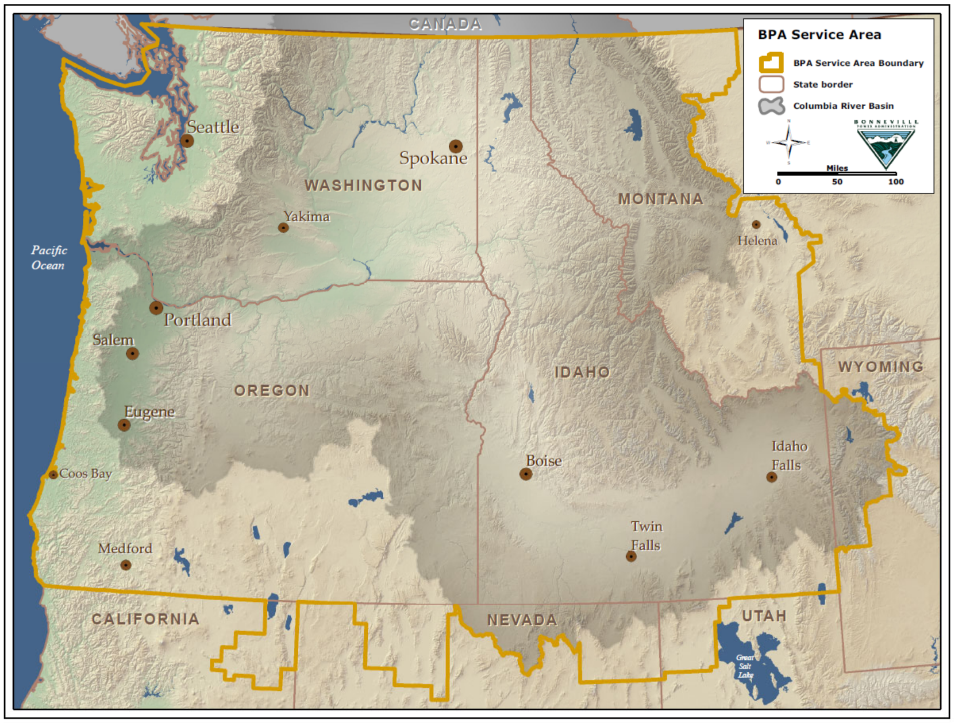


Figure 16 BPA Transmission Lines

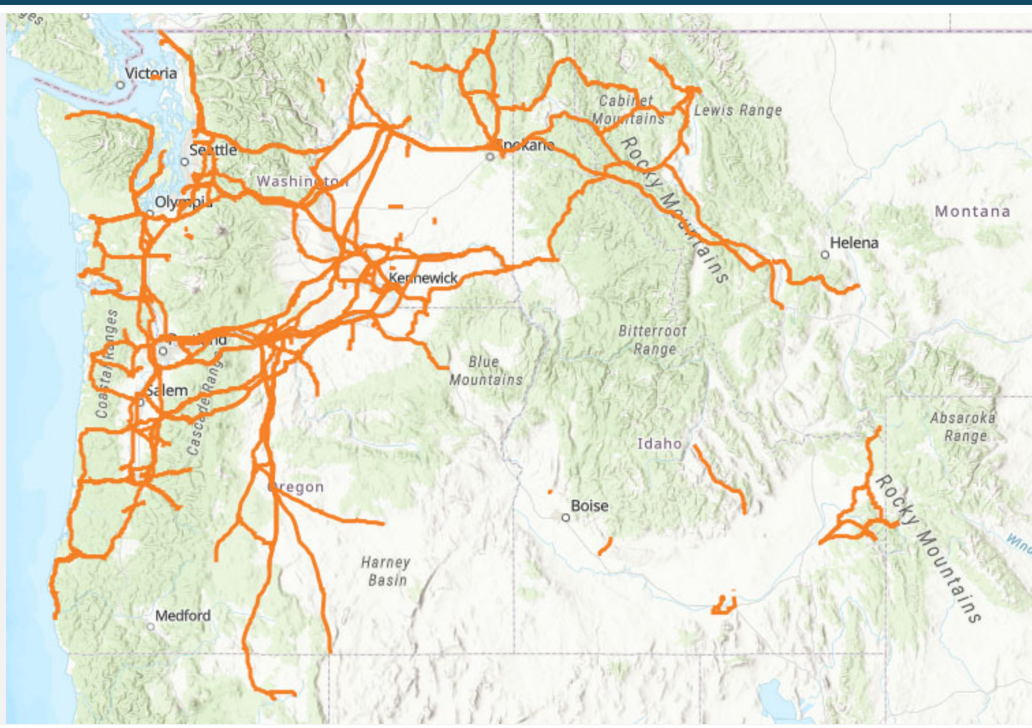


Figure 17 BPA Public, Tribal and Investor Owned Utility Service Areas

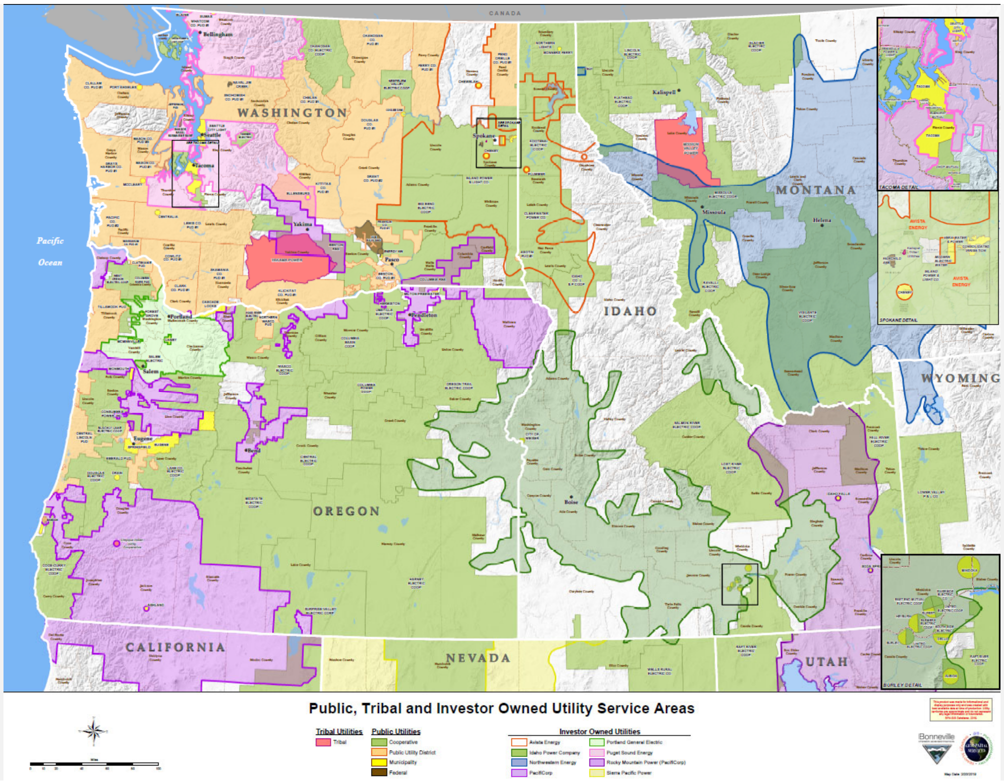
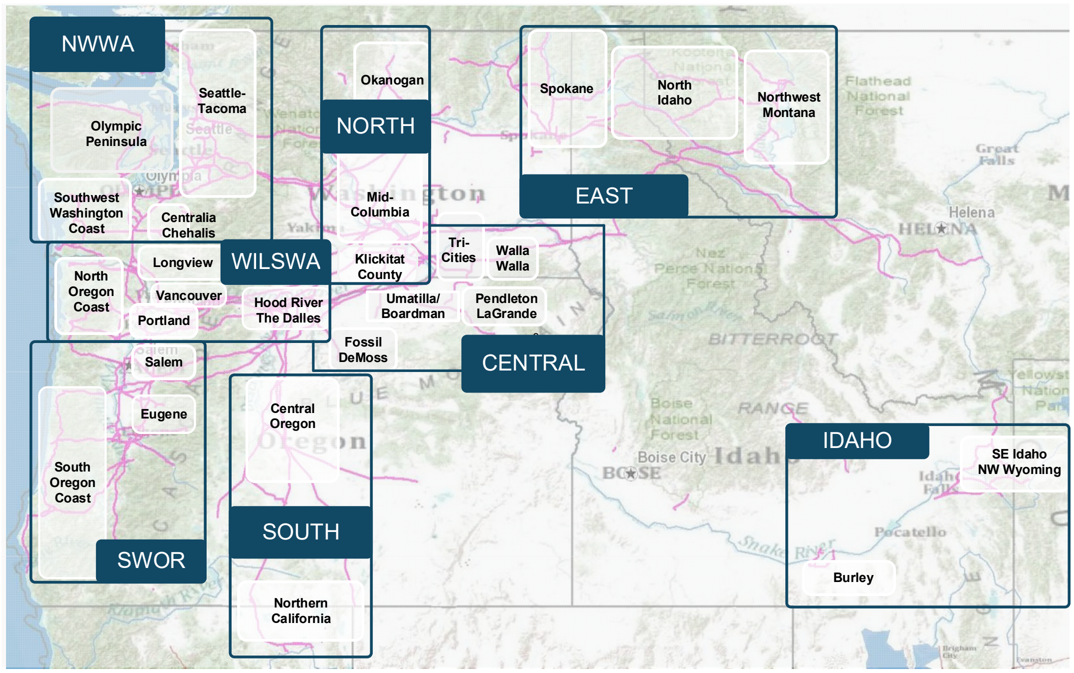


Figure 18 Main Stem of Columbia and Lower Snake Rivers Map – 31 Federal Dams

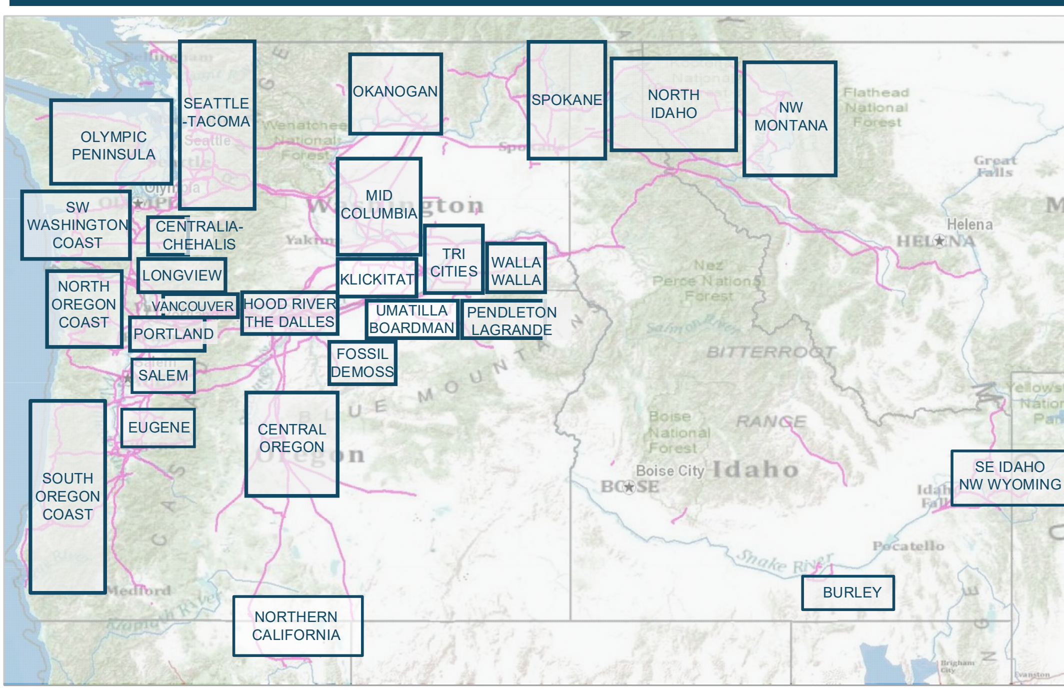
5.2 Transmission Planning Load Service Areas

Figure 19 Planning and Load Service Areas, Interties and Paths Maps

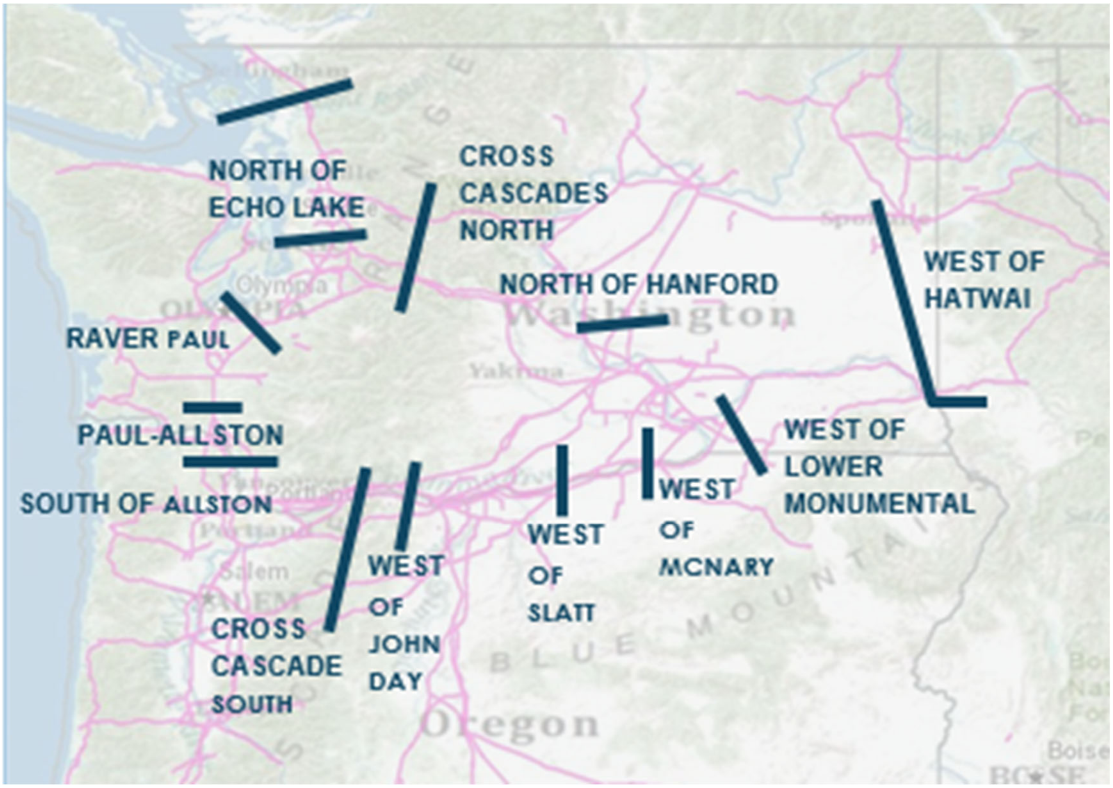
PLANNING AREAS



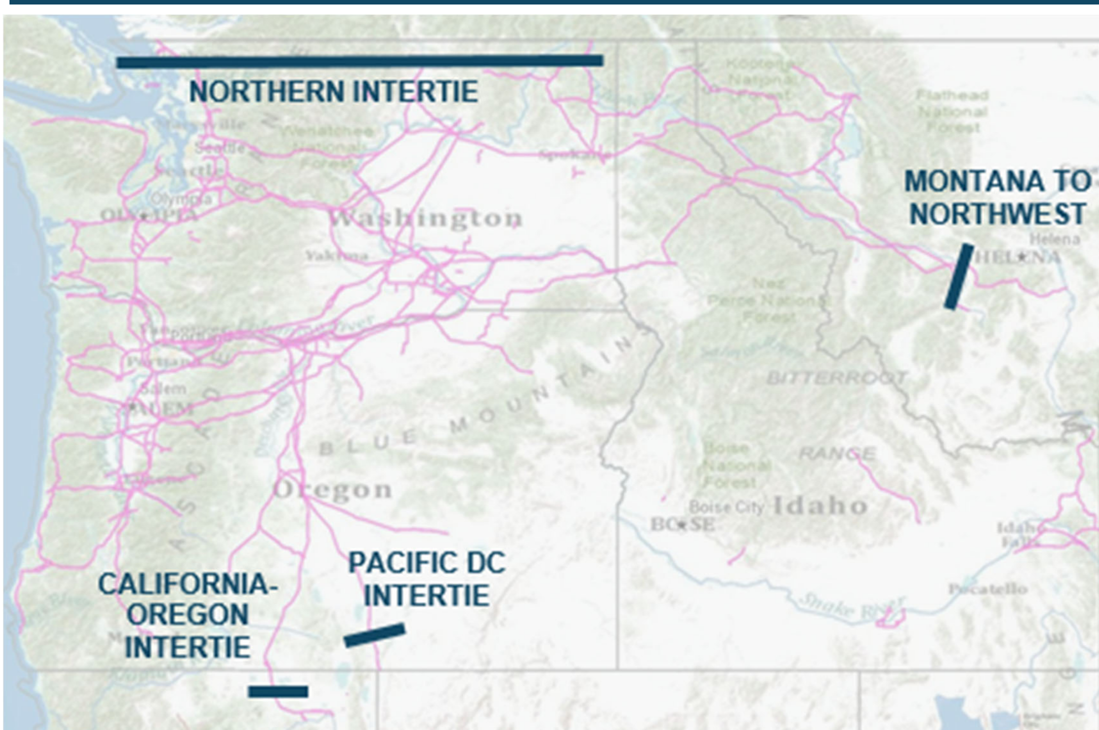
LOAD SERVICE AREAS



PATHS



INTERTIES



Planning and Load Service Areas	
Northwest Washington	**Central**
Load Service Areas	**Load Service Areas**
Seattle, Tacoma, and Olympia	De Moss, Fossil
Olympic Peninsula	Pendleton, La Grande
Southwest Washington Coast	Tri-Cities
Centralia, Chehalis	Umatilla, Boardman
Paths	Walla Walla
North of Echo Lake	**Paths**
South of Custer	West of Monumental
Raver-Paul	West of Slatt
West of Cascades North	West of John Day
Intertie	**South**
Northern	**Load Service Areas**
Willamette Valley - Southwest Washington	Central Oregon
Load Service Areas	Northern California
Hood River, The Dalles	**Interties**
Longview	California Oregon
North Oregon Coast	Pacific Direct Current
Portland	**East**
Vancouver	**Load Service Areas**
Paths	North Idaho
Paul-Allston	Northwest Montana
South of Allston	Spokane, Colville, Boundary
West of Cascades South	**Paths**
Northern	West of Hatwai
Load Service Areas	West of Lower Monumental
Klickitat County	**Intertie**
Mid-Columbia	Montana to Northwest
Okanogan	
Path	
North of Hanford	

Southwest Oregon	Idaho
Load Service Areas	**Load Service Areas**
Eugene	Burley
Salem, Albany	Southeast Idaho-Northwest Wyoming
South Oregon Coast	

Figure 20 List of Planning and Load Services Areas, Paths and Interties

Load Service Areas			
1	Seattle, Tacoma, and Olympia	15	Southeast Idaho and Northwest Wyoming
2	Portland	16	North Idaho
3	Vancouver	17	North Oregon Coast
4	Salem, Albany	18	South Oregon Coast
5	Eugene	19	De Moss, Fossil
6	Olympic Peninsula	20	Okanogan
7	Tri-Cities (includes Boardman)	21	Hood River, The Dalles
8	Longview	22	Pendleton, La Grande
9	Mid-Columbia	23	Walla Walla
10	Central Oregon (includes Alturas)	24	Burley (Southern Idaho)
11	Southwest Washington Coast	25	Northern California
12	Spokane, Colville, Boundary	26	Klickitat County
13	Centralia, Chehalis	27	Umatilla, Boardman
14	Northwest Montana		

Paths			
1	North-of-Hanford	11	West-of-Cascades North
2	West-of-McNary	12	West-of-Hatwai
3	West-of-Slatt	13	West-of-Lower Monumental
4	West-of-John Day		
5	Raver-Paul	**Interties**	
6	Paul-Allston	1	California Oregon
7	South-of-Allston	2	Pacific DC
8	West-of-Cascades South	3	Northern
9	North-of-Echo Lake	4	Montana to Northwest
10	South-of-Custer		

6. 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. Below are changes in the landscape that Transmission Planning participates in or is impacted by.

6.1 Western Energy Imbalance Market

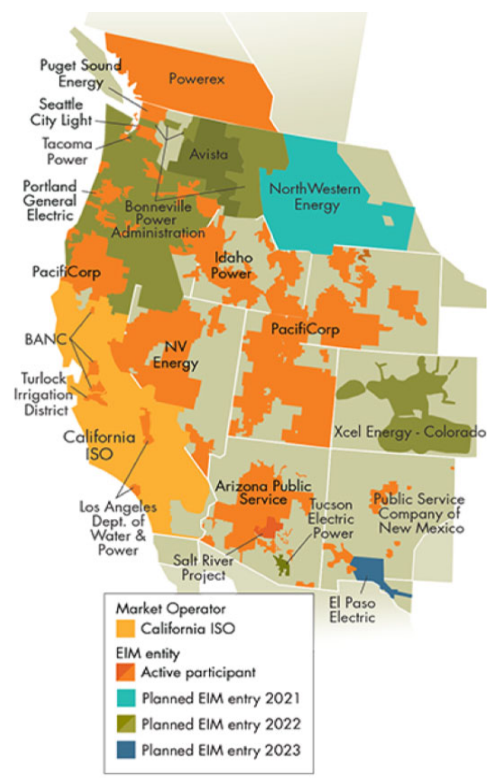
The Western Energy Imbalance Market (EIM) was launched in 2014 by the CAISO and interest has grown as more utilities join the EIM. It is a voluntary market that provides a sub-hourly economic dispatch of participating resources for balancing supply and demand every 5 minutes. The EIM is a real-time wholesale energy trading market that enables participants anywhere in the west to buy and sell energy when needed.

Expanding system access to non-ISO members in other states benefits consumers, producers, and other grid operators as the California Independent System Operator (CAISO) leverages the power of geographic diversity. A larger geographical area makes these changes less pronounced as production increases in one area help to offset reductions in others. In addition the ISO automated grid management systems find the most cost efficient power plants to serve demand creating substantial financial benefits.

BPA has evaluated whether to join the Western Energy Imbalance Market, with a planned go-live date of March 2, 2022. New market opportunities such as the EIM have the potential to both reduce BPA's costs through greater efficiencies and increase revenues by providing a new way to market surplus power. BPA is in the last phase of a five-phase decision process with a final decision on the agency's participation expected by Sept. 30, 2021.

BPA began exploring the feasibility and possible benefits of joining the EIM in 2018. This launched Phase I of BPA's decision process. On Sept. 26, 2019, BPA signed an EIM Implementation Agreement with the market operator, the California Independent System Operator. BPA also signed the EIM Policy Record of Decision in a move toward joining the EIM. With the EIM Implementation Agreement in place, BPA began work on EIM-specific projects identified in the Grid

EIM Participants



Source: CAISO

Modernization Roadmap and developed a detailed project plan with the CAISO to ensure the necessary systems, processes and training are in place before the proposed go-live date. The EIM Implementation Agreement and EIM Policy ROD concluded Phase II of the decision process.

Phase III commenced in October 2019 with discussion of policy issues that could involve rate or tariff changes. These discussions were held during the pre-rate and tariff case workshops. BPA issued the EIM Phase III Final Decision Document on Oct. 30, 2020, covering four issues that could be decided outside of the rate and tariff proceedings. This document ended the third phase of the decision process.

The BP-22 Rate Case and TC-22 Terms and Conditions Tariff Proceeding marked Phase IV of the process. These proceedings, which concluded on July 28, 2021, included important rate and tariff decisions that would enable BPA's participation in the EIM.

BPA made its final decision to join the EIM on Sept. 27, 2021, when it released the Final EIM Close-out Letter. This letter concludes the extensive assessment and public process conducted through all five phases of the EIM decision process. BPA remains committed to working with customers and constituents as it prepares for market participation and after Go Live.

