

WECC

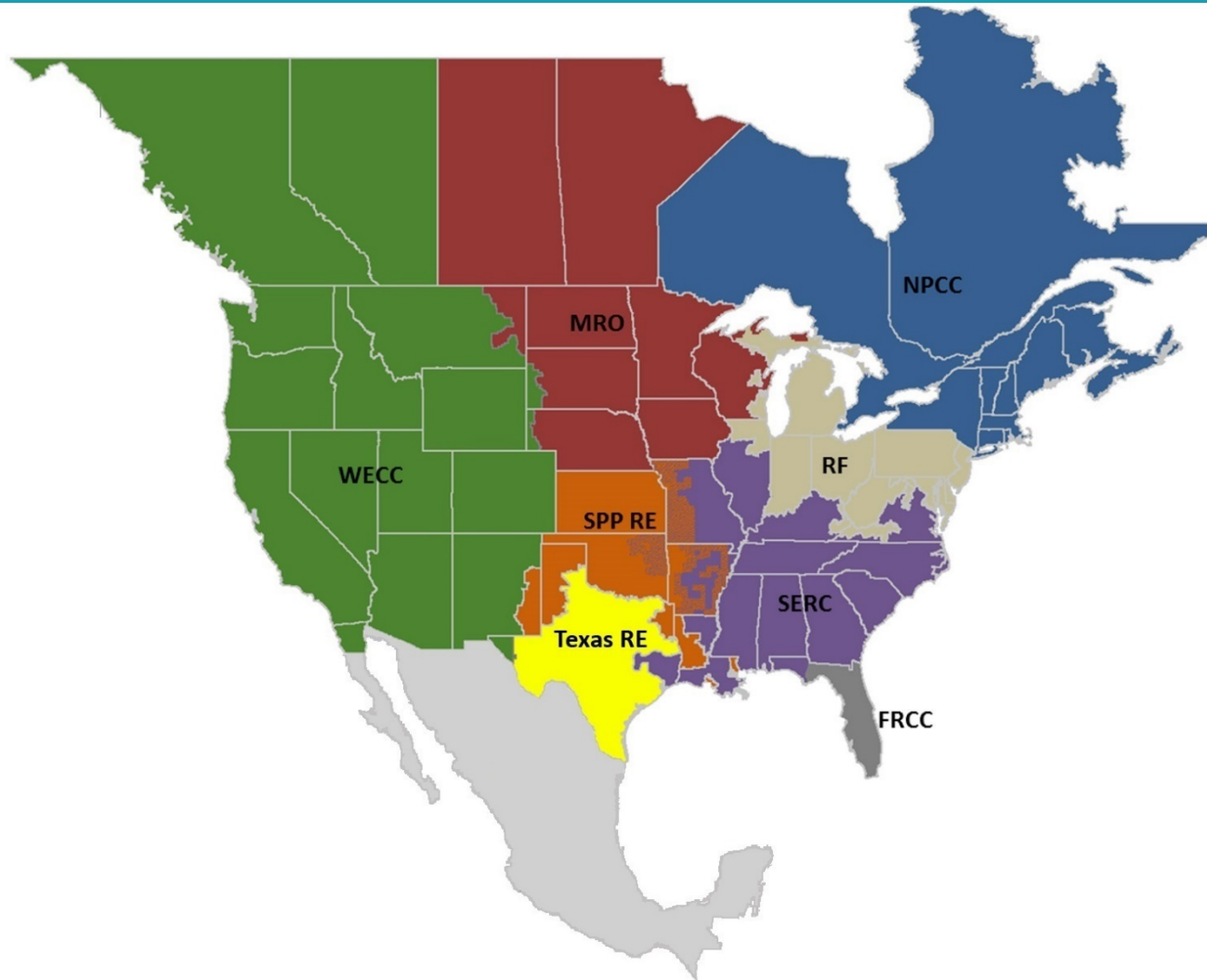
Assessing Reliability in the Western Interconnection

Vijay Satyal and Byron Woertz, WECC

Overview

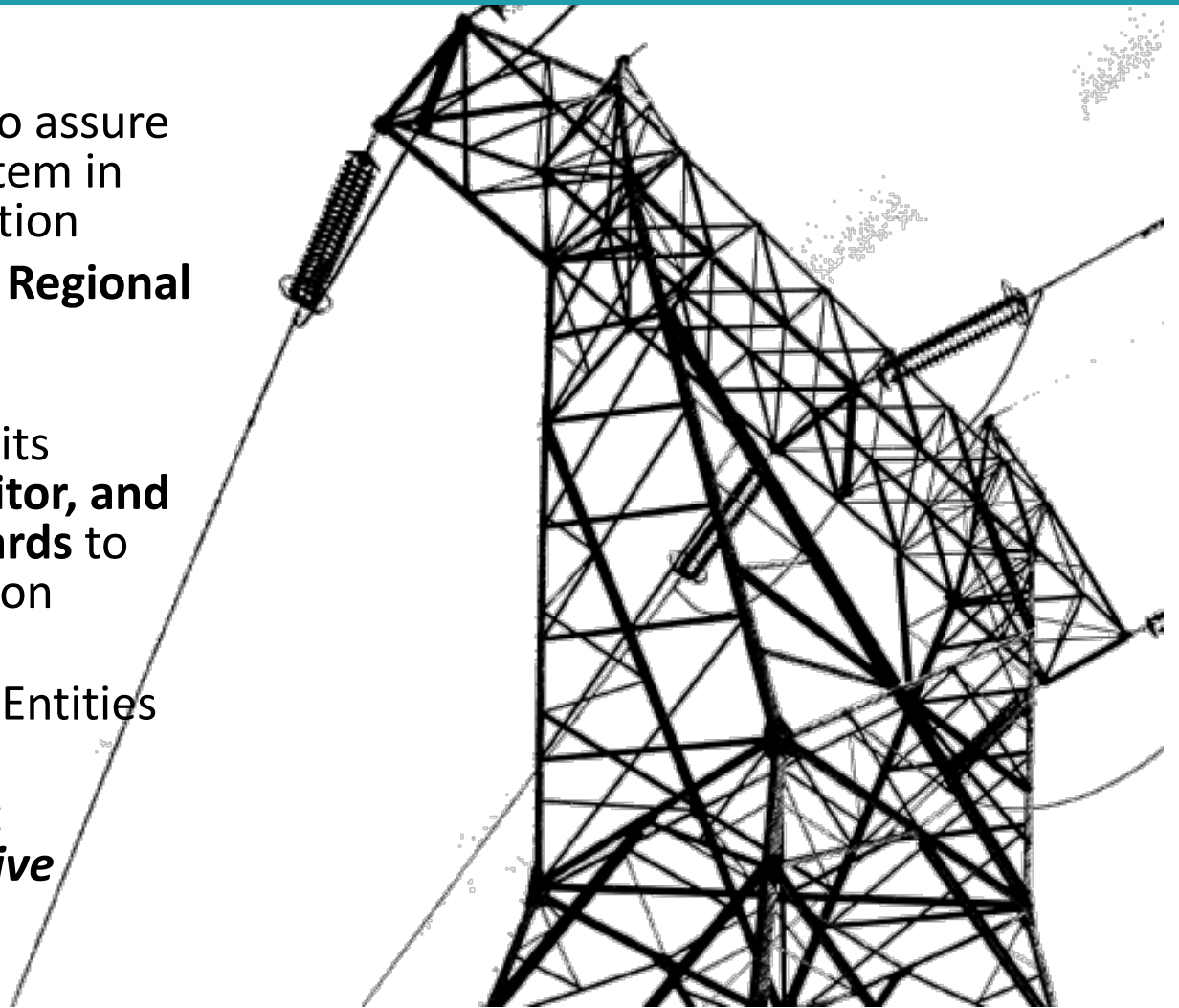
- Who/What is WECC?
- Current state of the Interconnection
- Assessing reliability 2017 – 2034
- Stakeholder collaboration on reliability assessments
- A foundation for reliability assessment data
- Next steps

NERC Regions

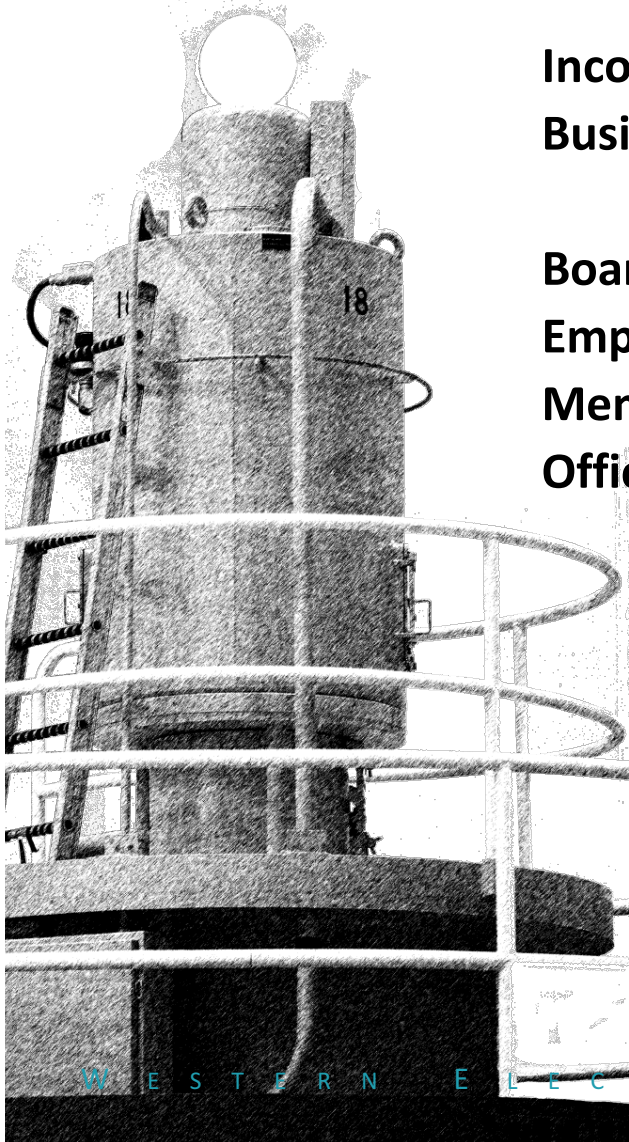


Who We Are

- **WECC is a not-for-profit organization** that exists to assure a reliable bulk power system in the Western Interconnection
- Approved by FERC as the **Regional Entity** for the Western Interconnection
- NERC delegated some of its authority to **create, monitor, and enforce reliability standards** to WECC through a Delegation Agreement
- Largest of eight Regional Entities
- Both a **Region and an Interconnection** makes it unique—better *perspective*



