



California ISO

Interregional Transmission Project Evaluation and 50% RPS Out-of-state Portfolio Assessment Study Plan

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1. Background

During the 2016-2017 planning cycle the ISO undertook a 50% RPS special study (2016-2017 50% RPS study) to focus on a broader investigation into the feasibility and implication of moving beyond 33% RPS from a transmission system perspective. The results of this analysis are documented in Section 6.3 of the ISO 2016-2017 Transmission Plan¹.

The intent of the 2016-2017 50% RPS study was to build on the 50% studies performed as part of the ISO's 2015-2016 planning cycle to assess 50 percent California RPS portfolios under full capacity deliverability and energy only arrangements. The 2016-2017 50% RPS study somewhat expanded the scope of the initial study effort to acquire general information on system requirements that might be needed to import wind resources from Wyoming and New Mexico. These studies were not intended to be used to support a need for policy-driven transmission. As such, these studies focused on:

- continuing its investigation of the transmission impacts of moving beyond 33 percent RPS requirements in California;
- testing the transmission capability estimates used in RPS calculator v6.2 and where appropriate, updating these transmission capability estimates for the next release of RPS calculator; and
- to begin an examination of the transmission implications of meeting part of California's 50 percent RPS requirement by assuming California's procurement of 2000 MW of wind resources in Wyoming and 2000 MW of wind resources in New Mexico.

Based on stakeholder comments received and other considerations from information learned from the 2016-2017 50% RPS study, the ISO concluded that additional analysis of California's 50% RPS obligation looking into access to wind renewables outside of California was warranted. While some information utilized in the 2016-2017 50% RPS study was coordinated with the other planning regions, the ISO believes that coordination of certain specific details such as renewable resource location and assumptions, planned transmission assumptions, the identification of specific contingencies to assess impact on the planning regions, and the development of specific "snapshots" for the system outside of California will provide useful information on how wind resources can be imported into California. As such, consideration of the Interregional Transmission Projects (ITPs) that were submitted to the ISO, Northern Tier Transmission Group (NTTG), and WestConnect in early 2016 would be beneficial. All three planning regions were required to assess these ITPs in their respective regional planning processes and as such, all three planning regions shared planning data and information that was utilized in each of the planning region's regional planning processes.

Finally, this Interregional Transmission Project Evaluation and 50% out-of-state Assessment "Assessment" will be completed as a continuation of the 2016-2017 planning cycle. The Assessment is strictly for informational purposes. Its results should not be construed as reflecting the direction of future inter-regional transmission, renewable generation development or policy direction in California

¹ http://www.caiso.com/Documents/Board-Approved_2016-2017TransmissionPlan.pdf

and outside of California nor will this study provide a basis for procurement/build decisions in 2016-17 TPP cycle or 2017-2018 TPP cycle. This document sets out the objectives, assumptions and the scope of work that will be completed in this assessment.

2. Objectives

This Assessment, as with the ISO's previous work on this initiative, is informational and intended to achieve the objectives discussed below. Where appropriate, information from the planning regions has been considered.

Identify out-of-state resource scenarios

Identify resource assumptions in Wyoming and New Mexico to be used in developing the out-of-state RPS scenarios for this study. In consideration of WestConnect's analysis of differing coal and gas-fired resource assumptions in their regional studies, develop and/or refine existing out-of-state scenarios that result in stressed system conditions for the transmission network between Wyoming, New Mexico, and California;

Identify Available Transfer Capability (ATC) between Wyoming/New Mexico and California

Depending on the availability of data, collect, evaluate and document the long-term, firm ATC between renewable resource development areas in Wyoming and New Mexico to determine the feasibility and cost of using the existing transmission system to deliver incremental resources to CAISO scheduling points;

Identify transmission constraints outside of California

Considering the specific out-of-state resource scenarios, assess and determine curtailments of renewables in Wyoming and New Mexico that may be required to meet established system performance requirements while delivering the incremental out-of-state renewable resources to California;

Test the effectiveness of ITPs in mitigating observed transmission issues outside of California

Considering the ITPs that were submitted through the ISO's ITP submittal process and the stressed system performance conditions determined in this study, assess the system performance conditions with one or more of the ITPs included in the analysis to identify their ability to meet California's renewable import need;