6.2 2021 Northwest Power Plan

The Northwest Power Act requires the Northwest Power and Conservation Council to develop a plan to ensure an adequate, efficient, economical, and reliable power supply for the region. The Council evaluates energy resources and their costs, electricity demand, and new technologies to determine a resource strategy for the region. The 2021 Northwest Power Draft Plan was published September 2021. In the years since the last power plan the power system has experienced changes that place more emphasis on renewables. The Council expects that in the near term change will be modest and in the long term a more substantial change toward cleaner sources of generation is expected. The potential impacts of climate change on electricity use and generation in the region was an area of uncertainty for the Council. Nonetheless, the draft plan estimates the impacts of climate change on demand for electricity. The Council also explored policies to reduce emissions. The Council focuses on three main topics which include energy efficiency, demand response, and regional collaboration.

6.2.1 Resource Strategy Recommendations

- The Council recommends BPA and regional utilities plan to acquire between 750 and 1,000 average megawatts of cost-effective energy efficiency by the end of 2027 and a minimum of 2,400 average megawatts by 2041.
- The Council recommends utilities examine demand response, specifically residential time-of-use rates and demand voltage regulation. Their assessment shows about 200 megawatts of time of use and 520 megawatts of demand voltage regulation are available by 2027.
- The Council recommends the region acquire 3,500 megawatts of renewable resources by 2027.
- Electricity imports from outside the region, particularly California, are important to the Northwest power supply.
- The Council recommends BPA and regional utilities work together, along with planning organizations to explore potential costs and benefits of new market tools, such as capacity and reserve products.

6.3 PNUCC Northwest Regional Forecast

The Pacific Northwest Utilities Conference Committee (PNUCC) produces a forecast that serves as a gauge for how much power will be needed and how utilities are meeting those needs. It also signals how utilities are adapting their long-term resource plans to address uncertainties. The 2021 Northwest Regional Forecast, released in April 2021 for years 2021-2031, states the region is actively navigating large thermal unit retirements and acquiring significant amounts of renewable generation in an effort to reduce carbon emissions. In recent years, coal unit retirements were occurring. Over 2,000 MW of coal plants have retired in the Northwest, and another 2,000 MW are in line to retire. With this changing resource mix and forecasted load growth, a growing peak capacity need is emerging and this is elevating system adequacy concerns. Trends observed in past analysis continue. In addition to coal retirements, the following key trends are summer peak load growth continues, energy efficiency is a priority, renewable resources are developing rapidly, and resources need to meet peak demand.

6.3.1 Load Forecast Comparisons

PNUCC reports the summer peak growth is 0.8 percent per year and remains stronger than winter peak growth of 0.5 percent per year. Annual average energy growth is 0.8 percent per year.

6.3.2 Annual Energy Load by Growth Rate

Each utility creates its own load forecast and is responsible for its own resource needs. Nearly 100 regional utilities (accounting for 55 percent of the load) are forecasting annual energy load growth under 0.5 percent per year, including 14 utilities expecting load decay.

6.3.3 Summer Peak Trending Upward

Winter peak loads vary year-to-year mostly due to weather. Summer peak loads are steadily trending upwards, and annual energy is flat. The global pandemic has impacted electric loads. For many utilities, commercial loads have fallen and residential loads have grown.

Loads

Figure 4. **Utility loads stacked by growth rate**

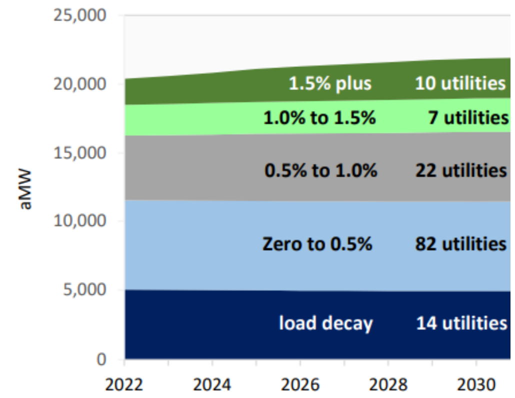
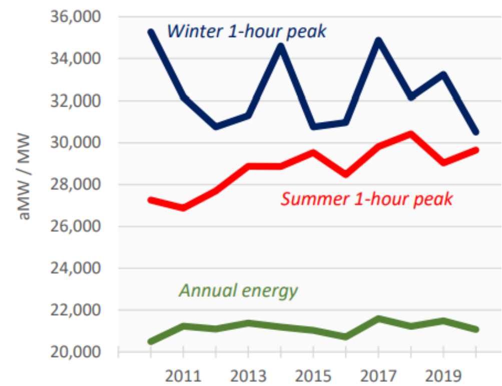
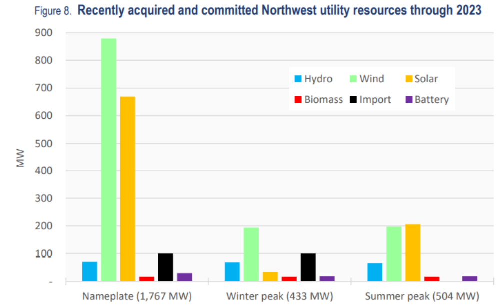


Figure 2. **Historical Northwest loads**



Resources

Figure 8. **Recently acquired and committed Northwest utility resources through 2023**



6.3.4 Renewable are the New Resource Focus

The majority of Northwest utilities' generating resources acquired last year and those under development are mostly wind and solar projects. Biomass, hydropower, batteries and imports make up the balance. The first large battery project of 30 MW is slated to arrive in the next few years.

6.4 Northwest Power Pool

The Northwest Power Pool (NWPP) is fundamentally a reserve sharing group among its members. Membership is voluntary and comprised of major generating utilities serving the Northwestern U.S., British Columbia and Alberta. Smaller, principally non-generating utilities in the region participate indirectly through the member system with which they are interconnected. The NWPP provides the benefits of coordinated operations. NWPP activities are largely determined by major committees – the Operating Committee, the PNCA Coordinating Group, the Reserve Sharing Group Committee, and the Transmission Planning Committee.

6.4.1 Resource Adequacy Program – Detailed Design Report

The NWPP released its Resource Adequacy Program – Detailed Design Report in July 2021. In 2019 the NWPP developed a coalition to explore the nature of the challenge of the changing power system and investigate mechanisms to assure sufficient supply to meet customer demand under a wide array of scenarios. NWPP states that while there are many ways to improve reliability and many forms of resource adequacy (e.g. capacity, flexibility, or energy), their program will focus on creating a capacity program with a demonstration of deliverability. More information is available in the 205+ page report.

Below is a snapshot of the Resource Adequacy Development timeline.

6.4.2 Resource Adequacy Program

The Power Pool states that the resource adequacy program provides benefits of enhanced coordination and transparency across the regional power system. Current planning and procurement to meet resource adequacy needs is handled by individual entities under the oversight of regulators, cooperative boards, and city councils. With this current framework it is challenging to understand where and when new capacity may be needed in the region and transmission capacity could fall below what is required to maintain reliability. The Power Pool says the program would augment the existing framework to increase visibility into the status of resources and transmission in the region as well as fill the gaps.

6.4.3 Program Design

The resource adequacy program will have two components: a forward-showing program and an operational program. The forward-showing program establishes regional metrics for the footprint, the qualified capacity contribution (QCC) and effective load-carrying capability (ELCC) of various resources, deliverability expectations. The forward-showing program ensures the footprint has enough demonstrated capacity, well in advance of required performance, to meet the established reliability metrics. The operational program creates a framework to provide participants with pre-arranged access to capacity resources in the program footprint during times when a participant is experiencing an extreme event. An extreme event could be when a participant's load is in excess of their forward-showing forecast or resources (generation and transmission) are experiencing unexpected outages. This portion of the program unlocks the footprint's load and resource diversity. The program seeks to achieve a balance between planning in a reasonably conservative manner but also to provide flexibility in order to protect customers from unreasonable costs.

6.5 BPA White Book Loads and Resources

The Pacific Northwest Loads and Resources Study (a.k.a. BPA White Book) is BPA's latest projection of the Pacific Northwest regional retail loads, contract obligations, contract purchases, and resource capabilities. The BPA White Book, which is a snapshot of conditions, documents the loads and resources for the federal system and the Pacific Northwest region loads and resources for a ten-year period. BPA's White Book provides estimates of energy and capacity sufficiency and deficiency periods for both the federal system and Pacific Northwest (PNW) regional loads. The White Book is primarily a planning tool and includes two distinct studies: Federal System Analysis and the PNW Regional Analysis.

The 2019 White Book (published October 2020) contains the analysis of the Federal system and the PNW region loads and resources. BPA's Federal System Analysis presents the federal system load and resource balance, by comparing expected loads and contract obligations to resources and contract purchases. In a similar fashion, BPA's PNW regional analysis calculates the regions load and resource balance, by comparing the regions expected total retails loads and contract obligations to the available resources and contract purchases. A brief summary of the sufficiency/deficit outcomes for energy and capacity is provided below.

6.5.1 Federal System Analysis

Energy

Annual energy under critical water conditions is projected to have deficits across the study period ranging from as low as -194 aMW to as large as -354 a MW. Under average water conditions, the Federal system is projected to have annual energy surpluses through the study period.

Capacity

Capacity under critical water conditions is projected to have deficits over the study period ranging from -950 MW to -1,226 MW. Under average water conditions, the system is projected to have surpluses over the study period.

6.5.2 Pacific Northwest Regional Analysis

Energy

Annual energy under critical water conditions is projected to have surpluses as large as 3,974 aMW in 2021, slowly decreasing to 698 aMW by 2030. Under average water conditions, the region would see even larger energy surpluses over the study horizon.

Capacity

Capacity under critical water conditions is projected to have deficits over the study period ranging from -696 MW to -3,460 MW. Under average water conditions, the region would have capacity surpluses through the final year of the study.

6.6 State's Renewable Portfolio Standard

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.

6.7 NorthernGrid Transmission Group

FERC approved the merger of Columbia Grid and Northern Tier Transmission Group to form NorthernGrid, a vast transmission planning region stretching across eight Western states. The NorthernGrid is the outcome of a single transmission planning region, facilitating regional transmission planning, enabling one common set of data and assumption, identifying regional transmission projects through a single stakeholder forum, and eliminating duplicate administrative processes. Participants include Bonneville, investor-owned and consumer-owned utilities in California, Idaho, Montana, Oregon, Utah, Washington and Wyoming.

The Federal Energy Regulatory Commission has accepted tariff modifications filed by the FERC-jurisdictional members of NorthernGrid — Avista Corporation, Idaho Power Company, MATL, NorthWestern Energy, PacifiCorp, Portland General Electric Company, and Puget Sound Energy. The filings asked FERC to accept modifications to each filing party's Open Access Transmission Tariff transmission planning section to reflect the new NorthernGrid regional transmission planning process.

Bonneville is a member and its Attachment K will reflect participation in NorthernGrid. Bonneville's strategic plan alignment (Objective 4a) is to develop and implement policies, pricing and procedures for regional planning and incentivize grid optimization and efficient regional resource development.

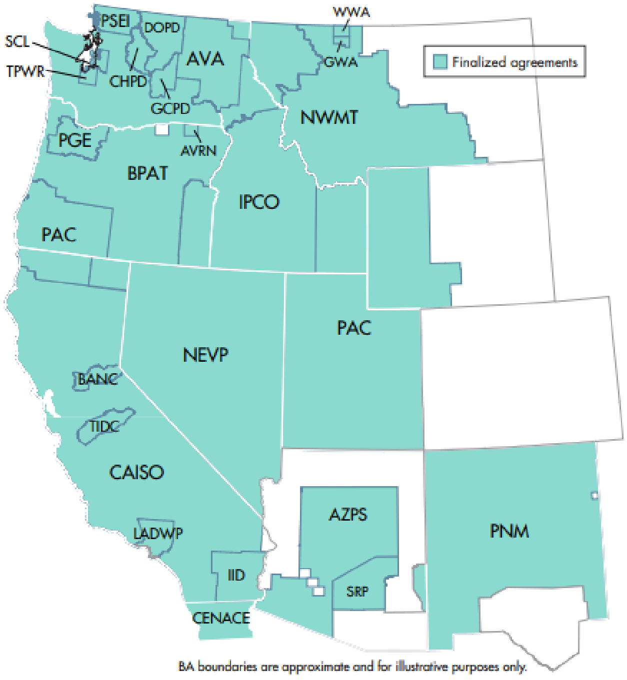
In 2021, NorthernGrid began developing a draft Reginal Transmission Plan, performed power flow cases, and conducted two regional transmission planning workshops with the states and enrolled parties.

6.8 RC West

The California Independent System Operator's (ISO) is the Reliability Coordinator of record for its footprint and has extended these services to other balancing authorities in the western United States. The ISO Reliability Coordinator, named RC West, launched its second phase of operations in late 2019, when it became the official Reliability Coordinator of record for 42 electricity balancing authorities and transmission operations in the West. An RC oversees grid compliance with federal and regional grid standards, and can determine measures to prevent or mitigate system emergencies in day-ahead or real-time operations. The RC also provides leadership in system restorations following major events.

For Bonneville, the transition to RC West is part of the grid modernization project undertaken by employees from across the agency. The team addressed new technological requirements, data integrations, process changes, communication and training to interface with the new reliability coordinator. Beyond the reliability coordinator services, this effort better positions Bonneville to participate in the Western EIM.

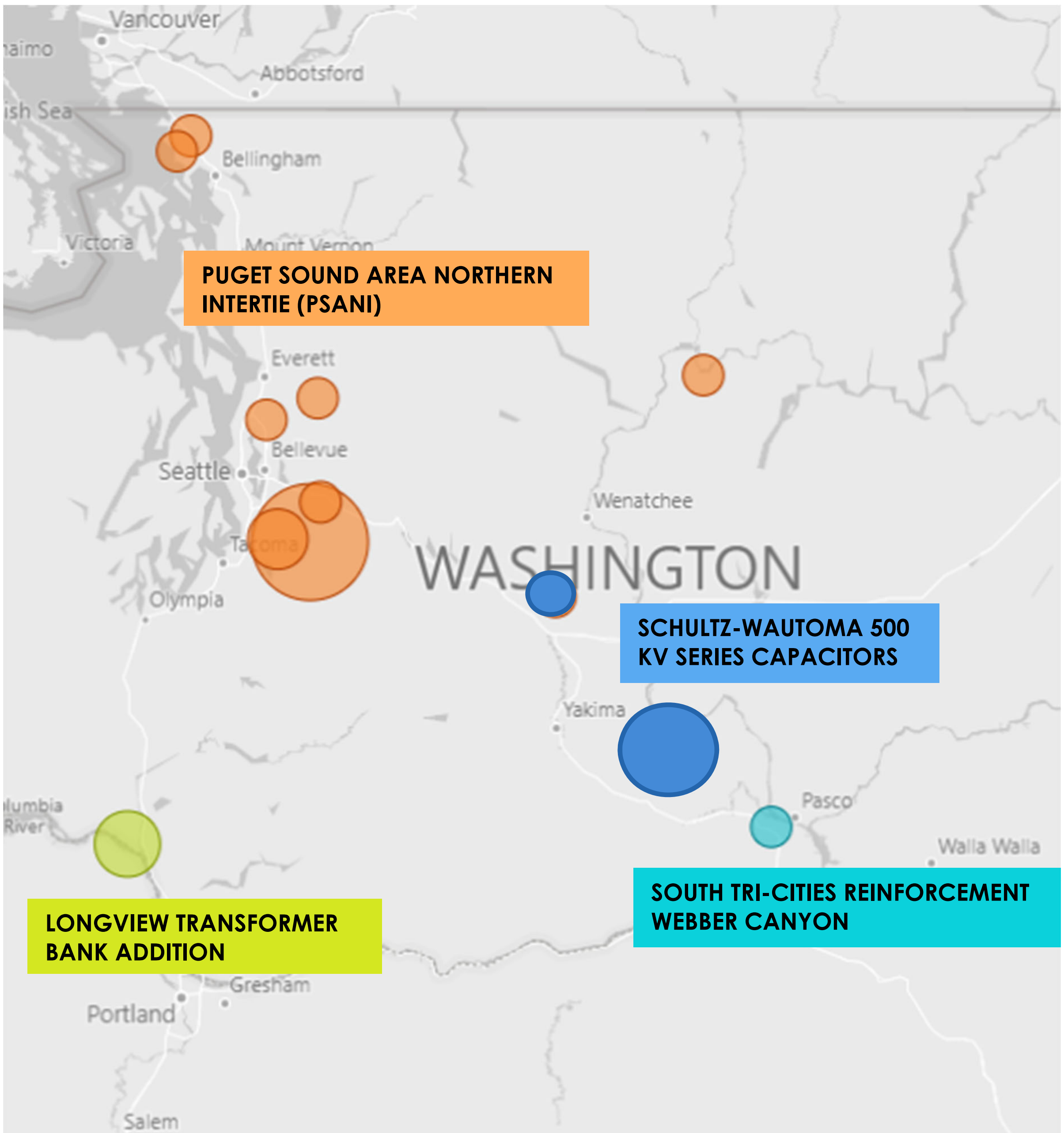
RC Entities



Source: RC West

7. Major Transmission Projects

Major transmission expansion projects with a plan of service shown in the map below include: Raver 500/230 kV Transformer Addition, Schultz – Wautoma 500 kV Series Capacitor Addition, South Tri-Cities Reinforcement, and the Longview Transformer Bank Addition. The Raver 500/230 kV Transformer Addition is in the construction phase. The transformer is in service and the rest of the project will be completed in 2024. The Longview Transformer Bank Addition was completed in 2021. This section provides more detailed information about each of these major transmission projects. Estimated project costs are direct costs (overheads are not included).



7.1 South Tri-Cities Reinforcement

This planned project reinforces the South Tri-Cities Area to address near-term operations and maintenance issues as well as provides operating flexibility in the rapidly growing Tri-Cities area in Washington. The area is compliant with planning standards for the loss of any single element. However, loss of two sources to the area may result in substantial loss of load. This hinders the ability to take any transmission facilities in the area out for maintenance during the summer since plans must be in place to address the potential loss of a second element. Also, requests for additional load service and generation interconnection depend on this reinforcement.

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.

- Expected Energization is 2025.
- Estimated costs is $96.7 million.
- The project is in the scoping phase.

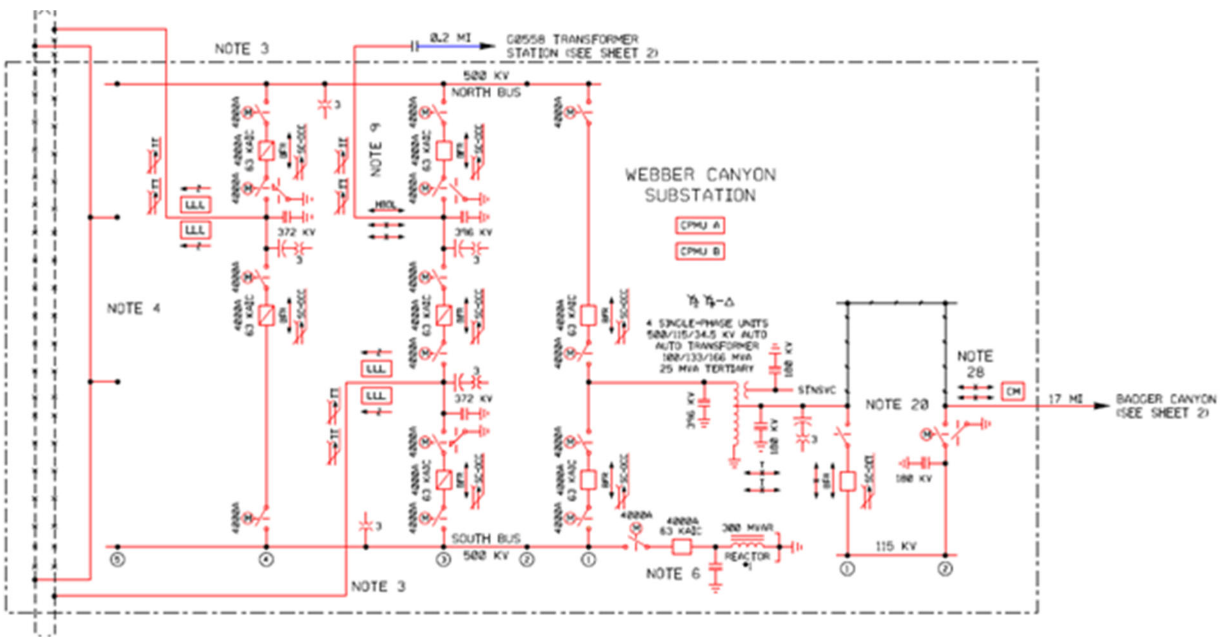


Diagram continues on next page.

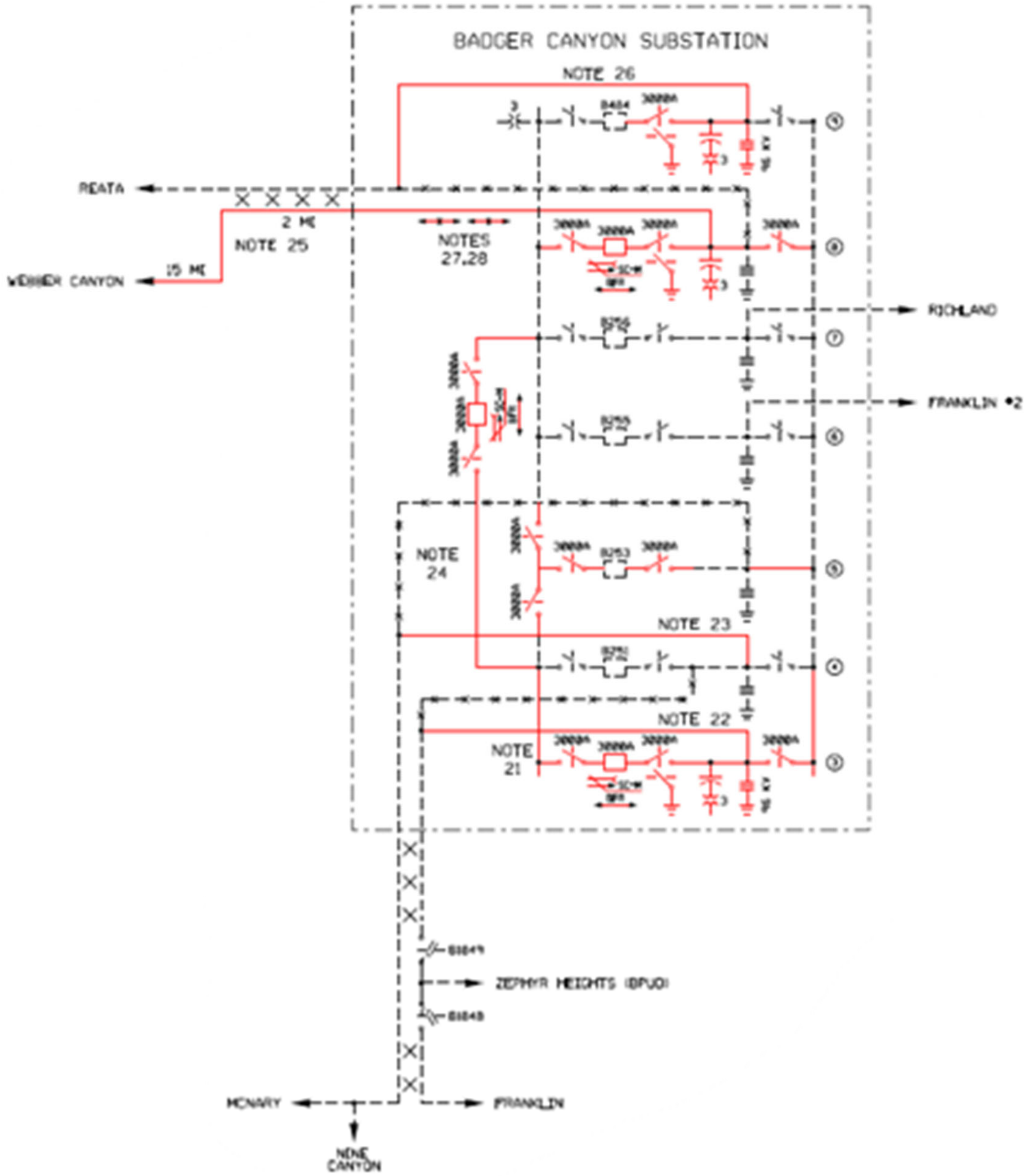


Figure 21 South Tri-Cities Reinforcement Project

7.2 Raver 500/230 kV Transformer Addition

The plan of service is to install a 500/230-kV 1300 MVA transformer at Raver substation. A new 230kV substation will be developed adjacent to the existing 500kV substation. The high side of the new transformer will terminate at Raver 500 KV. The project will also reconfigure the Tacoma-Raver 500 KV lines by removing jumpers and re-terminating the Tacoma-Raver #2 circuit into Covington 230 KV and Raver 230 KV Substations. The Tacoma-Raver #2 line will be renamed and operated as the Raver-Covington #3 230 KV line. The plan of service also requires reconfiguring the Covington 230 KV bus, adding a new sectionalizing breaker and two bus tie breakers.

