

# Agenda

TIME	TOPIC	PRESENTER
10:00 – 10:15	Welcome, introductions, meeting logistics, objectives & approve agenda	Gary DeShazo
10:15 – 12:30	Presentation/Discussion of Annual Interregional Information (current WPR regional plans; finding from 2016-17 ITP submittals) <ul style="list-style-type: none"><li>• ColumbiaGrid</li><li>• Northern Tier Transmission Group (NTTG)</li><li>• WestConnect</li><li>• California ISO</li></ul>	All
12:30 – 1:30	Lunch	
1:30 – 2:30	Open Discussion of 2018-19 WPR planning activities and ITP suggestions	All
2:30 – 3:45	WPR Coordination of Planning Data & Information through the ADS	All
3:45 – 3:55	Review of key points, action items, assignments	<u>Mudita</u> Suri
3:55 – 4:00	Closing remarks, next meeting & adjourn	Gary DeShazo



**ColumbiaGrid**

**2018 Annual Interregional  
Coordination Meeting (AICM)**

**February 22, 2018**

# In This Presentation



- **ColumbiaGrid (CG) planning activities**
  - Planning process – key components, products
  - Planning activities
  - Results – key conclusions from last year's (2017) activities
  - Next steps & 2018 planning activities
  - Information and notifications

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# CG Planning Process & Activities

# CG Planning Process: Overview



- **Governed by Planning and Expansion (PEFA) & Order 1000 Functional Agreements**
  - One single process
- **The planning process produces, at least, 2 key documents**
  - System Assessment (SA) report
  - Biennial Transmission Expansion Plan (BTEP)

# CG Planning Activities: What we do?



- **Several types of activities that are part of ColumbiaGrid's planning process**
- **Base case development**
  - Support MOD-032 process
- **Annual assessment**
  - Identify Order 1000 Needs
  - Reevaluation of Order 1000 projects

# CG Planning Activities: What we do?



- **Annual technical studies**
  - Reliability Assessment (Part of SA)
  - Sensitivity Studies (Flexible study scope)
- **Additional technical studies**
  - Economic Planning Study (EPS)
  - Transient Stability study
  - Geomagnetic Disturbance study (TPL-007-1)
  - Model validation study (MOD-032)

# CG Planning Activities: Studies & Assessment



- **Study Teams**

- Focus groups that address specific issues or specific areas
- Identify issues and/or develop plans of service
- Flexible timeline

- **Special Projects**

- As requested by the members

# CG Planning Process: SA



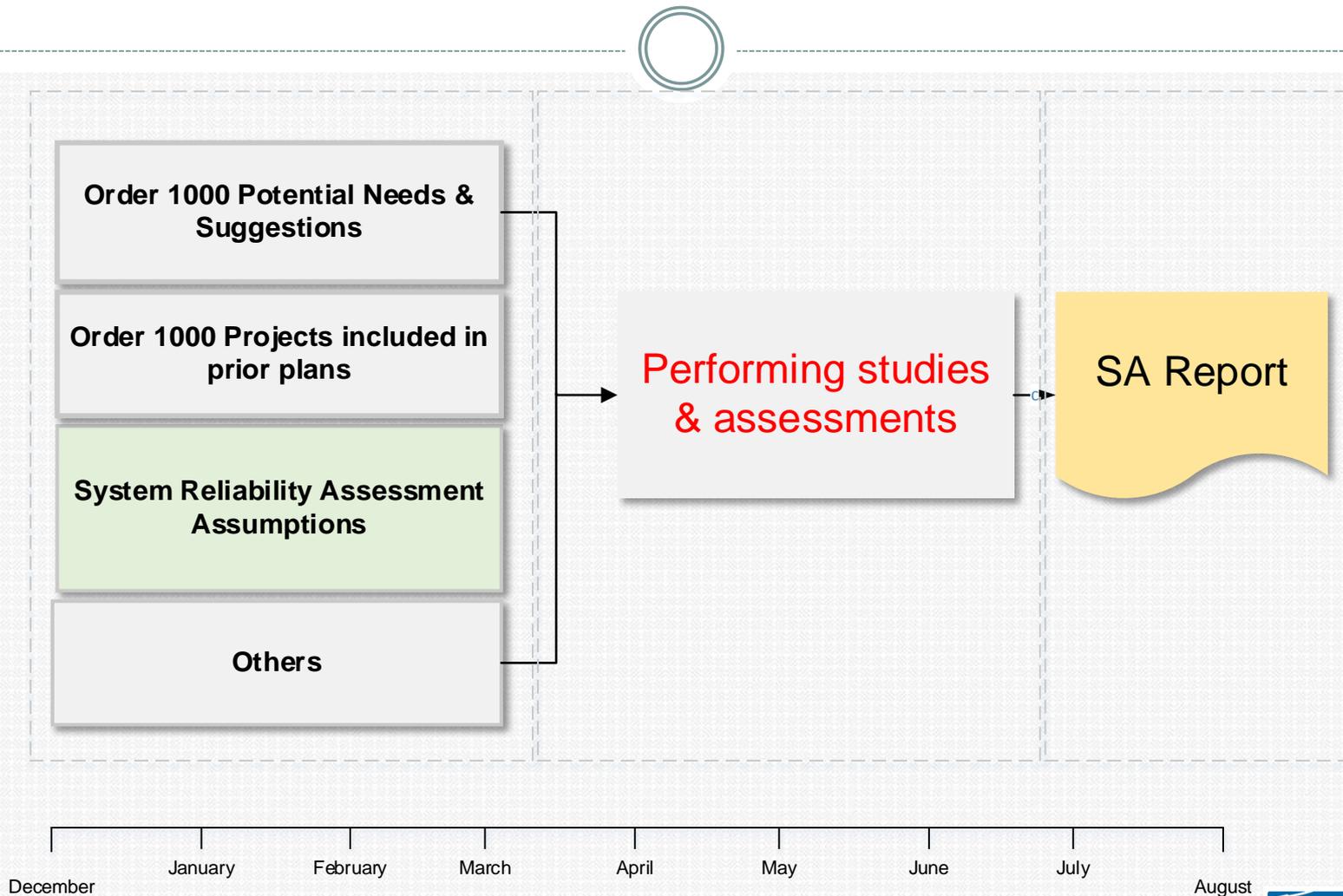
- **Conducted annually (Dec – Jul)**
  - The final report is issued by August of each year
- **Scope, assumptions, and scenarios are developed in the public forum**
  - Planning meetings (6 meetings a year)
- **Fulfill the requirements from both Functional Agreements (FA)**
  - Ability to serve load/transmission obligations
  - Identify Order 1000 Needs for regional transmission

# CG Planning Process: SA



- **The SA report contains major findings & results from various technical studies/evaluations**
  - Screening studies of the Regional Interconnected System (RIS) using the Planning Criteria
  - Determine the ability of each TOPP to serve native load and other obligations, consistent with planning criteria
  - Determine conceptual transmission solutions to address Multi-system reliability issues (as needed)
  - Identify Needs (Need Statements)
  - Reevaluate Order 1000 Projects included in prior plans

# CG Planning Process: SA



# CG Planning Process: BTEP



- **Single utility planning approach to develop a cost effective and efficient coordinated regional plan**
- **Covers ten-year planning horizon**
- **Identifies transmission additions necessary for members to:**
  - Provide reliable load service
  - Integrate new resources
  - Meet transmission service commitments
  - Facilitate economic transfers

# CG Planning Process: BTEP



- **Projects included in the Plan are typically “committed projects”**
  - In the permitting, design, or construction phases
- **Biennial plan**
  - The final report is issued in February (after the 2<sup>nd</sup> year of each planning cycle)
  - Ability to issue an “Updated” plan during the interim year (if needed)
  - The plan also discusses results from various “for information only” studies

# CG Planning Process: BTEP



- **Contents of the BTEP report include**
  - Key conclusions from the latest System Assessment(s) such as Need Statements
  - Conclusions from other studies/activities that have been completed during the planning cycle
  - Updates from other ongoing studies/activities
  - Other updates

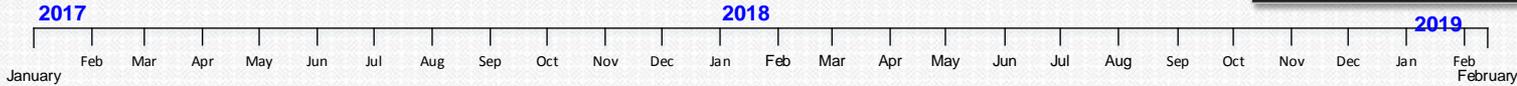
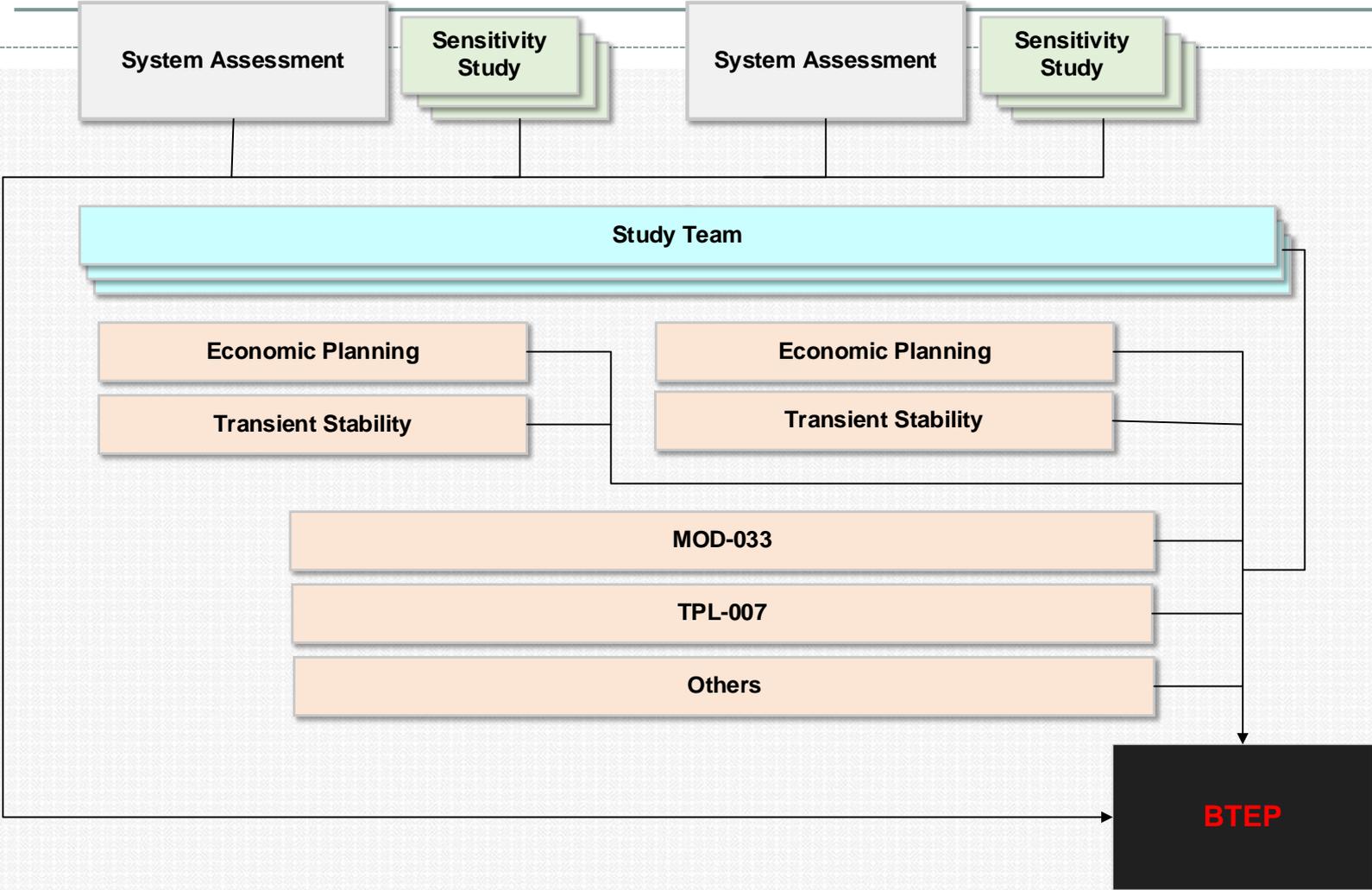
# CG Planning Process: BTEP



- “Other” studies that were conducted in 2017 (some still ongoing)
  - Sensitivity Studies (e.g. High Renewable, N-1-1)
  - Study Teams\*
  - Economic Planning Study (Production Cost Simulation)
  - Transient Stability Study
  - Model validation (MOD-033)
  - GMD studies (TPL-007)

\* *Timeline to conduct detailed studies or develop plan of service can be flexible*

# CG Planning Activities: BTEP



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# Results & Major Findings

# 2017 System Assessment: Overview

## 2017 System Assessment



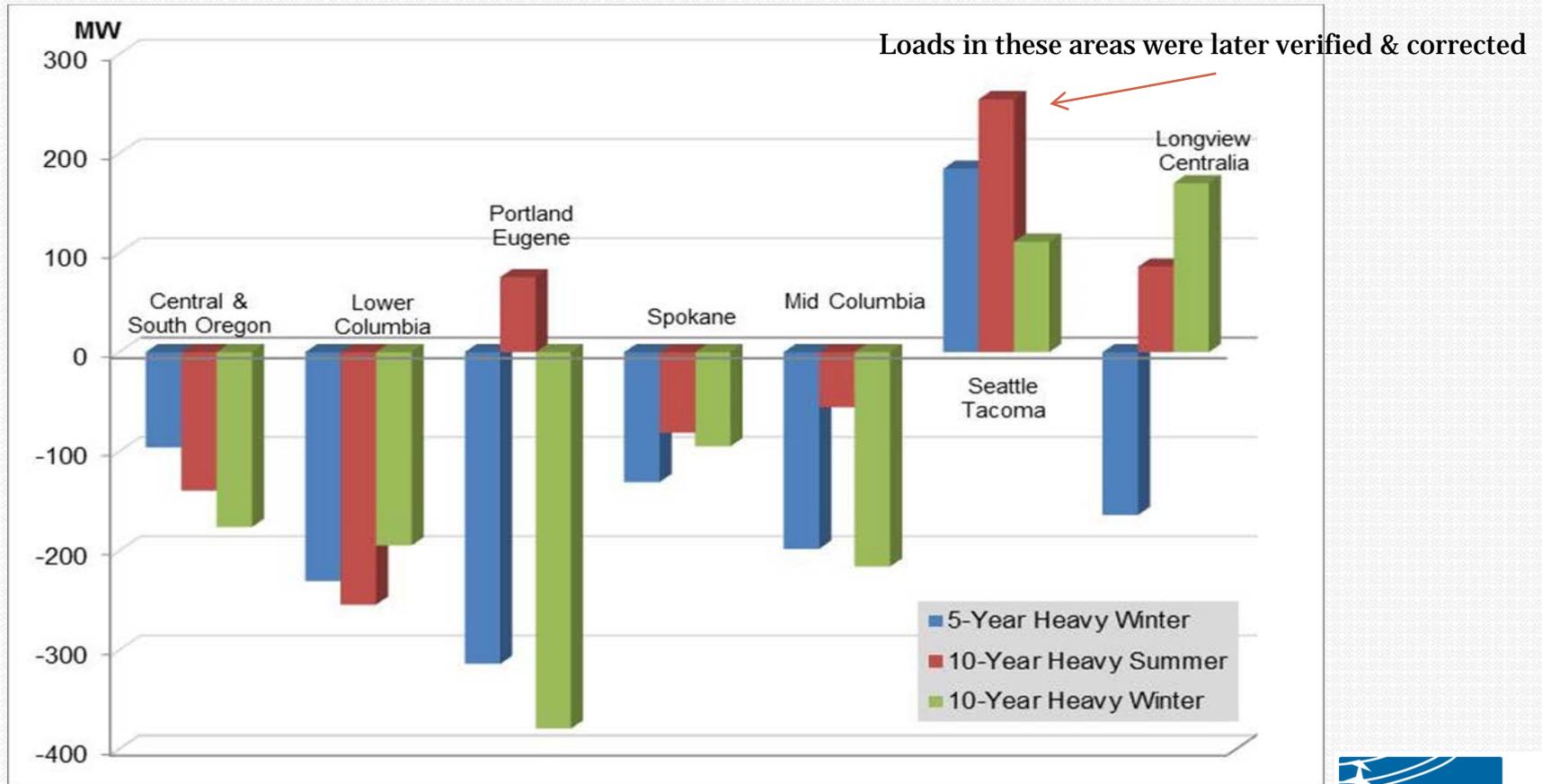
8338 NE Alderwood Rd., Suite 140 | Portland, OR 97220

## Major contents

- Overview of ColumbiaGrid regional planning process and interregional coordination.
- Description of major projects that comprise the ColumbiaGrid Ten Year Plan. Total costs ~ \$2.4B
- 2017 System Assessment:
  - Modeling assumptions, study methodology and study results
- 2017 Sensitivity Studies: N-1-1 outage study, future generation supply study
- Transient Stability Study status update
- Economic Planning Study status update
- MOD-033 study update
- Geomagnetic Disturbance study update

# 2017 System Assessment: Key observations

- Load forecasts continue to decline in most areas



# 2017 System Assessment: Results



- **Ten (10) areas of concern were identified**
  - Driven by thermal overload issues.
  - All of these areas were identified in previous system assessments and are classified as “Recurring” problems
  - Reduction from 15 areas of concern in 2016 SA due to lower loading on limiting facilities
  - Primarily due to modeling improvements and lower load forecasts
- **No new Order 1000 Needs has been identified**

# 2017 System Assessment: Results



- **Thirty-seven (37) unsolved cases were confirmed**
  - Mostly triggered by local system issues
  - Potential solutions may involve addition of shunt reactive support to prevent voltage instability
  - Details of unsolved cases can be found in this section of the SA report

# Sensitivity Studies: Results



- **Two Sensitivity Studies were conducted in 2017**
  - N-1-1
  - High Renewable
- **N-1-1 study simulated multi-million combination of contingencies**
  - Focus on multi-system issues
  - Identify potential reliability issues
  - Part of requirement under NERC planning standards

# Sensitivity Studies: Results



- **High Renewable Study focuses on potential impacts from significant supply changes**
  - Uses PCM to determine potential major changes or additional scenarios to consider
  - Power flow is used to revalidate the results
  - Provide additional information (for information only)

# Study Teams: Results



- **The Alcoa Study Team concluded its work in December 2017**
  - Evaluated impacts from major load shutdown
  - Study Team includes representatives from Chelan PUD, BPA, Grand PUD, Douglas PUD, and CG
  - The Study Team identified 7 alternatives to mitigate potential reliability issues
  - RAS option was recommended as the preferred alternative

# Study Teams: Update



- **A new Study Team was recently formed**
  - Quincy Area Study Team
  - Address potential issues related to higher than expected load forecast in Mid-Columbia area
  - Ongoing activity

# Economic Planning Study: Update



- **An assessment of potential long-term system impacts using Production Cost Simulation (PCM)**
  - Uses PCM as the screening tool
  - Revalidate results with power flow
  - For information only
  - Explore potential impacts on the longer timeframe such as 15 year horizon
  - Ongoing work

# Transient Stability: Update



- **Part of the annual study program to ensure system reliability**
  - In addition to power flow and voltage stability
  - Also supports the base case development process
  - ColumbiaGrid has been conducting this type of study since 2015
  - Foundation for other studies such as the model validation (MOD-033)

# Model Validation (MOD-033): Update



- **A new study, in compliance with several requirements under MOD-033 standard**
  - Model validation: Compare simulation results with actual events
  - Steady state power flow and transient stability
- **Three major tasks to be conducted by CG**
  - Development of the validation criteria document
  - Base case development
  - Perform the evaluation studies

# Model Validation (MOD-033): Update



- **Current status**
  - The validation criteria have been developed & posted on CG's website
  - The reference event was selected (Aug 8<sup>th</sup>, 2017)
  - Base case has been developed
  - The evaluation work is being conducted

# Geomagnetic Disturbance (GMD): Update



- **A new study, in compliance with several requirements under TPL-007-1 standard**
  - Evaluated power system performance during GMD events
  - The scope of current study focuses on assessing Geomagnetic Induced Current (GIC)
- **Major tasks**
  - Review of GIC system model data
  - Develop GMD study cases
  - Perform GMD study to determine GIC flow values

# Geomagnetic Disturbance (GMD): Update



- **Current status**
  - GIC base cases have been developed
  - Preliminary GIC studies have been completed, the initial results are being reviewed by CG members
  - Ongoing study
- **Next steps**
  - Expansion of the study scope to include GMD Vulnerability Assessment
  - Continue to monitor the development/requirements under TPL-007-2

# Next Steps

## 2018 Regional/Interregional Planning Activities

# Overview of Activities in 2018



- **January – March 2018**
  - CG Order 1000 Needs Suggestions window
  - Interregional Transmission Project (ITP) submittal window
  - Post annual interregional information
  - AICM Meeting
  - Finalize SA study plan and base cases
- **April – August 2018**
  - Evaluate O1K Needs suggestions that were received
  - Conduct 2018 SA and other studies
  - Develop the 2018 SA (Needs Statement) report

# Overview of Activities in 2018



- **September – December 2018**

- Begin study team activities to address regional needs
- Evaluate Order 1000 proposed projects
- Complete Sensitivity and other studies (such as MOD-033, GMD, etc.)
- Start developing the 2019 Biennial Expansion Transmission Plan (BTEP)

- **February 2019**

- Present the draft BTEP to CG's board for approval
- Once approved, finalizes the 2019 BTEP

# 2018 Interregional Activities: Current Status



- Annual Interregional Information is posted under CG's "Order 1000 Inter-regional page":  
<https://www.columbiagrid.org/O1000Inter-overview.cfm>
  - ColumbiaGrid information package
  - 2018 Draft Study Plan
  - 2017 Biennial Transmission Expansion Plan
  - 2017 System Assessment Report
- ITP submission window is open through Mar 31
- More information, once available, will be posted at this location & sent to interested persons

# 2018 Regional Activities: Current Status



- **Order 1000 Needs Suggestion Window**
  - Interested persons may submit suggestions for “Order 1000 Potential Needs”
  - Potential drivers for Order 1000 project(s)
  - An Order 1000 Potential Needs submission form can be downloaded at the following link:  
<https://www.columbiagrid.org/1000-overview.cfm>

# 2018 Planning Activities: Ongoing Studies



- **2018 System Assessment (2018 SA)**
  - Study Plan is being finalized
  - Focus on reliability compliance for joint areas of concern (involving multiple entities/systems)
  - 10-year planning horizon
  - NERC TPL Reliability Standards used as reference
  - Evaluate applicable Order 1000 Potential Needs
- **Sensitivity studies**
  - Start sensitivity studies after completion of the 2018 SA
  - Study scope will be determined by July

# 2018 Planning Activities: Ongoing Studies



- **Additional Studies**
  - Transient stability assessment
  - Economic Planning Study (PCM)
  - System model validation (MOD-033)
  - Geomagnetic Disturbance (TPL-007-1)
  - Third party verification of physical security assessments (CIP-014)
- **Study Teams: Dedicated study groups**
  - Quincy area Study Team is ongoing, more are possible

# Information and Notifications

# Information, Events and Announcements

[ABOUT](#) | [CORPORATE ACTIVITY](#) | [RESOURCES](#) | [NEWS](#) | [PROGRAMS](#) | [PARTICIPATION](#) | [DOCUMENTS](#) | [CALENDAR](#)



## CURRENT PROGRAMS

### [Mission and Vision](#)

ColumbiaGrid's mission is to improve the reliability and efficient use of the Northwest's transmission grid. ColumbiaGrid performs grid expansion planning, and develops and implements solutions related to the expansion, operation, reliability, and use of the interconnected Northwest transmission system. In carrying out its mission, ColumbiaGrid endeavors to provide sustainable benefits for its members and the region, while considering environmental concerns, regional interests, and cost-effectiveness. [ColumbiaGrid Work Plan](#)

### [Planning and Expansion](#)

ColumbiaGrid provides grid expansion planning based on a single-utility concept for the combined transmission grids of its planning parties. The goal of grid expansion planning is to determine reasonable solutions, or mitigations, of transmission grid issues pertaining to serving load and complying with reliability standards. In doing so, ColumbiaGrid helps to determine what should be built, where it should be built, and when it should be built. The participants in the Planning and Expansion program look to ColumbiaGrid's grid expansion planning to coordinate and support committing multi-party transmission projects in the ColumbiaGrid region.

For information on the Order 1000 Regional work please [click here](#).

For information on the Order 1000 Inter-regional work [click here](#).

