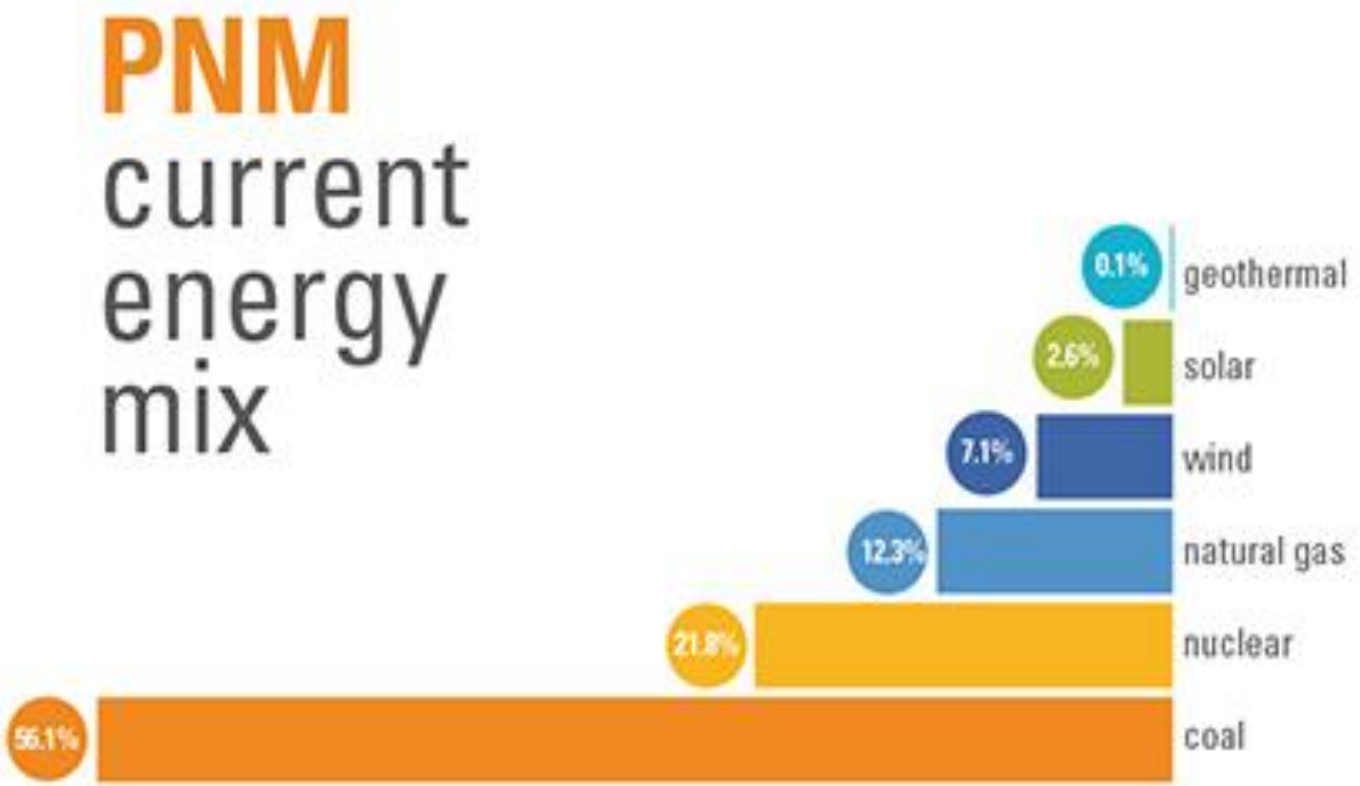
# Goodbye Coal, Hello Renewables
## Changing the Energy Future for NM

100 Percent Renewable New Mexico Conference
September 19, 2017


- Dr. Lee A Reynis
- UNM Bureau of Business and Economic Research
- bber@unm.edu
- Albuquerque, NM 87131

