

Transmission Overview

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Western Interstate Energy Board

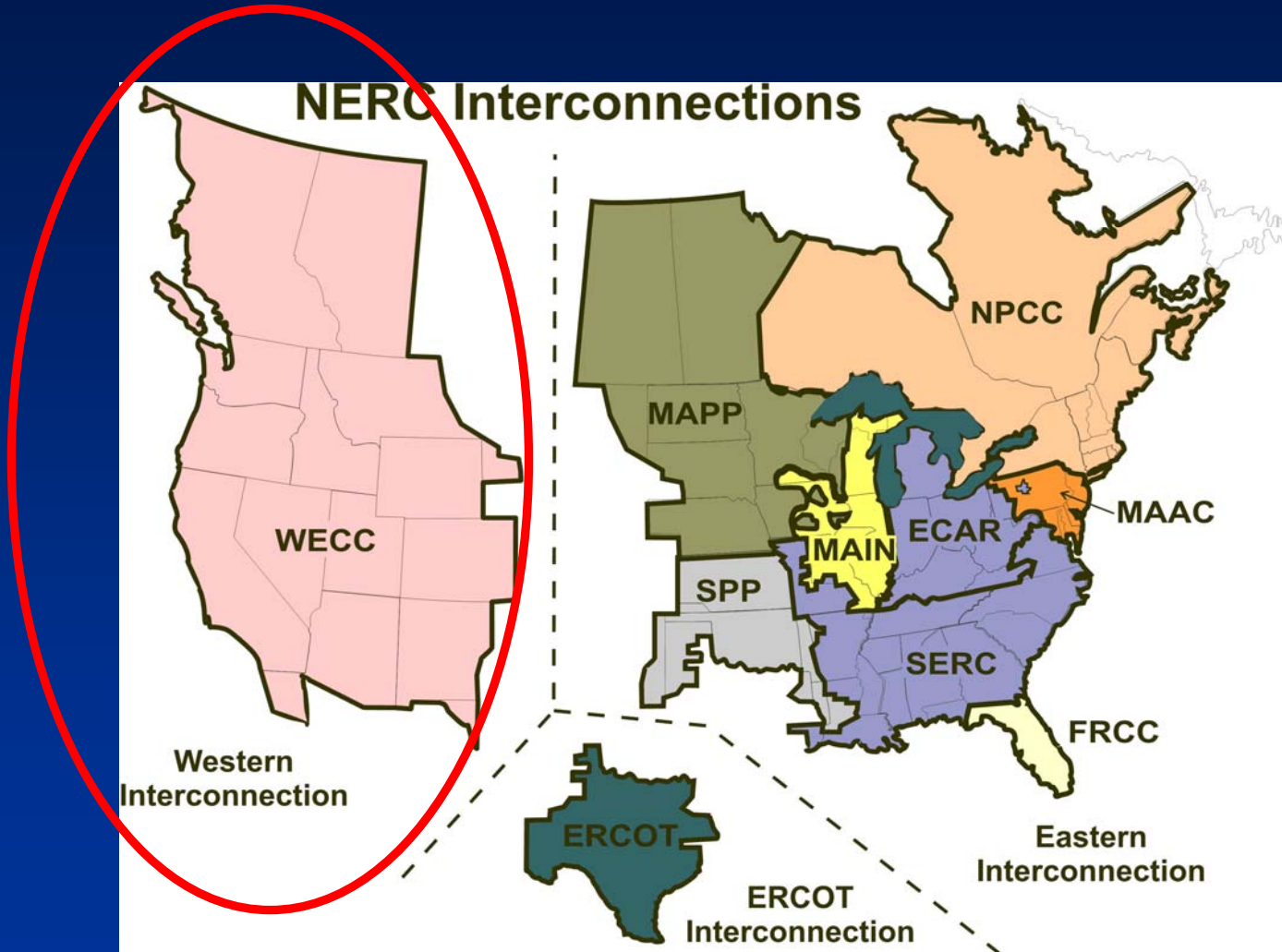


Outline of Presentation

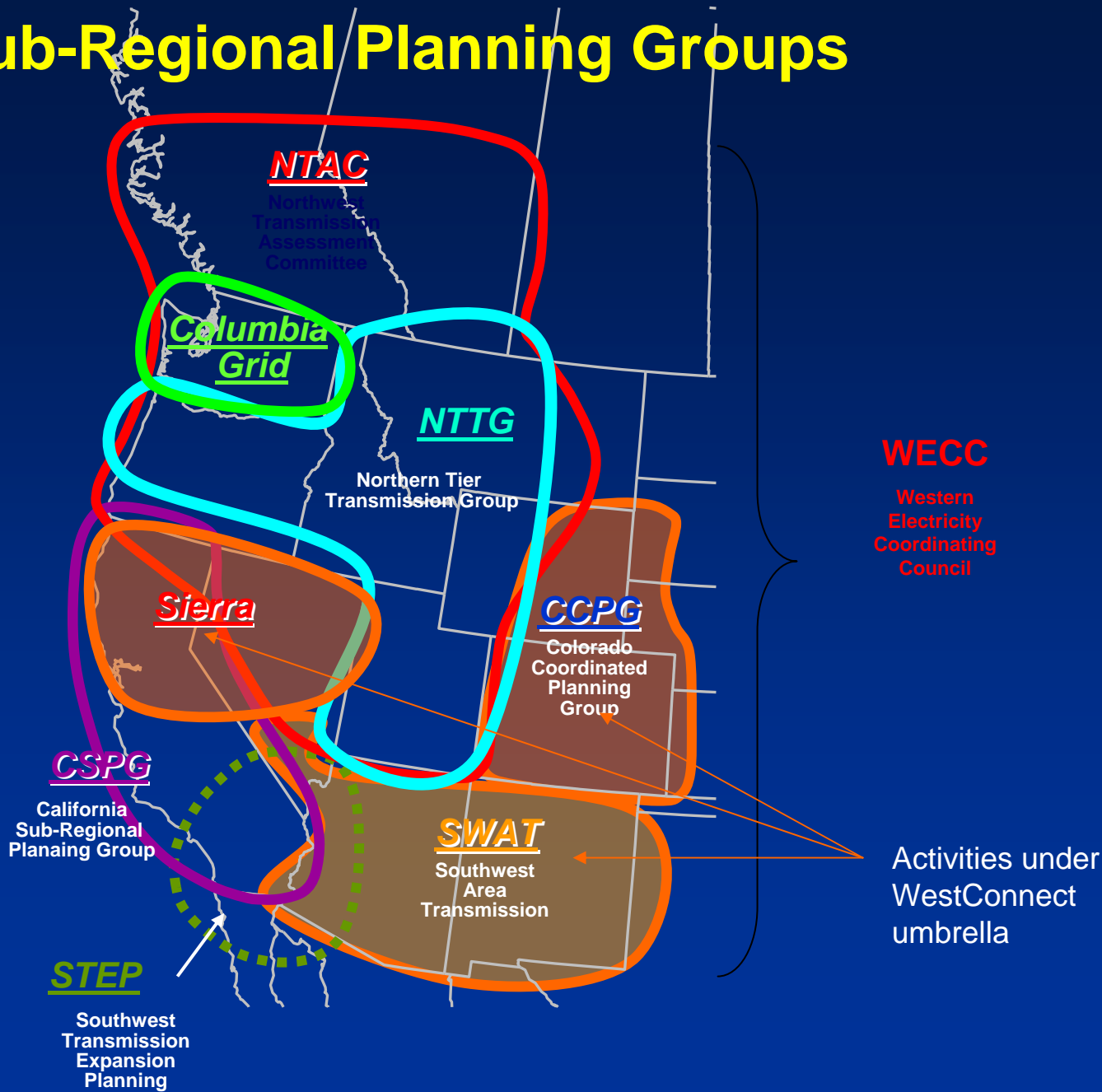
- Electrical context
- Transmission planning processes
- Western transmission expansion proposals
 - HPX
 - Gateway South/TransWest Express
- Know your market
 - LSEs generation choices ultimately determine what transmission gets built
 - Will Colorado import and export electricity?
- Key external events for HPX
 - Southwest wind integration study
 - WestConnect Balancing Authority consolidation study
 - Potential Western Renewable Energy Zone designations



