WestConnect Regional Transmission Planning

2020-21 Planning Cycle

Regional Transmission Needs Assessment Report

Approved by WestConnect Planning Management Committee on

February 17, 2021
Updated July 27, 2021 to Redact Non-Public Information
(Contact admin@westconnect.com to Request Non-Redacted Version)

Contents

1.0 Introduction and Summary

The purpose of this report is to summarize the regional transmission need identification phase of WestConnect's 2020-21 Regional Transmission Planning Process ("Planning Process"). With stakeholder input, the Planning Subcommittee developed this report to document the regional transmission needs assessment and includes both minority and majority views on decisions and assumptions used in performing the assessment.

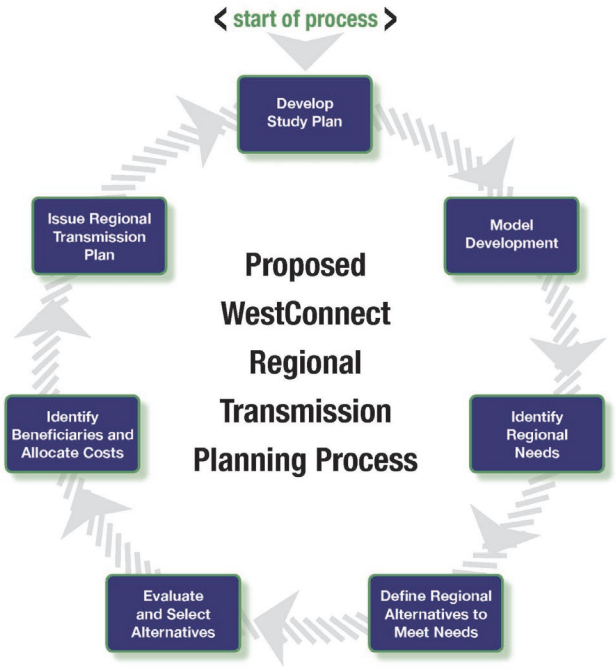
The Planning Management Committee (PMC) has decision-making authority in the implementation of the Planning Process. On December 16, 2020 the PMC approved the Planning Subcommittee's recommendation that no regional transmission needs were identified in the 2020-21 Regional Planning Process. This report provides documentation to the PMC in support of the Planning Subcommittee's recommendation with regard to the regional transmission need identification phase of the Planning Process.

1.1 WestConnect Regional Transmission Planning Process

The identification of regional needs is the third step in the Planning Process. The planning process was developed for compliance with Federal Energy Regulatory Commission (FERC) *Order No. 1000, Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities* (Order No. 1000).[1] The Planning Process is performed biennially, beginning in even-numbered years, and consists of the seven primary steps outlined in **Figure 1**.

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

Figure 1: WestConnect Regional Transmission Planning Process



Additional details of the Planning Process can be reviewed in the WestConnect Regional Planning Process Business Practice Manual (BPM), posted to the WestConnect website here. Readers can access the text of the FERC Order No. 1000 compliance documentation on the WestConnect website here and are encouraged to consult the compliance documentation and BPM for additional process information.

1.2 WestConnect 2020-21 Regional Study Plan

The first step in the Planning Process is the development of a Study Plan. The 2020-21 WestConnect Study Plan ("Study Plan") was approved by the PMC on March 18, 2020. The Study Plan identifies the scope and schedule of planning activities to be conducted during the planning cycle. The Study Plan also describes the models and studies to be developed in the model development portion of the Planning Process.

1.3 WestConnect 2020-21 Regional Model Development

The second step in the Planning Process is the development of regional models. Two types of studies are needed for the Planning Process: reliability ("power flow" and "stability") and economic ("production cost model" or PCM). During the second, third, and fourth quarters of 2020, the Planning Subcommittee developed regional models that were used in the identification of regional transmission needs for the 2020-21 Planning Process. WestConnect conducted an assessment of the region's transmission needs using models developed for the 2030 timeframe, approximately 10 years into the future. WestConnect

will also perform information-only scenario studies, as outlined in the Study Plan, which are designed to evaluate alternate but plausible futures.[2]

Table 1 lists the reliability and economic models developed for the 2020-21 cycle.