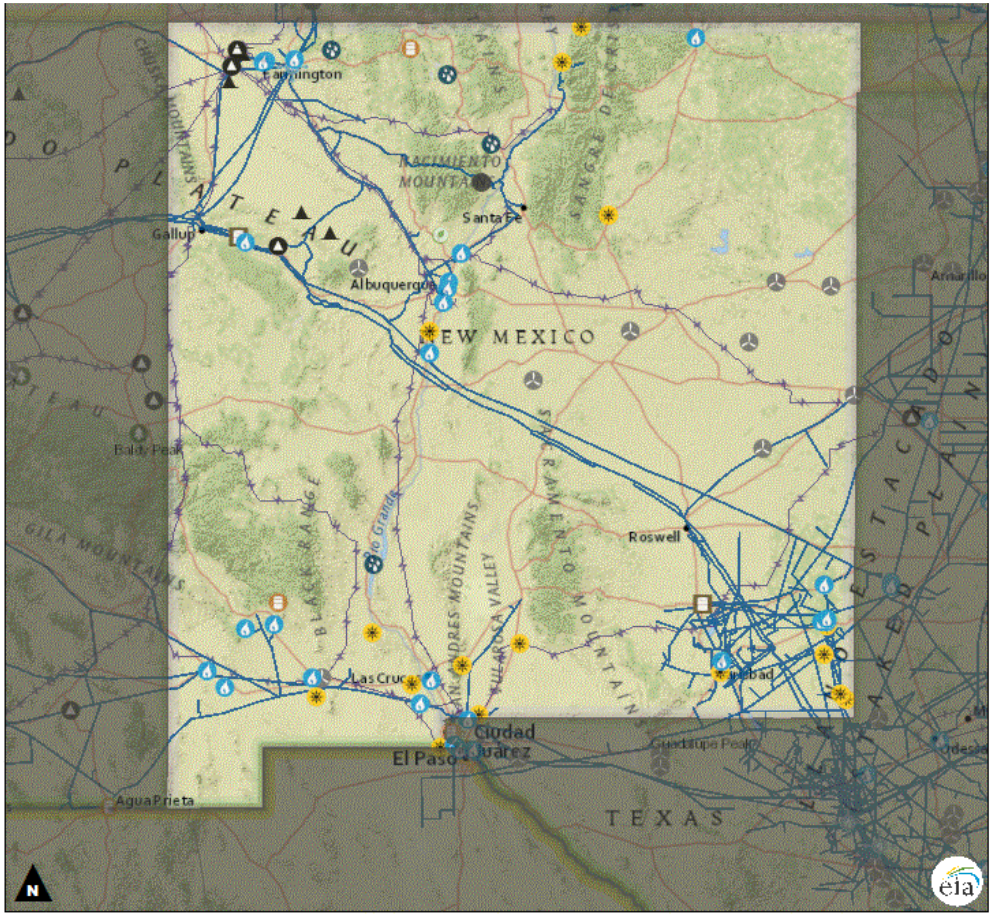
# The Ways Things Are: Electricity Production in NM



# PNM on Resource Tradeoffs

| Fuel Type | Advantages | Disadvantages |
|---|---|---|
| **Coal** | Inexpensive fuel<br>Abundant supply near existing resources<br>Low cost resource<br>Reliable, semi-flexible operation | Produces highest level of emissions, including carbon dioxide<br>Relatively water intensive |
| **Nuclear** | Produces no emissions<br>Low-cost resource<br>Reliable, fixed operation | High up-front capital cost<br>Produces radioactive waste, for which long-term storage and disposal is not resolved<br>Uses reclaimed water |
| **Natural Gas** | Cleaner burning than coal, including half of the carbon emissions<br>Abundant supply in New Mexico (local production as well as access to interstate pipelines)<br>Reliable, fully-flexible operation<br>Flexible design options from base load to peaking plant types | Still produces emissions, including carbon<br>Volatile in price<br>Can achieve low water intensities at a price |
| **Wind** | No emissions or water use<br>NM ranks 10th in the nation for wind energy production potential (Source: AWEA)<br>No fuel cost | Intermittent in nature<br>High up-front capital costs for equipment and transmission<br>Requires fossil-fueled backup<br>Wind power is often not available when customers use the most electricity. |
| **Solar** | No emissions or water use<br>NM ranks second in the nation for solar energy production potential<br>No fuel cost<br>While solar energy production peak does not precisely match the peak daily hours for energy consumption, generation is during daylight hours, when usage is high | Intermittent in nature<br>Prices have been declining, but still have high up-front capital costs for equipment<br>Requires large land area; 8-10 acres/MW for PV<br>Requires fossil-fueled backup<br>Other solar technologies such as solar thermal hold promise, but have not demonstrated cost-competitiveness with solar PV for electric utility needs |
| **Geothermal** | No air emissions<br>High capacity factor generation | High up-front capital costs<br>Water intensive<br>Favorable sites may not be available in all areas of the country or New Mexico |
| **Solar Thermal** | No Emissions<br>Less operational variation than wind or solar PV<br>No fuel cost | Intermittent in nature<br>Water intensive<br>High up-front capital costs |

