



WESTCONNECT REGIONAL TRANSMISSION PLANNING

2018-19 PLANNING CYCLE

DRAFT REGIONAL STUDY PLAN

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VERSION 2

APPROVED BY WESTCONNECT PMC ON MARCH DAY, 2018

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1 **1.0 Introduction**

2 The first step of the WestConnect Regional Transmission Planning Process is the development of a
3 Regional Study Plan which identifies the scope and schedule of the study work to be performed during
4 the planning cycle. This document reflects the WestConnect Study Plan (Study Plan) for the 2018–19
5 planning cycle.

6 The WestConnect Planning Management Committee (PMC) has responsibility for all WestConnect
7 regional planning activities. The planning process activities described within this Study Plan will be
8 conducted under the direction of the PMC by the Planning Subcommittee (PS) with input from
9 WestConnect Transmission Owners (TOs) and stakeholders as described in greater detail in subsequent
10 sections of this document.

11 **1.1 Process Background**

12 The WestConnect Regional Transmission Planning Process was developed for compliance with Federal
13 Energy Regulatory Commission (FERC) Order No. 1000, Transmission Planning and Cost Allocation by
14 Transmission Owning and Operating Public Utilities, (Order No. 1000).¹ The planning process is
15 performed biennially and consists of seven primary steps as outlined in **Figure 1**.

16 The WestConnect Planning Process is in conformance with Order No. 1000 as supplemented by
17 numerous Compliance Filings and resulting FERC Orders. Readers can access the text of the compliance
18 documentation on the WestConnect website,² and are encouraged to consult the compliance
19 documentation and the WestConnect Business Practice Manual (BPM) for additional process
20 information. Also, for TOs that are jurisdictional to the FERC, their FERC-approved tariff may preside
21 over this document.

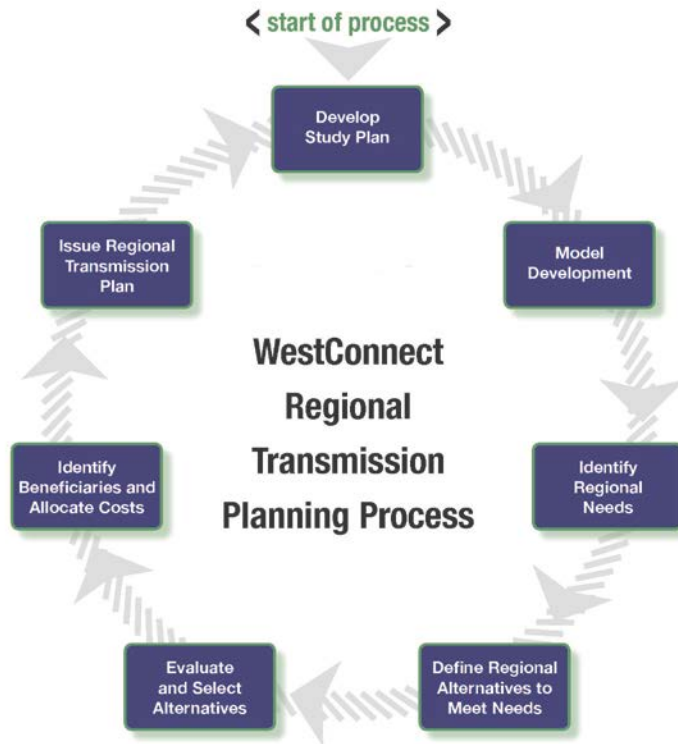
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¹ All references to Order No. 1000 include any subsequent orders

² www.westconnect.com

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Figure 1: WestConnect Regional Transmission Planning Process



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3 The WestConnect Regional Transmission Planning Cycle (planning cycle) commences in even-numbered
 4 years, resulting in the development of a Regional Transmission Plan every other year. During the first
 5 year of the planning cycle, WestConnect performs system assessments to determine if there are any
 6 regional reliability, economic, or public policy needs. If regional needs are identified WestConnect will
 7 solicit alternatives (transmission or non-transmission alternatives (NTAs)) from WestConnect members
 8 and stakeholders to determine if they have the potential to meet any identified regional needs.
 9 WestConnect will then evaluate those alternatives to determine whether any alternatives meet the
 10 identified regional needs, and which alternatives provide the more cost-effective or efficient solution.
 11 The more efficient or cost-effective regional projects will be identified in the WestConnect Regional
 12 Transmission Plan. Any regional alternatives that were submitted for the purposes of regional cost
 13 allocation and selected into the Regional Transmission Plan may go through the cost allocation process
 14 if they are deemed to be eligible for regional cost allocation. During the last quarter of the process
 15 WestConnect will develop and finalize the Regional Transmission Plan (Regional Plan). The Regional
 16 Plan will describe the process used to identify regional needs, identify transmission facilities or NTAs
 17 selected as the more efficient or cost-effective regional solutions identified regional needs, and
 18 document why projects were included or not included in the Regional Plan.

19 Additional details of the WestConnect Regional Transmission Planning Process can be reviewed in the
 20 BPM, which is posted to the WestConnect website.³

³ <https://doc.westconnect.com/Documents.aspx?NID=17155>

2.0 Overview of 2018–19 Regional Transmission Planning Activities

2.1 Schedule

Table 1 below provides an overview of the expected schedule of activities to be conducted as part of the 2018–19 planning cycle. This schedule is subject to change. Changes to the schedule of activities outlined below will be noticed on the WestConnect website, emailed to stakeholder lists, and discussed at committee meetings.

Table 1: Tentative Schedule for 2018–19 Regional Planning Cycle

<i>Due Date</i>	<i>Quarter</i>	<i>2018–2019 Activity</i>
February XX, 2018	Q1	Draft Regional Study Plan posted to WestConnect website
February 14, 2018	Q1	WestConnect Stakeholder Meeting to present draft Regional Study Plan
February 22, 2018	Q1	Interregional Coordination Meeting
March 14, 2018	Q1	Final Regional Study Plan approved by PMC
March 31, 2018	Q1	Interregional Transmission Project (ITP) submittal deadline ⁴
September 2018	Q3	Regional models finalized
December 2018	Q4	Regional transmission needs posted to WestConnect website
December 2018	Q4	Stakeholder meeting to discuss identified regional needs
January 2019	Q5	Submittal window opens for projects to meet the posted regional needs. Submittal window lasts for no less than 30 days
September 2019	Q7	WestConnect posts listing of projects meeting an identified regional need selected for the purposes of cost allocation
November 2019	Q8	Draft Regional Plan posted to WestConnect website
November 2019	Q8	WestConnect meeting to discuss the draft Regional Plan with stakeholders
Two weeks following stakeholder meeting	Q8	Stakeholder comments on draft Regional Plan due to WestConnect
December 2019	Q8	Final 2018–19 Regional Plan posted to WestConnect website

