

# *Generation and Transmission System Overview*

**RADIOACTIVE AND  
HAZARDOUS  
MATERIALS  
COMMITTEE**

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*The power to make life better. Together.*

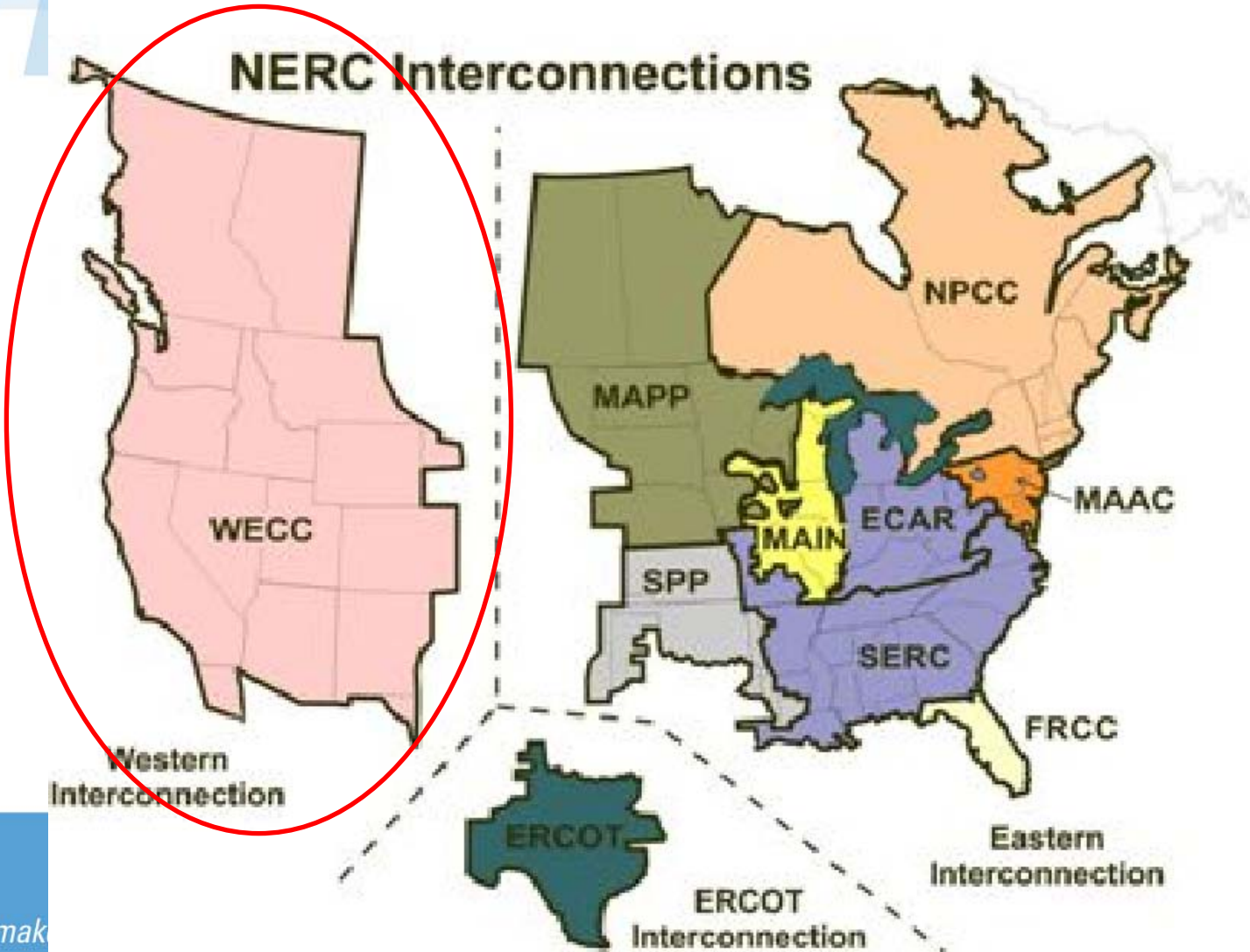


# Agenda

- Transmission Grids
- System Map Overview
- A Few Facts...
- PNM Transmission System Uses
- System Representation
- Load Characteristics and Load Growth
- Existing Queues
- Transmission Development Issues
- Renewable Resources and Wind Energy Potential in NM