# Farmington and San Juan County Power Plants, Coal Mines, Natural Gas and the Grid




States:Electricity Transmission Lines - Ventyx, Velocity Suite;Grey Base:National

0 25 50 100 Miles

- Mask
- Surface Coal Mine
- Underground Coal Mine
- Biomass Power Plant
- Coal Power Plant
- Geothermal Power Plant
- Hydroelectric Power Plant
- Natural Gas Power Plant
- Nuclear Power Plant
- Other Power Plant
- Other Fossil Gases Power Plant
- Petroleum Power Plant
- Pumped Storage Power Plant
- Solar Power Plant
- Wind Power Plant
- Wood Power Plant
- Petroleum Refinery
- Strategic Petroleum Reserve

These are critical export industries for San Juan County. They bring in dollars from elsewhere into the local economy, supporting additional jobs and income.

# Less Reliance on Coal-Fired Power Plants

## PNM's San Juan and APS's Four Corners in San Juan Co

| | Peak Capacity | # of units | Direct Employment | Direct Labor Income $Ms |
|---|---|---|---|---|
| Baseline 2013 | | | | |
| San Juan Power Plant | 1,683 MW | 5 | 400 | $40.5 |
| San Juan Mine | 6,000,000 tons | | 500 | $45.0 |
| | | | | |
| Four Corners Power Plant | 2,040 MW | 5 | 500 | $75.3 |
| Navajo Mine | 7,200,000 tons | | 530 | $63.8 |
| Post Unit Shutdowns 2018 | | | | |
| San Juan Generating Plant | 847 MW | 2 | 200 | $20.3 |
| San Juan Mine | 3,000,000 tons | | 250 | $22.5 |
| | | | | |
| Four Corners Gen. Plant | 819 MW | 2 | 350 | $52.7 |
| Navajo Mine | 4,800,000 tons | | 320 | $37.2 |

Highlands Economics, Northwest New Mexico Economic Assessment and Strategy; author calculations

These figures are rounded.

# Estimated Direct Annual Fiscal Impacts of Planned Reductions in Reliance on Coal

| Jurisdiction | Historic Tax Receipts From | Expected Taxes with Reduced Coal | Chg in Taxes with Reduced |
|---|---|---|---|
| Gross Receips Tax | | | |
| San Juan Co | $970,000 | $485,000 | -$485,000 |
| Farmington | $20,000 | $10,000 | -$10,000 |
| New Mexico[2] | $27,820,000 | $13,910,000 | -$13,910,000 |
| State Level Taxes [1] | | | |
| New Mexico[2] | $22,700,000 | $11,350,000 | -$11,350,000 |
| Tribal Government | | | |
| Navajo Mine only[3] | $45,700,000 | $40,200,000 | -$5,500,000 |

1 Includes Mineral Leasing royalties, rentals and bonuses, severance tax and surtax, resource excise tax.

2 State estimates include McKinley Co. activity.

3. Not altered from orignal report .

Based on estimates provided in Highland Economics and Catalyzt Environment Solutions, **Regional Economic Assessment & Strategy for the Coal-Impacted Four Corners Region**, Northwest New Mexico Council of Governments,Feb. 2017.

