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Land-Based Wind Market Report:

2024 Edition

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Land-Based Wind Market Report: 2024 Edition

Purpose and Scope:

– Summarize data on key trends in the U.S. wind power sector

– Focus on land-based wind turbines over 100 kW in size

- Separate DOE-funded data collection efforts on distributed and offshore wind
- Note that the *Installation Trends*, *Industry Trends*, and *Future Outlook* sections include data on both land-based and offshore wind; other chapters focus solely on land-based

– Focus on historical data, with some emphasis on the previous year – 2023

Funding:

– U.S. Department of Energy's Wind Energy Technologies Office

Products and Availability:

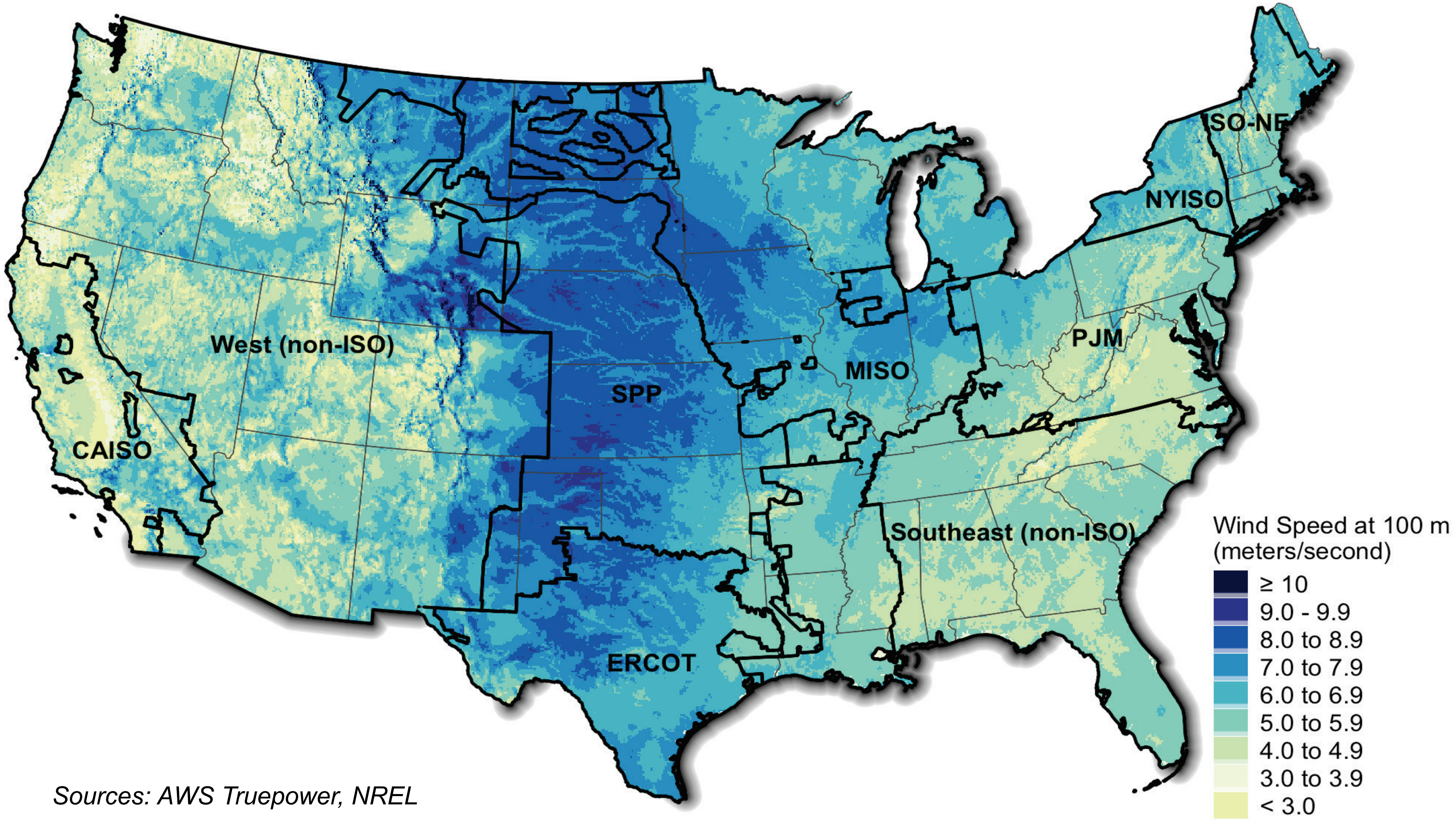
– This briefing is complemented with underlying report, data file, and visualizations

– All products available at: windreport.lbl.gov

Presentation Contents

- Installation trends
- Industry trends
- Technology trends
- Performance trends
- Cost trends
- Power sales price and levelized cost trends
- Cost and value comparisons
- Future outlook

Regional boundaries applied in this analysis include the seven independent system operators (ISO) and two non-ISO regions

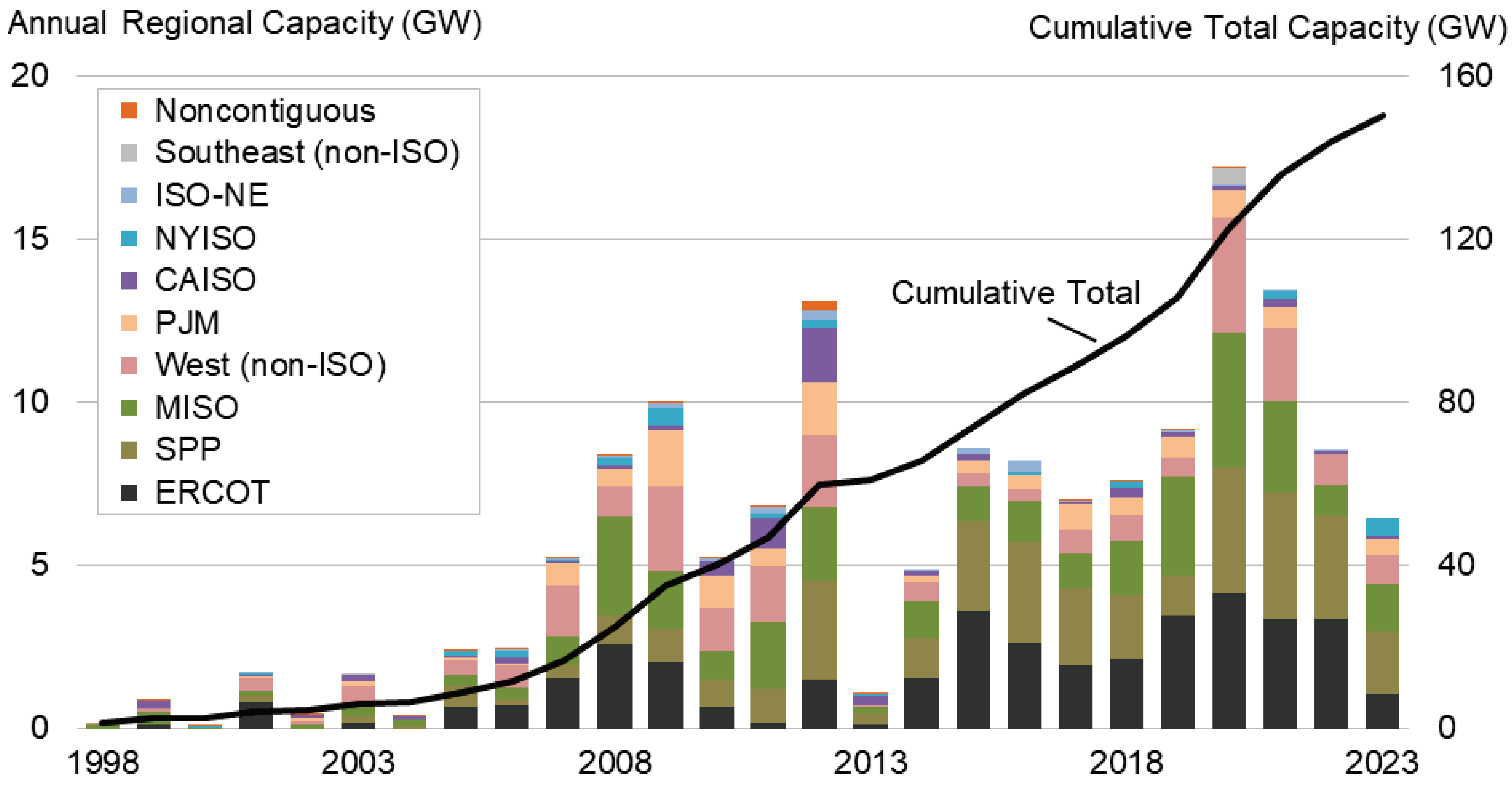


Sources: AWS Truepower, NREL

Regions: Southwest Power Pool (SPP), Electric Reliability Council of Texas (ERCOT), Midcontinent Independent System Operator (MISO), California Independent System Operator (CAISO), ISO New England (ISO-NE), PJM Interconnection (PJM), and New York Independent System Operator (NYISO), and the non-ISO West and Southeast.

Installation Trends

Total U.S. wind capacity additions equaled 6.5 GW in 2023, representing $10.8 billion in capital investment



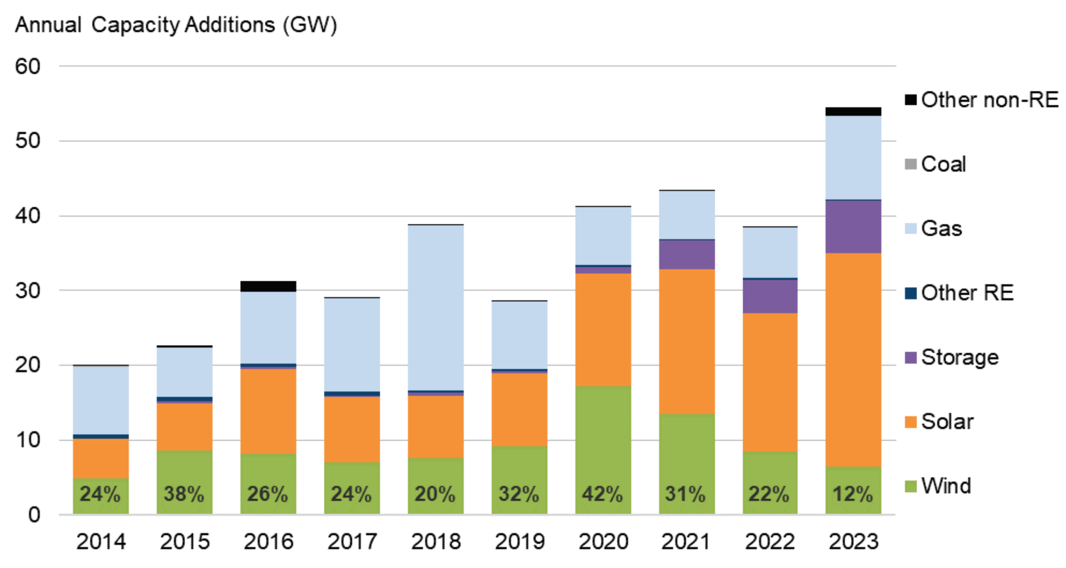
- Slow year in terms of new deployment: steep decline from the high in 2020, lowest since 2014
- 70% of new capacity in SPP, ERCOT, MISO
- Partial repowering: 0.6 GW of turbines retrofitted in 2023
- 150 GW of total installed capacity at end of 2023

Source: ACP

Interactive data visualization: https://emp.lbl.gov/wind-energy-growth

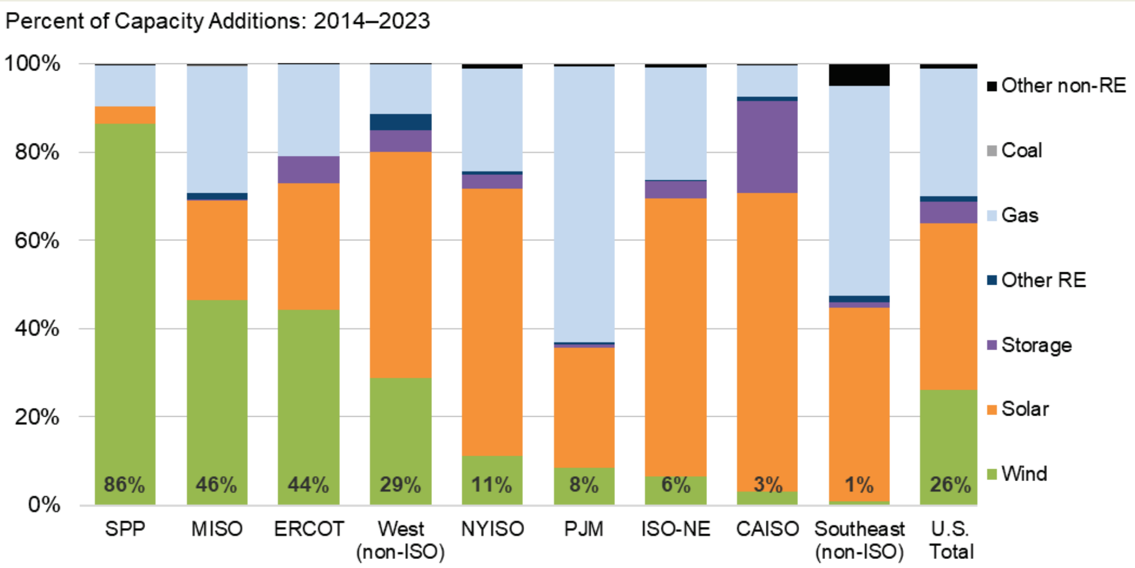
Wind power's contribution to total U.S. electric-power capacity additions in 2023 fell to 12%, the lowest level since 2013

Relative contribution of resource types in annual capacity additions



Sources: EIA, ACP

Resource capacity additions by region: 2014-2023



Over the last decade, wind has comprised 26% of total capacity additions, and a much higher proportion in SPP (86%), MISO (46%), ERCOT (44%)

Globally, the United States again ranked a distant 2nd in annual and cumulative total wind power capacity additions in 2023

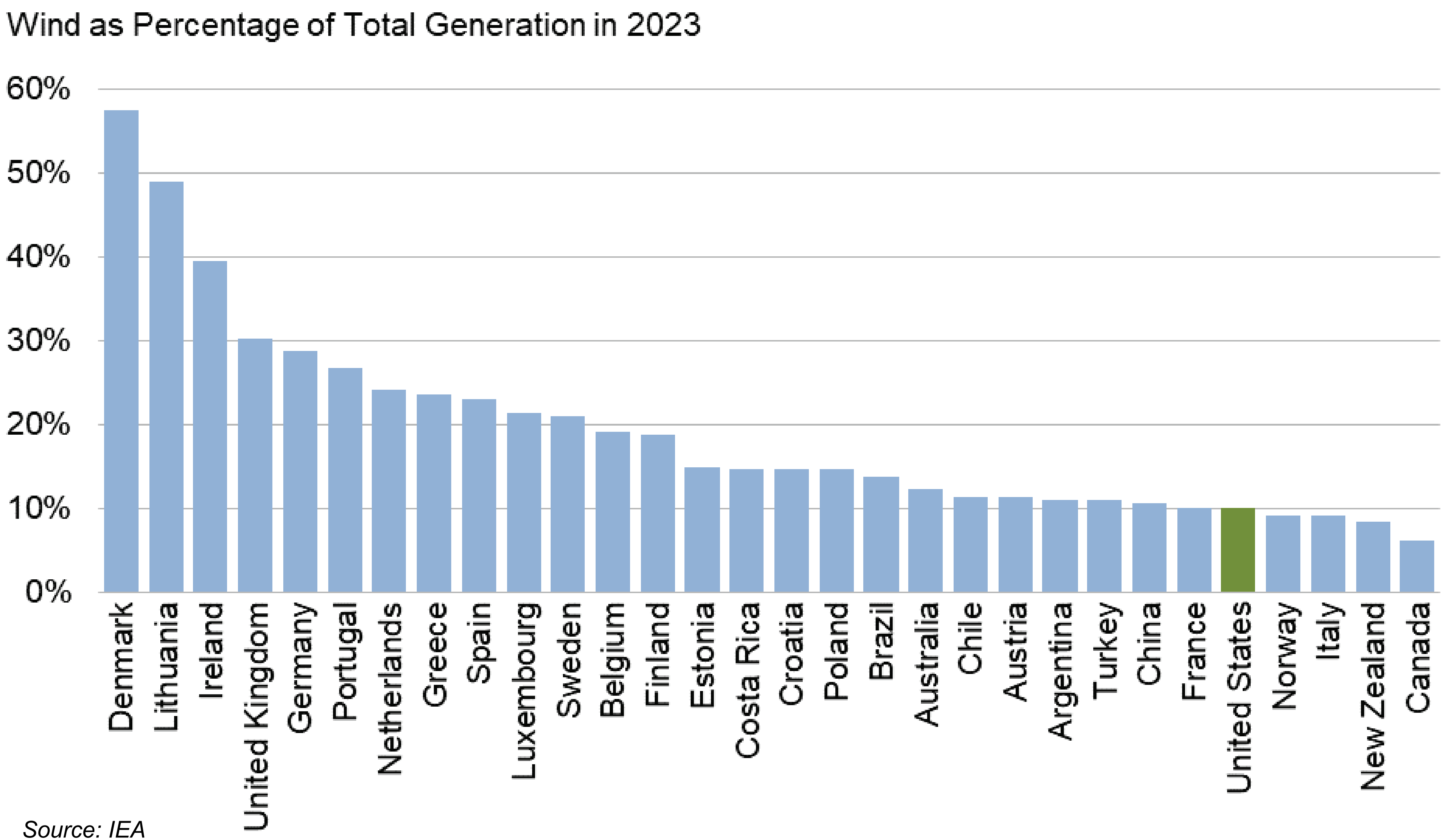
Annual Capacity (2023, GW)	
China	75.7
United States	**6.5**
Brazil	4.8
Germany	3.8
India	2.8
Netherlands	2.5
Sweden	2.0
France	1.8
Canada	1.7
United Kingdom	1.4
Rest of World	13.8
TOTAL	**117**

Cumulative Capacity (end of 2023, GW)	
China	441
United States	**150**
Germany	69
India	45
Spain	31
Brazil	30
United Kingdom	30
France	23
Canada	17
Sweden	16
Rest of World	168
TOTAL	**1,021**

- Global wind additions totaled over 117 GW in 2023, a new record
- U.S. remains a distant second to China in annual and cumulative capacity

