



THE ENERGY TRANSITION IN NEW MEXICO: INSIGHTS FROM A SANTA FE INSTITUTE WORKSHOP

CRIS MOORE, SANTA FE INSTITUTE

JESSIKA TRANCIK, SANTA FE INSTITUTE & MIT

SETH BLUMSACK, SANTA FE INSTITUTE & PENN STATE

Who are we and how did we get here?

Workshop at the Santa Fe Institute Feb. 26-28



**SANTA FE
INSTITUTE**

Local and international experts:

Sandia, Los Alamos, New Mexico Tech, Santa Fe Institute

MIT, Penn State, Vermont, Duke, Stanford, UCSB, Boise State...

Follow-up discussions with NM educators, industry, advocates

Report released October 16

Water and Natural Resources Committee, November 9

Public Regulation Commission, November 18

Public and Private Commitments to Decarbonization

Executive Order 2019-003: 45% reduction by 2030 economy-wide

Energy Transition Act:

- 50% carbon-free by 2030

- 80% by 2040

- 100% by 2045 for investor-owned utilities, 2050 for coops

PNM: 100% carbon-free by 2040 (five years ahead of the ETA)

Local governments: Albuquerque, Las Cruces, Santa Fe

Neighboring states: Colorado, Arizona, Nevada...

Utilities: Xcel, Tucson Electric Power, Arizona Public Service, Kit Carson...

WITH COMMITMENTS COME OPPORTUNITIES

PRC APPROVED REPLACEMENT FOR SAN JUAN GENERATING STATION: 650 MW SOLAR, 300 MW BATTERY STORAGE

\$447M IN CENTRAL CONSOLIDATED SCHOOL DISTRICT, \$430M IN MCKINLEY COUNTY AND JICARILLA APACHE NATION IN RIO ARRIBA

PICURIS/KIT CARSON 1 MW SOLAR FARM

NAVAJO NATION: KAYENTA I/II 55 MW SOLAR

JICARILLA APACHE NATION: 50 MW SOLAR, 20 MW STORAGE FOR ALBUQUERQUE, WNMU

ENERGY TRANSITION ACT (ETA) ADVISORY COMMITTEE PROPOSALS:

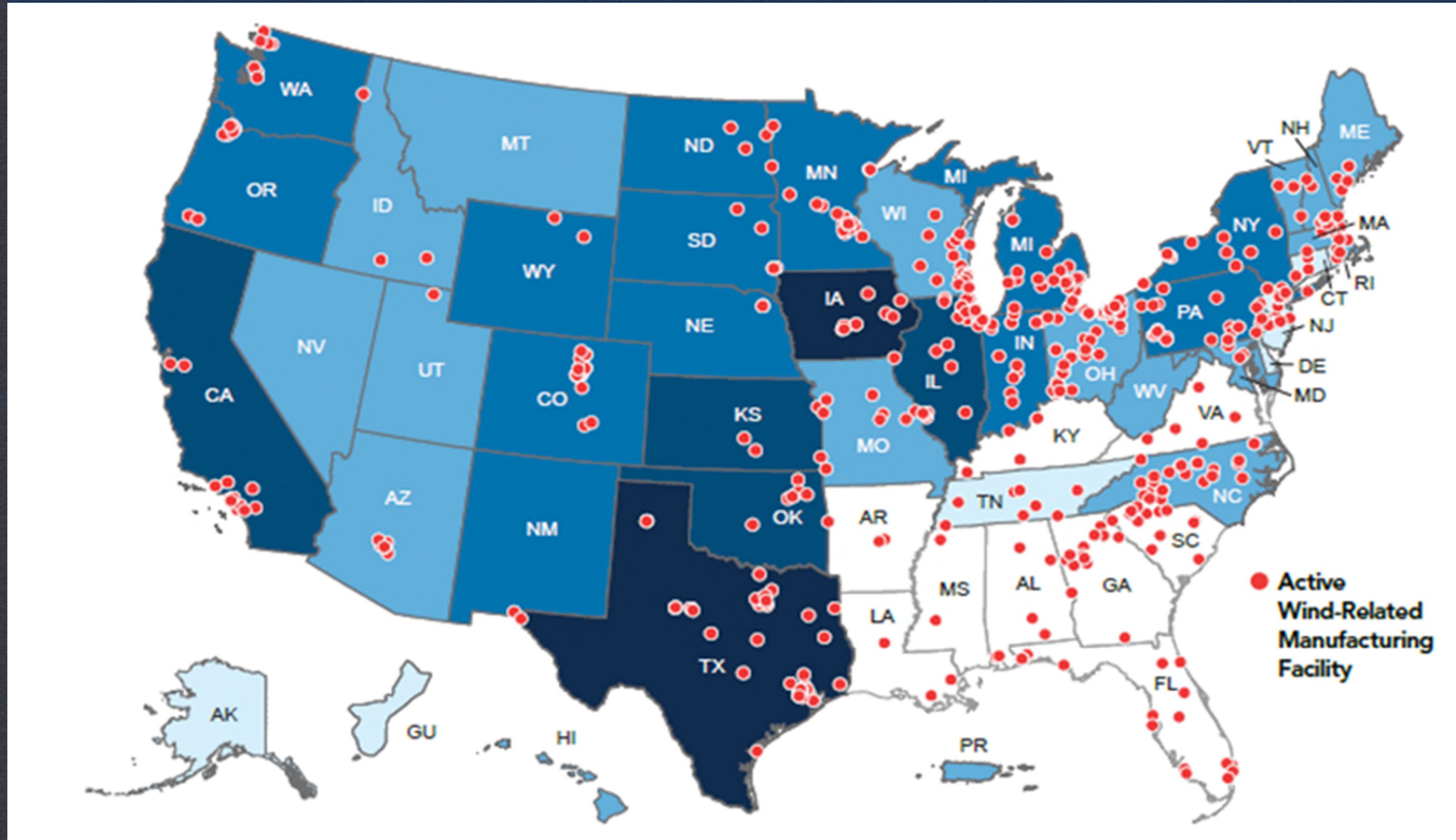
PUMPED HYDROPOWER [E.G. BECLABITO, 70 HOURS SEASONAL STORAGE]

HYDROGEN [E.G. LIBERTAD] FROM METHANE WITH CARBON CAPTURE OR GREEN ENERGY



[Source: Navajo Times]

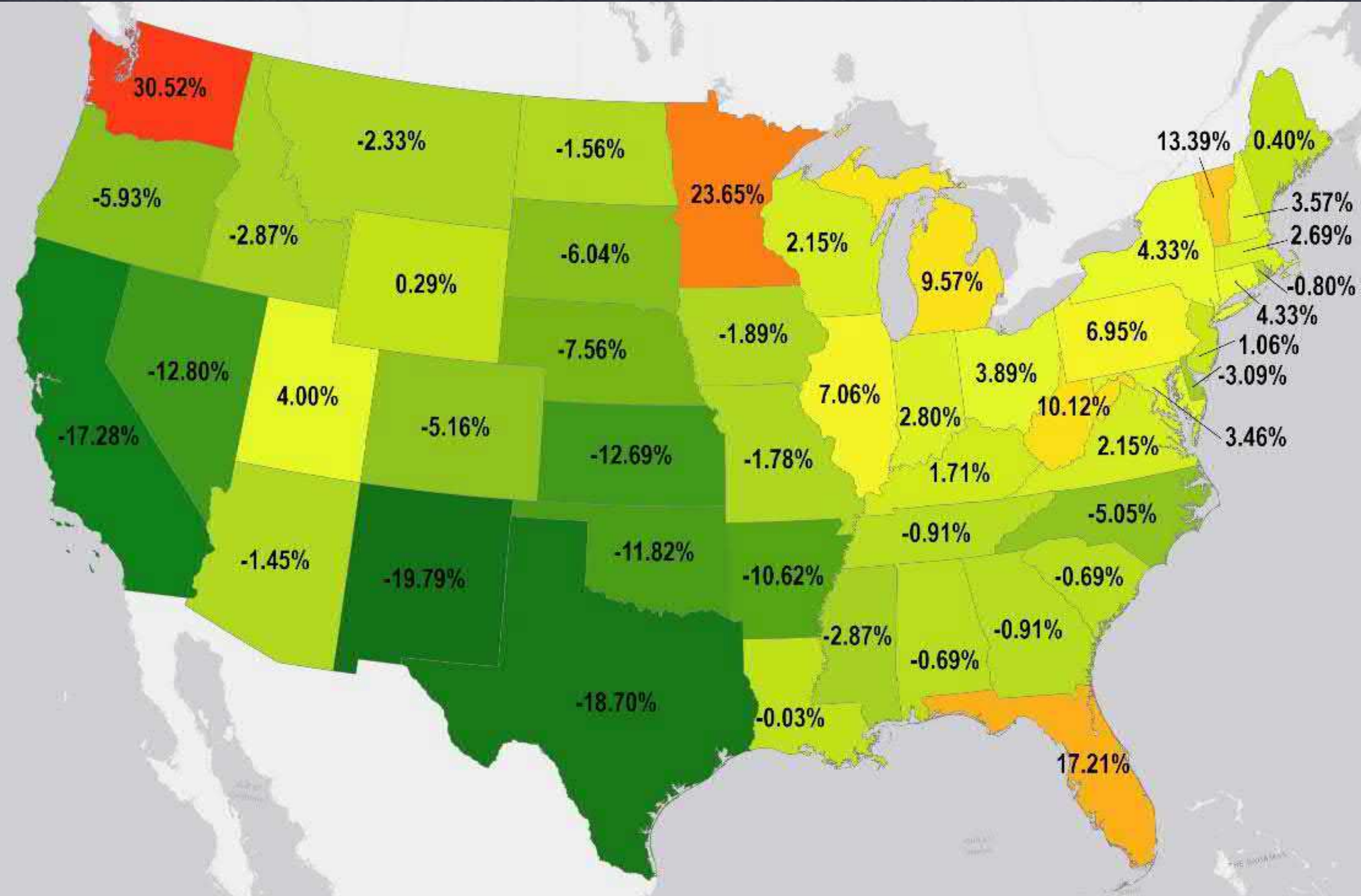
LOCAL MANUFACTURING OPPORTUNITIES



[Source: Lawrence Berkeley National Laboratory]