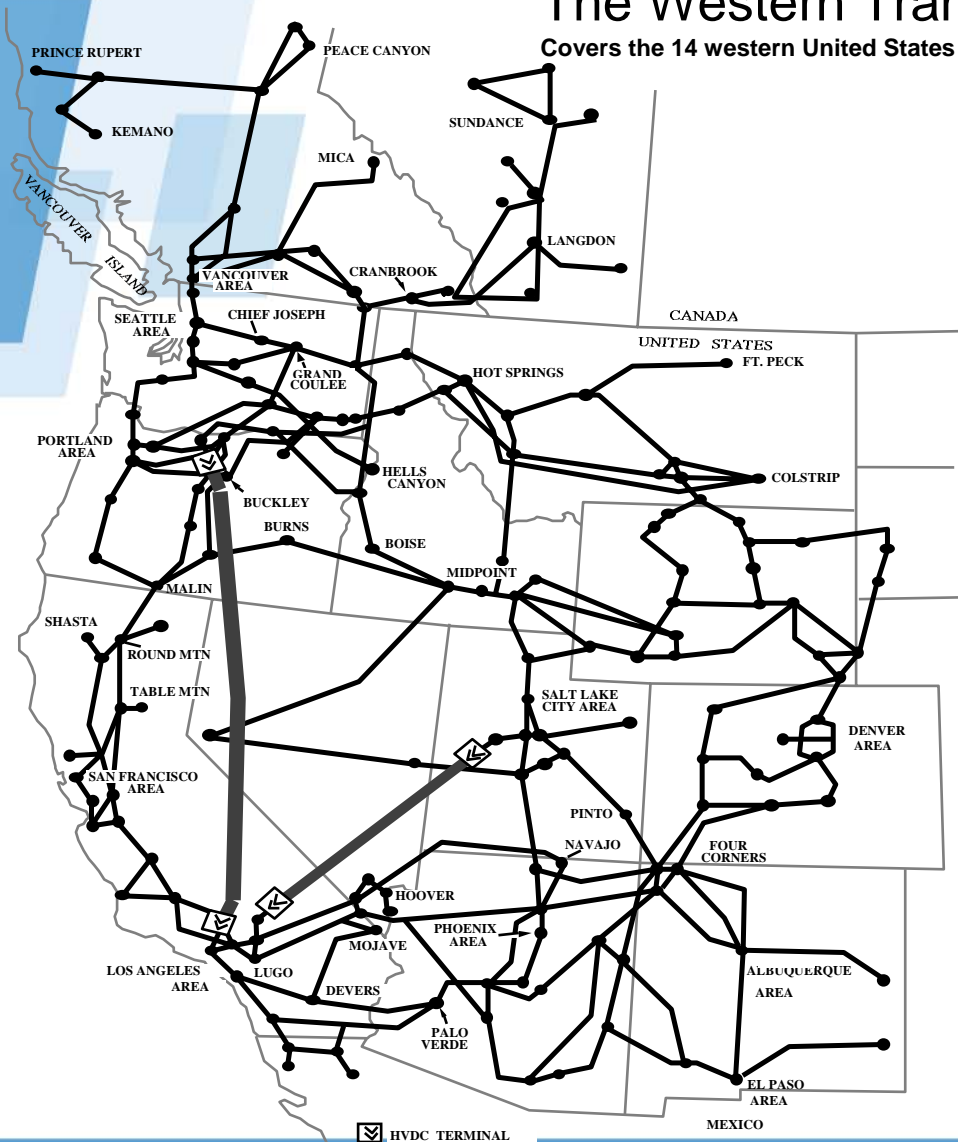


# Three Transmission/Grids Exist In The US



# The Western Transmission Grid

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

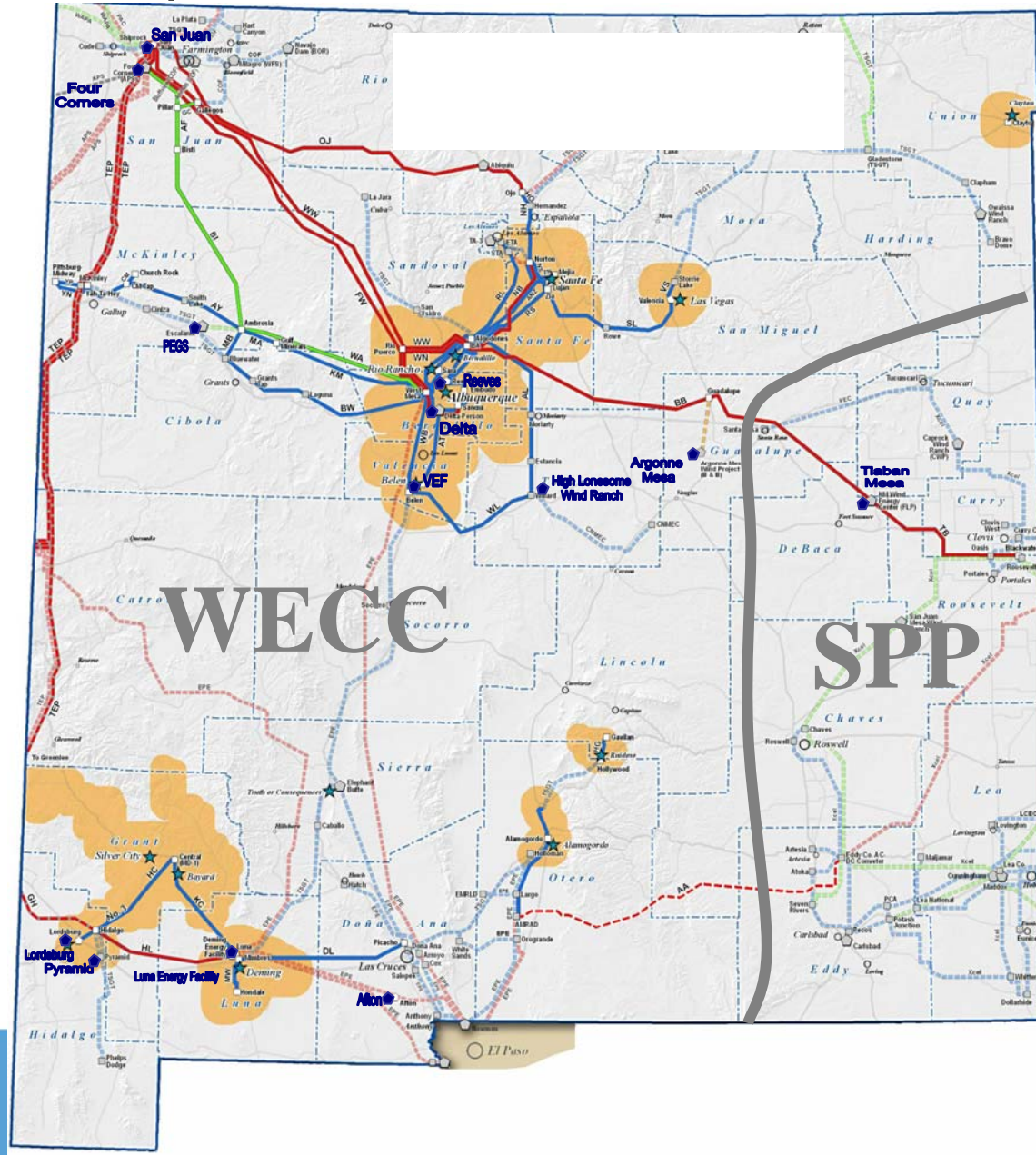
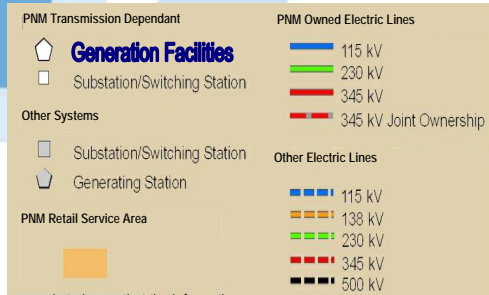


- 7 HVDC ( asynchronous interconnections) between Eastern and Western Grids- 1470 MW

- 2 HVDC interconnections between Eastern grid and ERCOT-820 MW

- No interconnections between Western grid and ERCOT

# System Map Overview



- Lines shown in red are the primary backbone transmission lines in NM
- The main function of transmission is to deliver power from generating resources to load centers
- 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



## A Few System Facts.....

### Line mileage (incl. jointly owned lines)

- 165 miles of 500 kV (Outlet lines from Palo Verde)
- 1556 miles of 345 kV
- 180 miles of 230 kV
- 1000 miles of 115 kV

“Backbone” transmission lines (345 kV and 230 kV) are 150 to 200 miles in length.

Majority of transmission lines built in late 1960s through the mid 1970s.