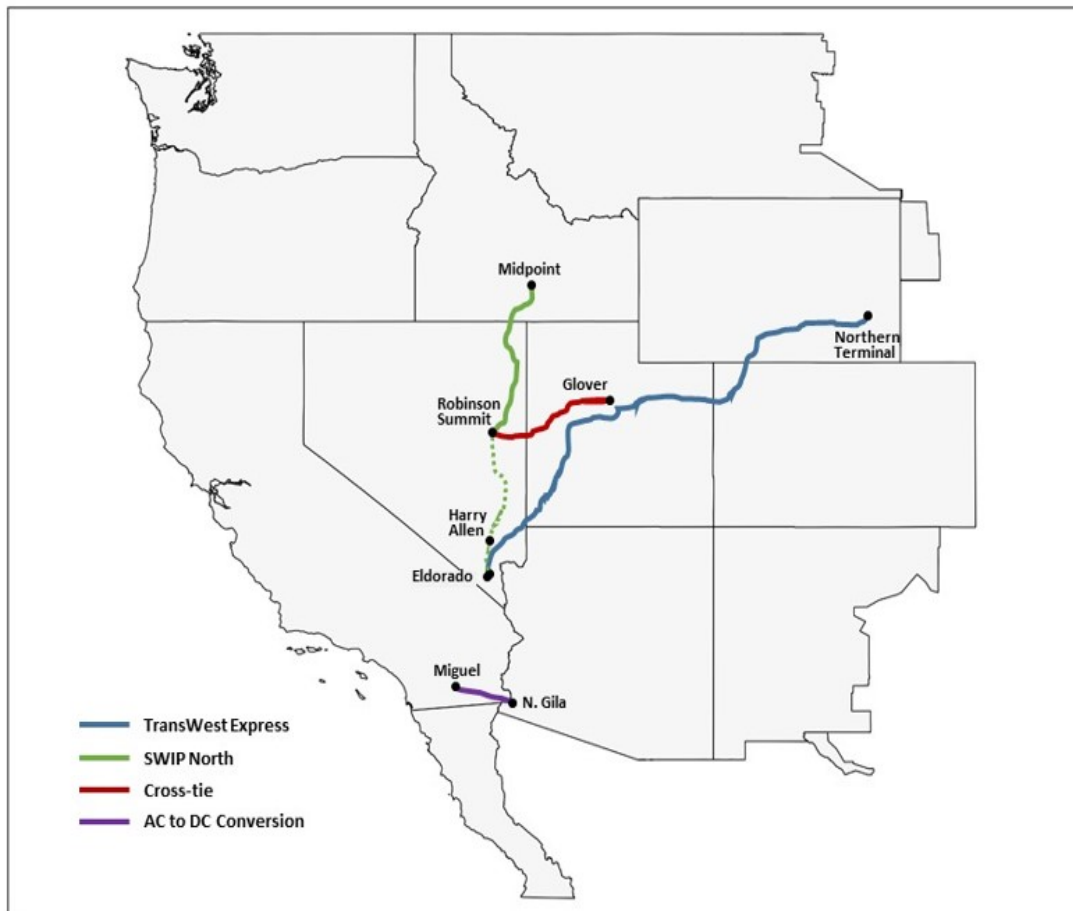
Perform a comparative assessment of ITPs

Based on the results of the effectiveness tests of the ITPs, perform a comparative assessment of the ITPs.

3. Interregional Coordination Background

In 2016, the western planning regions initiated the 2016-2017 interregional coordination cycle. During the first quarter of the interregional coordination cycle an “open window” was provided for project sponsors to submit ITP proposals to the planning regions for considering in their 2016-2017 regional planning cycles. On March 31, 2016 the “open window” was closed and four ITP proposals had been submitted to the ISO, NTTG, and WestConnect. These ITPs were reviewed by the ISO, NTTG, and WestConnect and were subsequently accepted for consideration in their regional planning processes. Once accepted, the ISO, NTTG, and WestConnect coordinated development of project evaluation process plans and when finalized, were shared with the project sponsors and ISO stakeholders². The general location of the projects are shown in Figure 3-1 and generally described in Table 3-1.

Figure 3-1: Interregional Transmission Projects Submitted to the ISO



² <http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=EAEB2EA-AE8D-4F8D-A7A6-E477B2ACD085>

Table 3-1: Interregional Transmission Project Descriptions

Proposed Project	Description
TransWest Express Transmission Project	The TransWest Express Transmission Project (TWE Project) is a proposed 730-mile, phased 1,500/3,000 MW, ±600 kV, bi-directional, two-terminal, high voltage direct current (HVDC) transmission system with terminals in south-central Wyoming and southeastern Nevada. The Relevant Planning Regions are the ISO, NTTG, and WestConnect.
Southwest Intertie Project North	The Southwest Intertie Project (SWIP) is a proposed 275 mile 500kV single circuit AC line that connects the Midpoint 500 kV substation to the Robinson Summit 500 kV substation. The SWIP is expected to have a bi-directional WECC-approved path rating of approximately 2000 MW. The Relevant Planning Regions are NTTG and WestConnect. (Note that this project was also submitted into the ISO’s regional planning process as a potential regional – e.g. ISO – economic driven project.)
Cross-Tie Project	The Cross-Tie Transmission Line (Cross-Tie) project is a 213 mile 500 kV HVAC transmission project that will be constructed between central Utah and east-central Nevada. The Cross-Tie Project is expected to have a rating of approximately 1500 MW. The Relevant Planning Regions are NTTG and WestConnect.
AC to DC Conversion Project	The AC to DC Conversion Project proposes to convert a portion of the 500 kV Southwest Powerlink (SWPL) to a multi-terminal, multi-polar HVDC system with terminals at North Gila (500 kV), Imperial Valley (500 kV), and Miguel Substations (230 kV). The Relevant Planning Regions are the ISO and WestConnect.