## EVENTS

**February 19, 2018**  
[Presidents' Day - Office Closed](#)

**February 21, 2018 8:00 - 9:20**  
[Members' Roundtable Meeting](#)

**February 21, 2018 9:30-12:30**  
[Board Meeting](#)

**February 22, 2018 9:00 - 3:00**  
[Annual Interregional Coordination Meeting](#)

**April 12, 2018 9:00-3:00**  
[Planning Meeting](#)

**May 16, 2018 8:00 - 8:50**  
[Members' Roundtable Meeting](#)

**May 16, 2018 9:00-12:30**  
[Biannual Member & Board Meetings](#)

**May 28, 2018**  
[Memorial Day - Office Closed](#)

**June 07, 2018 9:00-3:00**  
[Planning Meeting](#)

**July 04, 2018**  
[Independence Day - Office Closed](#)

## RECENT ANNOUNCEMENTS

*February 02, 2018*  
**[Final Agenda and Hotels are posted | 2018 Annual Interregional Coordination Meeting; February 22, 2018 Folsom, CA](#)**

*January 03, 2018*  
**[Interregional Transmission Project \(ITP\) proposal window is currently open through March 31, 2018](#)**

*December 20, 2017*  
**[Board Approves 2018 Schedule of Meeting Dates](#)**

*December 20, 2017*  
**[Board Approves Fiscal Years 2018 and 2019 Budget](#)**

*December 19, 2017*  
**[2018 Planning Meeting Schedule is published](#)**

### [Announcements](#)

Recent Announcements

Planning and Expansion:  
General postings & PEFA  
related information

Order 1000 Regional

Order 1000  
Inter-regional



# Stay Informed About Future Activities



- **Public notifications**
  - ColumbiaGrid will notify interested persons regarding future activities through email
  - Self-register system
  - Refer to “Join Interest List” on ColumbiaGrid’s main page

# Stay Informed About Future Activities



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## IMPROVING THE **PLANNING,** **EXPANSION & EFFICIENT USE** OF THE NORTHWEST GRID

[LEARN MORE](#)

### CURRENT PROGRAMS

[Mission and Vision](#)  
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# Future Planning Meetings



- Please refer to ColumbiaGrid's website for more details

No	Date	Location	Focus
1	February 8, 2018	Portland, OR	Order 1000 Needs suggestions, 2018 System Assessment assumptions, other updates
2	April 12, 2018	Portland, OR	Order 1000 Potential Needs, finalize 2018 study plan, updates on system assessment
3	June 7, 2018	Portland, OR	Order 1000 Needs, Draft System Assessment study results, Updates
4	August 16, 2018	TBD	Updates & Technical discussion
5	October 11, 2018	Portland, OR	Order 1000 updates, Draft Sensitivity Study results, Other updates
6	December 13, 2018	Portland, OR	Draft 2019 BTEP, Updates

# Questions

44

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# **NTTG Annual Interregional Information**

Annual Interregional Coordination Meeting

Folsom, CA

February 22, 2018



# **NTTG Organization and Planning Process Overview**

Presented by  
Sharon Helms, NTTG Program Manager



# Northern Tier Transmission Group

## Participating Utilities

Deseret Power Electric Cooperative  
Idaho Power  
MATL LLP  
NorthWestern Energy  
PacifiCorp  
Portland General Electric  
Utah Associated Municipal Power Systems

## Participating State Representatives

Idaho Public Utilities Commission  
Montana Consumer Counsel  
Montana Public Service Commission  
Oregon Public Utility Commission  
Utah Office of Consumer Services  
Utah Public Service Commission  
Wyoming Office of Consumer Advocates  
Wyoming Public Service Commission





# Planning Process Flow Map

**INITIAL REGIONAL PLAN (IRP)**  
NON-COMMITTED PROJECTS

Boardman to Hemingway (B2H)    Energy Gateway South (Gateway S)    Energy Gateway West (Gateway W)    Antelope Projects

**INTERREGIONAL TRANSMISSION PROJECTS**

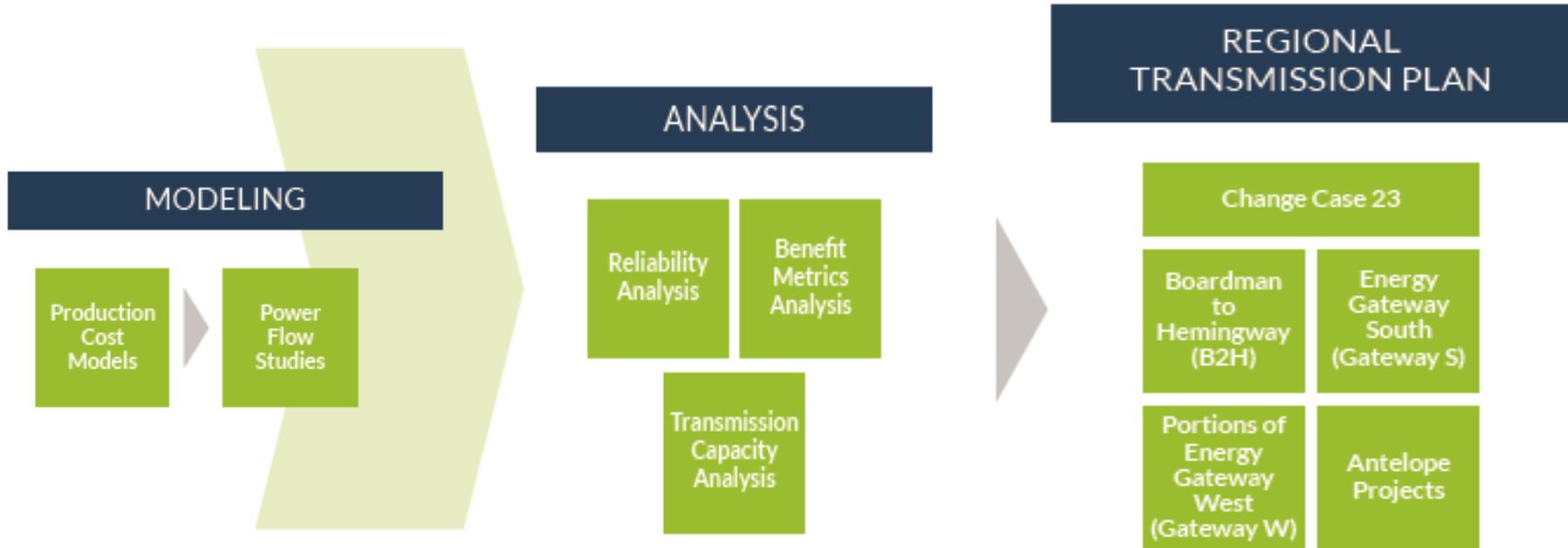
SWIP North (SWIPN)    Cross Tie    TransWest Express (TWE)

**CHANGE CASES CONSIDERED**

	B2H	GATEWAYS*	GATEWAYW*	ANTELOPE PROJECTS	SWIP N	CROSS-TIE	TWE
CASE							
null							
pRTP	X	X	d				
iRTP	X	X	X	X			
CC1	X						
CC2		X		X			
CC3		X	X				
CC4	X		X	X			
CC5							X
CC6						X	
CC7					X		
CC8							X
CC9		X					X
CC20		X	X				X
CC10						X	
CC11		X				X	
CC18		X	X			X	
CC12					X		
CC13			X		X		
CC19		X	X		X		
CC14		X	X		X	X	
CC15			X		X		X
CC16		X				X	X
CC17		X	X		X	X	X
CC21	X	X	a	X			
CC22	X	X	b	X			
CC23	X	X	c	X			



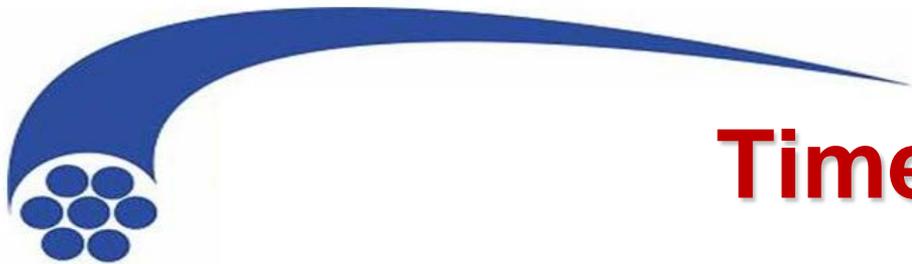
# Planning Process Flow Map





# **NTTG 2016-2017 Regional Plan Overview**

Presented by  
Chelsea Loomis, NTTG Planning Committee Chair



# Timeline



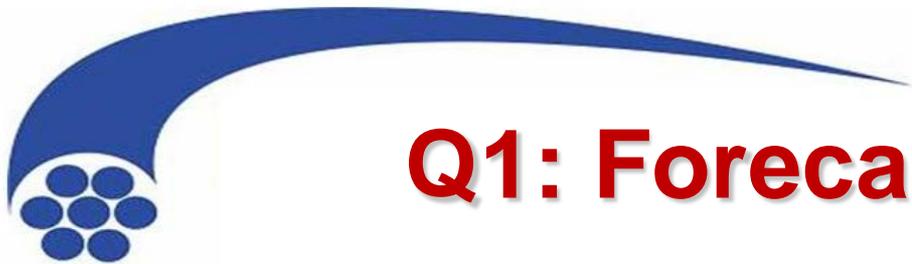


## Quarter 1 and Quarter 2

- Q1: Data Submittals
  - Load, resource, firm service, interregional projects, PPR/PPC, capital/reserves/losses
- Q2: Develop Study Plan
  - 10 year look at the system
  - Technical Work Group, composed of members of the Planning Committee
  - Approval of Study Plan from Steering Committee



SPONSOR	FROM	TO	VOLTAGE	CIRCUIT	TYPE	REGIONALLY SIGNIFICANT	COMMITTED	PROJECTS
<b>DESERET G&amp;T</b>	Bonanza	Upalco	138 kV	2	LTP	No	No	New Line
<b>IDAHO POWER</b>	Longhorn	Hemingway	500 kV	1	LTP & pRTP <sup>7</sup>	Yes	No	Boardman to Hemingway (B2H) Project
	Hemingway	Bowmont	230 kV	2	LTP	Yes	No	New Line (associated with Boardman to Hemingway)
	Bowmont	Hubbard	230 kV	1	LTP	Yes	No	New Line (associated with Boardman to Hemingway)
	Cedar Hill	Hemingway	500 kV	1	LTP	Yes	No	Gateway West Segment #9 (joint with PacifiCorp East)
	Cedar Hill	Midpoint	500 kV	1	LTP	Yes	No	Gateway West Segment #10
	Midpoint	Borah	500 kV	1	LTP	Yes	No	(convert existing from 345 kV operation)
	King	Wood River	138 kV	1	LTP	No	No	Line Reconductor
	Willis	Star	138 kV	1	LTP	No	No	New Line
<b>MATL</b>	SE Alberta		DC	1	LTP	Yes	No	MATL 600 MW Back to Back DC Converter
<b>PACIFICORP EAST</b>	Aeolus	Clover	500 kV	1	LTP & pRTP	Yes	No	Gateway South Project – Segment #2
	Aeolus	Anticline	500 kV	1	LTP & pRTP	Yes	No	Gateway West Segments 2&3
	Anticline	Jim Bridger	500 kV	1	LTP & pRTP	Yes	No	345/500 kV Tie
	Anticline	Populus	500 kV	1	LTP & pRTP	Yes	No	Gateway West Segment #4
	Populus	Borah	500 kV	1	LTP	Yes	No	Gateway West Segment #5
	Populus	Cedar Hill	500 kV	1	LTP	Yes	No	Gateway West Segment #7
	Antelope	Goshen	345 kV	1	LTP	Yes	No	Nuclear Resource Integration
	Antelope	Borah	345 kV	1	LTP	Yes	No	Nuclear Resource Integration
	Windstar	Aeolus	230 kV	1	LTP & pRTP	Yes	No	Gateway West Segment #1W
	Oquirrh	Terminal	345 kV	2	LTP	Yes	Yes	Gateway Central
	Cedar Hill	Hemingway	500 kV	1	LTP	Yes	No	Gateway West Segment #9 (joint with Idaho Power)
<b>PACIFICORP WEST</b>	Wallula	McNary	230 kV	1	LTP	Yes	Yes	Gateway West Segment A
<b>PORTLAND GENERAL</b>	Blue Lake	Gresham	230 kV	1	LTP	No	No	New Line
	Blue Lake	Troutdale	230 kV	1	LTP	No	No	Rebuild
	Blue Lake	Troutdale	230 kV	2	LTP	No	No	New Line
	Horizon	Springville Jct	230 kV	1	LTP	No	No	New Line (Trojan-St Marys-Horizon)
	Horizon	Harborton	230 kV	1	LTP	No	No	New Line (re-terminates Horizon Line)
	Trojan	Harborton	230 kV	1	LTP	No	No	Re-termination to Harborton
	St Marys	Harborton	230 kV	1	LTP	No	No	Re-termination to Harborton
	Rivergate	Harborton	230 kV	1	LTP	No	No	Re-termination to Harborton
	Trojan	Harborton	230 kV	2	LTP	No	No	Re-termination to Harborton



# Q1: Forecasted Loads

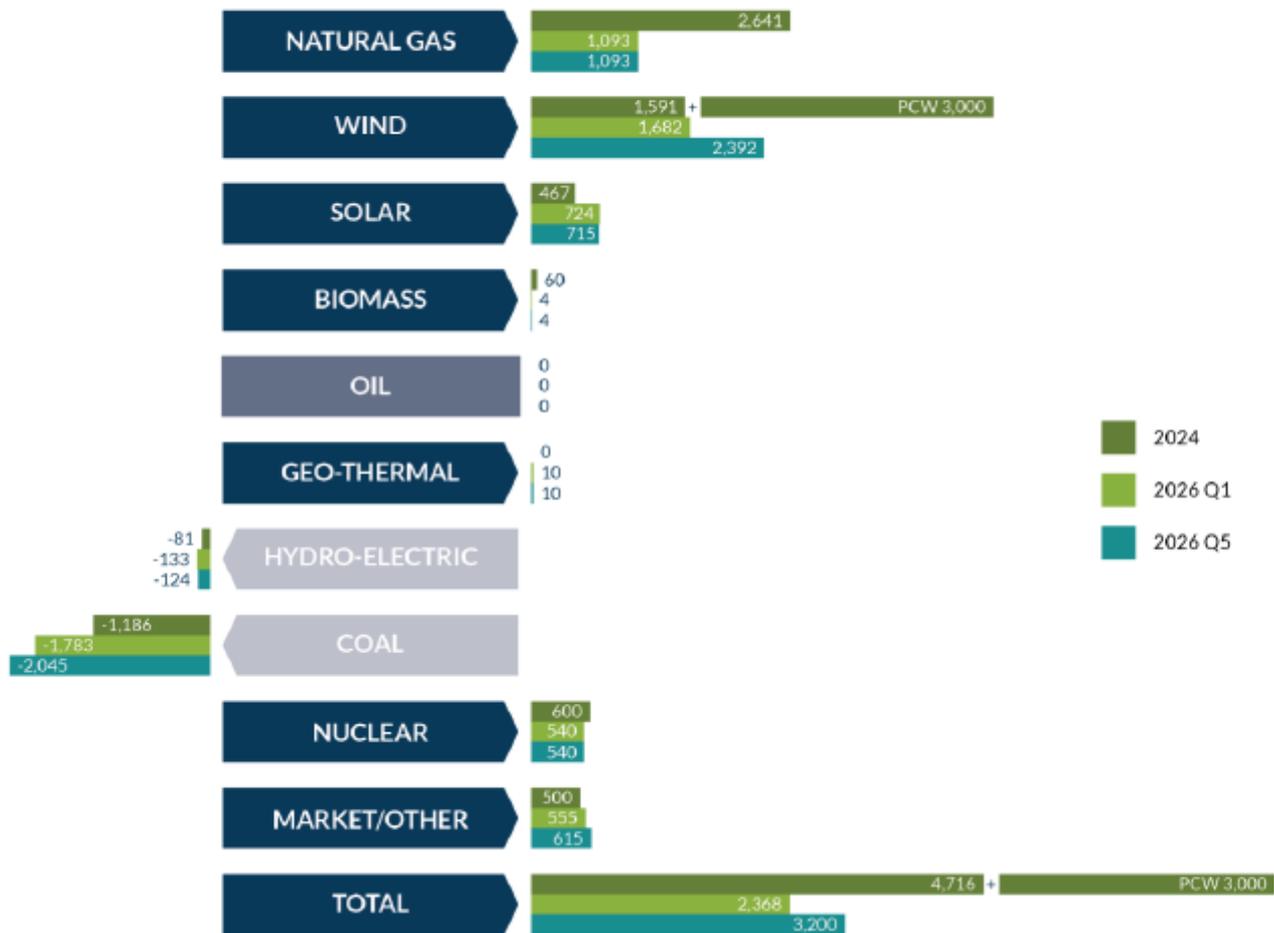
## 2026 NTTG FORECASTED LOADS

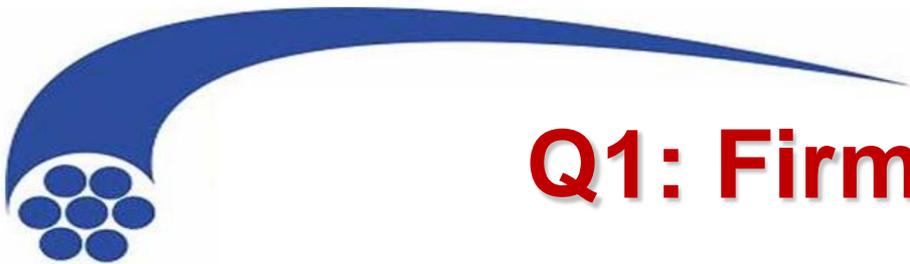




# Q1: Forecasted Resources

## COMPARISON OF FORECASTED RESOURCES (MW)





# Q1: Firm Service





# Q1: Public Policy Consideration

- NTTG received one combined request from Renewable Northwest and the Northwest Renewable Energy Coalition
- Accelerated phase out of Colstrip Unit 3 (CS units 1 and 2 already assumed offline)
- Analysis was performed in Q5

# Interregional Projects

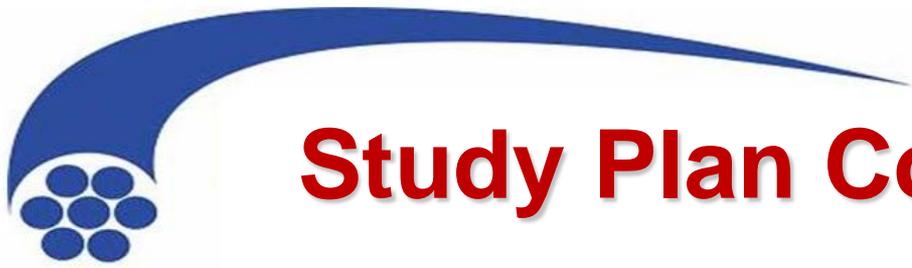


- Cross-Tie: 500 kV AC, 213 miles, 1500 MW
- SWIP: 500 kV AC, 275 miles, 2000 MW
- Transwest Express:  $\pm 600$  kV, 730 miles, phased 1500/3000 MW



## Q2: Development of Study Plan

- Methodology
- Assumptions
- Software to be used
  - Production Cost Modeling: GridView
  - Power flow: PowerWorld
- Criteria
- Public Policy Requirements/Considerations



# Study Plan Considerations

- NTTG assumed firm service for new projects
  - A note has been added to the data submittal form to clarify if new generation has associated firm transmission
- Goal: Find the “more efficient or cost effective” combination of projects



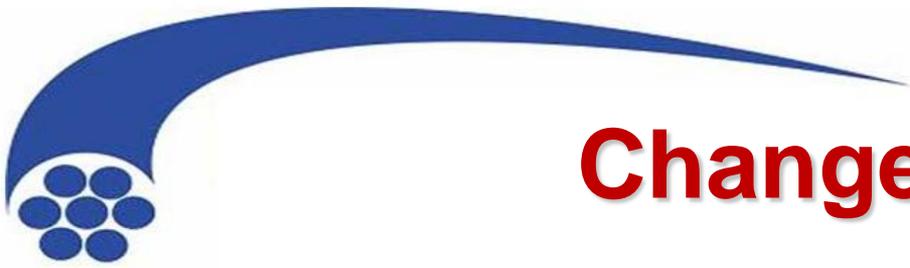
# Development of Base Cases

- “Round Trip” process
- Started with WECC 25hs1a (PF) and WECC TEPPC CC1.3 (PCM)
- Ran PCM which resulted in 8760 hours
- Selected 7 Stress cases from the 8760 hours
- Converted those PCM cases back to transient-stability ready PF cases



# The 7 Power Flow Base Cases

STRESSED CONDITION	DATE	HOUR	TWG LABEL
Max. NTTG Summer Peak	July 22, 2026	16:00	A
Max. NTTG Winter Peak	December 8, 2026	19:00	B
Max. MT to NW	September 10, 2026	Midnight	C
High Southern Idaho Import	June 11, 2026	14:00	D1
High Southern Idaho Export	September 17, 2026	2:00	D2
High Tot2 Flows	November 11, 2026	17:00	E
High Wyoming Wind	September 17, 2026	2:00	F



# Change Cases

- Null Case: Today's topology with forecasted changes
- Start with the Initial Regional Transmission Plan
  - Rollup of projects identified in the local plans AND those from the prior Regional Plan
- Scenarios where one or more of the Alternative Projects is added to or replaces one or more Non-Committed project in the Initial Regional Transmission Plan



	B2H	GATEWAY S*	GATEWAY W*	ANTELOPE PROJECTS	SWIP N	CROSS-TIE	TWE	
CASE								STRESSED CONDITIONS
null								A B D1 D2 F
pRTP	X	X	d					A B D1 D2 F
iRTP	X	X	X	X				A B D1 D2 E F
CC1	X							A B D1 D2 F
CC2		X		X				A D2 E F
CC3		X	X					A B D1 D2 E F
CC4	X		X	X				A B D1 D2 E F
CC5							X	A B D1 D2 F
CC6						X		A B D1 D2 F
CC7					X			A B D1 D2 F
CC8							X	E+RPS
CC9		X					X	E+RPS
CC20		X	X				X	E+RPS
CC10						X		E+RPS
CC11		X				X		E+RPS
CC18		X	X			X		E+RPS
CC12					X			E+RPS
CC13			X		X			E+RPS
CC19		X	X		X			E+RPS
CC14		X	X		X	X		E+RPS
CC15			X		X		X	E+RPS
CC16		X				X	X	E+RPS
CC17		X	X		X	X	X	E+RPS
CC21	X	X	a	X				D2 F
CC22	X	X	b	X				D2 F
CC23	X	X	c	X				A B D1 D2 E F



CASE	B2H	GATEWAY S*	GATEWAY W*	ANTELOPE PROJECTS	SWIP N	CROSS-TIE	TWE	STRESSED CONDITIONS
null								A B D1 D2 F
pRTP	X	X	d					A B D1 D2 F
iRTP	X	X	X	X				A B D1 D2 E F
CC1	X							A B D1 D2 F
CC2		X						A D2 E F
CC3		X	X					A B D1 D2 E F
CC4	X		X					A B D1 D2 E F
CC5							X	A B D1 D2 F
CC7								E+RPS
CC8								E+RPS
CC9								E+RPS
CC20								E+RPS
CC10								E+RPS
CC11		X						E+RPS
CC18		X						E+RPS
CC12								E+RPS
CC13								E+RPS
CC19		X						E+RPS
CC14		X			X			E+RPS
CC15					X			E+RPS
CC16						X		E+RPS
CC17			X		X	X	X	E+RPS
CC21	X	X	a	X				D2 F
CC22	X	X	b	X				D2 F
CC23	X	X	c	X				A B D1 D2 E F

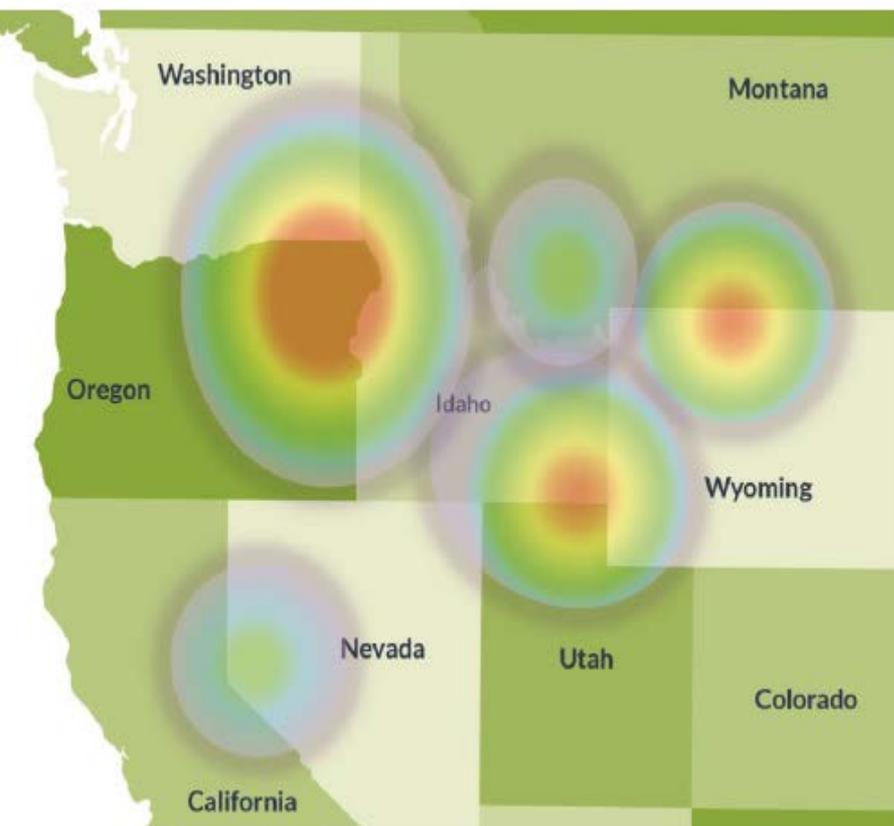
Altogether, NTTG Analyzed over 100 cases with over 410 contingencies for each case

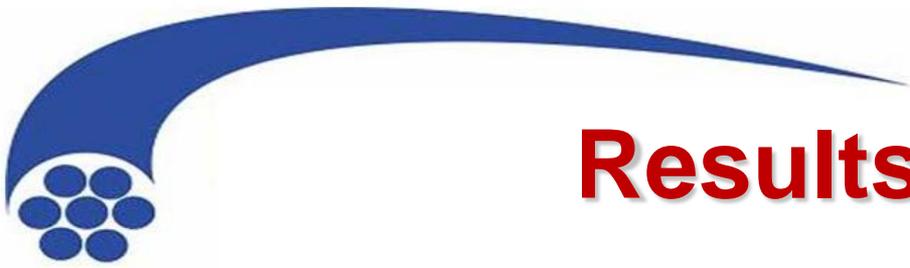


# Results: Heat Map Example

D2: Null Case, demonstrates violations

D2: Initial Regional Plan, demonstrates improvement from Null Case analysis



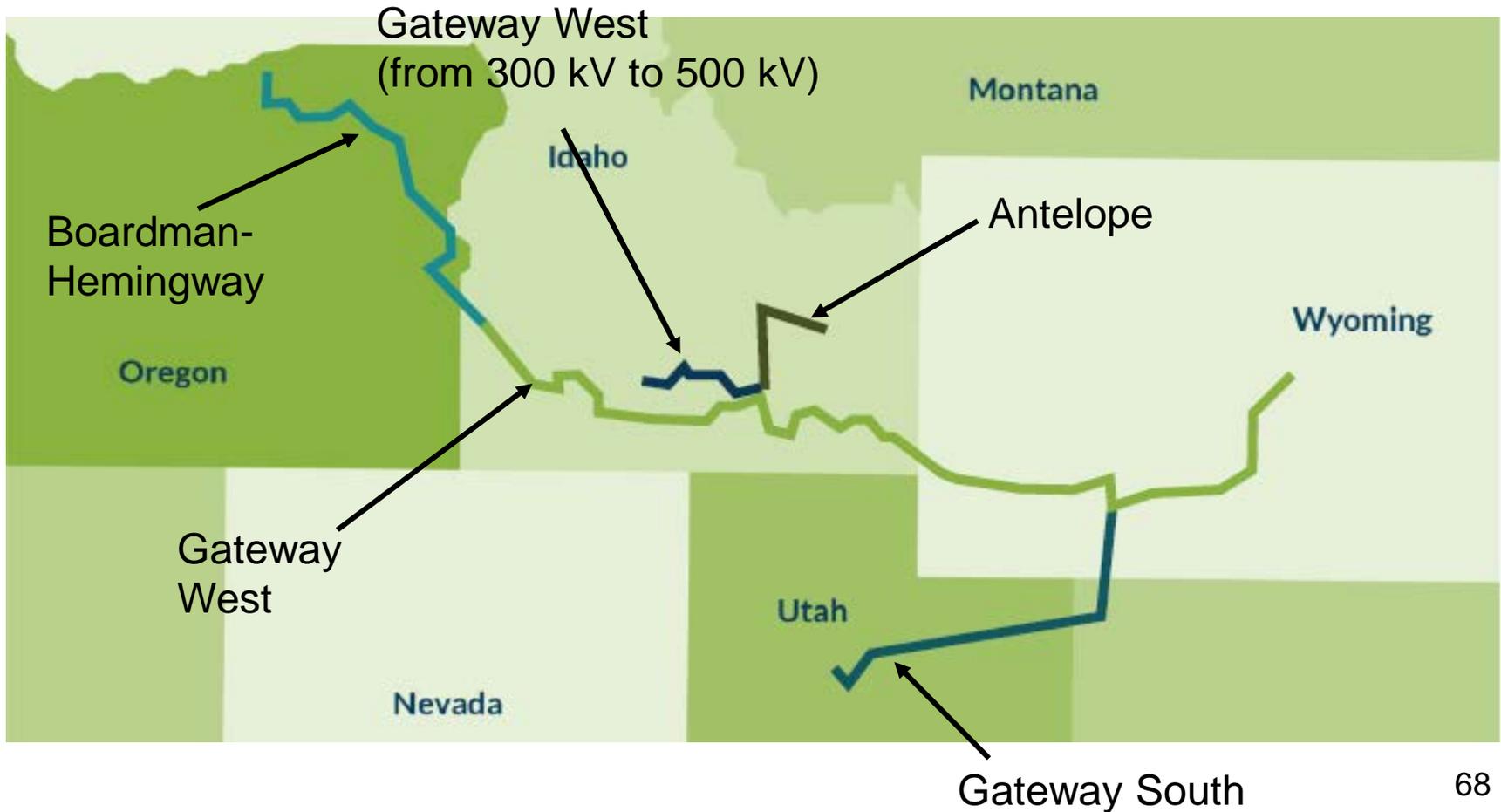


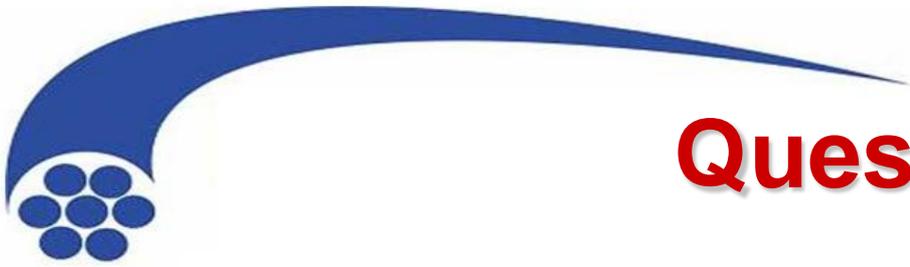
## Results (cont.)

