OPEN ACCESS TRANSMISSION TARIFF | ATTACHMENT K PLANNING PROCESS

2020 Transmission Plan

BONNEVILLE POWER ADMINISTRATION

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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 occurs on an annual basis and results in a public posting of this Transmission Plan. This plan documents the recommended 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, generation interconnection requests, and line-load interconnection requests. The various drivers and processes that occur during planning, as transmission needs are identified and plans of service are developed to meet those needs, are presented throughout this document. Most importantly, this T-Plan reflects our commitment to provide reliable service and meet our customer's needs efficiently and responsively. The intended audiences of this T-Plan are executives, organizations within BPA, and BPA customers and stakeholder of BPA's future transmission plans.

The **Transmission Needs section** 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 load area, path and intertie. This year three new loads areas were added which include Northern California, Klickitat County, and the Umatilla and Boardman area, for a total of 27 load areas. There are 14 paths and four interties. The Major Projects subsection provides a project requirement diagram and a more detailed description of the plan of service. 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 Raver 500/230 kV Transformer Addition has been studied as part of the sub-regional Puget Sound Area study team through ColumbiaGrid and is in the construction phase.
- The Longview Area 230/115 kV Transformer Addition is needed to maintain reliable load service in the area.
- 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 **2020 System Assessment** identified the following transmission needs which require corrective action. Those needs are the Libby 115 kV Substation Capacitor and Libby Power House 1 and 2 Redundant Transfer Trip in the North Idaho area, Morrow Flat 230 kV Shunt Reactor Addition in the Umatilla and Boardman area, Centralia – Roy Zimmerman Tap 69 kV Line Upgrade in the Centralia and Chehalis area, Tucannon River 115 kV 15 MVAR Shunt Reactor Addition in the Walla Walla area, Alvey – Dillard Tap 115 kV Line Upgrade in the Eugene area, and Troutdale 230 kV Series Bus Sectionalizing Breaker in the Portland area.

As we turn our focus from identifying specific transmission needs to the bigger **transmission planning landscape,** 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 is currently proceeding with the 2021 Power Plan and release is expected in 2021. To recap, the Power Council's Seventh Power Plan and Mid-Term Assessment shows there have been additional retirements of coal generation and larger-than-expected reduction in the cost of wind and solar generating technologies; the market for natural gas and electric prices are low; and gas, wind and solar plants are displacing coal generation. As a result of these factors, the region may have a potential shortfall in resources needed to meet electricity demand after 2020 when the Boardman and Centralia 1 coal plants retire. In addition, the following coal plants are expected to retire: North Valmy (1-2021, 2-2025), Colstrip (1 and 2-2022), Centralia (2-2025) and Jim Bridger (1-2028, 2-2032).

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 2020 Northwest Regional Forecast, released in March 2020 for years 2020-2030, states the trend of shifting towards fewer coal power plants and a greater reliance on wind, solar, and storage facilities will continue throughout the decade due to a combination of policy measures directed at reducing greenhouse gas emissions and the economics of inexpensive renewable resources. Some of these policy measures are government directives, but increasingly, electric utilities are setting their own aggressive emission-reduction or clean energy goals. These policies, coupled with declining wind, solar, and storage costs, illustrate why coal plants are being retired while wind, solar, and storage resources continue to be planned and developed.

Concerns over reliability and resource adequacy are rising in the Northwest. 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. According to NWPP, adequacy concerns were recently demonstrated on March 2019 when there was a gas pipeline interruption event and the west experienced extreme energy pricing throughout the entire interconnection. The NWPP continues to explore solutions to address the growing Northwest resource adequacy issue.

In addition to the broad industry issues described above, **The Western Energy Imbalance Market (EIM)** has gained significant interest as more of the region's utilities, public power utilities and power generators consider joining the market. BPA is currently determining how and under what conditions it could join the EIM, with a potential implementation date of April 2022. BPA's decision about whether to join the Western EIM is a five-part process. In 2019 BPA signed an implementation agreement with the CAISO and record of decision in a move toward joining the Western Energy Imbalance Market in 2022. With the signing of the implementation agreement and the record of decision, BPA concludes Phase II of the EIM decision process. The final decision on whether to join the EIM will follow a close-out letter to the region in the fall of 2021 and a corresponding public comment period.

Bonneville transitioned to **RC West** from Peak Reliability which is operated by the California Independent System Operator. For Bonneville, the transition is part of the grid modernization project undertaken by a large team of 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 if the agency decides to do so.

Federal Energy Regulatory Commission Order 845 adopted reforms to the *pro forma* large generator interconnection procedures (LGIP) and the *pro forma* large generator interconnection agreement (LGIA) pursuant to which generators can interconnect with electric utility transmission grids. FERC's goal is to improve certainty for developers of electric generating and storage projects that interconnect to the transmission grid, promote informed decisions about generator interconnection costs and timing, and enhance the interconnection processes. As part of BPA rate case settlement agreement, BPA posts large generation interconnection study metrics on a publically facing site and began implementing other 845 reforms in fiscal year 2020.

Finally, Transmission Planning conducts the planning process 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. Transmission Planning also strives to have a regionally coordinated system. In order to do just that BPA works with other regional entities such as the Pacific Northwest Utilities Conference Committee, the newly formed NorthernGrid, Northwest Power Pool, and RC West. The new regional planning organization, NorthernGrid, is intended to facilitate compliance with FERC requirements for utilities that are required to or elected to comply with such requirements, including cost allocation, when applicable.

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.

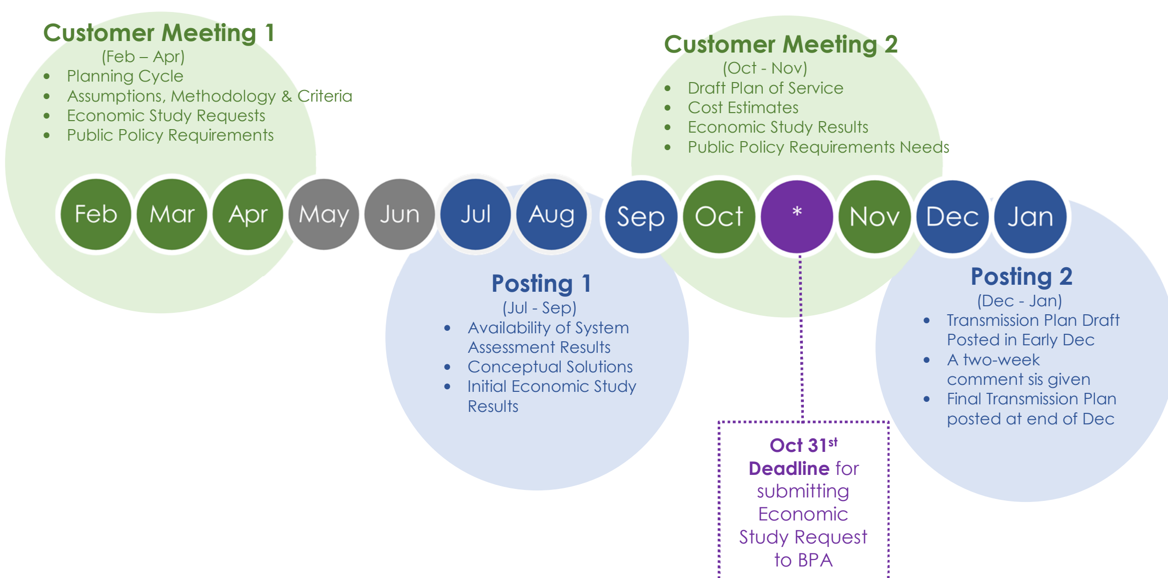


Figure 1 Attachment K Planning Cycle

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.

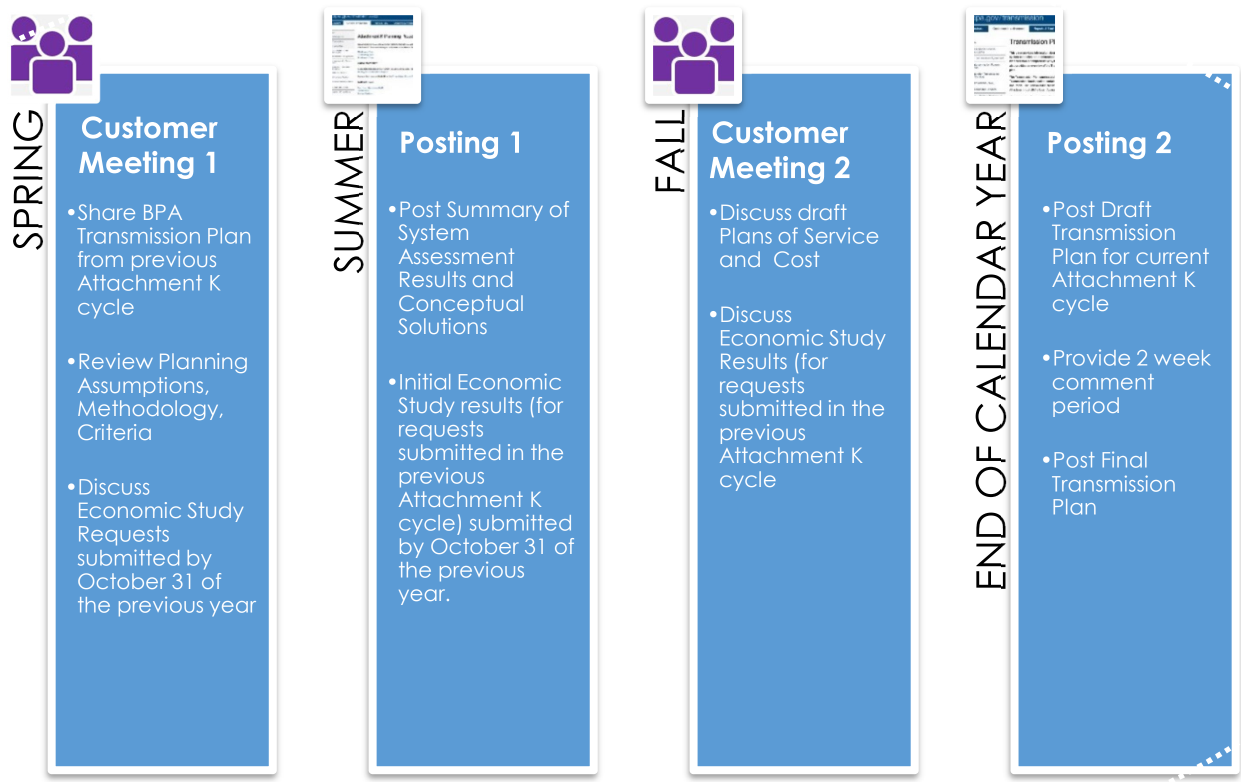


Figure 2 Attachment K Public Meetings and Postings Cycle Diagram

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: area planning and system assessment, customer requests for transmission service on BPA's system, and generator and line and load interconnection customer requests.

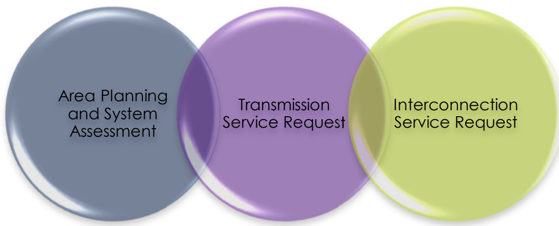


Figure 3 Planning Key Drivers Diagram

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 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 Areas, Path and Interties

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 planning standpoint, the power system can be viewed from a simplistic standpoint of 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.

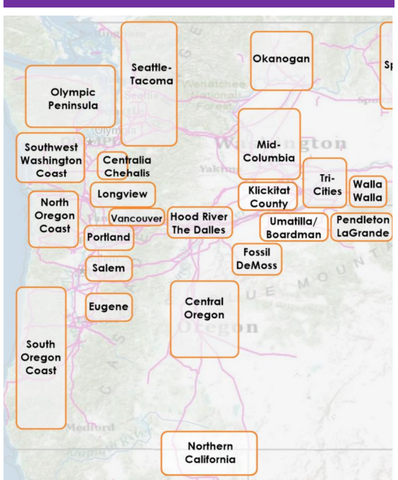
3.2.2 Paths

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

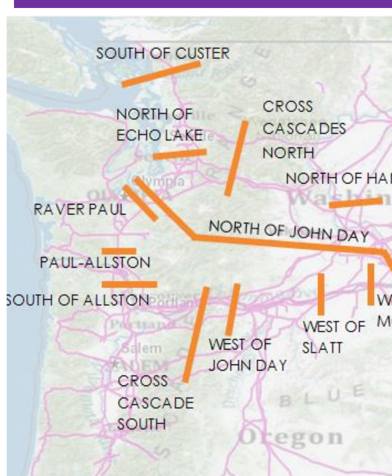
3.3.3 Interties

BPA is part of a 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 high capacity interties that interconnect the loads and resources in the Bonneville service area to loads and resources in these adjacent interconnected areas.

LOAD AREAS



PATHS

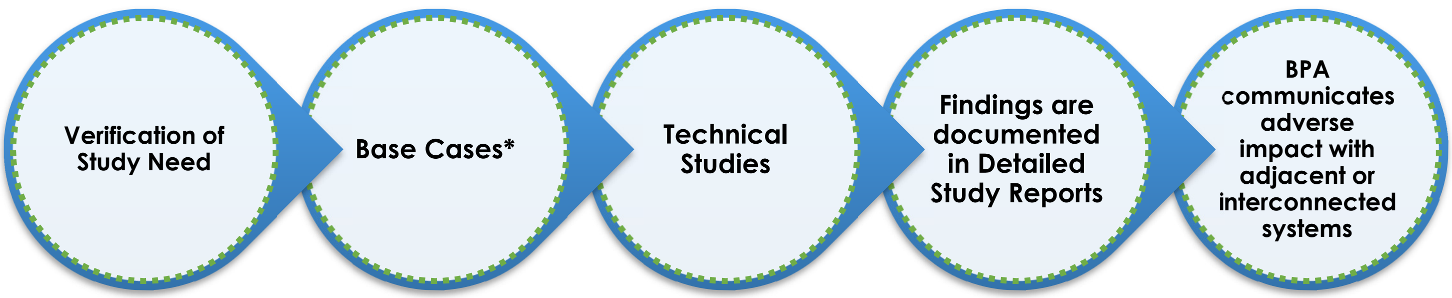


INTERTIES

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 serve expected system peak load conditions over the near-term (one to five years)and long-term (six to ten years) planning horizon while meeting the established reliability standards. The assessment covers a 10-year planning horizon. To meet NERC Planning Standard TPL-001-4, Corrective Action Plans are developed if studies identify potential performance deficiences. These corrective action plans are required in order to provide acceptable performance for contingency events as well as all lines in-service conditions. With these corrective action plans, BPA's system performance is acceptable and meets the requirements of the TPL-001-4 Standard. Deficiencies in meeting these standards are noted and addressed in the System Assessment Summary Report.

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 as the basis for compliance documentation.

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 pasty 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 will be 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 will result 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 good validation of the load forecast and topology used in studies for each load area should be done annually to verify the timing of corrective action plans.

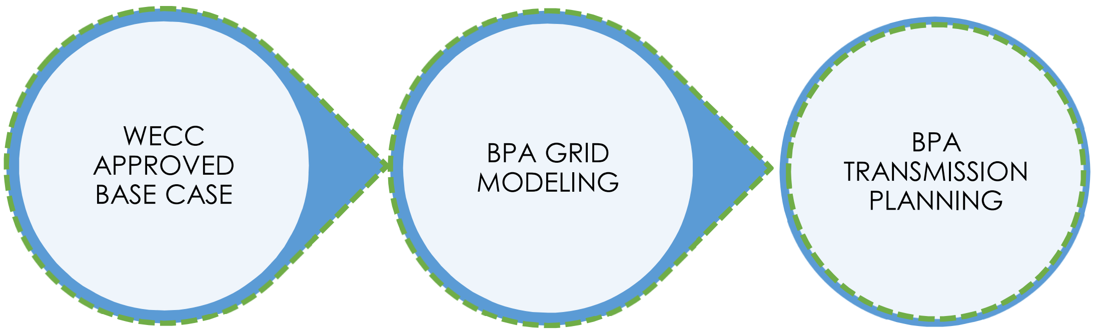
3.3.3 Base Cases

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. 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 loads and peak amounts for the long-term planning for BPA transmission 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 latest information. This is known as the seed case which is a generic case for all base cases. This generic case has 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 plans consider non-wire solutions, remedial action schemes, operating procedures or system additions/upgrades. 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 will be coordinated with non-wires team for feasibility of the solutions.

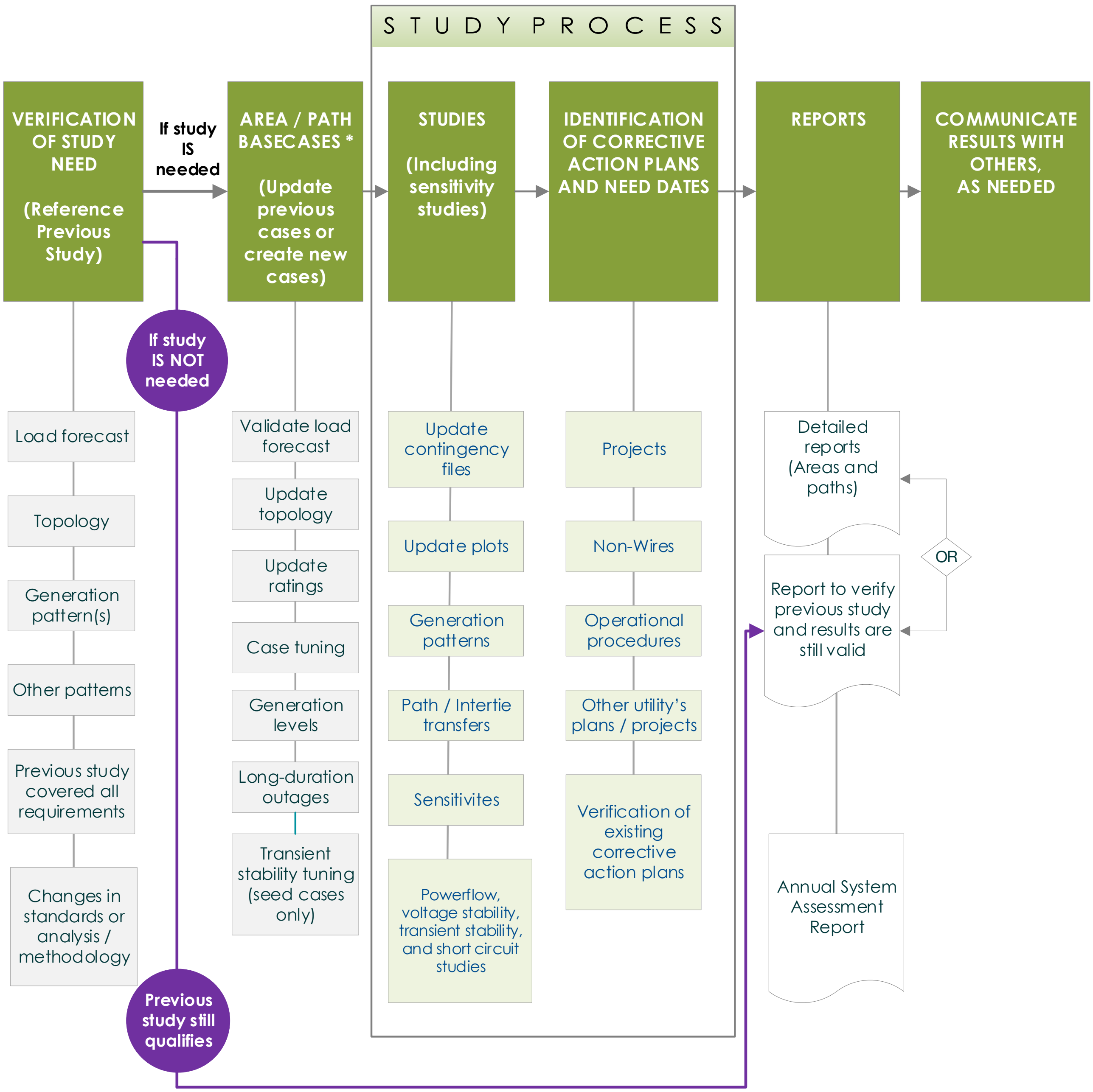
3.3.6 Technical Study Findings

After the study process is complete the findings are documented in detailed are and path study reports. In the event that a previous year's detailed report is still valid, a validation report will be 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

After the technical studies are completed and detailed reports are finalized the assessment report is shared with adjacent Transmission Planners (TPs) and Planning Coordinators (PCs). These are generally the TPs and PCs that are adjacent to or interconnected with the particular study area or path. If those TPs and PCs have systems adjacent to several BPA areas or paths, the respective planners for those areas and paths coordinate with regards to communicating the assessment results (e.g. sharing a single report or multiple reports, having a joint meeting with affected utilities, or several individual meetings, etc.). For those TPs and PCs where the assessment results show BPA has an impact on the adjacent system or the adjacent utility has an adverse impact on BPA's system, each area or path planner needs to resolve the issues with the adjacent TP and/or PC and document all communication and resolution. This can include face-to-face meetings to provide more detailed supporting documentation to the other utility in addition to the initial assessment results or perform joint studies to resolve common issues.

Transmission Planning
Area Planning Process – Detailed View



* Seed base case development process is done in alternate years.

Figure 6 Area Planning Process Diagram

3.4 Transmission Service - Commercial Assessment

BPA customers may make a request for long-term transmission service (TSR). Transmission Planning's tariff obligations for TSRs include Sections 19 and 32 of the BPA Open Access Transmission Tariff (OATT). These sections pertain to additional study procedures for firm point-to-point (PTP) and 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 NT 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 Transmission Service Requests (TSR) on the BPA network. The TSEP is a process to plan for, and grant transmission service to Network (NT) customers consistent with BPA's statutory authorities and BPA's tariff obligations while granting timely service to those customers seeking Point-to-Point (PTP) service. It is intended to be a repetitive and effective process that provides a balance in serving different customer classes (PTP and NT) on a non-discriminatory basis.

3.4.2 TSEP Cluster Study

Transmission Planning conducts the Cluster Study analysis of Transmission Service Requests (TSR) and determines the transmission reinforcement requirements to accommodate the transmission service. 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.

Cluster Study Cycle

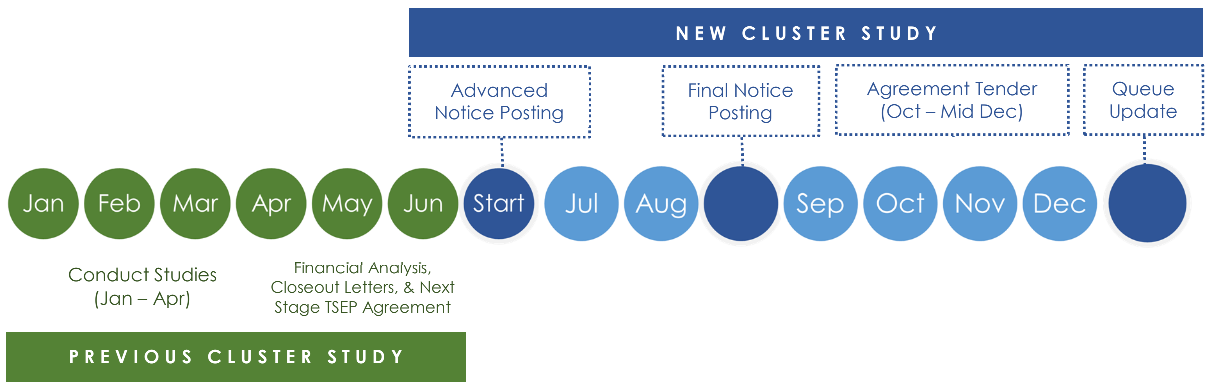


Figure 7 Cluster Study Cycle Diagram

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.

