

Wind: The Big Picture

Steve Gaw



The Wind Coalition

Wind Coalition Members

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- ❖ **Non-Profit Members:** [AWEA](#) | [Environmental Defense Fund](#) | [Public Citizen](#) | [TREIA](#)

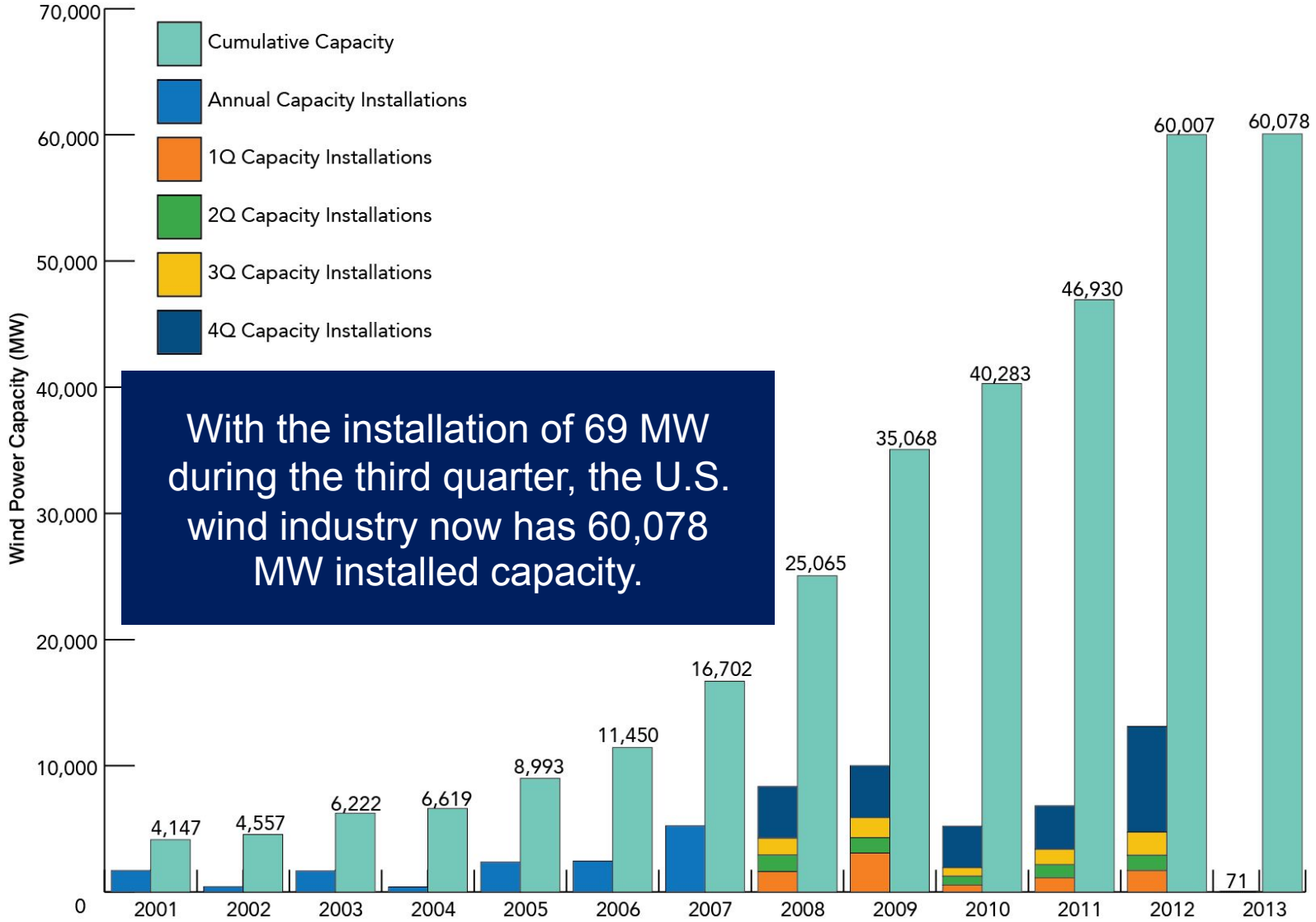
Why Wind?

- ✓ **Hedge:** Wind energy contracts can be used as a **long-term hedge** against volatility in fossil fuel prices and environmental regulations.
- ✓ **Price:** Wind energy is providing **prices that are competitive** with other new generation options, and has been shown to reduce prices to consumers.
- ✓ **Security:** Enhancing energy security by diversifying the electric generation portfolio.
- ✓ **Economic Development:** Billions have been invested as a result of wind development.
- ✓ **Environment:** Wind is a zero polluting and non-carbon emitting energy resource that uses no water to produce power.

What does wind power mean for America's energy future?

- ✓ Wind power was #1 in new capacity installed in 2012
- ✓ 13,124 MW of wind capacity installed during 2012
- ✓ 60,000 MW milestone reached for cumulative installed wind capacity
- ✓ 2012 was largest year in U.S. history, and largest fourth quarter
- ✓ 45,100 turbines installed across 39 states & Puerto Rico

Installed U.S. Wind Energy Capacity

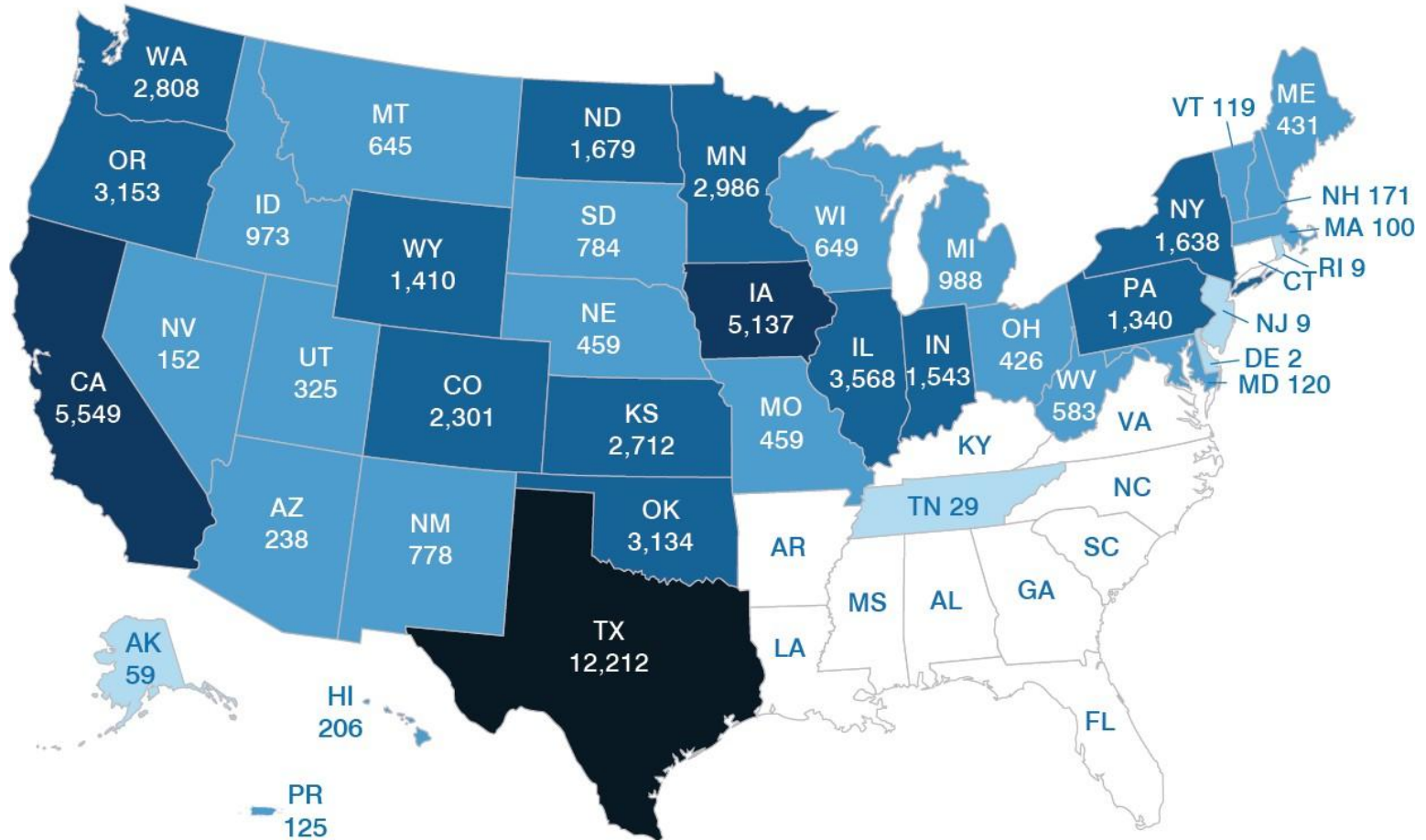


With the installation of 69 MW during the third quarter, the U.S. wind industry now has 60,078 MW installed capacity.

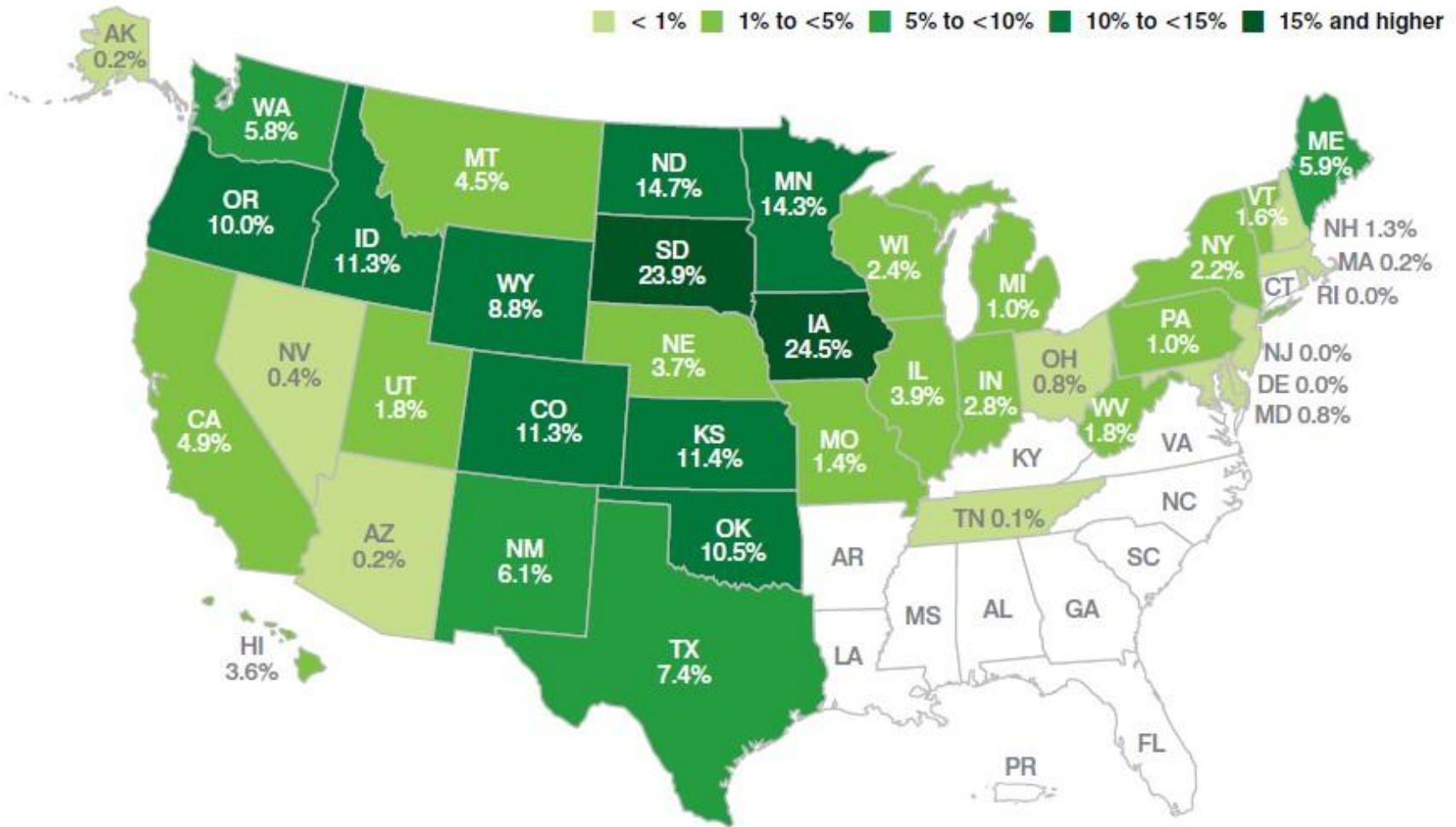
Source: AWEA U.S. Wind Industry Third Quarter 2013 Market Report

U.S. Wind Power Capacity Installations by State

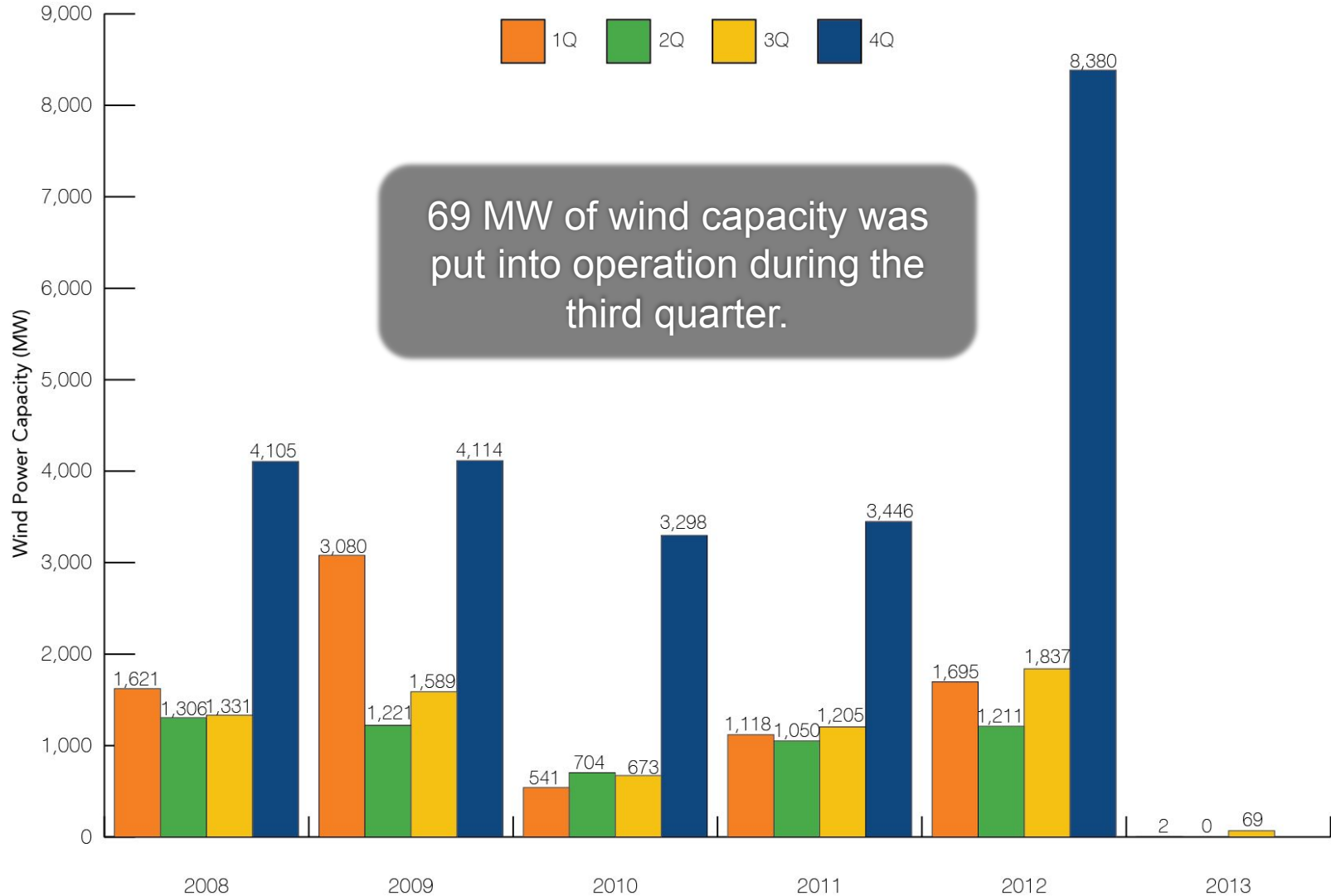
1 to 100 MW >100 to 1,000 MW >1,000 MW to 5,000 MW >5,000 MW to 10,000 MW > 10,000 MW



