PNM 2020-2039 Integrated Resource Plan

September 6, 2019

Transmission & Reliability

Real World Operations

PNM Resources®

Agenda

- Welcome and Introductions
- Safety and Ground Rules
- Online Participation Instructions
- California ISO – Electric System Operation
- PNM Wholesale Power Marketing
- PNM Power Operations – Reliability & Load Balancing
- PNM Transmission Planning
- Outline of next meeting's topic

Nick Phillips
Director, Integrated Resource Planning

Mr. Phillips manages the PNM Resource Planning department and is responsible for developing PNM resource plans and the regulatory filings to support those resource plans.

Prior to joining PNM, Mr. Phillips was involved with numerous regulated and competitive electric service issues including resource planning, transmission planning, production cost analysis, electric price forecasting, load forecasting, class cost of service analysis, and rate design.

Mr. Phillips received the Degree of Master of Engineering in Electrical Engineering with a concentration in Electric Power and Energy Systems from Iowa State University of Science and Technology, and the Degree of Master of Science in Computational Finance and Risk Management from the University of Washington Seattle.

Safety and logistics

- In case of an emergency please exit to the LEFT of the stage.
- Another exit is through the main entry of the Museum.
- Restrooms are located behind the Admission desk around the corner down the hall to the left.

Meeting ground rules

01

- Questions and comments are welcome – One Person Speaks at a Time

02

- Reminder; today's presentation is not PNM's plan or a financial forecast, it is an illustration of the IRP process

03

- Please wait for the microphone to raise your question or make your comment so we can ensure you are clearly heard and recorded. ***Only Q&A are transcribed for our filing package***.
- Questions and comments should be respectful of all participants

04

- These meetings are about the 2020 IRP, questions and comments should relate to this IRP. Any questions or comments related to other regulator proceedings should be directed towards the specific filing

Online Participation

Please follow these steps to join:

1) Call **+1 (949) 202-1057** with your phone, or select the hyperlink if you are using "**your computer**"
2) Enter the Pin # that was sent to you via the notification email
3) To view the presentation:
   a. Select the Screen Sharing hyperlink from the notification email
   b. Enter your name
   c. Select "Join Meeting"

4) Press 1 on your phone to ask a question or make a comment during the session.

Disclosure regarding forward looking statements

The information provided in this presentation contains scenario planning assumptions to assist in the Integrated Resource Plan public process and should not be considered statements of the company's actual plans. Any assumptions and projections contained in the presentation are subject to a variety of risks, uncertainties and other factors, most of which are beyond the company's control, and many of which could have a significant impact on the company's ultimate conclusions and plans. For further discussion of these and other important factors, please refer to reports filed with the Securities and Exchange Commission. The reports are available online at www.pnmresources.com.

The information in this presentation is based on the best available information at the time of preparation. The company undertakes no obligation to update any forward-looking statement or statements to reflect events or circumstances that occur after the date on which such statement is made or to reflect the occurrence of unanticipated events, except to the extent the events or circumstances constitute material changes in the Integrated Resource Plan that are required to be reported to the New Mexico Public Regulation Commission (NMPRC) pursuant to Rule 17.7.4 New Mexico Administrative Code (NMAC).

California ISO

Electric System Operations – Meeting Reliability Obligations

Phil Pettingill

Director, Regional Integration

Phil Pettingill, P.E.
Director, Regional Integration

Phil Pettingill currently serves as Director of Regional Integration at the California Independent System Operator Corporation (ISO). In his current role, he is coordinating the project to provide Reliability Coordinator services to the ISO balancing area and offer those services to other balancing authorities and transmission operators in the western United States. In many forums, he serves as an external spokesperson to provide expertise between the ISO and policy makers. He also engages in many regulatory initiatives supporting California's environmental goals, including achieving the 33 percent renewable portfolio standard by 2020 and 100 carbon-free energy by 2045.

He has served in various significant capacities at the ISO, representing the main grid operator for California before western state regulatory agencies and working with a diverse set of policy makers to ensure regulatory and policy initiatives consider impacts on the electric system operated by ISO and the customers it serves. Phil joined the ISO in September 1997 after working at Pacific Gas and Electric for 15 years.

California ISO

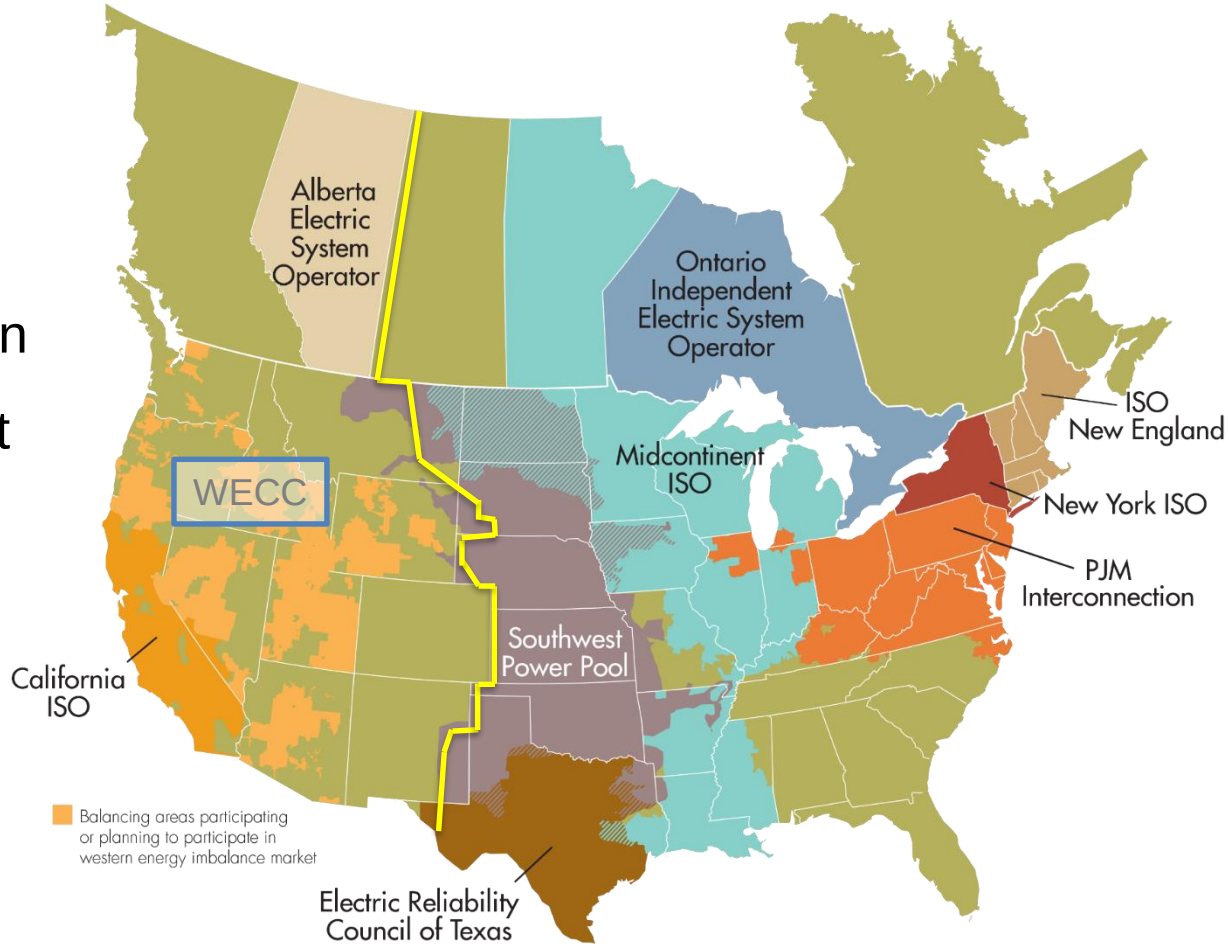
Electric System Operations – Meeting Reliability Obligations

Phil Pettingill
Director, Regional Integration
September 6, 2019

North American energy regions share the goal of maintaining reliability and market efficiency

California ISO

- One of 40 balancing authorities in the western interconnection
- Nonprofit public benefit corporation, serving over 30 million consumers
- Serves 80% of California and small portion of Nevada



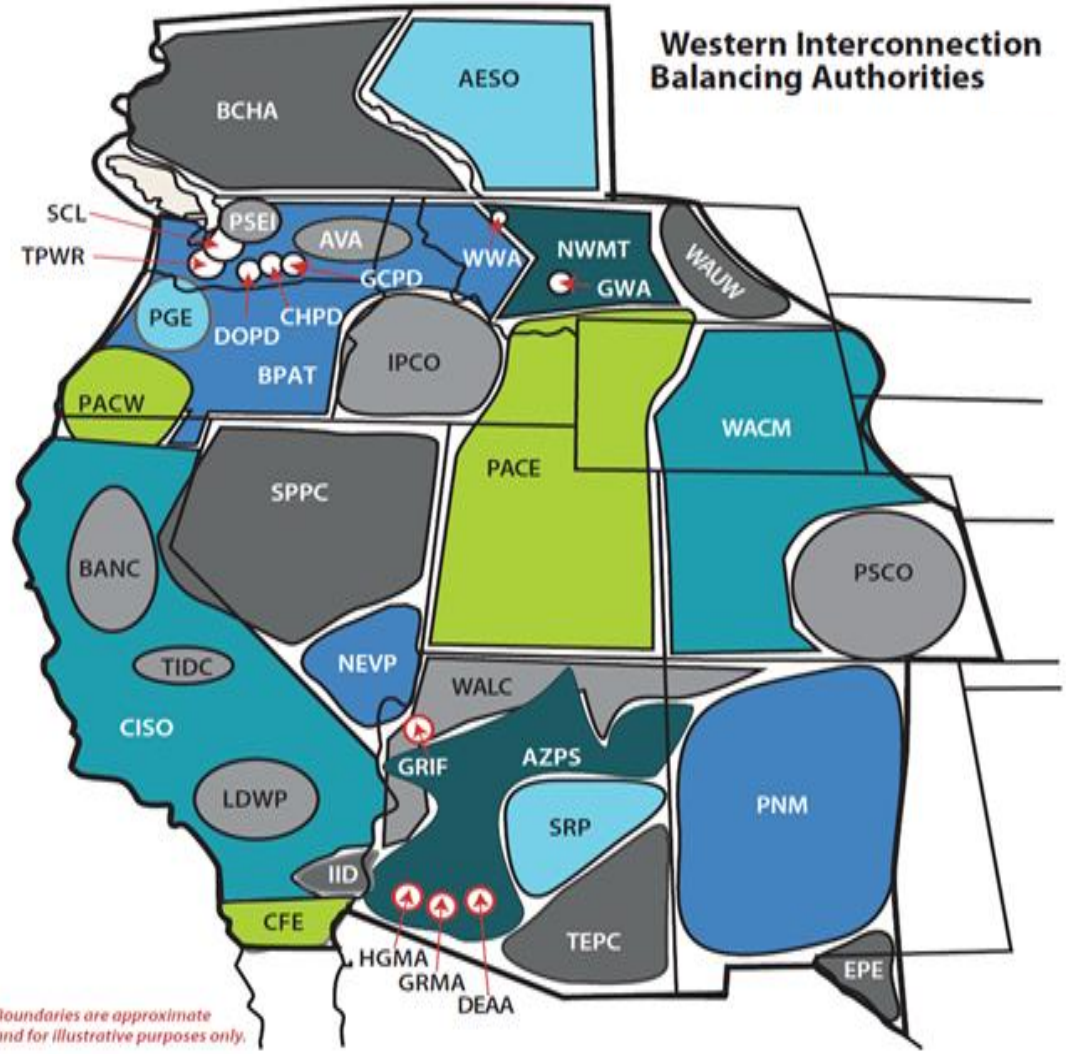
Independent System Operators (also called Regional Transmission Organizations)

- Coordinates, controls and monitors the operation of the electrical power system
- Independent from business interests in sales or purchases of electric power
- Provide grid operations, short-term reliability, and transmission service within a region
- Marketplace for wholesale power

Overview Concepts: Reliability Operations of the BAA

The Western Interconnection is made up of 40 Balancing Authority Areas (BAAs)

- Balancing Authority Area (BAA) is the collection of generation, transmission, and loads within the metered boundaries of the Balancing Authority
- Each BA is responsible for complying with national reliability standards set by Federal Energy Regulatory Commission
- Each BA instantaneously matches generation with load inside its borders while meeting import and export obligations



Reliability Criteria is established at the national level

Regulated by the Federal Energy Regulatory Commission

- Regulates the interstate transmission of electricity, natural gas and oil

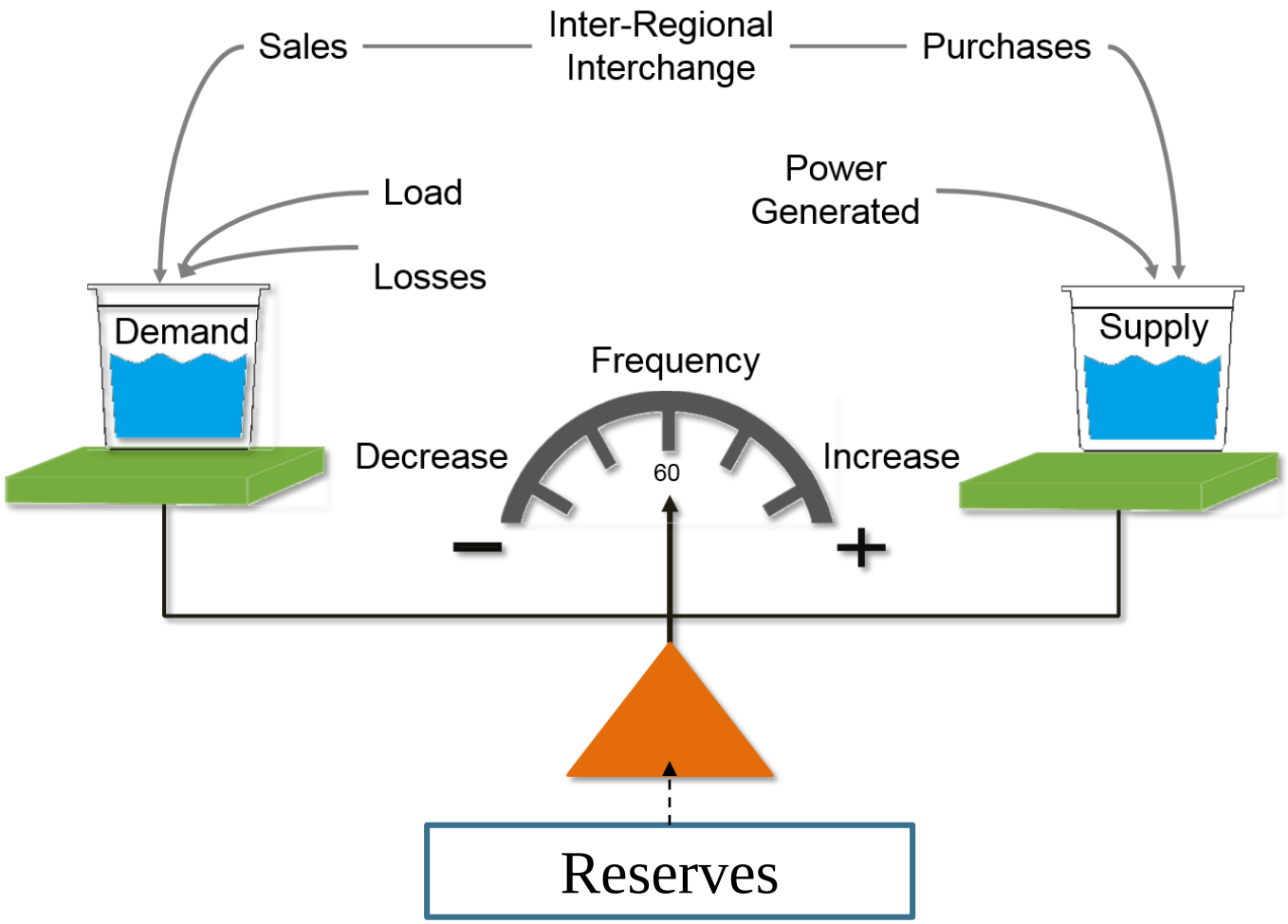
Compliant with the North American Electric Reliability Corp.

- Regulates the North American grid through the adoption and enforcement of reliability standards

Members of the Western Electricity Coordinating Council

- Coordinates bulk electric system reliability in the geographic area known as the Western Interconnection

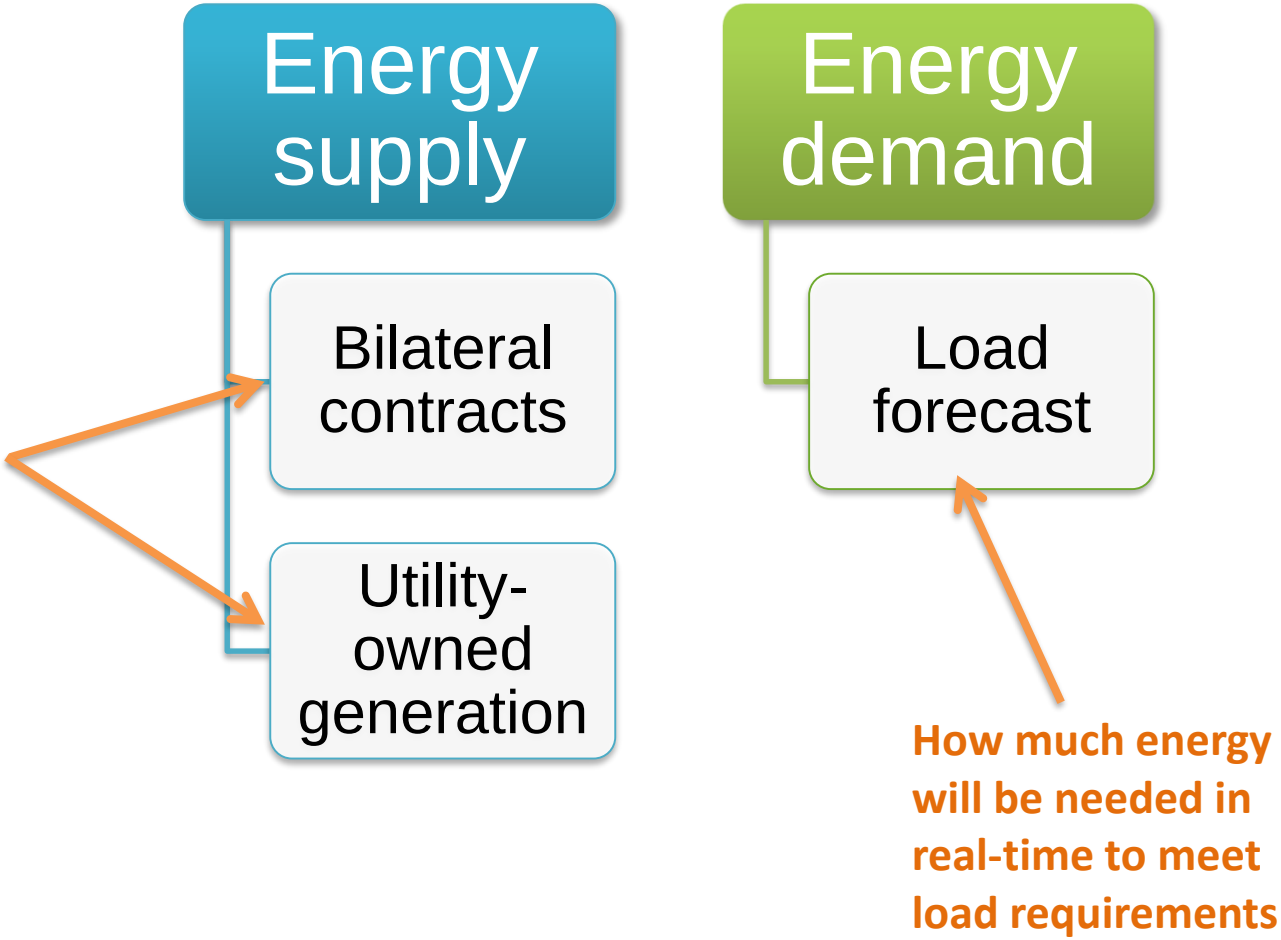
System reliability requires a constant and instantaneous match between supply and demand



Forecasting the system load is accomplished on multiple time horizons

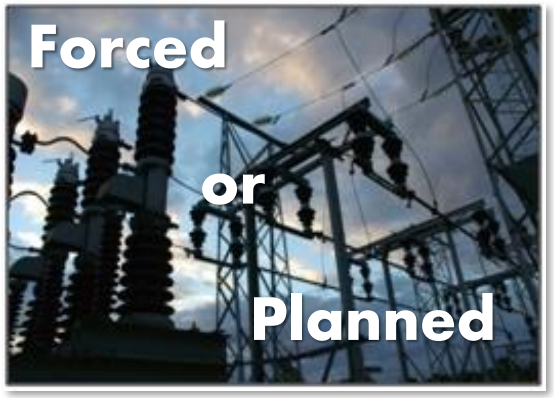
- Day Ahead Model
    - 4 hours – 9 days (configurable)
    - Similar days
    - Weather Inputs
- Hour Ahead Model
    - 40 minutes to 4 hours (configurable)
    - Forecasting off recent load
    - Weather inputs
- Persistence Model
    - 0 - 75 min (configurable)
    - Heavily weighted on recent load and day type
    - Blending into Hour Ahead Model

Physical energy is the electricity needed to meet the load needs of the balancing authority area