# Going to Zero Reliance on Coal

| | Peak Capacity | # of units | Direct Employment | Direct Labor Income $Ms |
|---|---|---|---|---|
| Baseline 2013 | | | | |
| San Juan Power Plant | 1,683 MW | 5 | 400 | $40.5 |
| San Juan Mine | 6,000,000 tons | | 500 | $45.0 |
| | | | | |
| Four Corners Power Plant | 2,040 MW | 5 | 500 | $75.3 |
| Navajo Mine | 7,200,000 tons | | 530 | $63.8 |
| Shutting Down All Coal in San Juan County | | | | |
| San Juan Generating Plant | 0 MW | 0 | 0 | $0.0 |
| San Juan Mine | 0 tons | | 0 | $0.0 |
| | | | | |
| Four Corners Gen. Plant | 0 MW | 0 | 0 | $0.0 |
| Navajo Mine | 0 tons | | 0 | $0.0 |

Highlands Economics, Northwest New Mexico Economic Assessment and Strategy; author calculations

These figures are rounded.

# Estimated Economic Impacts on San Juan County

| | Direct Losses | Estimated Indirect and | Total Estimated Losses |
|---|---|---|---|
| **Employment** | | | |
| Coal Mining | (1,056) | (3,156) | (4,212) |
| Power Plants | (894) | (1,778) | (2,672) |
| Total Mining & Power Plant | (1,950) | (4,934) | (6,884) |
| | | | |
| **Labor Income** | | | |
| Coal Mining | (108,800,000) | $ (115,110,400) | $ (223,910,400) |
| Power Plants | $(115,800,000) | $ (158,646,000) | $ (274,446,000) |
| Total Mining & Power Plant | $(224,600,000) | $ (273,756,400) | $ (498,356,400) |

Using the IMPLAN model, BBER has estimated a reduction in San Juan County employment of **6,900 jobs, or about 13%, of 2013 total employment**. This assumes Navajo Mine and Four Corner Plant are shut down completely. The **estimated total reduction in earnings is about $500 million, which is 16% of total 2013 earnings**, as reported by the Bureau of Economic Analysis. This is substantial hit! Note that IMPLAN does not have multipliers for San Juan County for these sectors, so had to use adjusted state estimates.

**Replacing these facilities, which accounted for 3,723 MW of electricity generation and which employed directly almost 2,000 people, is a challenge.** PNM would increase its reliance on natural gas in the near term and phase in greater reliance on renewables, retaining natural gas for peak production.

**In 2013, The Western Governor's Association identified 27 gigawatts of renewable generating capacity (solar, wind, geothermal & biomass) in NM – the largest capacity among the included states and western Canada.**