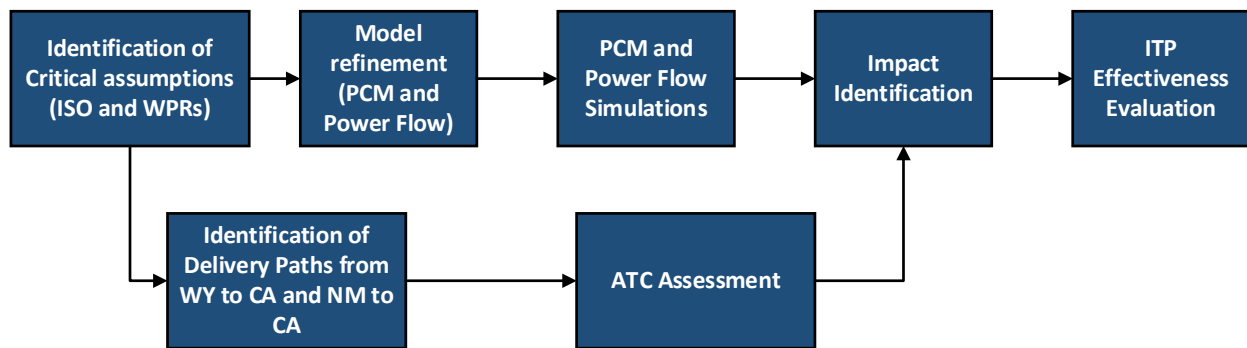
A common theme among all projects was their focus on providing California long-term firm transmission access to out-of-state renewable generation in Wyoming and New Mexico to support California’s 50 percent RPS goal. As required by the interregional coordination process, the ISO, NTTG, and WestConnect were required to develop and coordinate planning data and information related to the interregional transmission project assessments to ensure that this information was common in all of the regional studies being conducted by the planning regions. As part of this coordination effort, the ISO worked with NTTG and WestConnect to develop a common methodology for dispatching renewable resources in Wyoming and New Mexico and provided specific details on how these resources should be “sunked” to California. NTTG and WestConnect provided the ISO with renewable resource information in Wyoming and New Mexico for modeling in the ISO’s studies.

4. Scope

In the 2016-2017 TPP 50 percent RPS special study, the RPS portfolios were provided by the California Public Utilities Commission (CPUC). From these RPS portfolios the ISO created a mapping of renewable resources and modeled these resources for the in-state and out-of-state scenarios. These models were then used to perform the production cost simulations and power flow simulations. The Assessment will refine the RPS portfolio models built during the 2016-2017 TPP to incorporate the latest information received from the WPRs. While the 2016-2017 TPP 50% RPS study was intended to be more general in scope, the Assessment will focus on more detailed information from the NTTG and WestConnect planning regions as well as employing a more detailed study scope than was followed in previous studies. In particular, an assessment of Available Transmission Capacity (ATC) between Wyoming, New Mexico, and California will be performed to determine the availability, if any, of existing transmission availability to import wind renewables into California. An illustration of the specific study scope for the Assessment is shown in .

Critical activities proposed as part of this study are depicted in below –

Figure 4-1: ITP and Out-of-state portfolio Evaluation Steps



4.1 Coordination with ISO Stakeholders and WPRs

As the evaluation steps depicted in Figure 4-1 are completed, the ISO will provide information to ISO stakeholders at regularly scheduled transmission planning stakeholder meetings during the 2017-2018 planning cycle. As appropriate, the ISO will coordinate the study plan, assumptions, methodologies, and study results with the other WPRs during the course of the study and where appropriate, the ISO will seek input from the WPRs on certain study assumptions that include but will not be limited to:

- a. Out-of-state resource scenarios;
- b. Planned transmission modeling criteria for facilities outside of California;
- c. A set of contingencies to be tested on the system outside of California;
- d. Scheduling capability assumptions for the system outside of California

Information and/or comments received from the WPRs will be documented in the final Assessment report.

4.2 Refinement of existing out-of-state resource scenario

Through coordination with the WPRs and where appropriate, the ISO will refine and/or develop out-of-state resource scenarios to be considered in the Assessment. This information will be used to develop the power flow models and production cost models (PCM) that will be used to perform the studies. The ISO may, at its discretion, change or modify certain power flow and production cost model information it receives from the WPRs if it is inconsistent with accepted ISO modeling methodologies or practices. Any changes or modification to WPR information will be documented in the final Assessment report.

4.3 PCM and power flow simulations

Based on information collected as part of Section 4.2, out-of-state portfolio models will be refined and used to test system performance under the conditions established in the scenario model. Where possible, the ISO will consult with NTTG and WestConnect on the identification of specific sensitivities that may be used to assess the overall system performance impact on NTTG's and WestConnect's transmission network. Likewise, PCM simulations will be used to identify stressed "snapshots" which will represent certain hours of the year where significant congestion occurs in the NTTG and WestConnect systems. These "snapshots" will be used to develop power flow models of the interconnected system, from which specific system assessments can be performed. System performance results from these assessments will be used to identify and assess the reliability impact on the interconnected transmission network outside of California for scenarios considering renewable wind generation driven imports into California.

4.4 Scheduling capability assessment

Power flow and PCM assessment results can only provide information related to reliability which is specific to system constraints or limits; they cannot provide information about the existence of ATC on the interconnected network between Wyoming/New Mexico and California. This information can only be gained through an assessment of ATC on the existing network. This type of information is considered important when considering the overall "value" that an ITP can provide to the interconnected network. As part of the Assessment, the ISO will perform a point to point contract path assessment for the transmission network between the Wyoming, New Mexico, and California planning regions to determine available ATC, if any, that may exist to support renewable wind imports from Wyoming/New Mexico into California. Based on the information collected, the ISO may test the impact of scheduling limits using other tools such as PCM and/or power flow models.

4.5 Identification of adverse impact

As mentioned previously, based on the RPS and modeling information collected as part of this study, the ISO will model out-of-state renewable portfolio and assess the system performance of several scenarios on the interconnected network. This system performance assessment will consider the impact of meeting part of the 50 percent RPS obligation by relying on out-of-state renewable resources based on several performance metrics including but not limited to:

- a. Renewable curtailment;
- b. Congestion caused due to transmission constraints;
- c. Extent and number of reliability issues observed in the stressed snapshots modeled in power flow assessment;
- d. Scheduling capability limitations.