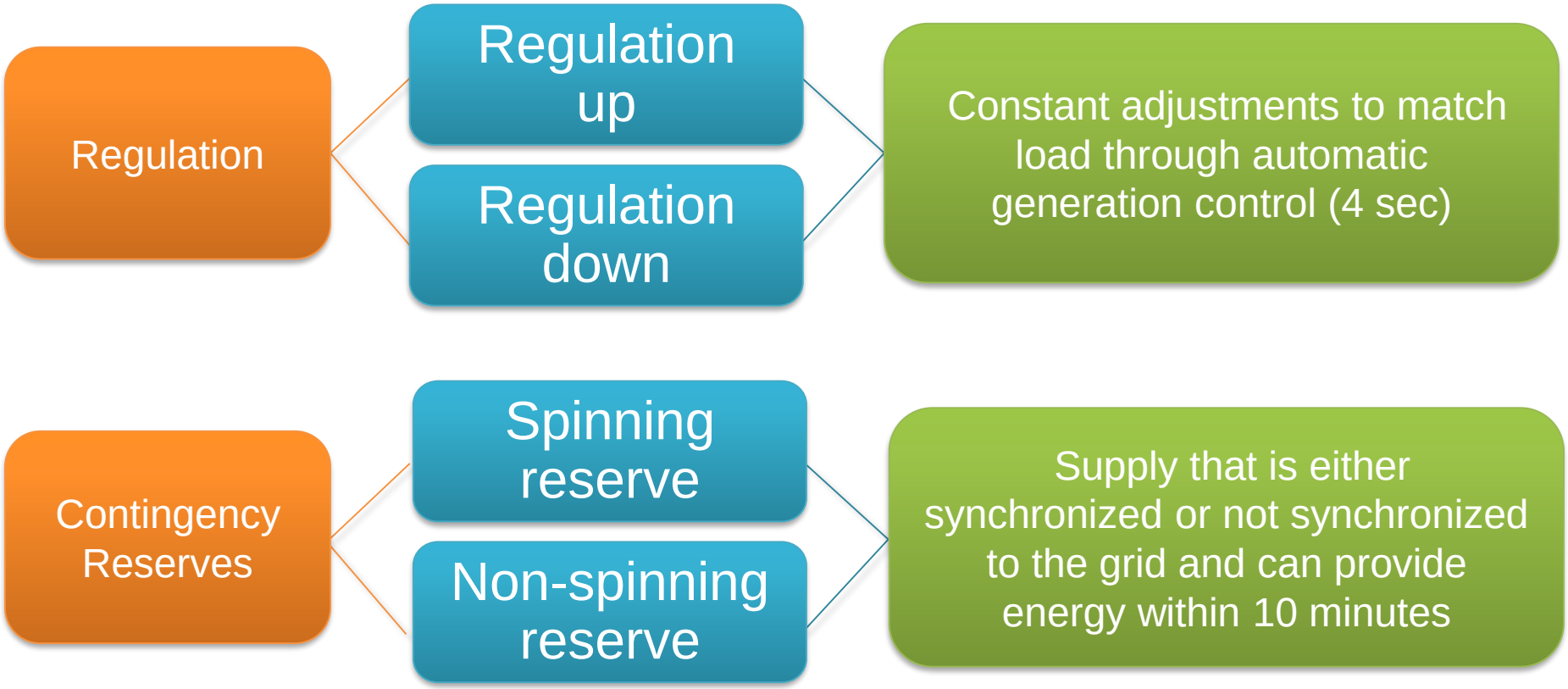


Changes to resource operating characteristics must be carefully tracked and coordinated

- Generation and transmission outages, derates, or changes to resource characteristics affect resource availability
- Forecasted production of renewable resources is necessary to establish a base resource plan
- Outage records are used to prevent resources with physical limitations from being dispatched to unachievable levels

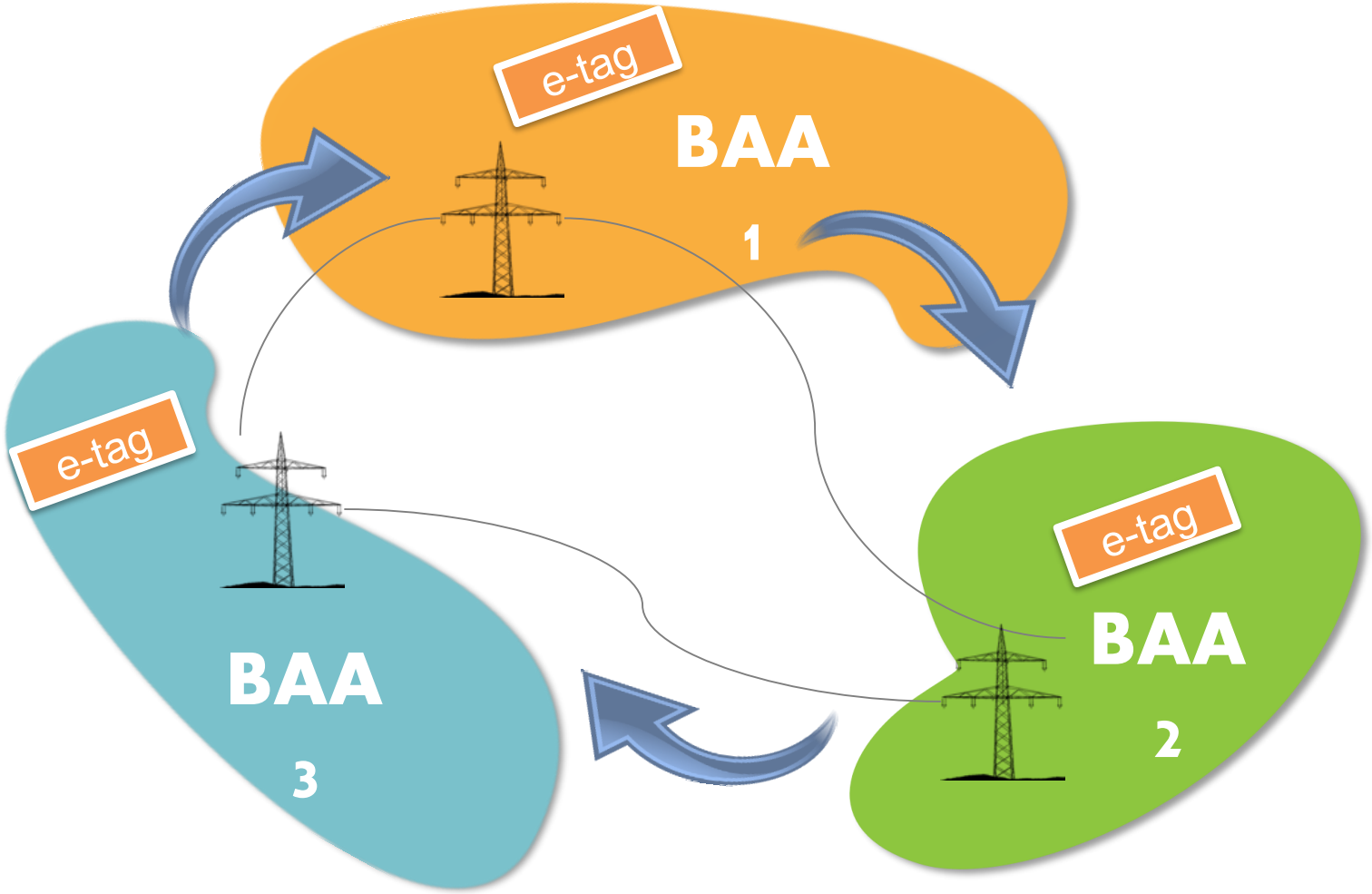


Ancillary services ensure reliability as electricity is moved from generating sources to customers instantly



Note: synchronized is connected and ready to produce energy

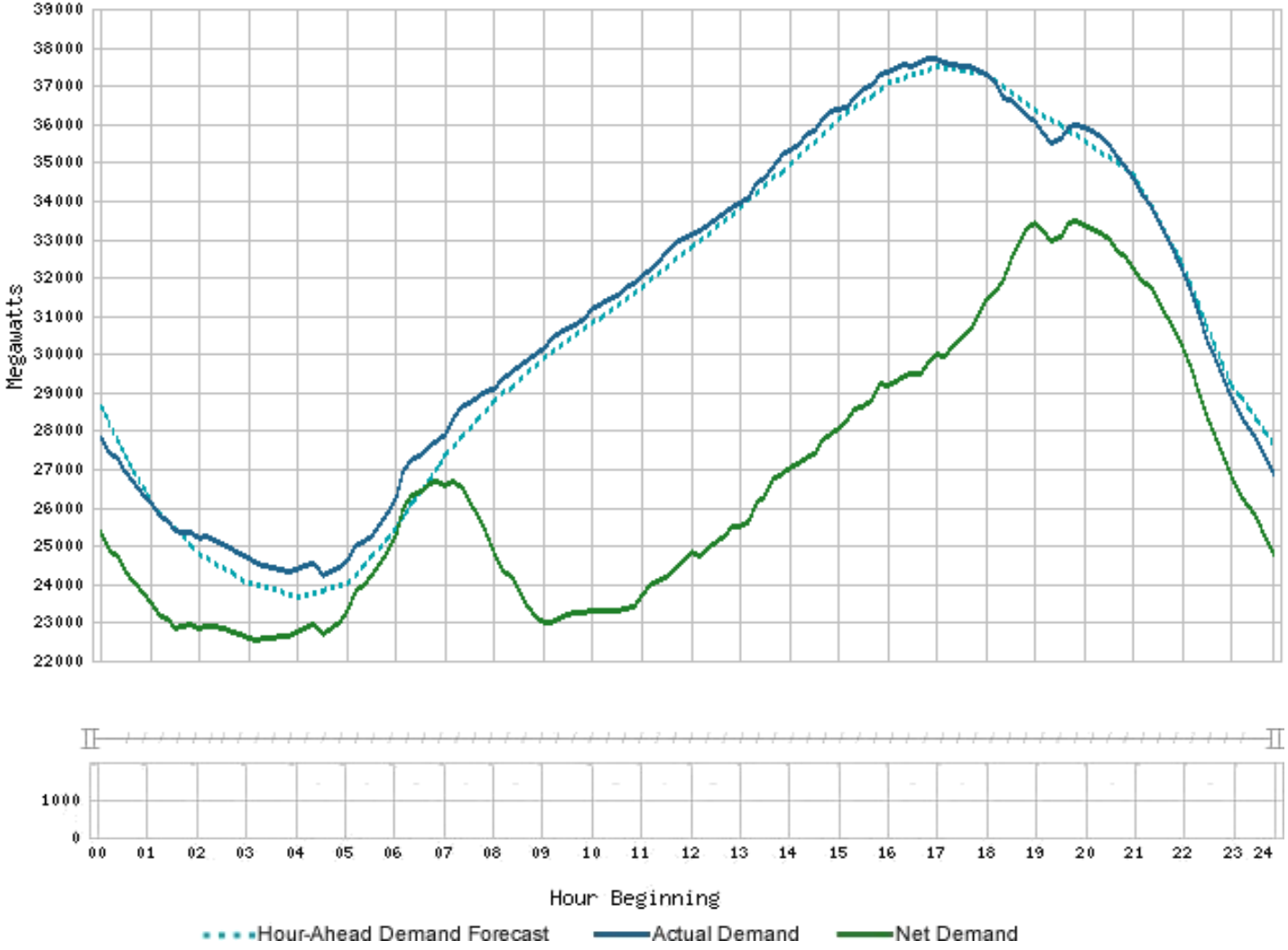
Interchange schedules provide transfers between Balancing Areas and are tracked by electronic tags



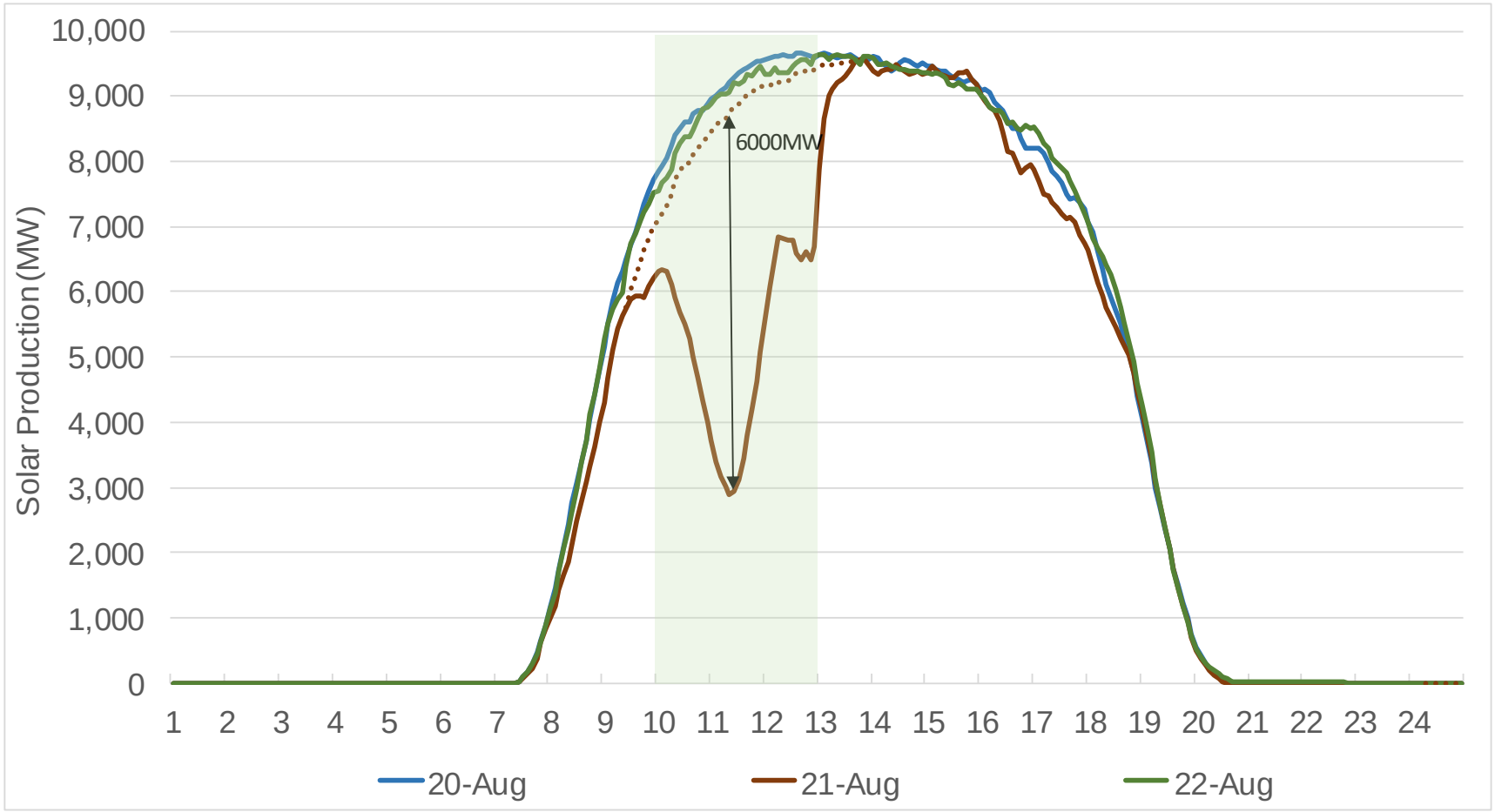
What is “imbalance”?

- Balancing authorities (BA) start the hour with matched generation and forecasted load
- Imbalances arise when load and generation deviations occur within the operating hour
- Generation and transmission outages, derates, or changes to resource characteristics affect resource availability
- All BAs have responsibility to maintain operating reserves for contingency events
- Most BAs procure extra flexibility reserves to balance variable supply and demand

Solar & wind production can drive a shift in use pattern for conventional resources on peak demand days



Actual solar production during the August 21, 2017 eclipse compared to adjacent days creates new operating challenge

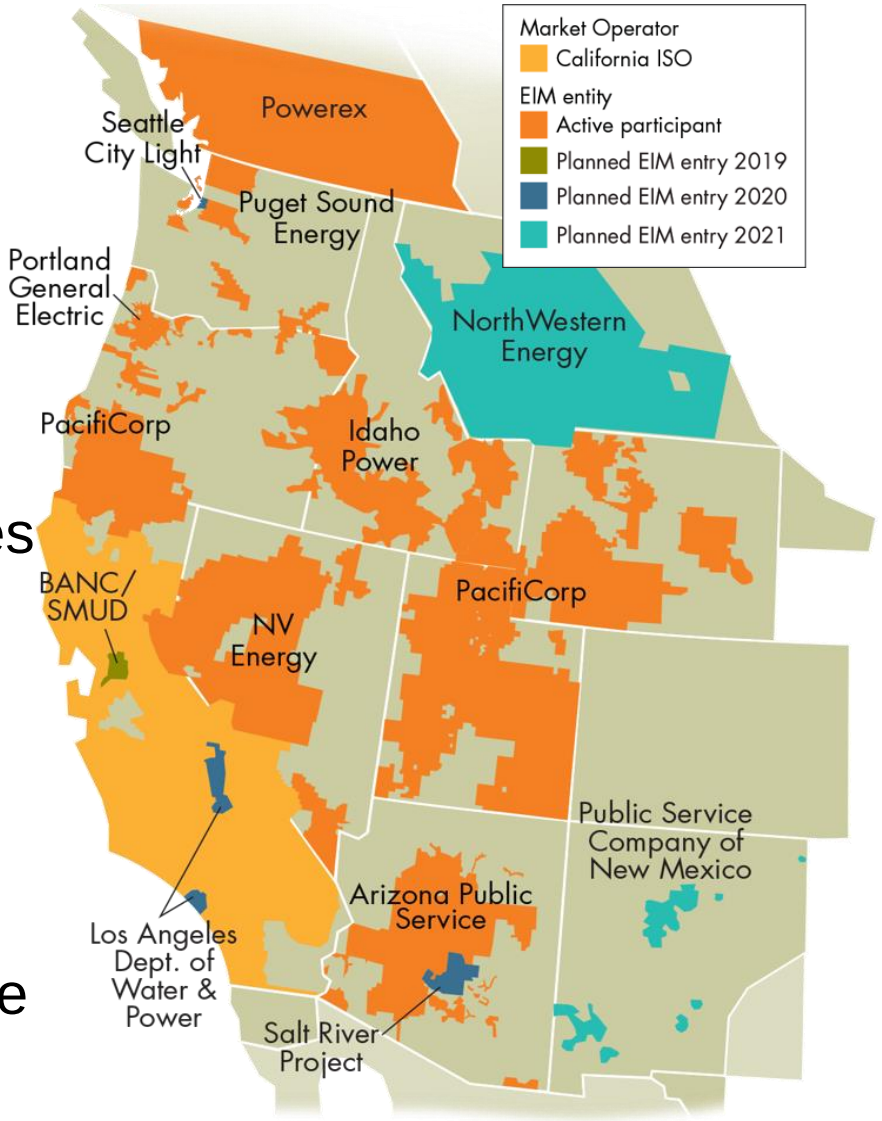


Energy Imbalance Market Overview

What is the EIM and how does it work?

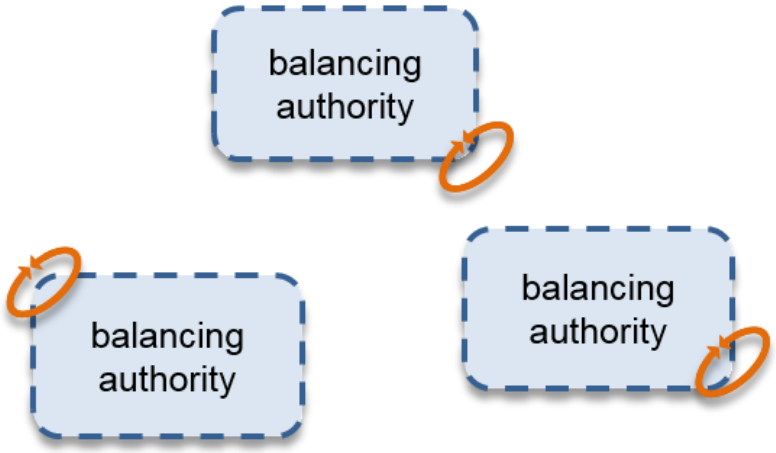
The Western EIM is a real-time only market

- Builds on existing market:
  - automated dispatch minimizes cost, facilitates renewables, resolves imbalance, and avoids congestion
- Easily scalable, low-cost, low risk, and voluntary option with no exit fees
- Preserves BAA autonomy, including compliance, balancing, and reserve obligations
- EIM adapts to regional reserve sharing programs and state resource procurement policy.