- Initial RTP, change case 21 and change case 23 satisfy reliability criteria
- Further evaluation after the Q5 data submittal indicated that change case 23 is the configuration that meets the needs of the NTTG footprint as well as being the most cost effective



# Projects Selected into NTTG's Regional Transmission Plan





# Questions



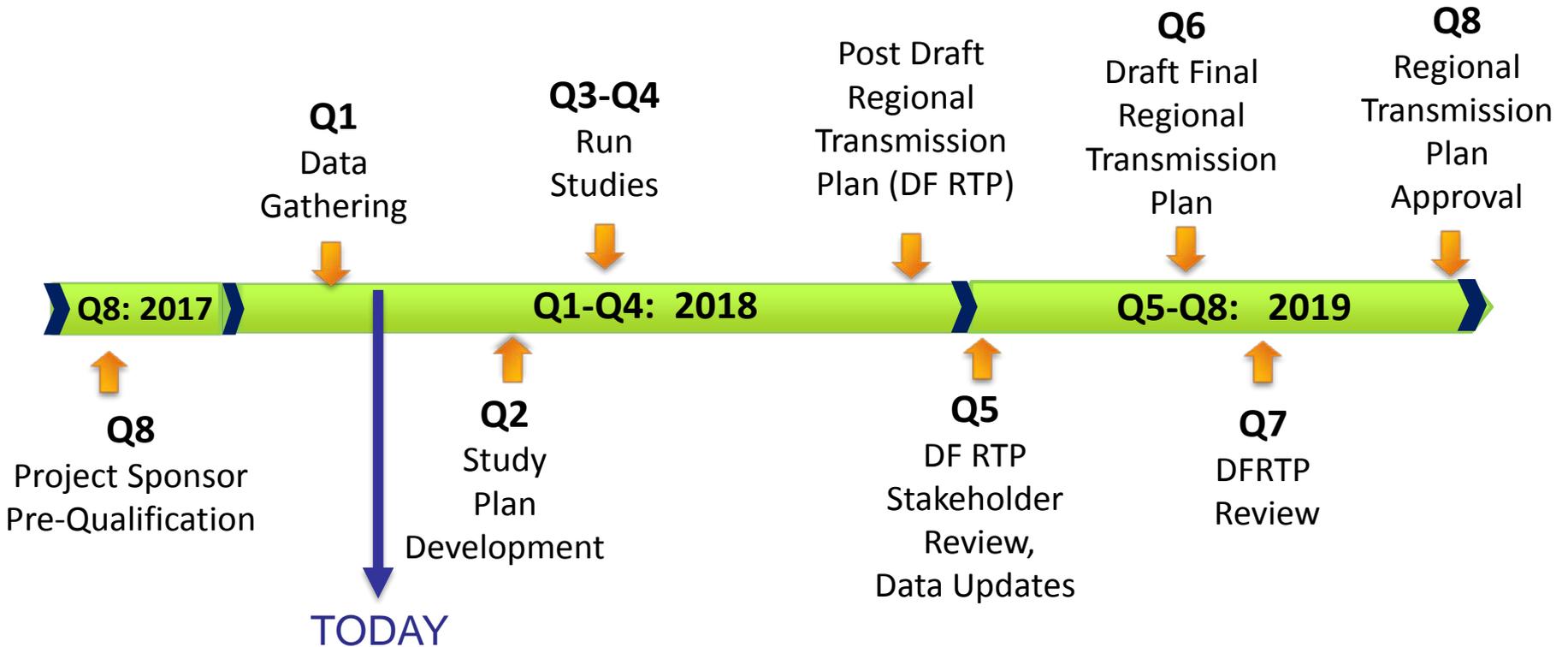


# **NTTG 2018-2019 Planning Activities**

Presented by  
Sharon Helms, NTTG Program Manager



# 2018-2019 Process Timeline





# Key 2018 Planning Milestones

Milestone	Key Dates
<b>Q1 Data Submittal Window Closes</b> <ul style="list-style-type: none"> <li>• Projects, NTA's and ITP's</li> <li>• Local TP Plans/Needs</li> <li>• Public Policy Consideration Studies</li> <li>• Economic Congestion Studies</li> </ul> <ul style="list-style-type: none"> <li>• Stakeholder Meeting – Portland, Oregon</li> </ul>	<b>March 31, 2018</b>          April 26, 2018
2018-19 Study Plan Posted for Stakeholder Comment <ul style="list-style-type: none"> <li>• Stakeholder Meeting – Boise, Idaho</li> </ul>	May, 2018   June 21, 2018
<b>2018-19 Study Plan Approval</b>	<b>July 10, 2018</b>
Q3-Q4 Reliability and Economic Analysis <ul style="list-style-type: none"> <li>• Stakeholder Meeting – Bozeman, Montana</li> <li>• Stakeholder Meeting – SLC, Utah</li> </ul>	September 27, 2018 December 13, 2018
<b>2018-19 Draft Regional Transmission Plan Posted</b>	<b>December 31, 2018</b>



# **WestConnect 2018 Annual Interregional Information**

Annual Interregional Coordination Meeting  
February 22, 2018

The background of the slide features a stylized landscape. In the foreground, there are dark blue silhouettes of mountains. In the middle ground, a tall, lattice-structured power transmission tower stands prominently. The sky is a gradient of orange and yellow, suggesting a sunset or sunrise, with a large, bright yellow sun partially visible on the right side.

# Topics

- WestConnect Regional Planning Overview
- 2016-17 Regional Transmission Plan
- 2018-19 Regional Planning Cycle Overview and Draft Study Plan
- Interregional Transmission Project Submittals
- Upcoming Meetings

The background of the slide features a stylized landscape. In the foreground, there are dark blue, layered mountain ranges. In the middle ground, a tall, black lattice power line tower stands prominently, with power lines extending across the sky. The background is a warm orange and yellow gradient, suggesting a sunset or sunrise, with a large, bright yellow sun partially obscured by the mountains on the right side.

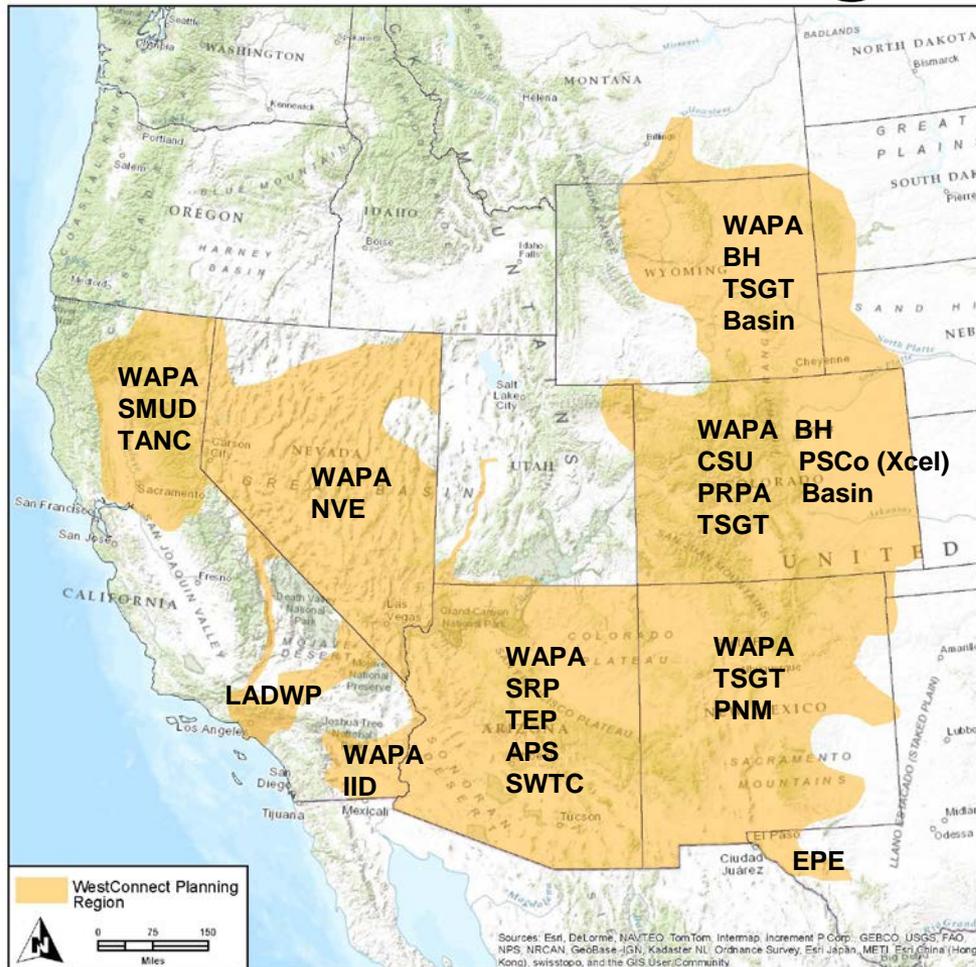
# **WestConnect Regional Planning Overview**

Charlie Reinhold,  
WestConnect Project Manager

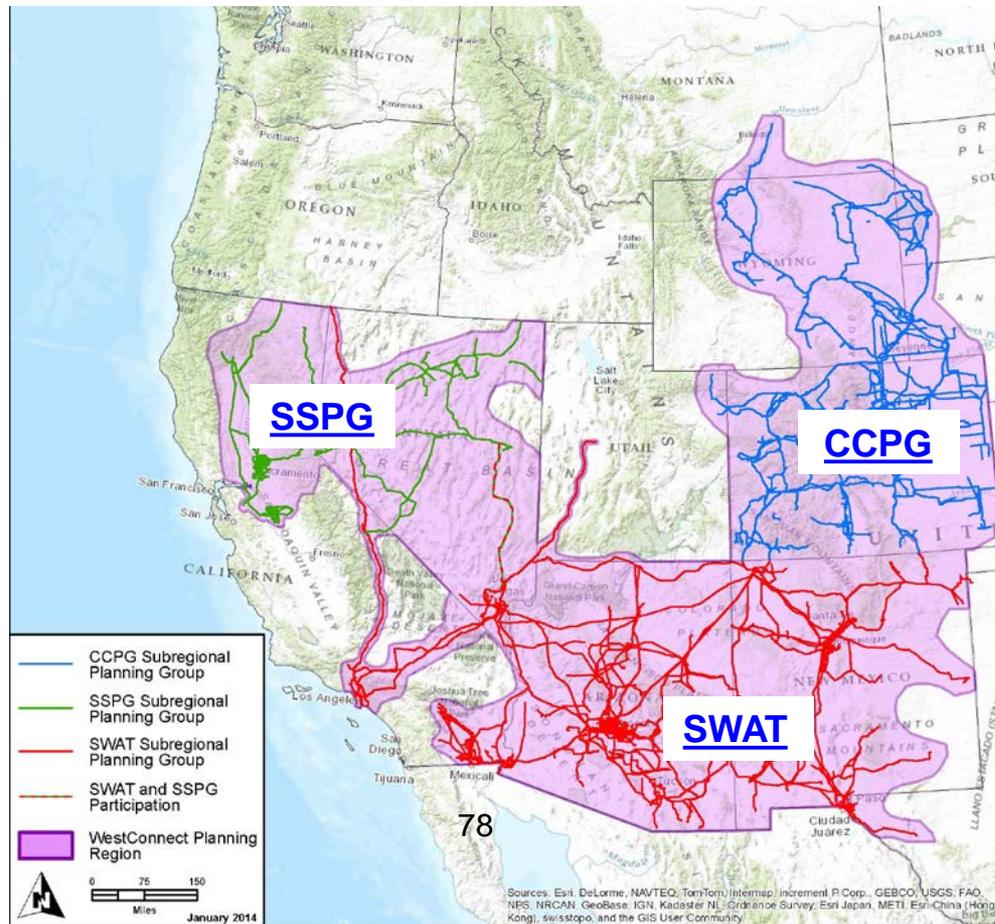
# Regulatory Update

- Regional Compliance Filings
  - All tariff revisions related to the regional planning requirements of Order 1000 were fully accepted by FERC on January 21, 2016
  - On August 8, 2016 the 5<sup>th</sup> Circuit Court of Appeals vacated FERC's compliance orders related to mandates regarding the role of the non-jurisdictional utilities in cost allocation
    - On [November 16, 2017](#) FERC upheld its previously compliance orders and provided further explanation as to why its mandates will ensure just and reasonable rates between public and non-public utility transmission providers in the WestConnect region
    - Numerous requests for review have been filed with FERC

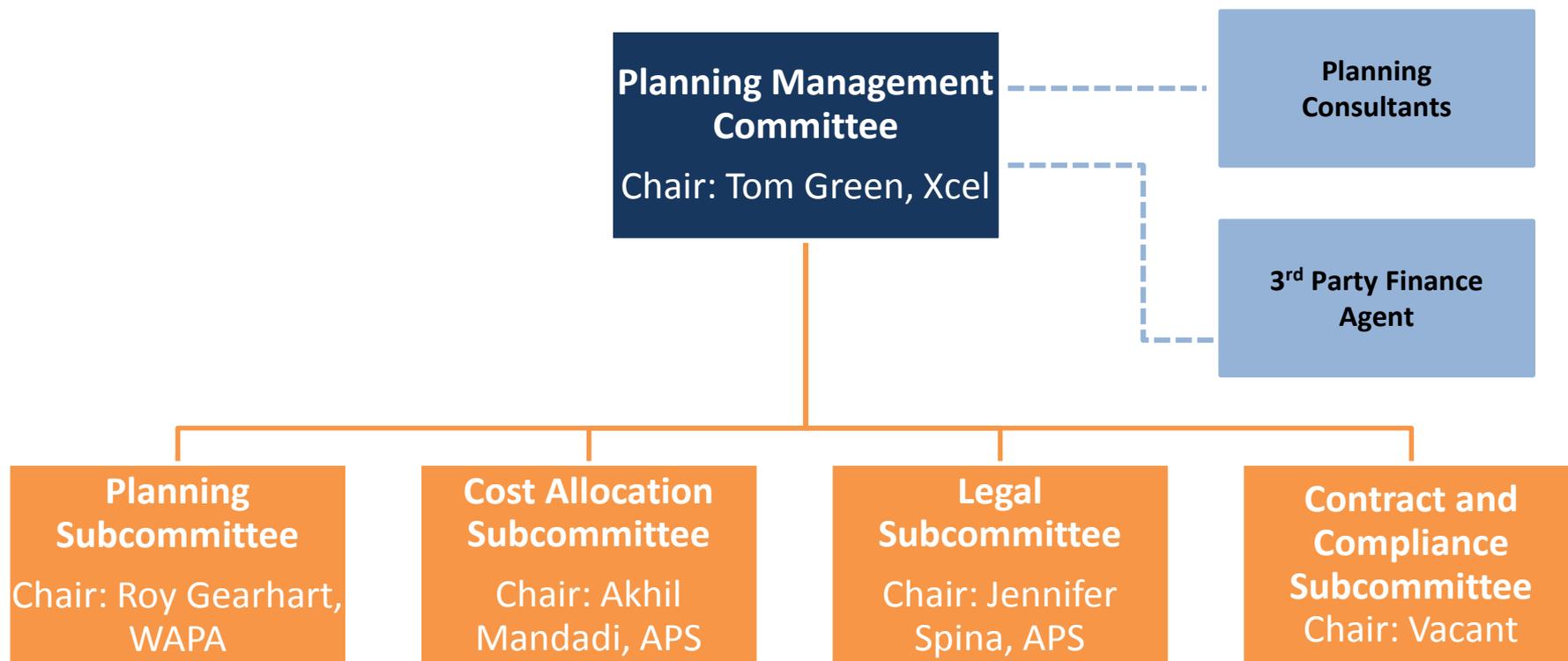
# WestConnect Planning Region



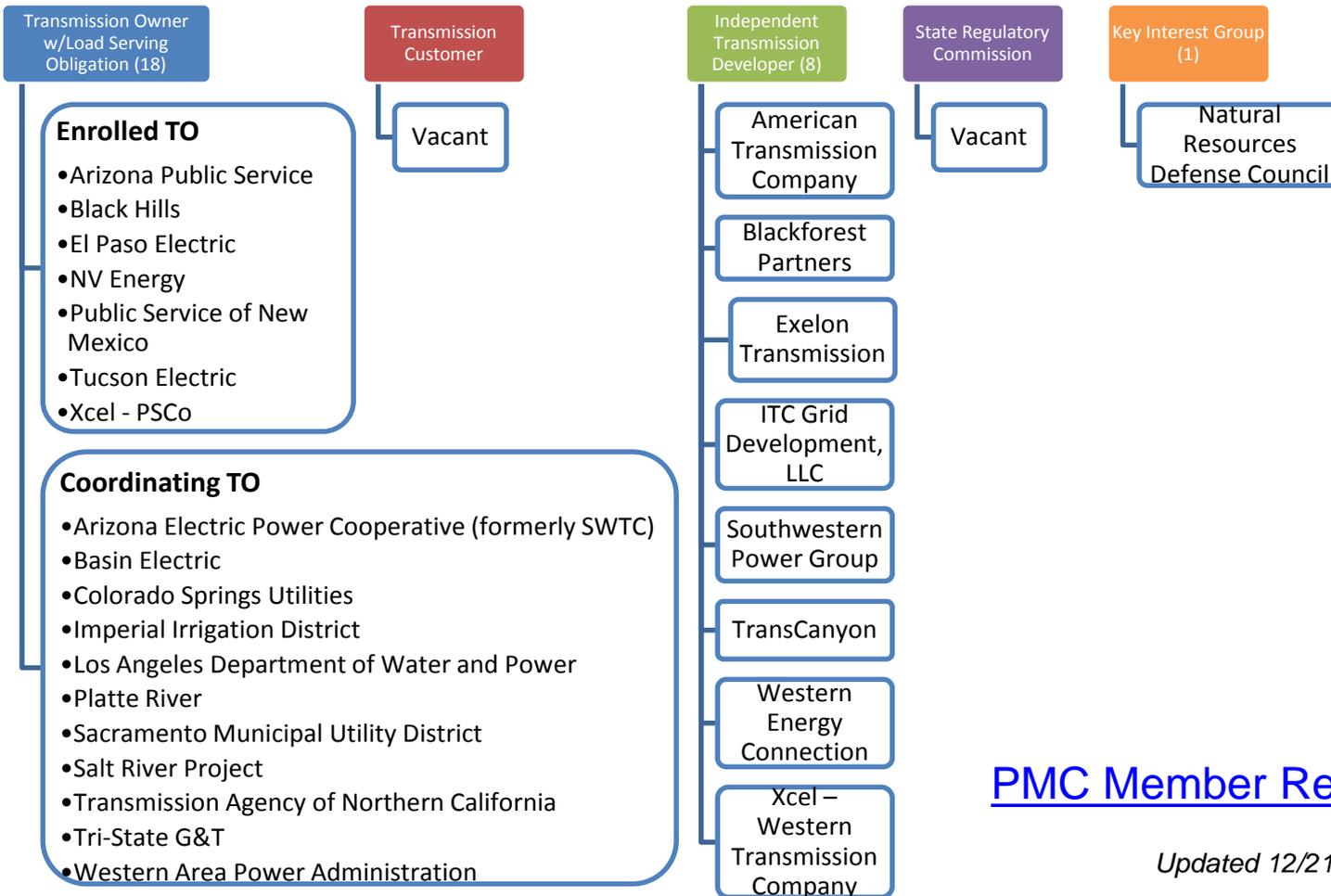
# WestConnect Subregional Planning Groups



# PMC Organization



# PMC Membership as of 12/21/2016



[PMC Member Reps](#)

## PMC Activities

- Monthly in-person meetings (2<sup>nd</sup> Wednesday) held at rotating member facilities
  - Meeting information can be accessed via the [WestConnect calendar](#)
- Manages the Regional Transmission Planning Process
- Currently focused on developing the study plan for the 2018-19 regional planning cycle