This project is primarily for load service to Tacoma and Covington Substations and has no significant impact to the WECC transmission system. It has been studied as part of a sub-regional Puget Sound Area Study team through Columbia Grid.

- The transformer was energized in 2021 and the rest of the project is expected to be energized in 2024.
- Estimated cost is $90 million.
- This project is in the construction phase.

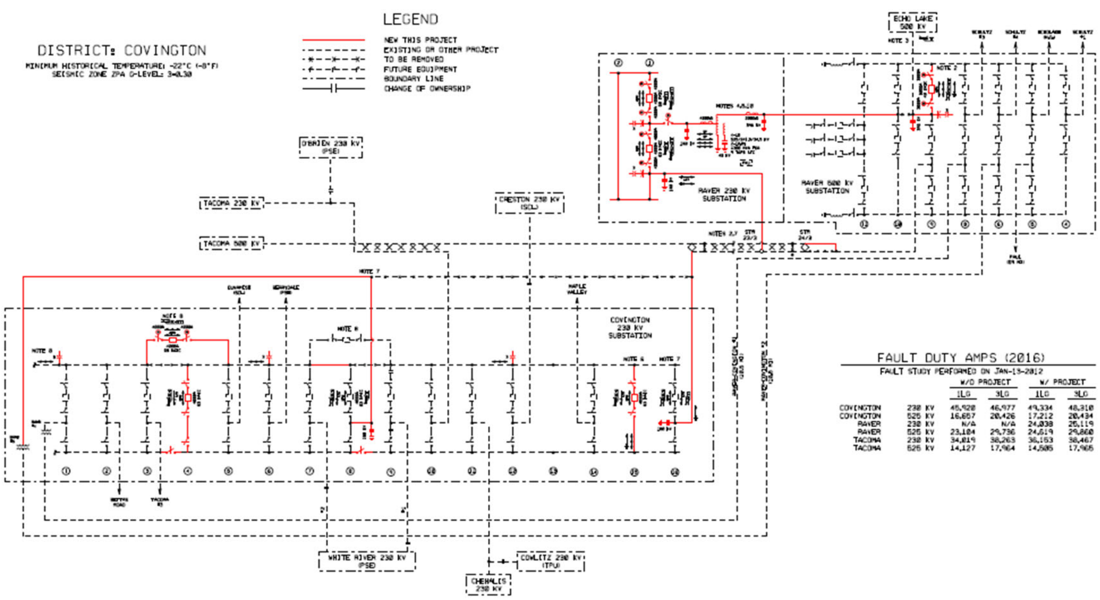


Figure 22 Raver 500/230 kV Transformer Addition Project

7.3 Longview Area 230/115 kV Transformer Addition

This project installs a second 230/115 kV transformer bank at the Longview Substation in the Longview area. To make room for the new transformer, the existing 230/13.8 kV transformer bank no. 5 will be removed. A new 230 kV bus sectionalizing breaker on the Longview 230 kV main bus section will be added. This project will maintain reliable load service to the Longview area. The Longview Load Service Area covers the area of Cowlitz County.

- The project was energized in 2021.
- Estimated cost is $15 million.

FAULT DUTY AMPS (2017)

		W/O PROJECT		W/ PROJECT	
		1LG	3LG	1LG	3LG
LONGVIEW	115 KV	25,187	30,174	33,290	37,386
LONGVIEW	230 KV	29,992	35,357	30,724	35,615
ALLSTON	230 KV	39,841	38,453	TBD	TBD

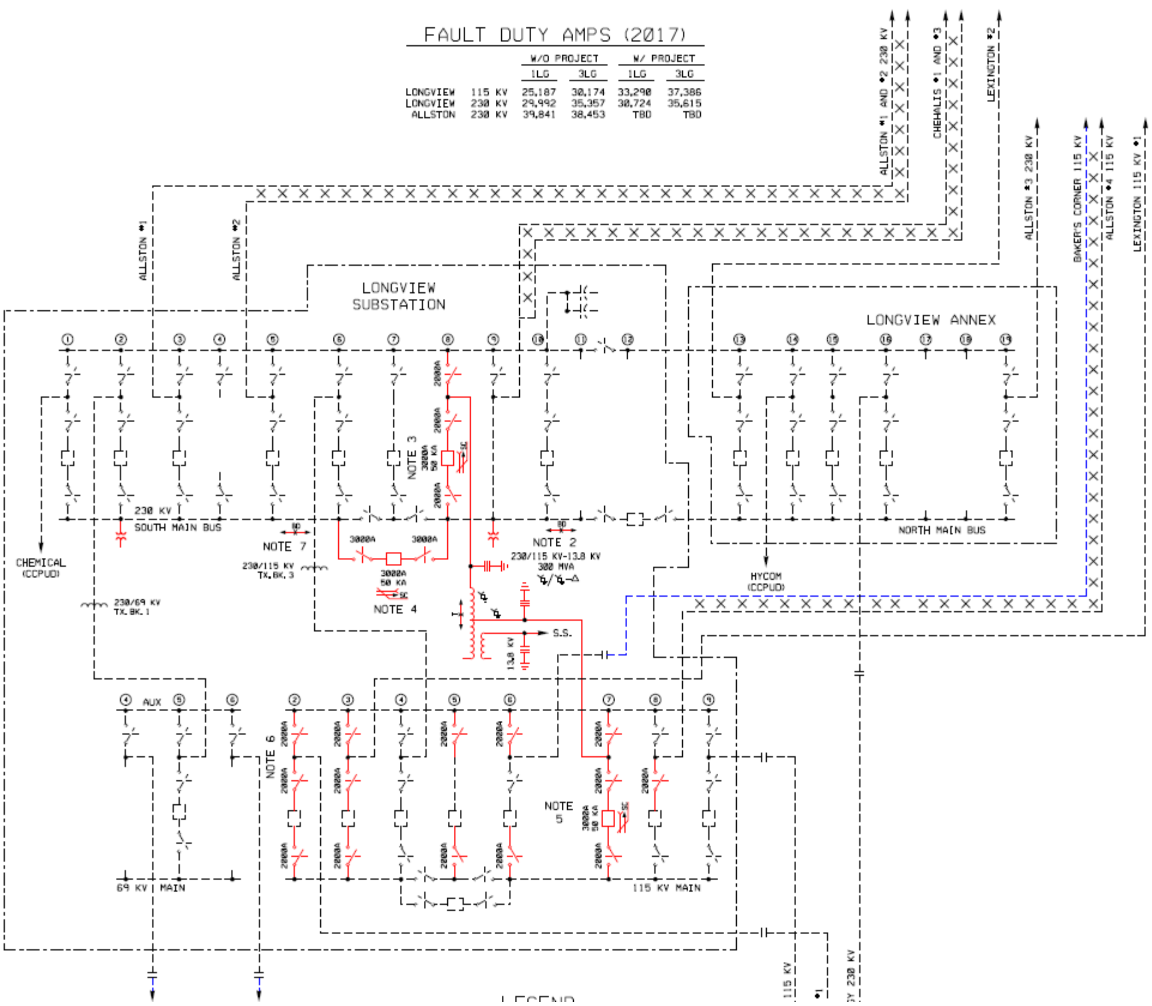


Figure 23 Longview Area 230/115 kV Transformer Addition Project

7.4 Schultz-Wautoma 500 kV Series Capacitor Addition

This project is necessary to increase South of Allston (SOA) available transfer capability and improve operations and maintenance flexibility for SOA. The project will add 1152 Mvar, 24 OHM series capacitor (rated 4000A at 500 kV) on the Schultz-Wautoma line at the Wautoma substation.

- Expected energization is 2023.
- Estimated cost is $30 million.
- The project is in the design phase

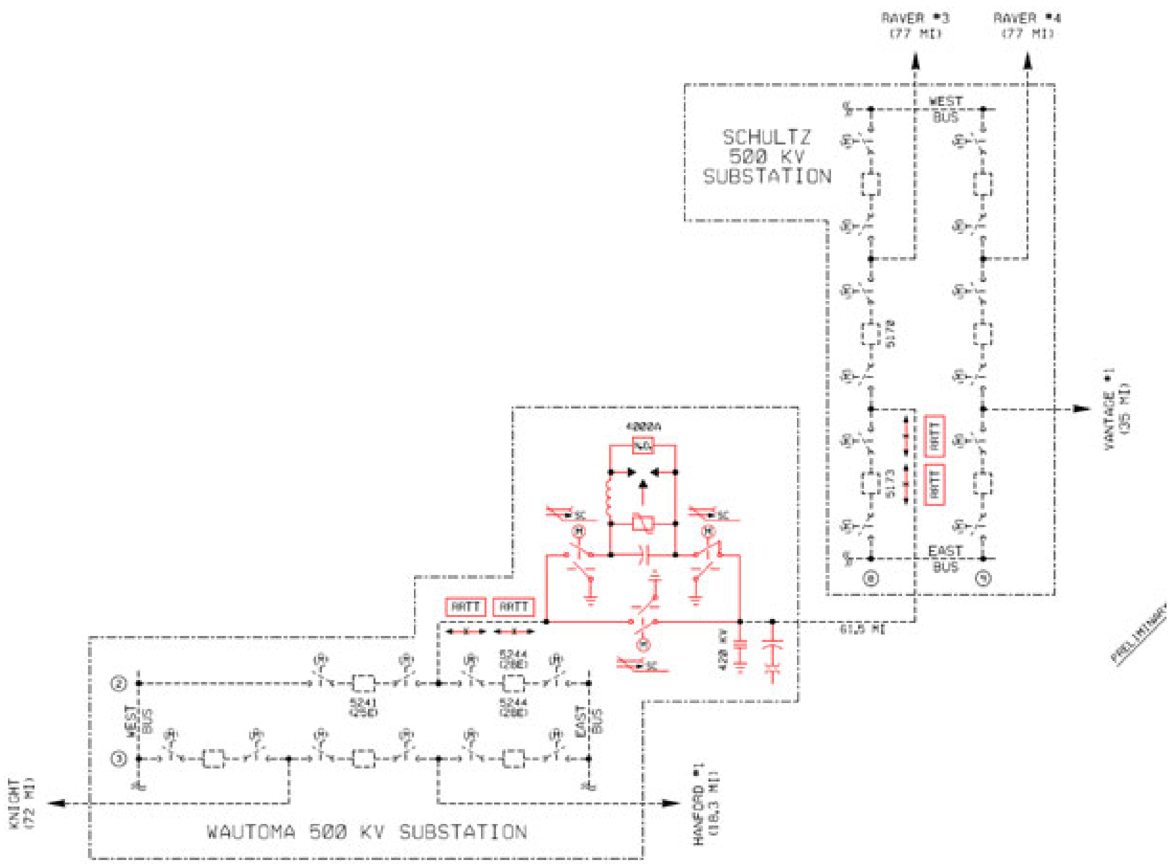


Figure 24 Schultz-Wautoma 500 kV Series Capacitor Addition Project

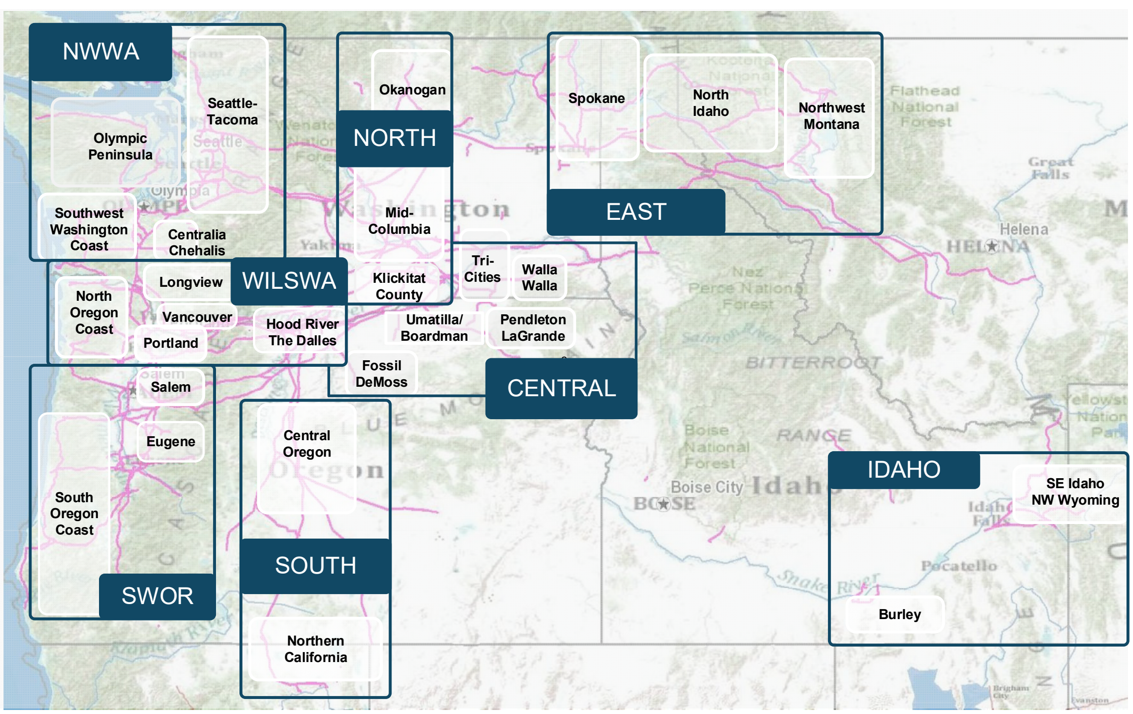
8. Transmission Needs by Planning Areas

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.

The major load centers in the Pacific Northwest are located west of the Cascade Mountains including Seattle and Portland. For study purposes, prior system assessments divided the transmission system into load service areas. For the 2021 system assessment, the load service areas are grouped into eight planning areas based on geographic and electrical proximity.



Transmission Planning along with the BPA Cross-Agency team considers non-wires alternatives for reliability and transmission service needs. BPA defines non-wires solutions as the broad array of alternatives, including but not limited to, demand response, distributed generation, conservation measures, generation siting and pricing strategies that individually or in combination delay or eliminate the need for upgrades to the transmission system. If an area has a performance deficiency and a corrective action plan is identified within the near or long-term planning horizon, the potential for non-wires alternatives to correct deficiency or defer the date when a project is required to comply with the NERC Standards is considered.

8.1 Northwest Washington Planning Area (NWWA)

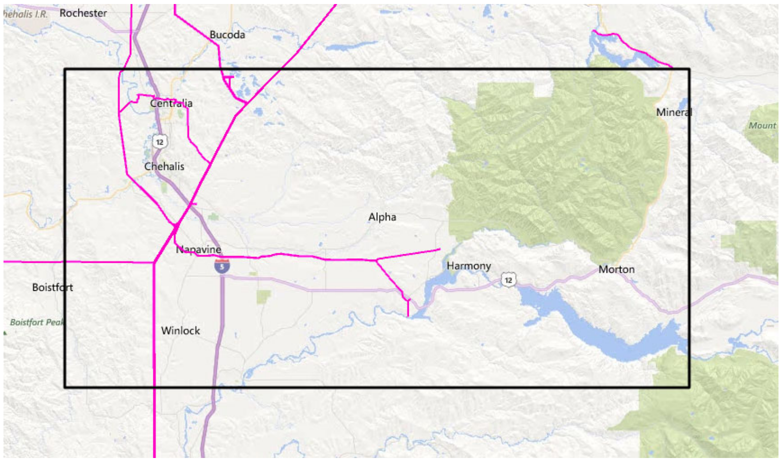
The Northwest Washington (NWWA) Planning Area contains four load service areas, one intertie, and four internal transmission paths. The load areas include Seattle-Tacoma, Olympic Peninsula, Southwest Washington Coast, and Centralia-Chehalis.

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.

Major Customers in the area include Puget Sound Energy, Seattle City Light, Snohomish County PUD, Tacoma Power, ALCOA, Alder Mutual, City of Blaine, Town of Eatonville, Elmhurst Mutual, Lakeview L&P, City of Milton, Ohop, Orcas L&P, Parkland L&W, Port of Seattle (SeaTac Airport), City of Steilacoom, City of Sumas, Tanner Electric, Whatcom County PUD, City of Port Angeles, Clallam County PUD, Jefferson County PUD, Mason County PUD 1, Mason County PUD 3, the U.S Navy, Grays Harbor PUD, Pacific County PUD 2, Wahkiakum County PUD, City of Centralia, City of Chehalis, and Lewis County PUD.

8.1.1 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
157	**283**	207	260	207	290	0.0	2.2

Non-Wires Assessment

In order to keep peak load growth flat, a load reduction of 0.7 MW/year would be required across the area in addition to the energy efficiency improvements assumed in the forecasts. This load area is not a candidate for a dedicated non-wires project or program.

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 the reliability and facilitates maintenance of the station.
- Estimated Cost: $10,500,000
- Expected Energization: 2023

Recently Completed Plans of Service

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

Cancelled Plans of Service

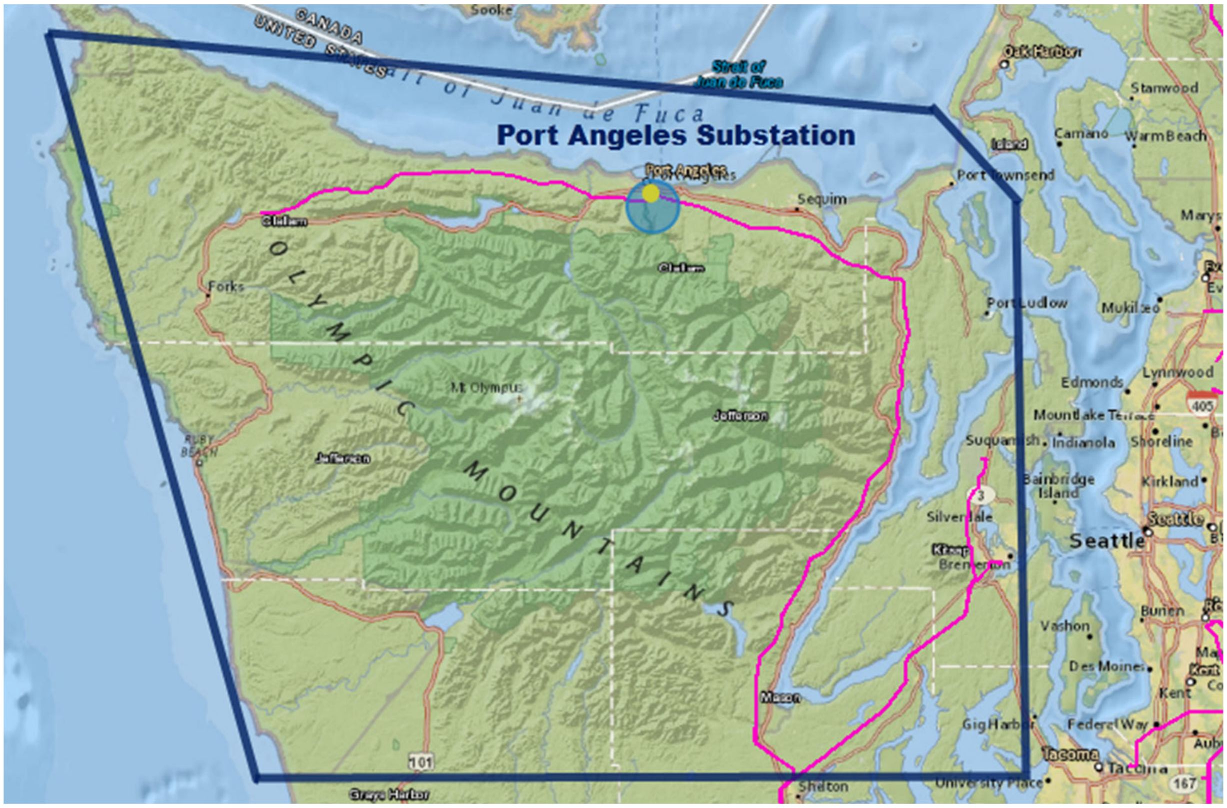
Centralia – Roy Zimmerman Tap 69 kV Line Upgrade

BPA is in the process of acquiring the Centralia City Light portion of the line, which also needs to be upgraded. Once the acquisition is complete a project may be re-initiated.

- Description: This project will upgrade a section of the 69 kV line between Roy Zimmerman and Centralia substations.
- Purpose: This project will maintain reliable load service to the Centralia - Chehalis area.
- Estimated Cost: $350,000
- Expected Energization: 2023

8.1.2 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 some 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
742	**1284**	804	1324	844	1389	1.0	1.0

Non-Wires Assessment

To maintain a flat growth rate across the 10 year planning horizon, approximately 4.7 MW of load would need to be reduced in the Olympic Peninsula study area per year.

Proposed 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: 2023

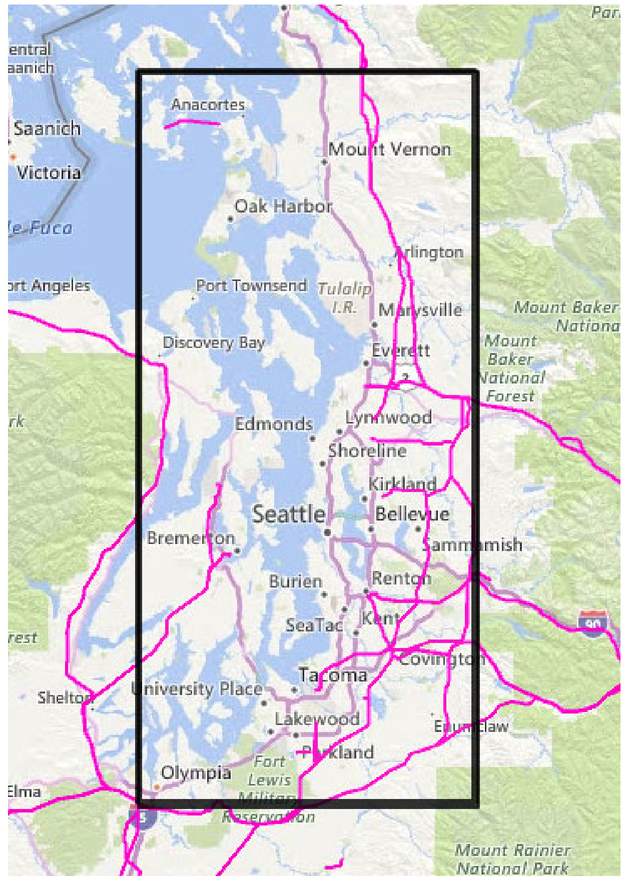
Recently Completed Plans of Service

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

8.1.3 Seattle/Tacoma/Olympia Area

The Seattle/Tacoma/Olympia area is located 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 2 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 (PI)

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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
6644	9163	6741	9687	7102	9195	1.0	-1.0

Non-Wires Assessment

The load reduction required to keep the winter peak load flat based on the long-term growth rates is 90 MW/year (summer) and 13 MW/year (winter). This load reduction is assumed for the total area, across all affected Transmission Planner footprints (PSE, SCL, TPWR, SNPD and BPA).

Re-dispatch of generation in the Puget Sound Area (PSA) is the single most effective non-wires solution to congestion in the Seattle/Tacoma load area. Redispatch is a request issued by the transmission system operator to power plants to adjust the real power they input in order to avoid or eliminate congestion. Several attempts in the past to implement re-dispatch amongst the Puget Sound Area utilities and BPA have been met with extraordinary commercial, contractual and legal challenges. In addition, most of the utilities in the PSA have historically expressed a preference to build transmission to resolve congestion and maximize generation flexibility rather than relying on re-dispatch solutions. As transmission becomes more expensive to build and physically harder to site, generation re-dispatch remains a viable non-wires alternative and can be pursued as a method for mitigating peak load forecasts.

