

# The Four Corners Wind Resource Center

[www.fourcornerswind.org](http://www.fourcornerswind.org)

With funding provided by the  
US Department of Energy, NREL,  
and the Utah Office of Energy  
Development



Photo courtesy of Avangrid Renewables, LLC

# UNDERSTANDING Regional Electricity Markets:

## The Impact on Wind and Solar Development

Four Corners Wind Resource Center

[www.fourcornerswind.org](http://www.fourcornerswind.org)

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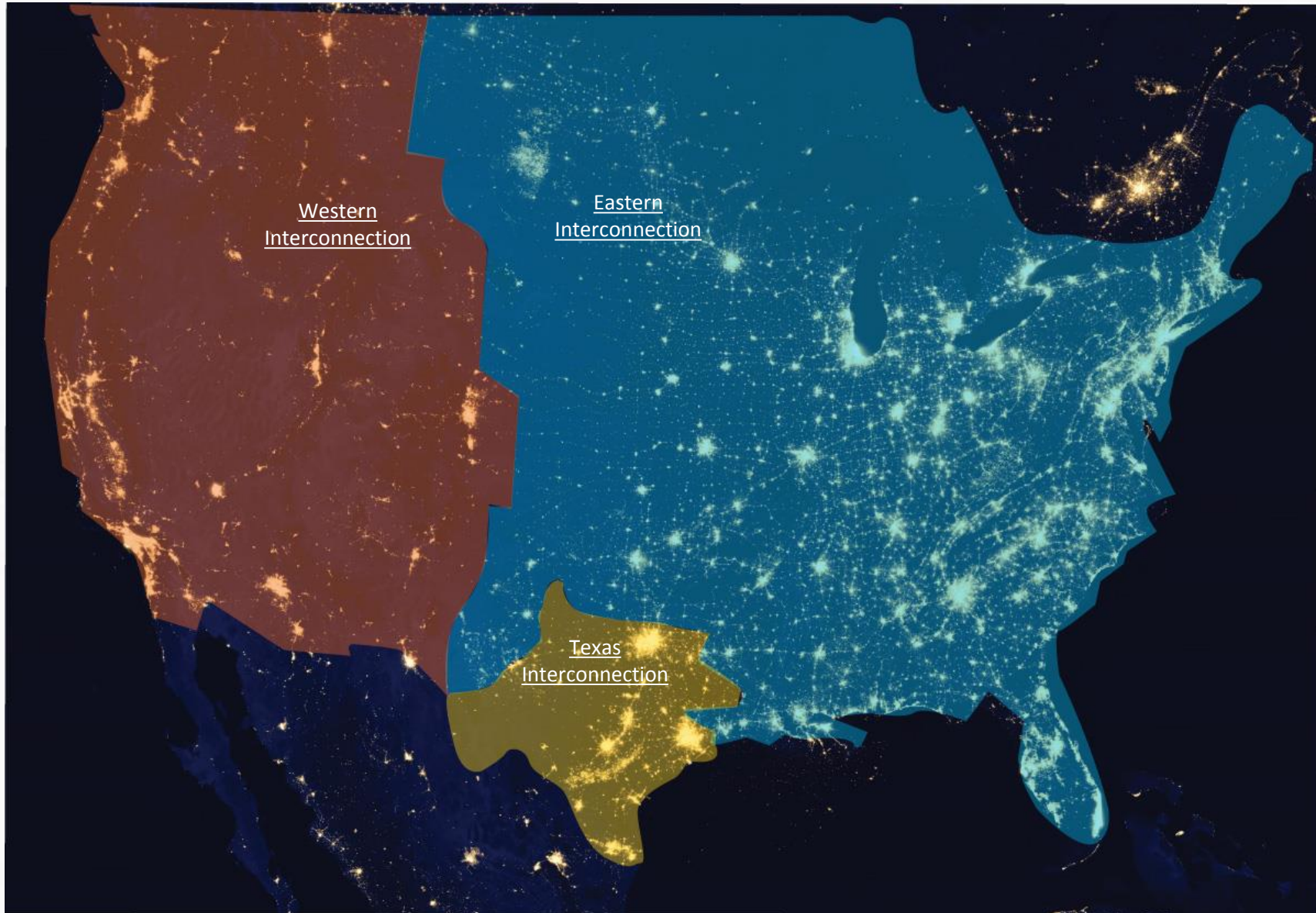
December 2016