# Concerns about relying on Wind and Solar

1. Storage, since wind doesn't always blow and sun doesn't always shine.

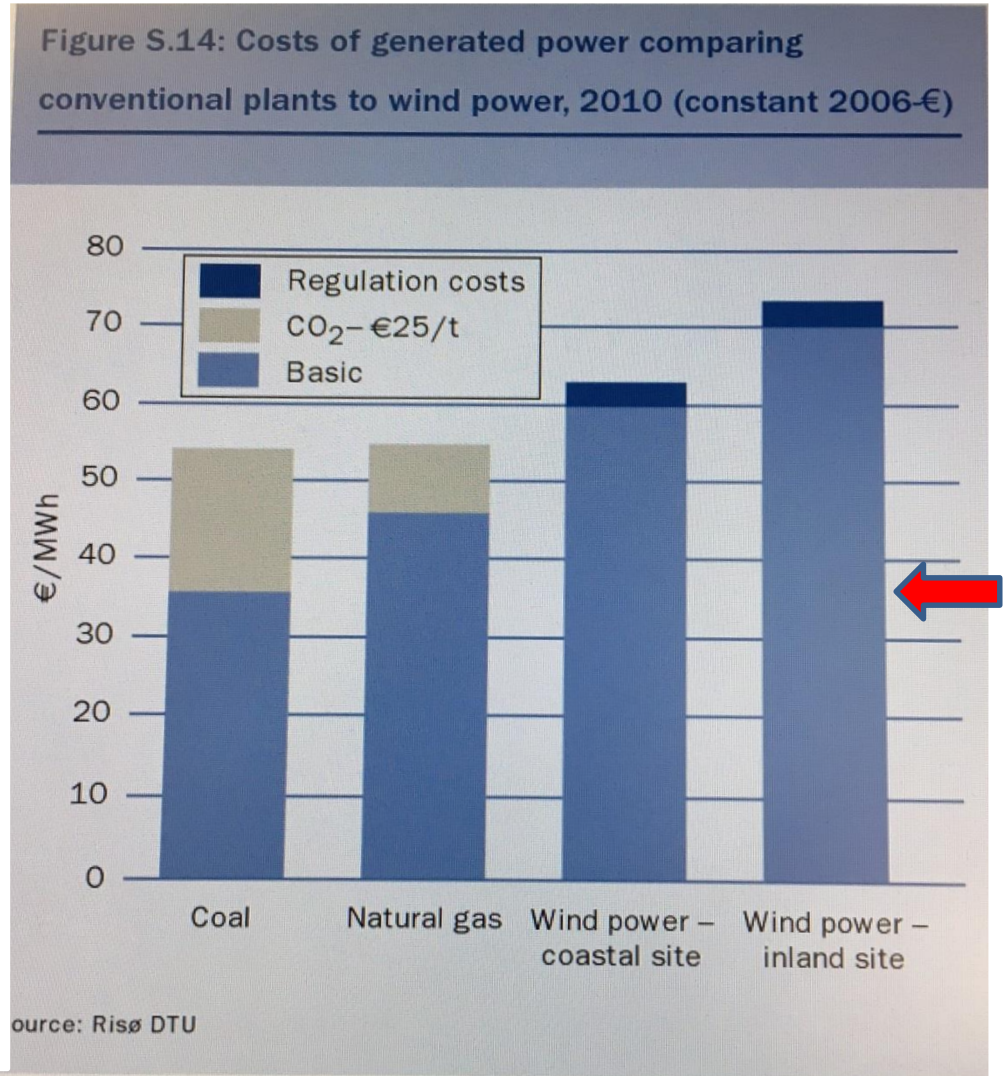
2. Wind doesn't always blow and is subject to considerable variability, with strong gusts.

3. Meeting peak demand, e.g., when people returning home from work for dinner. PNM would use natural gas to meet peak demand.