The Tacoma 230 kV Series Bus Sectionalizing Breaker was identified for this area based on previous system assessments. The driver for this project is a failure of the existing bus section breaker at the Tacoma 230 kV substation. For non-wires alternatives, this project is a poor candidate due to the very short lead time and the large magnitude of load relief that would be required to eliminate the transmission problems following a bus sectionalizing breaker failure at Tacoma.

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 C.
- Purpose: This project improves reliability for the Puget Sound load area.
- Estimated Cost: $2,500,000
- Expected Energization: 2023

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: $90,000,000
- Energization: The transformer was energized in 2021 and the rest of the project is expected to be energized in 2024.

Tacoma 230 kV Series Bus Sectionalizing Breaker
(This project is combined with Tacoma 230 kV Bus tie Breaker project below.)

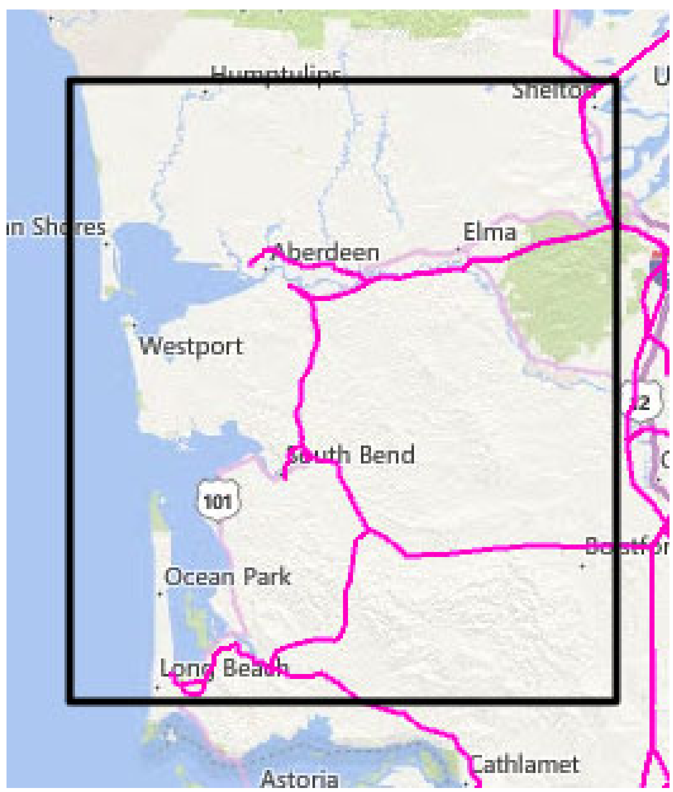
- Description: This project added a 230 kV series bus sectionalizing breaker at Tacoma Substation.
- Purpose: This project mitigates issues caused by a 230 kV bus sectionalizing breaker failure at Tacoma Substation.
- Estimated Cost: $11,500,000
- Energization: This project was energized in 2021.

Tacoma 230 kV Bus Tie Breaker
(This project is combined with the Tacoma 230 kV Series Bus Sectionalizing Breaker project above.)

- Description: This project added a 230 kV bus tie breaker, and a 230 kV auxiliary bus sectionalizing disconnect switch at Tacoma Substation.
- Purpose: This project improves the operations and maintenance flexibility at Tacoma Substation.
- Estimated Cost: See above.
- Energization: This project was energized in 2021

8.1.4 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 some 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
195	**375**	247	382	249	443	0.2	3.0

Non-Wires Assessment

To keep area load growth flat in the Southwest Washington Coast area, demand reduction will need to be 0.3 MW/year for summer and ~3 MW/year for winter. Projects recommended for the Southwest Washington Coast area are mainly to support generation and transmission service requests for injection at Satsop 230 kV substation. There are no viable non-wires alternatives.

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: 2023

Recently Completed Plans of Service

Holcomb-Naselle 115 kV Line Upgrade

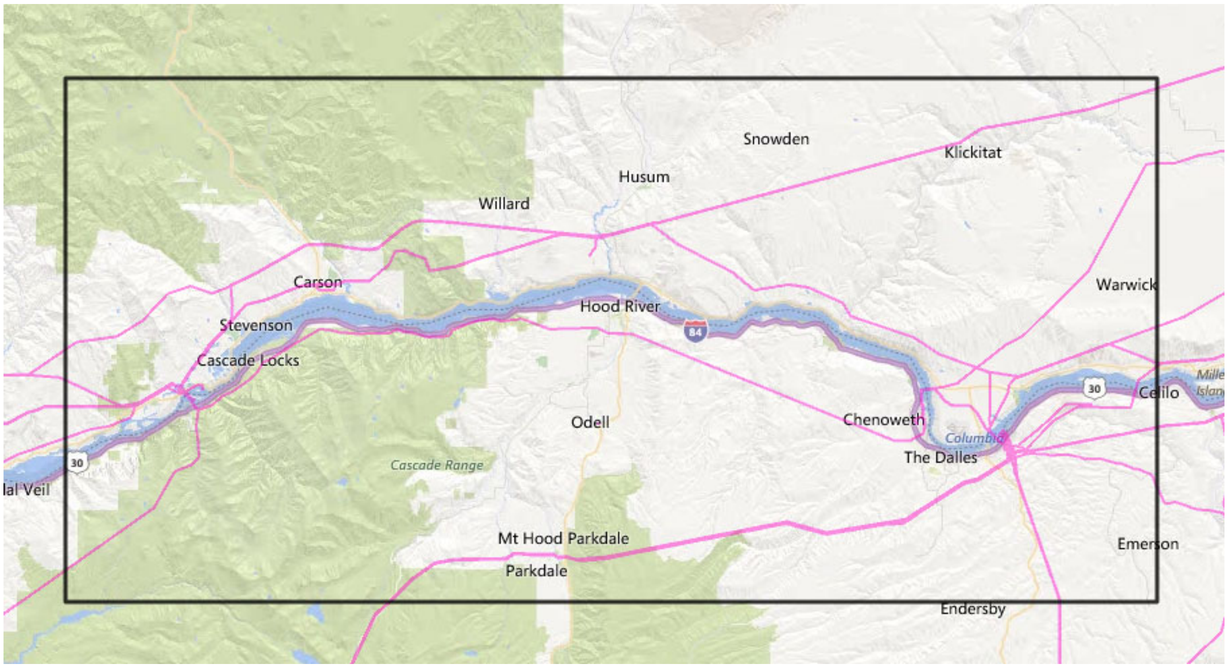
- Description: This line was rebuilt with larger conductor as part of the wood pole replacement program.
- Purpose: This project is required to maintain reliable load service to the Southwest Washington Coast area.
- Estimated Cost: The cost of this project was included as part of the overall wood pole replacement program. $13,100,000
- Energization: This project was energized in 2021.

8.2 Willamette Valley Southwest Washington Planning Area (WILSWA)

The 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, N.OR Coast, Portland and Vancouver). Customers include Portland General Electric (PGE), PacifiCorp (PAC), Cowlitz County PUD, Clark County PUD, Northern Wasco County PUD (NWCPUD), North Pacific Paper Company (NORPAC), Columbia River PUD (CRPUD), Tillamook PUD (TPUD), City of McMinnville, City of Forest Grove, Klickitat PUD, Skamania PUD and Wasco Electric Co-Op.

8.2.1 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.



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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
250	**269**	500	535	653	663	5.5	4.4

Non-Wires Assessment

In order to mitigate load growth due to non-industrial load, approximately 0.7 MW/year (summer) and 1.0 MW/year (winter) would have to be reduced by non-wires.

There are possibilities for non-wires efforts in the load area. Energy Efficiency (EE) would be a useful tool in the Hood River/The Dalles area to offset constantly lowering voltages at the PAC 69 kV substations served by BPA's Hood River substation. EE measures could be catered to the large amount of residential load in the area, as well as any commercial or industrial load, such as the new data center loads that are being installed in The Dalles.

There is also the possibility of some type of demand management, where peak load could potentially be shifted to off-peak hours by these new server farms or residential customers. With the two generation resources available in the area, re-dispatch on either end could help relieve some post-contingency voltage issues that may eventually arise due to load growth, but there is no need for that currently.

Proposed Plans of Service

L0380 Quenett Creek Substation Addition

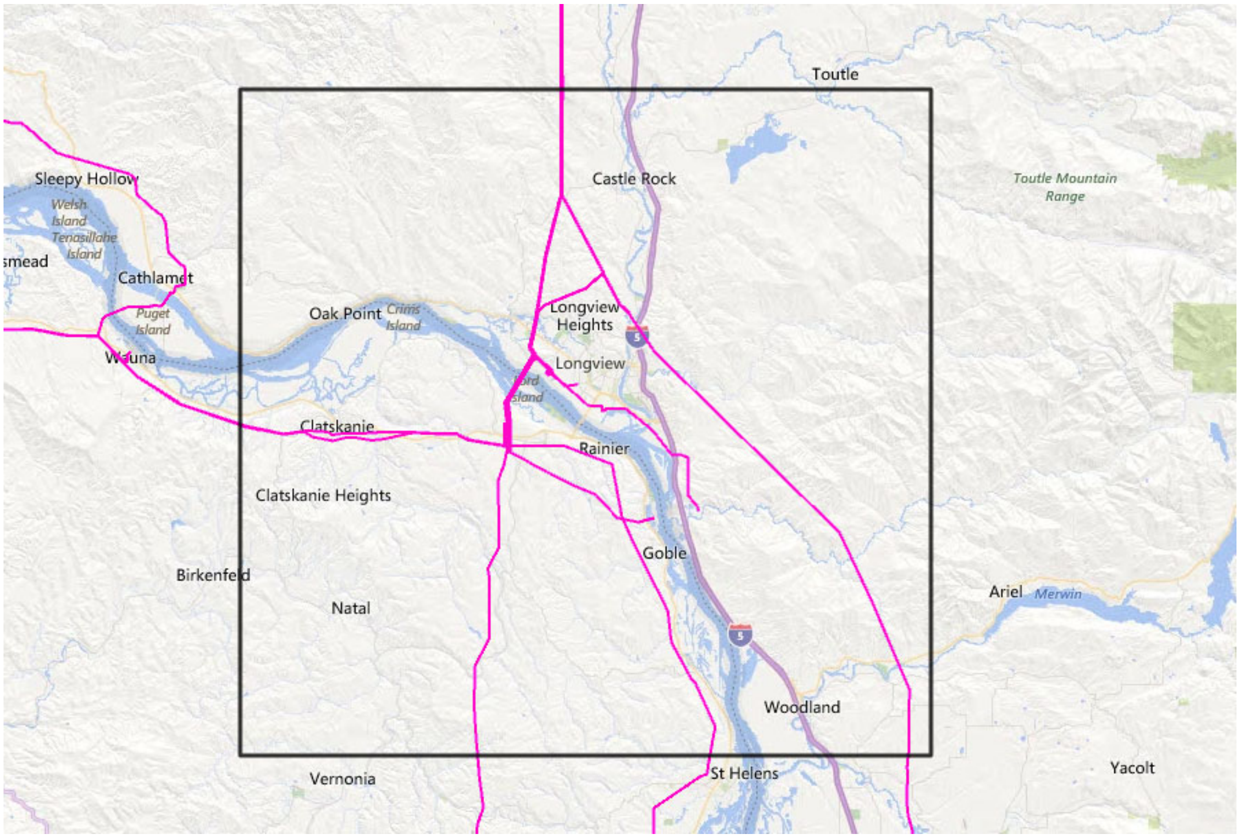
- Description: This project adds a new Quenett substation to accommodate new industrial load in the area.
- Purpose: This project is associated with interconnection L0380.
- Estimated Cost: $40,300,000
- Expected Energization: 2023

Recently Completed Plans of Service

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

8.2.2 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
643	**830**	530	746	554	772	0.9	0.7

Non-Wires Assessment

The load reduction required to keep the peak load flat (growth) is 5 MW/year in the summer and 6 MW/year in the winter.

Proposed Plans of Service

There are no proposed projects for this area at this time.

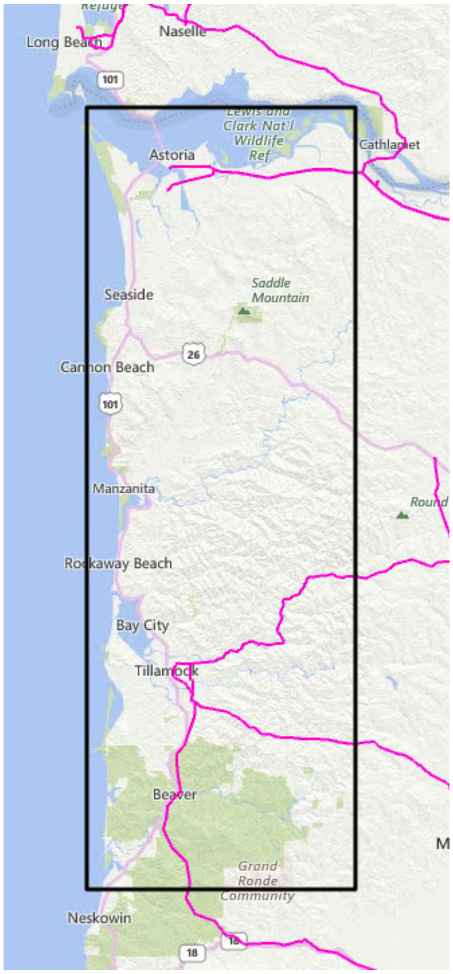
Recently Completed Plans of Service

Longview 230/115 kV Transformer Addition

- Description: This project installed a second 230/115 kV transformer bank at the Longview Substation in the Longview area. To make room for the new transformer, the existing 230/13.8 kV transformer bank no. 5 was removed. In addition, this project added a 230 kV bus sectionalizing breaker of the Longview substation which divided the south bus into two sections.
- Purpose: This project is required to maintain reliable load service to the Longview area. The breaker addition resolves the issues caused by a 230 kV breaker failure outage at Longview.
- Estimated Cost: $15,000,000
- Energization: This project was energized in 2021.

8.2.3 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 on the east and the Pacific Ocean on the west. It is bounded by 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
173	**274**	181	282	187	286	0.7	0.3

Non-Wires Assessment

The load reduction required to keep the peak load flat (growth) is one MW/year for the summer and winter seasons.

Proposed Plans of Service

There are no proposed projects for this area at this time.

Recently Completed Plans of Service

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

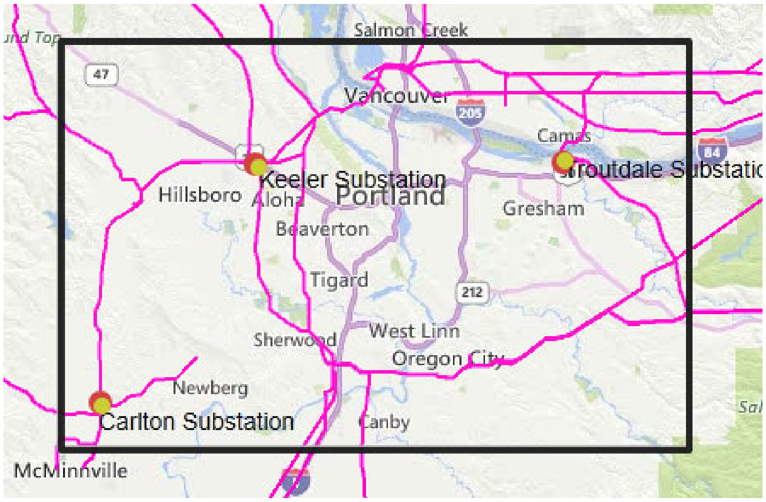
8.2.4 Portland Area

The Portland Load Area is located 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 nearly 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 high levels of air conditioning load. The peak winter loads are due to high levels of base board electric heating load. The Portland area load forecast is:

Portland Area Load							
Historical Peak Load (MW)		Five-Year Load 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
4022	**4136**	4977	4728	5245	5169	1.1	1.8

Non-Wires Assessment

The Portland load area has historically been a winter peaking area, but in recent years has become a dual peaking load area (summer and winter peaks). Beyond the near term planning horizon, trends indicate that Portland will become a summer peaking load area. Portland area summer loads (actual and forecasted) are growing faster than winter loads; and summer is expected to be the most limiting season for Portland due to adjacent system use (BES transfers from the Northwest to California) and facility ratings limited by ambient temperatures. BPA has less control and visibility to Portland area loads because more than 80% of the total load in the Portland area is owned and served by other utilities such as PGE and PAC. Both utilities plan for and have Energy Efficiency measures and non-wires alternatives in their respective integrated resource plans and transmission plans. Redispatch of generation in the I-5 corridor is the most effective non-wires solution to congestion in the Portland load area.

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: $4,400,000
- Expected Energization: 2022

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: 2023

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: $2,000,000
- 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: $10,000,000 (This estimate includes other sustain work which is being coordinated with the bus sectionalizing breaker addition.)
- Expected energization: 2026

Pearl 230 kV Series Bus Sectionalizing Breaker Addition

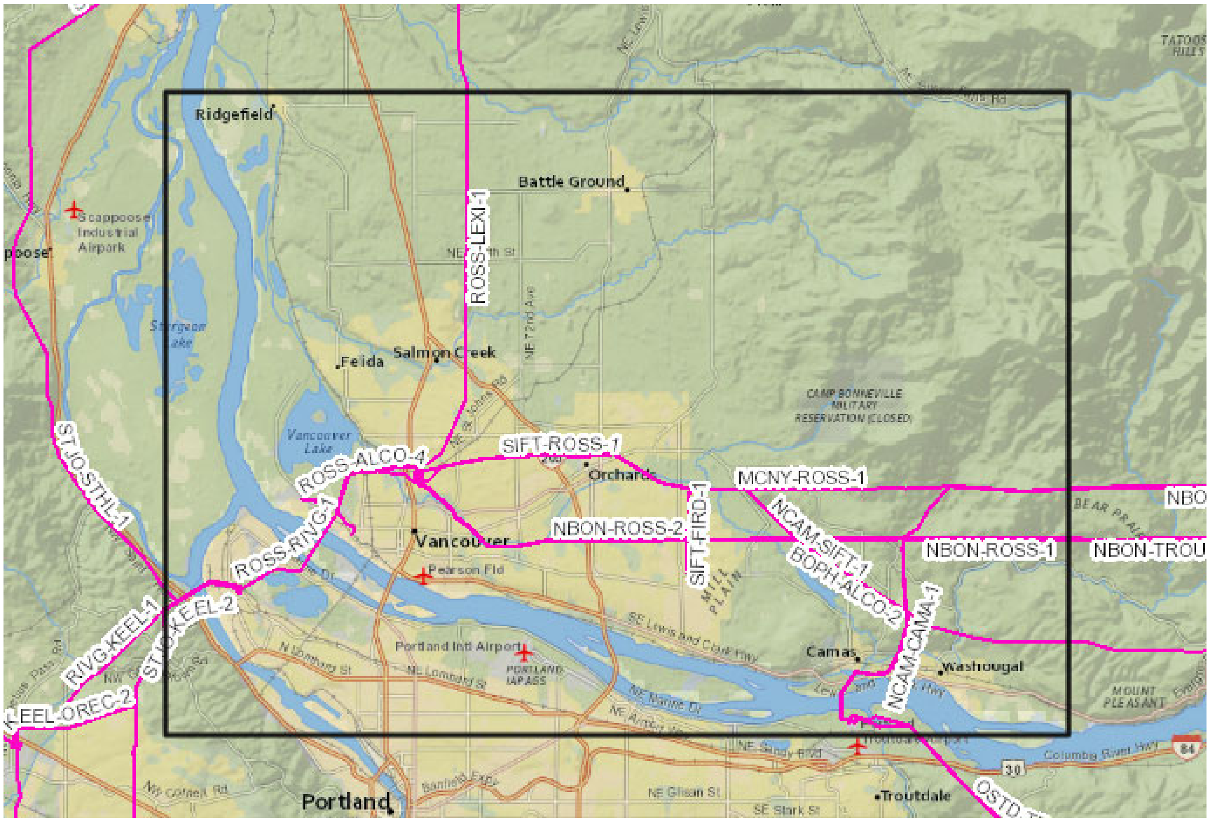
- Description: This project adds a new 230 kV bus sectionalizing breaker at Pearl Substation in series with the existing sectionalizing breaker.
- Purpose: This project is required to maintain reliable load service to the area.
- Estimated Cost: $2,000,000
- Expected Energization: 2029

Recently Completed Plans of Service

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

8.2.5 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
860	**1069**	783	987	860	1018	1.9	0.6

Non-Wires Assessment

The load reduction required to keep the winter peak load flat is 6.75 MW/year, and the load reduction required to keep the summer peak load flat is 13.9 MW/year based on the forecasts provided by Clark PUD in the WECC cases.

Proposed Plans of Service

There are no proposed plans of service for this area.

Recently Completed Plans of Service

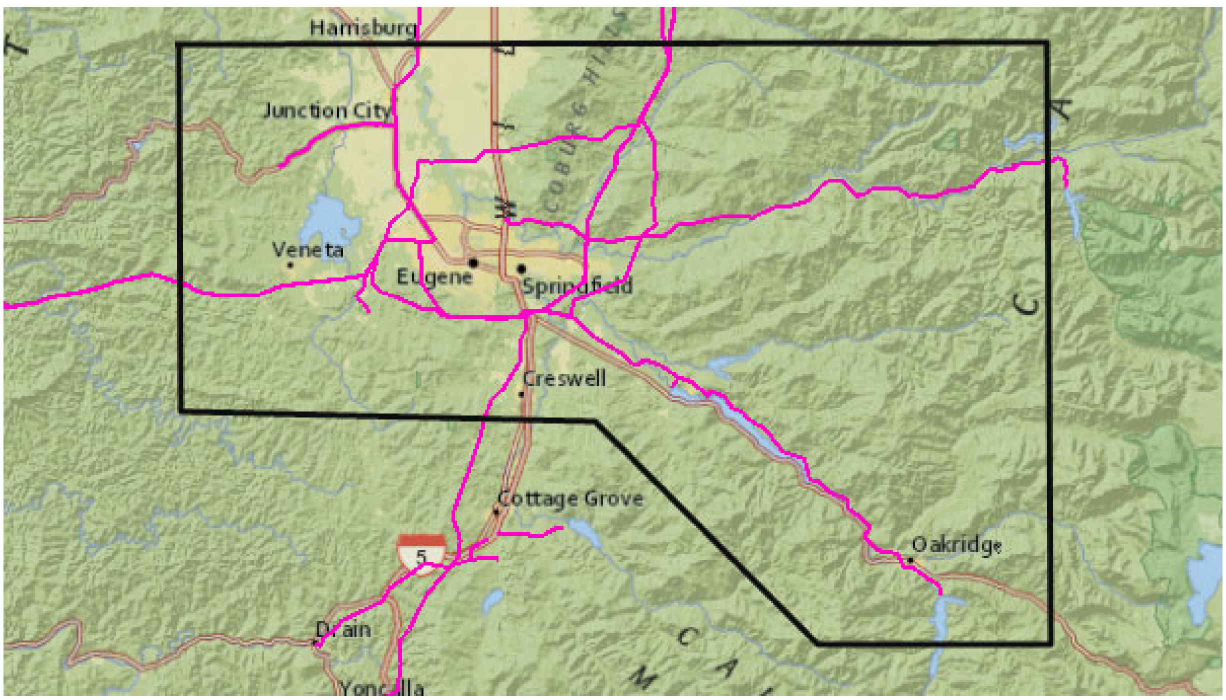
There are no projects that have been completed in this area since the previous planning cycle.

8.3 Southwest Oregon Planning Area (SWOR)

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.

8.3.1 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. It is bounded by Willamette National Forest on the east and the coast range on the west. It is bounded by 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 load, though some 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)
- Several Electric Cooperatives: 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
605	**896**	755	879	715	945	-1.1	1.5

Non-Wires Assessment

The load reduction required to keep the winter peak load flat is approximately 13 MW/year and the summer peak loads are already expected to decline by approximately 8 MW/year according to the forecast.