## Our Electricity Grid

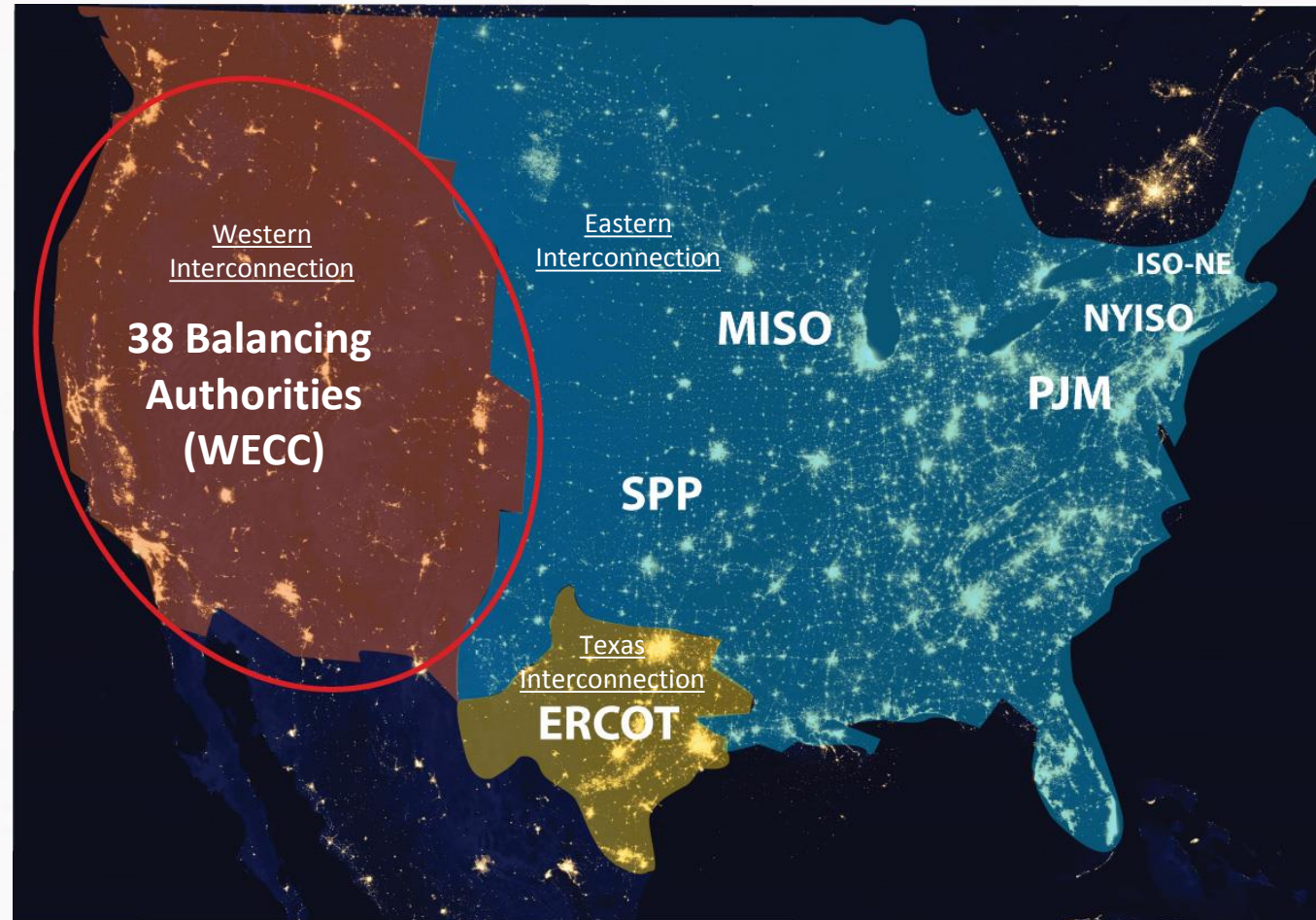


# Our Electricity Grid(s)



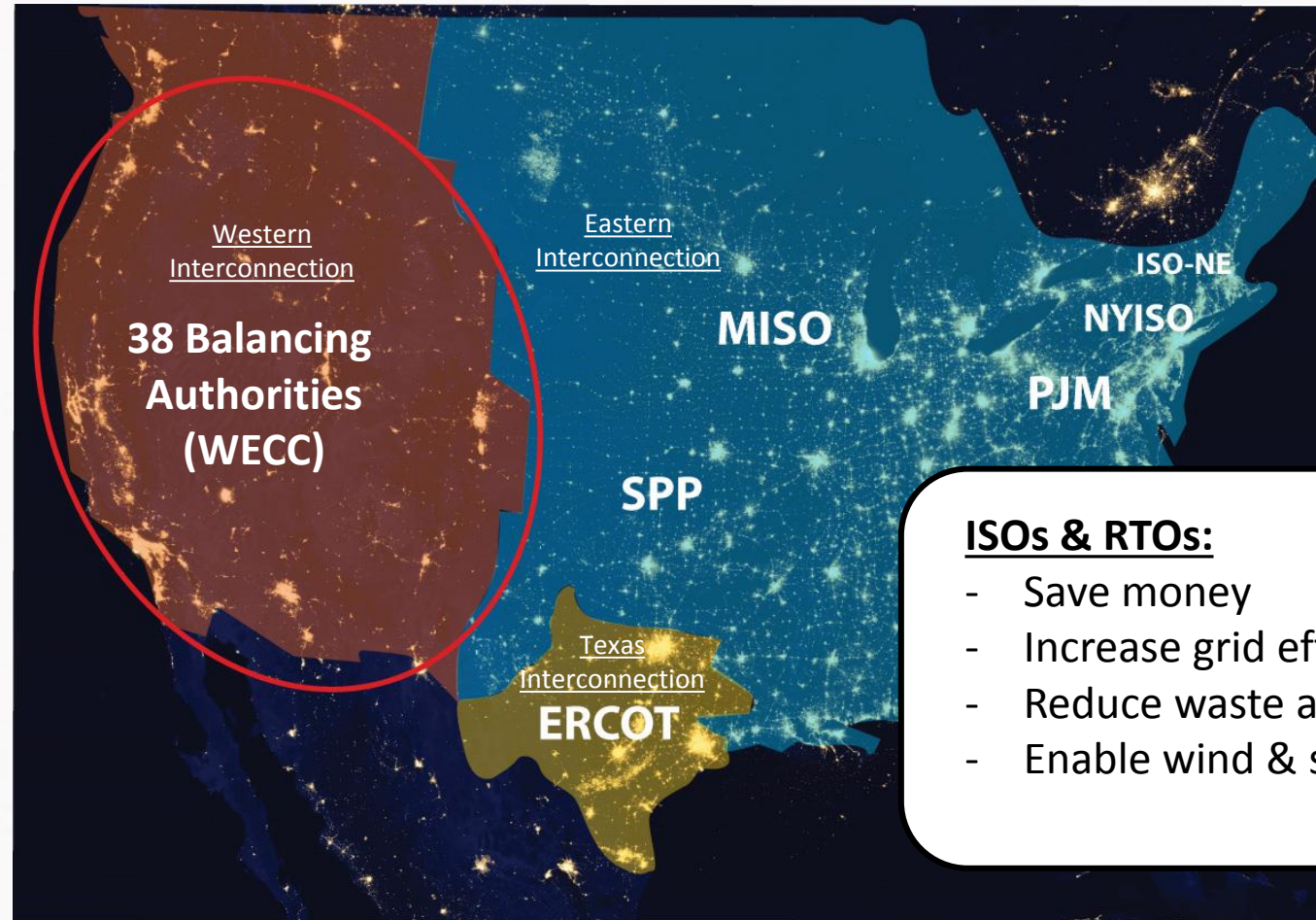


## Our Electricity Grid(s)



	States/ Territories	Population	Capacity (MW)	Balancing Authorities
MISO	16	45,100,000	176,559	1
SPP	14	23,000,000	83,465	1
PJM	14	61,000,000	142,863	1
Western Interconnection	14	82,000,000	284,300	38

## Our Electricity Grid(s)



### ISOs & RTOs:

- Save money
- Increase grid efficiency
- Reduce waste and CO<sub>2</sub>
- Enable wind & solar