GREENSHORING

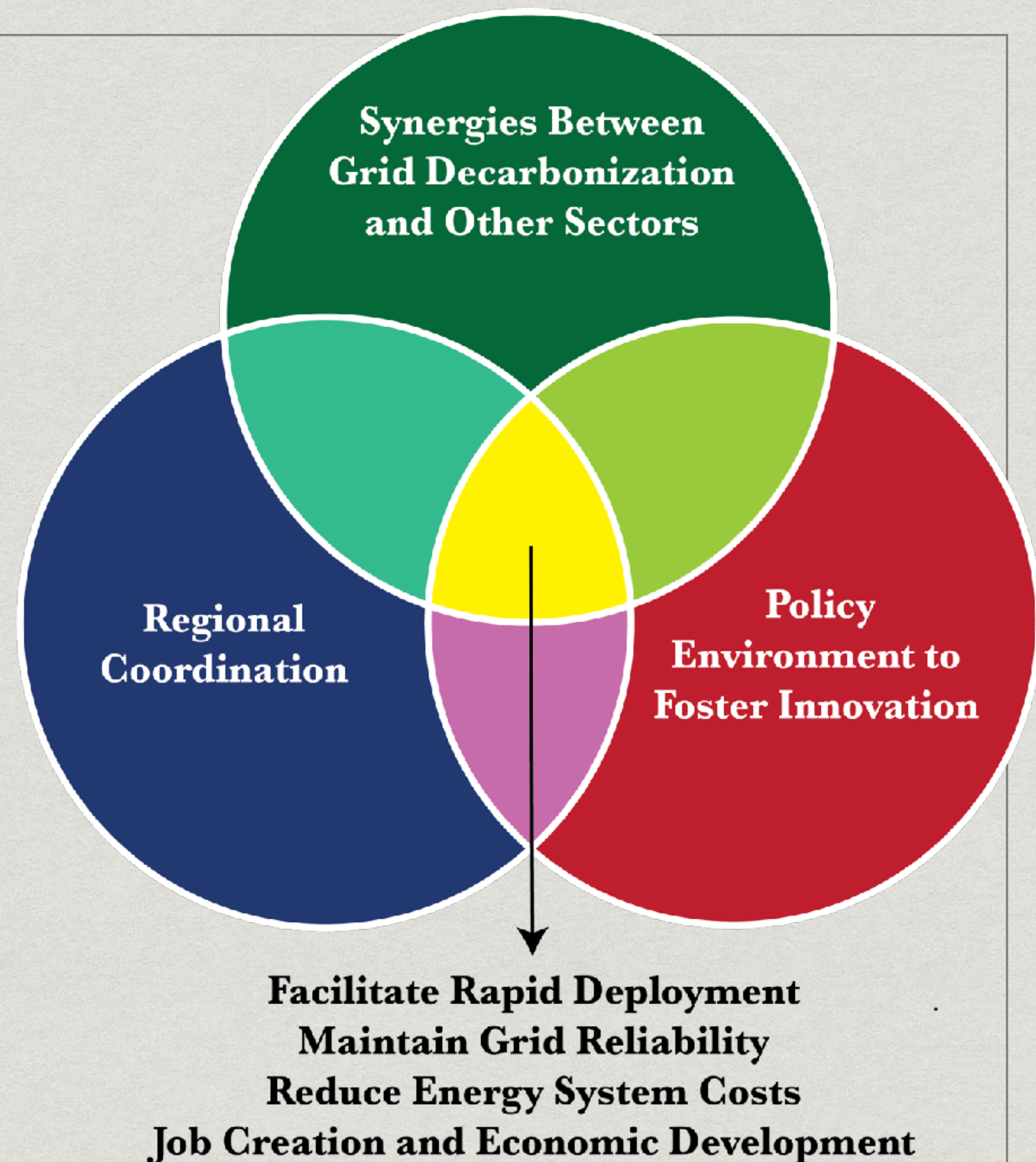
ATTRACT COMPANIES THAT WANT TO SWITCH TO RENEWABLE ENERGY



NEW MEXICO: LOWEST COST 50/50 MIX OF SOLAR AND WIND ENERGY

[Source: KiloNewton LLC]

How do we achieve these goals while creating high-quality jobs and economic growth?



Three strategies



1. Create a policy environment to foster innovation
2. Cross-sector synergies: use the grid to look beyond the grid
3. Regional coordination

1. Foster innovation: Background

Renewable energy technologies are getting cheaper and more efficient

Can smooth out variations in solar and wind with storage, demand response, and regional coordination

All this infrastructure needs to be built!

Opportunities in:

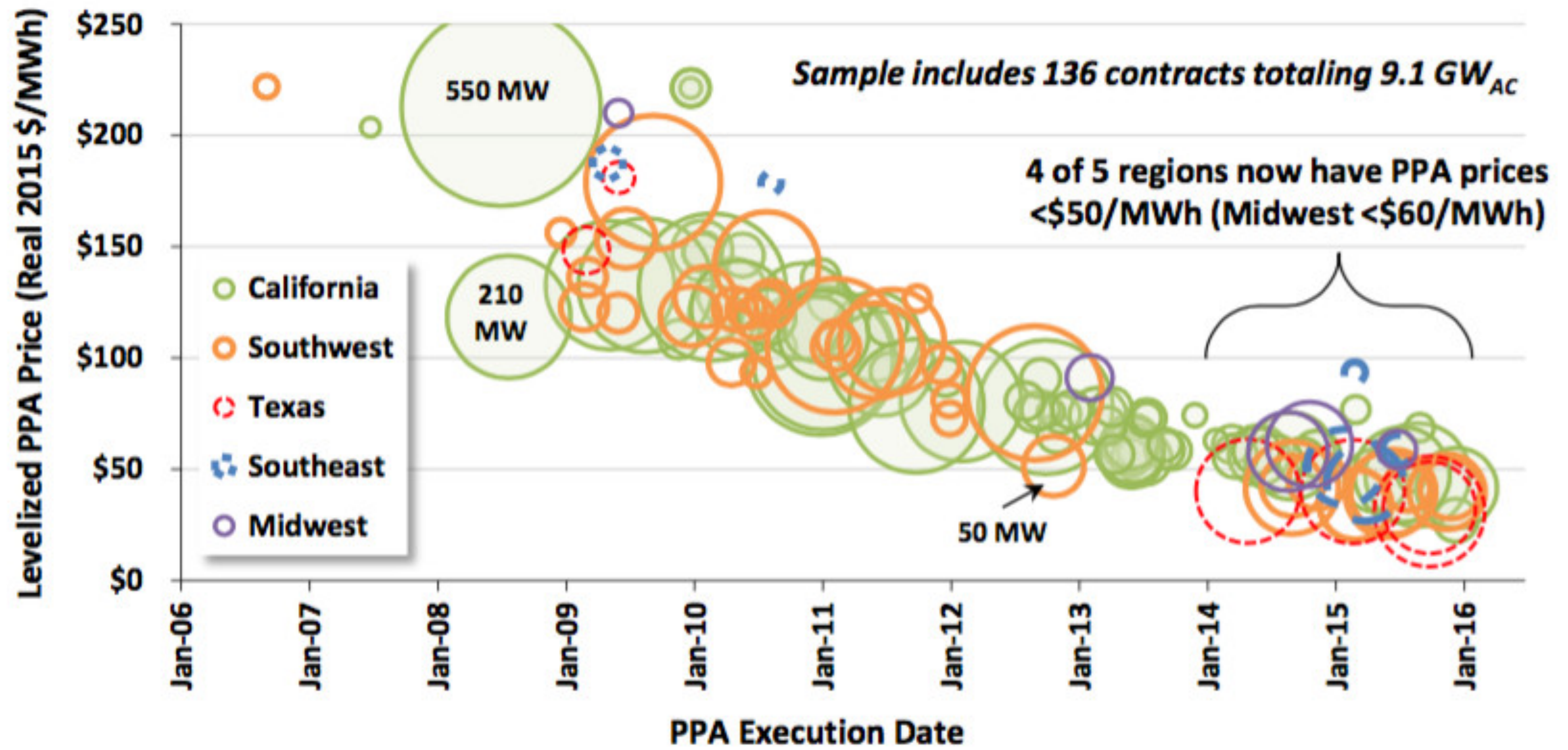
Local manufacturing

Building trades, retrofitting homes and businesses

Rural areas, Pueblos, Tribes, and Nations

Locally-based innovation to create sustained jobs and community economic growth opportunities