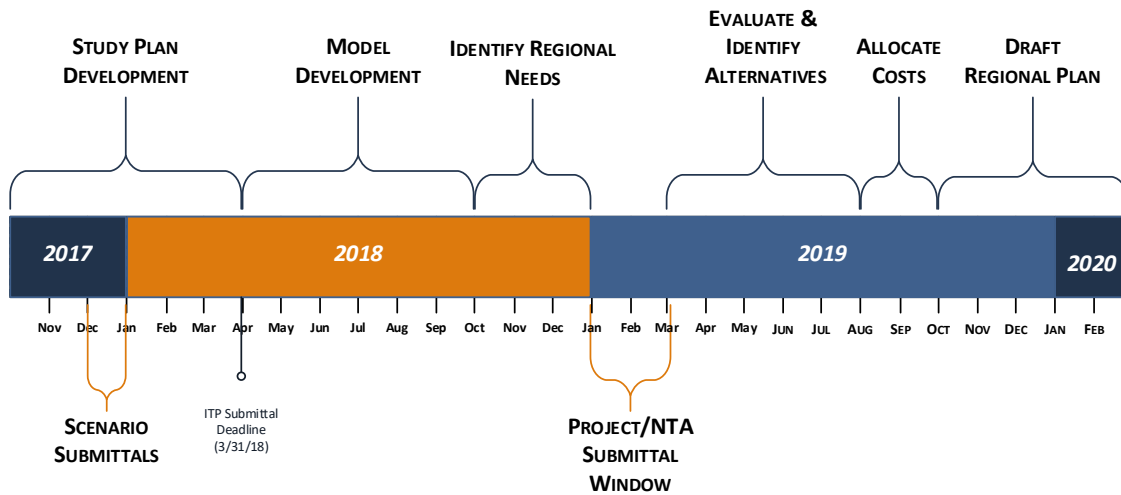
⁴ The timing of this ITP submittal deadline early in 2018, as opposed to after the PMC's identification of regional transmission needs, is driven by the fact that the four Western planning regions' coordination activities require, no later than March 31st, an identification of ITPs submitted into the regional processes of all relevant planning regions. For the WestConnect region, the PMC will not begin evaluating whether an ITP may satisfy an identified regional transmission need in the WestConnect region until after the PMC identifies regional transmission needs at year-end 2018.

1 The 2018-19 regional planning cycle timeline is shown in **Figure 2**.

2

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Figure 2: 2018-19 Planning Cycle Timeline



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5 **2.2 Regional Needs Assessment Background**

6 During Quarters 2 and 3 of the 2018–19 planning cycle, the models that are needed to perform the
7 regional transmission assessments will be developed as described in this document. The **PMC** will
8 conduct an assessment of the region’s transmission needs in the 10-year timeframe, using models
9 developed for year 2028. Three types of assessments will be performed during the planning process:
10 reliability (steady state and/or transient), economic (production cost), and public policy. The public
11 policy assessment will utilize the reliability and economic planning tools and models.⁵ Cases from the
12 Western Electricity Coordinating Council (WECC) will be used as seed cases and they will include the
13 systems of all WECC TOs. These cases are used as the foundation for the models that WestConnect will
14 develop and use for the regional transmission need assessments.

15 Members and participants will update the WECC models, as described in more detail below, to ensure
16 the WestConnect footprint is properly represented.⁶ To the extent WestConnect receives updated
17 modeling data from TOs outside of the WestConnect planning region during the development of the
18 regional models, it will be considered and, if appropriate, incorporated into the regional models. The
19 PMC will approve the WestConnect models prior to their use in the regional needs assessment. The PMC
20 will not evaluate regional transmission needs for systems outside of the WestConnect planning region.

21 After the PS completes the regional transmission assessments (as described in Sections 4.0, 5.0, and 6.0)
22 for the studies included in the scope of this study plan, the PS will identify a list of transmission issues
23 resulting from the studies, and make a recommendation to the PMC as to which, if any, regional issues
24 should constitute economic, reliability, or public policy transmission needs. The process for identifying
25 those regional transmission needs for which a regional transmission solution or solutions is sought and

⁵ Other Public Policy assessment methodologies may be used at the discretion of the PMC.

⁶ All parties participating in the model development process, and several other stages of the WestConnect planning process, are required to execute a non-disclosure agreement (NDA) with WestConnect. The agreement is located here: <https://doc.westconnect.com/Documents.aspx?NID=17191>

1 evaluated shall utilize various communication channels with stakeholders, including open PMC and PS
 2 meetings, stakeholder meetings, and the development of a Regional Transmission Needs Assessment
 3 Report (which will allow for stakeholder comment and input). This report will be delivered to the PMC
 4 for review and approval, and it will contain the PS's recommendation on regional transmission needs for
 5 the study cycle. The regional transmission needs will be finalized pending the PMC's approval of the
 6 report.

7 Study Area

8 The WestConnect planning process evaluates the regional transmission needs solely of the WestConnect
 9 planning region, which is defined as the combined footprints of signatories to the Planning Participation
 10 Agreement (PPA) within the TO Member Sector. TO Members participating in the WestConnect 2018–19
 11 planning process and the systems considered in the regional transmission needs assessment include:
 12

- | | | | |
|----|---|----|---|
| 13 | • Arizona Electric Power Cooperative, Inc. | 25 | • Public Service Company of New Mexico |
| 14 | • Arizona Public Service | 26 | • Sacramento Municipal Utility District |
| 15 | • Basin Electric | 27 | • Salt River Project |
| 16 | • Black Hills Energy | 28 | • Tucson Electric Company |
| 17 | • Colorado Springs Utilities | 29 | • Transmission Agency of Northern California |
| 18 | • El Paso Electric | 30 | • Tri-State Generation and Transmission |
| 19 | • Imperial Irrigation District | 31 | • Western Area Power Administration (Desert Southwest, Rocky Mountain, Sierra Nevada) |
| 20 | • Los Angeles Department of Water and Power | 32 | • Public Service Company of Colorado (Xcel Energy) |
| 21 | • NV Energy | 33 | |
| 22 | • Platte River Power Authority | 34 | |
| 23 | | 35 | |
| 24 | | 36 | |

37 WestConnect does not conduct FERC Order 1000 regional transmission needs assessments for TOs that
 38 are not WestConnect members. The approximate footprint of member a TOs is shown in **Figure 3**.

39
 40

Figure 3: Approximate Footprint of WestConnect Member TOs and Participating TOs



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1 The following PMC Members from the Independent Transmission Developer Member Sector and Key
2 Interest Group also participate in the planning effort:

- | | | | |
|---|---------------------------------|----|-------------------------------------|
| 3 | • American Transmission Company | 7 | • TransCanyon |
| 4 | • Black Forest Partners | 8 | • Western Energy Connection, LLC |
| 5 | • Excelon | 9 | • Xcel Western Transmission Company |
| 6 | • Southwestern Power Group | 10 | • Natural Resources Defense Council |

11 **Local versus Regional Transmission Issues**

12 For the purposes of the regional transmission needs assessment, a single-system need impacts only the
13 TO-footprint in which it resides. Single TO transmission issues and non-member issues are not within
14 the scope of the WestConnect regional transmission planning process, and are not considered regional
15 transmission needs. However, for the sake of completeness and study transparency, the study process
16 will include a review of all single-system transmission issues to ensure that in combination, none of the
17 issues are regional in nature and/or co-dependent. Any single-system issues are the responsibility of the
18 affected TO to resolve, if necessary.