4.6 Qualitative and quantitative comparison of ITPs

Through power flow and PCM studies, the impact of the ITPs on system performance will be assessed and documented in the Assessment report. Through PCM analysis, the ISO will determine and assess, as appropriate, WECC-wide production cost for the out-of-state scenario models with and without the ITPs.

It is important to note that the absolute production cost numbers may not be very meaningful due to modeling limitations, but this exercise will provide insight into the incremental production cost savings that may be attributable to the respective ITPs.

5. Critical assumptions and refinements

This section provides a discussion of important assumptions for resource and transmission modeling and the identification of Available Transfer Capability for delivering out-of-state resources to California. Data sources that were relied upon include –

- Models used by the ISO in 2016-2017 50% RPS study
- Information currently being prepared by the WPRs for the development of WECC’s Anchor Data Set
- NTTG’s biennial study plan version 3.5 (draft as on May 29, 2017)³
- WestConnect’s regional study plan for 2016-2017 planning cycle⁴

³ https://www.nttg.biz/site/index.php?option=com_docman&view=document&layout=default&alias=2825-2016-17-nttg-biennial-study-plan-quarter-6-revisions-redlined-05-08-2017&category_slug=planning-committee-meeting-material-05-10-2017&Itemid=31

⁴ <https://doc.westconnect.com/Documents.aspx?NID=17180>

5.1 Resource modeling

Based on the out-of-state portfolio provided by the CPUC, California’s renewable net short (RNS) is filled by renewable resources within California and wind resources in Wyoming and New Mexico. RNS is defined as the difference between the renewables compliance requirement and the actual renewables procurement that has been adjusted for some procured renewables that fail to materialize. The two out-of-state portfolios provided by the CPUC - Full Capacity Deliverability Status (FCDS) portfolio and Energy-Only (EO) portfolios used in the 2016-2017 50% RPS study were very similar in terms of resource selection within California. Since there was no material difference in these two portfolios, for study purposes the ISO created a common model to represent the FCDS and EO portfolios. The top 20 renewable resource zones and a detailed breakdown of renewable zones and renewable resources selected in these zones by technology that are represented in this common model are shown in Figure 5-1.

Figure 5-1 : Out-of-state portfolio (FCDS and EO)

