

# PNM 2017-2036

# Integrated Resource Plan

SEPTEMBER 1, 2016 TRANSMISSION, ENERGY EFFICIENCY & RENEWABLES



Talk to us.



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## DISCLOSURE REGARDING FORWARD LOOKING STATEMENTS

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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](http://www.pnmresources.com).

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# AGENDA

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## BASELOAD GENERATION IN THE 2017 IRP

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- Meeting preliminaries
- Transmission System and IRP
- Energy Efficiency and Demand Side Management
- Renewable Energy Resources
- Coordination with 2017 IRP

# SAFETY AND LOGISTICS

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## MEETING PRELIMINARIES

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- Fire escape routes via stairways at east and west ends of hallway; please let us know if you require special handicap egress or special assistance
- We must obey any fire or emergency alarm; even drills/test alarms
- Restrooms – Women's room at west end; Men's room at east end
- PNM's WiFi
- Please be aware that there are outlets/network connections on the floor

# SAFETY AND LOGISTICS CONTINUED

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## MEETING PRELIMINARIES

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- Must sign-in with security desk each time you enter the building
- Must be escorted in and out of the building by a PNM employee
- Recycling is easy and encouraged
- Please note that meeting room is scheduled immediately following the IRP meeting

# MEETING GROUND RULES

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## MEETING PRELIMINARIES

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- IRP Public Advisory purpose is to solicit and receive public input
- Questions and comments are welcome
- Comments should be respectful of all participants
- Use name tents to indicate you have a comment or question
- Please silence your cell phone
- Reminder; today's presentation is not PNM's plan or a financial forecast, it is a discussion of PNM's planning process

# SCHEDULE

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## THREE PUBLIC ADVISORY PHASES, ONE DEADLINE

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- July – October: Build assumptions and discuss scenarios and sensitivities
- November – February: Discuss analysis plan and discussion of findings
- March – June: Discuss draft report
- July 1, 2017 – File report documenting the Plan and process with New Mexico Public Regulation Commission

# NEAR TERM SCHEDULE

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## MEETING SCHEDULE THROUGH NOVEMBER

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- July 30: Kickoff, overview and timeline
- July 27: Reliability standards & grid modernization concepts
- August 11: Baseload resources
- **September 1: Transmission, renewable energy & energy efficiency**
- September 22: Natural gas price forecasts & environmental regulations
- October 13: Load forecast, rates and tariffs
- November 10: Modeling roadmap resulting from discussion at previous meetings



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TRANSMISSION TOPICS FOR INTEGRATED RESOURCE PLANNING

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**Jeff Mechenbier**

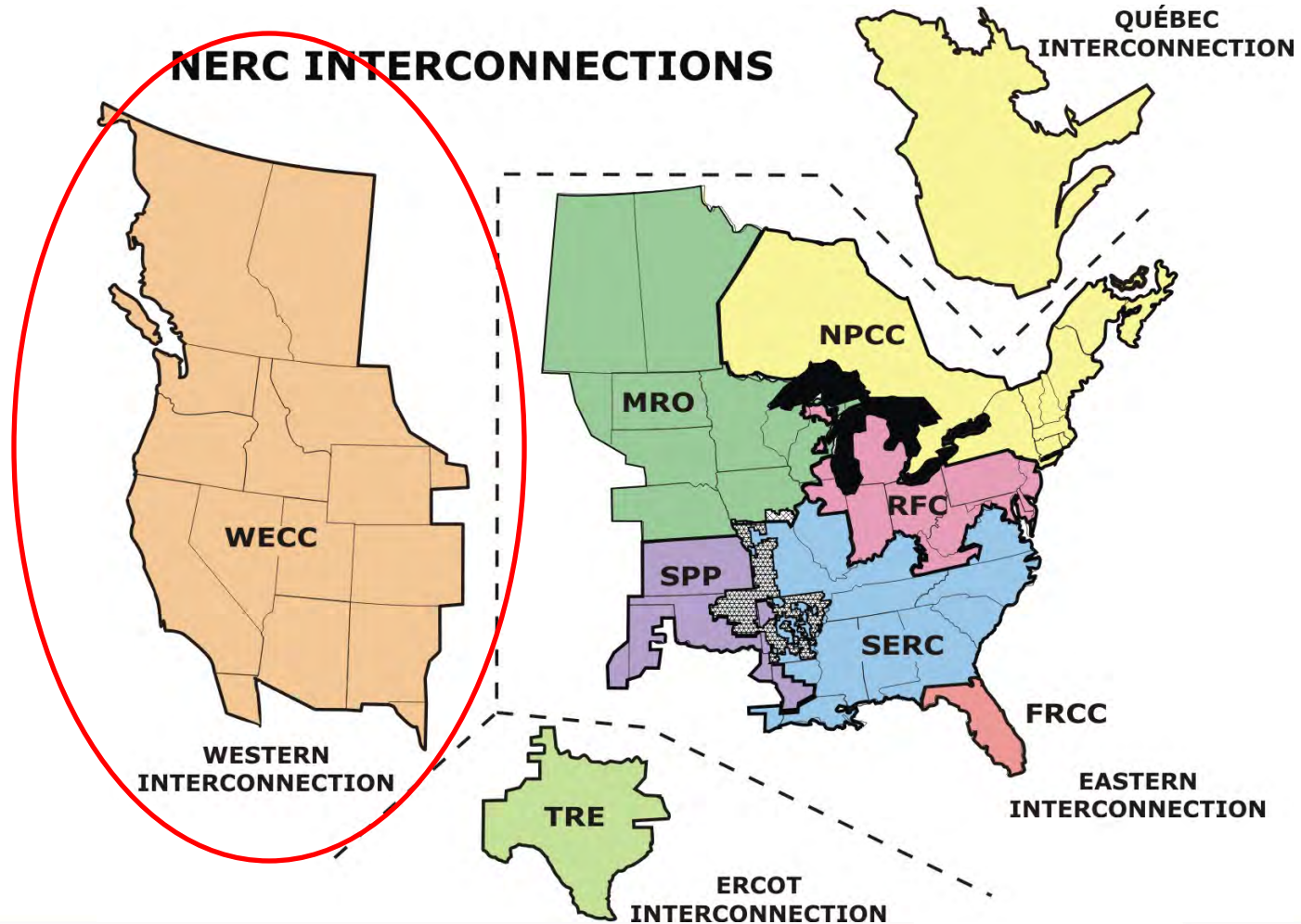
**Director, Transmission/Distribution Planning & Contracts**



Talk to us.