What We Are

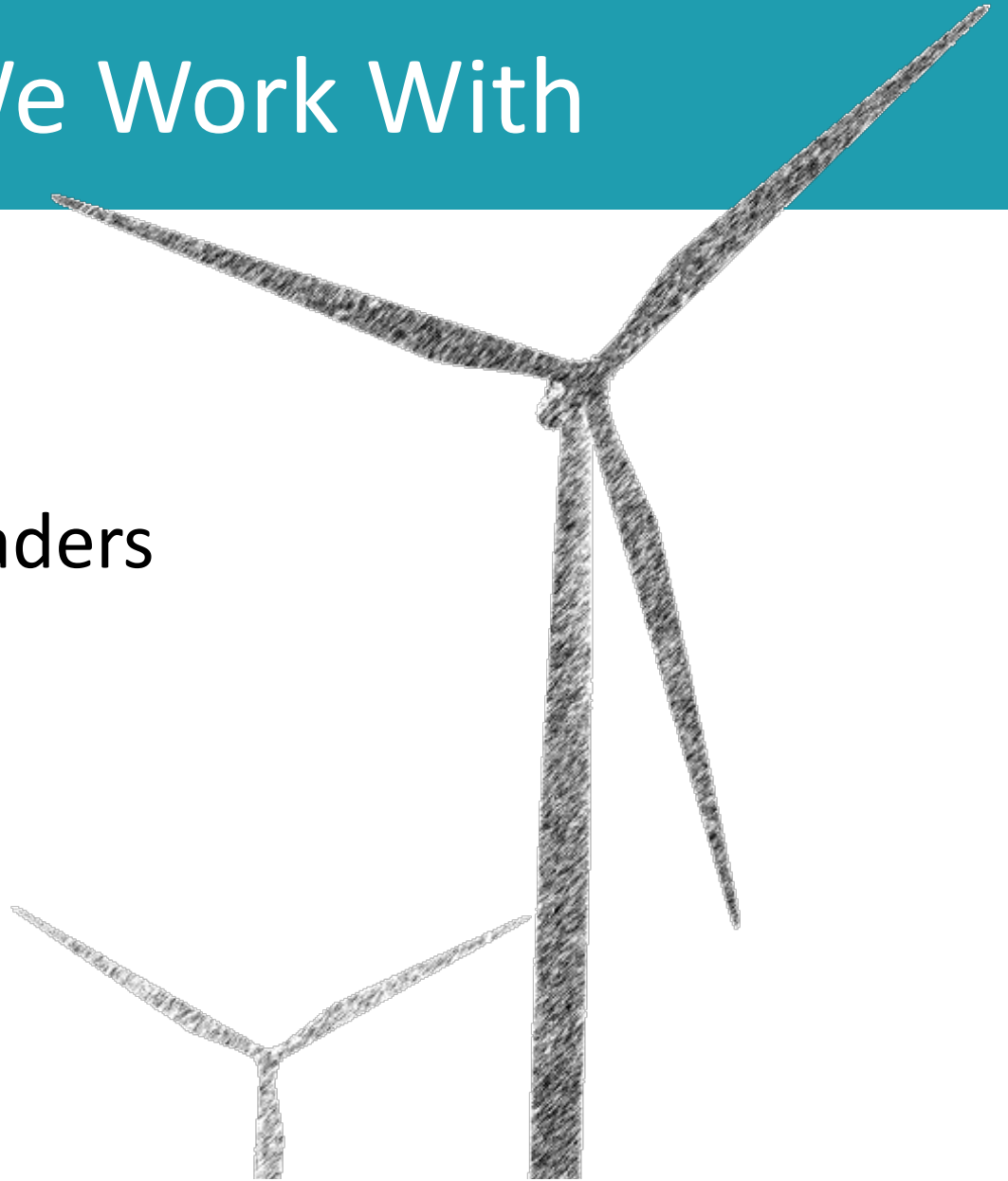


Incorporated:	2002
Business:	<i>501(c)(4) not-for-profit social welfare organization</i>
Board of Directors:	<i>10 Members, Independent</i>
Employees:	134
Members:	361
Offices:	<i>Salt Lake City, UT (HQ) Vancouver, WA</i>

Data as of September 19, 2017

Who We Work With

- Professional Staff
- Members
- Policy/Opinion Leaders

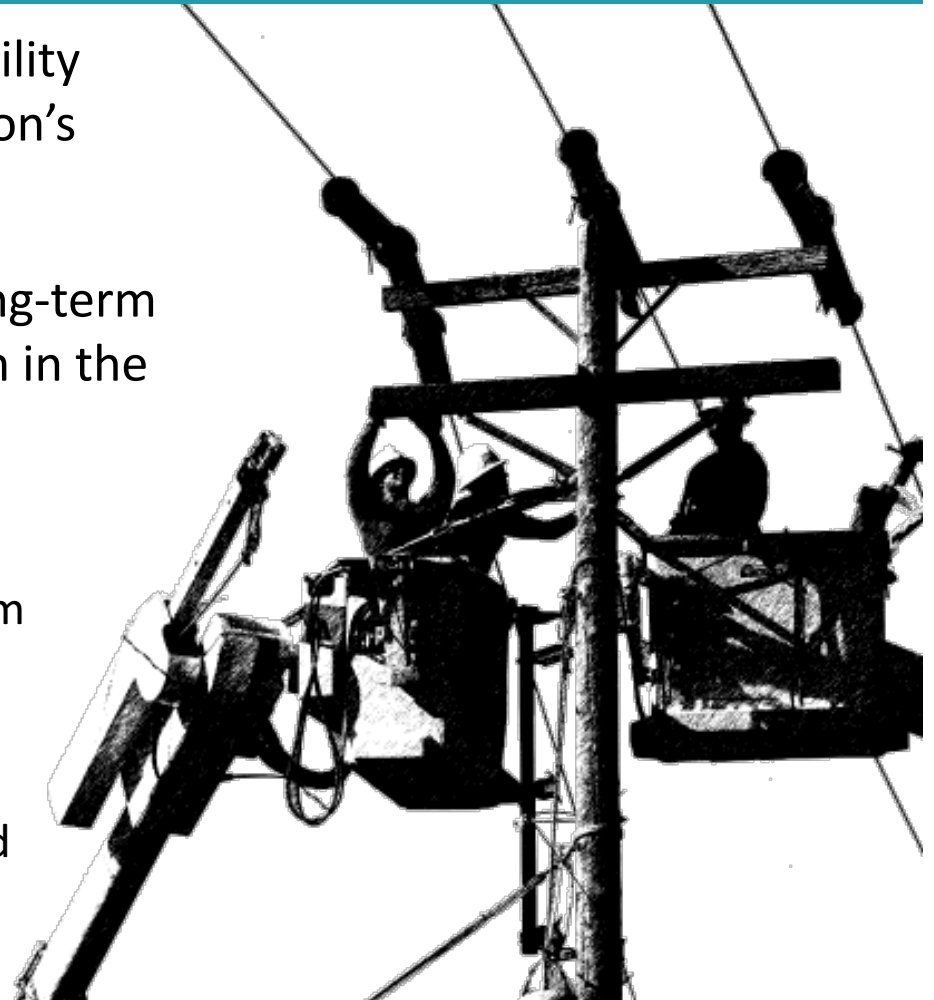


What We Do

Purpose: To assure the public of the reliability and security of the Western Interconnection's bulk power system.

Mission: To assure the near- and long-term reliability of the Bulk Electric System in the Western Interconnection.

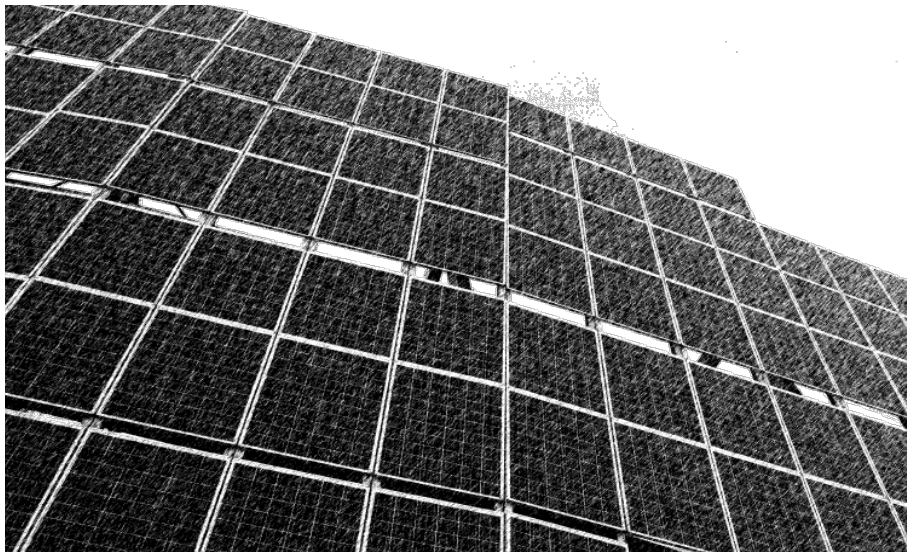
Vision: To serve the public interest by assuring the Bulk Electric System is reliable; to best inform the Region's leaders in their decisions regarding critical electric reliability issues facing the Western Interconnection; and to partner with our stakeholders to help them plan, develop and operate the Bulk Electric System in accordance with industry-accepted reliability standards.