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

22 **2.3 Opportunities for Stakeholder Involvement**

23 The WestConnect regional planning process is performed in an open and transparent manner to attain
24 objective analysis and results. WestConnect invites and encourages interested parties or entities to
25 participate in and provide input to the regional transmission planning process at all planning process
26 levels. Stakeholders also have opportunities to participate in and provide input to local transmission
27 plans as provided for in each Member TO's OATT.

28 WestConnect planning meetings are open to stakeholders (with the exception of PMC closed sessions).
29 Stakeholders' opportunities for timely input and meaningful participation are available throughout the
30 WestConnect planning process. More specifically, WestConnect will accept and consider stakeholder
31 comments on the following reports planned for the 2018–19 planning cycle:

- 32 • Study Plan;
- 33 • Model Development Report;
- 34 • Regional Needs Assessment;
- 35 • Alternative Evaluation (if applicable);⁷
- 36 • Cost Allocation (if applicable);⁸

⁷ The Alternative Evaluation will only occur if a regional need is identified

⁸ Cost Allocation will only occur if a project seeking cost allocation is identified and chosen as the more efficient or cost effective alternative to meet an identified regional need

- 1 • Regional Transmission Plan.

2 In addition, WestConnect will conduct at least two stakeholder meetings per year to update
3 stakeholders on the planning process and collect input. Additional meetings may be scheduled as
4 needed. Notice of all stakeholder meetings and stakeholder comment periods will be posted to the
5 WestConnect website.

6 **2.4 Interregional Coordination**

7 WestConnect will coordinate planning data and information with the three other established Planning
8 Regions in the Western Interconnection (California ISO, ColumbiaGrid, and Northern Tier Transmission
9 Group) by:

- 10 • Participating in annual interregional coordination meetings;
- 11 • Distributing regional planning data or information such as:
 - 12 ○ Draft and Final Regional Study Plan
 - 13 ○ Regional Transmission Needs Assessment Report
 - 14 ○ List of Interregional Transmission Projects (ITPs) submitted to WestConnect
 - 15 ○ Assessments and selection of ITPs into Regional Plan
 - 16 ○ Draft and Final Regional Transmission Plan
- 17 • Sharing planning assumptions if and when requested and subject to applicable
18 confidentiality requirements; and
- 19 • Participating in a coordinated ITP evaluation process, as necessary, when an ITP is
20 submitted to WestConnect as an alternative to meet an identified regional need.

21 The process WestConnect intends to utilize to conduct its interregional coordination activities is
22 described in the WestConnect Regional Planning Process BPM posted to the WestConnect website.⁹

23 **Interregional Transmission Project Submittals**

24 An ITP is defined in the common tariff language developed for the Order 1000 interregional compliance
25 filings as a proposed new transmission project that would directly interconnect electrically to existing or
26 planned transmission facilities in two or more planning regions and that is submitted into the regional
27 transmission planning processes of all such planning regions. If an ITP proponent desires to have their
28 project evaluated to meet an identified regional need, they must submit their project to WestConnect via
29 the WestConnect Regional Project Submittal Form no later than March 31, 2018, at which time they do
30 need not identify which regional transmission need the project proposes to address. ITP proponents can
31 also have their project evaluated for inclusion in the Base Transmission Plan by participating in the
32 process described in Appendix A.¹⁰

⁹ http://www.westconnect.com/planning_order_1000_bpm.php

¹⁰ Additional details regarding the ITP submittal and evaluation process can be found in the WestConnect Business Practice Manual

3.0 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 for the 10-year timeframe and evaluated in the regional needs assessments. The base transmission plan consists of the “planned” incremental transmission facilities included by TOs in local transmission plans,¹¹ as well as regional transmission facilities identified in previous regional transmission plans that are not subject to reevaluation.¹² It also includes any assumptions member TOs may have made with regard to other incremental regional transmission facilities in the development of their local transmission plans. “Conceptual” transmission projects are not included in the base transmission plan.

The base transmission plan may also include transmission projects under development by independent transmission companies (ITCs) in the WestConnect planning region, to the extent there is sufficient likelihood associated with these projects to warrant their inclusion in the base transmission plan. A description of the criteria used to identify projects for inclusion can be found in the WestConnect BPM.

The base transmission plan is 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 used for the 2018-19 planning cycle was based on updates submitted as of January 26, 2018.** The list of base transmission plan projects and details about the process used to identify the 2018-19 Base Transmission Plan are summarized in Appendix A and Appendix B.

3.1 Summarizing the 2018-19 Base Transmission Plan

As part of the planned activities for 2018, WestConnect intends to create summary information regarding the base transmission plan. The summary information will be developed using data in the TPPL and will include summary information regarding 2018-19 Base Transmission Plan, such as:

- Cost information;
- Line mileage information;
- Voltage information;
- State-level summaries;
- Information on how the 2018-19 Base Transmission Plan has changed as compared with the 2016-17 Base Transmission Plan, including a list of projects that have gone into service, new projects added to the Base Transmission Plan, and other summary statistics.

The base transmission plan summary information will be included in the 2018-19 Model Development Report, which is scheduled to be completed by the end of Q3, 2018. When the 2018-19 Regional Transmission plan describes the planned projects in the region, this summary information will be used and, if necessary, updated to include any additional regional projects selected into the plan as the more efficient or cost effective solution to a regional need.

¹¹ Developed in accordance with Order No. 890 local planning processes

¹² There were no regional transmission projects identified to meet regional need(s) in the 2016-17 Planning Cycle

4.0 Regional Reliability Assessment

The regional reliability needs assessment will be performed on power flow models developed by WestConnect. The study cases to be used for the regional reliability assessment are summarized in Table 2, below.

Table 2: Power Flow Cases for Regional Reliability Assessment

WestConnect Base Case Name	Case Description	WECC Seed Case
2028 Heavy Summer	Summer peak load conditions during 1500 to 1700 MDT, with typical flows throughout the Western Interconnection.	2028 Heavy Summer (28HS1)
2028 Light Spring	Light load conditions with high wind and solar dispatch. Case includes new wind/solar capacity consistent with what is planned by TOs or required by enacted public policy.	2028 Light Spring (28LSP1)

The process and scope for regional model development the regional reliability assessment is described further in this section. The models will be developed during Quarters 2 and 3 of the planning cycle. The PMC will approve the regional power flow models and contingency list at the end of Q3 before they are used to assess regional reliability transmission needs. The regional reliability assessment will take place in Quarter 4.

4.1 Model Development Process

WestConnect will review and modify WECC seed cases¹³ identified in this study plan through coordination with Subregional Planning Group (SPGs) and member TOs.¹⁴ Each TO member in SWAT and SSPG will compile their updates and submit change files individually to WestConnect for compilation. TO members in CCPG will make updates and compile them into a single master change file for the subregion before submitting the data to WestConnect.

