

# Overview of the U.S. Wind Energy Industry For the Rail Electrification Council

11/19/20

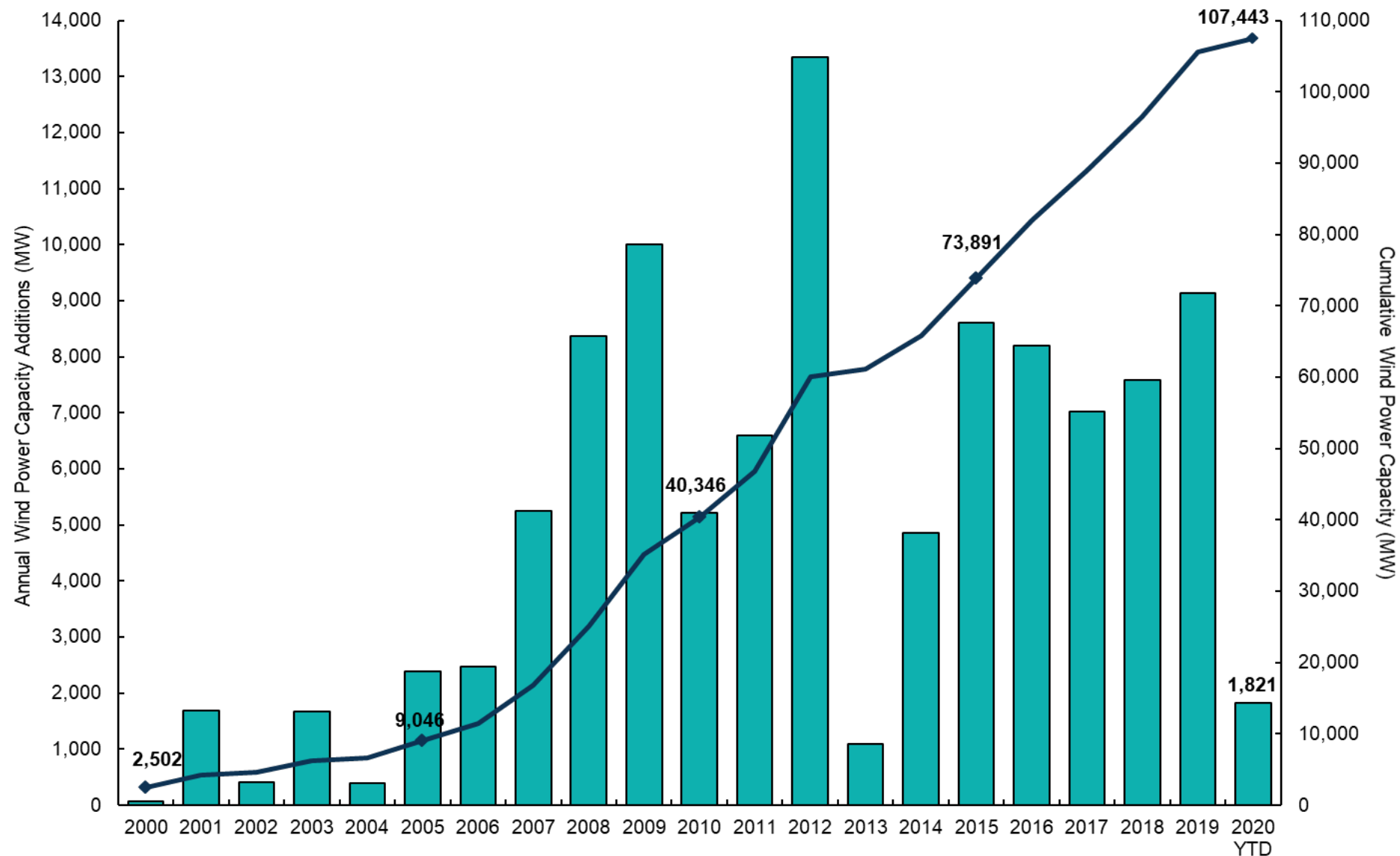
Gabe Tabak, Counsel  
American Wind Energy Association



AMERICAN  
WIND ENERGY  
ASSOCIATION

# OVER 107 GW OF OPERATING WIND POWER

Annual and Cumulative Wind Power Capacity

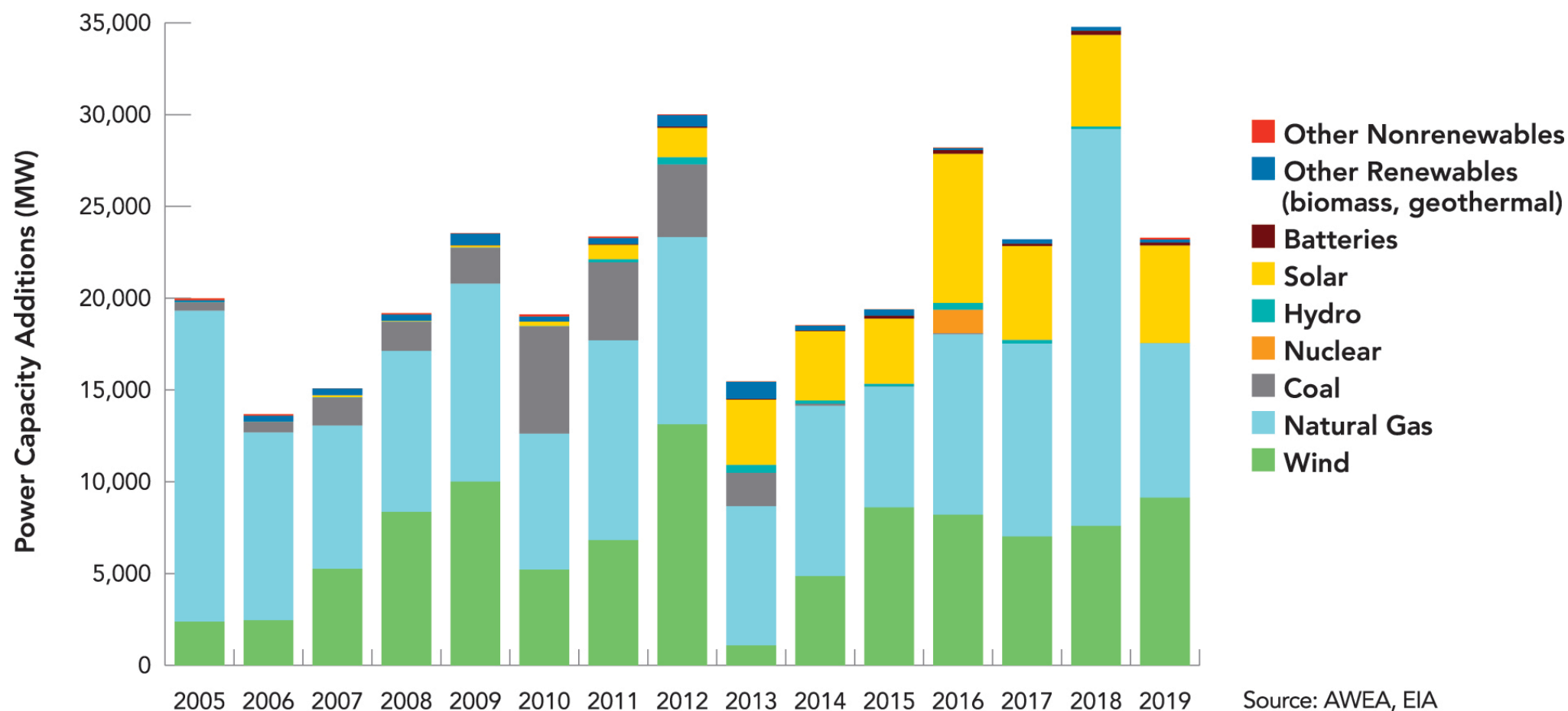


- Nearly 60,000 wind turbines across the U.S.
- 2019 was third strongest year for wind power capacity additions
- Installed wind power capacity has tripled in 10 years
- 10% CAGR—operational wind power capacity growth over past decade