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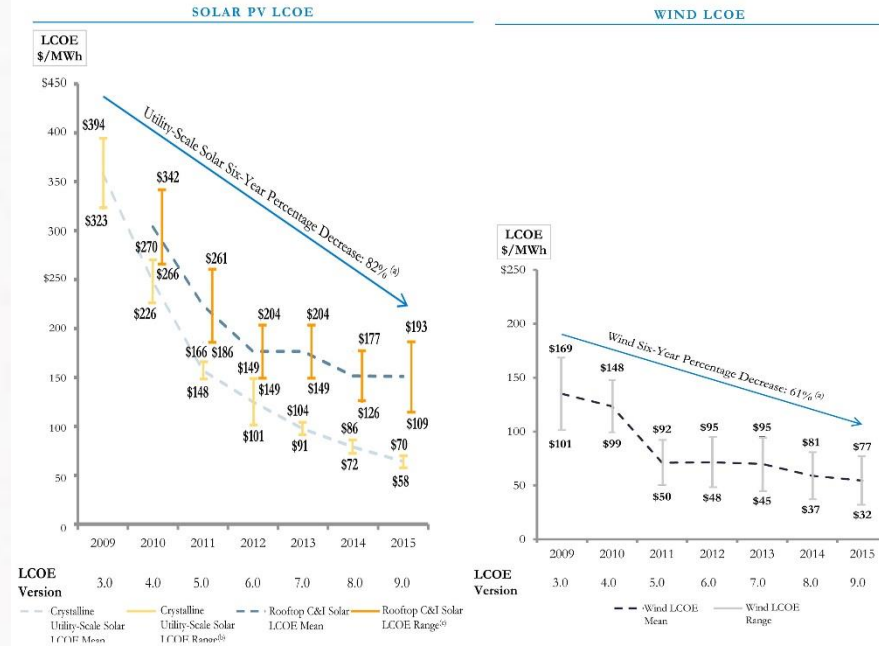
# **Why Does it Matter to the West?**

# Why Does an ISO Matter:

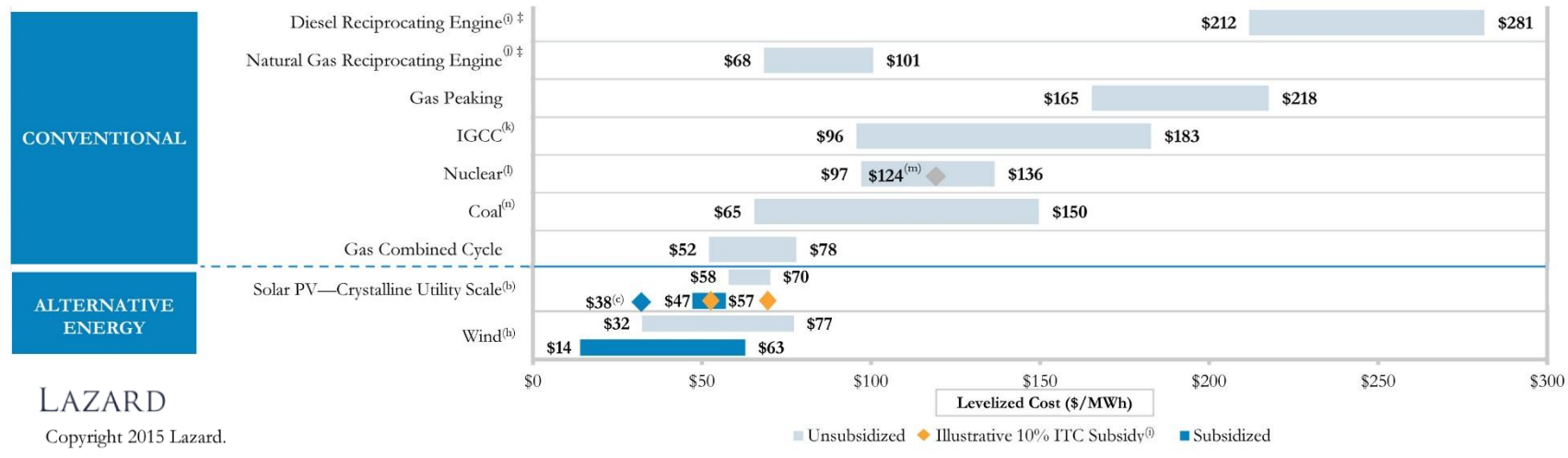
## 1. Low-cost energy

Wind and solar are cheaper than gas and coal.