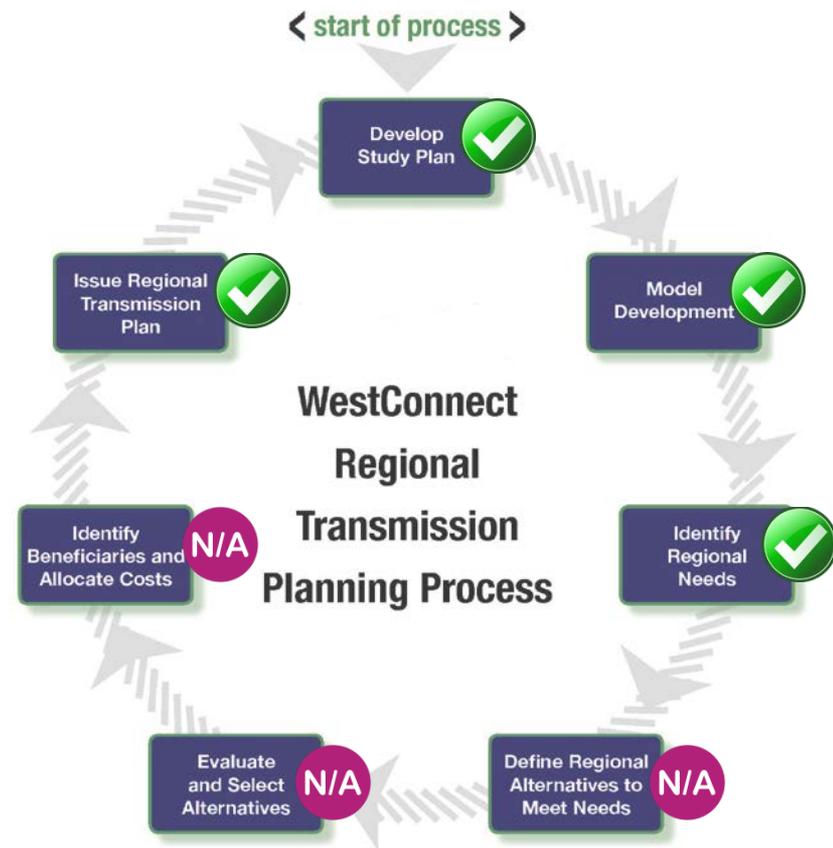


# 2016-2017 Regional Transmission Plan

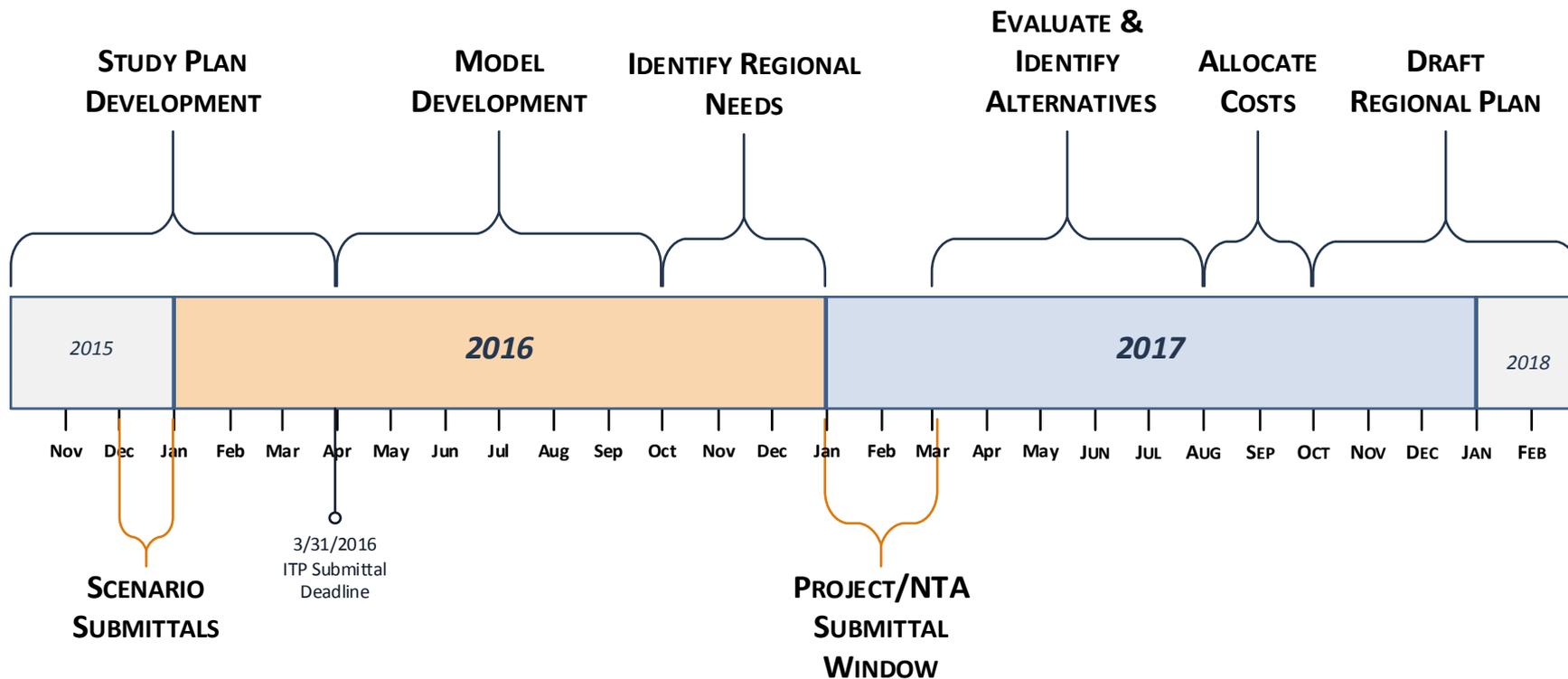
Tom Green, Planning Management Committee Chair,  
Xcel Energy

# 2016-17 Regional Process Overview

- First full biennial Order 1000 regional planning process for WestConnect
- 2016-17 Key Findings
  - Based on studies conducted in needs assessment, no regional transmission needs identified in 2016-17
  - PMC elected not to have project solicitation window based on this finding
  - [Link](#) to 2016-17 Regional Plan report



# 2016-17 Planning Cycle Schedule



**Reliability Model Case Summary**

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



<b>Economic Model Case Summary</b>			
	<b>Case Name</b>	<b>Case ID</b>	<b>Case Description and Scope</b>
<b>Base Case</b>	<b>2026 Base Case</b>	WC26-PCM	Business-as-usual case based on WECC 2026 Common Case with additional regional updates from PMC members.
<b>Scenario Cases</b>	<b>High Renewables</b>	WC26-PCM-HR	California 50% RPS with regional resources (Wyoming wind and New Mexico wind) <i>and</i> increase WestConnect state RPS requirement beyond enacted with other resources
	<b>CPP – WestConnect Utility Plans</b>	WC26-PCM-CPP1	Reflect individual WestConnect member utility plans for CPP compliance
	<b>CPP – Market-based Compliance</b>	WC26-PCM-CPP2	Model CO <sub>2</sub> price in WestConnect to achieve mass-based regional CPP compliance
	<b>CPP – Heavy RE/EE Build Out</b>	WC26-PCM-CPP3	Additional coal retirements, additional RE/EE, minimal new natural gas generation

# “Base” Cases

## Reliability Cases

- **Peak Summer**

- Based on WECC 2026 Heavy Summer 1 Base Case

- **Light Spring**

- Based on WECC 2026 Light Spring Base Case
- Low Load / High Renewable

## Economic Case

- Updated WECC 2026 Common Case

## 2016-17 Regional Needs Assessment

- Local versus Regional transmission issues
  - Regional needs impact more than one TOLSO
- Regional Reliability Assessment
  - NERC TPL-001-4 Table 1 (P0 and P1) and TPL-001-WECC-CRT-3
- Regional Economic Assessment
  - Reviewing modeling for congestion (hours and cost)
- Regional Public Policy Assessment
  - Enacted public policies are represented in regional base models
  - Proposed public policies considered as a part of planning process

## 2016-17 Regional Needs Assessment (cont.)

- Based on the Base Case scenarios performed as a part of the WestConnect 2016-17 Regional Planning Process there were:
  - *No regional reliability needs identified;*
  - *No regional economic needs identified; and*
  - *No regional public policy needs identified.*
- Because there were no regional needs identified, in 2017 there was no:
  - *Evaluation and selection of project solutions to meet regional needs (including interregional transmission projects);*
  - *Cost allocation evaluation and identification; and*
  - *Project developer selection.*

## High-level Summary of Scenario Cases

Scenario Name	Description	Key Assumptions (changes to Base)	Study Scope
<b>Regional Renewables (RR)</b>	50% <u>increase</u> to enacted WestConnect-state RPS with required resources added locally to TOs. 4,000 MW of resources added in Wyoming and New Mexico for CA 50% RPS purposes.	<ul style="list-style-type: none"> <li>• 3,651 MW of wind in WestConnect</li> <li>• 7,166 MW of solar in WestConnect</li> <li>• 396 MW of geothermal in WestConnect</li> <li>• 4,000 MW of wind in WY/NM for CA</li> </ul>	<i>Economic assessment only</i>
<b>CPP – WestConnect Utility Plans (CPP1)</b>	Reflect individual WestConnect member utility plans for CPP compliance, including retirements and replacement assumptions. Represents compiled set of assumptions developed independently by TOs from IRPs or other planning initiatives.	<ul style="list-style-type: none"> <li>• 1,322 MW of coal retirements</li> <li>• 444 MW of gas retired (175 MW of repowering)</li> <li>• 1,127 MW of gas added</li> <li>• 595 MW of renewable energy</li> </ul>	<i>Economic and reliability assessment</i>
<b>CPP – Heavy RE Build Out (CPP3)</b>	Reflects more aggressive coal retirements than in CPP3, with replacement capacity from additional RE minimizing new natural gas generation (while meeting resource adequacy).	<ul style="list-style-type: none"> <li>• 4,188 MW of coal retirements</li> <li>• 444 MW of gas retired (175 MW of repowering)</li> <li>• 1,158 MW of gas added</li> <li>• 10,286 MW of additional renewable energy</li> </ul>	<i>Economic and reliability assessment</i>

# Scenario Findings

- RR
  - Major Impact on Regional Congestion and Inter-regional Paths
  - 3% of added renewable gen curtailed due to transmission constraints
  - No Unserved Load
  - Also Had Inter-regional Impacts
- CPP1
  - Minimal impact on regional and single-TO congestion
  - zero curtailment due to transmission
  - No Unserved Load
  - No Apparent Regional Economic Issues
- CPP3
  - Major Impact on Regional Congestion and Inter-regional Paths
  - 10% of the added renewable generation curtailed due to transmission
  - No unserved load
  - Some Inter-regional Impacts

## WestConnect (& WECC) Production Cost

Scope	<i>Total Production Cost (M\$) Across Cases</i>			
	<i>WC 26PCM-D8_170108</i>	<i>CPP1rev1</i>	<i>CPP3rev1</i>	<i>RR</i>
<b>System (WECC)</b>	\$19,532	\$19,561	\$18,945	\$17,991
	Δ from Base	\$29 0.15%	(\$587) -3%	(\$1,541) -8%
<b>WestConnect Generation Shares</b>	\$6,520	\$6,405	\$5,944	\$5,831
	Δ from Base	(\$115) -2%	(\$577) -9%	(\$689) -11%

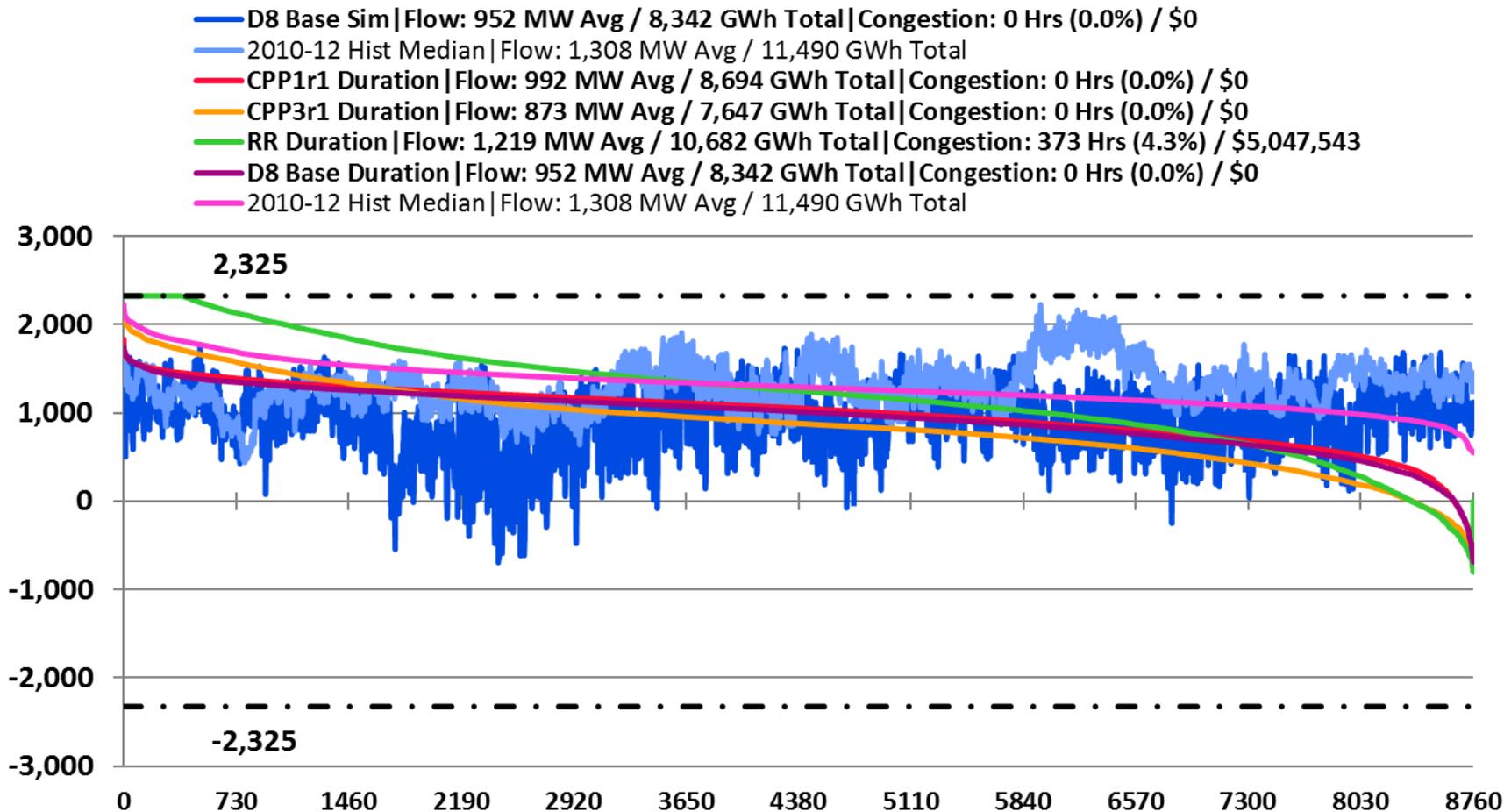
- Production cost of WestConnect generators reduced in all scenarios. Modeled RE additions have zero operation costs whereas the gas & coal they replaced had operating costs, mostly fuel costs.
- CPP1 reduced WestConnect cost yet slightly increased WECC cost
- RR case has lowest production cost because of renewables offsetting thermal generation

## WestConnect (& WECC) CO<sub>2</sub> Emissions

Scope	<i>CO2 Emissions (Short Ton) Across Cases</i>			
	<i>WC 26PCM-D8_170108</i>	<i>CPP1rev1</i>	<i>CPP3rev1</i>	<i>RR</i>
<b>System (WECC)</b>	342,423,714	337,084,544	311,636,370	318,163,454
	Δ from Base	(5,339,170)	(30,787,344)	(24,260,260)
		-2%	-9%	-7%
<b>WestConnect Generation Shares</b>	142,240,853	136,605,743	115,772,953	128,575,232
	Δ from Base	(5,635,109)	(26,467,900)	(13,665,620)
		-4%	-19%	-10%

- From a regional perspective, a bold set of coal retirements (>4 GW) plus additional renewables (CPP3) is more effective at reducing WestConnect CO<sub>2</sub> emissions than a major buildout of renewables on its own (RR)

## P22 Southwest of Four Corners [E→W]



- Base: Flow going SW out of Four Corners into Arizona system decreased 350 aMW from historical averages (driven by Four Corners retirements)
- CPP1: Similar to Base Case, Cholla retirement had little effect
- CPP3: More volatile flows (higher highs, lower lows) than Base & CPP1, likely due to the added variable resources
- RR: Significant congestion out of Four Corners (4%, \$5M)

Congestion Across All Cases (Branches & Paths)			Total Congestion Hours (% Hrs) / Cost (\$)			
Scope	Owner(s)	Branch/Path Name	WC 26PCM-D8_170108	CPP1rev1	CPP3rev1	RR
Multi-TO	PSCO TSGT	BOONE_230.0 - LAMAR_CO_230.0	-	-	3,625 (41%) / \$61,160K	2,290 (26%) / \$29,193K
	PSCO TSGT	SANLSVLY_230.0 - PONCHABR_230.0	-	-	2,311 (26%) / \$20,127K	2,311 (26%) / \$18,019K
	PSCO TSGT	BOONE_230.0 - MIDWAYPS_230.0	-	-	-	131 (1%) / \$1,522K
	PSCO WAPA-RM	MIDWAYPS_230.0 - MIDWAYBR_230.0	-	-	-	19 (0%) / \$123K
WECC Path		P24 PG&E-Sierra	493 (6%) / \$1,286K	511 (6%) / \$1,217K	896 (10%) / \$2,170K	554 (6%) / \$1,323K
		P66 COI	4 (0%) / \$58K	5 (0%) / \$46K	9 (0%) / \$89K	35 (0%) / \$514K
	PNM	P48 Northern New Mexico (NM2)	3 (0%) / \$3K	4 (0%) / \$13K	-	1 (0%) / \$5K
		P61 Lugo-Victorville 500 kV Line	1 (0%) / \$1K	-	1 (0%) / \$2K	99 (1%) / \$747K
		P52 Silver Peak-Control 55 kV	2 (0%) / \$0K	2 (0%) / \$0K	34 (0%) / \$5K	995 (11%) / \$154K
		P41 Sylmar to SCE	2 (0%) / \$0K	1 (0%) / \$1K	1 (0%) / \$1K	-
		P32 Pavant-Gonder InterMtn-Gonder 230 kV	-	1 (0%) / \$8K	127 (1%) / \$793K	223 (3%) / \$1,114K
	PNM EPE	P47 Southern New Mexico (NM1)	-	1 (0%) / \$0K	-	-
		P36 TOT 3	-	-	4 (0%) / \$23K	132 (2%) / \$1,292K
		P22 Southwest of Four Corners	-	-	-	373 (4%) / \$5,048K
	P30 TOT 1A	-	-	-	9 (0%) / \$15K	
Single TO	APS	TRYCLUB_230.0 - LINCSTRT_230.0	145 (2%) / \$1,705K	161 (2%) / \$2,035K	227 (3%) / \$2,638K	98 (1%) / \$975K
	LADWP	TARZANA_230.0 - OLYMPC_230.0	18 (0%) / \$1,327K	14 (0%) / \$1,043K	19 (0%) / \$1,864K	23 (0%) / \$1,787K
	NEVP	HIL TOP - HIL TOP	144 (2%) / \$492K	219 (3%) / \$798K	115 (1%) / \$423K	110 (1%) / \$336K
	LADWP	RINALDI_230.0 - AIRWAY_230.0	2 (0%) / \$118K	4 (0%) / \$183K	3 (0%) / \$74K	5 (0%) / \$235K
	PSCO	LEETSDAL_230.0 - MONROEPS_230.0	2 (0%) / \$16K	-	366 (4%) / \$2,801K	600 (7%) / \$4,942K
	NEVP	CLARK 6 - CLARK	1 (0%) / \$2K	1 (0%) / \$2K	20 (0%) / \$109K	8 (0%) / \$14K
	PSCO	GREENWD_230.0 - MONACO12_230.0	1 (0%) / \$0K	3 (0%) / \$29K	189 (2%) / \$2,731K	482 (6%) / \$6,545K
	APS	MEADOWBK_230.0 - SUNYSLOP_230.0	-	1 (0%) / \$8K	2 (0%) / \$16K	-
	WAPA-SN	TRCY PMP_230.0 - HURLEY S_230.0	-	-	10 (0%) / \$1,479K	-
	NEVP	FRONTIER_230.0 - MACHACEK_230.0	-	-	17 (0%) / \$74K	776 (9%) / \$5,218K
	NEVP	FT CHUR - FT CH PS	-	-	18 (0%) / \$61K	110 (1%) / \$298K
	WAPA-RM	SANJN PS - WATRFLW	-	-	8 (0%) / \$43K	-
	PSCO	STORY_230.0 - PAWNEE_230.0	-	-	5 (0%) / \$22K	-
	NEVP	FAULKNER - FAULKNER	-	-	1 (0%) / \$12K	-
	NEVP	GONDER_230.0 - MACHACEK_230.0	-	-	3 (0%) / \$9K	197 (2%) / \$717K
	WAPA-RM	ARCHER_230.0 - TERRY_RANCH_230.0	-	-	-	179 (2%) / \$2,360K
	PSCO	BOONE - BOONE	-	-	-	140 (2%) / \$1,065K

**Total Congestion Cost:**

**\$5,008K**

**\$5,383K**

**\$96,725K**

**\$84,700K**

**Negligible regional congestion in Base Case & CPP1 study**

**CPP3 & RR studies shows potential for regional congestion**

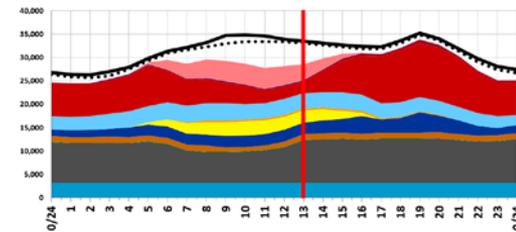
*\*Phase shifting transformers (PST) removed*

# Scenario Reliability Study Method

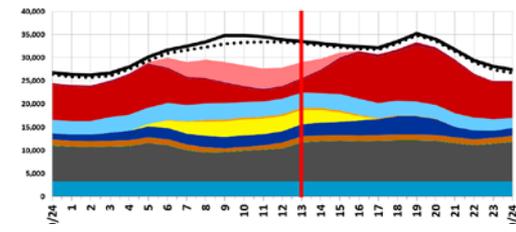
- Production cost modeling used to identify what stressed dispatch might look like under scenario futures
- Condition at 1pm on April 15<sup>th</sup> was selected and dispatch/flow assumptions were transferred to the reliability model for study
  - Did this for entire WECC system
- Reliability assessment scope included steady-state contingency analysis but focused on transient stability analysis to assess frequency response of system under major disturbances
  - The goal was to identify occurrences of under frequency load shedding (UFLS), system frequency losing stability (e.g., undamped oscillations), and system instability (e.g., cascading trips)

**Studied stressed hour with low thermal headroom, high renewable dispatch, and lower loads**

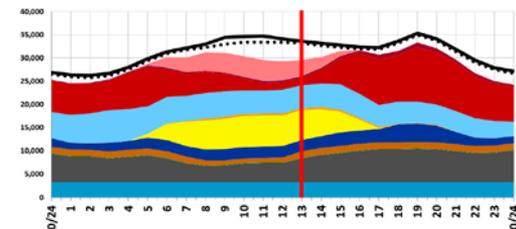
**Base Case**  
Renewables: 29% load  
Load: 33.5 GW  
Headroom: 3 GW



**Utility Plans Scenario**  
Renewables: 30% load  
Load: 33.5 GW  
Headroom: 3.1 GW



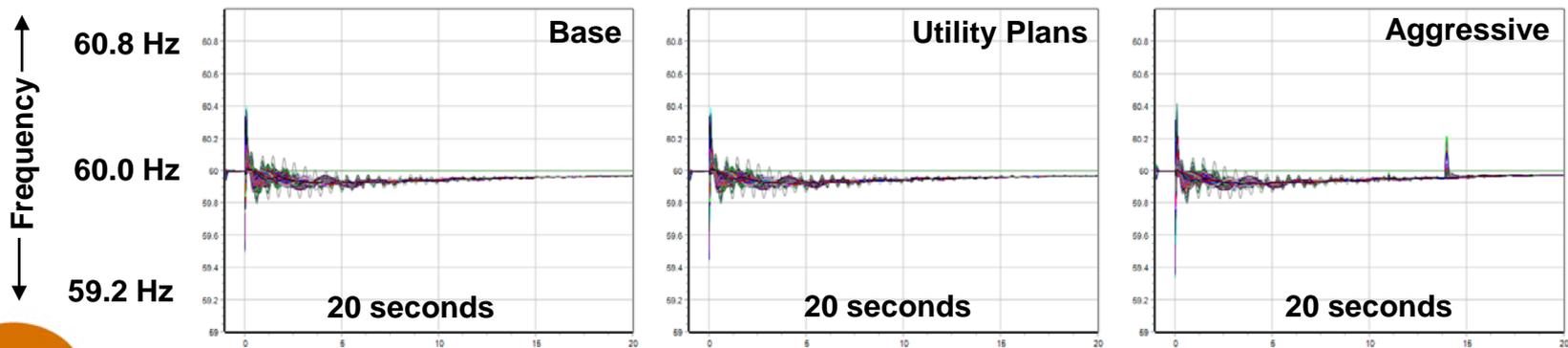
**Aggressive Scenario**  
Renewables: 45% load  
Load: 33.5 GW  
Headroom: 4.5 GW



April 15<sup>th</sup>

# Scenario Reliability Study Results

- **Key qualifications:** Operating reserves, reliance on neighboring systems, no mitigations studied, no local system analysis
- **Steady-state analysis:** Ability of system to maintain extended safe operation post-contingency
  - No regionally significant overloads or voltage issues were identified through contingency analysis
  - Several *single-system* issues were identified but were not addressed consistent with the study scope
- **Transient stability/frequency response analysis:** Ability to maintain synchronism following disturbance
  - Studied robust set of regionally-significant contingencies provided by members, including major generator trips, line trips, faults, stuck breakers, etc.
  - Results of scenarios were compared to base case to track relative performance – focus on first 30 seconds
  - System achieved stable frequency recovery within 20 seconds under all scenarios for condition studied, which is within WECC criterion



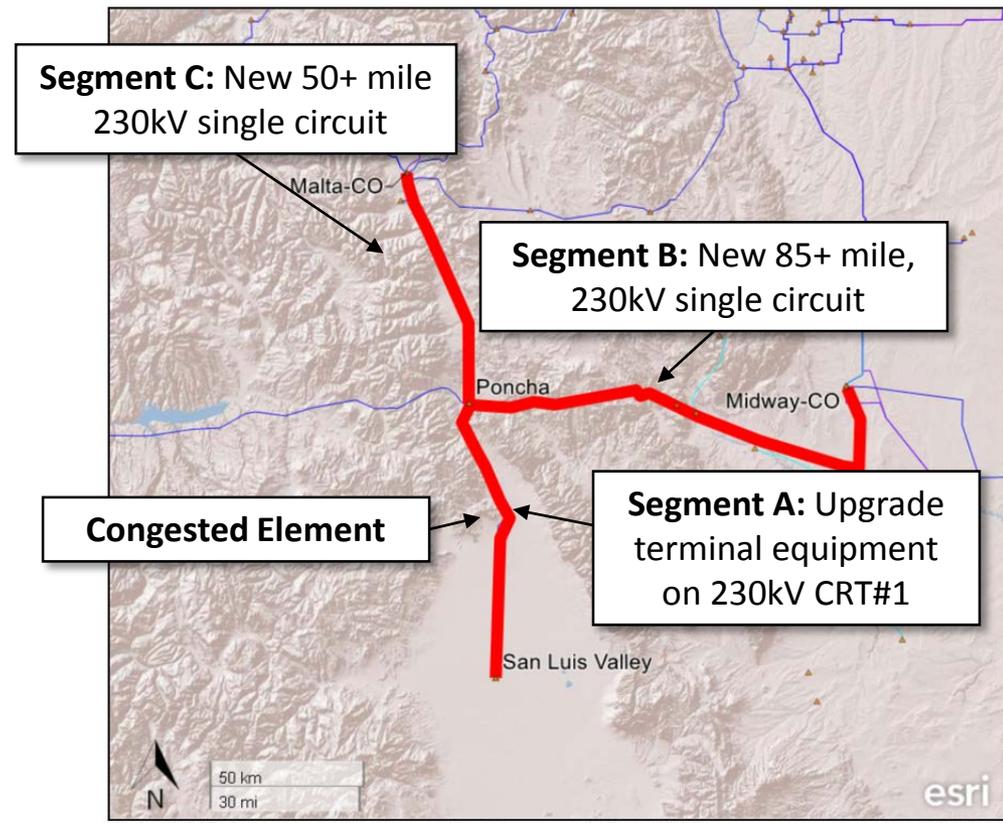
# “Opportunity” Investigation

- PMC agreed to explore scenario congestion
  - Limited Scope for a Single Example
- Not a perfect example, due to radial nature of the congested line
  - Ideally would also address “Deliverability”
- Investigation evaluated three alternatives
- Numerous assumptions required
  - some of these discussed and supported by the WC
  - others have not been contemplated.
- **Scope:**
  - 1. Confirm alternatives mitigates regional opportunity and do not cause additional regional issues**
  - 2. Evaluate Alternatives for Cost Effectiveness**
  - 3. Cost Allocation**