PNM has not built any backbone transmission since 1984

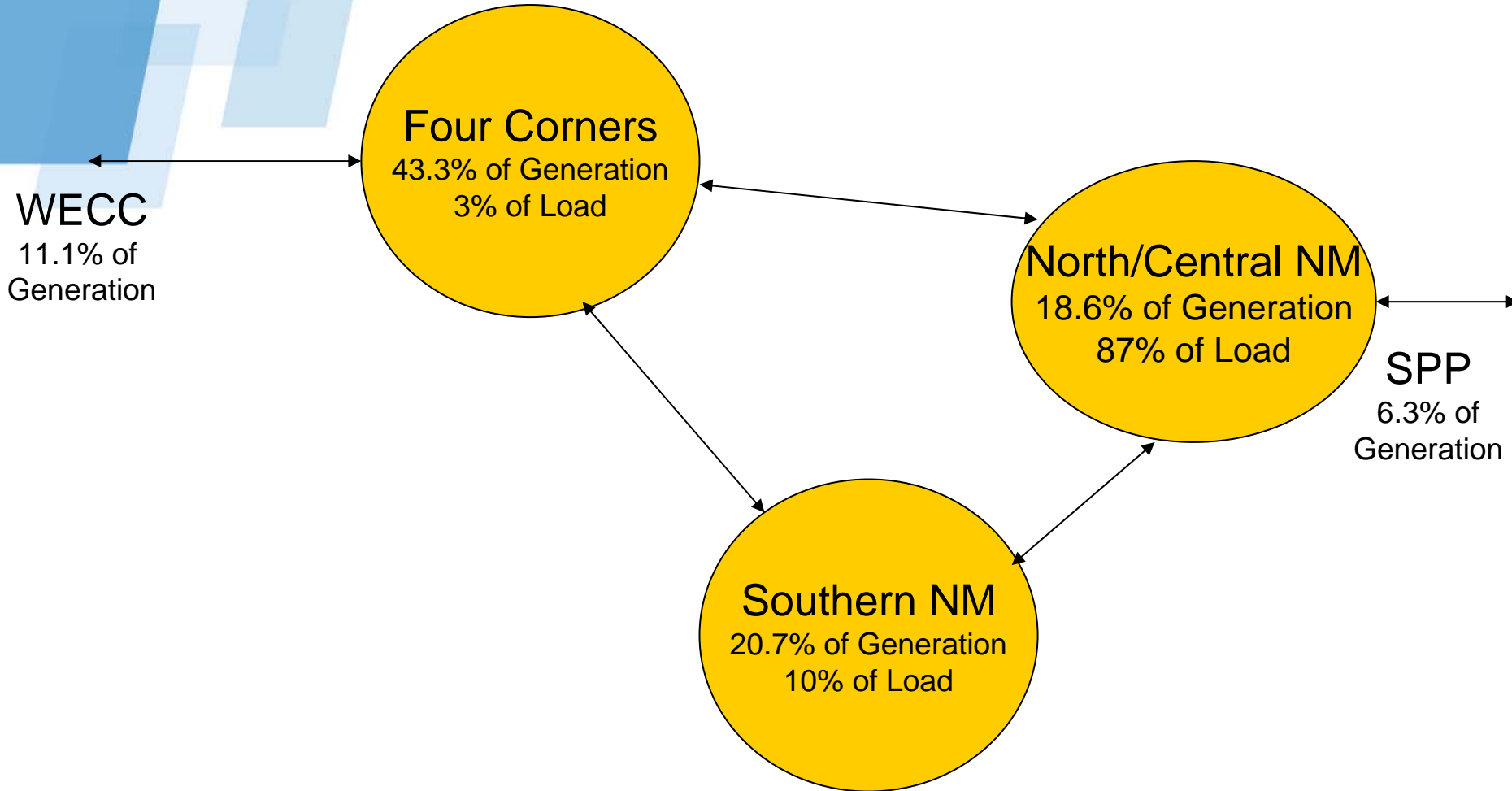


# PNM Transmission System Uses

## PNM Balancing Authority Load

- Retail-PNM customers represent about 60% to 65% of system use
- Wholesale-Transmission customers (network customers and P-to-P) represent 35% to 40% of system use