### Wind/Solar PV (Historical)



### Levelized Cost of Energy



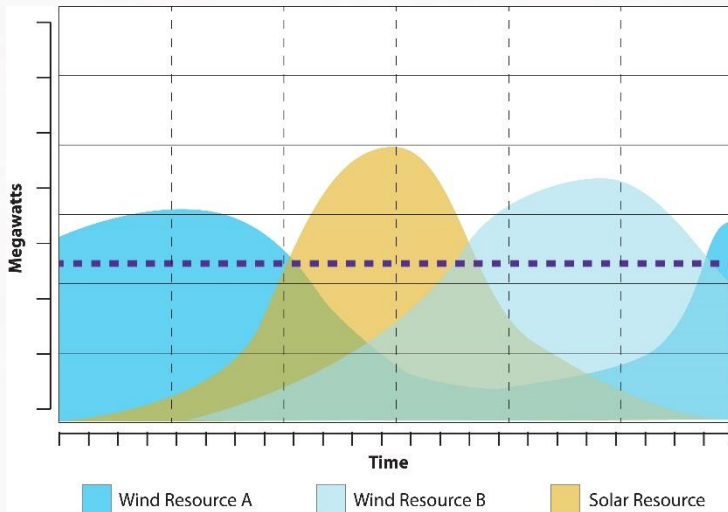


## Why Does an ISO Matter:

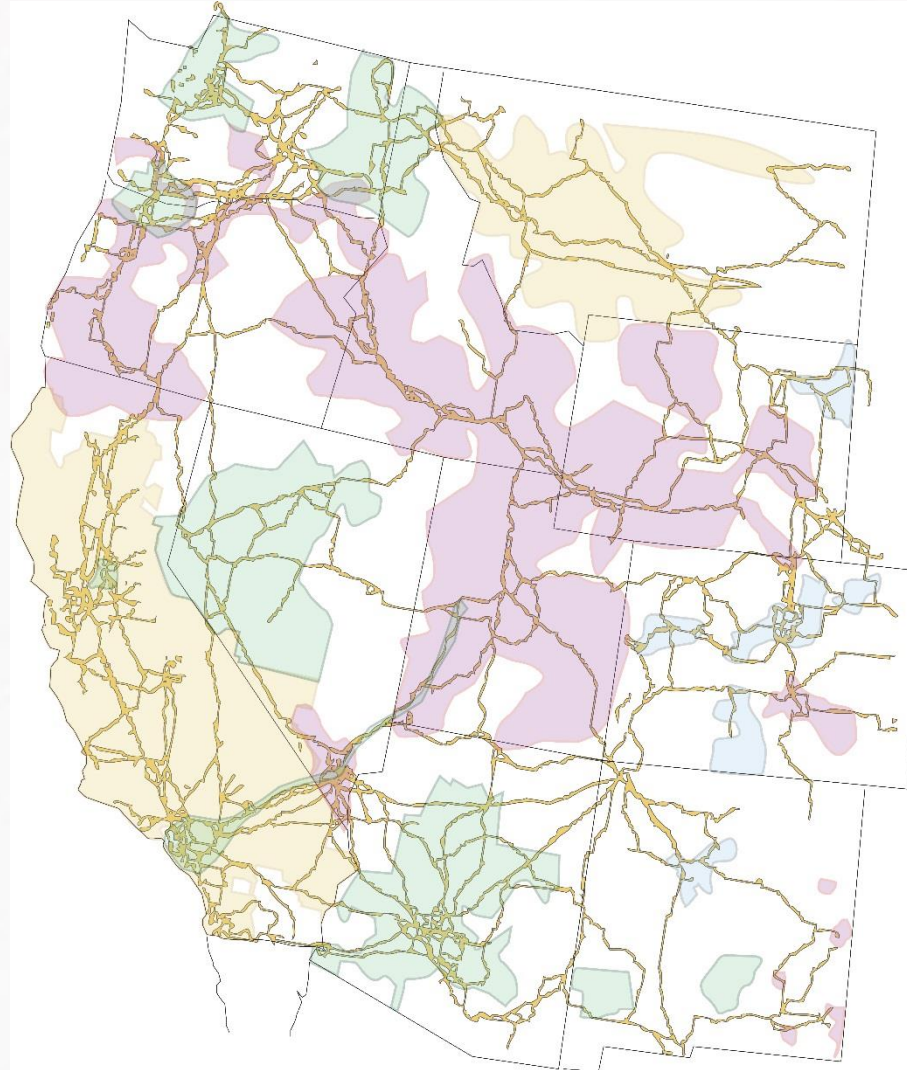
### 1. *Low-cost energy*

Wind and solar  
are cheaper than  
gas and coal.

But... they need a broad regional  
market to realize their full value.



Regional diversity enables optimized  
pairing of wind and solar.