After collecting initial updates through the process described above, WestConnect will compile the regional power flow models through a phased approach:

1. Review and revise WECC power flow base case topology, including transmission lines, transformers, connectivity, reactive devices and corresponding power flow data. These changes do not include load magnitudes and resource levels or status.
2. Review and revise interchange flows and schedules, iterating between any loads and resources revisions.

¹³ The regional power flow models will be developed in a format accessible by users of either the GE PSLF or Siemens PTI PSS/E power flow applications.

¹⁴ The WestConnect Subregional Planning Groups consist of the Southwest Transmission Planning Group (SWAT), the Sierra Subregional Planning Group (SSPG), and the Colorado Coordinated Planning Group (CCPG).

1 3. Provide remedial action schemes (RAS) and contingency definitions based on modeled
2 topology.¹⁵

3 The process utilized for model development, including coordinating with the WestConnect TO Members,
4 independent transmission developers, and other stakeholders in the development of these cases, will be
5 conducted and managed by the planning consultant at the direction of the Planning Subcommittee.

6 **4.2 Key Assumptions**

7 In developing the models for use in the regional reliability assessment, WestConnect must make a
8 number of assumptions as it relates to generation, transmission, and load modeling. Descriptions of the
9 assumptions that will be used in developing the study cases are provided below:

- 10 • **Transmission Assumptions** – Existing transmission system plus 2018-19 Base Transmission
11 Plan, with TO members confirming the inclusion/exclusion of projects through the process
12 described above.
- 13 • **Demand Forecasts** – Provided by TO member and embedded in WECC seed cases, specific to
14 season and condition of study case. May be updated as necessary by TO members.
- 15 • **Generation Projects** – Existing and planned generation facilities.
- 16 • **Renewable Generation** – Existing and planned renewable generation, with sufficient
17 generation modeled to meet any enacted public policy requirements.
- 18 • **Public Policy Requirements** – If not otherwise captured in renewable generation modeling,
19 enacted public policies are to be reflected in the study cases.
- 20 • **Major Path Flows and Interchange** – Path flows and interchange will be established based on
21 the generation, load, and system condition being modeled in the study case.
- 22 • **Operating Procedures** – Any special operating procedures required for compliance with NERC
23 reliability standards will be considered and included in the power flow cases.
- 24 • **Protection Systems** – The impact of protection systems including RAS required for compliance
25 with NERC reliability standards will be included in the power flow cases.
- 26 • **Control Devices and Reactive Resources** – Any special control devices or reactive resources
27 will be included in the power flow cases, including shunt capacitors/reactors, static var
28 compensators, synchronous condensers and other voltage control devices.
- 29 • **Contingency List** – Participants will provide the contingency list in the WECC RAS and
30 Contingency Format (available in GE PSLF and PowerWorld Simulator). A list of contingencies to
31 be studied will be developed by the TOs/SPGs and provided to the PMC concurrent with the
32 final review of the base cases. The PS along with the PMC can add to the list if needed. To
33 minimize flagging of local issues, contingencies will be limited to N-1 contingencies for elements
34 230-kV and above, generator step-up transformers for generation with at least 200 MW, and
35 specific member-requested N-2 contingencies. If a participant provides justification as to why

¹⁵ When submitting contingencies, PSLF or PowerWorld users should use the WECC RAS and Contingency File Format while PSS/E users should use "CON" files or spreadsheet format.

1 lower voltage contingencies might impact the system in a regional manner, the PS may decide to
2 include those contingencies.

3 **4.3 Study Methodology and Criteria**

4 An assessment of the WestConnect regional power flow cases will be conducted to ensure the
5 WestConnect planning region as a whole is in compliance with applicable North American Electric
6 Reliability Corporation (NERC) standards and WECC regional criteria for the 2028 planning horizon. The
7 assessment will include steady state contingency analysis and transient stability analysis. The following
8 standards and criteria are applicable for the assessment:

- 9 • **Table 1 Planning Events** from NERC TPL-001-4 Transmission System Planning Performance
10 Requirements;¹⁶ and
- 11 • WECC TPL-001-WECC-CRT-3.1 Transmission System Planning Performance.¹⁷

12
13 Transmission elements of 100 kV and above will be monitored for performance along with any
14 Member specified lower voltage Bulk Electric System (BES) elements.

15 **Steady State Contingency Analysis**

16 Power flow contingency analyses will be performed for all power flow areas within the WestConnect
17 planning footprint. More specifically, the assessment will evaluate performance of the regional system
18 under Normal system conditions consistent (TPL Category P0) with normal ratings and voltage ranges
19 and **under certain emergency system conditions and planning event contingencies** (TPL Category P1, P2,
20 P4, P5 and P7) with appropriate **post-contingency ratings** and voltage range.¹⁸

21 **Transient Stability Analysis**

22 **The transient stability performance of the regional system will be studied consistent with the standards**
23 **and criteria provided above to identify any occurrences of under frequency load shedding, insufficient**
24 **sufficient frequency recovery (e.g. undamped oscillations), and general instability (e.g., cascading trips).**
25 **WECC criterion will be used to defined acceptable voltage recovery and system performance.**

26 **WestConnect members will be invited to submit specific contingencies for inclusion in the transient**
27 **stability analysis. These contingencies will be limited to those that may have a regional impact, including**
28 **but not limited to major generator and transmission trips with and without faults.**

29 **4.4 Regional Reliability Needs**

30 When conducting the regional reliability assessment, violations of standards or criterion creating
31 reliability issues that the PMC determines to be regional in nature will be identified as a regional
32 reliability need. By definition, regional reliability needs are identified by reliability issues that impact
33 more than one TO Member system. Specifically, in the event a simulated outage produces one or more

¹⁶ <http://www.nerc.com/files/TPL-001-4.pdf>

¹⁷ <https://www.wecc.biz/Reliability/TPL-001-WECC-CRT-3.1.pdf>

¹⁸ P4, P5 and P7 contingencies are optional and must be volunteered by TO members

1 NERC TPL violations in more than one member TO system, those violations may result in the
2 identification of a regional reliability-driven transmission need.

3 If a single-system reliability violation is identified, the violation will be referred back to the appropriate
4 TO for resolution. The affected TO will have an opportunity to identify mitigation for the violation, and
5 new data will be accepted (or the violation will remain in the study results). The PS will review the
6 mitigation and make a recommendation to the PMC to include the mitigation in the study. Upon
7 approval by the PMC, the modeling for the mitigation will then be incorporated back into the regional
8 power flow model. Single-system reliability violations typically do not cause a regional reliability-driven
9 transmission need.¹⁹ In the event a simulated outage produces NERC TPL violations in more than one
10 TO Member’s system, that violation will first be referred to the affected TOs and discussed with the PS to
11 determine if the violation is local in nature. However, issues that impact more than one TO may result in
12 the identification of a regional reliability-driven transmission need. Once finalized, regional reliability
13 needs will be posted to the WestConnect website and described in the Regional Needs Assessment
14 documentation.

15 **5.0 Economic Assessment**

16 The regional economic needs assessment will be performed using a production cost model developed by
17 WestConnect. The cases to be used for the regional economic assessment is summarized in **Table 3**,
18 below.

