WestConnect Regional Transmission Planning 2016 -17 Cycle

Regional Transmission Plan

Approved by the WestConnect Planning Management Committee
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Updated July 28, 2021 to Redact Non-Public Information
(Contact admin@westconnect.com to Request Non-Redacted Version)

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1 Summary and Introduction

1.1 Summary

This WestConnect Regional Transmission Planning Report documents the process and analysis for developing the 2016-17 WestConnect Regional Transmission Plan ("Regional Plan"). It is the final step of the WestConnect biennial Regional Transmission Planning Process ("Planning Process") and summarizes the scope, methodologies, assessments, and results that form the Regional Plan. If the Planning Process had identified any reliability-, economic-, or public policy-driven regional transmission needs, then the Regional Plan would document the nature of the needs and the actions taken to identify regional solutions selected to meet those needs. The Regional Plan describes why projects were either included or not included in the Regional Plan.

Based on the analysis performed for reliability, economic, and public policy requirement-driven transmission needs, no regional transmission needs were identified in the 2016-17 cycle. Therefore, alternatives to meet regional needs were not solicited and no projects, aside from the projects identified in the Base Transmission Plan, were selected into the 2016-17 Regional Plan.

1.2 Study Area

The WestConnect planning process evaluates regional transmission needs solely of the WestConnect planning region, which is defined as the combined footprints of signatories to the Planning Participation Agreement ("PPA") within the Transmission Owner with Load Service Obligations ("TO") Member Sector. TO Members participating in the WestConnect 2016–17 planning process and the systems considered in the regional transmission needs assessment included:

- Arizona Electric Power Cooperative
- Arizona Public Service
- Basin Electric
- Black Hills
- Colorado Springs Utilities
- El Paso Electric
- Imperial Irrigation District
- Los Angeles Department of Water and Power
- NV Energy
- Platte River
- Public Service of New Mexico
- Sacramento Municipal Utility District
- Salt River Project
- Transmission Agency of Northern California
- Tri-State G&T
- Tucson Electric
- Western Area Power Administration
- Xcel Energy – PSCo

WestConnect only conducts Federal Energy Regulatory Commission ("FERC") Order Number 1000 ("Order No. 1000") regional transmission needs assessments for TOs that are WestConnect members.[1] The approximate footprint of both member and participating TOs is shown in **Figure 1**.

[1] *All references to Order No. 1000 include any subsequent orders. (see http://www.ferc.gov/whats-new/comm-meet/2011/072111/E-6.pdf)*

Figure 1: Approximate Footprint of WestConnect Member TOs and Participating TOs

The following Planning Management Committee ("PMC") members from the Independent Transmission Developer Member Sector and Key Interest Group also participate in the planning effort:

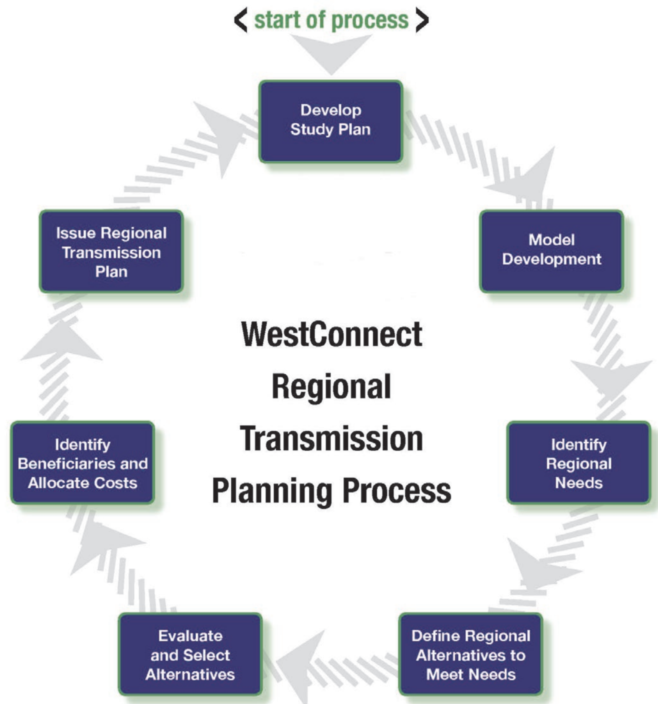
- American Transmission Company
- Black Forest Partners
- ITC Grid Development, LLC
- Exelon Transmission
- SouthWestern Power Group
- TransCanyon
- Western Energy Connection
- Xcel Energy – Western Transmission Company
- Natural Resources Defense Council

To the extent WestConnect received updated modeling data from TOs outside of the WestConnect planning region during the development of the regional models, it was considered, and if appropriate, incorporated into the regional models. The goal in seeking input from neighboring planning regions and TOs outside of the WestConnect planning footprint was to maintain external model consistency and align planning assumptions as closely as possible.

1.3 Planning Process

The WestConnect Planning Process was developed for compliance with Order No. 1000, Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities. The planning process consists of seven primary steps as outlined in **Figure 2**.

Figure 2: WestConnect Regional Transmission Planning Process



The Planning Process is biennial. It commences in even numbered years, resulting in the development of a Regional Transmission Plan every odd-numbered year. During the planning cycle, WestConnect identifies the region's reliability, economic, and public policy transmission needs. If needs are identified, WestConnect solicits alternatives (transmission or non-transmission alternatives ("NTAs")) from WestConnect members and stakeholders to meet the regional needs and evaluates the alternatives submitted to or developed by WestConnect to determine which alternatives meet the region's needs more efficiently or cost-effectively and identifies those alternatives in the Regional Plan. Identified alternatives submitted for the purposes of cost allocation may go through the cost allocation process if they pass the cost/benefit thresholds established for the relevant category of project (reliability, economic, or public policy) and if they are further determined to be eligible for regional cost allocation.

Additional details of the WestConnect Regional Transmission Planning Process can be reviewed in the WestConnect Regional Business Practice Manual ("BPM").[2]

1.4 Management of the Regional Plan Activities

The WestConnect Planning Management Committee ("PMC") has overall responsibility for all WestConnect regional planning activities. The planning process activities described within this Regional Plan have been conducted under the direction of the PMC by the Planning Subcommittee ("PS") and Cost Allocation Subcommittee ("CAS"), and with input from WestConnect TOs, Subregional Planning Groups[3] ("SPGs"), and stakeholders as described in greater detail in subsequent sections of this document.

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[2] *See Version 1.0: https://doc.westconnect.com/Documents.aspx?NID=17155*

[3] *The WestConnect Subregional Planning Groups consist of the Southwest Area Transmission ("SWAT"), the Sierra Subregional Planning Group ("SSPG), and the Colorado Coordinated Planning Group ("CCPG").*

2 Study Plan

The scope of work for the 2016-17 Planning Process is documented in the 2016-17 Regional Study Plan, which was approved by the PMC on March 16, 2016. The Study Plan includes methodologies for how reliability, economic, and public policy assessments are performed. It covers the scope of work for model development, and provides technical guidance regarding the identification of regional needs. The Study Plan documents how WestConnect performs its regional assessments using Base (or "Base Case") and Scenario models to provide a robust regional planning program for evaluating regional *needs* and *opportunities*. Regional transmission performance is evaluated through the reliability, economic, and public policy transmission assessments. This section describes the process used to perform and evaluate the various assessments, and also explains how WestConnect makes a clear distinction between what is classified as a regional need and what is referred to as a regional opportunity.

The transmission assessments utilized both Base Case and Scenario models, as described in the Study Plan. Both reliability and economic Base models are meant to reflect the transmission system, generators, loads, and policies as planned for the 10-year horizon. They represent a "current trend" or "expected future," inclusive of expected load and resource forecasts, planned transmission topology, and enacted public policies. The economic Base models include expected parameters, such as fuel costs, generating unit operating characteristics, and hourly load shapes. Regional reliability performance, economic congestion or public policy-driven issues that result from the Base Case assessments may constitute a regional reliability, economic, or public policy regional transmission need.

Scenario models represent alternate but plausible futures where resource and load assumptions are different than what is assumed in the Base models. Although the scenario futures may be plausible, they were not expected as of this planning cycle. By incorporating Scenario assessments into the Planning Process, WestConnect stands to benefit by understanding how futures other than the Base Case might impact the regional transmission system, should those futures appear to become plausible in subsequent planning cycles. The impacts that result from Scenario assessments might result in a regional reliability, economic, or public policy opportunity, but they do not trigger the identification of a transmission need. Opportunities do not require any additional action. However, the PMC may later decide if any opportunities resulting from Scenario assessments warrant further exploration and if additional information-only studies would be beneficial.

2.1 Regional Reliability Assessment

The reliability assessment for the 2016–17 Planning Process utilizes models that represent the 10-year planning horizon. The reliability assessment ensures the WestConnect planning region as a whole complies with applicable reliability standards and criteria. In particular, steady state contingencies (P1, P2, P4, P5 and P7) were run with the initial condition as system normal (P0), as stated in NERC TPL-001-4 Table 1.[4] In addition to steady state evaluations, the reliability assessment may also include post-transient and transient stability analyses. If the PMC determines any reliability issues to be regional in nature they may be identified as regional reliability needs. If such regional needs are identified, then potential solutions are solicited by the PMC for evaluation and potential inclusion into the Regional Transmission Plan. WestConnect has defined regional reliability issues as those that impact more than one TO Member system. Specifically, in the event a simulated outage produces one or more NERC TPL

[4] http://www.nerc.com/files/TPL-001-4.pdf

(Transmission Planning) violations in more than one member TO system, those violations may result in the identification of a regional reliability-driven transmission need.

When scenario models are evaluated, the same criterion for reliability standards are used to identify regional reliability issues. However, as stated previously, these issues result in potential regional opportunities rather than regional needs; regional needs cannot be identified in Scenario studies.

2.2 Regional Economic Assessment

To evaluate the potential for regional economic needs in the WestConnect planning footprint, WestConnect conducts a process in which potentially congested elements are identified through forward-looking production cost modeling. Using results from Base Case model runs and other relevant sensitivities, WestConnect reviews metrics such as congestion frequency in terms of number of hours, and congestion costs such as the cost to re-dispatch more expensive generation, for transmission elements greater than 100 kV and defined interfaces in the WestConnect footprint. WestConnect conducted sensitivity studies on the Base Case economic model to better understand whether regional transmission congestion may be impacted by adjusting certain parameters within the Base models. Sensitivity analysis is different from Scenario evaluation in that the sensitivities are meant to make relatively minor adjustments that would still remain within the expected future framework of the Base models. This sensitivity analysis includes variables such as load, location of new generation and/or retirement, hydro conditions (e.g., wet vs. dry), natural gas prices; emissions cost (e.g., carbon dioxide "CO_2"), and other modeling parameters.

By adjusting individual parameters, this assessment helps WestConnect understand how sensitive the Base Transmission Plan is to variables, while also supporting the Base Case congestion assessment.

Transmission elements that exhibit congestion are identified and verified through review, historical benchmarking, and follow-up study. Given the regional focus of the WestConnect process, the analysis is generally limited to:

- Transmission elements (or paths/interfaces) between multiple WestConnect member TOs;
- Transmission elements (or paths/interfaces) owned by multiple WestConnect member TOs; and
- Congestion occurring within the footprint of multiple TOs that has potential to be addressed by a regional transmission alternative or NTA.[5]

The process to assess regional congestion includes vetting significantly congested transmission elements. That process allows WestConnect to make a determination as to whether congestion issues are regional in nature and determine which should constitute regional economic needs. The objective is to arrive at a set of congested elements that warrant testing of regional project solutions, recognizing that the presence of congestion does not always equate to a regional economic need at a particular location since any solution needs to be economically justified.

For Scenario models, similar economic assessments are performed, but regional congestion issues may be classified as regional economic opportunities rather than regional economic needs. As with the reliability opportunities, the PMC may determine if the opportunities warrant further exploration and

[5] *Congestion within a single TO's footprint (and not reasonably related or tied to other TO footprints) is out of scope of the regional planning effort and is alternatively subject to Order 890 economic planning requirements.*

whether they might be evaluated later in the planning process. The identification of opportunities and subsequent evaluations are strictly informational studies.

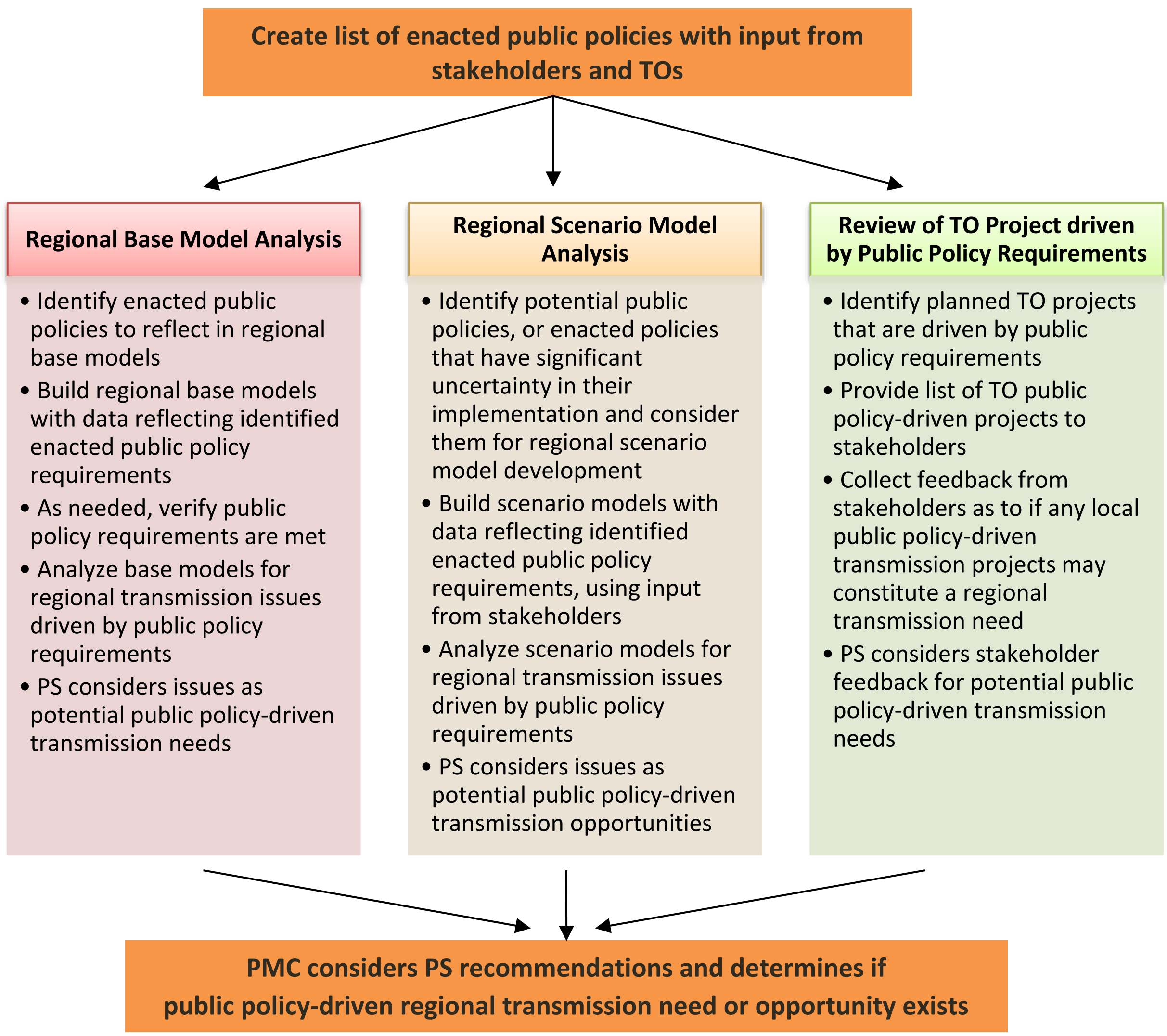
2.3 Regional Public Policy Assessment

Enacted public policy, including but not limited to, Renewable Portfolio Standards ("RPS"), energy efficiency/demand side management and distributed generation standards is considered in the regional planning process. Enacted public policies are considered early in the planning process and are incorporated into the Base models through the roll-up of local TO plans and their associated load, resource, and transmission assumptions. The PS has discretion to identify which enacted policies, if any, should be verified through the regional process to ensure they are properly represented in the regional Base models.

Enacted public policies that are subject to significant uncertainty within the planning horizon are also considered. These types of public policies may be studied through the development of regional scenario models. Non-enacted or proposed public policies may also be considered as part of the scenario planning process.

Stakeholders, through their participation in the regional planning process, have the opportunity to provide feedback to WestConnect as it evaluates public policy-driven transmission issues and determines what issues may constitute regional transmission needs or opportunities. The PMC, which is charged with identifying regional public policy-driven transmission needs for the WestConnect region, considers a recommendation from the PS for each of the public policy analyses described above. The regional public policy-driven transmission need identification process is outlined below in **Figure 3**.

Figure 3: Regional Public Policy Process



WestConnect begins the evaluation of regional transmission needs driven by public policy requirements by first identifying a list of enacted public policies that impact local TO plans in the WestConnect planning region. This list is developed by the PS in public meetings, and is made available on the WestConnect website. Once the list is developed, the PS, with input from stakeholders, divides the list into three categories to consider which enacted public policies (1) will be reflected in the regional base model analysis; (2) are subject to regional scenario model analysis given significant uncertainty in their implementation; or (3) are an enacted public policy but due to uncertainty, or modeling or data constraints, does not lend itself to technical modeling assessments in the current planning cycle.

For polices that fall into category (1), the regional Base models reflect the enacted public policies identified through the process described above. The data to reflect the public policies is provided by TOs as it is assumed that enacted public policies are already reflected in TOs' transmission plans. In some instances, the PS may choose to verify that the appropriate load, resources, or transmission are included in the models. Once the models are compiled, reviewed, and ultimately approved by the PMC, the PS performs economic and reliability assessments using the regional Base models to determine if there are any regional transmission issues. The PS determines if those issues are related to enacted public policy, and therefore, may constitute a public policy-driven transmission need.

Public policies that fall under category (2) are *enacted* yet have uncertain implementations. These are addressed through scenario analysis in the WestConnect process. The regional Base Case models are intended to represent the "expected" future, which should include all enacted public policies. However, in the event an enacted public policy has a wide range of alternative implementation options (and correspondingly, a wide range of transmission impacts) scenario analysis allows WestConnect to plan for and understand these various alternative futures, recognizing that at some point, the enacted public policy may gain enough certainty in its implementation such that a single set of assumptions can be included in the base regional models.

The scenario models that reflect enacted but uncertain public policies are evaluated using regional scenario models. These may be suggested by stakeholders or developed by the PS. Regional Base Case models are used as a starting point to develop the scenario models. Depending on the public policy being considered, WestConnect may perform analyses in order to determine what changes should be made to the base load, resource, and transmission assumptions for the scenarios to properly reflect the uncertainty in the enacted public policy.

The models built during the 2016–17 cycle for regional public policy scenario analysis are described in Section 3.3 and Section 3.4. Notably, the PMC is not obligated to identify a public policy-driven regional transmission need based on results from the Scenario analysis. However, the PMC may determine the opportunities warrant further exploration and whether the PS should further evaluate those opportunities later in the planning process.

The third category (3) of the WestConnect regional public policy planning process allows for the PS in consultation with stakeholders to review local TO public policy-driven transmission projects and make suggestions as to whether the TO's project may constitute a public policy-driven regional transmission need. As a part of its effort to "roll-up" local transmission plans to compile the regional Base Transmission Plan, WestConnect provides stakeholders with a list of public policy-driven transmission projects that are included in TOs' local plans. After reviewing this information, stakeholders are invited to make a recommendation to the PS as to whether any local public policy-driven transmission projects may suggest the consideration or identification of a regional transmission need. The PS considers the suggestion and makes a recommendation to the PMC as to whether it should be identified as a regional public policy-driven transmission need.

If any regional public policy needs are identified, a project solution submittal window opens. Upon closure of the submittal window, WestConnect initiates an evaluation of the proposed transmission and NTAs to identify if there is a more efficient or cost-effective regional solution.[6]

2.4 Local versus Regional Transmission Issues

For the purposes of the regional transmission needs assessment, a single-system "issue" is defined as a system issue that impacts only the TO-footprint in which it resides. Single TO issues and non-member issues are not within the scope of the WestConnect regional transmission planning process and are not considered regional transmission needs. However, for the sake of completeness and study transparency, the study process included a review of all single-system issues ensuring that in combination, none of the

[6] *If no solutions are submitted, WestConnect develops solutions to regional public policy-driven transmission needs.*

issues are regional in nature and/or co-dependent. Any single-system issue is the responsibility of the affected TO to resolve, if necessary.