Context – Western Interconnection

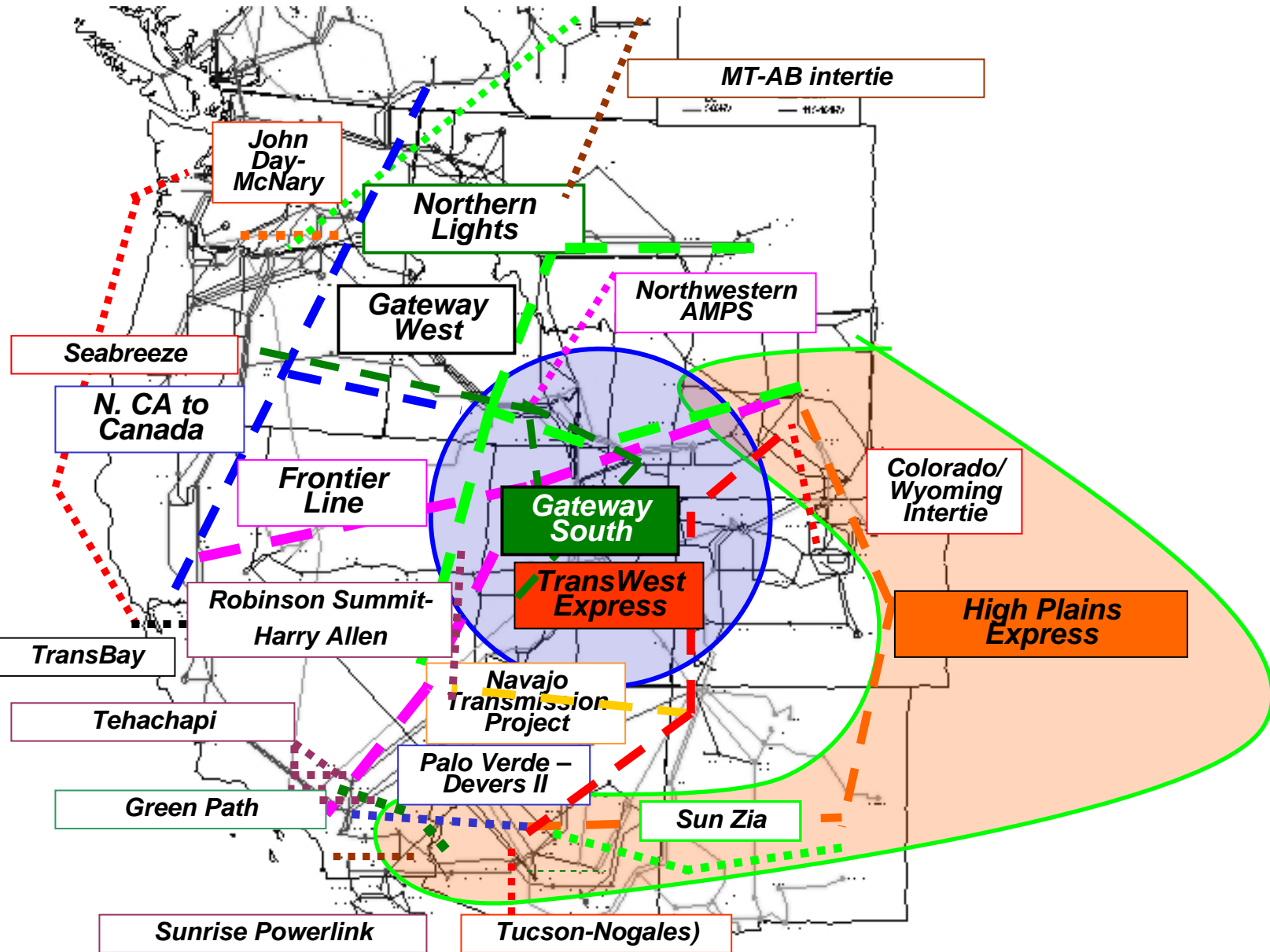


Sub-Regional Planning Groups

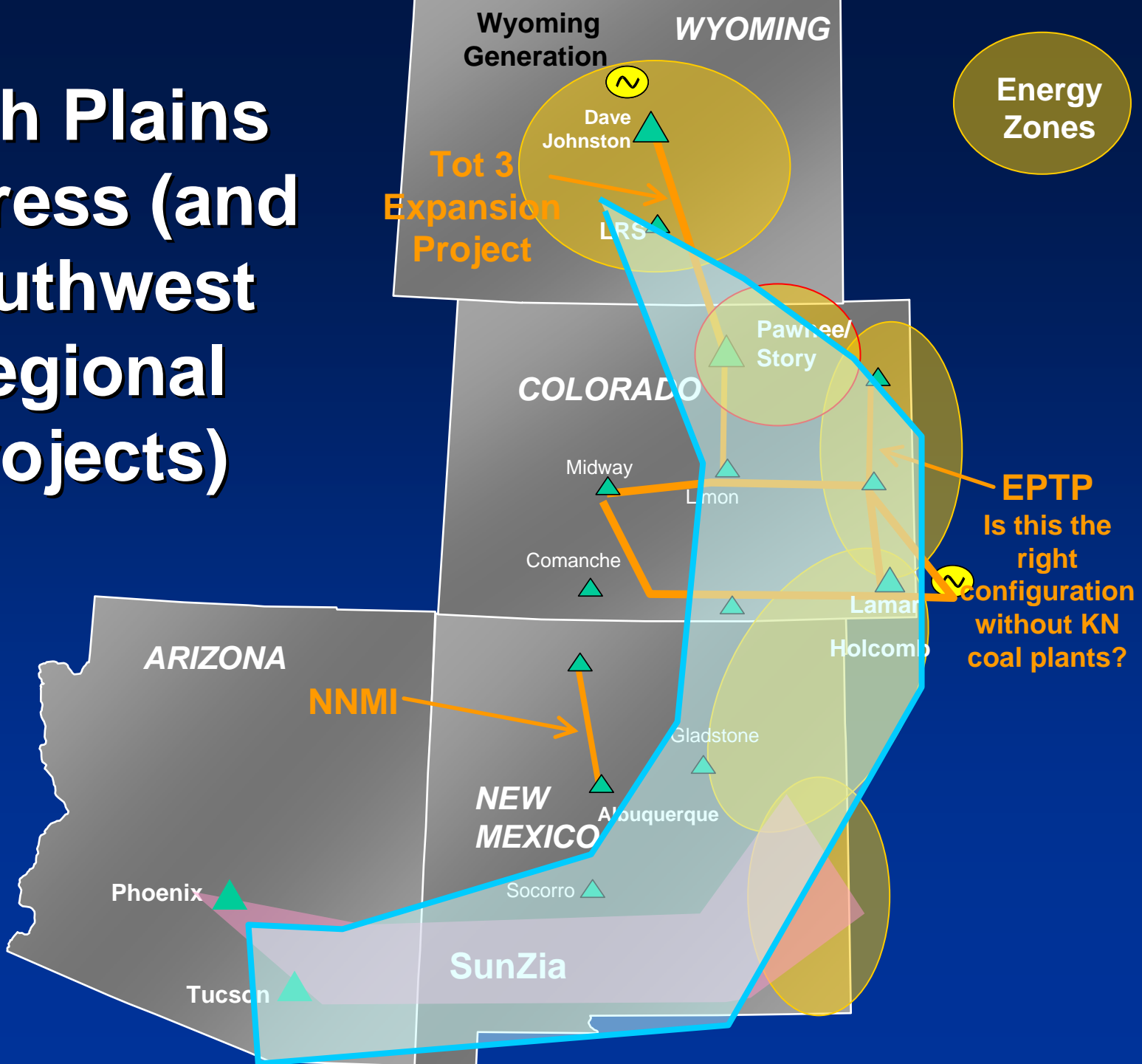


Proposed Transmission Projects

(some projects have alternative routes not shown on map)



High Plains Express (and Southwest Regional Projects)