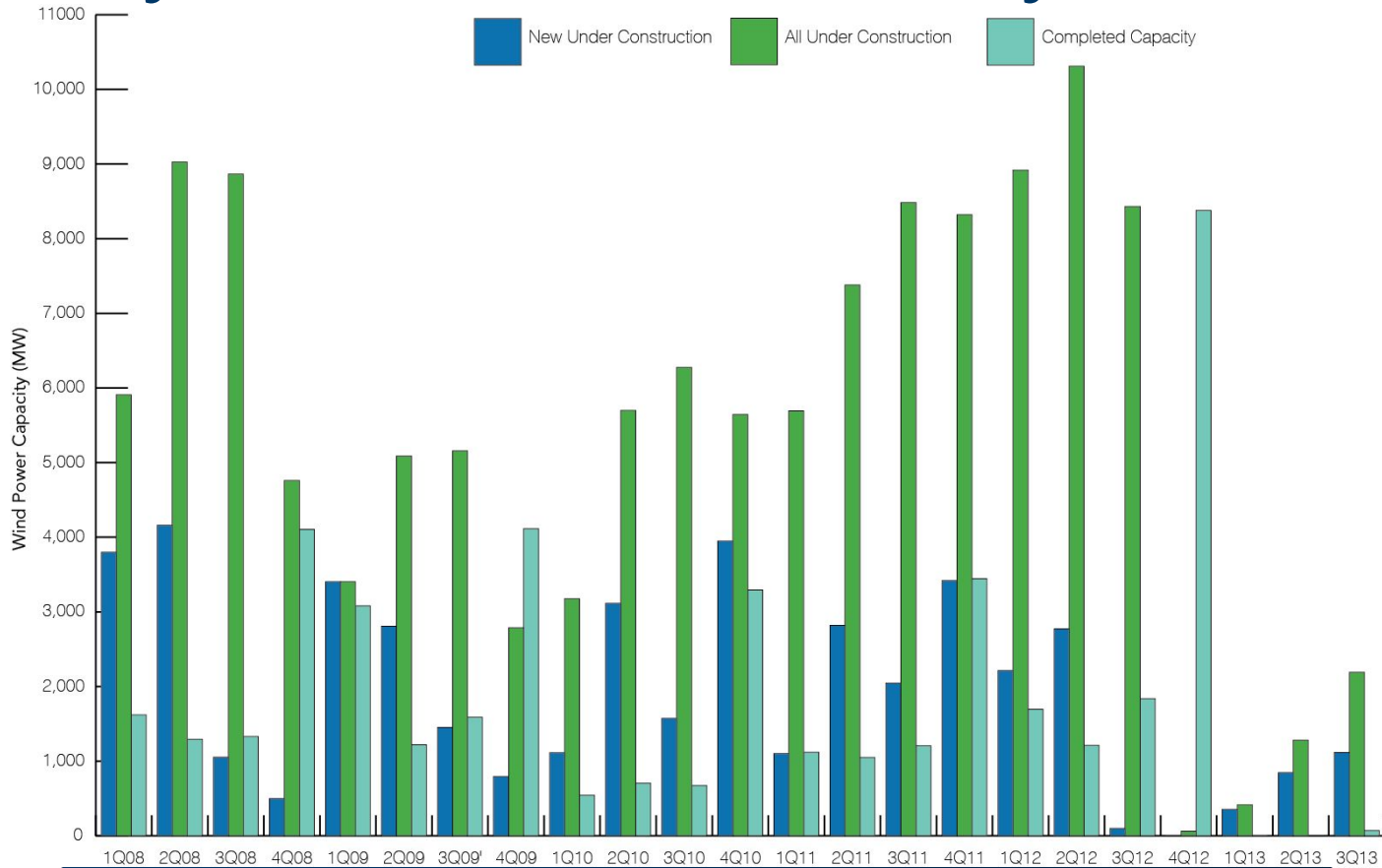
9 states have 10% or more of their electricity supplied by wind power



Installations by Quarter

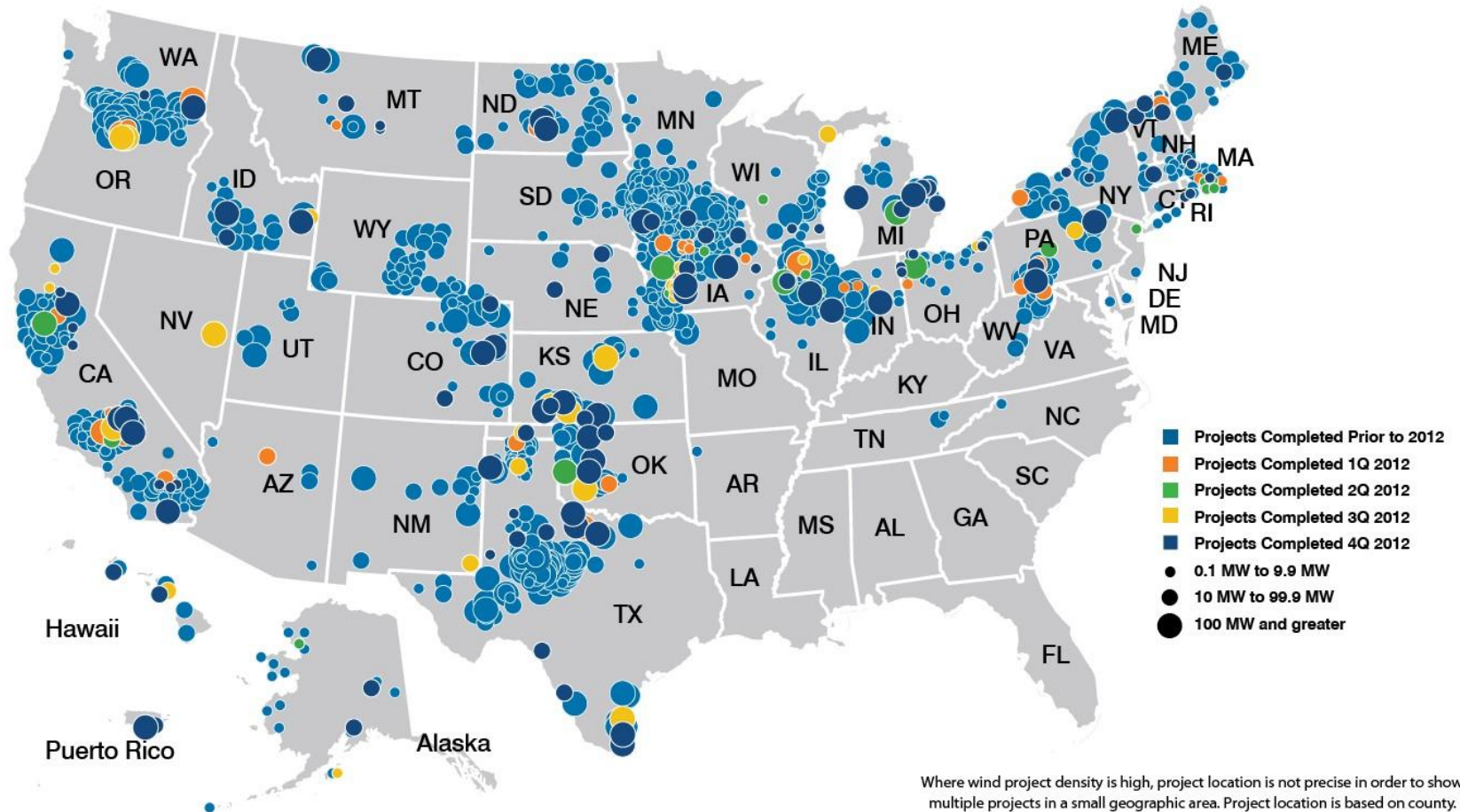


Quarterly Construction Activity

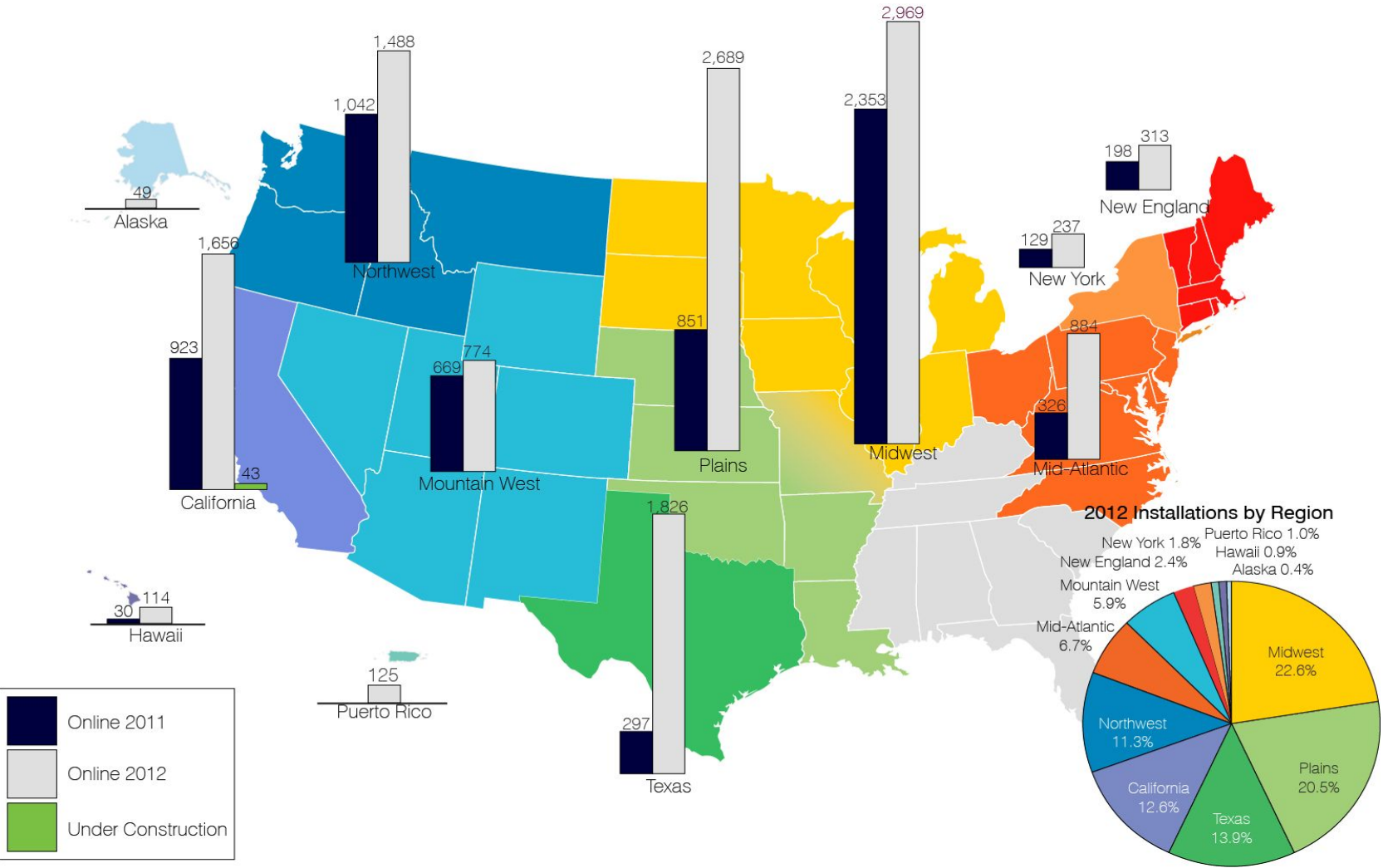


Through 3Q, over 2,300 MW of wind projects under construction across 13 states, with 1,100 MW of new construction starts during 3Q.