How We Do It

Reliability Planning and Performance Analysis

Planning Services:	<i>Base Cases, Transmission Studies, Scenario Planning</i>
Reliability Assessments:	<i>Power Supply Assessment, State of the Interconnection</i>
Performance Analysis:	<i>Event Analysis, Operational Practices Survey</i>
Standards Development:	<i>Regional Standards, Variances and Interpretations</i>
Training and Education:	<i>Human Performance, System Operation</i>



Risk-based Compliance Monitoring and Enforcement

Entity Registration

Compliance Risk Assessments:

Inherent Risk Assessment

Internal Controls Evaluation

Monitoring: *Critical Infrastructure Protection*

Operations and Planning

Standards Violation Enforcement

Spectrum of Reliability Analyses



- Voltage Stability
- Generation interconnection/retirement analysis
- N-1 contingency studies
- Project benefits and selection
- Cost allocation
- Resource Adequacy
- Transmission Congestion
- Path Utilization
- Frequency Response

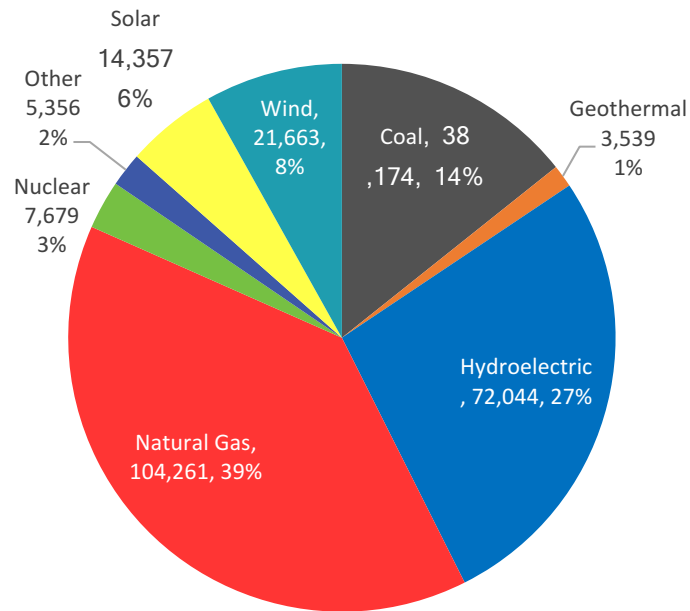
Time Horizons of our Work

Reliability Assessment and Performance Analysis

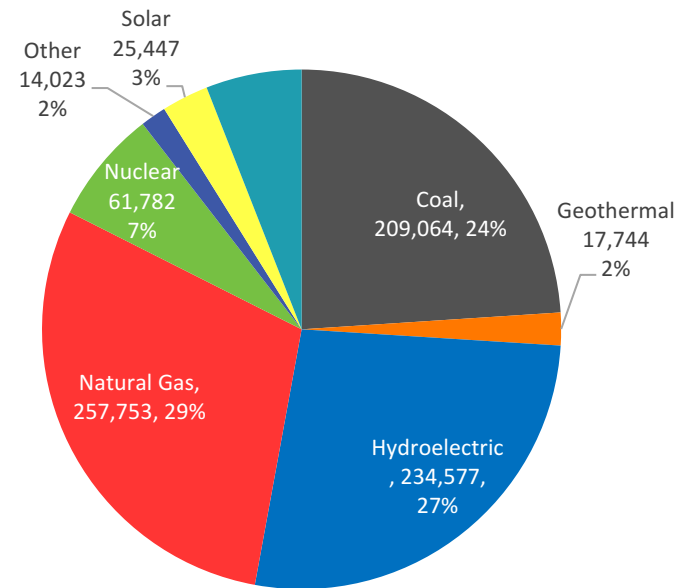
Past	Present	Future	
Performance Analysis	Event Analysis	Reliability Planning	
<ul style="list-style-type: none"> • Reliability vulnerability assessments • Reliability Performance Index • Special assessments/deep dive into emerging issues • State of the Interconnection report • Operational Practices assessment and related materials • Coordination with NERC on data management 	<ul style="list-style-type: none"> • Technical Committee support and facilitation • Event Analysis and lessons learned • Cause coding and Root Cause analysis • Event trending • Operational guidelines and best practices 	<ul style="list-style-type: none"> • RAC support and facilitation • Anchor Data Set development • Base case development • Production cost model development • Short circuit data collection • Probabilistic Resource adequacy assessments • NERC and regional reliability assessments 	<ul style="list-style-type: none"> • Special reliability assessments • Database management and model development • Scenario development • BES exception processing • Project coordination and Path Rating process

SOTI 2017 Trends

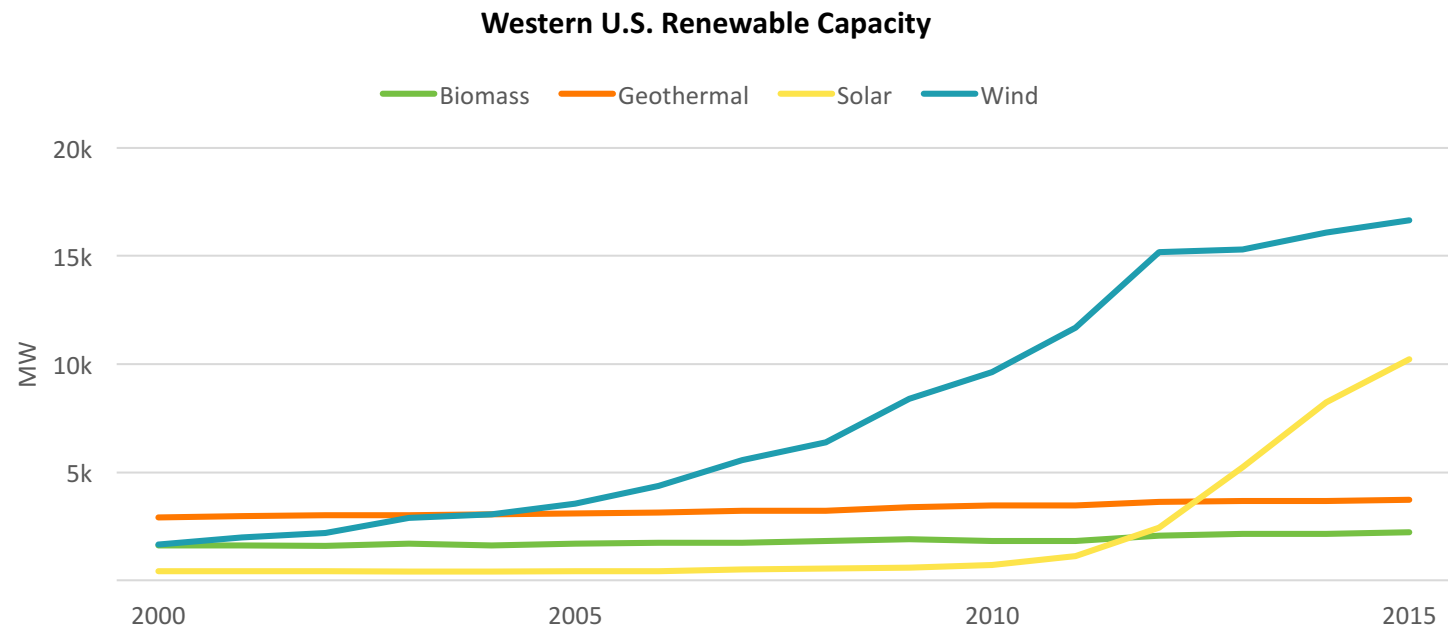
2016 Nameplate Capacity (MW)