## TOP CHOICE FOR NEW POWER

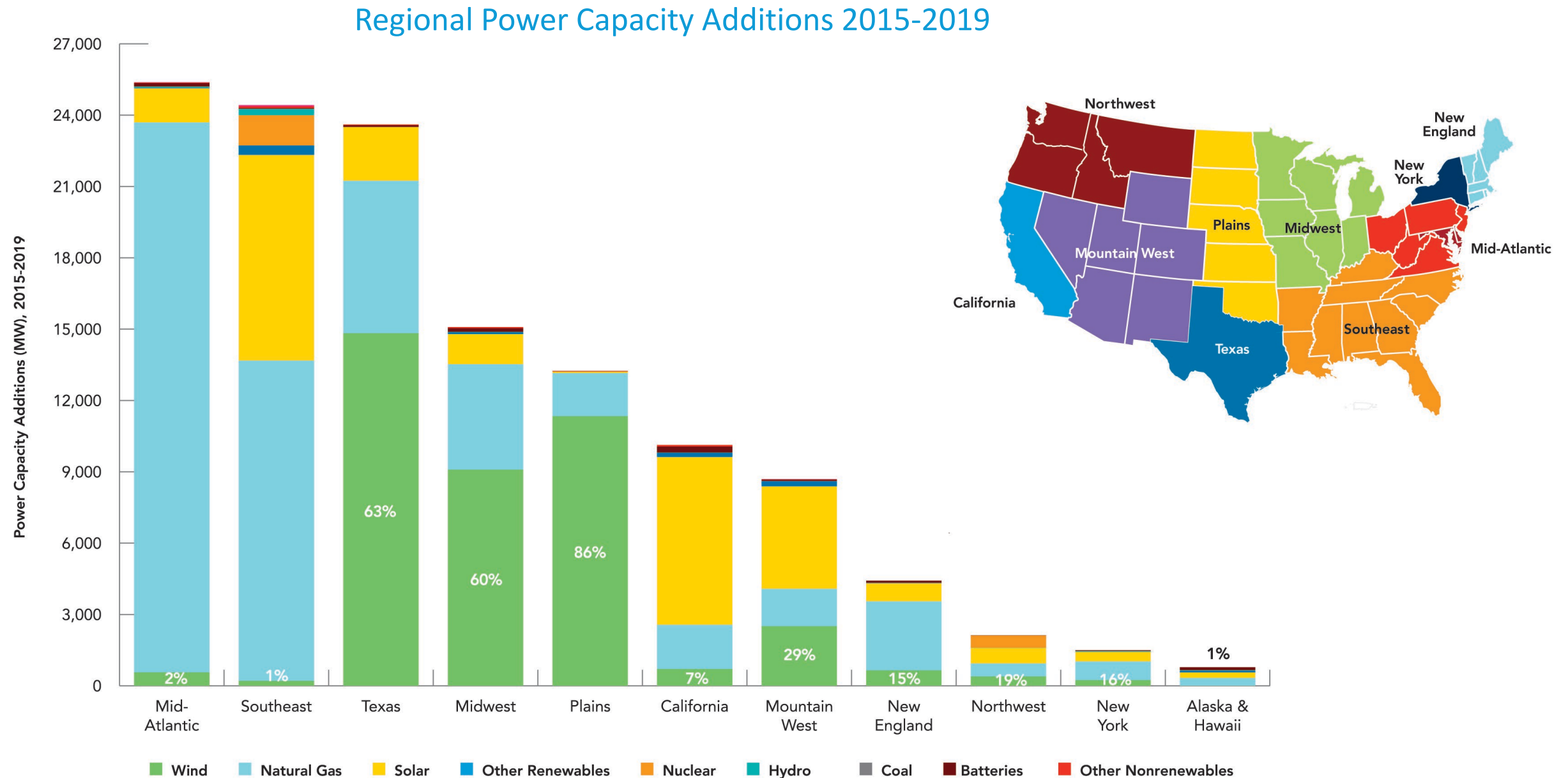
Wind captured 39% of utility-scale power additions in 2019

Annual Power Capacity Additions

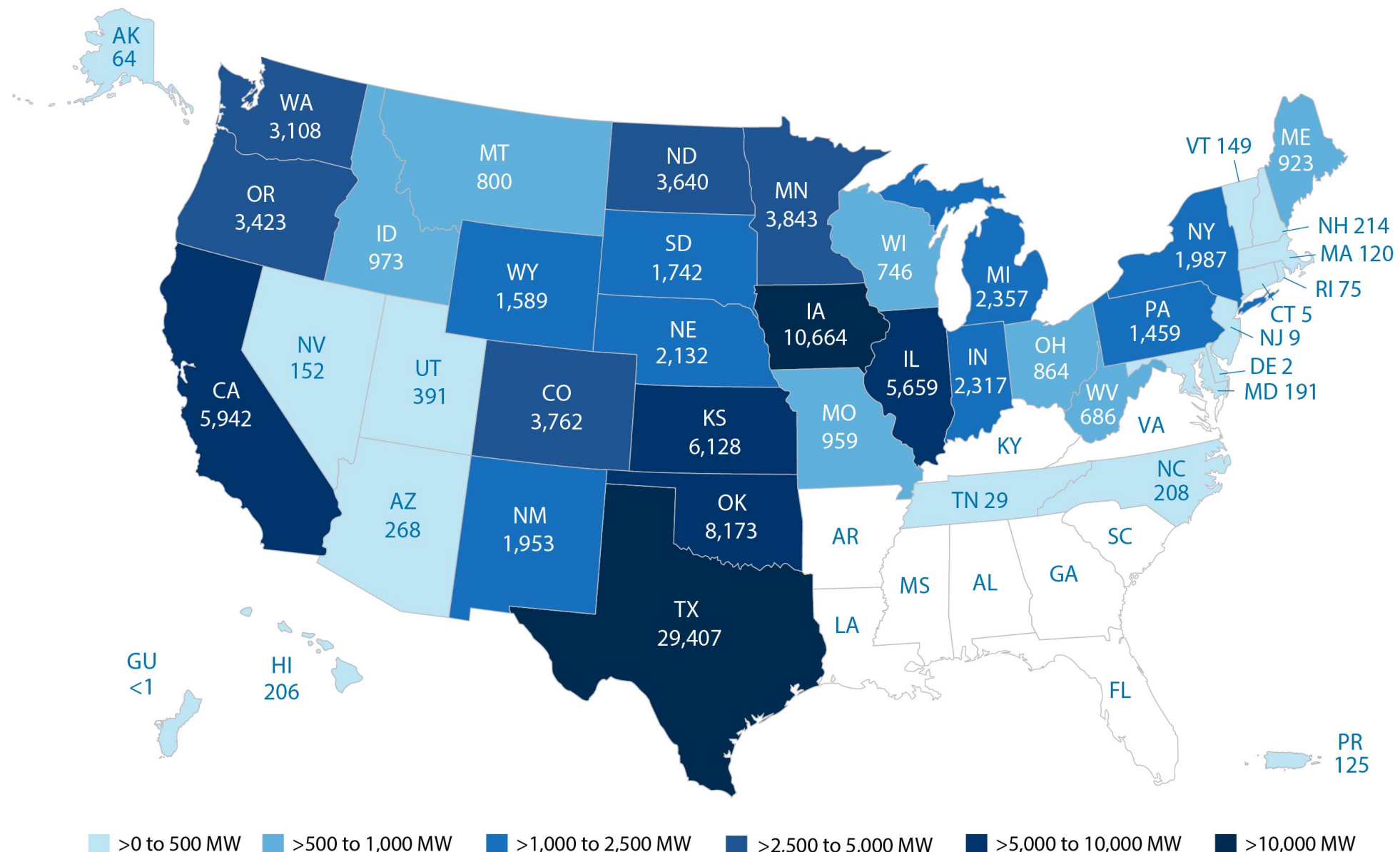


- U.S. electric sector added 23,292 MW of new electricity generating capacity in 2019
  - Wind: 9,137 MW
  - Natural gas: 8,398 MW
  - Solar: 5,328 MW
- All renewable energy sources captured 57% of new capacity additions over the last five years.
- Wind captured 39% of utility-scale power installations in 2019