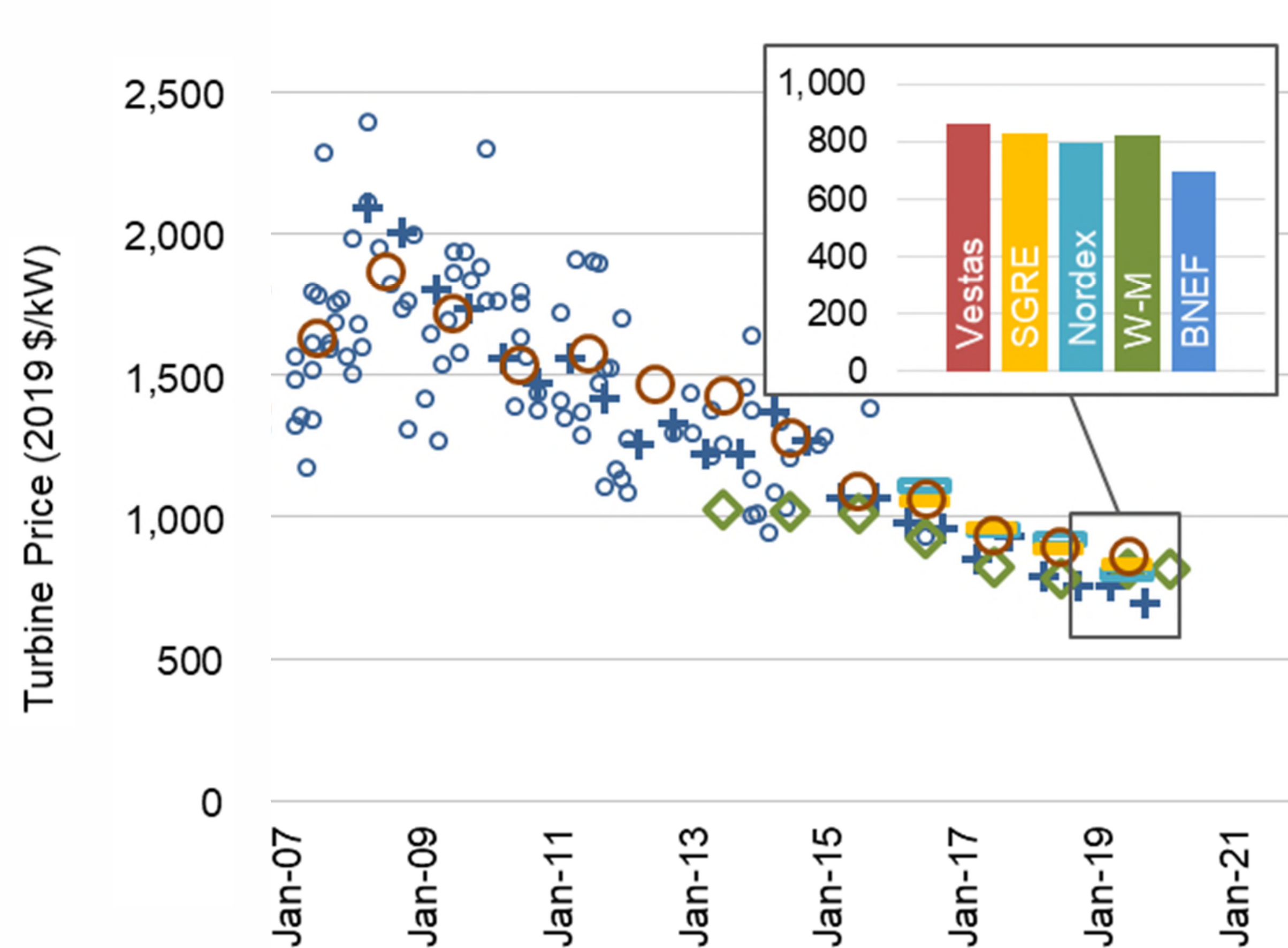
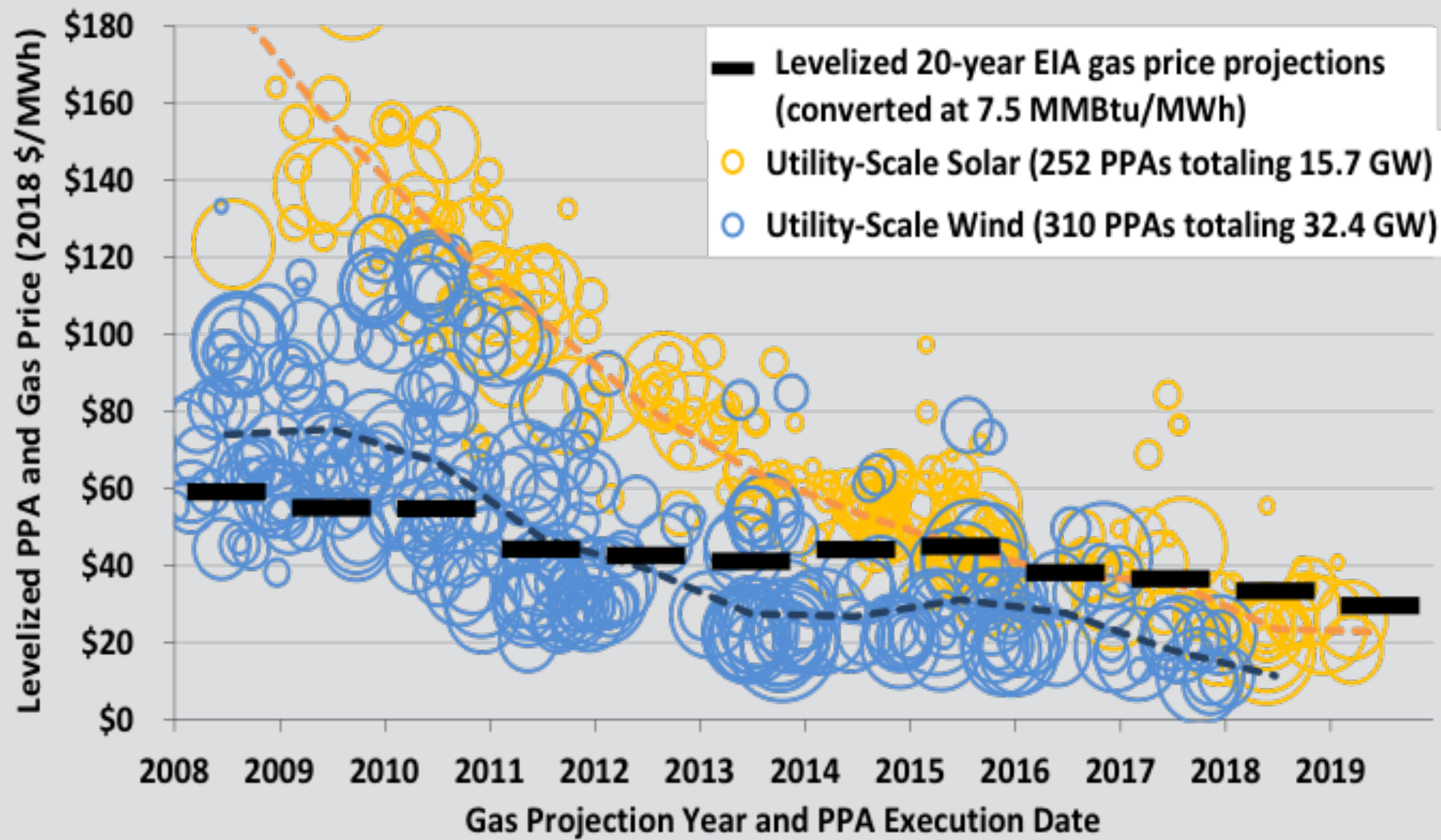




SOLAR

10X CHEAPER THAN 10 YEARS AGO

[Source: LBNL]



WIND

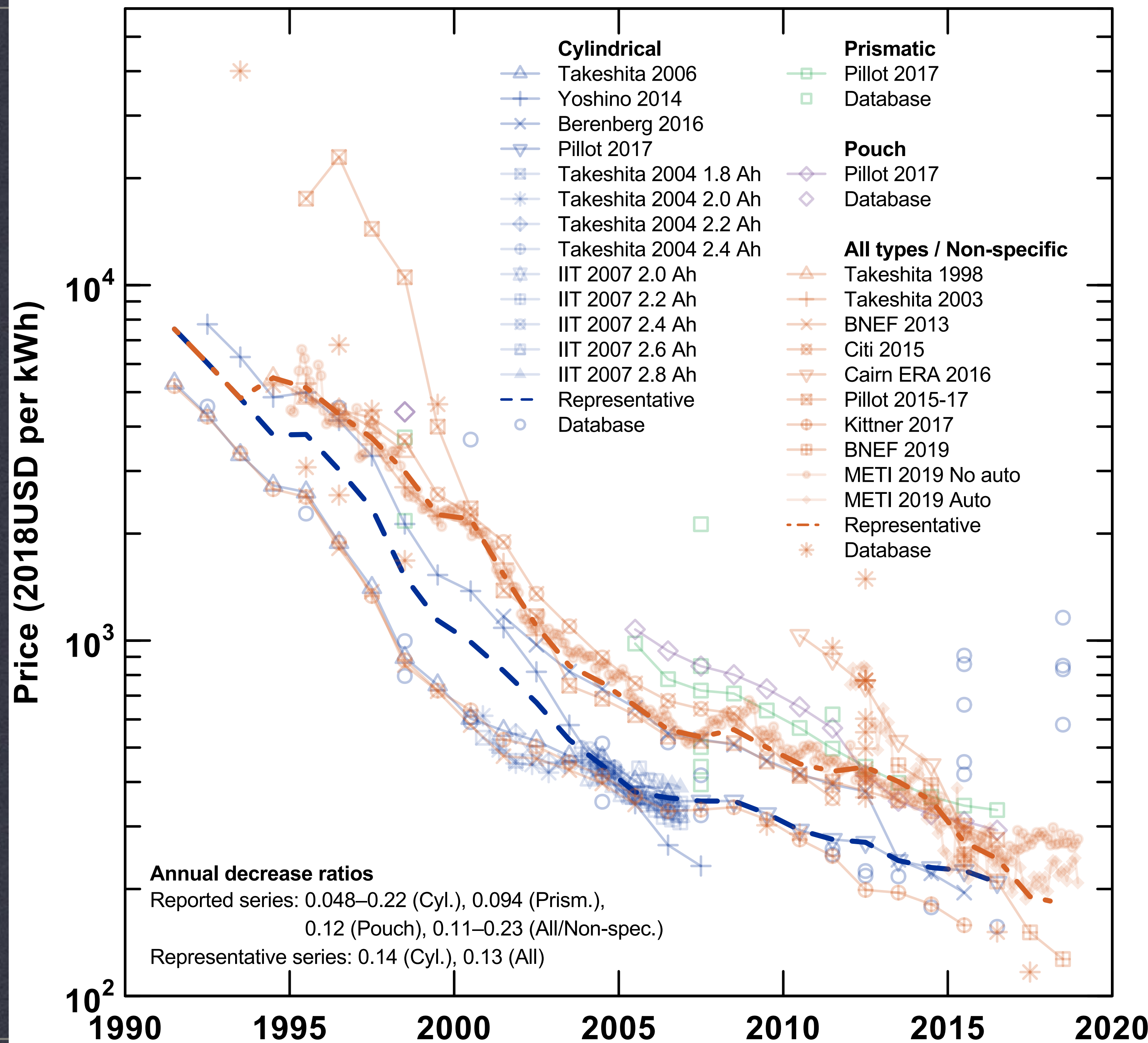
**4X-6X CHEAPER THAN 10 YEARS AGO
NOW CHEAPER THAN NATURAL GAS**

[Source: Lawrence Berkeley National Laboratory]

BATTERIES

40X CHEAPER THAN 25 YEARS AGO

[Source: Ziegler and Trancik, 2020]



REDUCING SOFT COSTS AND BARRIERS TO ENTRY

SOFT COSTS = DESIGN, PERMITTING, INSTALLATION, INSPECTION, INTERCONNECTION

STANDARDIZE ELECTRICAL CODE, UPDATE BUILDING CODES STATEWIDE

EXPEDITE PERMITTING AND INSPECTION [LAS CRUCES: SOLSMART GOLD]