Know Your Market and Competitive Edge

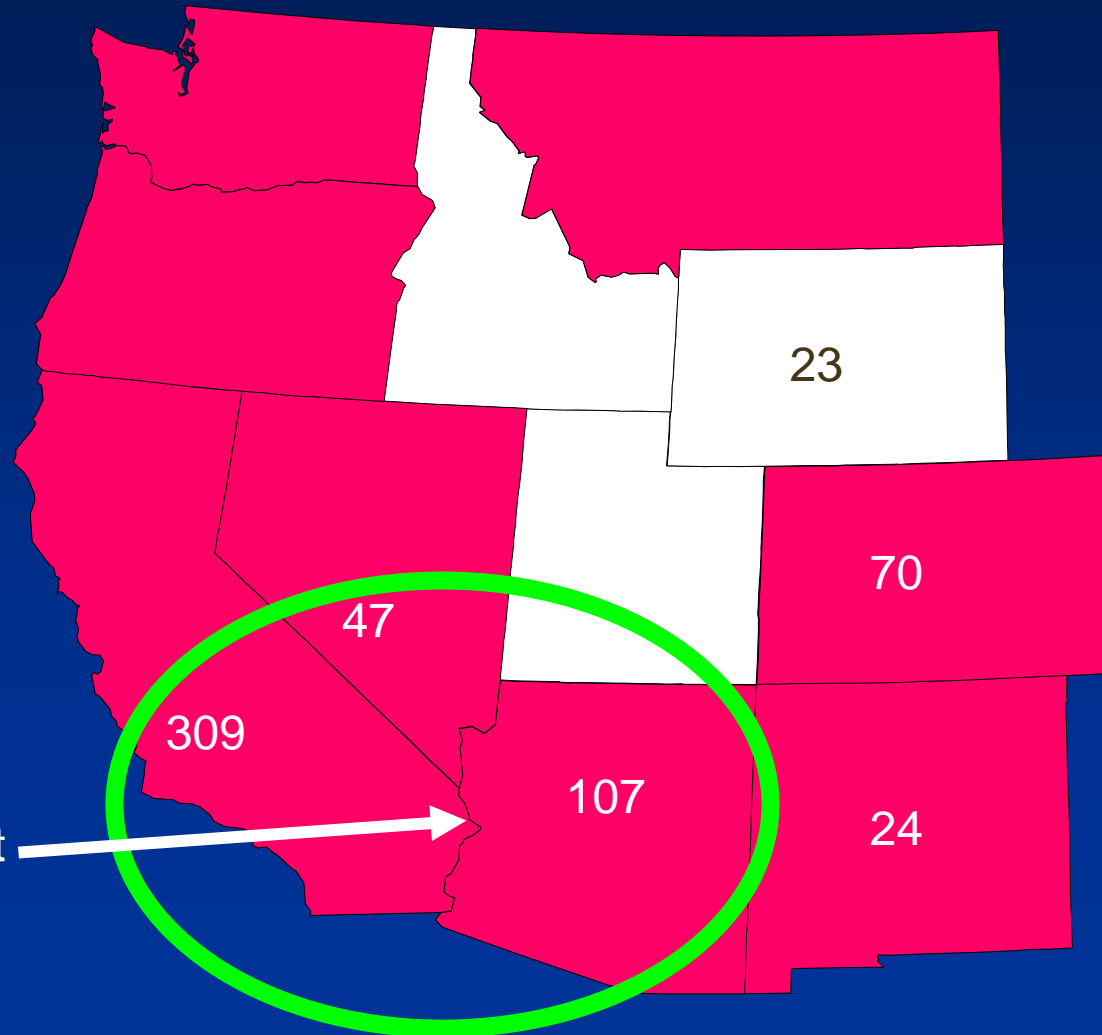
- Will Colorado export power to the Southwest?
- Colorado's competitive position in Southwest supply alternatives
 - Wind - good
 - Solar ?
 - Coal – no
 - Nuclear – no
 - Natural gas – no
- Consider securing expertise in SW electricity markets



Is Colorado going to be an export state?