# Wind #1 source of new capacity in Midwest, Plains, and Texas



# WIND POWER OPERATING IN 41 STATES



## Top 10 Wind States

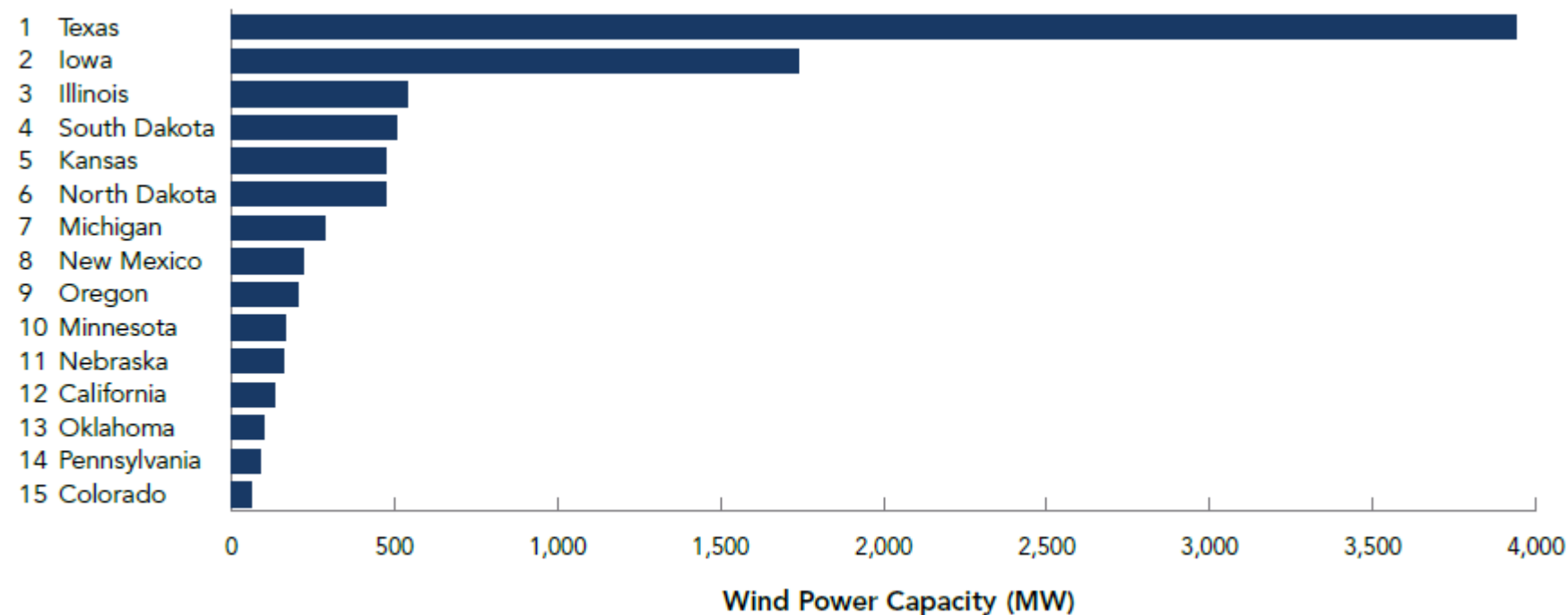
Texas	29,407 MW
Iowa	10,664 MW
Oklahoma	8,173 MW
Kansas	6,128 MW
California	5,942 MW
Illinois	5,659 MW
Minnesota	3,843 MW
Colorado	3,762 MW
North Dakota	3,640 MW
Oregon	3,423 MW



## TOP STATES

Texas and Iowa led 2019 installations

### 2019 Installations



- Texas and Iowa added more wind capacity in 2019 than any other year

### One-year Growth Rate

Rank	State	One-Year Growth Rate
1	South Dakota	50%
2	Iowa	21%
3	Texas	16%
4	New Hampshire	16%
5	Michigan	15%
6	North Dakota	15%
7	New Mexico	13%
8	Illinois	11%
9	Massachusetts	9%
10	Kansas	8%

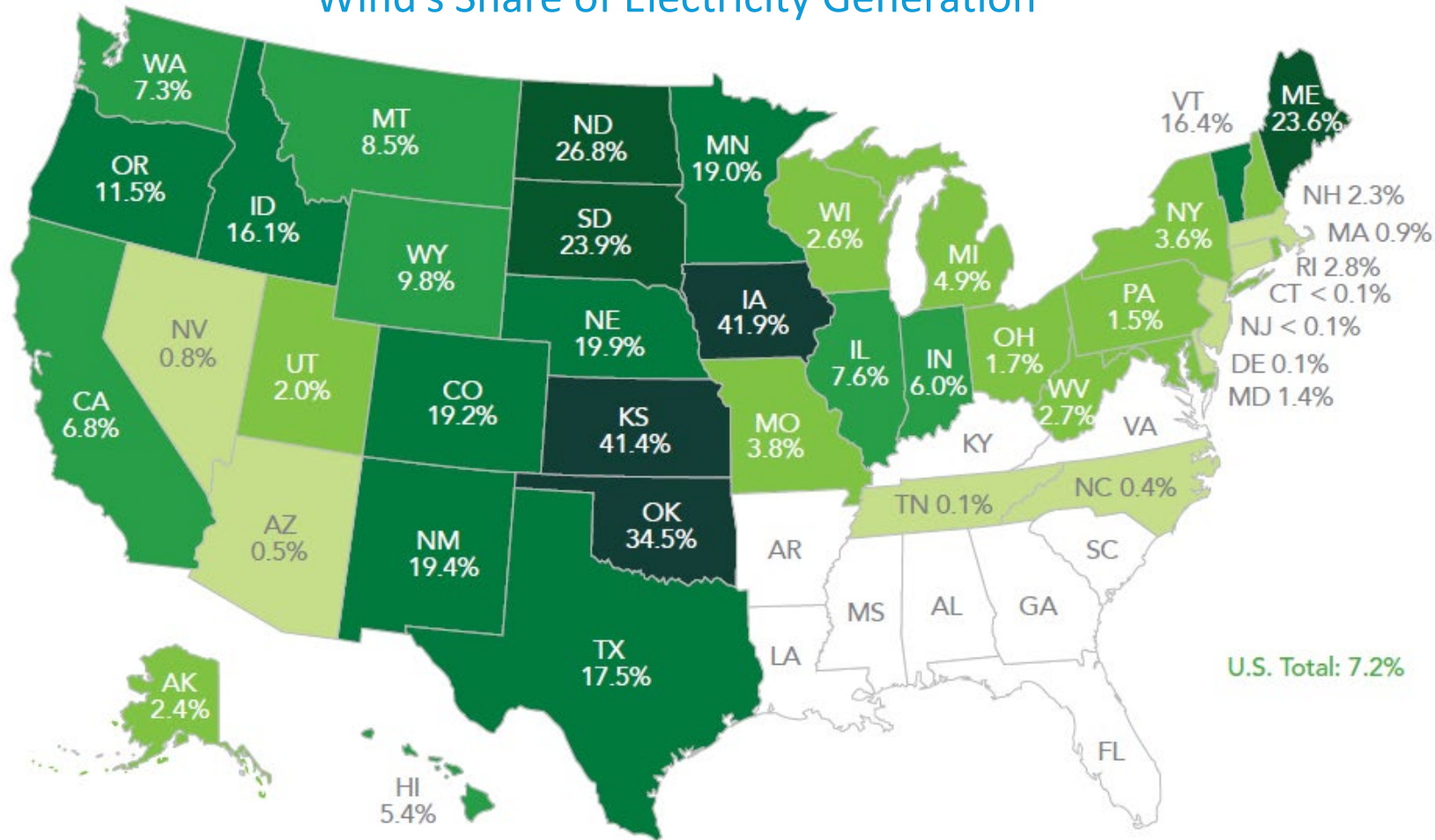
- South Dakota added 506 MW, growing its wind power by 50%