# Opportunity Alternatives

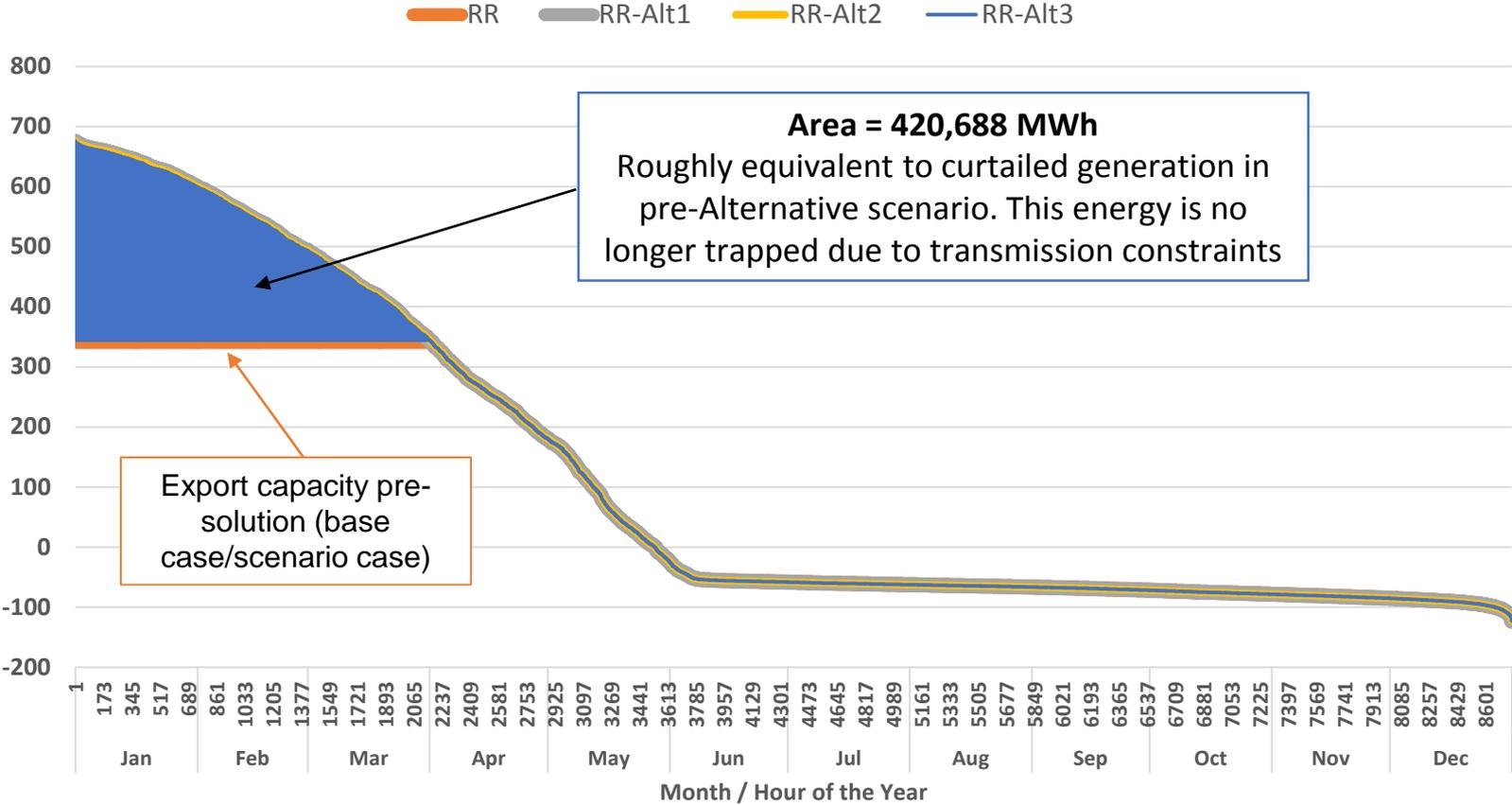
- **Base Case**
- **Alt 1: Build Segment B** is a new 230 kV
- **Alt 2: Build Segment C** is a new 230 kV
- **Alt 3: Energy storage**

Project Alternative	Description
Alt 1	Upgrade A + New Build B
Alt 2	Upgrade A + New Build C
Alt 3	Upgrade A + 250 MW Battery Storage at Poncha

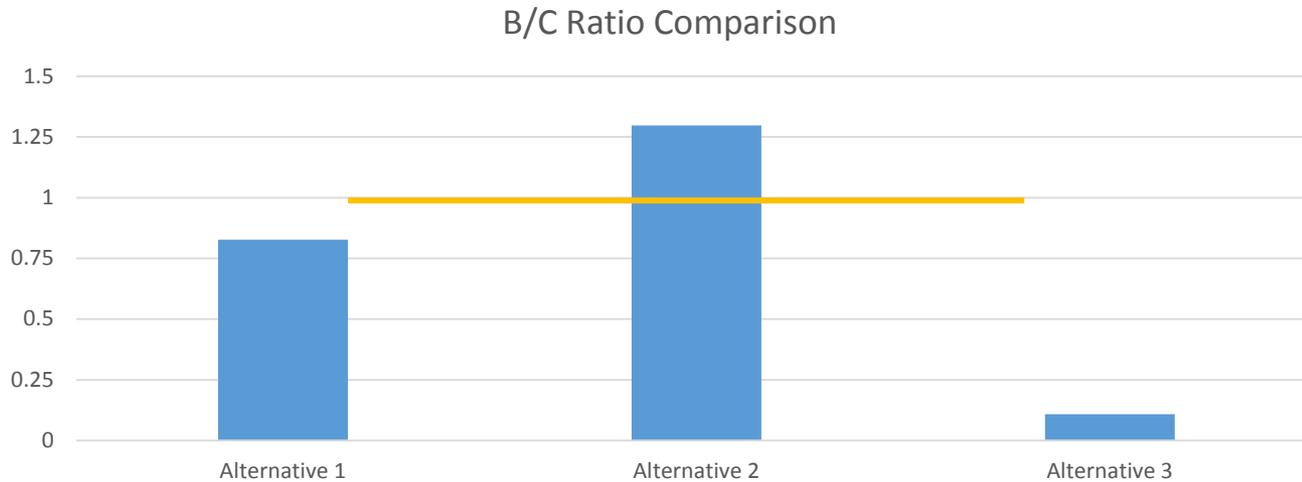
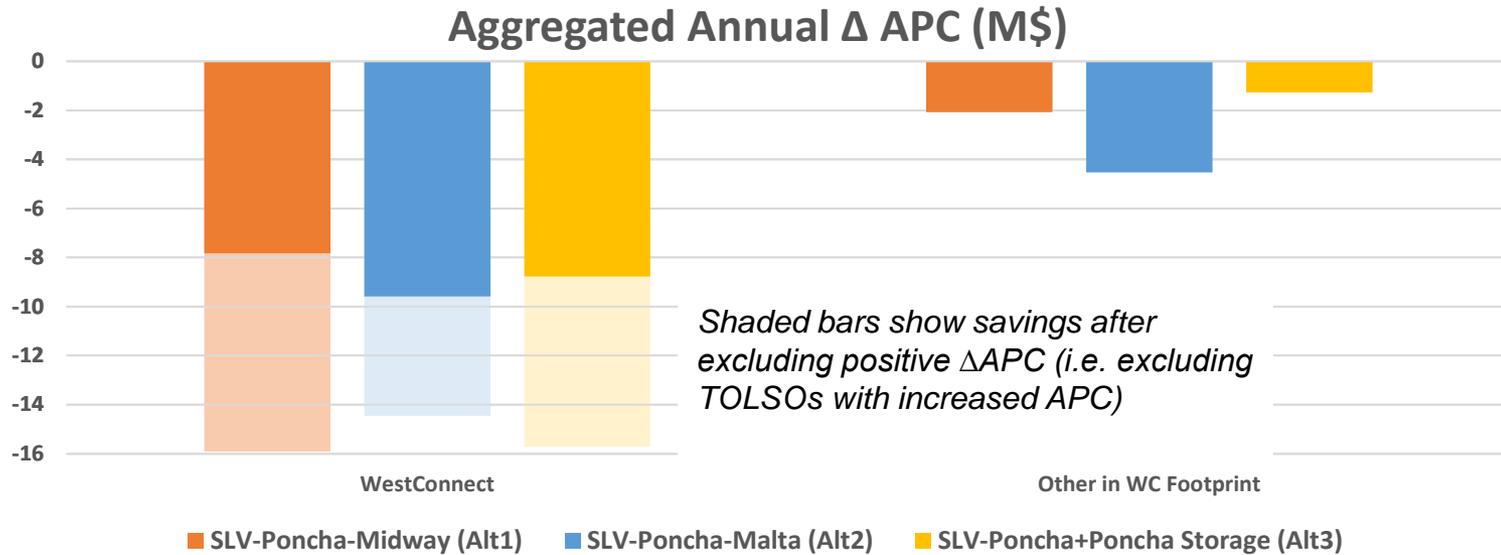


# All alternatives allowed for increased Flow

Duration Curves (Sorted High-to-Low) of Flow (MW)



# Economic Benefit & B/C Ratio



# Regional Plan Report Outline

- 1 Summary and Introduction
- 2 Study Plan
- 3 Model Development
- 4 Regional Transmission Needs Assessment
- 5 Scenario (Opportunity) Assessment
- 6 Stakeholder Involvement and Interregional Coordination
- 7 Regional Plan Conclusions

Appendix A – Information Confidentiality

Appendix B – Base Transmission Plan Process

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

Appendix D – WestConnect Regional Project Submittal Form

Appendix E – WestConnect Scenario Submittal Form

Appendix F – 2026 Base Case (PCM) Assumptions

Appendix G – Results of Reliability Need Assessment

Appendix H – Results of Economic Need Assessment

Appendix I – Scenario Resource Assumptions

Appendix J – Results of Reliability Scenario Assessment

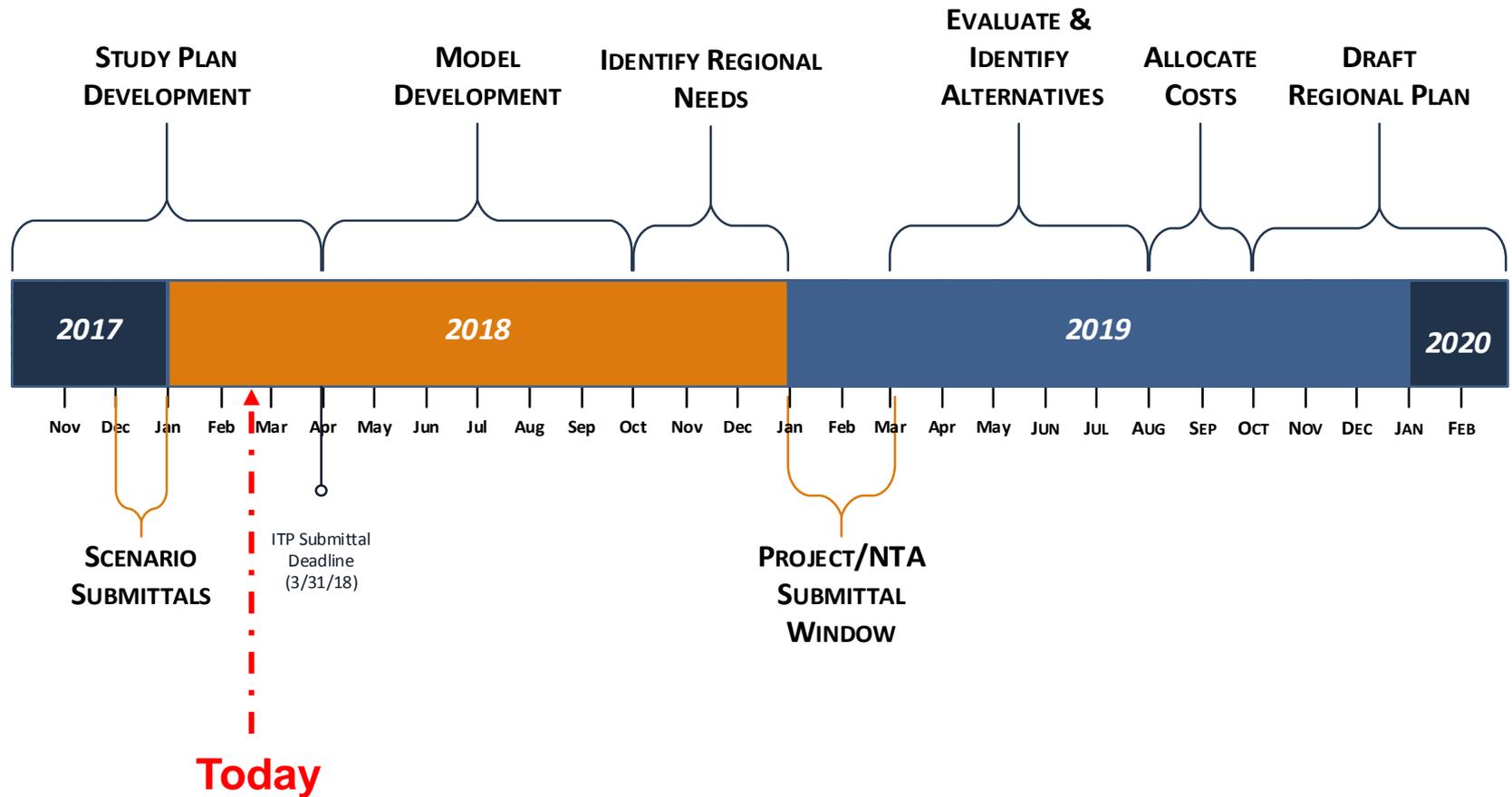


# **2018-2019 Regional Planning Cycle Overview and Draft Study Plan**

Keegan Moyer, WestConnect Planning Consultant,  
Energy Strategies

Roy Gearhart, Planning Subcommittee Chair, WAPA

# 2018-19 Process Timeline



The background of the slide is a stylized illustration. It shows a sunset with a large, bright yellow sun partially obscured by dark blue mountain ranges. A power line tower stands in the foreground, with power lines stretching across the sky.

## 2018-19 Study Plan Overview

- Study Plan identifies the scope and schedule of the study work to be performed during the planning cycle
- The subsequent slides review:
  - Base Transmission Plan
  - Regional Need Assessments (including key models)
  - Scenario Studies
  - Opportunities for participation and next steps
- Note that the Study Plan does not explain every aspect of the process and the [BPM](#) should be consulted for details not provided (especially when referenced)



# 2018-19 Base Transmission Plan

# Base Transmission Plan

- Base Transmission Plan: transmission network topology that is to be reflected in each of the regional planning models.
  - Base Transmission Plan = **Planned TO Projects** + **High probability ITD Projects**
- Based on project information gathered in WestConnect's Transmission Plan Project List for 2018-19 cycle
- Will document Base Transmission Plan in 2018-19 Study Plan (which will be approved by PMC), and **ensure this transmission is included in base models**
- Based on member feedback from survey, plan is to provide more details about what the 2018-19 Base Transmission Plan represents, and how it is different than the 2016-17 Base Transmission Plan
- The Base Transmission plan is current in draft form and will not be finalized until the Study Plan is approved
- The Model Development Report will include a summary as to how this Base Transmission Plan has changed relative to the 2016-17 Base Plan

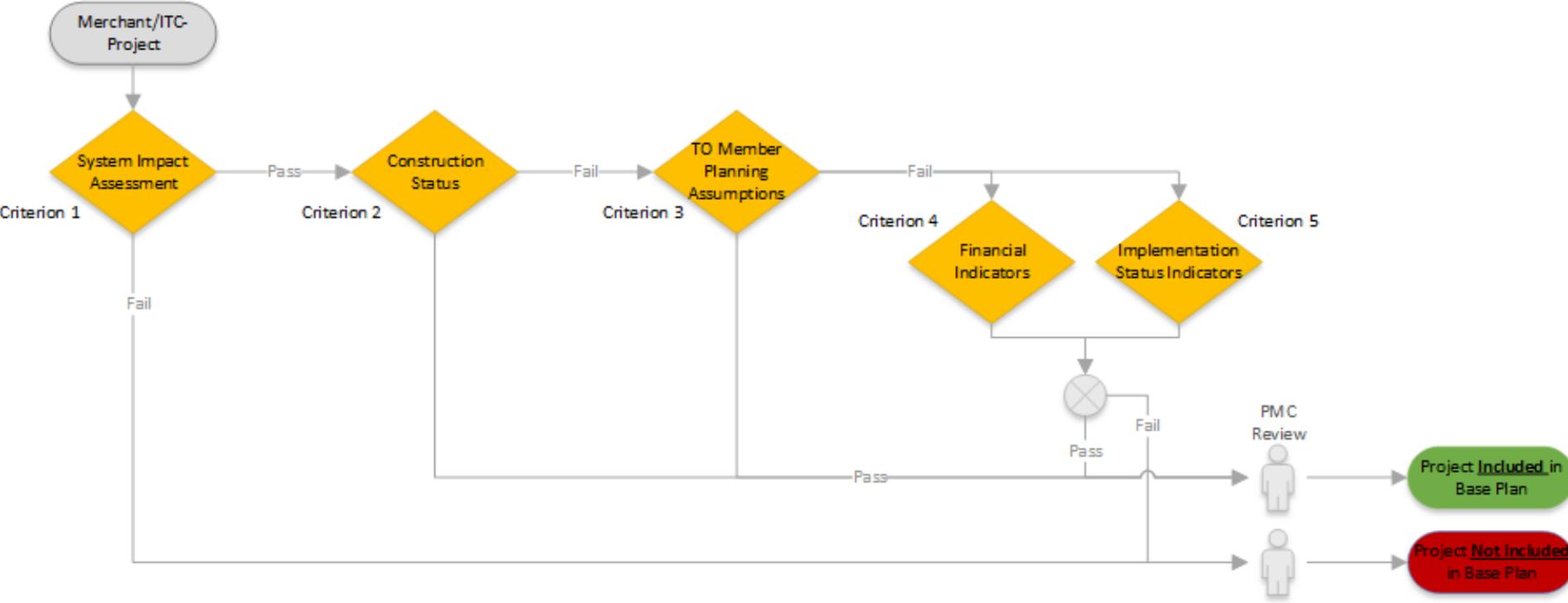
# Planned TO Projects

- Criteria from last study plan and BPM:
  - All TO projects designated with a “planned” project status are included in the base transmission plan. As defined by WestConnect, planned facilities include projects that have a sponsor, have been incorporated in an entity’s regulatory filings, have an agreement committing entities to participate and construct, or for which permitting has been or will be sought.

# “High Probability” Merchant/ITD Projects

- BPM lays out set of criteria to identify “high probability” ITD projects for inclusion in base transmission plan
  - Criteria uses information gathered in TPPL
- PS needs to compile initial list and include it in Study Plan for review and approval by PMC
- Inclusion means that WestConnect has high certainty that the project will be built
  - Would remove project for any evaluation against a regional need since it would be included in Base Transmission Plan

# Process for Including ITD Projects in Base Transmission Plan



The top portion of the slide features a landscape illustration. It shows a range of dark blue mountains under a bright orange and yellow sky. A large sun is visible on the right side, partially obscured by the mountains. A tall, dark silhouette of a power transmission tower stands in the center, with power lines extending across the sky.

# Regional Assessments

# Regional Needs Assessment Background

- The PMC will conduct assessments using models developed for year 2028
- Cases from WECC will be used as seed cases and they will include the systems of all WECC TOs.
  - Members will update the WECC models to ensure the WestConnect footprint is properly represented.
- The PMC will not evaluate regional transmission needs for systems outside of the WestConnect planning region
- Local vs. regional transmission issues
- After the regional transmission assessments, the Planning Subcommittee (PS) will identify a list of transmission issues resulting from the studies and make a recommendation to the PMC as to which, if any, regional issues should constitute economic, reliability, or public policy transmission needs.
  - Includes development of a Regional Transmission Needs Assessment Report (which will allow for stakeholder comment and input)
- This report will be delivered to the PMC for review and approval, and it will contain the PS's recommendation on regional transmission needs for the study cycle. The regional transmission needs will be finalized pending the PMC's approval of the report.

# Reliability Assessment

- Conducted to ensure the WestConnect planning region as a whole is in compliance with applicable North American Electric Reliability Corporation (NERC) standards and WECC regional criteria for the 2028 planning horizon.
- Assessment will include steady state contingency analysis and transient stability analysis.
- Transmission elements of 100 kV and above will be monitored for performance along with any Member specified lower voltage Bulk Electric System (BES) elements.

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

# Economic Assessment

- To create Base Case model, PS will initiate and coordinate a review of the data and assumptions contained within the WECC ADS dataset
- Assessment will include review of metrics such as congested hours and congestion cost for regional transmission elements greater than 100 kV and WECC transfer paths (or other defined interfaces in the WestConnect footprint) along with any Member specified lower voltage BES elements
- Regional transmission with significant congestion are identified and verified through Planning Subcommittee review, historical benchmarking, and follow-up study
- WestConnect will also conduct sensitivity studies on the 2028 Base Case

WestConnect Base Case Name	Case Description	WECC Seed Case
<b>2028 Base Case</b>	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

# Public Policy Assessment

- WestConnect begins evaluation by identifying a list of enacted public policies that impact local TO (see study plan)
- The regional base models will reflect the enacted public policies
- If the assessments identify regional issues that are related to enacted public policy these may constitute a public policy-driven transmission need
- There is also an opportunity to make suggestions as to whether a TO's policy-driven project may constitute a public policy-driven regional transmission need
  - Stakeholders are invited to make a recommendation to the Planning Subcommittee

# 2018-19 Scenario Considerations

## Scenario Status Summary

- Scenario requests were collected in December 2017
  - 8 Scenarios were submitted for 4 companies. These were reviewed and discussed by the PS.

Original Submission from Requestors

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

- The PS has recommended to include a list of three scenarios in the draft 2018-19 study plan, motivated by concepts of increased RPS, lower carbon, and high CAISO export

# 2018-19 Draft Scenarios

## 1. Load Stress Study (Heavy Summer)

- Reliability study based on 2028 Heavy Summer case where regional peak load is increased 10% and the load/gen imbalanced is filled with renewable capacity not dispatched in Base Case, or incremental renewable capacity if no headroom is available. Details of dispatch are TBD.
- Purpose of analysis is to test robustness of Base Transmission Plan against potential changes in load and incremental dispatch of renewable resources. Will consider congestion/economic study if deemed useful.

## 2. CAISO Export Stress Study

- Reliability study based on regional model that will be adjusted based on CAISO export conditions observed in regional production cost model. Alternatively, will seek guidance from CAISO on assumptions appropriate for export study.
- Purpose of analysis is to evaluate reliability of regional system if power flows from the CAISO to WestConnect during CAISO overgeneration conditions

## 3. EV Load Stress Study

- Reliability study and/or economic study designed to evaluate the effects of high EV penetration non the regional transmission system. Study scoping will determine the exact study scope. Study requires developing estimates for (1) EV penetration levels; (2) charging shape; (3) distribution of shape to loads for select conditions/hours. Option to test impact of different charging behaviors and their impact to the transmission system (reliability or congestion) and/or option to identify what penetration of EVs begin to substantially impact the reliability of the regional transmission system.

## Next Steps

- Stakeholder/WPR comment period for draft 2018-19 Study Plan v3 will be February 17-March 1
  - Comment window will be announced via email and will include instructions for submitting comments
- 2018-19 Study Plan will be finalized and approved by the PMC by the end of March
- The PS will then proceed with developing the regional planning models
  - More detail on this process will be provided in later agenda items



# Interregional Transmission Project (ITP) Submittals

Charlie Reinhold,  
WestConnect Project Manager

## 2016-17 Interregional Transmission Project Submittals

Project Name	Company	Project Submitted To	Relevant Planning Regions	Seeking Cost Allocation from WestConnect
SWIP North	Western Energy Connection, LLC	WestConnect CAISO NTTG	WestConnect NTTG*	Yes
Cross-Tie Project	TransCanyon, LLC	WestConnect CAISO NTTG	WestConnect* NTTG	Yes
TransWest Express	TransWest Express, LLC	WestConnect CAISO NTTG	WestConnect CAISO* NTTG	Yes
HVDC Conversion Project	San Diego Gas & Electric	WestConnect CAISO	WestConnect CAISO*	No

\* = Indicates lead planning region

WestConnect did not identify any regional transmission needs in the 2016-17 regional planning cycle, and as such, did not evaluate any ITPs in 2016-17.