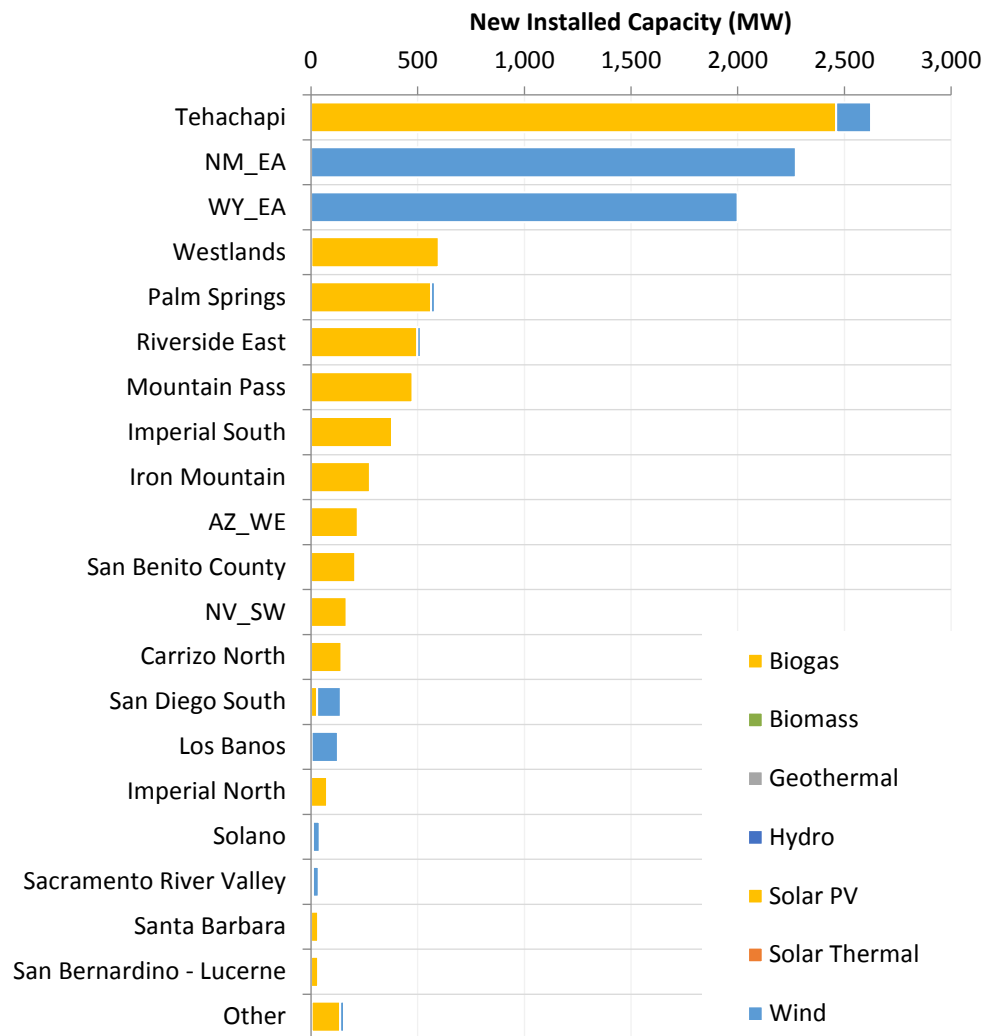


Table 5-1 : Out-of-state portfolio – Top 20 zones

No.	CREZ	Biogas	Biomass	Geothermal	Hydro	Solar PV	Solar Thermal	Wind	Total
1	Tehachapi	0	0	0	0	2461	0	164	2625
2	NM_EA	0	0	0	0	0	0	2272	2272
3	WY_EA	0	0	0	0	0	0	2000	2000
4	Westlands	0	0	0	2	597	0	0	599
5	Palm Springs	0	0	0	0	563	0	17	580
6	Riverside East	0	0	0	0	497	0	17	514
7	Mountain Pass	0	0	0	0	475	0	0	475
8	Imperial South	0	0	0	0	379	0	0	379
9	Iron Mountain	0	0	0	0	276	0	0	276
10	AZ_WE	0	0	0	0	219	0	0	219
11	San Benito County	0	0	0	0	207	0	0	207
12	NV_SW	0	0	0	0	166	0	0	166
13	Carrizo North	0	0	0	0	143	0	0	143
14	San Diego South	0	0	0	0	28	0	111	139
15	Los Banos	0	0	0	0	3	0	123	126
16	Imperial North	0	0	0	0	76	0	0	76
17	Solano	7	0	0	0	2	0	32	41
18	Sacramento River Valley	0	0	0	5	4	0	27	36
19	Santa Barbara	0	0	0	0	34	0	0	34
20	San Bernardino - Lucerne	0	0	0	0	34	0	0	34
	Other	0	0	0	3	134	0	19	155
	Total	7	0	0	9	6296	0	4780	11093

In-state resources

The inside California resource models used in the 2016-2017 50% RPS study will be used in the Assessment.

Out-of-state renewable resources in the portfolio

Wind resource locations in Wyoming and New Mexico used in the Assessment are based on information provided to the ISO by NTTG and WestConnect, respectively. The amount of out-of-state resources modeled in the out-of-state portfolio will be consistent with information provided by the CPUC which targeted 2000 MW of wind resources in Wyoming and 2000 MW of wind resources in New Mexico. Based on supporting information provided by NTTG and WestConnect, the ISO was able to model the wind resources in locations and amounts that were consistent with NTTG and WestConnect suggestions. Table 5-2 and Table 5-3 show the specific interconnection points that were identified based on the information regarding commercial interest at these locations and their locations and respective MW numbers are not an indication of a set of specific projects. These are reasonable assumptions about likely development of ~4, 000 MW of total incremental renewable resources in these areas.

Table 5-2: 50% RPS study resources modeled in New Mexico

Point of Interconnection	Bus #	Bus Name	MW
B-A 345 kV	10025	B-A	1400
AMRAD 345 kV	11010	AMRAD	300
West Mesa 345 kV	10369	WESTMESA	300
Total in New Mexico			2000

Table 5-3 : 50% RPS study resources modeled in Wyoming

Point of Interconnection	Bus #	Bus Name	MW
230 kV Dave Johnston Substation	65420	DAVEJOHN	200
230 kV Yellowcake Substation	66745	YELLOWCK	200
230 kV Aeolus Substation	67796	AEOLUS	500
230 kV Platte Substation	66240	PLATTE	500
230 kV Windstar Substation	67814	WINDSTAR	600
Total in Wyoming			2000MW

In addition to the out-of-state renewable resources modeled in the Assessment, the ISO learned that PacifiCorp was intending to procure up to 1,100 MW of wind resources from the Wyoming area. These additional resources were found to be modeled in the seed case being prepared by the WPRs for the development of WECC’s Anchor Data Set. These 1,100 MW of wind resources will be added to the out-of-state portfolio models for the Assessment. Based on information currently being prepared by the WPRs for the development of WECC’s Anchor Data Set, the ISO identified transmission facilities that would be modeled in the Assessment but were not modeled in the 2016-2017 50% RPS study but for one exception. Proposed generator ties between the Antelope 345 kV and Borah 345 kV and Goshen 345 kV buses are related to a proposed development of a nuclear resource. The ISO does not consider development of this resource viable in the timeframe of the Assessment and as such, these facilities will not be included in the ISO study. The transmission facilities associated with PacifiCorp’s renewable procurement are listed in Table 5-4 and along with their associated resources listed in Table 5-5, will be included in the ISO study. The ISO will provide the WPRs an opportunity to review and comment on the ISO’s models. Any information and/or comments received will be documented in the final Assessment report.

Table 5-4: Gen-tie models which were not included in 2016-2017 TPP out-of-state portfolio base case

From Bus	From kV	To Bus	To kV	Ckt	Included in Assessment
LONGHORN	230	JRDNB TP	230	1	Yes
AEOLUS	230	POI_WYWIND1	230	1	Yes
AEOLUS	230	WYWIND4_POI	230	1	Yes
AEOLUS	230	WYWIND6_POI	230	1	Yes
FREEZOUT	230	WYWINDAE	230	1	Yes
ANTELOPE345	345	BORAH	345	1	No
ANTELOPE345	345	GOSHEN	345	1	No
WYWIND1_CLC1	230	POI_WYWIND1	230	1	Yes
WYWIND7POI	230	WYWIND8POI	230	1	Yes

WYWIND7POI	230	WYWIND9POI	230	1	Yes
WYWIND7POI	230	WYWINDAE	230	1	Yes
WYWIND8POI	230	WYWIND10POI	230	1	Yes
WYWIND9POI	230	WYWIND10POI	230	1	Yes