INCENTIVIZE SOLAR AS PART OF ROUTINE CONSTRUCTION OR ROOF REPLACEMENT

PAY UTILITY TO MAINTAIN THE GRID

ALLOW SMART METERING AND EDGE-OF-GRID TECHNOLOGY IN RATEBASE

ALLOW DISTRIBUTED GENERATION AND STORAGE: MICROGRIDS, ROOFTOP AND COMMUNITY SOLAR

INNOVATION TESTBEDS: EXPERIMENT AND FAST-TRACK TESTING



BUILDING TRADES

**SANTA FE COMMUNITY COLLEGE:
ENERGYSMART ACADEMY, ACCREDITED BY
INTERSTATE RENEWABLE ENERGY COUNCIL
(IREC)**

**WEATHERIZATION ASSISTANCE PROGRAM:
23,300 HOMES SINCE 2002 (PEAK IN 2010)
\$7,500 PER HOUSEHOLD**

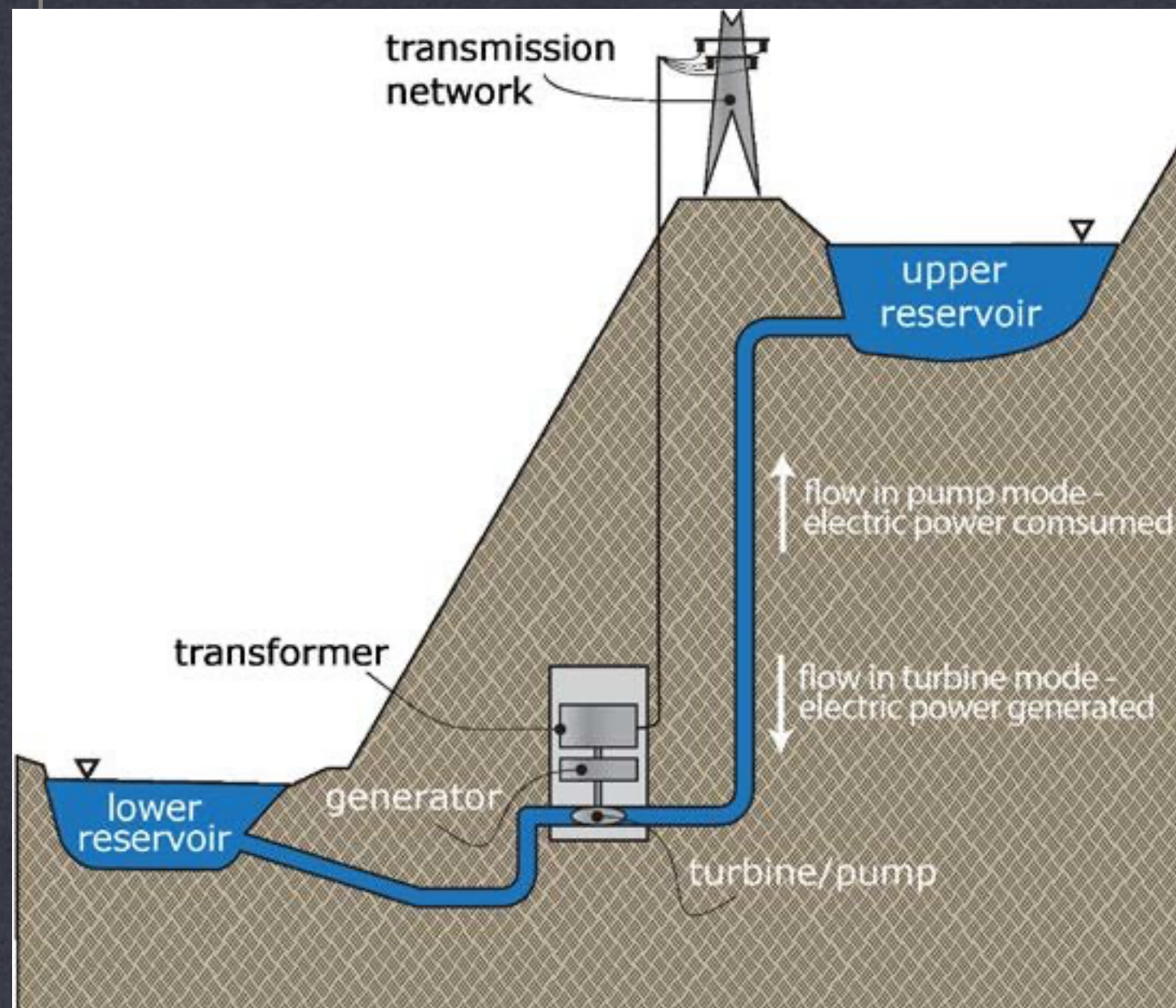
SAVINGS FOR HOMEOWNER

**HUGE POTENTIAL:
170,000 NM HOMES UNDER FEDERAL
POVERTY LEVEL**



DEALING WITH VARIABILITY: NOT JUST BATTERIES

NEED TO HANDLE VARIATIONS OVER MINUTES, HOURS, AND SEASONS



PUMPED HYDROPOWER

DEMAND RESPONSE

POWER-TO-GAS (HYDROGEN ETC.)

Three strategies



1. Create a policy environment to foster innovation

Fast-track innovation through an environment that supports experimentation: e.g. testbeds, public-private partnerships

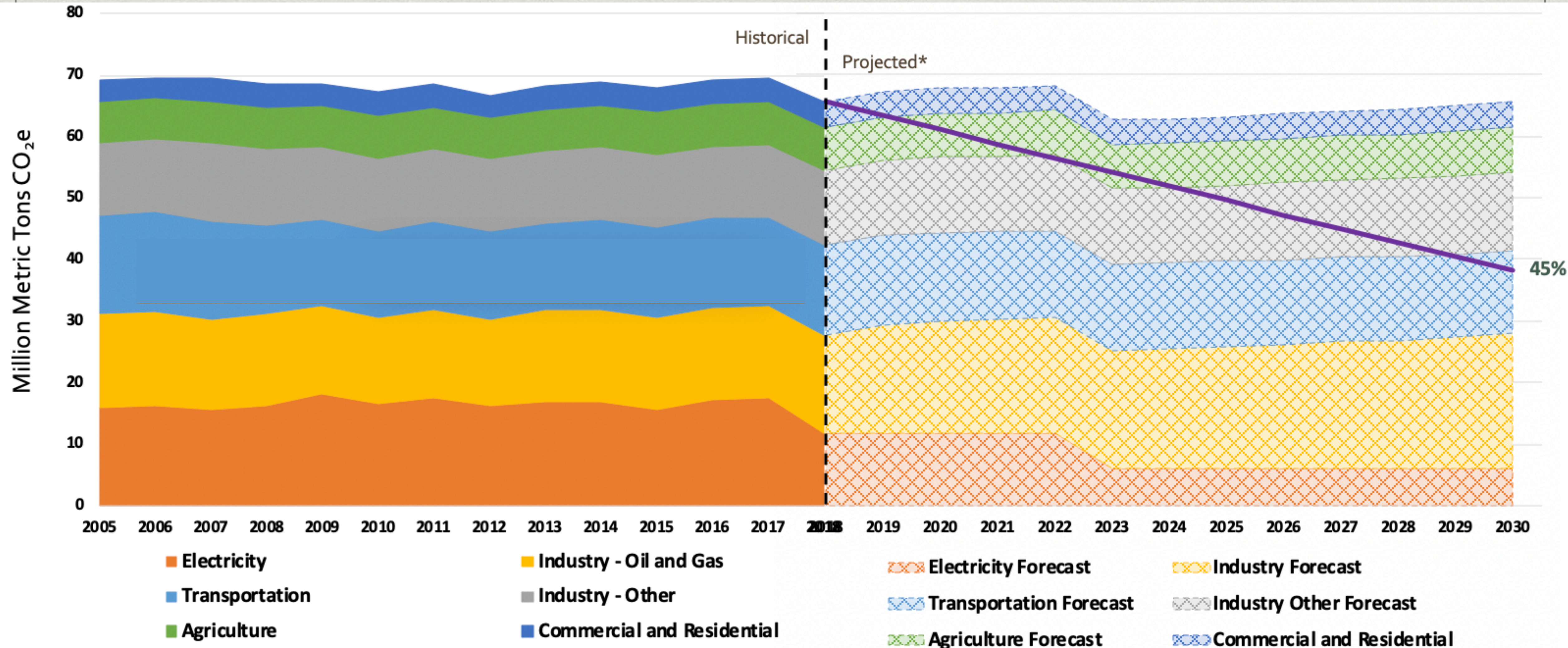
Factor technological innovation trends into regulatory decision-making