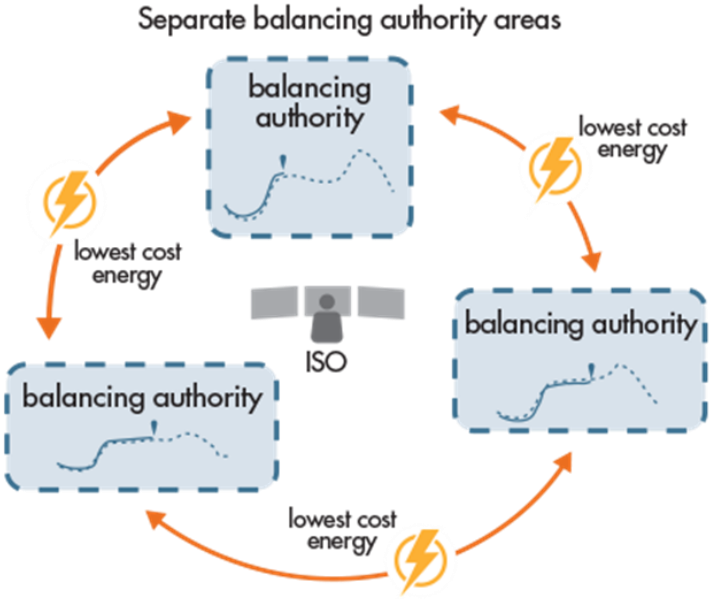


Energy Imbalance Market key points

In a non-EIM environment:
Each BA balances loads and resources within its borders

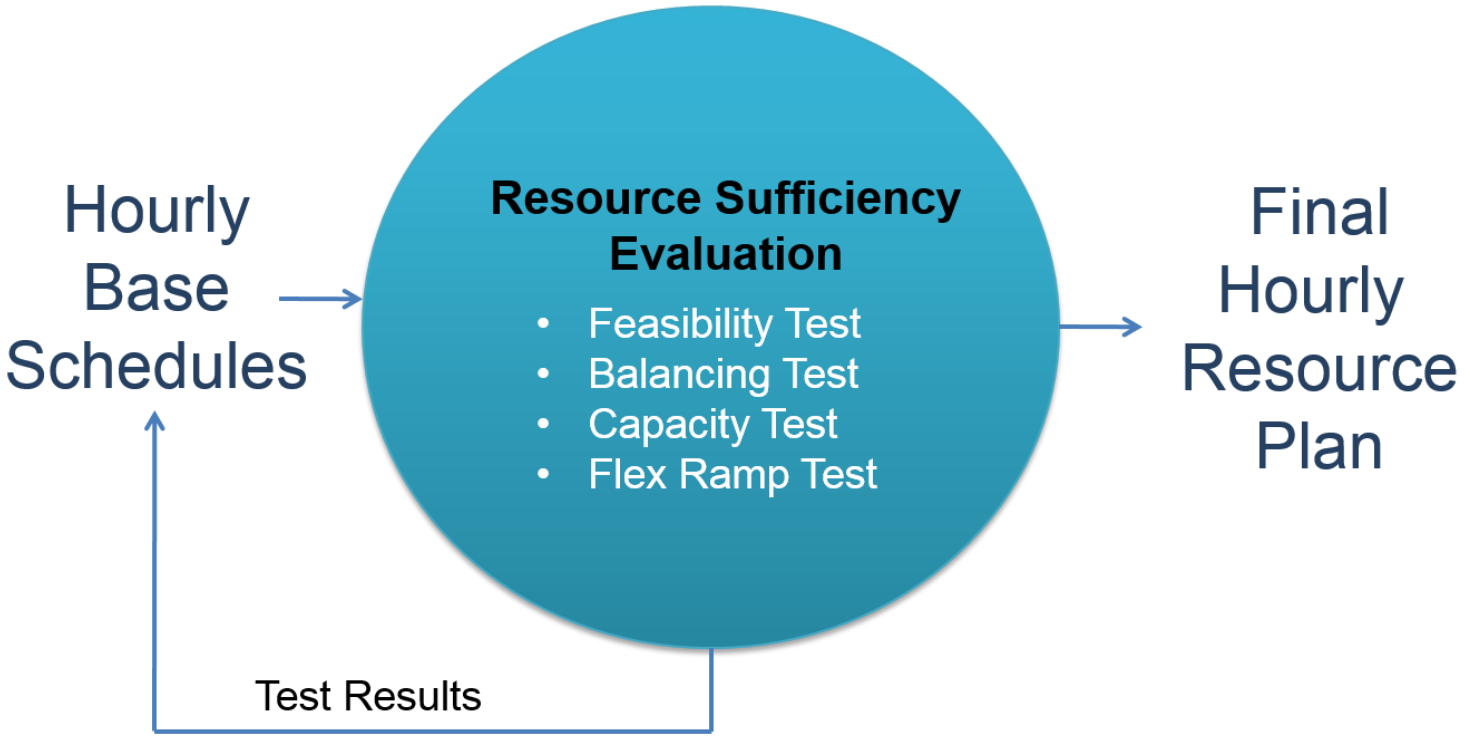


In an EIM:
The market dispatches resources across BAs to balance energy



Entities are still responsible for running their own BAAs

Hourly, EIM entities show they have adequate capacity to balance load and manage contingencies in their BAA



Commonly Used Acronyms

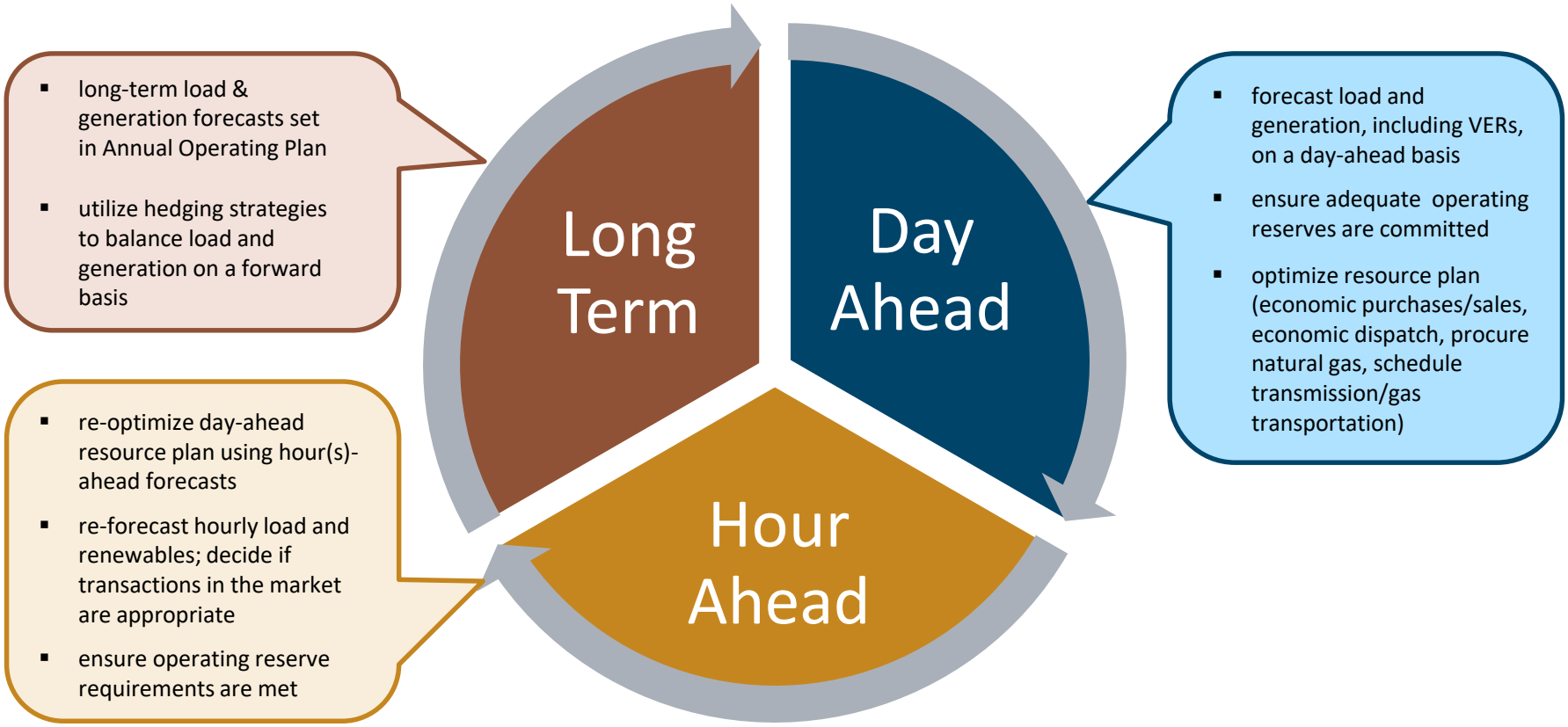
BA	Balancing Authority
BAA	Balancing Authority Area
DA	Day Ahead
FERC	Federal Energy Regulatory Commission
ISO	Independent System Operator
NERC	North American Electric Reliability Corporation
RC	Reliability Coordinator
RT	Real-Time
RTCA	Real-Time Contingency Analysis
RTO	Regional Transmission Organizations
WECC	Western Electricity Coordinating Council

PNM
Wholesale Power Marketing

Steve Maestas

Director, WPM

Load & Generation Forecasting & Planning



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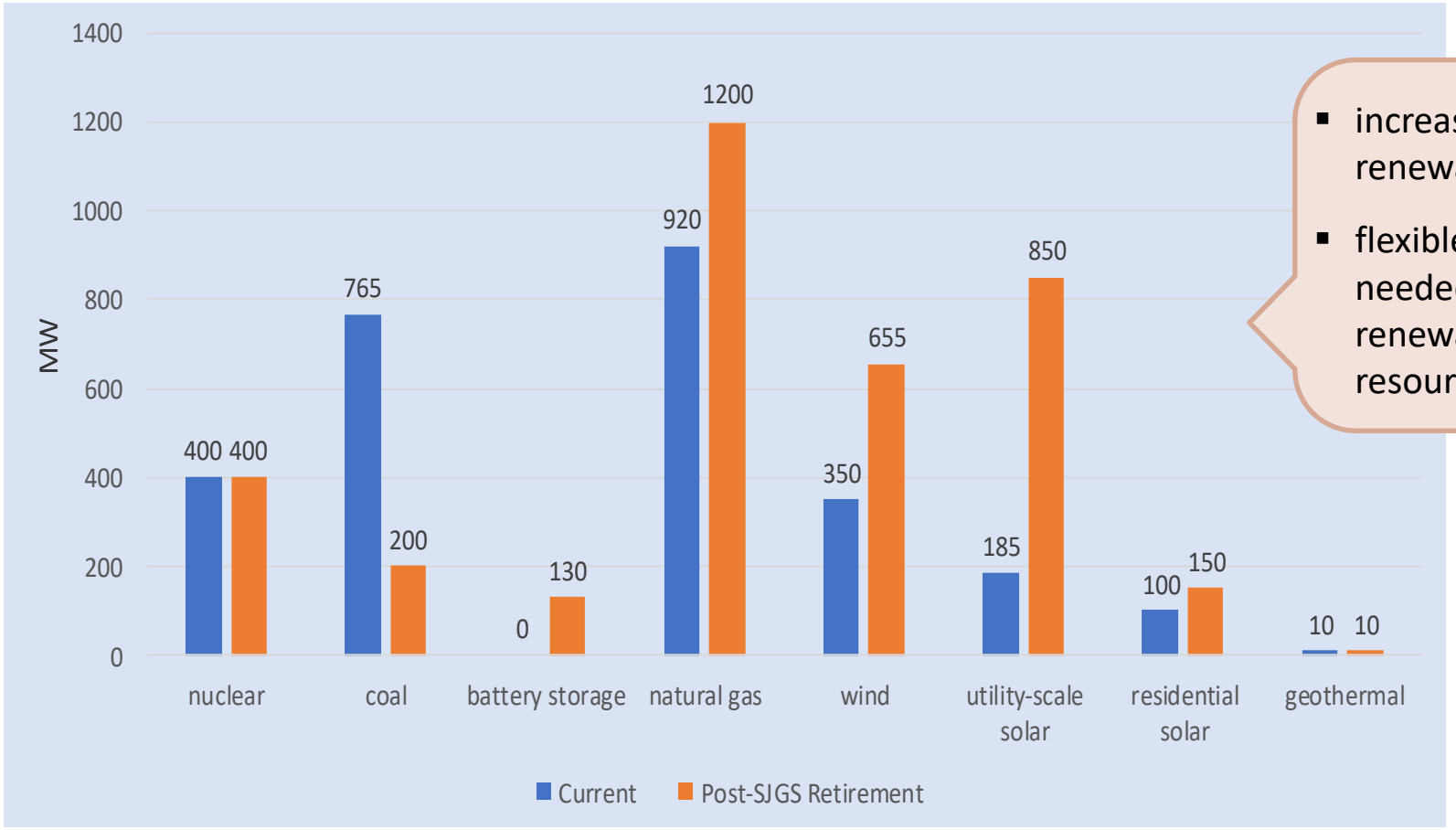
Current and Projected Resource Portfolio



- increased renewables
- flexible resources needed to manage renewable resource volatility

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Portfolio Challenges

Current Challenges

- trip recovery, reserve restoration
- accuracy of load, wind, and solar forecasts
- intra-hour wind volatility
- limited flexible resources to balance renewables
- lack of real-time markets
- plant availability

Future Challenges

- increased renewable portfolio (~750 MW)
- managing solar ramp profiles
- significant wind volatility with reduced baseload regulation
- development of large-scale storage projects
- managing gas supply
- tools needed to aid portfolio management

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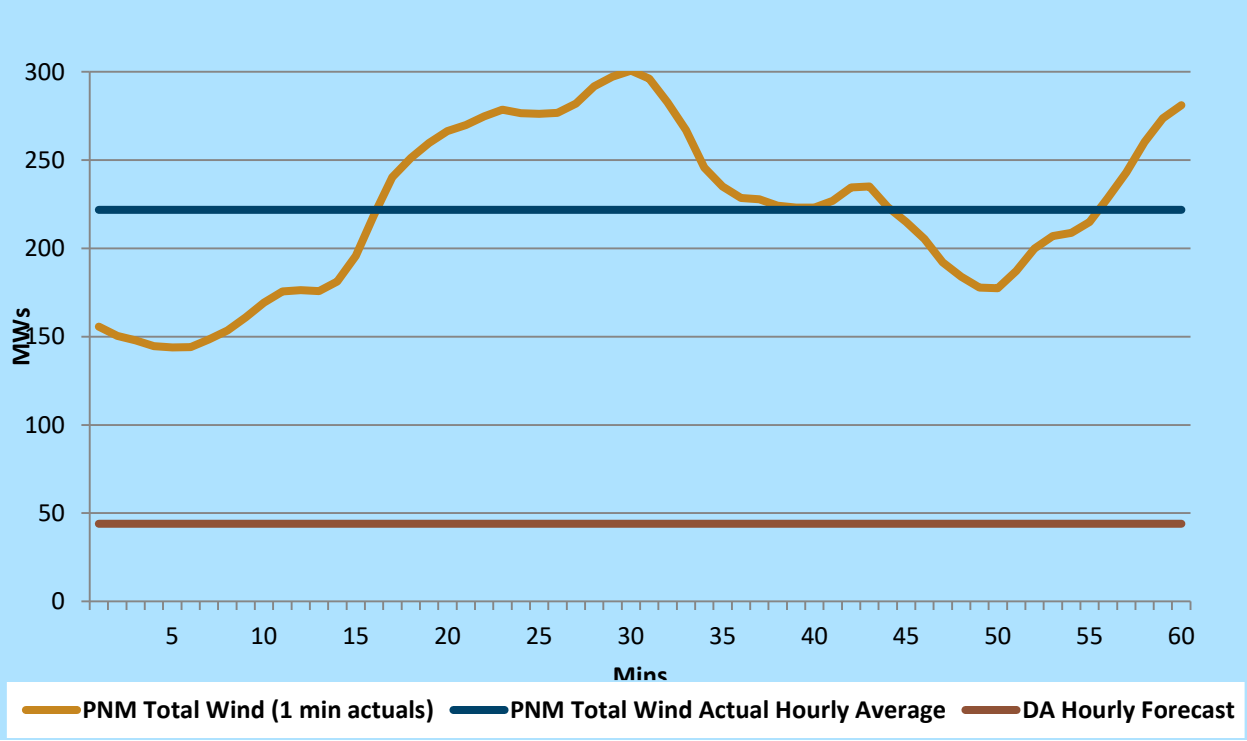
Wind Volatility – Monday, 6/17/2019, 7-8 pm



output increased 150 MW in 30 mins, then decreased by 85 MW in 10 minutes

fast-ramping units follow renewable resource output variability

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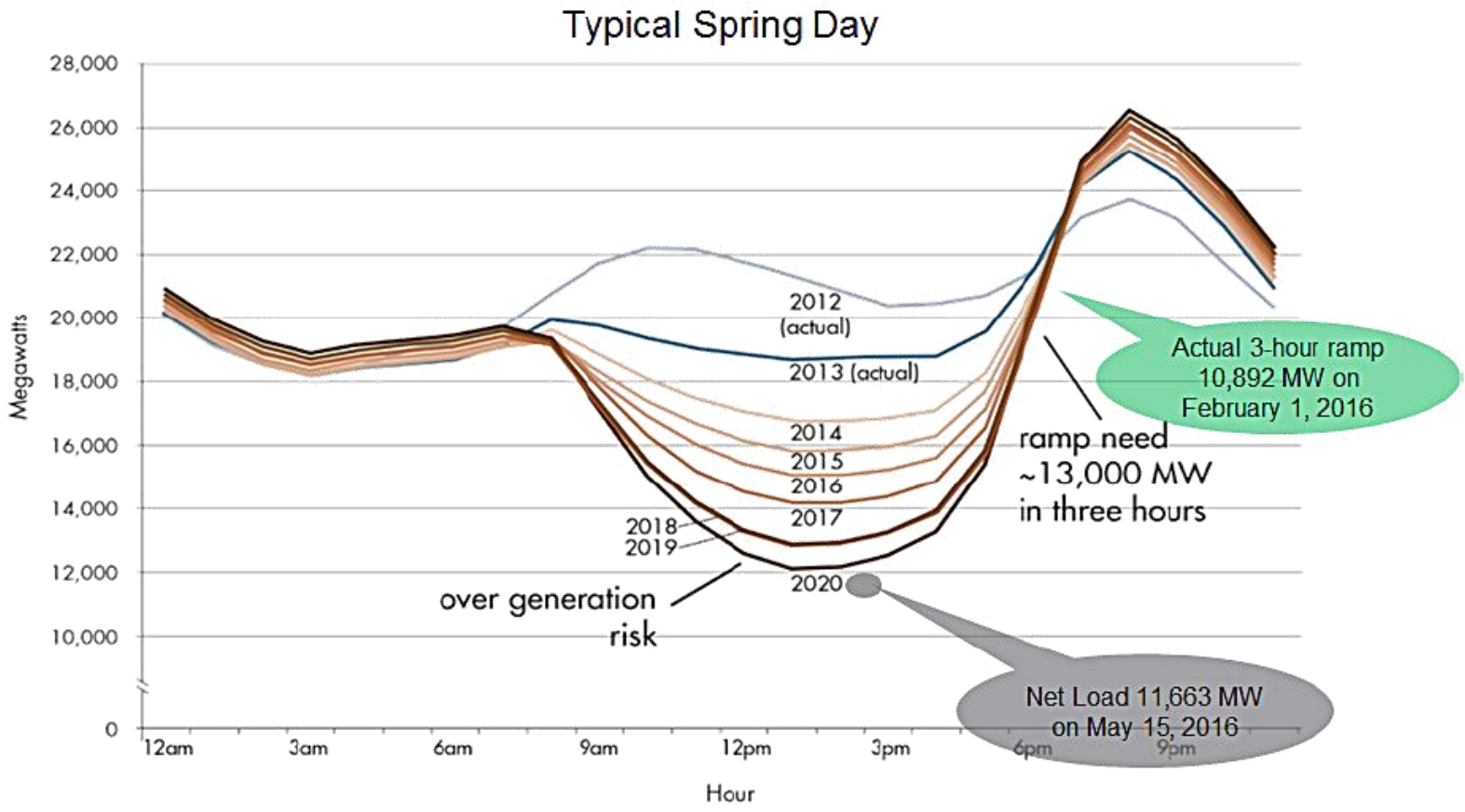
Example CISO Duck Curve



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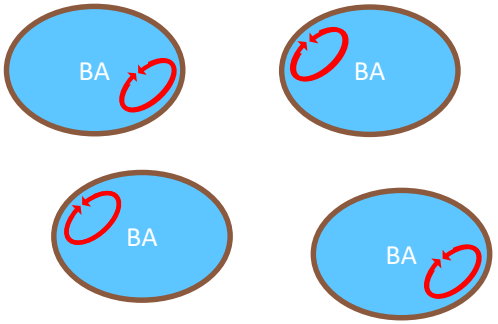
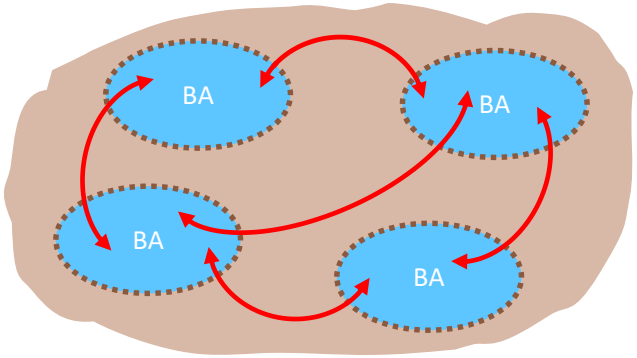
EIM Integrates VERs by Dispatching Every 5 Minutes

Today:
Each BA must balance loads and resources w/in its borders.



- Limited pool of balancing resources
- Inflexibility
- High levels of reserves
- Economic inefficiencies
- Increased costs to manage wind/solar variability

In an EIM:
The market dispatches resources across BAs to balance energy



- Diversity of balancing resources
- Increased flexibility
- Decreased flexible reserves
- More economically efficient
- Decreased cost for real-time balancing

Utilities are still responsible for maintaining generation capacity, flexible reserves, and reliability of their BA!

slide used courtesy of CAISO

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BREAK

PNM
Power Operations – Reliability and Load Balancing

Manuel Sanchez

Director, Power Operations

PNM's Reliability Responsibilities

Keeping the lights on

- PNM maintains 24x7 operations to ensure reliability for its customers and prevent adverse effects on neighboring systems
- PNM has the responsibility and authority to take whatever actions are needed to prevent or alleviate problems on our system.
- Actions within PNM's authority includes re-dispatch of generators, switching of facilities, adjust interchange, curtailment of energy schedules and, if conditions require, shedding load as a last resort.

PNM's Reliability Responsibilities

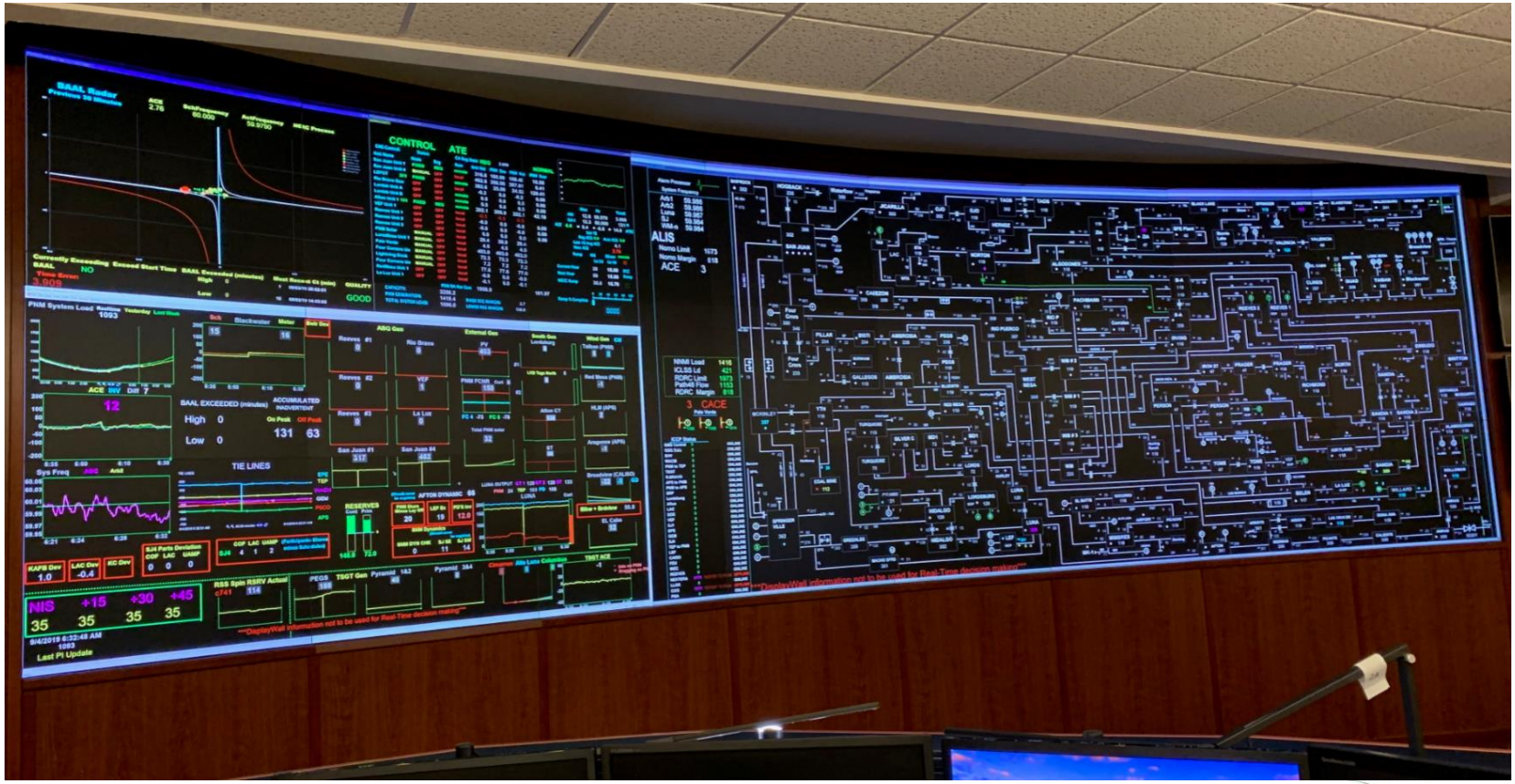
Keeping the lights on

- Virtually every aspect of PNM's real-time operations are regulated
  - Balancing performance, mitigation of generation and transmission disturbances, system operator training, procedure development and adherence to those procedures, emergency plans, etc.