- States in red have Renewable Portfolio Standards

- Numbers show estimated demand in 2017 in thousands of gigawatt-hours



The big market

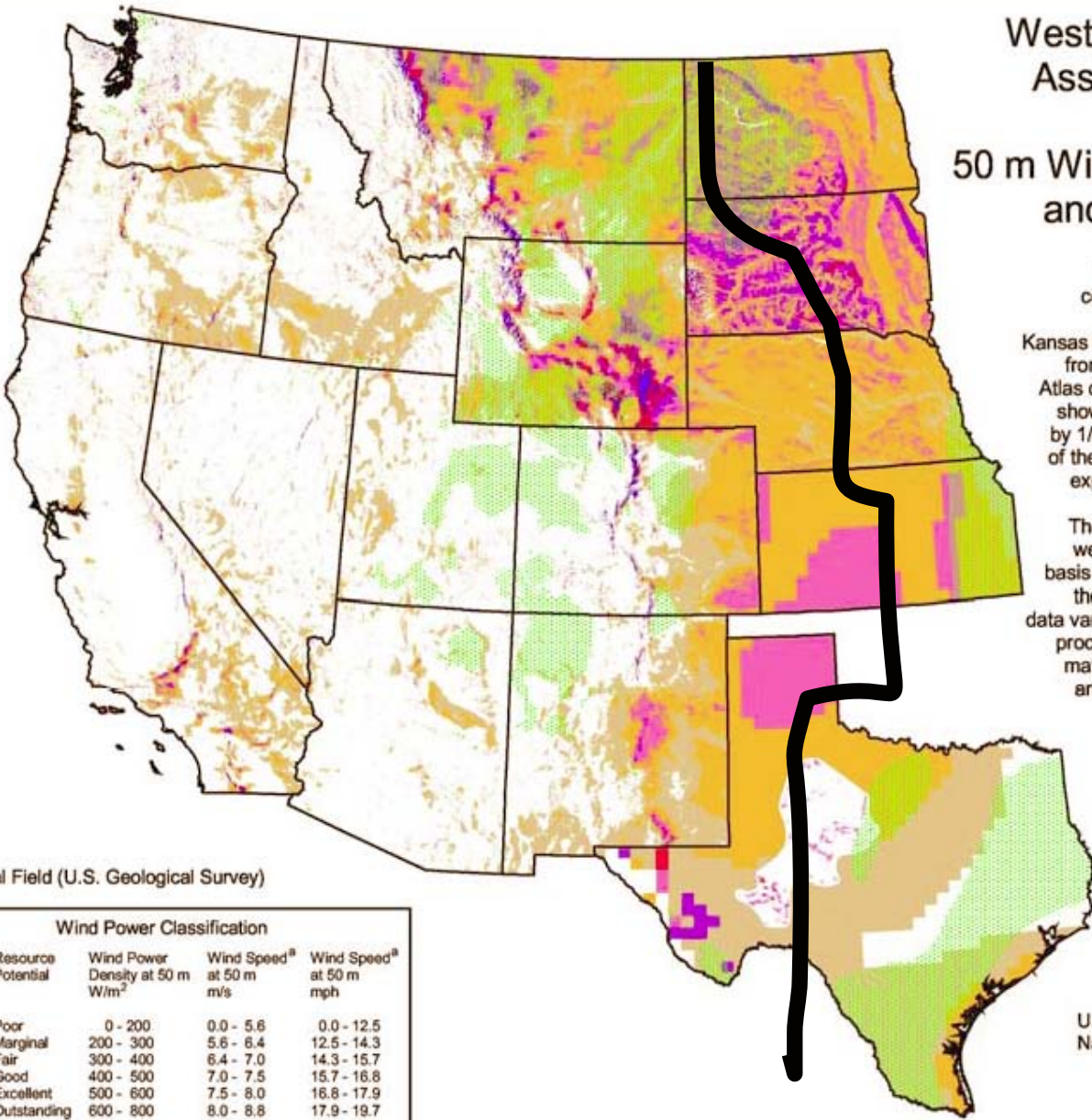
Western Governor's Association Area

50 m Wind Resource Data and Coal Fields

The wind resource data shown is a compilation of multiple assessments.

Kansas and the majority of Texas are taken from the 1987 "Wind Energy Resource Atlas of the United States". Wind class is shown for every 1/3 degree of longitude by 1/4 degree of latitude. As little as 5% of the resource area shown may be well-exposed to the power class displayed.

The high resolution wind assessments were conducted on a state or regional basis from 1999 to 2005. Over that time, the methodology and resolution of the data varied due to changes in the modeling process. The fine resolution of the data may prevent many good wind resource areas from appearing when viewed at this scale.