Sources: GWEC, ACP

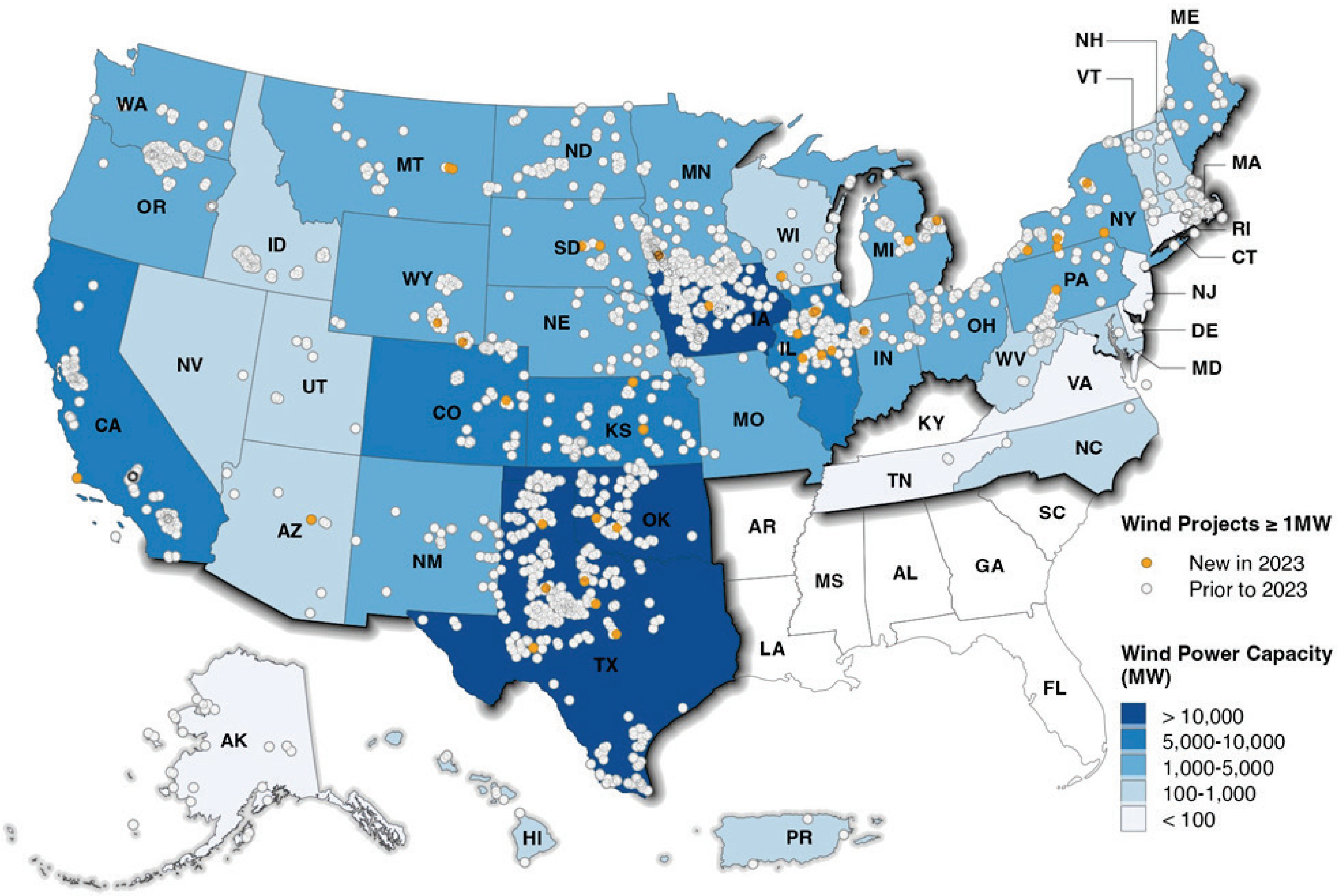
The United States ranks lower than many other countries in terms of wind energy as a share of total generation



Source: IEA

Note: Figure includes a subset of the top global wind markets

The geographic spread of wind power projects across the United States is broad, except for the Southeast



Interactive data visualization: https://emp.lbl.gov/wind-energy-growth

Source: ACP, Berkeley Lab

Texas installed the most wind power capacity in 2023; 12 states exceeded 20% wind as a fraction of in-state generation

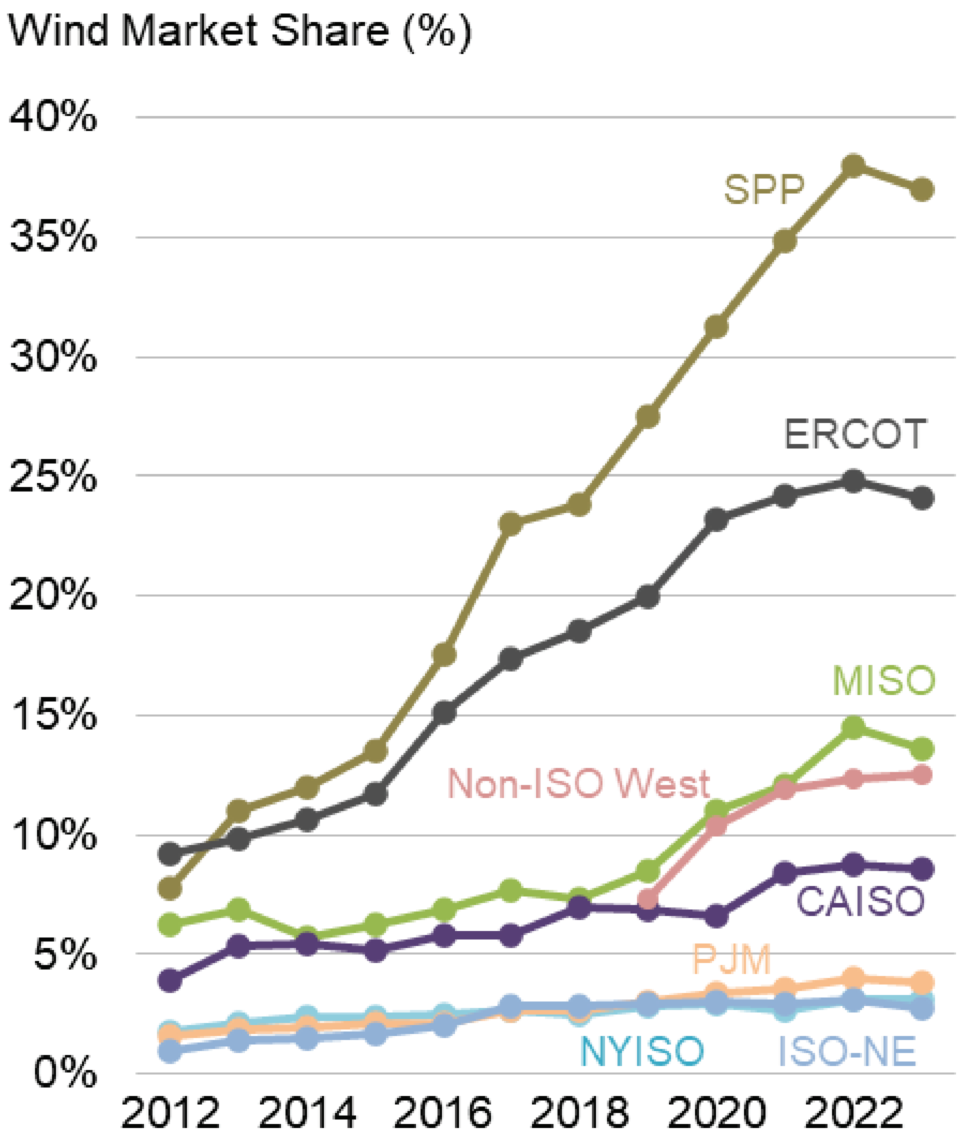
Installed Capacity (MW)			
Annual (2023)		Cumulative (end of 2023)	
Texas	1,323	Texas	41,594
Illinois	928	Iowa	13,007
Kansas	843	Oklahoma	12,624
New York	557	Kansas	9,078
Oklahoma	402	Illinois	7,968
South Dakota	399	California	6,195
Michigan	337	Colorado	5,394
Montana	311	Minnesota	4,859
Arizona	239	New Mexico	4,327
Iowa	224	North Dakota	4,302
Indiana	202	Oregon	4,055
Colorado	200	Indiana	3,658
Wyoming	134	South Dakota	3,618
Minnesota	100	Michigan	3,568
California	95	Nebraska	3,519
Wisconsin	92	Washington	3,407
Pennsylvania	88	Wyoming	3,286
		New York	2,749
		Missouri	2,435
		Montana	1,737
Rest of U.S.	*0*	*Rest of U.S.*	*9,112*
Total	**6,474**	**Total**	**150,492**

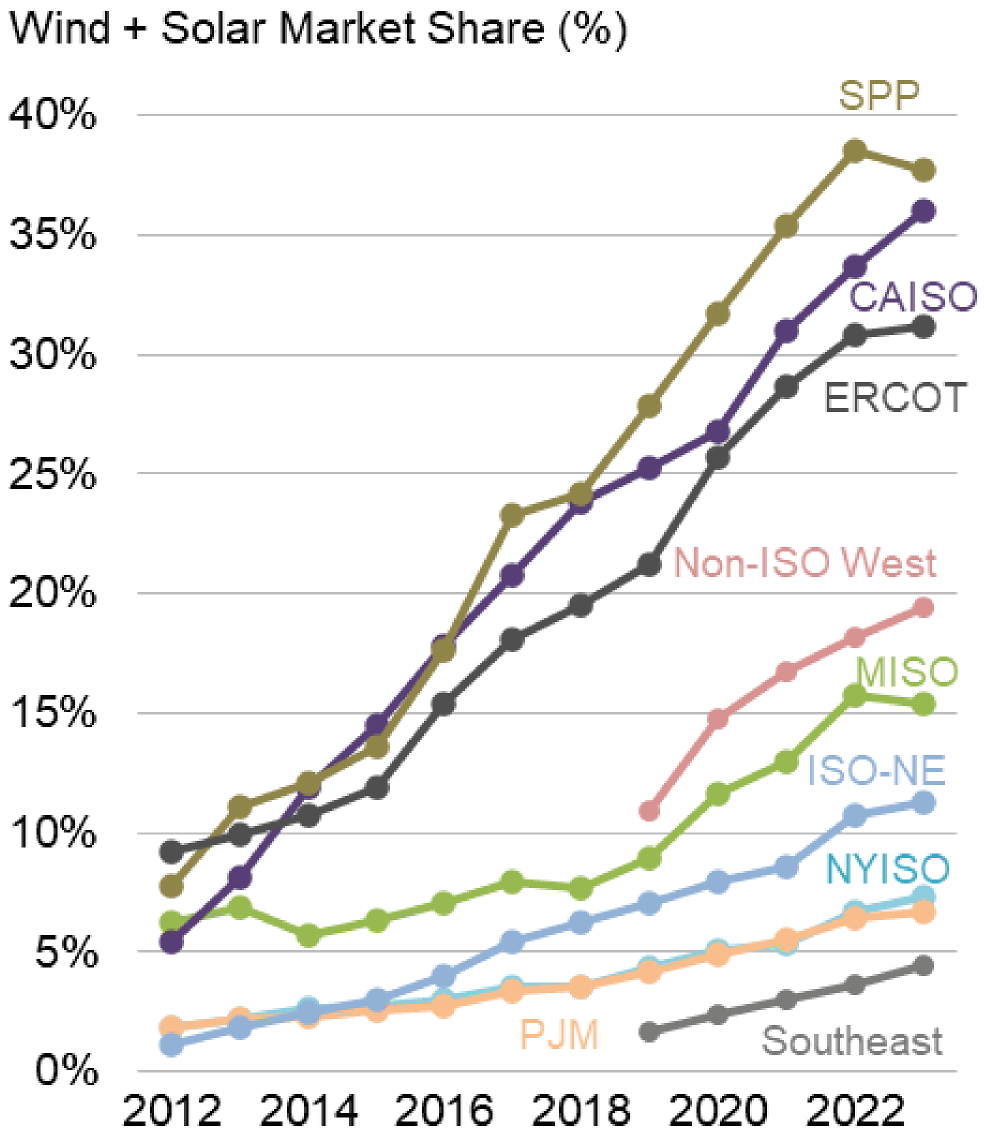
2023 Wind Generation as a Percentage of:			
In-State Generation		In-State Sales	
Iowa	59.2%	Iowa	76.4%
South Dakota	55.3%	South Dakota	69.7%
Kansas	46.2%	Kansas	66.3%
Oklahoma	41.9%	North Dakota	54.8%
New Mexico	38.0%	Wyoming	52.8%
North Dakota	36.0%	Oklahoma	51.9%
Nebraska	29.7%	New Mexico	51.3%
Colorado	27.2%	Nebraska	35.7%
Minnesota	25.3%	Colorado	29.5%
Texas	22.0%	Montana	28.4%
Wyoming	20.6%	Texas	24.6%
Maine	20.5%	Maine	22.1%
Montana	17.6%	Minnesota	21.8%
Idaho	14.8%	Oregon	16.9%
Vermont	14.6%	Illinois	16.1%
Oregon	14.6%	Idaho	9.9%
Illinois	12.3%	Washington	9.1%
Indiana	10.4%	Indiana	8.9%
Missouri	10.0%	Missouri	8.7%
Washington	7.5%	Michigan	8.6%
Rest of U.S.	*1.7%*	*Rest of U.S.*	*1.5%*
Total	**10.0%**	**Total**	**11.0%**

Interactive data visualization: https://emp.lbl.gov/wind-energy-growth

Source: ACP, EIA

Wind penetration by ISO/RTO is highly variable; in 2023, it was highest in SPP at 37% and ERCOT at 24%

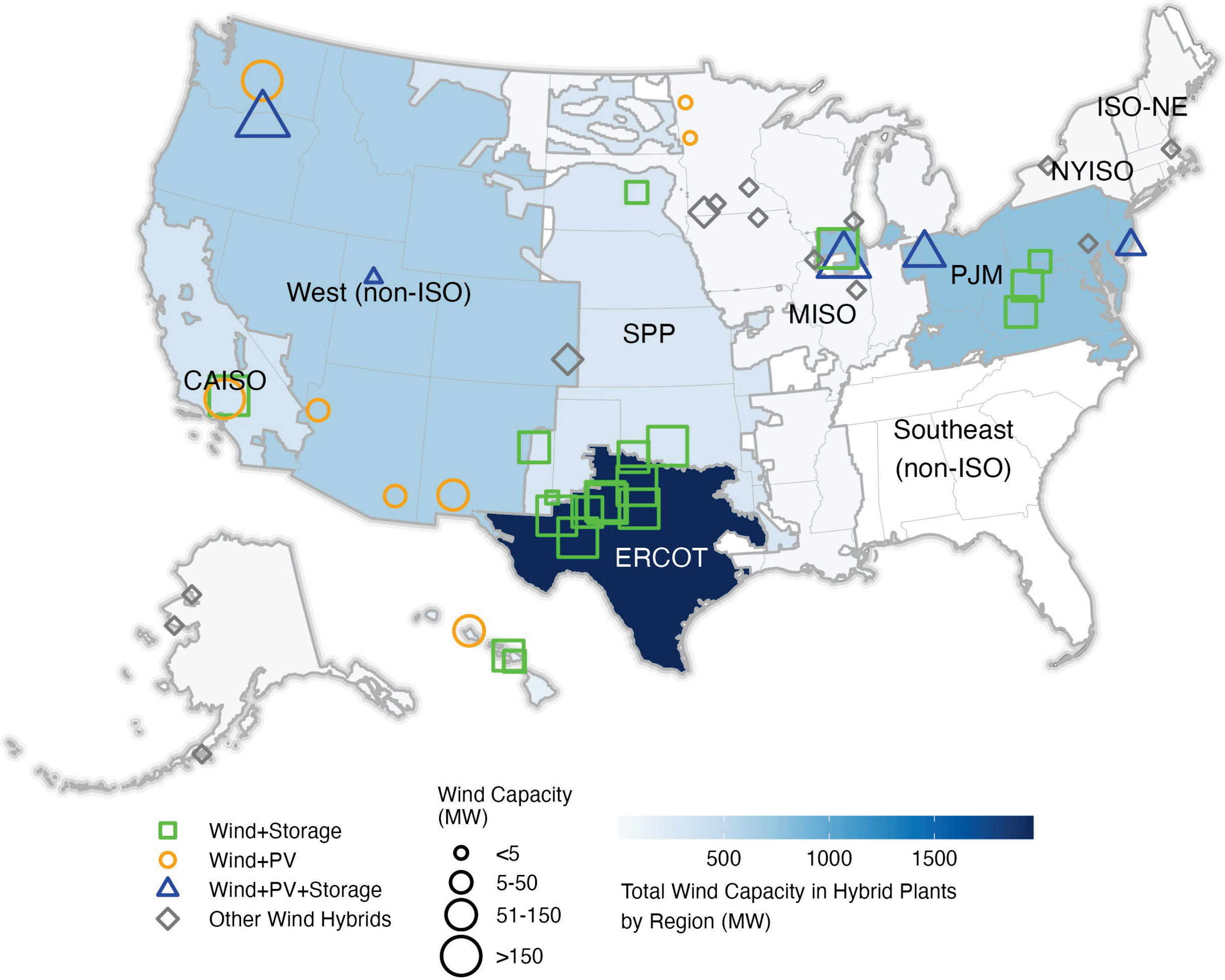




Sources: EIA, Hitachi, SPP, ERCOT, MISO, CAISO, PJM, ISO-NE, NYISO

Hybrid wind plants that pair wind with storage and other resources saw growth in 2023, with three new projects completed

Online Wind Hybrid / Co-Located Projects



- 46 hybrid wind power plants in operation at the end of 2023
- Represent 4.1 GW of wind power and 1.1 GW of co-located resources; three news plants in 2023 comprise 1.1 GW of co-located wind capacity
- Most common wind hybrid project combines wind+storage; other combinations include wind+PV; wind+PV+storage; wind+gas
- ERCOT, PJM, non-ISO West host largest amount of wind hybrid capacity

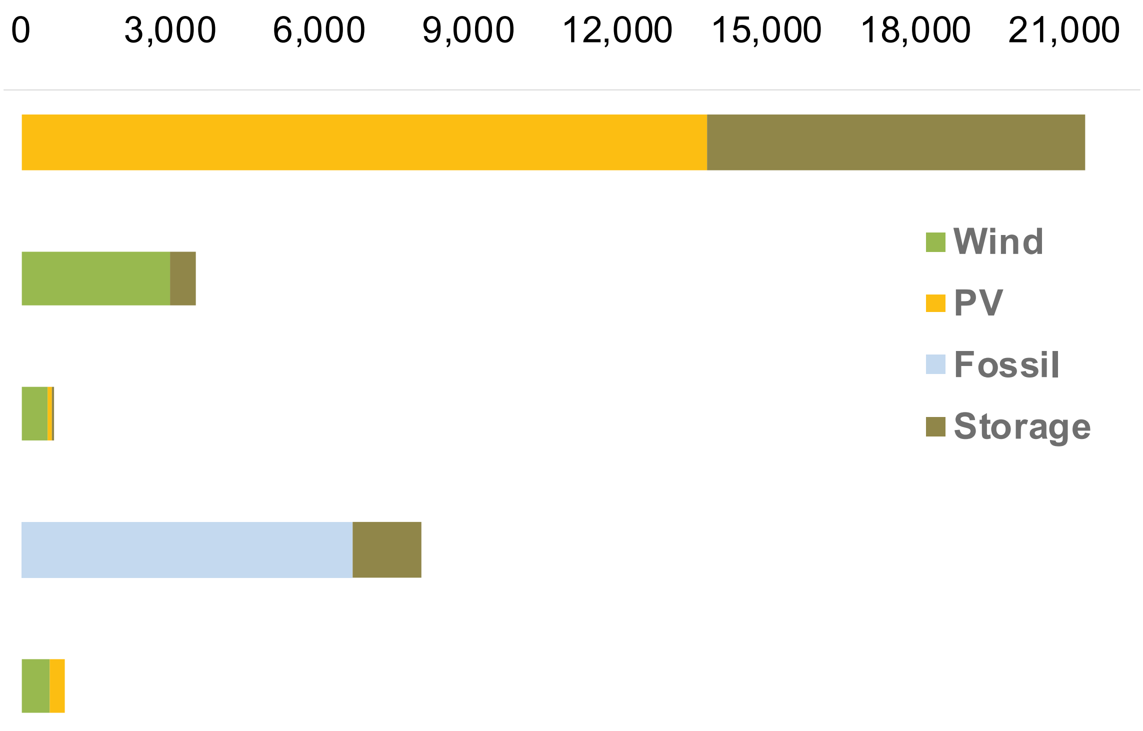
Interactive data visualization:
https://emp.lbl.gov/online-hybrid-and-energy-storage-projects