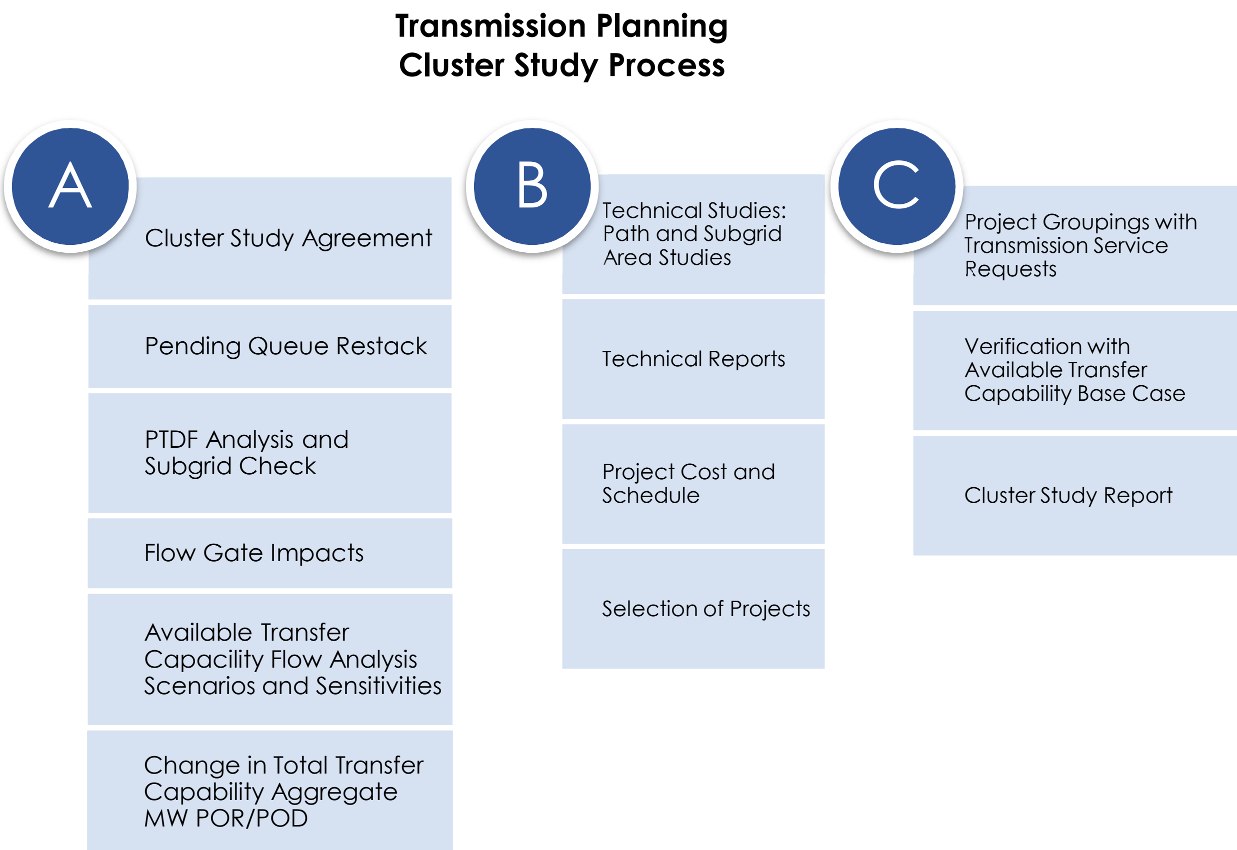


Figure 8 Cluster Study Process Diagram

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. Line or load interconnections (LLI) are typically for new load additions or to allow the customer to shift to different points on their system. Customers can also interconnect to existing points of interconnection such as an existing substation. BPA customers may also request 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.

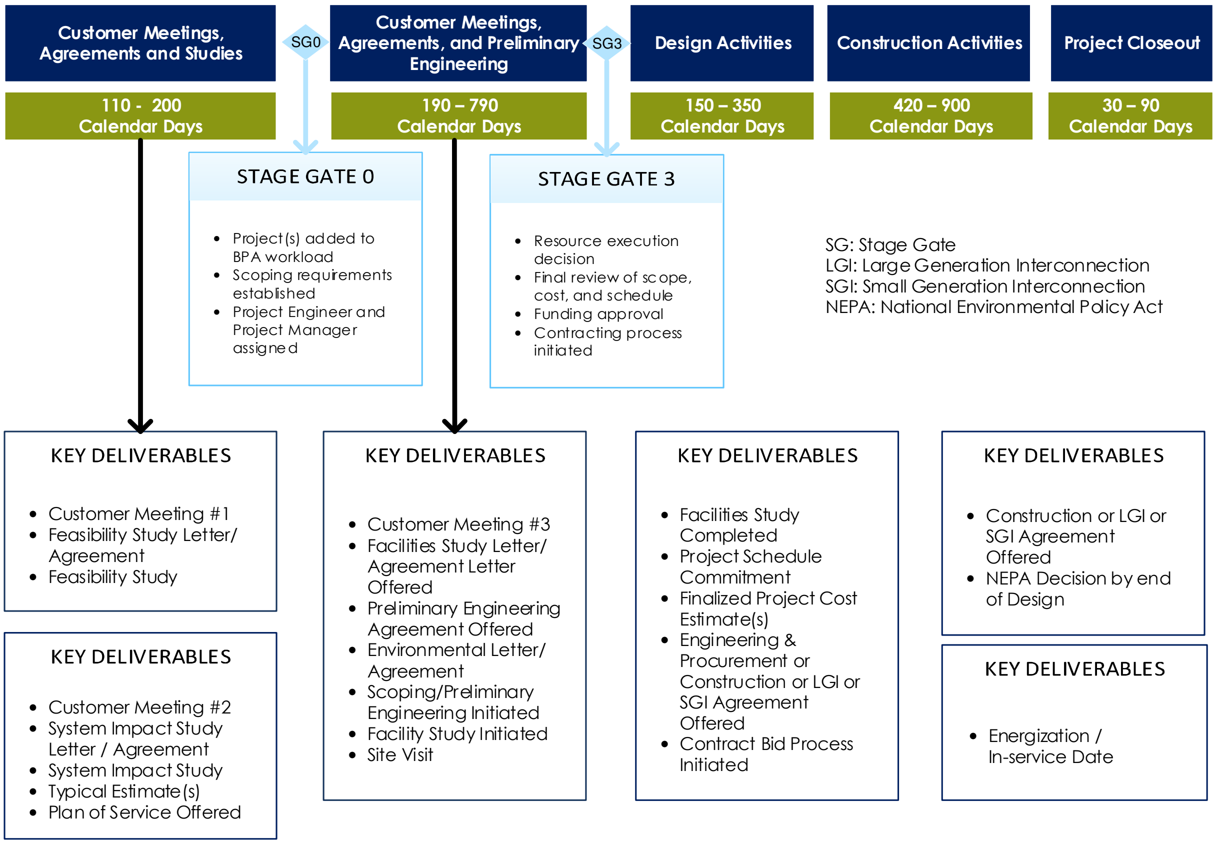


Figure 9 Interconnection Requests Process and Timeline Diagram

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 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 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 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 meeting with the customer.

3.5.6 Interconnection Study Process Diagram

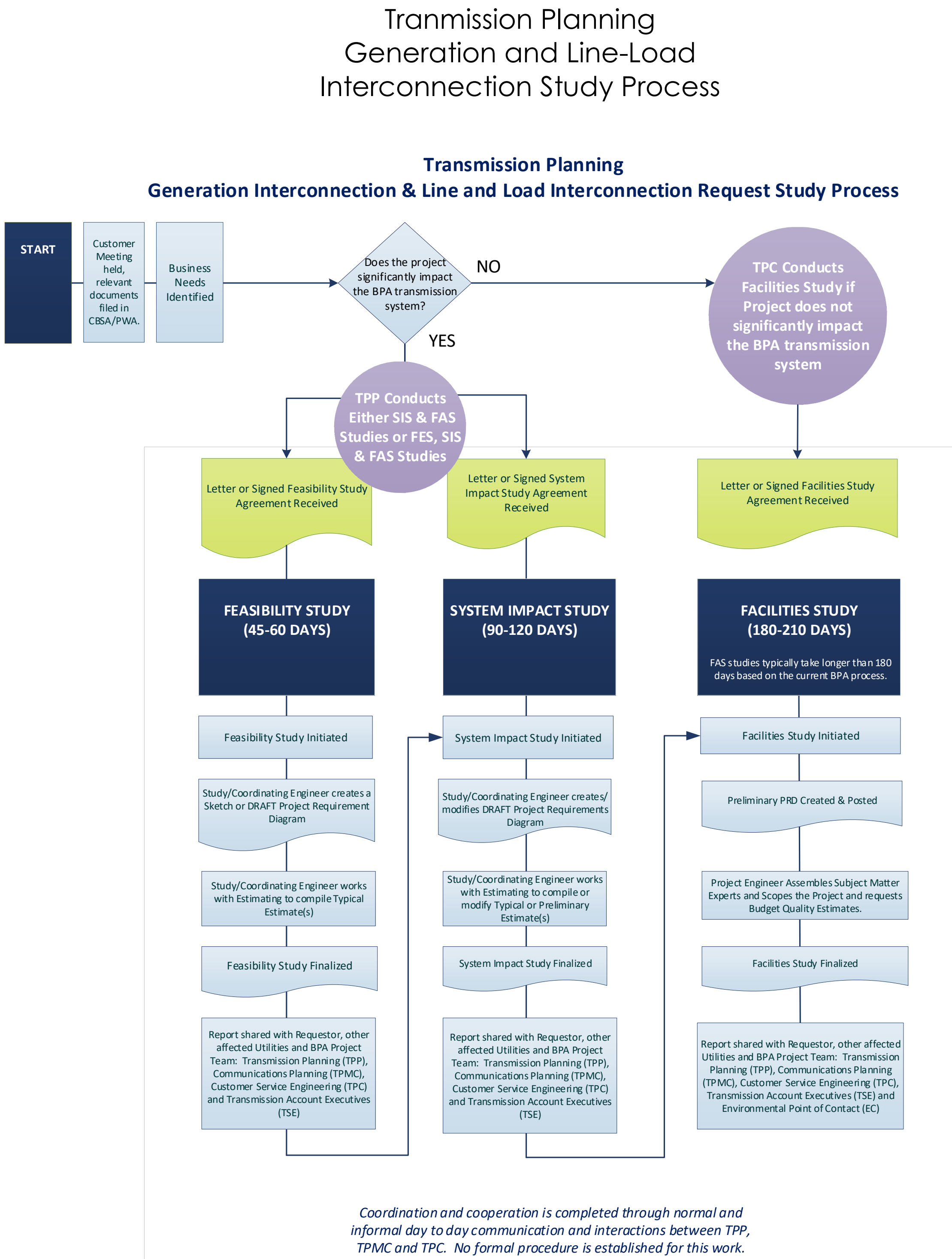


Figure 10 Interconnection Study Process Diagram

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 in each 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 in each of the 27 load areas. This internal report is used to help identify those areas which appear to have the greatest potential for non-wires measures. Typically the top three to five candidate areas are selected as the highest priority for further non-wires evaluation. These top candidate areas, together with the factors contributing to the ranking, are summarized in the annual Non-Wires Prioritization Report. This prioritization report is produced by Planning in collaboration with the 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

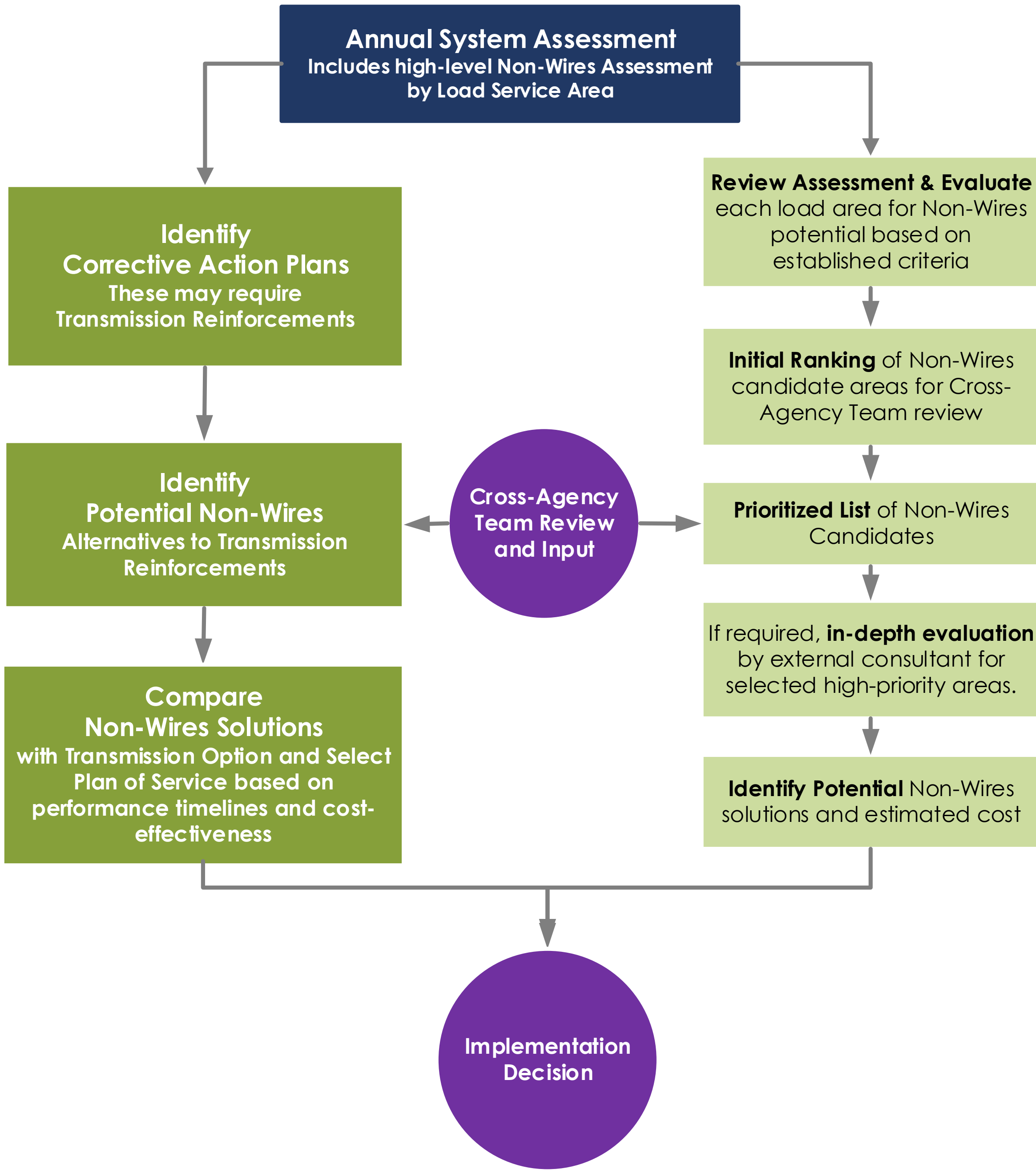


Figure 11 Non-Wires Planning Process Diagram

4. 2020 System Assessment

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 purpose of the TPL standard is to establish 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.

4.1 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.

4.1.1 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 2020 System Assessment adequately covered these scenarios and required sensitivities. The base cases used for the steady state portion of the 2020 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:

2020 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	25HW	Winter	Peak	Near term (5 year) expected winter peak
24HS2	2025	25HS	Summer	Peak	Near term (5 year) expected summer peak
29HW1	2029	29HW	Winter	Peak	Long-term (6-10 year) expected winter peak
29HS1	2029	29HS	Summer	Peak	Long term (6-10 year) expected summer peak

Figure 12 Steady State Base Case Assumptions Table

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 2020 System Assessment adequately covered these scenarios and required sensitivities. The base cases used for the stability portion of the 2020 System Assessment included the following:

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

4.1.2 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.

4.1.3 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.

4.1.4 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.

4.1.5 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 that were modeled.

4.2 Methodology

For the 2020 System Assessment, BPA's transmission system was divided into 27 load service areas. Each area was assessed under the limiting system conditions for that area. Each area was then analyzed in order to identify any potential performance deficiencies and determine possible corrective action plans or confirm existing corrective action plans and timing 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.

4.2.1 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.

4.2.2 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

4.2.2.1 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.

4.2.2.2 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).

4.2.2.3 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.

4.2.2.4 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.

4.2.2.5 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.

4.2.3 Assessment

4.2.3.1 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.

4.2.3.2 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.

4.2.3.3 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.

4.2.3.4 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.

4.2.3.5 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.

4.2.3.6 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.

4.2.4 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.

4.2.5 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

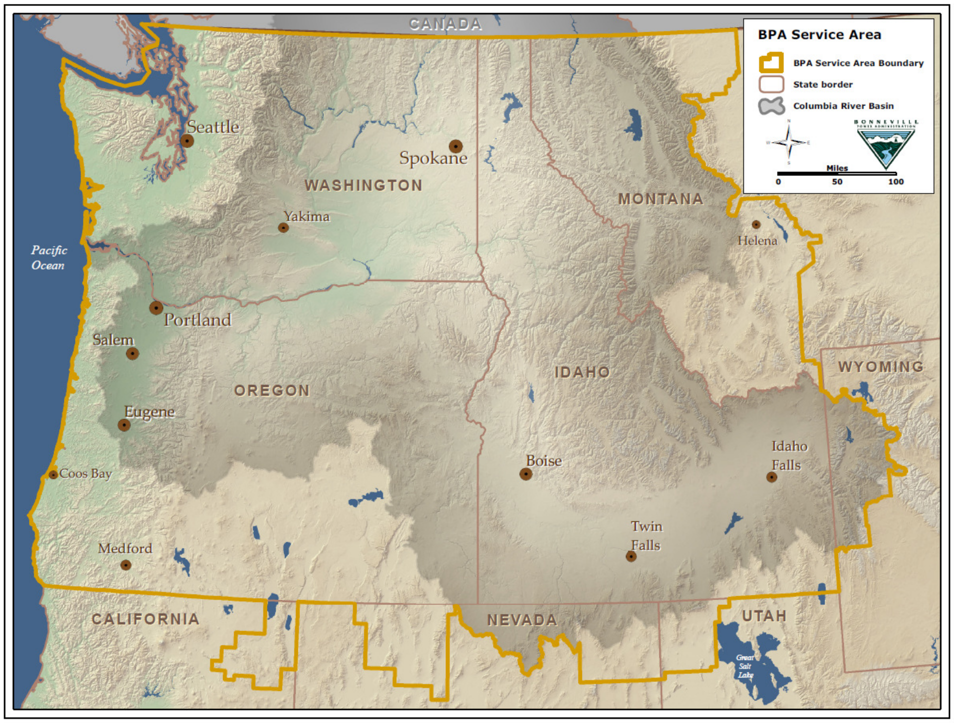


Figure 16 BPA Transmission Lines

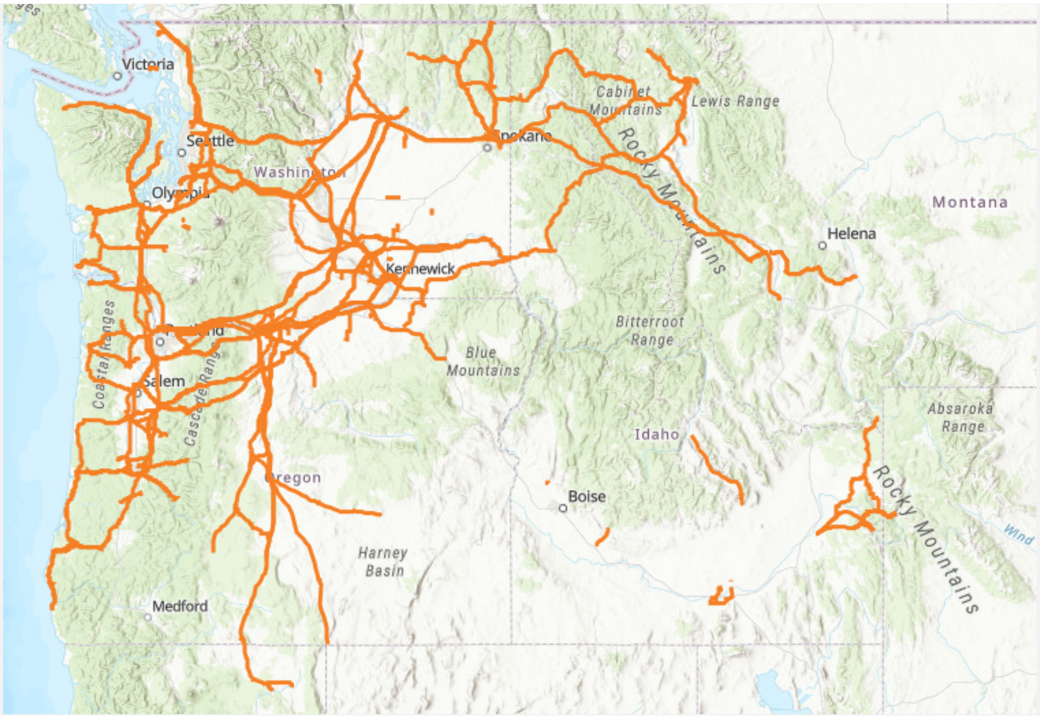


Figure 17 BPA Public, Tribal and Investor Owned Utility Service Areas

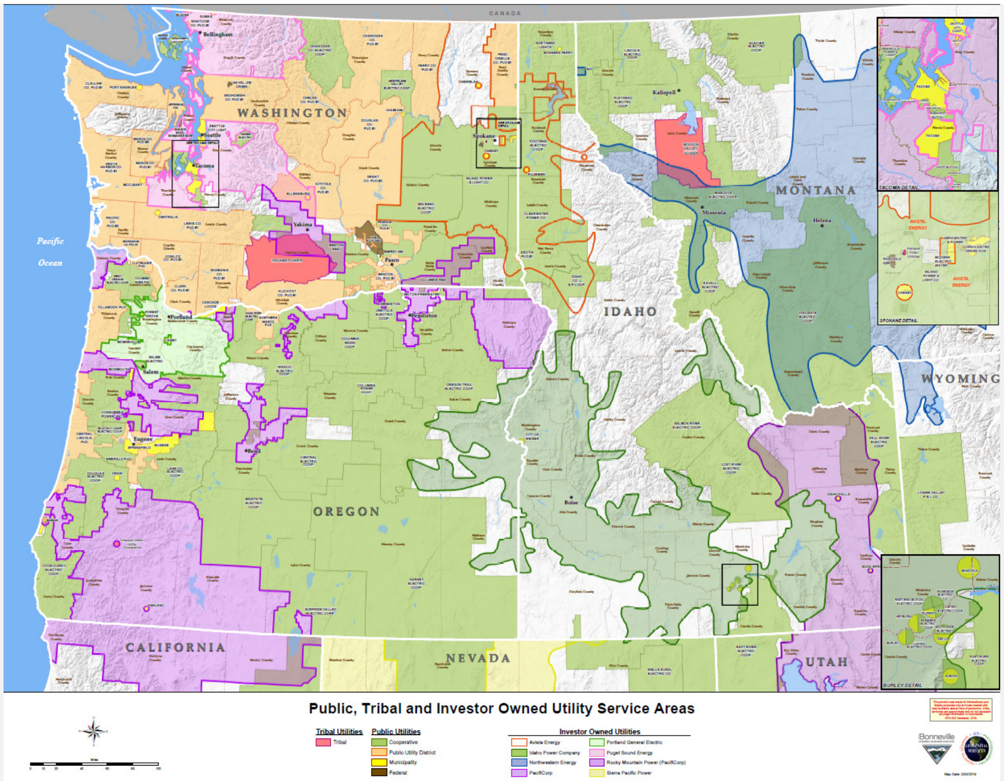
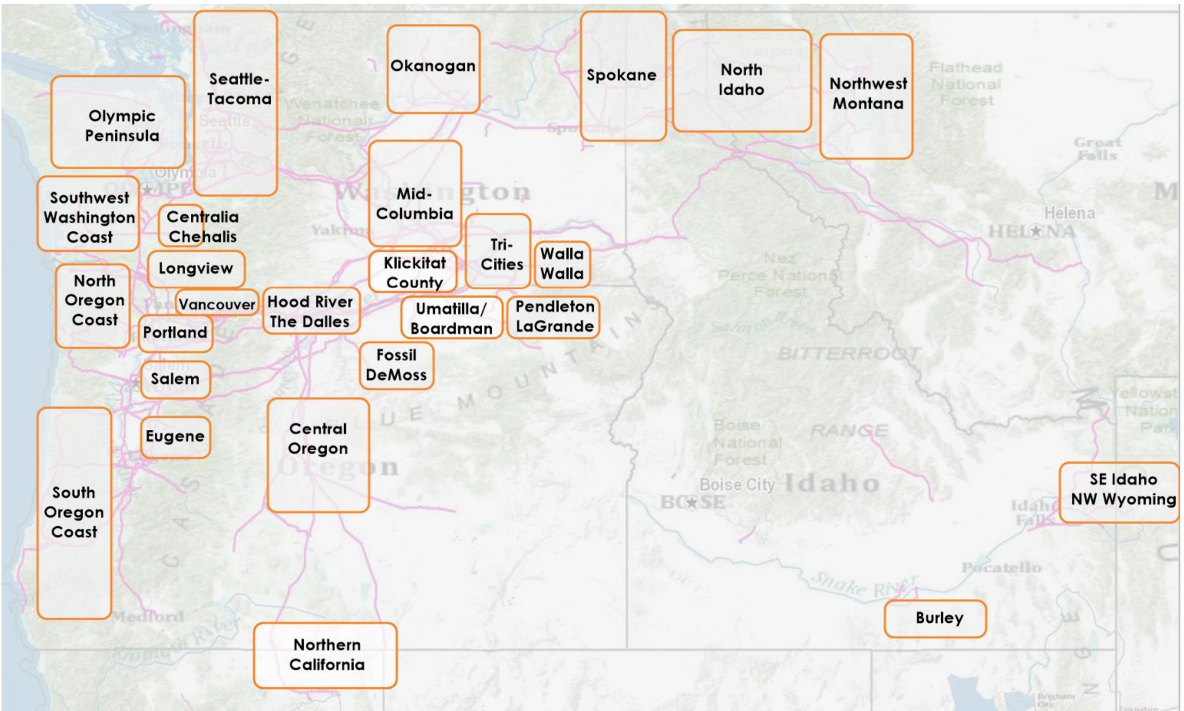