Regional needs are generally defined by impacts to more than one TO. However, the PMC may determine that in some instances, the multi-TO impacts are local, rather than regional, in nature. In such cases, WestConnect will provide an explanation as to how impacts are classified.

2.5 Base Transmission Plan

WestConnect creates the regional Base Transmission Plan at the beginning of each planning cycle to establish the transmission network topology that is reflected in the regional planning models. The Base Transmission Plan primarily consists of the "planned" incremental transmission facilities submitted and included by TOs in local transmission plans[7] as well as transmission facilities identified for inclusion in the Regional Plan of previous planning cycles that are not subject to reevaluation. However, no transmission facilities were identified in the previous regional planning cycle for this Base Transmission Plan. As defined by WestConnect, "planned" facilities include projects that have a sponsor, have been incorporated in an entity's regulatory filings, have an agreement committing entities to participate and construct, or for which permitting has been or will be sought.

The Base Transmission Plan can include assumptions member TOs have made with regard to regional transmission facilities in their local transmission plans – this is another way a regional project can enter into the Base Transmission Plan. "Conceptual" transmission projects are those that have not advanced to the planned stage and are discouraged from being modeled in the Base Transmission Plan.

The Base Transmission Plan may also include projects under development by independent transmission companies (ITCs) and transmission developers in the WestConnect planning region, to the extent there is sufficient likelihood of completion associated with these projects to warrant their inclusion in the Base Transmission Plan.[8] For the 2016-17 Regional Process, no ITC projects met the criteria for inclusion.

The Base Transmission Plan was developed using project information collected via the WestConnect Transmission Plan Project List ("TPPL"), which serves as a project repository for TO member and TO participant local transmission plans as well as ITC projects. The TPPL data collection window for the 2016–17 planning cycle opened on November 20, 2015, and closed on December 11, 2015.

The details about the process used to identify the 2016–17 Base Transmission Plan and list of projects are summarized in Appendix B and Appendix C, respectively. The Base Transmission Plan projects were included in all 2026 Base and Scenario models.

2.6 Identifying Regional Transmission Needs

After the PS completes the needs assessment (as described in Section 4), the PS identifies a list of transmission issues resulting from the studies, and makes a recommendation to the PMC as to which, if any, regional issues should constitute economic, reliability, or public policy transmission needs. The process for identifying those regional transmission needs for which a regional transmission solution(s)

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[7] Developed in accordance with Order No. 890 local planning processes

[8] A description of the criteria used to identify projects for inclusion in the base transmission plan is in the WestConnect BPM.

is sought and evaluated utilizes various communication channels with stakeholders, including open PMC and PS meetings, stakeholder meetings, and the Regional Transmission Needs Assessment. Each of these channels allow for stakeholder comment and input.

The Regional Transmission Needs Assessment report contains the PS recommendation on regional transmission needs for the study cycle and is delivered to the PMC for review and approval. The regional transmission needs are finalized with the PMC approval of the report.

In the event that no regional transmission needs are identified, the PMC does not collect transmission or NTAs for evaluation (since there would be no regional transmission needs to evaluate the alternatives against).

2.7 Alternatives to Meet Regional Needs

There is an open submission period to collect potential transmission or NTA solutions to identified regional transmission needs. The submission period is published on the WestConnect website and distributed via email to WestConnect Members and stakeholders. The submission period lasts for no less than thirty days and ends by the fifth quarter of the WestConnect planning cycle. More details on the specifics of the submittal window are made available upon the identification of regional needs.

Any active member[9] in good standing within one of the five PMC membership sectors may submit transmission alternatives and NTAs to meet an identified regional need and be considered for selection in the Regional Plan. The categories of projects that may be submitted to WestConnect include:

- Transmission projects not seeking cost allocation
- Transmission projects seeking cost allocation
- Non-transmission alternatives[10]

Entities submitting projects must use the WestConnect Project Submittal Form and provide as much information as possible in order to allow WestConnect to model the project accurately. The Project Submittal Form for alternatives to meet regional needs is included as Appendix D.[11] These submittals must be accompanied by a $25,000 study deposit.

Only projects that meet the qualification criteria outlined in the WestConnect Regional Planning Process BPM for valid project submittals will be evaluated in the regional planning process.

2.8 Alternative Selection, and Cost Allocation

If a regional need was identified, the models and studies used to identify regional transmission needs would have been used to determine whether proposed alternatives resolved the identified needs. This would normally occur during quarters 5, 6 and 7 of the planning cycle. Alternatives

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[9] *"Active member" is defined in Section 6.2 of the WestConnect Planning Participation Agreement.*

[10] *Remedial Action Schemes can be submitted for evaluation as an alternative to the construction of additional transmission facilities.*

[11] *In the event no project is submitted for an identified regional need during the project submittal window, the PMC seeks to develop a transmission alternative or NTA to resolve the identified regional need. The PMC may not be able to identify any feasible solutions in any given transmission planning cycle, but it does undertake this obligation to seek a resolution.*

would be evaluated to determine the more efficient or cost-effective solutions. If those solutions were eligible for cost allocation, then those solutions would go through the cost allocation process.

However, based on the analysis performed for reliability, economic, and public policy requirement-driven transmission needs, no regional transmission needs were identified in the 2016-17 cycle. Therefore, alternatives to meet regional needs were not solicited and no projects, aside from the projects identified in the Base Transmission Plan, were selected into the 2016-17 Regional Plan.

3 Model Development

During the second and third quarter of 2016, the PS developed regional models to prepare for identifying regional transmission needs and/or opportunities for the 2016-17 Planning Process. The 2016-17 Model Development Report, approved by the PMC on October 18, 2016, documents the model development process and the draft assumptions. **Table 1** summarizes the reliability ("power flow" or "PF") and economic ("production cost model" or PCM) cases developed for the 2016-17 cycle.

Table 1: WestConnect Planning Models

Reliability Model Case Summary			
Case Type	**Case Name**	**Case ID**	**Case Description and Scope**
Base Cases	**2026 Heavy Summer**	WC26-HS	Summer peak load conditions during 1500 to 1700 MDT, with typical flows throughout the Western Interconnection
	2026 Light Spring	WC26-LSP	Light spring load conditions between 0700 to 1000 MDT, with relatively high wind and solar generation
Scenario Cases	**CPP WestConnect Utility Plans (PF Case)**	WC26-CPP1	Reflect individual WestConnect member utility plans for Clean Power Plan ("CPP") compliance – *stressed hour from PCM*
	CPP Heavy RE/EE Build Out (PF Case)	WC26-CPP3	Additional coal retirements, additional renewable energy ("RE"), energy efficiency ("EE"), minimal new natural gas generation – *stressed hour from PCM*

Economic Model Case Summary			
Case Type	**Case Name**	**Case ID**	**Case Description and Scope**
Base Case	**2026 Base Case**	WC26-PCM	Business-as-usual case based on WECC 2026 Common Case with additional regional updates from PMC members.
Scenario Cases	**High Renewables**	WC26-PCM-HR	California 50% RPS with regional resources *and* increase WestConnect state RPS requirement beyond enacted with other resources

Economic Model Case Summary			
Case Type	**Case Name**	**Case ID**	**Case Description and Scope**
	CPP WestConnect Utility Plans (*PCM Case)*	WC26-PCM-CPP1	Reflect individual WestConnect member utility plans for CPP compliance
	CPP Heavy RE/EE Build Out (*PCM Case)*	WC26-PCM-CPP3	Additional coal retirements, additional RE/EE, minimal new natural gas generation

3.1 Base Reliability Models

The information in this section summarizes the Base reliability cases. This report summarizes major assumptions and updates incorporated and does not attempt to document each specific assumption.

3.1.1 2026 Heavy Summer Base Case

Description: The case was designed to test the Base Transmission Plan under heavy summer conditions. The seed case was the Western Electricity Coordinating Council ("WECC") 2026 Heavy Summer 1 Base Case dated April 11, 2016 (2026 HS1a), which was updated with the latest topology (i.e., generator, load, and transmission) information from WestConnect participants, and the load level and generator dispatch were updated to account for these updates while still representing typical heavy summer load conditions and generator dispatch.

Generation: Within WestConnect, the case features a dispatch of 59,046 MW of thermal and hydro resources and 5,180 MW of wind and solar resources.

Load: The aggregate coincident peak load level for the WestConnect footprint is 63,465 MW. The original WECC case represented the system coincident peak for a heavy summer conditions between the hours of 1500 to 1700 MDT during the months of June – August. WestConnect's intent was to continue these assumptions during its case development.

Transmission: Minor planned transmission additions beyond the Base Transmission Plan were included in the case and are listed below. Members were responsible for ensuring the case topology was consistent with the Base Transmission Plan.

- NV Energy's East Tracy - Valmy 345 kV Line Wavetrap Removal, in-service 2017
- NV Energy's Re-termination of Tracy - Pah Rah 120 kV line, in-service 2018[12]

Other assumptions:

- CAISO resource re-dispatch: Wind and solar photovoltaic ("PV") generation in SDG&E and SCE were increased by 1,230 MW to achieve a 1,200 MW increase in flow from CAISO to WestConnect: 341 MW of SDG&E PV, 92 MW of SCE Wind, and 797 MW of SCE PV. The increased CAISO to WestConnect flow was necessary to achieve load and resource balance given the

[12] *The existing Tracy – Pah Rah line will not be re-terminated. Instead, a new line from East Tracy to Pah Rah 120 kV, is being constructed and will be in service in 11/2017.*

revisions made to the seed case's load level and generator dispatch within the WestConnect footprint. CAISO feedback indicated that it was reasonable that solar PV would be close to full output rather than zero during the summer peak snapshot, and there were solar PV generators—identified per turbine type—in the SCE and SDG&E areas that were not fully dispatched in the seed case, so these generators' dispatch was increased to full output to provide the bulk of the dispatch increase. Beyond that, several wind generators—chosen because they had the largest available capacity in the seed case snapshot—were dispatched up to achieve flow between the CAISO and WestConnect that allowed for load and generation balance.

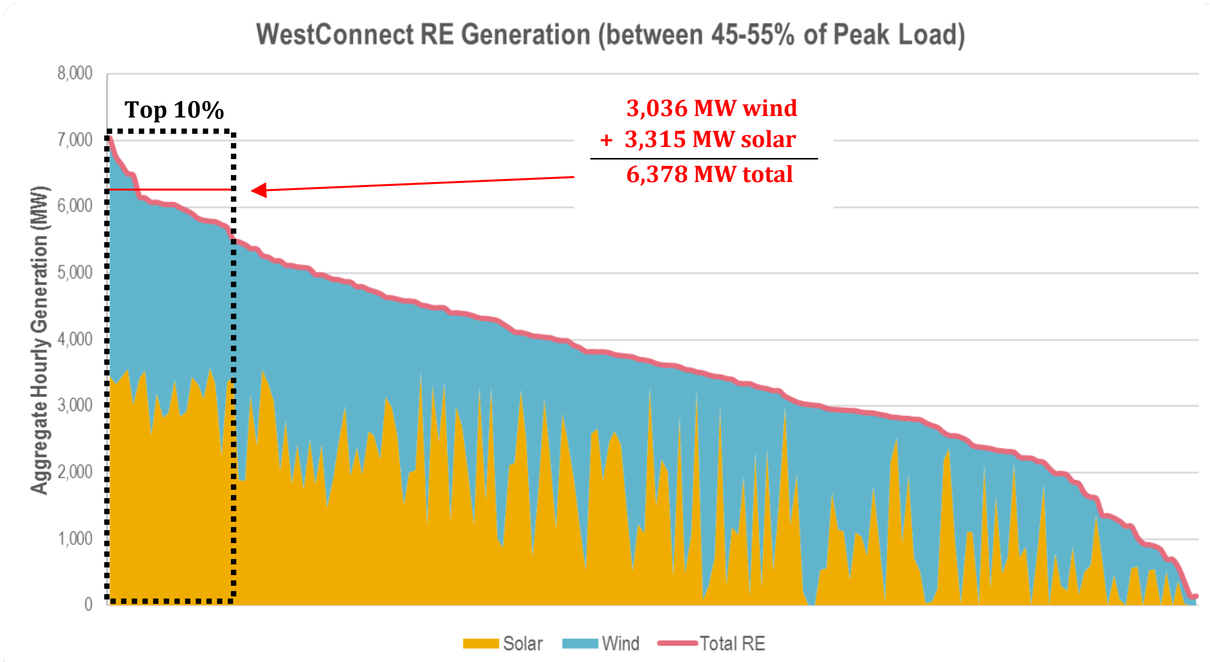
3.1.2 2026 Light Spring Base Case

Description: The purpose of the case was to assess the Base Transmission Plan performance under light-load conditions with solar and wind serving a significant but realistic portion of WestConnect's total load. The case did not include renewable resource capacity additions *beyond* what is already planned and included in the WestConnect Heavy Summer Base Case– the case intends to represent likely and expected system conditions were an inertia-stressed system results from wind and solar serving significant portions of load in light-loading conditions. As explained more fully below, the dispatch of the renewable resources was adjusted from the original WECC base case to better reflect the potential system conditions described above. The WECC 2026 LSP1-S case served as the seed case to which the modifications and updates were made.

Generation: Simulated historical weather data was used to adjust the dispatch level for all wind and solar resources in the WestConnect footprint.[13] The use of hourly wind and solar production data ensured a realistic and geographically matched dispatch of non-thermal resources across the WestConnect footprint. To identify the wind and solar dispatch level, the hourly wind and solar production data described above was filtered to only include data corresponding to mid-morning morning hours between 0700 and 1000 MST when load was between 45-55 percent of the WestConnect peak. The reduced set of hourly wind and solar production data for WestConnect during these hours is shown in **Figure 4**. WestConnect opted to represent a wind and solar dispatch consistent with the average of the top 10 percent of generation hours (after ranking by combined MW output). This resulted in a case with 3,063 MW of wind and 3,315 MW of solar (photovoltaic and thermal storage) generation (dispatch) in WestConnect, which would serve 19 percent of the total WestConnect light-spring load in the case.

[13] The National Renewable Energy Laboratory ("NREL") has created hourly solar and wind meso-scale production data for about 30,000 sites throughout the Western Interconnection. The shapes are based on meteorological modeling that produces historical wind speed and irradiance data for locations across the West. These shapes are used by WECC to develop energy production profiles for wind and solar generation resources in their Common Case production cost modeling dataset. The 2024 Common Case, whose data was used for the analysis described herein, used NREL profiles representing the 2005 historical weather year.

Figure 4: Hourly Production Data used to Estimate Wind and Solar Dispatch



After the wind and solar generators were re-dispatched, as outlined above (based on their geographically-specific generation profiles), the thermal fleet was re-dispatched by PMC members to balance load and resources, keeping interchange between regions and areas roughly the same as in the original WECC case.

The roughly 6,000 MW of wind and solar energy dispatched across WestConnect during the mid-morning hours, as modeled in this case, is intended to represent a realistic and likely future. This level of renewables served 19 percent of the total WestConnect load in this hour, as noted above. While poor data availability for actual historical hourly wind and solar generation data prevents benchmarking of this specific condition, several anecdotes suggest that the condition is feasible and realistic. For example, Xcel Energy commonly sees hours where wind provides more than 50 percent of their load – on October 31, 2013, wind supplied more than 61 percent of customers' energy needs.[14] In 2015, NV Energy's northern Nevada area and southern Nevada area served 31.3 percent and 21.2 percent of their respective loads with renewables. This suggests that there were hours when renewable generation served portions of NV Energy's load in excess of 20 percent.[15] These are just two examples that suggest serving 19 percent of the spring mid-morning WestConnect load with renewables is feasible. However, not all WestConnect members necessarily experience these types of renewable penetration levels.

Load: WestConnect member loads were adjusted slightly from the seed case to attempt to more closely correlate the load forecast to the wind and solar dispatch. The nature of the adjustment (i.e., up, down) was specific to each transmission owner. The total WestConnect load in the case is 30,606 MW, which is 48 percent of the WestConnect peak load in the WestConnect 2026 Heavy Summer Base Case. The load levels represent the system during the mid-morning hours between 0700 and 1000 MST, which was also used to develop the wind and solar generator dispatch.

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[14] https://www.xcelenergy.com/Energy_Portfolio/Renewable_Energy/Wind/Wind_Operations

[15] https://www.nvenergy.com/brochures_arch/RenewableGenerationsBrochure_2016.pdf

Transmission: Identical transmission assumptions as the 2026 Heavy Summer Base Case – see above for details.

Other assumptions:

- CAISO resource re-dispatch: To accommodate WestConnect's changes to interchange and load-gen levels, the two SCE Alameda generators were increased by 160 MW and the SCE area slack bus was reduced 40 MW, resulting in a net increase of 280 MW in SCE.
- No changes were made to the loads and resources (including wind and solar) outside of the WestConnect region. The original WECC 2026 LSP1-S seed case assumptions were modeled outside of the WestConnect footprint, which was intended to model wind at 30 percent of nameplate capacity around hours 0300 to 0500 MST. Thus, when the regional assessment results are based on the assumptions used for this model, including how neighboring loads and resources were represented, which could influence the magnitude and direction of interregional power flow. A deep understanding of the degree to which neighboring regions and areas can be relied on for reliability services, such as initial frequency response, was not investigated in this study.

3.2 Base Economic Model

The information in this section summarizes the Base economic case. This report summarizes major assumptions and updates incorporated and does not attempt to document each specific assumption.

3.2.1 2026 Base Case

Description: The 2026 Base Case is a PCM dataset designed to represent a likely, median 2026 future. The WECC 2026 Common Case Version 1.0 interconnection-wide, 10-year PCM ("WECC Common Case") and its accompanying Release Notes served as the primary seed case for the 2026 Base Case.

Generation:

- WestConnect made significant changes to the amount of generation represented in the generator stack in order to maintain consistent topology with the reliability models. **Table 2** below provides a summary by fuel category. The negative values represent the capacity (in MW) and resulting energy (in GWh) removed from the WECC 2026 Common Case V1.0 in order to make the generation consistent across the WestConnect 2026 Base Case, 2026 Heavy Summer Base Case, and 2026 Light Spring Base Case.

Table 2: Generation Changes Made to WECC 2026 Common Case V1.0

Fuel Category	Annual Generation (GWh)	Capacity (MW)
Gas	(6,102)	(4,897)
Water (Hydro)	(644)	(207)
Solar PV	(5,202)	(2,235)
Solar Thermal	(1,680)	(647)
Wind	(6,402)	(2,661)
Bio	(700)	(126)

Fuel Category	Annual Generation (GWh)	Capacity (MW)
Geothermal	(6,754)	(971)
Other	(227)	(32)
Overall	**(27,712)**	**(11,777)**

- WestConnect's latest generator-specific modeling was developed and used to update the dataset. This included but was not limited to: generator type, commission and retirement date, forced outage rate, outage duration, minimum and maximum capability with applicable de-rates for plant load or seasonal ambient temperature, minimum up and down times, fuel assignments, variable operations and maintenance and start-up costs, linkage to reserve modeling and regional/remote scheduling, linkage to operational nomograms, hydro fixed shape or load/price-driven scheduling, and hourly shapes.

- The behind-the-meter distributed generation modeled on the resource-side was retained from the WECC Common Case and is summarized in **Table 3**.

Table 3: Behind-the-Meter Distributed Generation Retained from WECC 2026 Common Case

Area Name	Capacity (MW)	Generation (GWh)	Capacity Factor (%)	Dispatch at Area Peak (% of Capacity)
AZPS	937	1,854	23%	1%
BANC[16]	323	552	20%	17%
EPE	44	89	23%	14%
IID	68	134	22%	46%
LDWP	984	1,765	20%	29%
NEVP	67	133	23%	50%
PNM	248	491	23%	23%
PSCO	500	906	21%	14%
SPPC	83	158	22%	40%
SRP	438	872	23%	0%
TEPC	433	863	23%	9%
TIDC	114	199	20%	39%
WACM	384	555	17%	46%
WALC	324	645	23%	16%
WAUW	2	3	17%	12%

Load: WestConnect made minor modifications to the load shapes and forecasts included in the WECC Common Case. No changes were made to the load forecasts for areas outside of WestConnect. The below charts provide the annual load energy, two load snapshots (peak load and load during system/WECC peak), and the average load of the WestConnect Areas.