Sources: EIA-860 Early Release, Berkeley Lab

At the end of 2023 there were far more PV+storage hybrid projects than wind+storage hybrids

	# projects	Storage ratio	Duration (hrs)
PV+Storage	284	55%	2.9
Wind+Storage	19	18%	1.1
Wind+PV+Storage	5	11%	2.0
Fossil+Storage	28	21%	2.7
Wind+PV	8	n/a	n/a

Total capacity (MW)



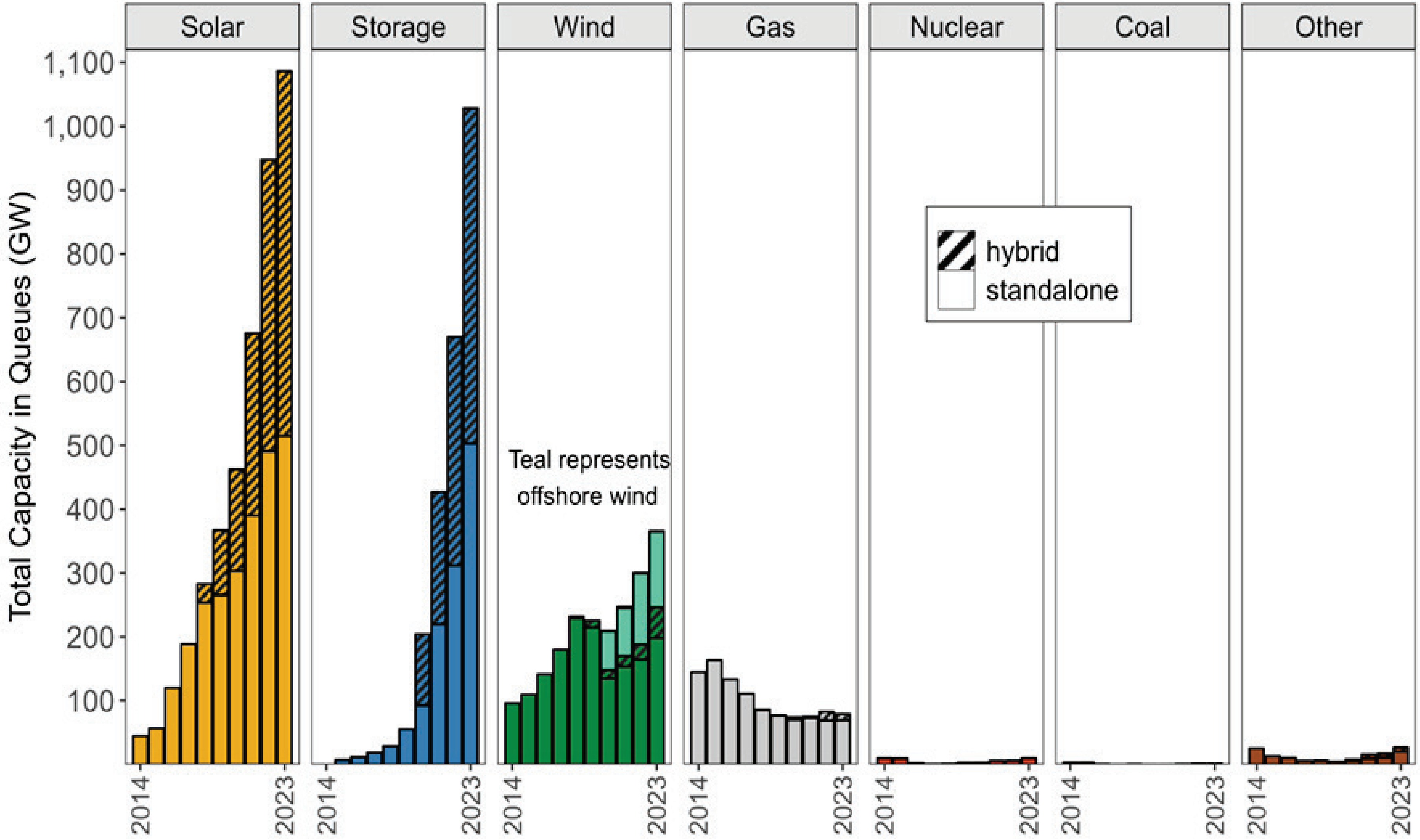
Notes: Not included in the figure are many other hybrid projects with other configurations. Storage ratio defined as total storage capacity divided by total generator capacity for a given project type.

Sources: EIA 860 Early Release, Berkeley Lab

Most wind hybrids are Wind+Storage, with limited storage duration, but more-recent projects have longer storage durations

Interactive data visualization: https://emp.lbl.gov/online-hybrid-and-energy-storage-projects

A record-high 366 GW of wind exists in transmission interconnection queues, but solar and storage dominate the queues



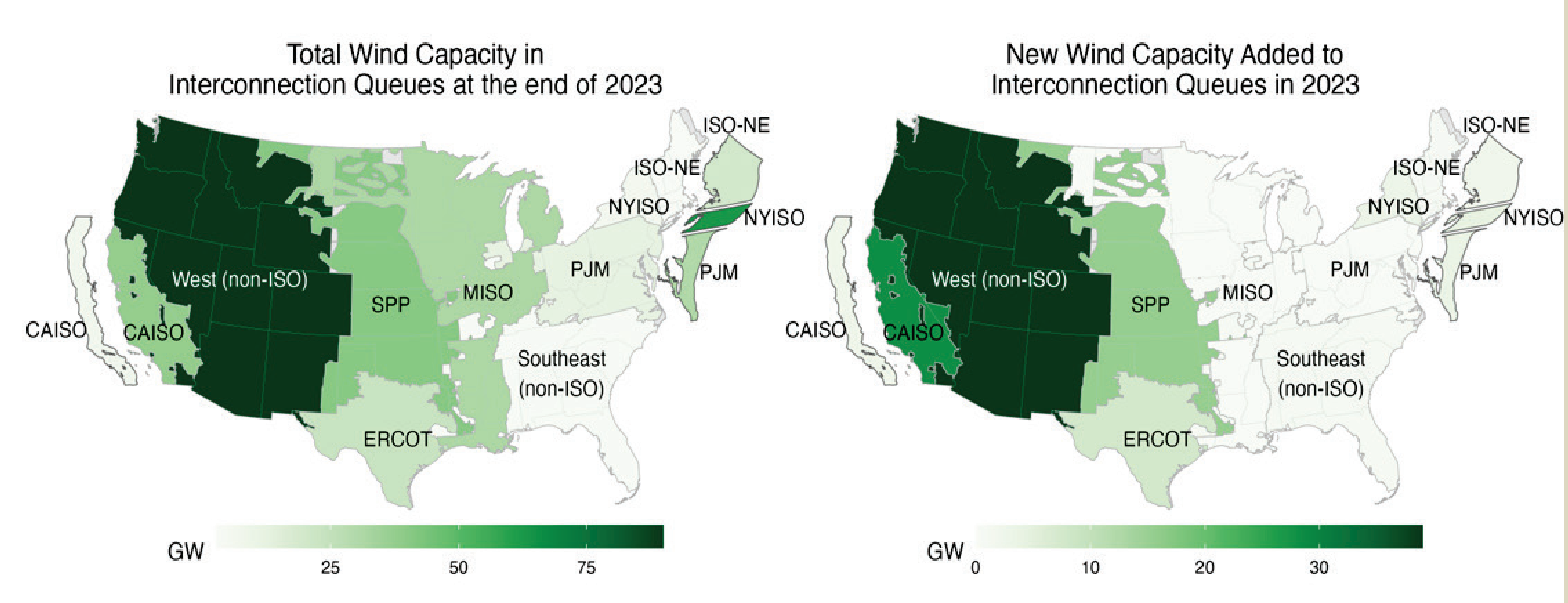
Not all this capacity will be built: ~20% historical completion rate

Interactive data visualization: https://emp.lbl.gov/generation-storage-and-hybrid-capacity

Note: Storage capacity in hybrids was not estimated for years prior to 2020; offshore wind was not separately identified prior to 2020

Source: Berkeley Lab review of interconnection queues

Larger amounts of wind capacity in non-ISO West, NYISO, CAISO, PJM queues; 33% (120 GW) of wind capacity in queues is offshore

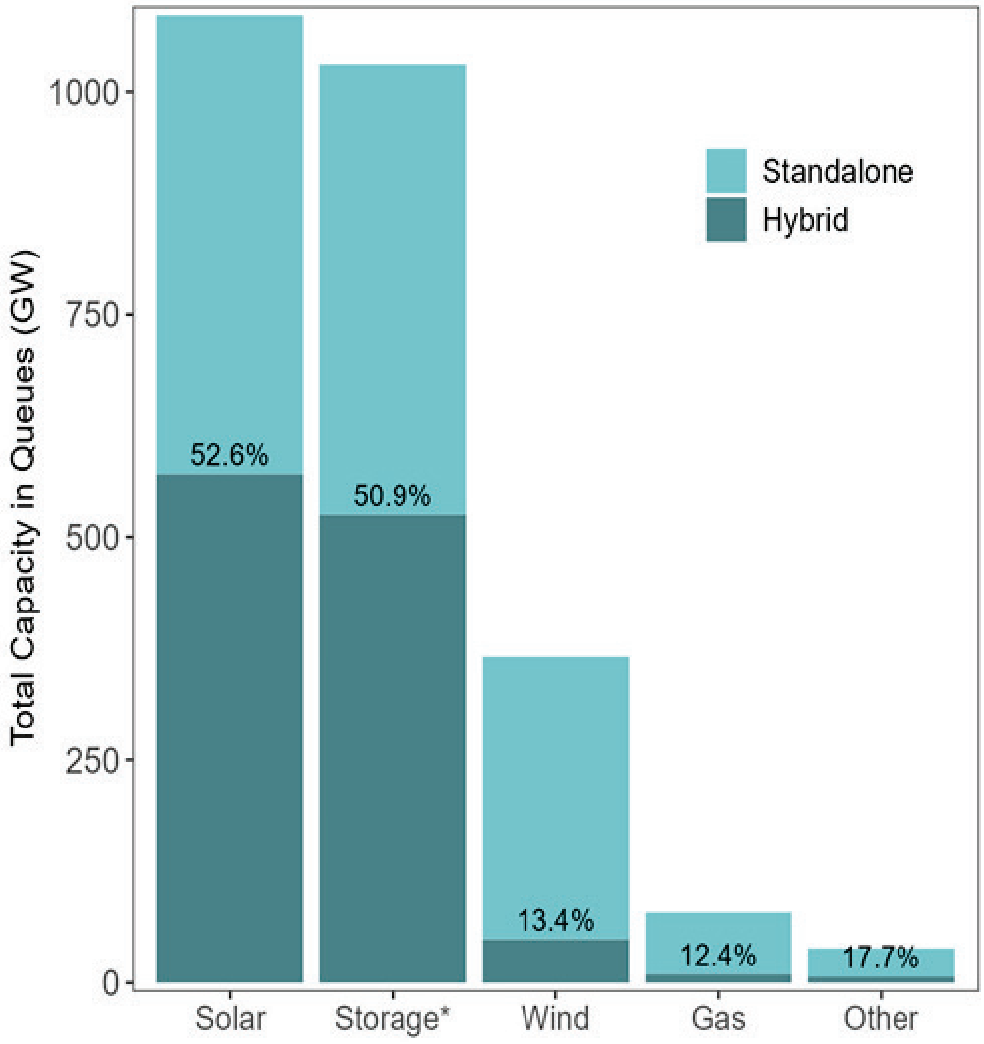


Source: Berkeley Lab review of interconnection queues

Note: Offshore areas reflect the amount of offshore wind in the interconnection queues of each region.

Interactive data visualization: https://emp.lbl.gov/generation-storage-and-hybrid-capacity

Hybrid plants: 13% of wind proposed as hybrids (49 GW); much larger fraction of solar proposed as hybrids, at 53%



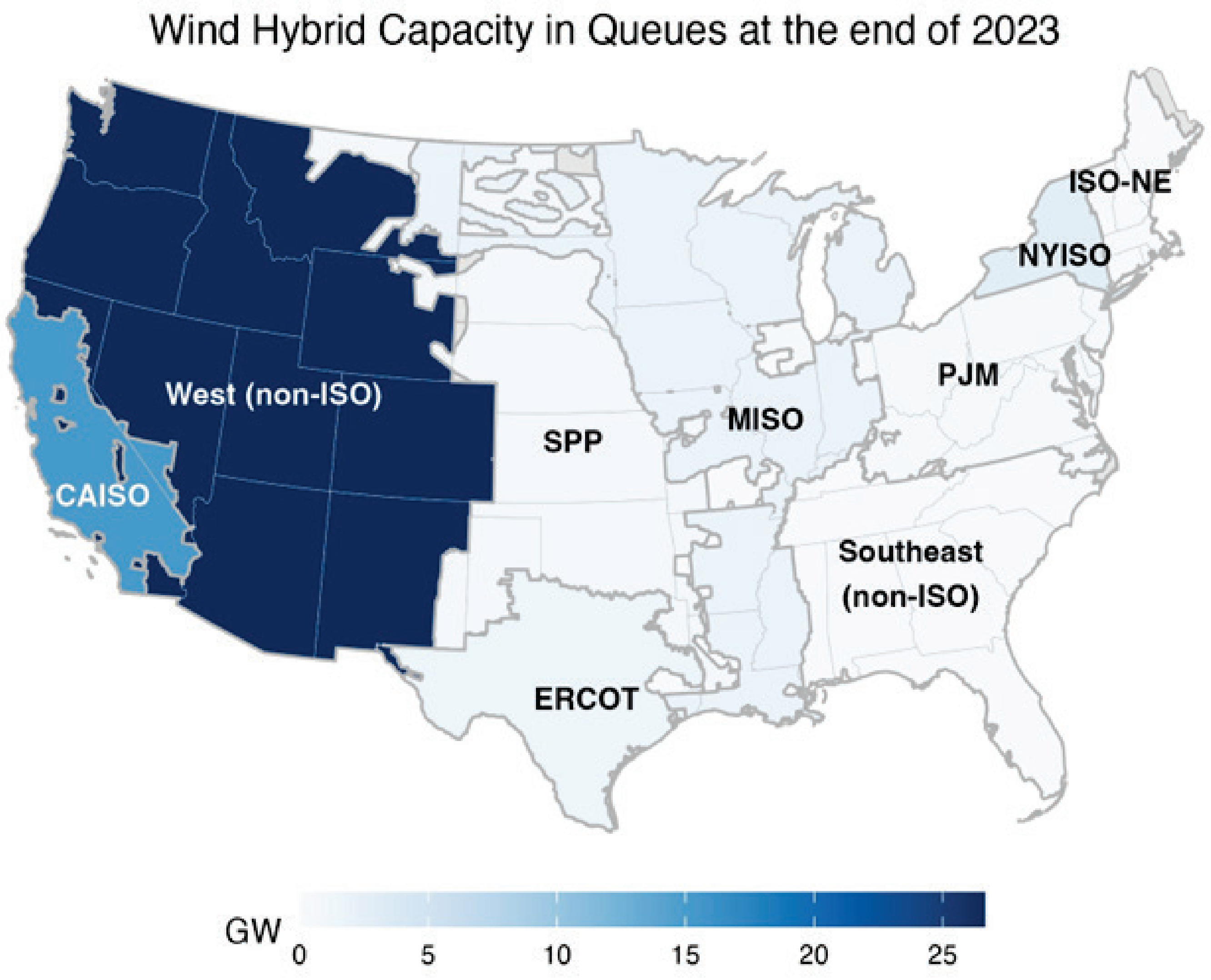
Source: Berkeley Lab review of interconnection queues

Greater historical commercial interest in solar hybrids is partly due to policy design—until recently, the investment tax credit for solar could be used for paired storage, whereas the production tax credit regularly used by wind plants had no such storage allowance; the Inflation Reduction Act changed these parameters, with storage or all configurations now benefiting from the investment tax credit

Notes: (1) Not all of this capacity will be built; (2) Each bar reflects the listed resource type; a solar+storage hybrid will have its solar capacity in the 'solar' column and its storage capacity in the 'storage' column; (3) hybrid storage capacity is estimated in some cases.