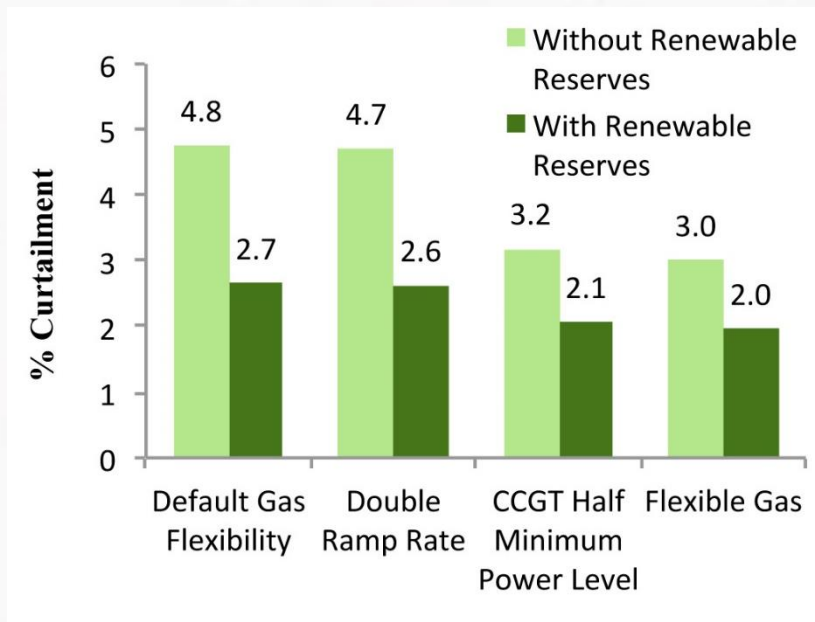
The current western grid is a patchwork of control areas,  
poorly equipped to benefit from high value renewables.

## Why Does an ISO Matter:

### 1. Low-cost energy

## A Grid Designed for Renewables

- ❖ Renewables are cheap, but if poorly managed the low cost energy can be wasted via curtailment.
- ❖ Renewables at high penetration need to offer Ancillary Services.
- ❖ A regional ISO enables renewables to do the “work” of the grid.



*“Renewable flexibility” from a regional ISO is more economical at 50% RPS levels than conventional gas methods of providing core grid services.*

WECC Average NCF Gas: **23%**

WECC Average NCF Coal: **62%**

WECC Wind Potential NCF: **55%**



## Why Does an ISO Matter:

1. *Low-cost energy*
2. *Coal transition*

**5,500+** MW of coal is slated to retire in the next decade.

### ❖ **Status Quo = Mostly Fossil Fuels**

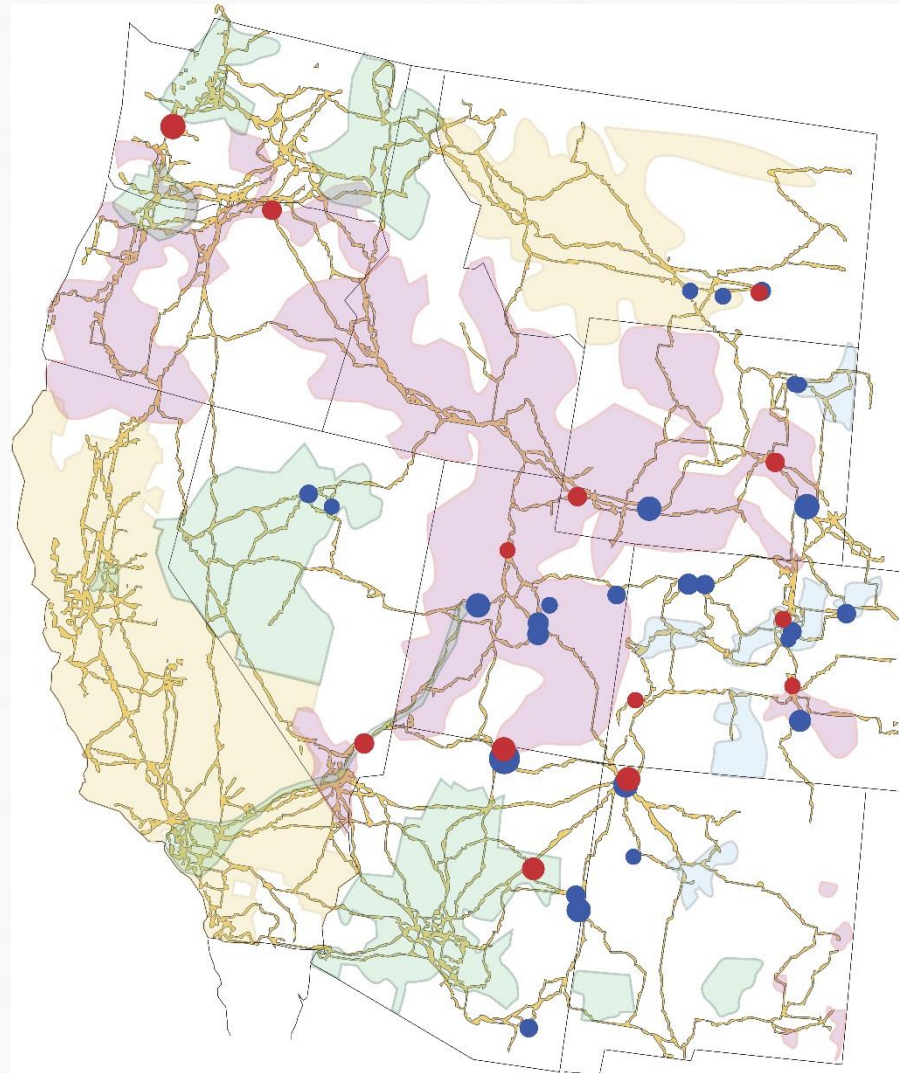
In the absence of a coordinated grid, the current “physical market” for transmission means that gas is most likely to replace coal.