[16] *Note that in several instances in the Plan, data for BANC is presented alongside data from other Balancing Authorities. However, BANC is not a WestConnect member. SMUD is a TO Member of WestConnect that is a member of the BANC Balancing Authority. There are other BANC entities that are non-WestConnect members. For consistency, BANC data is still reported but transmission evaluations are only performed for SMUD.*

Figure 5: Annual Load of WestConnect Areas in 2026 Base Case

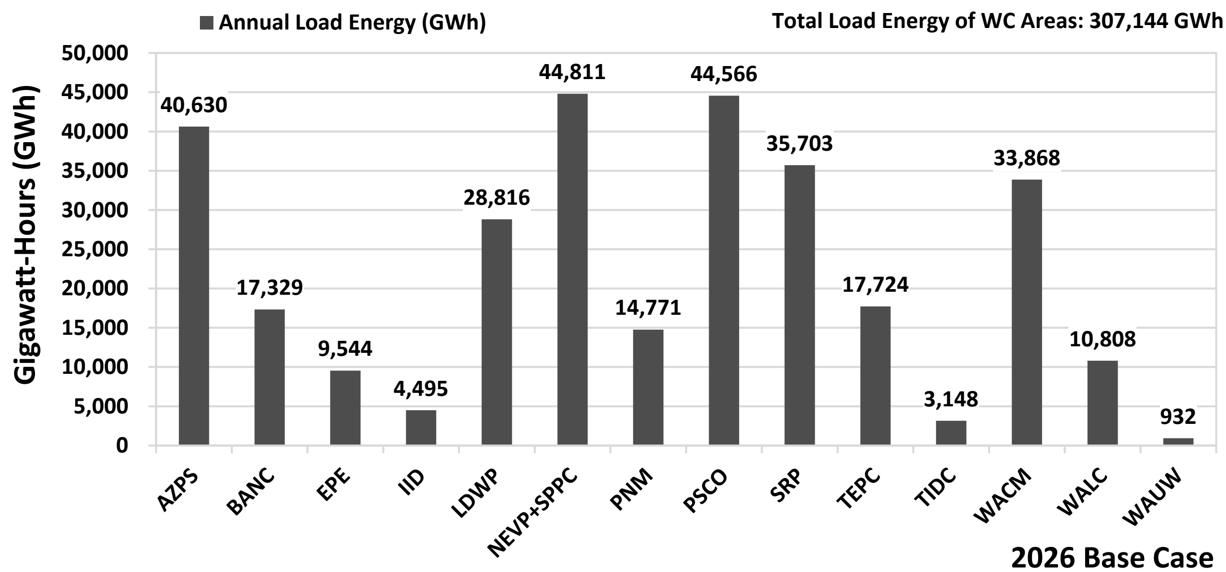
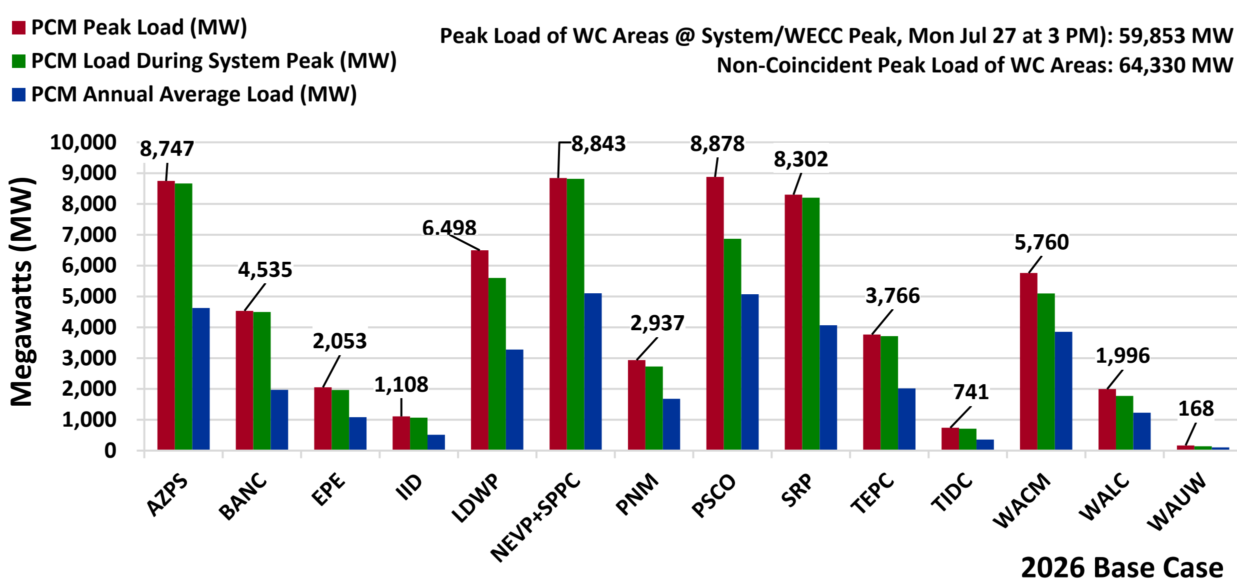


Figure 6: Load Snapshots and Annual Average Load of WestConnect Areas in 2026 Base Case (includes transmission losses)



Transmission: The WECC 2026 Common Case was updated with the WestConnect member topology to be consistent with the WestConnect Base Transmission Plan and the Base reliability cases. WestConnect also reviewed the case for seasonal branch ratings, interfaces, and nomograms – making the below listed changes in each of these categories. The transmission topology outside of WestConnect, including the Common Case Transmission Assumptions, was not modified.

- Increased bus and branch monitoring in the WestConnect footprint
    - Monitoring of all load buses
    - Monitoring of transmission lines ≥ 200 kV and transformers ≥100 kV

- Updated interface definitions
- Removal of the LADWP 25% minimum generation nomogram

Other Assumptions and Associated Developments:

- Numerous updates were made outside of the WestConnect footprint based on interregional coordination with Northern Tier Transmission Group ("NTTG"), California Independent System Operator ("CAISO"), ColumbiaGrid, and WECC (i.e., more recent versions of the WECC Common Case (through Version 1.5))
- Updated reserve requirements for consistency with FERC Order No. 789
- Developed critical disturbances either submitted by TO Members or those associated with WECC Transfer Paths
    - Initially developed for the 2026 Base Case, but ultimately, the TOLSO-submitted disturbances were studied as a sensitivity case
- Added "EPE Balance" and "TEP Local Gen"[17] nomograms and conditional constraints.
- Updated phase-shifting transformer (PST) modeling to ensure the branch thermal rating did not conflict with the operating range
- Used PCM software version in which the PST operating cost calculation logic was adjusted by the software vendor.[18]
- Any opportunity to more closely align the economic Base Case model with the reliability Base Case model was taken. For example, branch ratings were taken from the summer and winter ratings in the WC26HS power flow case and load distribution factors were aligned with the WC26HS case.
- Fuel price forecasts and emission rate assumptions were taken from the WECC Common Case.
- Updated hurdle rate (wheeling charge) modeling based on the latest Open Access Transmission Tariff (OATT) rate information, which included separate rates for peak and off-peak hours
    - Proxy modeling of the Energy Imbalance Market ("EIM") was also developed and studied with a sensitivity case.
- Hurdle rates (wheeling charges) underwent several updates.
    - Wheeling charges on inter-area transfers:
        - Implemented separate rates for peak and off-peak hours based upon the latest Open Access Transmission Tariff ("OATT") information, inclusive of mandatory Schedule 1 (Scheduling System Control and Dispatch Service) and Schedule 2

[17] The terms "EPE Balance" and "TEP Local Gen" refer to names of specific nomograms in the PCM dataset applied to El Paso Electric and Tucson Electric Power areas.

[18] Even with this adjustment, model output related to certain lines with phase shifters continued to show some amount of congestion in situations where member's engineering judgement and historical experience ran contrary to the modeling result.

(Reactive Supply and Voltage Control) charge components of transmission providers in the Western Interconnection.

    - Added $1/MWh trading margin and $4/MWh market friction rates aimed at aligning the results with current business practices and/or observed historical patterns. The market friction portion was only applied in the commitment step whereas all other charges were applied in both the commitment and dispatch steps of the PCM simulation.

  - Emission-related wheeling charges: WestConnect updated the California Global Solutions Act ("AB 32") modeling per WECC's Version 1.3 release of the 2026 Common Case was implemented and not updates were made to the Alberta or British Columbia emission-related hurdle rates.

3.2.2 Sensitivity Studies which informed the 2026 Base Case

As the 2026 Base Case was being developed and preliminary assessments were performed, there was considerable discussion around certain modeling assumptions. This discussion focused primarily on EIM, PSTs, and the inclusion of contingency modeling and sensitivity cases developed and run to explore these three issues.

- EIM: EIM refers to the real-time market to manage transmission congestion and optimize procurement of imbalance energy to balance supply and demand deviations for the balancing authorities that have agreed to participate in the CAISO EIM. Accurately modeling EIM in an hourly PCM presented a challenge. First, bids for resources in the EIM are generally submitted in short (5-15 minute) intervals rather the hourly PCM simulation's hour time step. Second, load to be served is known because it is a model input and therefore resources dispatched to meet the load match perfectly. Hence there is no imbalance. Third, the PCM uses assumed values for transmission charges while there are no transmission charges applied to resources that are eligible to be scheduled in the EIM. Although some WestConnect members participate to some extent in the EIM, it is not consistent throughout the WestConnect footprint. Preliminary assessments tried to model EIM participation (as currently planned/announced), but the group could not come to consensus on the appropriateness of having EIM in the Base models. However, the EIM representation was included in sensitivity analyses. The approximate EIM representation in the sensitivity case was implemented by significantly reducing (by 90 percent) the hour-ahead, inter-area wheeling charge within the dispatch phase of the PCM simulation.

- PSTs: The study results from preliminary assessments yielded some suspicious results attributed to how PSTs are represented in the PCM. In some instances, existing PSTs operated at a much different frequency in the PCM than they have historically operated in real-time. In addition, it was found that some PSTs were congested, which was not consistent with historic operating best practices for such facilities since they are normally used to relieve congestion rather than cause it. Some adjustments were made to the PST modeling to try to reflect expected operating characteristics and WestConnect agreed to refine the modeling in a reasonable manner, but it was decided that congestion issues associated with PSTs would be discounted until additional confidence could be gained in the PCM. In the PST sensitivity case used to evaluate the PST modeling, all PST-specific settings were removed and the PSTs were simply modeled as regular transformers.

- Contingencies: Modeling contingencies in a PCM can provide some insight as to how the system may perform when operators make adjustments to dispatch in anticipation of loading issues associated with particular contingencies. This is in contrast to contingency modeling in steady state power flow reliability cases that determine post-contingency loading on remaining elements with no change in resource dispatch. The PCM also evaluates how the system dispatch needs to adapt in each hour such that the modeled constraints in the pre- and post-contingency conditions are met. WestConnect members agreed to remove contingency modeling for the base assessment, but include it as a sensitivity study. The sensitivity case represented disturbances submitted by WestConnect members.

3.3 Scenario Economic Models

The information in this section summarizes the Scenario economic cases. This report summarizes major assumptions and updates incorporated and does not attempt to document each specific assumption. Notably, the Scenario models and their assumptions are different than the Base models, which is what WestConnect used in the evaluation of regional economic-driven transmission needs.

After the 2016-17 Study Plan was approved by the PMC, the WestConnect PS organized two scoping teams – one focused on the High Renewables Scenario and one focused on Clean Power Plan ("CPP") related scenarios. The scoping teams met several times throughout the second half of 2016, with the goal of developing detailed assumptions for the scenarios included in the Study Plan. The scoping teams included WestConnect member representatives and parties that requested scenario studies, which included representatives from environmental non-profit advocacy organizations and transmission development companies. The scoping teams received facilitation and technical support from the WestConnect Planning Consultant.

Once the scoping teams achieved consensus support for the study assumptions they sought the PS's approval of the general assumptions. Once approved, the PS implemented the scenario assumptions with the support of the WestConnect Planning Consultant.

The following sections summarize the assumptions developed for each of the scenarios.

3.3.1 High Renewables Scenario Case

Description: This scenario was designed to represent a future where a *portion* of California's 50 percent RPS requirement is met with resources located in or near the WestConnect footprint *and* WestConnect states increase their RPS 50 percent from current levels.

Generation: Additional assumptions are detailed in Appendix I. In aggregate, the scenario includes:

- 2,000 MW of wind in Wyoming
- 2,000 MW of wind in New Mexico
- Sufficient renewable additions to support a 50% increase to PMC members' RPS requirements.
    - 7,778 MW of Wind
    - 7,039 MW of Solar

- 396 MW of Geothermal

Load: Identical assumptions as the 2026 Base Case.

Transmission: Identical assumptions as the 2026 Base Case.

3.3.2 CPP WestConnect Utility Plans Scenario PCM Case

Description: This scenario was designed to reflect individual WestConnect member plans for CPP compliance, or a similar low-carbon future. Certain members, specifically those in Arizona, had previously developed utility-coordinated, state-level analysis that was used as input assumptions for this scenario. The case consists of coal and gas retirements (beyond what is included in the Base Case), additional renewable energy, and replacement resources for the coal and gas retirements. The purpose of the case was not to test the system for CPP compliance. Rather, the case was intended to gather various plans, compile them into an economic model in order to identify a stressed but realistic operating condition, and then test the performance of the WestConnect Base Transmission Plan under these conditions though this reliability scenario study.

Generation: Generator retirements, replacements, repowerings, and additional renewables are detailed in Appendix I. In aggregate, the scenario includes:

- 1,332 MW of coal retirements (incremental to the Base Case);
- 444 MW of gas retirements;
- 175 MW of repowered generation;
- 1,127 MW of gas-fired replacement generation (NGCTs and NGCCs); and
- 595 MW of additional renewable resources.

Load: Identical assumptions as the 2026 Base Case.

Transmission: Identical assumptions as the 2026 Base Case.

3.3.3 CPP Heavy RE/EE Build Out Scenario PCM Case

Description: This scenario was designed to reflect a future where significant changes to the region's generation portfolio are made for the purposes of CPP compliance, or a similar low-carbon future. The assumptions were developed by PMC members and stakeholders, leading to a case with aggressive coal retirements and a generation replacement strategy that relies heavily on renewable resources. The purpose of the case is not to test the system for CPP compliance or to achieve a particular carbon reduction goal. Rather, the case was designed to aggressively test the performance of the WestConnect Base Transmission Plan under a future with a low-carbon generation portfolio that looks substantially different from what is in-service today.

Generation: Generator retirements, replacements, repowerings, and additional renewables are summarized Appendix I. In aggregate, the scenario includes:

- 4,188 MW of coal retirements (incremental to the Base Case, and +2,856 MW incremental compared to CPP WestConnect Utility Plans Scenario PCM Case);
- 444 MW of gas retirements;

- 175 MW of repowered generation;
- 1,158 MW of gas-fired replacement generation (NGCTs and NGCCs); and
- 10,369 MW of additional renewable resources (wind, solar and geothermal).

Load: Identical assumptions as the 2026 Base Case.

Transmission: Identical assumptions as the 2026 Base Case.

3.4 Scenario Reliability Cases

One of the most important differences between the Scenario and Base models was the model development process used to establish the reliability cases. The Base reliability models, which consisted of a 2026 Heavy Summer Base Case and a 2026 Light Spring Base Case, were developed through the traditional case build process where an initial WECC seed case was reviewed and updated iteratively maintaining the general premise of the starting point case, with system resources set a generation levels based on historic company practice and/or engineering judgement.[19] The approach for building the two reliability Scenario cases, the CPP – WestConnect Utility Plans Scenario and the CPP – Heavy RE/EE Buildout Scenario, was altogether different as load levels and resource commitment and dispatch levels were set based on outputs from WestConnect scenario production cost model. This new approach for developing power flow model cases was employed because it allowed the investigation of futures with substantially different resource mixes where the status quo operational dispatch may not be applicable and thus, the security constrained economic dispatch from a production cost model was relied on to dictate the dispatch and loads in the corresponding power flow case. Presently, WestConnect does not have a centralized economic dispatch such as the one used in the economic models.

The resource, load, and generation assumptions for the two reliability Scenario cases are identical to the assumptions in the PCM cases for the same scenarios. See Section 3.3.2 and Section 3.3.3 for this information. The details of how the stressed conditions were identified is summarized below.

3.4.1 Stressed Conditions and Creating the PF Cases

The primary purpose of the CPP Scenarios was to test the reliability and stability of the WestConnect system under a future with less coal and more gas and renewables. Since the scenario futures are altogether different than today's system, WestConnect relied on generation dispatches from corresponding production cost models as a means to estimate what the dispatch in these future systems might look like. WestConnect also sought to stress the system as much as possible. As a result, the following criteria were developed to identify potential stressed hours for the reliability assessment:

- **Low headroom on thermal generators** – By seeking out situations where thermal generators typically providing contingency reserves had limited headroom available (while still meeting reserve requirements), WestConnect hoped to identify reliability issues that stem from having less inertia on the system;

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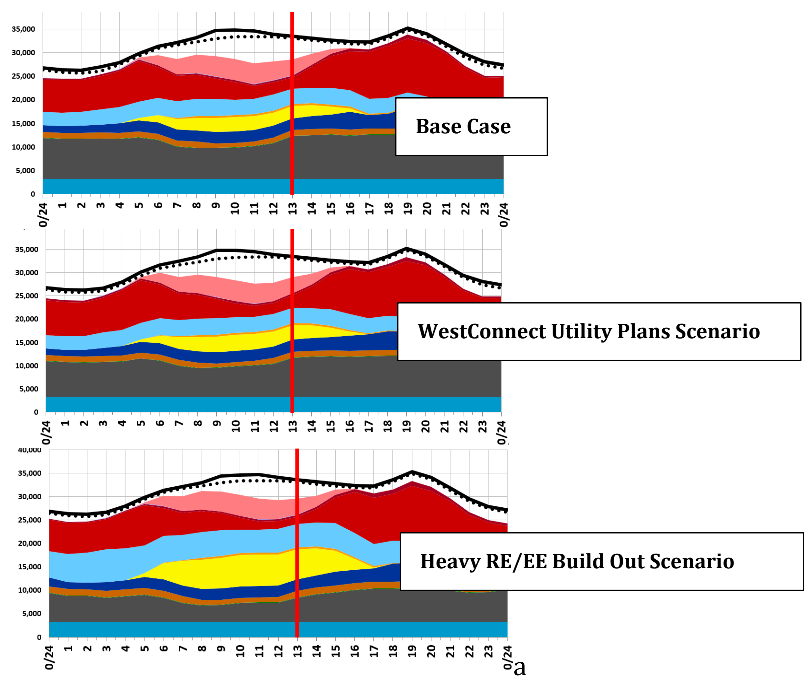
[19] With the minor exception of the renewable resource dispatch for WestConnect generation in the 2026 Light Spring case, which was developed based on National Renewable Energy Laboratory (NREL) hourly solar and wind meso-scale production data and applied consistent with a certain load regime.

- **High but balanced renewable energy dispatch** – High penetrations of variable resources were sought out, with balance between the Southwest (primarily solar) and the Eastern areas around Colorado (primarily wind).

- **Lower than normal loads** – Situations with lower loads might suggest some thermal generation that could support reliability would be shut off, since load net of wind and solar will require fewer thermal resources to be dispatched in these scenarios compared to the Base Cases.

Of the 8760-hours considered, WestConnect identified April 15th at 1pm MT as the hour that was most representative of these desired conditions. The generation dispatch and load in the WestConnect region is highlighted in the diagrams below for the Base Case and two CPP Scenarios. As shown, the scenarios feature increasing penetrations of solar and wind with significant decreases in coal dispatch relative to the Base Case. In the Base Case, WestConnect load was met with 29 percent renewables compared to 30 percent and 45 percent for the WestConnect Utility Plans Scenario and the Heavy RE/EE Build Out Scenario, respectively.

Figure 7: WestConnect Generation Dispatch and Load for April 15, 2026



The load and generation snapshot conditions from the production cost models were directly transferred to the WestConnect 2026 Heavy Summer power flow case, and the model was "walked" into the new system conditions, with minor changes to the dispatch made during this process. WestConnect had previously mapped all regional generation in its production cost and power flow models, making this one-to-one transfer possible.

Outside the WestConnect region, the load and resource levels were aggregated on an area basis and the total dispatch of the generation in the power flow area was scaled based on resource type, capacity, and location. The number of thermal and hydro facilities outside of WestConnect to which dispatch was spread was limited to ensure that the power flow cases represented both headroom and dispatch level comparable with the PCM snapshot.

Table 4, below, provides a summary of the WestConnect load, thermal headroom, and solar and wind dispatch in the final scenario reliability cases.

Table 4: Scenario case load, headroom, and solar/wind dispatch

Scenario PF	WestConnect Load (MW)	WestConnect Thermal Headroom (MW)	WestConnect Solar & Wind Dispatch	
			Dispatch (MW)	% of Load
Base Case	33,541	3,028	9,707	29%
CPP WestConnect Utility Plans	33,539	3,108	10,172	30%
CPP Heavy RE/EE Build Out	33,562	4,499	15,226	45%

4 Regional Transmission Needs Assessment

The purpose of this section is to summarize the analysis conducted by WestConnect to identify regional transmission needs. This analysis began after the PMC approval of the regional models, which occurred on October 18, 2016. The PMC phased the assessments. The Base Case assessments were completed first, followed by the Scenario assessments. This decision was based in part on the requirement that WestConnect identify regional needs by the end of the first year of the study cycle.