2016 Net Generation (GWh)

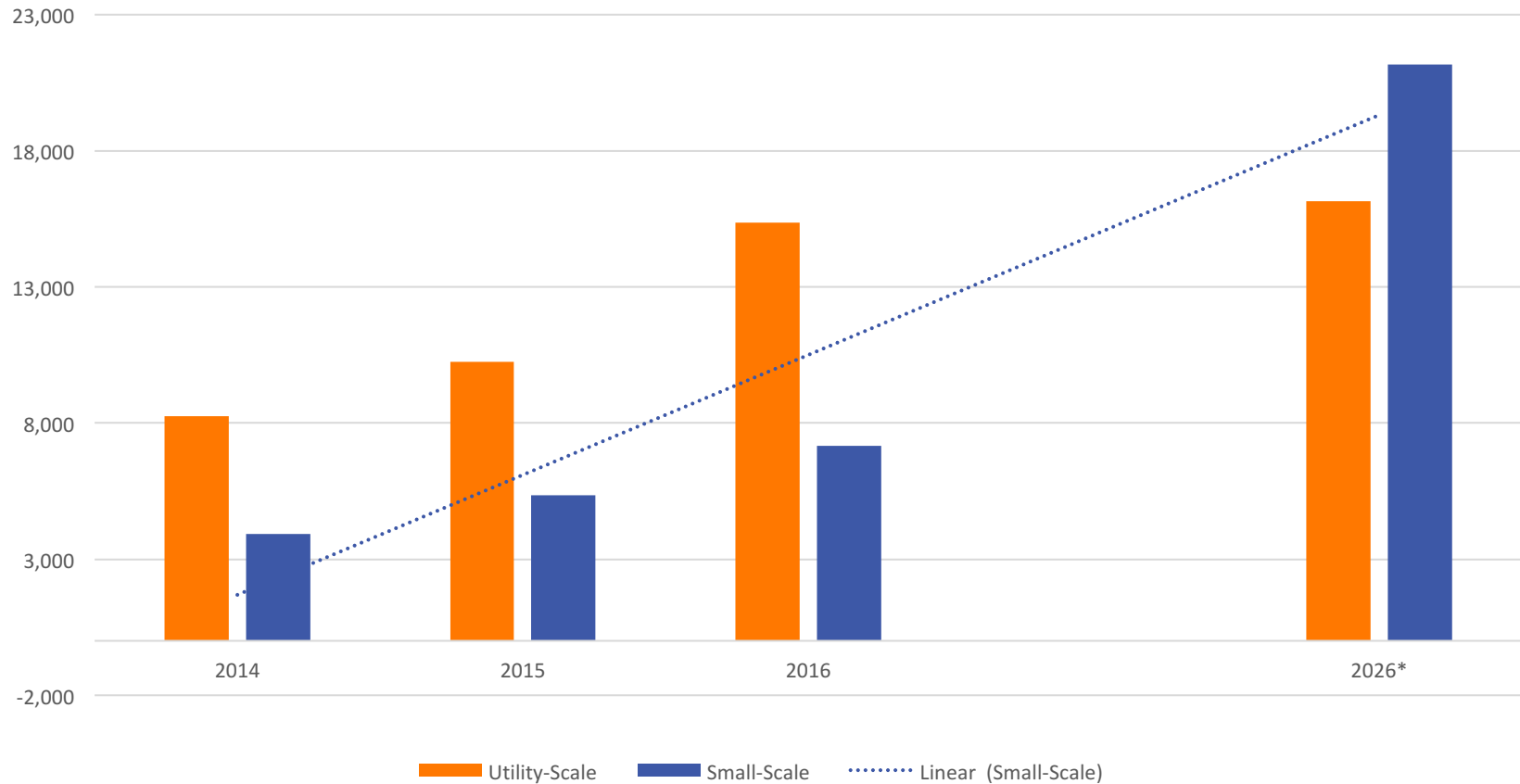


Western U.S. Renewable Resources

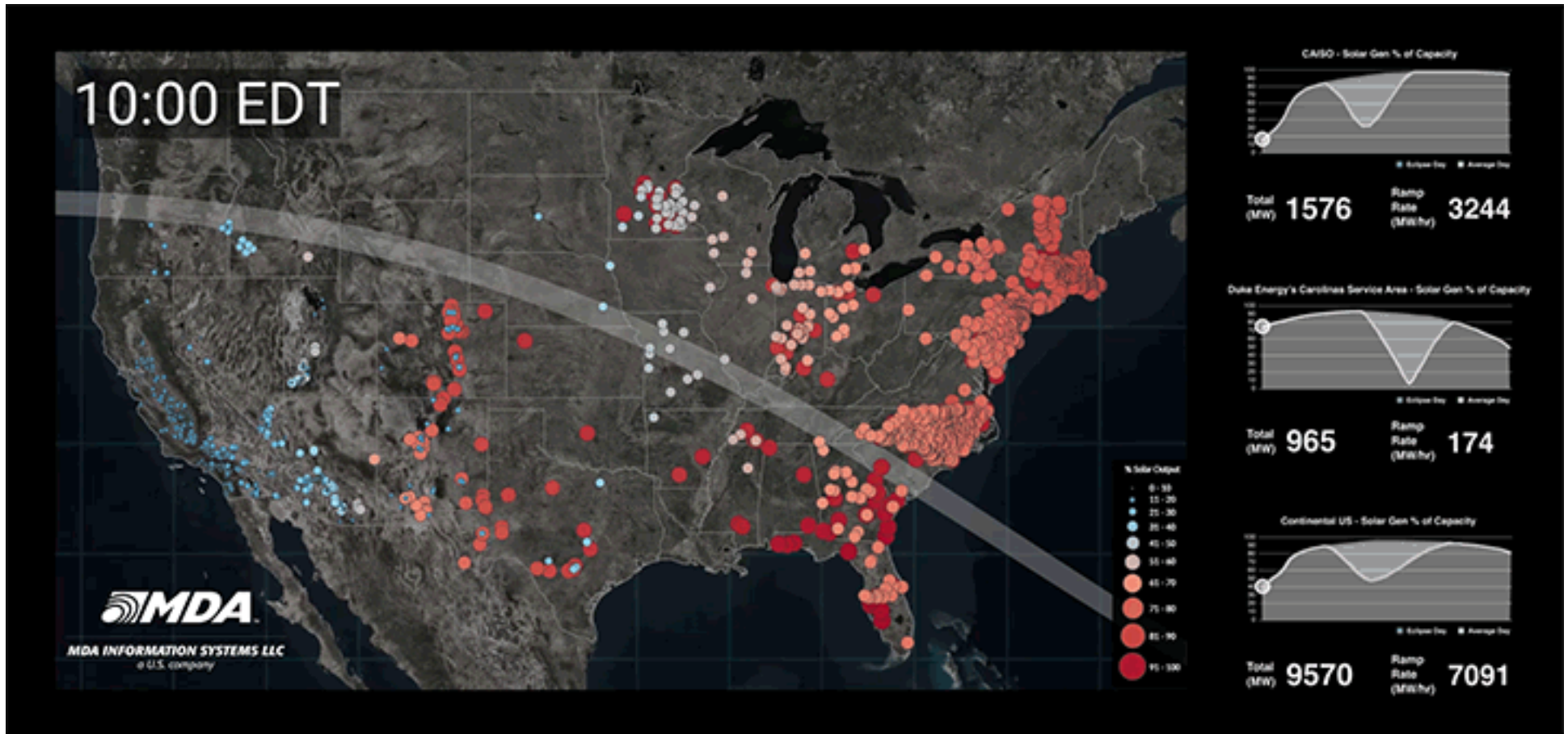


Changing Resource Mix: Solar

Western US Nameplate Capacity Solar Trends (MW)*

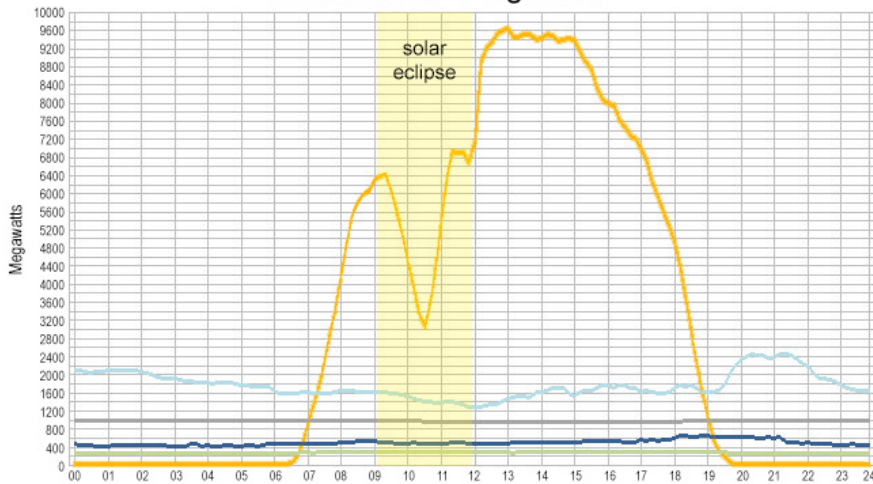


Eclipse Impacts on Solar Energy Production

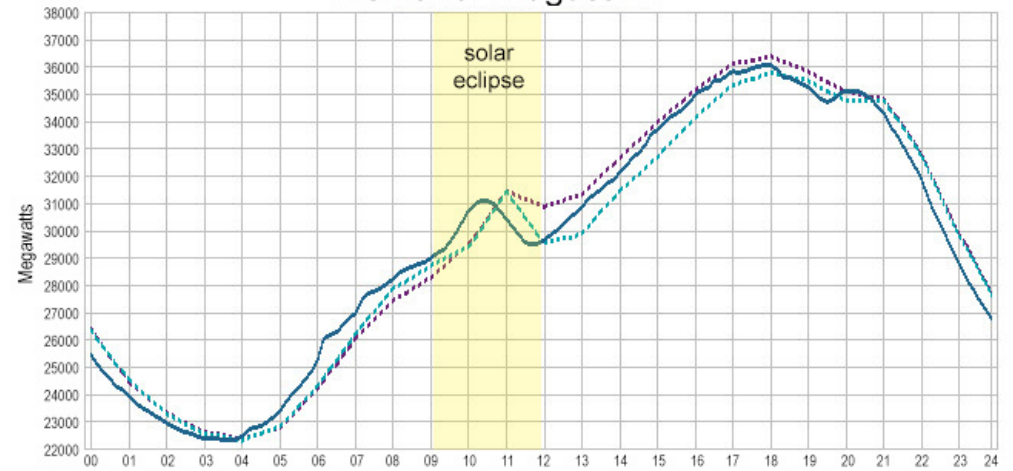


Solar Eclipse

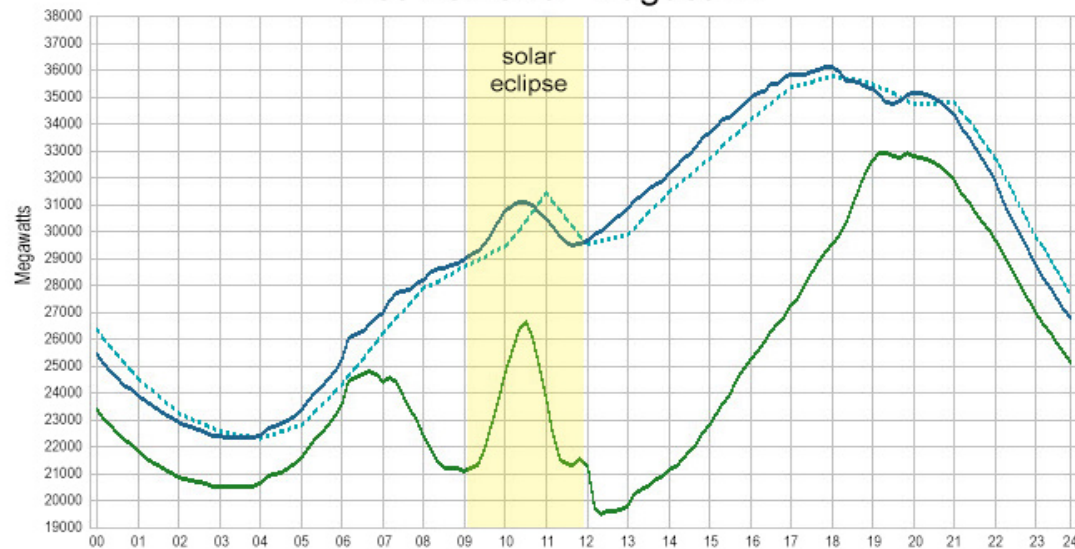
Renewables - August 21



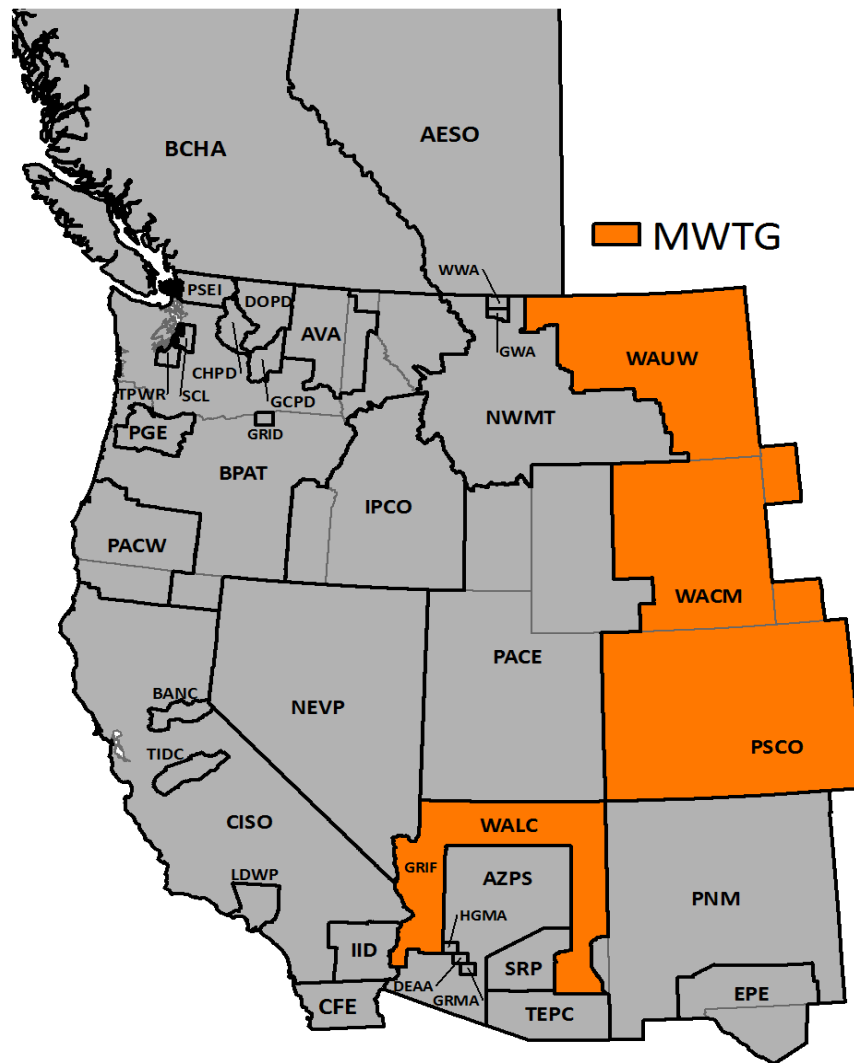
Demand - August 21



Net Demand - August 21

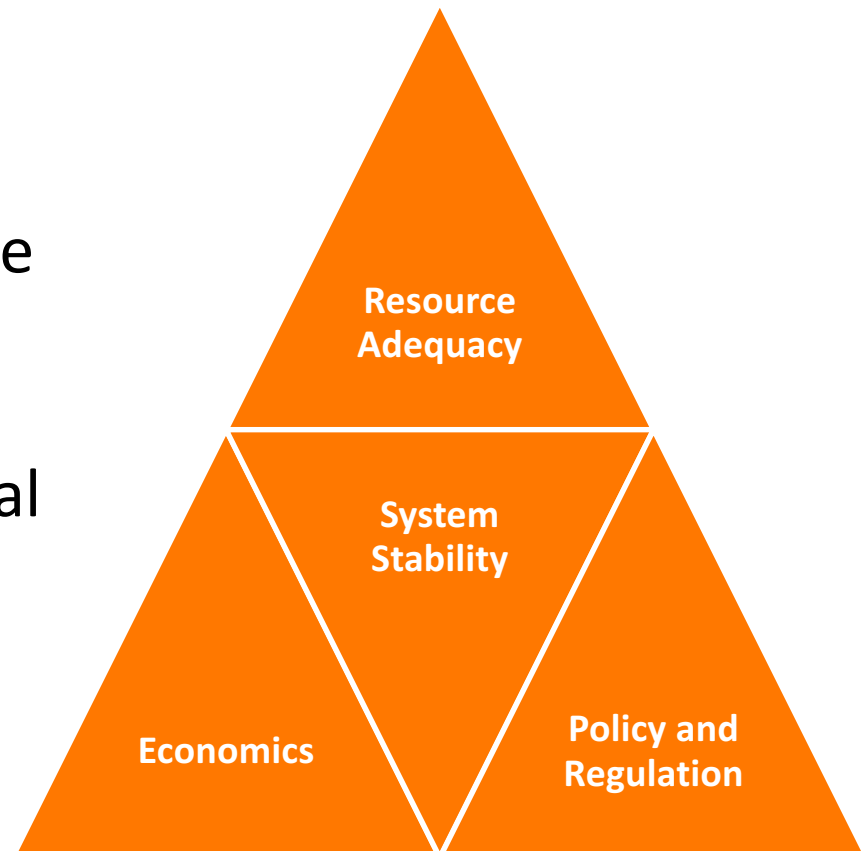


MWTG – Organized Market Efforts



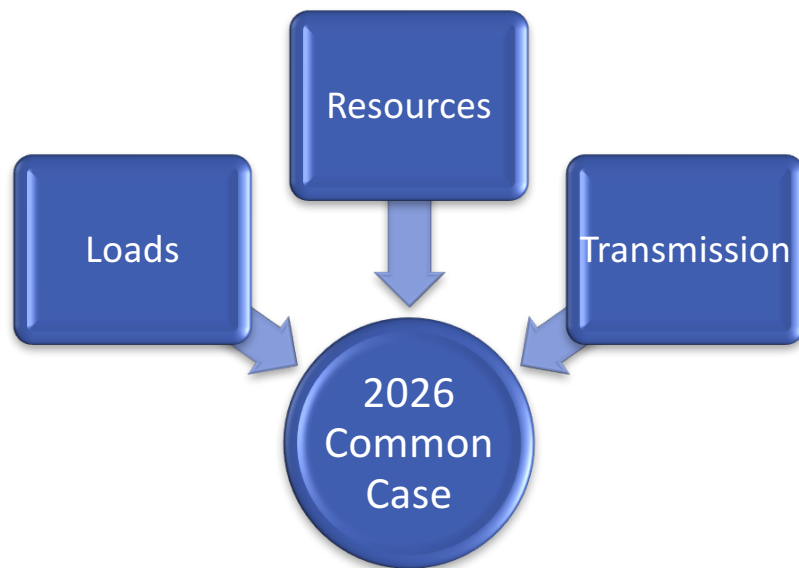
Reliability Context

- Focus questions:
 - What potential reliability risks might the Western Interconnection face in the next 1-20 years?
 - How can WECC best understand those potential risks?
- What is “reliability?”
 - The ability to meet load with available resources.



What Is the Common Case?

Data Set



WECC's view of the most likely combination of loads, resources and transmission topology 10 years in the future

Model

- Production Cost Model (PCM)
- Security Constrained Economic Dispatch (SCED)
- Resource dispatch for each of the 8,760 hours in the study year