Measure regulatory decisions against ETA and other climate goals

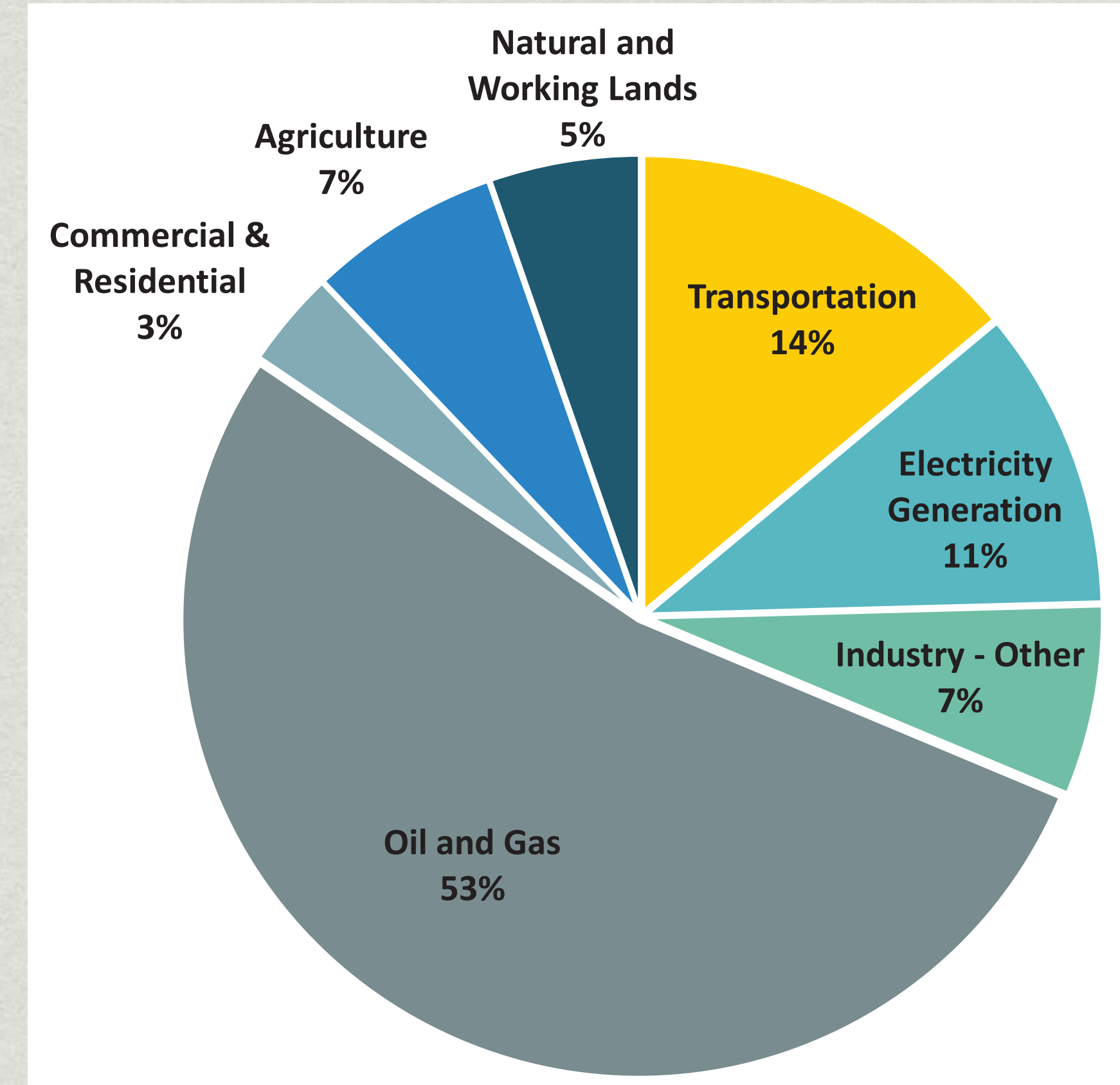
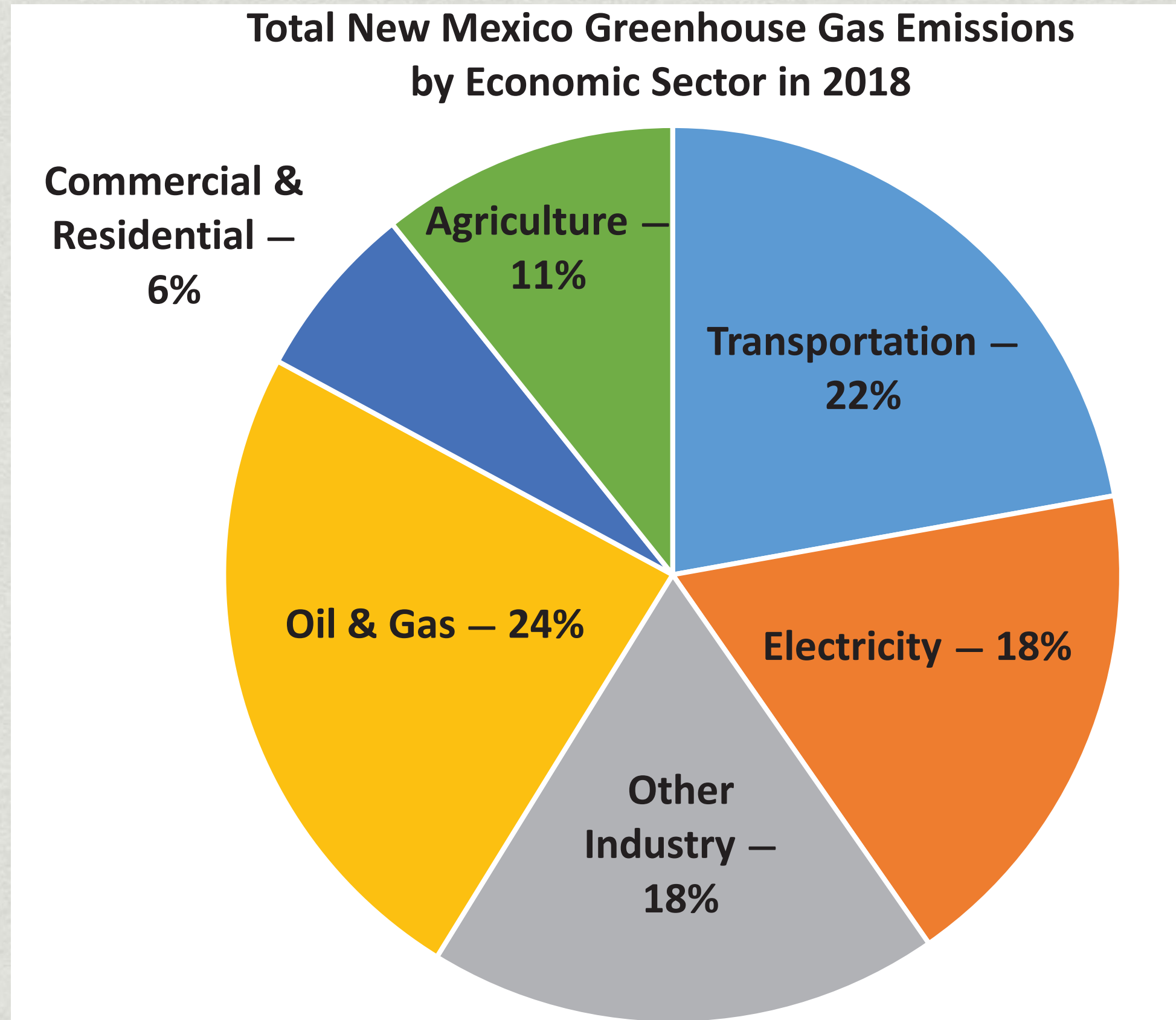
2. Cross-sector synergies: use the grid to look beyond the grid

3. Regional coordination

2. Cross-sector synergies: Background



2. Cross-sector synergies: Background



[Source: NM Climate Strategy, 2019/20]

2. Cross-sector synergies: use the grid to look beyond the grid

How can we leverage grid decarbonization to achieve goals in other sectors?