Table 1: WestConnect Planning Models

Case Name	Case Description and Scope
2030 Heavy Summer Base Case	Summer peak load conditions during 1500 to 1700 MDT, with typical flows throughout the Western Interconnection.
2030 Light Spring Base Case	Light load conditions during 1000 to 1400 MDT in spring months of March, April, and May with solar and wind serving a significant but realistic portion of the Western Interconnection total load. Case includes renewable resource capacity consistent with any applicable and enacted public policy requirements.
2030 Base Case PCM	Business-as-usual, expected-future case with median load and hydro conditions and representation of resources consistent with enacted public policies.

For the 2020-21 cycle, the Base Case models were approved by the PMC on December 16, 2020, and the documentation of the Base Case model development was finalized on February 17, 2021 with the PMC's approval of the 2020-21 Model Development Report (MDR). The MDR describes the development process of the regional base models created with assistance from WestConnect members and other stakeholders. The report details key model assumptions and parameters such as study timeframe, horizon, area, the Base Transmission Plan, and how public policy requirements were taken into account. Along with the MDR, the PMC approved the regional base models for use in assessments.

2.0 Regional Transmission Needs Assessment

The third step in the WestConnect regional Planning Process is the regional transmission needs assessment and identification of regional needs. The following sections outline the methods, assumptions, and results of the three types of regional need assessments: reliability, economic, and public policy.

[2] *As stated in the Study Plan, WestConnect regional assessments are centered on Base Cases and Scenarios, which when taken together, provide a robust platform that is used to identify the potential for regional transmission needs and emerging regional opportunities. Base Cases are intended to represent "business as usual," "current trends," or the "expected future." They are based on TO-supplied forecasts for load, generation, public policy resources, and transmission plans. Scenarios are intended to complement Base Cases by looking at alternate but plausible futures. They represent futures with resource, load, and public policy assumptions that are different in one or more ways than what is assumed in the Base Cases. The scenario assessments will be performed in 2021 and the results of the scenario assessments will be documented in a separate report.*

2.1 Regional Reliability Needs Assessment

WestConnect conducted the 2020-21 regional reliability assessment on two base cases: the 2030 Heavy Summer Base Case and the 2030 Light Spring Base Case. These models originated from cases developed and approved by the Western Electricity Coordinating Council (WECC). The assessment for regional needs was based on reliability standards adopted by the North American Electric Reliability Corporation (NERC) TPL-001-4 Table 1 (P0 and P1) and TPL-001-WECC-CRT-3.2 (Transmission System Planning Performance WECC Regional Criterion), and supplemented with any more stringent Transmission Owner with Load Serving Obligations (TOLSO) planning criteria based on TOLSO member feedback. Initial identification of regional issues for further review was defined as system performance issues impacting or between more than one TO Member system.

Study Procedure and Assumptions

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 base case contingency and transient stability analysis became the final system assessment.

The final evaluation of the base reliability assessment was limited to contingencies meeting specific voltage and generation criteria, as described below.

Steady State Contingency Analysis

Contingency definitions for the steady-state contingency 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 – i.e., elements above 90-kV – in the WECC model were monitored.

Transient Stability Analysis

The following contingencies were evaluated in the transient stability simulations for both cases:

[redacted]

[redacted]

Study Results

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 B.

2.2 Regional Economic Needs Assessment

WestConnect performed the 2020-21 regional economic assessment by conducting a PCM study on a 2030 Base Case along with four sensitivity case. The goal of the assessment was to test the base case and the Base Transmission Plan for economic congestion between more than one TOLSO Member's area. The WestConnect 2028 PCM from the 2018-19 planning cycle served as the seed case for the WestConnect economic model 2030 Base Case. The WestConnect 2028 PCM was reviewed and updated by WestConnect during Quarters 2, 3, and 4 of the 2020-21 planning cycle, and the Quarter 3 updates included assumptions pulled from the WECC 2030 Anchor Dataset (ADS) interconnection-wide 10-year PCM ("2030 ADS PCM V1.0"), dated June 30, 2020. The model was reviewed and updated by WestConnect members to maintain consistent electric topologies with the reliability base cases within the WestConnect footprint. Detailed model and data assumptions are described in Section 4 of the MDR.