2026 Common Case Transmission Assumptions (CCTA)

The purpose of the CCTA is to provide a basic set of facilities that TEPPC can use as a starting point for their own studies. The CCTA is a list of facilities that are expected to be in-service by 2026.



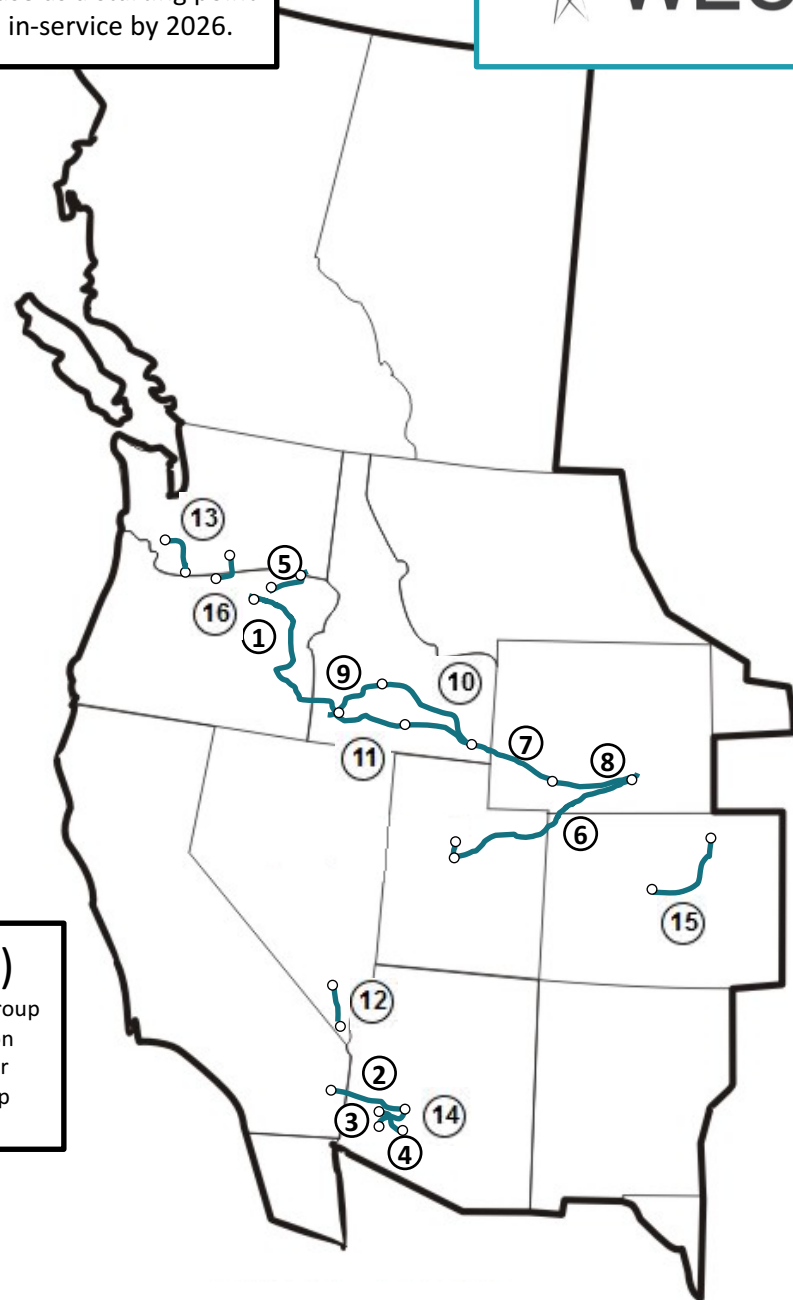
- (1) Boardman – Hemingway (B2H) [500 kV]
- (2) Delaney – Colorado River (Ten West Link)
- (3) Delaney – Palo Verde [500 kV]
- (4) Delaney – Sun Valley [500 kV]
- (5) Energy Gateway: Wallula – McNary [230 kV]
- (6) Energy Gateway South: Aeolus – Mona [500 kV]
- (7) Energy Gateway West: Bridger – Populus [500 kV]
- (8) Energy Gateway West: Windstar – Jim Bridger [230-500 kV]
- (9) Energy Gateway West: Midpoint – Hemingway [500 kV]
- (10) Energy Gateway West: Populus – Midpoint [500 kV]
- (11) Energy Gateway West: Populus – Cedar Hill – Hemingway [500 kV]
- (12) Harry Allen – Eldorado (Centennial II) [500kV]
- (13) I-15 Corridor Reinforcement Project (Castle Rock – Troutdale)
- (14) Morgan – Sun Valley [500 kV]
- (15) Pawnee – Daniels Park
- (16) West of McNary Reinforcement Project Group 2 (Big Eddy – Knight)

Blue text – Indicated “Under Construction”

Regional Planning Coordination Group (RPCG)