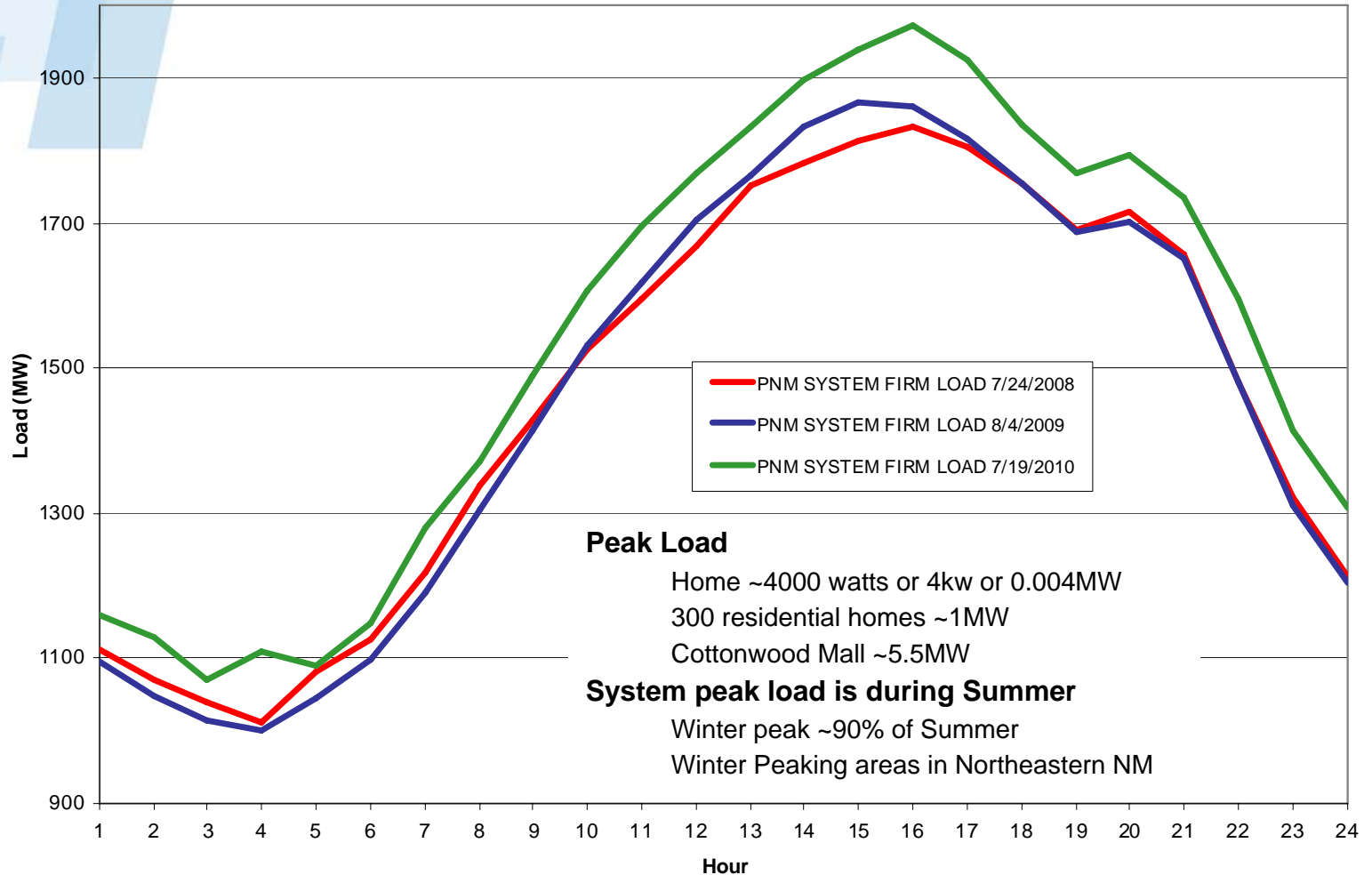
# System Representation Peak Load





# Load Characteristics and Load Growth

## PNM System Load



# Existing Queues

## Interconnection Requests

- 41 -- 14,143 MW (12,870 MW wind & 1,273 MW solar)
- 4 -- 1075 MW Pending LGIA
- 8 -- 635 MW Signed LGIA not operational (gas, wind, solar)
- 4 -- 492 MW Operational (December 2010)

## Joint Studies (EPE/TSGT)

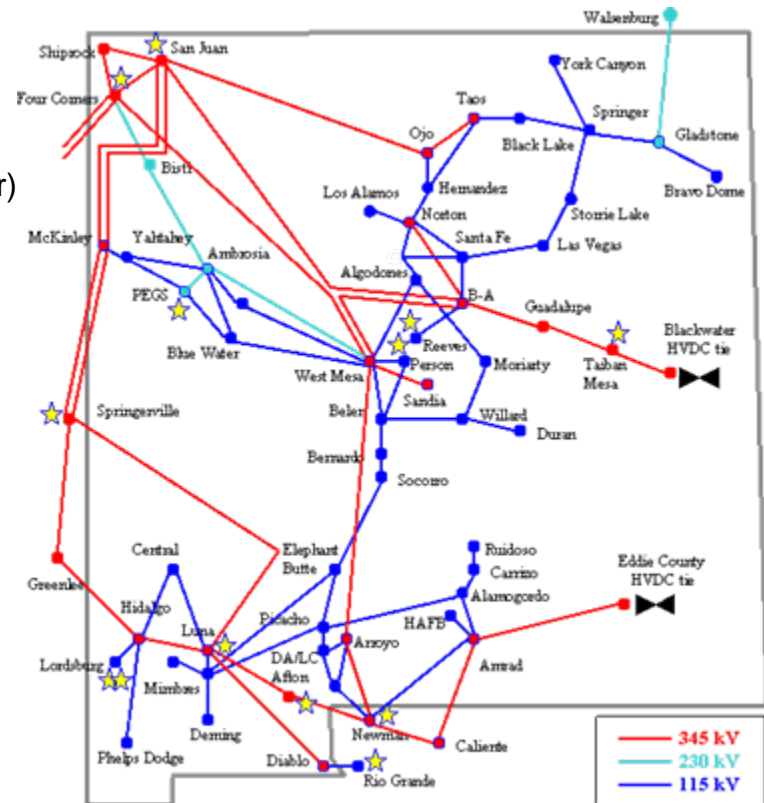
8,416 MW

## Transmission Delivery Service Requests

- 65 -- 8410 MW
- 4 -- 297 MW Signed TSA not operational

## Peak Load

- 1,973 MW (PNM)**
- ~2,600 MW (PNM Balancing Authority)**
- ~5,000 MW Total New Mexico**



# Transmission Development Issues

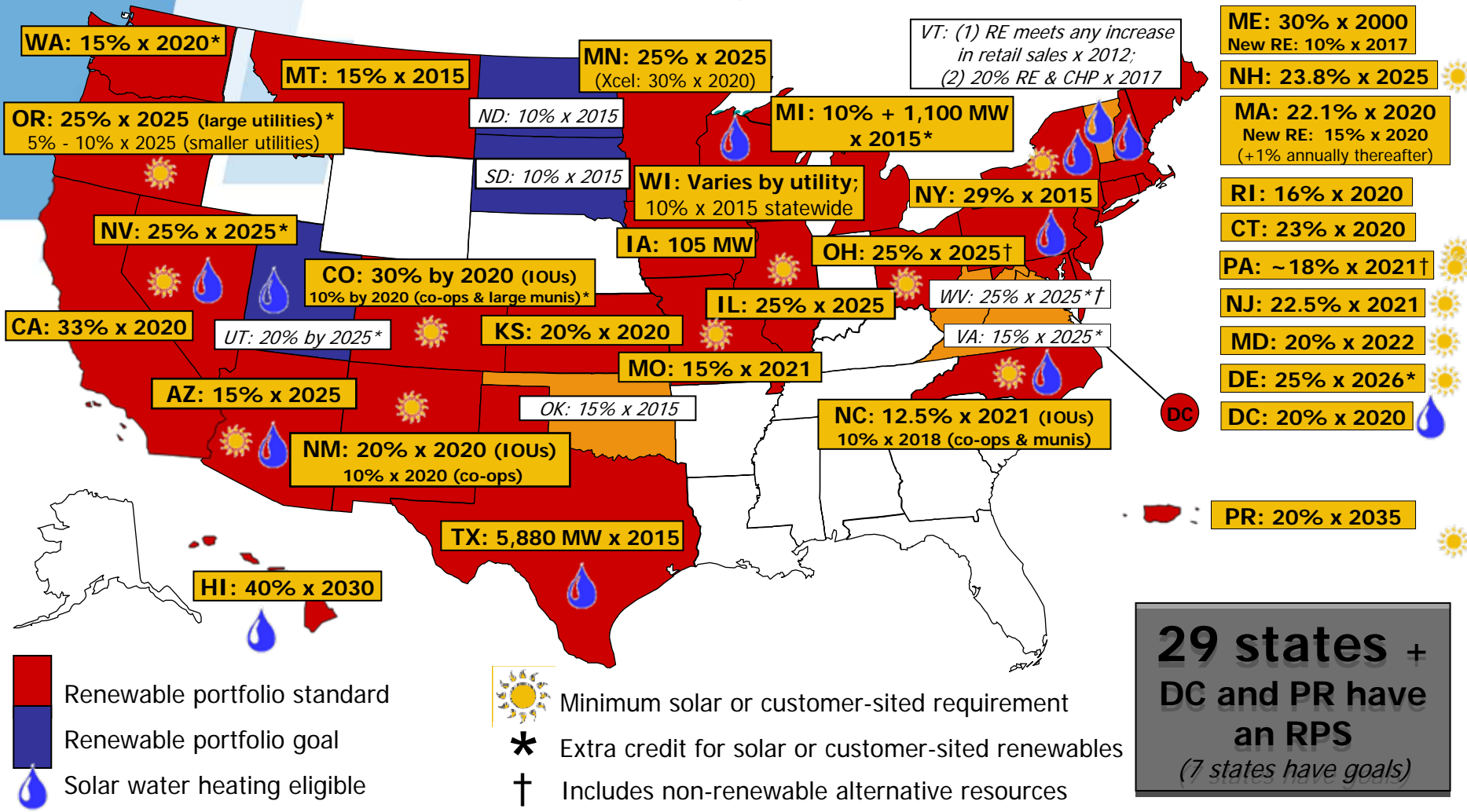
- **Few PPAs are being inked, projects are very slow to move forward with signed agreements**
- **Transmission lacking in renewable rich zones**
- **Congestion/ lack of transmission between NM-AZ and AZ-CA**
- **Transmission is a regional issue-All stakeholders in the region need to cooperate in solution**
- **Transmission very expensive-can't be justified for single use**
- **Transmission siting is lengthy and difficult-large costs at risk on front end**
- **Determining who pays and how costs are recovered for long distance lines is very difficult**
- **Collaboration needs to begin at the federal/state level to address conflicting goals of governments. Federal and state policies are not aiming at the same targets.**