Table 5-5: Generators associated with gen-tie models listed in Table 5-4

Bus Name	Pmax	Technology	Modeling Action
WYWIND2_GEN	100	Wind	Add
WYWIND3_GEN	100	Wind	Add
WYWIND1_GEN	200	Wind	Add
WYWIND4_GEN	124	Wind	Add
WYWIND5_GEN	126	Wind	Add
WYWIND6_GEN	134	Wind	Add
WYWIND8_GEN	80	Wind	Add
WYWIND9_GEN	80	Wind	Add
WYWIND7_GEN	80	Wind	Add
WYWIND10_GEN	80	Wind	Add
JRDNB W1	204	To be confirmed	Add

The ISO also compared the information currently being prepared by the WPRs for the development of WECC’s Anchor Data Set with information modeled in its 2016-2017 50% RPS study and found a number of generator tie-lines and their associated resources were not modeled in the more current WECC Anchor Data Set model. Because the information in the WPR Anchor Data Set model is more current, the additional generator tie-line models and their associated resources will not be modeled in the Assessment. Table 5-6 lists the generator tie-line models and Table 5-7 lists the corresponding generators that were removed from the out-of-state portfolio case in the Assessment.

Table 5-6: Gen-tie models to be removed from 2016-2017 TPP out-of-state portfolio base case

From Bus	From kV	To Bus	To kV	Ckt
EAGLEYE	230	G33_POI	230	1
MEAD N	230	SEARCHLI	230	1
DAVIS	230	SEARCHLI	230	1
MEAD	345	WHTHILLS	345	1
MEAD	345	WHTHILLS	345	1
GRIFFITH	230	CLIFROSE_SUB	230	1
G33_POI	230	LIBERTY	230	1
G33_POI	230	G33	230	1
SEARCHLI	230	SEARCH A	230	1
SEARCH A	230	SEARCH B	230	1
KOWSTA	230	MEAD S	230	1
WHTHILLS	345	HA-IC-G28	345	1
WHTHILLS	345	WINDQ1_Hill	345	1

Table 5-7: Generators associated with gen-tie models listed in Table 5-6

Bus Name	Pmax	Modeling Action
G33	100	Remove
SEARCH GENA	150	Remove
SEARCH GENB	150	Remove
WINDQ1G1	105	Remove
WINDQ1G2	105	Remove
WINDQ1G3	105	Remove
WINDQ1G4	105	Remove
WINDQ1G5	30	Remove
HPVGEN-G28	50	Remove
HWGEN2-G28	30.6	Remove
HWGEN1-G28	170	Remove
CLIFROSE_GEN	50	Remove
KOWSTA_G	191.5	Remove

Out-of-state non-renewable resources

While the ISO has been provided a great deal of information on renewable resources and their associated transmission facilities, very little information is being provided for non-renewable resources. For the Assessment, the ISO will rely on the 2026 WECC base case which was used as the starting case for the 2016-2017 50% RPS study. The WPRs will be provided an opportunity to review the ISO’s study cases for the Assessment once they are completed. Information and/or comments received from the WPRs will be documented in the Assessment final report.

5.2 Transmission Assumptions

The following transmission assumptions will be used in the Assessment.

Planned transmission within the ISO BA

All transmission project approved by the ISO will be modeled. This will ensure an updated model for transmission system within ISO BA.

Planned transmission outside the ISO BA

The 2026 WECC base case included certain transmission projects submitted by corresponding planning entities that were identified as “non-firm” compared to the modeling criteria used by the ISO. Unfortunately, a common criteria for including “planned” transmission in the WPR regional plans does not yet exist but will be developed in the future. In many instances the term “firm” is used to indicate a higher degree of probability of development, but again, there is no consistent definition across WECC. For example, some projects that do not have a sponsor are included in the WECC base cases if the projects has completed certain other milestones such as having been identified as needed by a planning region.

Publicly available data, data provided by the WPRs and the latest WECC Anchor Data Set seed case being developed as part of the WPRs’ joint effort with WECC were used for identifying modeling enhancements. The following modeling modifications were identified:

- Several sections of the Gateway Energy Project were identified for removal from the models used in the Assessment. The Gateway Energy Project was identified from the latest NTTG Biennial Study Plan⁵ as one of the main projects to impact the delivery of Wyoming wind resources to California. Table 5-8 shows the list of facilities associated with Gateway Energy Project and their corresponding status in the 2016-2017 50% RPS study, the ADS seed case being developed by WPRs and NTTG 2016-2017 biennial study plan (draft version 3.5 as of May 29, 2017). Gateway Energy Project facilities listed in Table 3 of NTTG’s biennial study plan version 3.5 that are listed as “committed” will be modeled as a baseline assumption in the Assessment. These facilities are shown in the rightmost column of Table 5-8. NTTG has indicated that certain facilities that are not “committed” should still be considered as part of the transmission model as reflected in the May 29, 2017 version of the WECC Anchor Data Set power flow model. To be consistent with the ISO “modeling” methodology used in the Assessment, facilities not listed as “committed” will be removed from the ISO’s base case models. However, since NTTG has informed the ISO that these facilities should be considered as part of the transmission model, a sensitivity analyses which includes these planned transmission assumptions will be performed (PCM and power flow).