Sections 4.1, 4.2 and 4.3 outline the methods, assumptions, and results of the three types of regional need assessments: reliability, economic, and public policy. The Regional Transmission Needs Assessment was approved by the PMC on April 19, 2017.[20] That report contains much of the information presented here in the Regional Plan.

4.1 Reliability Needs Assessment

WestConnect conducted the 2016-17 regional reliability assessment on two Base Cases described in Section 3.1: the 2026 Heavy Summer Base Case and the 2026 Light Spring Base Case.

The reliability assessment included extensive testing and multiple iterations of model refinements, simulations, participant review of results, and incorporation of modifications and comments into the subsequent round of simulations. The final assessment of the Base Cases with contingency analysis became the final system assessment.

The final evaluation of the base reliability assessment was limited to contingencies that could identify a regional need, as determined by the PS. The intent was to minimize flagging local or "non-regional" issues. Contingency definitions for the steady-state power flow analysis were limited to N-1 contingencies for elements 230-kV and above, generator step-up transformers for generation with at least 200 MW capacity, and member-requested N-2 contingencies. All bulk electric system ("BES") branches and buses in the WECC model were monitored with violation reports filtered to exclude branch flows that increased less than 1 percent and voltage deviation less than 0.5 percent.

Upon a comprehensive review of the regional reliability assessment results, no regional needs were identified. This conclusion was reached because neither the Heavy Summer nor Light Spring assessments identified reliability issues that were between two or more WestConnect members or impacted two or more WestConnect members. Results from the assessment are provided in Appendix G and in a posted workbook that includes the underlying steady-state assessment results.[21] The results include one branch overload and a couple voltage issues within single-TO systems that were determined to be local issues and not regional.

4.2 Economic Needs Assessment

WestConnect performed the 2016-17 regional economic assessment by conducting a PCM study on the 2026 Base Case and sensitivity cases. The goal of the assessment was to test the Base Transmission Plan for economic congestion on regional transmission. The economic Base Case maintained consistent electric topologies with the reliability Base Cases within the WestConnect footprint.

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[20] *https://doc.westconnect.com/Documents.aspx?NID=17749*

[21] *https://doc.westconnect.com/Documents.aspx?NID=17748*

There was no regional congestion identified in the Base Case, and thus, there were no identified regional economic needs. For completeness, the PS conducted sensitivity studies to confirm that single modeling variables were not hiding potential regional congestion. Only the High Natural Gas Price sensitivity showed significant changes from the Base Case with generally higher congestion costs for internal system transmission congestion. The congestion results for the Base Case and the PCM sensitivity studies are provided in Appendix H and in a posted workbook.[22]

4.3 Public Policy Needs Assessment

Enacted public policies were incorporated into the Base models through the roll-up of local TO plans and their associated load, resource, and transmission assumptions. Given this, regional public policy needs could have been identified one of two ways:

1) New regional economic or reliability needs driven by enacted Public Policy Requirements; or

2) Stakeholder review of local TO Public Policy Requirements-driven transmission projects and associated suggestions as to whether one or more TO projects may constitute a public policy-driven regional transmission need.

In conducting the regional reliability and economic assessments (see above) the PS did not find any regional issues driven by enacted public policy requirements. Furthermore, stakeholders did not suggest or recommend the identification of a public policy-driven transmission need based on TO's local transmission plans. Based on these two findings, there are no identified public policy needs in the WestConnect 2016-17 Regional Plan.

[22] *https://doc.westconnect.com/Documents.aspx?NID=17747*

5 Scenario (Opportunity) Assessment

The purpose of this section is to summarize results from the information-only scenario assessments performed during the WestConnect 2016-2017 Planning Process. These Scenario model assessments were reviewed by the PMC and stakeholders as the studies were completed. The results of the Scenario assessments are documented below in Section 5.

5.1 Reliability Scenario Assessment

The scope of the reliability assessment for the scenario studies was limited to steady-state contingency analysis as part of a cursory review of the cases and, ultimately, transient stability analysis to assess the frequency response of the system under significant disturbances. The below sections provide the results and findings of these analyses.

5.1.1 Clean Power Plan Scenarios – Steady-State Analysis

Test contingency analyses were conducted as part of developing and reviewing the scenario reliability cases prior to the transient stability analysis. These contingency analyses used the same contingency definitions and violation criteria as in the reliability needs assessment.

No regionally significant issues were identified by these contingency analyses. Some voltage issues, overloads, and failed solutions were initially flagged within the WestConnect footprint; however, these were ultimately confirmed as local, single system issues.

The analysis did not assess delivery of the additional resources.

5.1.2 Clean Power Plan Scenarios – Transient Stability

The goal of the transient stability study was to identify any occurrences of under frequency load shedding ("UFLS"), insufficient system frequency recovery (e.g., undamped oscillations), and general system instability (e.g., cascading trips). WECC Criterion TPL-001-WECC-CRT-3 provides specific requirements as to what defines acceptable voltage recovery. The results of the study were evaluated against this criterion. The transient stability studies were performed on the 2026 Base Case, as well as the 2026 CPP Utility Plans and 2026 CPP Aggressive Scenario.

WestConnect members were invited to submit any contingencies that would have a regional impact on the system. Ultimately, the transient stability studies for the three cases under a robust set of contingencies, including:

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

During the case preparation process a number of dynamic model errors were identified. Once these data errors were corrected, the studies were finalized and the contingencies listed above were studied.

In all cases, the system appeared to have stable frequency recovery within 20 seconds, which is within the timeframe of the WECC criterion mentioned earlier. Islanded generation, islanded load, and unrestored generation reported by the simulations were expected and part of the associated disturbances:

- All cases had [redacted] islanded station service load as part of the [redacted] disturbance
- All cases had [redacted] of islanded [redacted] gen and station serve load (respectively) as part of the [redacted] disturbances
- [redacted] was tripped by over-speed relay and was unrestored in all cases as part of the [redacted] disturbances

There was unrestored load in some simulations, though it was acceptable per TPL standards.[23] The total MWs of unrestored load in each of the simulations is shown in **Table 5**.

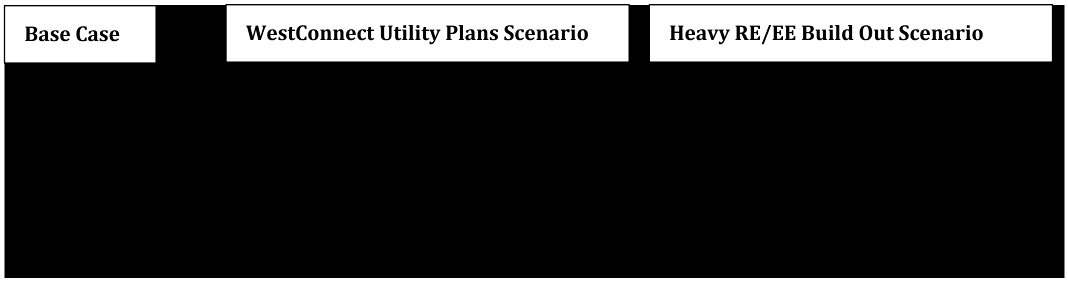
Table 5: WestConnect Unrestored Load in WestConnect Areas, Post-Contingency

Case	Unrestored Load in WestConnect Areas (MW)									
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Base	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
CPP Utility Plans	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
CPP Aggressive	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

WestConnect members reviewed the frequency response plots for the Base Case, the two scenario cases, and for all disturbances. This review led to the conclusion that the system was able to achieve stable frequency recovery within 20 seconds in all simulations. **Figure 8** provides an example of the review plots, showing all busses had stabilized their frequency at the 20-second mark. Appendix J includes the full set of voltage and frequency response plots.

[23] *Table 1, Note "c." in TPL-001-4: Simulate the removal of all elements that Protection Systems and other controls are expected to automatically disconnect for each event.*

Figure 8: Frequency Plots for all system busses for 2 PV Contingency



5.2 Economic Scenario Assessment

The analysis of the production cost modeling results focused on identifying significant curtailment of renewable resource resources as well as regional transmission congestion. In the case of the CPP Scenarios, the simulation results were also used to identify stressed system conditions.

5.2.1 Clean Power Plan Scenario Study Results

The two CPP Scenarios led to significantly different simulation results from almost every perspective. The Utility Plans Scenario, which retired over 1,300 MWs of coal, had essentially no impact on regional and single-TO congestion. The case had only a $1M increase to total congestion costs as compared to the Base Case. All of the added renewable generation (595 MWs) was able to serve load and there were zero additional curtailments. Transmission flows across the region were generally unchanged from the Base Case assessment. This was largely due to the fact that the majority of retirements/additions were in Nevada and Arizona, so New Mexico, Colorado, and California-member flows were generally unaffected, including those around the Four Corners region.

The Aggressive CPP scenario, which retired almost 4,200 MWs of coal while adding over 10,000 MWs of renewables, had much more curtailment and congestion. 10 percent of the added renewable generation was curtailed, with most of this occurring in Colorado. There were increased levels of congestion on two multi-TO regional elements: the Boone-Lamar 230-kV and the San Luis Valley – Poncha 230 kV. Both elements are in Colorado, are effectively radial lines, and are connected to substations where much of the incremental renewable generation was sited. The largest impact to regional power flows were observed in the transmission lines surrounding Four Corners as well as the import paths into California. Flows out of the Four Corners area decreased due to the modeled retirements. Note that the scenario assumptions in total, including unit retirements and renewable resource additions, were not planned and represent hypothetical assumptions designed to meet the intent of the scenario study.

The congestion hours and congestion cost on regional transmission elements from the two cases is shown in **Table 6**. There was no congestion on the two elements listed in both the Base Case and the Utility Plans Scenario case. As shown, in the Aggressive Case the Boone – Lamar 230-kV line was congested for 41 percent of the year, and the San Luis Valley – Poncha 230-kV was congested for 26 percent of the year.

Table 6: Multi-TO Congestion in Clean Power Plan Scenario (Congested Hours and % of year/Congestion Cost)

Owner(s)	Branch/Path Name	Base Case	CPP Utility Plans	CPP Heavy RE/EE Build Out
PSCO|TSGT	BOONE_230.0 - LAMAR_CO_230.0	-	-	3,625 (41%) / $61,160K
PSCO|TSGT	SANLSVLY_230.0 - PONCHABR_230.0	-	-	2,311 (26%) / $20,127K

5.2.2 Regional Renewables Scenario Study Results

The Regional Renewables Scenario modeled wide-spread renewable additions throughout the WestConnect footprint, with no coal retirements beyond those already being planned. Over 15,000 MWs of new renewable resources were added to the model, and this caused major impacts to regional congestion, flows on inter-regional import/export paths. Additionally, 3 percent of the added renewable generation was curtailed, mostly concentrated in Colorado.

From a power flow perspective, there were some major shifts in the region. Namely, flows on Path 48, which historically flows from the North to South (from Four Corners to northern New Mexico) completely reversed for a large portion of the year in this study, as indicated by the green line (scenario) compared to the purple line (Base Case) in **Figure 9**. This was caused by the 1,916 MW of wind sited at the combination of B-A and West Mesa substations in northern New Mexico. This flow toward Four Corners caused significant congestion on the paths west of Four Corners, such as Path 22, which is shown in **Figure 10**. This path was congested for more than 4 percent of the year in the Regional Renewables Scenario (compared with no congestion in the Base Case)

Figure 9: Path 48 Flows in Scenario Studies

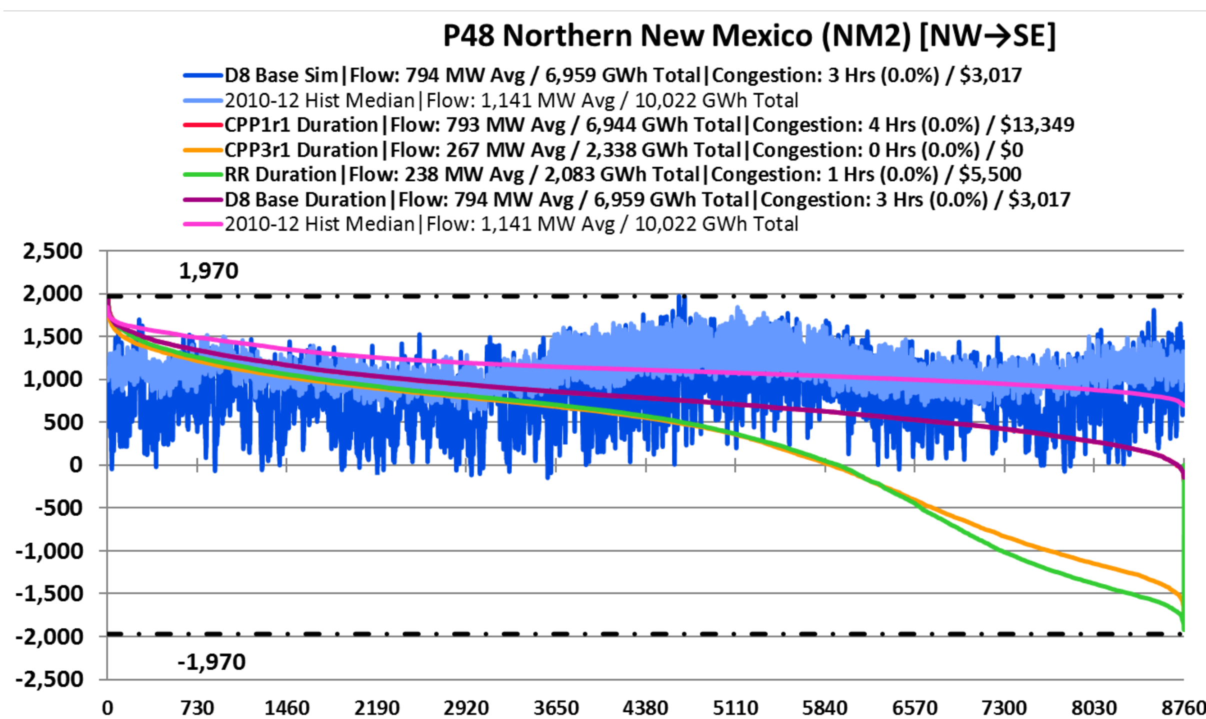
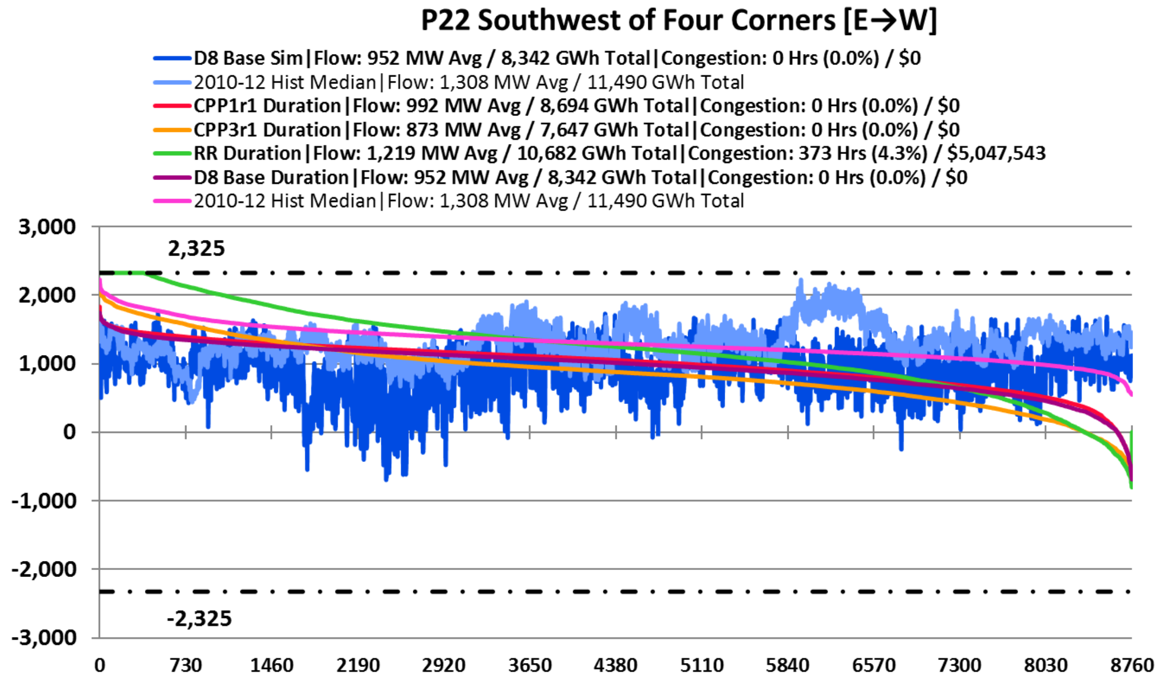


Figure 10: Path 22 Flows in Scenario Studies



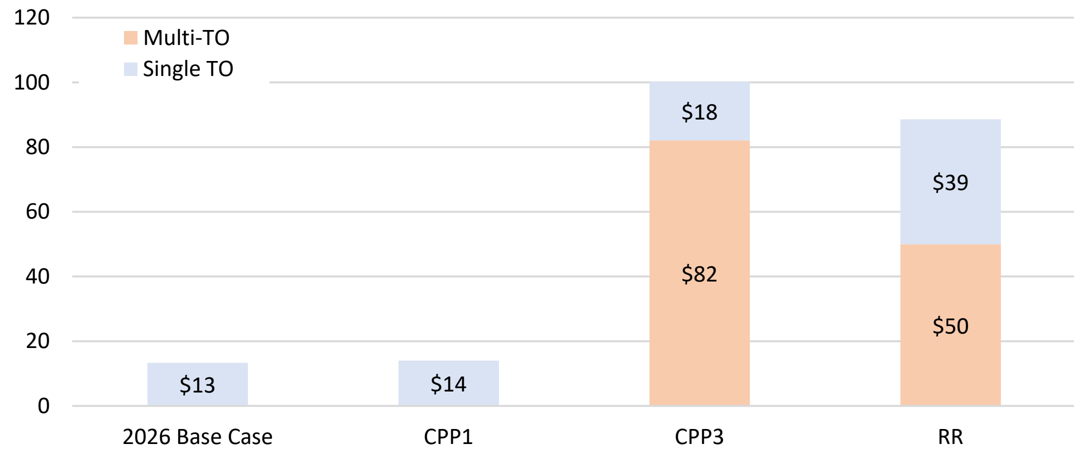
Similar to the Clean Power Plan Aggressive Case, the resources sited at Lamar and in the San Luis Valley (in Colorado), caused significant congestion on the surrounding systems. The same two elements were constrained, as shown in **Table 7**. Both the Boone-Lamar 230-kV and the San Luis Valley-Poncha 230-kV were congested for 26 percent of the year.

Table 7: Multi-TO Congestion in the High Renewables Scenario (Congested Hours and % of year/Congestion Cost)

Owner(s)	Branch/Path Name	Base Case	Regional Renewables
PSCO|TSGT	BOONE_230.0 - LAMAR_CO_230.0	-	2,290 (26%) / $29,193K
PSCO|TSGT	SANLSVLY_230.0 - PONCHABR_230.0	-	2,311 (26%) / $18,019K

The total congestion cost in all scenarios and the Base Case is provided in **Figure 11.** Looking across the scenario studies, most of the congestion was multi-TO /regional (brown bars in Figure 11). The Boone-Lamar and the San Luis Valley-Poncha lines were responsible for nearly all of this congestion. The single-TO congestion was relatively small, as seen in the blue bars in Figure 11.

Figure 11: Total Congestion Cost ($M)



5.3 Scenario Assessment Conclusions and Potential Regional Opportunities

The scenario studies performed by WestConnect during the 2016-17 Regional Planning Process are informational in nature and were not intended to identify any regional transmission needs. The goal of the assessments was to test the capabilities of the Base Transmission Plan under scenario futures which are significantly different than the "expected" future (i.e.; Base Case). WestConnect achieved this goal and found that generally, the system performed well (as judged by the criteria within the scope of the study). With that in mind, we present the following observations from the studies:

(1) **Congestion –** The Boone-Lamar 230-kV and the San Luis Valley-Poncha 230-kV were the only two significantly congested regional transmission elements identified in the economic scenario studies. The congestion was a product of the resource siting decisions made in the case development. Other congestion observed in the studies was either not regional in nature or was de minimis.

(2) **Steady-state –** There were no regional transmission overloads identified in the reliability assessment. The dispatch exported from the production cost model to the power flow model to conduct the reliability assessment reflected generation curtailments due to transmission constraints. Had the renewable resources been dispatched to their unconstrained generation output during the condition (1pm on April 15, 2026), then there likely would have been a number of overloads on regional transmission facilities, which is implied by the constraints represented in the production cost model. WestConnect may consider this resource deliverability issue in future planning cycles.