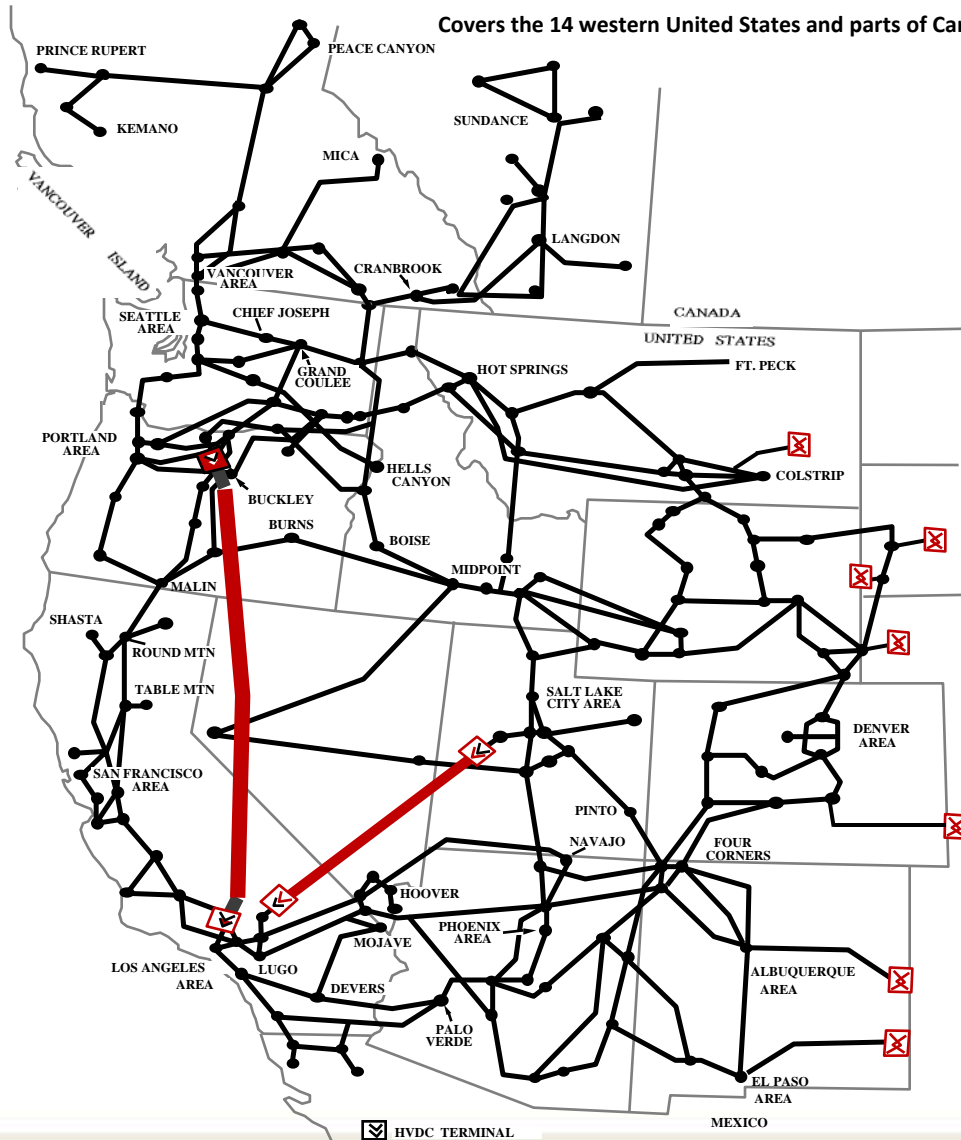


# US Transmission Grids



# The Western Transmission Grid

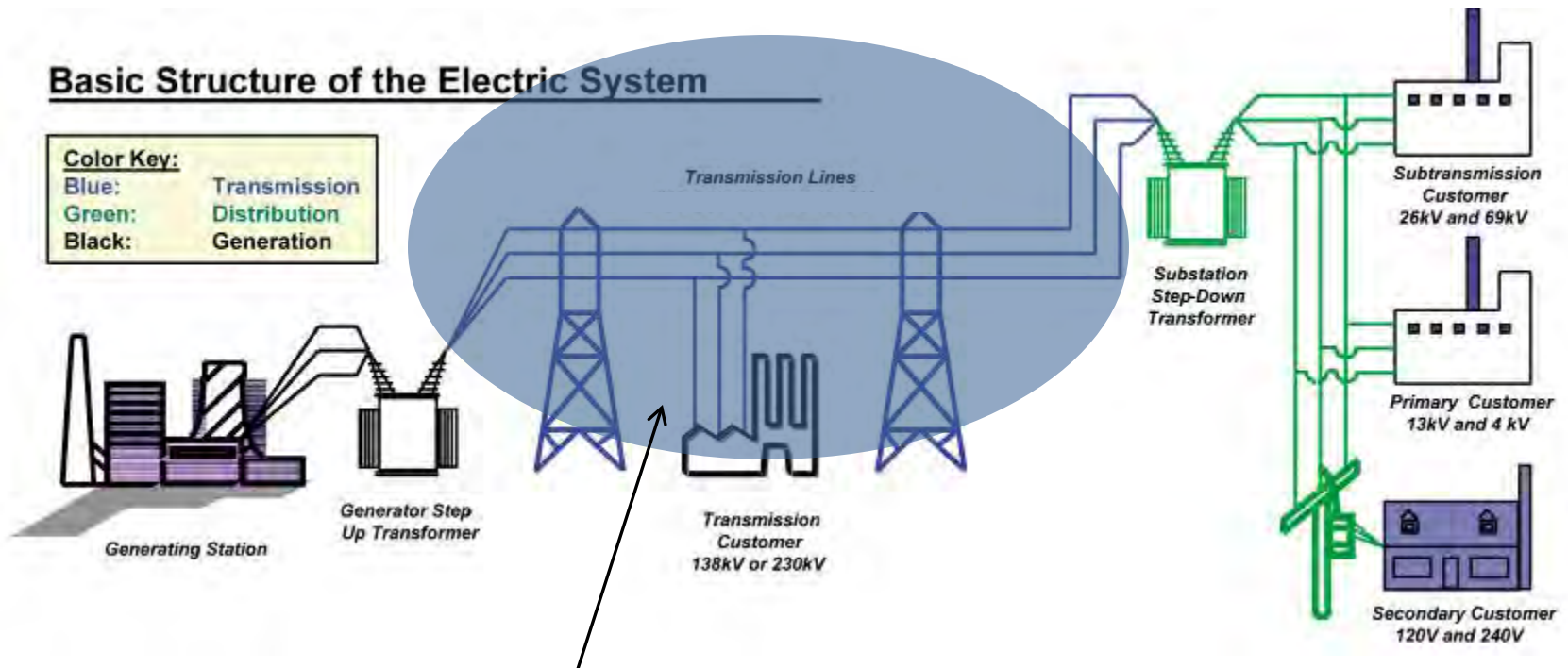
Covers the 14 western United States and parts of Canada and Mexico



## 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

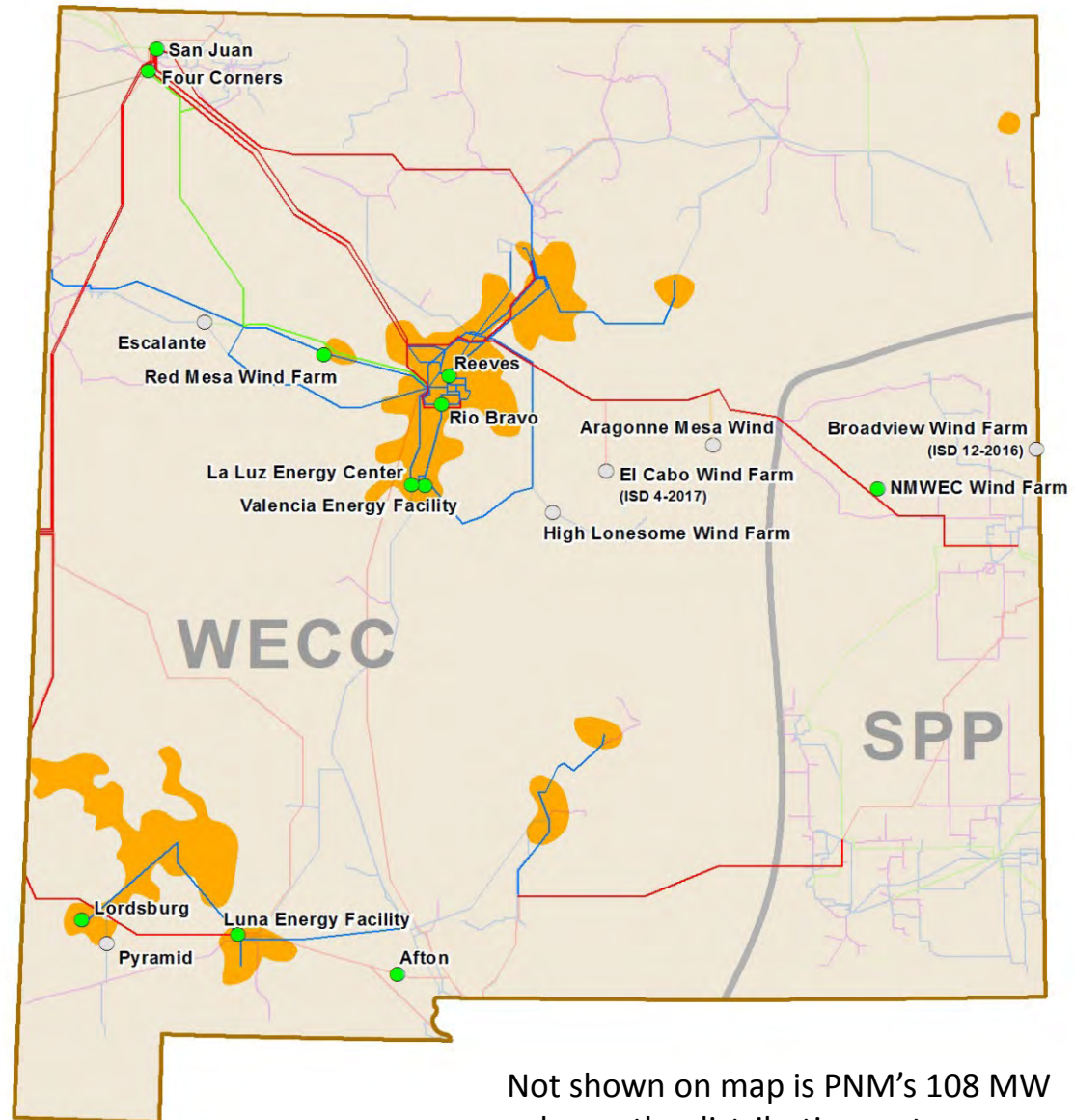
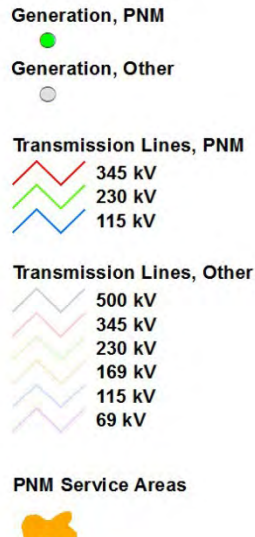
# Components of the Grid



Source: [www.nerc.com](http://www.nerc.com)

- PNM Transmission Voltage Levels are 115kV, 230kV, 345kV and 500kV (Transmission is 16% of PNM's net plant)

# System Map Overview



Not shown on map is PNM's 108 MW solar on the distribution system

- 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

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## A FEW PNM TRANSMISSION SYSTEM FACTS

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- 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
  - 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.