- Added Oversight from Reliability Coordination Centers
  - "Peak RC" in Loveland CO, and their Backup Center in Vancouver, WA
  - New California ISO "RC West" - November 4, 2019 located in Folsom, CA

PNM Balancing Area Authority

PNM Operations Awareness

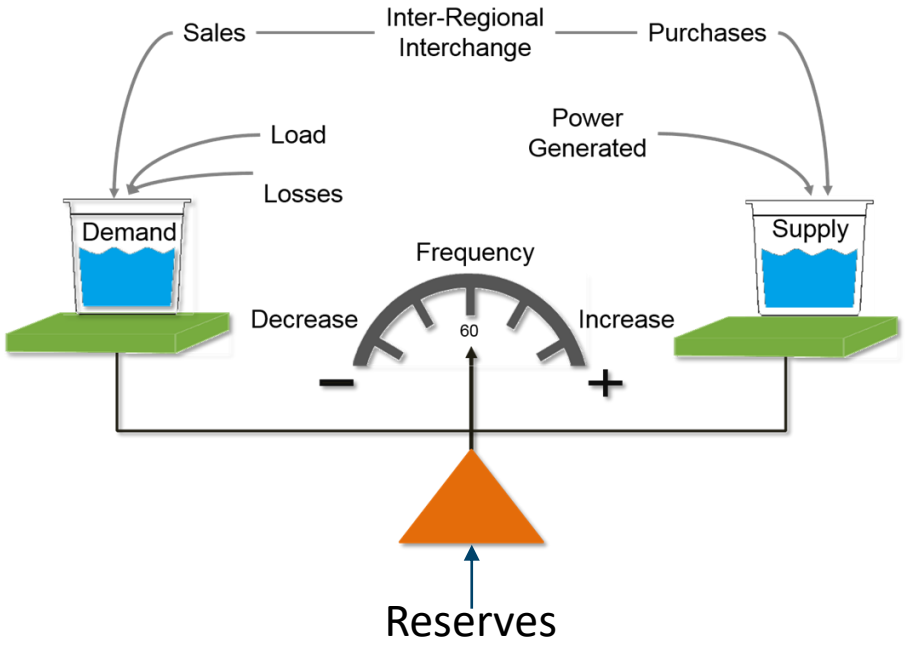


PNM's Specific reliability responsibilities

Power operations – PNM Balancing authority (BA) Area

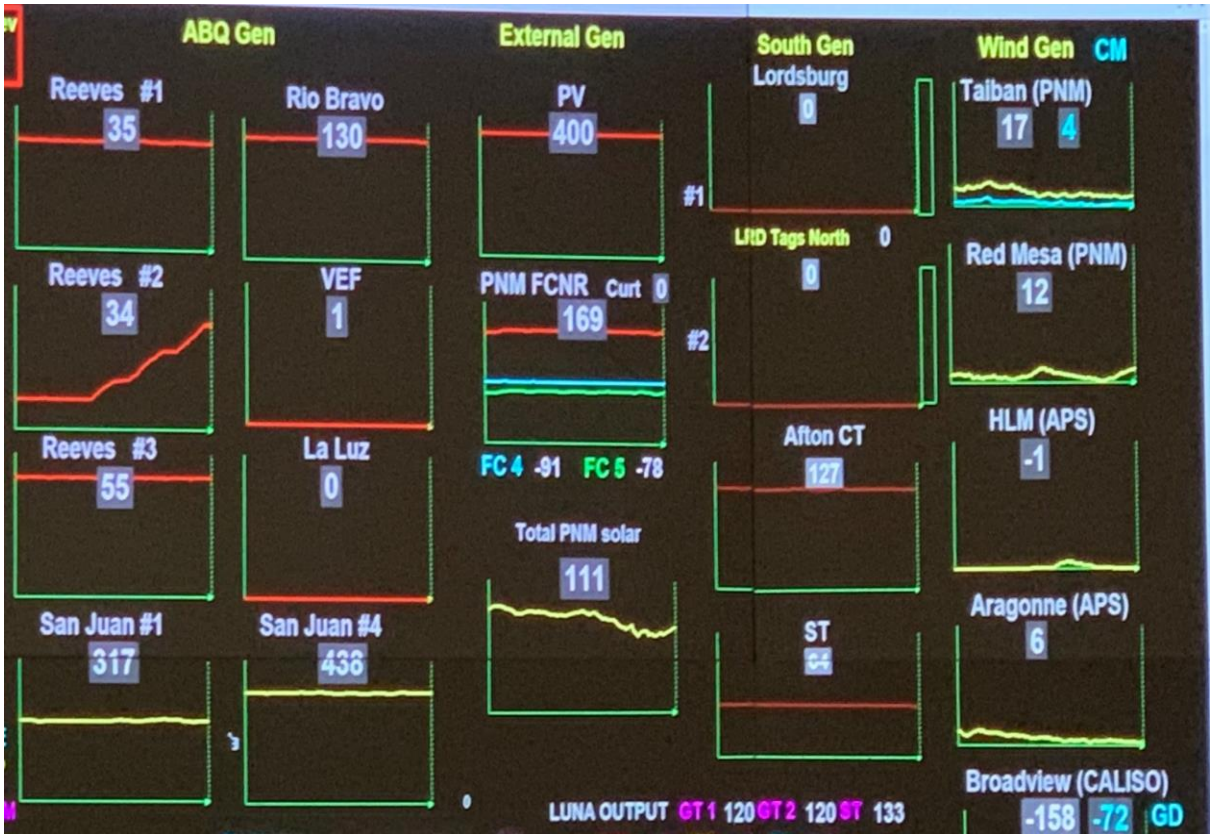
Ensure transmission grid reliability in real-time via:

- Balancing Operations:
  - Assure that the supply of power and the demand for power within the PNM BA system remains in balance to maintain 60hz power – PNM has this responsibility within its operating footprint and shares grid balancing responsibility with about 40 other operating entities in the western interconnection



Balancing load and generation

Balancing operations

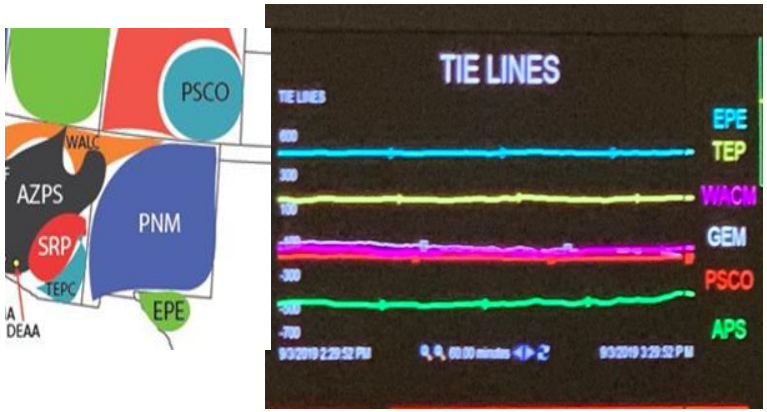


Balancing load and generation

Balancing operations – Balancing Area in the West

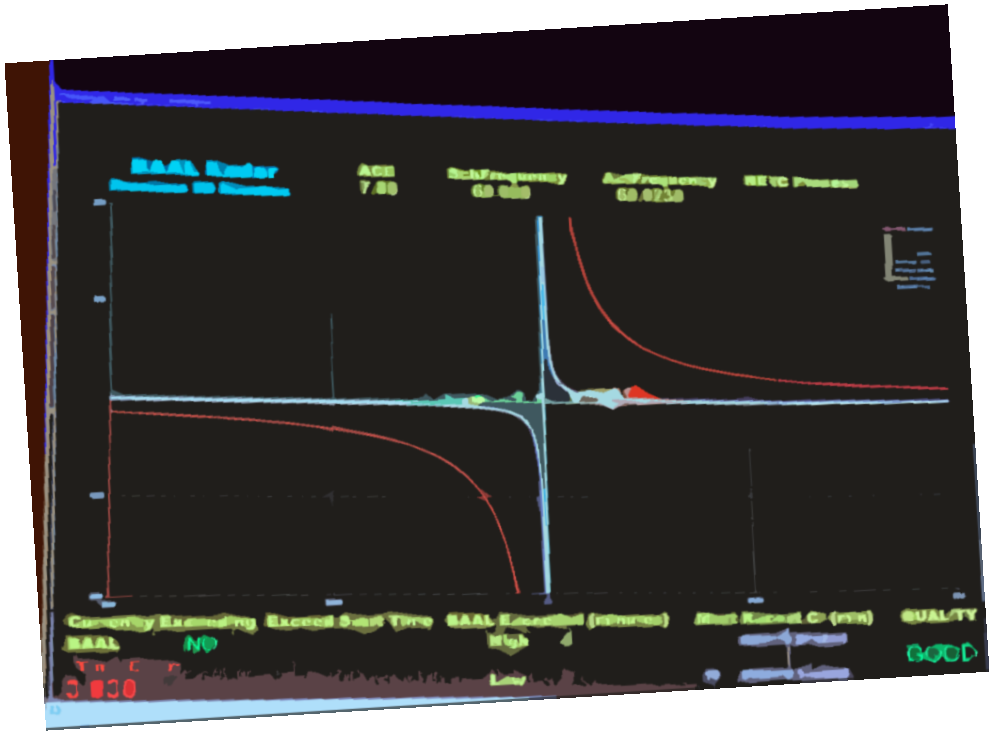
Performance is measured by "area control error" or "ACE" which is a function of load, frequency and time error.

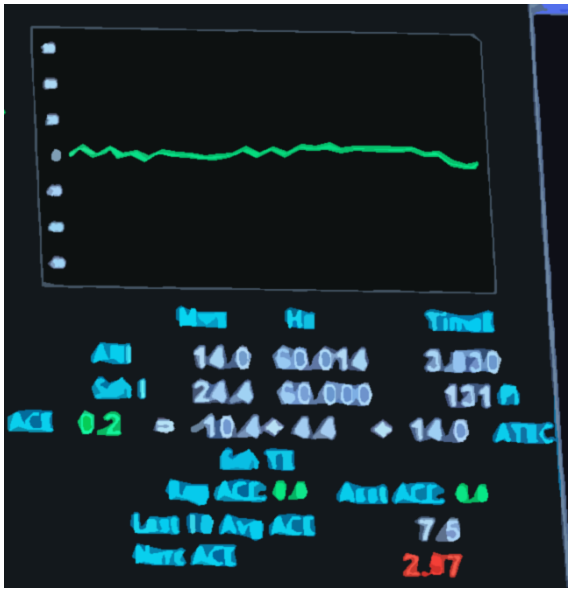
All schedules for power and all flows of power into and out of the PNM system are continuously monitored, recorded and verified on an hourly basis with neighboring utilities



Balancing Load and Generation

Balancing Area ACE Limit (BAAL)

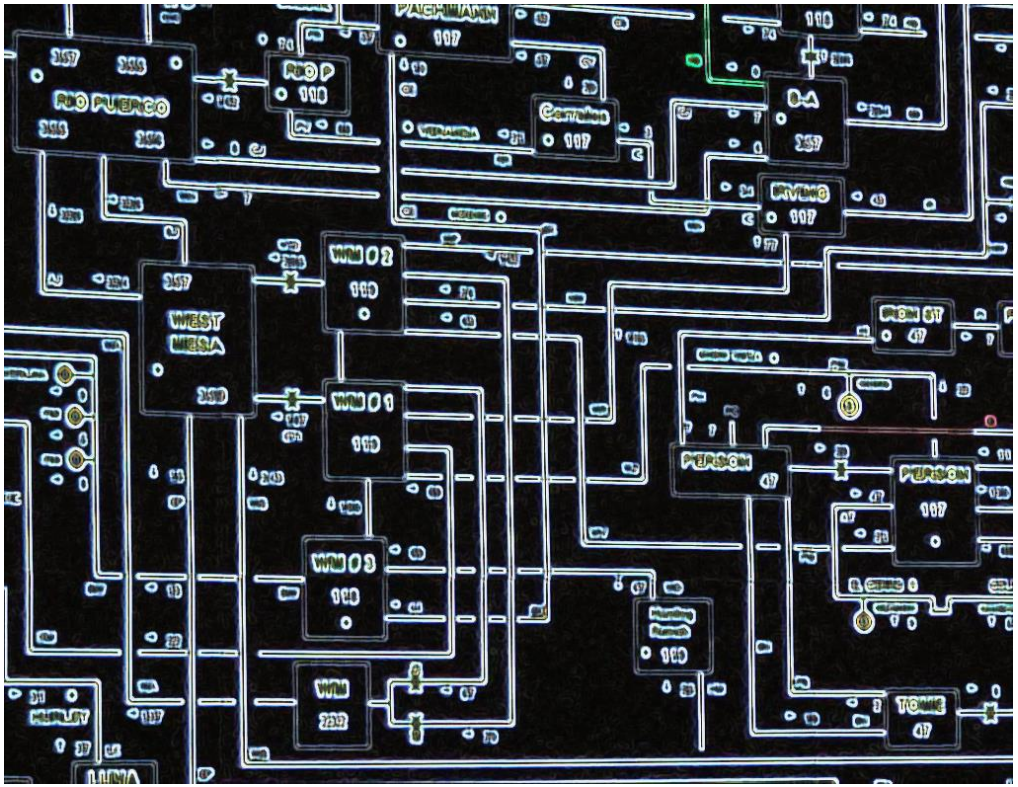




PNM's Specific reliability responsibilities

Power Operations - Awareness

- Transmission Operations:
  - Monitor power flow on transmission elements (lines and transformers) and if necessary, make adjustments primarily through generation dispatch
  - Facilitate restoration in response to forced outages – weather, animal contact
  - Manage planned outages for maintenance and construction activity

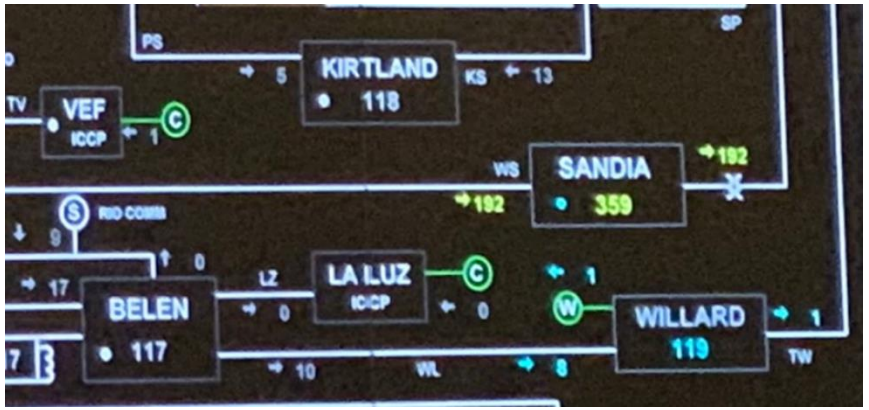


Transmission Operations

System Voltage Regulation

PNM manages the system to ensure that operating voltages are properly maintained throughout its service territory

- Why do we need to maintain voltage?
  - Keeping voltages at correct operating levels allows for electricity to be delivered in a reliable manner – protect PNM and customer equipment
  - Public Regulation Commission Rules
- How do we maintain voltage on our system?
  - Generator output voltage schedules
  - Operating transformer load-tap changers (LTC), voltage regulators, capacitor/reactor banks and static VAR compensators (SVC)



PNM's Specific Reliability responsibilities

Power Operations – Black Start

PNM has 35 separate cranking path procedures, 3 of which are considered **"primary".**

Path 1 - Shiprock-San Juan 345kV

- Start-up power from WALC via WACM BA at Shiprock to San Juan 345kV yard.

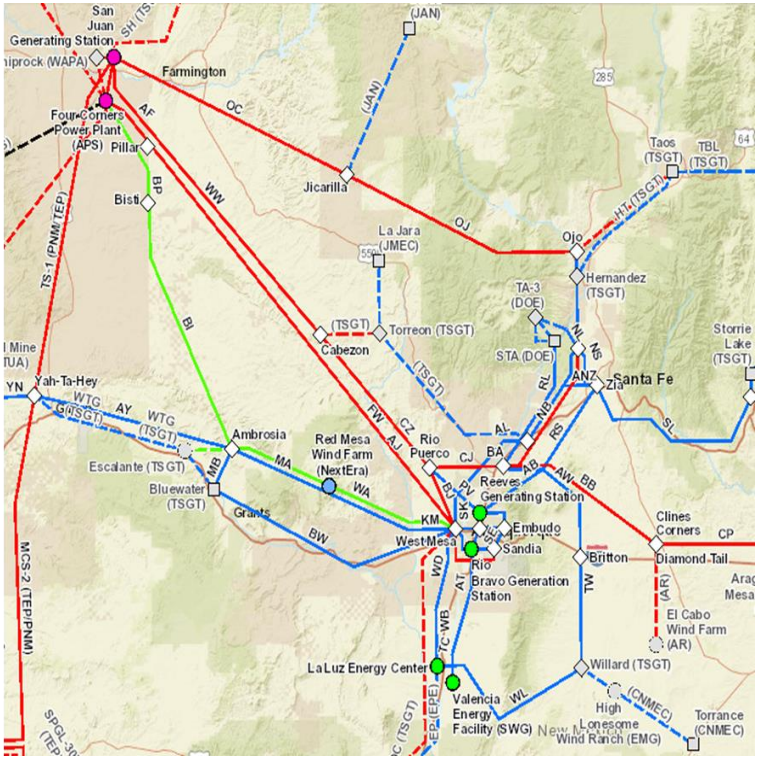
Path 2 - San Juan/Four Corners 345kV Bus – La Luz (generator south of Albuquerque)

- Start-up power from San Juan 345kV to Belen 115kV cranking path

Path 3 - Hidalgo 115kV Bus to Lordsburg (2 generators in southern NM)

- Hidalgo – Lordsburg 115kV cranking path.