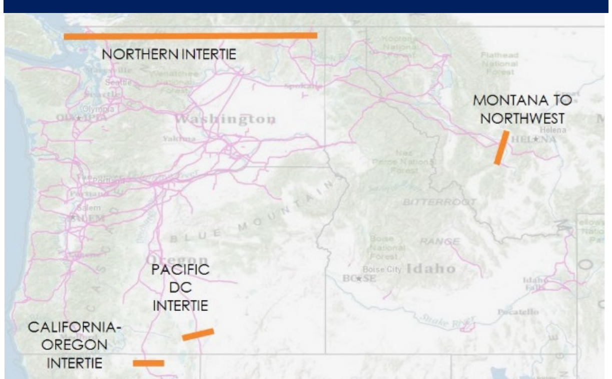
Figure 18 Main Stem of Columbia and Lower Snake Rivers Map – 31 Federal Dams

5.2 Transmission Planning Load Service Areas

Figure 19 Load Service Areas, Interties and Paths Maps



INTERTIES



PATHS

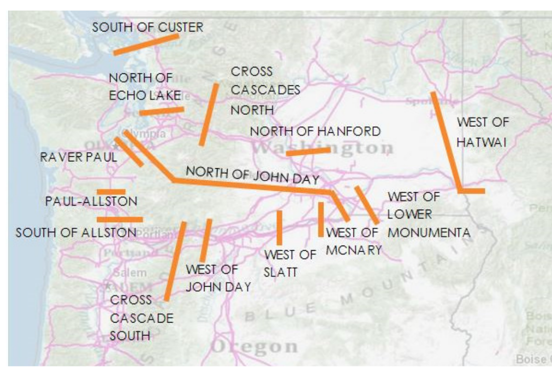


Figure 20 List of Load Services Areas, Paths and Interties

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, LaGrande
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

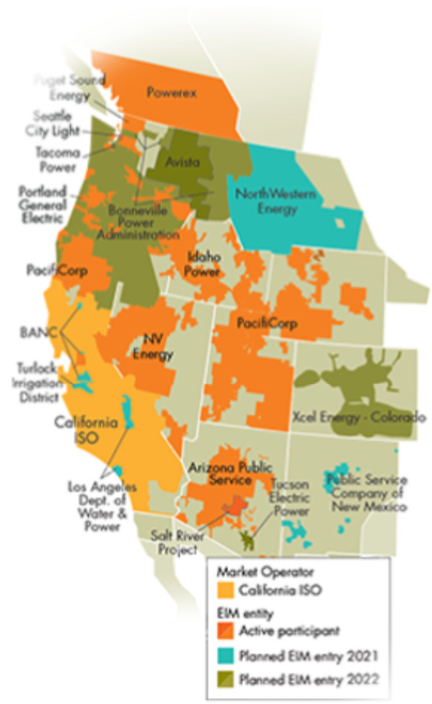
1	North-of-John Day	12	West-of-Cascades North
2	North-of-Hanford	13	West-of-Hatwai
3	West-of-McNary	14	West-of-Lower Monumental
4	West-of-Slatt		
5	West-of-John Day		
6	Raver-Paul		
7	Paul-Allston	**Interties**	
8	South-of-Allston	1	California Oregon Intertie
9	West-of-Cascades South	2	Pacific DC Intertie
10	North-of-Echo Lake	3	Northwest-Canada
11	South-of-Custer	4	Montana to Northwest

6. Transmission Planning Landscape

Transmission Planning's goal is to provide a reliable, flexible, environmentally responsible, and cost effective transmission system. Transmission Planning conducts the planning process 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. Transmission Planning also strives to have a regionally coordinated system. For instance, Transmission 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 is currently determining how and under what conditions it could join the EIM, with a potential implementation date of April 2022. It is important to note that the Western EIM is not a regional transmission operator. BPA is not joining an RTO. BPA would preserve its autonomy and retain authority over transmission planning, day-ahead marketing, and transmission system and balancing authority operations if it were to join the EIM.

For more information on BPA's EIM Stakeholder process and meetings please visit:
https://www.bpa.gov/Projects/Initiatives/EIM/Pages/Energy-Imbalance-Market.aspx

For more information on BPA's Grid Modernization Initiative please visit:
https://www.bpa.gov/goto/GridModernization

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.

6.2.1 2021 Power Plan Status

The 2021 Power Plan is scheduled to be released in final form in early 2021. At the September 2020 Power Committee meeting, staff reviewed issues with modeling that is expected to delay the draft plan release date.

6.2.2 Seventh Power Plan and Mid-Term Assessment Recap

The Power Council's Seventh Power Plan (Plan) was published in 2016. The purpose of the Plan is to provide recommendations so that regional entities can take specific action to implement the plan focusing on the early years of the 20-year plan. The Seventh Power Plan **Mid-Term Assessment** (Assessment) was final in early 2019. The purpose of the Assessment is to review the region's progress in implementing the Seven Northwest Power Plan.

As a recap, the Plan pointed to energy efficiency in the lead role in meeting the region's energy needs, followed by demand response and increased use of existing natural gas-fired plants as regional coal plants are retired. The Council's analysis shows that energy efficiency can meet the region's expected load growth, an average increase of 0.5 to 1.0 percent each year through 2035.

The Plan recommends continued improvement in system scheduling and operating procedures across the region's balancing authorities. The Plan stated the region also needs to invest in its transmission system to improve market access for utilities, reduce line losses, and help develop cost-effective renewable generation. The Seventh Plan calls for the region to be prepared to develop significant demand responsive resources by 2021 to meet additional winter peak needs. The Northwest's power system has historically relied on the hydro system to provide peaking capacity, but under critical water and weather conditions, additional capacity is needed to have sufficient resource adequacy in the region.

An important finding in the Seventh Power Plan is that future electricity needs can no longer be adequately addressed by only evaluating average annual energy requirements. Planning for capacity to meet peak load and flexibility to provide within-hour, load-following, and regulation services will also need to be considered.

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 2020 Northwest Regional Forecast, released in March 2020 for years 2020-2030, states the trend of shifting towards fewer coal power plants and a greater reliance on wind, solar, and storage facilities will continue throughout the decade due to a combination of policy measures directed at reducing greenhouse gas emissions and the economics of inexpensive renewable resources. Some of these policy measures are government directives, but increasingly, electric utilities are setting their own aggressive emission-reduction or clean energy goals. These policies, coupled with declining wind, solar, and storage costs, illustrate why coal plants are being retired while wind, solar, and storage resources continue to be developed and planned. In addition, concerns over reliability and resource adequacy are rising in the Northwest. 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.

6.3.1 Load Forecast Comparisons

PNUCC reports the summer peak growth is 0.92% per year and remains stronger than winter peak growth of 0.75% per year. Annual average energy growth is 0.90% per year. The figure bellows shows the load comparisons in megawatts.

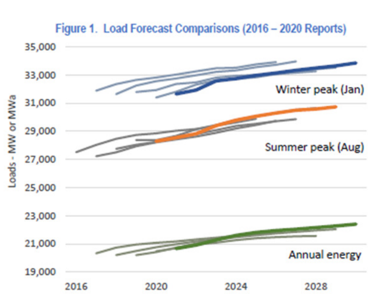
6.3.2 Annual Energy Load by Growth Rate

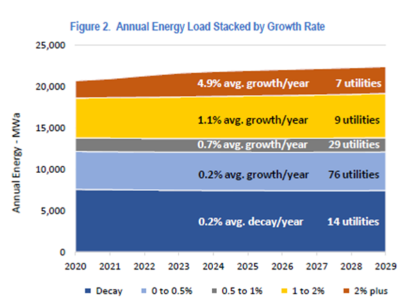
Historically load forecasts vary considerably by utility. The majority of forecasted growth is within seven utilities' making up 10 percent of the region's total load in 2021. There are14 utilities (37% of 2021 total load) where expect load decreases. Finally, the remaining utilities anticipate load growth from zero to two percent per year, with the greatest number of utilities expecting load growth under 0.5 percent per year.

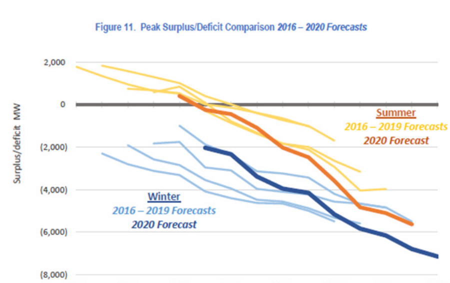
6.3.3 Summer Peak Need Reaching Winter Need Level

In the 2020 forecast the winter and summer peak deficits increased compared to last year's predictions, especially in the latter years. This is due to increased resource retirements and similar load expectations as last year's *forecast*. PNUCC's figure 3 shows how the summer deficit is moving closer to the level of the winter deficit. In the *2016 Forecast* summer was less of a concern. Today it is reaching a similar magnitude to the winter projections. This trend is largely due to the differences in expectations for load growth, with summer peak forecasts holding steady or increasing while the winter peak forecasts slipped in each of the 2016 through 2019 reports.

Source: *2020 Northwest Regional Forecast*







6.4 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.

6.4.1 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.

6.4.2 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.

6.5 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.

6.6 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.

In 2019 NWPP embarked on a mission, coordinating activities relating to a comprehensive review of resource capacity adequacy in the NWPP region. Adequacy concerns were recently demonstrated on March 2019 when the west experienced extreme energy pricing throughout the entire interconnection. As part of their comprehensive review, they held a meeting that resulted in the creation of two teams: The first team was tasked with recruiting regional executives to serve as an advisory group providing direction and oversight to a proposed capacity adequacy assessment forum. The second team is tasked with developing a one page description defining the scope of a limited work product comparing and contrasting several capacity adequacy studies that have been completed to date.

A recent 2020 update shows the NWPP Resource Adequacy Program development process includes a Stakeholder Advisory Committee (SAC) consisting of representatives from 21 organizations. Members of the SAC are carefully evaluating and discussing each phase of the program design. This video update touches on some of their perspectives on several broad topics related to a resource adequacy program.

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 expects to release an initial draft regional tranmission plan in January, a revised-draft plan in February, and a final-draft plan with cost allocation in September. The final regional tranmission plan is expected in December, 2021.

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.

7. Transmission Needs

On an annual basis, Transmission Planning provides a ten-year plan for reinforcements to BPA's transmission system and 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 any 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.

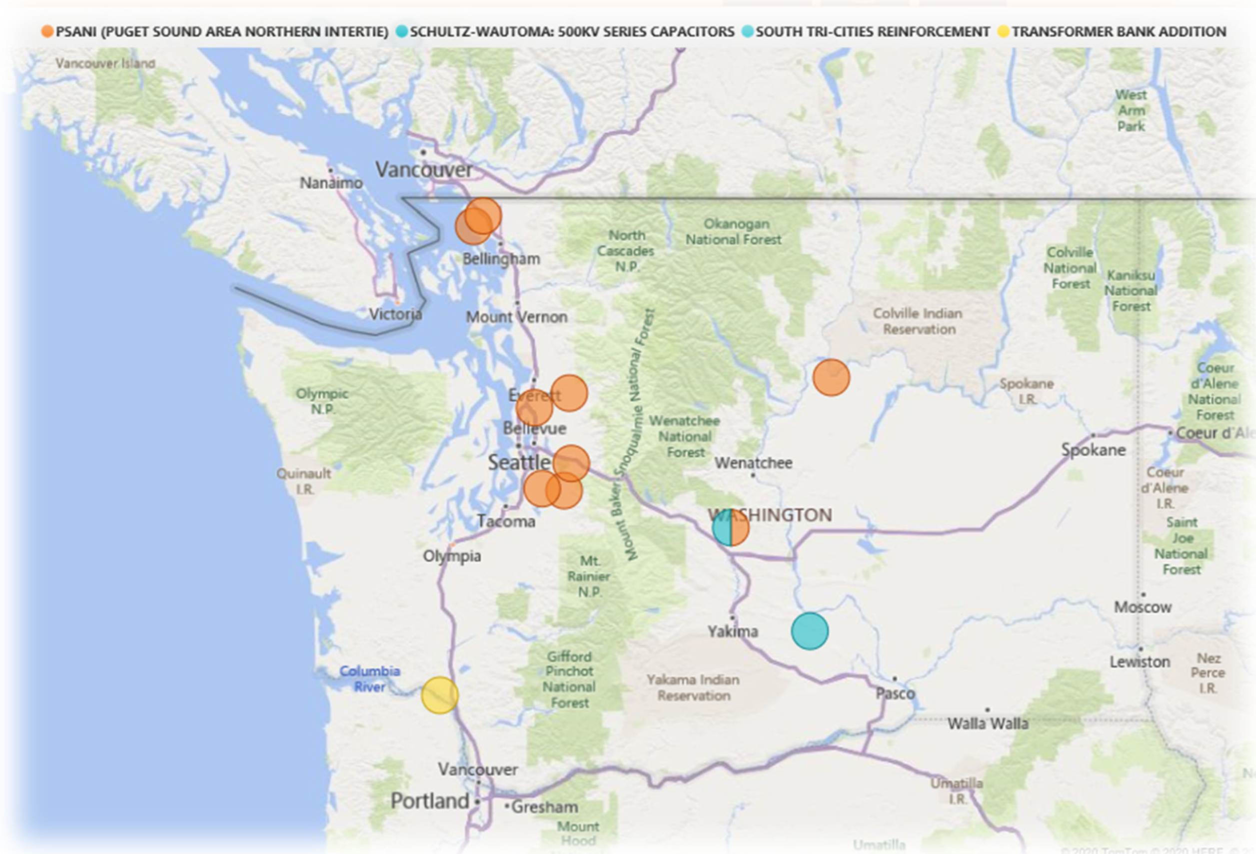
- Projects required to provide load service and meet Planning Reliability Standards,
- Project to improve operational or maintenance flexibility,
- Projects required to meet requests for transmission service,
- Projects required to meet requests for Generator Interconnection service, and
- Projects required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

NOTE: 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.

7.1 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. This section provides more detailed information about each of these major transmission projects.



7.1.1 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 of service for maintenance during the summer since plans must be in place to address the potential loss of a second element.

The plan of service taps the Ashe-Slatt No.1 500 kV line and builds a new Tumbleweed substation, creating a three-terminal 500 kV line. The new Tumbleweed 500/115 kV transformer then connects to a new, six mile long 115 kV line to Red Mountain substation.

The project is currently in the scoping phase and the estimated project costs and schedule will be refined as the project progresses through the scoping phase.

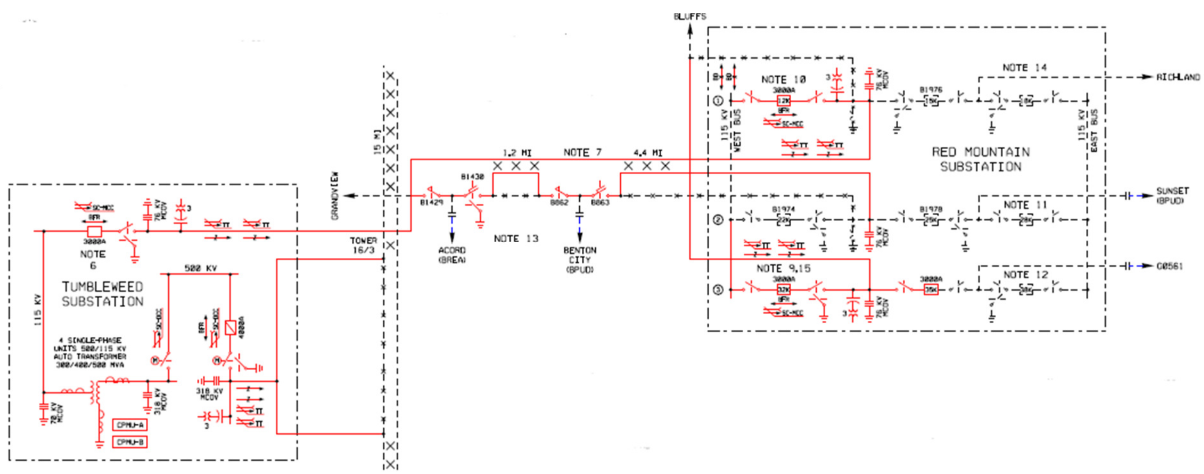


Figure 21 South Tri-Cities Reinforcement Project Requirement Diagram

7.1.2 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 230 kV substation will be developed adjacent to the existing 500 kV 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 2 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 scheduled energization date is 2022 and estimated cost is about $90 million. The project is in the construction phase.

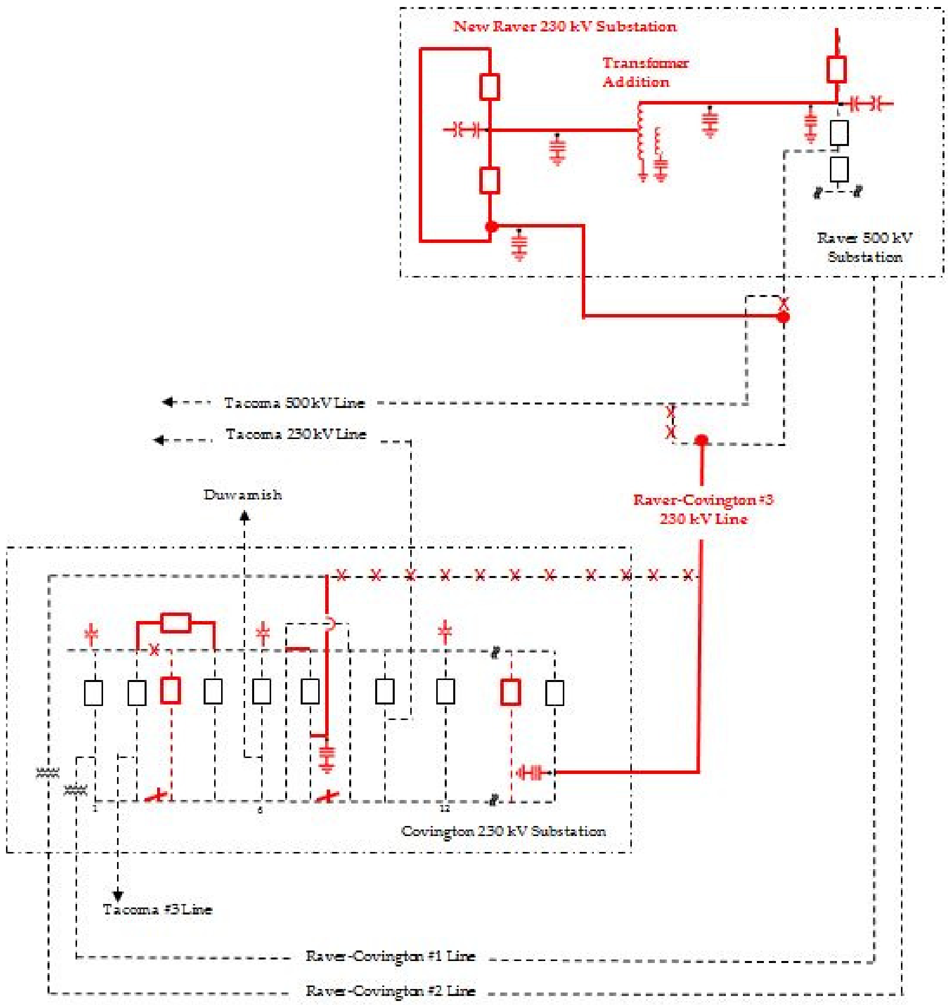


Figure 22 Raver 500/230 kV Transformer Addition Project Requirement Diagram

7.1.3 Longview Area 230/115 kV Transformer Addition

This project installs a second 230/115 kV 300 MVA 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 Cowlitz County. The scheduled energization date is 2021 and the estimated cost is about $15 million. This project is in the design phase.