Electrification: shift from fossil fuel use to carbon-free electricity

Save homeowners and businesses money

Retrofits for efficiency and fuel-switching create jobs

Use flexible devices to smooth variations in solar and wind



TRANSPORTATION

EQUITABLE INCENTIVES FOR EVS
INCLUDE CHARGING STATIONS
IN PUBLIC PARKING,
COMMERCIAL DEVELOPMENTS

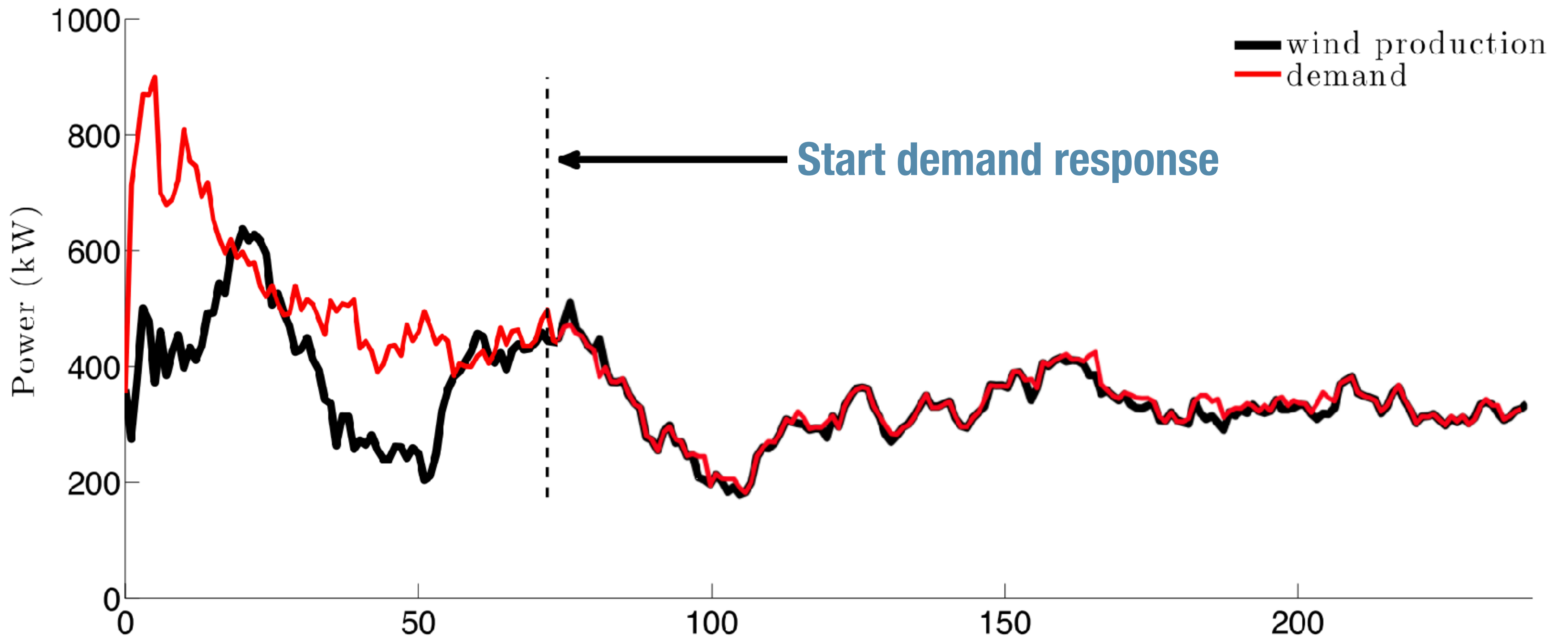


HEATING

SWITCH FROM NATURAL GAS AND
PROPANE TO HEAT PUMPS AND
ELECTRIC WATER HEATERS:
RETROFIT JOBS IN THE TRADES



USE DECARBONIZED GRID TO DECARBONIZE OTHER SECTORS



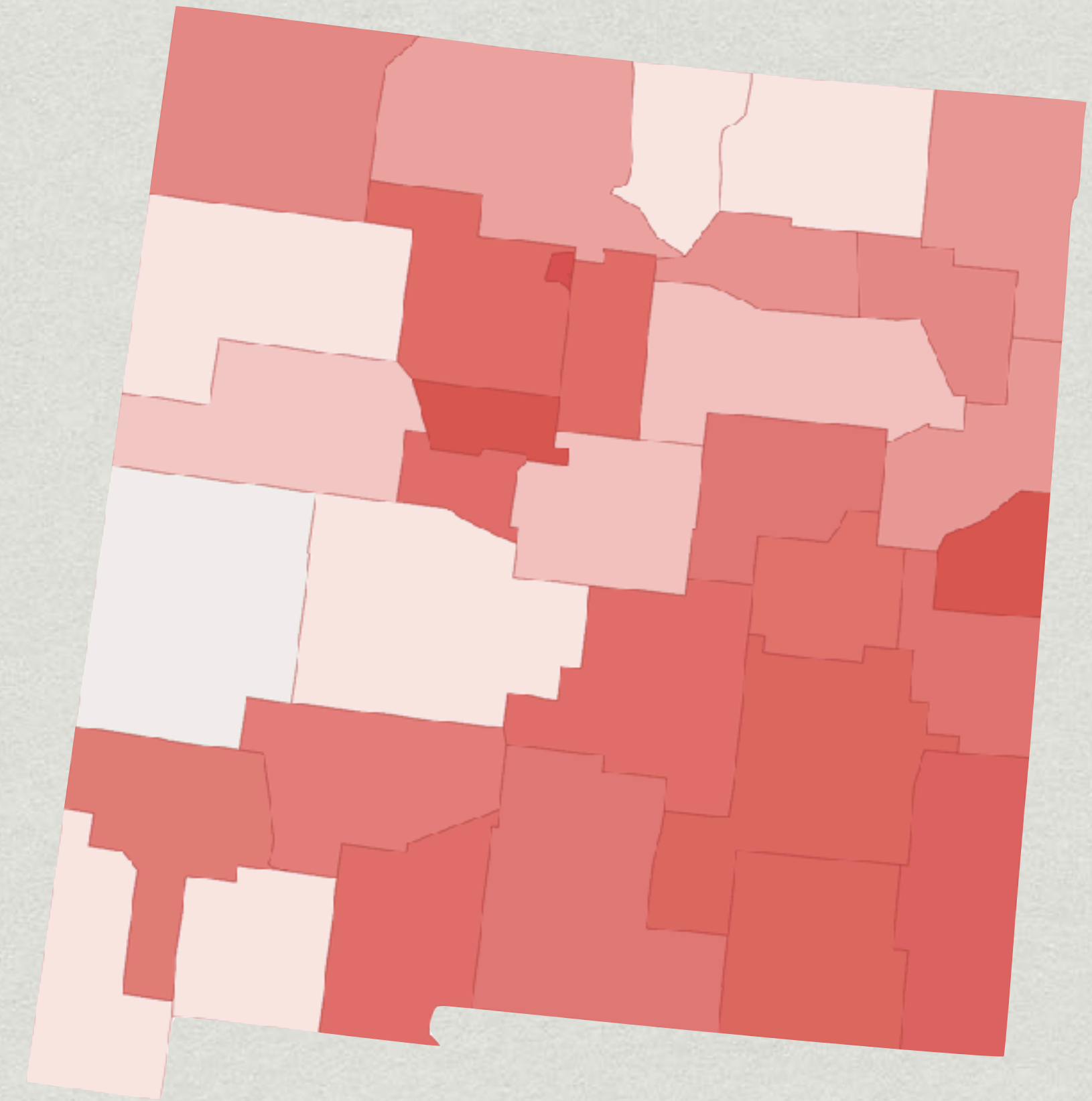
300 5-kW water heaters choreographed by PEM to track with 350 ± 150 kW of renewable generation **in real-time**

FLEXIBLE DEVICES CAN MATCH DEMAND WITH SUPPLY

2. Cross-sector synergies cont'd: Land use and infrastructure



**Affordable housing close to jobs, services
including mixed-use and multifamily**



**Rural broadband to allow telecommuting
and online education**

Three strategies



1. Create a policy environment to foster innovation

2. Cross-sector synergies: use the grid to look beyond the grid

Set specific targets and timelines for each sector like ETA did for the grid

Opportunities for job creation and economic growth, e.g. electrification

Keep sectors in sync: e.g. if vehicle electrification lags too far behind grid decarbonization, we miss an opportunity to use EVs as grid storage

3. Regional coordination

3. Regional Coordination: Background

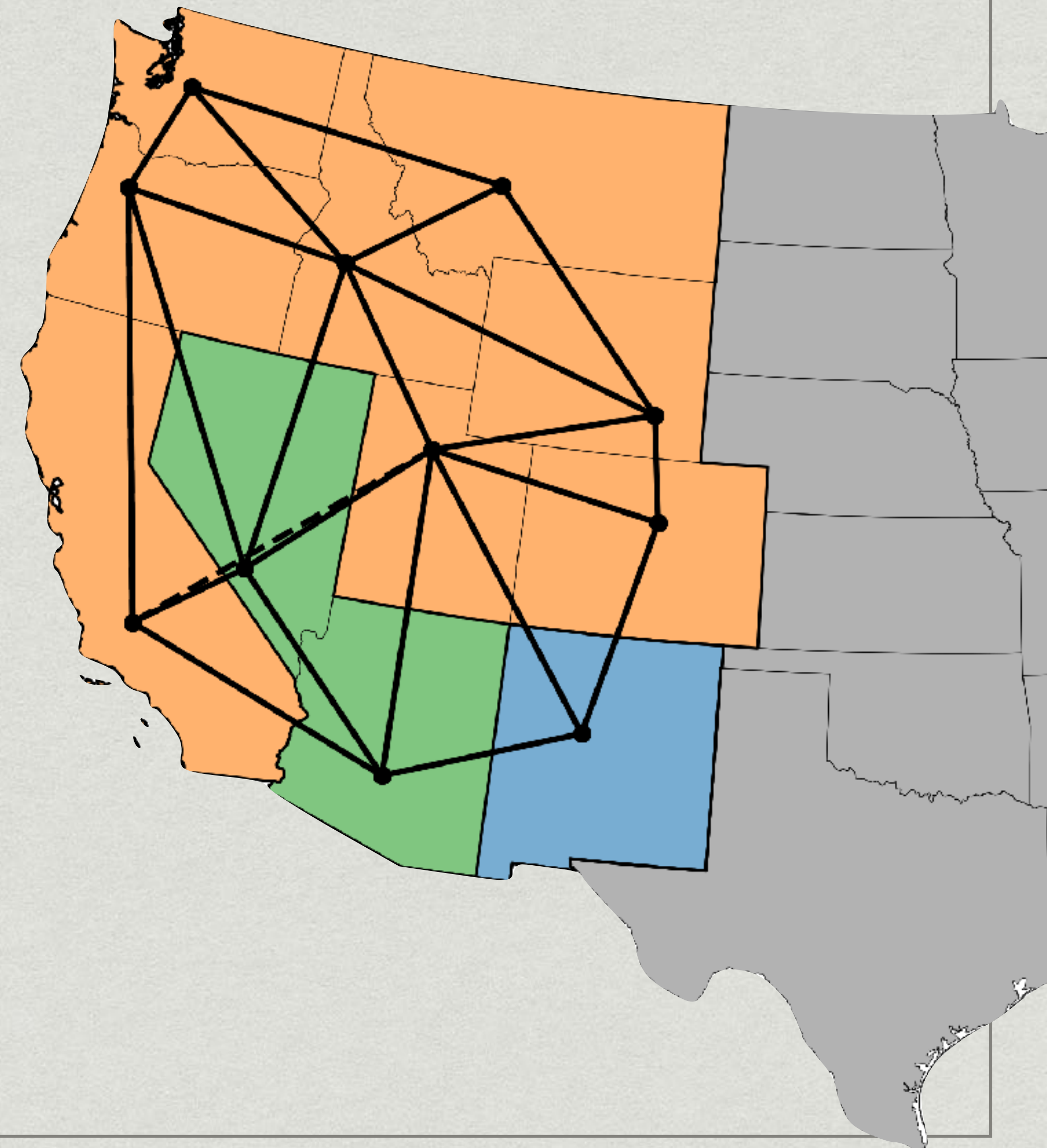
Let energy flow from where it's plentiful to where it's needed: supply and demand

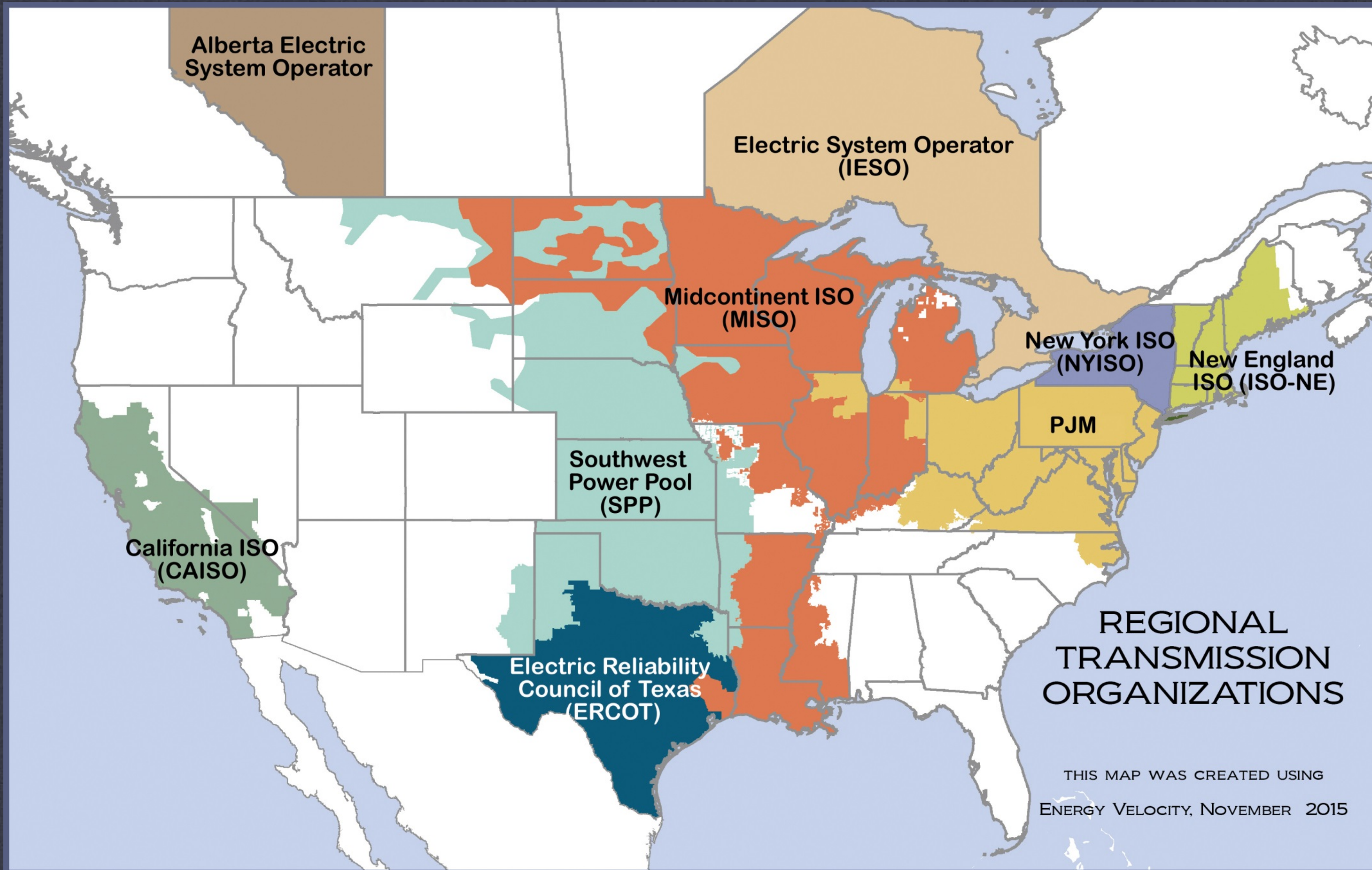
New Mexico has a surplus of solar and wind: wind in Eastern NM, solar everywhere