*Downsides: higher energy prices; high CO<sub>2</sub> risk/impact; fuel price volatility; limits on electric decarbonization in other sectors.*

### ❖ **Coordinated Market = Mostly Renewables**

A coordinated grid with a broad regional footprint would allow wind and solar to replace the majority of retiring coal plants.

*Upsides: low & stable energy prices; minimal CO<sub>2</sub> risk/impact; enables decarbonization of transportation and “built environment.”*



● Coal plant with announced retirement by 2027.

● Coal plant without near term retirement plans.

## Why Does an ISO Matter:

1. *Low-cost energy*
2. *Coal transition*
3. *CA Carbon Goals*

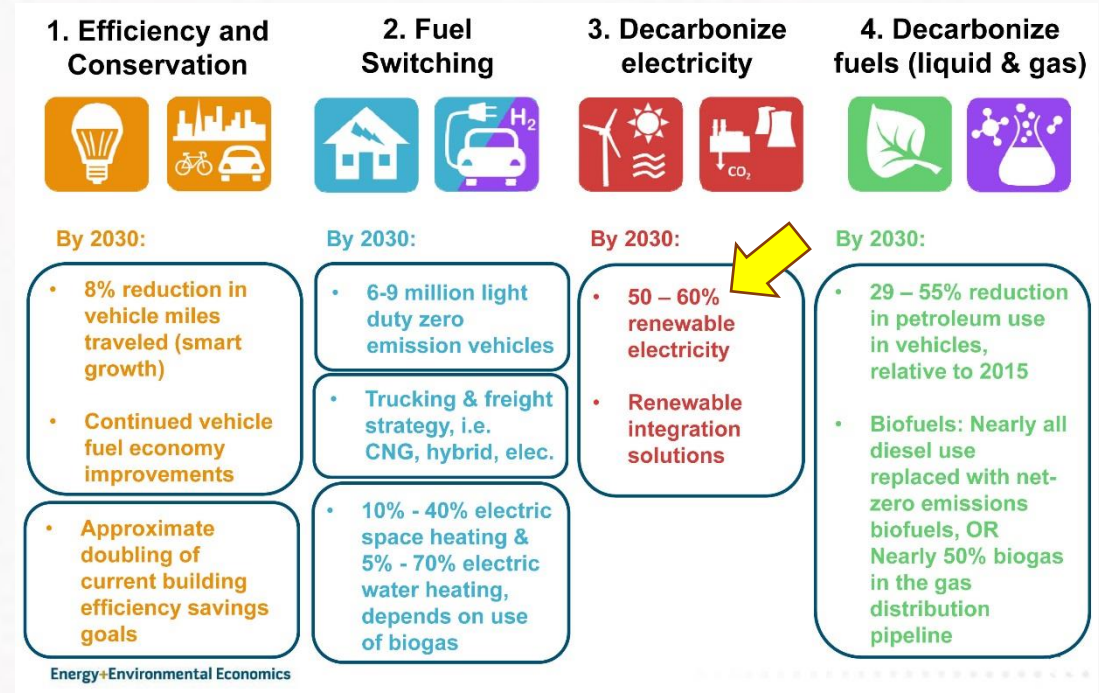
## California:

- Over 12% of US population
- Larger economy than France
- Over 60% of WECC
- Imports over 25% of its power