# Wind is now America's #1 renewable energy source

Generated 300 TWh of electricity—7.2% of 2019 generation

Wind's Share of Electricity Generation



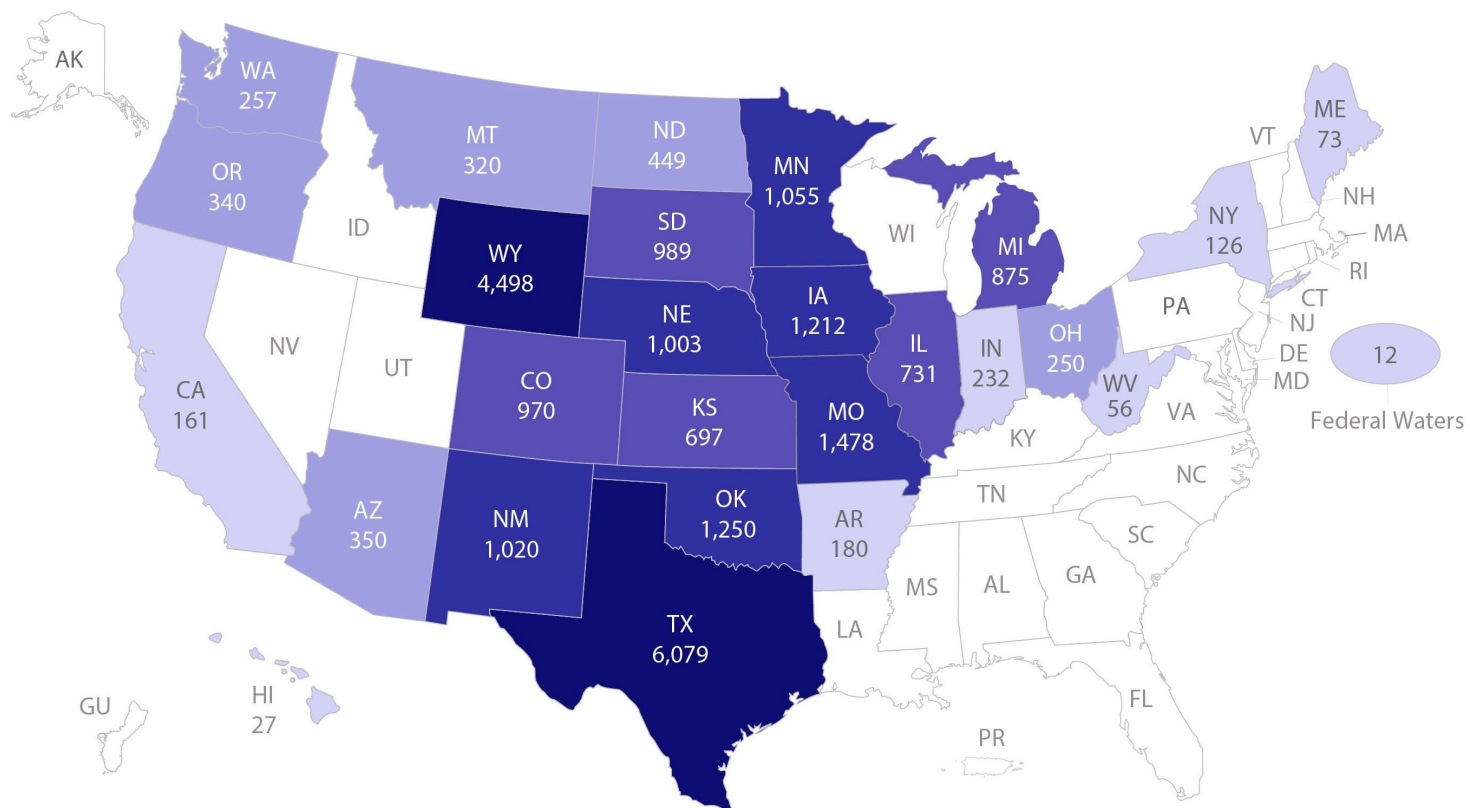
■ >0% to <1% 
 ■ 1% to <5% 
 ■ 5% to <10% 
 ■ 10% to <20% 
 ■ 20% to <30% 
 ■ 30% and higher

- Wind energy surpassed hydro in 2019 to become the largest source of renewable electricity in the country
- 6 states generated more than 20% of their electricity from wind power in 2019
- Iowa and Kansas generated more electricity from wind turbines than any other technology
- 21 states produced at least 5% of their generation from wind energy in 2019

# WIND GROWTH CONTINUES

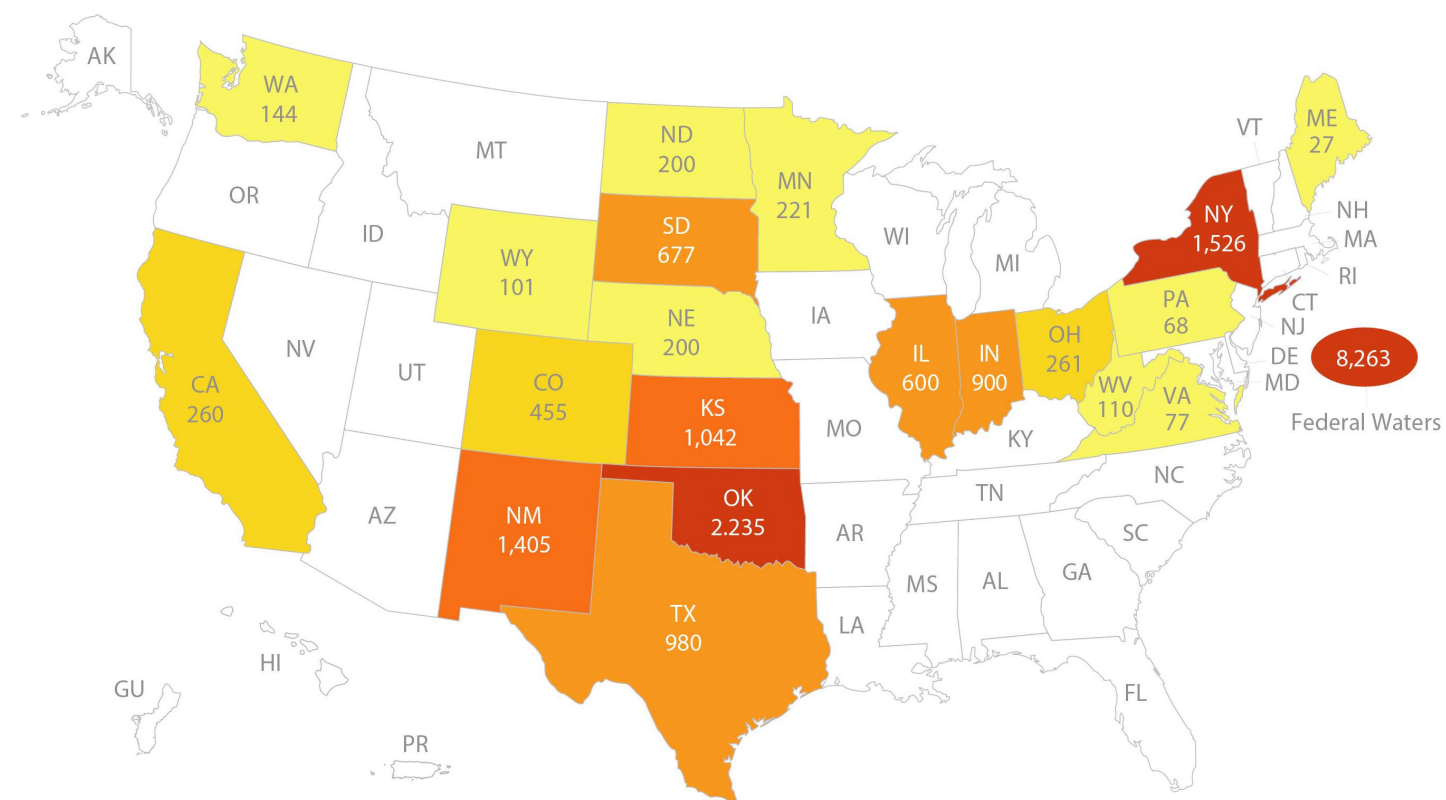
## Over 44 GW Under Construction or in Advanced Development