Interactive data visualization: https://emp.lbl.gov/generation-storage-and-hybrid-capacity

Proposed wind hybrids are primarily located in the non-ISO West and CAISO

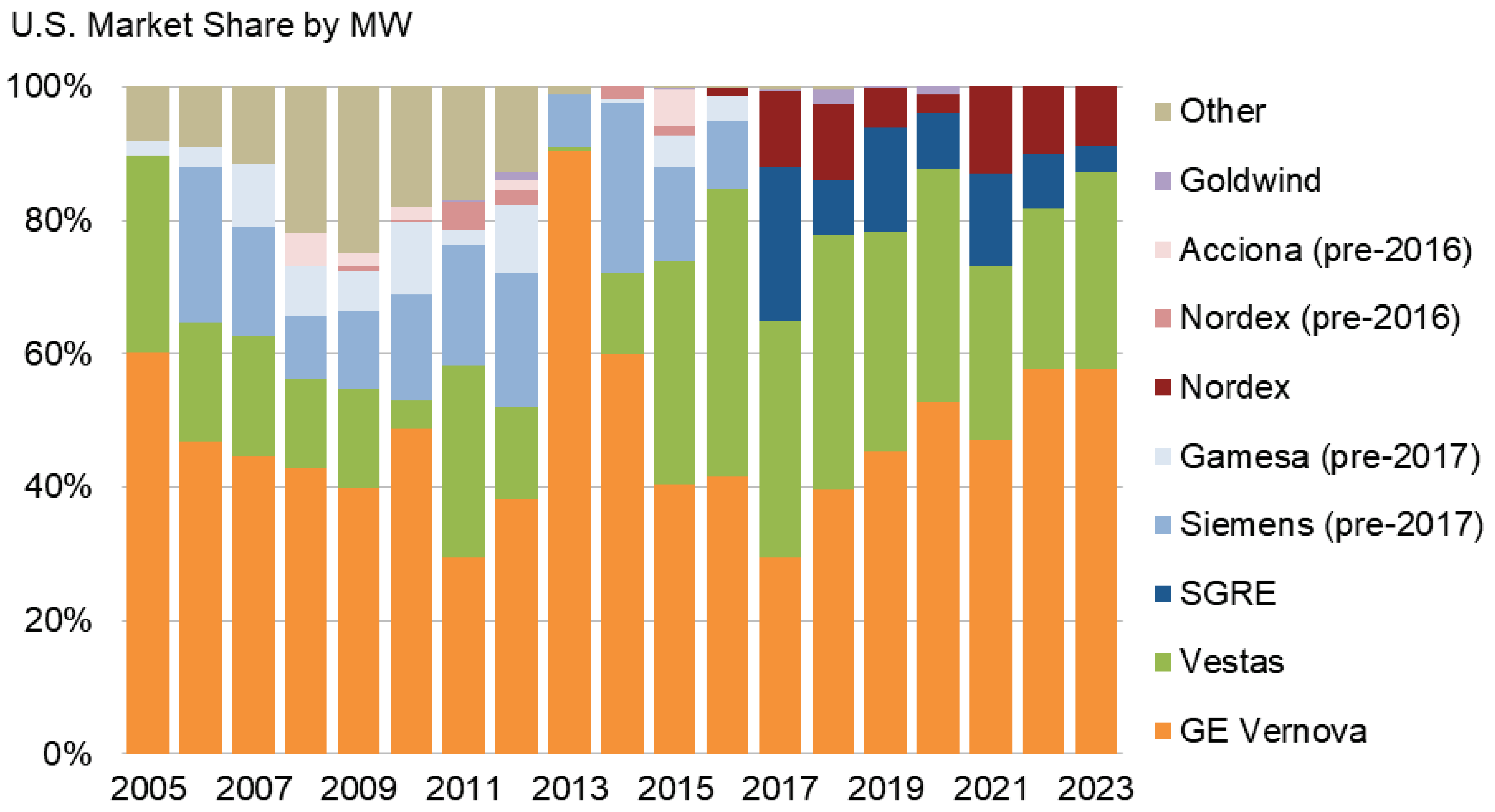


Source: Berkeley Lab review of interconnection queues

Interactive data visualization:
https://emp.lbl.gov/generation-storage-and-hybrid-capacity

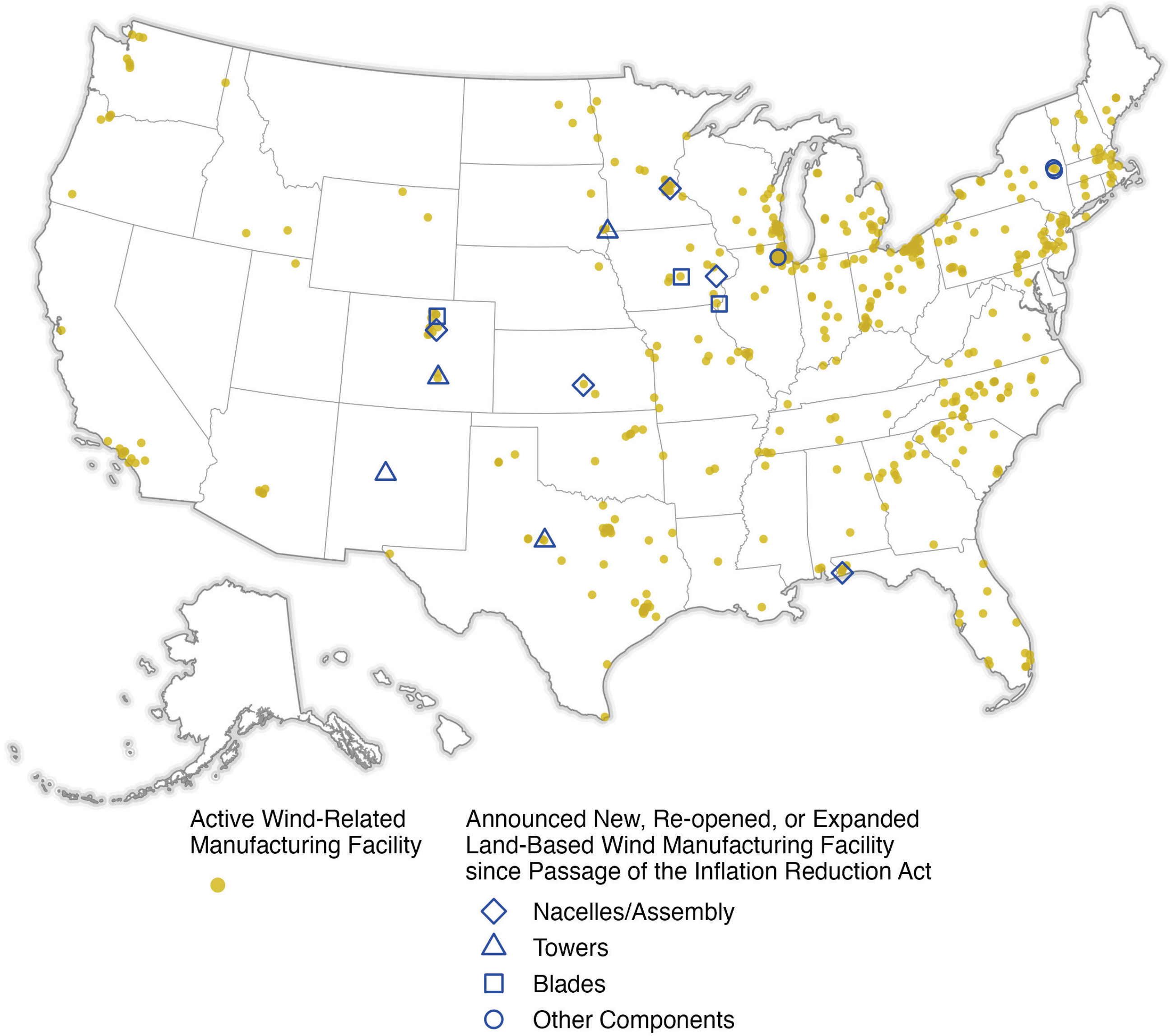
Industry Trends

Four turbine manufacturers, led by GE, supplied all the U.S. wind power capacity installed in 2023



Source: ACP

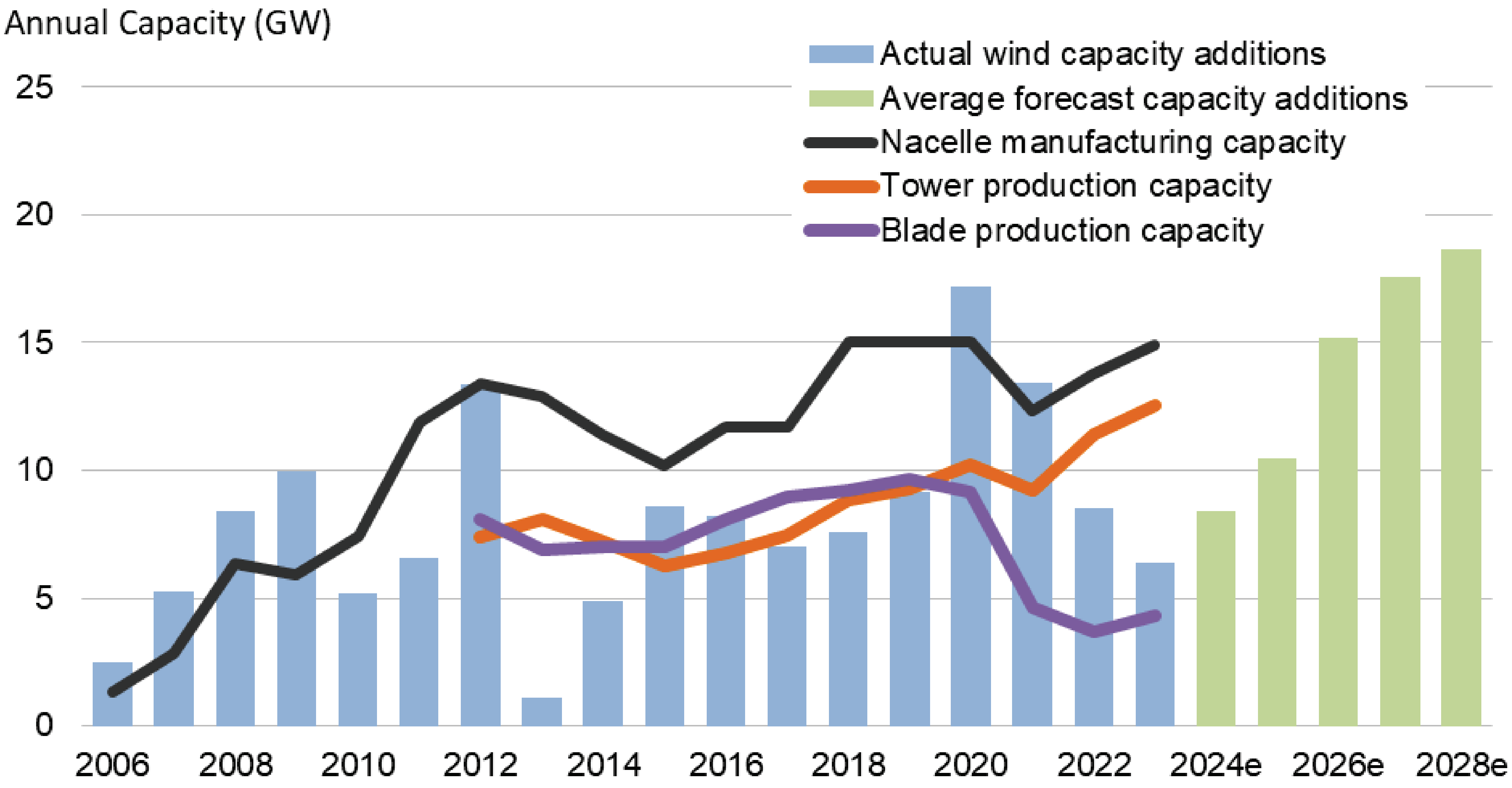
The Inflation Reduction Act has created renewed optimism about supply-chain expansion



- Wind equipment manufacturing is spread across the country
- Manufacturers have announced plans for 15 new, re-opened or expanded manufacturing plants focused on land-based wind after passage of the *Inflation Reduction Act*
- The *Inflation Reduction Act* contains:
  - Production-based tax credit for nacelle, blade, and tower manufacturing
  - PTC bonus for wind projects that meet domestic content requirements

Source: U.S. Department of Energy, ACP

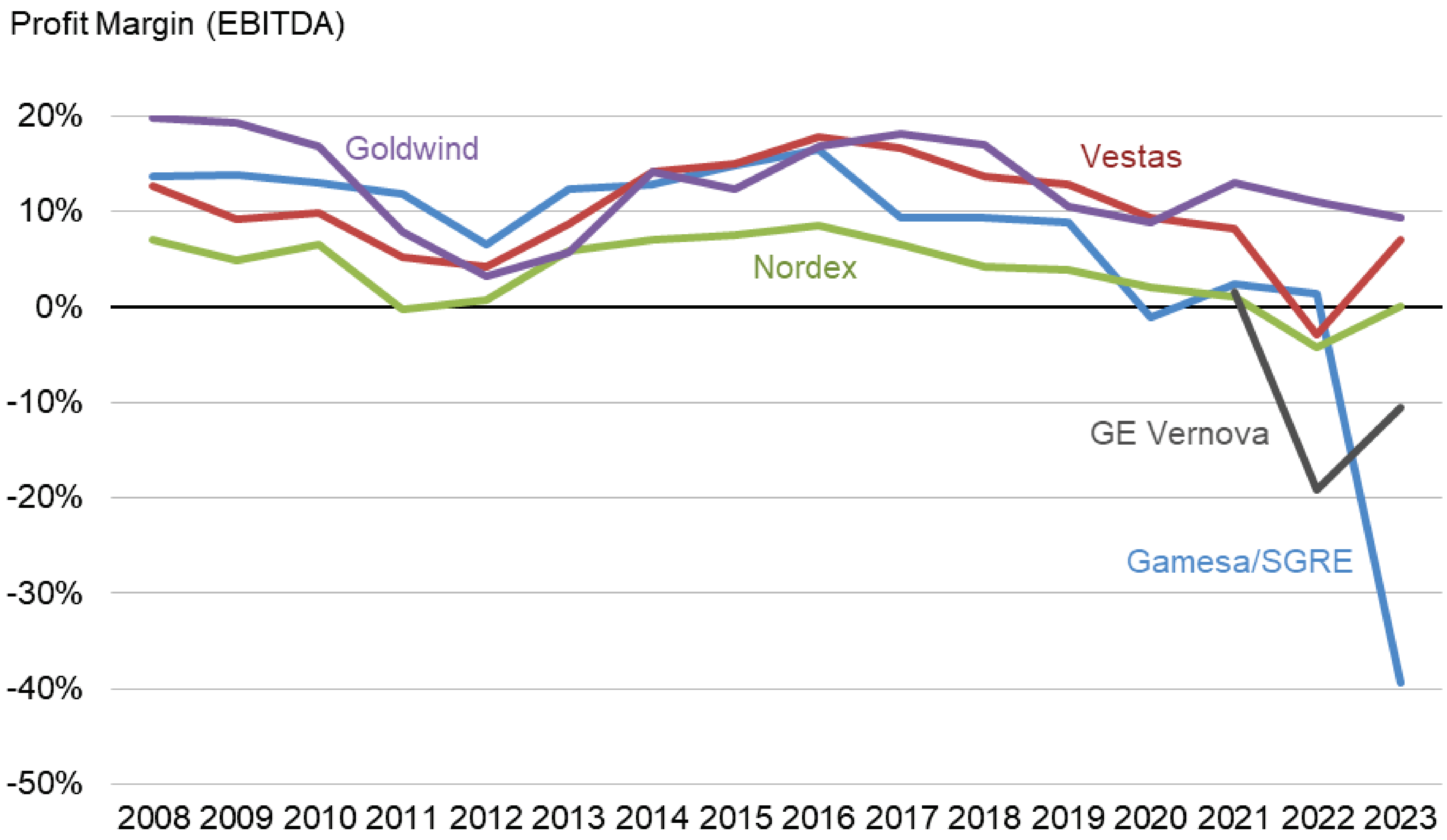
Blade manufacturing capability had fallen in recent years, but capability for blades, towers, and nacelles is now on the rise



Sources: ACP, independent analyst projections, Berkeley Lab

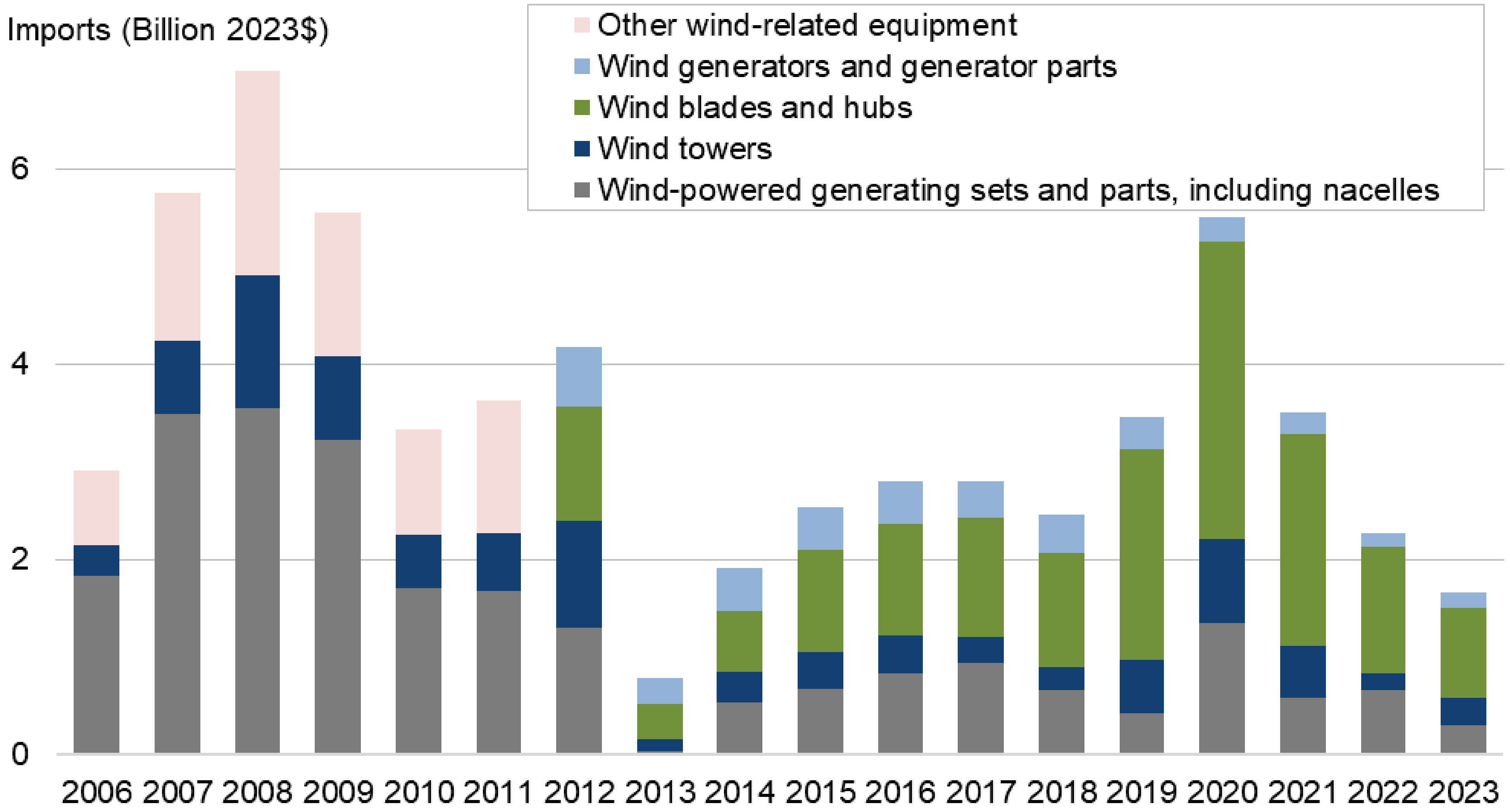
Note: Actual nacelle assembly, tower production, and blades production would be expected to be below maximum production capacity.