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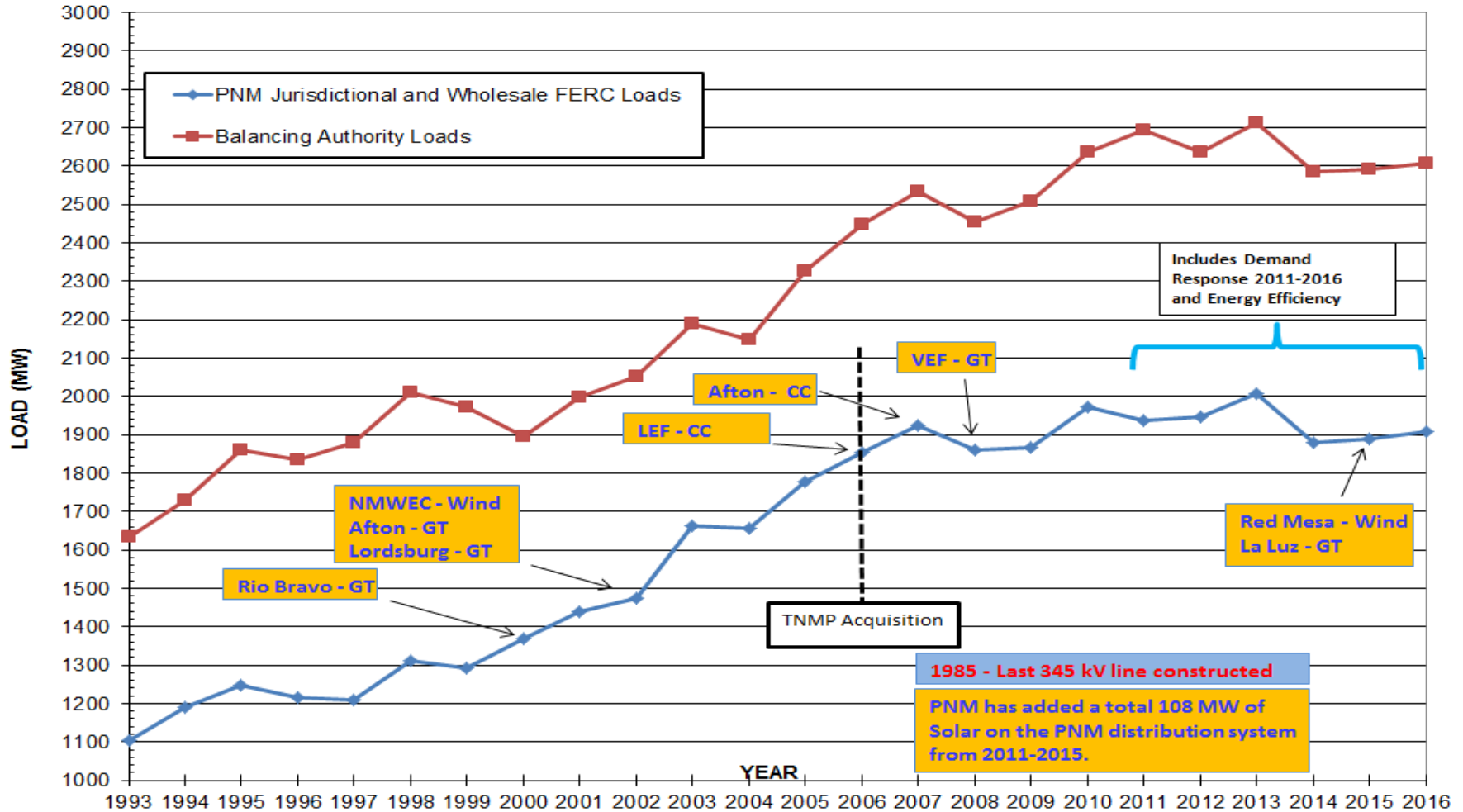
## PNM TRANSMISSION SYSTEM USE

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- Moves PNM's resources to consumers
- Moves PNM transmission customer resources to their delivery points
  - Wholesale services are provided per FERC Open Access Transmission Tariff (OATT)
  - **40% of system use is by others**
  - 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

# HISTORICAL RESOURCE ADDITIONS WITHIN LOAD AREA

## PNM Jurisdictional Load History





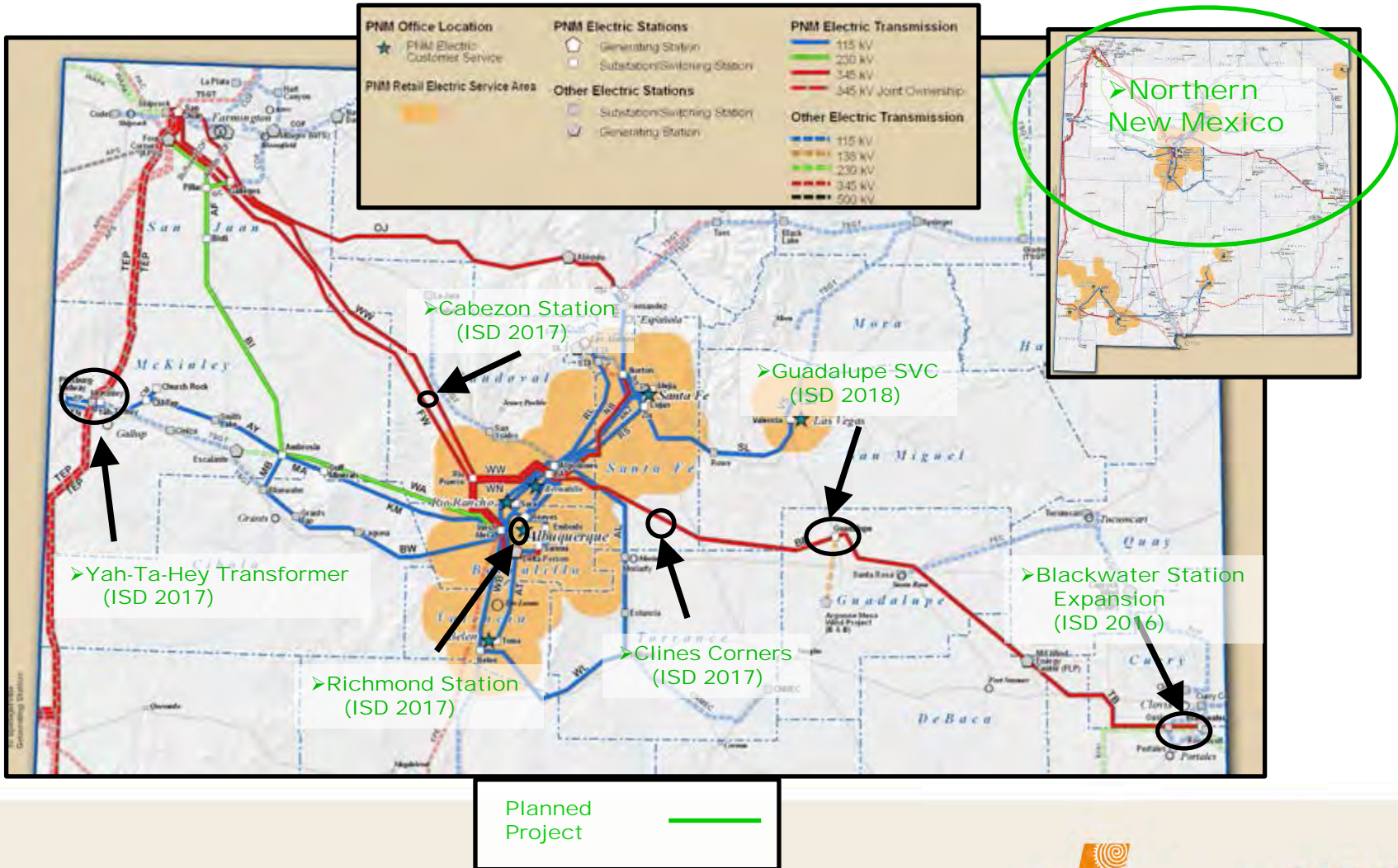
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## DRIVERS FOR TRANSMISSION EXPANSION

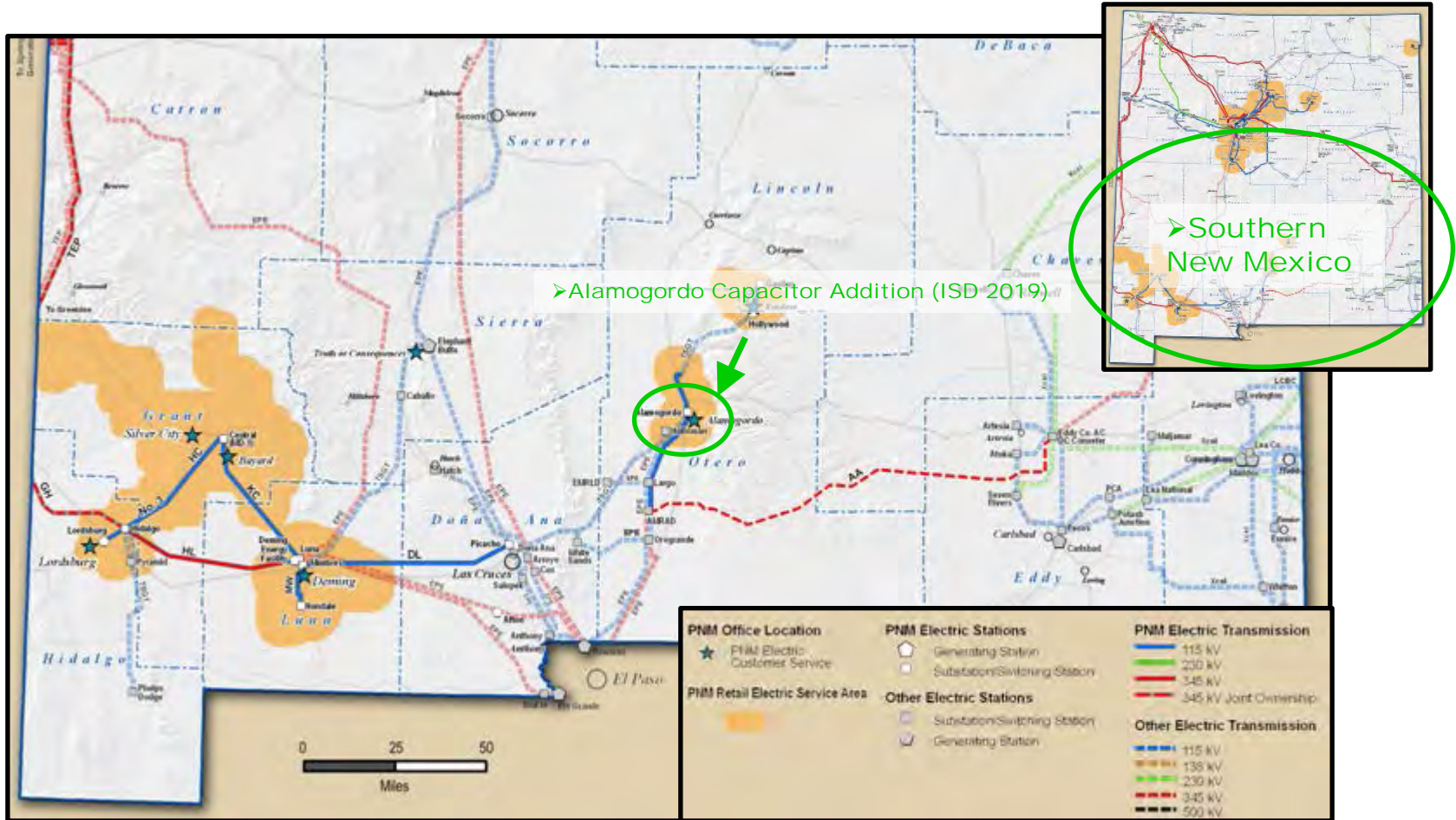
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- Annual adequacy studies are required to comply with NERC/WECC Reliability Standards
  - Jurisdictional and Network Customer Needs
- Generation Interconnection Procedures (OATT Process)
  - La Luz gas turbine, El Cabo wind, etc.
- Transmission Service Requests are studied Individually in Queue Process (OATT Process)
  - Broadview (transmission service from Blackwater to FC), etc.
- Wires-to-Wires Interconnections (OATT Process)
  - Western Interconnection, Verde, Mora Line, Western Spirt, etc.