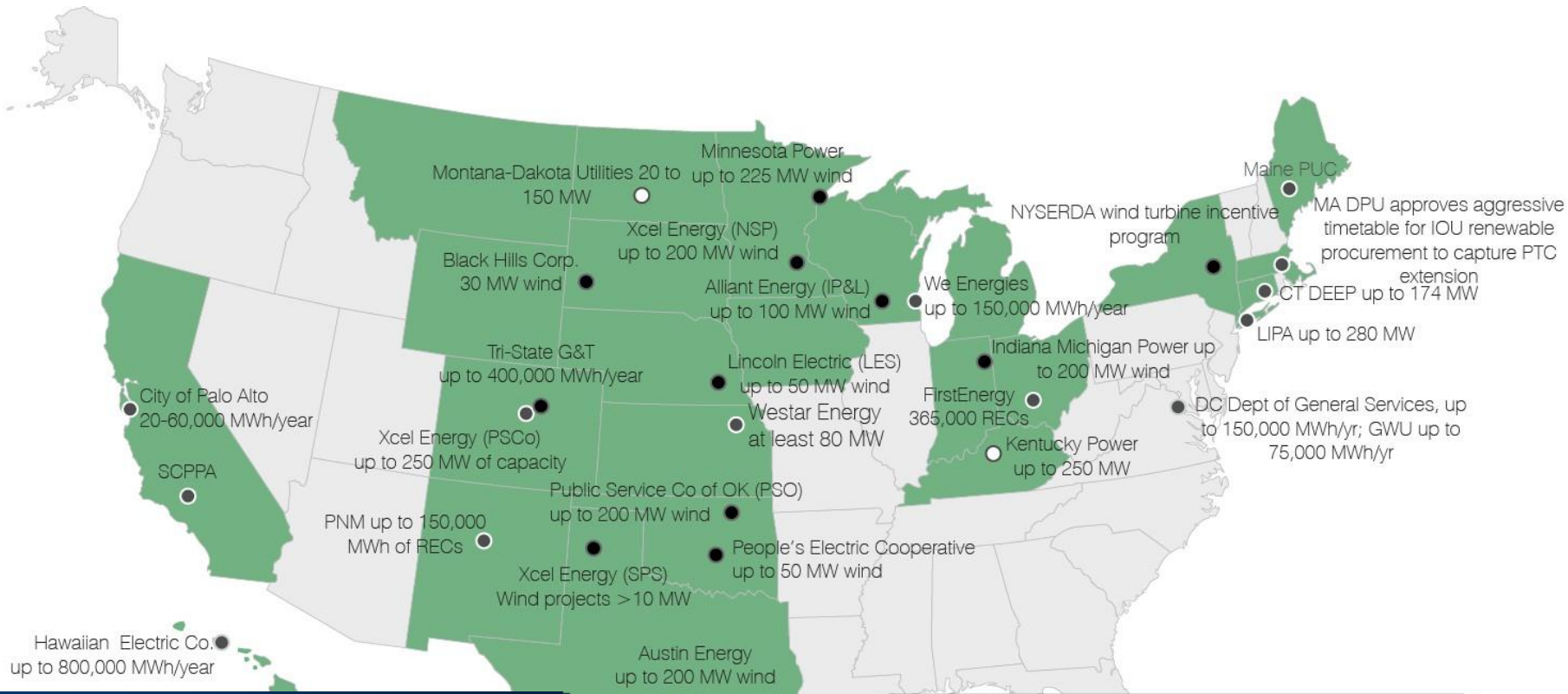
U.S. Wind Project Map



Regional Installation Trends



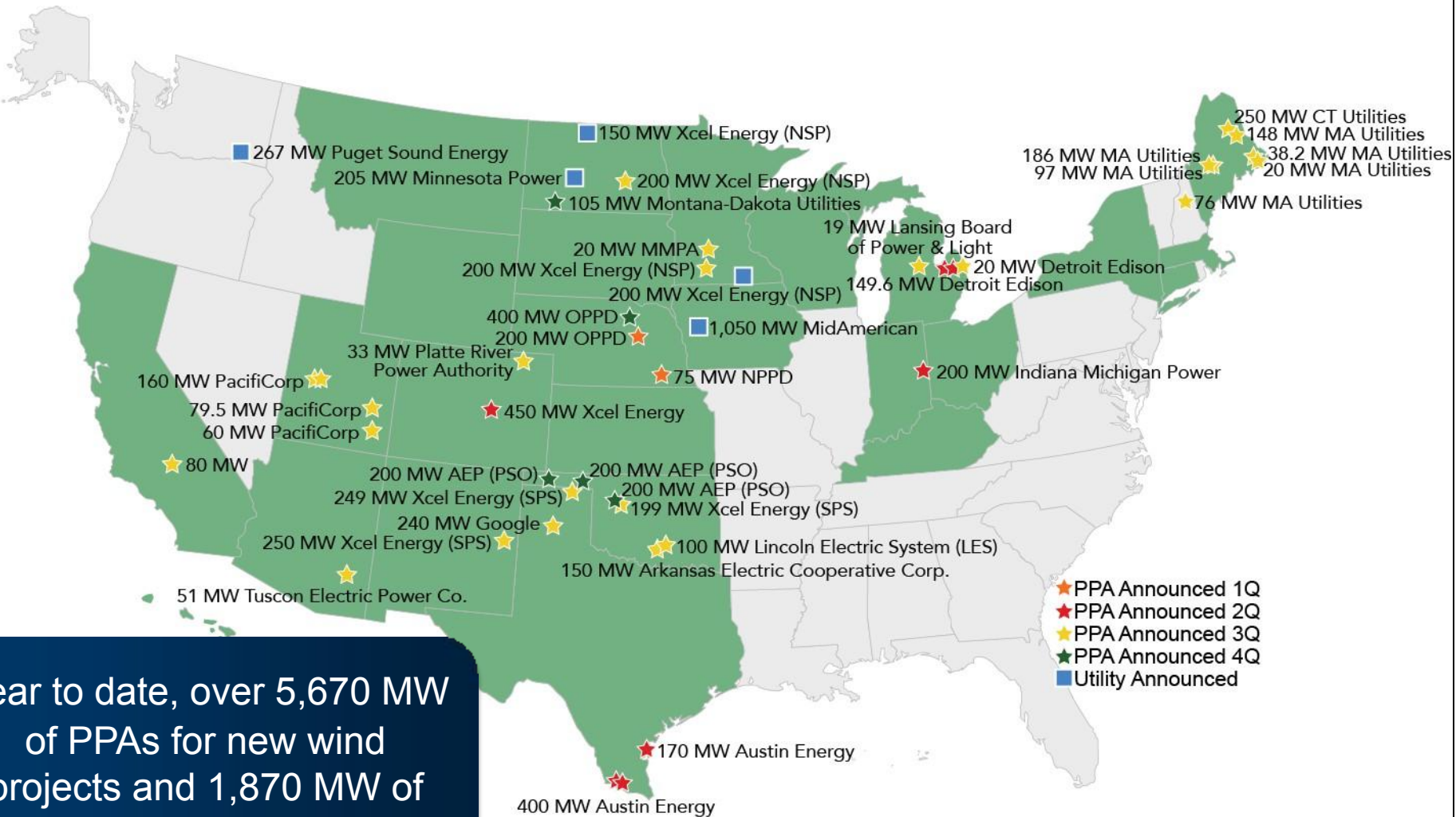
AWEA Market Update: 2013 RFPs



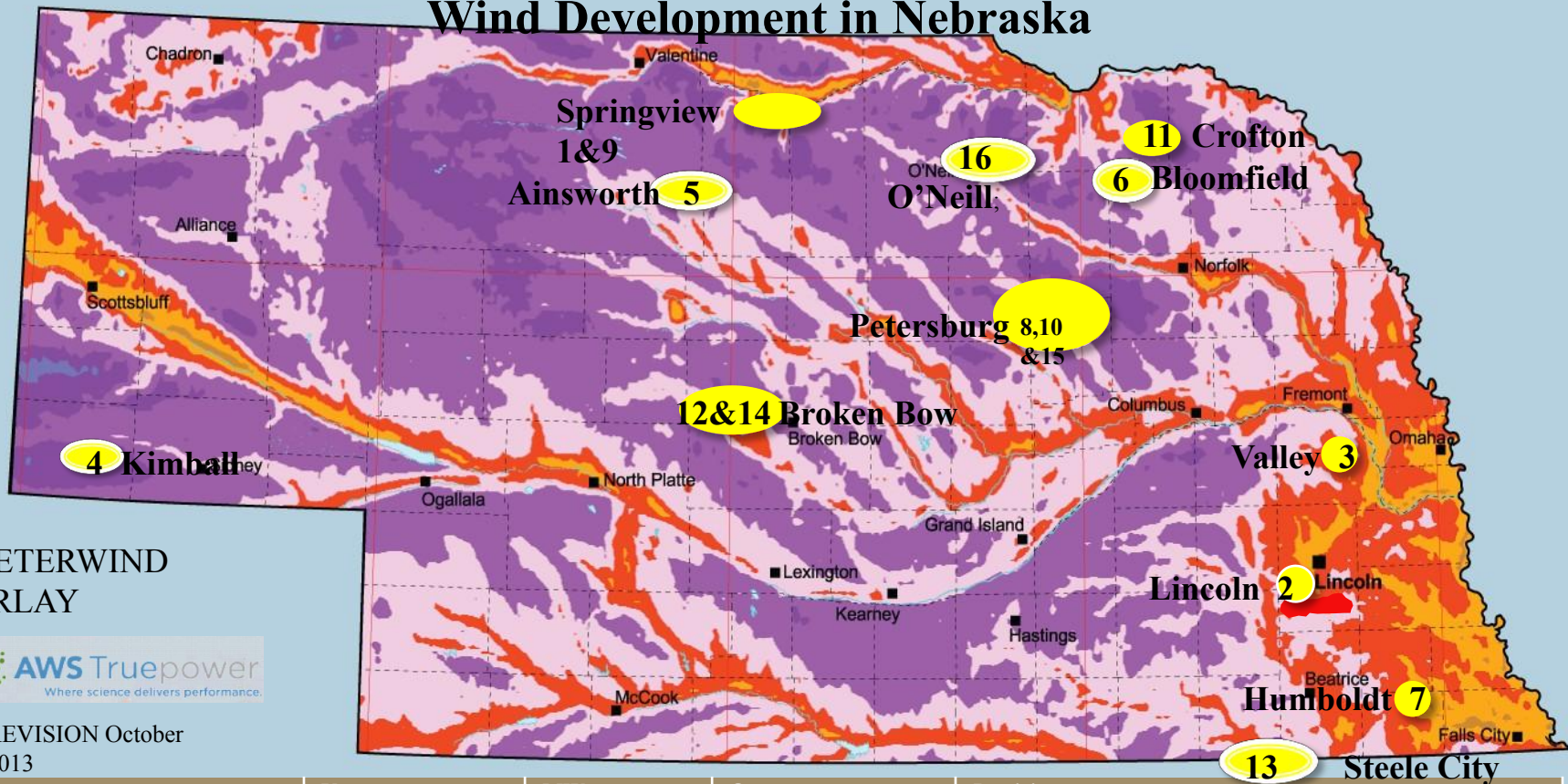
Year to date, at least 27 wind-eligible RFPs have been issued, most explicitly citing the PTC/ITC extension

- Green states represent the service territories of utilities issuing 2013 RFPs. Wind resources used to satisfy these RFPs may come from additional states.
- Wind-specific Requests for Proposals
- Renewable-specific Requests for Proposals
- Capacity Requests for Proposals

AWEA Market Update: 2013 PPAs



Wind Development in Nebraska



80 METER WIND
OVERLAY



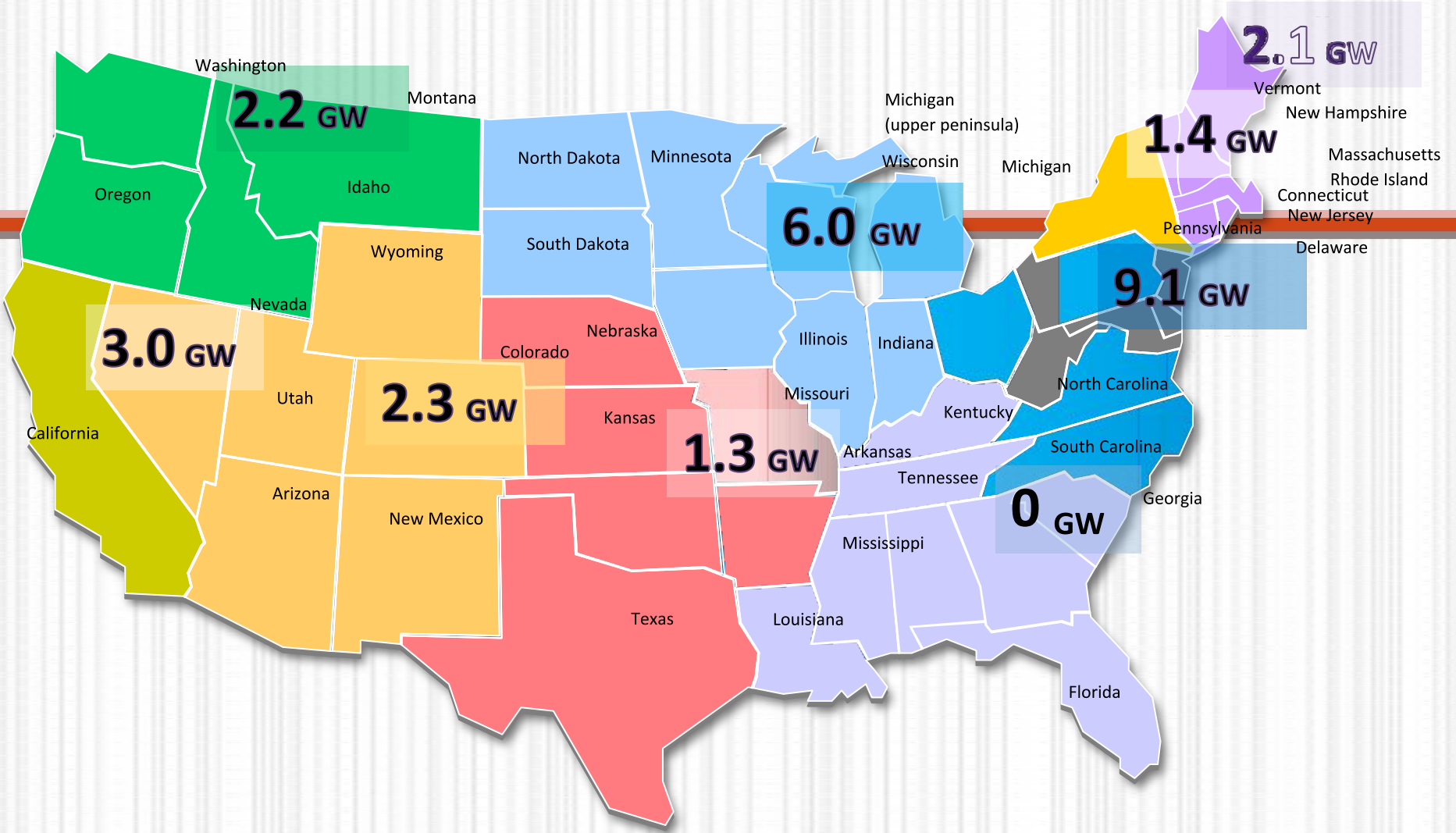
REVISION October
2013

| Project | Year | MW | Owner | Participants |
|--------------------------------|---------------|----------------|-------------------|---|
| 1) Springview Wind Energy | 1998 | Retired | NPPD | NPPD, LES MEAN, GI, KBR, Auburn |
| 2) Salt Valley | 1998 and 1999 | 1.32 | LES | LES |
| 3) Valley | 2001 | .66 | OPPD | OPPD, Valmont |
| 4) Kimball | 2002 | 10.5 | MEAN | MEAN |
| 5) Ainsworth Wind Energy | 2005 | 59.4 | NPPD | NPPD, OPPD, MEAN, GI, JEA* <i>*Financial Participant</i> |
| 6) Elkhorn Ridge Wind, LLC | 2009 | 80 | Edison Mission | NPPD , OPPD, MEAN, LES, GI |
| 7) Flat Water Wind Farm, LLC | 2010 | 60 | Gestamp Wind N.A. | OPPD |
| 8) Laredo Ridge Wind Farm | 2011 | 80 | Edison Mission | NPPD, LES, MEAN, GI |
| 9) Springview II/Bluestem, LLC | 2011 | 3 | Bluestem, LLC | NPPD, OPPD**, LES**, GI**, <i>***will receive direct drive knowledge</i> |
| 10) TPW Petersburg, LLC | 2011 | 40.5 | Gestamp Wind N.A. | OPPD Cs |
| 11) Crofton Bluffs Wind Farm | 2012 | 42 | Edison Mission | NPPD, OPPD, LES, MEAN |
| 12) Broken Bow Wind, LLC | 2012 | 80 | Edison Mission | NPPD, OPPD, LES, GI |
| 13) Steele Flats Wind | 2013 | 74.8 | NextEra | NPPD |
| 14) Broken Bow II | 2014 | 75 | Edison Mission | NPPD, OPPD |
| 15) Prairie Breeze | 2014 | 200 | Invenergy | OPPD |
| 16) Grande Prairie | 2015 | 400 | Geronimo | OPPD |
| | | ~1207 Total MW | | |