Profitability of wind turbine manufacturers has generally declined over the last several years, but there were signs of a turnaround in 2023



Sources: OEM annual reports and financial statements

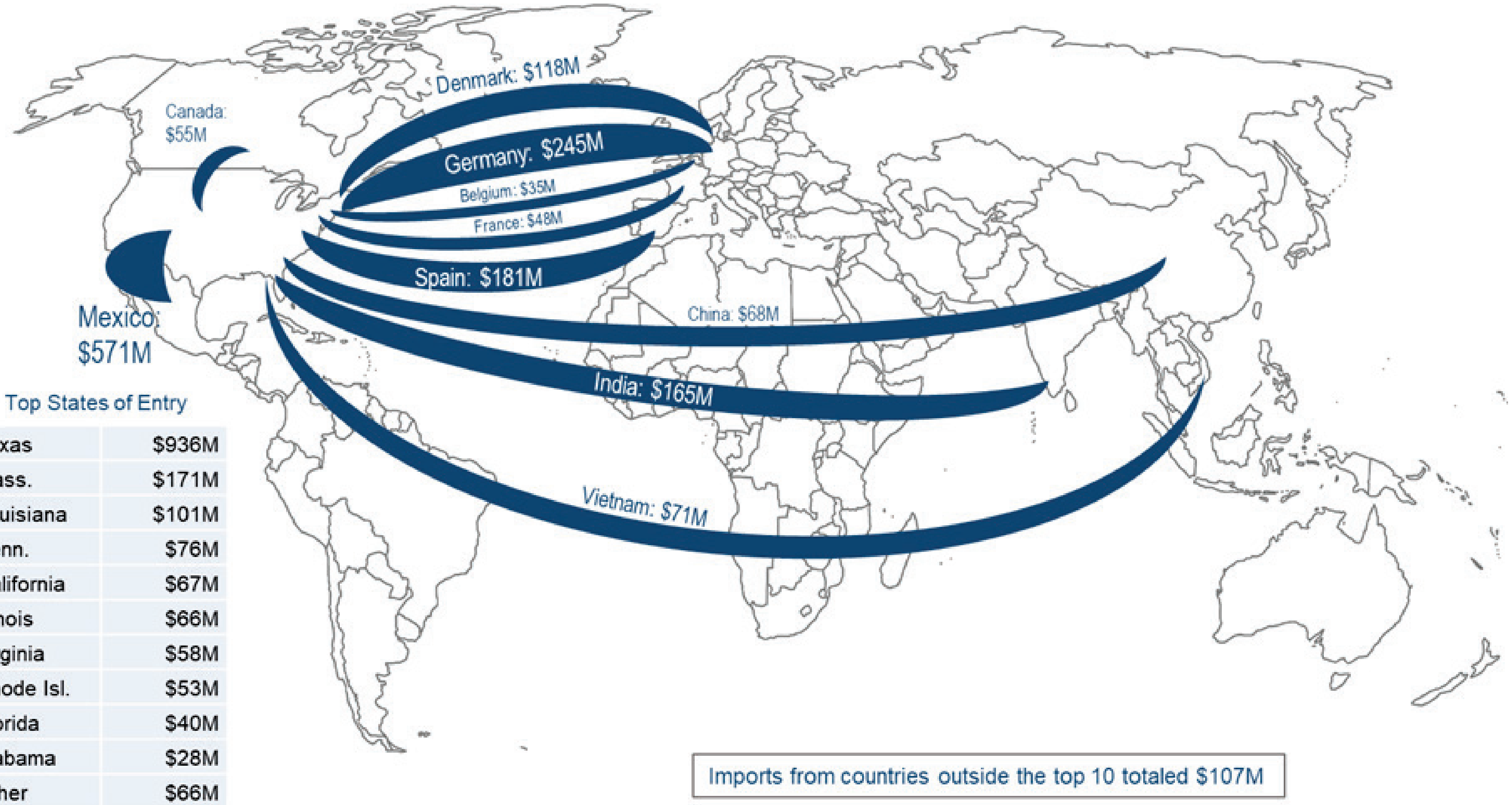
The U.S. wind industry continues to depend on imports, though these have fallen to their lowest level in a decade



Source: Berkeley Lab analysis of data from USA Trade Online, https://usatrade.census.gov

Notes: Figure only includes tracked trade categories, misses other wind-related imports; wind-related trade codes and definitions are not consistent over the full time period; see full report for the assumptions used to generate the figure.

Tracked wind equipment imports into the United States in 2023 came from multiple regions of the world



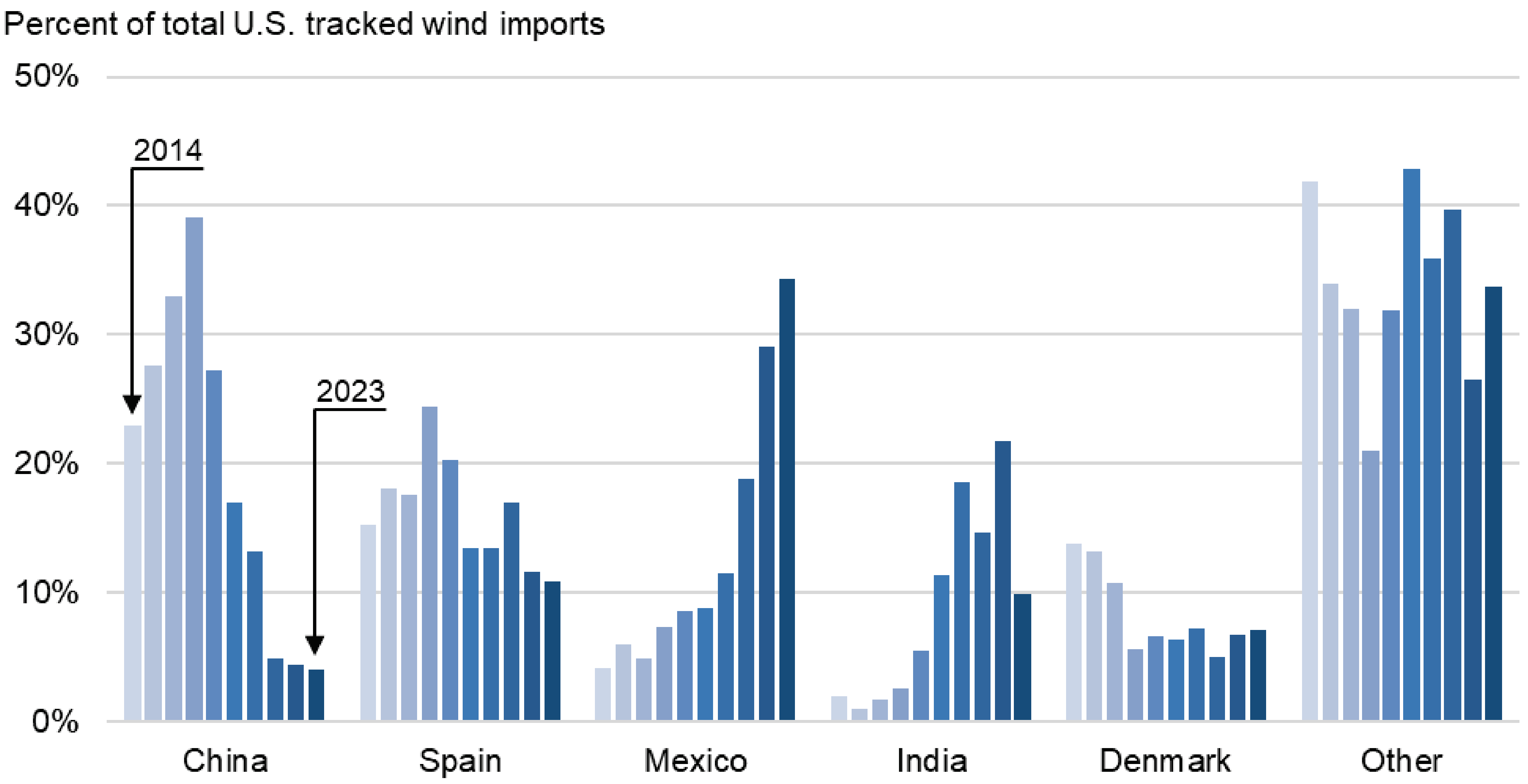
Top States of Entry

Texas	$936M
Mass.	$171M
Louisiana	$101M
Penn.	$76M
California	$67M
Illinois	$66M
Virginia	$58M
Rhode Isl.	$53M
Florida	$40M
Alabama	$28M
Other	$66M

Source: Berkeley Lab analysis of data from USA Trade Online, https://usatrade.census.gov

Notes: Line widths are proportional to amount of imports, by country. Figure does not intend to depict the destination of these imports, by state (that is shown in table). Tracked wind-specific equipment includes: wind-powered generating sets and parts, towers, generators and generator parts, blades and hubs, and nacelles

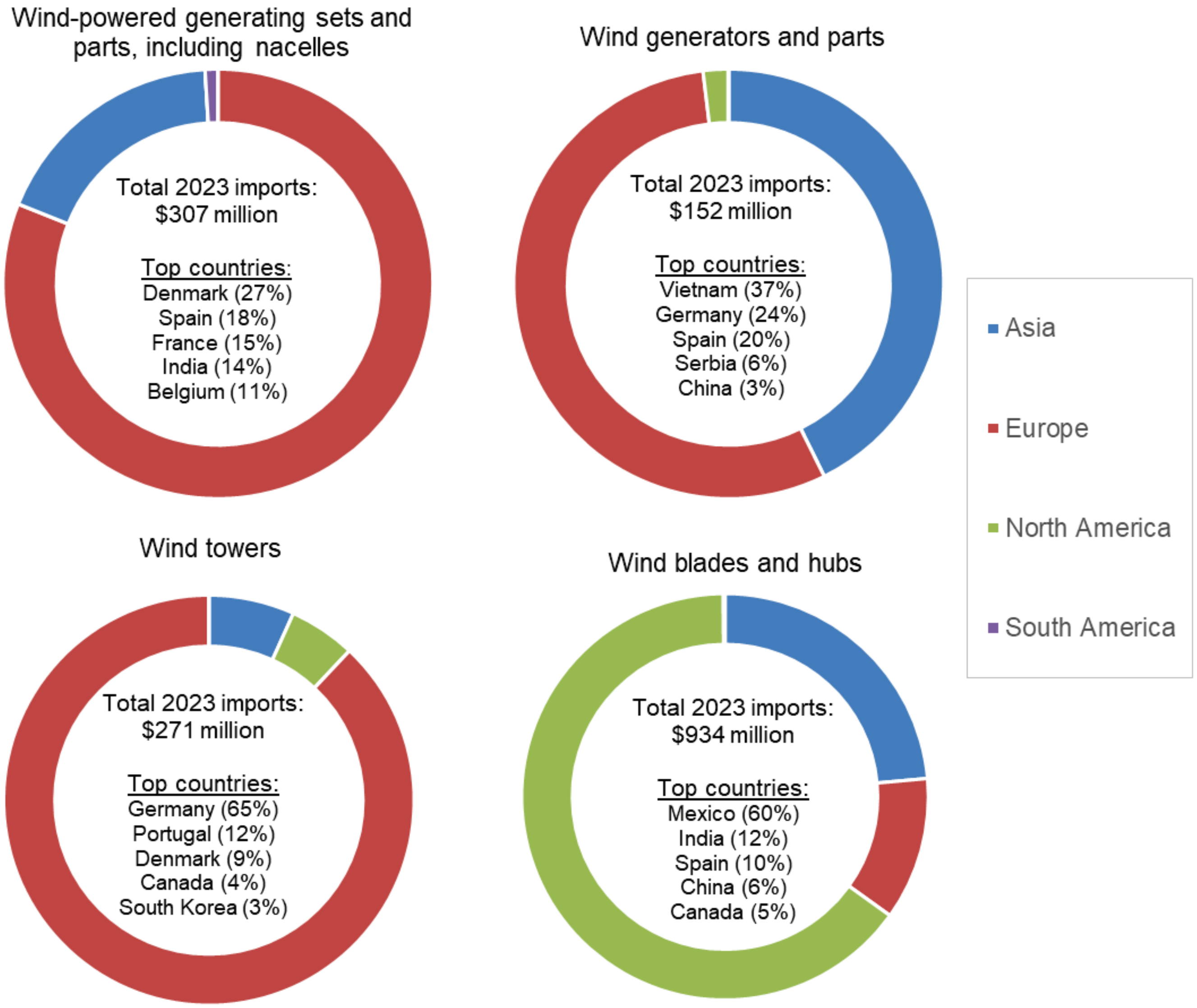
Tracked wind equipment imports from China have declined in recent years, whereas imports from India and Mexico have risen



Source: Berkeley Lab analysis of data from USA Trade Online, https://usatrade.census.gov

Notes: Tracked wind-specific equipment includes: wind-powered generating sets and parts, towers, generators and generator parts, blades and hubs, and nacelles

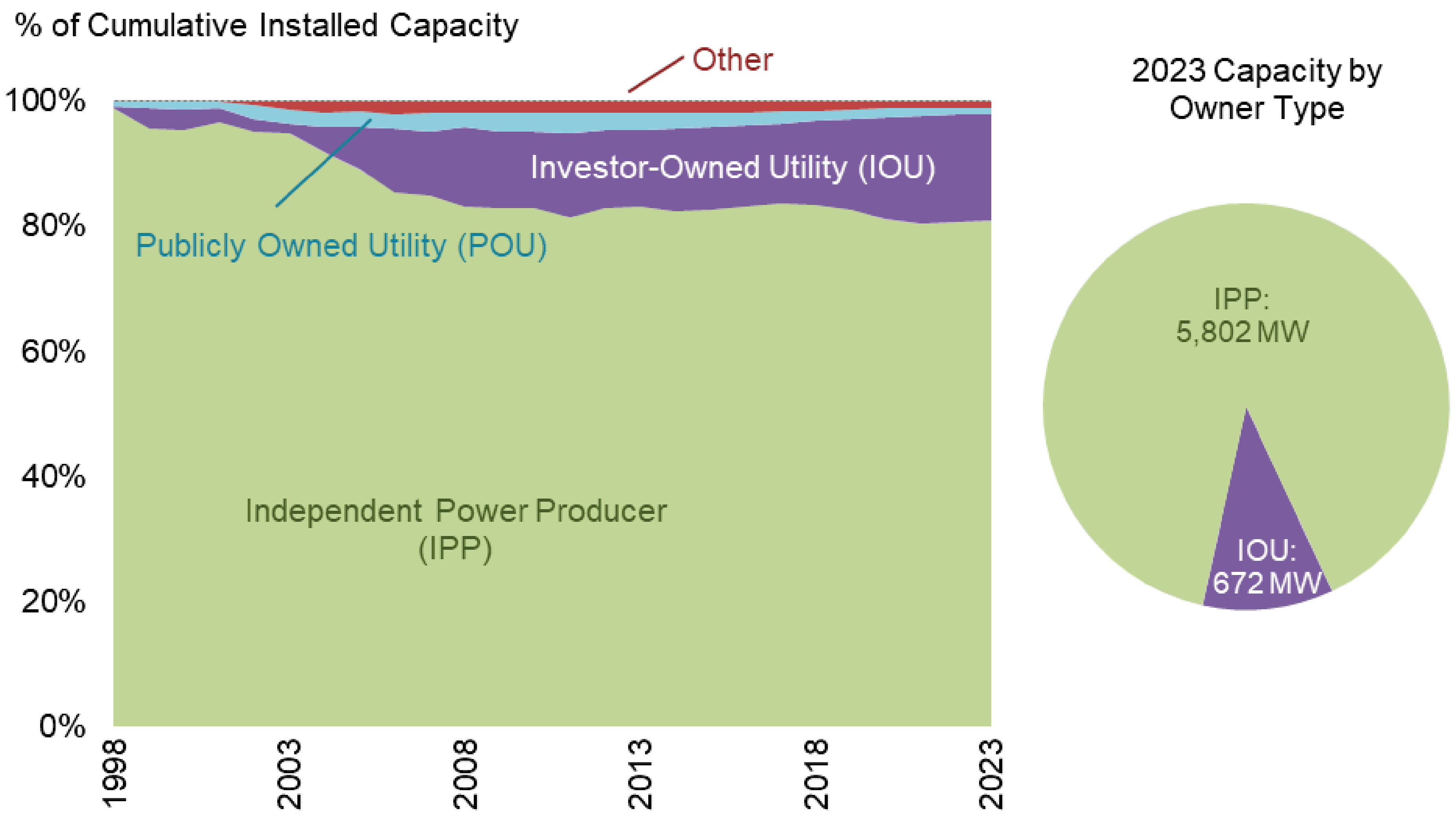
2023 wind equipment imports came from multiple countries and regions, which vary by type of wind equipment



- Denmark, followed by Spain, France, India, and Belgium, were the primary source countries for wind-powered generating sets and parts, including nacelles, in 2023
- Tower imports came from a mix of countries near and far—Germany, Portugal, Denmark, Canada, South Korea
- For blades and hubs, Mexico accounted for 60% of imports, with India, Spain, China, and Canada the next largest source countries
- 81% of wind-related generators and generator parts in 2023 came from Vietnam, Germany, and Spain, the rest primarily coming from Serbia and China

Source: Berkeley Lab analysis of data from USA Trade Online, https://usatrade.census.gov
Note: See full report for formal definitions of the equipment included in these trade categories

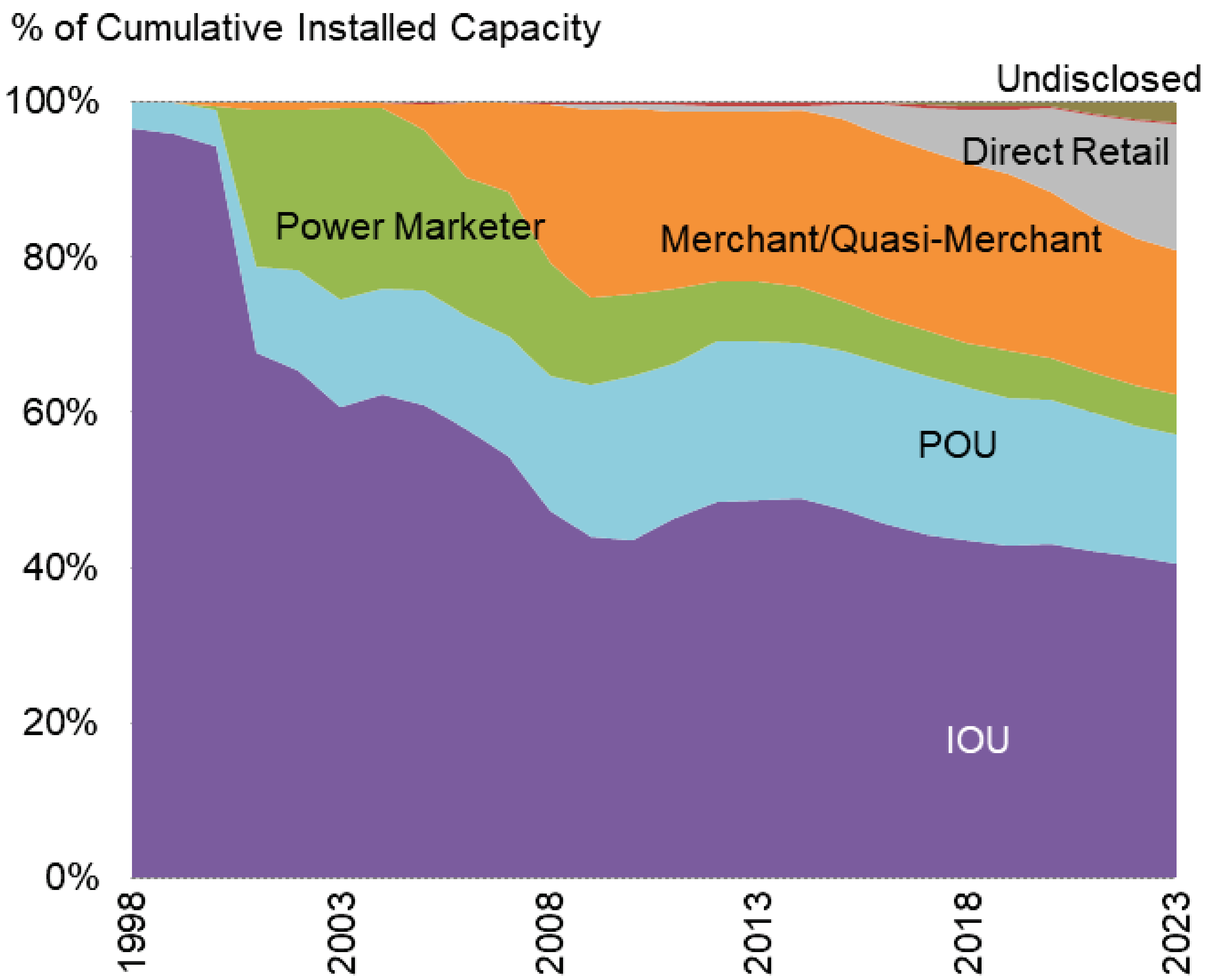
Independent Power Producers own most wind assets built in 2023, extending historical trends

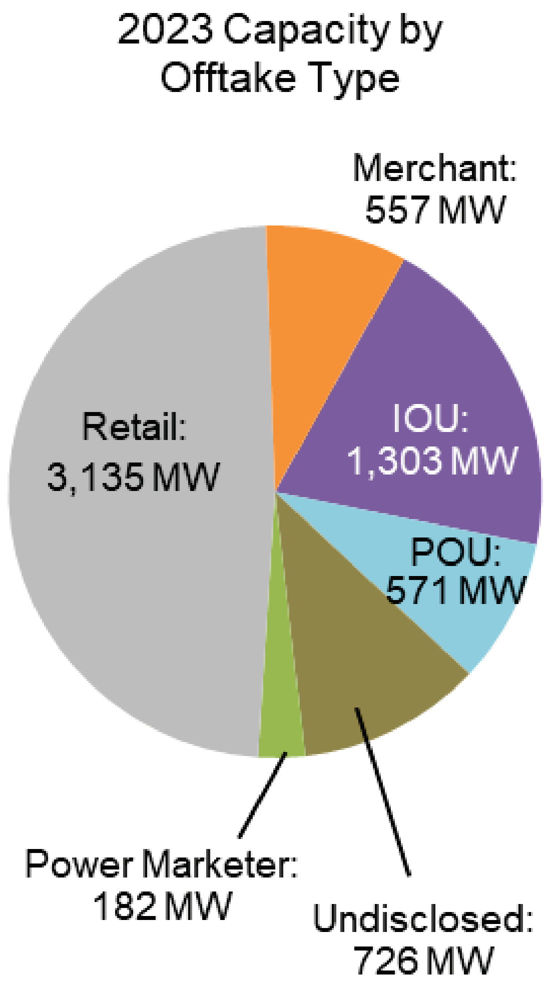


Source: Berkeley Lab estimates based on ACP

Note: Graphic on left shows distribution among growing cumulative fleet of projects installed. Pie chart shows distribution only among those projects built in 2023.