19
20

Table 3: Production Cost Model Case Summary

WestConnect Base Case Name	Case Description	WECC Seed Case
2028 Base Case	Business-as-usual, expected-future case with median load and hydro conditions and representation of resources consistent with enacted public policies.	WECC 2028 Anchor Data Set

21 The process used by WestConnect to develop the regional production cost model is described in the
22 following section. The analysis used to perform the regional economic assessment is also included. The
23 models will be developed during Quarters 2 and 3 of the 2018-19 planning cycle. The PMC will approve
24 the regional economic model before it is used to assess regional economic transmission needs. The
25 regional reliability assessment will take place in Quarter 4.

26 **5.1 Model Development Process**

27 The WECC 2028 Anchor Data Set (ADS) 10-year production cost model will be reviewed and updated by
28 WestConnect during Quarters 2 and 3 of the 2018–19 planning cycle consistent with the process
29 described below.

30 The PS will initiate and coordinate a review of the data and assumptions contained within the WECC
31 ADS dataset by the WestConnect members, participants, and stakeholders. Once the data and

¹⁹ They may be certain exceptions, such as when a jointly owned contingency causes reliability issues in a single area

1 assumptions have been reviewed by the TO Members, WestConnect will compile any changes submitted
2 by the TO Members to create the 2028 Base Case production cost model. Once compiled, the Planning
3 Subcommittee will perform a series of initial test and benchmarking studies with the goal of validating
4 the output of the WestConnect 2028 Base Case. Comparisons with historical path flows, typical
5 wind/solar operation, historical generator dispatch, and forward-looking resource and transmission
6 projections will be performed at the discretion of the Planning Subcommittee to help vet the model
7 results. Once the case has been vetted, the PMC will approve the regional model and direct the PS to
8 finalize the regional economic assessment. The Planning Subcommittee will also develop and conduct
9 sensitivities, as discussed in more detail in Section 5.4.

10 **5.2 Key Assumptions**

11 Specific data and assumptions to be reviewed by the TO Members will include, but are not limited to:

- 12 • In general, any changes needed to make data and assumptions consistent with the 2028 Heavy
13 Summer and Light Spring cases described earlier in the Study Plan;
- 14 • Peak and energy demand forecasts for the planning horizon (including Energy Efficiency (EE)
15 and Distributed Generation (DG));
- 16 • Incremental resources assumed to be used to meet load and public policy requirements within
17 the planning horizon;
- 18 • Incremental transmission facilities modeled within the planning horizon (i.e., the PCM topology
19 must be consistent with the base transmission plan and power flow model topology);
- 20 • Branch switching throughout the year;
- 21 • Fuel price assumptions including carbon;
- 22 • Unit operating characteristics; and
- 23 • Load, resource, and transmission bus assignments to balancing authorities.

24 **5.3 Study Methodology and Criteria**

25 To evaluate the potential for regional economic needs in the WestConnect planning footprint,
26 WestConnect identifies congested elements through forward-looking production cost modeling. Using
27 results from base case model runs and sensitivities, the PS will review metrics such as congested hours
28 and congestion cost for regional transmission elements greater than 100 kV and WECC transfer paths
29 (or other defined interfaces in the WestConnect footprint) along with any Member specified lower
30 voltage BES elements.

31 Regional transmission with significant congestion are identified and verified through Planning
32 Subcommittee review, historical benchmarking, and follow-up study. Given the regional focus of the
33 WestConnect process, the Planning Subcommittee will limit their analysis to:

- 34 • Transmission (or paths/interfaces) between multiple WestConnect member TOs;
- 35 • Transmission (or paths/interfaces) owned by multiple WestConnect member TOs; and

- 1 • Congestion occurring within the footprint of multiple TOs that has potential to be addressed by
2 a regional transmission project or NTA.²⁰

3 **Sensitivities**

4 WestConnect will also conduct sensitivity studies on the 2028 Base Case economic model to better
5 understand whether regional transmission congestion may be impacted by adjusting certain input
6 assumptions subject to significant uncertainty. Sensitivity analysis intended to make relatively minor
7 adjustments that would still remain within the expected future framework of the base models. This
8 sensitivity analysis may include variables such as:

- 9 • Load forecast;
- 10 • Hydro conditions (e.g., wet vs. dry);
- 11 • Natural gas prices;
- 12 • Emissions cost (e.g., CO₂); and
- 13 • Other modeling parameters.

14 By adjusting individual input assumption subject to uncertainty, the sensitivity assessment will help
15 WestConnect understand how sensitive Base Transmission Plan economic performance is to key
16 variables. The PS will make recommendations to the PMC regarding how sensitivity analysis will be
17 incorporated into the study process.

18 **5.4 Regional Economic Needs**

19 The process to assess congestion will include a vetting of any congested elements. That process is also
20 intended to allow the PS to make a determination as to whether congestion issues are regional in nature.
21 After this vetting process, the PS will produce a list of the congested elements that were identified in the
22 base case. The PMC may further evaluate that list of congested elements, and determine which should
23 constitute regional economic needs. The objective is to arrive at a set of congested transmission
24 elements that warrant being tested for the economic potential for a regional project solution,
25 recognizing that the presence of congestion does not always equate to a regional need for congestion
26 relief at a particular location.

27 **6.0 Public Policy Assessment**

28 The WestConnect Regional Planning Process is intended to identify regional needs and the more
29 efficient or cost-effective solutions to satisfy those needs. Enacted public policy (e.g., but not limited to,
30 Renewable Portfolio Standards, energy efficiency/demand side management and distributed generation
31 standards, and IRPs) is considered in the regional planning process through its inclusion in regional
32 planning models. Non-enacted or proposed public policies may be considered as part of the scenario
33 planning process.

²⁰ 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.

1 Enacted public policies are considered early in the planning process and are incorporated into the base
 2 models through the roll-up of local TO plans and their associated load, resource, and transmission
 3 assumptions. The PS has discretion to identify which enacted policies, if any, should be verified through
 4 the regional process to ensure they are properly represented in the regional base models. ²¹
 5 Stakeholders, through their participation in the regional planning process, will have the opportunity to
 6 provide feedback to WestConnect as it evaluates public policy-driven transmission issues and
 7 determines what issues may constitute regional transmission needs. The PMC, which is charged with
 8 identifying regional public policy-transmission needs for the WestConnect region, will consider a
 9 recommendation from the Planning Subcommittee for each of the public policy analyses described in
 10 Section 6.2.

11 6.1 Public Policy Requirements

12 WestConnect begins the evaluation of regional transmission needs driven by public policy requirements
 13 by first identifying a list of enacted public policies that impact local TO plans in the WestConnect
 14 planning region. The list, below in **Table 4**, summarizes those enacted public policies that will be
 15 reflected in regional base economic and power flow models.