# Renewable Resources and Wind Energy Potential in NM

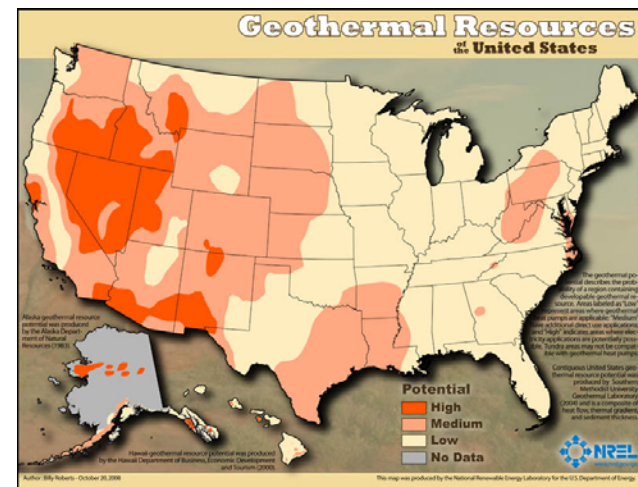
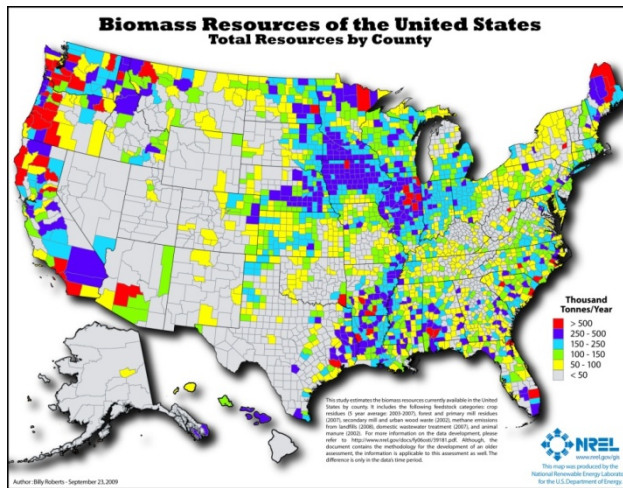
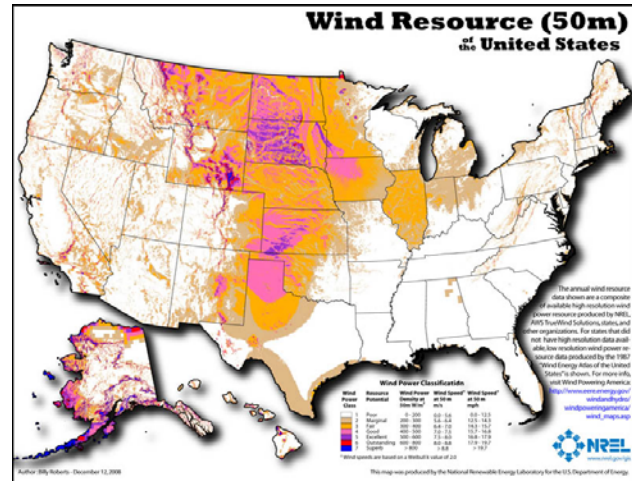
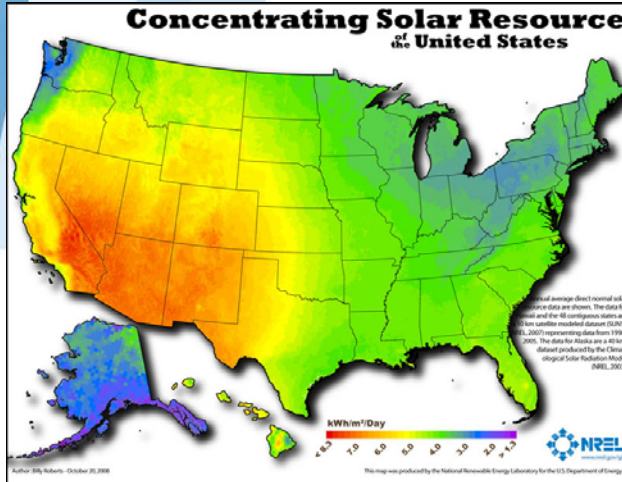
# Renewable Portfolio Standards