San Juan/Four Corners - La Luz Cranking Path



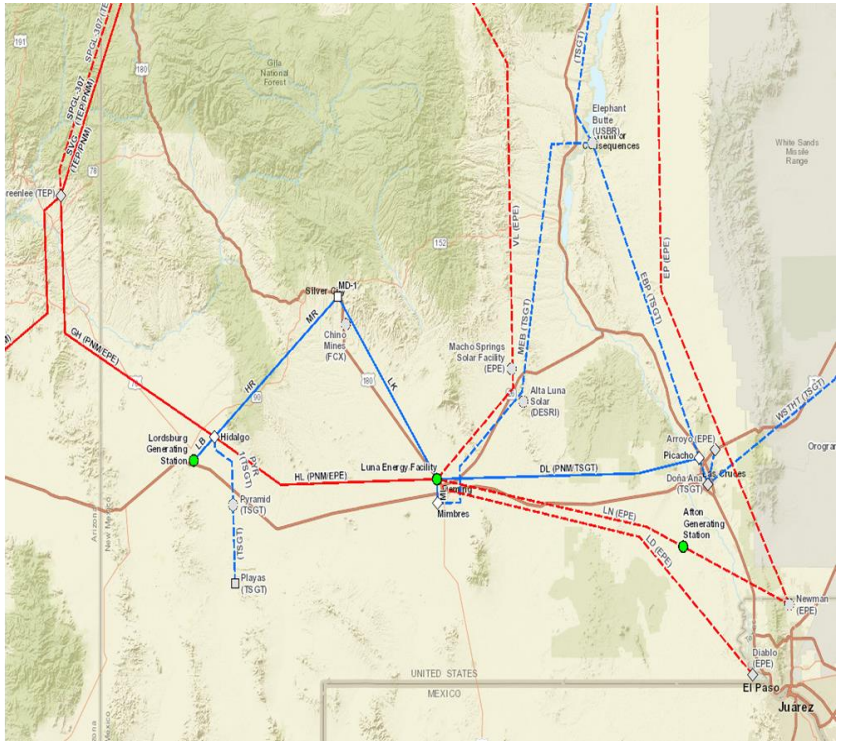
PNM's Specific Reliability responsibilities

Power Operations – Black Start

- Four Corners to San Juan
- San Juan to Jicarilla/Ojo/Taos
- McKinley to San Juan
- Greenlee to Luna
- Springerville to Luna
- Diablo to Luna
- Afton to Luna
- West Mesa to Arroyo (connecting North and South load centers)

Transmission, PNM
- 500 kV
- 345 kV
- 230 kV
- 115 kV
- 69 kV
- 46 kV

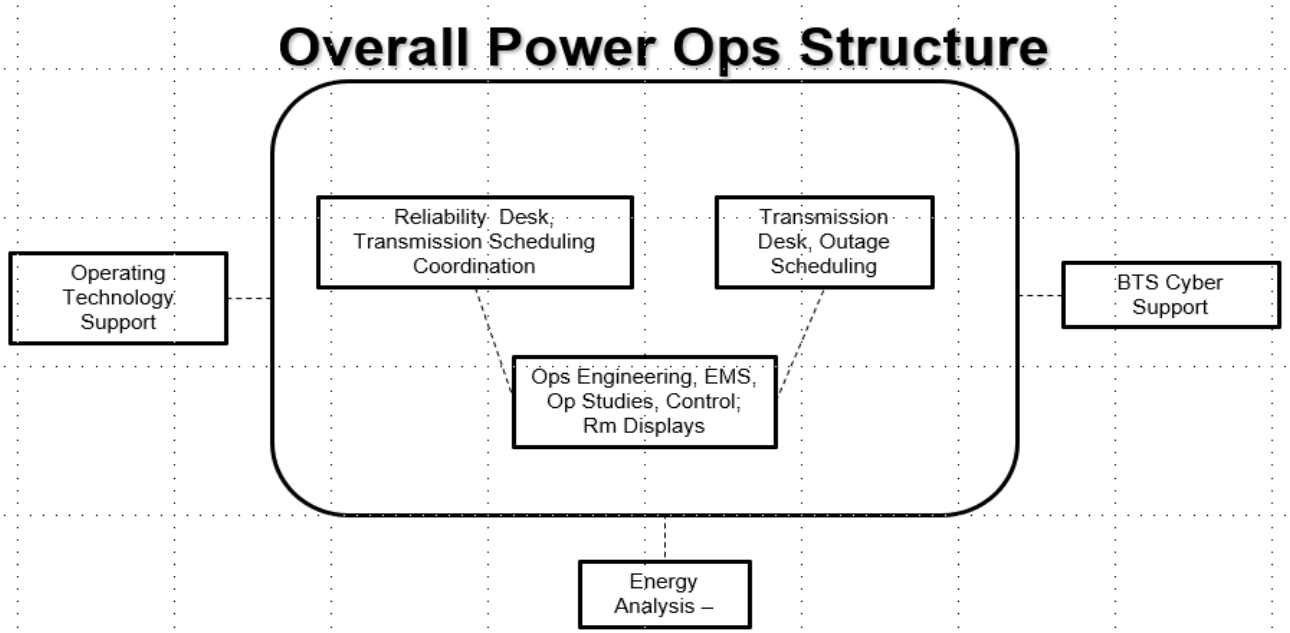
Hidalgo – Lordsburg Cranking Path



Other reliability support

Computing systems, operating procedures, and communications network

- PNM has IT staff support for its Energy Management System server systems and engineeri staff support for its Energy Management System (EMS) applications
- Extensive procedures to address:
  - Black Start and System restoration
  - Load Curtailments
  - Backup control center operation
- Extensive communications system
  - Fiber optic loops within the Albuquerque metro area
  - Microwave system to reach over long distances



PNM
Transmission Planning

Tom Duane

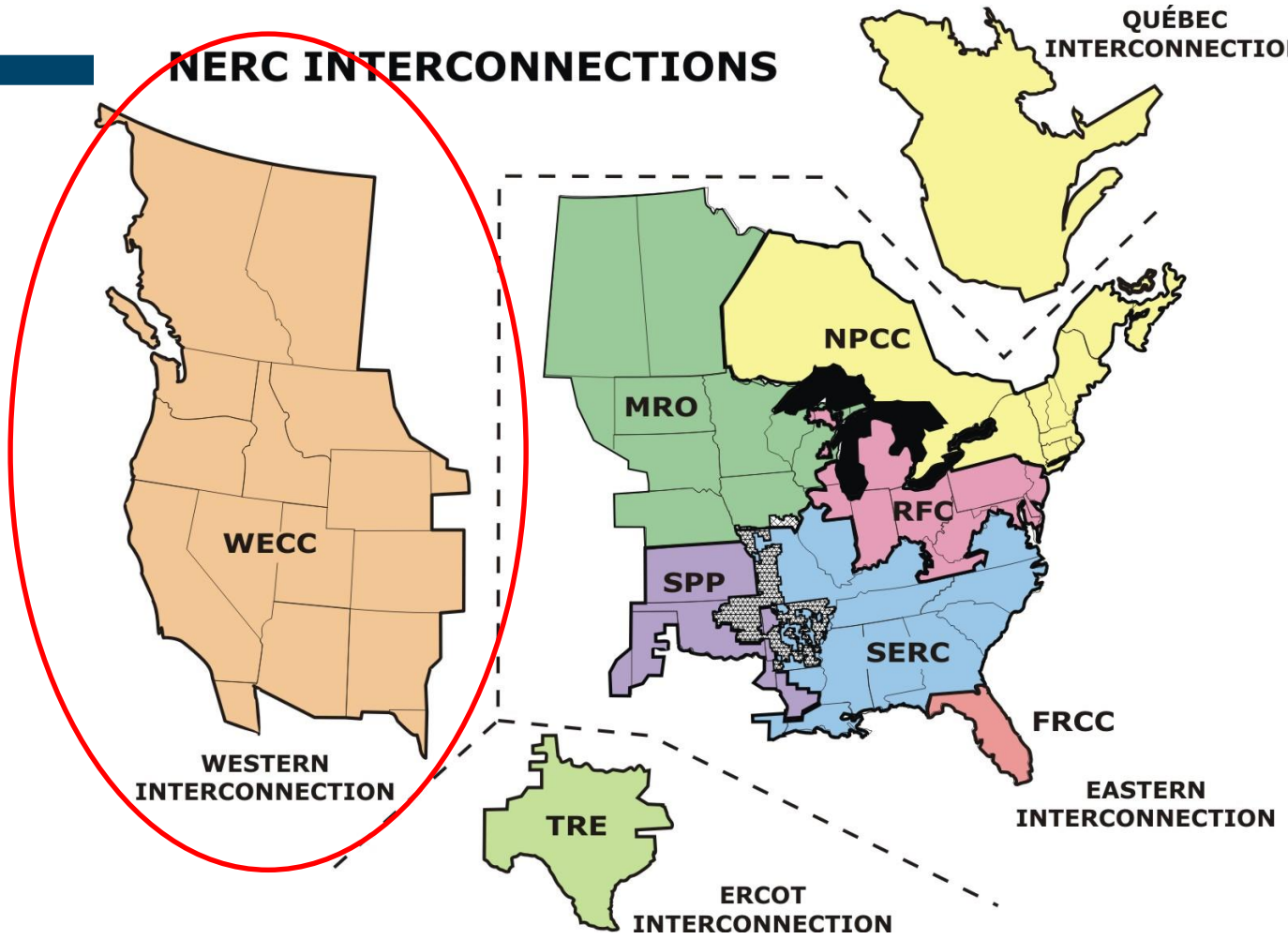
Manager, Transmission Planning

Tom Duane
Manager, Transmission Planning

Mr. Duane has managed the PNM transmission planning department over the last ten-years. He has supported transmission system analysis and expansion for over 25 years including representation of PNM in regional planning and stakeholder forums.

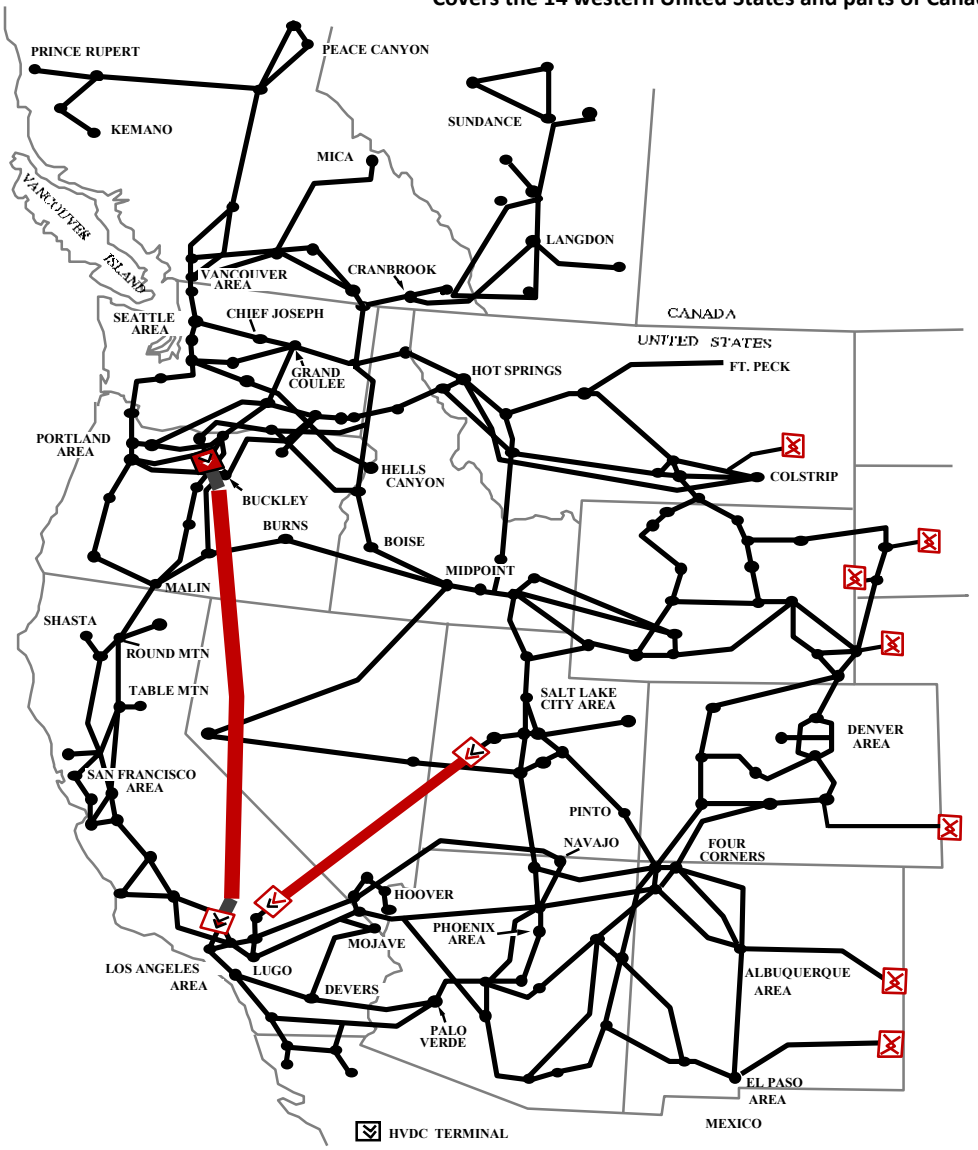
Mr. Duane has significant experience in the electric industry that includes providing technical support and guidelines for system operations as well as generation development activities through production cost analysis, market analysis and corporate modeling input.

US Transmission Grids



THE WESTERN TRANSMISSION GRID

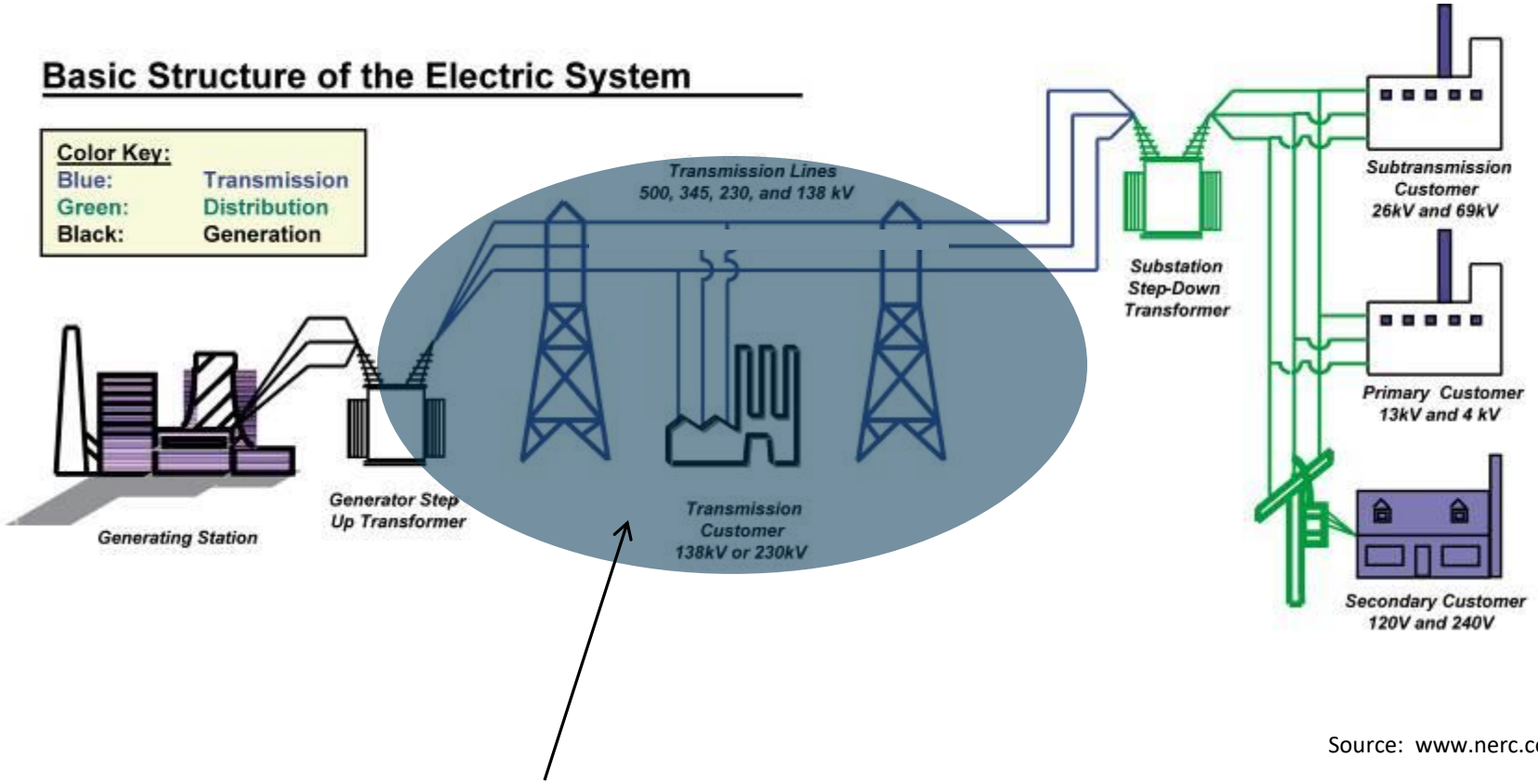
Covers the 14 western United States and parts of Canada and Mexico



A Few key characteristics:

- 1.6 million square miles, 110,129 miles, of transmission, population of approx. 74 million, ~160 GW peak
- Many Balancing areas (38) and transmission providers (55)
- Bilateral transactions dominate
- Economy of scale drove remote jointly-owned base load plants and long transmission lines to connect to load centers
- 2 High Voltage DC lines (serving So. California)
- 7 back to back High Voltage DC ties to eastern grid

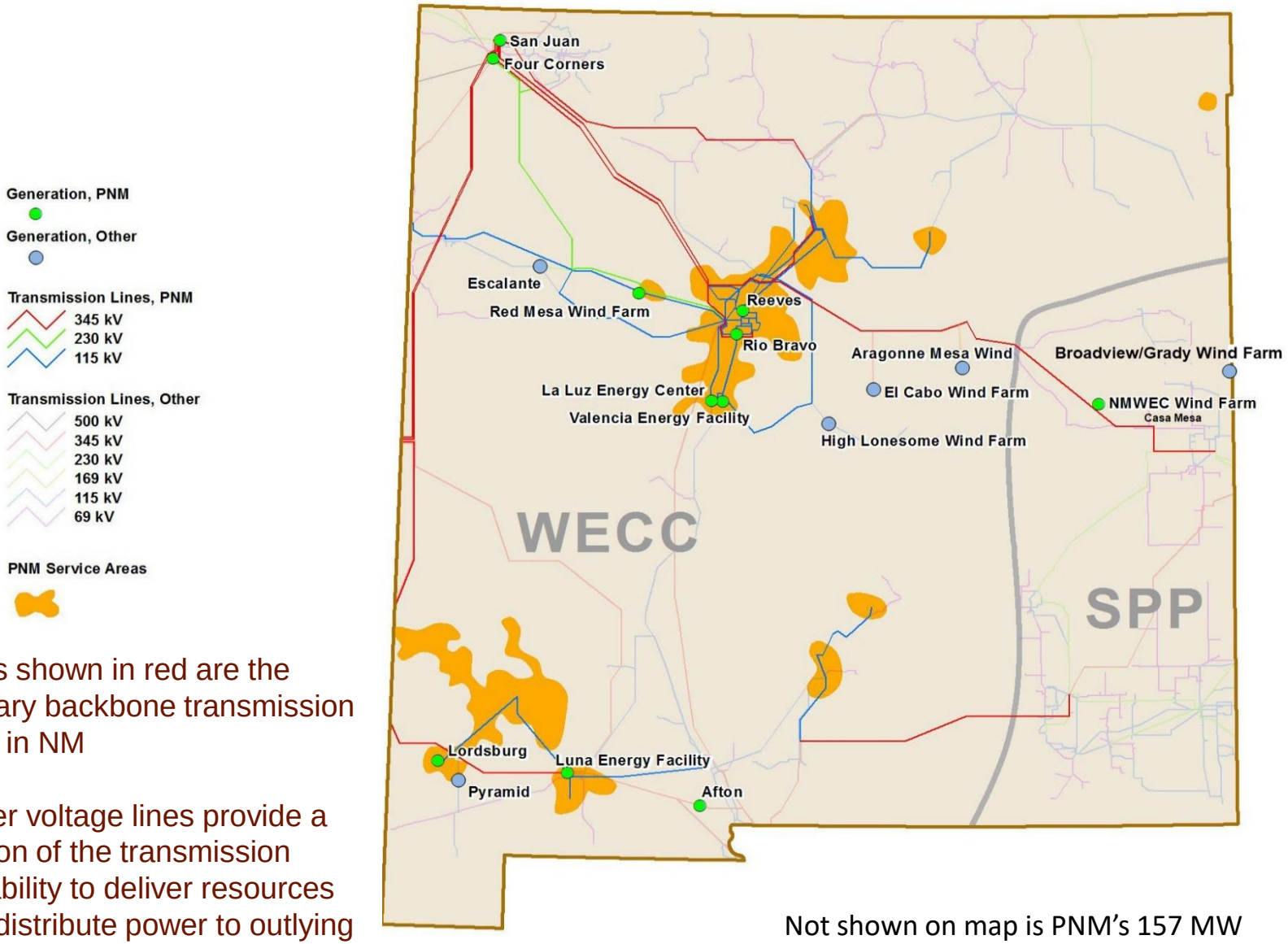
Components of the Grid



Source: www.nerc.com

PNM Transmission Voltage Levels are 115kV, 230kV, 345kV and 500kV

SYSTEM MAP OVERVIEW



- Lines shown in red are the primary backbone transmission lines in NM
- Lower voltage lines provide a portion of the transmission capability to deliver resources and distribute power to outlying smaller load areas distant from Albuquerque and El Paso

Not shown on map is PNM's 157 MW solar on the distribution system

A Few PNM Transmission System Facts

- Line mileage (incl. jointly owned lines)
  - 165 miles of 500 kV (Outlet from Palo Verde)
  - 1678 miles of 345 kV
  - 180 miles of 230 kV
  - 1175 miles of 115 kV
- Backbone transmission lines (345 kV and 230 kV) are 130 to 200 miles in length.
- Jointly Owned Transmission Projects:
  - Palo Verde Valley Transmission System
  - San Juan –Springerville- Vail Transmission System
  - Southwest New Mexico Transmission System
  - San Juan-Four Corners and San Juan- Shiprock 345 kV lines
  - Eddy County HVDC and Eddy– Amrad 345 kV System
- Majority of backbone transmission lines built in late 1960s through the mid-1970s.
  - Numerous system improvements made to existing system since that time
- PNM purchases a portion of its transmission needs to deliver generation resources located in southern New Mexico and western Arizona.

PNM Transmission System Use

- Moves PNM's resources to New Mexico retail customers
- Moves PNM transmission customer resources to their delivery points
  - Wholesale transmission services are provided per FERC Open Access Transmission Tariff (OATT)
  - 50% of system use is by others; Will increase to ~50% in 2021.
  - Network customers include:
    - Tri-State G&T, Western Area Power Authority (for SNL/KAFB), Los Alamos, Navajo Tribal Utility Authority, Navopache Co-op, City of Gallup, Kit Carson Co-op, Jicarilla Apache Nation, and PNM-WPM (for PNM retail).
  - Point-to-point Customers include:
    - El Paso Elec., WAPA, High Lonesome Mesa Wind, Aragonne Mesa Wind, and Tri-State. Pattern and Avangrid wind late-2016 and 2017.
- PNM plans and constructs its system to meet all customer needs

DRIVERS FOR Transmission EXPANSION

- Annual adequacy studies are required to comply with NERC/WECC Reliability Standards
  - Jurisdictional and Network Customer Needs
- Generation Interconnection Procedures (OATT Process)
  - Renewable Energy Requirements, La Joya wind, San Juan replacement resources etc.
- Transmission Service Requests are studied Individually in Queue Process (OATT Process)
  - Avangrid (transmission service from Clines Corners to FC), etc.
- Wires-to-Wires Interconnections (OATT Process)
  - Western Interconnection, Verde, Mora Line, Western Spirt, etc.