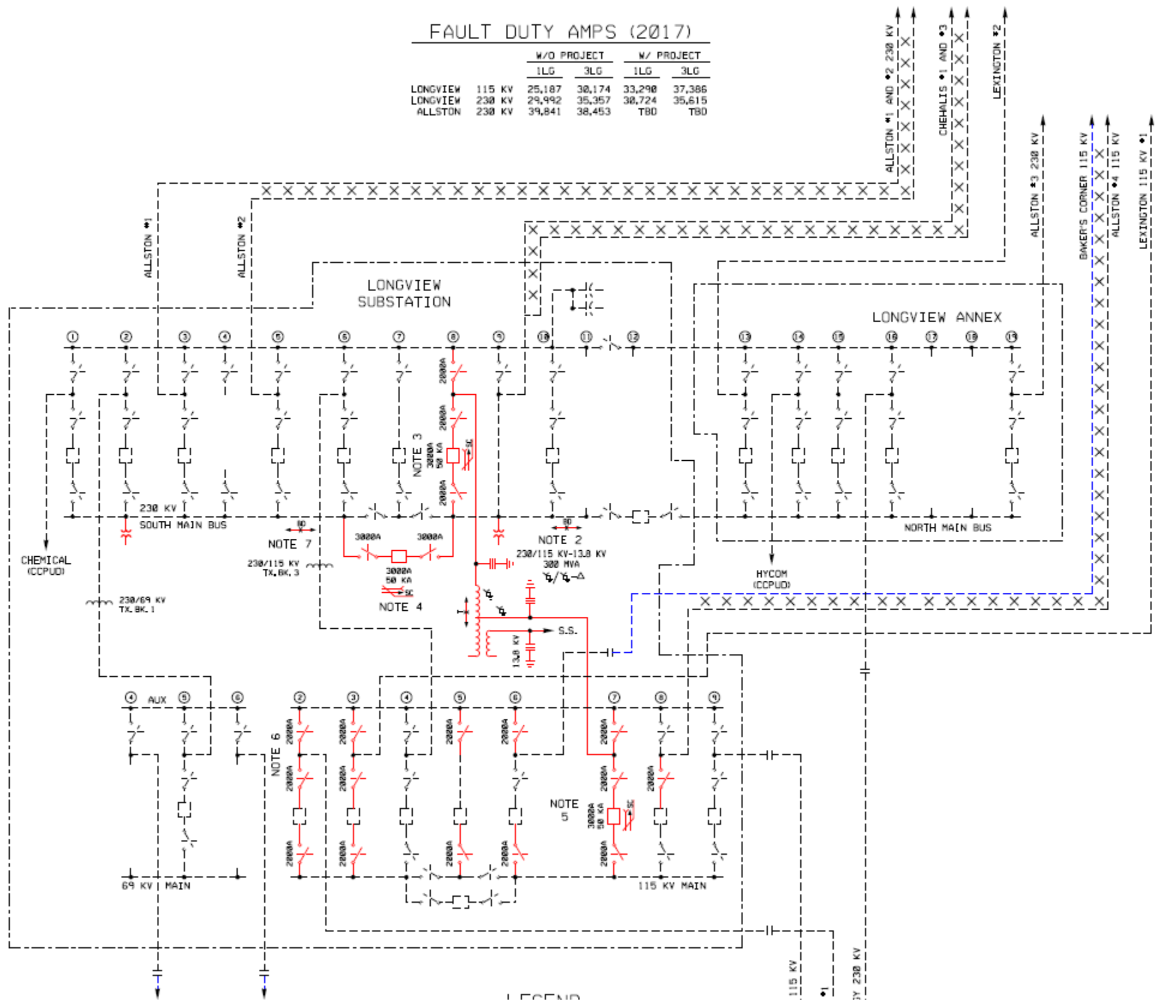


Figure 23 Longview Area 230/115 kV Transformer Addition Project Requirement Diagram

7.1.4 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. The proposed energization date is 2022 and the estimated costs are about $30 million.

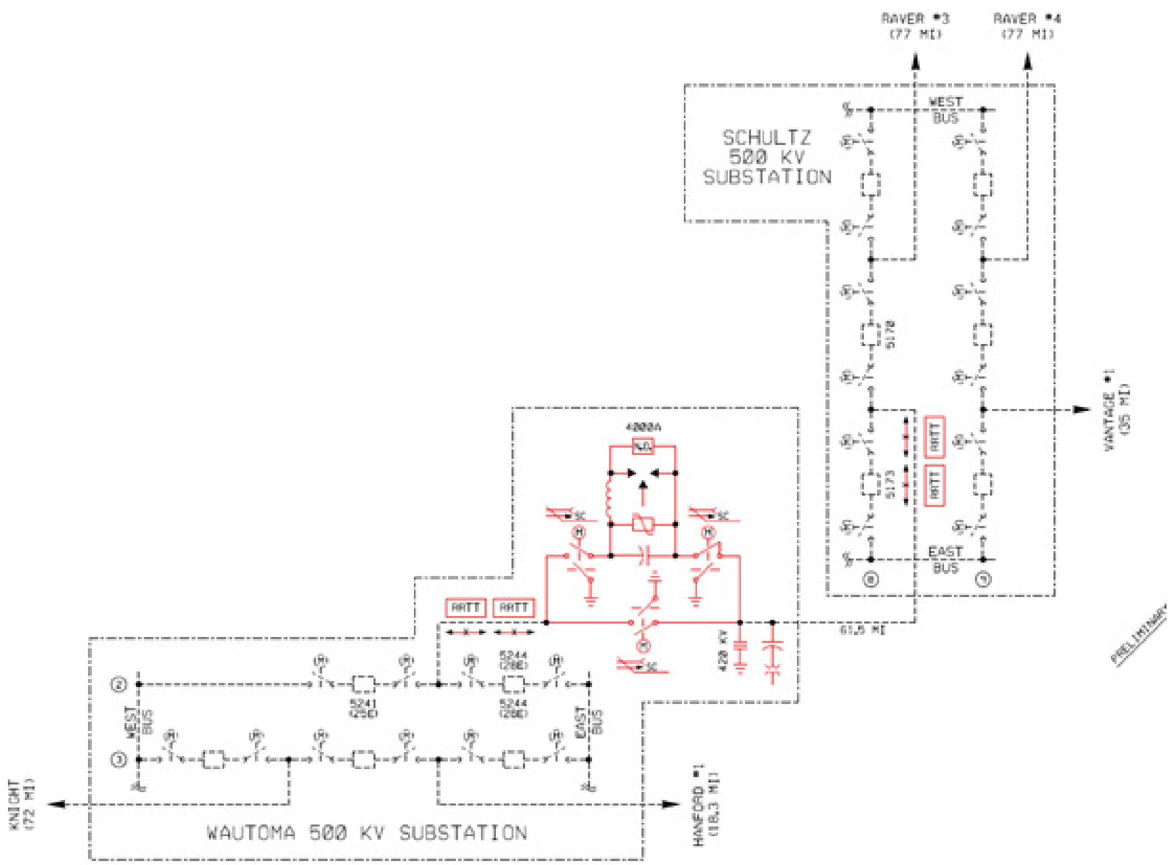


Figure 24 Schultz-Wautoma 500 kV Series Capacitor Addition Project Requirement Diagram

7.2 Transmission Needs by Load Service Area

The following subsections describe the transmission needs for the 27 load service areas summarizing the system conditions assessed including generation and loading conditions as well as the proposed plan of service for the load service areas. In addition, 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. For an area with no recommended project the potential for a non-wires measure to slow or flatten the load growth in the area can defer the need for transmission reinforcements that may be identified in the future.

7.2.1 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)

Seattle/Tacoma/Olympia Area

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 are has approximately 750 MW of local generation.

Seattle/Tacoma/Olympia Area Load							
Historical Peak Load (MW)		Five-Year Load 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
7056	9682	7292	9687	7417	9870	0.3	0.4

Non-Wires Assessment

For the Tacoma area, the load reduction required to keep the winter peak loads flat is 20 MW/year. For summer, the load reduction required to keep peak loads flat is 137 MW/year (for Seattle) and 12.67 MW/year (for Tacoma). This load reduction is assumed for the total area, across all local utilities (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: 2021

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

- Description: This project adds 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: $2,500,000
- Expected Energization: 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 adds 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.
- Expected Energization: See above.

Raver 500/230 kV Transformer (PSANI)

- Description: This project adds a 1300 MVA, 500/230 kV transformer at Raver Substation. This project is part of the overall Puget Sound Area/Northern Intertie (PSANI) Regional Reinforcement Plan. This is 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
- Expected Energization: 2022

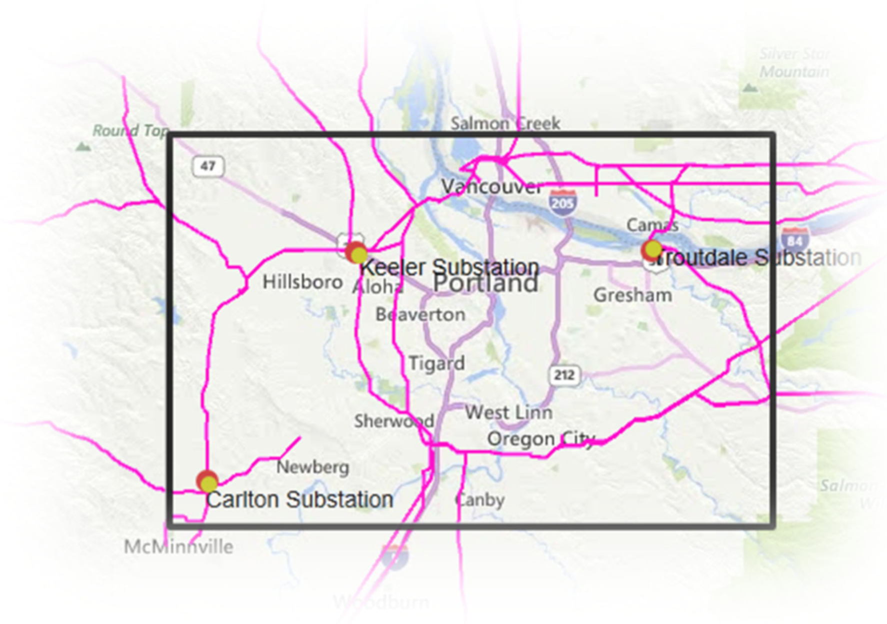
Recently Completed Plans of Service

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

7.2.2 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

Portland Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
4022	4136	4831	4728	4912	4918	0.3	0.8

Non-Wires Assessment

The Portland load area has historically experienced peak loads during the winter seasons but has recently experienced similar peak load magnitudes during the summer seasons. Beyond the long term planning horizon, trends indicate that Portland may become a summer peaking load area as Portland area summer loads are growing faster than winter loads.

More than 80% of the total load in the Portland area is served by utilities other than BPA such as Portland General Electric (PGE) and PacifiCorp West (PACW). Both entities plan for and include energy efficiency (EE) measures and non-wires alternatives in their respective Integrated Resource Plans and Transmission Plans.

Re-dispatch of generation along the I-5 corridor is the single most effective non-wires solution to congestion in the Portland area. In addition, many of the plants most effective for Portland area relief are already part of the South of Allston (SOA) remedial action scheme (RAS) which trips local area generation. Therefore, the RAS serves as a de-facto form of generation re-dispatch. As Willamette Valley and Southwest Washington utility generating plant regulations change and renewable energy requirements in Oregon and Washington increase, it may become less feasible to rely on generation re-dispatch as most of the I-5 generation facilities are thermal generators.

Non-wires alternatives may be feasible for projects in the Portland area which have relatively long lead times (> 5 years) and/or high capital costs. The Portland load area also experiences moderate load growth, contains industrial loads, and the local utilities have some experience participating in distributed generation and demand response projects.

Proposed Plans of Service

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: $1,800,000
- Expected Energization: 2022

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

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 serve to the area.
- Estimated Cost: $2,000,000
- Expected Energization: 2025

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 serve to the area.
- Estimated Cost: $2,000,000
- Expected Energization: 2029

Recently Completed Plans of Service

Keeler 500/230 kV Transformer Re-termination

- Description: This project re-terminates the Keeler 500/230 kV transformer from the west bus section to the east bus section.
- Purpose: This project improves the balance of the loads and sources to the Keeler 230 kV bus.
- Estimated Cost: $28,000,000
- Expected energization: 2020

7.2.3 Vancouver Area

The Vancouver area transmission system serves Clark County PUD customers 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

Vancouver Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
860	1069	786	987	853	1011	1.6	0.5

Non-Wires Assessment

The area historically has winter and summer peak loads with winter peaks being significantly higher. Forecasts show that winter peaks will continue to exceed summer peaks in the future, even though the opposite trend is occurring in the neighboring Portland load area. Approximately 7 MW of incremental load relief per year would be needed in order to maintain a flat rate of load growth for the Vancouver area. Presently, there are no transmission reinforcements proposed in the area within the ten-year planning horizon.

Proposed Plans of Service

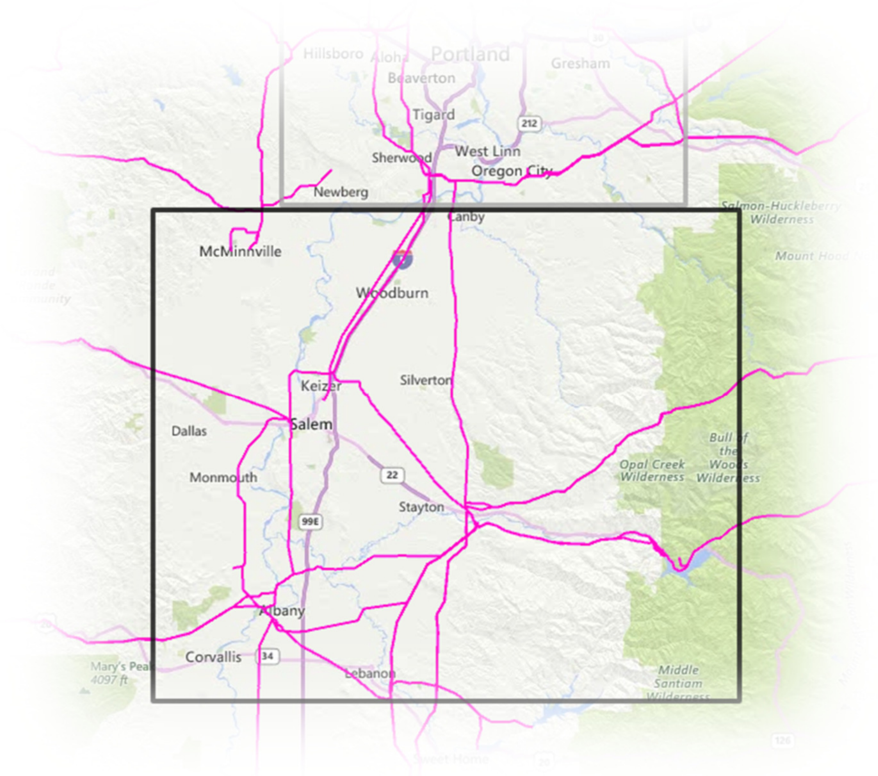
There are no proposed plans of service for this area.

Recently Completed Plans of Service

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

7.2.4 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

Salem/Albany Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
840	895	919	908	946	935	0.6	0.6

Non-Wires Assessment

Load growth forecasts for the Salem/Albany load area are expected to remain less than one percent per year beyond the long term planning horizon. The next logical transmission expansion project needed for this area is beyond the 10-year planning horizon and involves adding a second transformer at Chemawa or replacing the existing transformer with a new higher capacity transformer. This will be driven by either the need for additional load service capacity or by the existing transformer reaching the end of its service life; whichever comes first.

Proposed Plans of Service

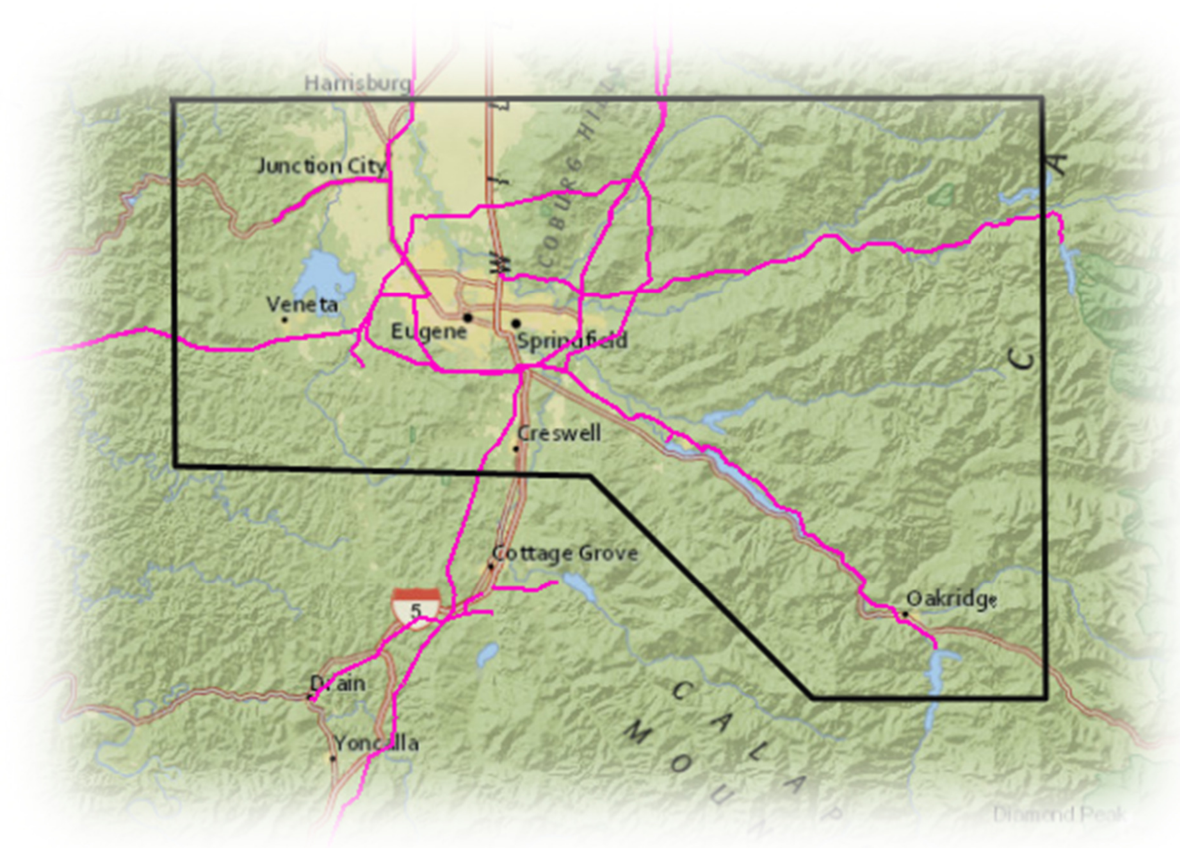
There are no proposed plans of service for this area.

Recently Completed Plans of Service

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

7.2.5 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

Eugene Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
602	896	680	879	717	886	1.1	0.2

Non-Wires Assessment

The Eugene area was considered a priority area for further non-wires analysis during the 2017 Non-Wires process. However, the cross-agency non-wires team determined that the Eugene area was not a viable candidate for further non-wires analysis at the time because the load reduction required to eliminate the potential overload was too high. In addition, the local area consists of mainly residential and commercial loads. The area has few large industrial loads that could be targeted to provide the magnitude of load relief needed.

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: $8,000,000
- Expected Energization: 2022

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

- Description: Installation of Transfer Trip on the Alvey – Lookup 115 kV Lines 1 and 2 is needed to prevent local generation from going out of step following three-phase line faults near Alvey Substation.
- Purpose: This project is required to maintain reliable load service to the area.
- Estimated Cost: $400,000
- 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.

7.2.6 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

Olympic Peninsula Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
741	1284	804	1324	865	1394	1.5	1.0

Non-Wires Assessment

To maintain a flat growth rate across the five-year planning horizon, approximately one MW of load reduction per year would be needed in the Olympic Peninsula area. Load reduction opportunities may exist at the industrial mills in the area. Pursuing energy efficiency opportunities at these facilities would benefit system reliability as both loads are at radial points of the system or on weak buses.

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.

7.2.7 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

Tri-Cities Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
1160	1007	1368	1038	1398	1055	0.4	0.3

Non-Wires Assessment

There have been several smart grid/demand response pilot projects in the area. The BPA/Energy Northwest 2015-2016 Demand Response Pilot implemented several regional projects. One of those was the implementation of demand voltage reduction with the capability to reduce power by about 1.5%-2% (Estimated 1-4 MW). A previous BPA Technology Innovation Project implemented demand response throughout the region. The Pacific Northwest Smart Grid Demonstration Project implemented many projects throughout the region. Implementing demand response in the Richland area may be effective in the short term for mitigating potential thermal overloads in the Tri-Cities area.

Tri-Cities 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: $4,600,000
- Expected Energization: 2022

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 impeding the ability to serve load.
- Purpose: The purpose of this project is to mitigate a bottleneck impeding the ability to serve load.
- Estimated Cost: $3,600,000
- Expected Energization: 2022

South Tri-Cities Reinforcement

- Description: The plan of service taps the Ashe-Slat No.1 500 kV line and builds a new Tumbleweed substation, creating a three-terminal 500 kV line. A new Tumbleweed 500/115 kV transformer then connects six miles of 115 kV line to Red Mountain substation.
- Purpose: This project is part of the longer team plan for the Tri-Cities area and is not needed for compliance with the NERC TPL Standard.
- Estimated Cost: To be determined.
- Expected Energization: To be determined.

Richland-Stevens Drive 115 kV Line

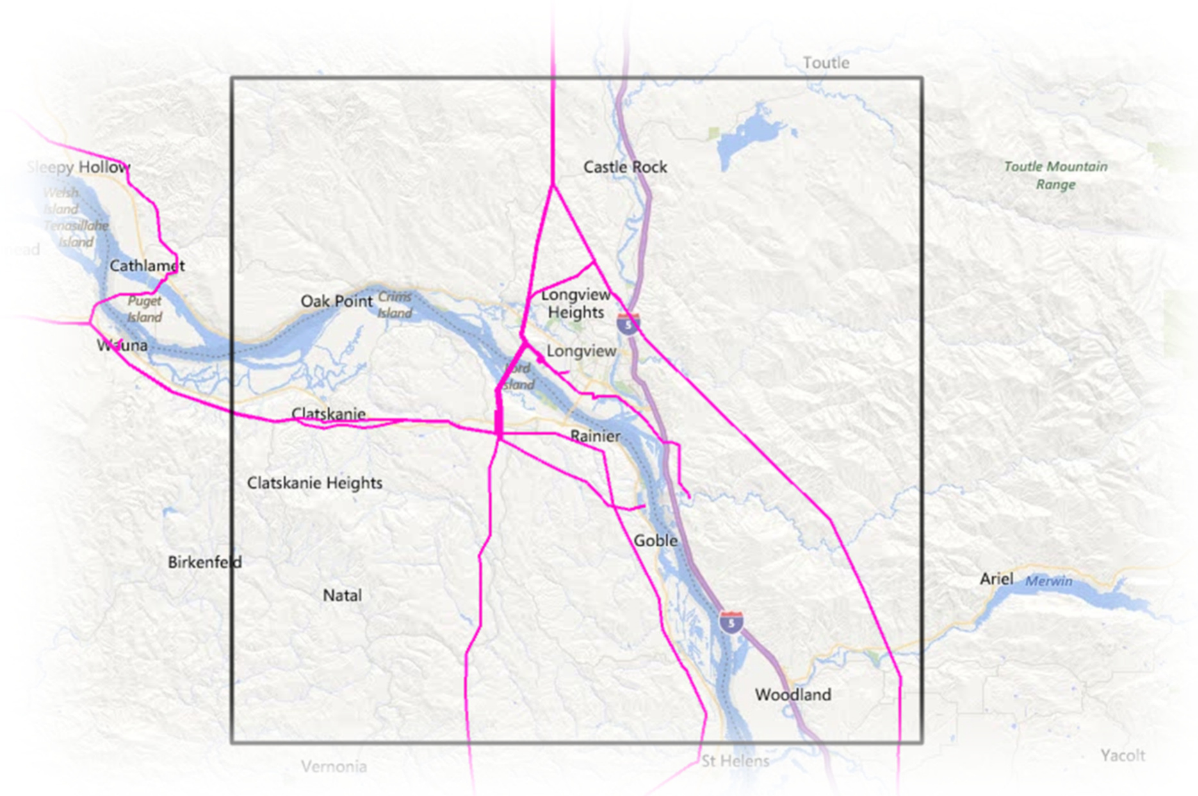
- Description: This project adds a new 115 kV line terminal and three miles of new 115 kV line.
- Purpose: This upgrade is needed to provide reliable load service to the Tri-Cities area.
- Estimated Cost: $12,500,000
- Expected Energization: 2024

Recently Completed Plans of Service

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

7.2.8 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

Longview Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
643	830	574	746	585	776	0.4	0.8

Non-Wires Assessment

A Longview non-wires assessment found 79 customers with a demand of at least 250 kW in the Longview 115 kV Network, which may be candidates for demand response. The largest load categories (loads over 9 MW) are chemical plants, grain elevators, steel fabrication, and wood products. The load reduction required to keep the peak load flat (in terms of growth) is 2.67 MW/year and 5 MW/year in the summer and winter, respectively.