Proposed Plans of Service

Alvey 115 kV Bus Sectionalizing Breaker Addition

- Description: This project adds a 115 kV bus sectionalizing breaker at Alvey Substation.
- Purpose: This project improves operations and maintenance flexibility.
- Estimated Cost: $18,700,000
- Expected Energization: 2022

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 area.
- Estimated Cost: $3,000,000
- Expected Energization: 2022

Alvey – Dillard Tap 115 kV Line Rebuild

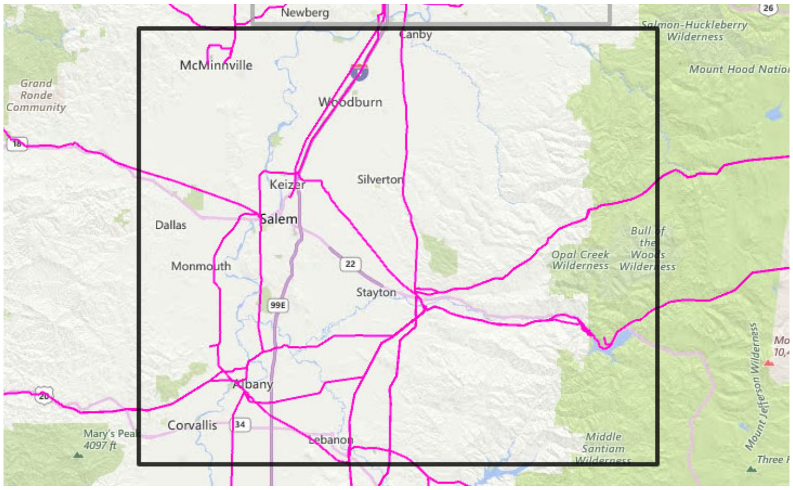
- Description: This project rebuilds the first 3.3 miles of the Alvey-Eugene 115kV line.
- Purpose: This project is required to maintain reliable load service to the load area.
- Estimated Cost: $1,300,000
- Expected Energization: 2023

Recently Completed Plans of Service

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

8.3.2 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
- Several Electric Cooperatives: 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

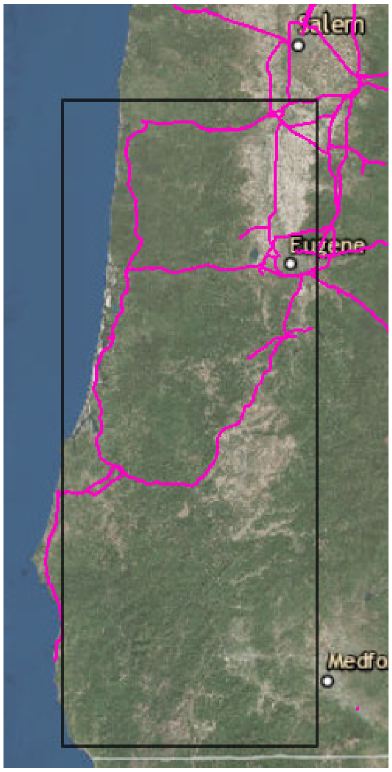
Salem/Albany Area Load							
Historical Peak Load (MW)		Five-Year Load 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
840	**895**	924	908	995	988	1.5	1.7

Non-Wires Assessment
In order to maintain flat growth in the Salem/Albany area 4.3 MW/year and 4.4 MW/year would have to be reduced in the summer and winter, respectively.

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.

8.2.3 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
252	**505**	247	461	249	443	0.2	-0.8

Non-Wires Assessment

There is no known distributed generation in the area that could be used to support local voltages. To maintain flat load growth across the entire South Oregon Coast area, peak summer loads would need to be reduced by approximately 0.4 MW/year and the winter peak loads are expected to decline by approximately 3.6 MW/year according to the forecast.

Proposed Plans of Service

Fairview 115 kV Reactor Additions

- Description: This project adds two 115 kV shunt reactors (approximately 25 Mvar each) at Fairview Substation.
- Purpose: This project is required to maintain acceptable voltage schedules in the South Oregon Coast area.
- Estimated Cost: $15,500,000
- Expected Energization: 2022

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: $4,500,000
- Expected Energization: 2023

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: 2023

Recently Completed Plans of Service

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

8.4 Northern Planning Area

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, Ferry County PUD, and Klickitat County PUD.

8.4.1 Klickitat County Area

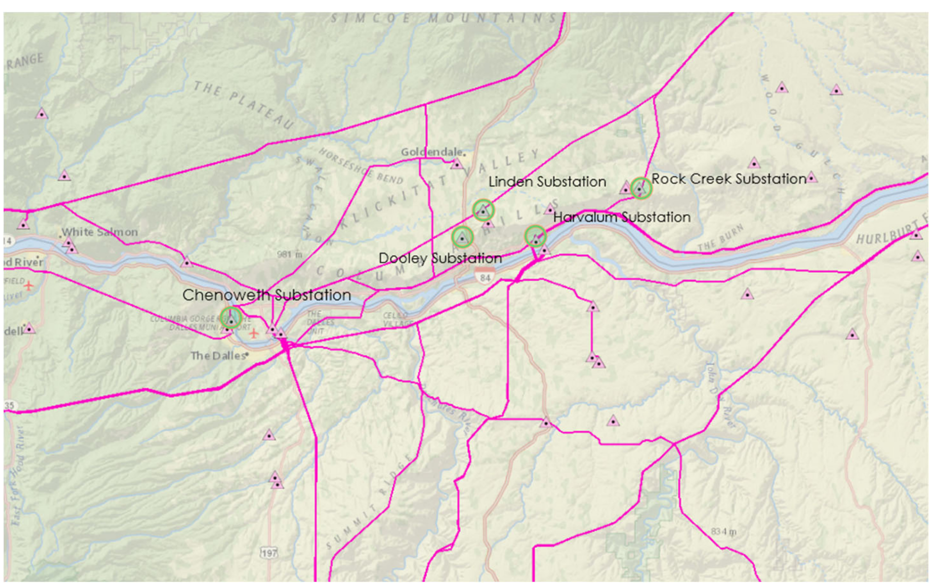
The Klickitat County area is located in south central Washington and is comprised of Klickitat County PUD and various generation projects interconnected to their transmission system.

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 interconnect wind generation radially to Rock Creek substation.

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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
59	**77**	54	86	56	77	0.7	-2.2

Non-Wires Assessment

There are no transmission reinforcement projects currently planned for this area. Therefore, additional non-wires assessment is not needed at this time.

Proposed Plans of Service

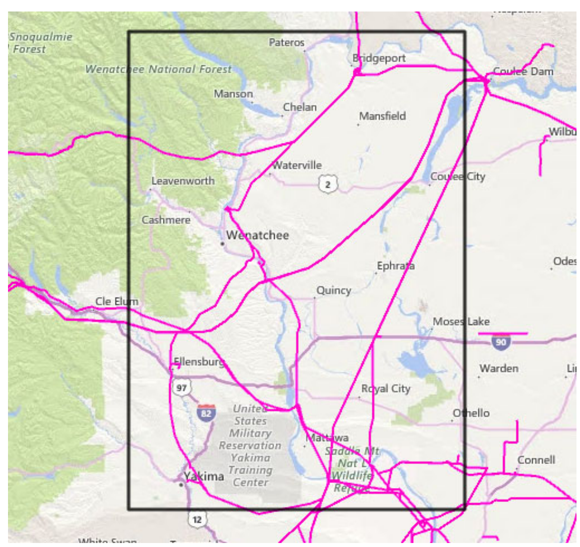
There are no proposed projects for this area at this time.

Recently Completed Plans of Service

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

8.4.2 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 major 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 5 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 2 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
2373	**2452**	2538	2403	2668	3003	1.0	4.6

Non-Wires Assessment

The Mid-Columbia area has more generation than load. Therefore, Mid-Columbia generation patterns have a greater impact than load growth on the Mid-Columbia area transmission performance. The capability to re-dispatch generation allows the Mid-Columbia transmission system to transfer power from the major dams, while operating within facility limits and reduces the need to build new facilities. Shifting generation from Upper Mid-Columbia units to Lower Mid-Columbia units is very effective in reducing the north to south to flow. Once the available capacity of the Lower Mid-Columbia units is used, the generation at Upper Mid-Columbia units can be shifted to Grand Coulee units to further relieve the transmission constraints. Moving generation farther north from Columbia substation reduces the flow through Columbia creating a more favorable transmission loading condition.

Proposed 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: $15,800,000
- Expected 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
- Expected Energization: 2023

Recently Completed Plans of Service

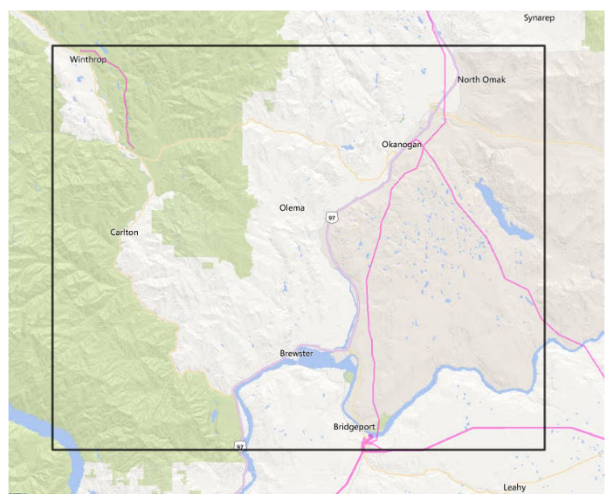
There are no projects that have been completed in this area since the previous planning cycle.

8.4.3 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
158	**232**	186	256	201	282	1.6	2.0

Non-Wires Assessment

Non-wires projects may not be feasible for the Okanogan load area due to the short lead time before the transmission need and the lack of industrial loads to target for demand response in the area.

Proposed Plans of Service

Grand – Coulee – Foster Creek (Nilles Corner) 115 kV Line Upgrade

- Description: This project will remove impairments on the Grand Coulee-Nilles Corner section of the Grand Coulee-Foster Creek #1 115 kV line to facilitate increasing the maximum operating temperature of the line to 80 °C.
- Purpose: This project is required to maintain reliable load service to the Okanogan Load area during peak summer conditions.
- Estimated Cost: $700,000
- Expected Energization: 2022

Recently Completed Plans of Service

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

8.5 Central Planning Area

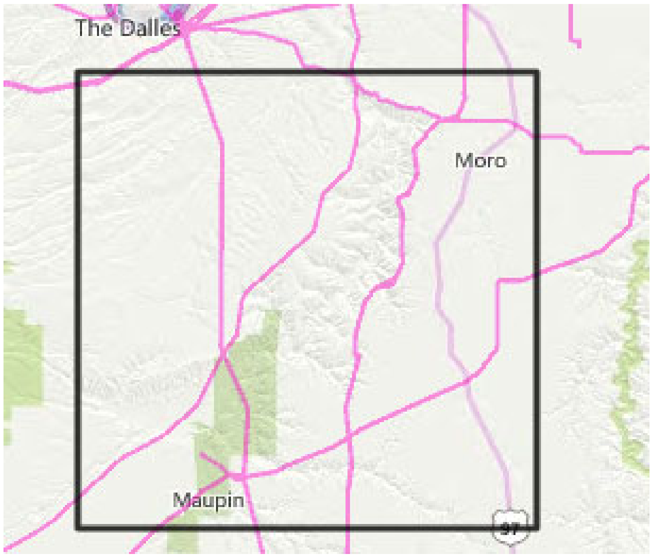
The Central Planning Region covers south central and southeast Washington, and north central and northeast Oregon, and adjacent areas in western Idaho. This includes the major cities of Richland, Kennewick, Pasco, Pullman, and Walla Walla in Washington, and Pendleton, Hermiston, La Grande, and Umatilla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

8.5.1 De Moss / Fossil Area

This DeMoss/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.

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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
29	**44**	28	37	29	38	0.7	0.5

Non-Wires Assessment

The DeMoss/Fossil area has a surplus of generation with forecasted peak loads ranging between 30 and 40 MW and peak wind generation at 60 MW. Because the output of the wind farms in the area exceeds load, reducing load levels in the area does not provide a benefit at this time. The 10-year energy and peak load forecasts are relatively flat for the area.

Proposed Plans of Service

There are no proposed projects for this area as this time.

Recently Completed Plans of Service

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

8.5.2 Pendleton / La Grande Area

This area includes the eastern Oregon communities of Pendleton and La Grande. The Pendleton/La Grande load area is located 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/LaGrande Area Load							
Historical Peak Load (MW)		Five-Year Load 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
146	139	153	139	158	146	0.6	1.0

Non-Wires Assessment

The system assessment identified one potential new project for this load area, although it is not required to meet reliability performance standards. The project would install a 230 kV shunt capacitor (approximately 20 Mvar) at Roundup Substation to provide reactive support to address potential low voltages on the local 230 kV and 69 kV systems. If the peak summer load was immediately reduced by 30 MW by demand response initiatives, the transmission project could be deferred indefinitely due to maintaining a flat rate of load growth in the area in summer. However, this magnitude of load reduction may not be feasible with a cost-effective demand-side management or distributed energy resources solution.

Proposed Plans of Service

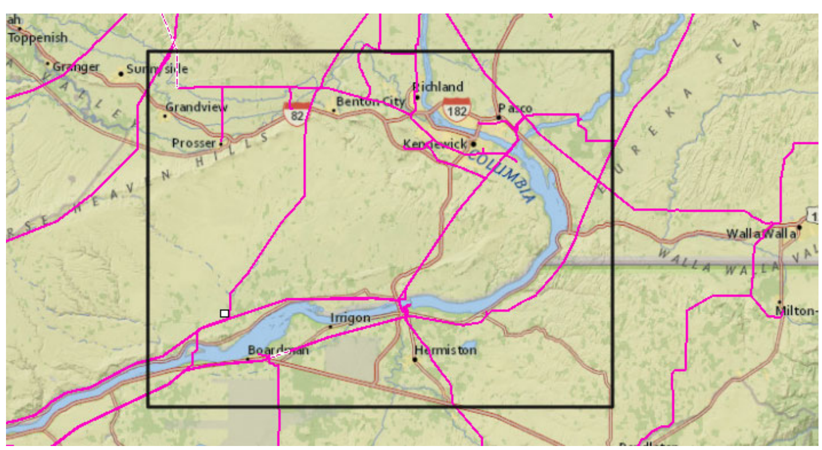
There are no proposed projects for this area at this time.

Recently Completed Plans of Service

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

8.5.3 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
1204	1009	1385	1038	1419	1048	0.5	0.2

Non-Wires Assessment

A non-wires study was performed for the Tri-Cities area in 2019 to determine the potential for demand response or other non-wires solutions to mitigate the potential load tripping scenarios for outage conditions in the Tri-Cities area. Based on the results of that study, there is not enough demand response in the area to mitigate the scenarios under which load tripping could occur. Therefore, the best option was to prioritize the transmission reinforcement projects in the area.

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 2 miles of new 115 kV line.
- Purpose: This upgrade is needed to provide reliable load service to the Tri-Cities area.
- Estimated Cost: $5,200,000
- Expected Energization: 2023

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: 2024

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: 2024

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: $96,700,000
- Expected Energization: 2025

Recently Completed Plans of Service

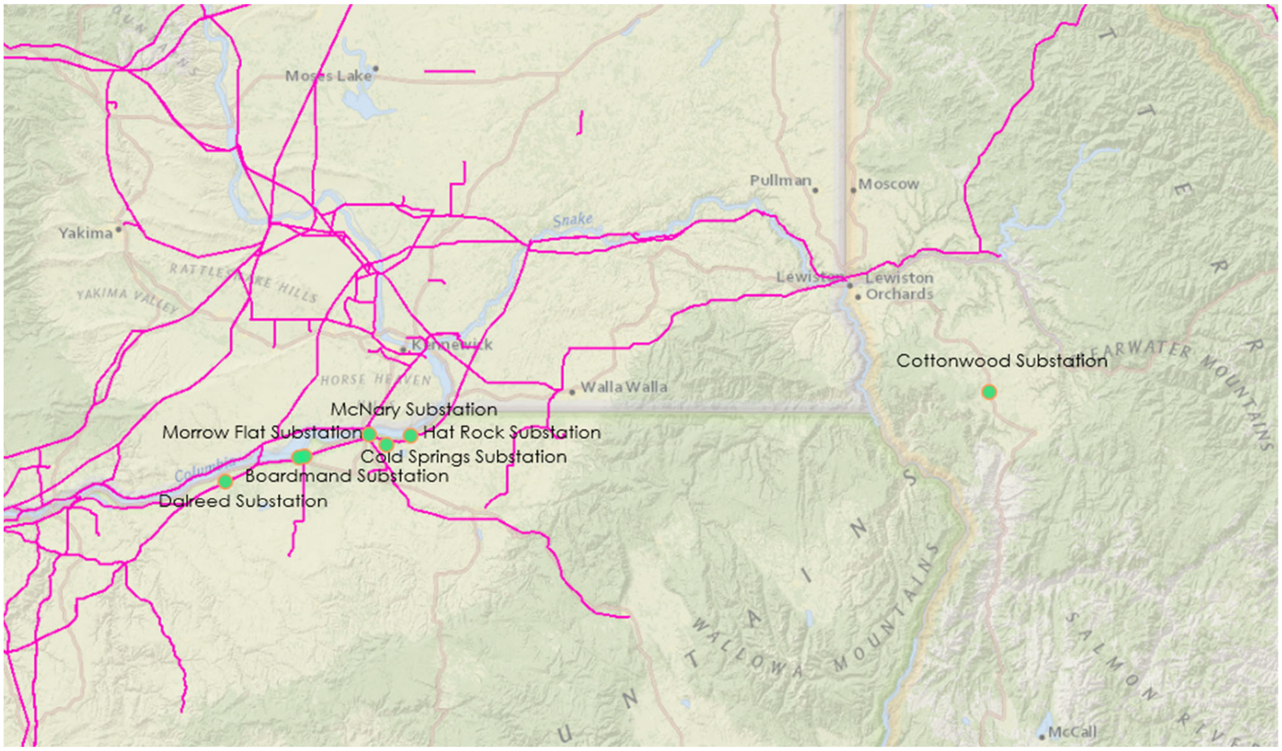
There are no projects that have been completed in this area since the previous planning cycle.

8.5.4 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
555	437	1076	910	1150	1013	1.3	2.2

Non-Wires Assessment

The Umatilla/Boardman area is the fastest growing area in the BPA system at over 11 percent per year due to new industrial (e.g. data centers) and agricultural loads. While some demand response may be available, it will not eliminate the need to expand the system to support the rapid load increase.

Proposed Plans of Service

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 is low.
- Estimated Cost: $2,900,000
- Expected Energization: 2022

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: 2023

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: TBD
- Expected Energization: 2024

Jones Canyon 230 kV Shunt Reactor Addition

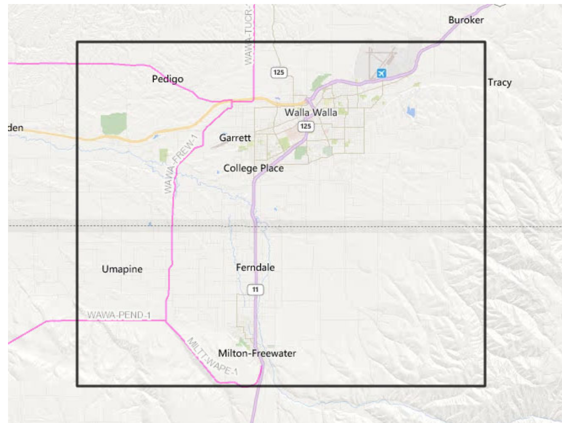
- Description: This project adds a 230 kV shunt reactor (40 MVAR) at Jones Canyon Substation.
- Purpose: This project is required to maintain voltage schedules in the area during light load conditions.
- Estimated Cost: $5,300,000
- Expected Energization: 2025

Recently Completed Plans of Service

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

8.5.5 Walla Walla Area

The Walla Walla load area is located 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
91	77	139	113	137	108	-0.3	-0.9

Non-Wires Assessment

The only transmission reinforcement identified for this area is a shunt reactor at Tucannon substation. Generally, shunt reactor additions are not good candidates for non-wires measures because the reactors are installed to correct high voltages on the transmission system. Non-wires measures typically involve load reduction which serves to raise voltages and thus would aggravate any existing high voltage problems in the area. Peak load is expected to grow in the Walla Walla area by about 28 MW between 2022 and 2029. Loads would need to decrease by about 2.8 MW per year until 2029 to maintain a flat growth rate for the duration of the planning horizon.

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: $3,500,000
- Expected Energization: 2025

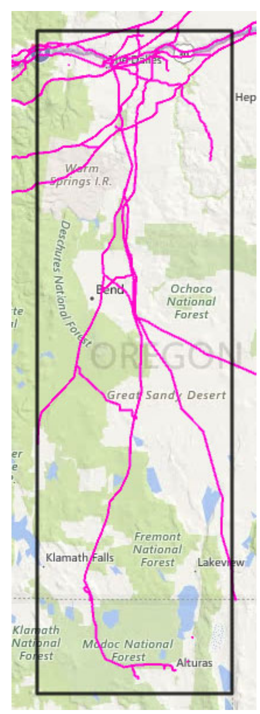
Recently Completed Plans of Service

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

8.6 Southern Planning Area

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).

8.6.1 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 a few smaller generation projects in the area (each less than 5 MW).

Central Oregon Area Load							
Historical Peak Load (MW)		Five-Year Load 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
544	**687**	665	800	823	945	4.4	3.4

Non-Wires Assessment

Generally, load growth will eventually drive the need for system reinforcements in the Central Oregon area. If energy efficiency gains can reduce the load growth, the need for system reinforcements will be further delayed. The current load forecast indicates that there is not a lot of expected load growth in the next 10 years besides at the CEC Brasada (4.3%) and PAC Yew (3.2%) locations.

Proposed Plans of Service

La Pine 115 kV Circuit Breaker Additions

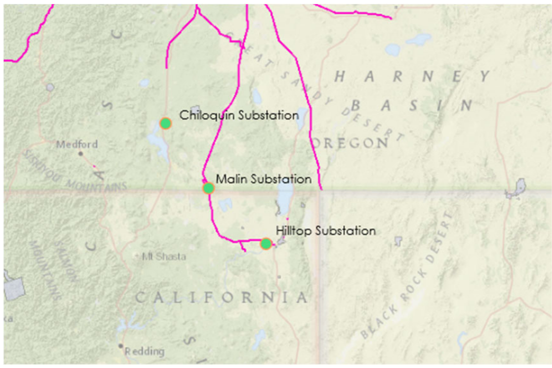
- Description: This project adds two 115 kV circuit breakers for the low side of the transformer banks 1 and 2 as well as a 115 kV bus tie breaker.
- Purpose: This project improves operations and maintenance flexibility.
- Estimated Cost: $3,900,000
- Expected Energization: 2022

Recently Completed Plans of Service

Central Oregon Series Capacitor (Included in the California-Oregon Intertie Section.)

8.6.2 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
107	85	120	87	113	75	-1.2	-2.9

Non-Wires Assessment

A potential project for this area is the Canby Under Voltage Load Shedding (UVLS) Relay addition. However it is not required to meet reliability performance standards. This potential project would install a UVLS at Canby 69 kV substation to shed load, as allowed by the standard, in response to outage conditions during peak summer loads. The potential UVLS project is within in the near-term planning horizon. As with many load areas, continued energy efficiency gains may postpone or potentially replace the eventual need to add system reinforcements.

Proposed Plans of Service

There are no proposed projects for this area at this time.