Regional Considerations: Merchant/Transmission Development and Market Initiatives

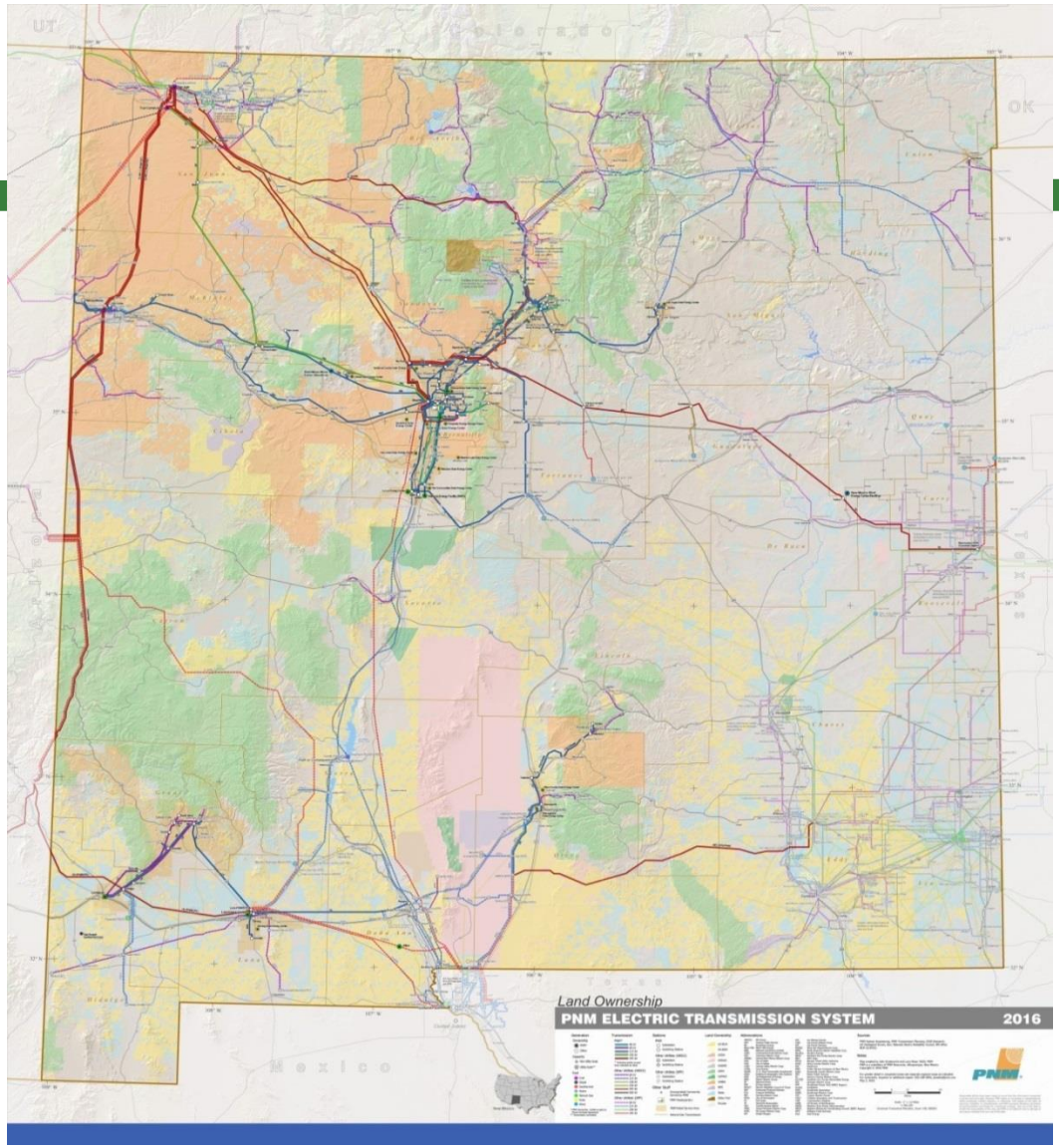
- NM's abundant potential for renewable energy development place us at the crossroads of many proposals with intended purpose of delivering NM renewable energy to markets.

- We Are Right In The Middle of Everything!

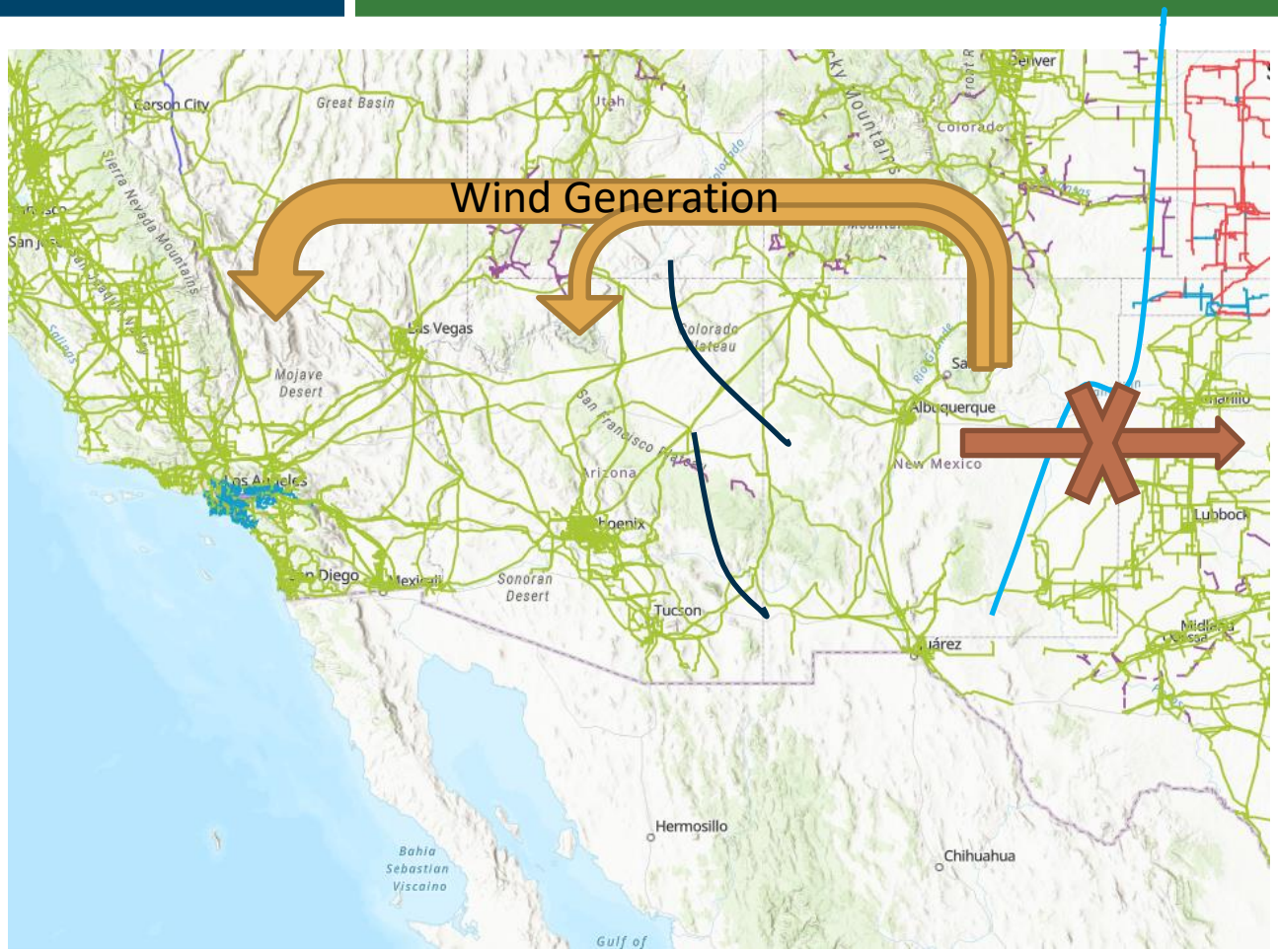
The Transmission Siting Challenge

NM Land Ownership / Management:

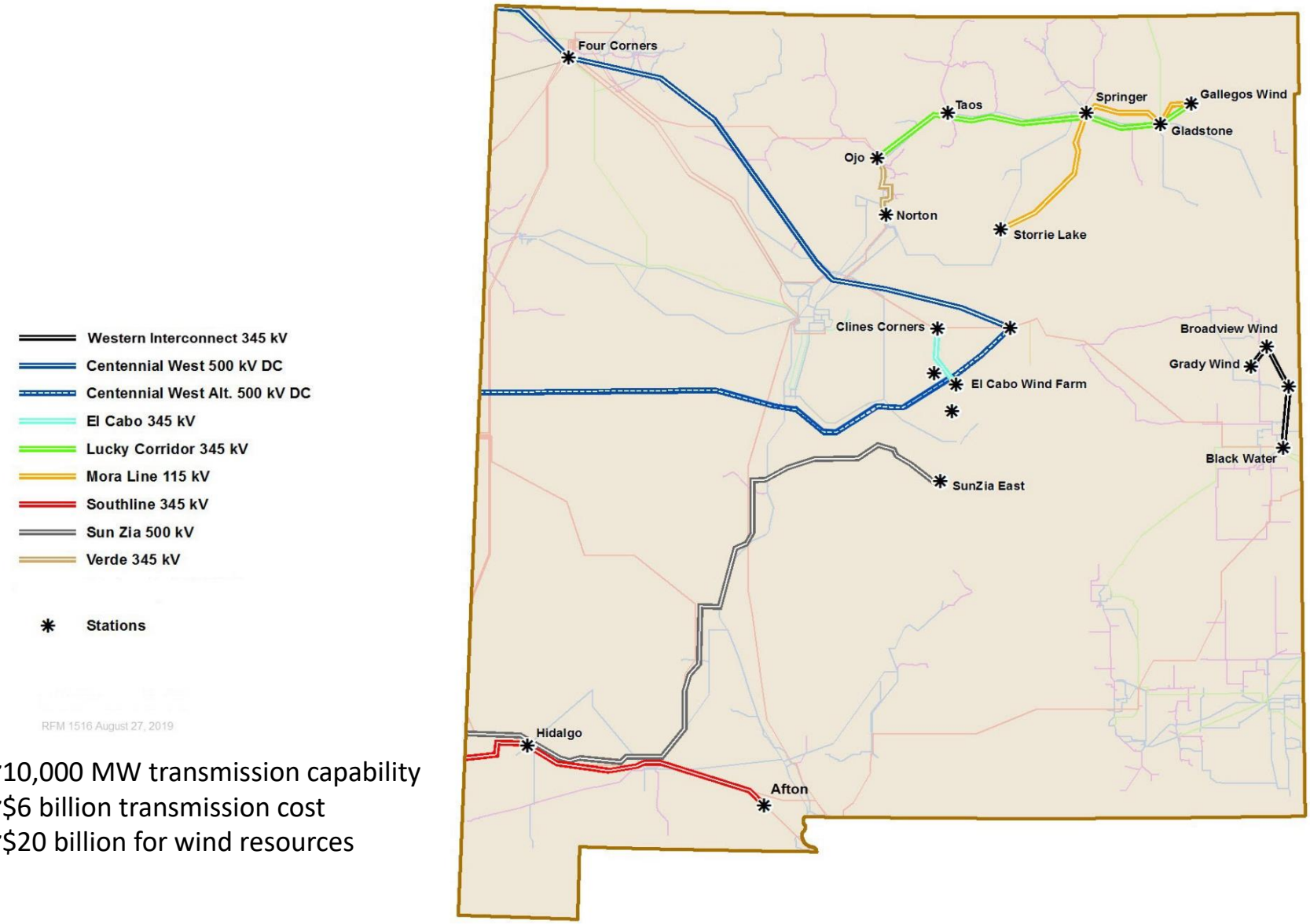
- US Forest Service
- Tribal Lands
- NM State
- Military
- US Bureau Land Management



Southwest Energy Picture



Merchant Transmission in New Mexico

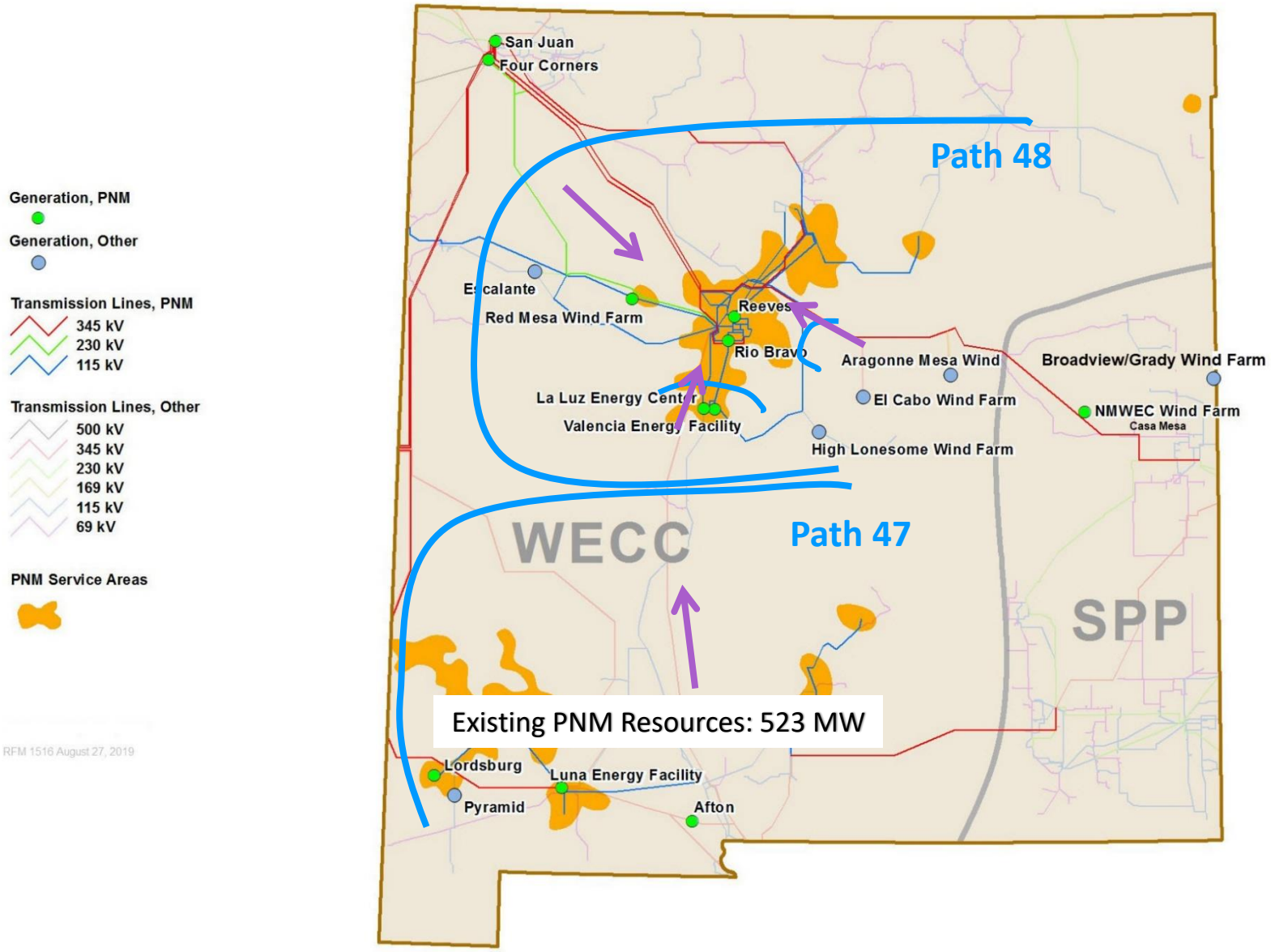


~10,000 MW transmission capability
~$6 billion transmission cost
~$20 billion for wind resources

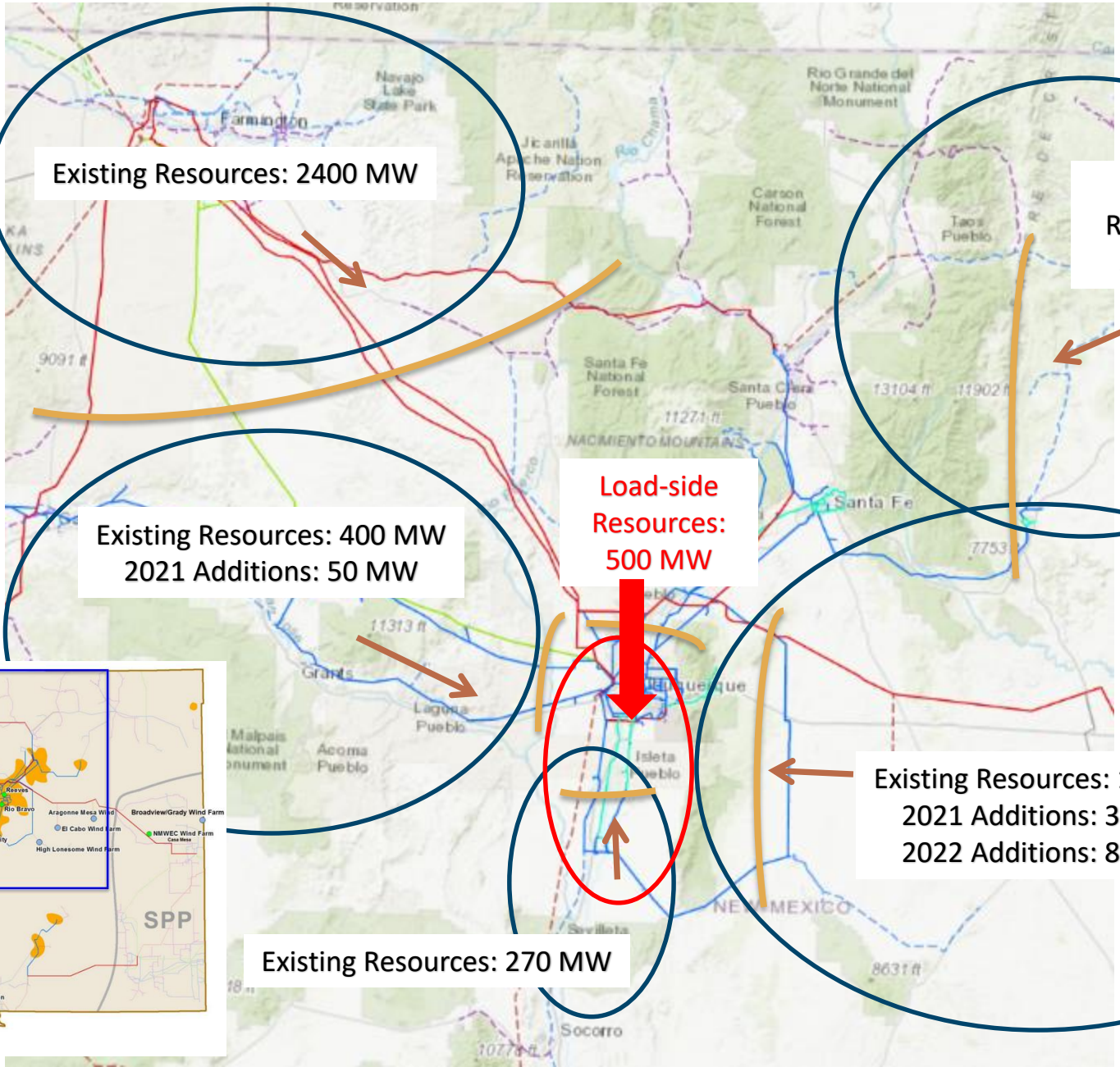
Merchant Transmission Timeline Experience

- Sunzia:
  - Development Started in 2007
  - NEPA process started May 2009; ROD issued January 2015
  - 2015 - ?: AZ & NM State Permitting and Land Owner Negotiations
  - In Service Date early 2020s
- Southline:
  - 2009-2011 Conceptual Development and Initial Public Engagement
  - 2012 Initiation of NEPA Process, ROD Issued April 2016
  - 2015-2016 State and Local Permitting, Right Of Way Acquisition
  - Solicitation process (March-June 2016)
  - In Service Date early 2020s
- Verde:
  - 2014-2015 Preliminary Project Planning
  - 2016-2017 Permitting, Public Engagement, ROW, Engineering
  - 2019 – Withdrew ROW application with BLM