Proposed Plans of Service

Longview 230/115 kV Transformer Addition

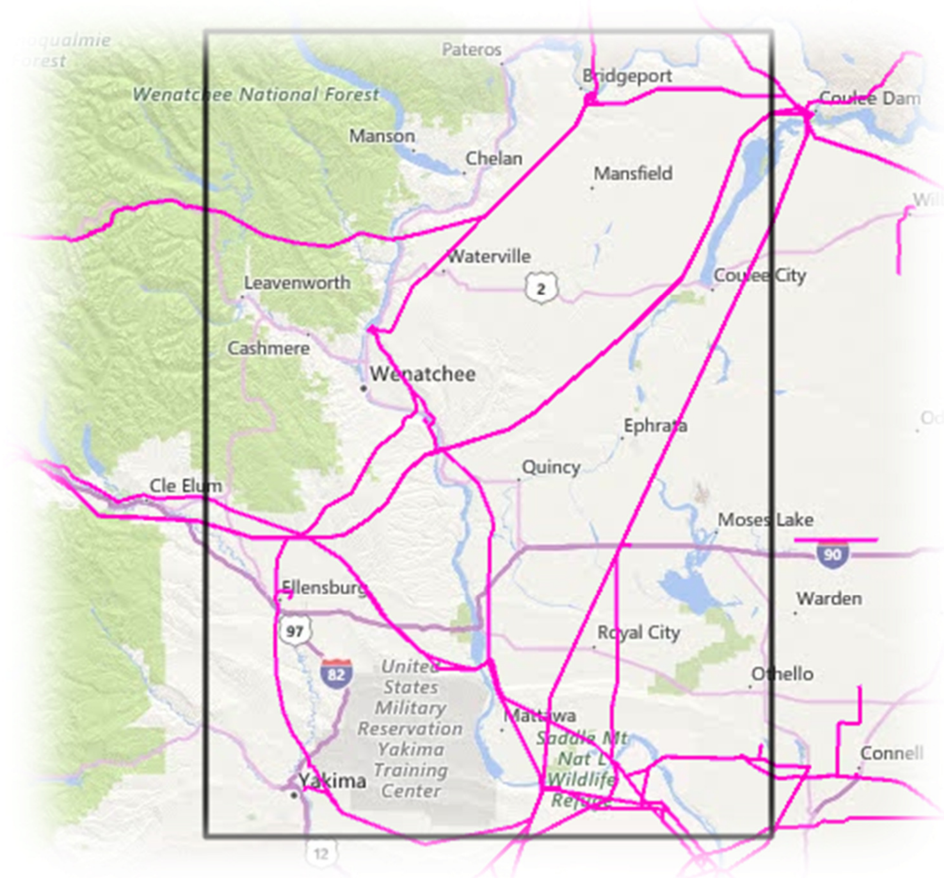
- Description: This project installs a second 230/115 kV transformer bank at the Longview Substation in the Longview area. To make room for the new transformer, the existing 230/13.8 kV transformer bank no. 5 will be removed. In addition, this project adds a 230 kV bus sectionalizing breaker of the Longview 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
- Expected Energization: 2021

Recently Completed Plans of Service

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

7.2.9 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

Mid-Columbia Area

Local Generation and Load

The Mid-C area has five Columbia River hydroelectric facilities, two wind farms and six 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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
2373	2374	2437	2403	2514	2691	0.6	2.3

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.

Mid-Columbia Area

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: $15,000,000
- Expected Energization: 2022

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: 2022

Recently Completed Plans of Service

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

7.2.10 Central Oregon Area

Central Oregon

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
544	687	652	800	764	967	3.2	3.9

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

LaPine 115 kV Circuit Breaker Additions

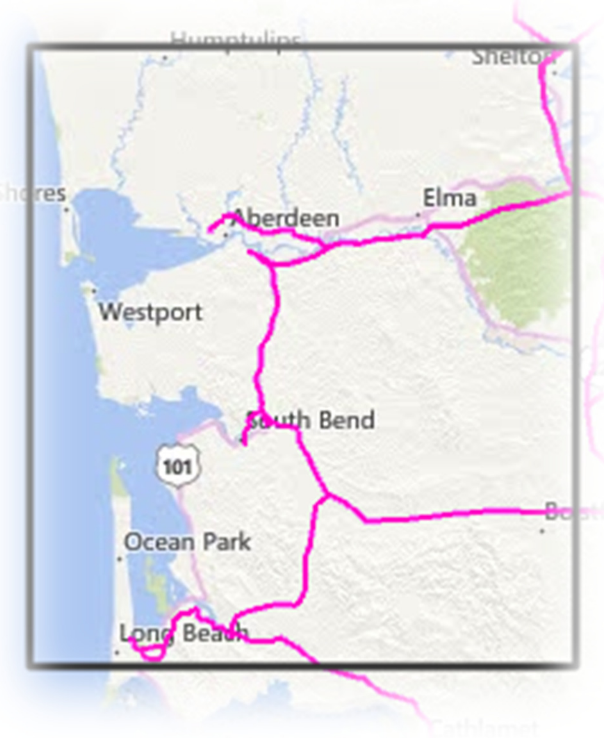
- Description: This project adds two 115 kV circuit breakers for the low side of the transformer banks 1 and 2 as well as a 115 kV bus tie breaker.
- Purpose: This project improves operations and maintenance flexibility.
- Estimated Cost: $3,800,000
- Expected Energization: 2021

Recently Completed Plans of Service

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

7.2.11 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 2023 (MW)		Ten-Year Load 2028 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
195	375	236	382	238	394	0.2	0.6

Southwest Washington Coast Area
Non-Wires Assessment

There are no known demand response programs, distributed energy resource or Smart Grid projects in the area. In order to keep peak load growth flat in this area, load reduction would be required across the area in addition to the energy efficiency improvements assumed in the forecasts. The load reduction required to keep load growth flat in this area is about 4 MW per year in winter and 0.33 MW per year in summer.

This area was considered a priority area for potential further non-wires assessment during the 2017 Non-Wires process. However, there are presently no candidate projects that can be effectively deferred or replaced with non-wires solutions.

Proposed Plans of Service

Holcomb-Naselle 115 kV Line Upgrade

- Description: This line will be 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. $12,500,000
- Expected Energization: 2021
- This project is experiencing delays due to environmental requirements.

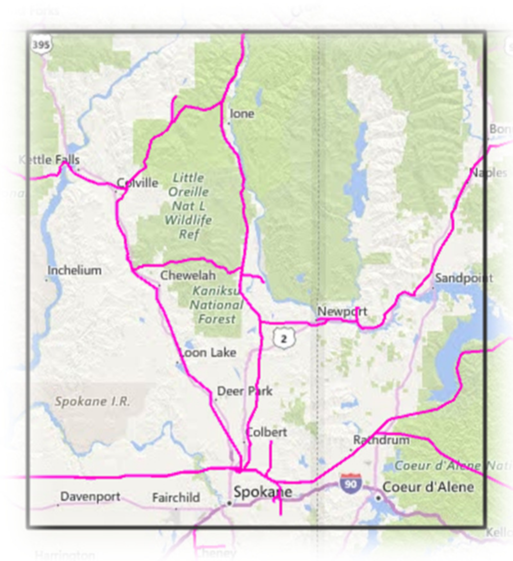
Aberdeen Tap to Satsop Park – Cosmopolis 115 KV Line Upgrade

- Description: Rebuild the section between Aberdeen Tap and Structure 1/3 (0.06 mi) to remove bottle neck.
- Purpose: This project is required to maintain reliable load service to the Southwest Washington Coast area.
- Estimated Cost: $191,000
- Expected Energization: 2022

Recently Completed Plans of Service

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

7.2.12 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's
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's
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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
896	924	919	882	953	892	0.7	0.2

Non-Wires Assessment

Non-wires solutions to curb load growth in this area or to provide demand side management immediately following critical outages, could significantly delay the need for potential transmission projects. Non-wires solutions could also increase operational flexibility. However, there are no transmission expansion projects proposed in the 10-year planning horizon. The load reduction needed to keep load growth flat in this area is about 6 MW/year in the winter.

Proposed Plans of Service

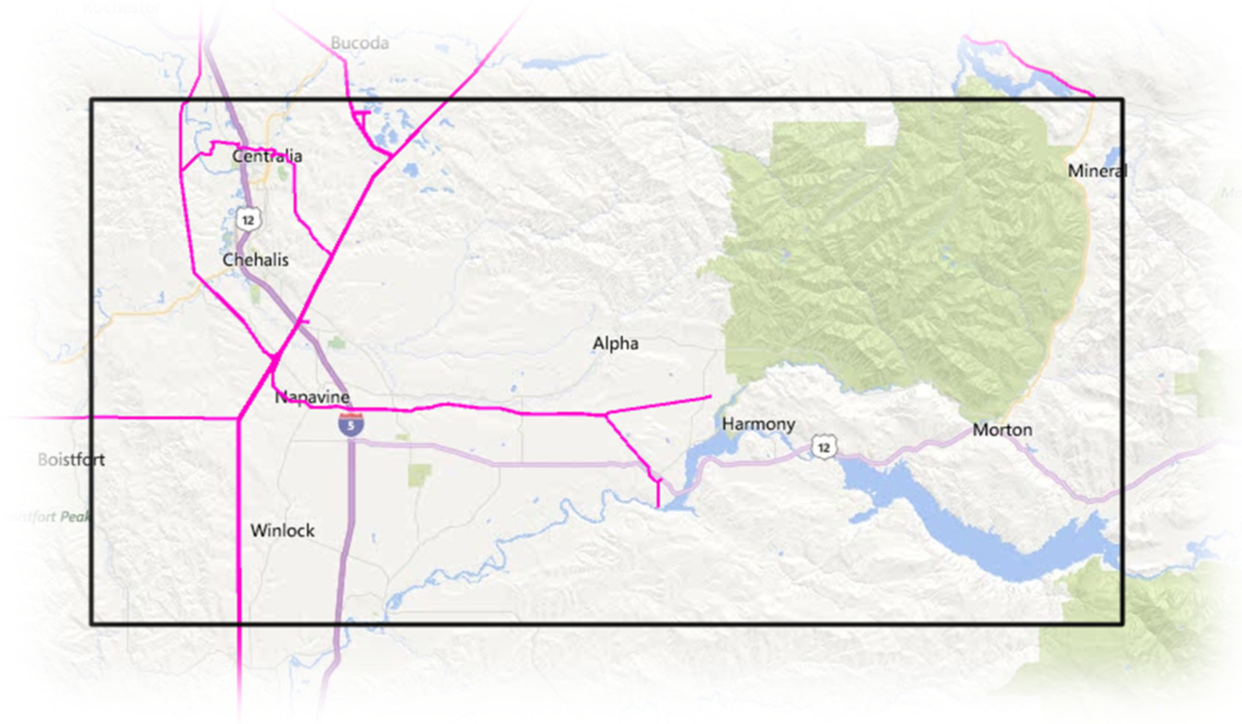
There are no proposed projects for this area at this time.

Recently Completed Plans of Service

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

7.2.13 Centralia/Chehalis Area

The Centralia/Chehalis 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

Local Generation and Load

Centralia/Chehalis Area Load							
Historical Peak Load (MW)		Five-Year Load 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
134	261	176	260	183	263	0.8	0.2

Non-Wires Assessment

In order to keep peak load growth flat in this area, a load reduction of approximately one MW per year (winter) would be required in addition to the energy efficiency improvements assumed in the forecasts.

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: 2022

Centralia – Roy Zimmerman Tap 69 kV Line Upgrade

- 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

Recently Completed Plans of Service

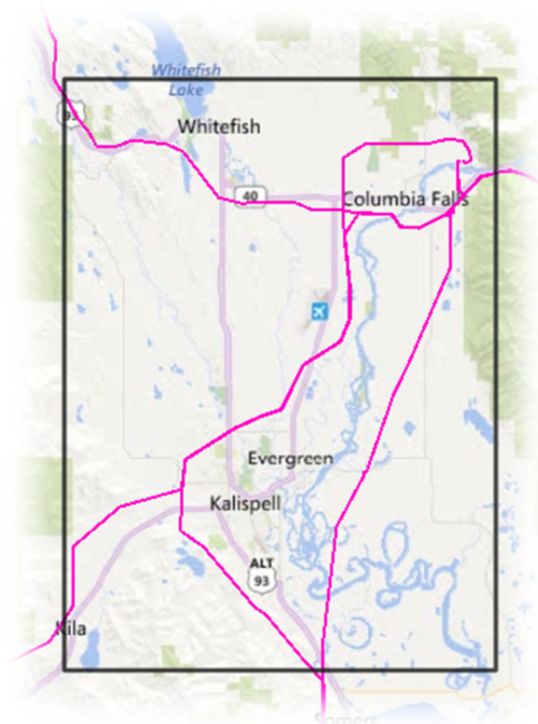
There are no projects that have been completed in this area since the previous planning cycle.

7.2.14 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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
259	354	289	384	302	406	0.9	1.1

Northwest Montana Area

Non-Wires Assessment

No transmission reinforcement needs were identified for this area. However, beyond the ten-year planning horizon, shunt capacitors may be needed in the area to address low voltages in the Trego/Eureka vicinity. Also, an upgrade of the Columbia Falls-Kalispell 115 kV line may be needed if loads in the Kalispell area grow high enough and the generation requirements at Hungry Horse become too restrictive.

In order to keep area load growth flat and defer any potential future transmission needs, load reduction of about 6 MW per year (summer) and 5 MW per year (winter) would be needed in the near-term (five-year) horizon.

Proposed Plans of Service

Conkelley Substation Retirement

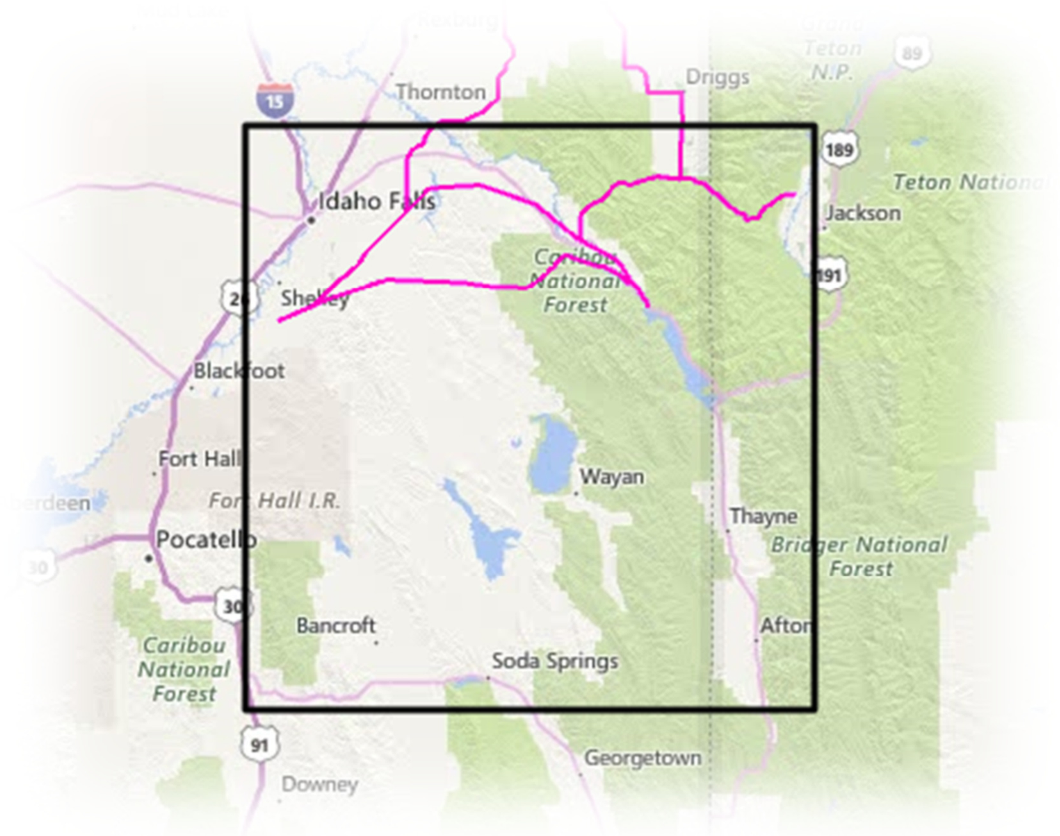
- Description: This project will accommodate the retirement of Conkelley substation. When the substation is retired, all substation facilities will be removed. The existing Libby-Conkelley, Hungry Horse-Conkelley, and Columbia Falls-Conkelley 230 kV lines will be tied together at Conkelley. Also, the 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.

7.2.15 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

Southeast Idaho/Northwest Wyoming Area

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 2023 (MW)		Ten-Year Load 2028 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
148	291	193	298	201	318	0.8	1.3

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 a 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

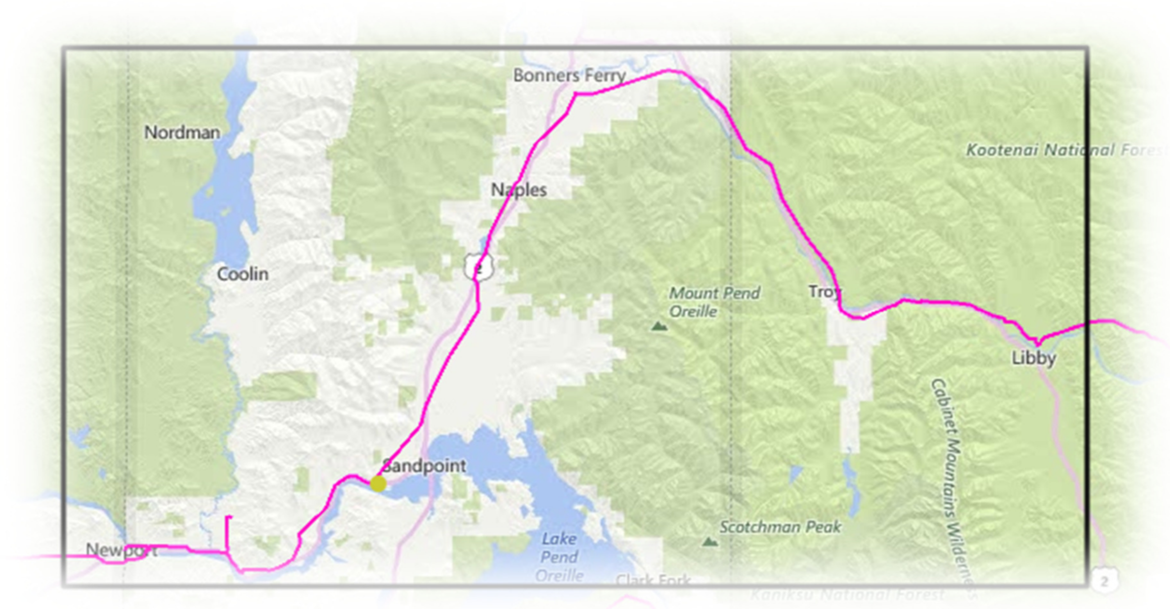
- Description: This project adds a 230 kV 25 Mvar shunt reactor at Spar Canyon Substation.
- Purpose: This project improves the ability to maintain voltage schedules and increases operations and maintenance flexibility at Spar Canyon.
- Estimated Cost: $3,800,000
- Expected Energization: 2022

Recently Completed Plans of Service

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

7.2.16 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

North Idaho Area Load							
Historical Peak Load (MW)		Five-Year Load 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
101	187	120	191	131	196	1.8	0.5

Non-Wires Assessment

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 FEC 115 kV Shunt Capacitor Replacement or Restoration

- 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

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: $400,000
- Expected Energization: 2023

Recently Completed Plans of Service

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

7.2.17 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

North Oregon Coast Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
147	274	178	282	180	287	0.2	0.4

Non-Wires Assessment

The load makeup of the North Oregon Coast load area includes industrial, commercial, and residential loads. Industries on the North Oregon Coast include paper and wood mills. The North Oregon Coast load area meets the performance requirements for the near term and long term planning horizon. The North Oregon Coast transmission system will also meet the expected load growth for the ten-year planning horizon.

Proposed Plans of Service

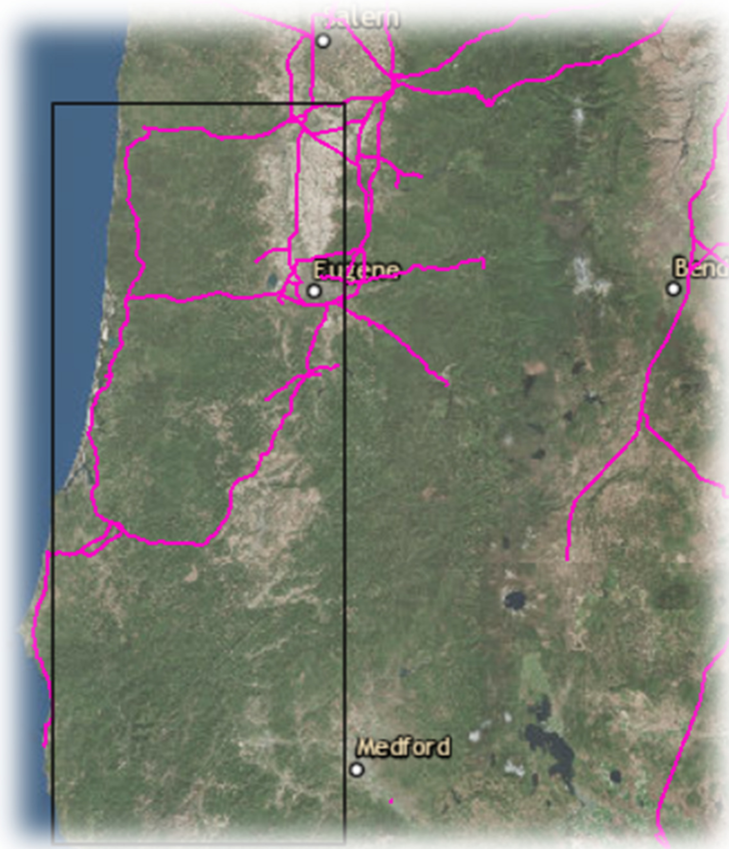
There are no proposed projects for this area at this time.