(3) **Transient stability –** Despite the high level of renewable penetration detailed in the study, the system was able to recover frequency appropriately and within WECC criteria. The retirement of significant amounts of coal generation did not appear to compromise the reliability of the system (for the condition studied). However, one limitation of the study is that the dispatch

condition was not made consistent West-wide and as such, the WestConnect system could have overestimated the response from neighboring systems. WestConnect may address this issue in future studies.

The WestConnect 2016-17 Study Plan states that the PMC can choose to identify a regional issue in a scenario study as an “opportunity”, thereby initiating a deeper review of the issue. The PMC elected to identify the congestion along the San Luis Valley – Poncha 230-kV line identified in the Regional Renewables Scenario as an opportunity worthy of further investigation. The main purpose for doing this was to give the PS and Cost Allocation Subcommittee a workable example to gain experience at evaluating solutions to economic issues. Due to the radial nature of the line, the San Luis Valley – Poncha 230-kV congestion is not a perfect example of regional congestion and is more akin to a generation deliverability issue. Regardless, WestConnect decided to proceed with the evaluation as an example since the area already had proposed project alternatives that could be evaluated.

6 Stakeholder Involvement and Interregional Coordination

6.1 Stakeholder Process

The PS and PMC meetings held to support the regional transmission needs assessment were open to the public, and each meeting provided an opportunity for stakeholder comment. Notice of all stakeholder meetings and stakeholder comment periods were posted to the WestConnect website[24] and distributed via email.

Open stakeholder meetings to discuss the WestConnect regional transmission needs assessment were conducted on November 17, 2016, February 15, 2017 and November 16, 2017. The meetings were announced through WestConnect's stakeholder distribution lists, and all stakeholders were invited to attend.

The WestConnect regional planning process is performed in an open and transparent manner to attain objective analysis and results. WestConnect invites and encourages interested parties or entities to participate in and provide input to the regional transmission planning process at all planning process stages. Stakeholders have opportunities to participate in and provide input to local transmission plans as provided for in each Member TO's OATT. Further, stakeholders have opportunities to participate in and provide input into subregional planning efforts within SSPG, CCPG, and SWAT.

All WestConnect planning meetings are open to stakeholders with the exception of PMC closed sessions which were identified in agendas distributed prior to meetings and posted on the WestConnect website. Stakeholders' opportunities for timely input and meaningful participation are available throughout the WestConnect planning process. More specifically, WestConnect accepted stakeholder comments on the following reports created throughout the 2016–17 planning cycle:

- Study Plan, including scenario submittals;
- Model Development;
- Regional Needs Assessment; and
- Regional Transmission Plan.

6.2 Interregional Coordination

WestConnect coordinates planning data and information with the three other established Planning Regions in the Western Interconnection (i.e., CAISO, ColumbiaGrid, and NTTG) by:

- Participating in annual interregional coordination meetings;
- Distributing regional planning data or information such as:
    - Draft Regional Study Plan

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[24] *WestConnect Regional Planning meeting calendar is available here: http://regplanning.westconnect.com/calendar_rp.htm*

    - Final Regional Study Plan
    - Files and data used to compile regional models, including planning study assumptions and study methodologies
    - Regional Transmission Needs Assessment Report
    - List of Interregional Transmission Projects ("ITP") submitted to WestConnect
    - Assessments and selection of ITPs into Regional Plan
    - Draft Regional Transmission Plan
    - Final Regional Transmission Plan
- Sharing planning data and assumptions if and when requested;[25] and
- Participating in a coordinated ITP evaluation process, as necessary, when an ITP is submitted to WestConnect as an alternative to meet an identified regional need.

The process WestConnect utilized to conduct its interregional coordination activities is described in the WestConnect Regional Planning Process BPM which is posted on the WestConnect website.[26]

6.3 Interregional Project Submittals

An ITP is defined in the common tariff language developed for the Order No. 1000 interregional compliance filings as "a proposed new transmission project that would directly interconnect electrically to existing or planned transmission facilities in two or more planning regions and that is submitted into the regional transmission planning processes of all such planning regions." ITP proponents seeking to have their project included in the WestConnect Base Transmission Plan needed to submit their project per the process described under Appendix B. ITP proponent that want their ITP considered for cost allocation and/or to have their project evaluated to meet an identified regional need, they needed to submit their project to WestConnect via the WestConnect Regional Project Submittal Form no later than March 31, 2016, so that WestConnect could coordinate the ITP evaluation process with all other Relevant Planning Regions.

WestConnect received the following ITP submittals:

- Cross-Tie Project
- HVDC Conversion Project
- SWIP North
- TransWest Express

Details on the ITP submittals can be found on the WestConnect website. [27]

WestConnect does not evaluate ITP submittals until regional transmission needs are identified. If regional needs are identified, then the ITPs have an opportunity to indicate which need they would seek to address, and the ITP would be studied alongside any other regional project submittals. However,

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[25] *Non-disclosure obligations are provided for under the member's OATTs. WestConnect interregional data sharing was conducted pursuant to those tariff provisions.*

[26] *https://doc.westconnect.com/Documents.aspx?NID=17155*

[27] *http://regplanning.westconnect.com/interregional_coordination.htm*

since there were no regional transmission needs identified by WestConnect in the 2016-17 Planning Process, the submitted ITPs were not studied in this cycle.

6.4 Regional Cost Allocation Update

Because no regional needs were identified in the 2016-17 planning cycle, WestConnect did not review projects selected into the Regional Plan to determine if they were eligible for regional cost allocation, nor did it perform regional cost allocation. However, during the 2016-17 planning cycle, WestConnect did develop many of implementation steps that may be used by WestConnect in the future to determine whether a project identified as the more efficient or cost-effective solution to an identified region transmission need is eligible for regional cost allocation and how costs would be allocated to identified beneficiaries when a project is deemed eligible for regional cost allocation.

Those cost allocation details are described in the WestConnect Cost Allocation Procedures, which were approved by the PMC in April 2017.[28] The Cost Allocation Procedures documents some of the assumptions and methodologies that are currently planned for use in the WestConnect cost allocation process, should it be deployed. The document memorializes efforts by the CAS and the PMC in evaluating various options to implement the cost allocation processes contained in the WestConnect Member OATTs.

The Cost Allocation Procedures discuss the general assumptions to be used in the cost allocation process, including the use of present value of revenue requirements in calculating benefit cost ratios for determining cost allocation eligibility, the discount rate used in net present value calculations, the metric used to calculate economic benefits, and various other methodologies and assumptions.

Many aspects of the cost allocation process continue to be refined and the Cost Allocation Procedures do not fully address this evolution. For instance, WestConnect has not decided, and thus the Cost Allocation Procedures do not specify, how many years of benefits and costs will be included in the net present value calculations for determining cost allocation eligibility and making cost allocation determinations. In addition, WestConnect has not determined how TOs with increased production costs (e.g., negative economic benefits) will be considered in determining whether a project selected into the plan is eligible for regional cost allocation.

7 Regional Plan Conclusions

Based on the findings from the 2016-17 cycle analysis performed for reliability, economic, and public policy transmission needs as described in this report, no regional transmission needs were identified in the 2016-17 assessment.

Since no regional transmission needs were identified, the PMC did not collect transmission or non-transmission alternatives for evaluation since there were no regional transmission needs to evaluate the alternatives against. Given this, the Regional Transmission Plan is identical to the Base Transmission Plan and it does not include any additional regional projects.

[28] https://doc.westconnect.com/Documents.aspx?NID=17744&dl=1

Appendix A – Information Confidentiality

The PS handled confidential information in accordance with the protocols outlined in the BPM. Although the Regional Planning Process is open to all stakeholders, stakeholders are required to comply at all times with certain applicable confidentiality measures necessary to protect confidential information, proprietary information, or Critical Energy Infrastructure Information (CEII).

As it related to the model development portion of the process, confidentiality protections were accorded for the following:

- WestConnect powerflow models are considered CEII. Based on this, during the case development process, only those entities having signed the appropriate Non-Disclosure Agreement (NDA) with WECC were granted access to the model. This iteration does not contain any information that is different from what would be typically contained in the original WECC base case.
- Certain generator procurement and contract information gathered during the RPS evaluation was considered commercially sensitive. Based on this assessment, that data was considered confidential and was not shared.
- WestConnect PCM is subject to the WestConnect Non-Disclosure Agreement, and its distribution was limited to signatures of that agreement.

Appendix B – Base Transmission Plan Process

To identify TO projects for inclusion in the 2026 Base Transmission Plan, the PS reviewed the transmission project lists submitted to WestConnect by the TO members and participants via the TPPL, inclusive of the project status (e.g., planned, conceptual). All TO projects designated with a "planned" project status are included in the Base Transmission Plan. As defined by WestConnect, planned facilities include projects that have a sponsor, have been incorporated in an entity's regulatory filings, have an agreement committing entities to participate and construct, or for which permitting has been or will be sought. Individual members and participants reviewed the TPPL project lists and provided any necessary updates with regard to the project status.

The PS also met to review the list of non-incumbent projects submitted via the TPPL to see if any of those projects met the threshold identified by the PMC for inclusion in the Base Transmission Plan. These meetings were open to the public and noticed accordingly. Upon reviewing the project information submitted by the project sponsors, the PS did not identify any non-incumbent projects that warranted inclusion in the Base Transmission Plan.

Based on member and participant feedback, the WestConnect PS considered for inclusion in the regional models two CAISO transmission projects that were recently approved by the CAISO Board of Directors. These projects are:

- Delaney – Colorado River 500 kV, estimated in-service date 2020, and
- Harry Allen – Eldorado 500 kV, estimated in-service date 2020.

Since both projects have been approved by the CAISO Board of Directors, they are currently included in CAISO 10-year planning studies. To align the WestConnect models with that of the CAISO, the projects were included in the WestConnect models used in the 2016-17 planning cycle.[29]

[29] The PS did not make any judgment with regard to any interregional aspects of these two projects. They were not submitted for the purposes of cost allocation.

Appendix C –Base Transmission Plan (2016-2026 Projects)

The tables below have the planned and conceptual projects which were submitted into the WestConnect TPPL. The planned projects are slated for inclusion in the Base Transmission Plan whereas the conceptual projects will not be included in the models.

CCPG – Planned

Sponsor	Project Name	Development Status	Voltage
Black Hills Energy	Overton 115 kV Substation	Planned	115 kV
Black Hills Energy	LaJunta 115kV Substation	Planned	115 kV
Black Hills Energy	Baculite Mesa – Overton 115 kV Line Rebuild	Planned	115 kV
Black Hills Energy	Portland 115/69kV Transformer Replacement	Planned	115 kV
Black Hills Power	Second 230/69kV Yellow Creek Transformer	Planned	230 kV
Black Hills Power	South Rapid City – Westhill 230kV Rebuild	Planned	230 kV
Cheyenne Light Fuel and Power	Swan Ranch 115 kV Substation	Planned	115 kV
Cheyenne Light Fuel and Power	King Ranch 115kV Substation	Planned	115 kV
Cheyenne Light Fuel and Power	East Business Park – Cheyenne Prairie 115kV Line Reconductor	Planned	115 kV
Cheyenne Light Fuel and Power	Archer – Cheyenne Prairie 115kV Reconductor	Planned	115 kV
Cheyenne Light Fuel and Power	North Range – Swan Ranch 115kV Reconductor	Planned	115 kV
Platte River Power Authority	Boyd 230/115kV Substation Expansion	Planned	230 kV
Platte River Power Authority	Fort Collins Northeast 115/13.8kV Substation	Planned	115 kV
Platte River Power Authority	Timberline 230/115kV Transformer T3 Replacement	Planned	230 kV
Platte River Power Authority	Laporte 230kV Expansion	Planned	230 kV
Public Service Company of Colorado/ Xcel Energy	Pawnee – Daniels Park 345 kV Transmission Project	Planned	345 kV
Public Service Company of Colorado/ Xcel Energy	Rifle – Parachute 230 kV Line #2	Planned	230 kV

Sponsor	Project Name	Development Status	Voltage
Public Service Company of Colorado/ Xcel Energy	Happy Canyon Substation	Planned	115 kV
Public Service Company of Colorado/ Xcel Energy	Thornton Substation	Planned	115 kV
Public Service Company of Colorado/ Xcel Energy	Avery Substation	Planned	230 kV
Public Service Company of Colorado/ Xcel Energy	Moon Gulch 230/13.8 kV, 50 MVA Distribution Substation	Planned	230 kV
Public Service Company of Colorado/ Xcel Energy	Gilman – Avon 115 kV Transmission Line and Cap Bank	Planned	115 kV
Public Service Company of Colorado/ Xcel Energy	Weld to Rosedale 230 kV Line	Planned	230 kV
Public Service Company of Colorado/ Xcel Energy	Ault – Cloverly 115 kV Transmission Project	Planned	115 kV
Public Service Company of Colorado/ Xcel Energy	Milton – Rosedale 230 kV Transmission Line	Planned	230 kV
Tri-State Generation and Transmission Association	Big Sandy – Calhan 230 kV Project	Planned	230 kV
Tri-State Generation and Transmission Association	Falcon – Midway 115 kV Line Uprate Project	Planned	115 kV
Tri-State Generation and Transmission Association	La Junta (TS) 2nd 115/69kV, 42 MVA XFMR	Planned	115 kV
Tri-State Generation and Transmission Association	Badwater – Sawmill Creek 230 kV Line (Badwater - DJ 230 kV Line)	Planned	230 kV
Tri-State Generation and Transmission Association	Lost Canyon – Main Switch 115 kV Line	Planned	115 kV
Tri-State Generation and Transmission Association	San Luis Valley – Poncha 230 kV Line #2	Planned	230 kV
Tri-State Generation and Transmission Association	Wind River 115kV Reliability Upgrade	Planned	115 kV
Western Area Power Administration – RMR	Granby – Windy Gap	Planned	138 kV

Sponsor	Project Name	Development Status	Voltage
Western Area Power Administration – RMR	Estes – Flatiron 115-kV rebuild	Planned	115 kV
Western Area Power Administration – RMR	Badwater Reactor	Planned	Below 115 kV
Western Area Power Administration – RMR	Ault 345/230 kV XFMR Replacement	Planned	345 kV
Western Area Power Administration – RMR	Alliance – Dunlap 115 kV Rebuild	Planned	115 kV

CCPG – Conceptual

Sponsor	Project Name	Development Status	Voltage
Black Hills Energy	West Station – West Cañon 115kV	Conceptual	115 kV
Black Hills Energy	Desert Cove – Fountain Valley – MidwayBR 115kV Line Rebuild	Conceptual	115 kV
Cheyenne Light Fuel and Power	Cheyenne Prairie – South Cheyenne 115kV Double Circuit	Conceptual	115 kV
Public Service Company of Colorado/ Xcel Energy	Lamar – Vilas 230kV Transmission Project	Conceptual	230 kV
Public Service Company of Colorado/ Xcel Energy	Bluestone Substation	Conceptual	230 kV
Public Service Company of Colorado/ Xcel Energy	Parachute – Cameo 230 kV Transmission Line	Conceptual	230 kV
Public Service Company of Colorado/ Xcel Energy	Weld County Expansion Project	Conceptual	230 kV
Public Service Company of Colorado/ Xcel Energy	Wilson Substation	Conceptual	115 kV
Public Service Company of Colorado/ Xcel Energy	Glenwood – Rifle 115 kV Upgrade	Conceptual	115 kV
Public Service Company of Colorado/ Xcel Energy	Wheeler – Wolf Ranch 230 kV Transmission Project	Conceptual	230 kV
Tri-State Generation and Transmission Association	Lamar – Front Range Project	Conceptual	345 kV

Sponsor	Project Name	Development Status	Voltage
Tri-State Generation and Transmission Association	Boone – Walsenburg 230 kV Line	Conceptual	230 kV
Tri-State Generation and Transmission Association	Boone – Lamar 230 kV Line	Conceptual	230 kV
Western Area Power Administration – RMR	Basin Cap Bank	Conceptual	115 kV
Western Area Power Administration – RMR	Powell Cap Bank	Conceptual	115 kV

SSPG – Planned

Sponsor	Project Name	Development Status	Voltage
NV Energy	California – Bordertown 120kV Line	Planned	115 kV
NV Energy	Carlin Trend 120 kV Separation Scheme (RAS) to mitigate thermal overloading	Planned	345 kV
NV Energy	MYS (My Switch)	Planned[30]	138 kV
Western Area Power Administration – SNR	Reconductor Keswick – Airport – Cottonwood 230 kV Lines	Planned	230 kV
Western Area Power Administration – SNR	Reconductor Olinda – Cottonwood #1 & #2 230 kV Lines	Planned	230 kV
Western Area Power Administration – SNR	Install 230 kV Reactive Voltage Support	Planned	230 kV
Western Area Power Administration – SNR	Elverta Line Swap	Planned	230 kV

SWAT – Planned

Sponsor	Project Name	Development Status	Voltage
Arizona Public Service	North Gila – Orchard 230kV Line	Planned	230 kV
Arizona Public Service	Morgan – Sun Valley 230kV Line	Planned	230 kV
Arizona Public Service	Morgan – Sun Valley 500kV Line	Planned	500 kV AC

[30] *Project is now in-service*

Sponsor	Project Name	Development Status	Voltage
Arizona Public Service	Ocotillo 230kV Generation Interconnections	Planned	230 kV
El Paso Electric Company	Wrangler – Sparks Transmission Line Reconductor	Planned	115 kV
El Paso Electric Company	Leo Substation Upgrade from 69 kV to 115 kV	Planned	115 kV
El Paso Electric Company	LE1 (Organ) Substation	Planned	115 kV
El Paso Electric Company	LE1 (Organ) – Jornada Transmission Line	Planned	115 kV
El Paso Electric Company	Leo – Dyer (6500) Transmission Line Upgrade to 115 kV	Planned	115 kV
El Paso Electric Company	Leo – Milagro (7800) Transmission Line Upgrade to 115 kV	Planned	115 kV
El Paso Electric Company	NW2 (Verde) Substation 30 MVA Transformer	Planned	115 kV
El Paso Electric Company	Global Reach Substation Transformer (T2)	Planned	115 kV
El Paso Electric Company	Rio Bosque Substation Transformer (T2)	Planned	Below 115 kV
El Paso Electric Company	Patriot Substation Transformer (T2)	Planned	115 kV
El Paso Electric Company	Felipe 69 kV Substation Capacitor Bank	Planned	Below 115 kV
El Paso Electric Company	Afton North Autotransformer	Planned	345 kV
El Paso Electric Company	NW3 (Transmountain) Substation Transformer	Planned	115 kV
El Paso Electric Company	Afton North – Airport Transmission Line	Planned	115 kV
El Paso Electric Company	Airport – Jornada Transmission Line	Planned	115 kV
El Paso Electric Company	Global Reach Substation Capacitor Bank	Planned	115 kV
El Paso Electric Company	Picante Substation Capacitor Bank	Planned	115 kV
El Paso Electric Company	Uvas Substation 12 MVA Transformer	Planned	115 kV
El Paso Electric Company	Pipeline Substation 33.6 MVA Transformer	Planned	115 kV
El Paso Electric Company	Leasburg Substation 33.6 MVA Transformer	Planned	115 kV
El Paso Electric Company	Sol – Vista Transmission Line Upgrade	Planned	115 kV
El Paso Electric Company	Lane – Pendale – Copper (16900) 69 kV Line Rebuild & Reconductor	Planned	Below 115 kV

Sponsor	Project Name	Development Status	Voltage
El Paso Electric Company	Rio Grande-Sunset (5600) 69 kV Line Reconductor	Planned	Below 115 kV
El Paso Electric Company	Rio Grande – Asarco Tap (5500) 69 kV Line Reconductor	Planned	Below 115 kV
El Paso Electric Company	East-side Loop Expansion Phase I	Planned	115 kV
El Paso Electric Company	East-side Loop Expansion Phase I	Planned	115 kV
El Paso Electric Company	East-side Loop Expansion Phase 2	Planned	115 kV
El Paso Electric Company	Move Sparks 115/69 kV Autotransformer to Felipe Substation	Planned	115 kV
El Paso Electric Company	Sparks to Felipe 69 kV to 115 kV Line Upgrade	Planned	115 kV
Imperial Irrigation District	Niland Substation Transformer Replacement	Planned	161 kV
Los Angeles Department of Water and Power	Reconductor Haskell Canyon – Rinaldi 230 kV Rinaldi Line 1	Planned	230 kV
Los Angeles Department of Water and Power	New Scattergood-Olympic 230 kV Cable A	Planned	230 kV
Los Angeles Department of Water and Power	Reconductor Barren Ridge – Haskell Canyon 230 kV Line 1	Planned	230 kV
Los Angeles Department of Water and Power	Castaic-Haskell Canyon 230 kV Line 3	Planned	230 kV
Los Angeles Department of Water and Power	Upgrade Haskell Canyon – Sylmar 230 kV Line1	Planned	230 kV
Los Angeles Department of Water and Power	Upgrade Haskell Canyon – Olive 230 kV Line	Planned	230 kV
Los Angeles Department of Water and Power	Upgrade Olive – North Ridge 230 kV Line	Planned	230 kV
Los Angeles Department of Water and Power	Re-conductor Valley – Rinaldi 230 kV Lines 1&2	Planned	230 kV
Los Angeles Department of Water and Power	Re-conductor Valley – Toluca 230 kV Lines 1&2	Planned	230 kV
Los Angeles Department of Water and Power	Victorville 500/287 kV Autotransformer Installation	Planned	500 kV AC
Los Angeles Department of Water and Power	Upgrade Toluca 500/230 kV Bank H	Planned	500 kV AC
Los Angeles Department of Water and Power	Upgrade Rinaldi 230 kV CBs	Planned	230 kV
Los Angeles Department of Water and Power	New Haskell Canyon – Sylmar 230 kV Line	Planned	230 kV
Los Angeles Department of Water and Power	Intermountain Replacement at 1200 MW	Planned	Below 115 kV