## 2018-19 ITP Submittals

- Proponents of an ITP for which WestConnect is a Relevant Planning Region must submit the project to WestConnect by March 31, 2018
- [Link to project submittal form](#)
  - \$25k study deposit is not required at this stage
- The project will need to be resubmitted following the needs identification stage of the 2018-19 planning cycle, at which time the study deposit is required
- WestConnect has received no ITP submittals to-date

# Upcoming Meetings

- **WestConnect PS & PMC Meetings:**
  - March 13-14, Salt Lake City, UT (Energy Strategies)
  - No CAS meeting, Next CAS meeting April 10, 2018
- **2018 WestConnect Stakeholder Meetings:**
  - November 15, 2018, Tempe, AZ (*tentative*)

**Additional Information Regarding the  
Regional Planning Process can be  
Accessed at:**

**[www.WestConnect.com](http://www.WestConnect.com)**

# Questions?

Presenter Contact Information:

Charlie Reinhold, [reinhold@ctcweb.net](mailto:reinhold@ctcweb.net)

Tom Green, [Thomas.Green@xcelenergy.com](mailto:Thomas.Green@xcelenergy.com)

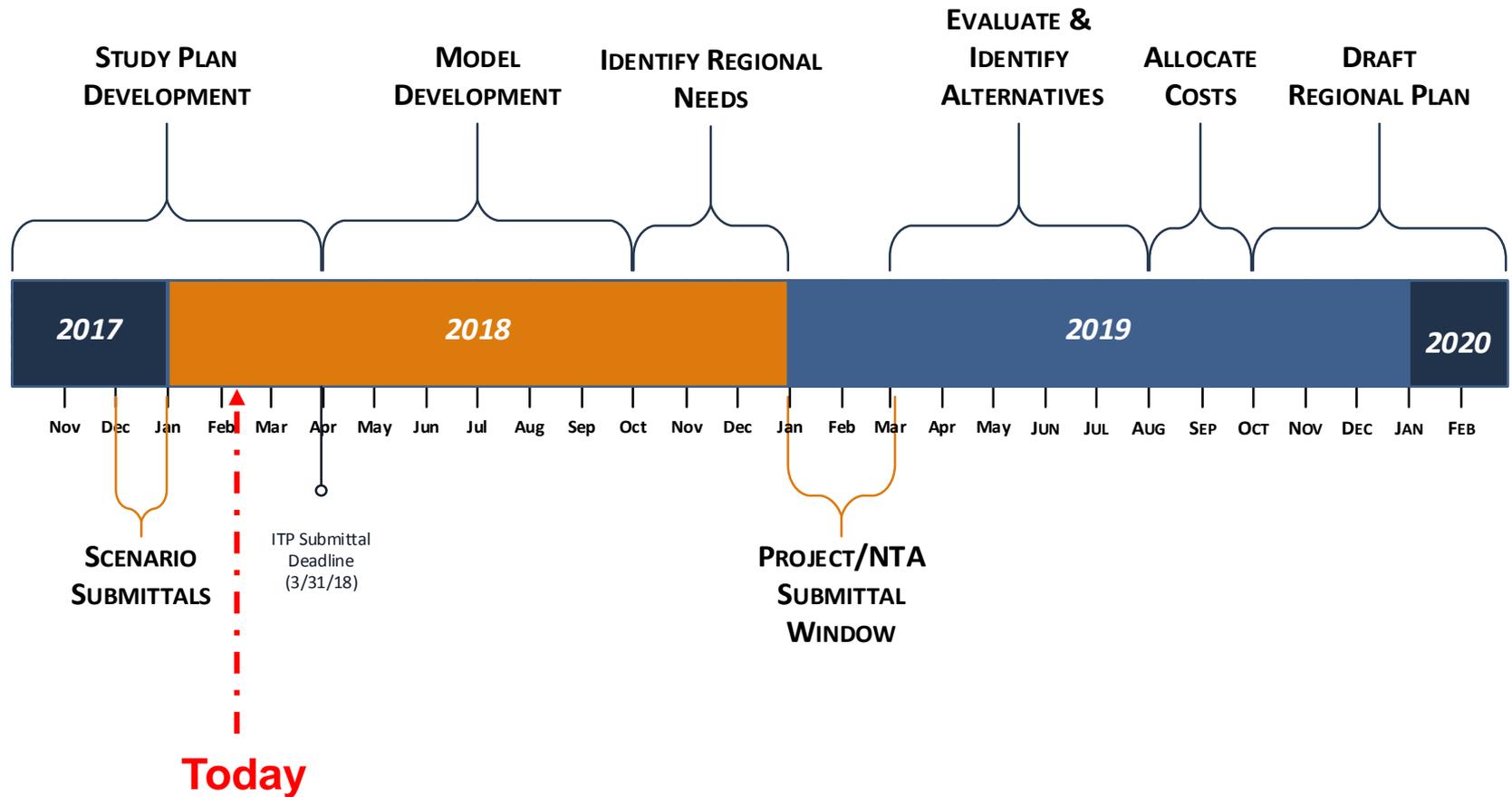
Roy Gearhart, [Rgearhar@wapa.gov](mailto:Rgearhar@wapa.gov)

Keegan Moyer, [kmoyer@energystrat.com](mailto:kmoyer@energystrat.com)



# 2018-19 WestConnect Planning Activities

# 2018-19 Process Timeline



# 2018-19 Schedule

<i>Due Date</i>	<i>Quarter</i>	<i>2018-2019 Activity</i>
February 16, 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
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



# WestConnect Regional Model Development

Keegan Moyer, WestConnect Planning Consultant,  
Energy Strategies

Roy Gearhart, Planning Subcommittee Chair, WAPA

# 2018-19 Regional Models

## Powerflow Models

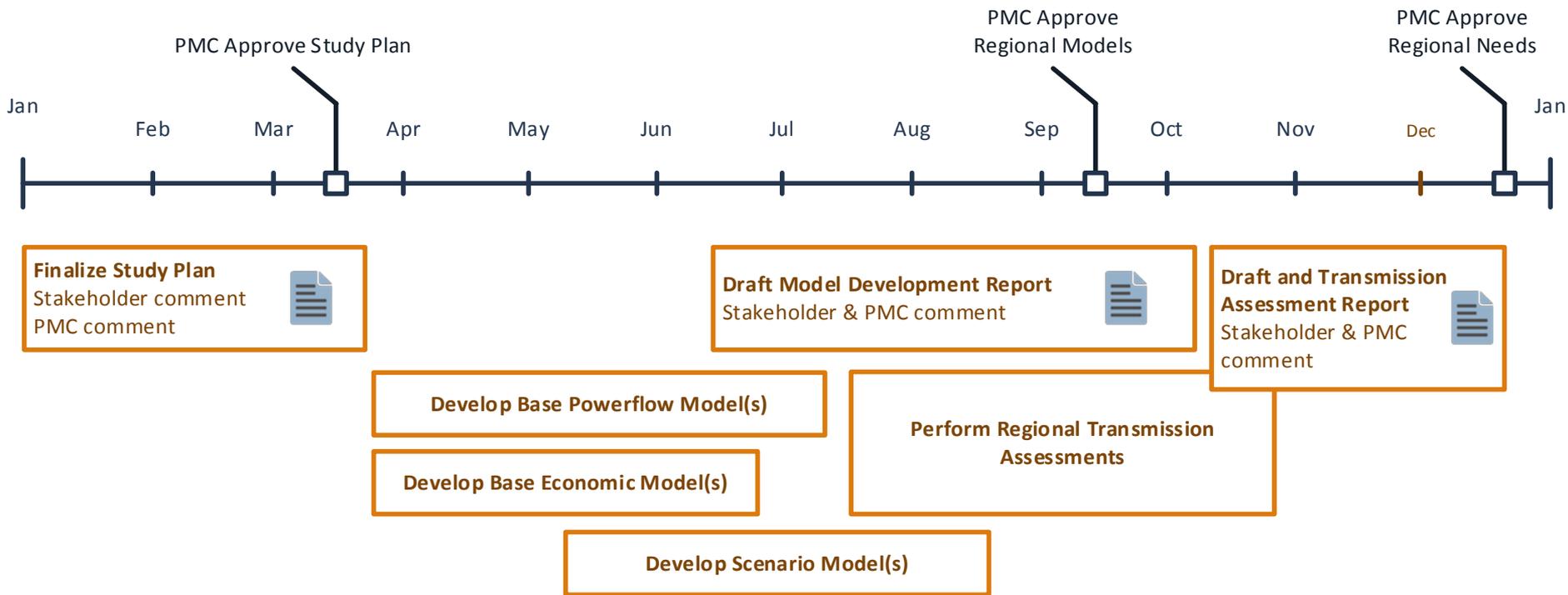
WestConnect Base Case Name	Case Description	WECC Seed Case
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## Production Cost Models

WestConnect Base Case Name	Case Description	WECC Seed Case
<b>2028 Base Case</b>	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

- Depending on the final scenarios selected for the Study Plan, WestConnect may utilize the round trip to evaluate the reliability of the regional system under flows observed in the PCM dispatch (CAISO Export Stress Study)

## 2018 Technical Schedule





California ISO

# Annual Interregional Information 2017-2018 Transmission Planning Process

*Annual Interregional Coordination Meeting*

*Folsom, CA*

*February 22, 2018*

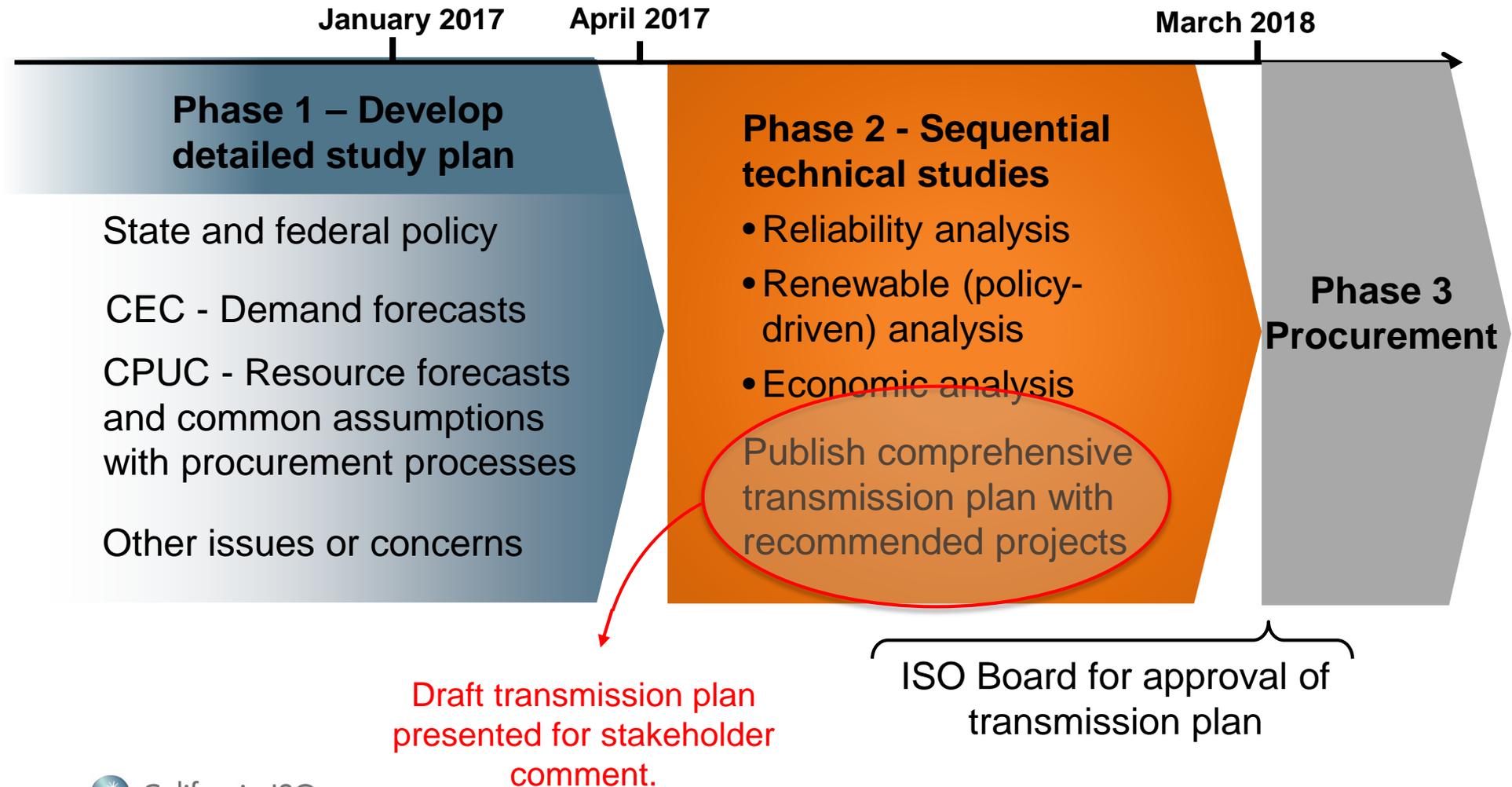


California ISO

# Introduction and Overview

## Draft 2017-2018 Transmission Plan and transmission project approval recommendations

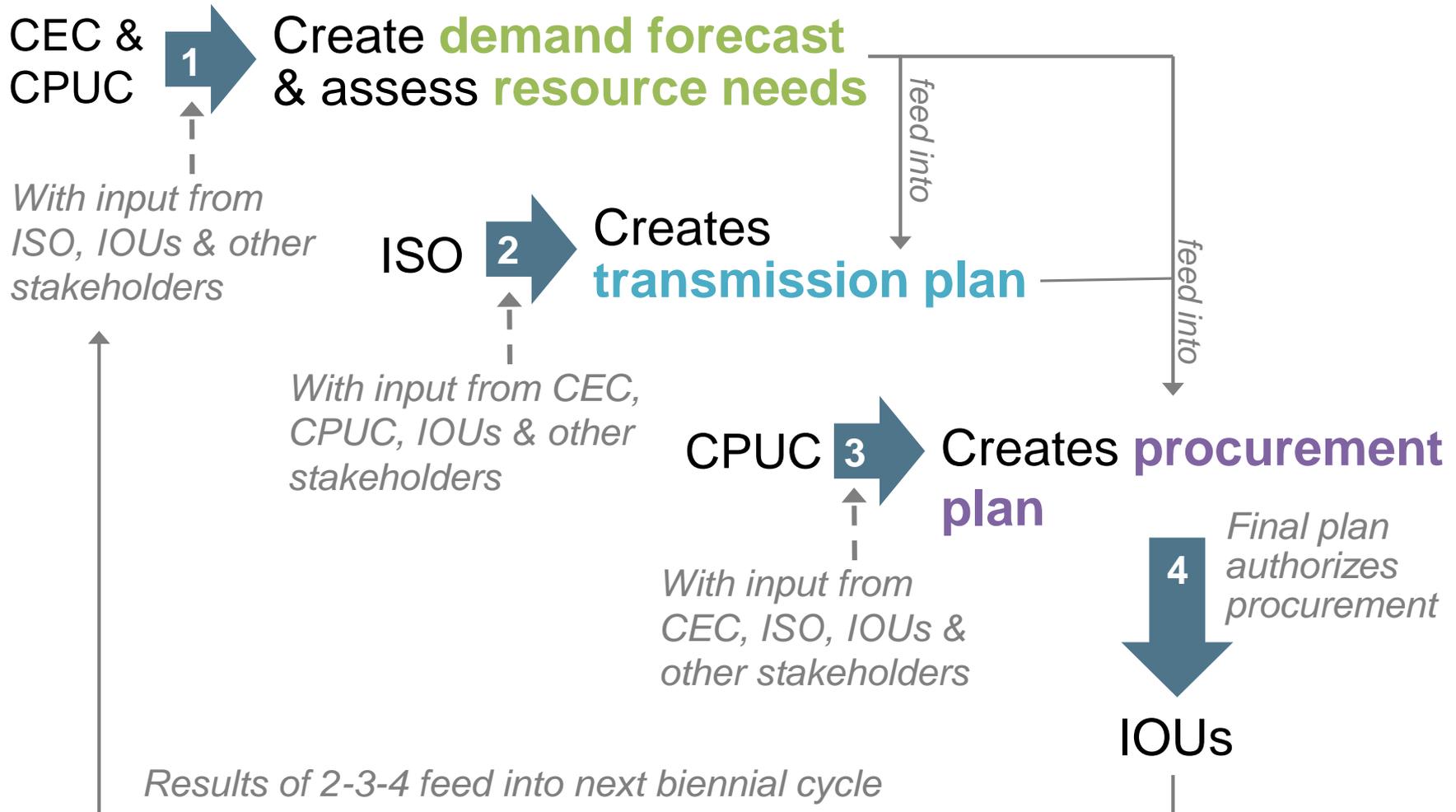
# 2017-2018 Transmission Planning Process



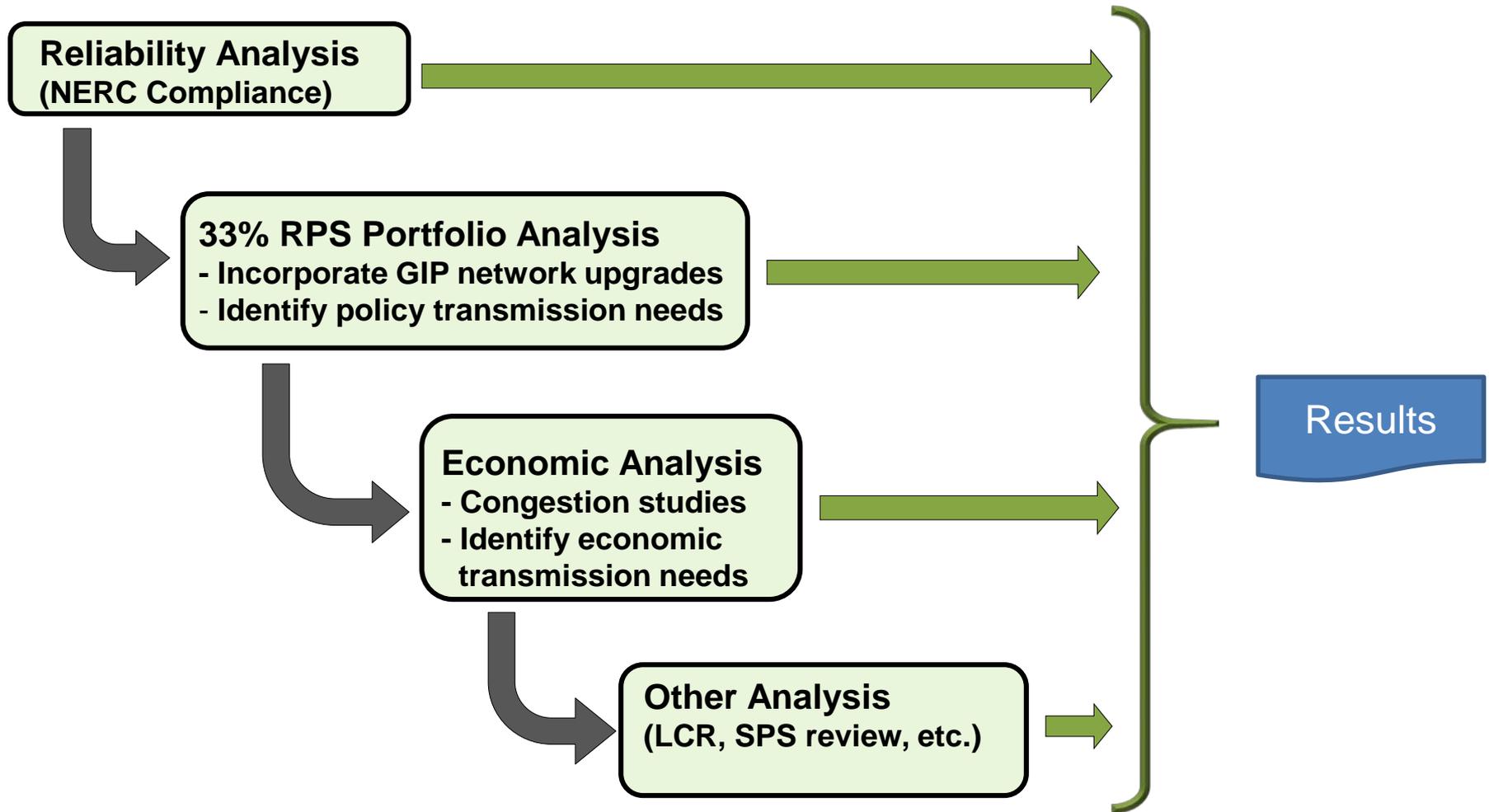
# 2017-2018 Ten Year Plan Milestones

- Preliminary reliability study results were posted on August 15
- Stakeholder session September 21st and 22nd
- Comments received October 6
  - (slow response resource special study extended to October 10)
- Request window closed October 15
- Preliminary policy and economic study results and update on other issues November 16
- Comments received November 30
- Draft plan posted February 1, 2018
- Comments due February 22
- Revised draft for approval at March Board of Governor meeting

# Planning and procurement overview



# Development of 2017-2018 Annual Transmission Plan



## Emphasis in the transmission planning cycle:

- A modest capital program, as:
  - Reliability issues are largely in hand, especially with load forecasts declining from previous years and behind the meter generation forecasts increasing from previous projections
  - Policy work was largely informational as we await actionable renewable portfolio policy direction regarding moving beyond 33% (for approvals)
  - Modestly-sized economic-driven projects emerging as evolving industry circumstances create some new opportunities
- A major effort in this third and final year of the programmatic review of previously-approved projects
- Preferred resources and transmission upgrades playing a critical role in the integrated solutions in several areas
- Emerging issues continuing to drive re-thinking on how we study and assess transmission system issues

## Consideration of the impacts of behind the meter photovoltaic generation on load shapes – and shifting the time of load peaks to later in the day – is evolving:

- In CED 2015 (2016-2026 Forecast), the CEC determined peak loads through downward adjustments to the traditional mid-day peak loads and acknowledged the issue of later-day peaks. In the 2016-2017 planning cycle the ISO conducted its own sensitivities
- In CEDU 2016 (2017-2027), the CEC provided sensitivities of later day peaks. The ISO used those sensitivities in this 2017-2017 planning cycle to review previously-approved projects, but not as the basis for approving new projects
- Through CED 2017 (2018-2028) the ISO is anticipating hourly load shapes

## The ISO's reliability analysis led to the following:

- 12 new reliability projects are recommended – firming up the February 1 posted plan
- In the PG&E service territory ,19 previously-approved projects are recommended to be canceled and 21 have been re-scoped, paring over \$2.7 billion from current estimates. 6 have been identified as needing further review
- Two previously-approved projects in the SDG&E service territory are recommended to be canceled

## Policy-driven analysis for approval purposes was not needed - no policy-driven approvals are recommended

- Portfolio direction received from the CPUC and CEC on June 13, 2016:

*“Recommend reusing the “33% 2025 Mid AAEE” RPS trajectory portfolio that was used in the 2015-16 TPP studies, as the base case renewable resource portfolio in the 2016-17 TPP studies”*

*“Given the range of potential implementation paths for a 50 percent RPS, it is undesirable to use a renewable portfolio in the TPP base case that might trigger new transmission investment, until more information is available”*

- This policy direction remained in place for the 2017-2018 transmission planning cycle
- Portfolios used in the ISO’s informational 50% RPS special studies and evaluation of interregional projects were provided by CPUC staff

## The ISO is recommending a number of economic-driven projects:

- One – in the VEA service territory – provides production simulation benefits
- One – in the Imperial Valley area – provides both local capacity requirement reduction benefits and production simulation benefits
- Two – in the East Bay/Moss Landing Sub-area – focus on reducing local capacity requirements in the area

## Status of proposal to add Phasor Measurement Units (PMUs) to all CAISO Interties:

- In November 2017, the ISO introduced the proposal that PMUs be added to all ISO intertie transmission facilities to other balancing areas
- Phasor measurement units will enhance accuracy of measurements to demonstrate compliance with NERC Reliability Standard BAL-003-1.1
- The ISO must meet frequency response obligation based on net actual interchange measurements
- The ISO is continuing to refine the scope of the effort and will bring forward a recommendation in the future

## Special studies performed as part of the 2017-2018 planning process will help inform future studies

- The six special studies conducted in 2017 have been summarized in the 2017-2018 Transmission Plan
  - Interregional Transmission Project (ITP) Evaluation and 50% RPS Out-of-State Portfolio Assessment (extension of 2016-2017 studies)
  - Risks of early economic retirement of gas fleet (extension of 2016-2017 studies)
  - Benefits analysis of large energy storage (extension of 2016-2017 studies)
  - Frequency response assessment
  - Gas/Electric coordination special study
  - Characteristics of slow response local capacity resources

## The ISO Board has approved the proposal to remove the conceptual statewide plan requirement

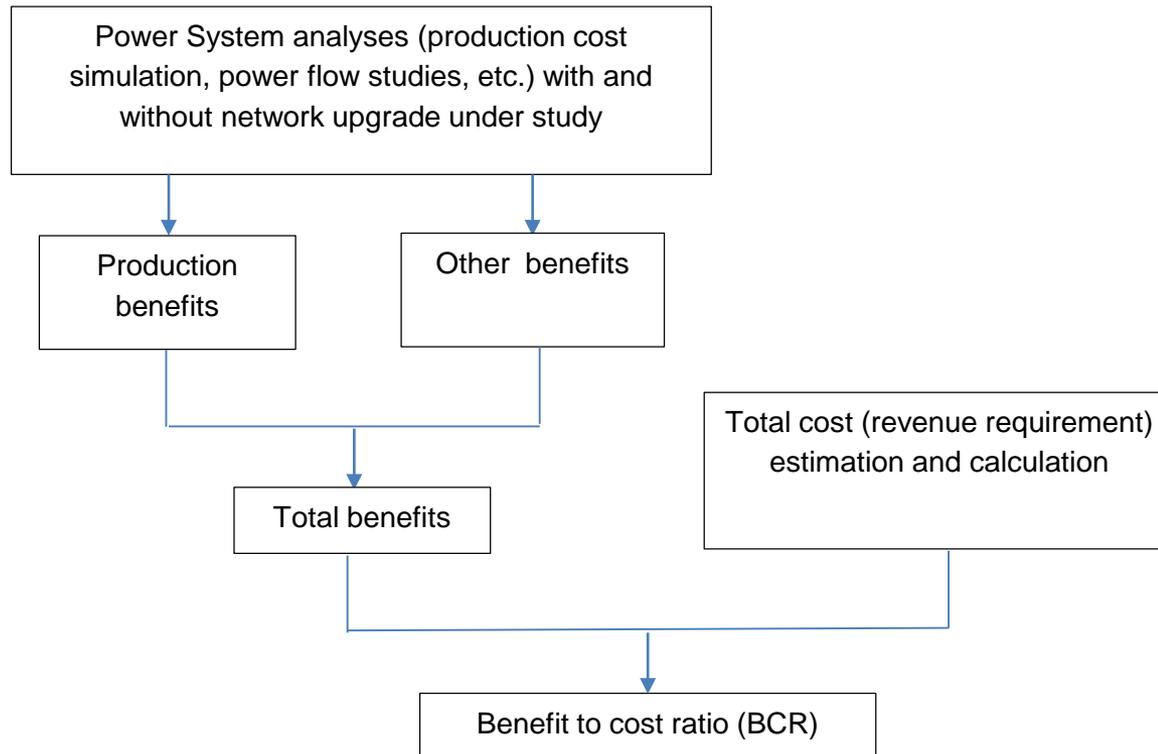
- Since 2010, the ISO has prepared and published the statewide plan as part of its annual planning process, initially developed to facilitate coordination with the California Transmission Planning Group (CTPG)
- Implementation of FERC Order No. 1000 has supplanted the need to develop the statewide plan
  - CTPG is no longer functioning and its members are focused on regional planning through Order 1000
  - The statewide plan no longer facilitates the coordination function it was intended to provide
  - ISO developing the plan on its own diverts resources away from Order 1000 activities
- After an ISO stakeholder process in May and June, the ISO Board approved the proposal on July 26.
- The change was filed with FERC on August 26 and we are awaiting a decision