Recently Completed Plans of Service

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

7.2.18 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

South Oregon Coast Area

Local Generation and Load

There is no local generation in this area.

South Oregon Coast Area Load							
Historical Peak Load (MW)		Five-Year Load 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
259	505	258	461	259	465	0.1	0.2

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 winter loads would need to be reduced by an incremental one MW per year for both summer and winter.

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: $11,100,000
- Expected Energization: 2023

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.)

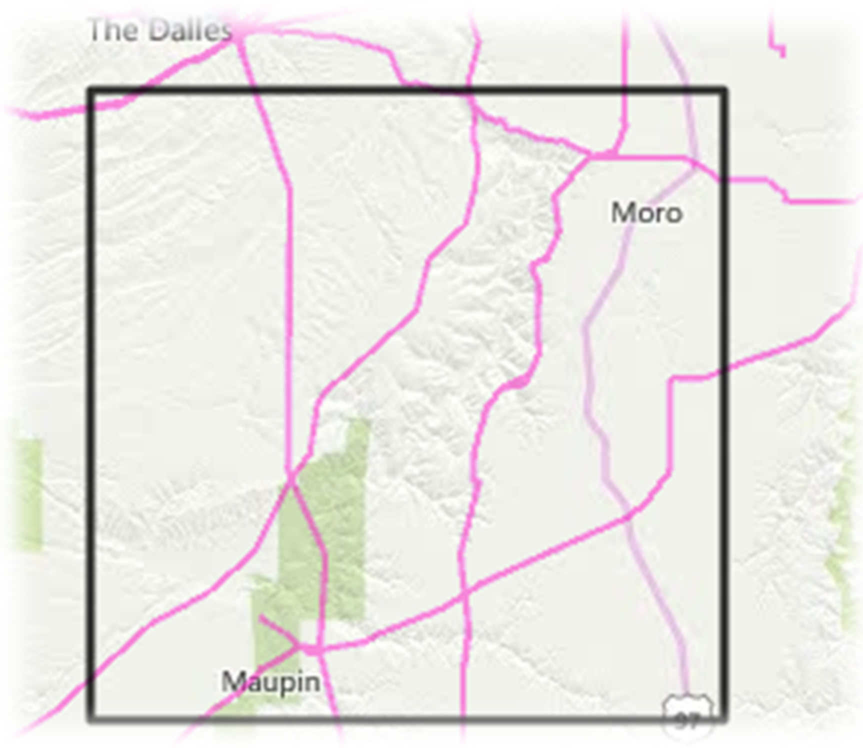
- Description: This project adds a 115 kV bus tie breaker at Wendson Substation.
- Purpose: This project improves operations and maintenance flexibility at Wendson.
- Estimated Cost: See above
- Expected Energization: 2023

Recently Completed Plans of Service

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

7.2.19 DeMoss/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)

DeMoss/Fossil Area

Local Generation and Load

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

DeMoss/Fossil Area Load							
Historical Peak Load (MW)		Five-Year Load 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
29	44	24	37	24	38	0.0	0.5

Non-Wires Assessment

Energy efficiency would be moderately useful in the DeMoss/Fossil/Maupin load area. The winter peak load has grown in the last 5 years, and further growth may require additional reactive support in the future. Since the peak load hours are the main issue, measures to assist with peak shaving would be useful, such as demand response or the addition of local generation. Since the existing resources in the load area are wind generation projects (which are intermittent resources), it is not feasible to rely on them to help with voltage issues, since they are not always available for dispatch. To reduce the effects of peak load in the area, integrating a new generation resource would support local loads and raise voltages during outage conditions at peak loading. Generation additions could include battery storage. Battery storage may mature and drop in price in the long-term (5-10+ years) timeframe when transmission reinforcements may be needed in the area. Another option would be to reduce the peak load using demand management/response techniques, such as working with farmers or businesses in the area to shift their operations from peak to off-peak hours, or developing agreements to reduce energy usage when demand is especially high.

Proposed Plans of Service

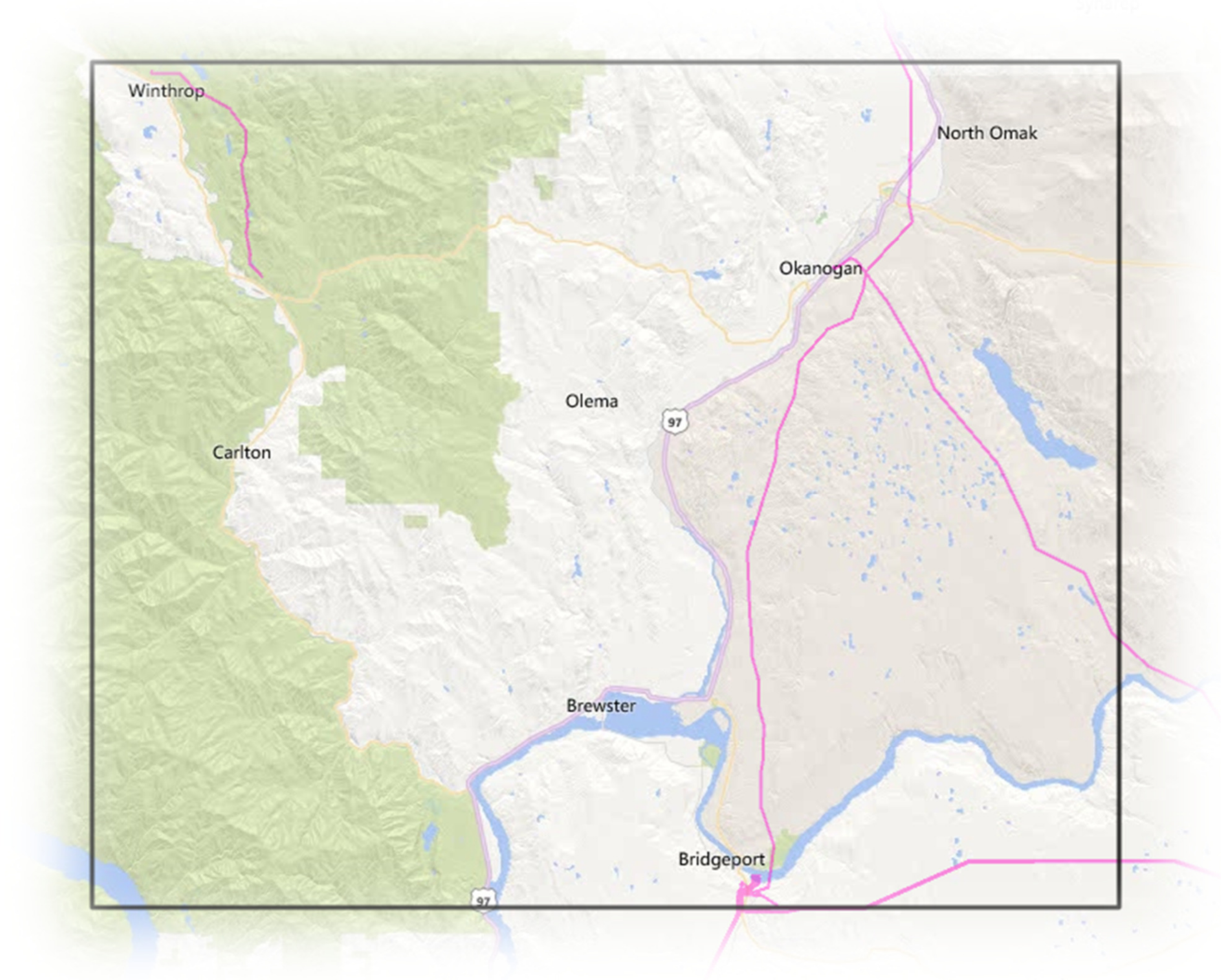
There are no proposed projects for this area as this time.

Recently Completed Plans of Service

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

7.2.20 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)

Okanogan Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
158	232	179	256	186	266	0.8	0.8

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. To maintain a flat rate of load growth in this area would require a reduction of three MW of load per year.

Proposed Plans of Service

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

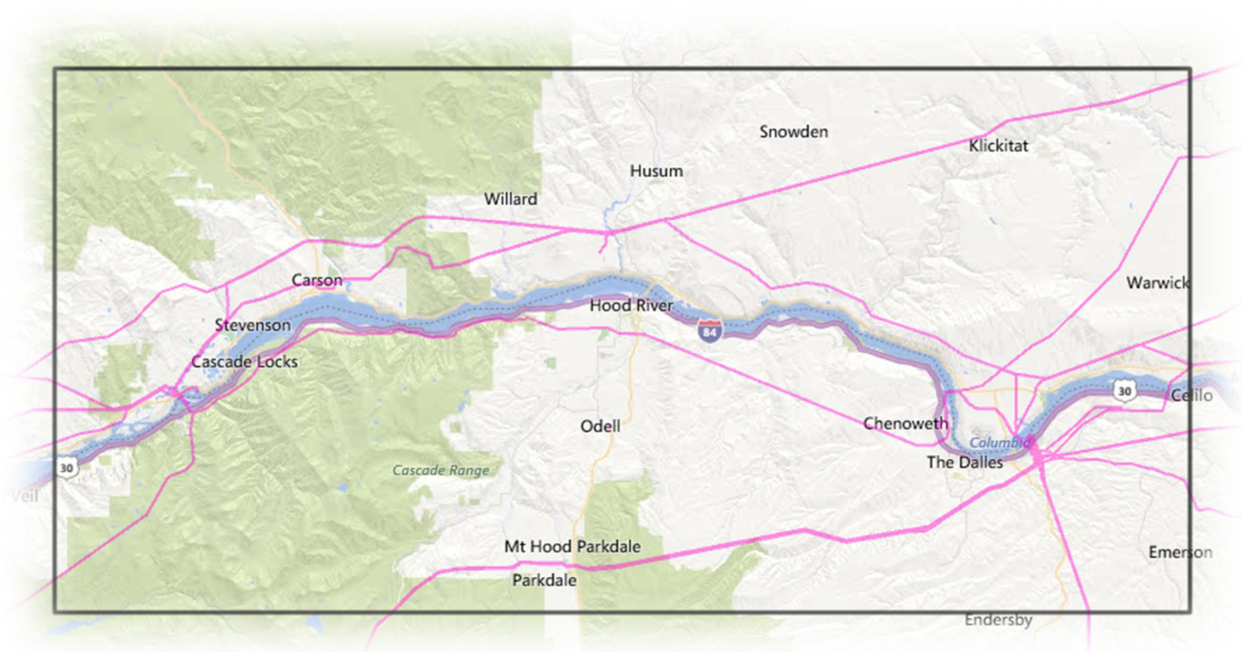
- Description: This project will remove impairments on the Grand Coulee-Nilles Corner section of the Grand Coulee-Foster Creek #1 115 kV line to facilitate increasing the maximum operating temperature of the line to 80 °C.
- Purpose: This project is required to maintain reliable load service to the Okanogan 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.

7.2.21 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

Hood River/The Dalles Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
234	265	522	535	542	575	0.8	1.5

Non-Wires Assessment

Energy efficiency would be a useful tool in the Hood River/The Dalles area to offset low voltages at the PacifiCorp 69 kV substations served by BPA's Hood River substation. Energy efficiency measures could be catered to the large amount of residential load in the area, as well as any commercial or industrial load, such as data centers that have been installed in The Dalles. There is also the possibility for demand management, where peak load could be shifted to off-peak hours by these new server farms or residential customers. With the two generation resources (Bonneville Powerhouse and The Dalles) 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 this is not needed at the present time.

Load growth in this area is rapidly increasing as the new large industrial (server farm) loads are increasing the overall load in the area by large increments. In order to mitigate load growth due to just the residential growth component, approximately 3 MW of load per year would have to be reduced in the winter by non-wires measures.

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.

7.2.22 Pendleton/LaGrande 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

Pendleton/LaGrande Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
146	139	140	139	141	141	0.1	0.3

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 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

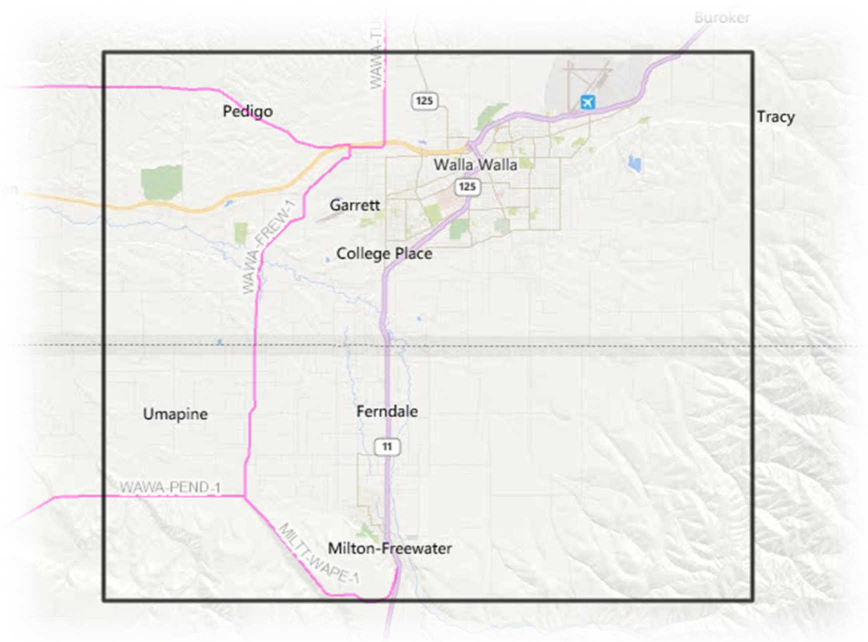
There are no proposed projects for this area at this time.

Recently Completed Plans of Service

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

7.2.23 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)

Walla Walla Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
91	77	135	113	141	120	0.9	1.2

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

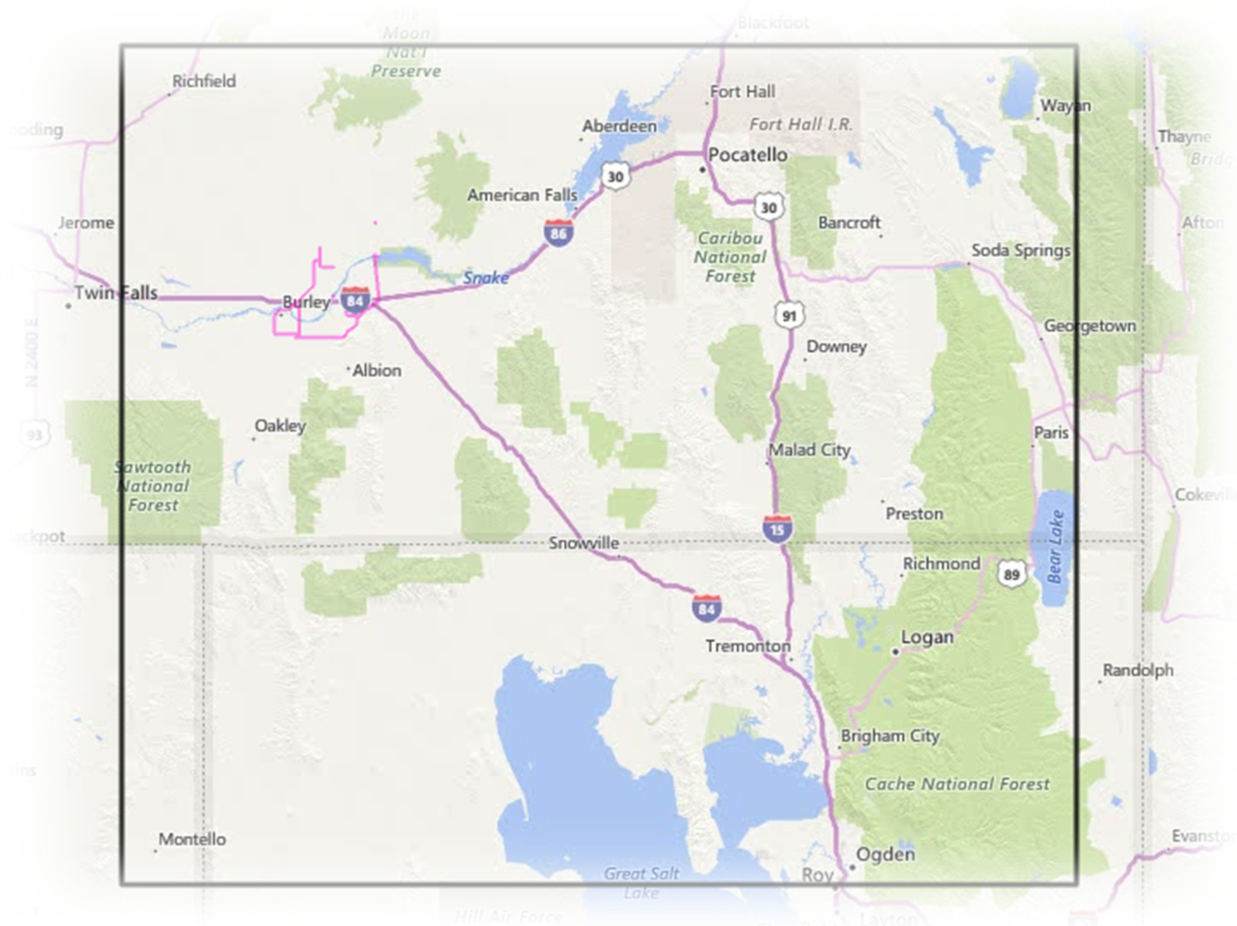
- Description: A 15 MVAR shunt reactor will be added at Tucannon River 115 kV substation.
- Purpose: This project is required to provide voltage control for multiple contingencies involving the Tucannon River-North Lewiston 115 kV line.
- Estimated Cost: $2,000,000
- Expected Energization: 2025

Recently Completed Plans of Service

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

7.2.24 Burley (Southern Idaho) 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.

Burley Area (Southern Idaho) Area

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
200	157	228	164	248	170	1.7	0.7

Non-Wires Assessment

While BPA may not be responsible for future upgrades beyond the BPA owned system, all of the affected utilities – BPA, Raft River Rural Electric, and Wells Rural Electric – would benefit from implementation of non-wires solutions to postpone any future need for system expansion.

To offset the effects of peak loads in the area, integrating a new dependable generation resource would support loads and improve voltages following outages that occur during peak loading conditions. Another option would be to shave the peak load using demand management or demand response measures, such as 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.

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.

7.2.25 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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
114	92	114	87	118	83	0.7	-0.9

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 in response to outage conditions during peak summer loads. The potential 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.

7.2.26 Klickitat County Area

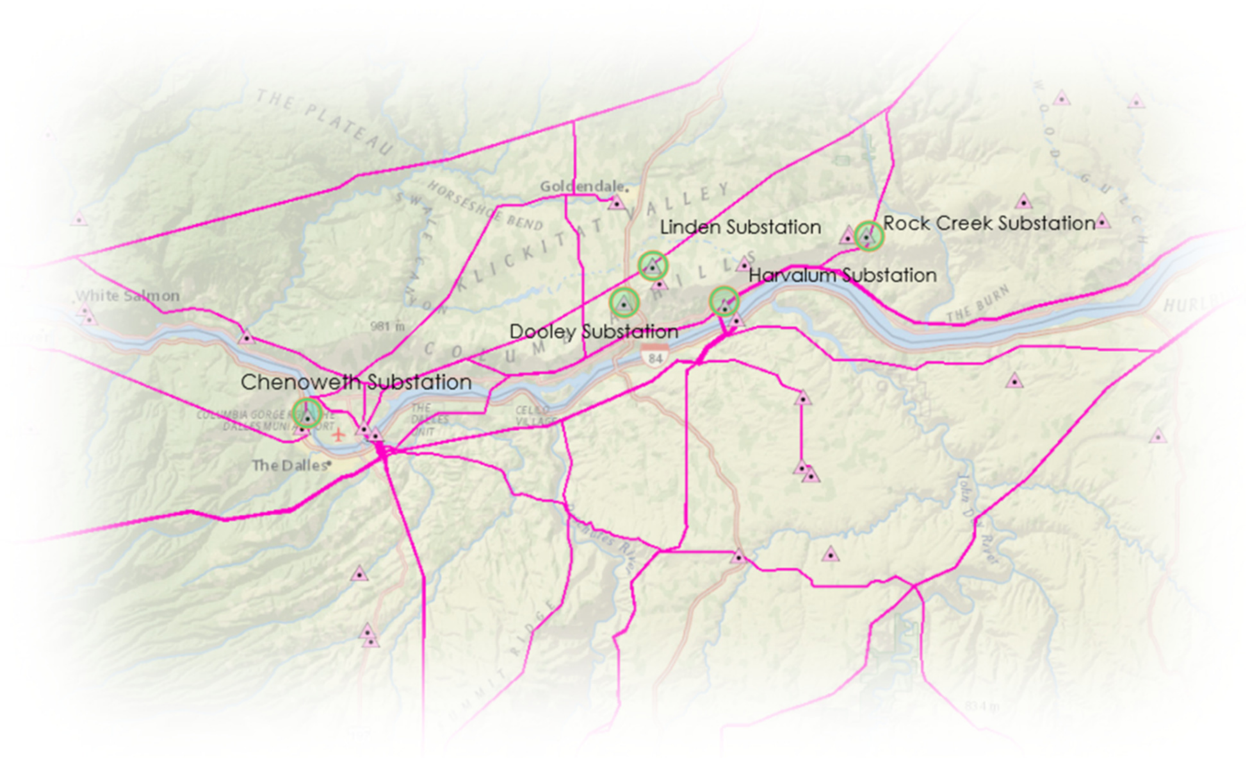
The Klickitat County area is located in south central Washington and is comprised of Klickitat County PUD and various generation projects interconnected to their transmission system.

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 2025 (MW)		Ten-Year Load 2029 (MW)		Long-Term Annual Load Growth Rate (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
62	82	69	86	70	76	0.3	-2.4

Non-Wires Assessment

There are no transmission reinforcement projects currently planned for this area.