Sponsor	Project Name	Development Status	Voltage
Public Service Company of New Mexico	Alamogordo Voltage Support Phase II	Planned	115 kV
Public Service Company of New Mexico	Second Yah-Ta-Hey 345/115 kV Transformer	Planned	345 kV
Public Service Company of New Mexico	Guadalupe SVC	Planned	345 kV
Public Service Company of New Mexico	Cabezon Switching Station	Planned	345 kV
Salt River Project	Abel – Pfister – Ball 230kV (formerly RS12-RS-24-Abel and Abel – Moody)	Planned	230 kV
Salt River Project	Rogers – Santan 230kV	Planned	230 kV
Salt River Project	Schrader – RS28 230kV Transmission Line	Planned	230 kV
Salt River Project	RS28 Substation	Planned	230 kV
Salt River Project	Hassayampa – Pinal West #1 Jojoba Line Loop	Planned	500 kV AC
Salt River Project	Browning – Corbell 230kV Line Reconfiguration	Planned	230 kV
Southwest Transmission Cooperative	Butterfield Substation Capacitor Bank	Planned	230 kV
Southwest Transmission Cooperative	San Rafael Substation Capacitor Bank	Planned	230 kV
Southwest Transmission Cooperative	Bicknell Substation Capacitor Bank	Planned	115 kV
Tri-State Generation and Transmission Association	NENM Reliability Improvement	Planned	115 kV
Tucson Electric Power	Kino 138/13.8 kV Substation	Planned	138 kV
Tucson Electric Power	Marana 138/13.8 kV Substation	Planned	138 kV
Tucson Electric Power	Corona 138/13.8 kV Substation	Planned	138 kV
Tucson Electric Power	Craycroft Barril 138/13.8 kV Substation	Planned	138 kV
Tucson Electric Power	Irvington – Tucson 138 kV Transmission Line Circuit 2	Planned	138 kV
Tucson Electric Power	Harrison 138/13.8 kV Substation	Planned	138 kV
Tucson Electric Power	Hartt 138/13.8 kV Substation	Planned	138 kV
Tucson Electric Power	Marana 138kV Transmission Line	Planned	138 kV
Tucson Electric Power	Orange Grove 138/13.8 kV Substation	Planned	138 kV
Tucson Electric Power	Rosemont 138kV Line	Planned	138 kV

Sponsor	Project Name	Development Status	Voltage
Tucson Electric Power	Point of Interconnection 138kV Switchyard (Rosemont)	Planned	138 kV
Tucson Electric Power	Tortolita 500 kV Switchyard	Planned	500 kV AC
Tucson Electric Power	Naranja 138/13.8 kV Substation	Planned	138 kV
Tucson Electric Power	Rancho Vistoso to La Canada 138kV Line Uprate	Planned	138 kV
Tucson Electric Power	Irvington – Drexel 138 kV Line Uprate	Planned	138 kV
Tucson Electric Power	NL - NARANJA 138 kV Project	Planned	138 kV
Tucson Electric Power	Tortolita – Rancho Vistoso 138kV Line Re-configuration: Tortolita – NL EXP / NL EXP – Rancho Vistoso	Planned	138 kV
Tucson Electric Power	NL EXP – Rancho Vistoso 138kV Line Uprate	Planned	138 kV
Tucson Electric Power	NL Expansion 138kV Capacitor Bank Upgrades, Banks 1&2	Planned	138 kV
Tucson Electric Power	Del Cerro - Tucson 138 kV Line Uprate/Reconductor	Planned	138 kV
Tucson Electric Power	Irvington 138 kV Breaker-and-a-half Substation	Planned	138 kV
Tucson Electric Power	South Loop 345 kV, Conversion to Breaker-and-a-half Substation	Planned	345 kV
Tucson Electric Power	Greenlee 345 kV, Conversion to Breaker-and-a-half Substation	Planned	345 kV
Tucson Electric Power	East Loop Bus Tie Breaker	Planned	138 kV
Tucson Electric Power	La-Canada Line Switch	Planned	138 kV
Tucson Electric Power	NorthEast Bus Tie Breaker	Planned	138 kV
Tucson Electric Power	North Loop – Naranja Line Uprate	Planned	138 kV
Tucson Electric Power	Naranja – Rancho Vistoso Line Uprate	Planned	138 kV
Tucson Electric Power	Roberts Capacitor Bank Addition	Planned	138 kV
Western Area Power Administration – DSW	Parker – Headgate Rock	Planned	161 kV
Western Area Power Administration – DSW	Tucson Substation	Planned	230 kV
Western Area Power Administration – DSW	Gila 161 kV Substation Rebuild	Planned	161 kV
Western Area Power Administration – DSW	ED-5 – Marana Tap "Saguaro Bypass"	Planned	115 kV

SWAT – Conceptual

Sponsor	Project Name	Development Status	Voltage
Arizona Public Service	Northeastern Arizona – Phoenix 500kV line	Conceptual	500 kV AC
Arizona Public Service	Komatke 230/69kV Substation	Conceptual	230 kV
Arizona Public Service	Buckeye – TS11 – Sun Valley 230kV Line	Conceptual	230 kV
Arizona Public Service	Sun Valley – TS10 – TS11 230kV Line	Conceptual	230 kV
Arizona Public Service	Pinal Central – Sundance 230kV Line	Conceptual	230 kV
Arizona Public Service	Orchard – Yucca 230kV Line	Conceptual	230 kV
Arizona Public Service	El Sol – Westwing 230kV Line	Conceptual	230 kV
Arizona Public Service	Avery 230/69kV Substation	Conceptual	230 kV
Arizona Public Service	Scatter Wash 230/69kV Substation	Conceptual	230 kV
Salt River Project	Hassayampa – Pinal West 500kV #2	Conceptual	500 kV AC
Salt River Project	Silver King to RS29 230kV Transmission Line	Conceptual	230 kV
Salt River Project	RS29 to RS30 115kV Transmission Line	Conceptual	115 kV
Salt River Project	RS28 to RS27 230kV Transmission Line	Conceptual	230 kV
Salt River Project	New Oak Flat – Silver King 230kV	Conceptual	230 kV
Salt River Project	New Superior – New Oak Flat 230kV	Conceptual	230 kV
Tucson Electric Power	East Ina 138/13.8 kV Substation	Conceptual	138 kV
Tucson Electric Power	Sun City 138/13.8 kV Substation	Conceptual	138 kV
Tucson Electric Power	Golden Valley 230kV Transmission Line	Conceptual	230 kV
Tucson Electric Power	Griffith – N. Havasu 69/230kV Transmission Line	Conceptual	230 kV
Tucson Electric Power	Orange Grove – East Ina 138kV Transmission Line	Conceptual	138 kV
Tucson Electric Power	Midvale – Spencer 138 Transmission Line	Conceptual	138 kV
Tucson Electric Power	Winchester – Vail Double Circuit 345kV Line	Conceptual	345 kV
Tucson Electric Power	Vail 345/138kV Transformer T4	Conceptual	345 kV
Tucson Electric Power	Vail – Irvington (New Substation) – South Loop 345kV Line and Irvington Substation	Conceptual	345 kV

Sponsor	Project Name	Development Status	Voltage
Tucson Electric Power	Willow 345kV Substation	Conceptual	345 kV
Tucson Electric Power	University of Arizona Tech Park 138/13.8kV Substation	Conceptual	138 kV
Tucson Electric Power	Spencer 138/13.8kV kV Substation	Conceptual	138 kV
Tucson Electric Power	Rancho Vistoso – Sun City 138kV Line	Conceptual	138 kV
Tucson Electric Power	Irvington – Tech Park / Tech Park – Vail 138 kV Line Reconductor	Conceptual	138 kV
Tucson Electric Power	Anklam 138/13.8kV Substation	Conceptual	138 kV
Tucson Electric Power	Medina 138/13.8 kV Substation	Conceptual	138 kV
Tucson Electric Power	Raytheon 138/13.8 kV Substation	Conceptual	138 kV
Tucson Electric Power	UA Med 138/13.8 kV Substation	Conceptual	138 kV
Western Area Power Administration – DSW	Blythe – Goldmine Tap	Conceptual	161 kV
Western Area Power Administration – DSW	Bouse – Kofa	Conceptual	161 kV
Western Area Power Administration – DSW	Dome Tap-Gila	Conceptual	161 kV
Western Area Power Administration – DSW	Dome Tap – Wellton Mohawk	Conceptual	161 kV
Western Area Power Administration – DSW	Gila – Knob	Conceptual	161 kV
Western Area Power Administration – DSW	Goldmine Tap – Knob	Conceptual	161 kV
Western Area Power Administration – DSW	Headgate Rock – Blythe	Conceptual	161 kV
Western Area Power Administration – DSW	Kofa – Dome Tap	Conceptual	161 kV
Western Area Power Administration – DSW	Parker – Blythe	Conceptual	161 kV
Western Area Power Administration – DSW	Coolidge – Valley Farms	Conceptual	115 kV
Western Area Power Administration – DSW	ED5 – Saguaro Northern	Conceptual	115 kV
Western Area Power Administration – DSW	ED5 – Saguaro Southern	Conceptual	115 kV
Western Area Power Administration – DSW	Valley Farms – Oracle	Conceptual	115 kV
Western Area Power Administration – DSW	Tucson – Nogales	Conceptual	115 kV
Western Area Power Administration – DSW	Saguaro – Tucson	Conceptual	115 kV
Western Area Power Administration – DSW	Nogales – Apache	Conceptual	115 kV

Sponsor	Project Name	Development Status	Voltage
Western Area Power Administration – DSW	Saguaro – Oracle 115kV	Conceptual	115 kV
Western Area Power Administration – DSW	Tucson – Oracle	Conceptual	115 kV

Regional (TO Projects in >1 SPG) – Planned

Sponsor	Project Name	Development Status	Voltage
NV Energy	Harry Allen 500/230 kV Transformer[31]	Planned	500 kV AC
NV Energy	Miller – NLV 69kV Upgrade	Planned	Below 115 kV
NV Energy	First Solar – Playa 2 (HA230kV)(100MW)	Planned	230 kV
NV Energy	Sun Power – Boulder (NSO230kV) (100MW)	Planned	230 kV
NV Energy	Silverhawk 700MW CC Generator	Planned	500 kV AC
NV Energy	Reid Gardner 4 Retirement	Planned	230 kV
NV Energy	Clark 4 Generator Retirement	Planned	Below 115 kV
NV Energy	Apple 120kV Load	Planned	115 kV
NV Energy	Wild Horse 120kV	Planned	115 kV
NV Energy	Luning Solar – Table Mountain 50MW PV Generator	Planned	115 kV
NV Energy	Coyote Creek 120kV Ring Bus	Planned	115 kV
NV Energy	Tracy 345/120kV XFMR #2	Planned	345 kV
NV Energy	Painted Rock Distribution Substation	Planned	115 kV

[31] *Now that as of the approval date of this document, Harry Allen 500/230 kV transformer, the First Solar – Playa 2, Luning Solar – Table Mountain 50MW PV Generator, and Coyote Creek 120kV ring bus are in-service, and a new line (1-mi) from East Tracy to Pah Rah 120 kV, is being constructed and will be in service in 11/2017*

Regional (TO Projects in >1 SPG) – Conceptual

Sponsor	Project Name	Development Status	Voltage
Tri-State Generation and Transmission Association	San Juan Basin Energy Connect Project	Conceptual	230 kV

Non-Incumbent Developer Projects

The following projects were submitted into the WestConnect TPPL and evaluated for inclusion in the Base Transmission Plan. No projects passed the threshold required by the WestConnect Planning Process for inclusion in the Base Transmission Plan, as indicated by the third column. However, exclusion from the Base Transmission Plan does not mean that a project is ineligible to seek Order No. 1000 regional cost allocation. Eligibility for Order No. 1000 cost allocation is a separate analysis, which follows the identification of regional transmission needs. Project submittals for new transmission projects to satisfy an identified regional transmission need occurs later in the WestConnect Regional Planning Process.

Sponsor	Project Name	In Base Plan Transmission Plan?	Voltage
Tres Amigas LLC	Tres Amigas Superstation	No[32]	345 kV
Clean Line Energy Partners	Centennial West Clean Line	No	600 kV DC
Great Basin Transmission, LLC	Southwest Intertie Project or SWIP (SWIP Phase II)	No	500 kV AC
Lucky Corridor, LLC	Lucky Corridor Transmission Project	No	345 kV
San Luis River Colorado Project	SLRC Power Center, Transmission Line	No	230 kV
Southline Transmission, LLC	Southline Transmission Project (Afton – Apache)	No	345 kV
Southline Transmission, LLC	Southline Transmission Project (Apache – Saguaro)	No	230 kV
SunZia Transmission, LLC	SunZia Southwest Transmission Project	No	500 kV AC
TransWest Express, LLC	TransWest Express Project	No	600 kV DC
Wyoming-Colorado Intertie, LLC	Wyoming-Colorado Intertie	No	345 kV

[32] *Only the line from the Tres Amigas Superstation to the Blackwater 345 kV bus is slated for inclusion in the Base Transmission Plan, not the Tres Amigas Superstation facility which is proposed to simultaneously interconnect the Western, Texas, and Eastern Interconnects.*

Sponsor	Project Name	In Base Plan Transmission Plan?	Voltage
Central Arizona Project	Harcuvar Transmission Project (HTP)	No	230 kV
Clean Line Energy Partners	Western Spirit Clean Line	No	345 kV
Duke-American Transmission Company	Zephyr	No	500 kV DC
Great Basin Energy Development, LLC	Great Basin HVDC	No	500 kV DC
Southwest Transmission Partners, LLC	North Gila – Imperial Valley #2	No	500 kV AC
TransCanada	Chinook	No	500 kV DC

Appendix D – WestConnect Regional Project Submittal Form

The WestConnect Regional Project Submittal Form is located on the WestConnect website (https://doc.westconnect.com/Documents.aspx?NID=17183). Refer to the website for the most recent version of the form. Excerpts of the form are provided below for reference.

WestConnect Regional Project Submittal Form[33]

(To be used for submittal of transmission and non-transmission alternatives to address regional transmission needs identified during the WestConnect Regional Planning Process)

Instructions:

To be eligible to propose a project for selection in the WestConnect Regional Transmission Plan via this submittal form, a project proponent must be an active member in good standing within one of the five Planning Management Committee (PMC) membership sectors as described under the section entitled "WestConnect Planning Governance Process" in the WestConnect Transmission Owners' Order No. 1000 tariffs.

All submittals of transmission projects or non-transmission alternatives (collectively referred to as "projects") to address an identified regional transmission need, without regard to whether or not the project seeks regional cost allocation, are to contain the information set forth below, together with the identified deposit for study costs, and be submitted timely within the posted submittal window in order for the project submittal to be eligible for evaluation in the WestConnect Regional Transmission Planning Process.[34], [35]

A single project submittal may not seek multiple study requests. To the extent a project proponent seeks to have its project studied under a variety of alternative project assumptions, the individual alternatives must be submitted as individual project submittals.

Following the conclusion of the project submittal window, the PMC will post a document on the WestConnect website detailing why any project submittals were rejected as incomplete. Upon posting of the document, any project submittal rejected as incomplete will be given a reasonable opportunity to cure any deficiencies to the satisfaction of the PMC in its sole discretion.

Once complete, please return this form and any supplemental information via email to projects@westconnect.com.

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[33] *As described under "Transmission Project Submittals" & "Submission of Non- Transmission Alternative Projects" in the section entitled "Submission of Data by Customers, Transmission Developers, and Transmission Owners" in the Transmission Owners' FERC Order 1000 tariff filings.*

[34] *Should the Project Sponsor believe certain information requested within this form is not necessary, it shall identify the information it believes is not necessary and shall provide a justification for that conclusion. The PMC retains the sole authority for determining completeness of the project submittal form.*

[35] *The deadline for interregional transmission project submittals and additional submittal instructions are provided under section 1 of this submittal form.*

*All information submitted to WestConnect must be marked by the submitter in accordance with the appropriate document class such that it can be treated appropriately by WestConnect. The markings should be as follows: a) None or “Public”; b) Contains CEII – Do Not Release; c) Contains Privileged Information – Do Not Release.

Project Sponsor Information	
Legal Name:	
Mailing Address:	
City/State/Zip:	
Business Phone:	

Primary Contact Information	
Name:	
Title:	
Mailing Address:	
City/State/Zip:	
Phone:	
Email Address:	

1. General Project Information	
Description of the Project:	Enter a description of the project, and state whether the project is a transmission project or a non-transmission alternative. Attach supporting documents, as necessary.
Is the project seeking cost allocation?	☐Yes ☐No

Is the project an interregional transmission project?[36][37]	☐Yes. Please indicate which other regions this project has been or will be submitted to: ☐ California Independent System Operator (CAISO) ☐ ColumbiaGrid ☐ Northern Tier Transmission Group (NTTG) ☐No

1

2. Need(s) Addressed	
Identify which of the posted regional transmission needs the project seeks to satisfy.	Please enter a detailed explanatory statement addressing how the project meets the posted regional transmission need(s). In addition, explain how the project is a more efficient or cost effective solution to the identified need(s). Attach supporting documents, as necessary.
To the extent known, identify the multiple solutions set forth in the local transmission plans of WestConnect Transmission Owners(i.e., the solutions of two or more TOs to the identified regional need)for which your single regional project would be the more efficient or cost effective solution.	

2

3. Study Deposit[38]

[36] An interregional transmission project is a proposed new transmission project that would directly interconnect electrically to existing or planned transmission facilities in two or more Planning Regions (i.e. WestConnect, CAISO, ColumbiaGrid, or NTTG) and that is submitted into the regional transmission planning processes of the Planning Regions it will directly interconnect with electrically.

[37] Interregional transmission projects must be submitted to WestConnect no later than March 31 of even-numbered calendar years. Since this is outside of the regional project submittal window, a submitter of an interregional transmission project need not identify which of the posted regional transmission needs the project seeks to satisfy (section 2) and need not submit the study deposit (section 3) as of March 31. During the regional project submittal window, a submitter of an interregional transmission project must provide any updates to previously submitted project information and must complete section 2 and section 3 to be considered a valid project submittal eligible for consideration by WestConnect.

[38] Please contact projects@westconnect.com to obtain instructions for submitting the study deposit.