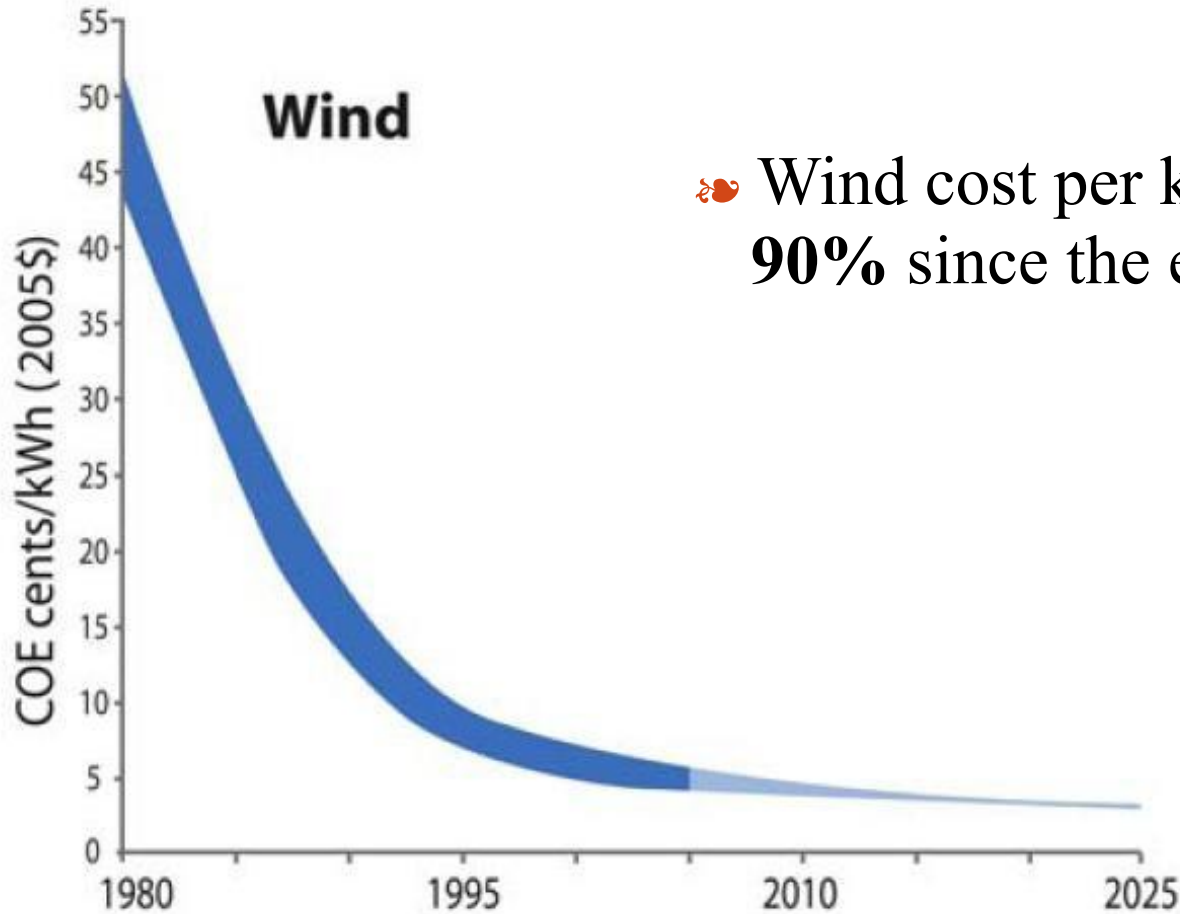
SPP Wind Generation's Increasing Importance in Supplying Electricity

- ❧ As of May 30, 2011, there were over **4,000 MW** of wind generation in operation within the SPP region. This is an increase from 3,300 MW indicated in the 2010 report.
- ❧ Today SPP has over 8000 MW of installed wind Generation
- ❧ “Because of growing output from wind generators, the value and use of electric baseload capacity is declining in the [Southwest Power Pool \(SPP\)](#).” EIA release September 2013

Regional Expected Wind RPS Demand

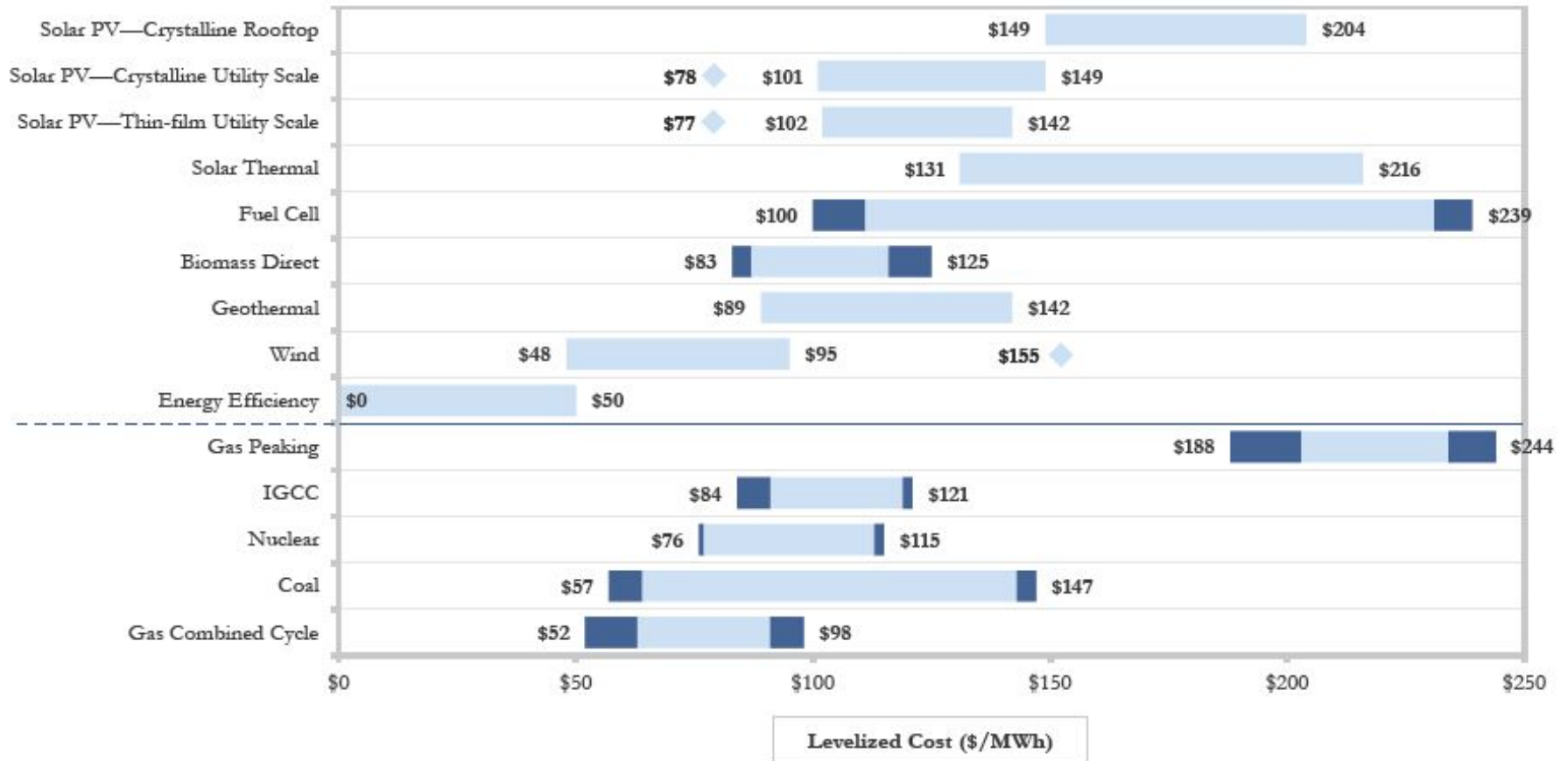


Historical Cost of Wind Energy



👉 Wind cost per kw/hr has **declined 90%** since the early 1980's

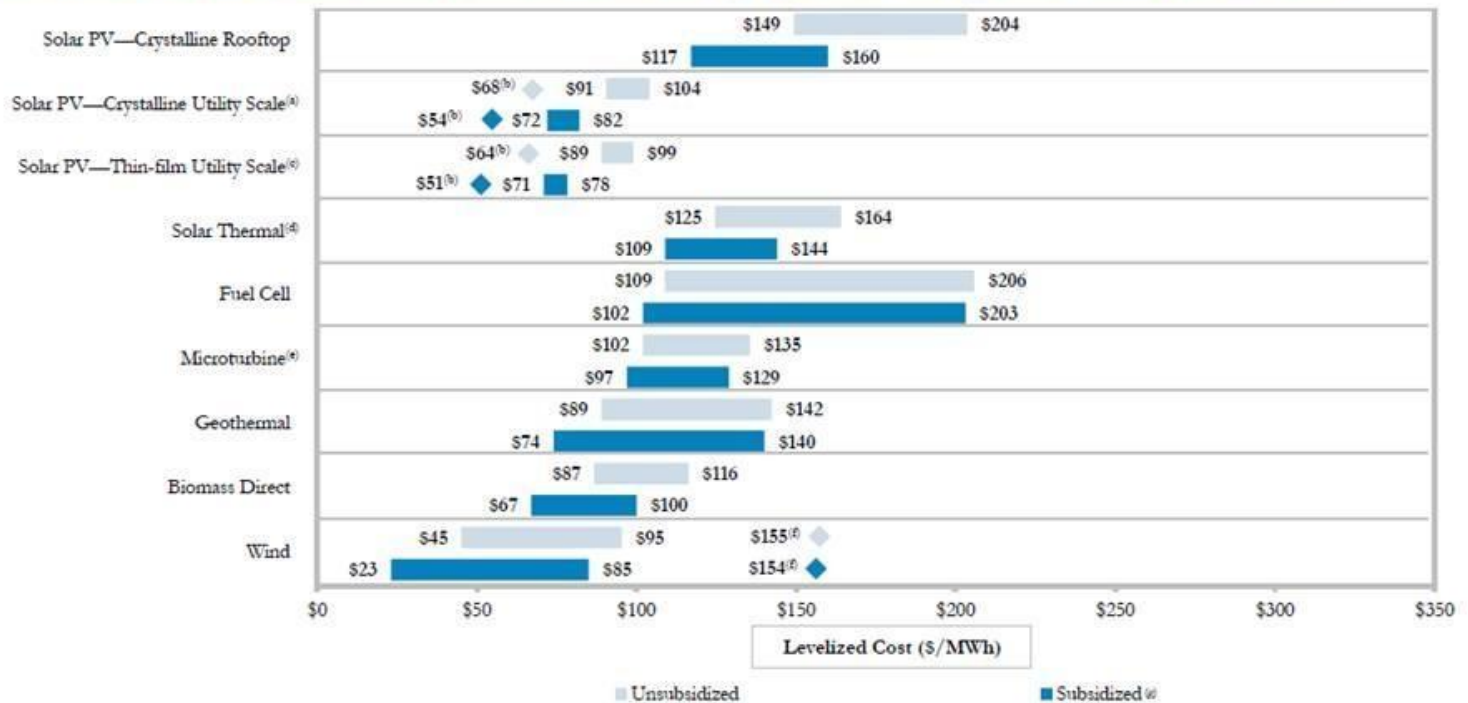
Wind Energy Is Cost Competitive With New Generation



Wind Prices

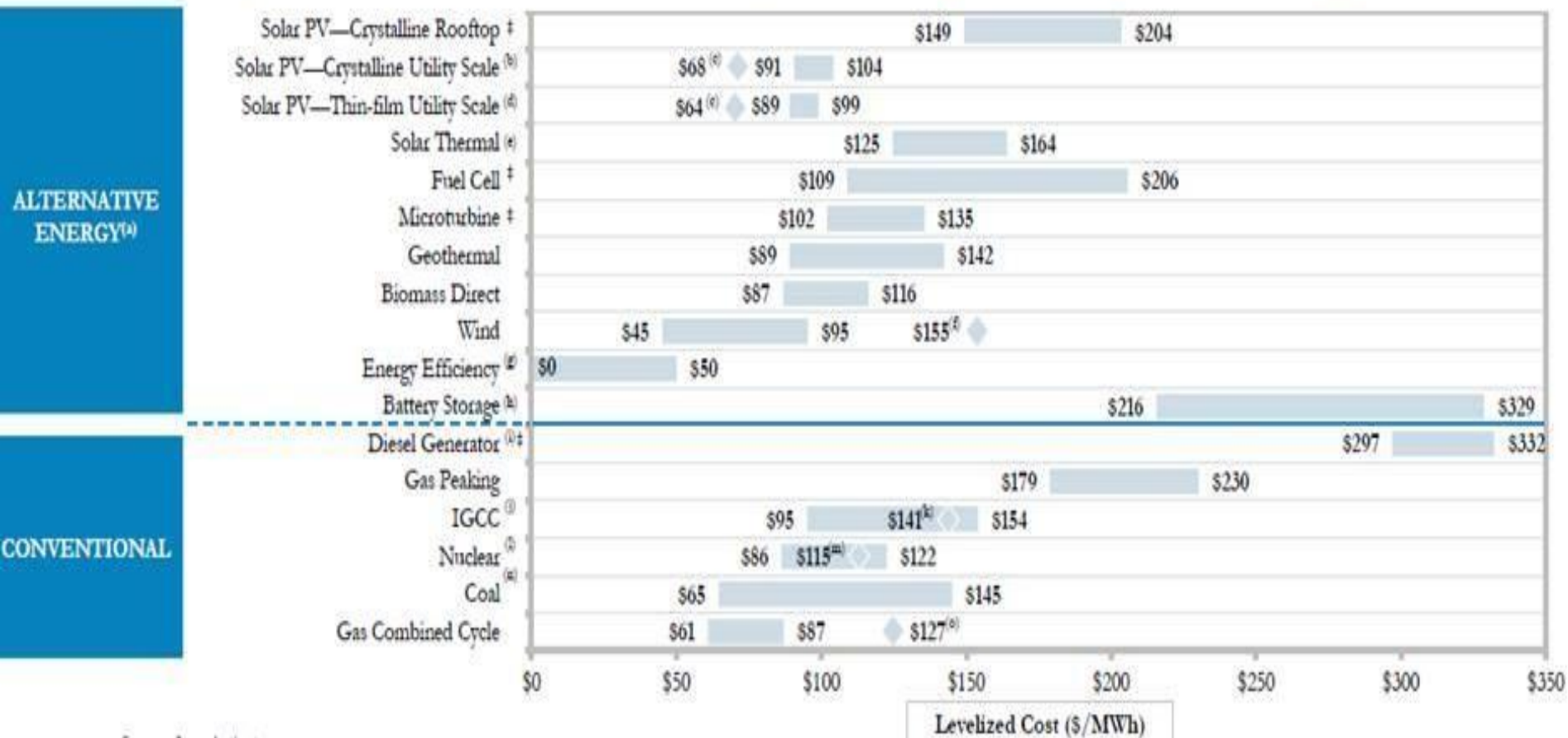
Levelized Cost of Energy—Sensitivity to U.S. Federal Tax Subsidies