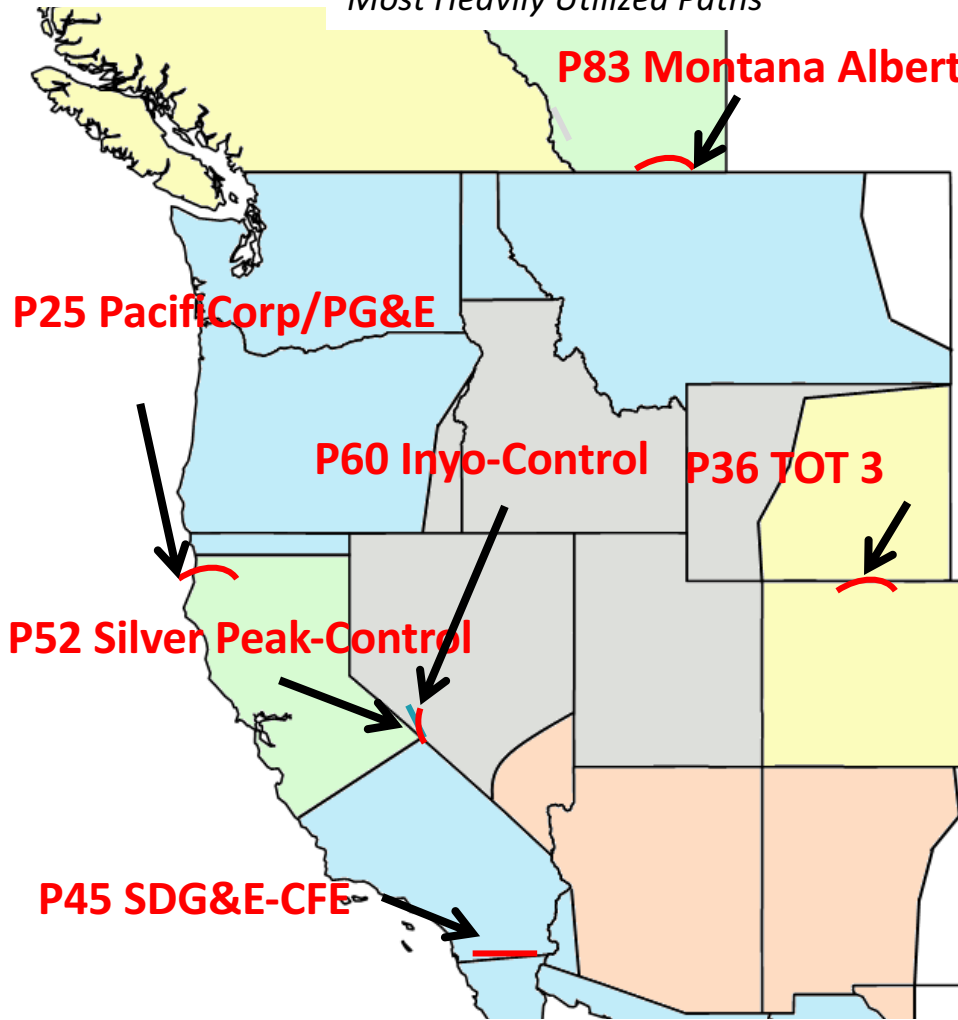
CAISO – California Independent System
CTPG – California Transmission Planning Group
CG – Columbia Grid
CCPG – Colorado Coordinated Planning Group
NTTG – Northern Tier Transmission Group

SIERRA – Sierra Subregional Planning Group
SWAT – Southwestern Area Transmission
AESO – Alberta Electric System Operator
BCCPG – BC Coordinated Planning Group



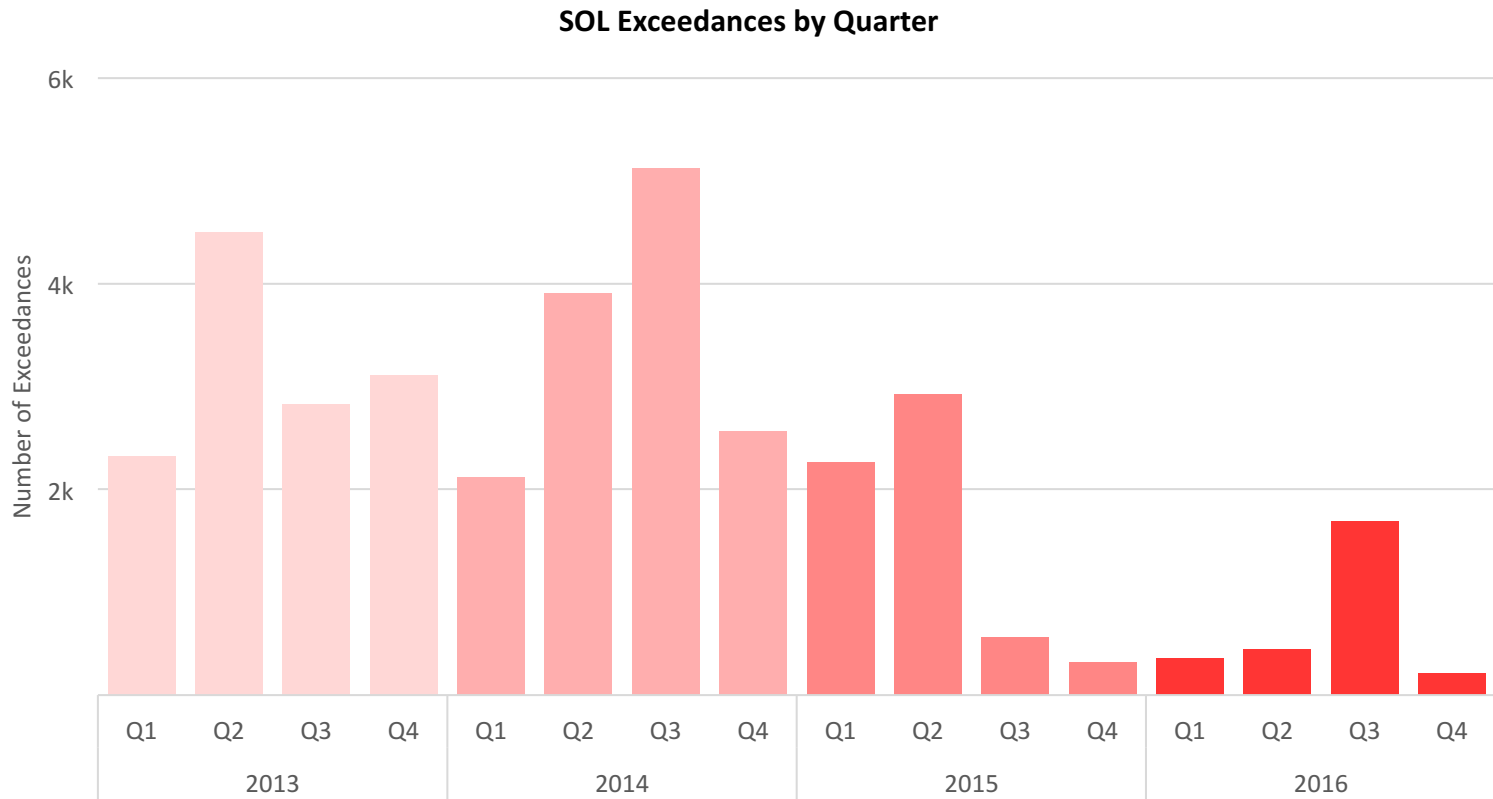
2026 CC Transmission Utilization

Most Heavily Utilized Paths



Most Heavily Utilized Paths	U75	U90	U99
P25 PacifiCorp/PG&E 115 kV Interconnection	13.30 %	8.94%	6.42%
P45 SDG&E-CFE	11.23 %	6.79%	4.73%
P52 Silver Peak-Control 55 kV	12.89 %	5.08%	0.00%
P83 Montana Alberta Tie Line	10.50 %	3.79%	0.09%
P36 TOT 3	20.99 %	3.41%	1.00%
P60 Inyo-Control 115 kV Tie	10.82 %	1.59%	0.00%

System Operating Limit(SOL) Exceedances (SOTI 2017)



New Committee Responsibilities

Reliability Assessment Committee

Planning Coordination Committee

- Base Case development
- Power flow cases
- Dynamic and stability study cases
- System model validation
- Special assessments
 - Underfrequency load shedding
 - Disturbance validation
 - Applications of synchrophasor data

Transmission Expansion Planning Policy Committee

- Common Case development
- Production cost model study cases
- Capital expansion model study cases
- Scenario development
- NERC assessments
- Special assessments
- Probabilistic and stochastic assessments