# PLANNED PROJECTS FOR NORTHERN NEW MEXICO



# PLANNED PROJECTS FOR SOUTHERN NEW MEXICO



Planned Project ———

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## REGIONAL CONSIDERATIONS: MERCHANT/TRANSMISSION DEVELOPMENT AND MARKET INITIATIVES

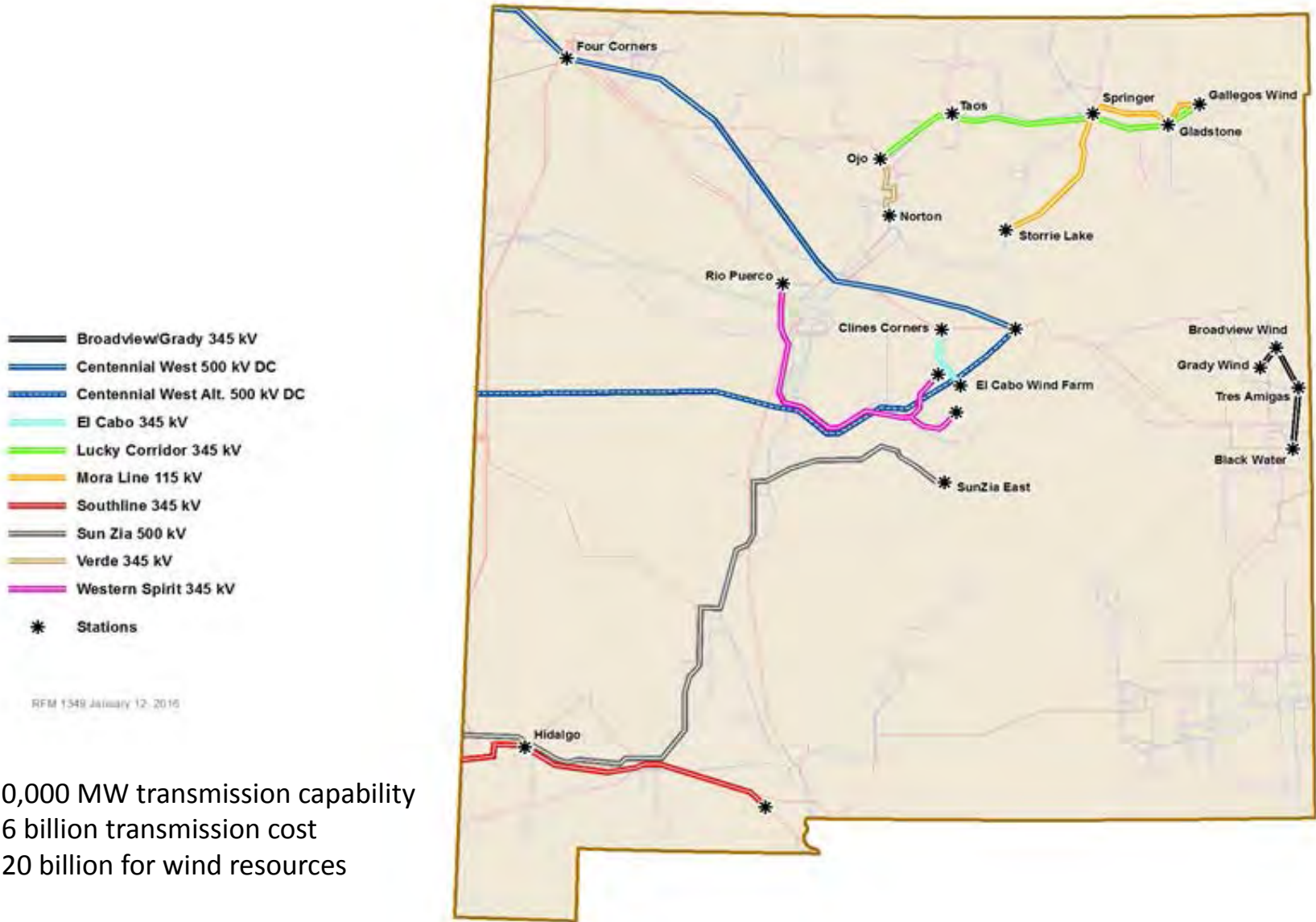
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NM's abundant potential for renewable energy development place us at the crossroads of many proposals with intended purpose of delivering NM renewable energy to markets.

We Are Right In The Middle of Everything!



# MERCHANT TRANSMISSION IN NEW MEXICO



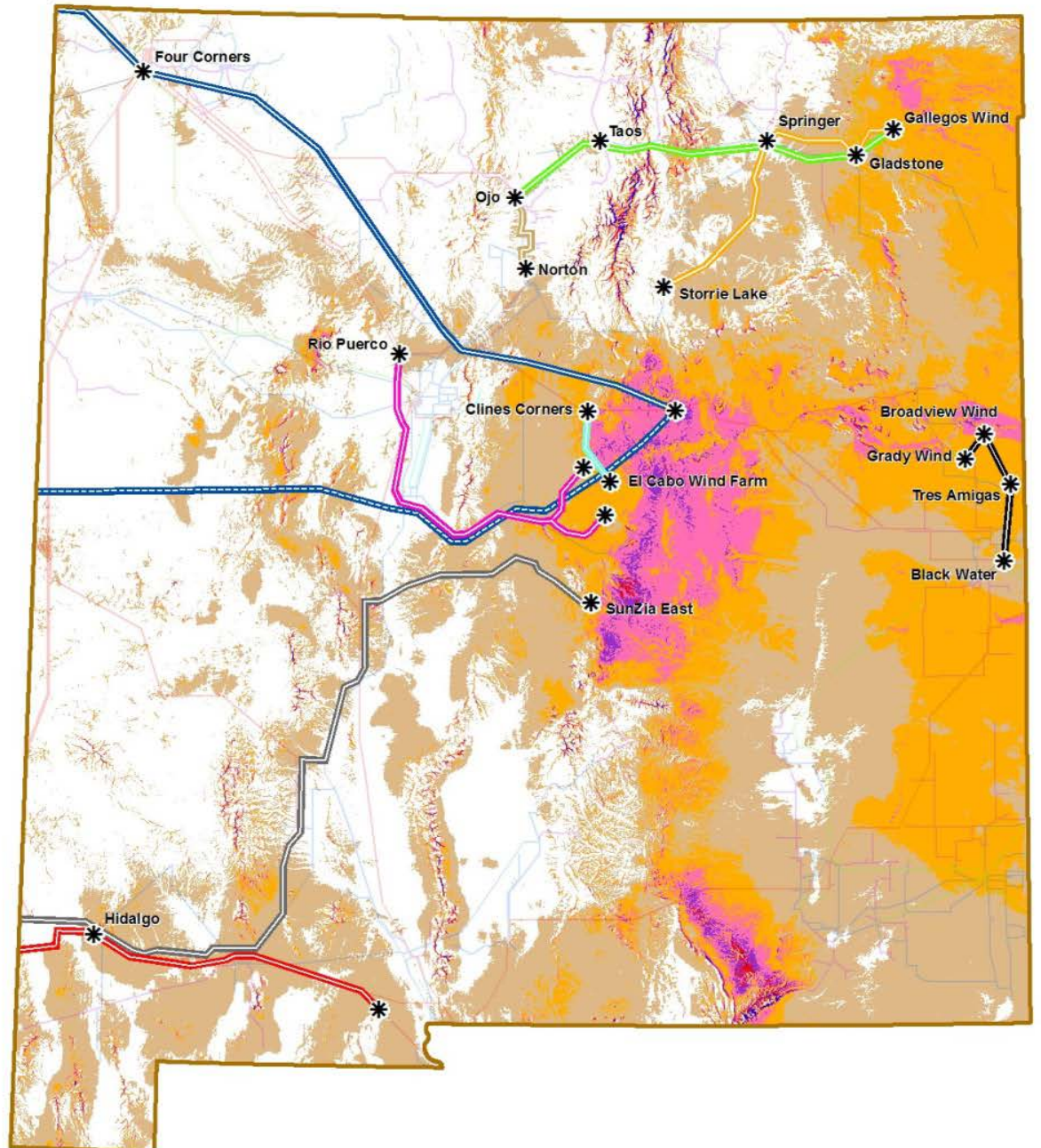
~10,000 MW transmission capability  
~\$6 billion transmission cost  
~\$20 billion for wind resources