Capacity Under Construction



>0 to 249 MW   250 MW to 499 MW   500 MW to 999 MW   1,000 MW to 1,999 MW   2,000 MW and Above

Capacity in Advanced Development



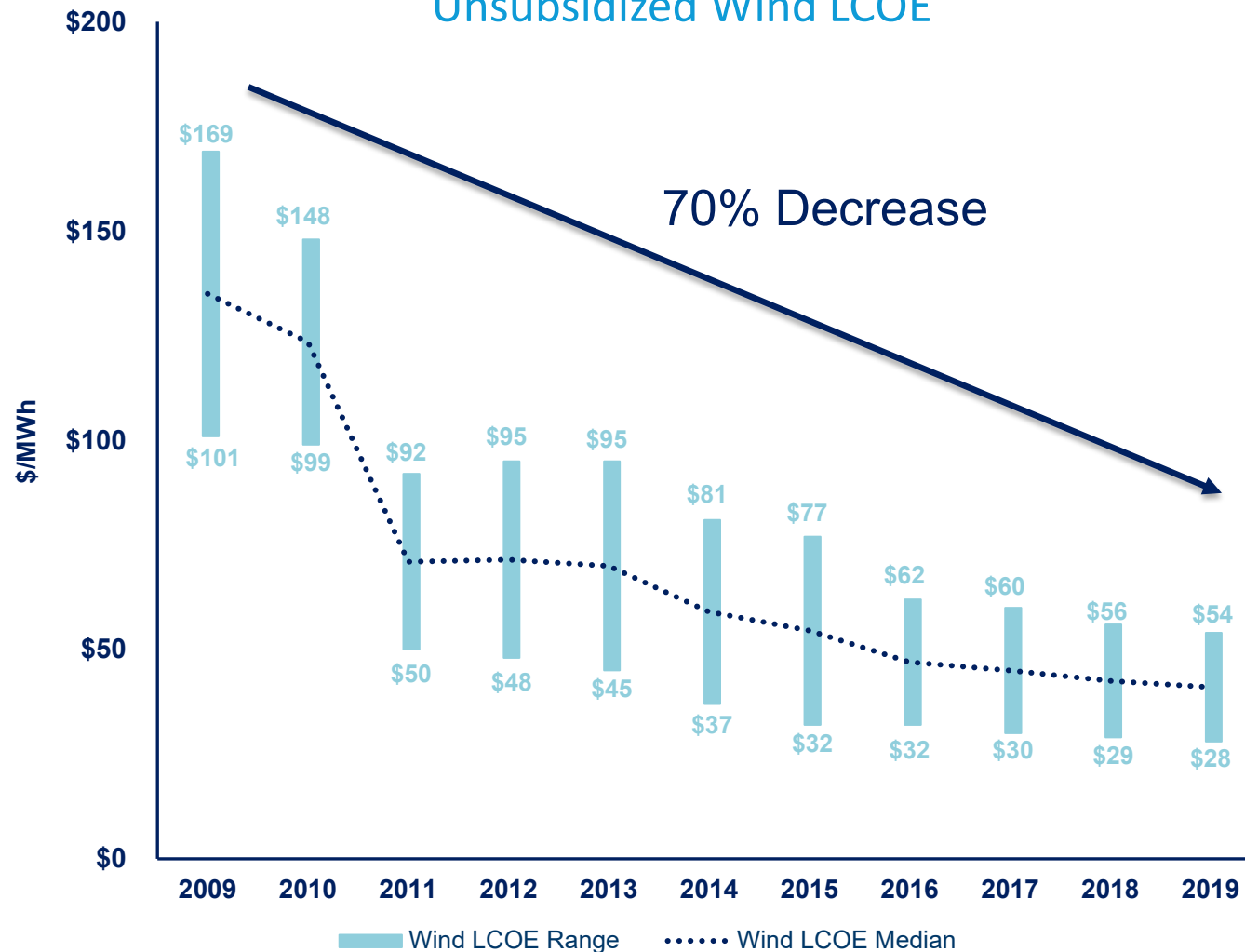
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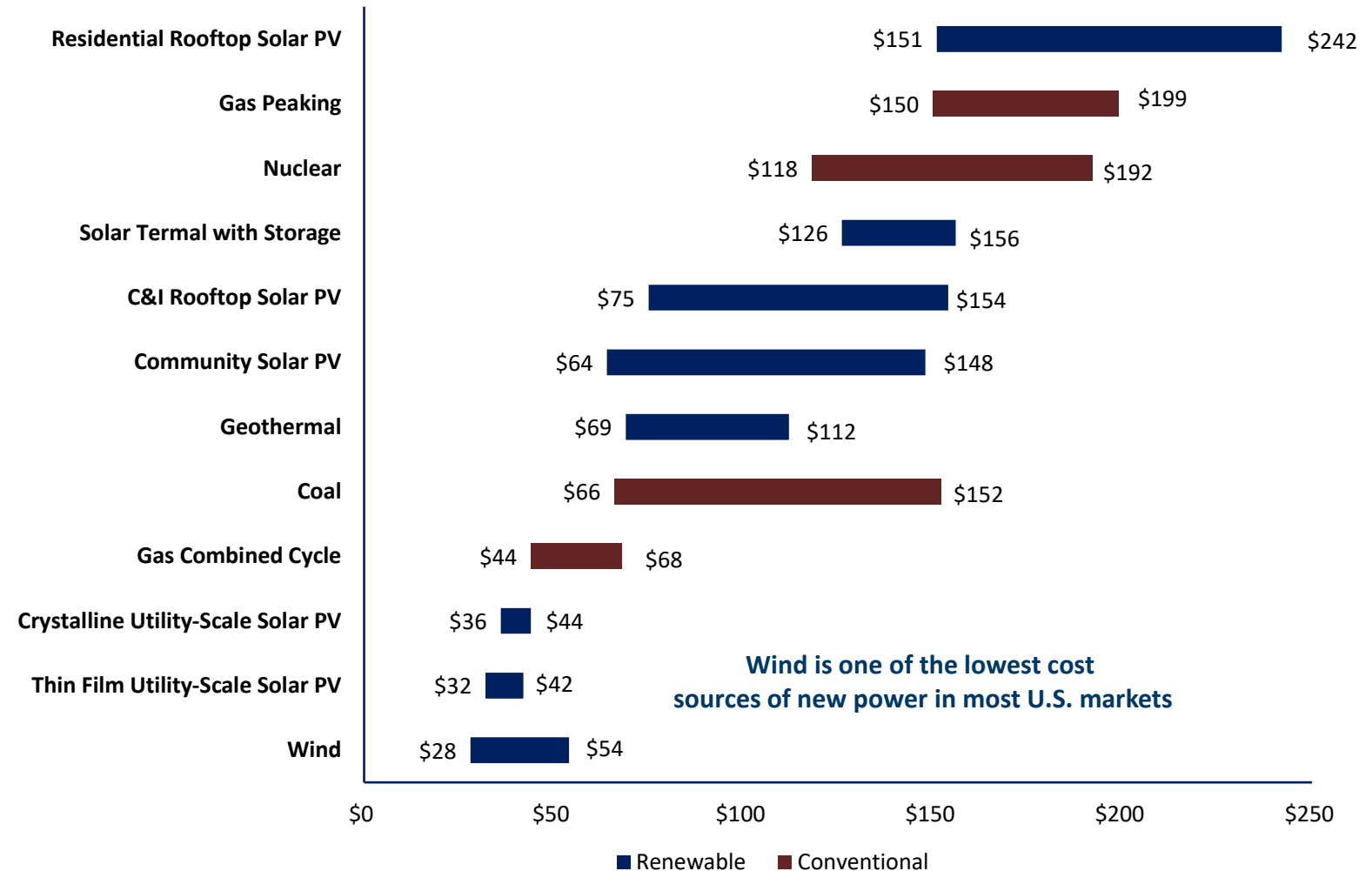
# COST REDUCTIONS