Study Procedure and Assumptions

The Planning Subcommittee conducted the study and reviewed the 2030 Base Case PCM results for regional congestion (i.e., number of hours) and congestion cost (i.e., the cost to re-dispatch more expensive generation because of transmission constraints). As with the reliability assessment, the economic 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. Wheeling charge assumptions were further vetted through a sensitivity analysis described below.

Given the regional focus of the WestConnect process, the Planning Subcommittee limited its congestion analysis 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 footprints of multiple TOs that has potential to be addressed by a regional transmission project or non-transmission alternative.[3]

Sensitivity Study

Models were developed for sensitivity studies on the 2030 Base Case economic model to better understand whether regional transmission congestion may be impacted by adjusting certain input assumptions subject to significant uncertainty. The sensitivity analysis is intended to make relatively minor adjustments that would still remain within the expected future framework of the base models. The Planning Subcommittee determined four sensitivities of interest, and their assumptions are summarized below. The detailed assumptions are provided in Section 4.1 of the MDR.

1. **2030 High Load Sensitivity Case**: The hourly load shapes of the Balancing Authority Areas (BAAs) within WestConnect were scaled up so their annual peak and energy was beyond their values in the 2030 Base Case. The WestConnect BAAs total coincident annual peak load and load energy in this case ended up being higher than the 2030 Base Case by 8,644 MW (14%) and 45,591 GWh (15%), respectively.

2. **2030 Low Hydro Sensitivity Case**: The hydro modeling was replaced with WECC's 2001-based hydro modeling developed by WECC in conjunction with their 2024 Common Case PCM dataset. The system-wide hydro generation of this case ended up being lower than in the 2030 Base Case by 40,249 GWh (17%).

3. **2030 High Gas Price Sensitivity Case**: All the natural gas prices were increased to 140% of their value in the 2030 Base Case.

4. **2030 System-Wide Carbon Emission Cost Sensitivity Case**: Applied CO_2 emission charges to all generators in WECC.

Study Results

The objective of the economic needs assessment was to arrive at a set of congested elements that warranted testing for the economic potential for a regional project solution, recognizing that the presence of congestion does not always equate to a regional need for congestion relief at a particular location.

There was no significant congestion to identify a regional need in the base case. For completeness, the Planning Subcommittee conducted the sensitivity studies described above to confirm that the wheeling charge assumptions were not hiding potential regional congestion.

The Planning Subcommittee determined the congestion results for the base case did not result in the identification of regional needs. The congestion results for the base case and the sensitivity case PCM and detailed explanations are provided in Appendix C.

[3] *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.*

2.3 Public Policy Needs Assessment

The WestConnect Regional Planning Process is intended to identify regional needs and the more efficient or cost-effective solutions to satisfy those needs. Enacted public policy was considered in the Planning Process as a part of the base case development. Non-enacted or proposed public policies were considered as part of the scenario planning process. In this context, enacted public policies are state or federal laws or regulations, meaning enacted statutes (i.e., passed by the legislature and signed by the executive) and regulations promulgated by a relevant jurisdiction, whether within a state or at the federal level. 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 can be 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.

Study Procedure and Assumptions

WestConnect began the evaluation of regional transmission needs driven by public policy requirements by identifying a list of enacted public policies that impact local TO plans in the WestConnect planning region. This list was developed by the Planning Subcommittee in public meetings and posted in meeting materials. It was agreed that enacted public policies driving local TO transmission including, but not limited to, state RPS and distributed generation goals/set-asides would be represented in the base cases. Stakeholders were invited to suggest possible regional public policy-driven transmission needs based on the enacted public policies driving local transmission needs and the associated list of local public policy-driven transmission projects, presented via the November 19, 2020 Stakeholder Meeting slides.

Study Results

In conducting the regional reliability and economic assessments (see above) the Planning Subcommittee did not find any regional issues driven by enacted public policy requirements. Furthermore, stakeholders did not suggest or recommend the identification of a regional public policy-driven transmission need based on this information. Based on these two findings, there are no identified public policy needs in the WestConnect 2020-21 regional Planning Process.

3.0 Stakeholder Involvement

The Planning Process is performed in an open and transparent manner. The Planning Subcommittee and PMC meetings held in support of 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[4] and distributed via email.