Has the Project Sponsor submitted a $25,000 deposit to support the cost of relevant study work, subject to true-up (up or down) based upon the actual cost of the study(ies)?[39]	☐Yes (Please attach supporting documents) ☐No

4. Project Description & Engineering and Modeling Data Required - Transmission	
Transmission Alternatives Please provide a detailed explanation of each of the project characteristics identified in this Section 4. Attach supporting documents, as necessary. Should the Project Sponsor believe certain information is not necessary, it shall identify the information it believes is not necessary and shall provide a justification for its conclusion that the information is not necessary.	
a. Project Scope	
b. Points of interconnection to existing (or planned) system	
c. Operating Voltage and Alternating Current or Direct Current technology utilized	
d. Circuit Configuration (Single, Double, Double-Circuit capable, etc.)	
e. Impedance Information	
f. Approximate circuit mileage	
g. Description of any special facilities (series capacitors, phase shifting transformers, etc.) required for the project	
h. Status within the WECC path rating process	

[39] *The true-up will include interest on the difference between the deposit and the actual cost, with such interest calculated in accordance with section 35.19a(a)(2) of FERC's regulations. A description of the costs to which the deposit was applied, how the costs were calculated, and an accounting of the costs will be provided to each project sponsor within 30 calendar days of the completion of the study. Dispute resolution is addressed pursuant to the "Dispute Resolution" section for disputes between members of the PMC, as listed in the Transmission Owners' FERC order 1000 Tariff filings.*

i. Change files to add the project to the WestConnect regional power flow model (PSLF .epc file format is preferred)	☐Provided as an attachment
j. System one-line diagram	☐Provided as an attachment ☐Not available

4. Project Description & Engineering and Modeling Data Required - NTA	
<u>Non Transmission Alternatives</u> Please provide a detailed explanation of each of the project characteristics identified in this Section 4. Attach supporting documents, as necessary. Should the Project Sponsor believe certain information is not necessary, it shall identify the information it believes is not necessary and shall provide a justification for its conclusion that the information is not necessary. Although non-transmission alternative projects will be considered in the Regional Planning Process, they are not eligible for regional cost allocation.	
a. Basic description of the project (e.g. fuel, size, location, point of contact)	
b. Operational benefits	
c. Load offset, if applicable	
d. Description of the issue sought to be resolved by the generating facility or non- transmission alternative, including reference to any results of prior technical studies	
e. Network model of the project, and associated system one-line diagram	☐Provided as an attachment ☐Not available
f. Short-circuit data	☐Provided as an attachment ☐Not available

g. Protection data	☐Provided as an attachment ☐Not available
h. Other technical data that might be needed for resources	☐Provided as an attachment
i. Additional miscellaneous data (e.g., change files if available)	☐Provided as an attachment

5. Proposed Project Schedule	
a. Project in-service date b. Estimated Project Cost (expressed in current year's dollars) and description of basis for that cost. c. Description of plan for post-construction maintenance and operation of the proposed line d. Operating costs (For Non-Transmission Alternatives Only)	Please provide a detailed explanation of each of the project characteristics identified in this Section 5. Attach supporting documents, as necessary.

6. Environmental Impact(s)	
a. Comparison Risk Score and other data obtained from WECC Environmental Data Work Group, if available. b. Diagram showing geographical location and/or preferred route; general description of permitting challenges	Please provide a detailed explanation of each of the project characteristics identified in this Section 6. Attach supporting documents, as necessary.

7. System Impact and Other Study Work	
a. Impacts to other regions. Provide transmission system impact studies showing system reliability impacts to neighboring transmission systems or another transmission planning region.[40] The information should identify all costs associated with any required upgrades to mitigate adverse impacts on other transmission systems. b. Independent study work of, or relevant to, the project. c. WECC study work of, or relevant to, the project.	Please provide a detailed explanation of each of the items identified in this Section 7. Attach supporting documents, as necessary.

8. Description of Attachments	
Please list any attachments submitted with this form and reference the question number addressed by the attachment.	

[40] If impact studies and costs are not available at the time of submittal, the Project Sponsor may request that impact studies be performed, at the Project Sponsor's expense, as part of the analysis to determine whether the project is the more efficient or cost-effective solution. Requests for transmission system impact studies are approved through the PMC depending on whether the project proponent provides funding for the analysis. The PMC will provide, subject to appropriate confidentiality and CEII restrictions, the information in the possession of the PMC that the Project Sponsor needs to perform the transmission system impact study and to identify the costs associated with any upgrades required to mitigate adverse impacts.

Acknowledgements

The individual signing below affirms that the information contained in and accompanying this submittal is true and correct and also agrees to submit any additional information for the Project when requested.

Project Sponsor:
Project Sponsor Contact:
Title/Company:

Authorized Signature: ______________________________
Date:

Appendix E – WestConnect Scenario Submittal Form

The WestConnect Scenario Submittal Form is located on the WestConnect website (https://doc.westconnect.com/Documents.aspx?NID=17182). Refer to the website for the most recent version of the form. Excerpts of the form are provided below for reference.

WestConnect Scenario Submittal Form
2016/17 Planning Cycle

Requestor Organization Information	
Legal Name:	Click here to enter text.
Mailing Address:	Click here to enter text.
City/State/Zip:	Click here to enter text.
Business Phone:	Click here to enter text.
Primary Contact Information	
Name:	Click here to enter text.
Title:	Click here to enter text.
Mailing Address:	Click here to enter text.
City/State/Zip:	Click here to enter text.
Phone:	Click here to enter text.
Email Address:	Click here to enter text.

General Information	
Scenario Name:	Click here to enter text.
Requested Study Year (e.g. 2026):	Click here to enter text.
Study Type: Check one or more	☐ Reliability (steady-state) ☐ Reliability (transient stability) ☐ Economic (production cost analysis)
Scenario Description & Summary: *Summary of key load, resource, transmission, and/or policy assumptions*	Click here to enter text.
Describe how scenario provides valuable information to the WestConnect PMC: *Summary of issues addressed by scenario*	Click here to enter text.

General Information	
Describe the expertise and information that the requestor will provide to the PMC in support of this scenario:	Click here to enter text.
Geographic scope:	Click here to enter text.
Load and resource assumptions: Details on assumptions	Click here to enter text.
Transmission modeling assumptions: Details on assumptions	Click here to enter text.
Policy Issues to be Addressed: Expanded summary**;** e.g. State, RES, FERC, NERC, etc	Click here to enter text.
Attached map of study elements?	Choose an item.

1

Appendix F – 2026 Base Case (PCM) Assumptions

This appendix contains select modeling assumptions reflected in the WestConnect 2026 Base Case (PCM) which, unless otherwise noted, were taken from the 2026 TEPPC-approved interconnection-wide 10-year PCM.

Figure 12: WECC Assumptions for Fuel Prices by month (2016$/mmBtu)

Fuel Name in Model	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bio_Agri_Res	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Bio_Blk_Liquor	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Bio_Landfill_Gas	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29
Bio_Other	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87
Bio_Sludge_Waste	0	0	0	0	0	0	0	0	0	0	0	0
Bio_Solid_Waste	0	0	0	0	0	0	0	0	0	0	0	0
Bio_Wood	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93
Coal_Alberta	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31
Coal_AZ	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52
Coal_CA_South	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76
Coal_CO_East	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
Coal_CO_West	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
Coal_ID	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
Coal_MT	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Coal_NM	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31
Coal_NV	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13
Coal_PNW	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Coal_UT	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12
Coal_WY_E	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66
Coal_WY_PRB	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Coal_WY_SW	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.28
Geothermal	0	0	0	0	0	0	0	0	0	0	0	0
NG_AB	5.308	4.721	4.285	4.9	4.602	4.911	4.466	4.284	3.978	4.097	4.612	5.469
NG_AZ North	5.052	5.088	4.743	4.836	4.867	4.913	4.975	4.739	4.581	4.797	5.047	5.583
NG_AZ South	5.274	5.31	4.96	5.054	5.086	5.133	5.195	4.955	4.795	5.014	5.269	5.815
NG_Baja	5.366	5.406	5.014	5.119	5.155	5.208	5.278	5.009	4.83	5.075	5.36	5.971
NG_BC	5.356	4.763	4.323	4.944	4.643	4.955	4.506	4.322	4.014	4.133	4.653	5.518
NG_CA PGaE BB	4.891	4.928	4.57	4.667	4.699	4.747	4.811	4.566	4.402	4.626	4.886	5.442
NG_CA PGaE LT	5.601	5.64	5.263	5.365	5.399	5.45	5.517	5.258	5.086	5.322	5.596	6.183
NG_CA SDGE	5.83	5.872	5.459	5.57	5.608	5.663	5.737	5.454	5.265	5.523	5.824	6.467
NG_CA SJ Valley	4.998	5.036	4.671	4.769	4.803	4.851	4.917	4.666	4.499	4.727	4.993	5.562
NG_CA SoCalB	5.087	5.125	4.754	4.854	4.888	4.937	5.004	4.749	4.579	4.811	5.081	5.66
NG_CA SoCalGas	5.988	6.031	5.618	5.729	5.767	5.822	5.896	5.613	5.424	5.682	5.982	6.625
NG_CO	4.955	4.857	4.909	4.698	4.494	4.592	4.525	4.291	4.349	4.57	4.637	5.247
NG_ID North	5.224	4.628	4.185	4.809	4.507	4.82	4.369	4.184	3.874	3.995	4.517	5.387

Fuel Name in Model	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NG_ID South	5.113	5.009	5.064	4.841	4.625	4.728	4.657	4.409	4.471	4.706	4.776	5.422
NG_MT	5.05	4.95	5.003	4.788	4.58	4.68	4.611	4.373	4.432	4.658	4.726	5.347
NG_NM North	4.893	4.927	4.595	4.684	4.715	4.759	4.818	4.591	4.439	4.647	4.888	5.404
NG_NM South	5.22	5.005	4.906	4.802	4.854	5.039	5.099	4.768	4.629	4.84	5.263	5.291
NG_NV North	5.498	5.393	5.449	5.224	5.006	5.11	5.038	4.788	4.851	5.087	5.158	5.809
NG_NV South	5.082	5.12	4.749	4.849	4.883	4.932	4.999	4.744	4.574	4.806	5.076	5.655
NG_OR	5.542	4.91	4.44	5.103	4.782	5.114	4.635	4.439	4.111	4.238	4.792	5.715
NG_OR Malin	5.051	4.948	5.002	4.782	4.568	4.67	4.6	4.355	4.417	4.648	4.718	5.356
NG_TX West	4.878	4.664	4.565	4.462	4.514	4.698	4.758	4.428	4.289	4.499	4.921	4.95
NG_UT	5.454	5.356	5.408	5.199	4.997	5.093	5.027	4.795	4.853	5.072	5.139	5.743
NG_WA	5.786	5.156	4.689	5.348	5.029	5.36	4.883	4.688	4.36	4.487	5.039	5.958
NG_WY	4.952	4.854	4.906	4.696	4.492	4.589	4.522	4.288	4.347	4.568	4.635	5.244
Oil_DistillateFuel_2	22.94	22.94	22.94	22.94	22.94	22.94	22.94	22.94	22.94	22.94	22.94	22.94
Oil_DistillateFuel_H	30.58	30.58	30.58	30.58	30.58	30.58	30.58	30.58	30.58	30.58	30.58	30.58
Oil_DistillateFuel_L	15.36	15.36	15.36	15.36	15.36	15.36	15.36	15.36	15.36	15.36	15.36	15.36
Petroleum Coke	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43
Propane	23.55	23.55	23.55	23.55	23.55	23.55	23.55	23.55	23.55	23.55	23.55	23.55
Purchased_Steam	1	1	1	1	1	1	1	1	1	1	1	1
Refuse	0	0	0	0	0	0	0	0	0	0	0	0
Synthetic Gas	6.99	6.99	6.99	6.99	6.99	6.99	6.99	6.99	6.99	6.99	6.99	6.99
Uranium	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Waste_Heat	0	0	0	0	0	0	0	0	0	0	0	0

Figure 13: WECC Assumptions for Fuel Emission Rates by Type (lb/mmBtu)

Fuel Name in Model	Emission Type			Fuel Name in Model	Emission Type		
	SO_2	NOx	CO_2		SO_2	NOx	CO_2
Bio_Agri_Res	0.00579	0.1766362	130	NG_CA PGaE LT	0.0006	0.08	117
Bio_Blk_Liquor	0.00579	0.1766362	130	NG_CA SDGE	0.0006	0.08	117
Bio_Landfill_Gas	0.00579	0.1766362	130	NG_CA SJ Valley	0.0006	0.08	117
Bio_Other	0.00579	0.1766362	130	NG_CA SoCalB	0.0006	0.08	117
Bio_Sludge_Waste	0.00579	0.1766362	130	NG_CA SoCalGas	0.0006	0.08	117
Bio_Solid_Waste	0.00579	0.1766362	130	NG_CO	0.0006	0.08	117
Bio_Wood	0.00579	0.1766362	130	NG_ID North	0.0006	0.08	117
Coal_Alberta	0.35	0.5	205	NG_ID South	0.0006	0.08	117
Coal_AZ	0.571	0.459146	205.0311	NG_MT	0.0006	0.08	117
Coal_CA_South	0.3303097	0.3824139	203.5343	NG_NM North	0.0006	0.08	117
Coal_CO_East	0.6911747	0.552889	204.7532	NG_NM South	0.0006	0.08	117
Coal_CO_West	0.6911747	0.552889	205.2	NG_NV North	0.0006	0.08	117
Coal_ID	0.6911747	0.552889	204.7532	NG_NV South	0.0006	0.08	117
Coal_MT	0.6911747	0.552889	204.7532	NG_OR	0.0006	0.08	117
Coal_NM	0.3303097	0.3824139	203.5343	NG_OR Malin	0.0006	0.08	117
Coal_NV	0.112818	0.3485	202.6215	NG_TX West	0.0006	0.08	117
Coal_PNW	0.621817	0.288333	205.2	NG_UT	0.0006	0.08	117
Coal_UT	0.6911747	0.552889	204.7532	NG_WA	0.0006	0.08	117
Coal_WY_E	0.464041	0.276	200	NG_WY	0.0006	0.08	117
Coal_WY_PRB	0.07	0.1	205.2	Oil_DistillateFuel_2	0.00579	0.176636	156.3
Coal_WY_SW	0.07	0.1	205.2	Oil_DistillateFuel_H	0.00579	0.176636	156.3
DefaultFuel	0.35	0.276	200	Oil_DistillateFuel_L	0.0006	0.116	161.3
Geothermal	0.00579	0.1766362	20	Petroleum Coke	0	0.028	224
NG_AB	0.0006	0.08	117	Propane	0.00579	0.176636	123.1133
NG_AZ North	0.0006	0.08	117	Purchased_Steam	0	0.028	224
NG_AZ South	0.0006	0.08	117	Refuse	0.00579	0.176636	130
NG_Baja	0.0006	0.08	117	Synthetic Gas	0.0006	0.08	117
NG_BC	0.0006	0.08	117	Uranium	0	0	0
NG_CA PGaE BB	0.0006	0.08	117	Waste_Heat	0	0	0

Figure 14: WestConnect Wheeling Rate Assumptions

Wheeling Zones	PCM Area(s)	WestConnect PCM Export Wheels ($/MWh)	
		Commitment Export Wheel	Dispatch Export Wheel
AB_AESO	AESO	11.200	7.200
BC_BCHA	BCHA	11.400	7.400
BS_IPCO	IPFE,IPMV,IPTV	9.740	5.74 (No EIM) 0.574 (EIM)
BS_PACE	PAID,PAUT,PAWY	11.314	7.314 (No EIM) 0.7314 (EIM)
CA_BANC+	BANC,TIDC	8.300	4.300
CA_CFE	CFE	18.200	14.200

Wheeling Zones	PCM Area(s)	WestConnect PCM Export Wheels ($/MWh)	
		Commitment Export Wheel	Dispatch Export Wheel
CA_CISO	CIPB,CIPV,CISC,CISD,VEA	17.500	13.5 (No EIM) 1.35 (EIM)
CA_IID	IID	8.822	4.822
CA_LDWP	LDWP	15.484	11.484
NW_AVA	AVA	11.770	7.770
NW_BPAT+	BPAT,CHPD,DOPD,GCPD,SCL,TPWR	9.990	5.990
NW_NWMT+	NWMT,WAUW	10.560	6.560
NW_PACW	PACW	11.314	7.314 (No EIM) 0.7314 (EIM)
NW_PGE	PGE	7.020	3.02 (No EIM) 0.302 (EIM)
NW_PSEI	PSEI	9.274	5.274 (No EIM) 0.5274 (EIM)
RM_PSCO	PSCO	12.708	8.708
RM_WACM	WACM	11.188	7.188
SW_AZPS	AZPS	11.918	7.918 (No EIM) 0.7918 (EIM)
SW_EPE	EPE	10.661	6.661
SW_NVE	NEVP,SPPC	11.857	7.857 (No EIM) 0.7857 (EIM)
SW_PNM	PNM	11.781	7.781
SW_SRP	SRP	9.534	5.534
SW_TEPC	TEPC	11.601	7.601
SW_WALC	WALC	7.811	3.811

Note: Actual values used in the assessment were calculated to reflect on-off peak non-firm wheeling costs. $1/MWh loss adder was also removed to avoid duplication with LMP loss component.

Appendix G – Results of Reliability Need Assessment

Table 8: Results of Regional Reliability Assessment

2026 Base Case	Disturbance	Affected Element					Regional Need	Comment
		Owner/ Operator(s)	Affected Element	Value under Disturbance	Limit	Issue		
LSP	N/A (base case)	SPPC	CRTZ PIPE 120kV Bus (64175)	[redacted]	[redacted]	Low V	**NO**	Local Issue. Per NVE, can be fixed by [redacted].
			CRTZ S PIPE 120kV Bus (64387)	[redacted]	[redacted]	Low V	**NO**	
			CROSSROADS 120kV Bus (64655)	[redacted]	[redacted]	Low V	**NO**	
		LADWP	HYN1314G 230kV Bus (26155)	[redacted]	[redacted]	Low V	**NO**	Local issue. Per LADWP, can be fixed by [redacted].
			HYN1516G 230kV Bus (26156)	[redacted]	[redacted]	Low V	**NO**	
			HYN1112G 230kV Bus (26154)	[redacted]	[redacted]	Low V	**NO**	
			SYL PF BUS 1 230kV Bus (26270)	[redacted]	[redacted]	Low V	**NO**	
			SYL PF BUS 2 230kV Bus (26271)	[redacted]	[redacted]	Low V	**NO**	
			SYLMAR1 230kV Bus (26097)	[redacted]	[redacted]	Low V	**NO**	
HS	APS's P1 ([redacted])	APS	CACTUS - OCOTILLO 230kV Line #1 (14202-14219-1)	[redacted]	[redacted]	Branch Overload	**NO**	Local Issue. Per APS, detailed power flow case (rather than bulk power flow case) modeling eliminates this issue.
	Either IID's P1 ([redacted]) or IID's P1 ([redacted])	IID	MW1TAP 92kV Bus (21670)	[redacted]	[redacted]	Low V	**NO**	IID confirmed local issue and use of [redacted] low voltage limit was appropriate.
			MIDWAY 230kV Bus (21699)	[redacted]	[redacted]	Low V	**NO**	
			MIDWAY 92kV Bus (21700)	[redacted]	[redacted]	Low V	**NO**	

Appendix H – Results of Economic Need Assessment

Table 9: Results of Regional Economic Needs Assessment (2026 Base Case)

Element Information		Total Congestion Hours (% Hrs) / Cost ($)	Regional Need	Comments
Owner/ Operator(s)	Branch/Path Name			
VEA|CAISO (WAPA-DSW/VEA Border)	MEAD S_230.0 - BOB SS_230.0	643 (7%) / $8,062K	**NO**	
NEVP|PG&E|CAISO	P24 PG&E-Sierra	493 (6%) / $1,286K	**NO**	Modeling results are not an indication of any regional congestion as they are an artifact of phase shifter performance, which was a recognized modeling issue in the study. NVE's explanation of the disagreement with the shown congestion hours/cost is detailed in the footnote.[41]
NEVP (NEVP/BPA Border)	HIL TOP - HIL TOP	144 (2%) / $492K	**NO**	Congestion is negligible; PST eliminates it completely
PG&E|CAISO (TANC/PG&E Border)	LODI_230.0 - EIGHT MI_230.0	128 (1%) / $175K	**NO**	
LADWP	RINALDI_230.0 - AIRWAY_230.0	2 (0%) / $118K	**NO**	
TANC|WAPA-SN|BPA|PacifiCorp|PGE|CAISO	P66 COI	4 (0%) / $58K	**NO**	
LADWP|SCE|CAISO	P60 Inyo-Control 115 kV Tie	56 (1%) / $30K	**NO**	
PSCO	LEETSDAL_230.0 - MONROEPS_230.0	2 (0%) / $16K	**NO**	
NEVP|IPCO	P16 Idaho-Sierra	4 (0%) / $16K	**NO**	
LADWP|Anaheim|Riverside|Pasadena|Burbank|Glendale	P29 Intermountain-Gonder 230 kV	1 (0%) / $9K	**NO**	
IPCO (NEVP/IPCO Border)	MIDPOINT_345.0 - IDAHO-NV_345.0	3 (0%) / $6K	**NO**	
PNM	P48 Northern New Mexico (NM2)	3 (0%) / $3K	**NO**	

[41] *Comments from NVE: This path between Sierra (NVE) & PG&E (CAISO) is an inter-regional tie between the WC & CAISO footprint&; also, it is controlled by a PST. on the NVE's side. Proper modeling information was not obtained from PG&E/CAISO. The congestion is shown only in CAISO->NVE direction, which is limited by a CAISO nomogram to 100MW only (which is not applied to the model). The modeling issues, specifically application of available transmission capacity to the existing paths, application of proper TAC for multiple entities (including CAISO, which is outside of WC) are not resolved at this time & therefore the congestion result as a modeling issue and should be ignored. Furthermore, the amount and cost of congestion (if it would be real) cannot justify any potential mitigation projects.*