Recently Completed Plans of Service

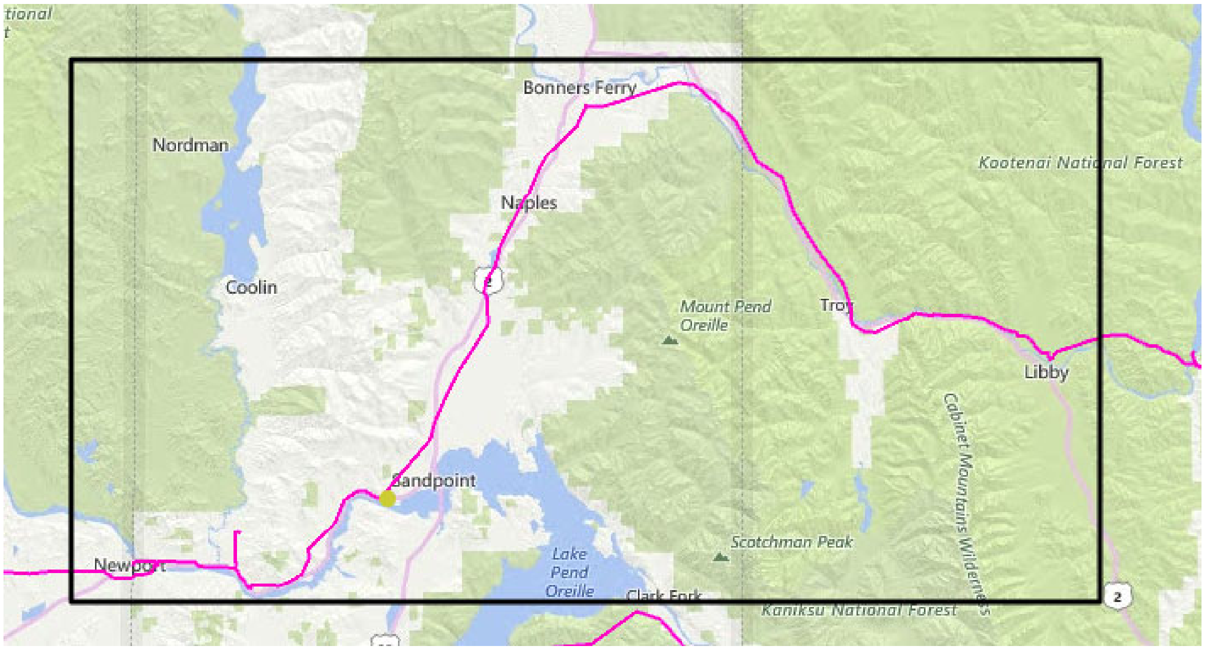
There are no projects that have been completed in this area since the previous planning cycle.

8.7 Eastern Planning Area

The Eastern Planning Region 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 mainly hydroelectric facilities in northwest Montana, north Idaho, and northeastern Washington along with some thermal generation around Spokane.

8.7.1 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
107	**187**	126	191	132	182	0.9	-1.0

Non-Wires Assessment

Some non-wires initiatives have already been applied in this area. Flathead Electric Cooperative participated in the Pacific Northwest Smart Grid Demonstration Project, which was a five-year project that started in 2010. This project involved completing the deployment of FEC's automated meter-reading system (AMS). Additionally, FEC launched a pilot project called Peak Time, which was a voluntary demand response project. Avista also participated in the Pacific Northwest Smart Grid Demonstration Project and is continuing to install smart meters across its system. Lessons learned from these projects will help with future implementation of Smart Grid and demand response programs in the area.

Proposed Plans of Service

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 maintenance flexibility.
- Estimated Cost: $500,000
- Expected Energization: 2023

Recently Completed Plans of Service

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

Cancelled Plans of Service

Libby FEC 115 kV Shunt Capacitor Replacement or Restoration

This project will be combined with other needs in the area and will be moved to the Troy substation. A new plans of service will be developed and a new project will be initiated at Troy.

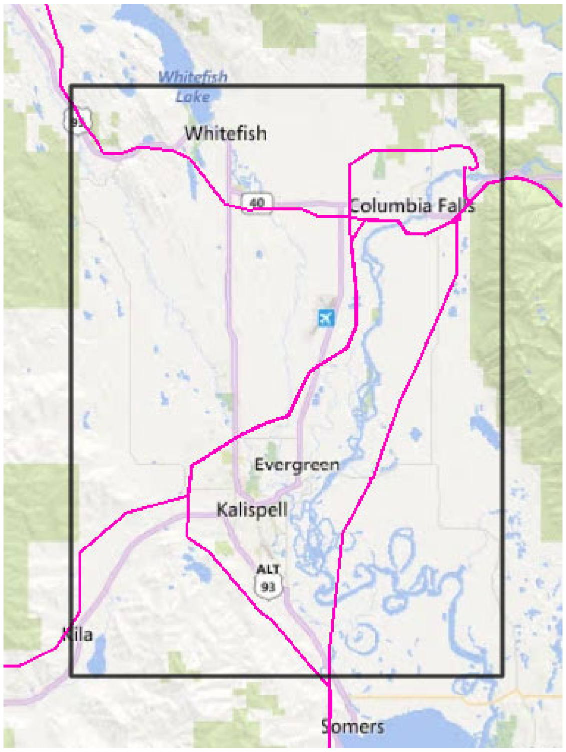
- Description: This project refurbishes the existing unusable 115 kV shunt capacitor at the Libby FEC Substation.
- Purpose: This project is required to maintain adequate voltages in the area following contingencies that involve loss of the connection to the Libby 230 kV system.
- Estimated Cost: $1,500,000
- Expected Energization: 2023

8.7.2 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
259	**354**	293	384	309	431	1.1	2.3

Non-Wires Assessment

No corrective action plans were identified for this area during the assessment, but 10-year cases with high generation levels suggest that an upgrade of the Columbia Falls – Kalispell 115 kV line could eventually be needed if Kalispell load grows high enough and coincides with high generation levels at Hungry Horse. Restricting generation levels at Hungry Horse, Libby, and Kerr is one way to mitigate the problem. The restriction may become more burdensome as Kalispell load grows. Load growth projections suggest that the need date could be delayed indefinitely by a 0.4 MW yearly load reduction at the Kalispell load center, which would completely offset the load growth.

Proposed Plans of Service

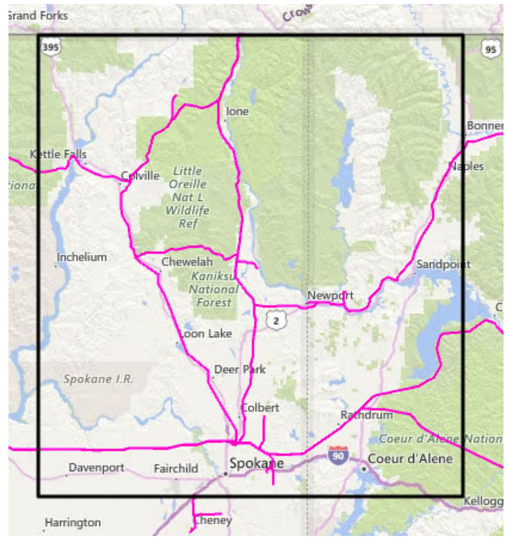
Conkelley Substation Retirement

- 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 3 terminal Flathead-Columbia Falls-Hungry Horse 230 kV line.
- Purpose: This project is needed to accommodate the retirement of Conkelley substation.
- Estimated Costs: $27,600,000
- Expected Energization: 2024

Recently Completed Plans of Service

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

8.7.3 Spokane / Colville / Boundary Area



This area includes Pend Oreille, Stevens, and Spokane County. This area is located 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
896	**924**	914	882	934	910	0.4	0.6

Non-Wires Assessment

In order to keep the Spokane load growth flat, 3.6 MW/year of load reduction is needed for the summer and 3.9 MW/year of load reduction is needed for the winter.

Proposed Plans of Service

There are no proposed projects for this area at this time.

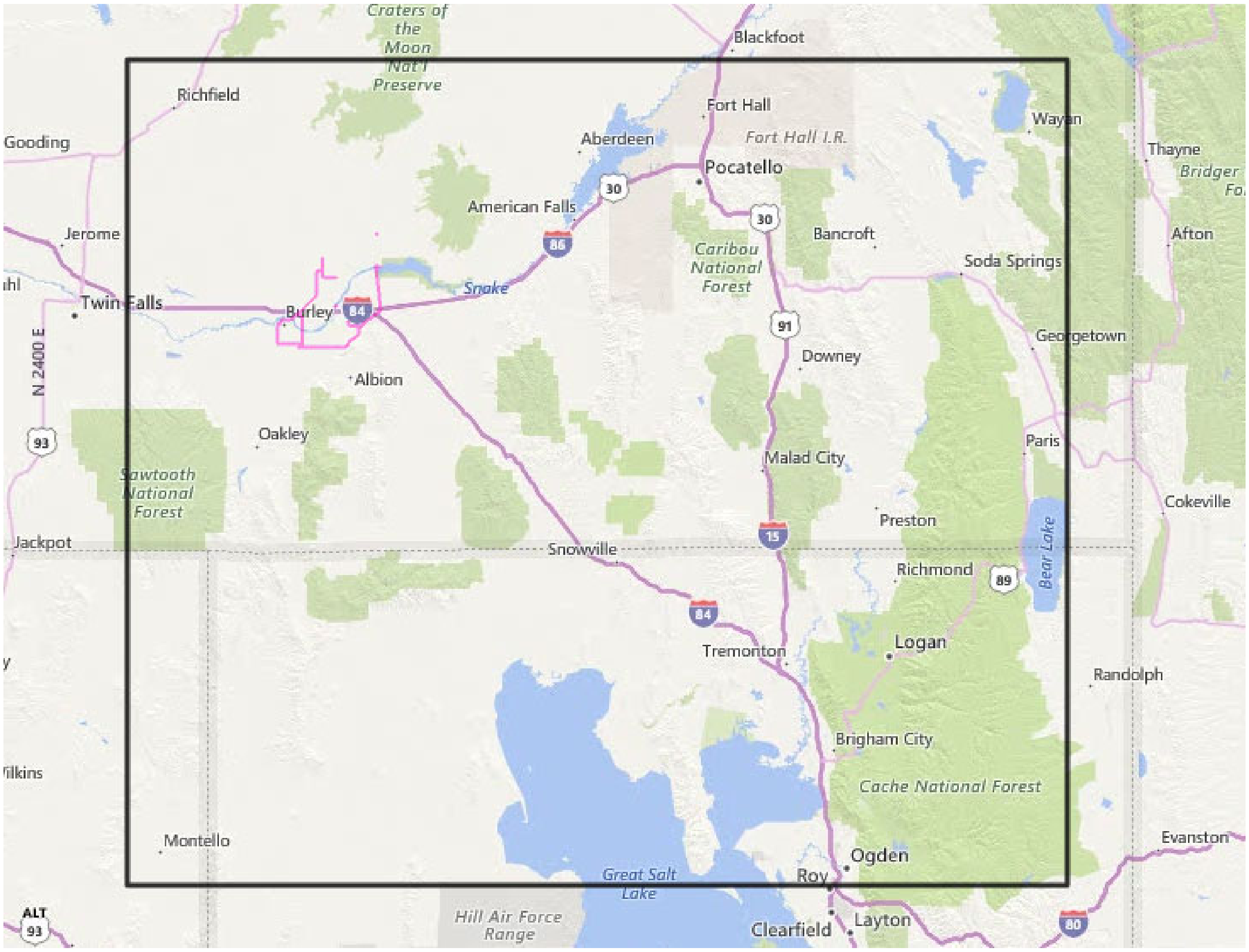
Recently Completed Plans of Service

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

8.8 Idaho Planning Area

8.8.1 Burley Area

The Burley area is located 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
192	153	221	164	224	168	0.3	0.5

Non-Wires Assessment

Demand management or demand response measure could be used to offset the effects of peak loads in the area. This could include working with farmers or businesses in the area to shift the times when they use large amounts of energy to off-peak hours, or developing agreements to temporarily reduce energy usage when demand is especially high.

Energy efficiency would also be a useful tool and the areas where this would be most beneficial are West Wendover (Wells) and all of the loads along the Minidoka-Bridge-Tecoma 138 kV line. It would also be helpful to have some small distributed generation or energy storage in this area, (preferably 30 MW or less) at or near West Wendover and/or Bridge Substation.

In order to keep load growth flat for this area, at least 3 MW per year of load reduction along the Bridge-West Wendover 138kV line is needed.

Proposed Plans of Service

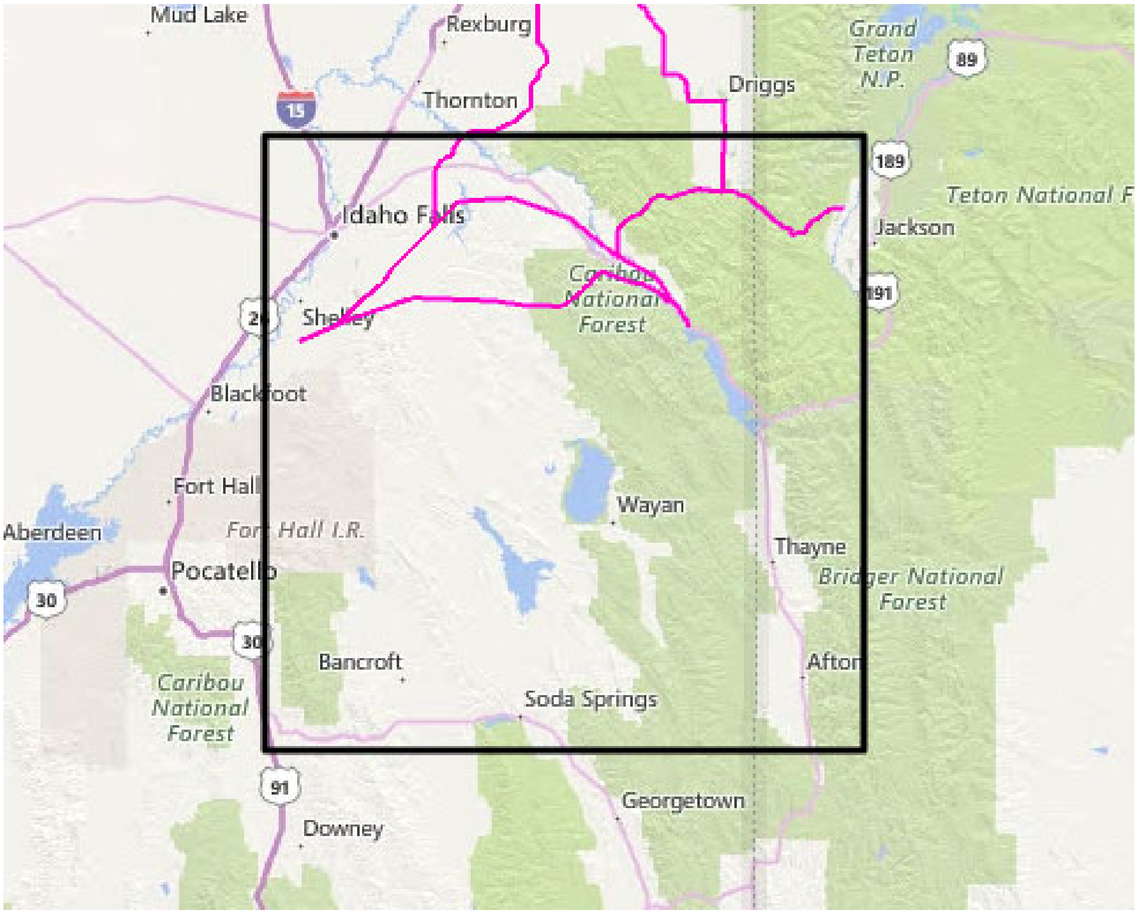
There are no proposed projects for this area at this time.

Recently Completed Plans of Service

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

8.8.2 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 2026 (MW)		Ten-Year Load 2030 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
148	**291**	193	298	201	295	0.8	-0.2

Non-Wires Assessment

The Southeast Idaho system has plans to meet the demands placed on it. Continued system changes will increase demands in the area. As these demands materialize, potential alternatives to transmission system expansion may include energy efficiency or demand response of the Fall River Electric loads in and around Driggs and Drummond, Idaho. The forecast indicates approximately 13 MW of growth over the next 10 years. Demand response of approximately one MW per year could postpone a future project to build a new 11-mile 115 kV line from Targhee Tap to Targhee Substation and remove the Targhee Tap altogether.

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: $3,800,000
- Expected Energization: 2023

Recently Completed Plans of Service

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

9. Transmission Needs by Path

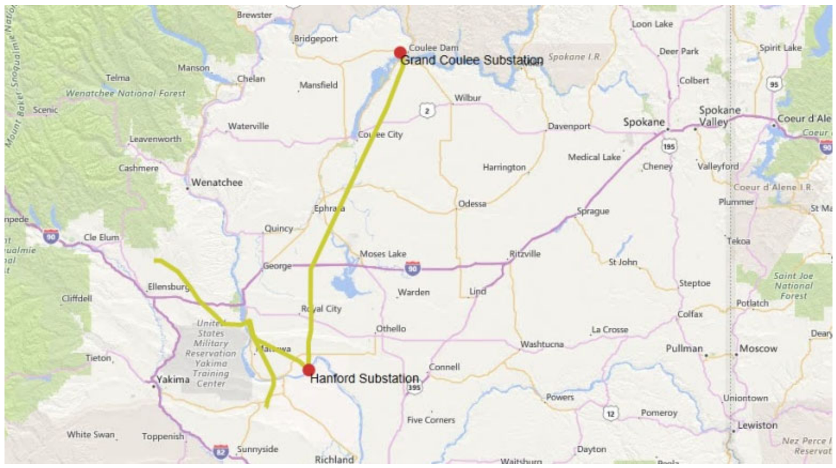
9.1 North of Hanford Path

Description

This path is located north of Hanford (NOH) substation between Hanford and Grand Coulee. The NOH path is located 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 number of factors: low or zero generation on the Upper Columbia hydro, 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 lesser often in the winter. Higher south-to-north flows are most common during light loads (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 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 significant change for the path. This project is described under the South of Allston Path section.

Potential Long-Range Needs

There are none identified for this path at this time.

Recently Completed Plans of Service

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

9.2 West of McNary Path

Description

This path is located between McNary and Slatt substations in Oregon. West of McNary (WOM) is an east-to-west path that transfers power from Northeastern Oregon and Southeastern Washington, east of the city Arlington, to the California-Oregon Intertie (COI) at John Day substation, the Pacific DC Intertie (PDCI) at Big Eddy substation and Northwest (NW) load centers west of the Cascade Mountains. The WOM path is spring/summer peaking as a result of late spring and early summer run off. The WOM path flow peaks when the following plants have high outputs: McNary and. Lower Snake River hydro; thermal plants at Coyote Springs, Calpine, Hermiston and Goldendale; and wind plants at Jones Canyon, Walla Walla and Central Ferry.

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

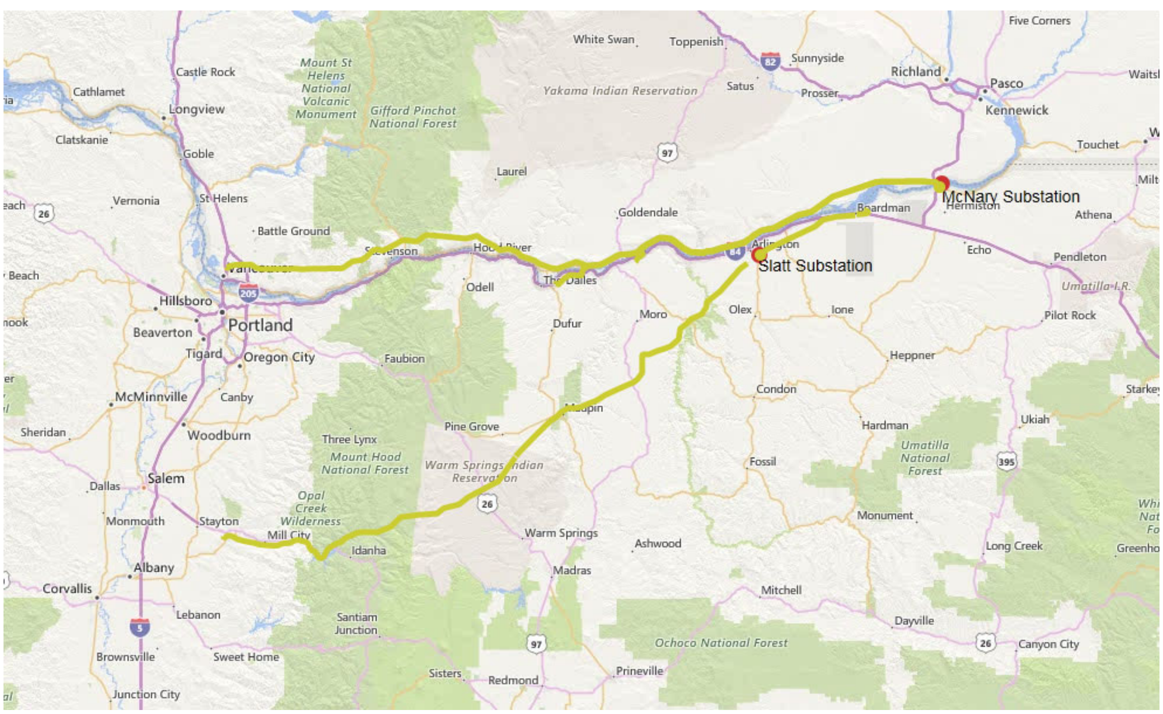
There are no proposed projects for this path at this time.

Potential Long-Range Needs

There are none identified for this path at this time.

Recently Completed Plans of Service

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



9.3 West of Slatt Path

Description

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. WOS and West of John Day (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:

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

Proposed Plans of Service

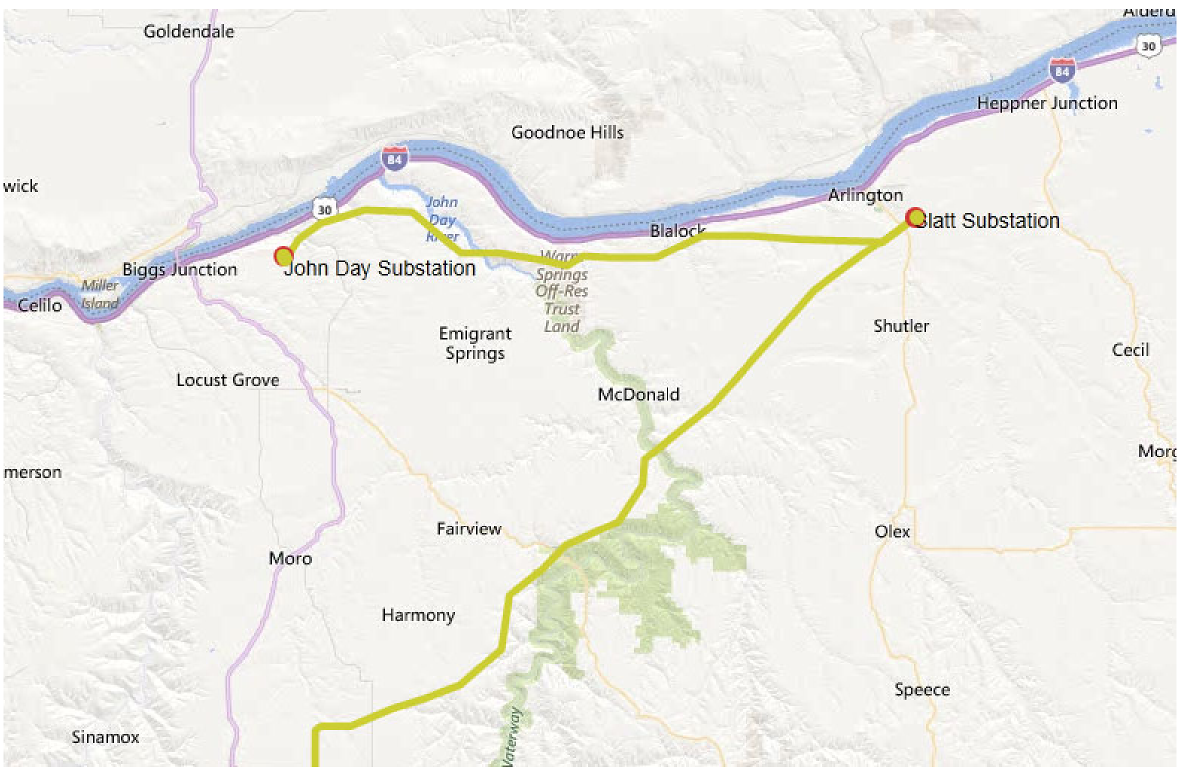
There are no proposed projects for this path at this time.