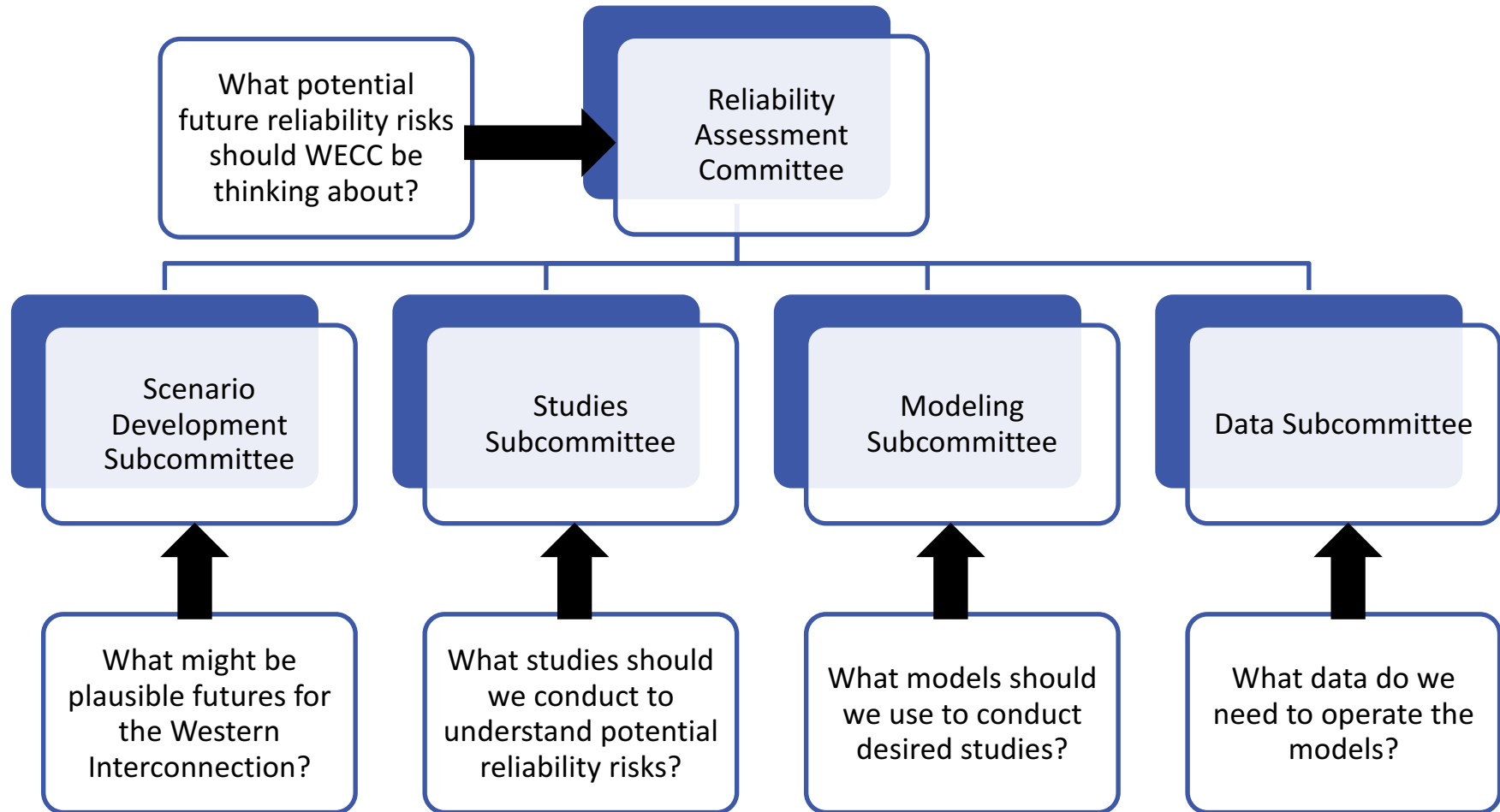
Recommendation & Benefits of RAC

Recommendation: Create a Reliability Assessment Committee (RAC) and consolidate TEPPC & PCC functions into this new committee

Potential Benefits:

- Reduced duplication in data collection
- Accurate, consistent and complete data set for Western Interconnection planning
- Increased buy-in from users
- Improved coordination between WECC's near- and long-term planning
- Enhanced verification of data sources and modeling assumptions
- More focused stakeholder engagement and participation
- Planning expertise focused within a single committee
- Improved efficiency and cost effectiveness

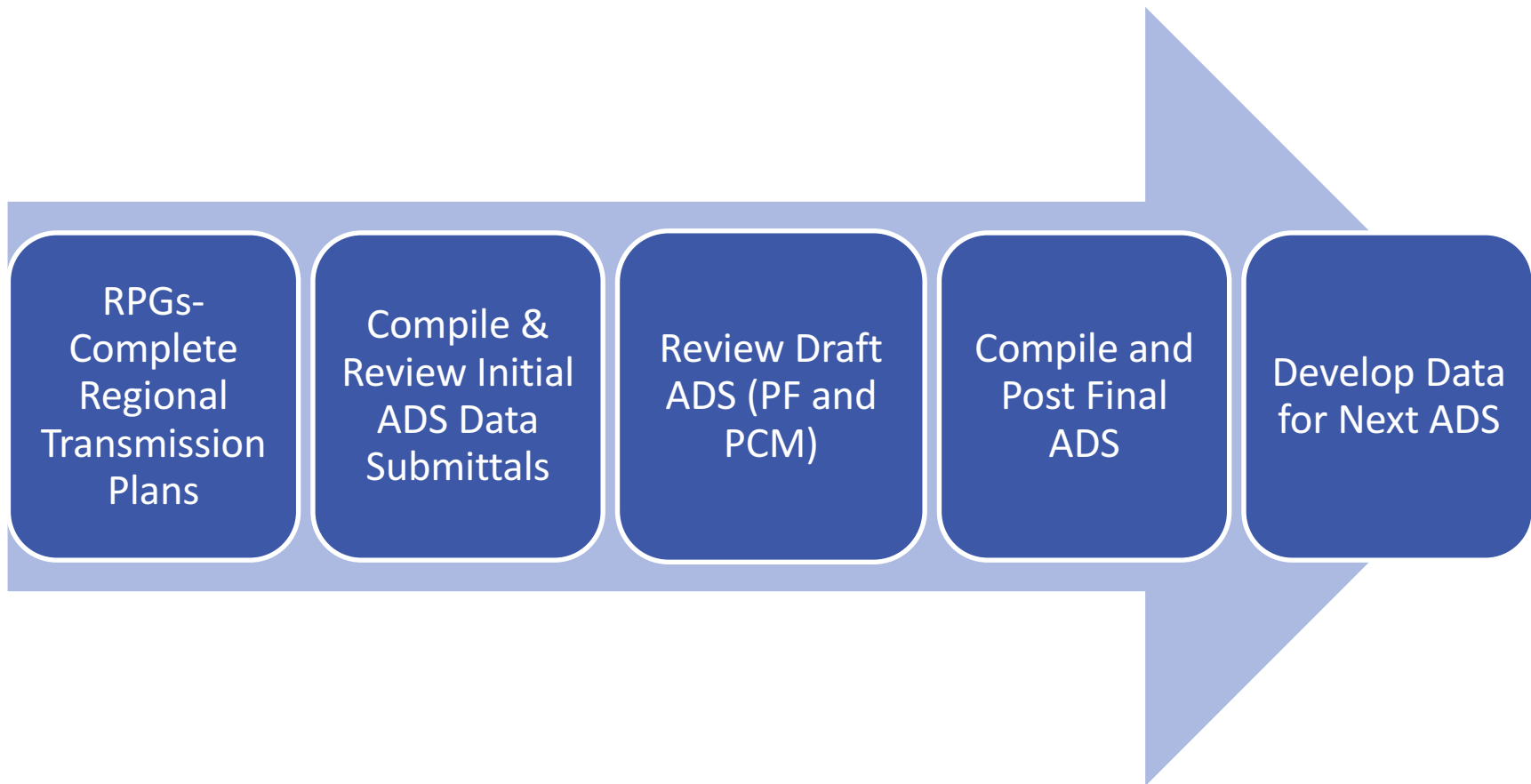
RAC Organizational Structure



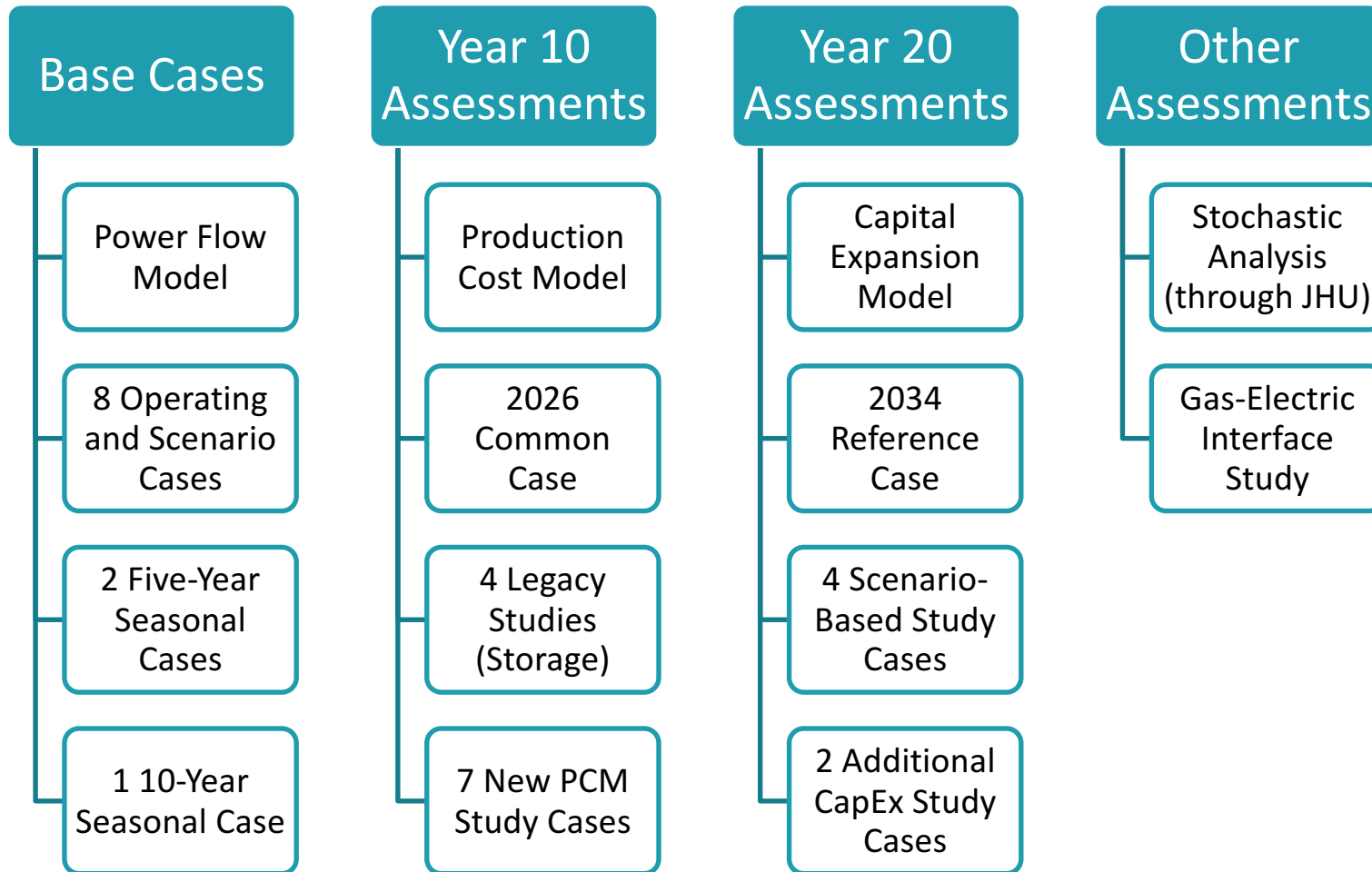
Anchor Data Set (ADS)

- Planning Objective for WECC:
 - Consistency in “initial assumptions” about the “status quo.”
 - Common Starting Point – Consistent initial data from the RPGs that helps WECC populate their Base Case(s) for reliability/transmission planning studies
 - Assists entities and RPGs with FERC Order 1000 planning and project selection.
- Reflects key planning assumptions of:
 - Resource and transmission topology
 - RPS compliance
 - Other public policy considerations (related new project investments)
- Key Products: 2028 HS PF; 2028 ADS PCM, Change files and roundtrip-validated 1-hour exports.