16 **Table 4: Enacted Public Policies Incorporated into Planning Process**

Enacted Public Policy	Description
Arizona Renewable Energy Standard	Requires IOUs and retail suppliers to supply 15% of electricity from renewable resources by 2025), with a minimum of 30% of the renewable resources provided by distributed generation
California SB350	Requires IOUs and municipal utilities to meet a 50% RPS by 2030 and also requires the establishment of annual targets for energy efficiency savings
Colorado SB 07-100	Requires IOUs to identify Energy Resource Zones, plan transmission to alleviate constraints from those zones, and pursue projects according to the timing of resource development in those zones
Colorado HB10-1001	Established Colorado Renewable Energy Standard (RES) to 30% by 2020 for IOUs (Xcel & Black Hills)
Colorado SB13-252	Requires cooperative utilities to generate 20% of their electricity from renewables by 2020
Colorado HB10-1365	Requires rate regulated utilities in CO with coal-fired generation to reduce emissions on the smaller of 900 MW of generation of 50% of a company's coal generation fleet. Full implementation to be achieved by 12/31/2017
Nevada SB123	To reduce emissions from coal-fired generators, requires reduction of at least 800 MW generation capacity from coal-fired generation plants, addition of at least 350 MW of generating capacity from renewable energy facilities,

²¹ 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.

Enacted Public Policy	Description
	and construction of at least 550 MW of generating capacity from other types of generating plants by 2020.
Nevada SB374	Requires net metering be available to each customer-generator who submits a request to the company.
Nevada Renewable Portfolio Standard	The percentage of renewable energy required. Increases every two years until it reaches 25 percent by 2025.
New Mexico Efficient Use of Energy Act	Require utilities to include cost-effective EE and DR programs in their resource portfolios and establish cost-effectiveness as a mandatory criterion for all programs.
New Mexico Renewable Energy Requirements	<p>Subject to the Reasonable Cost Threshold (RCT), the RPS Rule outlines renewable energy requirements that are a function of PNM’s retail energy sales.</p> <ul style="list-style-type: none"> • No less than 10% of retail energy needs for calendar years 2011 through 2014; • No less than 15% of retail energy needs for calendar years 2015 through 2019; • No less than 20% of retail energy needs for calendar year 2020 and subsequent years

1

2 **6.2 Study Methodology and Criteria**

3 The regional base models, including both power flow and production cost, will reflect the enacted public
4 policies identified above. The data to reflect the public policies will be provided by TOs as the enacted
5 public policies are already reflected in TO’s transmission plans and generation data. In some instances,
6 the Planning Subcommittee may choose to verify (through spreadsheet based analyses) that the
7 appropriate load, resources, or transmission are included in the models. Once the models are compiled,
8 reviewed, and ultimately approved by the PMC, the Planning Subcommittee will perform economic and
9 reliability assessments (as described in Section 4.0 and Section 5.0) using the regional base models to
10 determine if there are any regional transmission issues. The Planning Subcommittee will seek to
11 determine if those issues are related to enacted public policy and therefore may constitute a public
12 policy-driven transmission need.

13 The second component of the WestConnect regional public policy planning process allows for the
14 Planning Subcommittee, in consultation with stakeholders, to review local (TO) public policy-driven
15 transmission projects and make suggestions as to whether the TO’s project may constitute a public
16 policy-driven regional transmission need. As a part of its effort to “roll-up” local transmission plans to
17 compile the regional base transmission plan, WestConnect will provide stakeholders with a list of public
18 policy-driven transmission projects that are included in TOs’ local plans. After reviewing this
19 information, stakeholders are invited to make a recommendation to the Planning Subcommittee

1 whether any local public policy-driven transmission projects may suggest consideration/identification
2 of a regional transmission need. The Planning Subcommittee will consider the suggestion, and make a
3 recommendation to the PMC as to whether it should be identified as a regional public policy-driven
4 transmission need.

5 **6.3 Regional Public Policy-driven Transmission Needs**

6 If any regional public policy needs are identified, the need will be identified and described in the
7 Regional Need Assessment report and posted to the WestConnect website.

8 **7.0 Solutions to Regional Needs**

9 After the Regional Need Assessment Report is finalized, regional needs will be posted to the
10 WestConnect website and project solution submittal window will open. Upon closure of the submittal
11 window, WestConnect will initiate an evaluation of the benefits and costs of proposed solutions to
12 identify if any is a more efficient or cost-effective regional solution.

13 If no project solutions are submitted, WestConnect will seek to develop solutions to needs. The amount
14 of technical planning rigor dedicated to seeking a WestConnect-developed regional solution will be
15 informed by planning discussions held at the PS and PMC. These discussions and decisions made in
16 investigating potential regional solutions proposed by WestConnect (in the absence of proposed
17 solutions) will be documented in the Regional Plan.

18 In the event that no regional transmission needs are identified, the PMC will not collect transmission or
19 non-transmission alternatives for evaluation (as there will be no regional transmission needs to
20 evaluate the alternatives against).

21 **8.0 Scenario Studies**

22 In addition to the regional needs assessment, WestConnect also conducts information-only scenario²²
23 studies that look at alternate but plausible futures. They represent futures with resource, load, and
24 public policy assumptions that are different in one or more ways than what is assumed in the Base
25 Cases.

26 Proposals for scenarios enter into the planning process through a 30-day open submittal window, which
27 opens during Quarter 8 of the previous planning cycle. During the open window, stakeholders may
28 provide proposals for specific scenarios they would like for WestConnect to include in its Study Plan for
29 the upcoming planning cycle. The PMC and Planning Subcommittee can also develop scenarios for
30 inclusion in the Study Plan.

31 Once the scenario proposals are received, the PS evaluates the scenarios and makes a recommendation
32 (documented through the Study Plan) to the PMC on which ones should be evaluated in the study cycle.
33 The PS may work with individual requestors to clarify the intent of the scenarios. The PS may also
34 recommend combining scenarios that appear to have common goals, themes, or modeling assumptions.

²² The term "scenario" may be used differently in other documents, including the cost allocation section of the common tariff.

1 The PMC also has ultimate authority to determine how to treat regional transmission issues that are
 2 identified in the information-only scenario studies. They will determine whether an issue identified in a
 3 scenario—whether it be reliability, economic, or public-policy based—constitutes additional
 4 investigation by the Planning Subcommittee. Since the assessment of a scenario is different than an
 5 “expected future” base case such assessments may provide useful information for future planning cycles,
 6 especially if the scenario appears likely to become an expected future for the region. Also, results from
 7 the scenario assessments may be help the region identify emerging opportunities for infrastructure
 8 (generation, transmission, or otherwise). Any transmission issues that might come to light as a result of
 9 the WestConnect scenario assessments are not to be confused with the WestConnect task under Order
 10 No. 1000 to identify regional transmission needs and to solicit for proposals to more cost effectively or
 11 efficiently satisfy such needs. In other words, the WestConnect scenario assessments do not obligate TO
 12 members of WestConnect to any responsibility outside the scope of Order No. 1000.

13 WestConnect also provides the opportunity for stakeholders to provide suggestions that might allow for
 14 more efficient or cost-effective alternatives to the regional plans. These types of suggestions may be
 15 different from the scenarios mentioned above. They may also be different than proposals to meet
 16 identified regional needs. These types of suggestions may be submitted at any time, but have the most
 17 potential to contribute to the regional planning process if they are presented through the scenario
 18 submission window. The PMC will consider such suggestions on a case-by-case basis to determine if any
 19 such suggestions warrant analyses, and how to incorporate any analyses into the regional planning
 20 process. Stakeholders submitting such suggestions are expected to provide evidence as to how their
 21 proposals might result in a more efficient or cost-effective regional plan. As with scenarios, the PMC will
 22 determine whether the PS should assess any suggestions.