Element Information		Total Congestion Hours (% Hrs) / Cost ($)	Regional Need	Comments
Owner/ Operator(s)	Branch/Path Name			
NEVP	CLARK 6 - CLARK	1 (0%) / $2K	**NO**	Congestion is negligible; internal NVE XF which may restrict Clark plant output
LADWP|SCE|CAISO| Anaheim|Riverside	P61 Lugo-Victorville 500 kV Line	1 (0%) / $1K	**NO**	
NEVP|SCE|CAISO	P52 Silver Peak-Control 55 kV	2 (0%) / $0K	**NO**	
LADWP|PG&E|SCE|CAISO| SDG&E|CDWR|Pasadena| Anaheim|Riverside	P41 Sylmar to SCE	2 (0%) / $0K	**NO**	
PSCO	GREENWD_230.0 - MONACO12_230.0	1 (0%) / $0K	**NO**	
	Total Congestion Cost:	**$13,306K**		

Table 10: Results of Regional Economic Needs Assessment Sensitivity Analysis

Element Information		Total Congestion Hours (% Hrs) / Cost ($)				Comments
Owner/ Operator(s)	Branch/Path Name	High Natural Gas Price ("HighNG")	Phase Shifters Converted to Normal Branches ("NoPST")	EIM Proxy Modeling ("WithEIM")	TOLSO-Submitted Contingencies ("WithOTG")	
APS	CTRYCLUB_230.0 - LINCSTRT_230.0	112 (1%) / $2,826K	150 (2%) / $1,657K	148 (2%) / $1,902K	127 (1%) / $1,599K	Internal to APS
NEVP|PG&E|CAISO	P24 PG&E-Sierra	769 (9%) / $2,038K	624 (7%) / $4,508K	237 (3%) / $629K	577 (7%) / $1,412K	
LADWP	TARZANA_230.0 - OLYMPC_230.0	21 (0%) / $1,414K	22 (0%) / $1,535K	16 (0%) / $955K	19 (0%) / $1,128K	
NEVP (NEVP/BPA Border)	HIL TOP - HIL TOP	442 (5%) / $1,891K	-	2 (0%) / $5K	162 (2%) / $564K	
LADWP	RINALDI_230.0 - AIRWAY_230.0	2 (0%) / $62K	3 (0%) / $155K	4 (0%) / $168K	4 (0%) / $156K	
SMUD|BPA|PacifiCorp| PGE|CAISO	P66 COI	12 (0%) / $233K	3 (0%) / $49K	8 (0%) / $137K	4 (0%) / $49K	
PSCO	LEETSDAL_230.0 - MONROEPS_230.0	-	3 (0%) / $18K	3 (0%) / $20K	-	
PNM	P48 Northern New Mexico (NM2)	4 (0%) / $42K	2 (0%) / $1K	2 (0%) / $2K	-	

PSCO	GREENWD_230.0 - MONACO12_230.0	10 (0%) / $110K	2 (0%) / $2K	2 (0%) / $1K	4 (0%) / $13K	
NEVP	CLARK 6 - CLARK	2 (0%) / $4K	4 (0%) / $17K	1 (0%) / $16K	3 (0%) / $9K	
LADWP|PG&E|SCE|CAISO|SDG&E|CDWR|Pasadena|Anaheim|Riverside	P41 Sylmar to SCE	1 (0%) / $0K	-	2 (0%) / $1K	-	
APS	MEADOWBK_230.0 - SUNYSLOP_230.0	-	-	-	10 (0%) / $393K	Internal to APS
NEVP	TRACY E_345.0 - VALMY_345.0	-	-	1 (0%) / $9K	-	Congestion is negligible; internal NVE path
PSCO	CABINCRK_230.0 - DILLON_230.0	13 (0%) / $70K	-	-	-	
WAPA-RM|PRPA|TSGT|UAMP	P30 TOT 1A	-	-	2 (0%) / $3K	-	
NVE|LADWP|CAISO|PacifiCorp	P32 Pavant-Gonder InterMtn-Gonder 230 kV	1 (0%) / $1K	2 (0%) / $4K	7 (0%) / $36K	3 (0%) / $8K	Congestion is negligible/non-existent
WAPA_RM|MBPP|PSCO|TSGT	P36 TOT 3	45 (1%) / $1,247K	-	-	-	
EPE|PNM|Tri-State	P47 Southern New Mexico (NM1)	7 (0%) / $61K	-	-	-	Congestion is negligible/non-existent, and appears only in the High NG case that assumed extreme prices outside the range of any recognized forecast.
NEVP|SCE|CAISO	P52 Silver Peak-Control 55 kV	64 (1%) / $9K	184 (2%) / $420K	2 (0%) / $0K	2 (0%) / $0K	
LADWP|SCE|CAISO|Anaheim|Riverside	P61 Lugo-Victorville 500 kV Line	3 (0%) / $21K	-	-	-	
	Total Congestion Cost:	**$10,029K**	**$8,367K**	**$3,884K**	**$5,330K**	

Appendix I – Scenario Resource Assumptions

High Renewables Scenario

In developing the scenario it was assumed the renewable resources would be driven by two factors. First, it was assumed that WestConnect state RPS would increase by 50 percent from current enacted policy. This resulted in the need for approximately 38,000 GWh of incremental renewable generation in the scenario. These resources were sited within or near the states for which they were required. The following table provides a TO-level summary of the additional renewable resources that were required to represent a 50 percent increase to statutory RPS levels (in the 2026 timeframe).

Table 11. Renewable Energy Requirement Calculation Summary

Area	New Renewable Energy Needed (GWH)	RPS Assumptions	
		Enacted RPS (%)	Scenario RPS (%)
AZPS	2,704	15.0%	22.5%
EPE	116	10.0%	15.0%
NEVP+SPPC	6,544	25.0%	37.5%
PNM	1,591	20.0%	30.0%
PSCO+CSU	6,466	30.0%	45.0%
SRP	2,605	15.0%	22.5%
TEPC	1,276	15.0%	22.5%
WACM	3,591	20.0%	30.0%
WALC	797	15.0%	22.5%
BANC	3,000	33.0%	50.0%
IID	767	33.0%	50.0%
LDWP	5,607	33.0%	50.0%
Total	**38,654 GWh**		

In addition to the resources added for WestConnect-state RPS purposes, it was assumed that 2,000 MW of wind would be added in Wyoming and New Mexico (respectively) for the purposes of meeting California's exacted 50 percent RPS with out-of-state wind. This assumption was consistent with Special Studies performed by the California Independent System Operator (CAISO) through their Order No. 1000 regional planning process during 2016-17.[42] WestConnect assumed that long-term firm transmission had been procured for these resources and the resources were scheduled to the CAISO balancing authority area and were not assigned any transmission wheeling rates.

[42] http://www.caiso.com/planning/Pages/TransmissionPlanning/2016-2017TransmissionPlanningProcess.aspx

Since WestConnect conducts nodal production cost model studies, the state and area level resources needed to be sited to specific substations. The PS coordinated with the TO members to identify specific substations for the additional resources. The members and Planning Consultant used information about interconnection queues, resource quality, and engineering judgement related to local transmission systems to guide the develop these assumptions. Existing 8760-hour wind and solar profiles from the 2026 Base Case (which were based on the 2026 WECC Common Case) were applied to these new resources.

Based on the RPS assumptions, load forecasts, and resource types and quality in the scenarios, the WestConnect region added 11,213 MW of additional renewable resources for the scenario RPS estimates, while adding an additional 4,000 MW of wind for California RPS purposes.[43]

The following table shows how the capacity of the additional renewable resources are distributed.

Table 12. Renewable Generator Capacity Distribution

State	Area	New Renewable Energy Expected (GWh)	Capacity (MW)			
			Wind	Solar	Geothermal	TOTAL
AZ	AZPS	2,704	116	874	-	990
	SRP	2,605	127	843	-	970
	TEPC	1,276	62	413	-	475
	WALC	797	91	152	-	243
CA	BANC	3,000	489	571	-	1,060
	IID	767	-	29	93	122
	LDWP	5,607	914	1,067	-	1,981
CO	PSCO	6,466	780	557	-	1,337
	WACM (CSU)		253	181	-	434
	WACM (TSGT)	3,591	287	235	-	522
	WACM (Other)		287	175	-	462
NM	PNM	1,591	254	182	-	436
	EPE	116	5	38	-	43
NV	NEVP	6,544	-	1,218	-	1,218
	SPPC		113	504	303	920
	Subtotal	***38,653***	***3,778***	***7,039***	***396***	***11,213***
WY	PAWY (OOS CA)	7,884	2,000	-	-	2,000
NM	PNM (OOS CA)	7,884	2,000	-	-	2,000
	Total	**54,421**	**7,778**	**7,039**	**396**	**15,213**

[43] *Note that in this context California RPS refers to the California load managed by the CAISO. BANC, IID, and LDWP are are located in California and their resource needs were addressed consistent with the other WestConnect TOs. Note that SMUD, which is a member of the BANC Balancing Authority, is a WestConnect member. BANC is not a WestConnect member.*

Clean Power Plan Scenarios

In late-2015 scenarios were collected for consideration in the 2016-17 Planning Process. At this time the EPA's Clean Power Plan (CPP), which was released in August, 2015, was a semi-enacted public policy of concern to local and regional transmission planners. The original policy, which required individual states to meet certain carbon dioxide reductions, is not being implemented as a result of legal challenges and pending federal reviews. Despite these developments, WestConnect proceeded with the CPP Scenarios in 2016 in order to create planning information and to test the approach used to develop the models.

The CPP Scenarios were designed to test the impacts of two bookend carbon reduction scenarios. One scenario, called the WestConnect Utility Plans Scenario, aggregated individual WestConnect member plans for CPP compliance, or a similar low-carbon future. Certain members, specifically those in Arizona, had previously developed utility-coordinated, state-level analysis that was leveraged as input assumptions for this scenario. The case consisted of coal and gas retirements (beyond what is included in the Base Case), additional renewable energy, and replacement resources for the coal and gas retirements. The purpose of the case was not to test the system for CPP compliance from an emissions standpoint. Rather, the case was intended to gather various utility plans, compile them into an economic model in order to identify stressed but realistic operating conditions, and then test the performance of the WestConnect Base Transmission Plan under these conditions though a reliability scenario study, looking at both steady-state and transient performance of the system.

The other bookend scenario was the Heavy RE/EE Build Out Scenario. This case was designed to reflect a future where significant changes to the region's generation portfolio were made for the purposes of CPP compliance or a similar low-carbon future. The assumptions were developed by members and stakeholders, leading to a case with aggressive coal retirements and a generation replacement strategy that relied heavily on renewable resources. Once again, the purpose of the case was not to test the system for CPP compliance or to achieve a particular carbon reduction goal. Rather, the case was designed to aggressively test the performance of the WestConnect Base Transmission Plan under a future with a low-carbon generation portfolio that looks substantially different from what is in-service today.

Replacement resources for coal and gas retirements was a topic of debate within the scoping team. The WestConnect Utility Plans Scenario replaced the 1,776 MWs of retirement coal and gas generation with 65 percent gas-fired capacity and 35 percent renewable resource capacity. WestConnect used the resource replacement assumptions provided by members "as-is" and did not perform any capacity planning analyses as it was assumed those factors were considered by the members in developing the portfolio. The Aggressive Scenario assumed 4,632 MW of coal and gas retirements (2,856 MW more than the Utility Plans Scenario). The capacity lost due to the retirements was replaced by a combination of gas-fired resources and renewables. New gas-fired resources contributed 25 percent of the lost capacity (in MWs), and new renewables contributed 75 percent of the lost capacity. Thermal resources were assumed to contribute 100% of their net capacity to system peak (for resource adequacy purposes). The capacity contribution of renewable resources to system peak load was approximated using effective load carrying capability (ELCC) parameters calculated in a recent WECC resource adequacy assessment of the WECC 2026 Common Case.[44]

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[44] *ELCC measures a generator's contribution to overall resource adequacy and is a function of the generator's energy delivery, in terms of time, and its ability to reduce system Loss of Load Expectation as a result of this delivery. Thus, wind and solar each contribute differently to system peak and at factors measurably less than dispatchable generators.*

Load and transmission assumptions in both scenarios were consistent with the 2026 Base Case.

Both scenarios were developed with input from the scoping team participants, then reviewed and approved by the PS and PMC. The focus of the assessments was power flow contingency analysis and transient stability analysis on a single stressed hour identified in each scenario. The scenarios were also evaluated for economic congestion.

The replacement capacity assumptions are important for this scenario. It was agreed that the capacity lost due to retirements was to be replaced by a combination of gas-fired resources and renewables. New gas-fired resources would contribute 25 percent of the lost capacity (in MWs), and new renewables would contribute 75 percent of the capacity. The retired resources and replacement gas-fired resources were assumed to contribute each MW of nameplate capability to system peak. The contribution of renewable resources to system peak load was approximated using effective load carrying capability (ELCC) parameters calculated in a recent WECC resource adequacy assessment of the WECC 2026 Common Case.

ELCC measures a generator's contribution to overall resource adequacy and is a function of the generator's energy delivery, in terms of time, and its ability to reduce system Loss of Load Expectation as a result of this delivery. Thus, wind and solar each contribute differently to system peak and at factors measurably less than dispatchable generators. What this assumption does, in effect, is require additional MWs of renewable resources be added to the system in order to roughly maintain system resource adequacy at levels prior to the retirements – an initial goal of the study. Note that the ELCC parameters were not recalculated as additional resources were added to the system. Since this assessment is transmission-oriented and not a resource or capacity planning exercise, this approach to estimate resource adequacy was deemed to be reasonable.

The tables below summarize the resource assumptions for the CPP Scenarios, CPP – WestConnect Utility Plans and CPP – Heavy RE/EE Build Out. Note that specific resource siting assumptions were generally consistent with the assumptions established for the High Renewables Scenario. Thermal replacement generation was sited based on feedback from members.

Table 13: Retirements in CPP Scenarios

State	Name	Unit ID	Capacity (MW)	Fuel Type	Retire in WestConnect Utility Plans Scenario?	Retire in Heavy RE/EE Build Out Scenario?
AZ	Cholla	1	116	Coal	YES	YES
AZ	Cholla	3	271	Coal	YES	YES
AZ	Cholla	4	380	Coal	YES	YES
NV	[redacted]	[redacted]	70	Gas	YES	YES
NV	[redacted]	[redacted]	70	Gas	YES	YES
NV	[redacted]	[redacted]	70	Gas	YES	YES
NV	[redacted]	[redacted]	265	Coal	YES	YES
NV	[redacted]	[redacted]	300	Coal	YES	YES

What this assumption does, in effect, is require additional MWs of renewable resources be added to the system in order to roughly maintain system resource adequacy at levels prior to the retirements – an initial goal of the study. Note that the ELCC parameters were not recalculated as additional resources were added to the system. Since this assessment is transmission-oriented and not a resource or capacity planning exercise, this approach to estimate resource adequacy was deemed to be reasonable.

State	Name	Unit ID	Capacity (MW)	Fuel Type	Retire in WestConnect Utility Plans Scenario?	Retire in Heavy RE/EE Build Out Scenario?
NV	[redacted]	[redacted]	117	Gas	YES	YES
NV	[redacted]	[redacted]	117	Gas	YES	YES
AZ	ApacheST3	3	175	Coal	NO	YES
AZ	Springerville_1	1	420	Coal	NO	YES
NM	San Juan	1	373	Coal	NO	YES
NM	San Juan	4	544	Coal	NO	YES
CO	Martin_Drake_6	6	83	Coal	NO	YES
CO	Comanche_1	1	325	Coal	NO	YES
CO	Comanche_2	2	335	Coal	NO	YES
CO	Martin_Drake_7	7	131	Coal	NO	YES
CO	Craig	1	470	Coal	NO	YES

Table 14: Thermal Additions in CPP Scenarios[45]

State	Name/Location	Capacity (MW)	Fuel Type	Prime Mover	Add in WestConnect Utility Plans Scenario?	Add in Heavy RE/EE Build Out Scenario?
AZ	APS generic	172	Gas	CT	YES	YES
NV	[redacted]	152	Gas	CT	YES	YES
NV	[redacted]	77	Gas	CT	YES	YES
NV	[redacted]	574	Gas	CC	YES	YES
NV	[redacted]	152	Gas	CT	YES	YES
AZ	Apache	44	Gas	CT	NO	YES
AZ	Cholla	97	Gas	CT	NO	YES
CO	Martin Drake	54	Gas	CT	NO	YES
NV	[redacted]	53	Gas	CT	NO	YES
NM	San Juan	229	Gas	CT	NO	YES
CO	Comanche	165	Gas	CT	NO	YES
NV	[redacted]	200	Gas	CT	NO	YES
AZ	Springerville	105	Gas	CT	NO	YES
CO	Craig	118	Gas	CT	NO	YES

[45] *In addition to these additions, both scenarios assumed that Apache Station Unit 2 would be repowered to gas*

Table 15. Renewable Additions in CPP Scenarios

State	Area	Capacity Added in WestConnect Utility Plans Scenario (MW)				Capacity Added in Heavy RE/EE Build Out Scenario (MW)			
		Wind	**Solar**	**Geothermal**	**TOTAL**	**Wind**	**Solar**	**Geothermal**	**TOTAL**
AZ	AZPS	26	193	-	219	401	1,297	-	1,698
	SRP	29	187	-	216	41	133	-	174
	TEPC	14	91	-	105	197	638	-	835
	WALC	21	34	-	55	-	-	-	-
CA	BANC	-	-	-	-	-	-	-	-
	IID	-	-	-	-	-	-	-	-
	LDWP	-	-	-	-	-	-	-	-
CO	PSCO	-	-	-	-	1,444	330	-	1,774
	WACM (CSU)	-	-	-	-	468	107	-	575
	WACM (TSGT)	-	-	-	-	-	-	-	-
	WACM (Other)					1,028	235	-	1,263
NM	PNM	-	-	-	-	-	840	-	840
	EPE	-	-	-	-	78	348	210	636
NV	NEVP	-	-	-	-	-	-	-	-
	SPPC	-	-	-	-	2,000	491	-	2,491
Subtotal		**90**	**505**	**-**	**595**	***5,657***	***4,419***	***210***	***10,286***

Appendix J – Results of Reliability Scenario Assessment

[redacted]

Figure 15: Frequency and Voltage Plots for all BES buses for 1PV Contingency

BASE	CPP1	CPP3
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Figure 16: Frequency and Voltage Plots for all BES buses for 2PV Contingency

BASE	CPP1	CPP3
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Figure 17: Frequency and Voltage Plots for all BES buses for 3PV Contingency

BASE	CPP1	CPP3
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Figure 18: Frequency and Voltage Plots for all BES buses for DP-Com Contingency

BASE	CPP1	CPP3
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Figure 19: Frequency and Voltage Plots for all BES buses for PV-Rudd Contingency

BASE	CPP1	CPP3
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Figure 20: Frequency and Voltage Plots for all BES buses for TEP1 Contingency

BASE	CPP1	CPP3
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Figure 21: Frequency and Voltage Plots for all BES buses for TEP2 Contingency

BASE	CPP1	CPP3
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Figure 22: Frequency and Voltage Plots for all BES buses for TEP3 Contingency

BASE	CPP1	CPP3
		
		

Figure 23: Frequency and Voltage Plots for all BES buses for MS-Wind Contingency

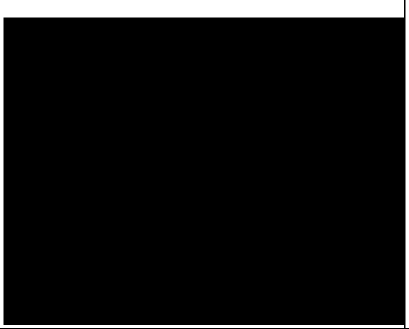
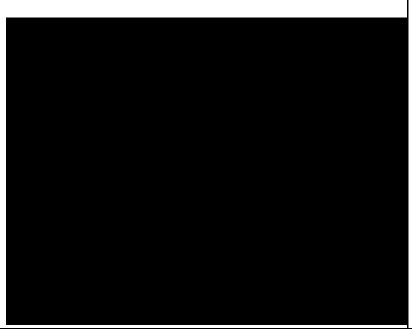
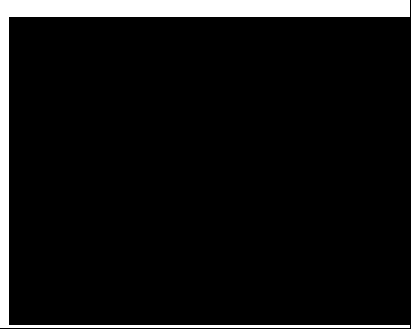
BASE	CPP1	CPP3
		
		

Figure 24: Frequency and Voltage Plots for all BES buses for LSR1 Contingency

BASE	CPP1	CPP3
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]