4. "Very Expensive", according to one utility economist

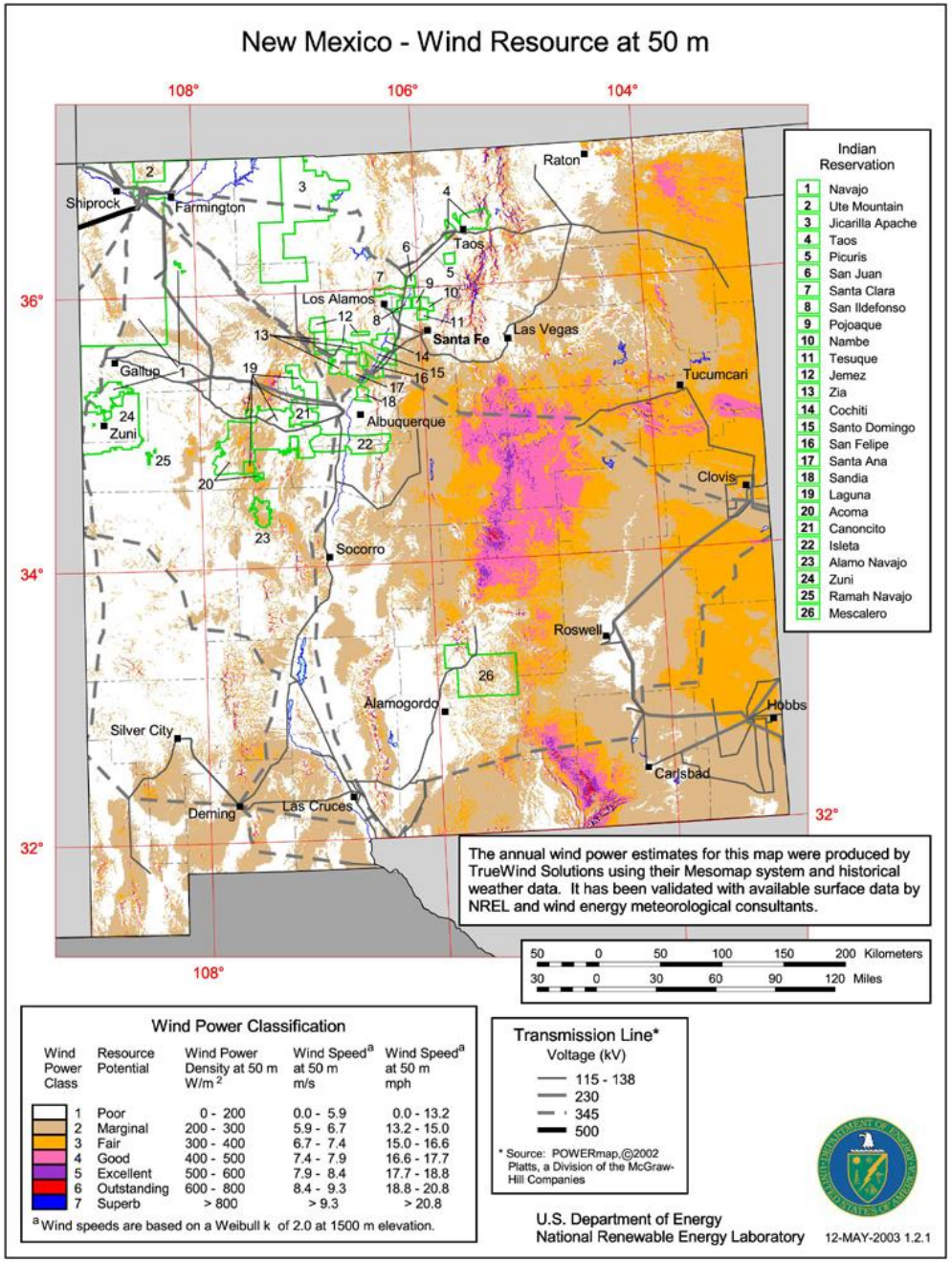
# Alternative 1: Wind

European Countries have considerable experience. This cost comparison is based on their experience:



Producing electricity with wind may be a great option for parts of