Potential Long-Range Needs

There are none identified for this path at this time.

Recently Completed Plans of Service

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



9.4 West of John Day Path

Description

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

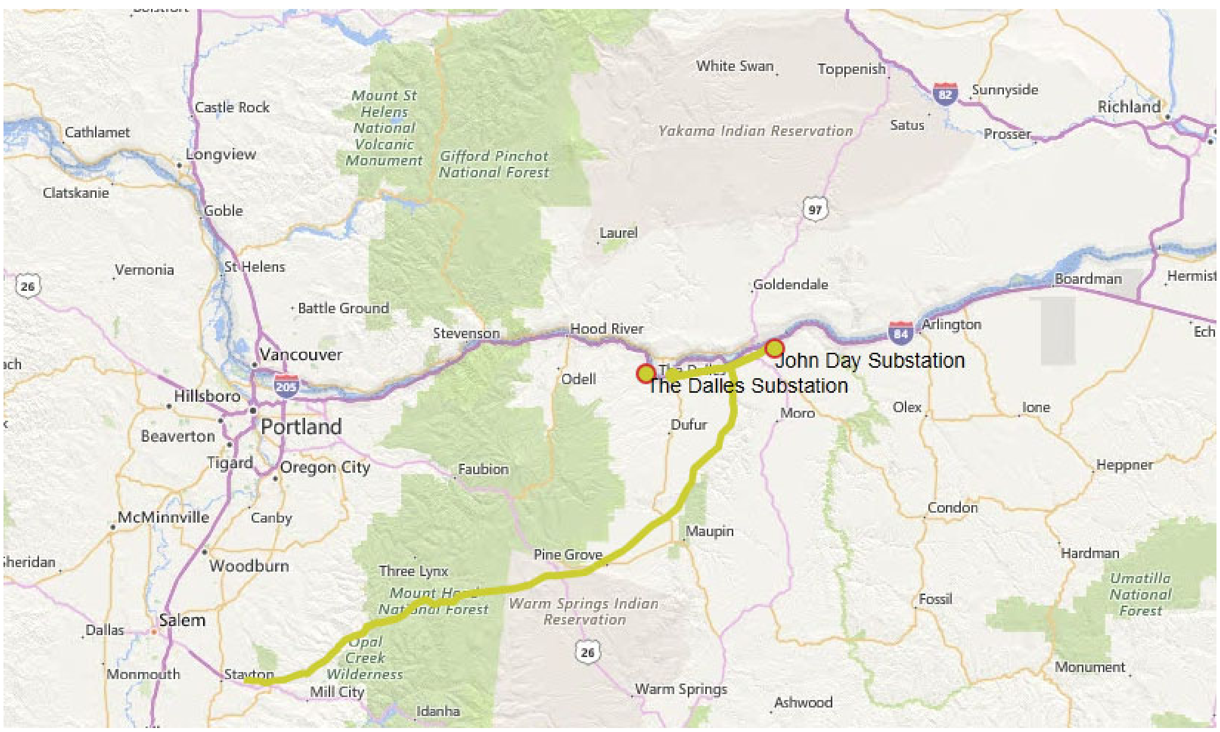
There are no proposed projects for this path at this time.

Potential Long-Range Needs

There are none identified for this path at this time.

Recently Completed Plans of Service

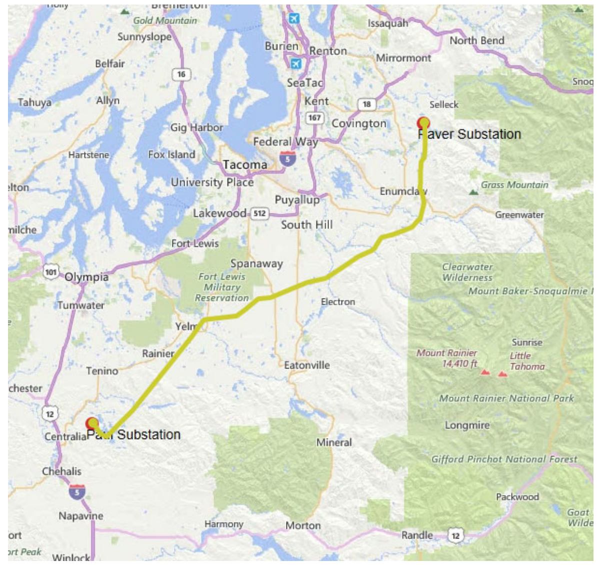
There are no recently completed plans of service for this path since the last planning cycle.



9.5 Raver to Paul Path

Description

The Raver-Paul (RP) 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. This path is located between Raver and Paul Substations in western Washington. The generation projects in this area are the Centralia, Fredrickson LLP, Fredrickson 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. During late spring and early summer conditions, large 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 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

St. Clair – South Tacoma 230 kV Disconnect Switch Upgrade

- Description: This project removes the disconnect switch on the St. Clair South Tacoma line.
- Purpose: This project is needed to maintain reliability on the Raver-Paul path.
- Estimated Cost: $34,500
- Expected Energization: 2022

Potential Long-Range Needs

There are none identified for this path at this time.

Recently Completed Plans of Service

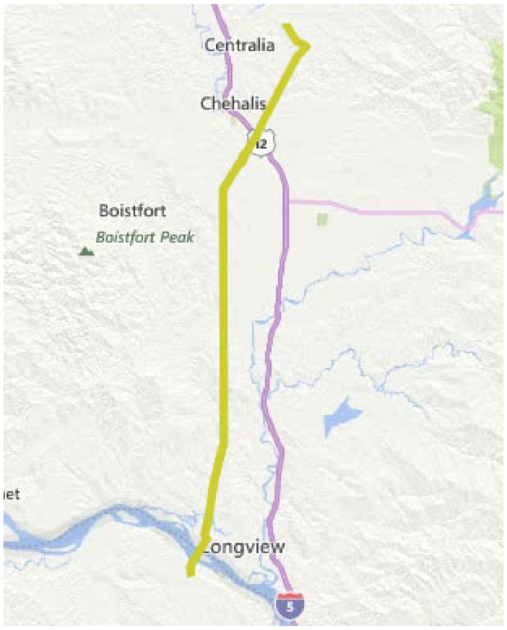
Raver 500/230 kV Transformer (PSANI), (Also included in the Seattle, Tacoma and Olympia area.)

- 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: $90,000,000
- Energization: 2021 for the transformer and 2024 for the rest of the PSANI project

9.6 Paul to Allston Path

Description

The Paul-Allston (P-A) 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 P-A path is bi-directional (north-to-south and south-to-north).



This path includes the following lines:

- Napavine-Allston 500 kV line
- Paul-Allston 500 kV line

Proposed Plans of Service

There are no proposed projects for this path at this time.

Potential Long-Range Needs

There are none identified for this path at this time.

Recently Completed Plans of Service

Holcomb-Naselle 115 kV Line Upgrade (Also included in Southwest Washington Area.)

- Description: This line was rebuilt with larger conductor as part of the wood pole replacement program.
- Purpose: This project is required to maintain reliable load service to the Southwest Washington Coast area.
- Estimated Cost: The cost of this project is included as part of the overall wood pole replacement program. $13,100,000
- Energization: This project was energized in 2021.

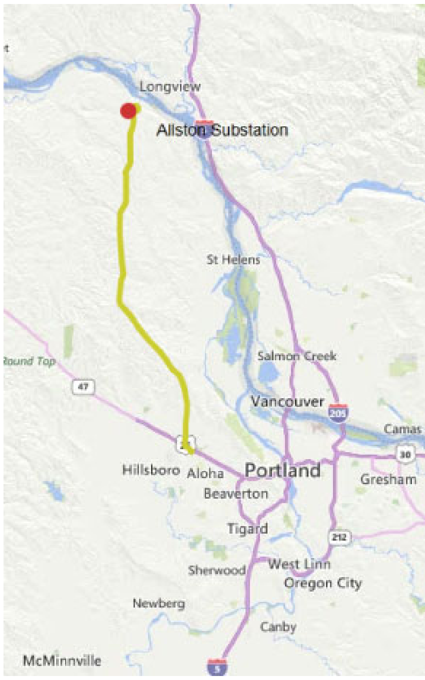
9.7 South of Allston Path

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. 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)

Schultz-Wautoma 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.



Proposed Plans of Service

Schultz-Wautoma 500 kV Line 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 capacitor (rated 4000A at 500 kV) on the Schultz-Wautoma line at the Wautoma substation.
- Purpose: This project will improve operations and maintenance flexibility for SOA.
- Estimated Cost: $30,000,000
- Expected Energization: 2023

Potential Long-Range Needs

Keeler 500 kV Reconfiguration & Breaker Additions

- This project will reconfigure the existing Keeler 500 kV ring bus into a breaker-and-a-half configuration by adding several new 500 kV breakers and re-terminating existing lines.

Keeler-Rivergate 230 kV Line Upgrade

- This project will increase the rating of the line. This project was identified as a beneficial upgrade to increase Operational and Maintenance flexibility for deeper contingencies or extreme events.

Keeler 500/230 kV No. 2 Transformer Addition

- This project will add another 500/230 transformer bank at Keeler Substation, and will utilize one of the new bay positions created by the Keeler 500 kV Reconfiguration project.

Recently Completed Plans of Service

Longview 230/115 kV Transformer Addition (Also included in Longview Load Area.)

Description: This project adds a 230/115 kV transformer in the Longview area. In addition, this project adds a 230 kV bus sectionalizing breaker at the Longview substation, which will divide the south bus into two sections.
Purpose: This project is required to maintain reliable load service to the Longview area. The breaker addition will resolve the issues caused by a 230 breaker failure outage at Longview.
Estimated Cost: $15,000,000
Energization: The transformer was energized in 2021.

9.8 West of Cascades South Path

Description

The West of Cascades South path spans the Cascade Mountains in southern Washington and Northern Oregon, serving the Willamette Valley and Southwest Washington (WILSWA). The main grid facilities for this path include Marion, Ostrander, Knight, John Day, Wautoma, and Big Eddy substations. The Willamette Valley, Northwest Oregon, and Southwest Washington load service areas (WILSWA area) includes the cities of Portland, Vancouver, Eugene and Salem with high concentrations of commercial and residential load. 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

There are no proposed projects for this path at this time.

Potential Long-Range Needs

Pearl-Sherwood 230 kV Corridor Reconfiguration

This will be a joint project with PGE. It includes splitting the existing BPA/PGE Pearl-Sherwood No.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-Sherwood-Mcloughlin 230 kV 3-terminal line into a new Pearl-Sherwood No. 3 230 kV line and a new Pearl-Sherwood-Mcloughlin three terminal line.

Recently Completed Plans of Service

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

9.9 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 at this time.

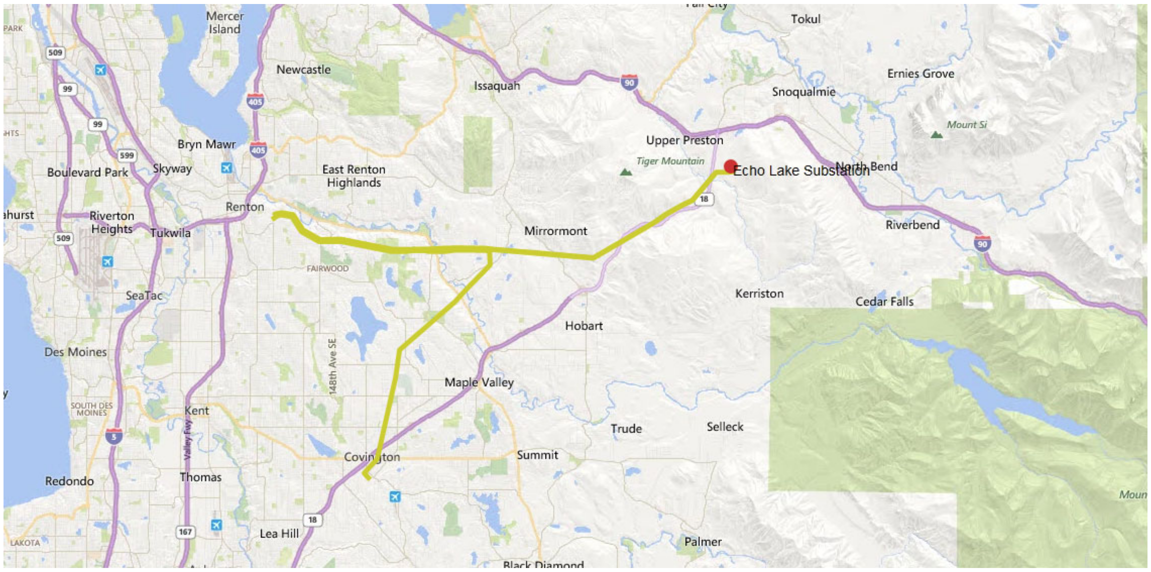
Potential Long-Range Needs

There are none identified for this path at this time.

Recently Completed Plans of Service

Monroe 500 kV Line Re-terminations

- Description: This project reconfigured Monroe Substation by developing a new 500 kV bay and re-terminating the Custer and Chief Joseph 500 kV lines.
- Purpose: This project will increase reliability and capacity on the Northern Intertie.
- Estimated Cost: $10,800,000
- Energization: This project was energized in 2021.



9.10 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

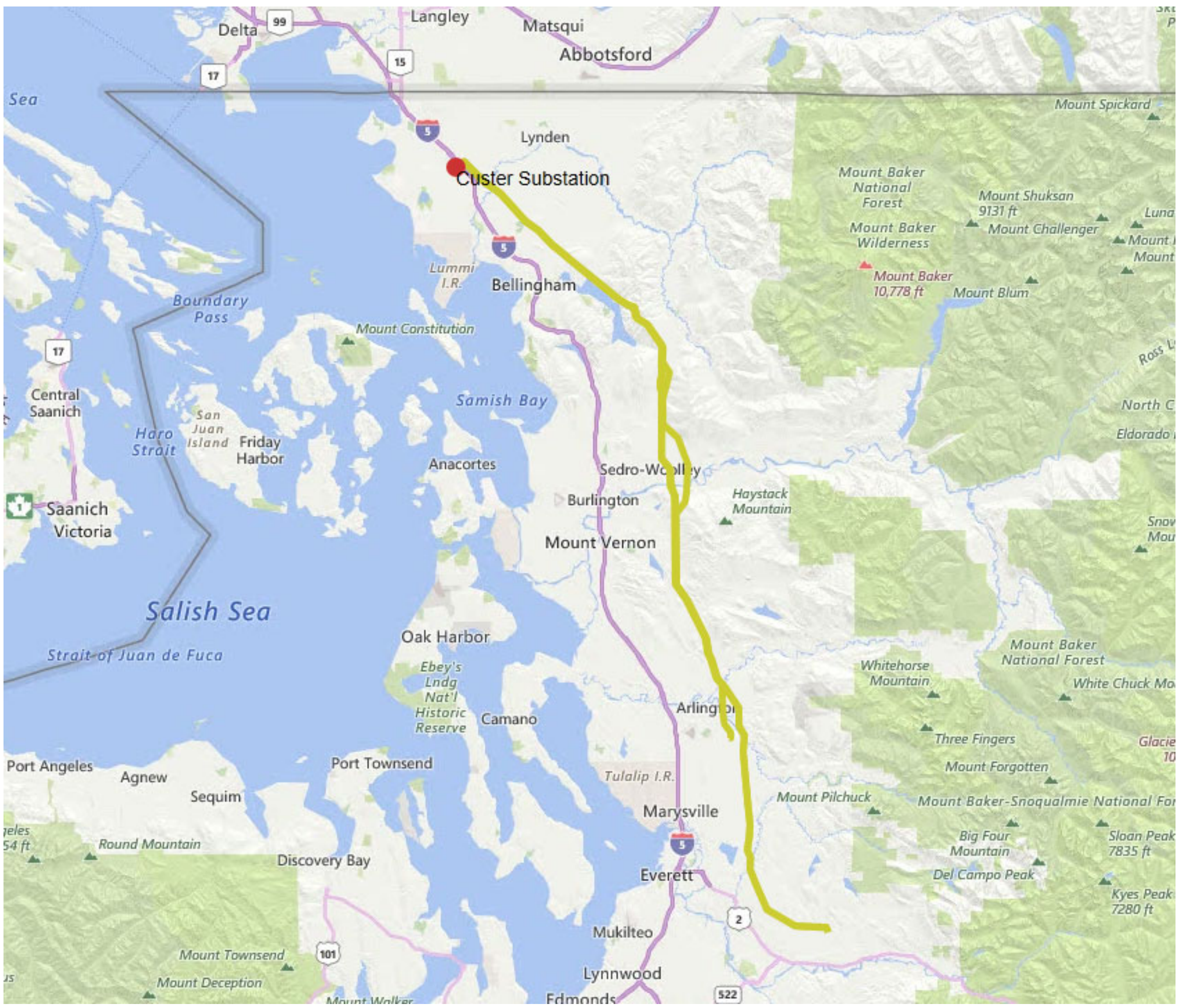
There are no proposed projects for this path at this time.

Potential Long-Range Needs

There are none identified for this path at this time.

Recently Completed Plans of Service

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



9.11 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 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 345 kV line (BPA)
- Grand Coulee-Olympia 287 kV line (BPA)
- Rocky Reach-Cascade 230 kV line (PSE)
- Bettas Road-Covington 230 kV line (BPA)

Proposed Plans of Service

There are no proposed projects for this path at this time.

Potential Long-Range Needs

There are none identified for this path at this time.

Recently Completed Plans of Service

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

9.12 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

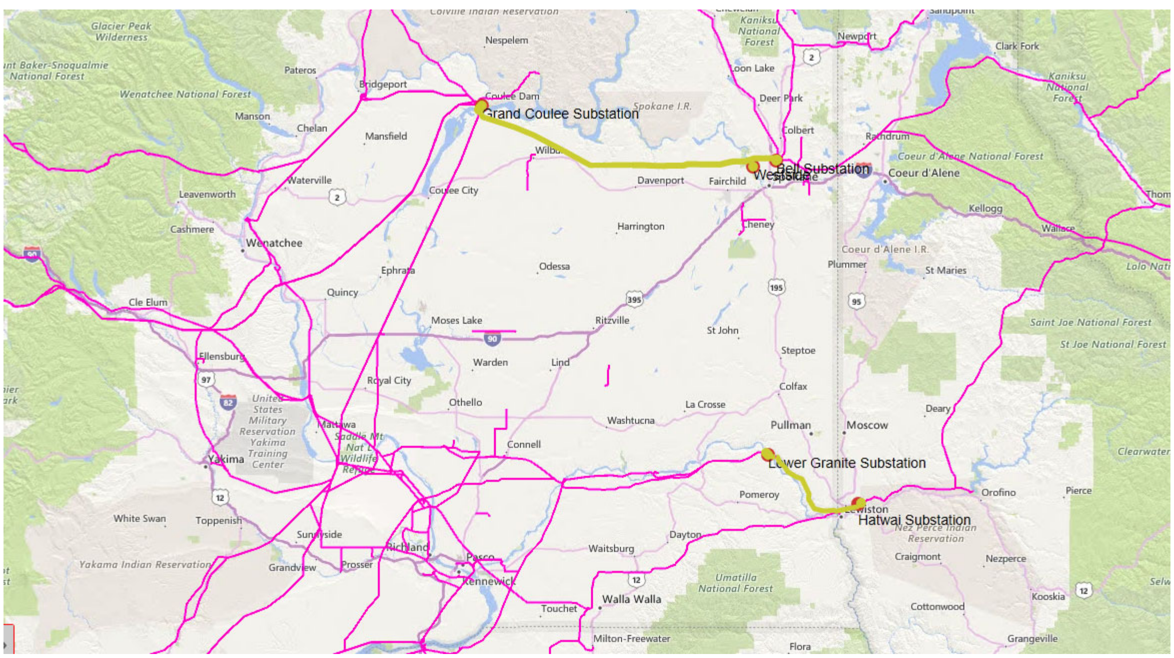
There are no proposed projects for this path at this time.

Potential Long-Range Needs

There are none identified for this path at this time.

Recently Completed Plans of Service

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



9.13 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 the late spring/early summer (May/June) time frame during spring 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

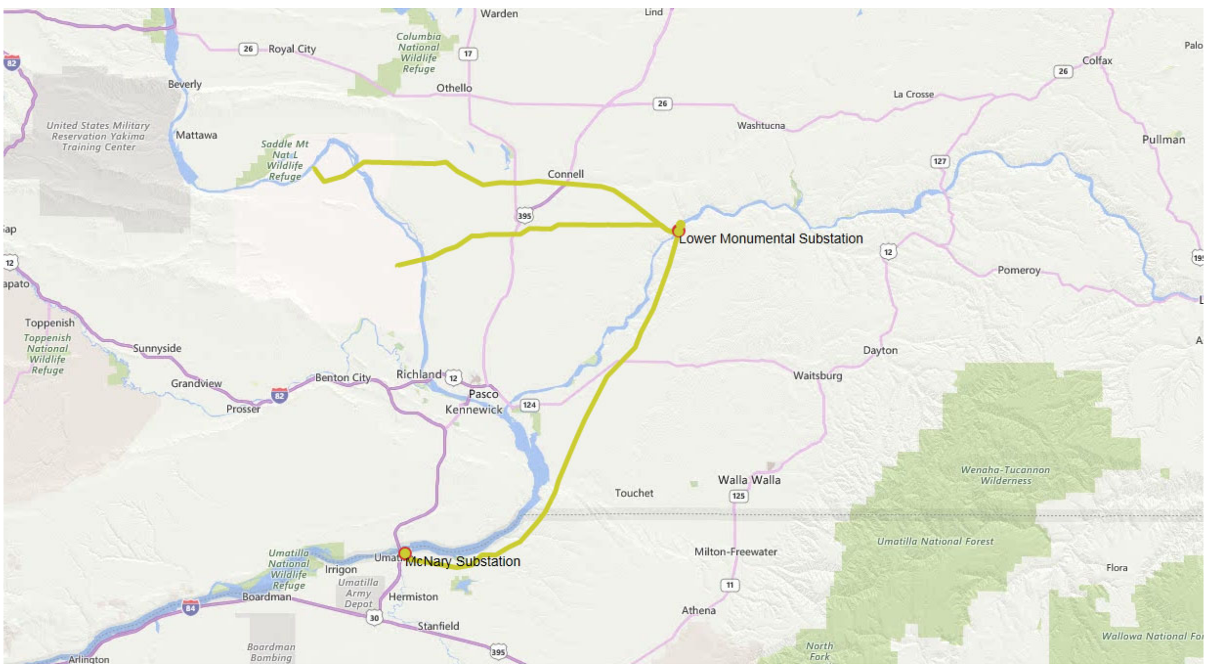
There are no proposed projects for this path at this time.

Potential Long-Range Needs

There are none identified for this path at this time.

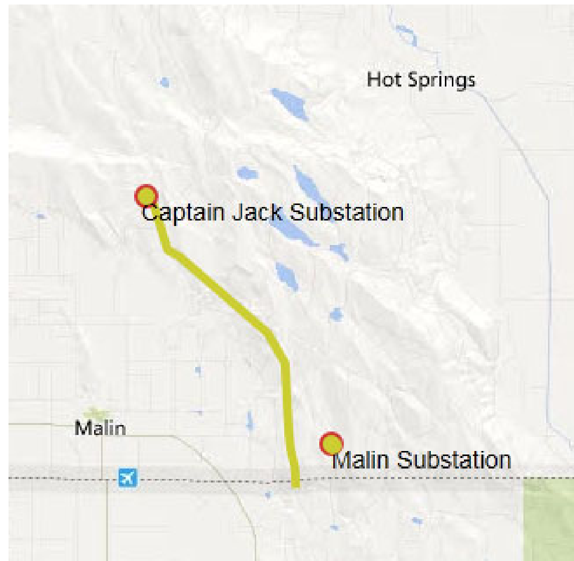
Recently Completed Plans of Service

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



10. Transmission Needs by Intertie

10.1 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 roughly 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.

The path includes the following lines:

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

Proposed Plans of Service

No projects are proposed for this intertie.

Potential Long-Range Needs

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.