Table 5-8: Gateway Energy Project modeling in ITP-OOS 50 percent RPS evaluation - baseline

Energy Gateway	Line Segment	Voltage kV	Status in TPP16 case	Status in Merged WPR case	Committed in NTTG study plan ?	In Service?	Modeling action
Gateway Central	B- Populus to Terminal (2 lines)	345kV	Modelled online	Modelled online	-	Yes	Leave in
	Terminal to Oquirrh (2 lines)	345kV	Modelled online	Modelled online	Yes	Yes	Leave in
	Oquirrh to Limber (2 lines)	345kV	Modelled online	Modelled online	No	No	Remove
	C- Limber to Mona	500kV	Modelled online	Modelled online	No	No	Remove
	Mona to Clover	500kV	Modelled online	Modelled online	No	No	Remove
Gateway West	E- Hemingway to Cedar Hill	500kV	Modelled online	Modelled online	No	No	Remove
	Hemingway to Midpoint ck1	500kV	Ck 1 Modelled online, but Ck2 is status off	Ck 1 Modelled online, but Ck2 is status off	No	No	Remove
	Midpoint to Cedar Hill	500kV	Modelled online	Modelled off	No	No	Remove
	Midpoint to Borah	500kV	Modelled online	Modelled online	No	No	Remove
	Borah to Populus	500kV	Modelled online	Modelled off	No	No	Remove
	Cedar Hill to Populus	500kV	Modelled online	Modelled online	No	No	Remove
	D- Populus to Bridger	500kV	Modelled online	Modelled online	No	No	Remove
	Bridger to Aeolus	500kV	Modelled online	Modelled online	No	No	Remove
Gateway South	Aeolus to Windstar	230kV	Modelled online	Modelled online	No	No	Remove
	F- Aeolus to Clover	500kV	Modelled online	Modelled online	No	No	Remove
West of Hemingway	G- Red Butte to Sigurd	345kV	Modelled online	Modelled online	No	No	Remove
	A- McNary to Wallula	230kV	Modelled online	Modelled online	Yes	Yes	Leave in
	H-Hemingway to Boardman/Longhorn	500kV	Modelled online	Modelled online	No	No	Remove

⁵ https://www.nttg.biz/site/index.php?option=com_docman&view=document&layout=default&alias=2825-2016-17-nttg-biennial-study-plan-quarter-6-revisions-redlined-05-08-2017&category_slug=planning-committee-meeting-material-05-10-2017&Itemid=31

- The following 230 kV facilities in New Mexico, Arizona and WAPA – Rocky Mountain listed Table 5-9 in were removed because these facilities are not modeled in the latest WECC Anchor Data Set power flow.

Table 5-9: Transmission facilities in WestConnect to be removed from 2016-2017 TPP out-of-state portfolio base case

From Bus	From kV	To Bus	To kV	Ckt
AVERY_PS	230	AULT	230	1
CAREY_TS	230	TIMBERLN	230	1
IRONHRS	230	COYOTEG	230	1
THRERVR2	230	BLKGLADE	230	1
THRERVR2	230	SHIPROCK	230	1
THRERVR3	345	SHIPROCK	345	1
BLKGDPE	230	COYOTEG	230	1

All planned transmission in WestConnect region, as per the latest WestConnect study plan⁶, is assumed to be modeled in the ADS seed case and will be modeled for the purpose of this study. The ISO will perform modeling checks to ensure that transmission projects flagged as conceptual in the WestConnect study plan are not modeled in the Assessment. Per the WestConnect Business Practice Manual⁷, Section 4.1.1.1, "As defined by WestConnect, planned facilities include projects that have a sponsor, have been incorporated in an entity's regulatory filings, have an agreement committing entities to participate and construct, or for which permitting has been or will be sought."

5.3 Identifying Available Transfer Capability for delivering out-of-state resources to California

The ISO will utilize information from OASIS, as available, to identify ATC that may be available to deliver out-of-state resources to California. The proposed steps for this evaluation are listed in section 7.3. This will be first of its kind evaluation for the 50% RPS out-of-state portfolio, so the critical assumption for this assessment will be the accessibility and availability of data.

The ISO will also review information with WPRs regarding available transmission capability for long-term firm transmission service along potential contract paths or any known scheduling limitations that could create hurdles for delivering the RPS out-of-state resources from Wyoming and New Mexico to California.

⁶ <https://doc.westconnect.com/Documents.aspx?NID=17180>

⁷ <https://doc.westconnect.com/Documents.aspx?NID=17155>

6. Base case modeling

The base cases used for in the 2016-2017 50% RPS study will be used to develop the base cases for the Assessment. Where appropriate, input from the WPRs will be included.

6.1 Production cost simulation base case

Starting base case

The ISO economic planning database for 2026 prepared during the 2016-2017 TPP was used to develop the renewables portfolio production cost simulation models in the 2016-2017 50% RPS study. These 50% portfolio resources were mapped to specific transmission substations and added to the ISO economic planning database. The 2026 load levels used in the TEPPC model will be used in the Assessment. Contingency and RAS modeling will be updated to reflect the potential impact of the new resources in the 50 percent portfolios used in the Assessment. Regulation and load following requirements will also be updated based on the 50 percent renewables portfolio and incorporated into the Assessment models. In addition, the expected net load growth in California is expected to fall due to several factors such as energy efficiency and development of new behind-the-meter resources. As such,, the 2026 load levels used in the TEPPC model are expected to be a reasonable approximation for the 2026 to 2030 time frame considered in the Assessment.

Modeling enhancements to the 2016-2017 TPP PCM case

The following changes will be made to the 2016-2017 50% RPS PCM model to develop the PCM model for the Assessment:

- Resource modeling in WY was updated in accordance with section 5.1. Additional wind resources were modeled in WY area pursuant to ~1,100 MW of renewables procured by PacifiCorp. No changes were made to the in-state resource modeling.
- Transmission modeling was updated based on the assumptions described in section 5.2.

6.2 Power flow and stability base cases

Starting base case

Base cases used in the 2016-2017 50% RPS study will be used as a starting point for the Assessment.