23 **Scenarios Received for the 2018-19 Study Plan**

24 WestConnect held an open window from December 1, 2017 through January 5, 2018. The following
 25 scenarios were received during the open window:

26 **Table 5: Scenarios Received During Open Window**

Requestor	Description/Name
ITC	50% RPS
ITC	Coal Retirement
ITC	High Import from California
ITC	Remove Base Transmission Plan Projects In-service After 2022
NRDC	Low Carbon Grid
NRDC	Low Carbon Grid and Seams Issues
Sonoran Institute	50% RPS
WIEB Staff	Low Carbon Grid

27
 28 These scenarios were reviewed by the PS on January 19, 2018. A representative for each scenario
 29 request provided a presentation to the PS to summarize the request and answer questions. Following

1 the meeting, the PS prepared a work plan that would encompass the intent of the specific scenarios, yet
2 provide an approach that shifted the descriptions towards public policies, and resource mix. The
3 resulting plan consists of scenarios that are intended to capture the impacts of policy futures as
4 represented by coal plant retirements, renewable and natural gas resource additions, and increased
5 energy efficiency. The approach was supported by the individual scenario requestors, and also agreed
6 to by the Planning Management Committee. The scenarios are described in the following sections.

7 **8.1 SCENARIO PLACEHOLDER**

8 Scenarios and their study scope will be determined by the PMC before finalizing the Study Plan.

9 **8.2 SCENARIO PLACEHOLDER**

10 Scenarios and their study scope will be determined by the PMC before finalizing the Study Plan.

11 **8.3 SCENARIO PLACEHOLDER**

12 Scenarios and their study scope will be determined by the PMC before finalizing the Study Plan.

13

1 **Appendix A – Base Transmission Plan Process**

2 To identify TO projects for inclusion in the 2028 base transmission plan, the Planning Subcommittee
3 reviewed the transmission project lists submitted to WestConnect by the TO members and participants
4 via the TPPL, inclusive of the project status (e.g., planned, conceptual). All TO projects designated with a
5 “planned” project status are included in the base transmission plan. As defined by WestConnect, planned
6 facilities include projects that have a sponsor, have been incorporated in an entity’s regulatory filings,
7 have an agreement committing entities to participate and construct, or for which permitting has been or
8 will be sought. Individual members and participants reviewed the TPPL project lists and provided any
9 necessary updates with regard to the project status.

10 The Planning Subcommittee also met to review the list of non-incumbent projects submitted via the
11 TPPL to see if any of those projects met the threshold identified by the PMC for inclusion in the base
12 transmission plan. These meetings were open to the public and noticed accordingly. Upon reviewing the
13 project information submitted by the project sponsors, the Planning Subcommittee did not identify any
14 non-incumbent projects that warranted inclusion in the base transmission plan.

15 **CAISO Projects**

16 The California Independent System Operator (CAISO) and WestConnect transmission planning
17 footprints have strong electrical and operational ties, requiring close coordination of planning
18 assumptions and information. Based on member and participant feedback, the WestConnect Planning
19 Subcommittee considered for inclusion in the regional models two CAISO transmission projects that
20 were recently approved by the CAISO Board of Directors. These projects are:

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

23 Since both projects have been approved by the CAISO Board of Directors, they are currently included in
24 CAISO 10-year planning studies. To align the WestConnect models with that of the CAISO, the projects
25 will also be included in the WestConnect models.²³

²³ The Planning Subcommittee 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.

1 **Appendix B – Base Transmission Plan**

2

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

6

7

- THE BASE TRANSMISSION PLAN WILL BE ADDED BELOW

8

9

Appendix C – Other Regional Planning Process Activities

The PMC will identify transmission developers eligible to utilize cost allocation developed in the Regional Planning Process using the Transmission Developer Qualification Criteria. Transmission developers seeking eligibility for potential designation as the entity eligible to use the regional cost allocation for a transmission project selected in the Regional Plan for purposes of cost allocation must submit to the PMC information as specified in the tariff of each TO Member. The submittal window for this information as part of the 2018–19 planning cycle will be determined by the PMC.

Once projects have been selected for inclusion in the Regional Plan, WestConnect will select an eligible transmission developer (as determined by the Transmission Developer Qualification Criteria mentioned above) to utilize the cost allocation developed for each project selected for the purposes of cost allocation.

Please follow a link listed below to view the Transmission Developer Qualification Criteria and the developer selection process.

WestConnect TO Member	OASIS Link to Tariff
Arizona Public Service Company	http://www.oasis.oati.com/azps/index.html
Black Hills Power, Inc.	http://www.oatioasis.com/BHBE/index.html
Black Hills Colorado Electric Utility Company, LP	http://www.oatioasis.com/bhct/index.html
Cheyenne Light Fuel & Power Company	http://www.oatioasis.com/CLPT/index.html
El Paso Electric Company	http://www.oatioasis.com/epe/index.html
NV Energy	http://www.oatioasis.com/NEVP/index.html
Public Service Company of New Mexico	http://www.oatioasis.com/pnm/index.html
Tucson Electric Power Company	http://www.oatioasis.com/tepc/index.html
UNS Electric, Inc.	http://www.oatioasis.com/UNST/index.html
Xcel Energy – Public Service Company of Colorado	http://www.oasis.oati.com/psco/index.html

Appendix D – Data Exchange Procedures for Regional Model Development

{TO BE UPDATED – WestConnect is considering deleting this section or will updated it for the 20181-9 Planning Process }

The steps below provide a summary of how the regional planning models will be developed. More details will be provided in a forthcoming Model Development Report. Importantly, the power flow models and production cost models should maintain consistent electric topologies (e.g., matching load, generator, and branch models) throughout their development.

Step 1 - Review topology and data accuracy of the WECC Cases

Power Flow Models

Participants will identify changes to the WECC 2028 Heavy Summer (28HS1) and WECC 2028 Light Spring (28LS1) power flow cases necessary to represent the regional base transmission plan. Data accuracy should be ensured for all elements (buses, branches, shunt devices, loads, resources, etc.) excluding review of individual load and resource magnitudes (L&R modifications will be done at a later step after topology is correct).

Open elements that represent planned projects not included in the base transmission plan (or “excluded planned projects”) should be removed from the cases.

Changes that include more than one data owner (e.g., tie lines) need to be coordinated with all affected owners and such coordination should be documented in the review comments.

Production Cost Model

Participants will identify electric topology changes to the WECC 2028 ADS necessary to represent the regional base transmission plan and for consistency with the 28HS1 and 28LS1 power flow cases.