[4] *WestConnect Regional Planning meeting calendar: http://regplanning.westconnect.com/calendar_rp.htm*
Stakeholder Comments webpage: http://regplanning.westconnect.com/stakeholder_comments.htm

An open stakeholder meeting to discuss the WestConnect regional transmission needs assessment was conducted on November 19, 2020 and on February 18, 2021. The meetings were announced through WestConnect's stakeholder distribution lists, and all stakeholders were invited to attend.

There was an open stakeholder comment window between November 19, 2020 and December 3, 2020 for stakeholders to comment on the Draft 2020-21 Regional Needs Assessment, as presented via the November 19, 2020 Stakeholder Meeting slides. No stakeholder comments were received.

4.0 Conclusions and Next Steps

Based on the findings from the 2020-21 cycle analysis performed for reliability, economic, and public policy transmission needs as described in this Regional Needs Assessment Report, no regional transmission needs were identified in the 2020-21 needs assessment.

Since no regional transmission needs were identified, the PMC will not collect transmission or non-transmission alternatives for evaluation as there are no regional transmission needs to evaluate the alternatives against.

5.0 Appendix A: Information Confidentiality

The Planning Subcommittee 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 power flow 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 and power flow models are subject to the WestConnect Confidentiality Agreement, and their distribution was limited to signatories of that agreement.

6.0 Appendix B: Results of Reliability Needs Assessment

The single-TO issues are provided in the slides of the PMC meeting on December 16, 2020.

Figure 2. Frequency at All WestConnect Load Buses with WECC Voltage Criteria, for All Transient Stability Simulated Contingencies in Each Reliability Base Case