Coal Field (U.S. Geological Survey)

Wind Power Classification				
Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m ²	Wind Speed ^a at 50 m m/s	Wind Speed ^a at 50 m mph
1	Poor	0 - 200	0.0 - 5.6	0.0 - 12.5
2	Marginal	200 - 300	5.6 - 6.4	12.5 - 14.3
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7

^aWind speeds are based on a Weibull k value of 2.0

U.S. Department of Energy
National Renewable Energy Laboratory

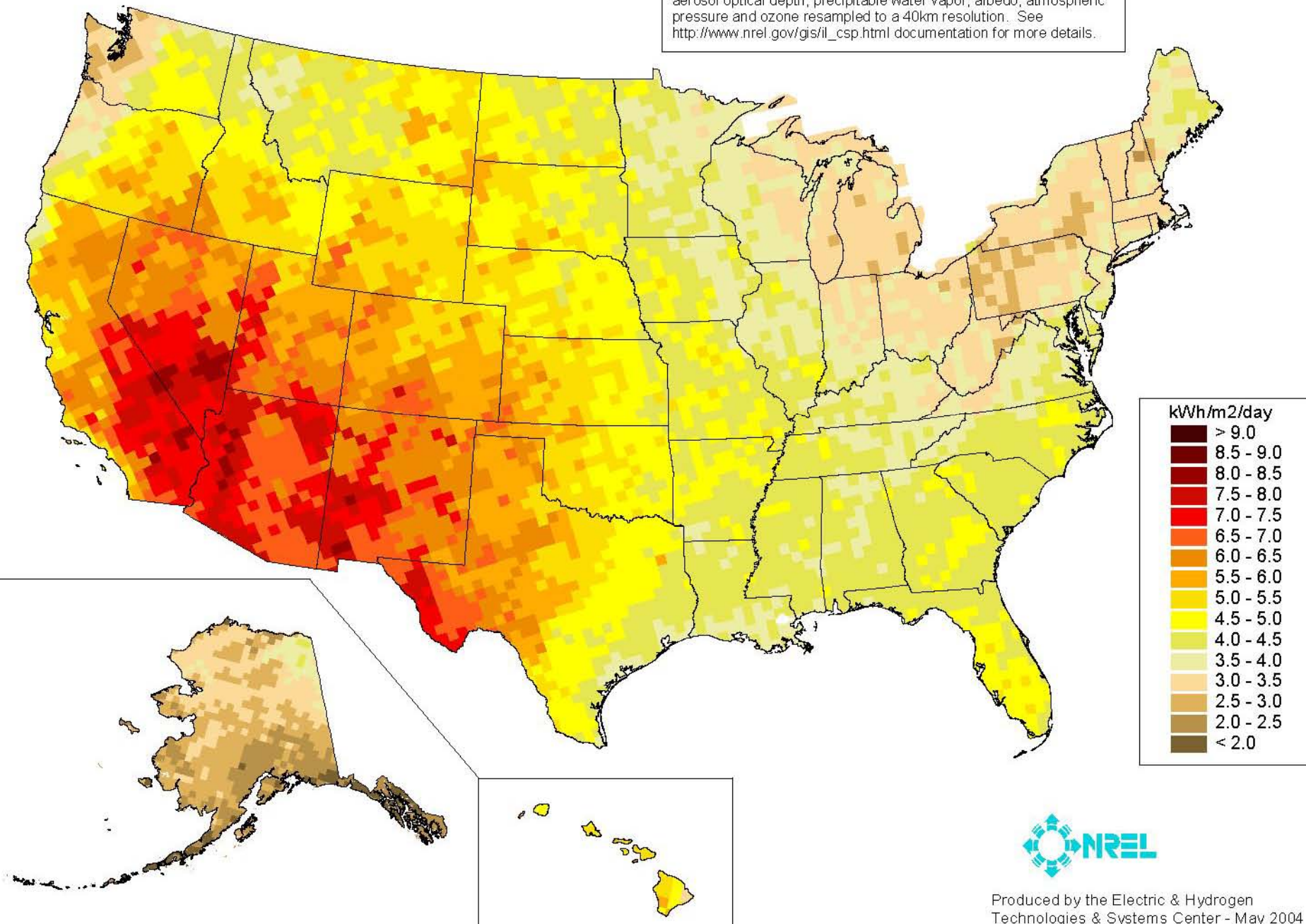


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Direct Normal Solar Radiation (Two-Axis Tracking Concentrator)

Annual

Model estimates of monthly average daily total radiation using inputs derived from satellite and/or surface observations of cloud cover, aerosol optical depth, precipitable water vapor, albedo, atmospheric pressure and ozone resampled to a 40km resolution. See http://www.nrel.gov/gis/il_csp.html documentation for more details.