U.S. federal tax subsidies remain an important component of the economics of Alternative Energy generation technologies (and government incentives are, generally, currently important in all regions); future cost reductions in technologies such as solar PV have the potential to enable these technologies to approach “grid parity” without tax subsidies and may currently reach “grid parity” under certain conditions (albeit such observation does not take into account issues such as dispatch characteristics, the cost of incremental transmission and back-up generation/system reliability costs or other factors)



Unsubsidized Levelized Cost of Energy Comparison

Certain Alternative Energy generation technologies are cost-competitive with conventional generation technologies under some scenarios, before factoring in environmental and other externalities (e.g., RECs, transmission and back-up generation/system reliability costs) as well as construction and fuel cost dynamics affecting conventional generation technologies



Source: *Lazard estimates.*

Note: Assumes 60% debt at 8% interest rate and 40% equity at 12% cost for conventional and Alternative Energy generation technologies. Assumes Powder River Basin coal price of \$1.99 per MMBtu and natural gas price of \$4.50 per MMBtu. As many have argued, current solar pricing trends may be masking material differences between the inherent economics of certain types of thin-film technologies and crystalline silicon.

† Denotes distributed generation technology.

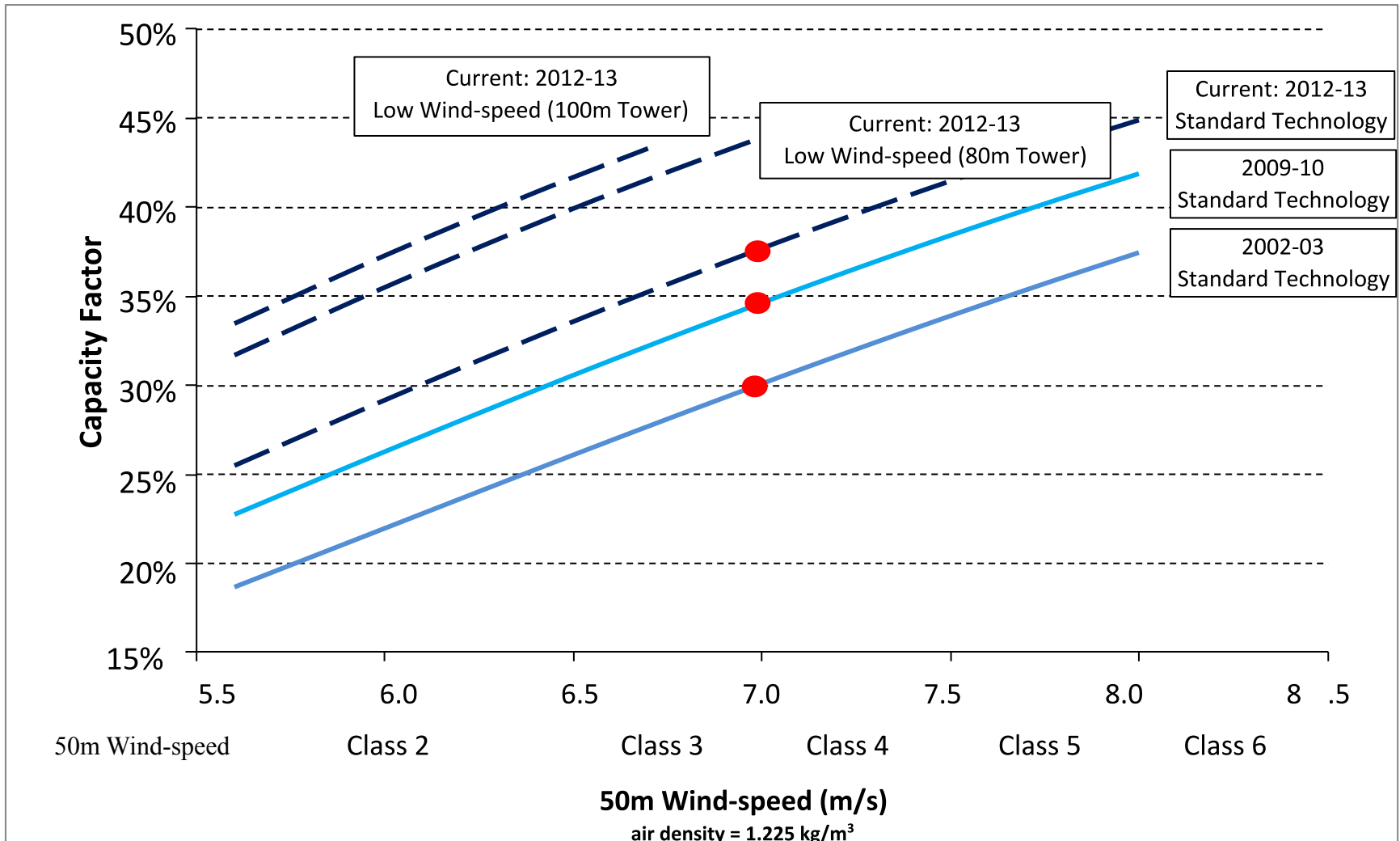
(a) Analysis excludes integration costs for intermittent technologies. A variety of studies suggest integration costs ranging from \$2.00 to \$10.00 per MWh.

(b) Low end represents single-axis tracking. High end represents fixed-tilt installation. Assumes 10 MW system in high insolation jurisdiction (e.g., Southwest U.S.). Not directly comparable for baseload.

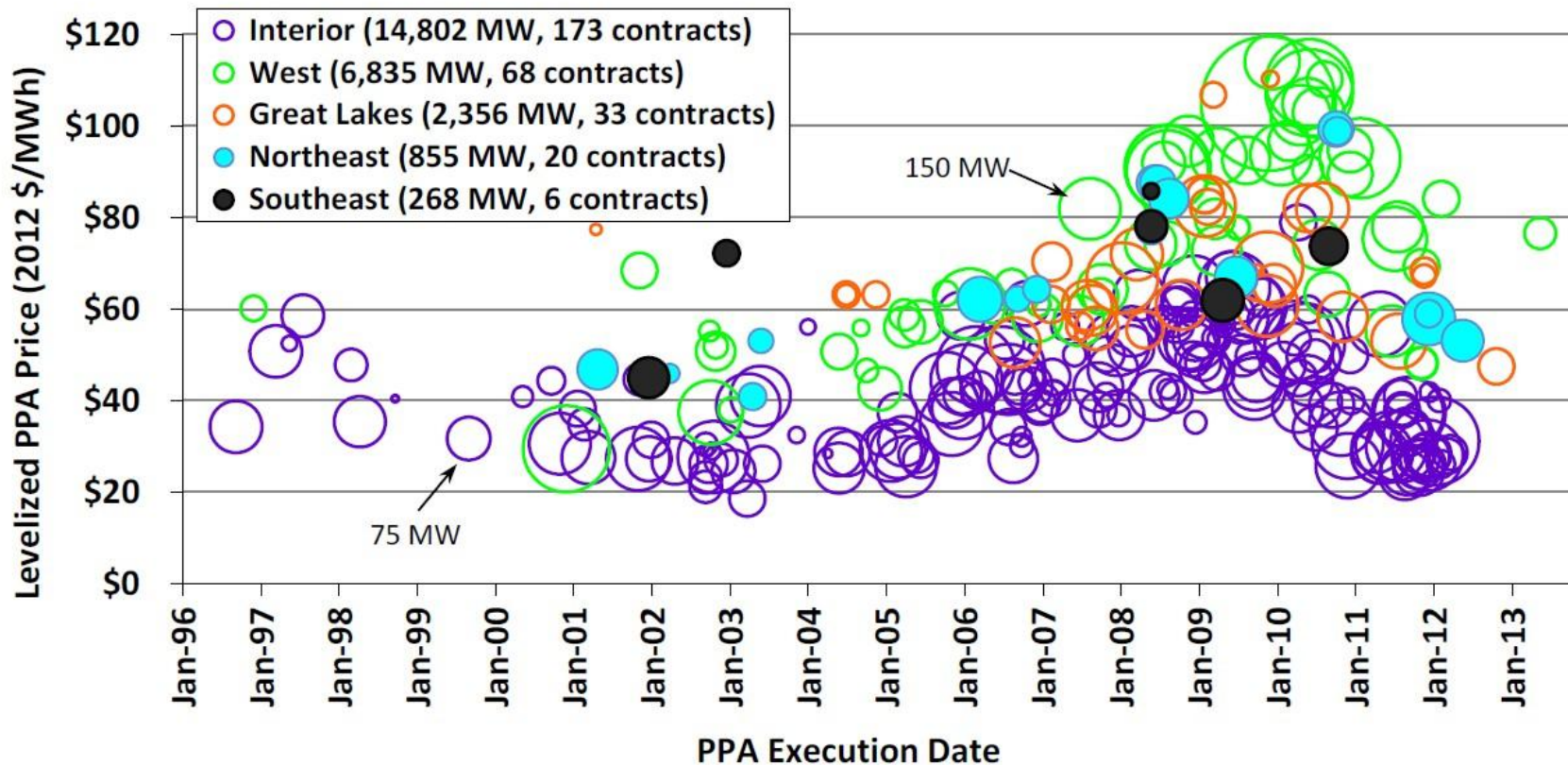
(c) Diamonds represent estimated implied levelized cost of energy in 2015, assuming \$1.50 per watt for a crystalline single-axis tracking system and \$1.50 per watt for a thin-film single-axis tracking system.

(d) Low end represents single-axis tracking. High end represents fixed-tilt installation. Assumes 10 MW fixed-tilt installation in high insolation jurisdiction (e.g., Southwest U.S.).

Cost Competitiveness: Technology Improvement & Capacity Factors

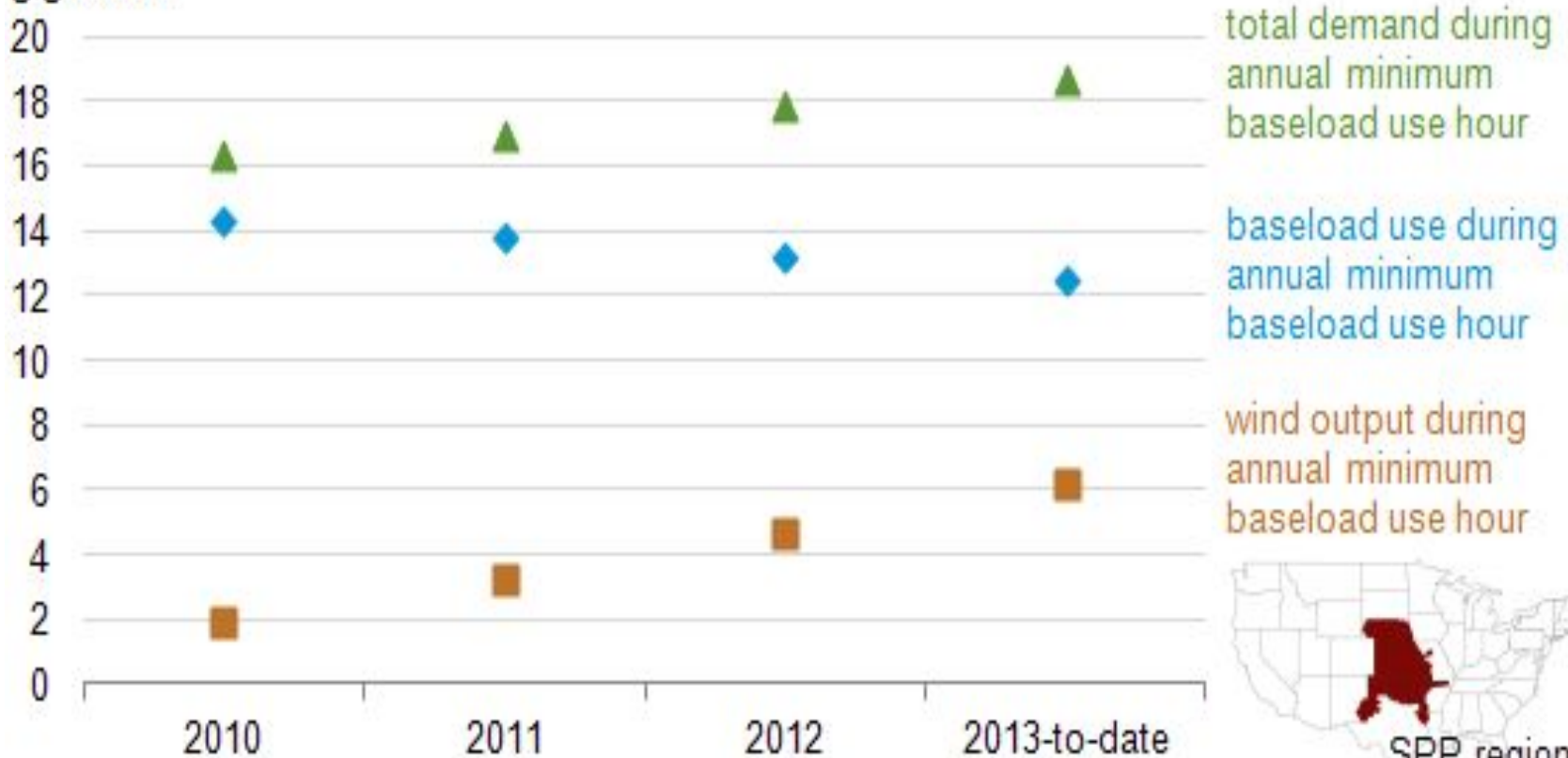


New Technology Is Reducing the Cost of Wind Energy



Increasingly offsetting the use of baseload generation

Total electricity demand, wind output, and use of baseload capacity during annual minimum baseload use hours in the Southwest Power Pool (2010-13)
gigawatts



Utilities on Wind

✓ Midwest

“We’ve found a way to meet the state of Minnesota’s renewable energy standard early and reduce costs at the same time ... Expanding Bison will add to our renewable energy supply, resulting in the lowest cost resource over time by capturing the benefits of the extended production tax credit and a competitive turbine market”

- Al Hodnik, chairman and CEO of ALLETE after announcing the expansion of their Bison Wind Energy Center

✓ Interior West

“It works out to a very good levelized cost for our customers, ... These prices are so compelling, the energy [cost] associated with it is less than you can do locking in a 20-year gas strip.”