Eastern NM but <u>not</u> for San Juan County.

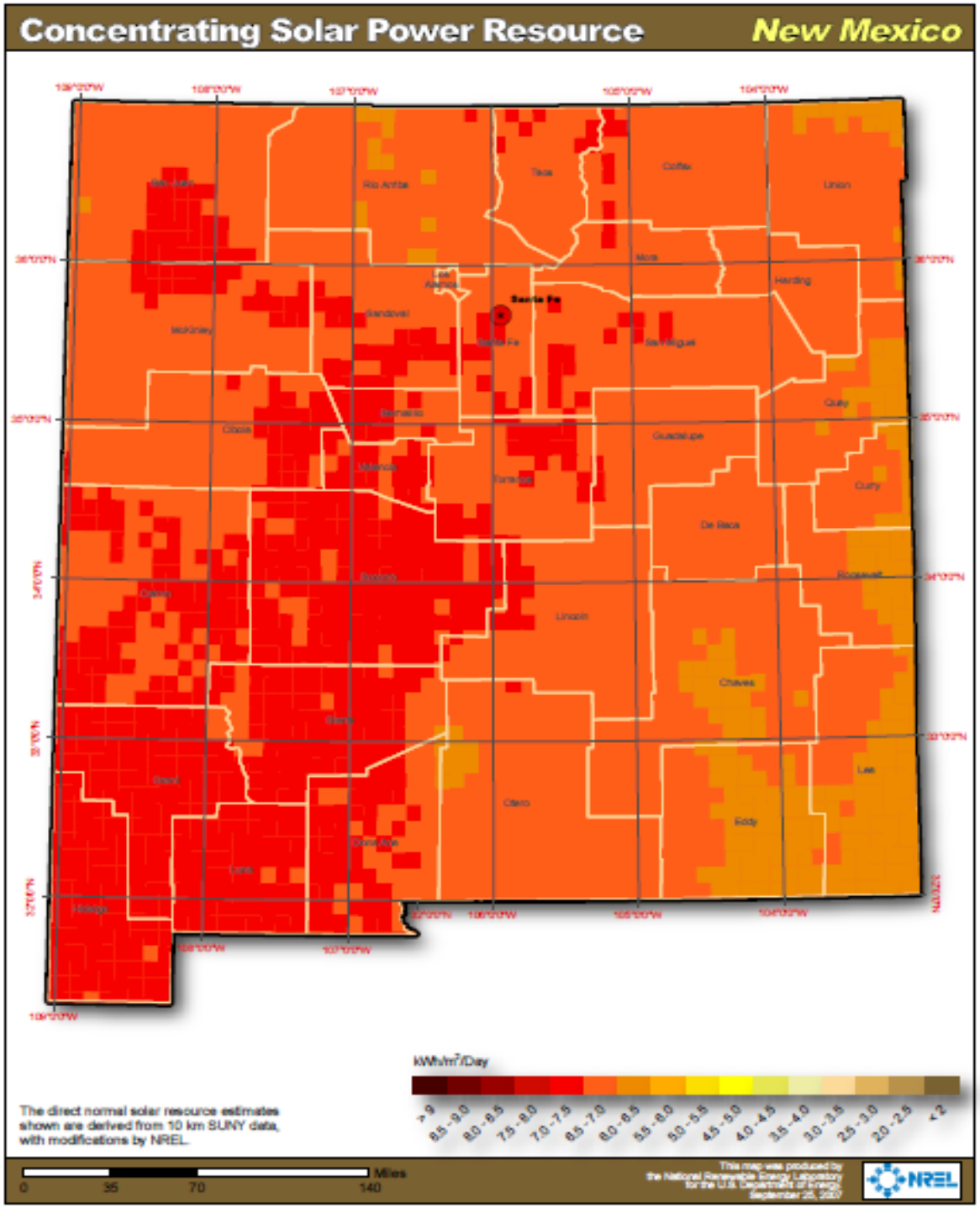
Indeed, PNM documents on future reliance on renewables assume utilizing wind energy produced in eastern NM (after freeing up grid capacity). This would not help fill the void in San Juan Co economy.