[www.dsireusa.org](http://www.dsireusa.org) / November 2010



**29 states + DC and PR have an RPS**  
(7 states have goals)

# Regional Diversity of Renewable Resource Opportunities





# Typical Cost to Install Wind and Solar (PV) 100 MW plant

**Wind ~\$235 Million**

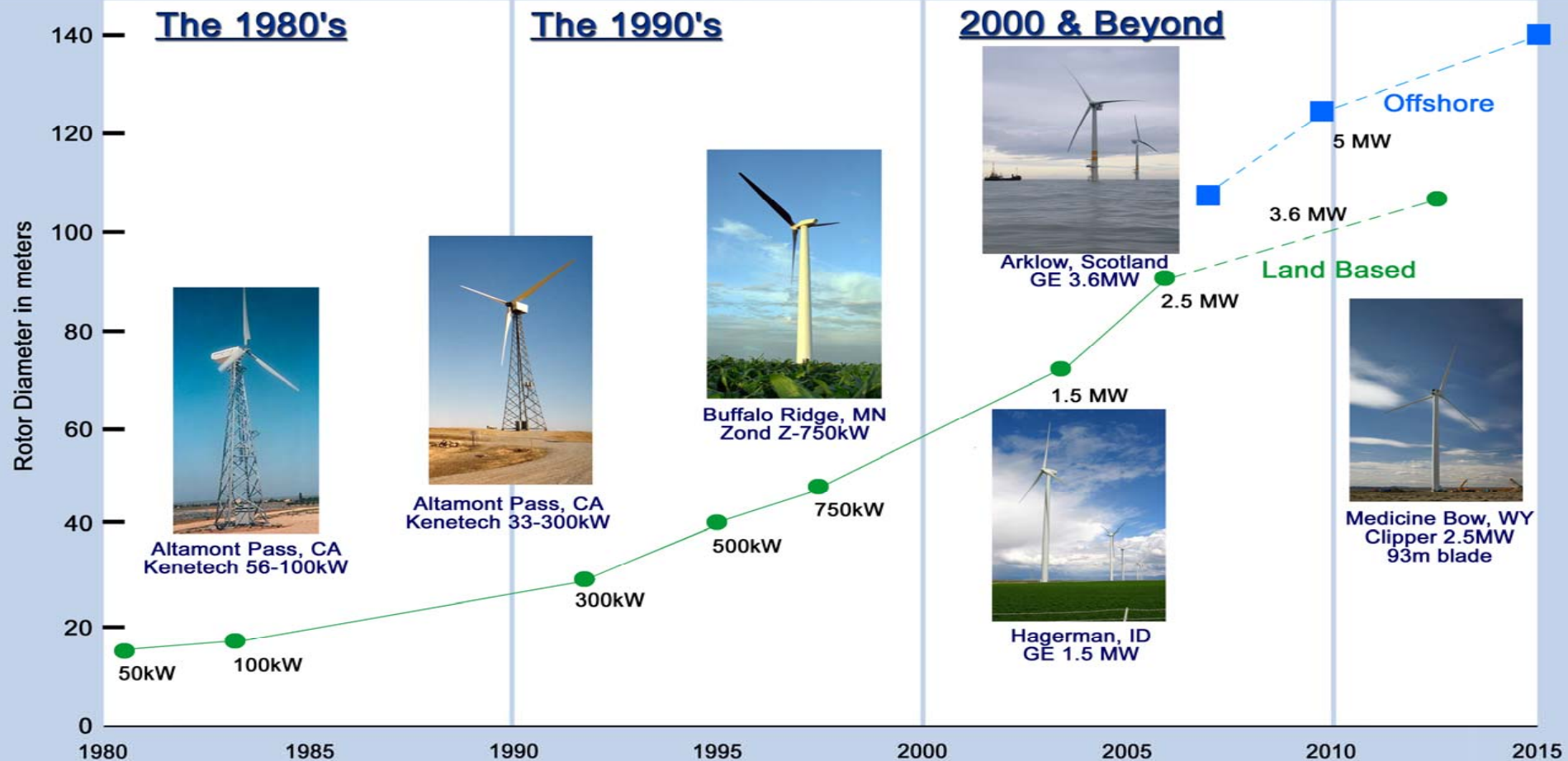
Land owner ~\$3k to \$5k per turbine/year

**Solar (PV) ~\$450 Million**

**Solar-Thermal (storage) ~\$610 Million**

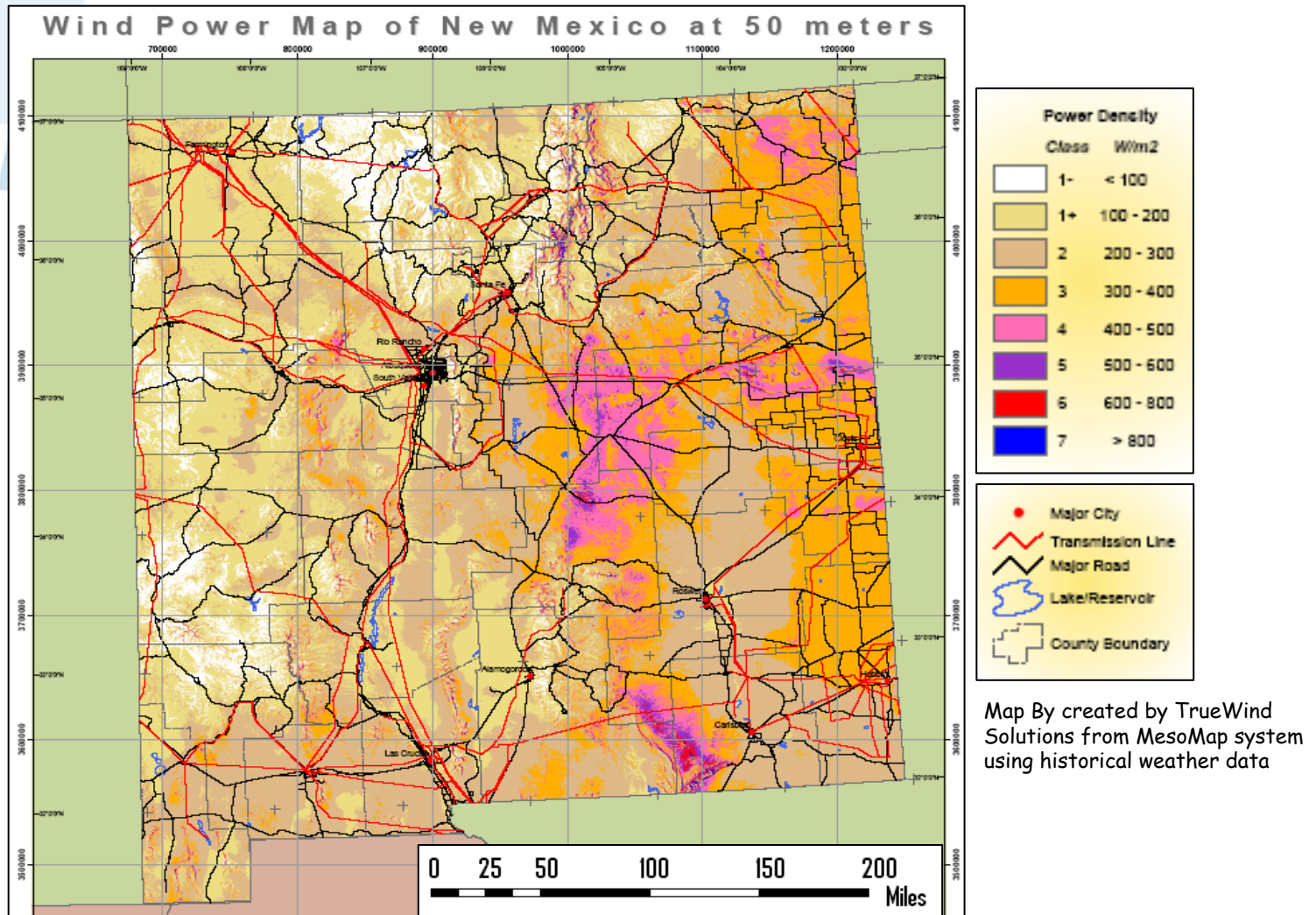
# Larger, Water-bound

## Evolution of U.S. Commercial Wind Technology





# Wind Energy Potential in NM



## Existing Wind Generation in New Mexico

**Installed: 698 MW**

2 MW “Llano Estacado” near Clovis - Cielo Wind, SPS (1999, expanded in 2003)

204MW “NMWEC” near Fort Summer – NextEra, PNM (2003)