Our wind “complements” solar elsewhere in the West: blows at night, October thru May

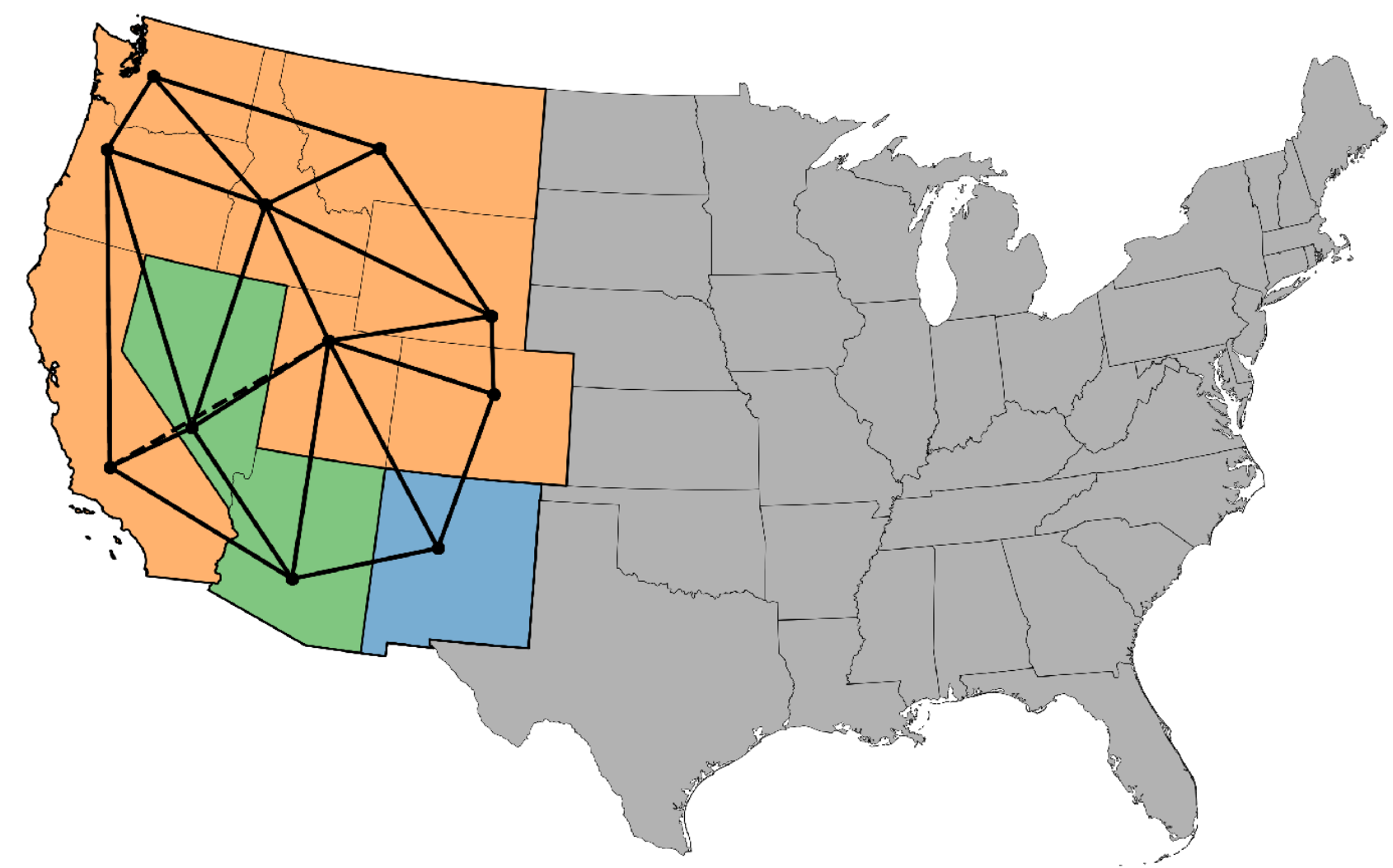
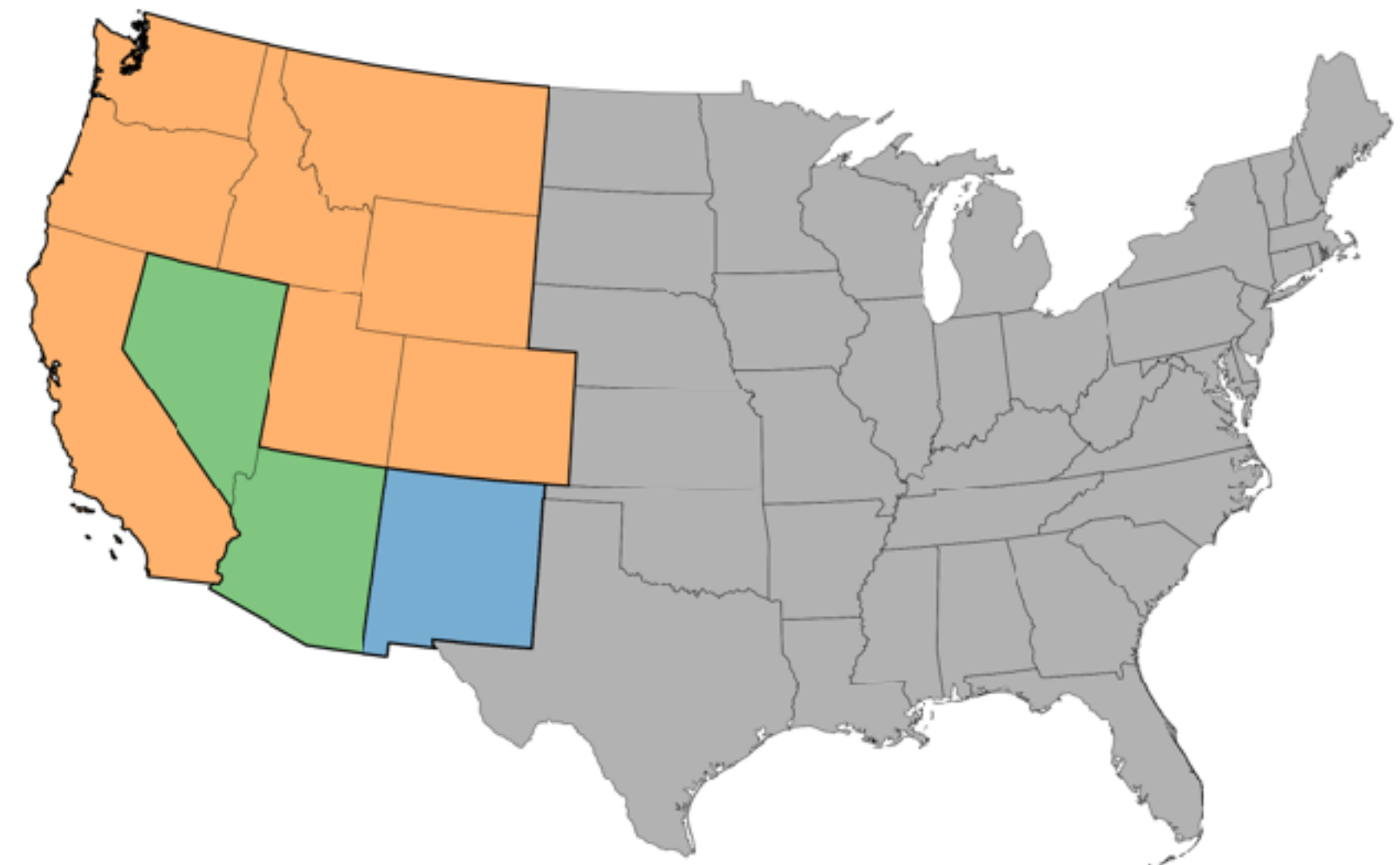
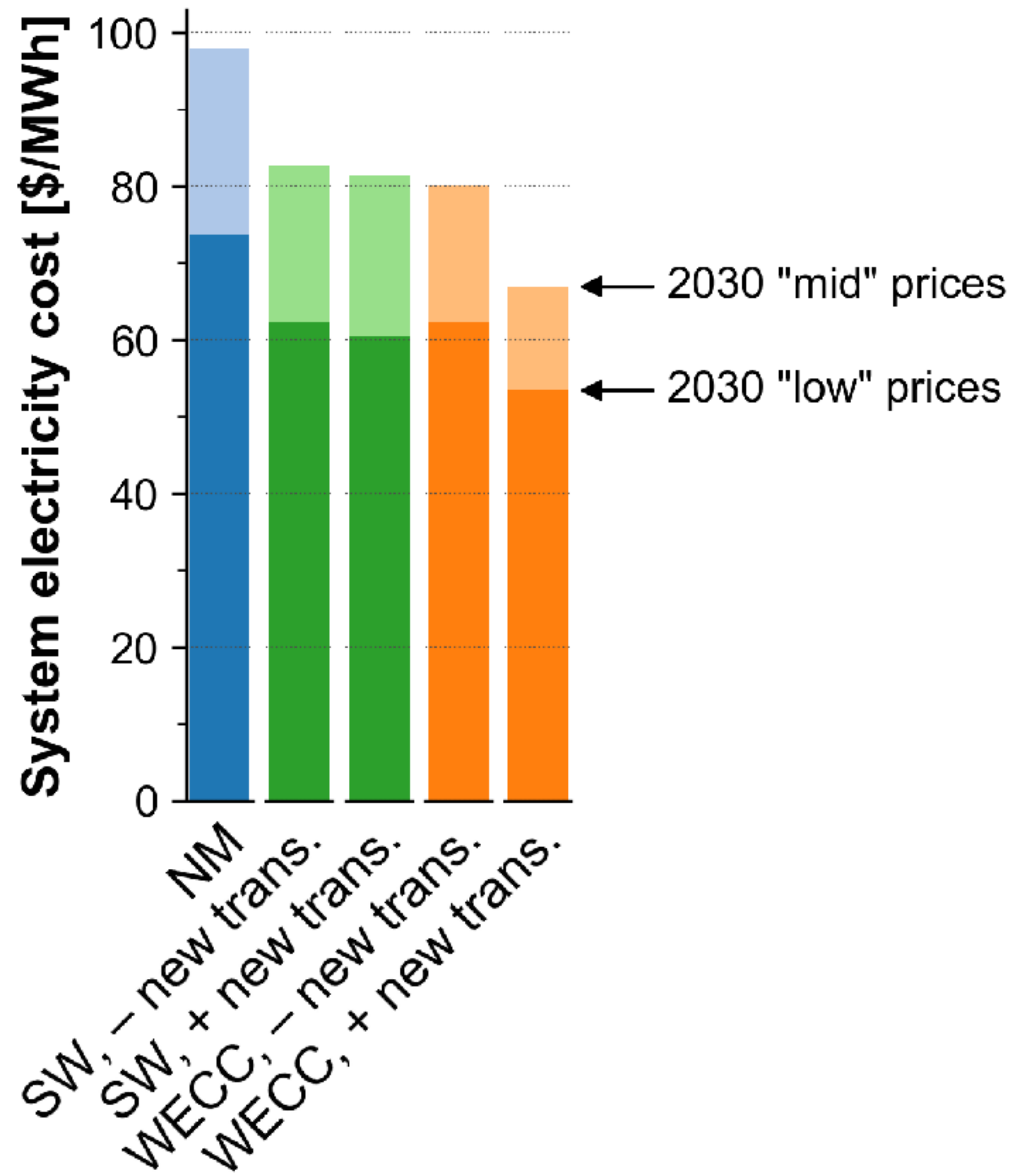
New Mexico can export more power...