# WIND RESOURCES

- \* Stations
- Broadview/Grady 345 kV
- Centennial West 500 kV DC
- Centennial West Alt. 500 kV DC
- El Cabo 345 kV
- Lucky Corridor 345 kV
- Mora Line 115 kV
- Southline 345 kV
- Sun Zia 500 kV
- Verde 345 kV
- Western Spirit 345 kV








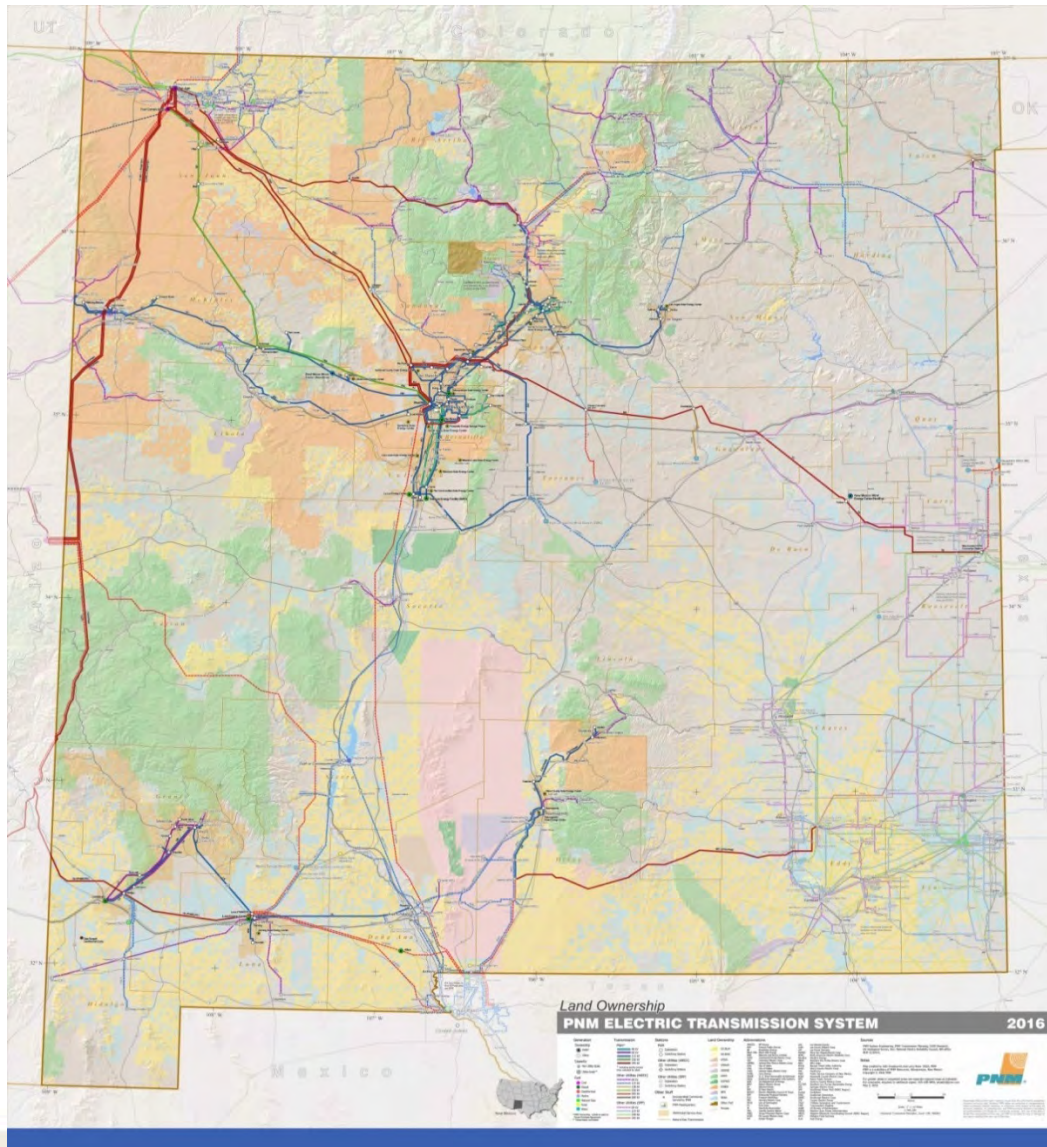
RFM 1516 August 17, 2016



# THE TRANSMISSION SITING CHALLENGE

## NM Land Ownership / Management:

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



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## MERCHANT TRANSMISSION TIMELINE EXPERIENCE

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### 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 2021

### 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 2018-2020

### Verde

- 2014-2015 Preliminary Project Planning
- 2016-2017 Permitting, Public Engagement, ROW, Engineering
- 2018-2019 Construction, In Service Date 2020



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## MARKET INITIATIVES

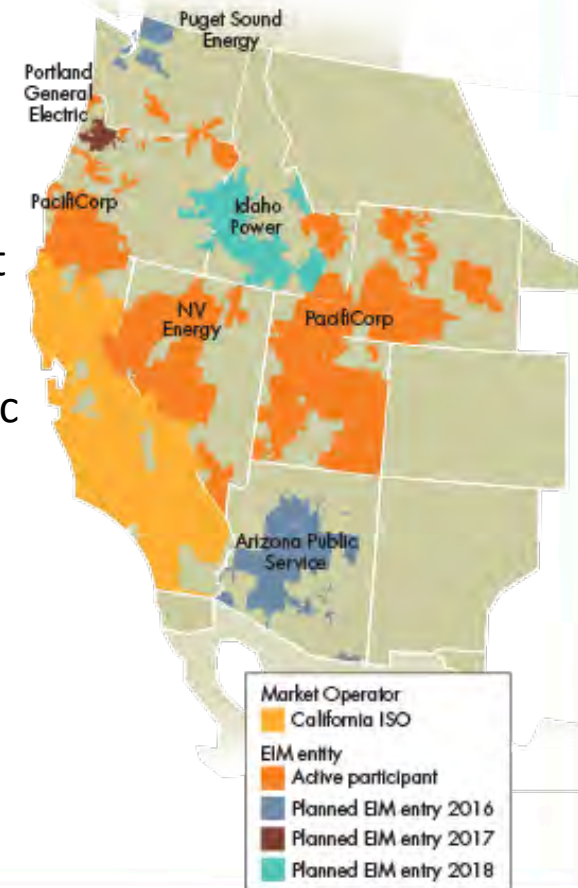
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- California Independent System Operator (CAISO)  
Energy Imbalance Market (EIM)
- Mountain West  
Transmission Group