Modeling enhancements to the starting base case

Enhancements to the power flow base case will be aligned with the modeling enhancements to be reflected in the PCM base case as described in section 6.1

- Resource modeling in WY was updated in accordance with section 5.1. Additional wind resources were modeled in WY area pursuant to ~1,100 MW of renewables procured by PacifiCorp. No changes were made to the in-state resource modeling.
- Transmission modeling was updated based on the assumptions described in section 5.2.

Load assumptions

Stressed snapshot/s will be identified from PCM simulations based on parameters including but not limited to

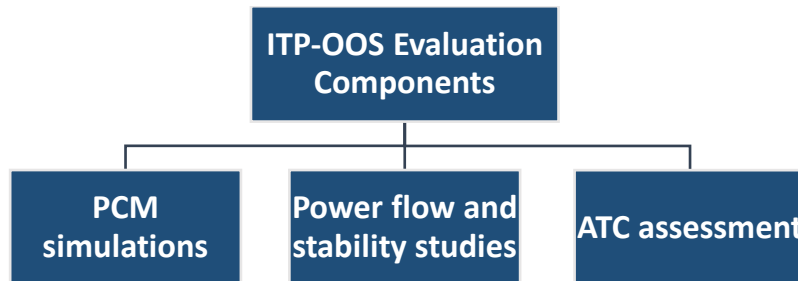
- High transmission system (paths between Wyoming, New Mexico and California) usage hours
- High Wyoming and New Mexico renewable dispatch and high curtailment

Load levels corresponding to these snapshot/s will be modeled in the power flow case.

7. Study Components Summary

Three types of assessments will be performed as part of the Assessment. These components are depicted in Figure 7-1.

Figure 7-1: Study components of ITP and Out-of-state portfolio evaluation



PCM simulations and power flow and stability studies will utilize the critical assumptions, base cases and modeling refinements described in this study plan. The effort to identify ATC on critical paths necessary to support out-of-state imports from Wyoming/New Mexico into California. This information will be used to assess the “value” which the proposed ITPs may provide to achieve the desired imports into California.

7.1 PCM simulations

PCM simulations will be performed using GridView and the updated PCM models as described in section 6.1. The expected outcome of PCM simulations include:

- Extent of curtailment of out-of-state renewables

- Identification of transmission constraints outside of California that may result in significant amount of congestion when delivering wind resources from WY and NM to CAISO BA
- Stressed snapshot identification for the purpose of power flow studies

PCM simulations will also be used to determine and assess, as appropriate, WECC-wide production cost for the out-of-state scenario models with and without the ITPs.

It is important to note that the absolute production cost numbers may not be very meaningful due to modeling limitations, but this exercise will provide insights about the incremental production cost savings that may be attributable to the respective ITPs.

7.2 Power flow studies

Power flow studies will be performed in order to identify additional transmission limitations that may not be captured by PCM studies and to confirm the transmission system limitations identified by PCM simulation. The 8,760 hours of snapshots created during PCM simulations will be used to identify high transmission system usage patterns to be tested using the power flow models for reliability assessment.

Contingency assessment will be performed with a focus on the system outside of California. The ISO will invite the WPRs to provide a list of critical contingencies to be tested in order to test the ability of transmission system to deliver wind resources in Wyoming and New Mexico to California.

The ISO will also work with WECC and WPRs to refine the stability model for the base case and run transient stability studies in addition to the steady-state assessment.

7.3 Available Transfer Capability assessment

As discussed in section 4.4 the power flow and PCM assessment results can only provide information related to reliability which is specific to system constraints or limits; they cannot provide information about the existence of ATC on the interconnected network between Wyoming/New Mexico and California. The ISO will utilize information from OASIS, as available, to identify ATC that may be available to deliver out-of-state resources to California. Initially, representative transmission paths between the renewable wind resources in Wyoming/New Mexico and California will be identified. Based on available information, the available ATC on these representative transmission paths will be identified to provide an opportunity assessment of utilizing the existing transmission system to meet California's intended out-of-state renewable goal. The impact of ITPs on available ATC will be considered in terms of the available information and additional information received from the relevant parties. The ATC assessment will include the following steps:

- Identify discrete scheduling points
 - Source: Project POIs are known based on the assumptions

- Sink: CA boundary points
- Identify scheduling paths that can achieve the “point-to-point” transfers
- Identify the ATC on the identified scheduling paths
- Test the ATC for the point to point transfers “without” any ITP
- If sufficient ATC is not available, then the ISO will review available information about the incremental ATC offered by the ITCs, and as a next step will work with the relevant entities, as needed, to assess the incremental ATC offered by the ITCs.

8. Timeline and Milestones

Table 8-1: Proposed ITP and 50% OOS portfolios assessment timeline and milestones

Milestone	Target Date
Initial discussion with WPRs	April 2 st week
Input from WPRs	May 30, 2017
<u>Final study plan</u>	<u>June 08, 2017</u>
Share the enhanced models with WPRs	June 22, 2017
Modeling feedback from WPRs	June 29, 2017
<u>Meeting with WPRs – status update (PCM results, ATC assessment, power flow)</u>	<u>July 21, 2017</u> <u>(tentative)</u>
<u>ATC assessment summary</u>	<u>August 07 , 2017</u>
Reliability assessment results summary	August 24, 2017
<u>Consolidation of results, conclusions and recommendations</u>	<u>September 07, 2017</u>
<u>Stakeholder Meeting</u>	<u>September 2017</u>

Figure 8-1: Proposed work streams and timeline