80MW “Caprock” near Tucumcari, Cielo Wind, PNM (2005)

120MW “San Juan Mesa Wind Project” near Elida, Padoma Wind Power, SPS (2005)

90 MW “Aragonne Mesa” Superior Wind, west of Santa Rosa, APS (2005)

100 MW “High Lonesome Mesa” Edison Mission, near Willard, APS (2009)

102 MW “Red Mesa” – NextEra, short-term TEP (2010)

## New Mexico Wind Energy Center

- **Located in Eastern New Mexico**
- **204 MW capacity**
- **Installed in 2003, in record time!**
- **Owned and operated by FPL Energy (NextEra)**
- **PNM purchases all the output**



## 210 feet Tower Erection - 1 of 3 Tower Sections



Quick Fact: The bottom tower section has a base 16-foot diameter and weighs 39 tons.

## Tower Erection - 2nd Tower Section



## Placing Generator - 60 Tons



## Placing the Generator



## 235 feet Diameter Blade Assembly





## Flying The Rotor



Quick Fact:

The rotor and 3 blades weigh 43 tons.

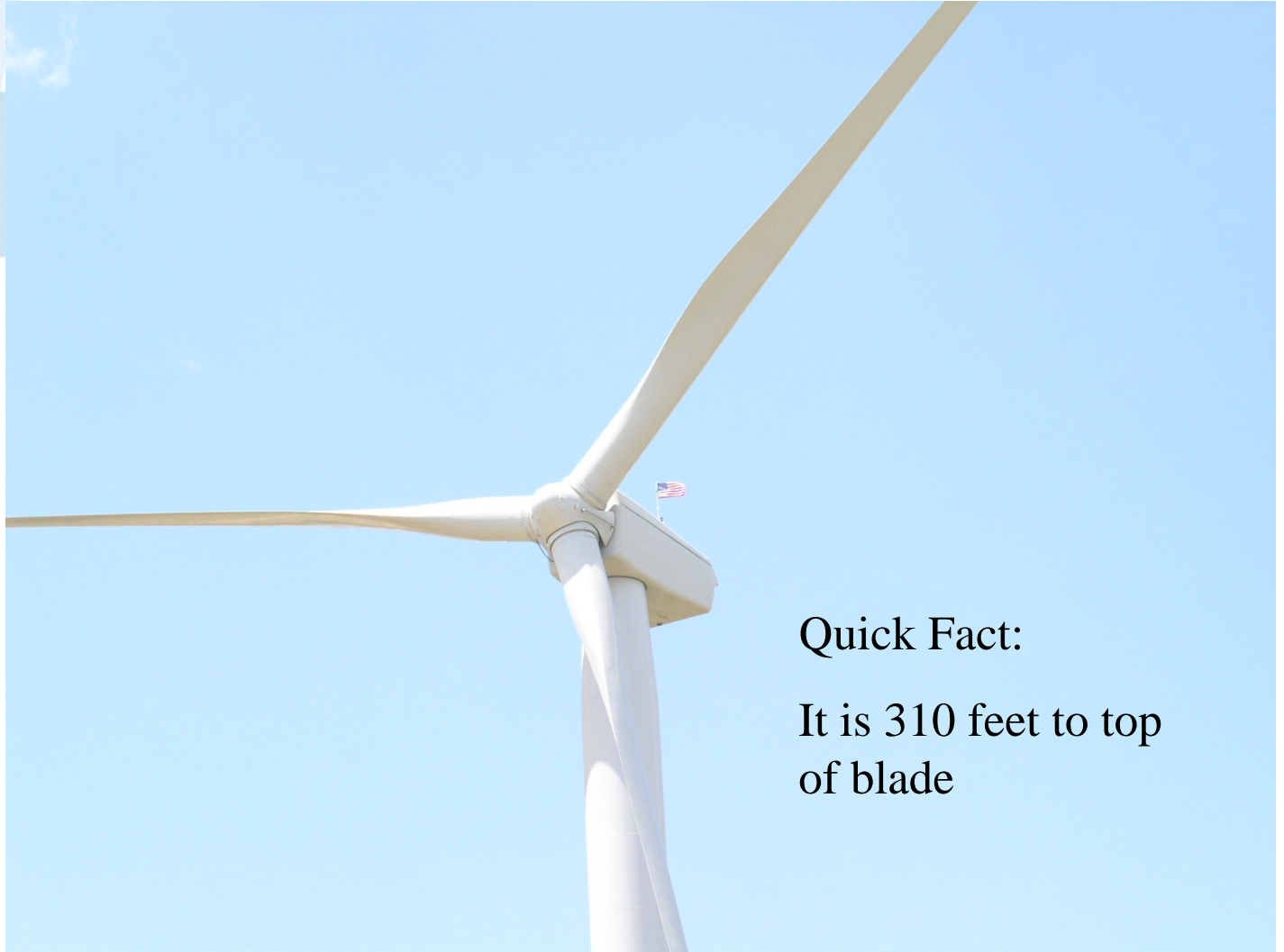
Quick Fact:

The 275-ton crane's boom is 300 ft long.