- Xcel Energy, Ben Fowke, Xcel President and CEO. The Colorado and Minnesota public utility commissions approved wind PPAs totaling 850 MW. Xcel Energy expects to pay about \$25/MWh to \$35/MWh over 20 years for the recently approved wind power purchase agreements

✓ Northeast

“By pooling the resources of all the utilities, we were able to purchase a large amount of clean, renewable energy for the state at below-market prices. In addition to delivering benefits for years to come, these agreements have the potential to save customers money over the long term.”

- Ronald Gerwatowski, National Grid Sr. VP for U.S. Regulation and Pricing. The The state’s biggest utilities, National Grid, Northeast Utilities, and Unitil Corp, in a milestone for New England’s wind power industry, have signed long-term contracts for 565 MW of wind. If approved, the contracts would eventually save customers between 75 cents and \$1 a month, utilities estimated.

✓ Plains

“The decision to contract for an additional 400 MW was based on extraordinary pricing opportunities that will lower costs for PSO’s customers by an estimated \$53 million in the first year of the contracts. Annual savings are expected to grow each year over the lives of the contracts.”

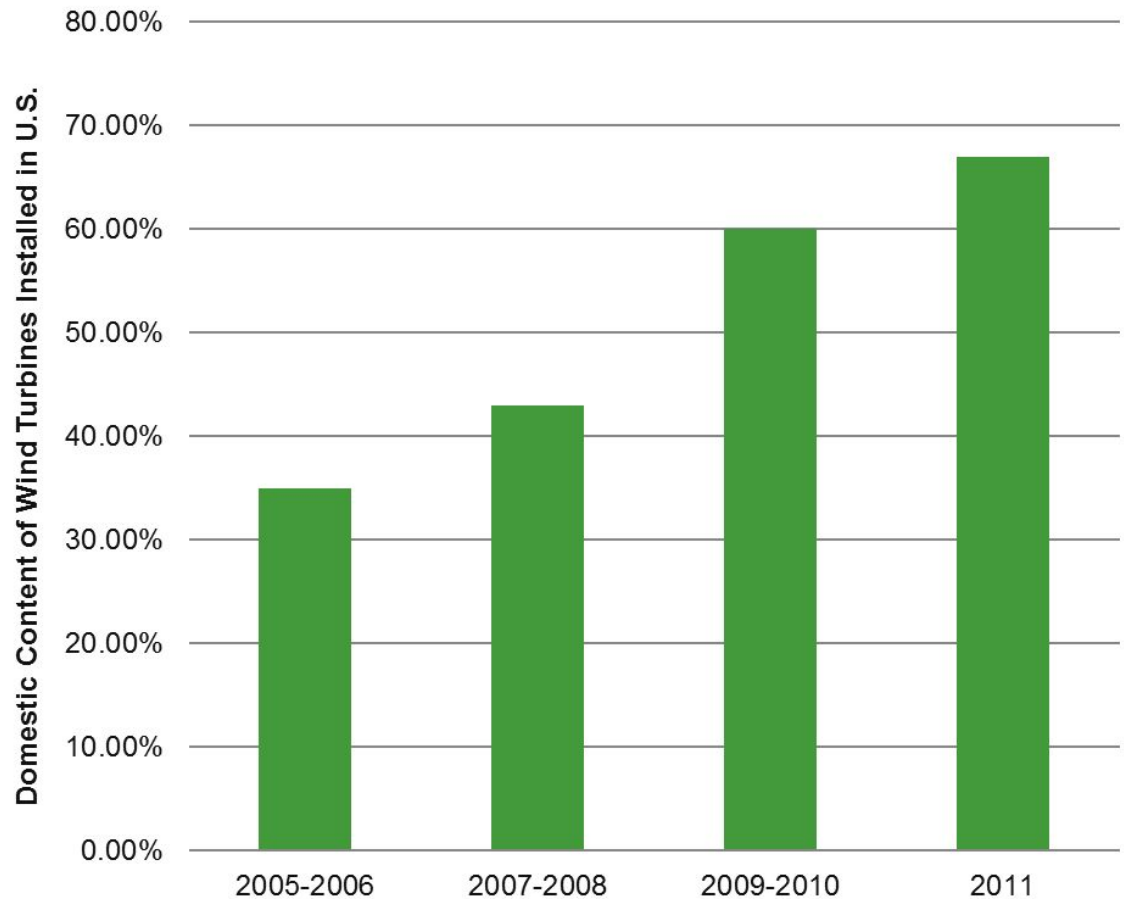
- American Electric Power’s Public Service Company of Oklahoma, signed power purchase agreements for 400 MW of wind energy capacity, noting it decided to triple the amount of requested wind energy capacity.

Consumers Price Benefits

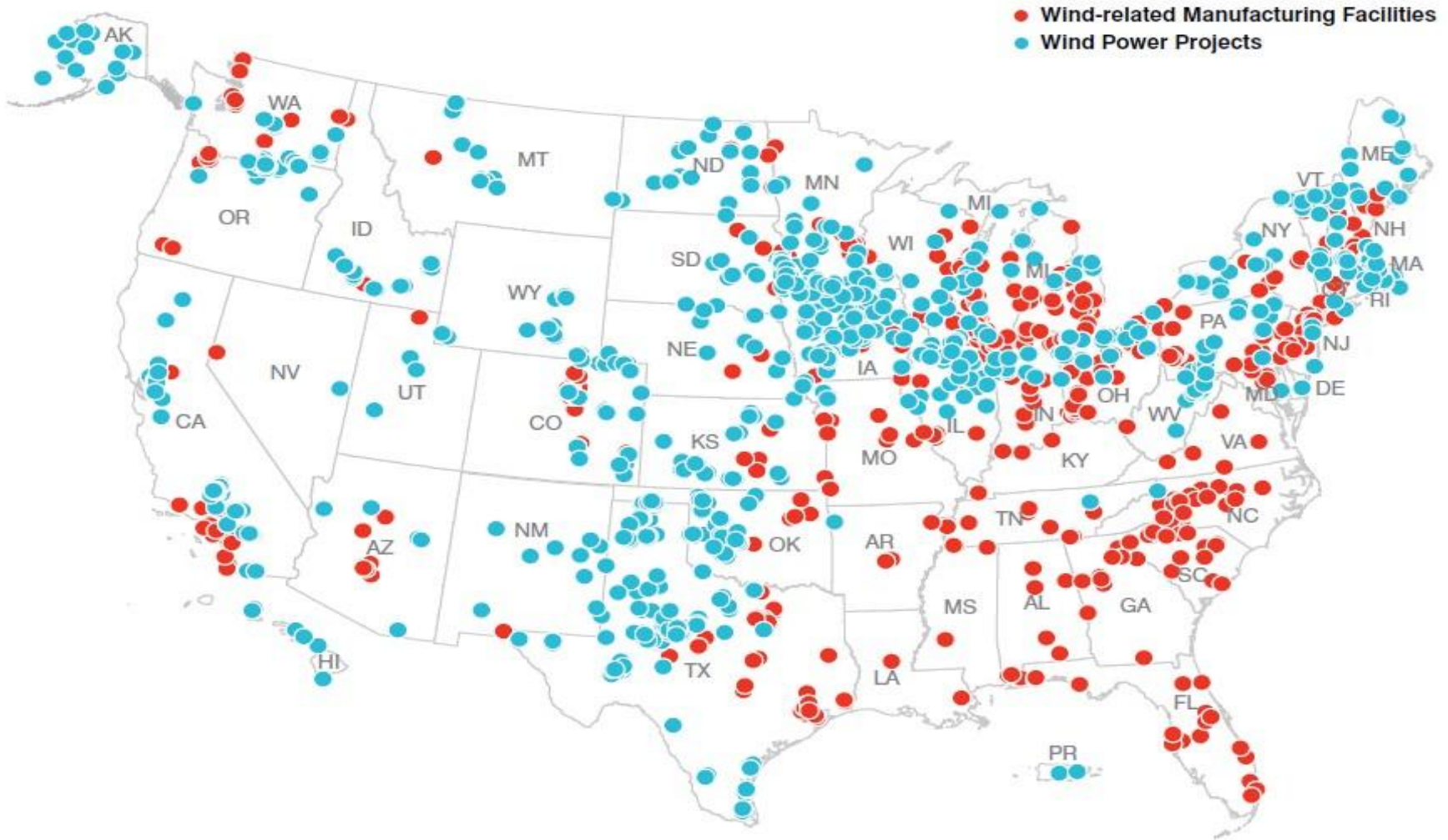
- ❧ Flat Ridge 2 wind power could lower SWEPCO customer bills in 2013 by roughly \$.05 per monthly bill for customers using 1,000 kilowatt hours and \$.11 per monthly bill in 2014.” – SWEPCO
- ❧ Alabama Power, a subsidiary of Southern Company, is “absolutely looking for more wind power” to import from Midwestern states. Noting that Alabama does not have good wind resource. **“Wind energy is cost-effective for the utility’s customers and helps diversify its fuel mix.”** - Michael Sznajderman of Alabama Power.
- ❧ *“Wind generation provides value simply for the insurance it furnishes in insulating customers from some of the aspects of unexpectedly high and volatile fuel and wholesale energy prices” -Westar President & CEO William B. Moore, in direct testimony to the KCC on why Westar wished to add approximately 300 MW of wind power to its portfolio, Oct. 2007, 18 months*

Domestic Content of U.S. Installed Turbines

- ✓ Prior to 2005, wind turbines installed in U.S. had **25% of their components made in the U.S.**
- ✓ Today, U.S. manufacturing expanded rapidly so that now over **67% of the components installed in wind turbines are made in the U.S.**