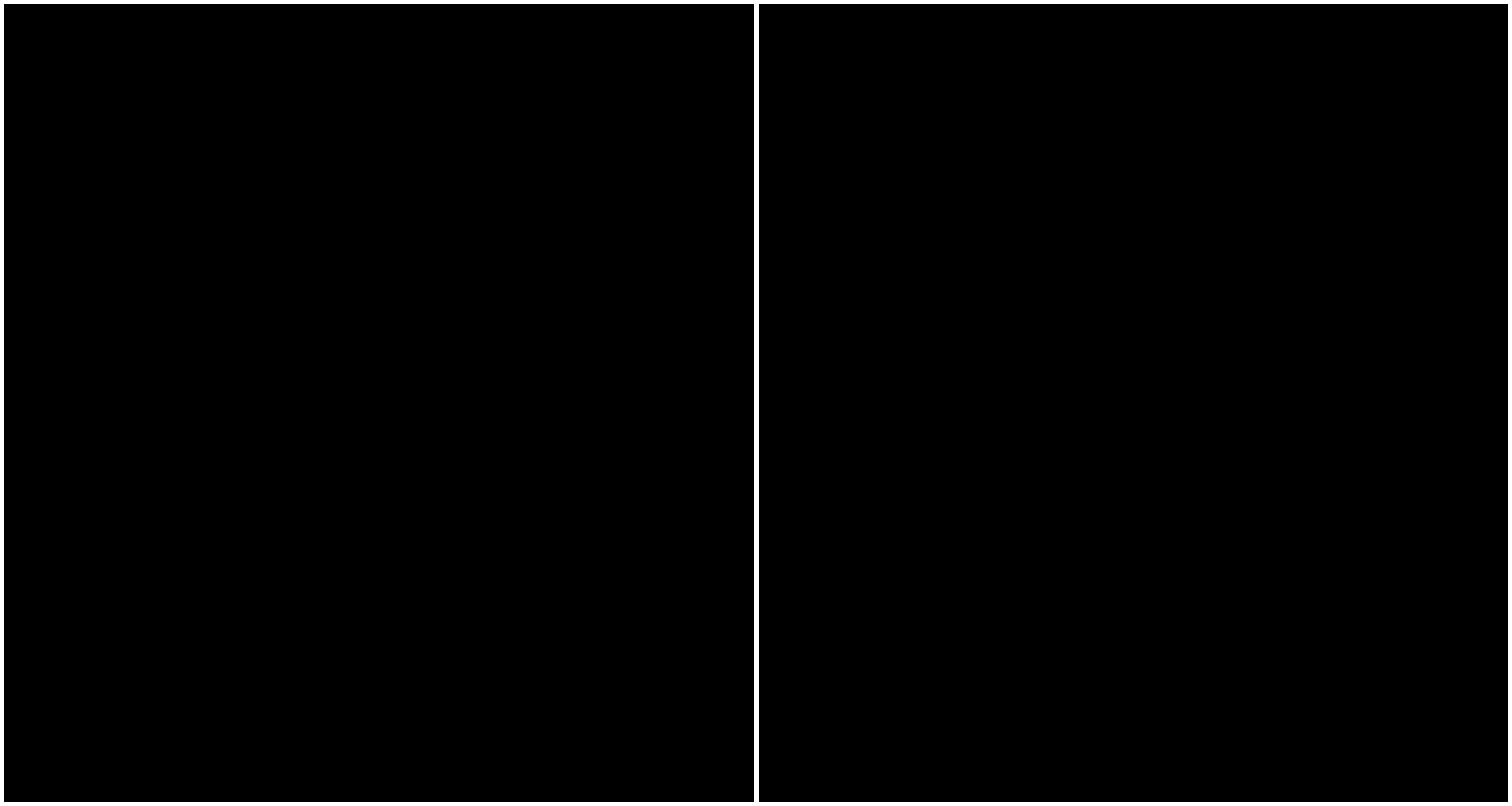


Figure 3. Per Unit Voltage at All WestConnect Load Buses with WECC Voltage Criteria, for All Transient Stability Simulated Contingencies in Each Reliability Base Case