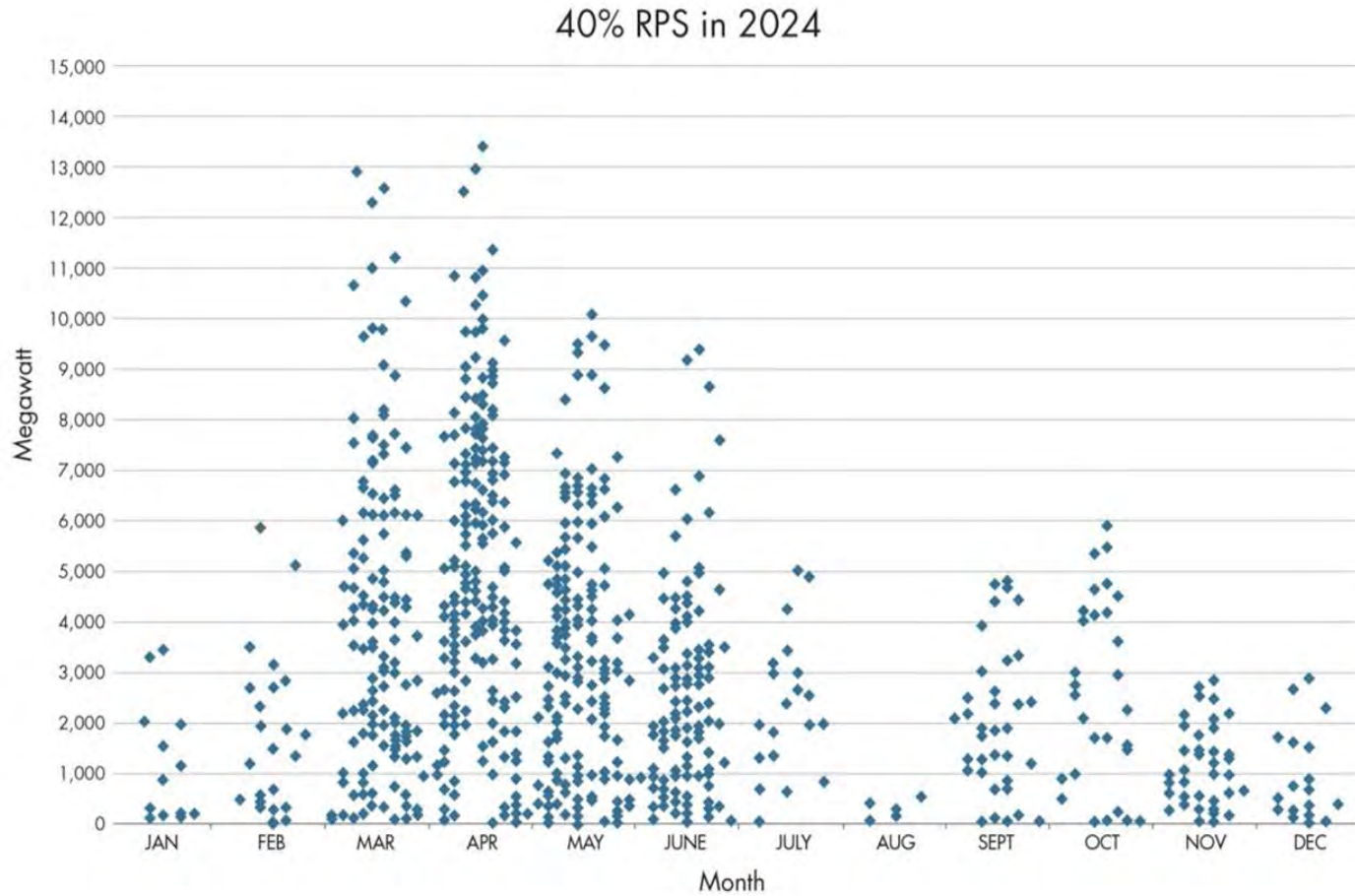


## WHAT IS THE WESTERN ENERGY IMBALANCE MARKET (EIM)?

- The EIM enables Balancing Authority Area to use low cost excess renewable energy that avoids having to curtail renewable energy
- The EIM is an automated sub-hourly market that matches energy supply and demand across the participating footprint in real time (5 minute market)
- The EIM is operated by CAISO to facilitate the most economic dispatch of generation resources to serve imbalances
- An EIM effectively aggregates the variability of generation and load over many BAs reducing the total deployment of regulating reserves
- **In the EIM, utilities are still responsible for generation capacity, flexible reserves, and maintaining reliability**



## RENEWABLE CURTAILMENT POSSIBILITIES IN CALIFORNIA



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## MOUNTAIN WEST TRANSMISSION GROUP

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Foot print covers Colorado and Wyoming and small areas of Arizona, New Mexico, Utah and Montana

### Goal

Create a single multi company transmission tariff and explore market alternatives (organized market).

### Transmission Owners

Public Service of Colorado  
Black Hills  
Platte River Power Authority  
Western Area Power Administration  
Tri-State G&T  
Colorado Springs Utility  
Basin Electric

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## MOUNTAIN WEST BENEFITS

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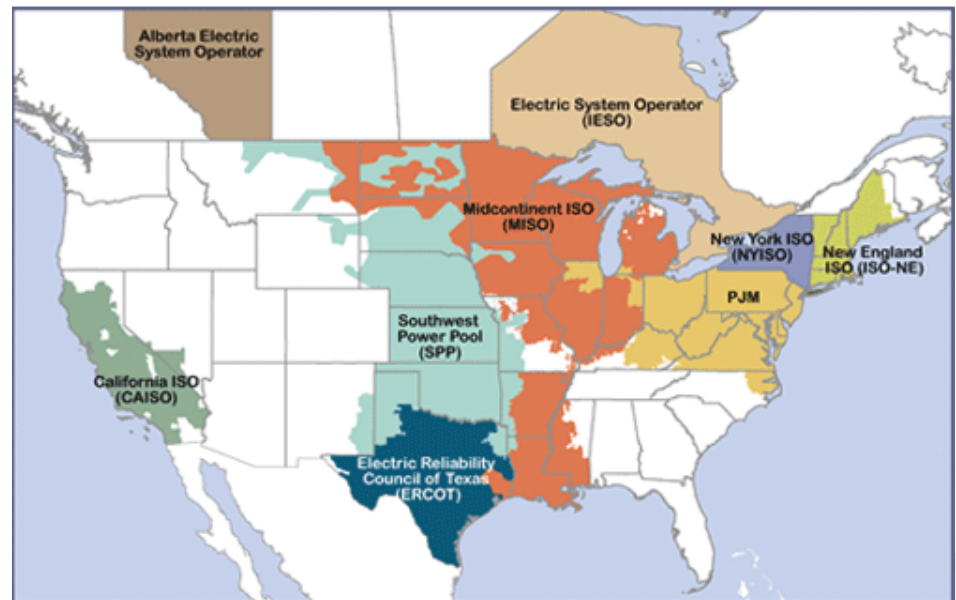
- Merge to one transmission provider
  - "Postage Stamp" concept for transmission service
  - Single point of contact for transmission service
- Single Network Tariff
  - Each party is a network customer of Mountain West
- Additional siting opportunities for new resources
- Provide a foundation for an RTO and/or organized markets
- Cost shifts mitigated through 7 year mitigation agreement

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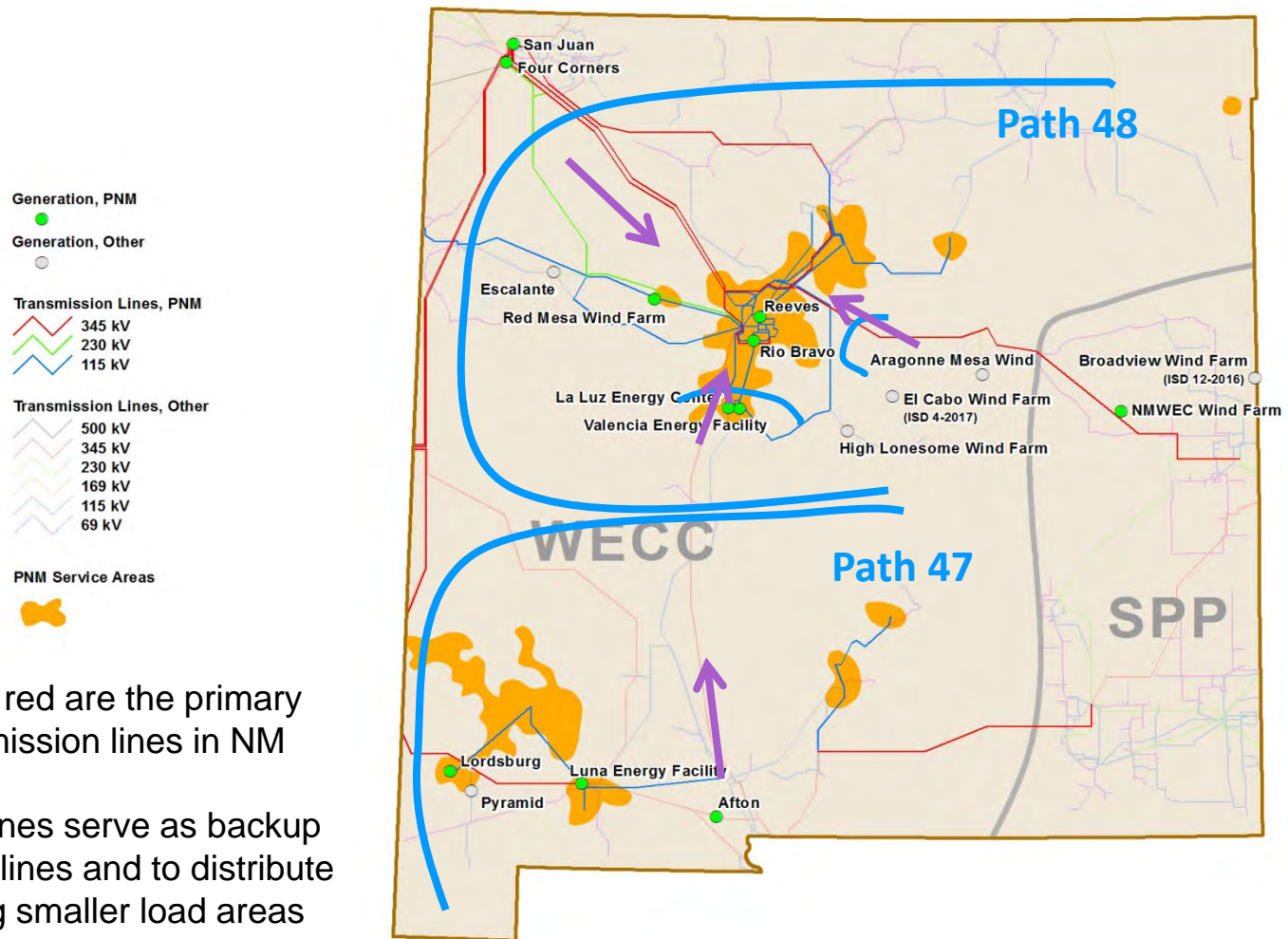
## KEY POINTS OF EIM AND MOUNTAIN WEST AND POTENTIAL IMPACTS FOR PNM<sup>11</sup>

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- Currently, less available market transactions for PNM to trade at Four Corners:
  - ✓ Making it more difficult to cover resources shortages
  - ✓ Providing less opportunity to make economic sales
- PNM would be exposed to higher transmission costs with Mountain West, since PNM's transmission cost are low compared to other transmission providers.
- PNM will evaluate EIM in the future to determine if the benefits outweigh costs
- RTO approaches are viewed as favorable to renewable economics and to minimize transmission costs
- Slow march for all western utilities to RTOs?