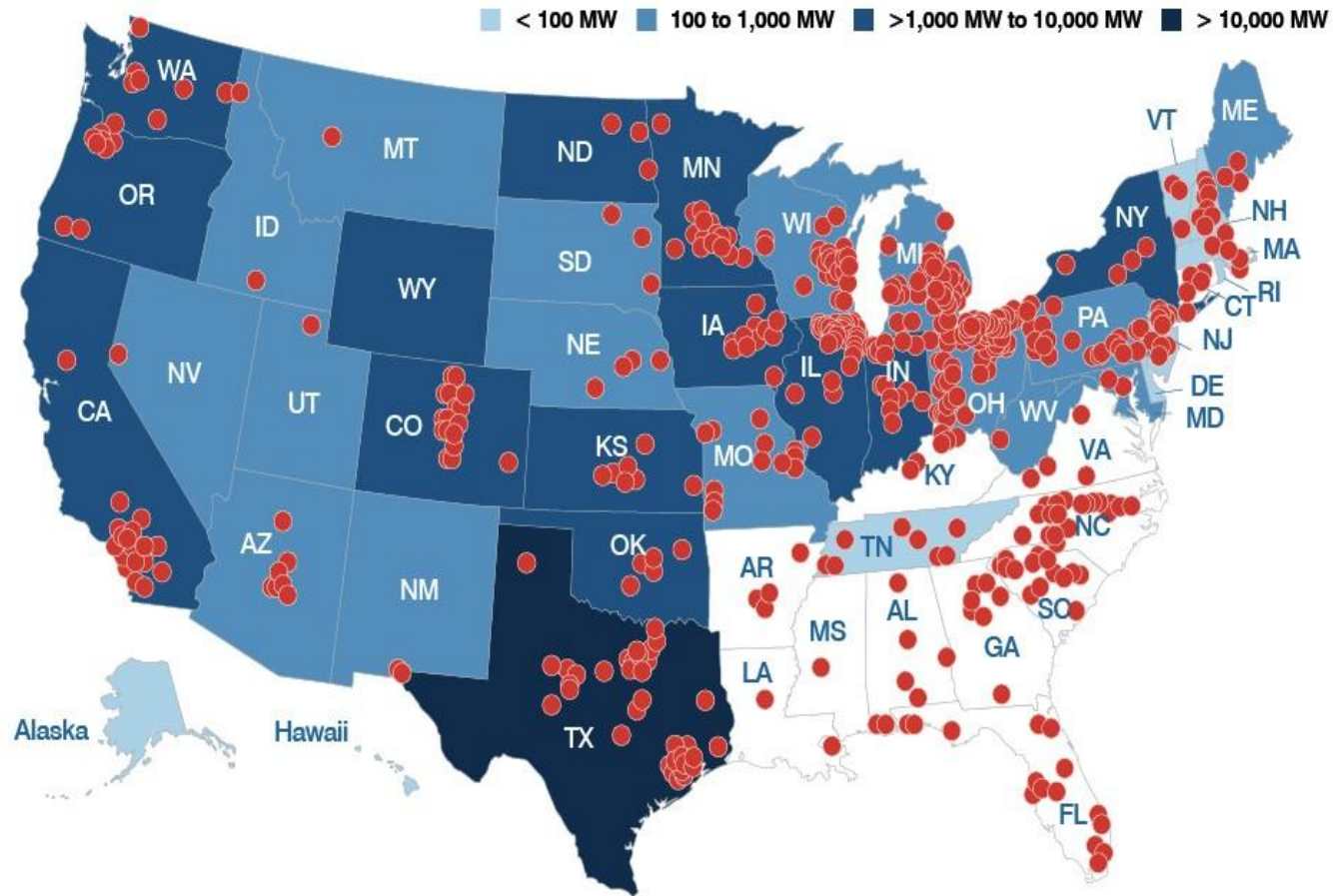


Wind-Related Manufacturing and Projects, by State

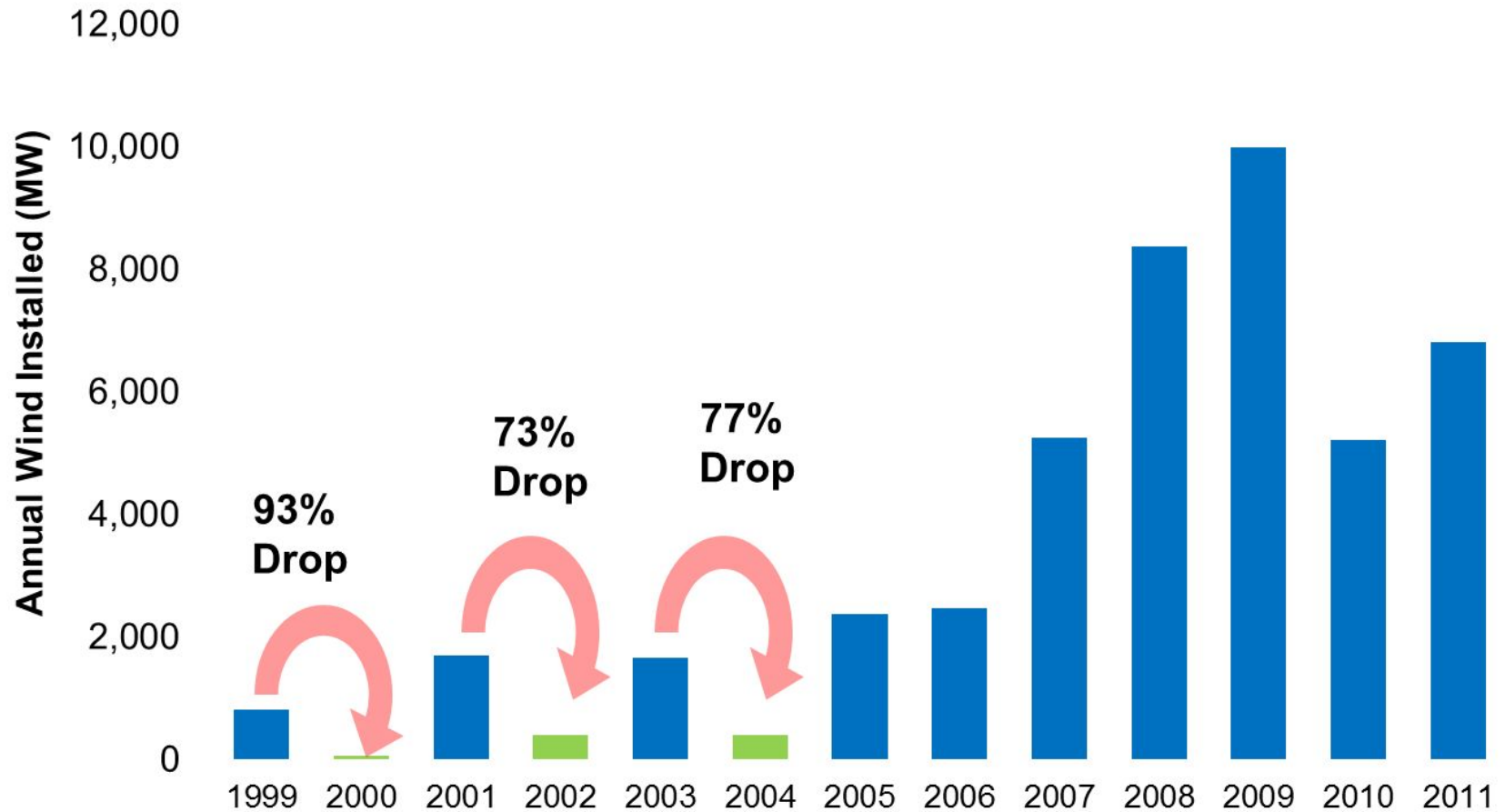


With 500 facilities, wind is one of the fastest-growing sources of U.S. Manufacturing jobs

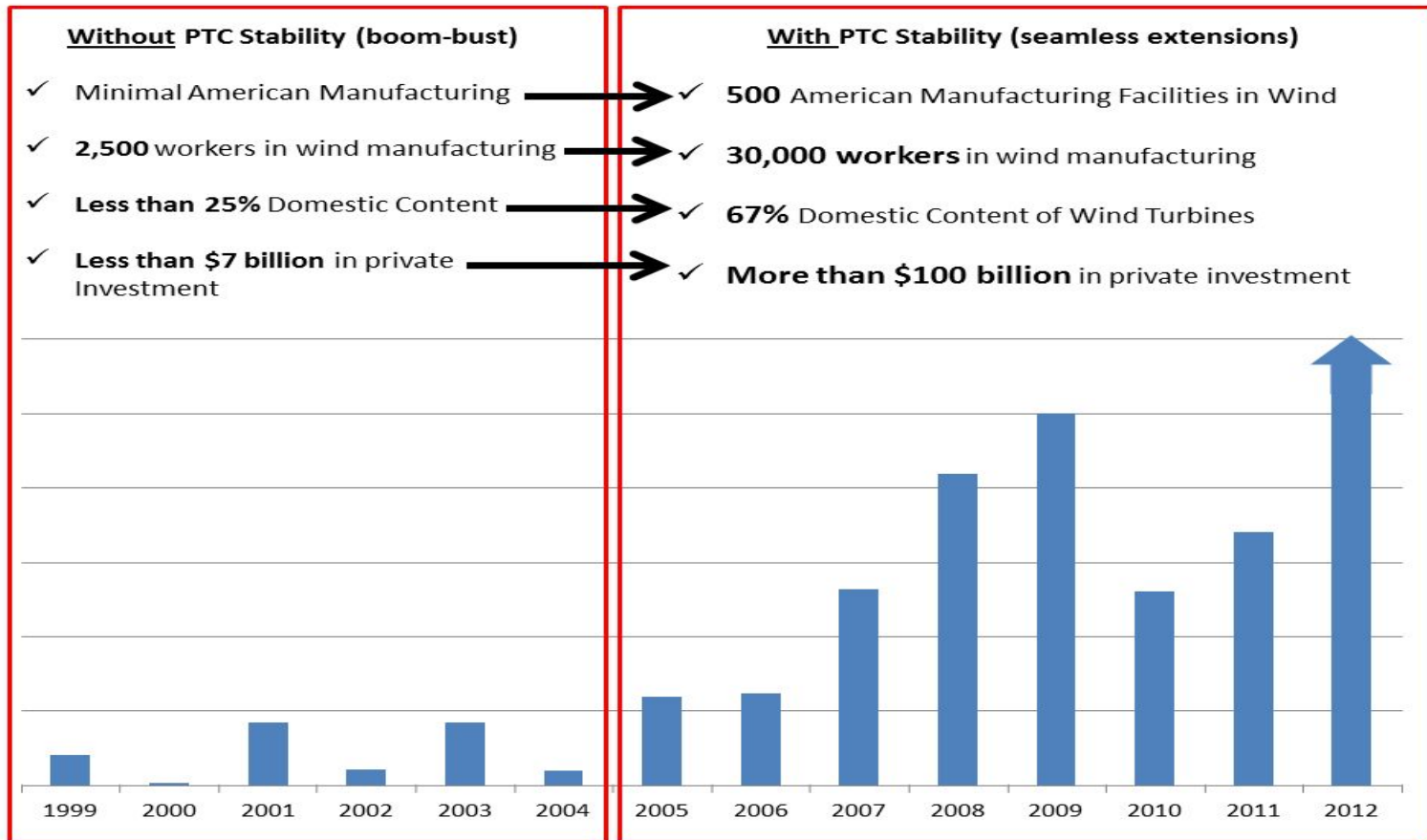
At the end of 2012, there were **559** manufacturing facilities online making wind-related products. These online facilities span **43** states



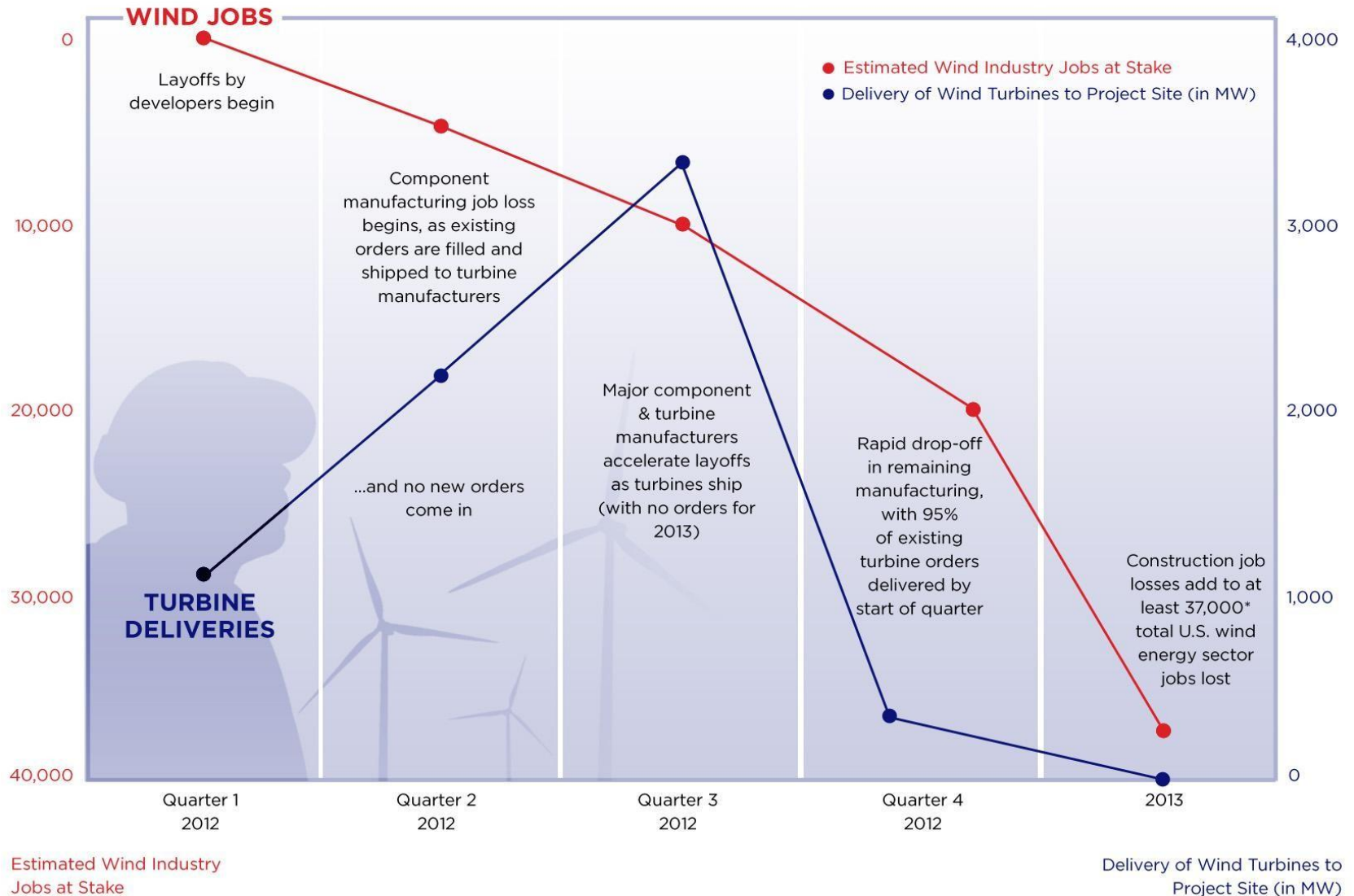
Key Drivers: Production Tax Credit (PTC)



Impact of Policy Certainty & Stability



PROJECTED JOB LOSSES IN U.S. WIND ENERGY AS PTC EXPIRES

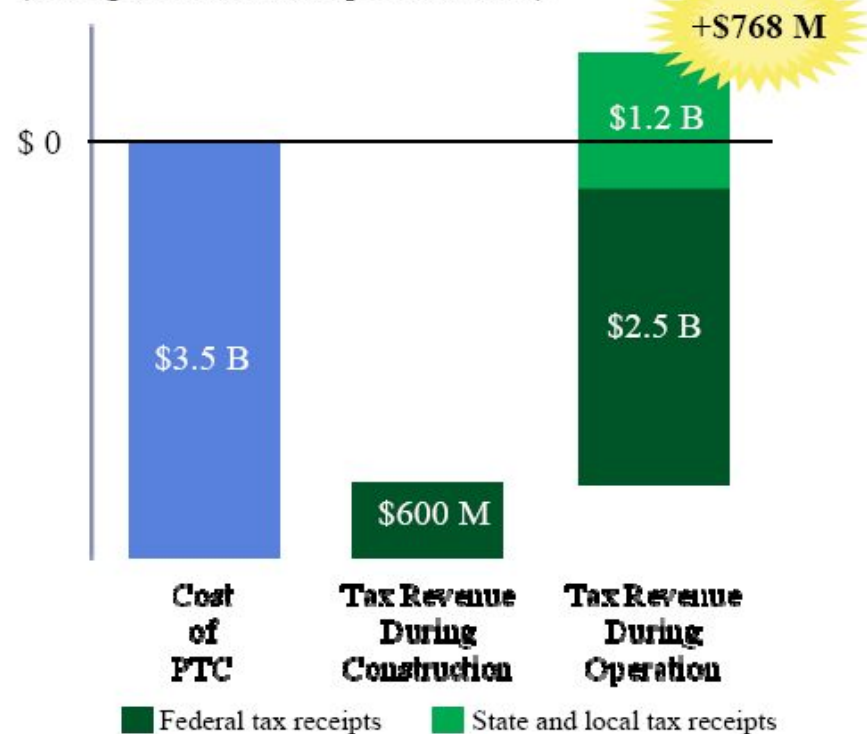


*Source for 37,000 Job Loss: Navigant Consulting

PTC Provides a Fiscal Net Benefit to the Government

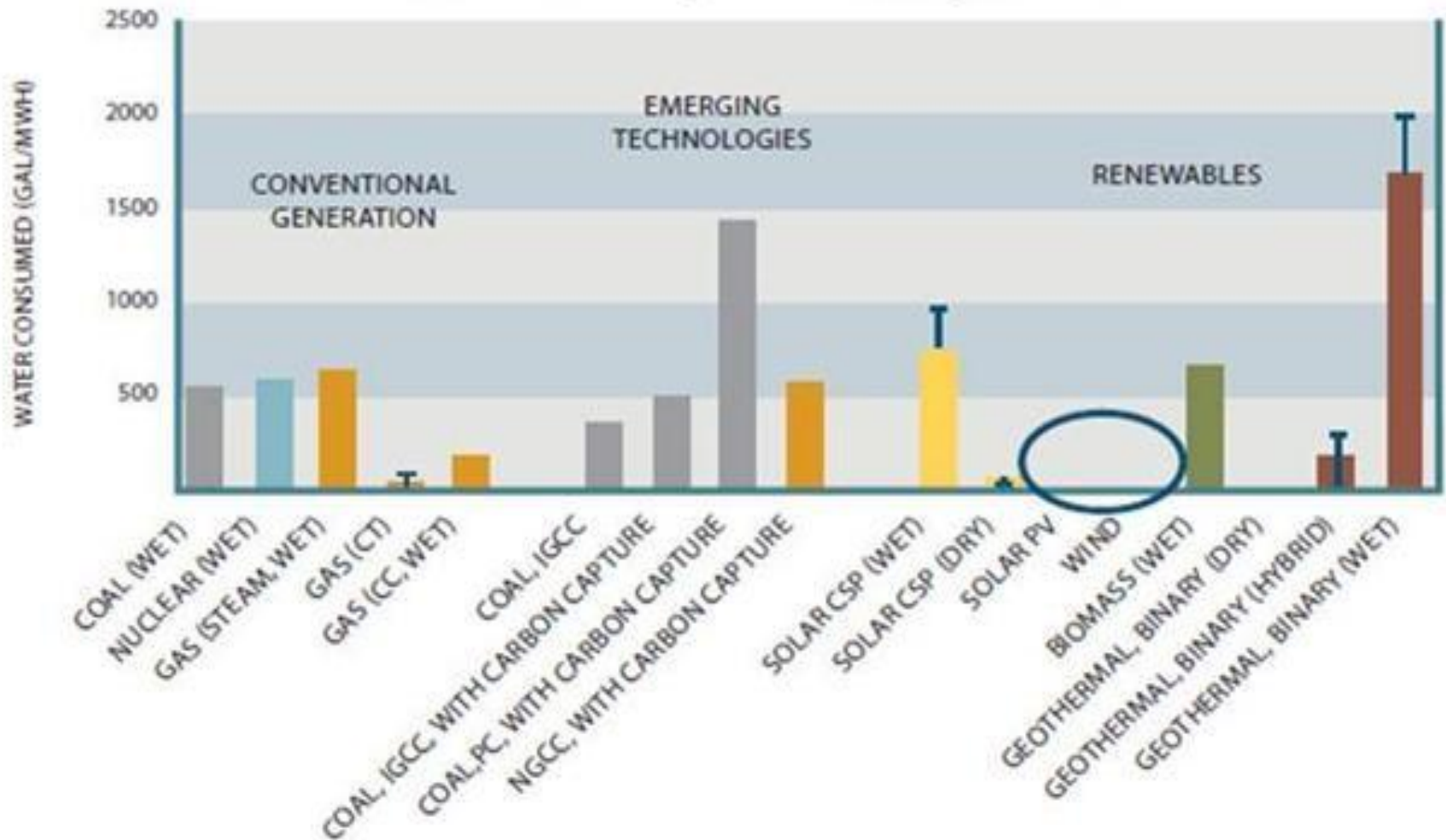
- 🍷 **Federal impact:** Tax revenues flow from wind development projects for the life of the wind farm, well beyond the 10 years that the PTC is awarded. Income taxes on corporate profits and worker payroll also help offset the cost of the PTC to the U.S. Treasury.
- 🍷 **State and local impact:** Wind projects deliver significant tax revenues to state and local governments through state income tax on wages and profits, property taxes and sales taxes.