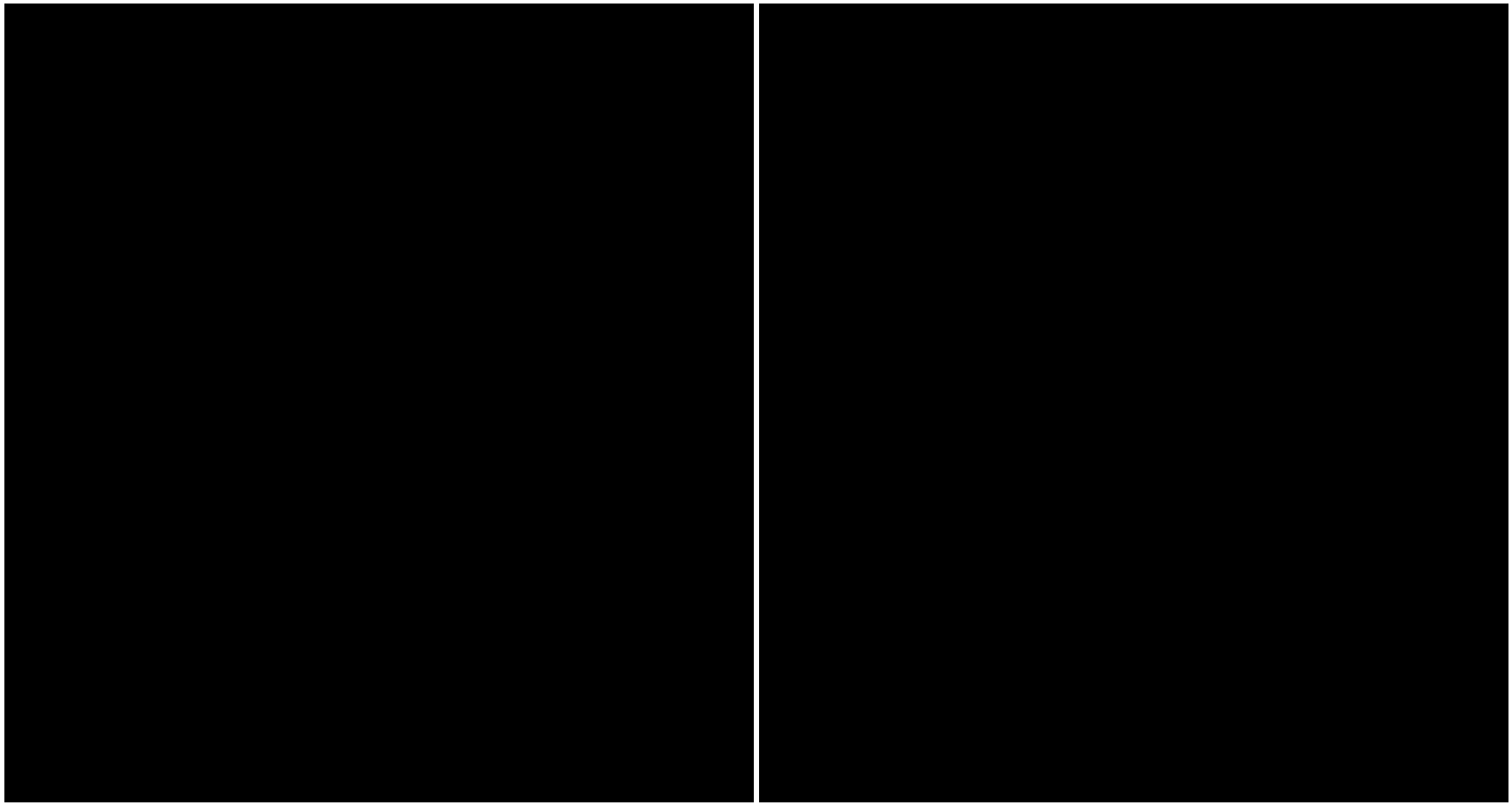


Table 2. Summary of Transient Stability Simulations Which Show No Violations. The Unrestored Load & Tripped Generation Reported by The Simulations Is Acceptable Per TPL standards[5]

[5]*See TPL-001-4 references noted below:*

- *Note "b." in TPL-001-4: Consequential Load Loss as well as generation loss is acceptable as a consequence of any event excluding P0.*
- *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.*

7.0 Appendix C: Results of Economic Needs Assessment

The single-TO issues are provided in the slides of the PMC meeting on December 16, 2020.

Table 3: Results of Regional Economic Needs Assessment

Element Information		Congestion Hours (% Hrs) / Cost ($) [& Penalty Cost Component of Congestion Cost (if any)]					Regional Need	Determination
		Base Case	Sensitivity Cases (Results filtered to only show changes to the congestion in the Base Case)					
Owner/ Operator(s)	Branch/Path Name	2030 Base Case	High Gas Price Sensitivity	High Load Sensitivity	Low Hydro Sensitivity	System-wide Carbon Emission Cost Sensitivity		
PSColorado|Tri-State G&T	STORY - PAWNEE 230kV Line #1 (73192_70311_1)	434 (5%) / 5,997K	379 (4%) / 6,116K	385 (4%) / 4,518K	395 (5%) / 4,751K	970 (11%) / 22,410K	**NO**	PSCo & TSGT: observed congestion on this line does not warrant establishing this as a regional need. The total congestion hours are low and historic flow for this line on BA Peak day has been well below line capacity. Further, there are concerns with the confidence level of having a singular data point. PSCo would encourage multiple futures and years to allow for averaging of results. Additionally, the line itself and the Pawnee terminal are fully owned by PSCo. The Story terminal equipment has mixed ownership, with PSCo having full ownership of some equipment. This makes the congestion on this facility more similar to a single TO facility in nature.
Gila River Power, LP|Sundevil Power Holdings, LLC|Salt River Project|Arizona Public Service	GILARIVR - PANDA 500/230kV Transformer #1 (159970_14238_1)	154 (2%) / 5,164K	177 (2%) / 6,837K	399 (5%) / 29,345K* *Penalty Cost: $4,036K (14%)	159 (2%) / 5,889K	146 (2%) / 8,630K	**NO**	APS & SRP: Minimal hours of congestion. Further, this specific transformer is unique in that APS has no ownership, however APS has 100% rights for the entire transformer capacity. Further, the congestion manifesting itself here is a result of market energy sales since APS has not ownership in Gila River generation.