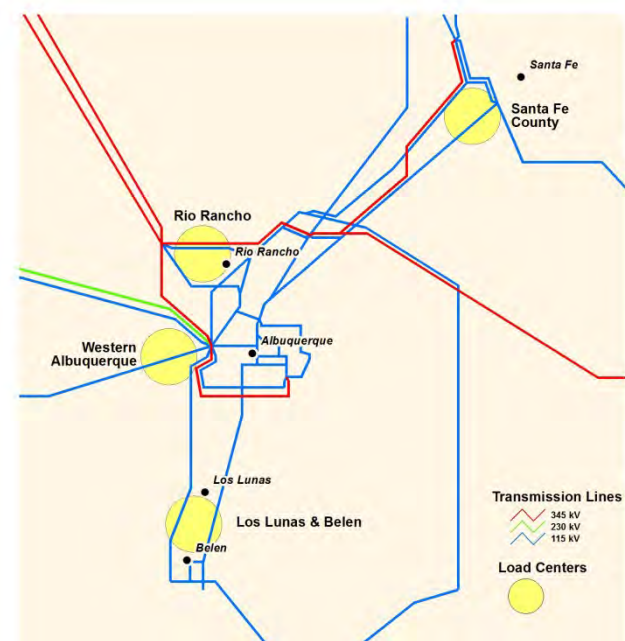
# TRANSMISSION LIMITATIONS: CONSTRAINTS FOR GENERATION DELIVERY



- Lines shown in red are the primary backbone transmission lines in NM
- Lower voltage lines serve as backup to the backbone lines and to distribute power to outlying smaller load areas distant from Albuquerque and El Paso

## TRANSMISSION LIMITATIONS: CONSTRAINTS FOR LARGE PERSPECTIVE LOAD OPPORTUNITIES

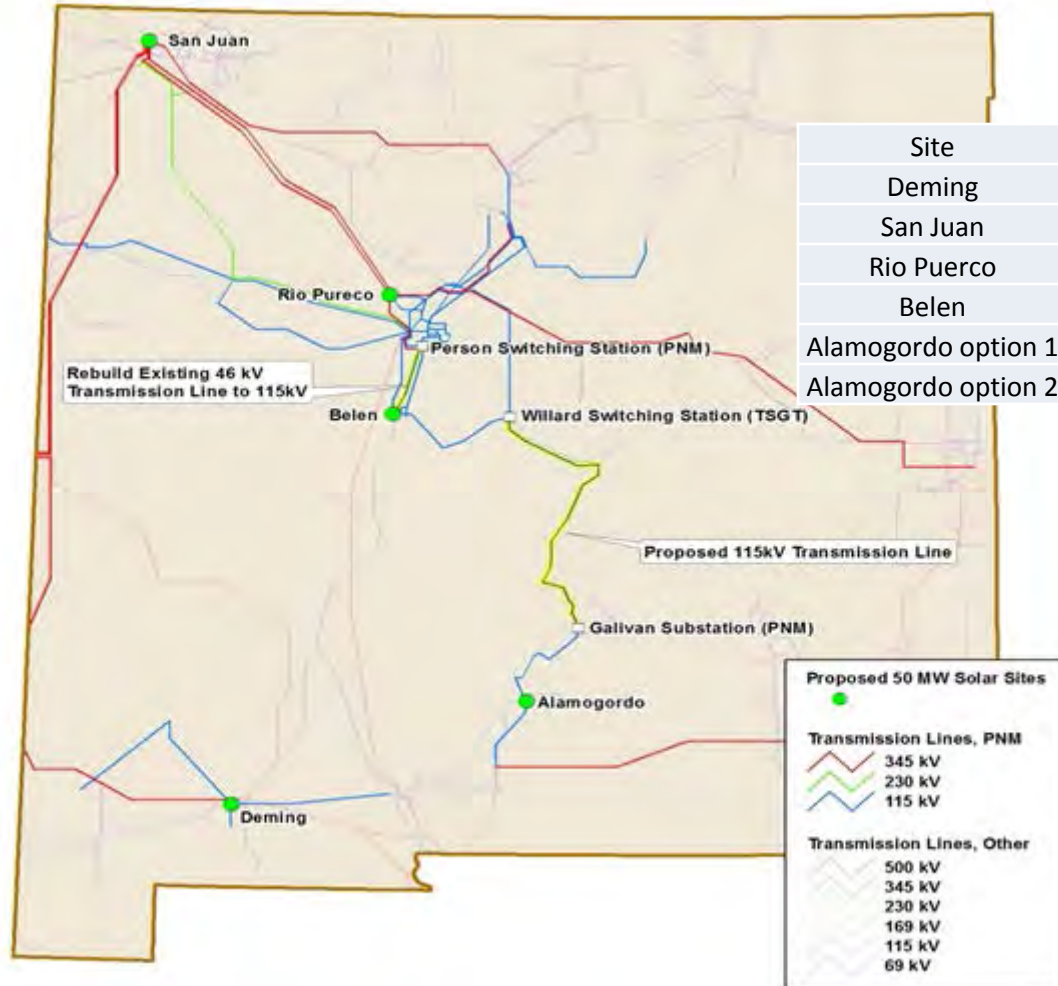
- Requests for large load additions (30 to 500 MW) beyond PNM's normal load forecast
- Limited locations for accommodating and all require transmission additions.
- For example: serving additional load of 150 MW
  - ✓ Los Lunas/Belen Areas (~\$80M – 36 months)
  - ✓ Western Albuquerque (~\$30M – 36 months)
  - ✓ Santa Fe County (~\$55M + Verde Project – 36 months)
  - ✓ Rio Rancho (~\$15M -15 months)



BSM 1516 August 22, 2016



# OPTIONS FOR 50 MW SOLAR RESOURCE ADDITION WHEN CONSIDERING TRANSMISSION LIMITATIONS



Site	Interconnection Cost	Transmission Wheeling
Deming	\$1-3M	\$1.5M/yr.
San Juan	\$1-3M	none
Rio Puerco	\$1-3M	none
Belen	\$21M	none
Alamogordo option 1	\$70 M	none
Alamogordo option 2	\$1-3M	\$1.5M/yr.

(PJM 151) August 24, 2010

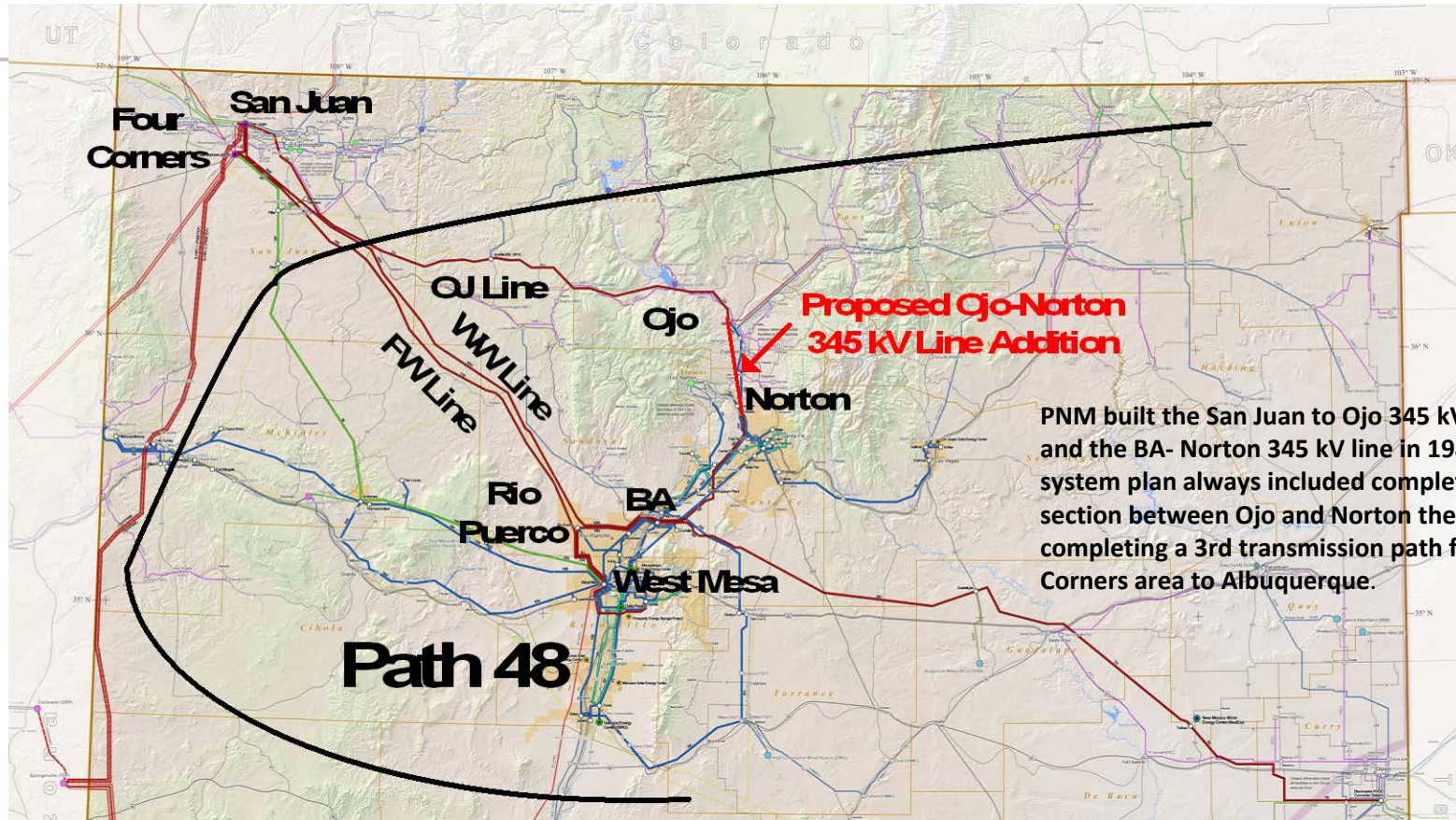


Talk to us.