Proposed Plans of Service

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

Recently Completed Plans of Service

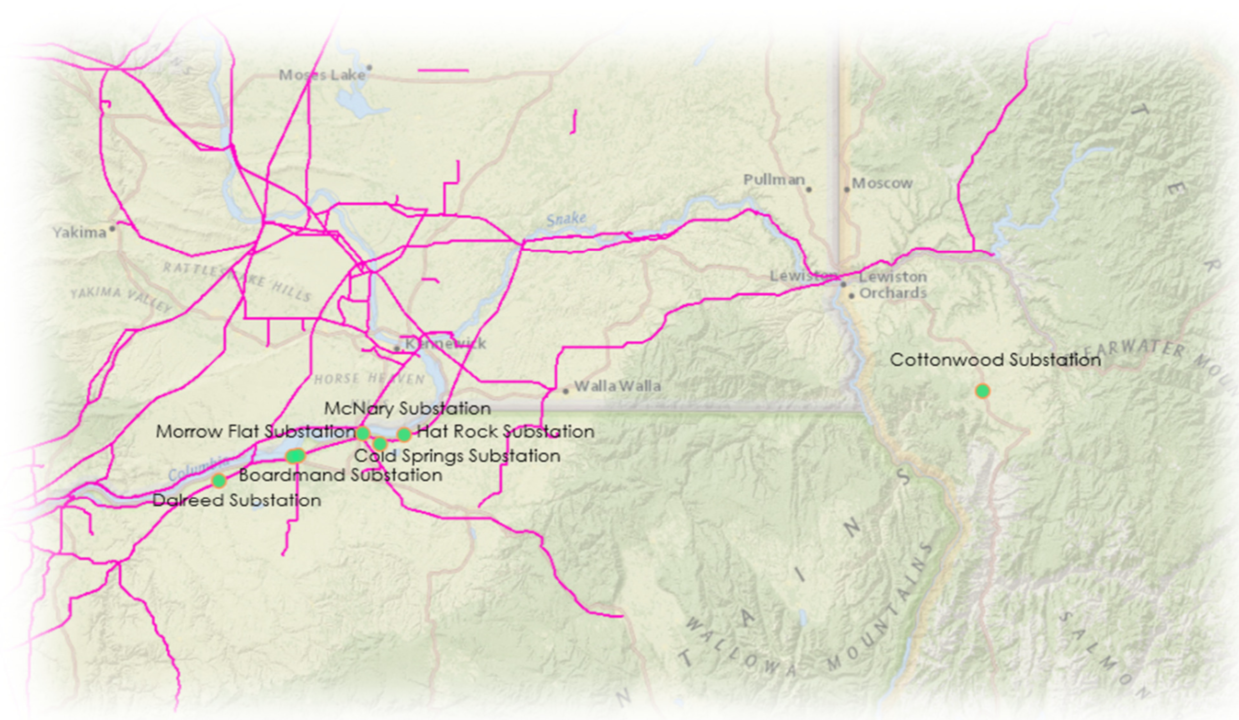
There are no projects that have been completed in this area since the previous planning cycle.

7.2.27 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 2025 (MW)		Ten-Year Load 2029 (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

Load is rapidly growing in the Umatilla area, averaging 9.5% annual growth over the past four years. This growth can be attributed largely to industrial expansion in the area with a number of data centers being installed. The area load is summer peaking due to pump irrigation and cooling load, and reached a new historic peak of 555 MW in the summer of 2019. Winter peaks in the area are much lower, and during a year with a mild winter season may have the lowest peak load of the year.

Shunt reactive additions are needed at Jones Canyon and Morrow Flat substations to alleviate high voltages in the area. 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.

Proposed Plans of Service

Jones Canyon 230 kV Shunt Reactor Addition

- Description: This project adds a 230 kV shunt reactor (40 MVAR) at Jones Canyon Substation.
- Purpose: This project is required to maintain voltage schedules in the area during light load conditions.
- Estimated Cost: $5,300,000
- Expected Energization: 2022

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

Recently Completed Plans of Service

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

7.3 Transmission Needs by Path

7.3.1 North of John Day Path

Description

The North of John Day (NJD) WECC Path 73 is located north of John Day Substation in Oregon. The path consist of six lines that run north to south through BPA's transmission system between the Upper and Lower Columbia river systems. The established rating of the NJD path is 8400 MW in the north to south direction. The limit for the NJD path is a measure used to ensure the voltage stability performance of the transmission system is adequate for high loading of the major Northwest to California paths simultaneously with high generation in the northern part of the system. The limit ensures the California Oregon Intertie (COI) is served via generation resources that are close to the COI path. The highest loading on the COI and NJD paths occurs during peak summer load conditions when the paths are simultaneously heavily loaded due to air condition usage in California and excess generation in the Northwest and Canada.

The path includes the following lines:

- Raver-Paul 500 kV No. 1
- Ashe-Marion 500 kV No. 2
- Wautoma-Ostrander 500 kV No. 1
- Ashe-Slatt 500 kV No. 2
- Wautoma-Rock Creek 500 kV No. 1
- Lower Monumental-McNary 500 kV No. 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 completed plans of service for this path since the last planning cycle.

7.3.2 North of Hanford Path

Description

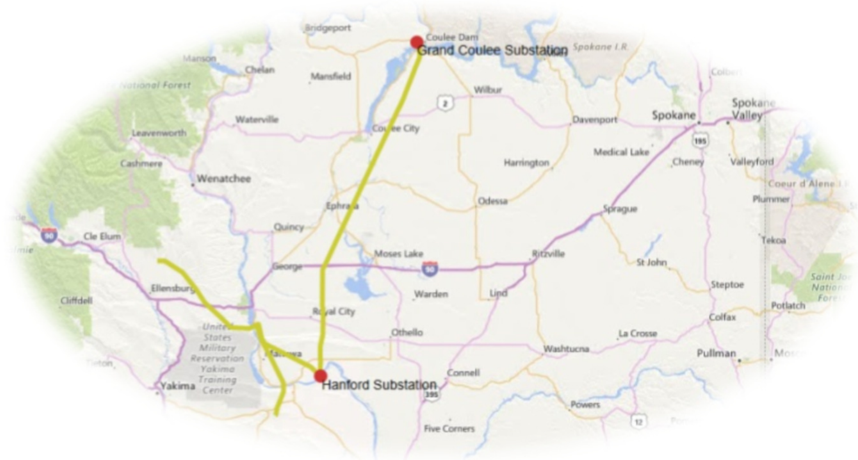
This path is located north of Hanford (NOH) substation between Hanford and Grand Coulee. The NOH path is located in central Washington and is a bi-directional path with a north-to-south and south-to-north flow.

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. The 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 on 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.

7.3.3 West of McNary Path

Description

This path is located between McNary and Slatt substations in Oregon. The 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. 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.

7.3.4 West of Slatt Path

Description

This path is located between Slatt and John Day Substations in Oregon. 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. West of John Day (WOJ) 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. Both paths 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:

- 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.

7.3.5 West of John Day Path

Description

This path is located between John Day Substation and The Dalles Substation in Oregon. 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. West of John Day (WOJ) 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. Both paths 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

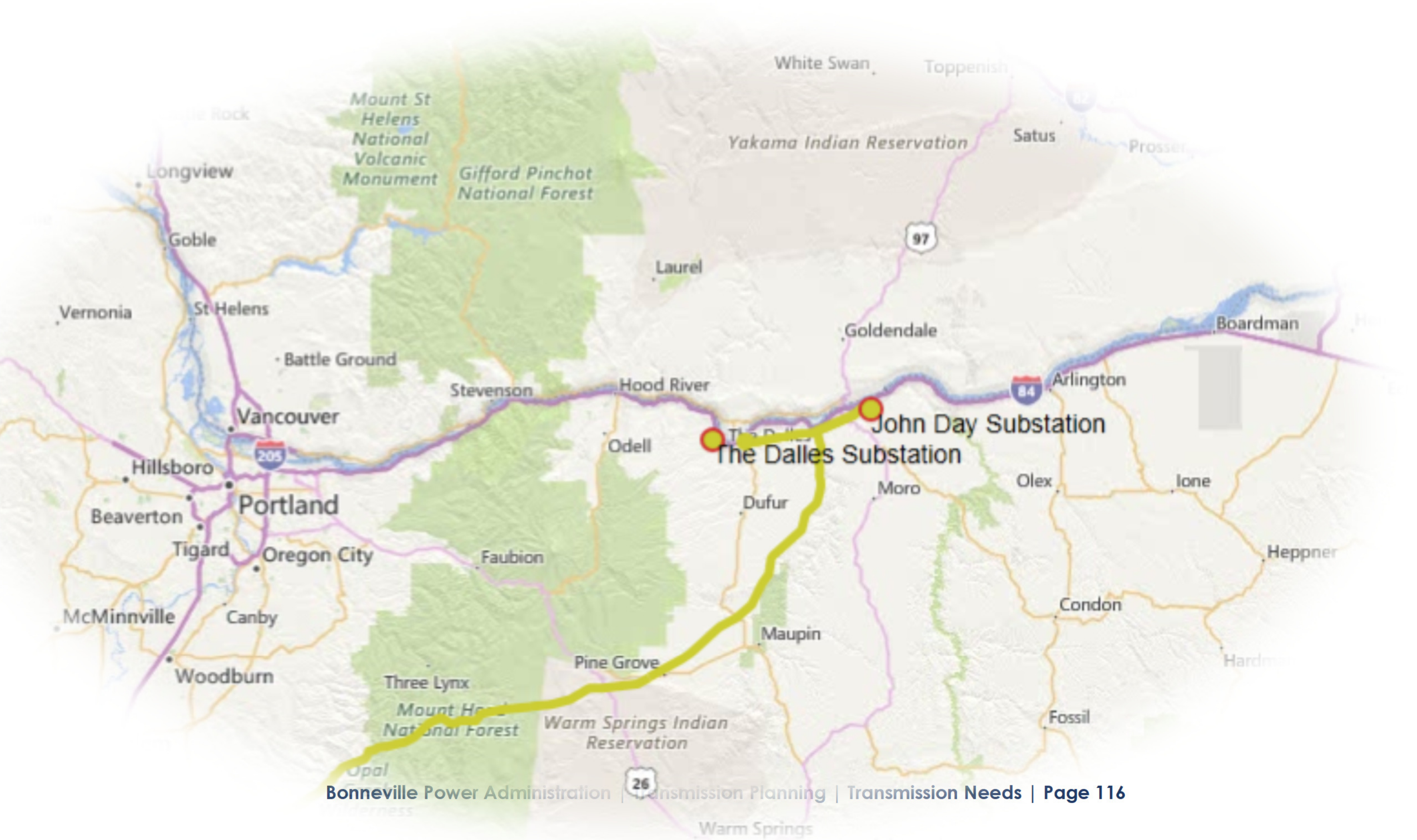
There are no proposed projects for this path at this time.

Potential Long-Range Needs

There are none identified for this path at this time.

Recently Completed Plans of Service

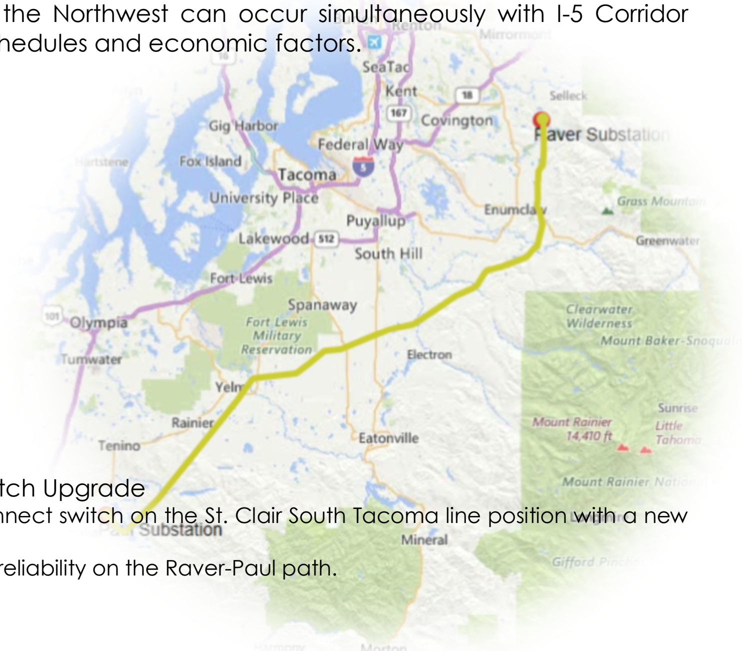
There are no recently completed plans of service for this path since the last planning cycle.



7.3.6 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 replaces the disconnect switch on the St. Clair South Tacoma line position with a new switch rated 2000 Amps (minimum).
- Purpose: This project is needed to maintain reliability on the Raver-Paul path.
- Estimated Cost: $150,000
- Expected Energization: 2022

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

- Description: This project adds a 1300 MVA, 500/230 kV transformer at Raver Substation. This project is part of the overall Puget Sound Area/Northern Intertie (PSANI) Regional Reinforcement Plan. This is 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
- Expected Energization: 2022
  This project originally had an expected energization date of 2016, but energization has been delayed due to land acquisition issues. The project is currently in the execution phase.

Potential Long-Range Needs

Centralia Unit No. 2 Re-termination

- The Centralia Unit No. 1 is planned to retire in 2020. Re-terminating BPA Unit No. 2 into its bay will eliminate a limiting breaker failure for the path. It is not required to meet the NERC Reliability Planning Standard, but it will increase operational flexibility.

Recently Completed Plans of Service

St. Clair – South Tacoma 230 kV Line Upgrade

- Description: When the St. Clair 230 kV substation was energized in the summer of 2014, the South Tacoma-Olympia 230 kV line was resurveyed and four spans where de-rated from100 C MOT to 80 C MOT. This project will resag the four limiting spans of the South Tacoma – St. Clair 230 kV line from 80 deg. C MOT to 100 deg. C MOT.
- Purpose: This project is required to accomodate firm transmission service obligations once Centralia unit 1 retires.
- Estimated Cost: $400,000
- Expected Energization: 2020

7.3.7 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

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

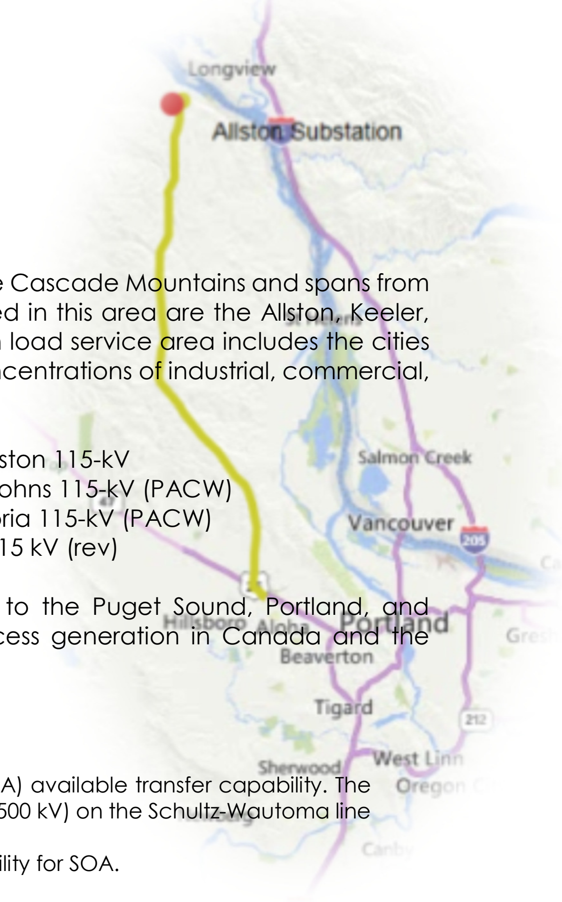
- Description: This line will be rebuilt with larger conductor as part of the wood pole replacement program.
- Purpose: This project is required to maintain reliable load service to the Southwest Washington Coast area.
- Estimated Cost: The cost of this project is included as part of the overall wood pole replacement program. $11,700,000
- Expected Energization: 2021
  This project is experiencing delays due to environmental requirements.

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.



7.3.8 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: 2022

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. It may be possible to accomplish this by re-strapping an existing 230/69 kV transformer bank to 230/115 kV operation. 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: $16,000,000
- Expected Energization: 2021

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

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

7.3.9 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.

7.3.10 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

Monroe 500 kV Line Re-terminations

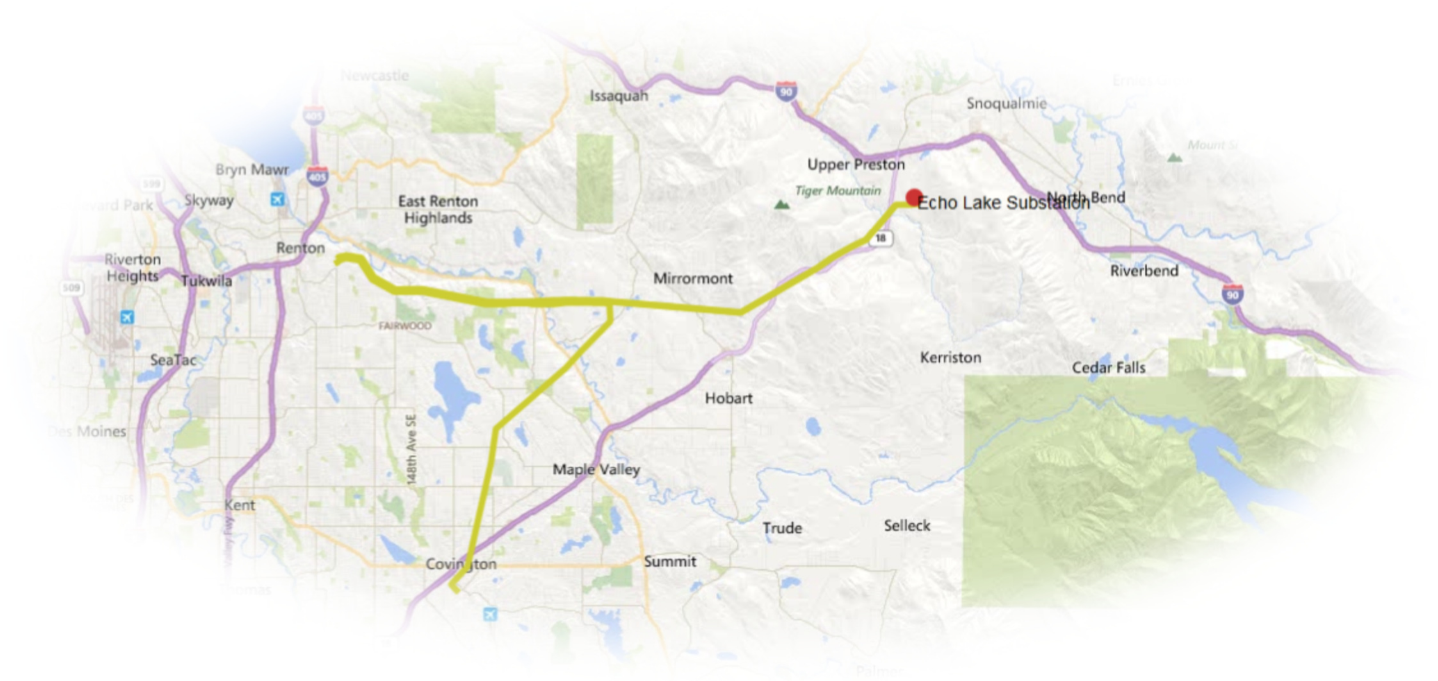
- Description: This project reconfigures Monroe Substation by developing a new 500 kV bay and re-terminating the Custer and Chief Joseph 500 kV lines.
- Purpose: This project will increase reliability and capacity on the Northern Intertie.
- Estimated Cost: $10,800,000
- Expected Energization: 2021

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.



7.3.11 South of Custer Path

Description

South of Custer (SOC) is a north-to-south path that connects the northern PSA. 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.

7.3.12 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.

7.3.13 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

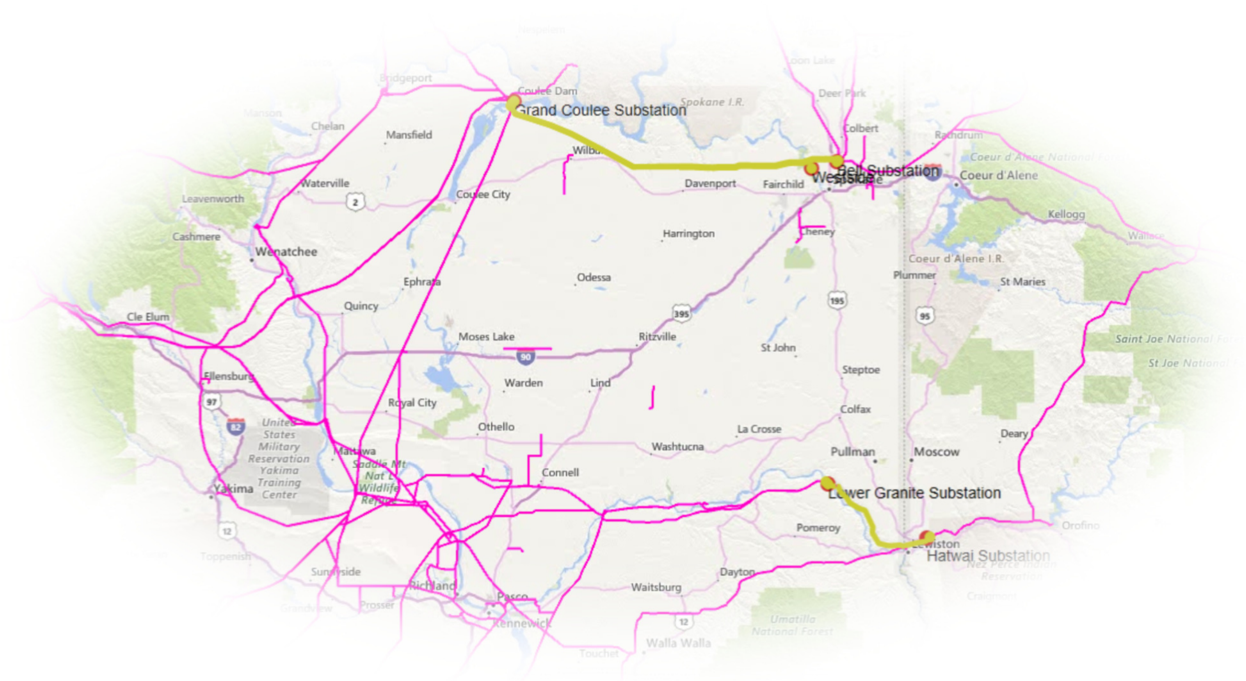
There are no proposed projects for this path at this time.

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.



7.3.14 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 on 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

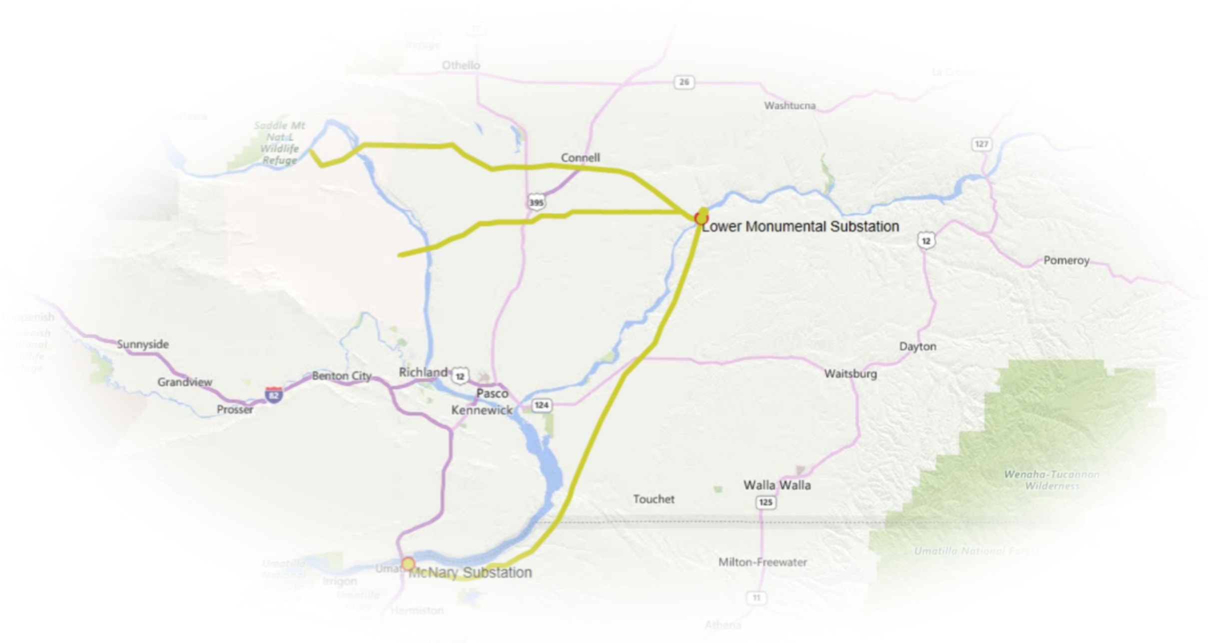
There are no proposed projects for this path at this time.