# Installing the Rotor



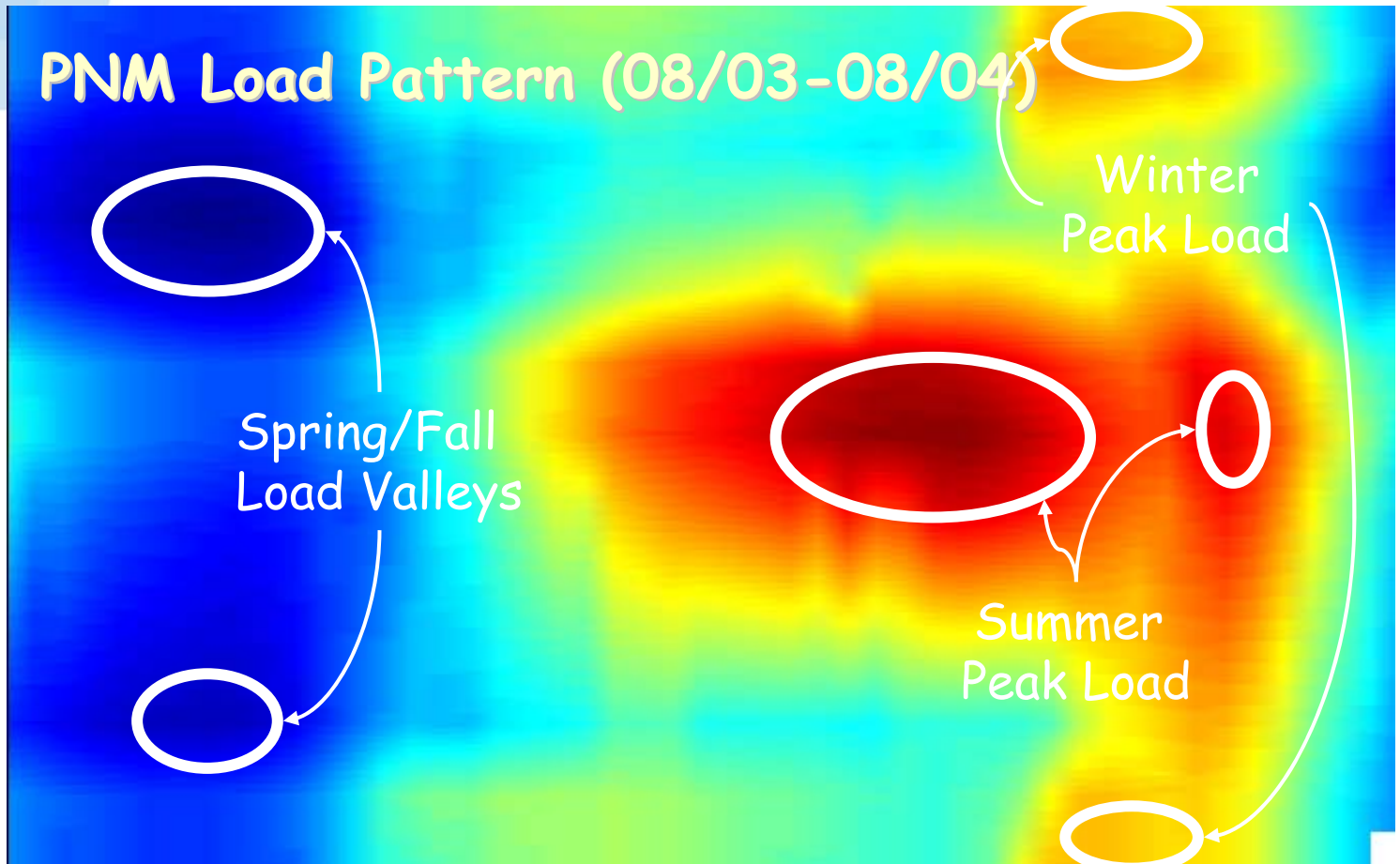
# All 136 Turbines Erected!



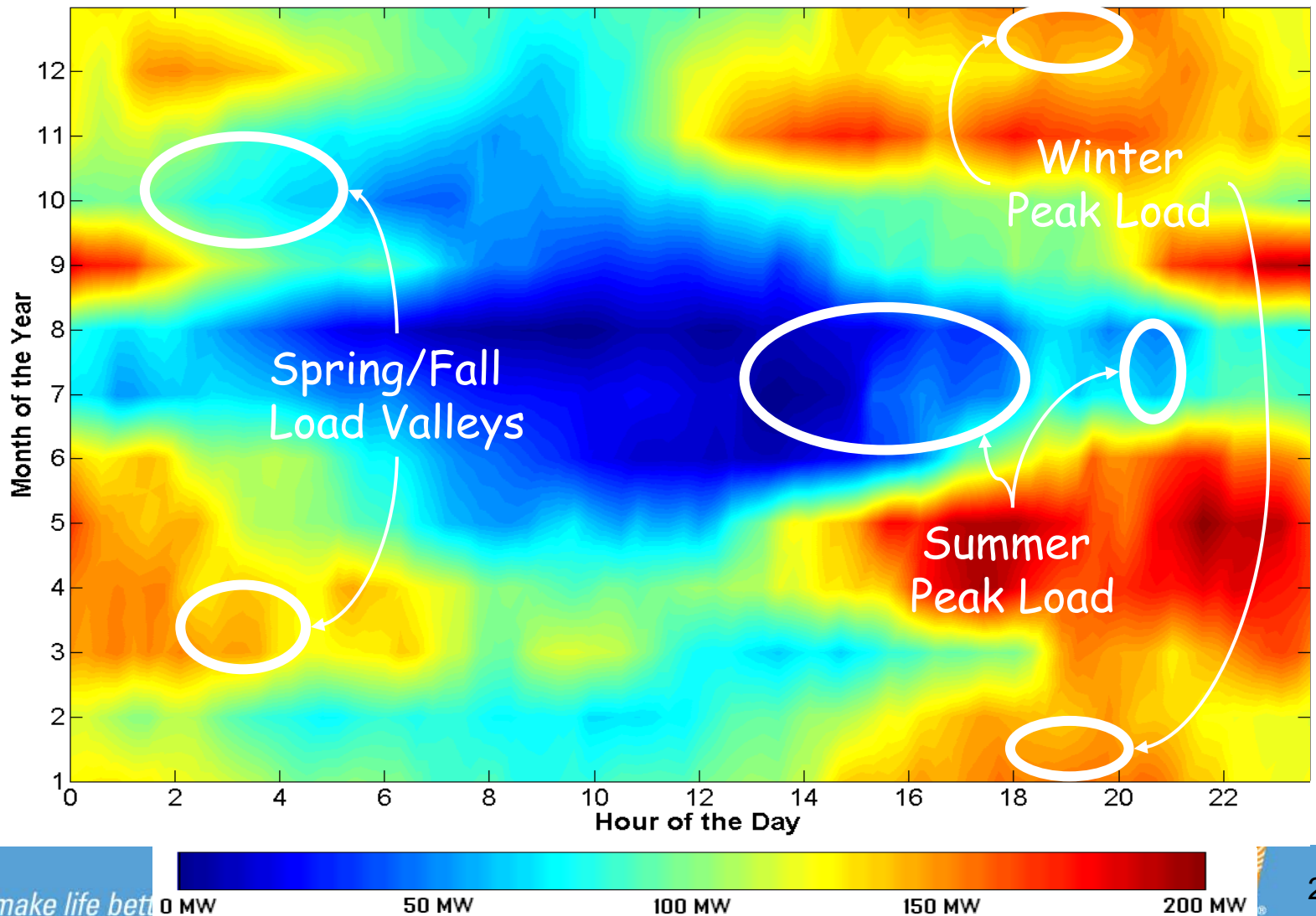
Quick Fact:

It is 310 feet to top  
of blade

# PNM Load (08/03-08/04)



# NMWECC Output Pattern (08/03-08/04)





# Questions?