Overall process



Current Reliability Assessments



Contact Information



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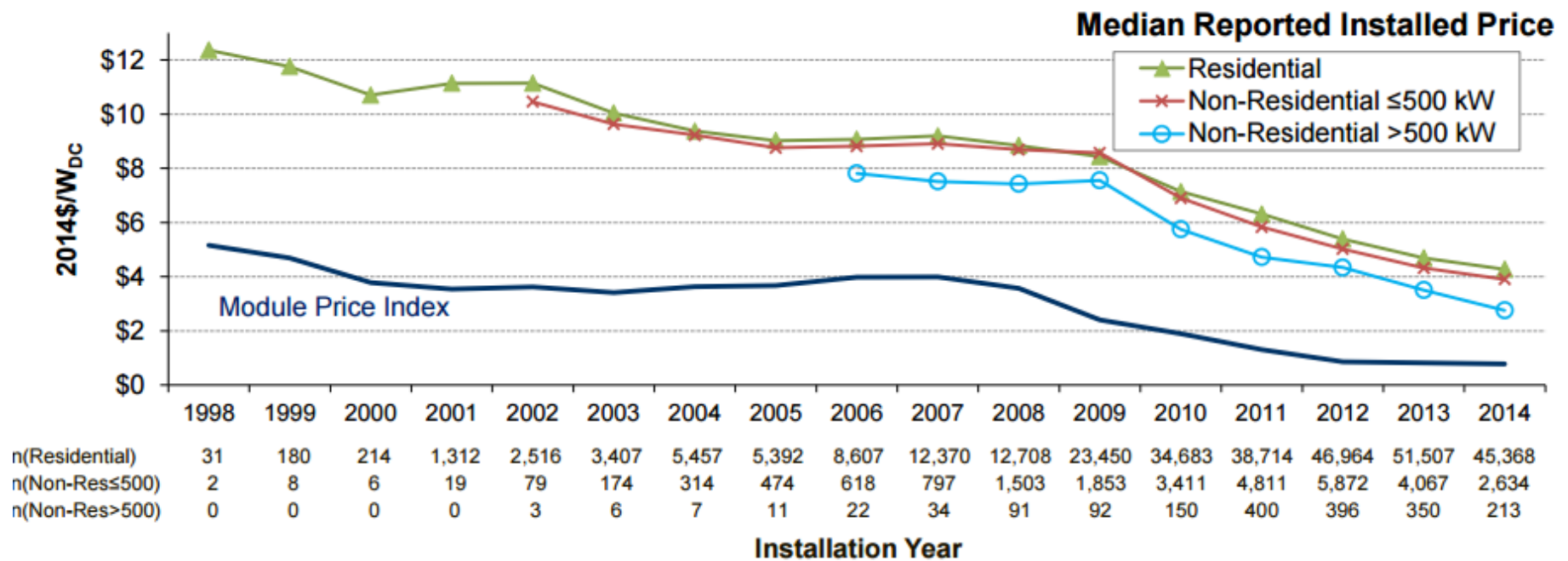
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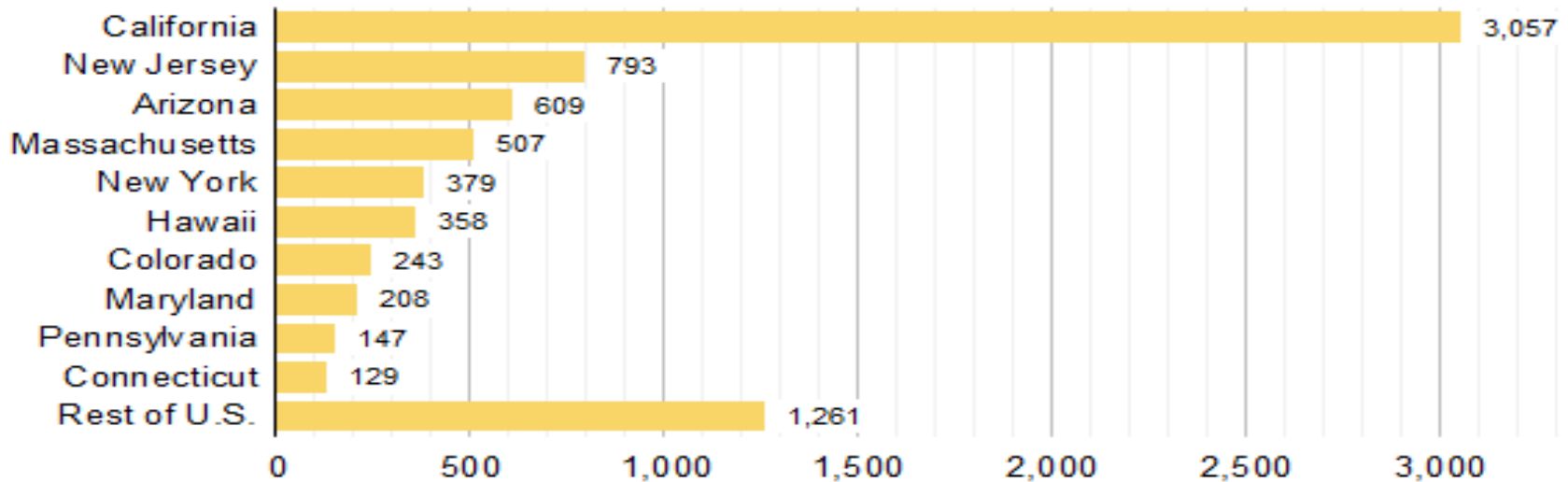
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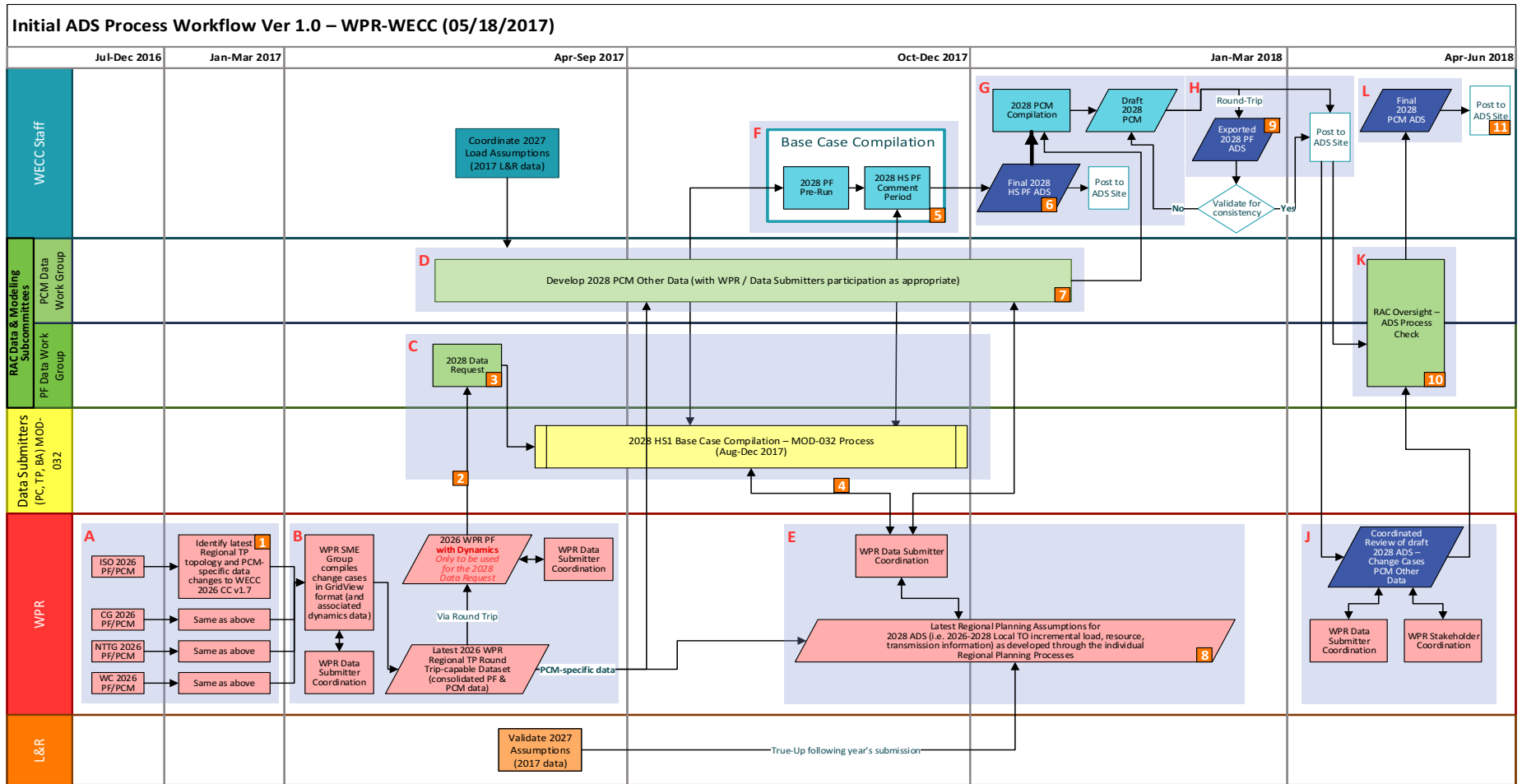
Extra Slides



Distributed solar PV installed capacity, top 10 states, as of September 2015
megawatts (MW_{AC})



Operational ADS Workflow (1.0)



FOOTNOTES

- 1 Each planning region makes their own decisions regarding the scope of changes they wish to submit for compilation
- 2 WECC needs two weeks to convert the case into PSS/E for some Data Submitters
- 3 Disclaimer to be added that this is a Seed Case to assist in 2028 HSI Base Case Development, not to be used for studies.
- 4 This loop is essential for all Topology and Resource changes that includes RPS and Resource Adequacy
- 5 This case will be reviewed by the Data Submitters, WPRs should be involved through the Data Submitters.
- 6 No further changes can be made to the transmission topology, resources, or RPS compliant PF Case.
- 7 Depending on what "Other Data" is needed, this will take more time. WECC staff will define which items will be decided in committee and by staff.
- 8 WPR will coordinate with respective BAs to reconcile 2017 L&R data for the 2018 submittals.
- 9 Roundtrip process is for validating PF and PCM dataset consistency.
- 10 RAC Oversight of the ADS Process Only.
- 11 ADS Site will include posted version of the 2028 PF, Exported 2028 PF, 2028 PCM and Change Files.



What does the workflow mean?

- RPGs have the first touchpoint with Data Submitters.
- RPGs will ensure the seed-data provided to WECC reflects RPS considerations/mandates.
- WECC will NOT undertake the next CCTA effort (PCM)
- Data Submitters will have access to the MOD-32 HS PF Base Case process and review WPR/IPR inputs.