Element Information		Congestion Hours (% Hrs) / Cost ($) [& Penalty Cost Component of Congestion Cost (if any)]					Regional Need	Determination
		Base Case	Sensitivity Cases (Results filtered to only show changes to the congestion in the Base Case)					
Owner/ Operator(s)	Branch/Path Name	2030 Base Case	High Gas Price Sensitivity	High Load Sensitivity	Low Hydro Sensitivity	System-wide Carbon Emission Cost Sensitivity		
Intermountain Power Agency|Sierra Pacific Power Co.	P29 Intermountain-Gonder 230 kV Interface	139 (2%) / 894K	185 (2%) / 1,027K	85 (0.97%) / 556K	208 (2%) / 1,257K	11 (0.13%) / 110K	**NO**	LADWP: The observed congestion is insignificant both by hours and by cost. NVE: defer to LADWP (Congestion is relatively small). PACE's generation is one of the contributors+ path 29 effectively shares transfer capacity with Path 32 (+Pavant-Gonder line) - so this looks like "inter-regional" issue
Basin Electric Power Coop.|Tri-State G&T|PacifiCorp - East	DAVEJOHN - LAR.RIVR 230kV Line #1 (65420_73107_1)	24 (0.27%) / 795K	25 (0.29%) / 617K	30 (0.34%) / 3,255K* *Penalty Cost: $933K (29%)	20 (0.23%) / 629K	38 (0.43%) / 1,602K	**NO**	TSGT: Only 24 hours of congestion is very minor (<1% of the year) and can be considered noise
WAPA L.M.|DG&T|Tri-State G&T	P30 TOT 1A Interface	33 (0.38%) / 499K	42 (0.48%) / 821K	198 (2%) / 57,779K	10 (0.11%) / 54K	47 (0.54%) / 723K	**NO**	TSGT: Only 33 hours of congestion is very minor (<1% of the year) and can be considered noise
Tri-State G&T|WAPA L.M.|PSColorado|Basin Electric Power Coop.	P36 TOT 3 Interface	4 (0.05%) / 295K	4 (0.05%) / 402K	35 (0.40%) / 60,897K* *Penalty Cost: $25,965K (43%)	4 (0.05%) / 218K	4 (0.05%) / 559K	**NO**	TSGT: Only 4 hours of congestion is very minor (<1% of the year) and can be considered noise. PSCo: this level of congestion does not warrant a regional need. Cost and hours are insignificant and would not justify capital investment.

Element Information		Congestion Hours (% Hrs) / Cost ($) [& Penalty Cost Component of Congestion Cost (if any)]					Regional Need	Determination
		Base Case	Sensitivity Cases (Results filtered to only show changes to the congestion in the Base Case)					
Owner/ Operator(s)	Branch/Path Name	2030 Base Case	High Gas Price Sensitivity	High Load Sensitivity	Low Hydro Sensitivity	System-wide Carbon Emission Cost Sensitivity		
TSGT New Mexico|EPE El Paso Electric Company	UVAS - ALTLUNTP 115kV Line #1 (11193_12195_1)	14 (0.16%) / 108K	34 (0.39%) / 284K	266 (3%) / 6,106K	15 (0.17%) / 101K	23 (0.26%) / 379K	**NO**	TSGT & EPE: Only 14 hours of congestion is very minor (<1% of the year) and can be considered noise. Furthermore, the 115 kV UVAS substation interconnection proposed in EPE's future transmission plans will be constructed under the auspices of the EPE/Tri-State Interconnection Agreement. Therefore, any mitigations on the EPE and/or Tri-State systems required for this 115 kV interconnection will be evaluated and constructed under that Agreement.
Intermountain Power Agency|Sierra Pacific Power Co.	P32 Pavant-Gonder InterMtn-Gonder 230 kV Interface	12 (0.14%) / 79K	4 (0.05%) / 46K	14 (0.16%) / 140K		26 (0.30%) / 891K	**NO**	LADWP: The observed congestion is insignificant both by hours and by cost. NVE: Congestion is very small. Also, there's a potential for rating increase of P32 W-E (>235MW) if needed. Pavant-Gonder line is between Sierra & PacifiCorp (NG) - so this looks like "inter-regional" issue.
WAPA L.M.|PSColorado	MIDWAYPS - MIDWAYBR 230kV Line #1 (70286_73413_1)	1 (0.01%) / 2K		2 (0.02%) / 14K	1 (0.01%) / 11K	10 (0.11%) / 85K	**NO**	PSCo: this level of congestion does not warrant a regional need. Cost and hours are insignificant and would not justify capital investment.

Multi-Owner Total Congestion Cost:	**$13,833,021**	**$16,149,951**	**$162,610,075**	**$12,910,321**	**$35,389,165**

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