# CAN MERCHANT PROJECTS PLAY A ROLE?

## VERDE PROJECT EXAMPLE



PNM built the San Juan to Ojo 345 kV line in 1975 and the BA- Norton 345 kV line in 1984. The system plan always included completion of the section between Ojo and Norton thereby completing a 3rd transmission path from the Four Corners area to Albuquerque.

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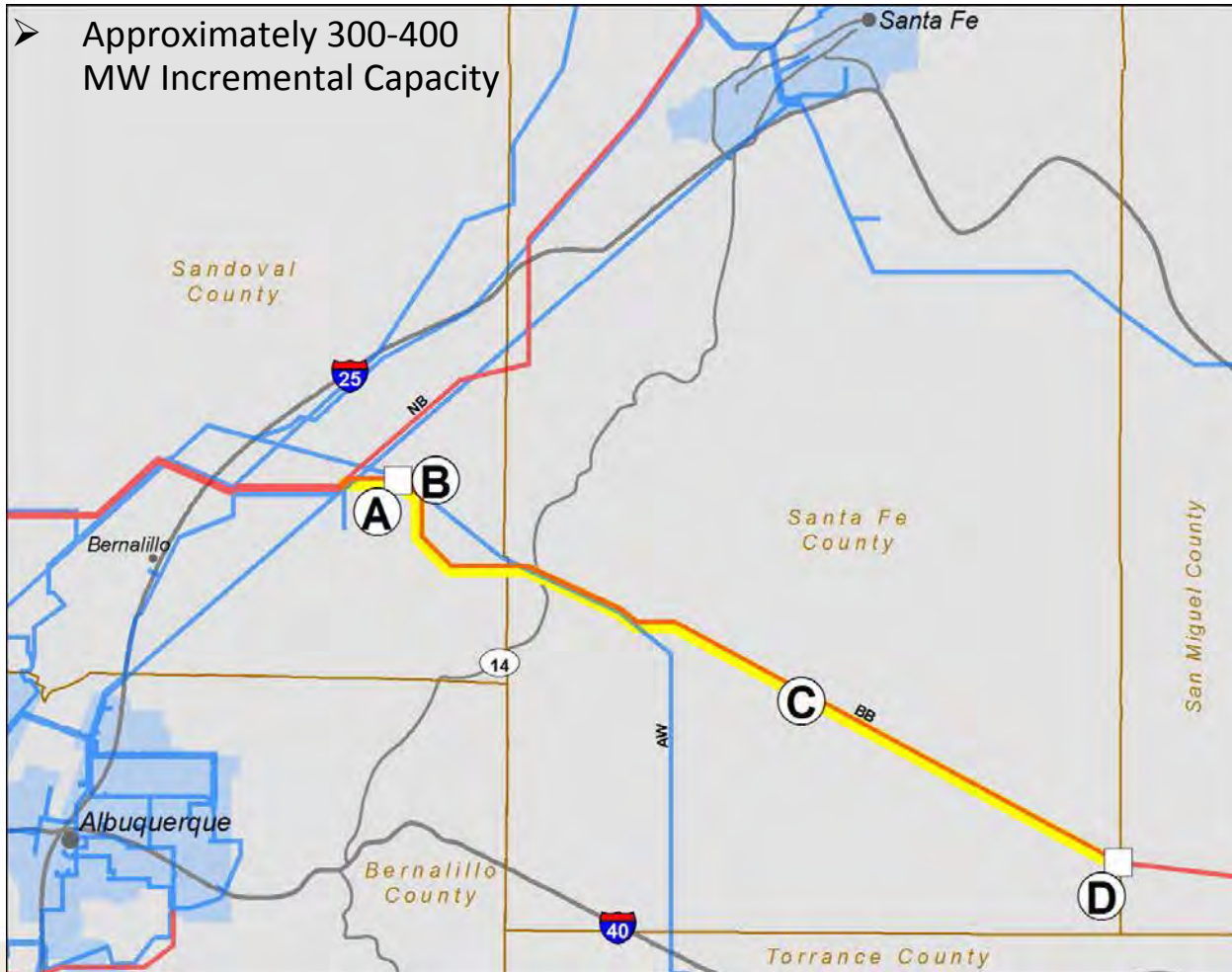
## VERDE PROJECT – IMPROVES ABILITY TO ACCOMMODATE RESOURCES AND LOAD

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- Would support a large customer load in northern New Mexico
- Provides access to renewables delivered at Four Corners to loads in northern New Mexico
- Reduce reliance for existing load shedding safety net schemes
- Allows planned bulk transmission outages with greatly reduced risk of load shedding on next contingency.
  - ✓ Existing bulk transmission lines will require more maintenance outages due to age of equipment
  - ✓ Majority of backbone transmission lines built in late 1960s through the mid-1970s.

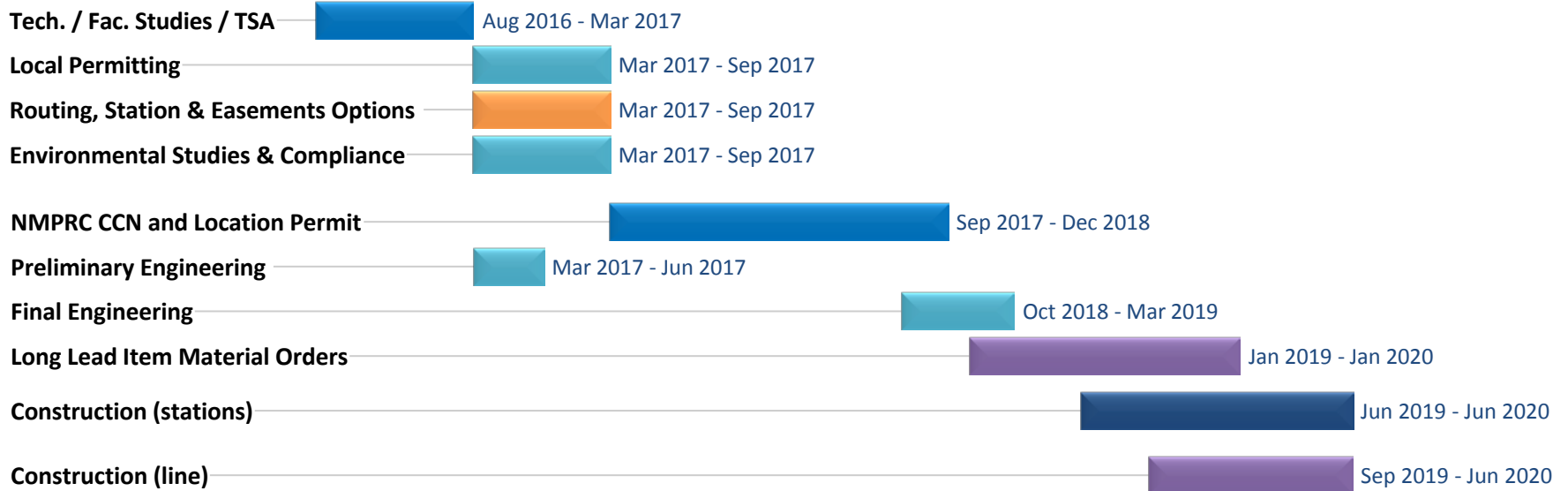
## DOES EXPANSION OF PNM TRANSMISSION PLAY A ROLE?

### SECOND BB 345 KV EXAMPLE – IMPROVES ACCESS TO WIND RESOURCES



- A** New double circuit 345kV to loop NB 345kV into BA2 (2 miles)
- B** New BA2 Switching Station
- C** New 345 kV parallel to existing BB 345 kV (42 miles)
- D** Clines Corners Switching Station

# Clines Corners to BA2 345kV Conceptual Schedule



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## KEY POINTS ON TRANSMISSION EXPANSION

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- Addressing transmission limitations can substantially increase time and cost to add resources or to serve large new loads
  - Initial development activities shorten time to develop new transmission
- 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.
  - PNM potentially has a requirement to build transmission to accommodate transmission service.
- There is continuing pressure towards integrating transmission into more regional uses versus dedicated vertical utility uses.
  - Reduces local control of transmission uses and will move expansion to a broader stakeholder audience involved in the approval of new transmission.

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TRANSMISSION TOPICS FOR INTEGRATED RESOURCE PLANNING

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**Pat O'Connell**

**Director, Planning and Resources**



Talk to us.



# TRANSMISSION DISCUSSION

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## RELATIONSHIP TO 2017 IRP

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- Use knowledge of existing transmission system and transmission system plan to build models and evaluate portfolios – example is the new natural gas combined cycle options discussed on August 11
- Evaluate Renewable Portfolio Standard compliance strategies that include transmission system investments to provide more access to wind resources
- Evaluate the benefits of participating in merchant transmission projects like Project Verde
- Will provide specific transmission impact scenarios and sensitivities at the November 10<sup>th</sup> Public Advisory Meeting



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**MAKE SURE WE HAVE UP TO DATE CONTACT INFORMATION FOR YOU**

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[www.pnm.com/irp](http://www.pnm.com/irp) for documents

[irp@pnm.com](mailto:irp@pnm.com) for e-mails

Register your email on sign-in sheets for alerts of upcoming meetings and notices that we have posted new information to the website.

**Meetings Schedule:**

Thursday, Sept. 1, 2016, 10 am – 3 pm

Thursday, Sept. 22, 2016, 10 am – 3 pm

Thursday, Oct. 13, 2016, 10 am – 3 pm

# Thank you