The consultant will export the 2026CC topology into a set of spreadsheets for review by all participants, in which the differences between it and the 26HS1 & 26LS1 cases will be highlighted. Participants with the ABB GridView software will be able to review the model directly. At a minimum, the review of topology will include:

- General Load, Generator, and Branch (Transformers & Lines) data – e.g., name, ID, bus location, ownership, type, and the area or region to which it belongs
- Branch switching throughout the year
- Lists of Interfaces (groups of branches) and Nomograms (groups of operationally tied elements) and their definitions (included elements), along with limit values (ratings)
- List of Areas, Regions, and Reserve Sharing Groups, along with mappings to power flow areas and zones

1 **Step 2 - Submit changes**

2 All change submittals will include two pieces of information: (1) software-specific change files for direct
3 application to the power flow cases and (2) written comments which describe the intended revisions. In
4 particular, modeling details for each “excluded planned project” should be submitted in separate change
5 files so that they can be tracked separately from other topology updates (e.g., for potential application to
6 one or more scenario cases or as alternatives to meet regional needs).

7 **Power Flow Models**

8 SWAT and SSPG participants (PSLF users) will submit change files in epc append format (*.epc) to the
9 study consultant. PNM has a tool that works like the WECCtools epcl_extract program for PSLF users—it
10 produces an epc file instead of an EPCL script (*.p). A separate epc change file should be provided for
11 each set of related updates, and each with comments describing the intended updates.

12 CCPG participants (primarily PSS/E users) will submit changes to the CCPG coordinator. One hundred is
13 the estimated threshold for element deletions; above this number, it will likely be more efficient for the
14 study consultant to develop a script to produce individual epc change files. As a result:

- 15 • If the number of element deletions is 100 or less, then the CCPG coordinator will submit PSS/E
16 raw format append files (*.raw) to the study consultant that each include comments describing
17 intended updates, with **emphasis** given to elements that must be deleted from the model, since
18 raw append files do not explicitly include deletion flagging.
- 19 • If the number of element deletions exceeds 100, then the CCPG coordinator will submit a
20 complete case in PSS/E raw format (*.raw) which includes all desired updates, including
21 comments describing the embedded updates, with **emphasis** given to elements that must be
22 deleted from the model, since raw files do not explicitly include deletion flagging.

23 **Production Cost Model**

24 Participants will submit changes based on whether or not they have the ABB GridView software:

- 25 • All participants will be able to update the information in the spreadsheets provided in Step 1.
26 Participants will submit the revised spreadsheet file(s) and comments describing the intended
27 updates to the study consultant.
- 28 • GridView users will be able to update the information directly within the GridView software.
29 These participants will submit change files in MS Access format (*.mdb) that can be made via
30 GridView’s “Database Comparison” feature (i.e., comparing the updated case with the original).
31 A separate MDB change file should be provided for each set of related updates, and each with a
32 descriptive name and comments describing the intended updates.

33 **Step 3 - First Modification of WECC Cases**

34 **Power Flow Models**

35 The study consultant will incorporate submitted topology revisions, check RPS, solve cases, and flag
36 suspicious data. Participant voltage limits and contingency definitions developed during the 2015
37 abbreviated planning cycle will be used to test the cases. The cases and test contingency analysis output

1 will be posted for participant review. This test contingency analysis output will be discarded after
2 review because testing is the only purpose of the output. Contingency definitions for the 2018–19
3 planning cycle will be developed in a later step.

4 **Production Cost Model**

5 The study consultant will incorporate submitted topology revisions, check RPS and resource adequacy,
6 run a test simulation, and flag suspicious data. The case (in GridView and spreadsheet formats) and its
7 simulation output (benchmarked against historical data) will be posted for participant review.

8 **Step 4 - Second Modification of WECC Cases and Creation of** 9 **Regional Scenario Cases**

10 **Power Flow Models**

11 Participants will review the first modification cases along with their test contingency analysis output
12 and submit further topology and voltage limit corrections, if any.

13 The participants, in coordination with the SPGs, will review and submit revisions to the loads, resources,
14 and area interchange for corrected base and scenario power flow conditions. The SPGs will submit
15 Loads and Resources (L&R) and area interchange in any of three formats: PSLF epc append files, PSS/E
16 raw append files, and/or spreadsheets.

17 The study consultant will modify and solve the cases. The test contingency analysis will be repeated. The
18 cases and test contingency analysis output will be posted for participant review (as previously
19 mentioned, test contingency analysis output will be discarded after review).

20 **Production Cost Models**

21 Participants will review the first modification case along with its outputs and submit further topology
22 corrections, if any.

23 The participants, in coordination with the SPGs, will review and submit revisions to the loads, resources,
24 and associated economic and constraint data to represent each of the year-long base & scenario
25 production cost cases. At a minimum, the data to be reviewed and revised will include:

- 26 • Generator minimum and maximum capacity(ies), operating efficiencies (e.g., heat rates), and
27 costs (e.g., fuel, variable operations and maintenance, or VOM)
- 28 • Ratings for Interfaces (group of branches)
- 29 • Limits of Nomograms (groups of operationally tied elements)
- 30 • Reserve Requirements by Areas, Regions, Reserve Sharing Groups, and Owner

31 The participants will submit updates in either of two formats: revised spreadsheets or MDB change files
32 made with GridView’s “Database Comparison” feature.

33 The study consultant will incorporate submitted revisions, check RPS and resource adequacy, run a test
34 simulation, and flag suspicious data. The cases (in GridView and spreadsheet formats) and their
35 simulation outputs (benchmarked against historical data) will be posted for participant review.

1 **Step 5 - Develop Contingency Definitions**

2 **Power Flow Models**

3 The guiding objective for developing contingency definitions is to identify regional transmission needs.
4 The objective does not include supplementing TO's TPL standards compliance studies.

5 After receipt of the final changes from participants, the study consultant will incorporate the changes
6 and solve the cases. An initial list of automatically created single branch outages 230kV and above will
7 be created and contingency analysis performed. (Note that results from the 2015 abbreviated cycle
8 appeared to show no regional issues for 115kV outages, but participant time was spent reviewing and
9 addressing many flagged 115kV issues. The intent of limiting the scope of contingencies to 230kV and
10 above for this planning cycle is to improve efficiency). The cases and contingency analysis results will be
11 posted for participant review.

12 Participants will review the single branch outage list and (a) identify invalid single branch outages to
13 remove and (b) identify other contingencies (regardless of P level) not included in the list that could
14 potentially flag regional transmission needs. Participants should submit contingency definitions in the
15 WECC Contingency and RAS Format. PSS/E does not support the WECC Contingency and RAS Format.
16 Participants who rely on PSS/E and do not use PSLF or PowerWorld Simulator can submit contingency
17 definitions in the PSS/E ACCC *.con format.

18 **Production Cost Model**

19 Participants will identify which, if any, contingencies warrant representation in the production cost
20 cases.

21 **Step 6 - Finalize Cases**

22 The study consultant will incorporate final submitted changes. The final cases, contingency analysis
23 outputs (for power flow cases), and simulation outputs (for production cost cases) will be posted for a
24 final review before PMC approval.

25 **Step 7 - Transient Stability Simulations (Power Flow Only)**

26 Transient stability simulations require additional data (switching sequences and times, fault impedance,
27 and dynamic data not included in the WECC Master Dynamics File) and a customized procedure will be
28 developed in order to enable those specific simulations.