Wind costs downs 70% in last decade

Unsubsidized Wind LCOE

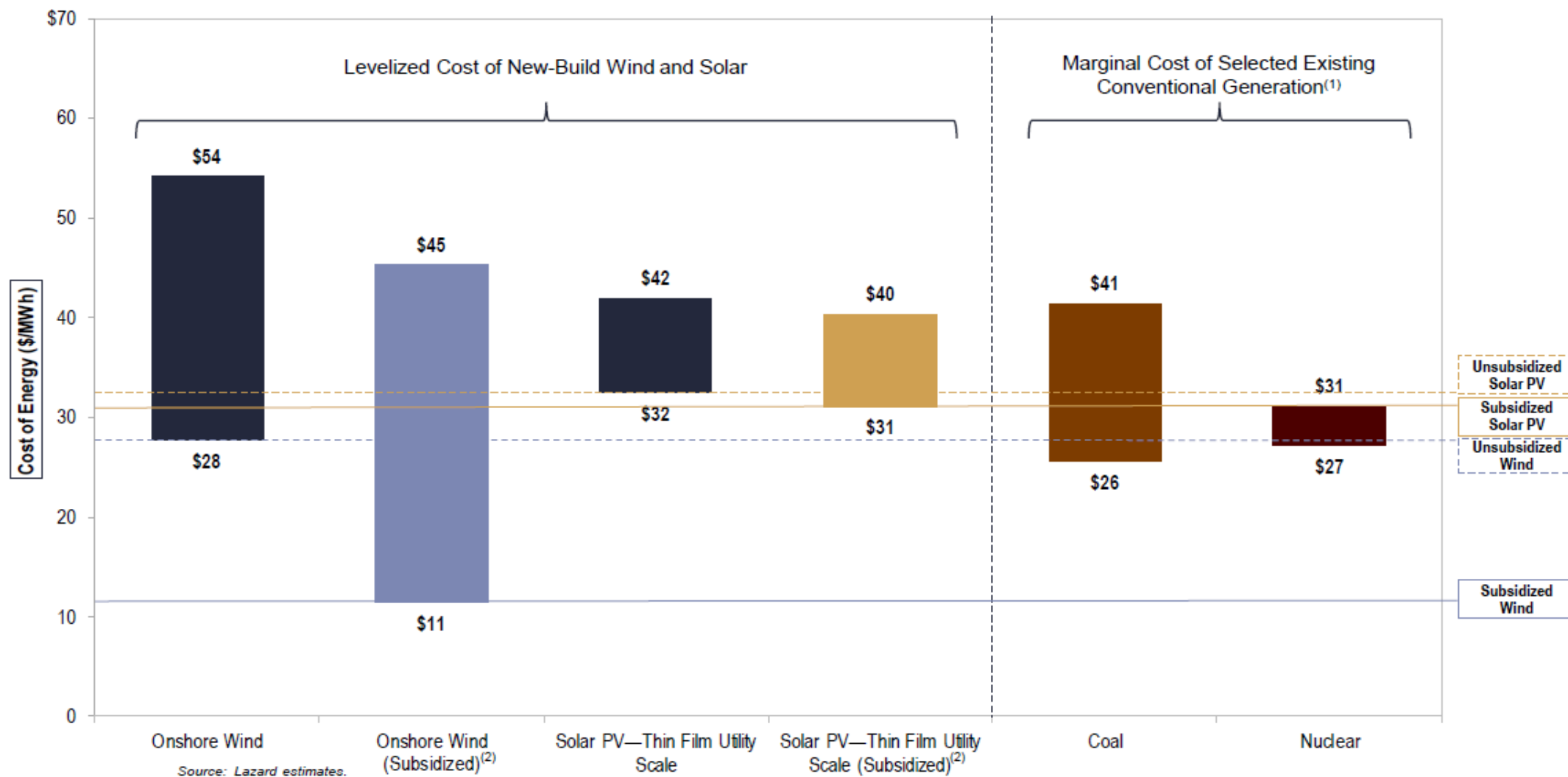


LCOE Comparison



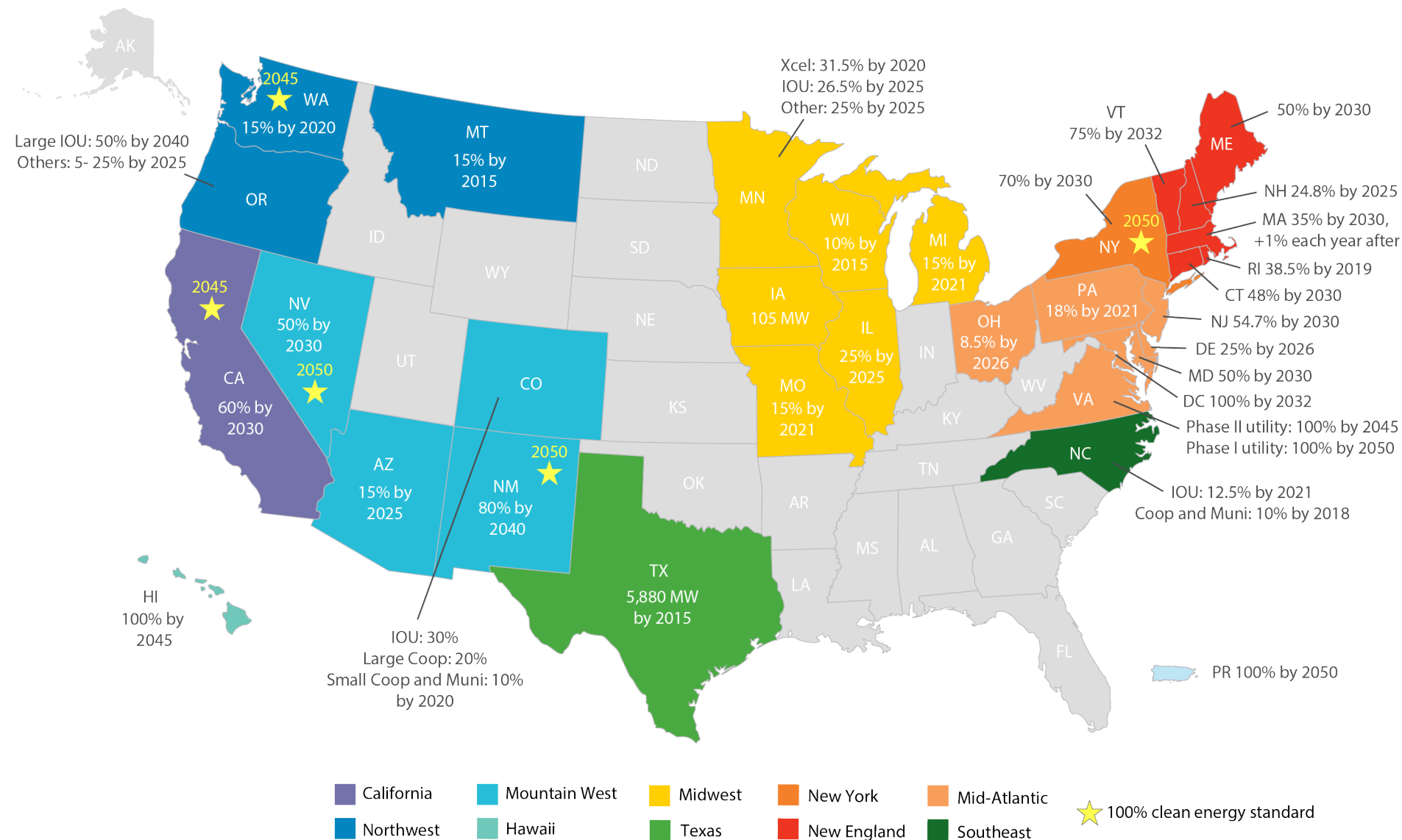
# COMPETITIVE POWER

Wind increasingly competitive with existing generation



# POLICY DRIVERS

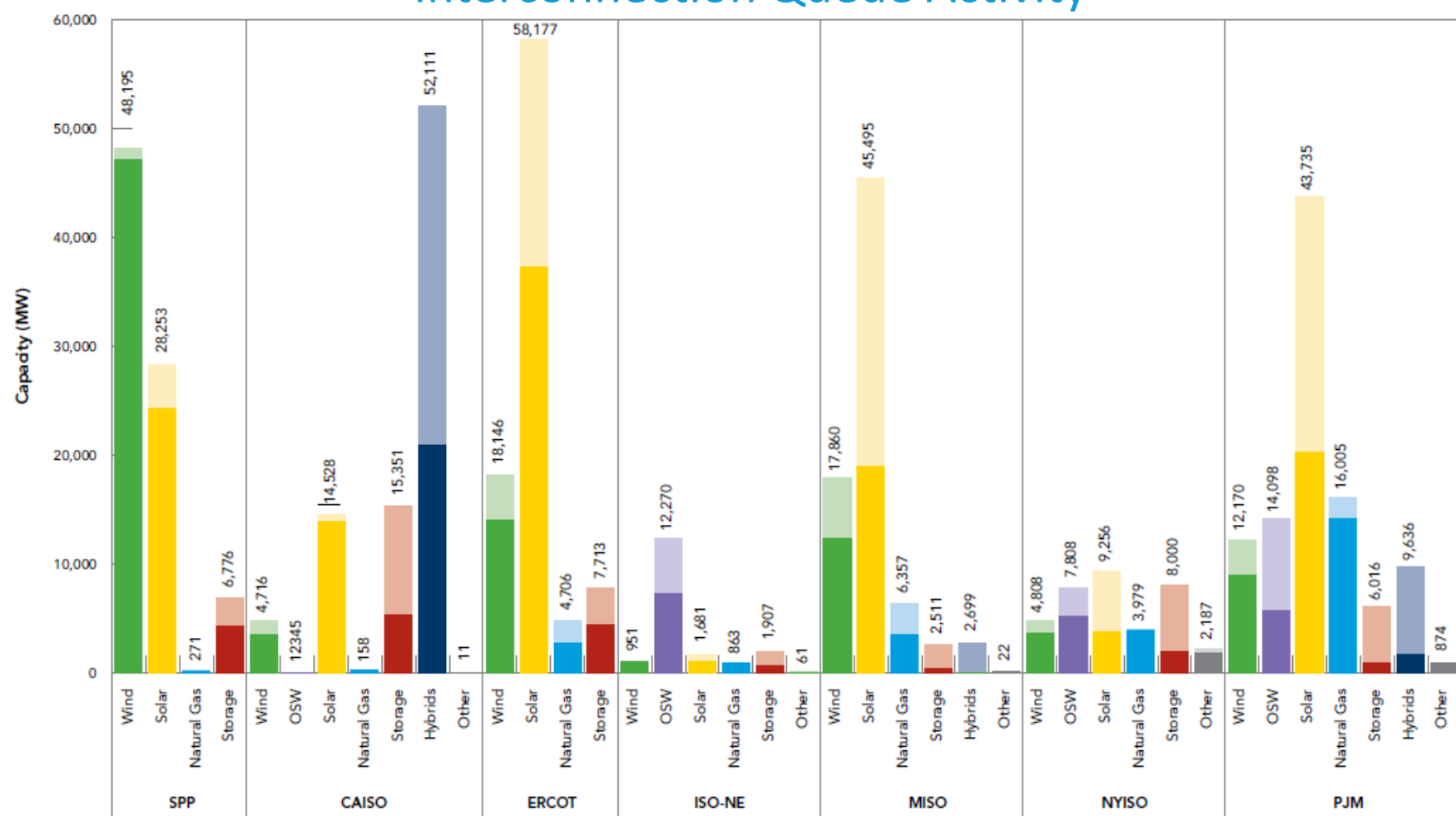
## State renewable portfolio standards and clean energy standards



# RENEWABLES DOMINATE QUEUES

32 GW of land-based and offshore wind added to queues in 2019

## Interconnection Queue Activity



- 16 GW of land-based and 16 GW of offshore wind capacity entered interconnection queues in 2019
- Total 141 GW of wind capacity in queues led by SPP with 48 GW
- SPP has most wind capacity in the queue with 48 GW, followed by PJM
- More solar in interconnection queues than any other technology at 201 GW

Source: AWEA, RTO/ISO data

\* Hybrids/Co-Located column includes capacity for all projects with multiple resources in one interconnection request. The majority are solar plus battery storage projects but this includes some wind plus storage, wind plus solar and natural gas plus storage. SPP, ERCOT, ISO-NE, and NYISO either do not have hybrid/co-located projects in their queue or their data did not specify.