A one-year PTC extension results in a net government benefit of \$768M
(All figures shown net present value)



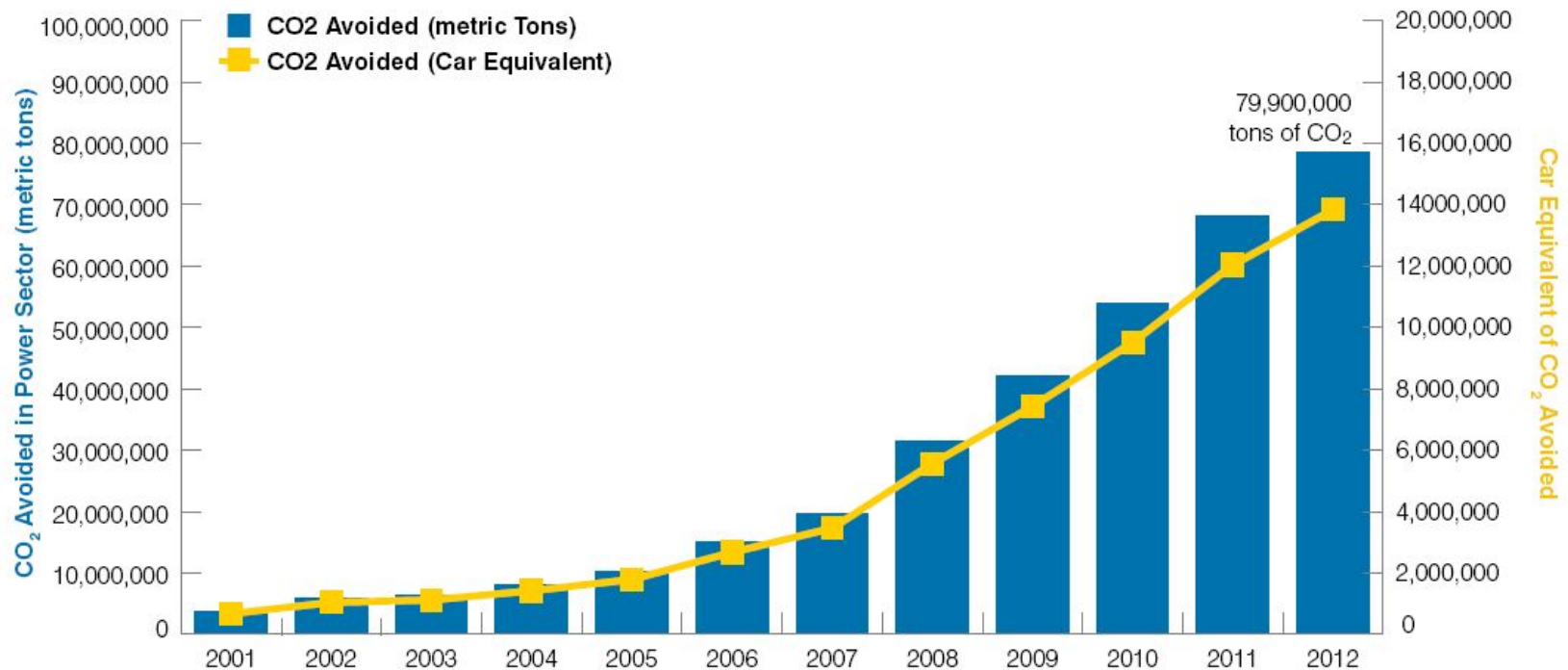
Water Use by Technology

Water Intensity of Electricity Generation



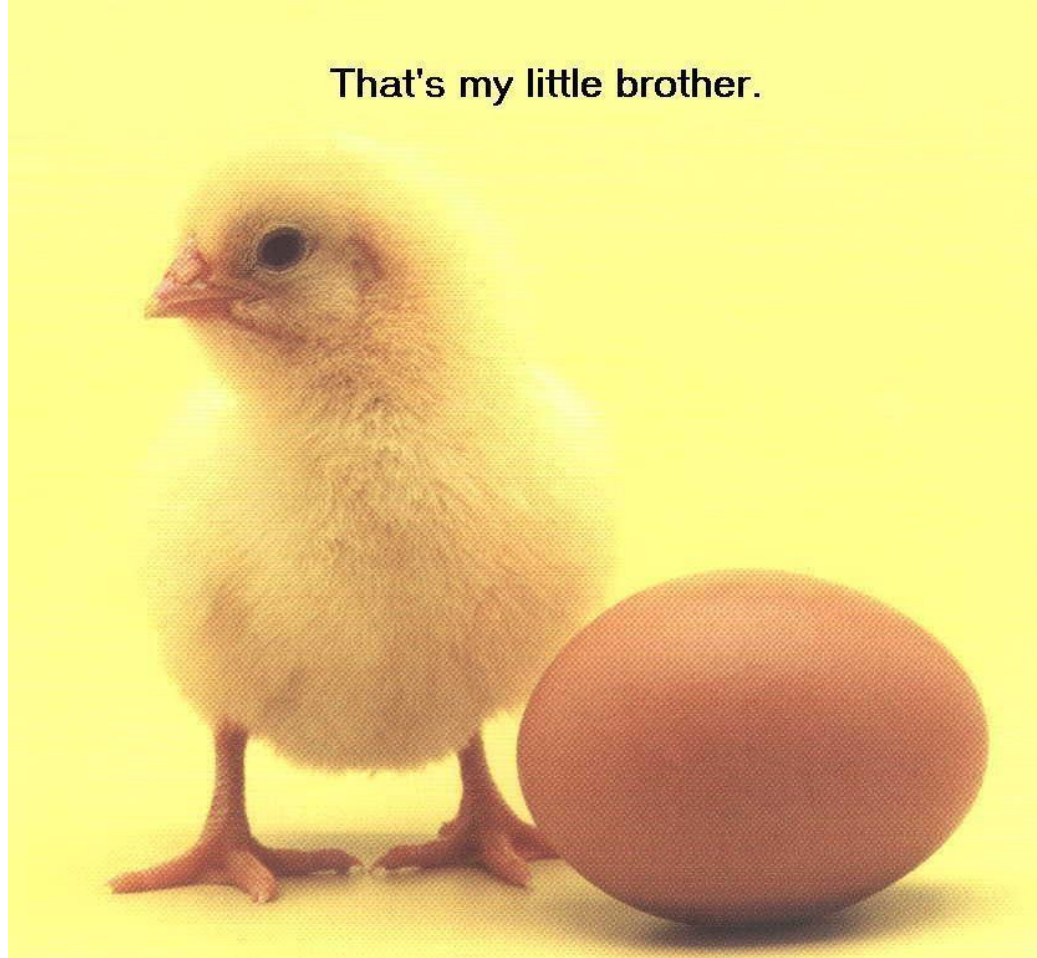
CO₂ Emissions Reduction

- In 2012, the roughly 140 million megawatt-hours (MWh) generated by wind energy avoided 79.9 million metric tons of carbon dioxide (CO₂)—the equivalent of reducing power-sector CO₂ emissions by 3.6%,
- When the new wind projects installed throughout 2012 produce power for a full year, the entire U.S. wind fleet will avoid nearly 98.9 million metric tons of CO₂, the equivalent of reducing power sector emissions by 4.4%.



Which comes first: Renewable Generation
or transmission to deliver it?

That's my little brother.



Roadblock to potential development



**2013 ITP20
Future 2, Grouping D
As of February 2013**

Upgrade Type

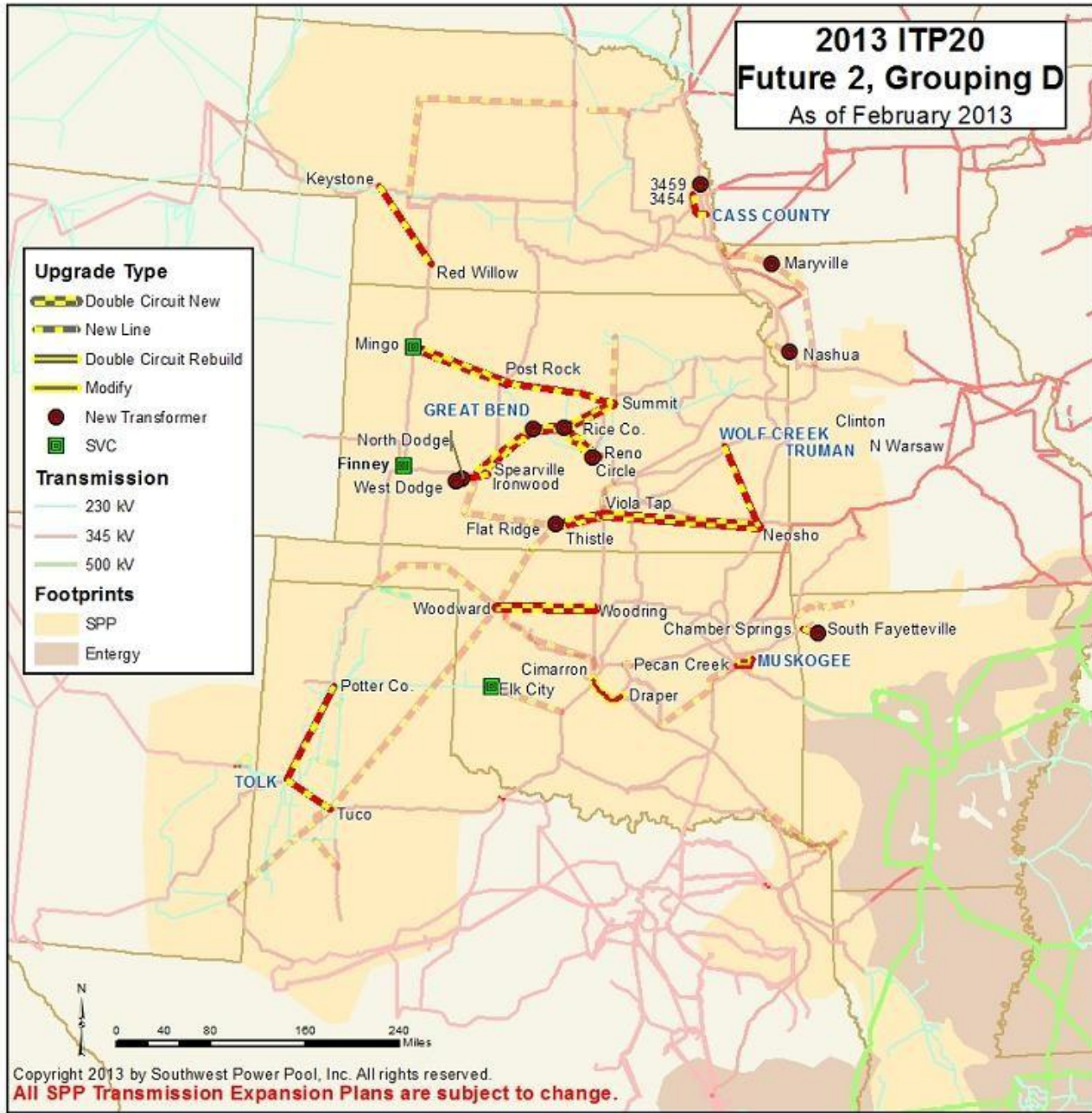
- Double Circuit New
- New Line
- Double Circuit Rebuild
- Modify
- New Transformer
- SVC

Transmission

- 230 kV
- 345 kV
- 500 kV

Footprints

- SPP
- Entergy



Future 2

Total Cost: \$2.47B

Reliability Cost:
\$775M

Policy Cost: \$1.7B
Economic Cost: \$0

Total Mileage: 1,973

Reliability Miles:
648

Policy Miles:
1,325

Economic Miles:
0

Total Transformers: 10

**2013 ITP20
Future 3,
Grouping C**
As of
February 2013



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All SPP Transmission Expansion Plans are subject to change.

Future 3 C

Total Cost: \$9.1B

Reliability Cost:
\$1.1B

Policy Cost: \$8.0B
Economic Cost: \$0

Total Mileage:
6,862

Reliability Miles:
858

Policy Miles:
6,004

Economic Miles:
0

Total Transformers: 22

2013 ITP20
Future 3, Grouping D
 As of February 2013



| Upgrade Type | Transmission |
|------------------------|-------------------|
| Double Circuit New | 230 kV |
| New Line | 345 kV |
| Double Circuit Rebuild | 500 kV |
| Modify | 600 kV (DC) |
| New Transformer | Footprints |
| SVC | SPP |
| | Entergy |

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All SPP Transmission Expansion Plans are subject to change.

Future 3 D

Total Cost: \$7.23B

Reliability Cost:
 \$986M

Policy Cost: \$2.2B

HVDC Cost: \$4.05B

Economic Cost: \$0

Total Mileage: 5,297

Reliability Miles: 762

Policy Miles: 1,865

HVDC Miles: 1,275

Economic Miles: 0

Total Transformers: 10

Thank
You!