## Economic Assessment Draft 2017-2018 Transmission Plan and transmission project approval recommendations

# Overview of economic planning methodology

- ISO's economic planning study follows the updated TEAM documentation updated in 2017
- Study approach:



# Overview of ISO's planning PCM development and enhancement (cont.)

- Database development with more accurate representation of network models
  - Identical network models for the ISO system in PCM and in the reliability power flow cases
    - Transmission topology, generator location, load distribution
  - Load modifiers were modeled as generators at the locations as in power flow cases
  - Coordinated with other regions to update their system models
- Most recently updated operational data and models
  - Updated solar profiles (in collaboration with WPR ADS process) with higher granularity based on NREL measurements
  - Updated thermal unit ramp rates based on industry average
  - IV PFC dispatchable

# Summary and recommendations

Four upgrades were found to be needed as economic-driven projects in the 2017-2018 planning cycle:

- S-Line Upgrade
- Bob SS to Mead S 230 kV Line Upgrade,
- South Bay-Moss Landing enhancements comprising of the San Jose-Trimble 115 kV series reactor and the Moss Landing–Panoche 230 kV Path Upgrade

Congestion or study area	Production benefit (\$M)	Capacity benefit (\$M)	Estimated total cost (\$M)	Economic justification
S-Line	40	85~110	46~72	Yes
Bob SS-Mead S	180	Not applicable	37	Yes
San Diego North	27	Not applicable	101~116	No
South Bay-Moss Landing area	Not applicable	400-600 MW LCR benefit	\$14	Yes

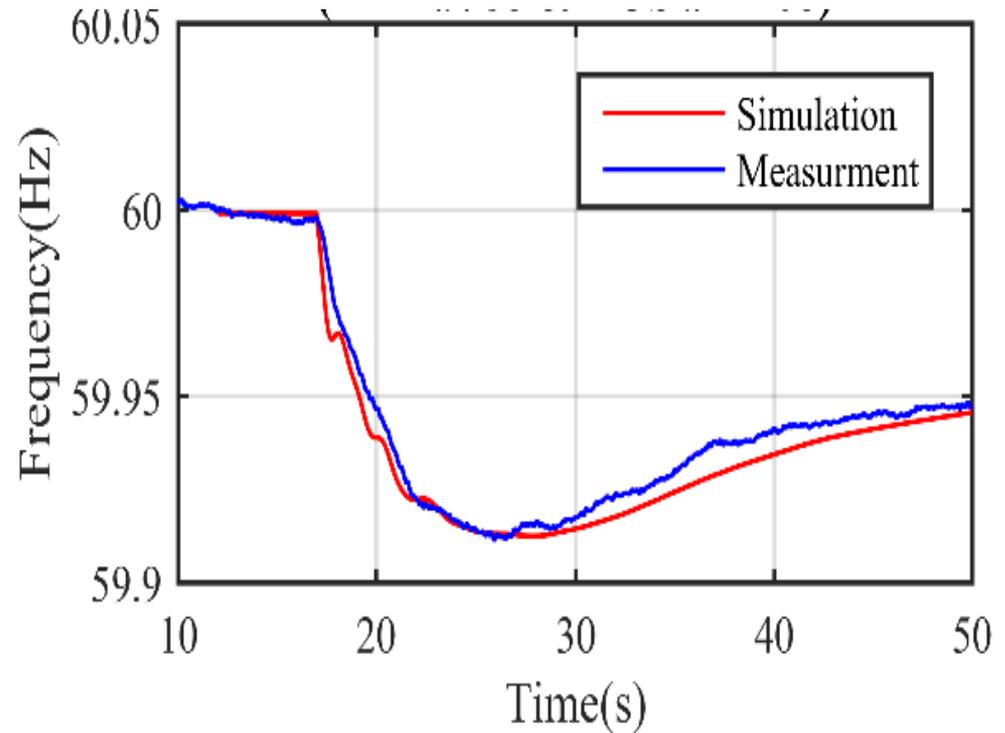


California ISO

# Special Study Frequency Response Assessment-Generation Modeling

# Frequency Response Studies

- Frequency response studies performed in the previous Transmission Plans showed optimistic results
- Actual measurements of the generators' output were lower than the generators' output in the simulations
- Therefore models update and validation is needed
- After improvement of models, more frequency studies will be performed



# Update of Generator Models

- The ISO reviewed, and identified issues with dynamic stability models for multiple units
- Issues
  - Missing models
  - Suspicious models
  - Models with generic parameters
  - Models no longer approved by WECC
- Currently working with the PTOs to get results from generator testing and improve the models
- Challenges:
  - Challenges in getting fully validated models from generation owners
  - Difference between NERC Standards and WECC Policy on generator testing

# Standards on Generator Testing

- NERC dynamic data related compliance (MOD-26 and MOD-27) applies to the following to Western Interconnection
  - Individual generating unit greater than 75 MVA (gross nameplate rating)
  - Individual generating plant consisting of multiple generating units that are directly connected at a common BES bus with total generation greater than 75 MVA (gross aggregate nameplate rating)
- WECC Policy applies to
  - Generating facilities connected to the Western Electricity Coordinating Council (WECC) transmission grid at 60 kV or higher voltage (both new and existing, synchronous and non-synchronous) with single unit capacity of 10 MVA and larger, or facilities with aggregate capacity of 20 MVA and larger

# Questions?

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# Interregional Transmission Project (ITP) Evaluation and 50% RPS Out-of-State Portfolio Assessment

*An information-only study performed as a continuation of 2016-  
2017 Transmission Planning Process*

## Continuation of the information-only 50% RPS special study (2016-2017 TPP)

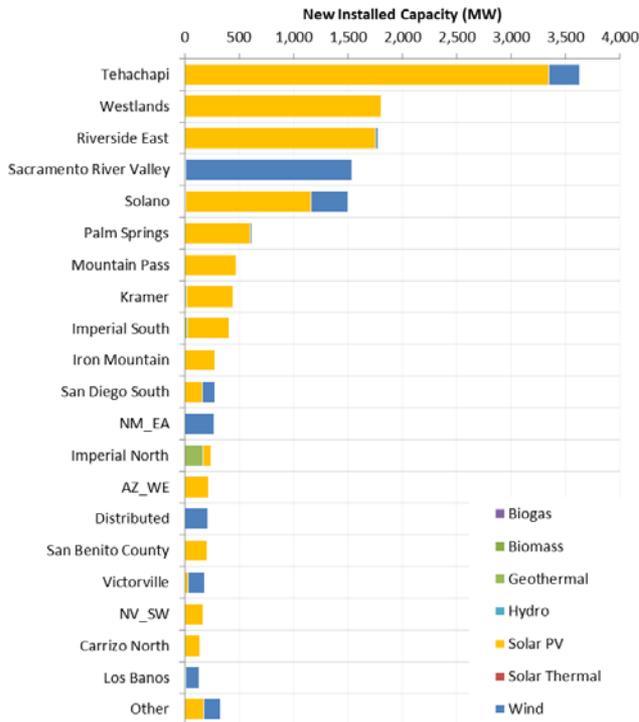
The 2016-2017 50% RPS study focused on

- Investigating 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; and
- Investigating transmission implications on in-state facilities 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.

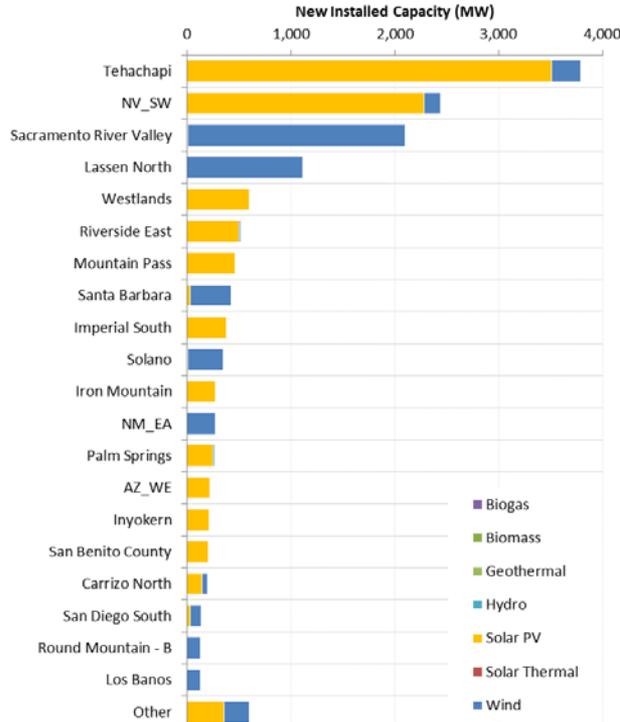
# Portfolios provided by the CPUC; the Out-of-state portfolio shows a shift to higher WY and NM wind

Portfolio	In-state FCDS	In-state EODS	OOS EODS/FCDS
<b>MW Capacity</b>	14,842	14,814	11,093

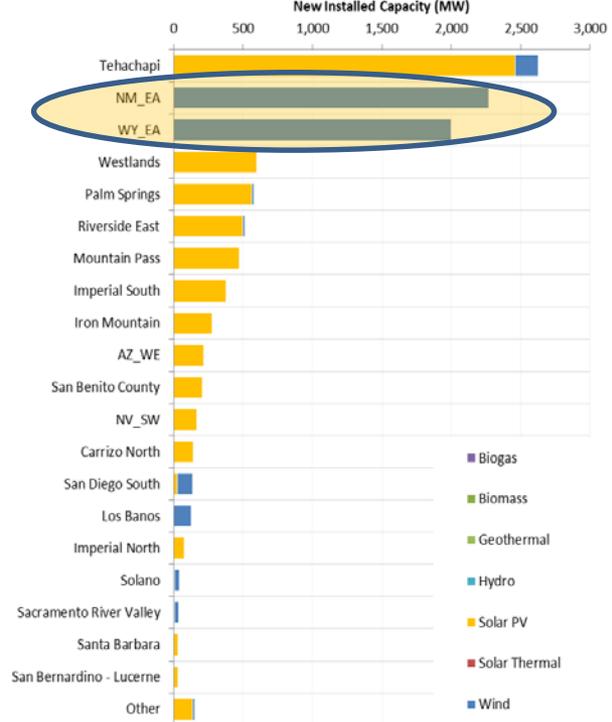
In-state FCDS



In-state EODS



Out-of-state FCDS/EODS



Note - RPS calculator v6.2 was used to generate the portfolios

# Findings from 2016-2017 out-of-state portfolio assessment helped us identify three action items

Assessment	Key findings pertaining to OOS portfolio (2016-2017 50% special study)
Production Cost Simulation	<ul style="list-style-type: none"> <li>• Curtailment: OOS portfolio showed the lowest curtailment</li> <li>• Transmission congestion: OOS portfolio showed the least amount of intra-CA congestion</li> <li>• <u>Further coordination is expected on stressed scenario identification and reviewing study results</u></li> </ul>
Reliability Assessment	<ul style="list-style-type: none"> <li>• OOS portfolio was the least severe one</li> <li>• No major issues in the Northern CA system due to lower amount of resource selection</li> <li>• One potential issue in Southern CA observed in all portfolios</li> <li>• <u>The snapshots identified with CA transmission in mind were not the most stressed ones for the system outside of CA</u></li> </ul>
Deliverability	<ul style="list-style-type: none"> <li>• Evaluated the need for MIC expansion and found that adequate import capacity exists to deliver OOS resources (NM and WY) from injection point into CAISO BA to CAISO loads</li> </ul>



Three action items identified based on ISO's analysis and stakeholder feedback –

1. Refining the assumptions and models
2. Using the out-of-state portfolio to test ITP evaluation framework in preparation for the next planning cycles; and
3. Exploring a way to capture the Available Transmission Capacity (ATC) for out-of-state RPS resources

## Regional coordination efforts resulted in model refinement and contingency list creation

- Considered the four ITPs submitted to the planning regions in 2016
- Received input from WestConnect and NTTG about the location and size of wind resources in NM and WY respectively
- WPRs provided input regarding transmission topology enhancements in alignment with the ongoing WECC Anchor Data Set work
- Shared power flow models with WPRs and received feedback
- Shared contingency files with ColumbiaGrid, WestConnect and NTTG; the WPRs provided crucial information regarding additional contingencies to be tested
- APS and NV Energy provided specific input regarding contingencies to be tested

Test the system outside of CA using OOS portfolio and leverage the findings to gain insights about ITPs

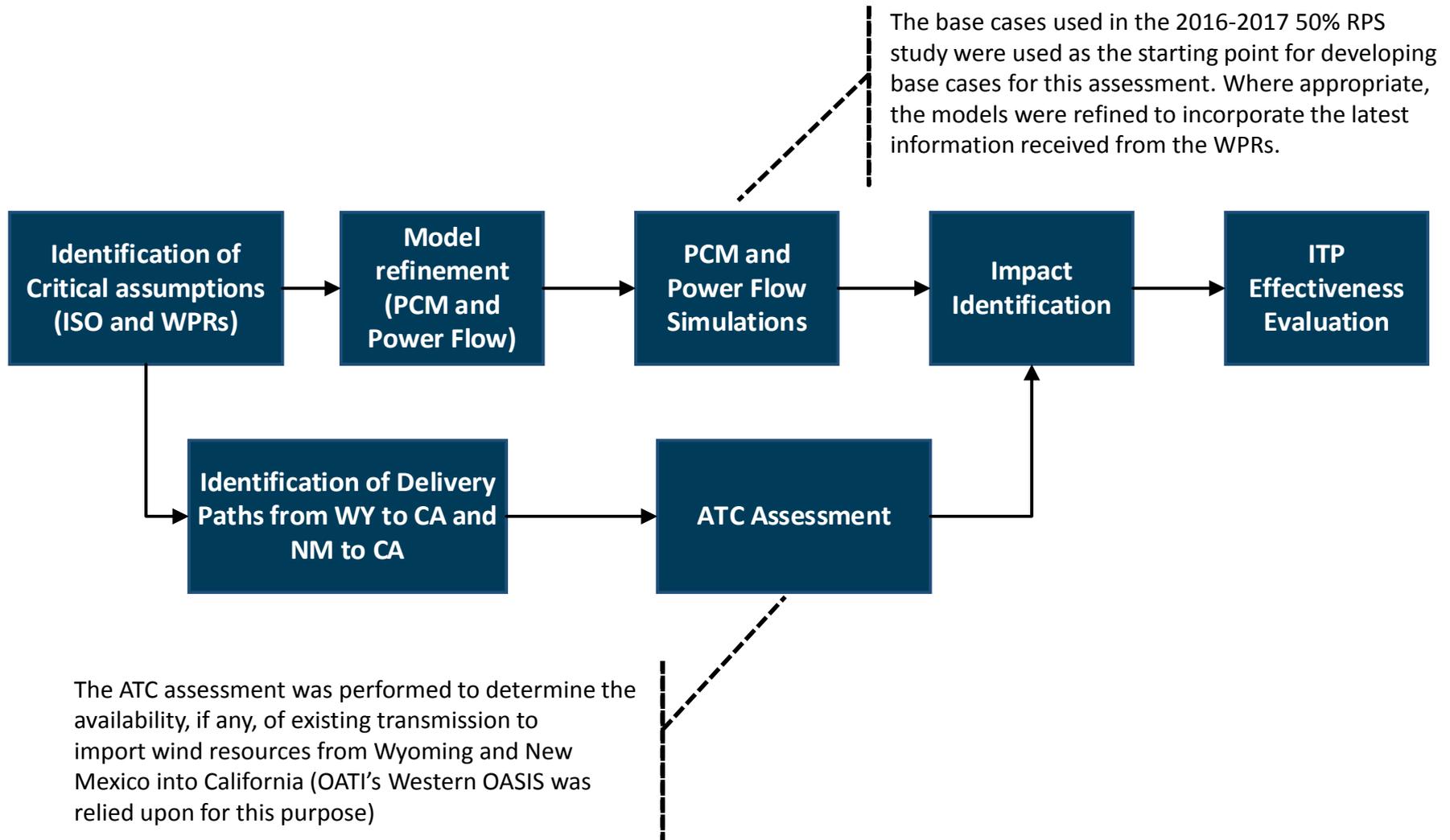
**Refine the out-of-state resource and topology modeling**

**Identify Available Transfer Capability that can be used by the wind resources in WY and NM in order to deliver to CA**

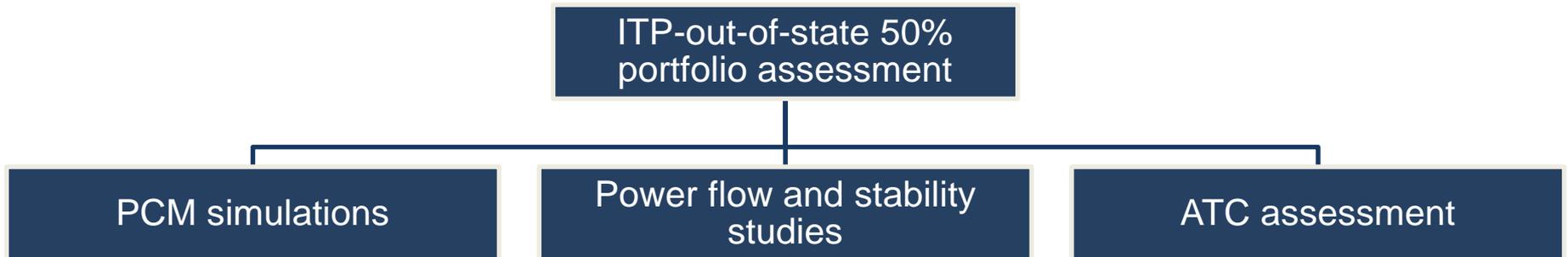
**Identify transmission constraints outside of CA while trying to meet part of the 50% RPS obligation by relying on wind resources in WY and NM**

**Test effectiveness of ITPs in mitigating observed transmission issues outside of CA and test a framework for comparing ITPs**

# Study methodology and sequence



# Study Components



The expected outcome of PCM simulations was:

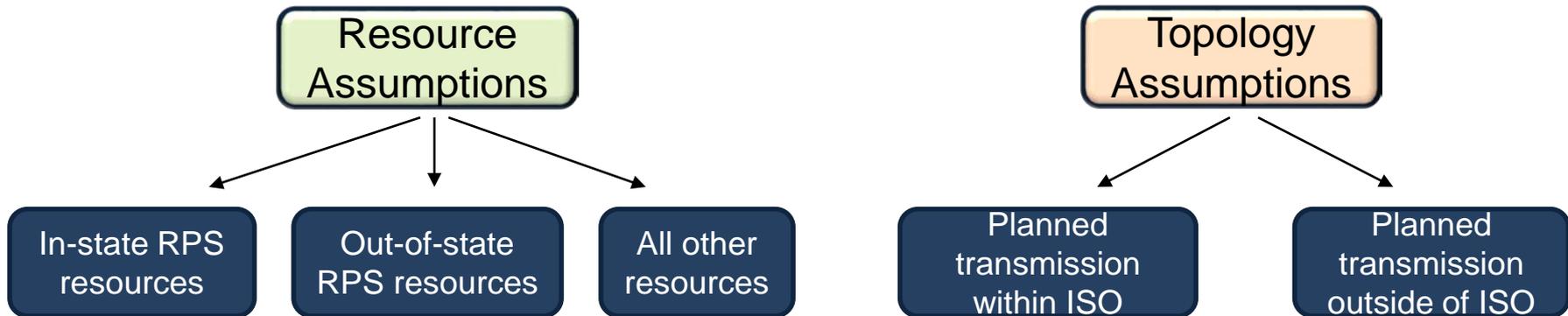
- Extent of curtailment of out-of-state renewables
- Identification of transmission constraints outside of California that may result in significant amount of congestion when delivering wind resources from WY and NM to CAISO BAA
- Stressed snapshot identification for the purpose of power flow studies
- Impact of ITPs on PCM results

- Power flow studies were performed in order to (i) identify additional transmission limitations that may not be captured by PCM studies and (ii) to confirm the transmission system limitations identified by PCM simulation and (iii) capture the impact of ITPs
- The 8,760 hours of snapshots created during PCM simulations were used to identify high transmission system usage patterns to be tested using the power flow models for reliability assessment.
- Contingency assessment was performed with a focus on the system outside of California

- The ISO tested for ATC adequacy for delivering renewable resources from Wyoming and New Mexico to the ISO BAA
- At a conceptual level, this effort can be viewed as a “loose” proxy for testing “deliverability” of these out-of-state resources
- However, the ISO believes it reasonable to assume that large out-of-state resource installations cannot serve California load without viable long-term firm transmission service from the point of receipt to the CAISO BAA boundary

# Key modeling enhancements and topology/resource assumptions

Starting study model: 2016-2017 TPP 50% RPS out-of-state portfolio case



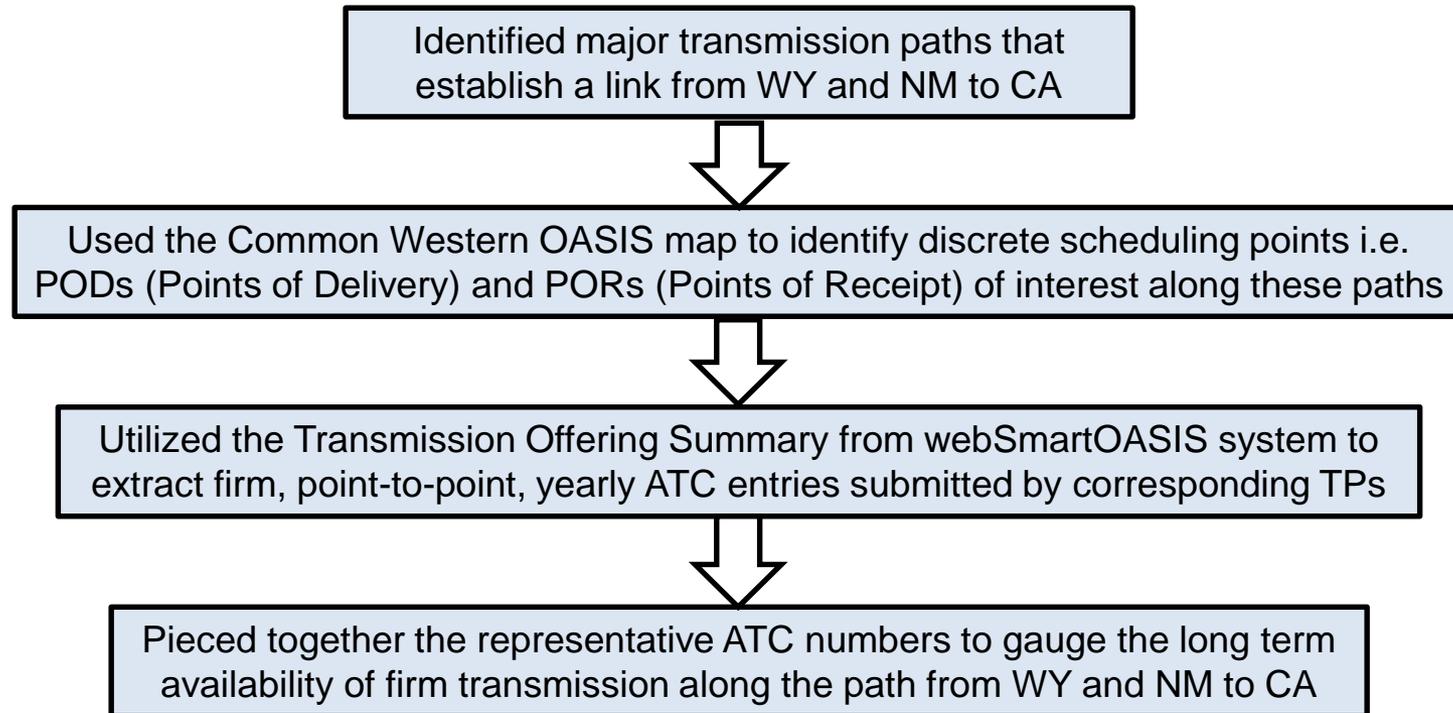
- No change to in-state RPS
- WY and NM RPS resources identified in the out-of-state portfolio
- Additional wind resources identified in WY as part of PacifiCorp's IRP (~1,100 MW)
- Minor generation adjustments per the latest WPR ADS seed case (as of May 2017)

- Modeled projects approved in the 2016-2017 TPP
- Relied on the information received from the Anchor Data Set work being performed by WPRs
- Gateway Energy Project
- SunZia Project

# Overview of Production Cost Model for ITP studies

- Started from the PCM for OOS 50% portfolio in 2016/17 planning cycle
- Updated ISO's network model to reflect the changes identified in 2017/2018 planning cycle reliability assessment
- Updated WPR ( NTTG, WestConnect, and ColumbiaGrid) system models based on recommendations of the corresponding planning regions
- Load forecast and NG/CO2 prices remained the same as in the last planning cycle
- WY local 230 kV line limits were not enforced

# Stakeholders raised a question about the availability of ATC outside of California



- OATI's webSmartOASIS system was utilized to extract ATC data
- Transmission Offering Summary in OASIS was utilized; this is what each Transmission Provider (TP) has submitted as available on a facility over a particular timeframe
- We looked for the active offerings in the first month of 2027 as a proxy for long-term availability

## Summary of Findings

## PCM simulations

1. The ISO renewable curtailment did not show a noticeable reduction after adding any of the ITPs.
2. Relaxation of ISO Net Export Limit resulted in almost zero renewable curtailment. This indicates that the renewable curtailment under 2,000 MW ISO Net Export scenario is not primarily related to transmission congestion.
3. ITPs show a variation in transmission congestion performance. It is important to note that this congestion is driven by overall dispatch which includes non-renewable resource

## Power flow studies

1. Power flow performance of TWE, SWIP-N (with Gateway West) and Cross-tie (with Gateway South) is comparable
2. SWIP-N and Cross-tie projects without the corresponding Gateway segments do not provide much thermal relief when delivering resources from WY to CA
3. REX HVDC project does not greatly impact power flow performance when delivering resources from NM to CA

## ATC assessment

1. ATC assessment shows severe shortage of contractual capacity to deliver WY and NM resources to CA over the existing transmission system
2. TWE would provide ~1,500 MW of ATC from Southwestern WY to Southern CA
3. SWIP-N and Cross-tie would rely corresponding segments of Gateway project and some existing facilities to establish ~1,500 MW ATC between WY and CA
4. REX HVDC would not add ATC at the most constrained locations along the NM to CA path

# Summary of directional insights about ITPs

	SWIP-N with Gateway West*	Cross-Tie with Gateway South*	TransWest Express	REX HVDC with SunZia
Total ISO renewables including WY and NM wind	—	—	—	—
Impact on only WY and NM wind curtailment	↓ ↓ ↓	↓ ↓	↓	—
	—	—	—	↓ ↓
	—	—	—	—
	↓ ↓	↓ ↓	↓ ↓	—
	\$2B - \$3.9B	\$1.5B - \$2.1B	\$2.4B - 3.2B	\$1.9B - \$4.6B

↓ Reduction in curtailment or overload

— No impact relative to baseline

\* SWIP-N and Cross-Tie without certain segments of Gateway were studied and were found to be decisively inadequate for the purpose of delivering Wyoming resources to California

\*\* Curtailment under 2,0000 MW Net ISO Export Limit

\*\*\* Based on (i) the request window submittals and (ii) cost information specified in RETI 2.0 Western Outreach Project Report – [http://docketpublic.energy.ca.gov/PublicDocuments/15-RETI-02/TN214339\\_20161102T083330\\_RETI\\_20\\_Western\\_Outreach\\_Project\\_Report.pdf](http://docketpublic.energy.ca.gov/PublicDocuments/15-RETI-02/TN214339_20161102T083330_RETI_20_Western_Outreach_Project_Report.pdf)

## ATC Assessment

- The ISO’s examination of yearly, firm, point-to-point ATC data from the Western OASIS points to a severe lack of scheduling capability to deliver Wyoming and New Mexico wind to California
- None of the ITPs except TWE will create sufficient long-term, firm ATC from the renewable resource area all the way to the ISO without relying on other transmission not owned by the project sponsor. Note the proponent of the SWIP North project cites having pre-existing arrangements to secure transmission rights on the One Nevada Transmission Line (ON Line), addressing one of two transmission paths needing ATC on other transmission.