Could San Juan County become a producer of wind turbines?

The sun does shine in NM including San Juan County!

Unfortunately, NM policies are no longer so favorable as they once were.

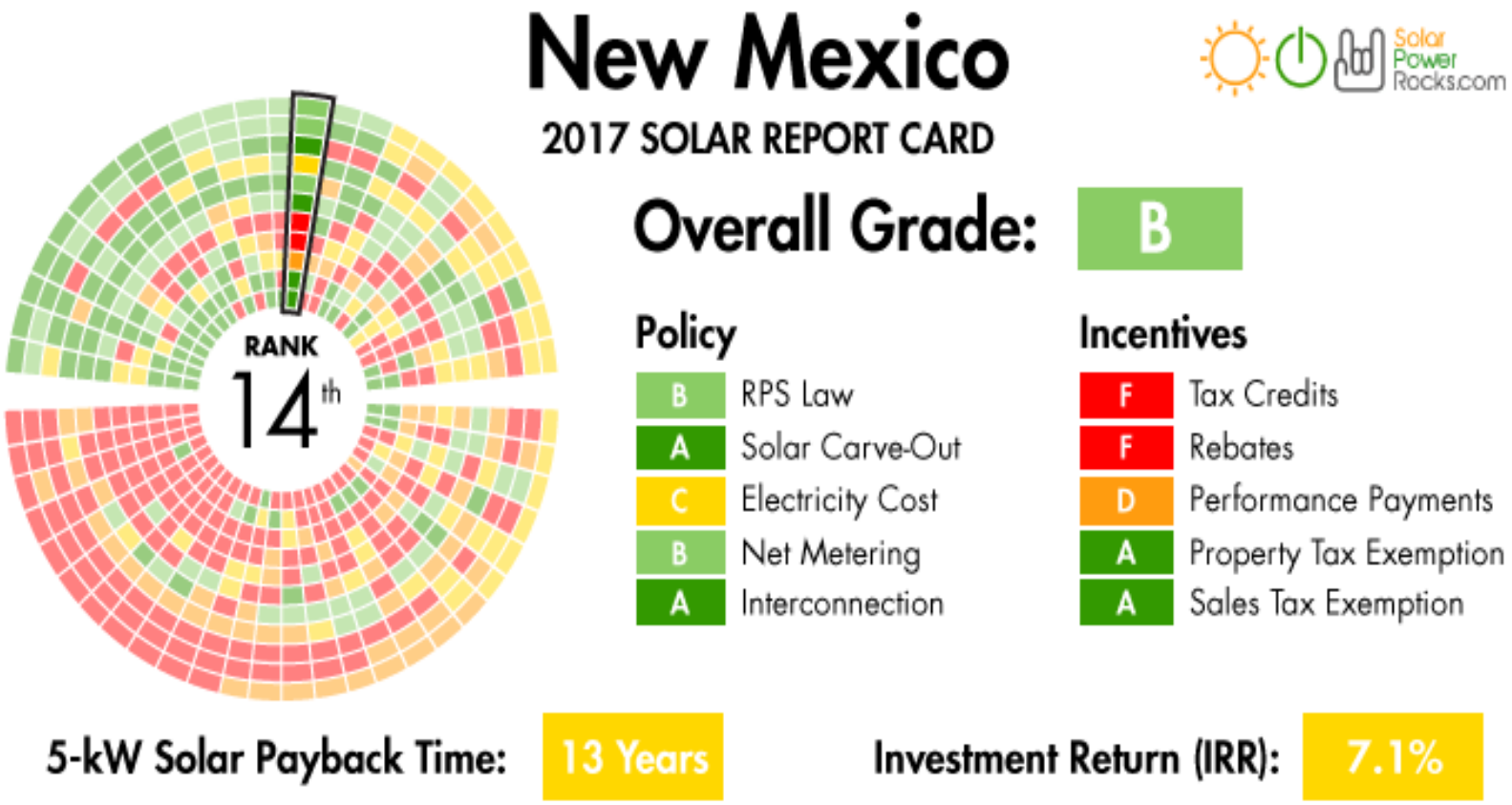


# Alternative 2: Solar

PNM has some solar facilities in San Juan Co and plans to develop more. In NM as elsewhere the biggest gains in solar generation have come from private renewable distributed generation from roof-top panels.

Growth in PNM's Private Renewable Distributed Generation

| Year | Cumulative Number of Participants | Cumulative KWAC Installed | Annual RECs (MWh) | Peak Hour Generation KWAC (55% of capacity) | Percentage of Growth over Previous |
|---|---|---|---|---|---|
| 2006 | 93 | 164 | 413 | 90 | |
| 2007 | 187 | 348 | 1,593 | 191 | 112% |
| 2008 | 368 | 748 | 3,525 | 411 | 115% |
| 2009 | 708 | 2,124 | 7,132 | 1,168 | 184% |
| 2010 | 1,342 | 6,165 | 13,611 | 3,391 | 190% |
| 2011 | 2,192 | 14,208 | 26,767 | 7,814 | 130% |
| 2012 | 2,994 | 19,894 | 41,914 | 10,942 | 40% |
| 2013 | 3,777 | 31,441 | 56,366 | 17,293 | 58% |
| 2014 | 5,071 | 39,372 | 85,239 | 21,655 | 25% |
| 2015 | 5,422 | 42,550 | 93,577 | 23,403 | 8% |
| 2016 | 8,710 | 62,830 | 119,574 | 34,557 | 48% |




Lost 10% Solar Market Development Credit against Personal Income Tax used by both households and small commercial businesses when Governor Martinez exercised a pocket veto of 2016 legislation to extend.

In addition to more investments in solar facilities and roof top solar for households and small commercial, could San Juan County become a producer of solar panels?

Schott Solar used to produce panels in Albuquerque. Couldn't compete with China. On the other hand, Array Technologies is producing solar trackers.

# New Mexico also Losing Ground in Terms of its Renewable Portfolio Standard

***Once a leader, per Tom Solomon's Webinar, 10 states have RPS significantly (>5%) above NM's 20%:*** **HI, CA, OR, CO, MN, NY, ME, VT, RI, CT.**

If want to change results, need to change policies. We need to switch from coal to renewables. We also need to restore economic vitality in San Juan County. While the goals can be made compatible, fixing one won't necessarily fix the other.