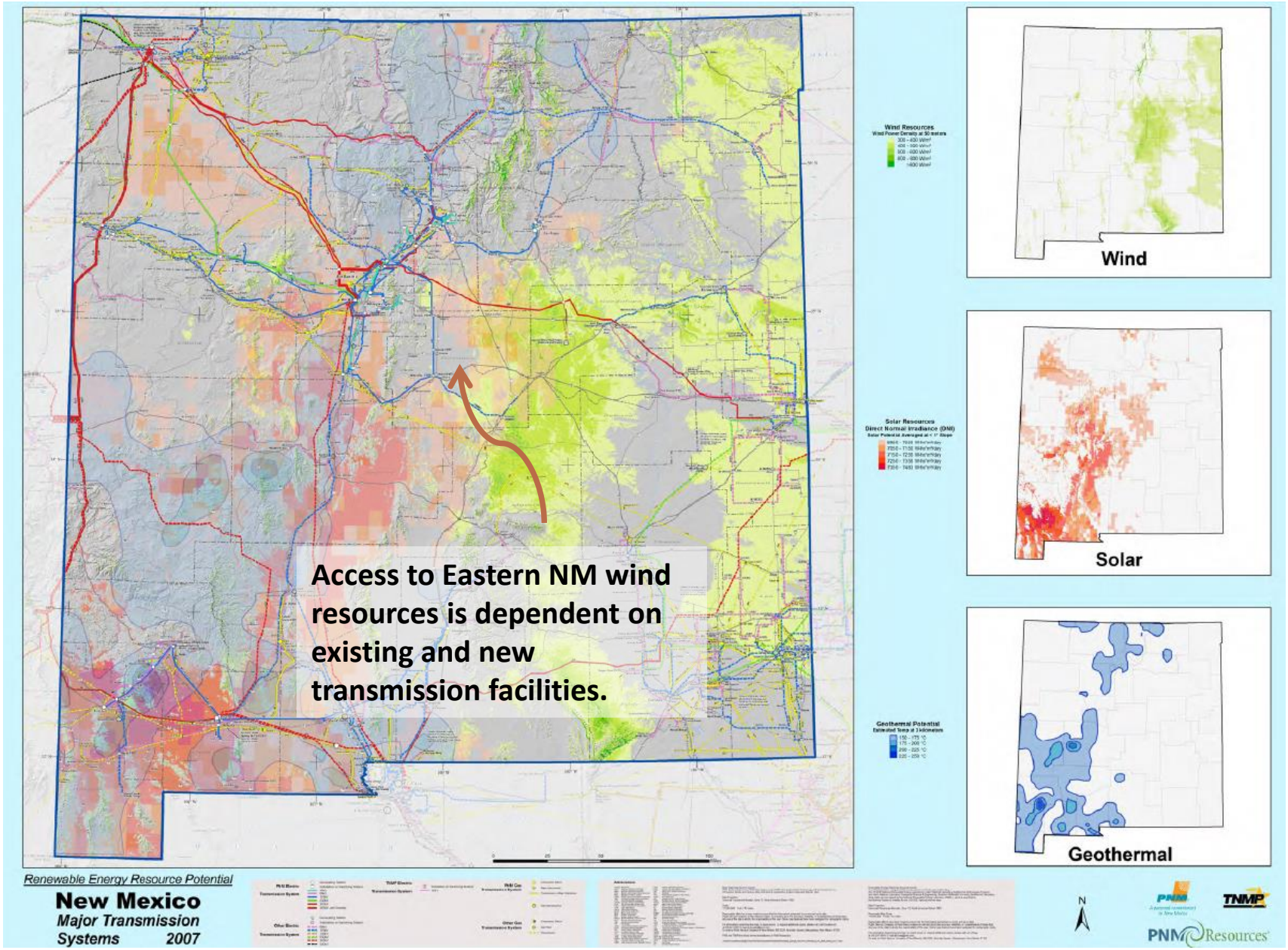
TRANSMISSION LIMITATIONS: CONSTRAINTS FOR GENERATION DELIVERY



TRANSMISSION LIMITATIONS: CONSTRAINTS FOR GENERATION DELIVERY

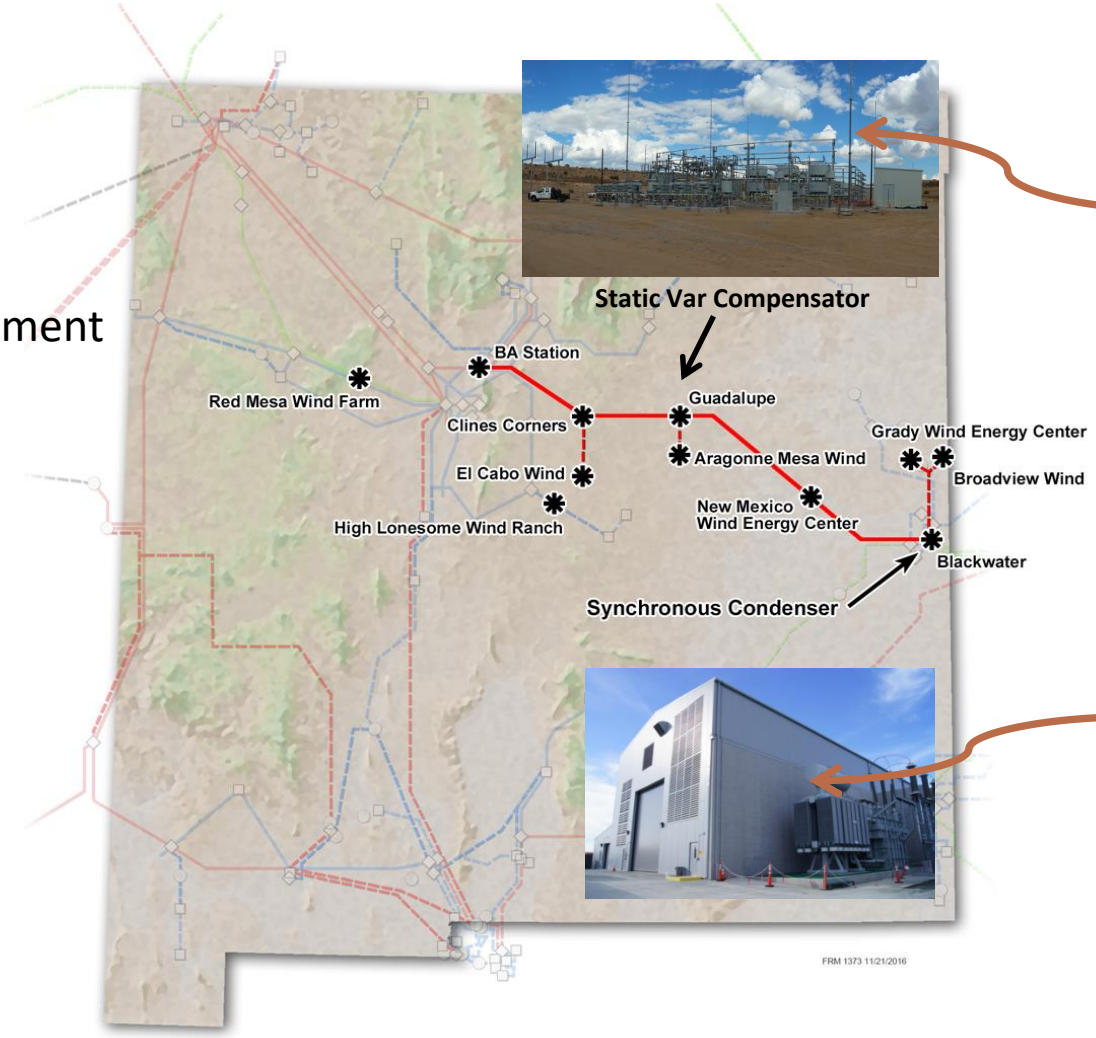


NEW MEXICO RENEWABLE RESOURCES



EASTERN NM WIND CAPACITY INTERCONNECTED TO PNM IS APPROXIMATELY 1300 MW!

Over a $2B investment in windfarms

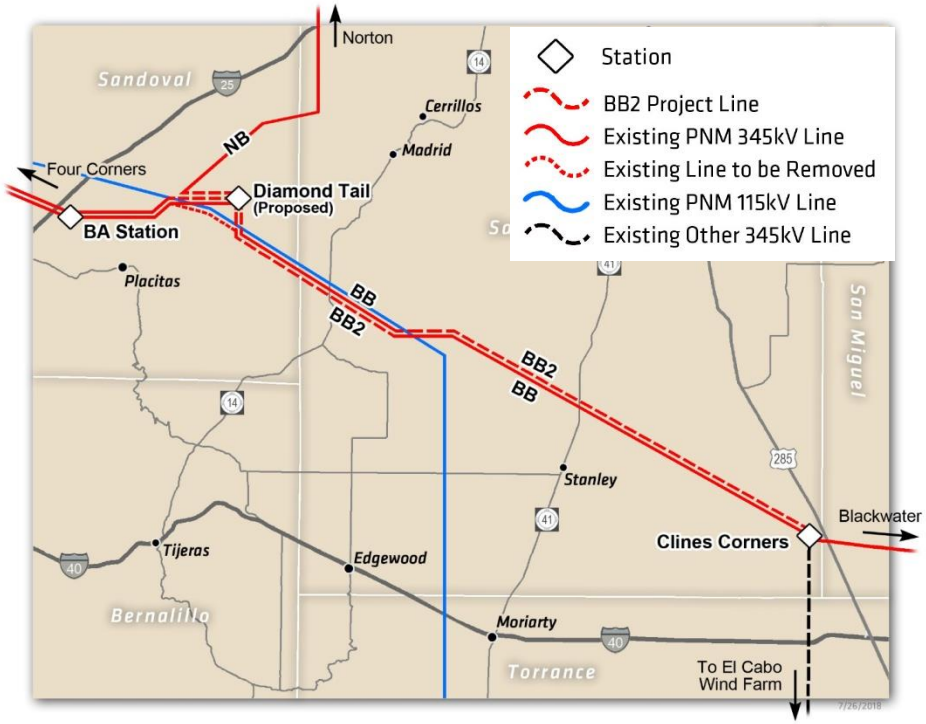


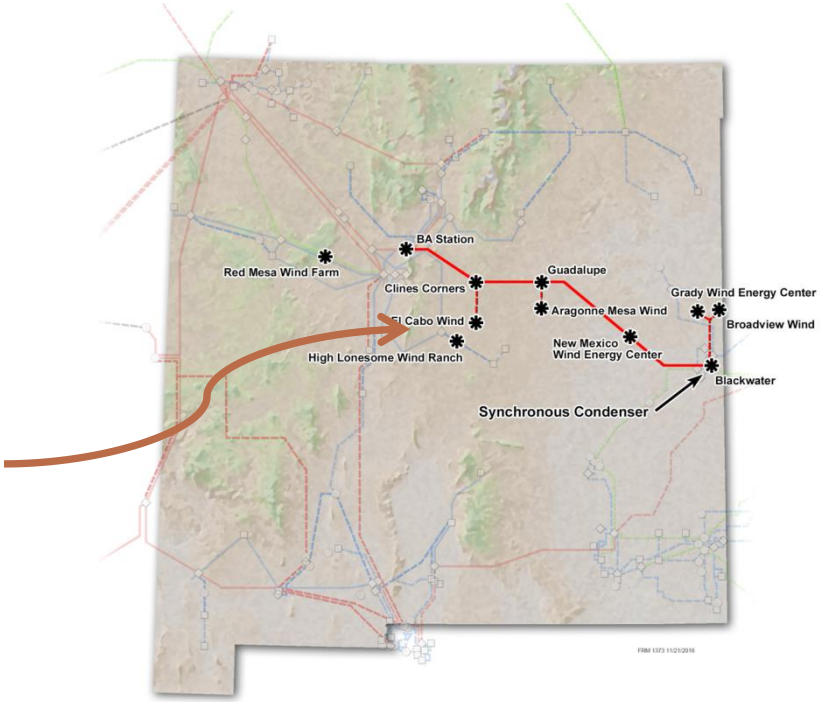
Required to provide voltage support

Required to provide voltage and dynamic support

Transmission and Renewable Energy Expansion in New Mexico

- Second BA-Clines Corners Line Improves access to wind resources
- 362 MW Incremental Capacity – ISD Q4 2020





Beyond BB2: Western Spirit Transmission Project

- New Mexico Wind, LLC (Pattern), a wind developer in eastern New Mexico, requested 800 MW of transmission service on PNM's system to deliver wind resources west

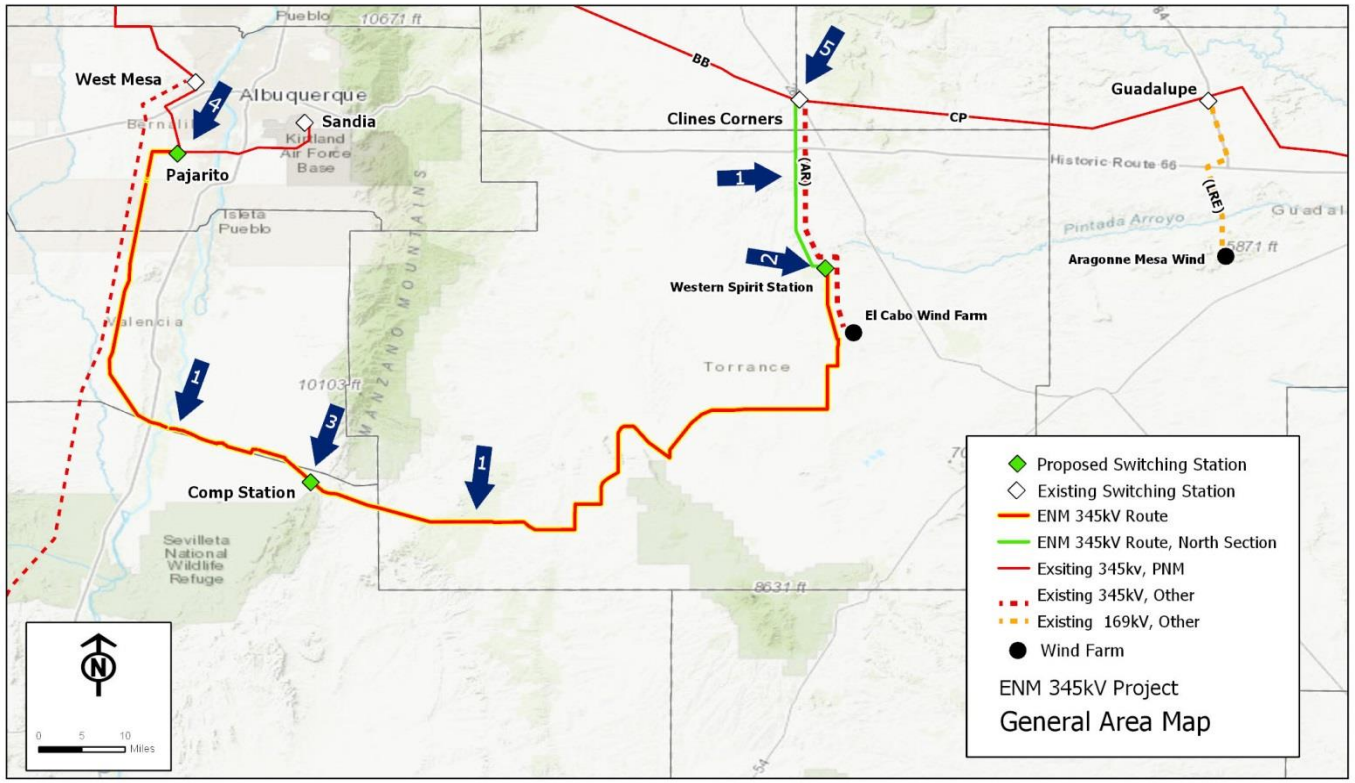
- Due to substantial wind development in eastern New Mexico, there is no longer available capacity on PNM's transmission system

- To meet Pattern's accelerated timeline for service, Western Spirit Transmission, LLC (WST) in partnership with New Mexico Renewable Energy Transmission Authority (RETA) is developing a new transmission line and associated facilities and PNM will construct the interconnection facilities, collectively referred to as the Western Transmission Project.

Beyond BB2: Western Spirit Transmission Project

- PNM will purchase the portion of the Project constructed by WST/RETA at its commercial operation date, expected in Q3 2021.
- PNM is not seeking to recover any of the project costs from retail customers.
- PNM received FERC approval of acquisition and incremental tariff rate.
- NMPRC hearing held; waiting for recommended decision and NMPRC approval

Western Spirit Transmission Project Map



Project elements:

1. New 345kV transmission line - WST/RETA constructed
2. New switching station - WST/RETA constructed
3. New compensation station - WST/RETA
4. New switching station PNM constructed
5. Expansion of existing switching station - PNM constructed

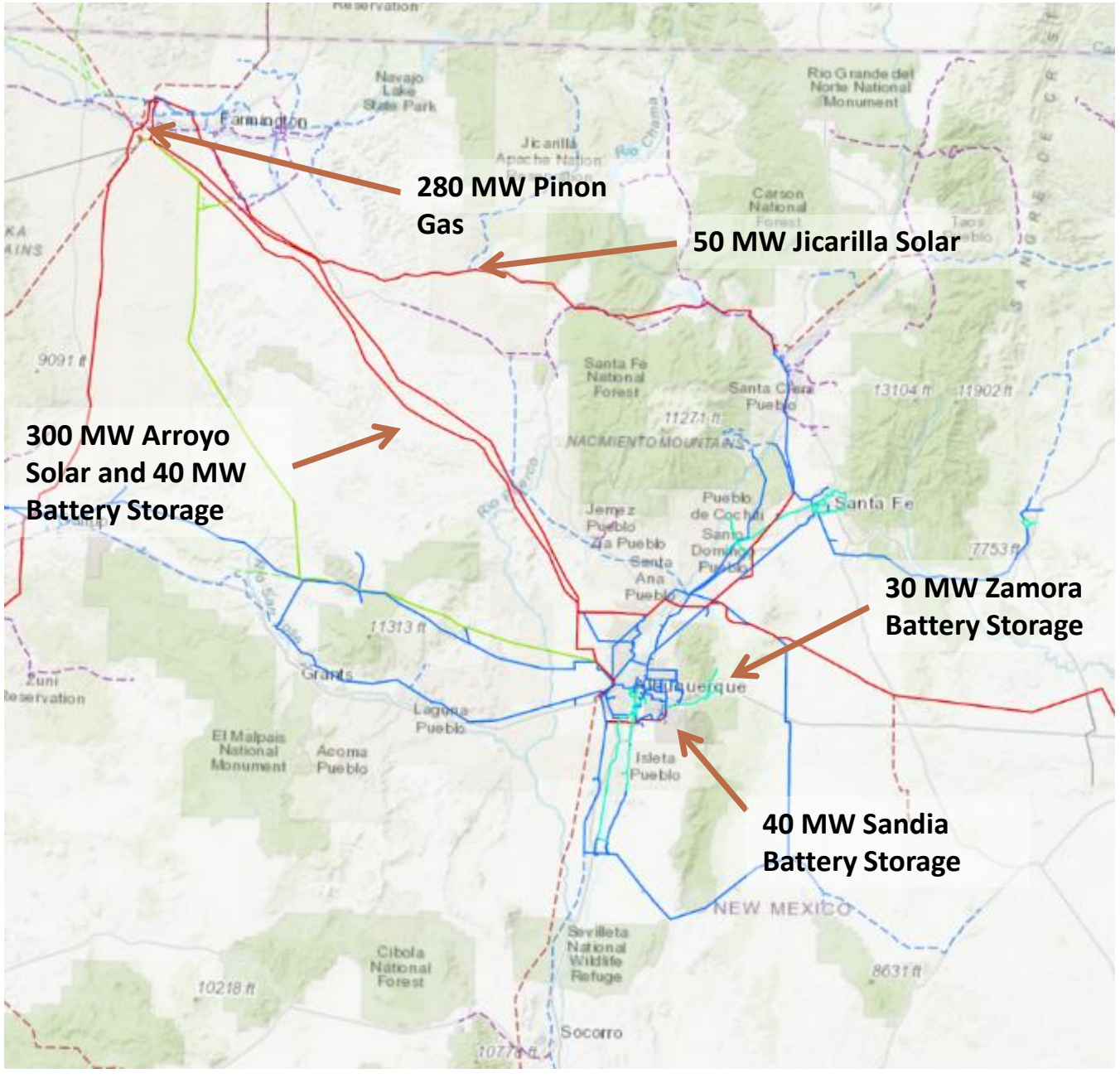
PNM Resources

Energy Transition Act

- Potential Transmission Expansion

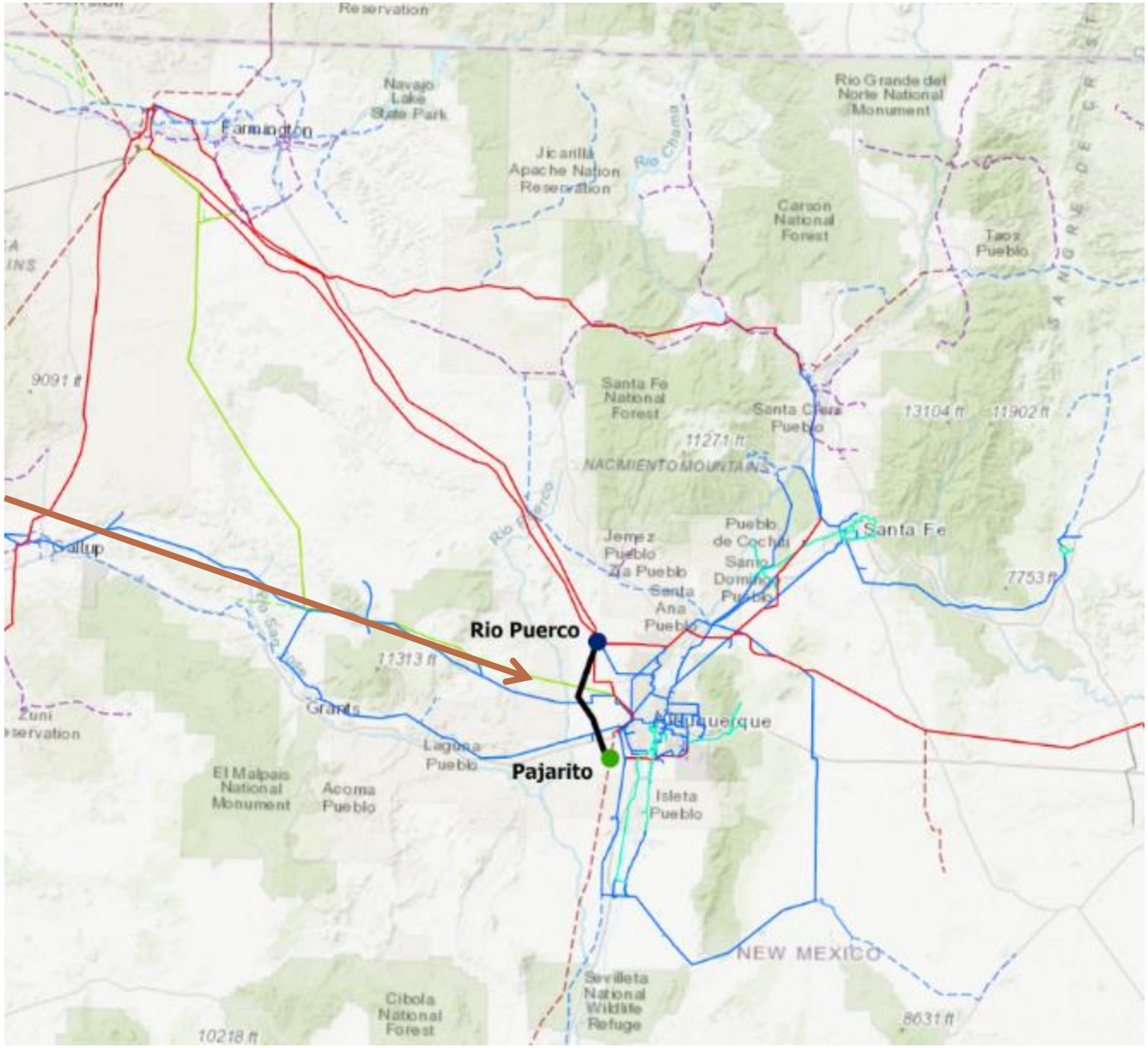
- San Juan Replacement Resources
- Moving Towards Carbon Free
- Transmission is not an explicit requirement in the ETA, but in order to reach the requirements of RPS and carbon free, expansion of transmission capacity will be required.