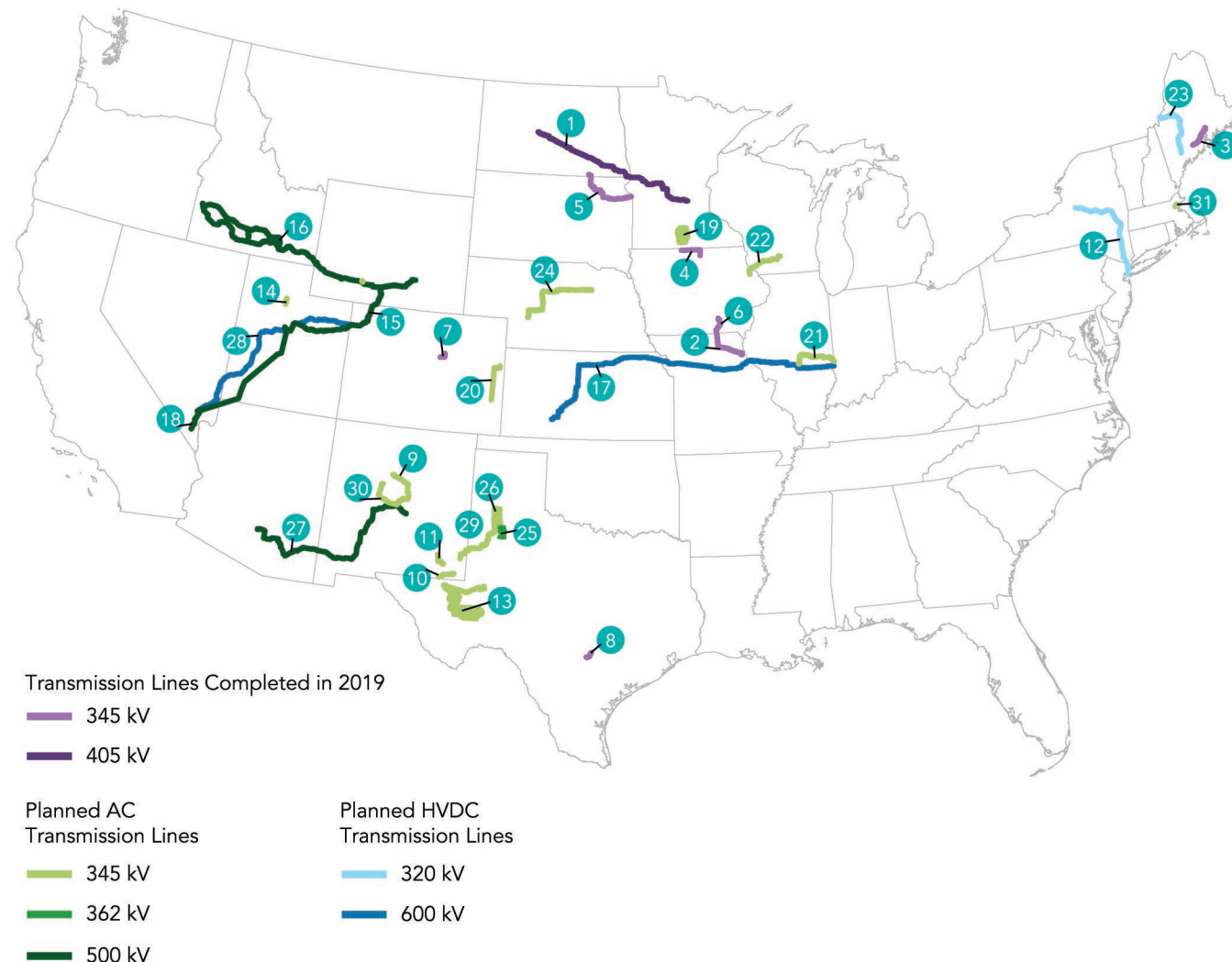
Entered Queue during 2019

Entered Queue prior to 2019



# ENABLING INFRASTRUCTURE

## Eight transmission projects enabling wind power completed in 2019



Transmission Line Activity Serving Wind			
Lines Completed during 2019		State	In-Service Date
1	CU HVDC	MN,ND	2019
2	Mark Twain	MO	2019
3	MEPCO Rebuild	ME	2019
4	MVP 4	IA	2019
5	MVP 6	ND,SD	2019
6	MVP 7	IA,MO	2019
7	Pawnee to Daniels Park	CO	2019
8	Zorn to Marion	TX	2019
Planned Lines		State	In-Service Date
9	BB2	NM	2020
10	China Draw-Phantom-Roadrunner	NM	2021
11	Eddy County-Kiowa	NM	2020
12	Empire State Connector	NY	2024
13	Far West Texas 2	TX	2020
14	Gateway Central	UT	2024
15	Gateway South	CO,UT,WY	2023
16	Gateway West	ID,WY	2020 - 2024
17	Grain Belt Express	IL,IN,KS,MO	2023
18	Harry Allen-Eldorado	NV	2020
19	Huntley-Wilmarth	MN	2021
20	Lamar - Front Range	CO	2023
21	MVP 11	IL,IN	2020
22	MVP 5	IA,WI	2023
23	New England Clean Energy Connect	ME, QC	2022
24	R-Project	NE	2021
25	South Plains Abernathy to Wadsworth	TX	2021
26	South Plains Ogallala to Abernathy	TX	2021
27	SunZia Southwest	AZ,NM	2020
28	TransWest Express	CO,NV,UT,WY	2023
29	Tuco-Yoakum-Hobbs	NM,TX	2020
30	Western Spirit	NM	2020
31	Woburn to Wakefield 345 kV Transmission	MA	2020

- 8 wind-enabling transmission projects completed in 2019: MISO, ISO-NE, ERCOT, Colorado
- Transmission needed to transport wind energy from remote areas to load centers
- Critical to approve and build transmission projects currently in development
- Near-term transmission projects in development could support tens of thousands of MWs of additional wind capacity



## MORE TRANSMISSION WILL BE NEEDED

High upgrade costs, especially between regions, can hinder development.

### MISO West Risks Becoming 'Dead Zone,' Stakeholders Warn

November 12, 2020

By [Amanda Durish Cook](#)

[MISO](#) stakeholders sounded alarm bells this week, saying another round of prohibitively expensive system upgrades would render the RTO's West planning region a "dead zone" for new generation.

MISO West — which includes Minnesota, Iowa, parts of the Dakotas and western Wisconsin — is again facing high system upgrade costs for interconnection hopefuls, this time from [SPP](#) studies of generator interconnections, or affected-system studies, along the seams.

SPP's draft studies of a 2017 cycle of generation projects in MISO West recommend about \$500 million of upgrades for 250 MW of projects.



BRIEF

### Ameren cancels 157 MW wind project, citing transmission upgrade costs

By Catherine Morehouse

Published July 30, 2019

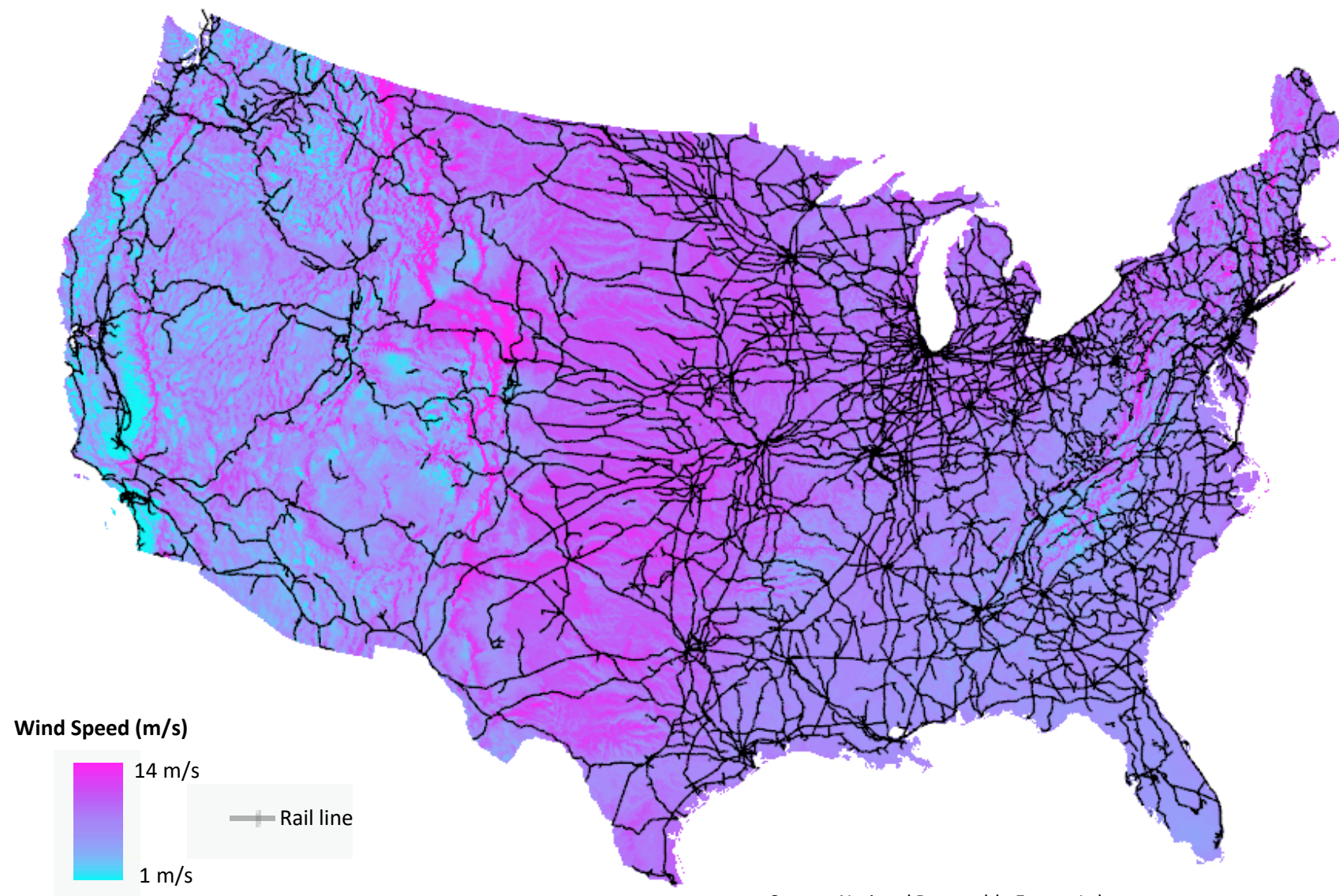
#### Dive Brief:

- Ameren Missouri on Thursday cancelled development of a 157 MW wind project, citing "unacceptably high" transmission upgrade costs.
- The utility reached a mutual agreement with developer EDF Renewables to terminate the project, noting it didn't want to push those costs on to ratepayers. The two originally announced the project last October



## **RAIL RIGHTS-OF-WAY CAN HELP CONNECT WIND TO MARKET**

Class 1 Railroads traverse high-quality wind areas, including regional seams.



Source: National Renewable Energy Laboratory;  
U.S. Dep't of Transportation.

## AWEA Data Services

Past Quarterly and Annual Market Reports:

[www.awea.org/marketreports](http://www.awea.org/marketreports)

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Additional Analysis Available:

State RPS Market Assessment, Corporate Purchasers,  
Property Tax Treatment, and More

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