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.

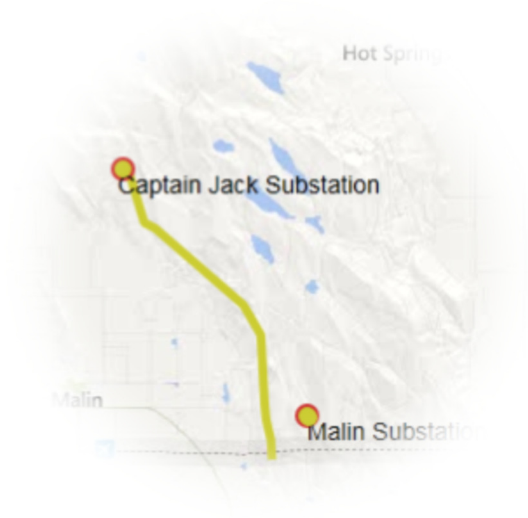


7.4 Transmission Needs by Intertie

7.4.1 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: A new Buckley air insulated substation will replace the existing Buckley 500 kV gas insulated substation because the technology of that era has become obsolete and there are limited spare parts available to maintain the equipment.
- Purpose: This project is needed to maintain reliability in the area.

Recently Completed Plans of Service

Central Oregon Series Capacitor
(Slatt Series Capacitor Addition and Bakeoven Series Capacitor Upgrade)

- Description: This project involves adding a new 14 ohm series capacitor at Slatt Substation at the Slatt-Buckley 500 kV line and upgrading the existing series capacitors at Bakeoven in both John Day – Grizzly No. 1 and No. 2 500 kV lines by reducing the size from 25 ohms to 21.21ohms.
- Purpose: This project was initiated in response to line and load interconnection requests in the Central Oregon area which impacts the California-Oregon Intertie.
- Estimated Cost: $15,000,000
- Expected Energization: 2020

7.4.2 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 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.

7.4.3 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

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

- Description: This project adds a 1300 MVA, 500/230 kV transformer at Raver Substation. This project is part of the overall Puget Sound Area/Northern Intertie (PSANI) Regional Reinforcement Plan. This is 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
- Expected Energization: 2022

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

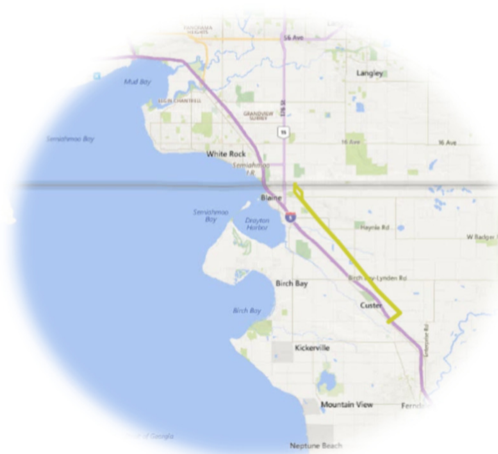
- Description: This project reconfigures Monroe Substation by developing a new 500 kV bay and re-terminating the Custer and Chief Joseph 500 kV lines.
- Purpose: This project will increase reliability and capacity on the Northern Intertie.
- Estimated Cost: $10,800,000
- Expected Energization: 2021

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.



7.4.4 Montana to Northwest Intertie

Montana to Northwest WECC Path 8 Description

This path is the intertie 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 from mid-summer to early spring.

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 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.

Appendix

A.1 List of Projects by Load Service Area

Area	Project Title	Project Number	Expected In-Service Date	Estimated Cost
1	**Seattle – Tacoma – Olympia**			
	Tacoma 230 kV Series Bus Sectionalizing Breaker and Bus Tie Breaker	P02401	2021	$2,300,000
	Monroe-Novelty 230 kV Line Upgrade	P02367	2021	$2,500,000
	Raver 500/230 kV Transformer (PSANI)	P00094	2022	$90,000,000
2	**Portland**			
	Forest Grove – McMinnville 115 kV Line Upgrade	P03469	2022	$1,800,000
	Carlton Upgrades	P01367	2022	$4,400,000
	TROUTDALE 230 KV SERIES BUS SECTIONALIZING BREAKER	P04401	2025	$2,000,000
	PEARL 230 KV BUS SECTIONALIZING BREAKER ADDITION (SERIES)	TBD	2029	$2,000,000
3	**Vancouver**			
4	**Salem – Albany**			
5	**Eugene**			
	Alvey 115 kV Bus Sectionalizing Breaker Addition	P02250	2022	$8,000,000
	Lookout Point – Alvey No. 1 and 2 Transfer Trip Addition	P03258	2022	$400,000
	ALVEY-DILLARD TAP 115 KV LINE REBUILD	P04286	2023	$1,300,000
6	**Olympic Peninsula**			
	Kitsap 115 kV Shunt Capacitor Modification	P01443	2023	$4,000,000
7	**Tri-Cities**			
	McNary-Paterson Tap 115 kV Line	P02364	2022	$4,600,000
	Red-Mountain – Horn Rapids 115 kV Line Reconductor	P03102	2022	$3,600,000
	South Tri-Cities Reinforcement	P03264	TBD	TBD
	Richland-Stevens Drive 115 kV Line	P02365	2024	$12,500,000
8	**Longview**			
	Longview 230/115 kV Transformer Addition	P02281	2021	$15,000,000
9	**Mid-Columbia**			
	Columbia 230 kV Bus Tie and Sectionalizing Breaker Addition and Northern Mid-Columbia Area Reinforcement (Joint Utility)	P00076	2022	$15,000,000
10	**Central Oregon – Alturas**			
	La Pine 115 kV Circuit Breaker Additions	P02467	2021	$3,800,000
11	**Southwest Washington Coast**			
	Holcomb-Naselle 115 kV Line Upgrade	P02261	2021	$12,500,000

	Aberdeen Tap to Satsop Park – Cosmopolis 115 kV Line Upgrade	P03506	2022	$191,000
12	**Spokane – Colville – Boundary**			
13	**Centralia – Chehalis**			
	Silver Creek Substation Reinforcements	P01092	2022	$10,500,000
	CENTRALIA-ROY ZIMMERMAN TAP 69KV LINE UPGRADE	P03257	2023	$350,000
14	**Northwest Montana**			
	Conkelley Substation Retirement	P02259	2024	$27,600,000
15	**Southeast Idaho – Northwest Wyoming**			
	Spar Canyon 230 kV Reactor Addition	P02306	2022	$3,800,000
16	**North Idaho**			
	LIBBY (FEC) 115 KV SUBSTATION CAPACITOR	P04095	2023	$1,500,000
	LIBBY POWER HOUSE 1 AND 2 REDUNDANT TRANSFER TRIP	P04231	2023	$400,000
17	**North Oregon Coast**			
18	**South Oregon Coast**			
	Fairview 115 kV Reactor Additions	P01465	2023	$11,100,000
	Central Oregon Coast O&M Flex (Toledo, Wendson, Santiam, Tahkenitch)	P02230	2024	$4,500,000
19	**DeMoss – Fossil**			
20	**Okanogan**			
	GRAND-COULEE-FOSTER CREEK (NILLES CORNER) LINE UPGRADE	P03253	2022	$700,000
21	**Hood River – The Dalles**			
22	**Pendleton – La Grande**			
23	**Walla Walla**			
	TUCANNON RIVER 115 KV 15 MVAR SHUNT REACTOR	TBD	2025	$2,000,000
24	**Burley**			
25	**Northern California (Alturas)**			
26	**Klickitat County**			
27	**Umatilla - Boardman**			
	Jones Canyon 230 kV Shunt Reactor	P03491	2022	$5,300,000
	MORROW FLAT 230 KV SHUNT REACTOR	P04423	2022	$2,900,000

Note: Projects in bold are newly identified transmission needs based on the most recent system assessment.

A.2 List of Projects by Path

No.	Project Title	Bundle No.	Expected In-Service Date	Estimated Cost
1	**North of John Day**			
2	**North of Hanford**			
3	**West of McNary**			
4	**West of Slatt**			
5	**West of John Day**			
6	**Raver to Paul**			
	Raver 500/230 kV Transformer (PSANI)	P00094	See Seattle Area	
	St Clair-South Tacoma 230 kV Disconnect Switch Upgrade	P04277	2022	$150,000
	Centralia Unit No. 2 Re-termination	TBD	Long-Term	–
7	**Paul to Allston**			
	Holcomb – Naselle 115 kV Line Upgrade	P02261	See SW Washington Coast Area	
8	**South of Allston**			
	Longview 230/115 kV Transformer Addition	P02281	See Longview Area	
	Schultz-Wautoma 500 kV Line Series Capacitor	P03259	2022	$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	–
9	**West of Cascades South**			
	Pearl – Sherwood 230 kV Corridor Reconfiguration	TBD	Long-Term	–
10	**North of Echo Lake**			
	Monroe 500 kV Line Retermination	P00716	2021	$10,800,000
11	**South of Custer**			
12	**West of Cascades North**			
13	**West of Hatwai**			
14	**West of Lower Monumental**			

A.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 Re-terminations	P00716	See North of Echo Lake Path	
4	**Montana to Northwest**			

A.4 List of Line and Load Interconnection Projects

Project ID	Project Title	Status	Expected In-Service Year
P03861	L0296: BENHAM FALLS-SUNRIVER FINAL SPAN CONNECTION	CONSTRUCTION	2020
P03367	L0372: SOUTHRIDGE SUBSTATION LINE TAP AND METER SET	CONSTRUCTION	2020
P03075	L0407: TOTTEN SUBSTATION METER INSTALLATION	COMPLETION IN PROCESS	2020
P03074	L0414: RUPPERT RD SUBSTATION	CONSTRUCTION	2020
P02994	L0415: PACIFICORP PROJECT VITESSE PONDEROSA SUBSTATION - PHASE 2	COMPLETION IN PROCESS	2020
P02313	L0316: PACIFICORP MCNARY SUBSTATION	COMPLETION IN PROCESS	2020
P02287	L0390: CHICKEN CREEK SUBSTATION	COMPLETION IN PROCESS	2020
P00065	L0293: PACIFICORP - VANTAGE 23KV INTERCONNECTION	COMPLETION IN PROCESS	2020
P02242	L0394: SALZER VALLEY	CONSTRUCTION	2021
P02240	L0346: AIRPORT SUBSTATION	CONSTRUCTION	2021
P02256	L0380: QUENETT CREEK SUBSTATION	CONSTRUCTION	2022

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 phase or completion is in process.

A.5 List of Projects Expected to be Energized

Area	Project Title	Project Number	Expected In-Service Date	Estimated Cost
2	**Portland**			
	Keeler 500/230 kV Transformer Re-termination	P02227	2020	$1,600,000

Path	Project Title	Project Number	Expected In-Service Date	Estimated Cost
1	**California to Oregon AC Intertie WECC Path 66 –North of John Day**			
	Central Oregon Series Capacitor: Slatt Series Capacitor Addition and Bakeoven Series Capacitor Upgrade	P02455	2020	$15,000,000
6	**Raver to Paul**			
	St. Clair – South Tacoma 230 kV Line Upgrade	P02516	2020	$400,000

Note: Most projects go into service as expected. 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.

A.6 System Assessment Historical and Forecast Peak Load by Area

A.6.1 2020 System Assessment Historical and Forecasted Load Information

No.	LOAD AREAS	Historical		2019 Assessment Near Term (2 yr)			2020 Assessment Near Term (2 yr)			2019 Assessment Near Term (5 yr)		2020 Assessment Near Term (5 yr)		2019 Assessment Long Term (10 yr)		2020 Assessment Long Term (10 yr)	
		Historical Peak Load (MW)		2021 Peak Load Forecast (MW)			2022 Peak Load Forecast (MW)			2023 Peak Load Forecast (MW)		2025 Peak Load Forecast (MW)		2028 Peak Load Forecast (MW)		2029 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	7056	**9682**	3654	6843	9639	5745	6843	9639	6699	9438	7292	9687	6792	9565	7417	9870
2	Portland	4022	**4136**	1746	3533	3442	2581	4453	4409	3910	3912	4831	4728	4129	4137	4912	4918
3	Vancouver	860	**1069**	488	753	987	726	767	971	790	1012	786	987	913	1017	853	1011
4	Salem - Albany	840	**895**	441	819	891	505	899	895	880	973	919	908	907	952	946	935
5	Eugene	602	**896**	558	643	841	554	656	866	609	775	680	879	727	780	717	886
6	Olympic Peninsula	741	**1284**	503	755	1240	610	800	1322	852	1404	804	1324	827	1356	865	1394
7	Tri-Cities	**1160**	1007	836	1158	957	1123	1322	968	1342	1089	1368	1038	1404	1137	1398	1055
8	Longview	643	**830**	637	716	831	763	566	732	678	873	574	746	674	876	585	776
9	Mid-Columbia	2373	**2374**	1406	2097	2187	1251	2060	2843	2563	2897	2437	2403	2550	3033	2514	2691
10	Central Oregon	544	**687**	343	480	643	450	591	759	530	697	652	800	605	789	764	967
11	SW Washington Coast	195	**375**	112	248	326	161	235	371	286	421	236	382	300	430	238	394
12	Spokane	896	**924**	571	879	879	677	909	865	828	858	919	882	891	893	953	892
13	Centralia/ Chehalis	134	**261**	109	167	248	178	178	258	169	263	176	260	173	270	183	263
14	NW Montana	259	**354**	214	258	357	190	271	370	268	373	289	384	284	399	302	406
15	SE Idaho - NW Wyoming	148	**291**	82	150	300	237	187	284	153	309	193	298	161	333	201	318
16	North Idaho	101	**187**	90	116	188	115	119	187	122	191	120	191	123	199	131	196
17	North Oregon Coast	147	**274**	131	185	288	118	176	278	187	291	178	282	197	304	180	287
18	South Oregon Coast	259	**505**	166	242	420	202	255	459	268	476	258	461	272	534	259	465
19	De Moss - Fossil	29	**44**	13	23	32	19	24	36	30	36	24	37	31	38	24	38
20	Okanogan	158	**232**	135	162	239	152	171	249	201	270	179	256	213	302	186	266
21	Hood River - The Dalles	234	**265**	77	312	361	292	374	396	373	422	522	535	457	507	542	575
22	Pendleton / La Grande	**146**	139	76	146	139	109	140	141	151	143	140	139	150	142	141	141
23	Walla Walla	**91**	77	64	91	77	76	113	82	153	133	135	113	164	145	141	120
24	Burley	**200**	157	97	206	136	115	216	159	193	134	228	164	197	136	248	170
25	Northern California[1]	**114**	92	53	121	82	76	115	83	119	82	114	87	125	89	118	83
26	Klickitat[2]	62	**82**	*Note 2*			59	68	73	*Note 2*		69	86	*Note 2*		70	76
27	Umatilla[3]	**555**	437	*Note 3*			300	848	683	*Note 3*		1076	910	*Note 3*		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 2020 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 2019 and 2020 System Assessments. The 2019 System Assessment used the forecasts shown for the years 2021 (2 year near term), 2023 (5 year near term), and 2028 (long term). 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). This table indicates how the area load forecasts changed between the 2019 and 2020 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.

Footnotes to the Summary of Loads Table on the previous page:

1 For the 2020 System Assessment, Northern California is identified/documented as a distinct load area. For the 2019 System Assessment, Northern California was studied as part of the Central Oregon load area.

2 For the 2020 System Assessment, Klickitat was added as a distinct load area. For the 2019 System Assessment, Klickitat was included as part of the North of Hanford and West of McNary path studies, so the Klickitat load forecast was embedded in those studies.

3. For the 2020 System Assessment, Umatilla was added as a distinct load area. For the 2019 System Assessment, Umatilla was studied as part of the Tri-Cities load area, so the Umatilla forecast was embedded in those studies.

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

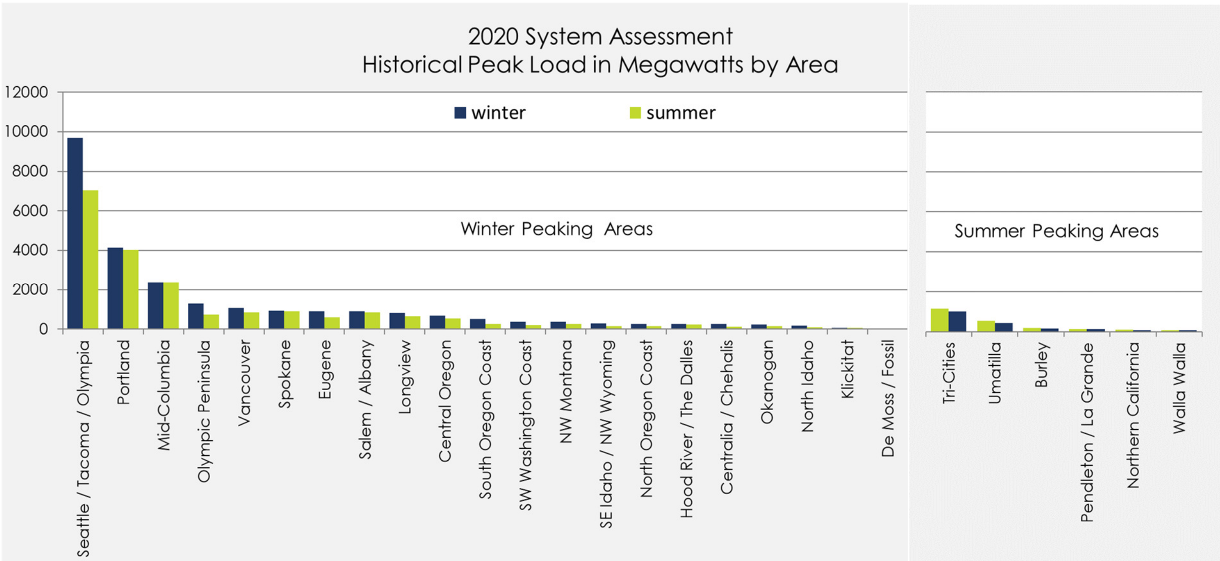
5. Walla Walla – The forecast includes a 58 MW future load interconnection request at Worden Substation

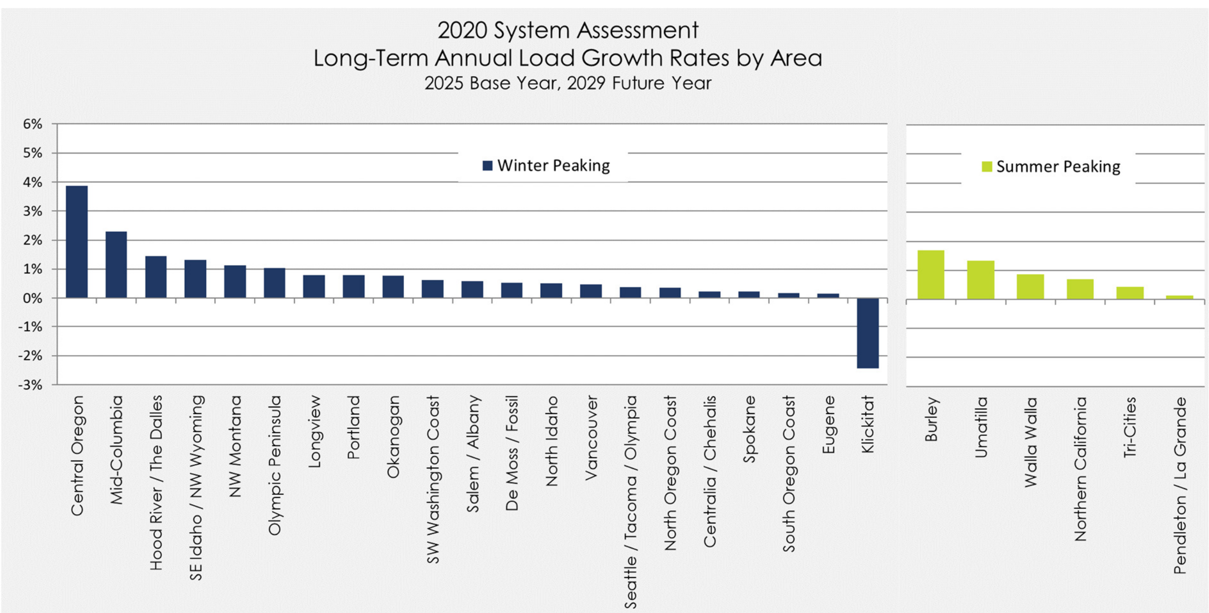
A.6.2 2020 System Assessment Long-Term Peak Load Growth by Area

	Load Areas	2020 Assessment: 2025 Peak Load Forecast Near Term, 5 year (MW)		2020 Assessment: 2029 Peak Load Forecast Long Term, 10 year (MW)		Growth: Long-Term Annual Load Growth Rate, 2025 Base, 2029 Future (%)	
		Summer	Winter	Summer	Winter	Summer	Winter
1	Seattle / Tacoma / Olympia	7292	9687	7417	9870	0.3	0.4
2	Portland	4831	4728	4912	4918	0.3	0.8
3	Vancouver	786	987	853	1011	1.6	0.5
4	Salem / Albany	919	908	946	935	0.6	0.6
5	Eugene	680	879	717	886	1.1	0.2
6	Olympic Peninsula	804	1324	865	1394	1.5	1.0
7	Tri-Cities	1368	1038	1398	1055	0.4	0.3
8	Longview	574	746	585	776	0.4	0.8
9	Mid-Columbia	2437	2403	2514	2691	0.6	2.3
10	Central Oregon	652	800	764	967	3.2	3.9
11	SW Washington Coast	236	382	238	394	0.2	0.6
12	Spokane	919	882	953	892	0.7	0.2
13	Centralia / Chehalis	176	260	183	263	0.8	0.2
14	NW Montana	289	384	302	406	0.9	1.1
15	SE Idaho / NW Wyoming	193	298	201	318	0.8	1.3
16	North Idaho	120	191	131	196	1.8	0.5
17	North Oregon Coast	178	282	180	287	0.2	0.4
18	South Oregon Coast	258	461	259	465	0.1	0.2
19	De Moss / Fossil	24	37	24	38	0.0	0.5
20	Okanogan	179	256	186	266	0.8	0.8
21	Hood River / The Dalles	522	535	542	575	0.8	1.5
23	Pendleton / La Grande	140	139	141	141	0.1	0.3
22	Walla Walla	135	113	141	120	0.9	1.2
24	Burley	228	164	248	170	1.7	0.7
25	Northern California	114	87	118	83	0.7	-0.9
26	Klickitat	69	86	70	76	0.3	-2.4
27	Umatilla	1076	910	1150	1013	1.3	2.2
	All Areas	25199	28967	26038	30206	0.7	0.8

* The long-term annual growth rate is calculated as follows:
(Future Year in MW 2029 - Base Year in MW 2025)^(1/(2029-2025)) * 100 -100

A.6.3 Historical Peak Loads & Long-Term Annual Growth Rates by Area





A.7 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

BPA TRANSMISSION PLAN

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