...and reduce overall costs by coordinating transmission planning



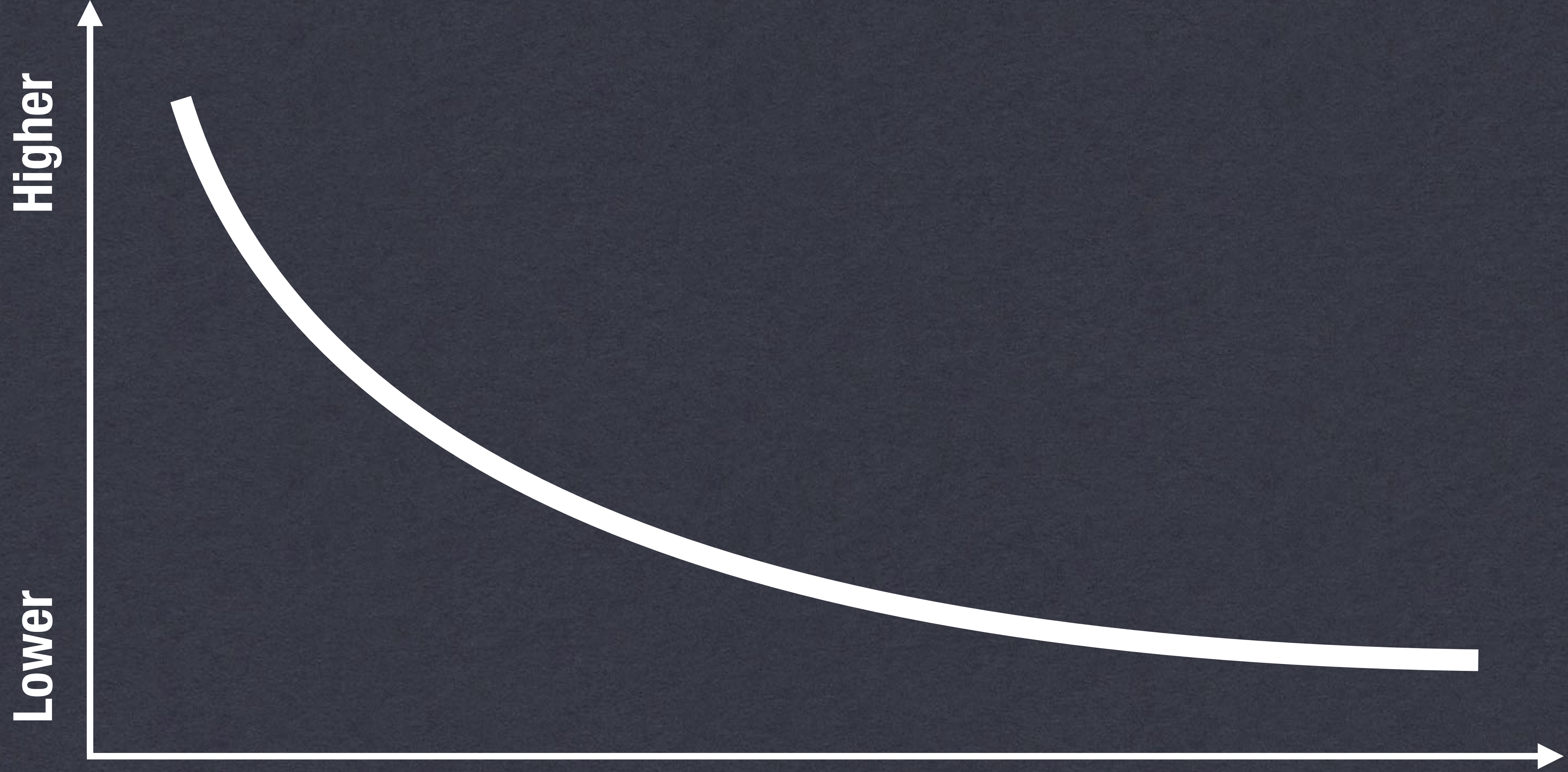


REGIONAL TRANSMISSION ORGANIZATIONS



REGIONAL COORDINATION REDUCES COSTS

**Engineering Cost to
Decarbonize the Grid**



**New Mexico
Alone**

**EIM
Market**

**Southwestern
Power Pool or RTO**

Western RTO

FROM MARKETS TO POWER POOLS TO AN RTO

Three strategies



1. Create a policy environment to foster innovation
2. Cross-sector synergies: use the grid to look beyond the grid
- 3. Regional coordination**
 - Lower the cost of decarbonization, improve grid stability**
 - Export solar and wind power to neighboring states**
 - Expand markets for successful innovations, create more jobs, more economic opportunity**

Conclusions

New Mexico can **Lead** Decarbonization in the Southwest and **Create Economic Opportunities**

Policy Environment to Foster Innovation

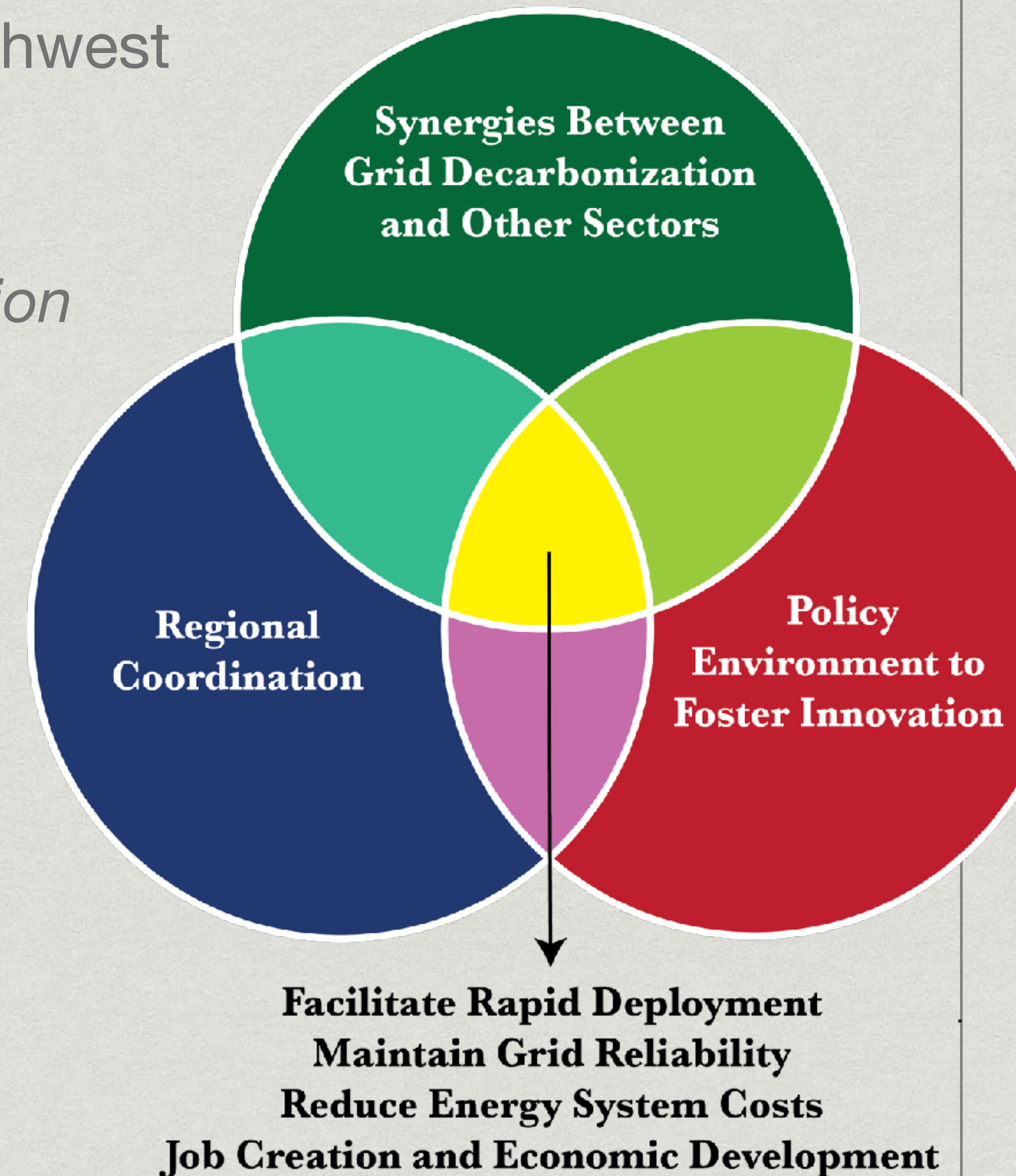
Support partnerships, experimentation and innovation
Use innovation trends to inform regulation
Keep decisions consistent with climate goals

Synergies Between the Grid and Other Sectors

Targets and timelines for broader decarbonization
Where can a green grid help other industries?

Regional Coordination

Expand markets for NM's green power
Lower the costs of meeting the ETA
Make a greener grid more reliable





QUESTIONS?

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