SAN JUAN REPLACEMENT (SCENARIO ONE)

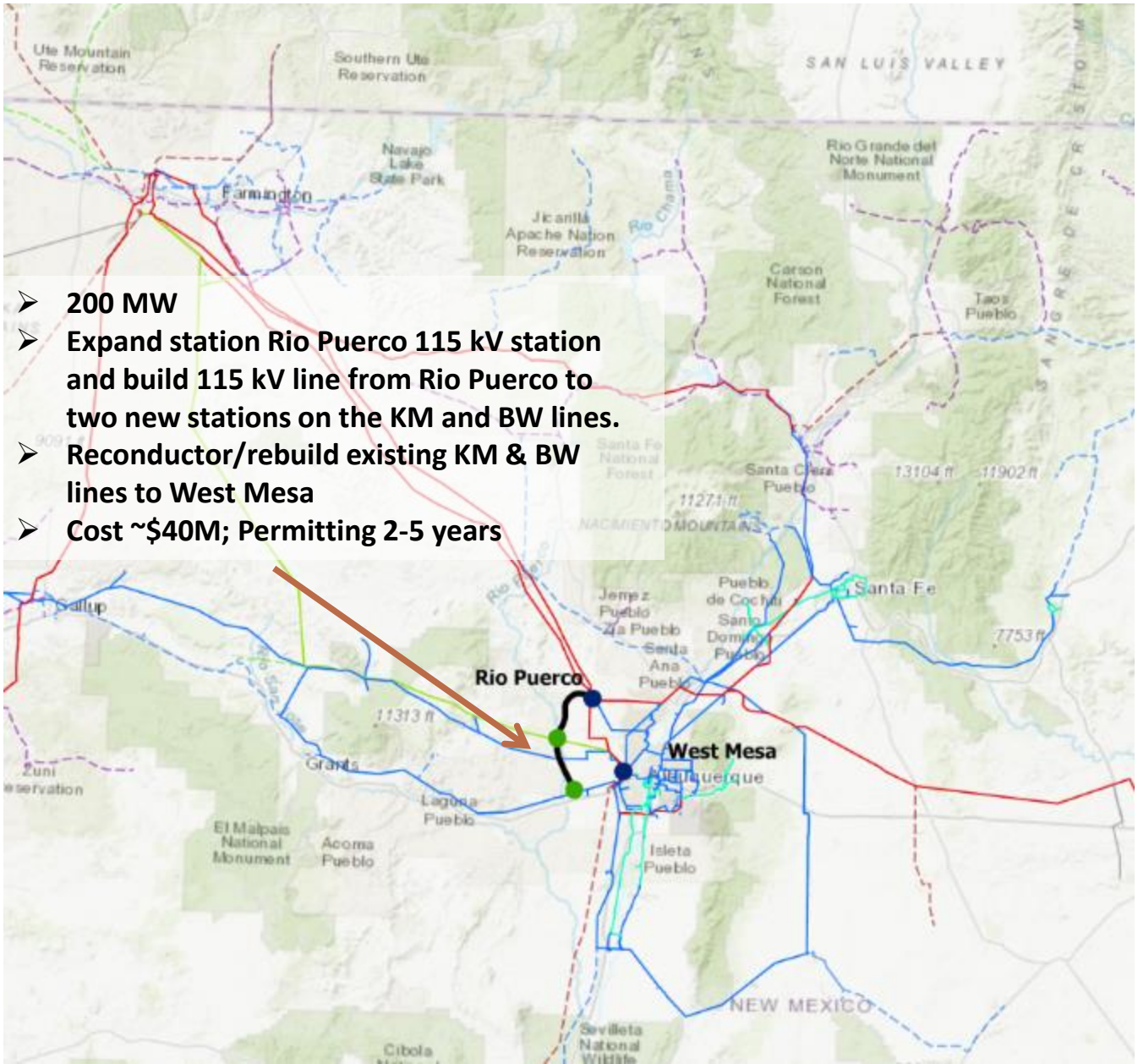


TRANSMISSION IMPROVEMENT FOR ALL OPTIONS

- **Expand stations and build Rio Puerco-Pajarito 345 kV line (30 miles)**
- **Cost ~$70M; Permitting/ CCN - 3-5 years**

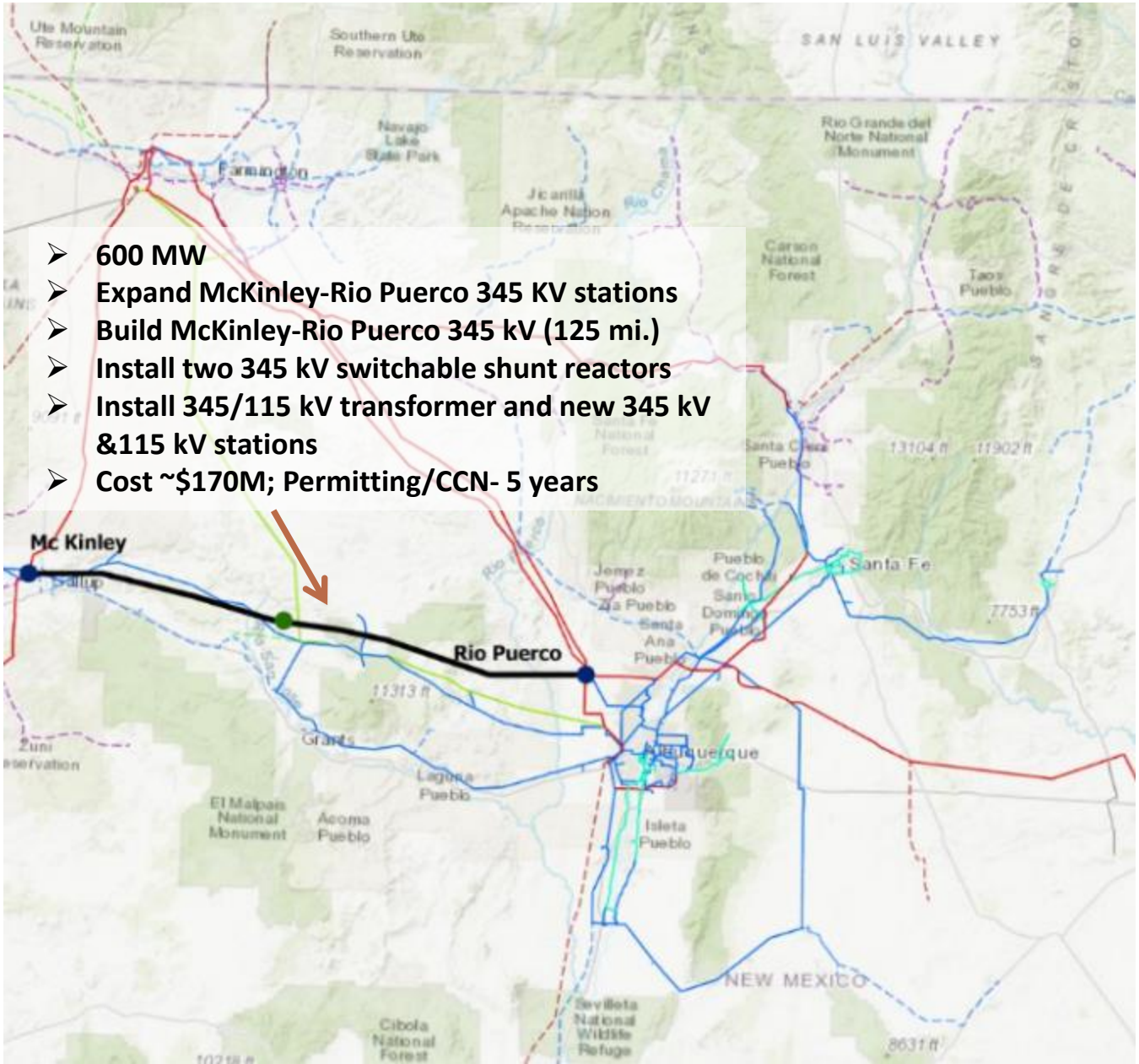


TRANSMISSION EXPANSION FOR WESTERN ABQ SOLAR RESOURCES



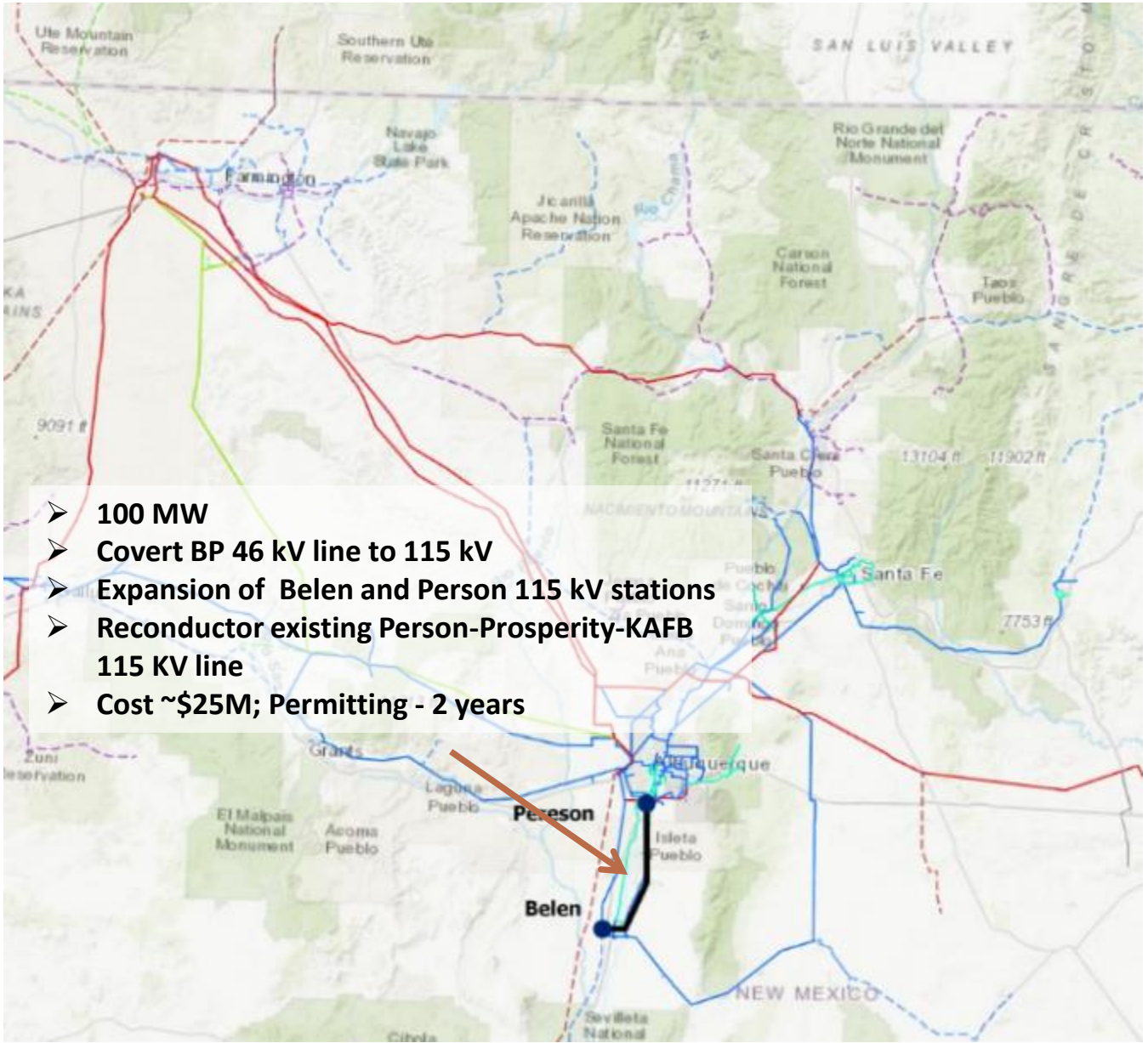
- **200 MW**
- **Expand station Rio Puerco 115 kV station and build 115 kV line from Rio Puerco to two new stations on the KM and BW lines.**
- **Reconductor/rebuild existing KM & BW lines to West Mesa**
- **Cost ~$40M; Permitting 2-5 years**

TRANSMISSION EXPANSION FOR WESTERN NM SOLAR RESOURCES

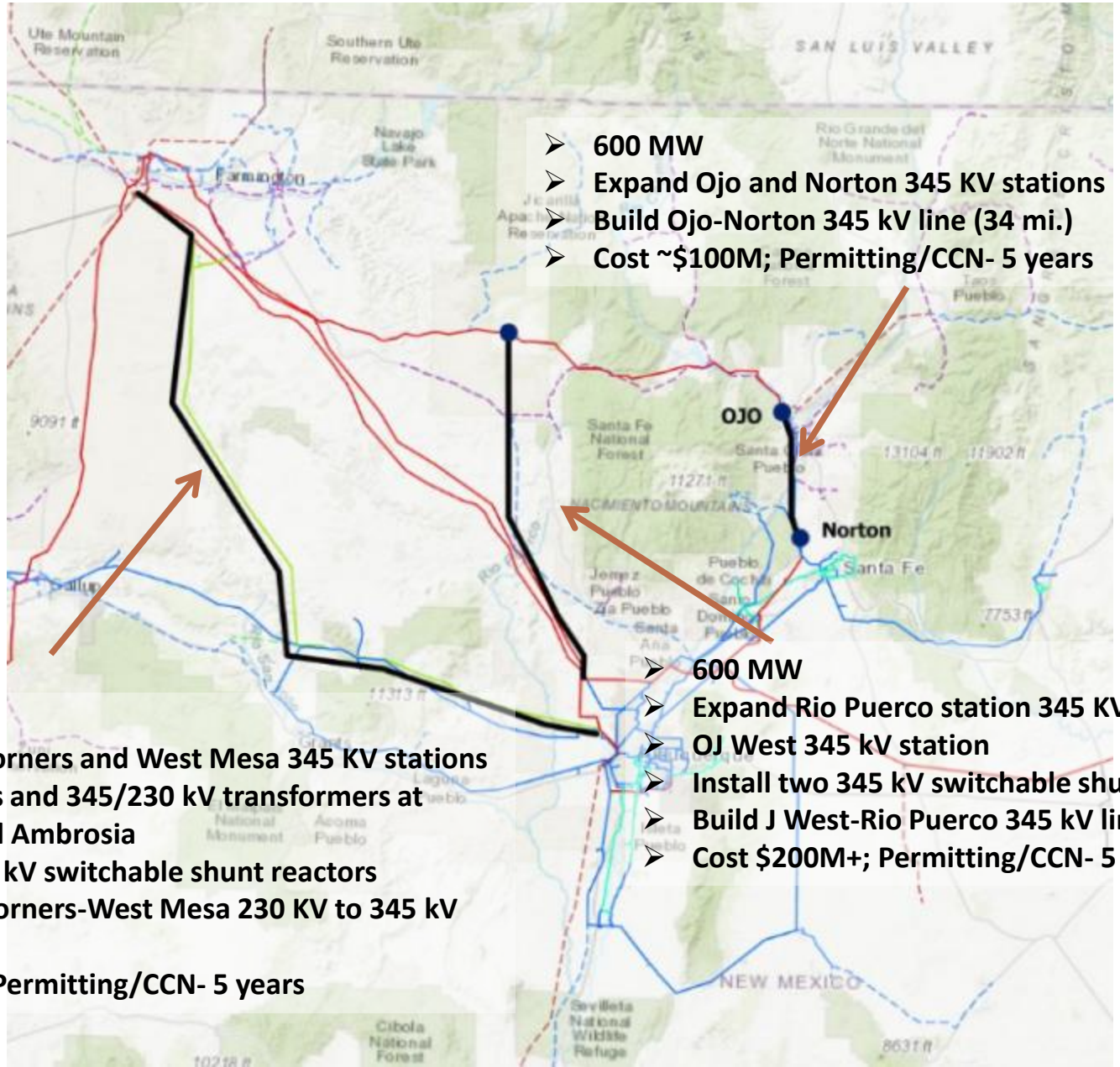


- **600 MW**
- **Expand McKinley-Rio Puerco 345 KV stations**
- **Build McKinley-Rio Puerco 345 kV (125 mi.)**
- **Install two 345 kV switchable shunt reactors**
- **Install 345/115 kV transformer and new 345 kV &115 kV stations**
- **Cost ~$170M; Permitting/CCN- 5 years**

TRANSMISSION EXPANSION FOR SOUTH OF ABQ SOLAR RESOURCES



TRANSMISSION EXPANSION FOR NORTHERN NM RESOURCES

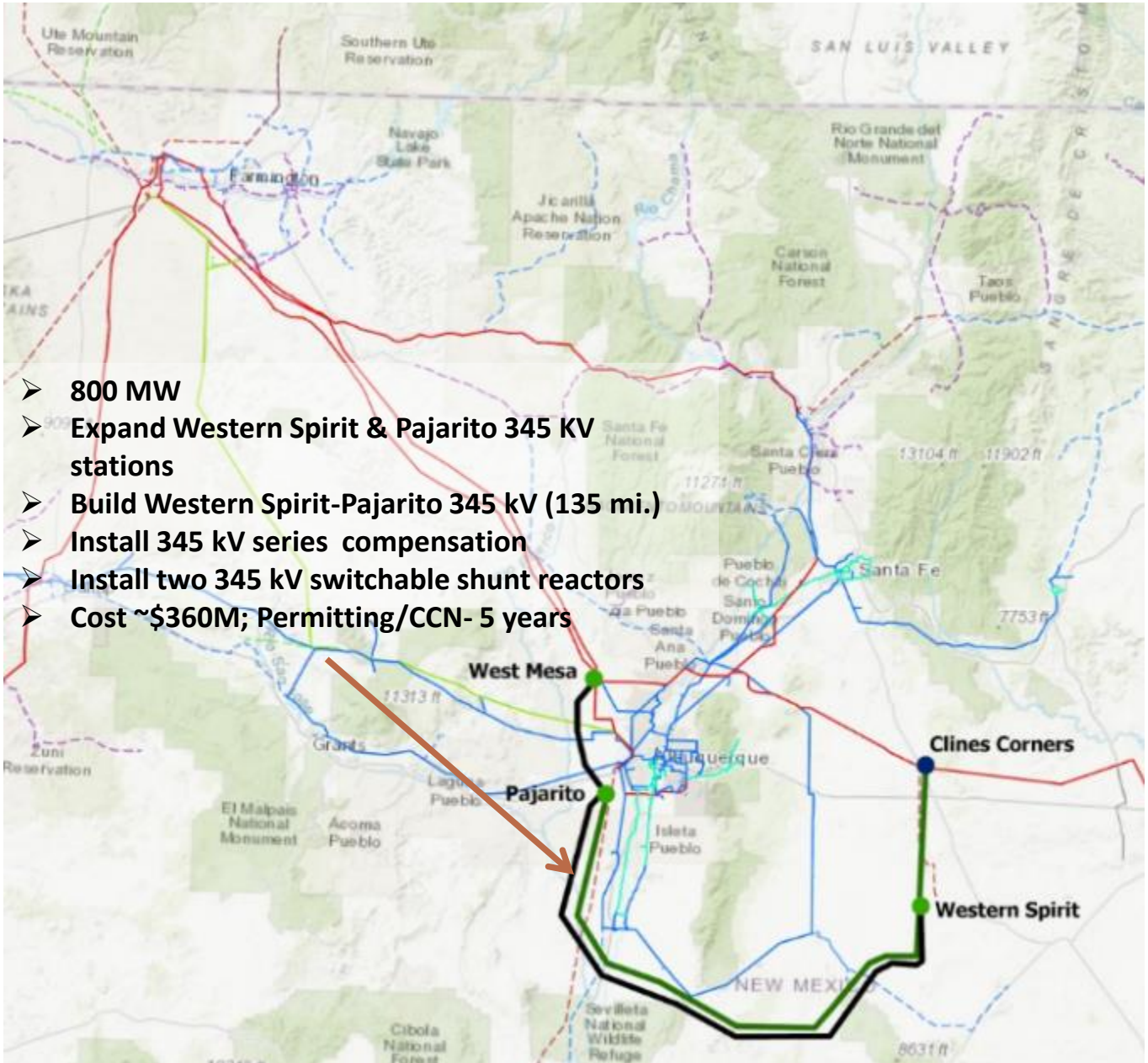


- 600 MW
- Expand Ojo and Norton 345 KV stations
- Build Ojo-Norton 345 kV line (34 mi.)
- Cost ~$100M; Permitting/CCN- 5 years

- 600 MW
- Expand Four Corners and West Mesa 345 KV stations
- 345 kV stations and 345/230 kV transformers at Pillar, Bista and Ambrosia
- Install two 345 kV switchable shunt reactors
- Rebuild Four Corners-West Mesa 230 KV to 345 kV line (180 mi.)
- Cost $400M+; Permitting/CCN- 5 years

- 600 MW
- Expand Rio Puerco station 345 KV station
- OJ West 345 kV station
- Install two 345 kV switchable shunt reactors
- Build J West-Rio Puerco 345 kV line (80 mi.)
- Cost $200M+; Permitting/CCN- 5 years

TRANSMISSION EXPANSION FOR EASTERN NM WIND RESOURCES



- **800 MW**
- **Expand Western Spirit & Pajarito 345 KV stations**
- **Build Western Spirit-Pajarito 345 kV (135 mi.)**
- **Install 345 kV series compensation**
- **Install two 345 kV switchable shunt reactors**
- **Cost ~$360M; Permitting/CCN- 5 years**

Market Initiatives

- Mountain West Transmission Group (MWTG)

MOUNTAIN WEST

- MWTG involved several Colorado utilities to develop a regional transmission operation business model. The proposed MWTG is intended to provide a single transmission tariff and provider throughout Colorado and the WAPA system in Arizona.

- Provide a foundation for an RTO and/or organized markets.

- PSCo announced on April 20, 2018 that it is ending its participation in the MWTG and in related efforts to form a regional transmission organization RTO. In making its announcement the company cited a number of issues for its decision, including limited benefits; lack of market expansion opportunities for the MWTG; and increasing uncertainty over the costs of the RTO.

- Without PSCo the MWTG initiative has a limited viability since PSCo load constituted over 50% of MWTG total load.

Key Points on Transmission Expansion

- Interest in New Mexico renewables is widespread but expansion has become limited by existing transmission constraints.
  - Use of PNM's transmission by others for delivery of renewable energy has increased the utilization of PNM's transmission system for FERC required transmission service.
  - In addition to state requirements, PNM has FERC requirements to pursue transmission additions to accommodate transmission service.

Key Points on Transmission Expansion

- Addressing transmission limitations can substantially increase time and cost to add resources or serve large load increases.
  - Existing locations with transmission capacity have largely been utilized.
  - Recommended San Juan replacement resources will utilize transmission previously used to import San Juan generation allowing existing transmission capacity to be utilized and minimize transmission costs.
  - Transmission capacity must be expanded to accommodate expected resource beyond San Juan replacement to get to a carbon free portfolio.
  - Projects are actively being pursued to increase access to additional wind resources in eastern New Mexico.

- There is continuing efforts towards market initiatives that allow for better integration across broader regions to deal with larger renewable penetration levels resulting in increased needs for transmission expansion.

Tentative Meeting Schedule Through January 2020

July 31:	Kickoff, Overview and Timeline
August 20:	The Energy Transition Act & Utilities 101
August 29:	Resource Planning Overview: Models, Inputs & Assumptions
September 6:	Transmission & Reliability (Real World Operations)
September 24:	Resource Planning “2.0”
October 22:	Demand Side/EE/Time of Use
November 5:	Load & CO2 Forecast
December 10:	Technology Review/ Finalize scenarios based on technical adv
January 14:	Deadline for Scenario Requests

Registration for Upcoming Sessions

Please register for each upcoming session separately. You will receive a reminders two days in advance and the day of the event.

To access documentation presented so far and to obtain registration links for upcoming sessions, go to:

www.pnm.com/irp

Other contact information:

irp@pnm.com for e-mails

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THANK YOU