Attributes requiring further consideration given the differing nature of the projects and dependencies:

- How the transmission would be procured – interregional project, regional project, or component of generation procurement?
- Arrangements with other non-ISO transmission owners for capacity, and for development of non-ISO transmission
- Costs and cost responsibilities
- Staging and sequencing of transmission and generation resources

## Recommendations for next steps

- Utilize the results obtained from this study for future out-of-state RPS portfolio creation
- Create a framework for accounting for interdependencies of ITPs and other non-ITP infrastructure projects while evaluating ITPs
- Incorporate ATC assessment as part of the ITC evaluation framework for future ITP RW submittals
- Explore further the other attributes that would be taken into account in selecting a “preferred” project to access out of state wind resources

## Focus in 2018-2019 Transmission Planning Cycle:

- Focus on renewable integration issues – both in-front-of and behind-the-meter resources
- A major economic study being focused on local capacity areas
- Special studies targeting:
  - ISO support for CPUC proceeding re Aliso Canyon
  - Potential for increasing opportunities for transfers of low carbon electricity with the PAC Northwest, and for PAC Northwest Hydro to play role in reducing dependence on resources impacted by Aliso Canyon
- Interregional projects will be addressed as per tariff-defined processes:
  - The ISO is not planning additional “special study” efforts at this time focusing on out-of-state renewables given the recently completed studies spanning the 2016-2017 and 2017-2018 planning cycles.

# Questions?

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# ITP Suggestions and Open Discussion of WPR Planning Activities



# TransWest Express Transmission Project

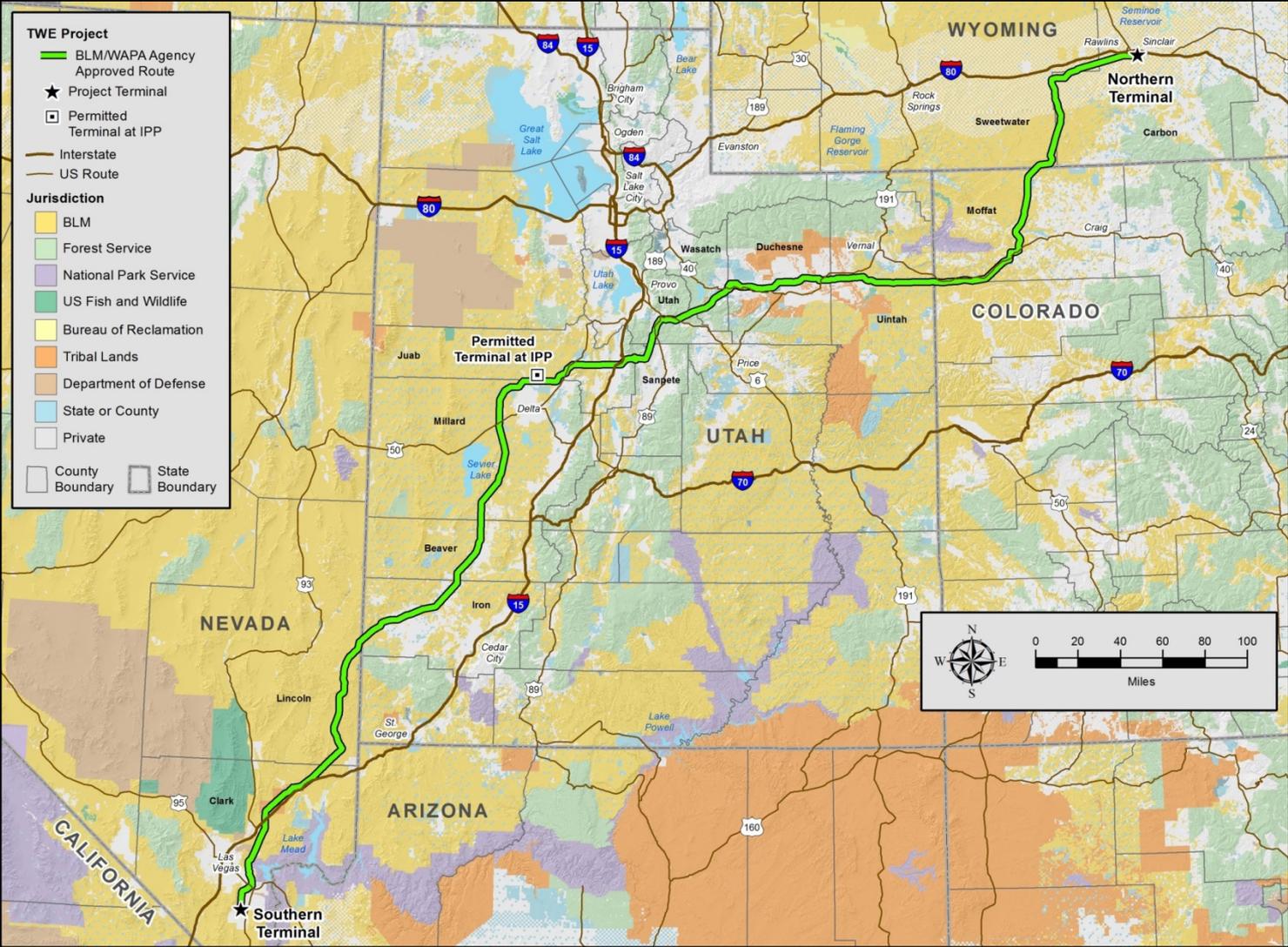
2018 Interregional Transmission Project Submittals  
DC Project and AC & DC Project Configurations

Annual Interregional Transmission Coordination Meeting

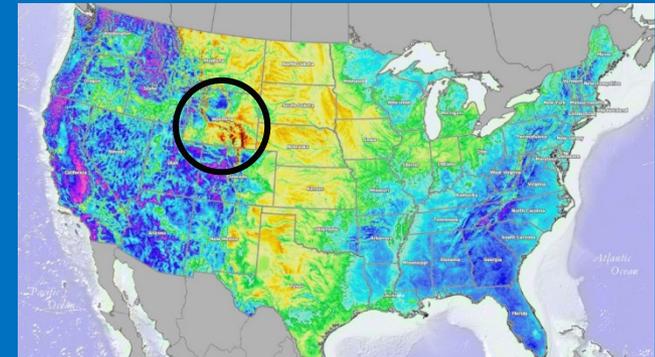
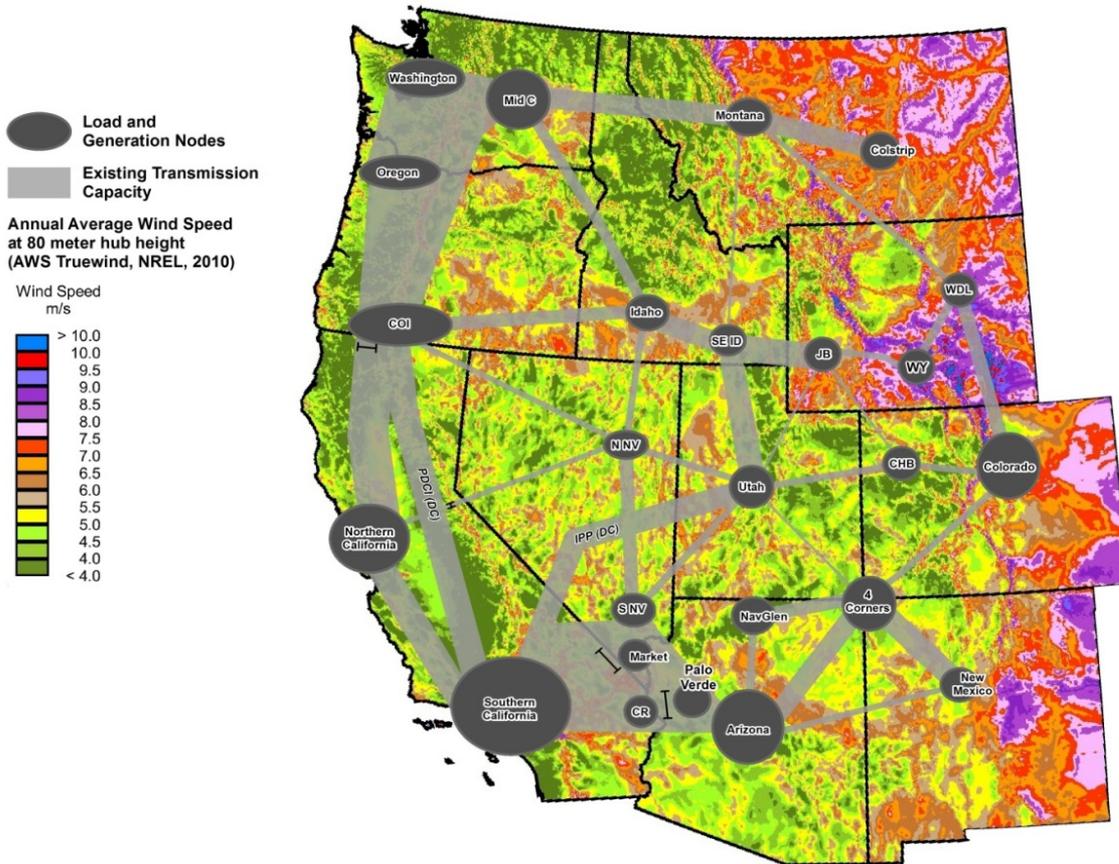
Folsom, California

February 2018

# TransWest Express Transmission Project Route



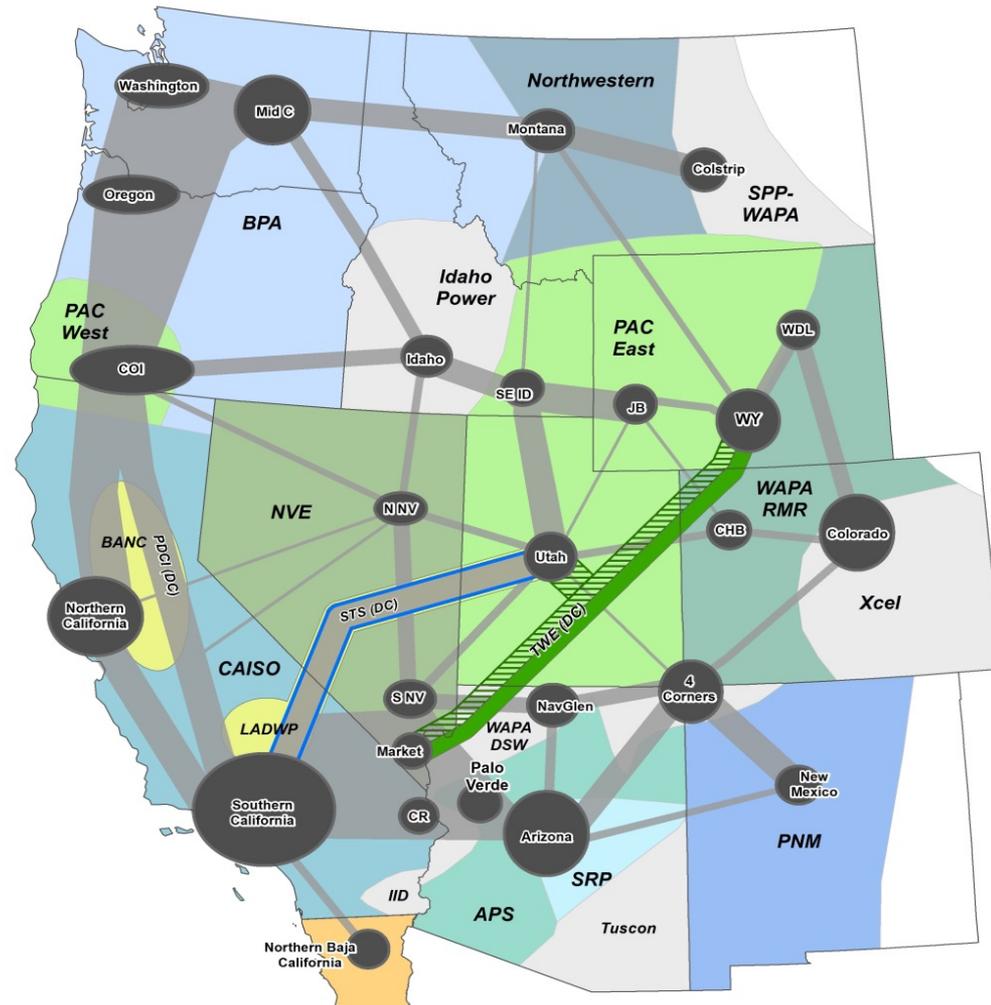
# Wind Resources Within WECC and Existing Transmission Capacity



- **Highest-quality wind resources** in the U.S. are located in the Rocky Mountain Region in **Wyoming**
- Transmission studies have identified a **lack of transmission** to connect California to this resource
- Economic studies have shown wind resources plus the cost of transmission **provides a diversity and cost benefit** if added to California RPS portfolios

# TransWest Express DC Project

- Same as ITP submittal in 2016
- 2022 in-service date
- 730-mile, 600 kV DC from WY (Platte-Latham) to NV (Eldorado Valley)
- 1,500 MW Initial Accepted Rating, 3,000 MW Ultimate Rating
- Relevant Regional Planning Groups: CAISO, WestConnect (multiple) and NTTG (PacifiCorp)
- Seek Cost Allocation: CAISO, possibly WestConnect



# TransWest Express AC & DC Project

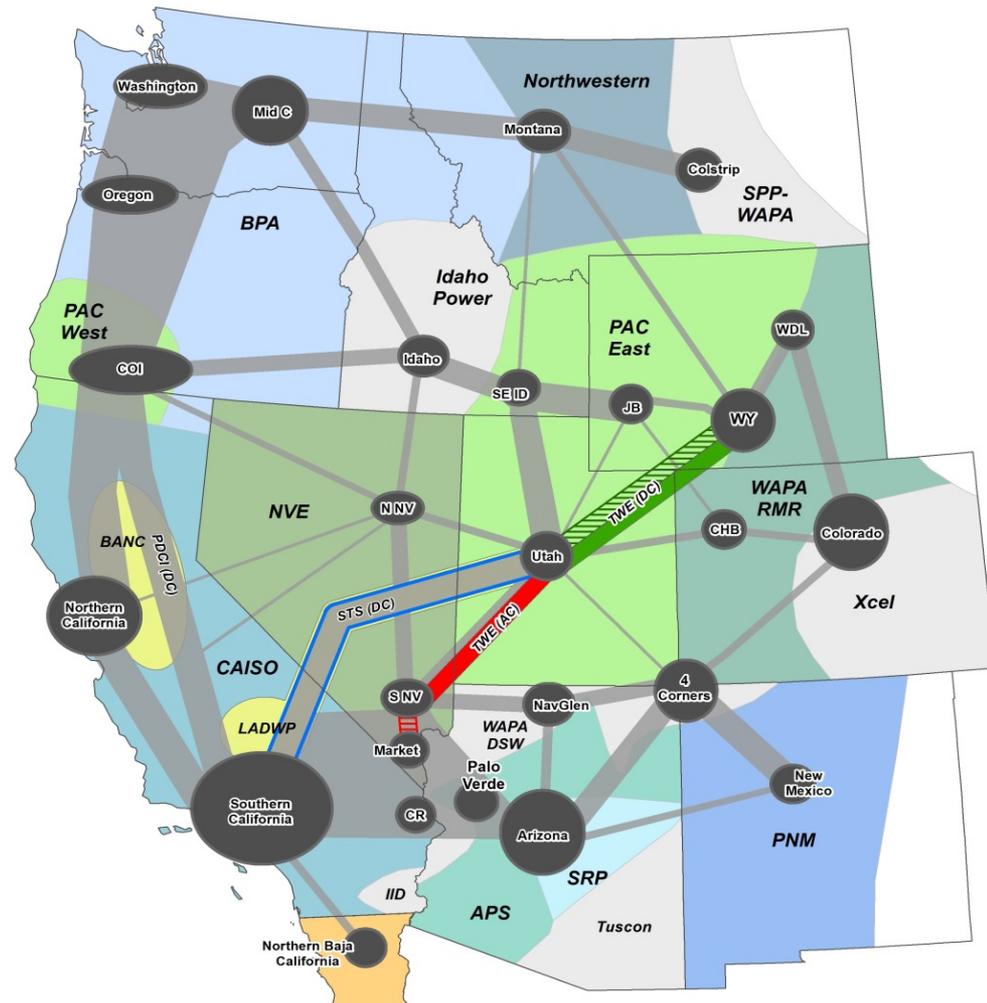
- 2022 in-service date

## DC Segment:

- 406-mile, 600 kV DC from WY to UT (IPP)
- 1,500 MW Initial, 3,000 MW Ultimate Rating
- Relevant Regional Planning Groups: WestConnect (LADWP) and NTTG (PacifiCorp)
- Seek Cost Allocation: WestConnect, possibly CAISO and/or NTTG

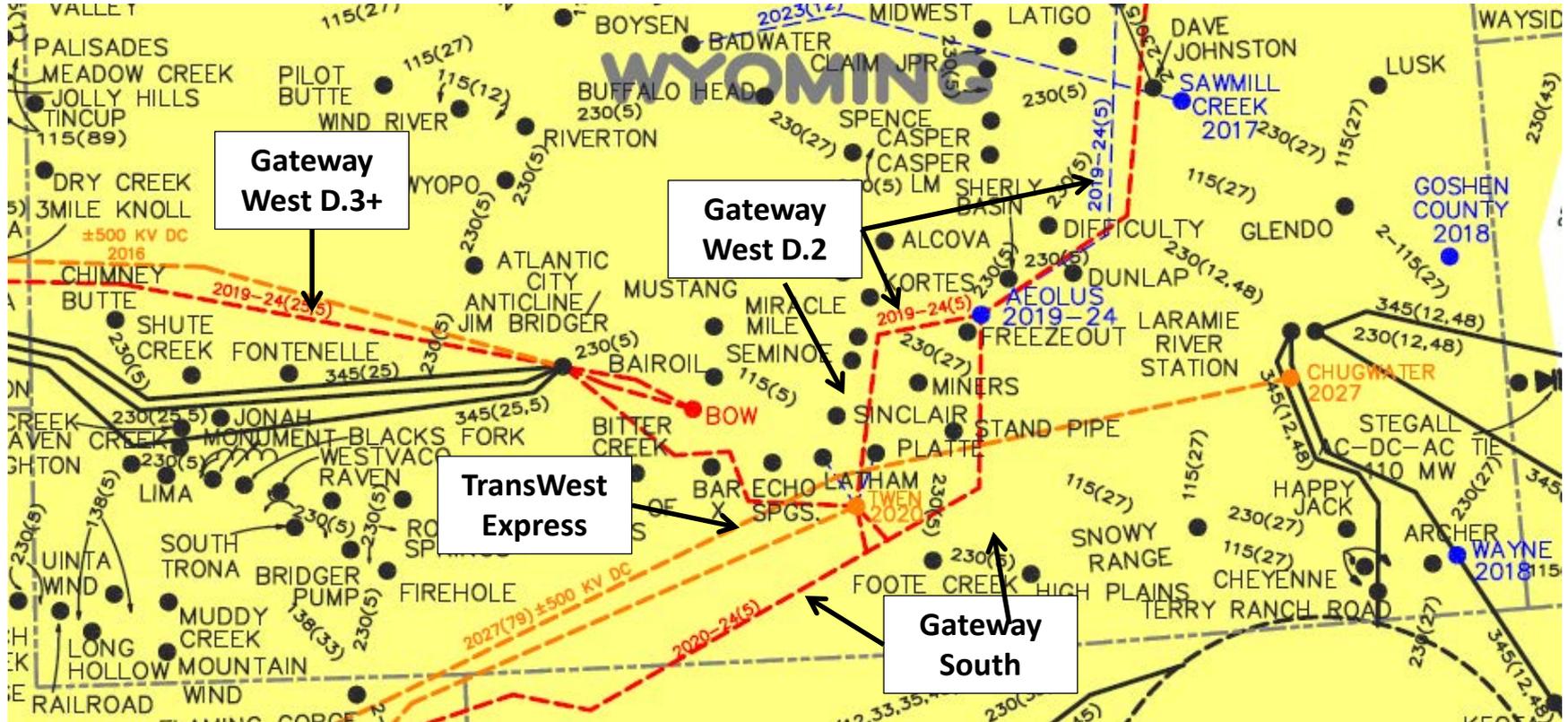
## AC Segment:

- 324-mile, 500 kV AC from UT to NV
- 1,500 MW Rating
- Relevant Regional Planning Groups: WestConnect and CAISO
- Seek Cost Allocation: CAISO, WestConnect and NTTG (PacifiCorp)



# TWE Project

## Wyoming Interconnection



Southern Wyoming, from WECC 2017 Planned Facilities Map, January 2017

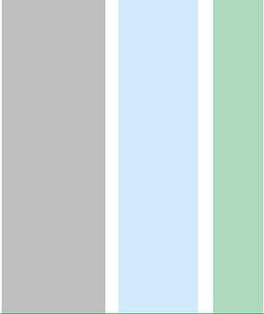
# Advanced Permitting and Development Status

## Significant Milestones

- Nevada PUC UEPA Permit – September 2015
- Bureau of Land Management Record of Decision (ROD) – December 2016
- Western Area Power Administration ROD – January 2017
- BLM Right-of-Way Grant – June 2017

## Ongoing/Planned Activities

- Private ROW Easements – 2017-18
- Wyoming Industrial Siting Permit – 2018
- County Permits – 2018-19
- Agency Notice to Proceed (Construction Start) – 2018 (2019)



## For More Information

[www.transwestexpress.net](http://www.transwestexpress.net)

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TransWest Express LLC  
303-299-1545

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# WPR Coordination of Planning Data and Information through the ADS



# **NTTG Use of ADS in 2018-2019 Biennial Cycle**

Presented by  
Ron Schellberg, NTTG TWG Project Manager

Annual Interregional Coordination Meeting

Folsom, CA

February 22, 2018



# NTTG Use of 2028 ADS in Studies

- The ADS forms the basis for its studies, subject to:
  - A consistency check with the Prior Regional Transmission Plan (pRTP) and Quarter 1 data submittals (due March 31st)
  - There are known differences between the 28hs1a Powerflow case which is the basis of the 2028 ADS and the pRTP
    - Mostly missing resources, but there may be also bulk transmission addition difference as well.
- Change files will be developed in layers to track recommended changes to draft ADS (delivered in March 2018) that should be incorporated into the Final 2028 ADS (delivered in June 2018), for example:
  - Layer 1 – Missing resources and transmission missing from draft ADS based upon pRTP
  - Layer 2 – Changes necessary to reflect Q1 Data submittals



# NTTG Use of 2028 ADS in Studies

- Studies are performed and managed by the Technical Workgroup, comprised of NTTG members with study expertise. The Technical Workgroup reports to the NTTG Planning Committee.
- NTTG will review and validate modified ADS prior to performing studies
- Typically, NTTG will select 6+ conditions for study, which may include:
  - Heavy Summer Peak NTTG loads
  - Heavy Winter Peak NTTG Loads
  - Selected stressed path conditions:
    - Colstrip System
    - Tot 2 with North-to-South flows
    - Low/High renewable production (no change in installed capacity)



# NTTG Use of 2028 ADS in Studies

- NTTG will use the ADS to extract study seed conditions for its studies
  - These seed conditions may need to be adjusted to meet the study objectives. Examples:
    - Heavy Summer and Winter NTTG co-incident loads will be scaled from 1 in 2 to 1 in 5 and/or 1 in 10 probability
    - Adjust interchange/resource dispatch to meet path flow targets.
- NTTG will study a subset of these conditions using today's network topology (Null Case)



# NTTG Use of 2028 ADS in Studies

- NTTG typically analyzes each condition with over 400 single and credible double contingencies.
- NTTG depending on contingency results, additional dynamic simulations may be performed.
- Results will be tabulated or displayed in heat-map form in a manner that does not expose CEII
- Studies will begin in July and a draft study report will be drafted and available by the end of the year.



# Questions and Discussion



# Meeting Conclusion

- Review of key points, action items and assignments
- Closing remarks, next meeting and adjourn

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