Non-utility buyers entered more contracts to purchase wind than did utilities in 2023



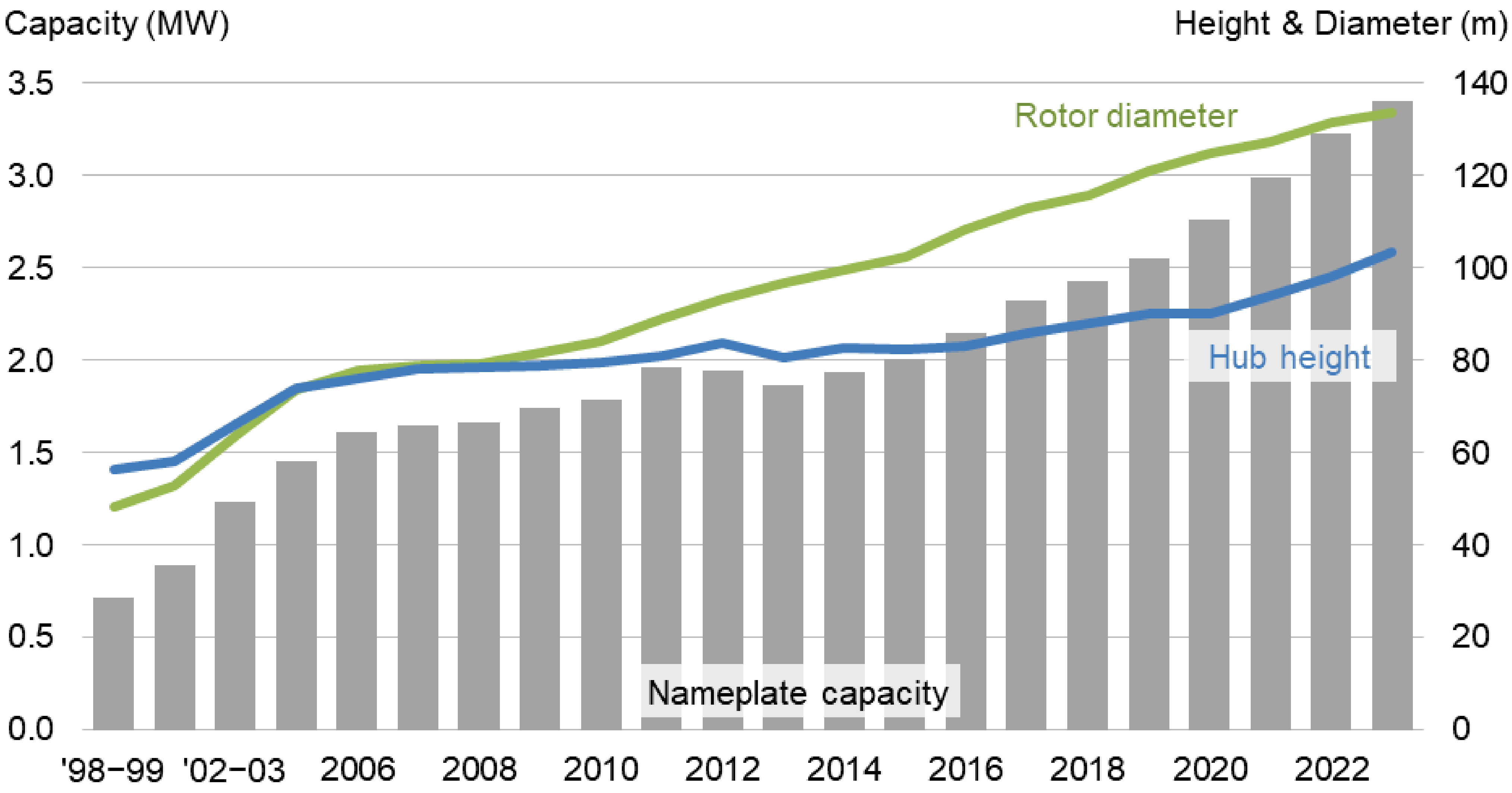


Source: Berkeley Lab estimates based on ACP

Note: Graphic on left shows distribution among growing cumulative fleet of projects installed. Pie chart shows distribution only among those projects built in 2023.

Technology Trends

Turbine capacity, rotor diameter, and hub height have all increased over the long term

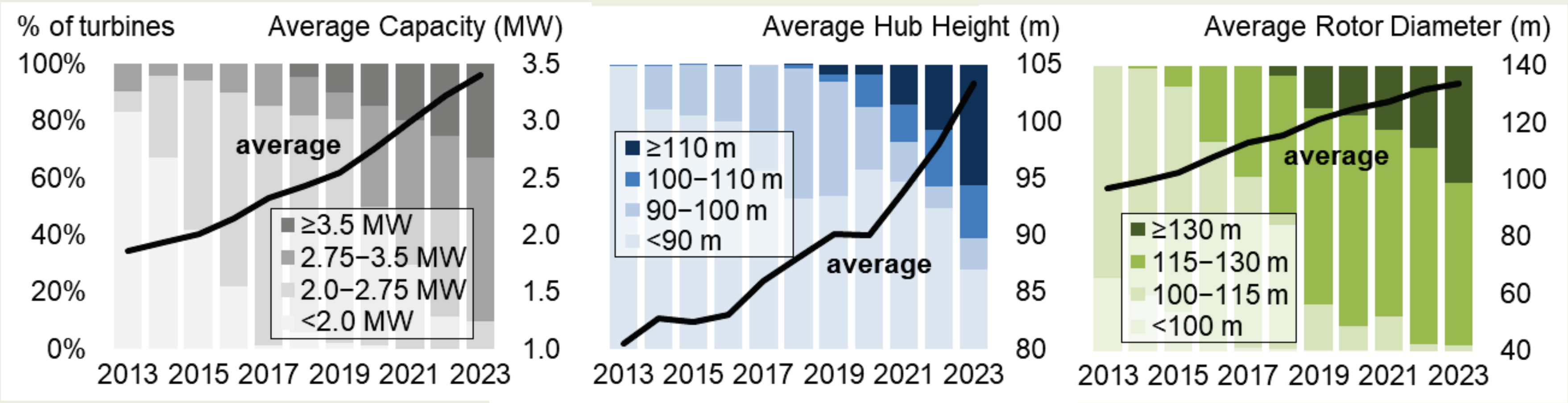


Graphic is based on new installations, each year

Sources: ACP, Berkeley Lab

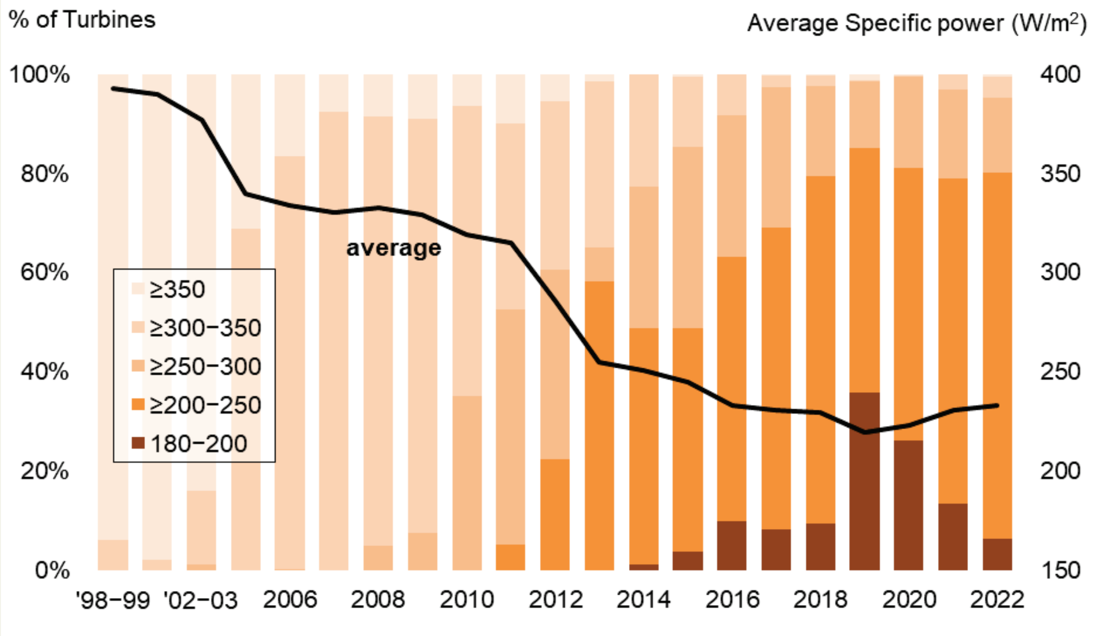
Interactive data visualization: https://emp.lbl.gov/wind-power-technology-trends

Turbine size maintains upward trajectory; turbines originally designed for lower wind speeds dominate the market



Specific power: turbine capacity divided by swept rotor area; lower specific power leads to higher capacity factors, as shown later

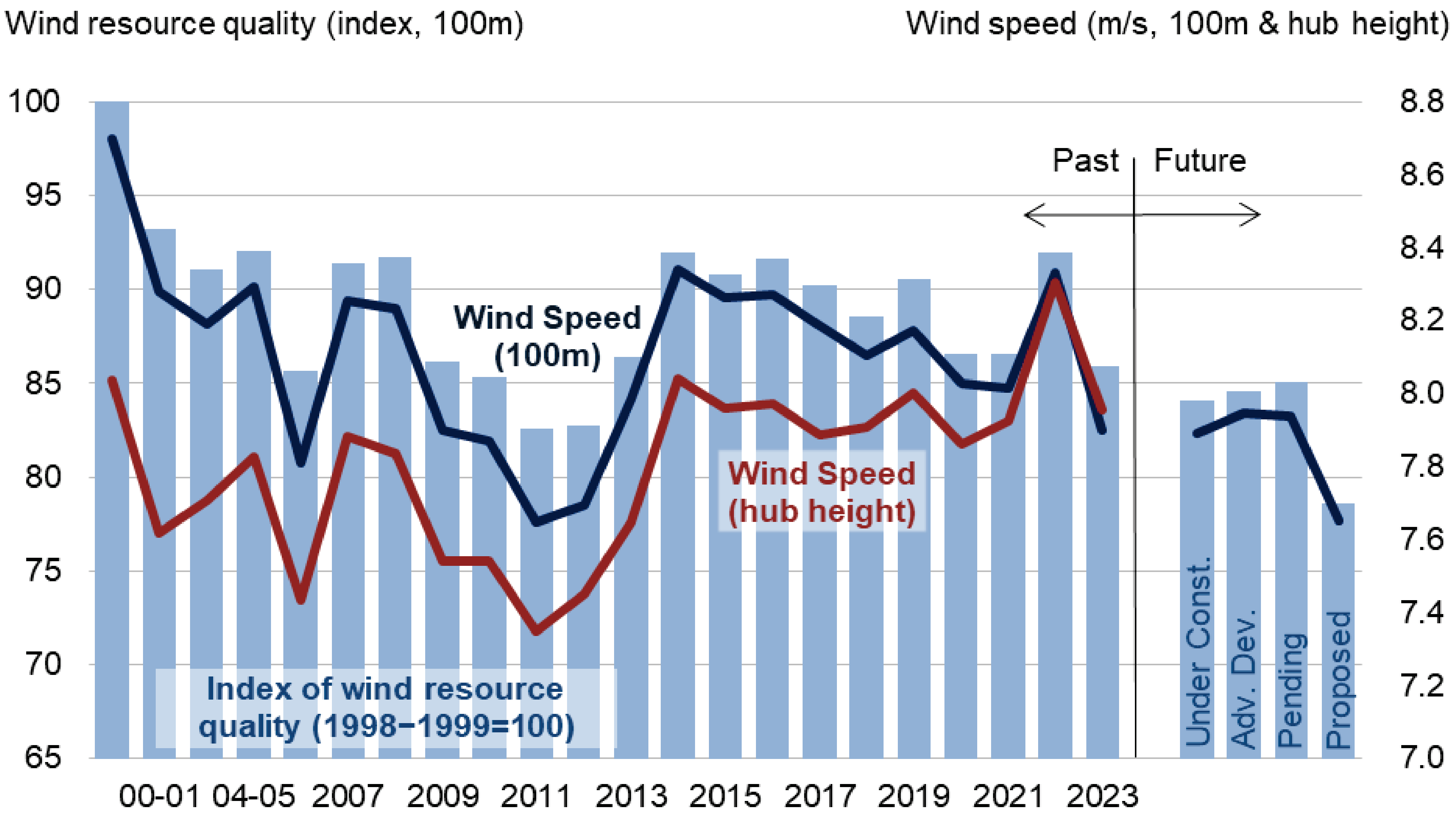
2022 average = 237 W/m^2



Interactive data visualization: https://emp.lbl.gov/specific-power

Sources: ACP, Berkeley Lab

Wind turbines were deployed in lower wind-speed sites in 2023 than in recent years

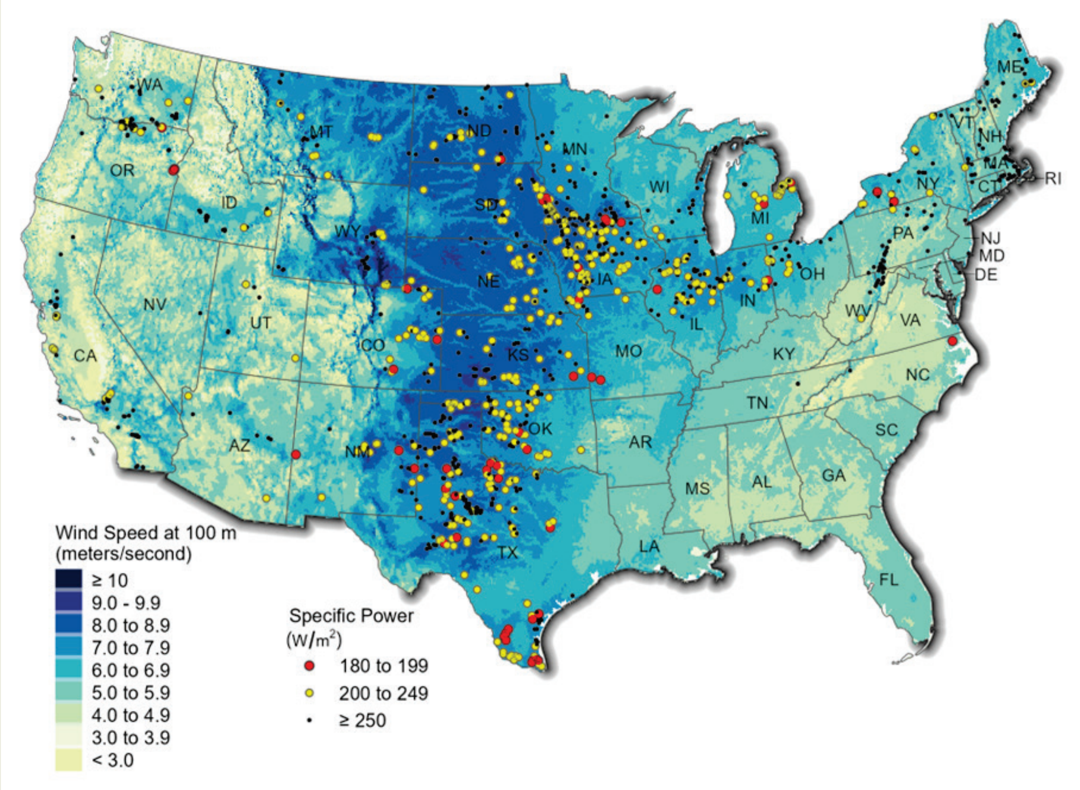


Sources: ACP, Berkeley Lab, AWS Truepower, FAA files

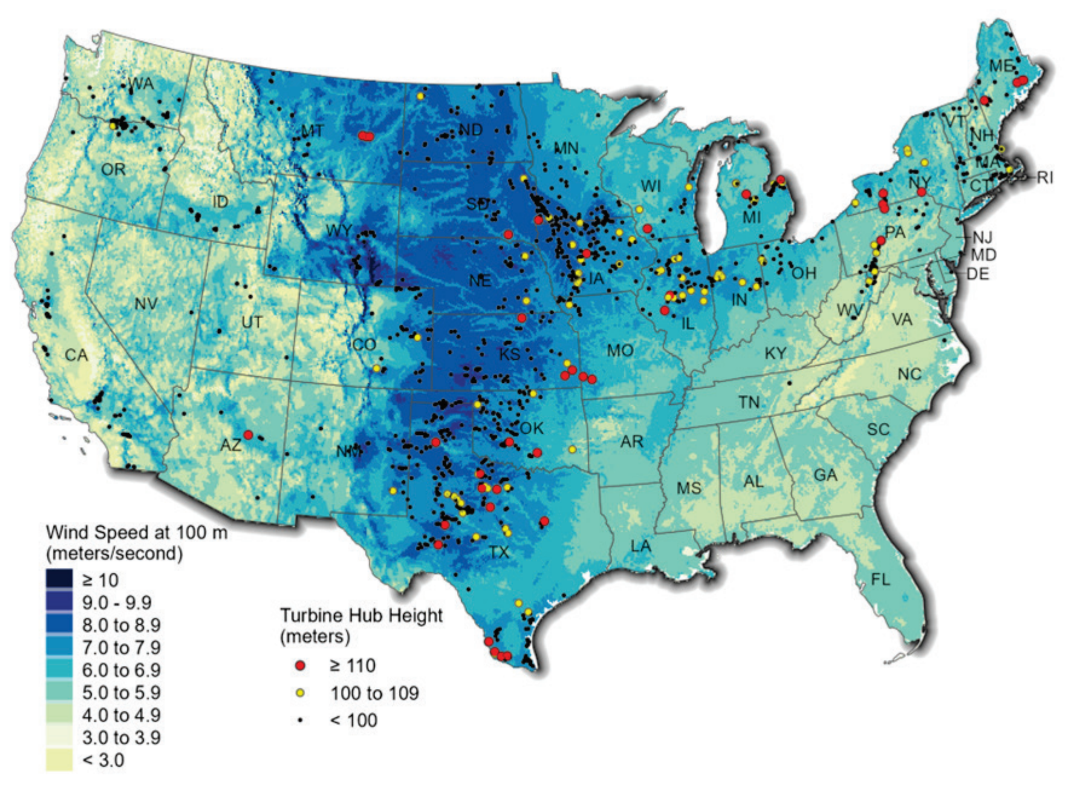
Note: Wind resource quality index is based on site estimates of gross capacity factor at 100 meters. A single, common wind-turbine power curve is used across all sites and timeframes, and no losses are assumed. Values are indexed to those projects built in 1998—1999.