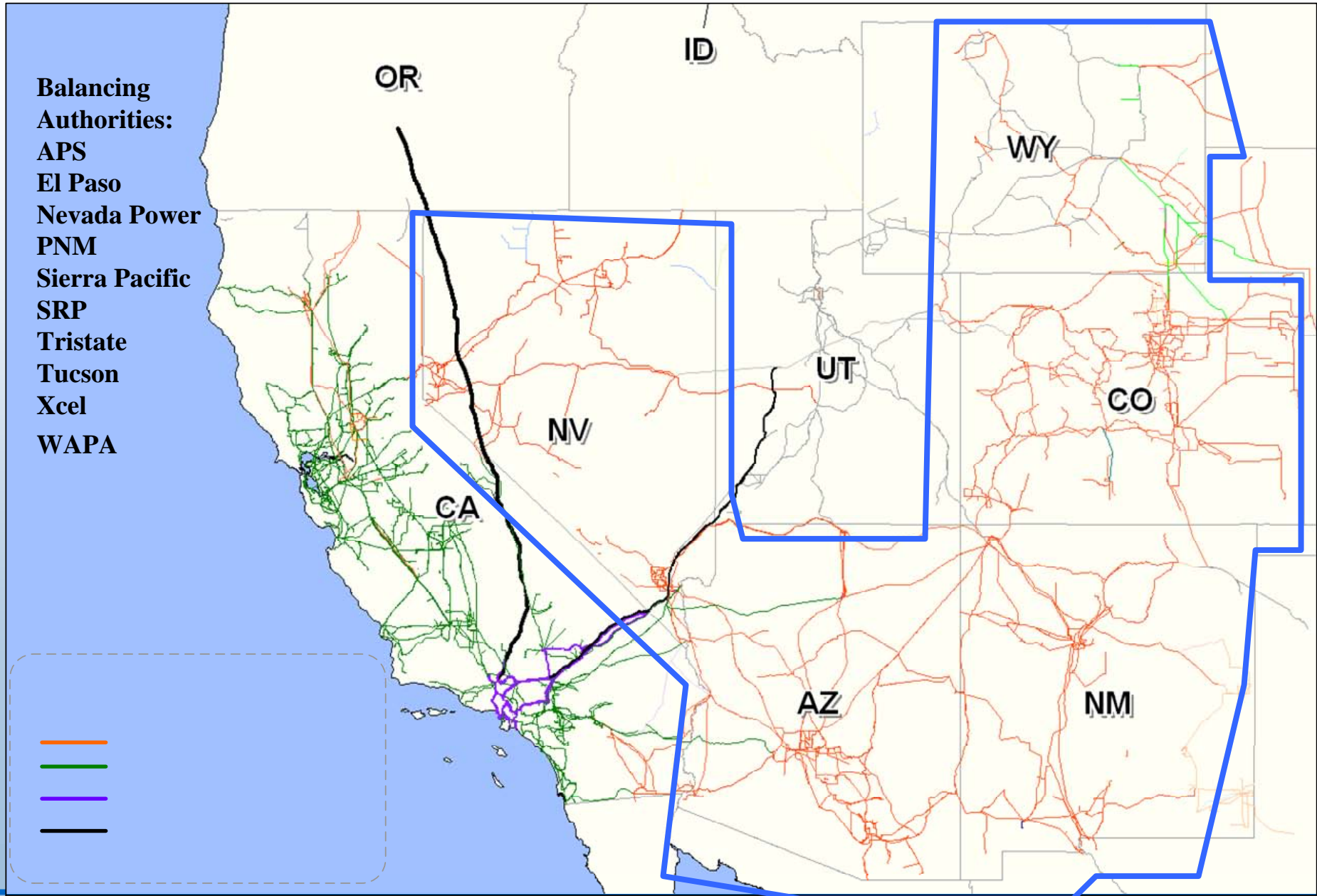


Key External Events

- Soon – next Xcel resource plan
- Nov.14 HPX stakeholder briefing
- 1st quarter 2008 – mesoscale wind data from NREL
 - Are there synergies among wind sites in WY, CO, NM?
- 2008 - WestConnect Balancing Authority Study
- 2008-09 – NREL SW wind integration study
- Other potential events
 - Designation of Renewable Energy Zones throughout the Western Interconnection



NREL SW Wind Integration Study Footprint



Too Many Small
Balancing Authorities for
maximum wind
integration

WestConnect
consolidation study