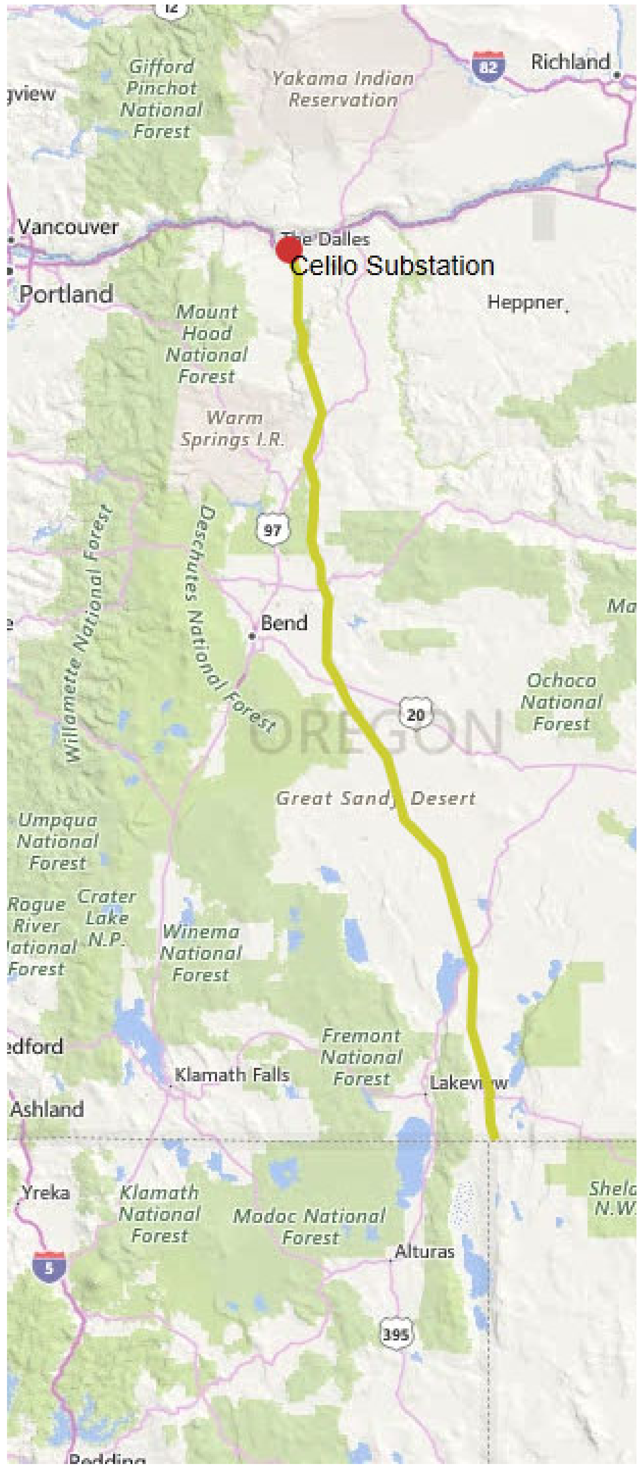
Recently Completed Plans of Service

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

10.2 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.

Potential Long-Range Needs

There are none identified for this intertie at this time.

Recently Completed Plans of Service

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

10.3 Northern Intertie

Description

The Northwest to British Columbia WECC Path 3, also known as the Northern Intertie, 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 bi-directional path that is dictated by import and export schedules from Canada. Several Puget Sound Area/Northern Intertie (PSANI) reinforcements were developed jointly between Seattle City Light, Puget Sound Energy and BPA in 2011 as a result of the Columbia Grid Puget Sound Area Study Team (PSAST). The Northern Intertie (NI) on the west side is a bi-directional path and flows are driven by import and export schedules from Canada.

This path 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.

Potential Long-Range Needs

There are none identified for this intertie at this time.

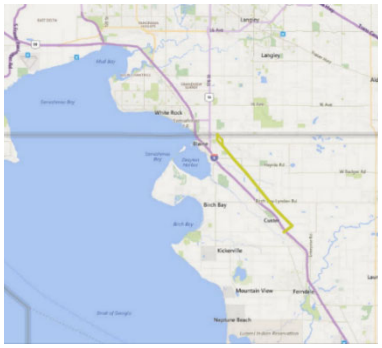
Recently Completed Plans of Service

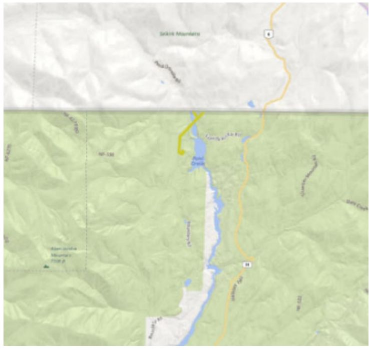
Raver 500/230 kV Transformer (PSANI), (Also included in the Seattle area.)

- 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: $90,000,000
- Energization: The transformer was energized in 2021 and the rest of the project is expected to be energized in 2024.

Monroe 500 kV Line Re-terminations (Also included in the North of Echo Lake Path.)

- Description: This project reconfigured Monroe Substation by developing a new 500 kV bay and re-terminating the Custer and Chief Joseph 500 kV lines.
- Purpose: This project increases reliability and capacity on the Northern Intertie.
- Estimated Cost: $10,800,000
- Energization: This project was completed in 2021.





10.4 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

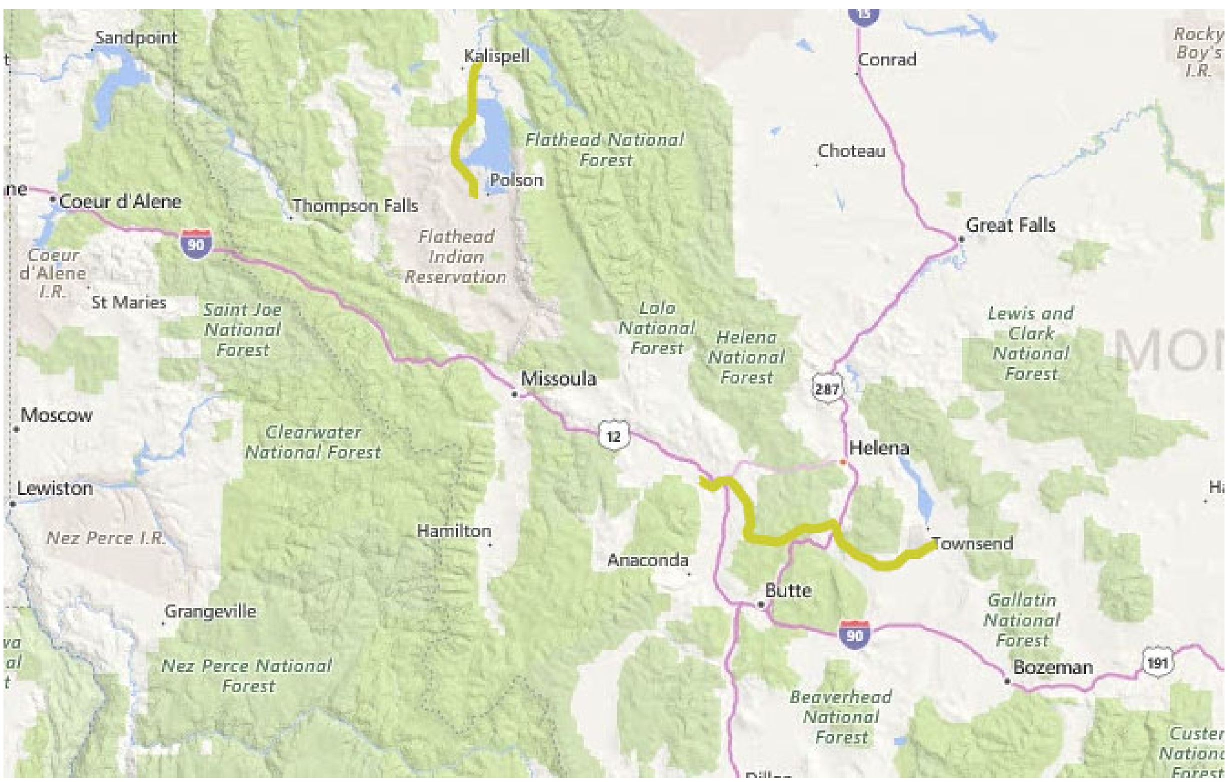
No projects are proposed for this intertie.

Potential Long-Range Needs

There are none identified for this intertie at this time.

Recently Completed Plans of Service

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



11. Supplemental Information

11.1 List of Projects by Planning and Load Service Area

Area	Project Title	Project Number	Expected In-Service Date	Estimated Cost
1	**Northwest Washington Planning Area**			
	Chehalis - Centralia			
	Silver Creek Substation Reinforcements	P01092	2023	$10,500,000
	Centralia-Roy Zimmerman Tap 69KV Line Upgrade	P03257	Cancelled	
	Olympic Peninsula			
	Kitsap 115 kV Shunt Capacitor Modification	P01443	2023	$4,000,000
	Seattle – Tacoma – Olympia			
	Monroe-Novelty 230 kV Line Upgrade	P02367	2023	$2,500,000
	Tacoma 230 kV Series Bus Sectionalizing Breaker and Bus Tie Breaker	P02401	2021*	$11,500,000
	Raver 500/230 kV Transformer (PSANI)	P00094	2021 (Transformer)*, 2024 (Entire Project)	$90,000,000
	Southwest Washington Coast			
	Aberdeen Tap to Satsop Park – Cosmopolis 115 kV Line Upgrade	P03506	2023	$551,000
	Holcomb-Naselle 115 kV Line Upgrade	P02261	2021*	$13,100,000
2	**Willamette Valley Southwest Washington Planning**			
	Hood River – The Dalles			
	L0380 Quenett Creek Substation Addition	P02256	2023	$40,300,000
	Longview			
	Longview 230/115 kV Transformer Addition	P02281	2021	$15,000,000
	North Oregon Coast			
	Portland			
	Carlton Upgrades	P01367	2022	$4,400,000
	Forest Grove – McMinnville 115 kV Line Upgrade	P03469	2023	$1,000,000
	Troutdale 230 KV Series Bus Sectionalizing Breaker	P04401	2025	$2,000,000
	Keeler 230 kV Bus Sectionalizing Breaker Addition	P04910	2026	$10,000,000

	Pearl 230 KV Bus Sectionalizing Breaker Addition (SERIES)	TBD	2029	$2,000,000
	Vancouver			
3	**Southwest Oregon Planning Area**			
	Eugene			
	Alvey 115 kV Bus Sectionalizing Breaker Addition	P02250	2022	$18,700,000
	Lookout Point – Alvey No. 1 and 2 Transfer Trip Addition	P03258	2022	$3,000,000
	Alvey-Dillard Tap 115 KV Line Rebuild	P04286	2023	$1,300,000
	Salem – Albany			
	South Oregon Coast			
	Fairview 115 kV Reactor Additions	P01465	2022	$15,500,000
	Central Oregon Coast O&M Flex (Toledo, Wendson, Santiam, Tahkenitch)	P02230	2023	$4,500,000
4	**Northern Planning Area**			
	Klickitat County			
	Mid-Columbia			
	Columbia 230 kV Bus Tie and Sectionalizing Breaker Addition and Northern Mid-Columbia Area Reinforcement (Joint Utility)	P00076	2023	$15,800,000
	Okanogan			
	Grand-Coulee-Foster Creek (NILLES CORNER) Line Upgrade	P03253	2022	$700,000
5	**Central Planning Area**			
	DeMoss – Fossil			
	Pendleton – La Grande			
	Tri-Cities			
	McNary-Paterson Tap 115 kV Line	P02364	2023	$5,200,000
	Red-Mountain – Horn Rapids 115 kV Line Reconductor	P03102	2024	$3,600,000
	Richland-Stevens Drive 115 kV Line	P02365	2024	$12,500,000
	G0558 South Tri-Cities Reinforcement Webber Canyon	P03264	2025	$96,700,000
	Umatilla - Boardman			
	Morrow Flat 230 KV Shunt Reactor	P04423	2022	$2,900,000
	Jones Canyon 230 kV Shunt Reactor	P03491	2025	$5,300,000
	L0481 McNary 230 kV Bay Addition	P04246	2023	$4,800,000

	L0482 Longhorn 500/230 kV Substation	P04342	2024	TBD
	Walla Walla			
	Tucannon River 115 KV 15 MVAR Shunt Reactor	P04438	2025	$3,500,000
6	**Southern Planning Area**			
	Central Oregon			
	La Pine 115 kV Circuit Breaker Additions	P02467	2022	$3,900,000
	Northern California			
7	**Eastern Planning Area**			
	North Idaho			
	Libby Power House 1 AND 2 Redundant Transfer Trip	P04231	2023	$500,000
	Libby (FEC) 115 KV Substation Capacitor	P04095	Cancelled and will be reinitiated	
	Northwest Montana			
	Conkelley Substation Retirement	P02259	2024	$27,600,000
	Spokane – Colville – Boundary			
8	**Idaho Planning Area**			
	Burley			
	Southeast Idaho – Northwest Wyoming			
	Spar Canyon 230 kV Reactor Addition	P02306	2023	$3,800,000

Note: Projects in bold are newly identified transmission needs based on the most recent system assessment.
* Project or a component of the project is expected to be energized. In some instances a project's expected in-service date maybe revised during 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.

11.2 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	
	St Clair-South Tacoma 230 kV Disconnect Switch Upgrade	P04277	2022	$34,500
6	**Paul to Allston**			
	Holcomb – Naselle 115 kV Line Upgrade	P02261	See SW Washington Coast Area	
7	**South of Allston**			
	Longview 230/115 kV Transformer Addition	P02281	See Longview Area	
	Schultz-Wautoma 500 kV Line Series Capacitor	P03259	2023	$30,000,000
	Keeler 500 kV Reconfiguration and Breaker Additions	TBD	Long-Term	–
	Keeler – Rivergate 230 kV Line Upgrade	TBD	Long-Term	–
	Keeler 500/230 kV No. 2 Transformer Addition	TBD	Long-Term	–
8	**West of Cascades South**			
	Pearl – Sherwood 230 kV Corridor Reconfiguration	TBD	Long-Term	–
9	**North of Echo Lake**			
	Monroe 500 kV Line Retermination	P00716	2021	$10,800
10	**South of Custer**			
11	**West of Cascades North**			
12	**West of Hatwai**			
13	**West of Lower Monumental**			

11.3 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	Long-Term	–
2	**Pacific DC Intertie**			
3	**Northern Intertie**			
	Raver 500/230 kV Transformer (PSANI)	P00094	See Seattle Area	
	Monroe 500 kV Line Retermination	P00716	See North of Echo Lake Path	
4	**Montana to Northwest**			

11.4 List of Transmission Service Request Projects

Project Title	Bundle No.
PEARL-SHERWOOD-MCLOUGHLIN UPGRADE TSEP 2021	P04974
SCHULTZ-RAVER: SERIES CAPS TSEP 2020	P04364
MONTANA TO WASHINGTON TSEP 2016	P03902
UPGRADE ABERDEEN TAP TO SATSOP PARK-COSMOPOLIS-1: 115KV (TSEP)	P03506
LAPINE SUBSTATION UPGRADE TSEP 2016	P03443
G0367 AVANGRIDS BRICKOVEN PROJECT (MAUPIN PROJECT)	P03399
SCHULTZ-WAUTOMA: 500 KV SERIES CAPACITORS	P03259
MONROE-NOVELTY 230 KV LINE UPGRADE	P02367
PUGET SOUND AREA NORTHERN INTERTIE	P00094

11.5 List of Generation Interconnection Projects

Project ID	Queue Number	Status
P00755	G0242-G0420	CONSTRUCTION
P02157	G0518	CONSTRUCTION
P02342	G0409, G0410, G0376, G0379	CONSTRUCTION
P02523	G0362	CONSTRUCTION
P02624	G0521	COMPLETION IN PROCESS
P02300	G0514	CONSTRUCTION
P03398	G0368	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.

11.6 List of Line and Load Interconnection Projects

Project ID	Queue Number and Project Title	Status
P03074	L0414: RUPPERT RD SUBSTATION	CONSTRUCTION
P02242	L0394: SALZER VALLEY	COMPLETION IN PROCESS
P03367	L0372: SOUTHRIDGE SUBSTATION LINE TAP AND METER SET	COMPLETION IN PROCESS
P02240	L0346: AIRPORT SUBSTATION	COMPLETION IN PROCESS
P02287	L0390: CHICKEN CREEK SUBSTATION	COMPLETION IN PROCESS
P02454	L0389: UEC PHASE II	COMPLETION IN PROCESS
P02991	L0415: PACIFICORP PROJECT VITESSE PONDEROSA SUBSTATION - PHASE 1	COMPLETION IN PROCESS
P01374	L0365: PGES BLUELAKE-TROUTDALE-2	COMPLETION IN PROCESS
P02324	L0387: SE RICHLAND CITY OF RICHLAND & BENTON COUNTY PUD	COMPLETION IN PROCESS
P02478	L0388: CHENOWETH SUBSTATION RIVERTRAIL SUPPORT	COMPLETION IN PROCESS

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.

11.7 2021 System Assessment: Historical and Forecast Peak Load by Area

		Historical		2020 Assessment Near Term (2 yr)			2021 Assessment Near Term (2 yr)			2020 Assessment Near Term (5 yr)		2021 Assessment Near Term (5 yr)		2020 Assessment Long Term (10 yr)		2021 Assessment Long Term (10 yr)	
No.	LOAD AREAS	Historical Peak Load (MW)		2022 Peak Load Forecast (MW)			2022 Peak Load Forecast (MW)			2025 Peak Load Forecast (MW)		2026 Peak Load Forecast (MW)		2029 Peak Load Forecast (MW)		2030 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	6644	**9163**	5745	6843	9639	4000	6773	9456	7292	9687	6741	9142	7417	9870	7102	9195
2	Portland	4022	**4136**	2581	4453	4409	2637	4609	4972	4831	4728	4977	4932	4912	4918	5245	5169
3	Vancouver	860	**1069**	726	767	971	581	729	963	786	987	783	986	853	1011	860	1018
4	Salem - Albany	840	**895**	505	899	895	482	896	906	919	908	924	932	946	935	995	988
5	Eugene	605	**896**	554	656	866	446	702	938	680	879	755	936	717	886	715	945
6	Olympic Peninsula	742	**1284**	610	800	1322	498	779	1370	804	1324	804	1352	865	1394	844	1389
7	Tri-Cities	**1204**	1009	1123	1322	968	454	1331	954	1368	1038	1385	1007	1398	1055	1419	1048
8	Longview	643	**830**	763	566	732	438	510	679	574	746	530	710	585	776	554	772
9	Mid-Columbia	2373	**2452**	1251	2060	2843	1657	2403	2585	2437	2403	2538	2875	2514	2691	2668	3003
10	Central Oregon	544	**687**	450	591	759	335	610	720	652	800	665	804	764	967	823	945
11	SW Washington Coast	195	**375**	161	235	371	154	245	436	236	382	247	439	238	394	249	443
12	Spokane	896	**924**	677	909	865	462	898	871	919	882	914	901	953	892	934	910
13	Centralia/ Chehalis	157	**283**	178	178	258	154	207	290	176	260	207	290	183	263	207	290
14	NW Montana	259	**354**	190	271	370	185	278	388	289	384	293	409	302	406	309	431
15	SE Idaho - NW Wyoming	148	**291**	237	187	284	237	187	284	193	298	193	298	201	318	201	295
16	North Idaho	107	**187**	115	119	187	84	122	174	120	191	126	177	131	196	132	182
17	North Oregon Coast	173	**274**	118	176	278	94	178	282	178	282	181	286	180	287	187	286
18	South Oregon Coast	252	**505**	202	255	459	154	245	436	258	461	247	439	259	465	249	443
19	De Moss - Fossil	29	**44**	19	24	36	11	29	35	24	37	28	36	24	38	29	38
20	Okanogan	158	**232**	152	171	249	120	190	275	179	256	186	277	186	266	201	282
21	Hood River - The Dalles	250	**269**	292	374	396	204	302	322	522	535	500	500	542	575	653	663
22	Pendleton / La Grande	**146**	139	109	140	141	54	142	140	140	139	153	141	141	141	158	146
23	Walla Walla	**91**	77	76	113	82	39	105	72	135	113	139	111	141	120	137	108
24	Burley	**192**	153	115	216	159	115	217	159	228	164	221	163	248	170	224	168
25	Northern California	**107**	85	76	115	83	44	79	79	114	87	120	70	118	83	113	75
26	Klickitat	59	**77**	59	68	73	25	50	72	69	86	54	74	70	76	56	77
27	Umatilla	**555**	437	300	848	683	300	848	683	1076	910	1076	910	1150	1013	1150	1013

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

The following table lists the load areas in the 2021 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 2020 and 2021 System Assessments. The 2020 System Assessment used the forecasts shown for the years 2022 (2 year near term), 2025 (5 year near term), and 2029 (long term). The 2021 System Assessment used the forecasts shown for the years 2022 (2-year near term), 2026 (5-year near term), and 2030 (long term). This table indicates how the area load forecasts changed between the 2020 and 2021 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. Several of the load areas 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 down due to lower expected load growth. Also reference the footnotes to the table on the following page.

1. Hood River / The Dalles – The forecast includes requested load additions at Chenoweth and Quenett Creek Substations that haven't materialized yet.

2. Walla Walla – The forecast includes a 58 MW future load interconnection request at Worden Substation.

3. The cut plane for the Klickitat area was redefined in the 2021 System Assessment, so historic peaks and load forecast values may not appear to follow previous trends.

11.8 2021 System Assessment: Long-Term Peak Load Growth by Area

Load Areas		Historical Peak Load (MW)		2026 Peak Load Forecast Near Term 5 year (MW)		2030 Peak Load Forecast Long Term 10 year (MW)		Long-Term Annual Load Growth Rate 2025 Base, 2029 Future (%)	
		Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
1	Seattle / Tacoma / Olympia	6644	9163	6741	9687	7102	9195	1.0	-1.0
2	Portland	4022	**4136**	4977	4728	5245	5169	1.1	1.8
3	Vancouver	860	**1069**	783	987	860	1018	1.9	0.6
4	Salem / Albany	840	**895**	924	908	995	988	1.5	1.7
5	Eugene	605	**896**	755	879	715	945	-1.1	1.5
6	Olympic Peninsula	742	**1284**	804	1324	844	1389	1.0	1.0
7	Tri-Cities	**1204**	1009	1385	1038	1419	1048	0.5	0.2
8	Longview	643	**830**	530	746	554	772	0.9	0.7
9	Mid-Columbia	2373	**2452**	2538	2403	2668	3003	1.0	4.6
10	Central Oregon	544	**687**	665	800	823	945	4.4	3.4
11	SW Washington Coast	195	**375**	247	382	249	443	0.2	3.0
12	Spokane	896	**924**	914	882	934	910	0.4	0.6
13	Centralia / Chehalis	157	**283**	207	260	207	290	0.0	2.2
14	NW Montana	259	**354**	293	384	309	431	1.1	2.3
15	SE Idaho / NW Wyoming	148	**291**	193	298	201	295	0.8	-0.2
16	North Idaho	107	**187**	126	191	132	182	0.9	-1.0
17	North Oregon Coast	173	**274**	181	282	187	286	0.7	0.3
18	South Oregon Coast	252	**505**	247	461	249	443	0.2	-0.8
19	De Moss / Fossil	29	**44**	28	37	29	38	0.7	0.5
20	Okanogan	158	**232**	186	256	201	282	1.6	2.0
21	Hood River / The Dalles	250	**269**	500	535	653	663	5.5	4.4
23	Pendleton / La Grande	**146**	139	153	139	158	146	0.6	1.0
22	Walla Walla	**91**	77	139	113	137	108	-0.3	-0.9
24	Burley	**192**	153	221	164	224	168	0.3	0.5
25	Northern California	**107**	85	120	87	113	75	-1.2	-2.9
26	Klickitat	59	**77**	54	86	56	77	0.7	-2.2
27	Umatilla	**555**	437	1076	910	1150	1013	1.3	2.2
	All Areas			24987	28967	26414	30322	1.1	0.9

* The long-term annual growth rate is calculated as follows:
(Future Year in MW 2030 - Base Year in MW 2026)^(1/(2030-2026)) * 100 -100

11.9 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
7th 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