Low-specific-power turbines are deployed on a widespread basis; taller towers are seeing increased use in a wider variety of sites

Specific Power



Hub Height

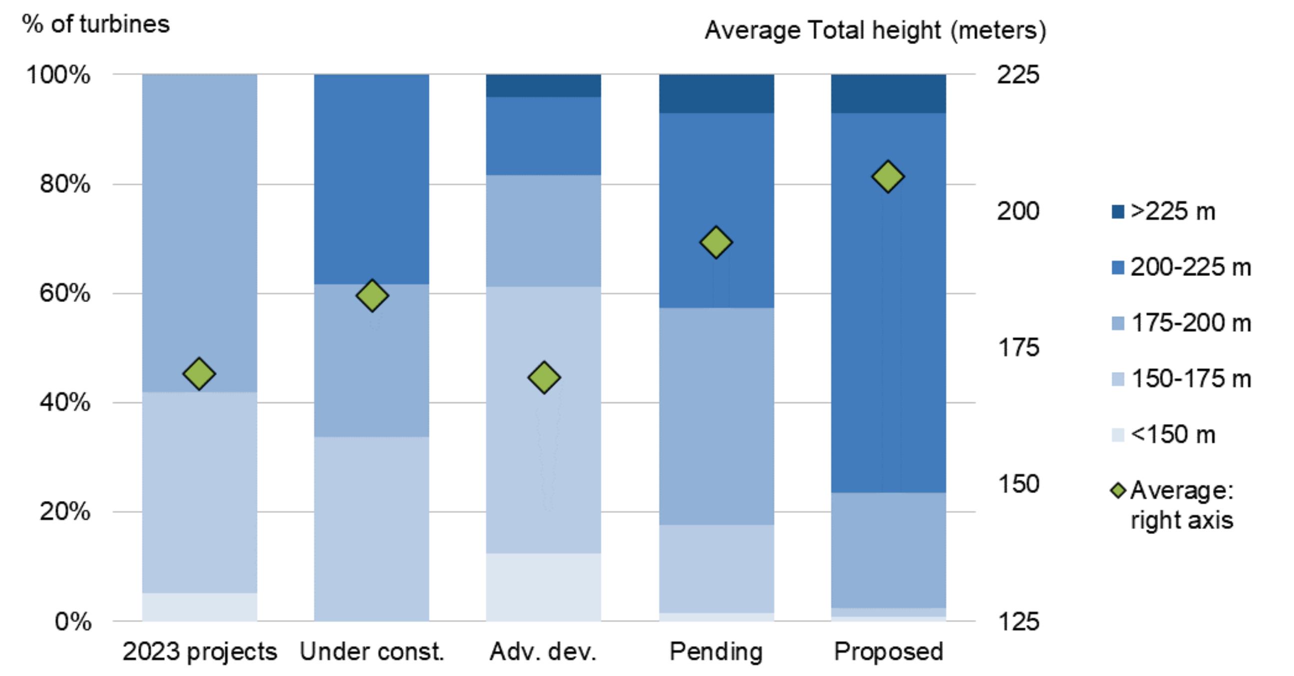


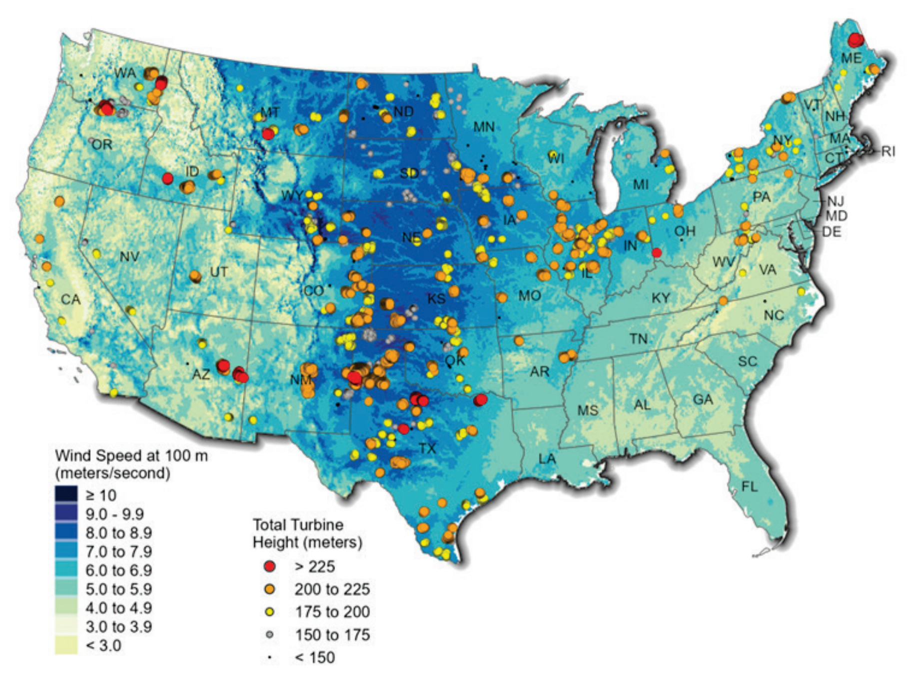
Sources: ACP, U.S. Wind Turbine Database, AWS Truepower, Berkeley Lab

Interactive data visualization: https://emp.lbl.gov/wind-power-technology-trends

Wind projects planned for the near future are poised to continue the trend of taller turbines

Proposed turbines show significant growth in total turbine height, compared to projects that entered commercial operation in 2023



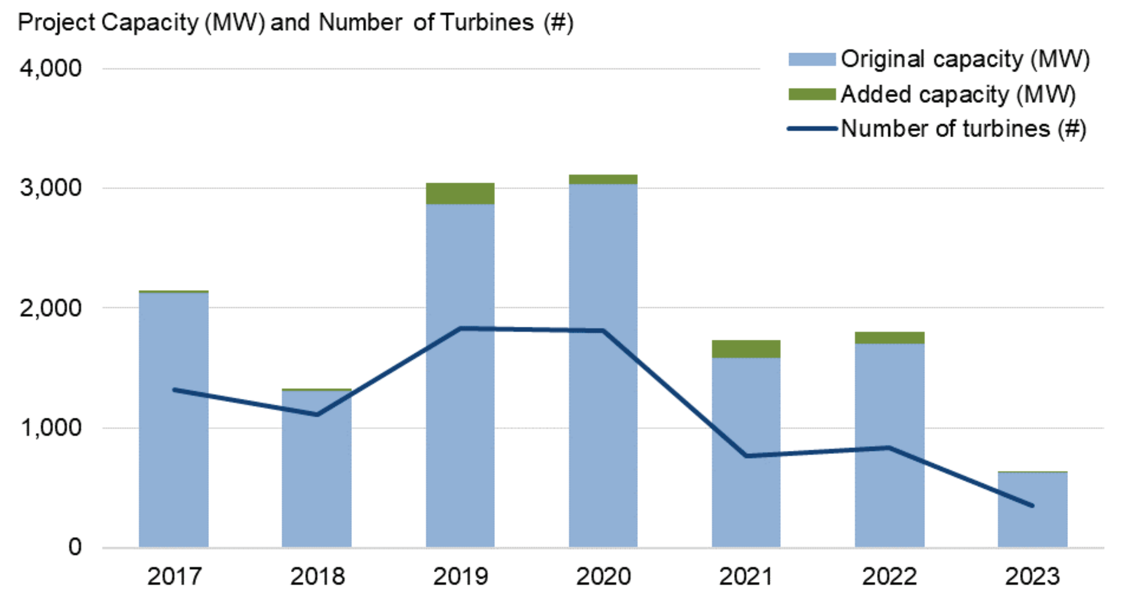


Sources: ACP, FAA files, AWS Truepower, Berkeley Lab

In 2023, seven projects were partially repowered, all of which now feature significantly larger rotors and lower specific power ratings

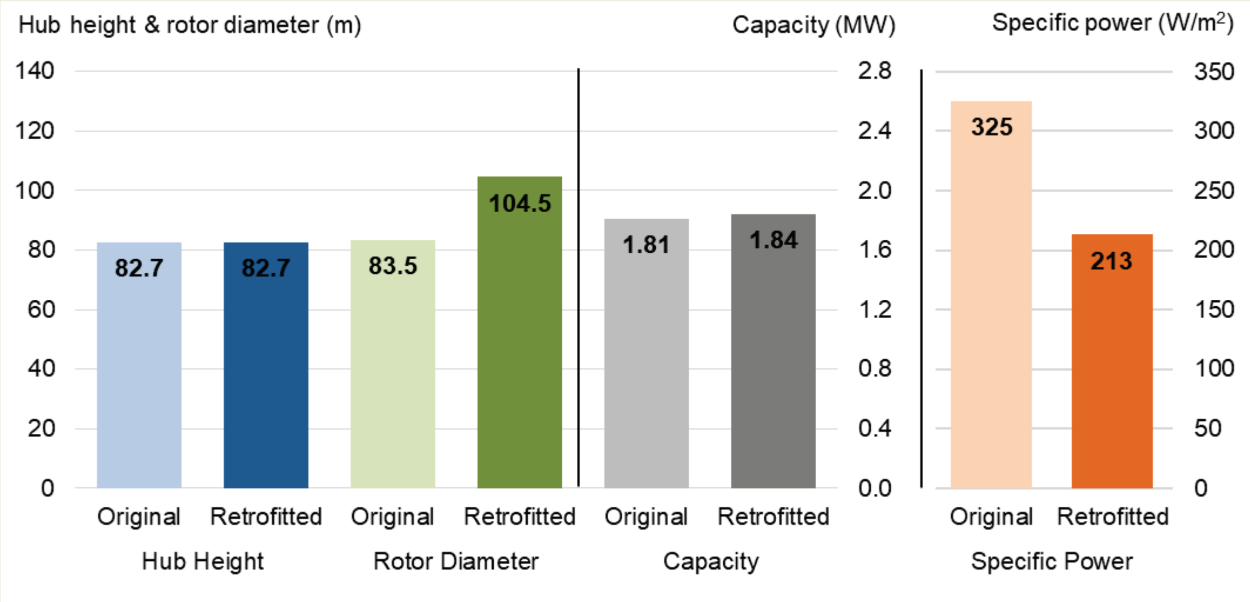
Partial Repowering by Year

(Figure shows wind project capacity repowered each year)



Technology Change with Partial Repowering

(Figure shows average technology change for wind turbines repowered in 2023)

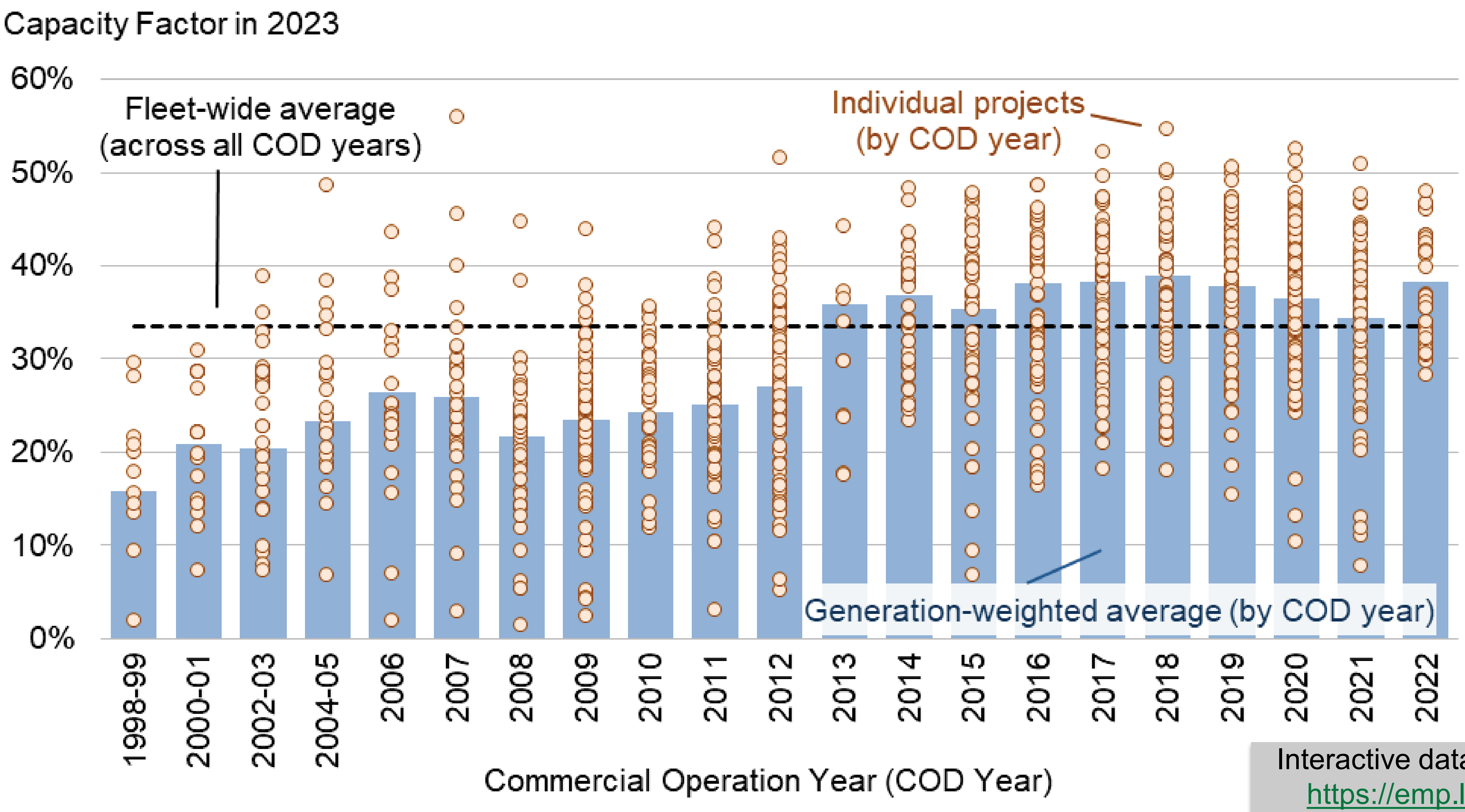


Sources: ACP, Berkeley Lab, turbine manufacturers

The mean age of turbines retrofitted in 2022 was just 11 years

Performance Trends

Average capacity factor in 2023 (a low wind year, nationwide) was 33.5% on a fleet-wide basis and 38.2% among projects built in 2022

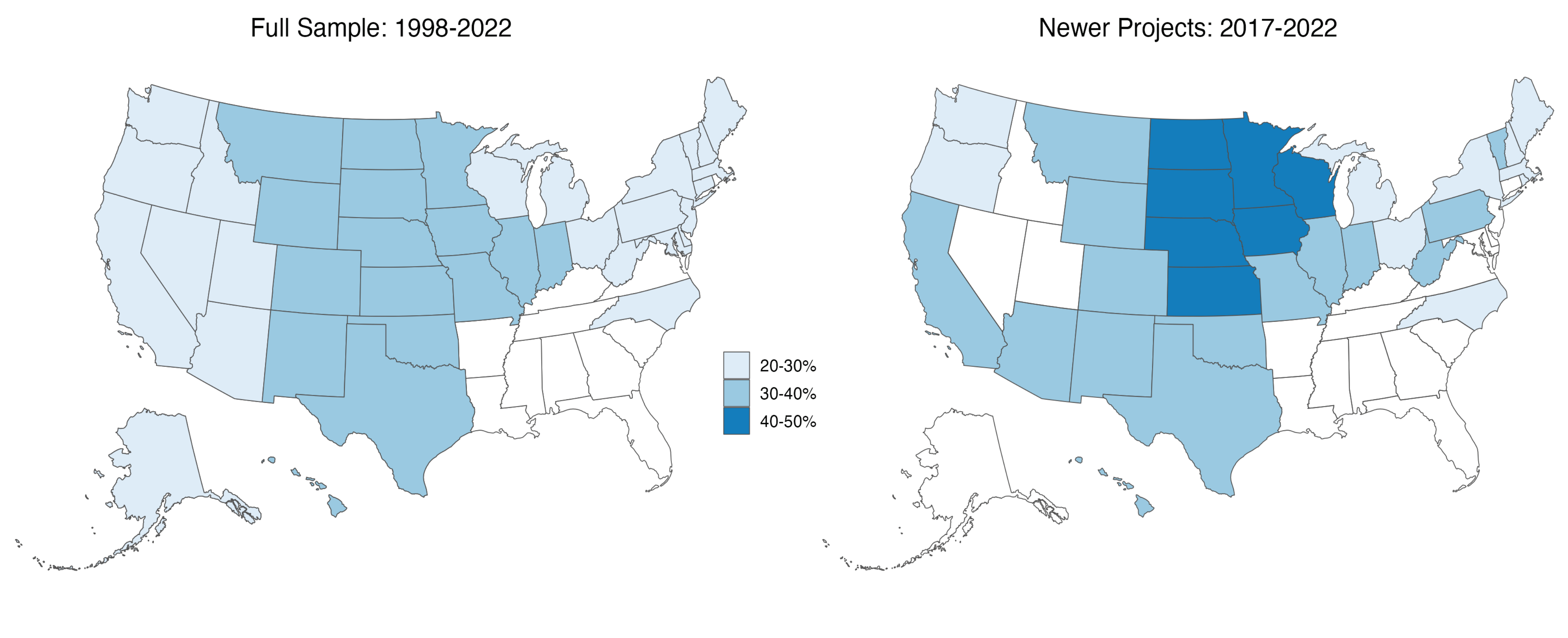


Source: EIA, FERC, Berkeley Lab

Interactive data visualization: https://emp.lbl.gov/wind-power-performance

The central part of the country features the highest capacity factors, in part reflecting the strength of the wind resource

Newer projects (right figure) have higher capacity factors than the full sample of projects (left figure)