## Laws & Orders:

- 50% Renewables Portfolio Standard (RPS) by 2030
- Carbon targets for 2030; 2050
  - E3 estimates need for 60% renewable by 2030<sup>1</sup>
- Can be a driver of regional reform

## E3: CA's Carbon Targets Require Four Key Transitions:



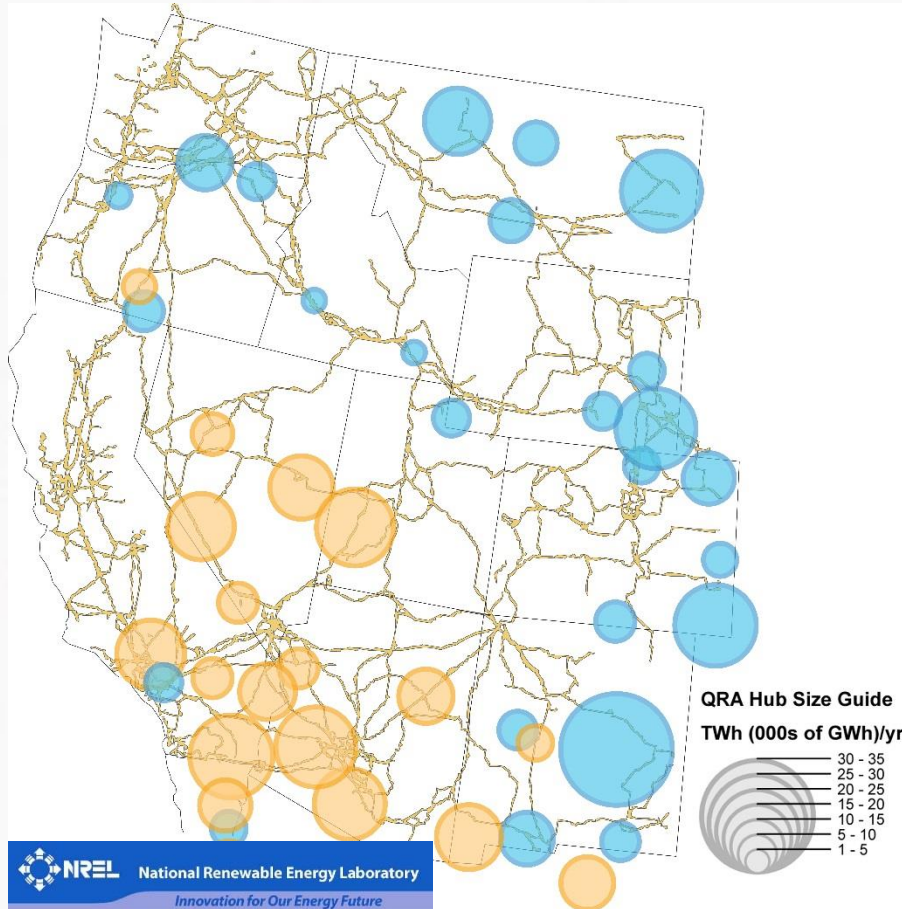
<sup>1</sup>[ethree.com/public\\_projects/energy\\_principals\\_study.php](http://ethree.com/public_projects/energy_principals_study.php)



## Why Does an ISO Matter:

1. *Low-cost energy*
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### Wind & Solar Resources in WECC



### So where does CA get 60%?

- ❖ Regional diversity creates strongest economics for achieving CO<sub>2</sub> targets<sup>1</sup>.
  - **\$1.5 Billion savings/year** for CA customers with a regional portfolio.
  - Wind + Solar enhances both.
- ❖ California needs to collaborate with its neighbors in order to succeed.
  - **Creates economic opportunities throughout WECC.**
  - Difficult to realize without an ISO.
- ❖ In the context of an effective ISO, California CO<sub>2</sub> targets can drive up to:
  - **4-8 GW wind**
  - **10-15 GW solar** (utility scale PV)

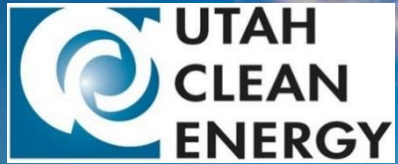
<sup>1</sup>CA 2030 Low Carbon Grid Study

## Regional Markets in the West:

- ❖ Unlock the value of wind and solar;
- ❖ Lay the foundation for renewables to replace coal;
- ❖ Help states meet carbon and RPS goals economically.

Thank you!





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