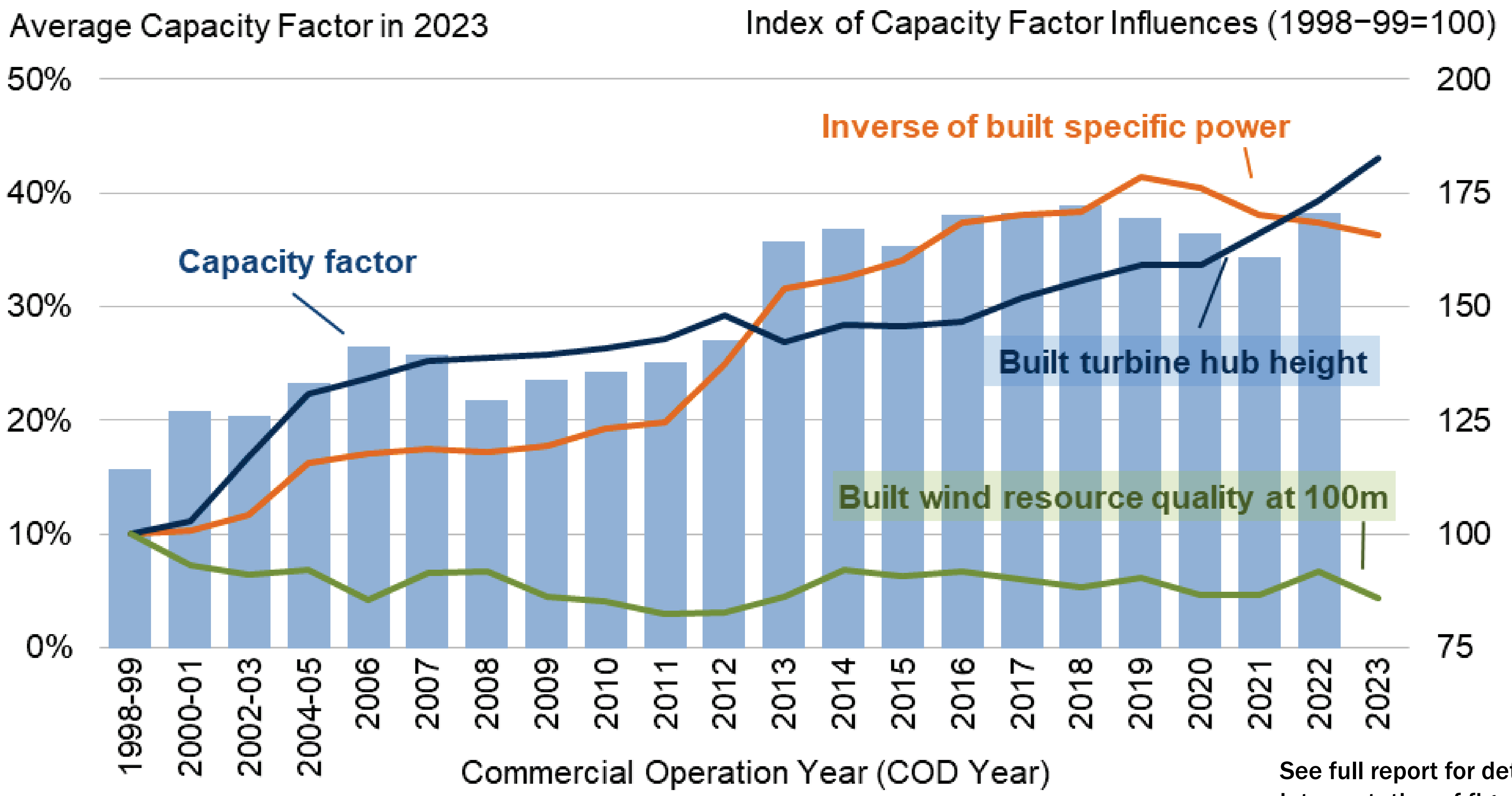


Source: EIA, FERC, Berkeley Lab

Note: States shaded in white have no projects in full sample (left) or in newer sample (right)

Interactive data visualization:
https://emp.lbl.gov/wind-power-performance

Turbine design and site characteristics influence performance

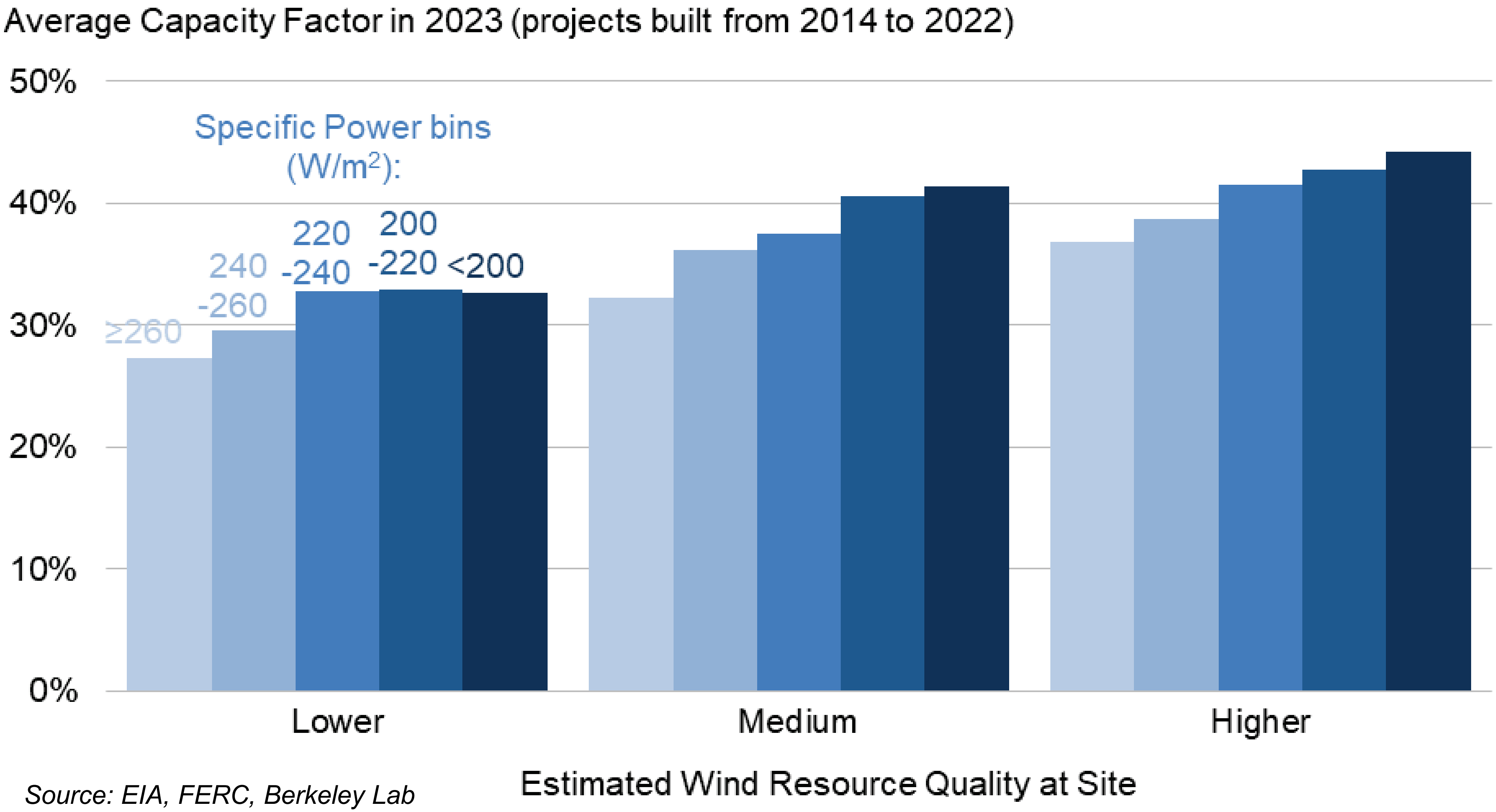


Source: EIA, FERC, Berkeley Lab

See full report for details on and interpretation of figure

Controlling for wind resource quality and specific power demonstrates impact of turbine evolution

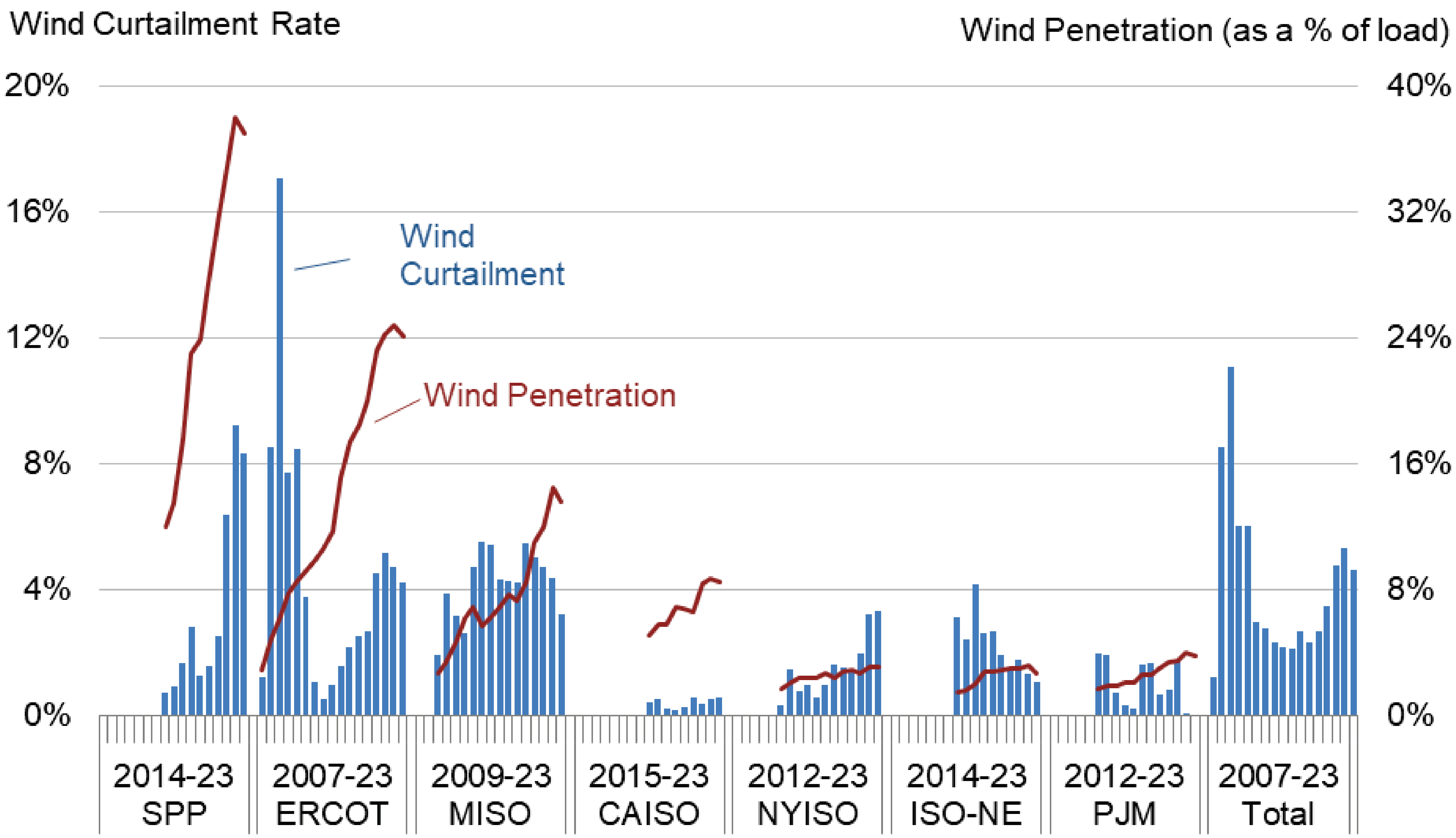
Low specific power turbines have generally driven capacity factors higher for projects located in given wind resource regimes



Note: See full report for a description of this categorization of wind resource quality

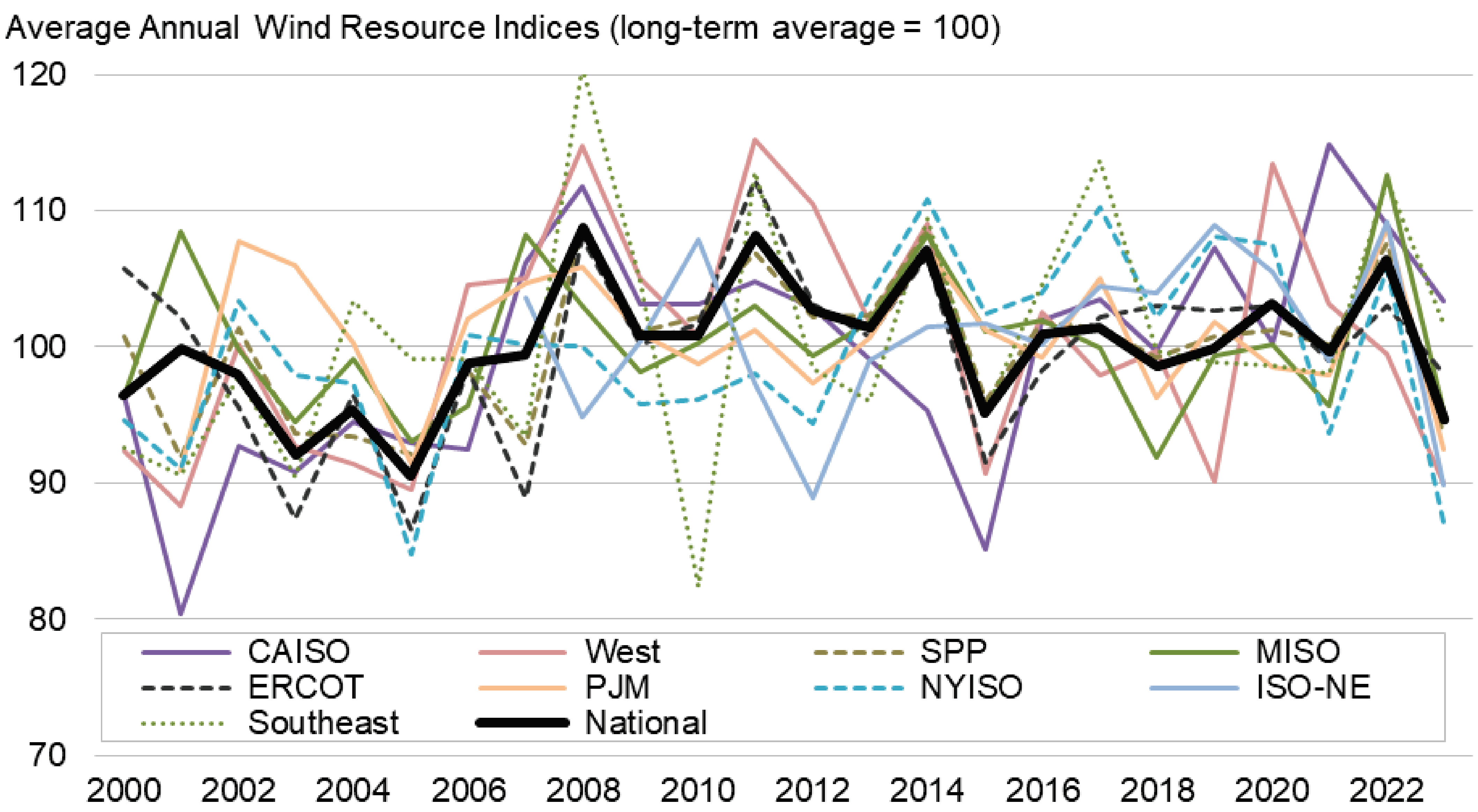
Source: EIA, FERC, Berkeley Lab

Wind power curtailment in 2023 varied by region, averaging 4.6% across seven ISOs; highest in SPP and ERCOT



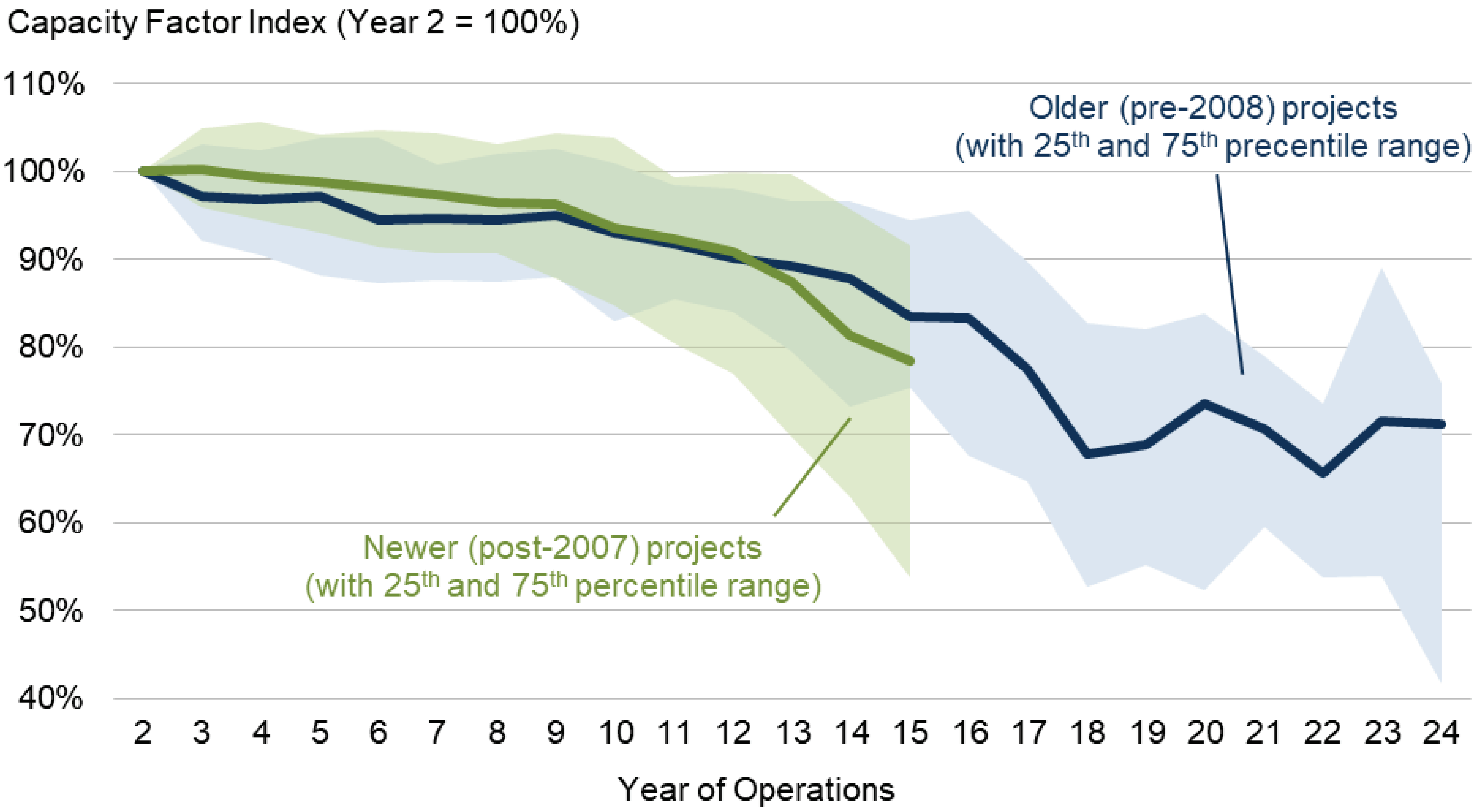
Sources: ERCOT, MISO, CAISO, NYISO, PJM, ISO-NE, SPP

2023 was a low wind resource year across most of the country: 33.5% fleet-wide capacity factor in 2023 was down from 36.1% in 2022



Source: ERA, Berkeley Lab; methodology behind the index of inter-annual variability is explained in report appendix

Wind project performance declines as projects age, both for older (pre-2008) projects and newer (post-2007) projects

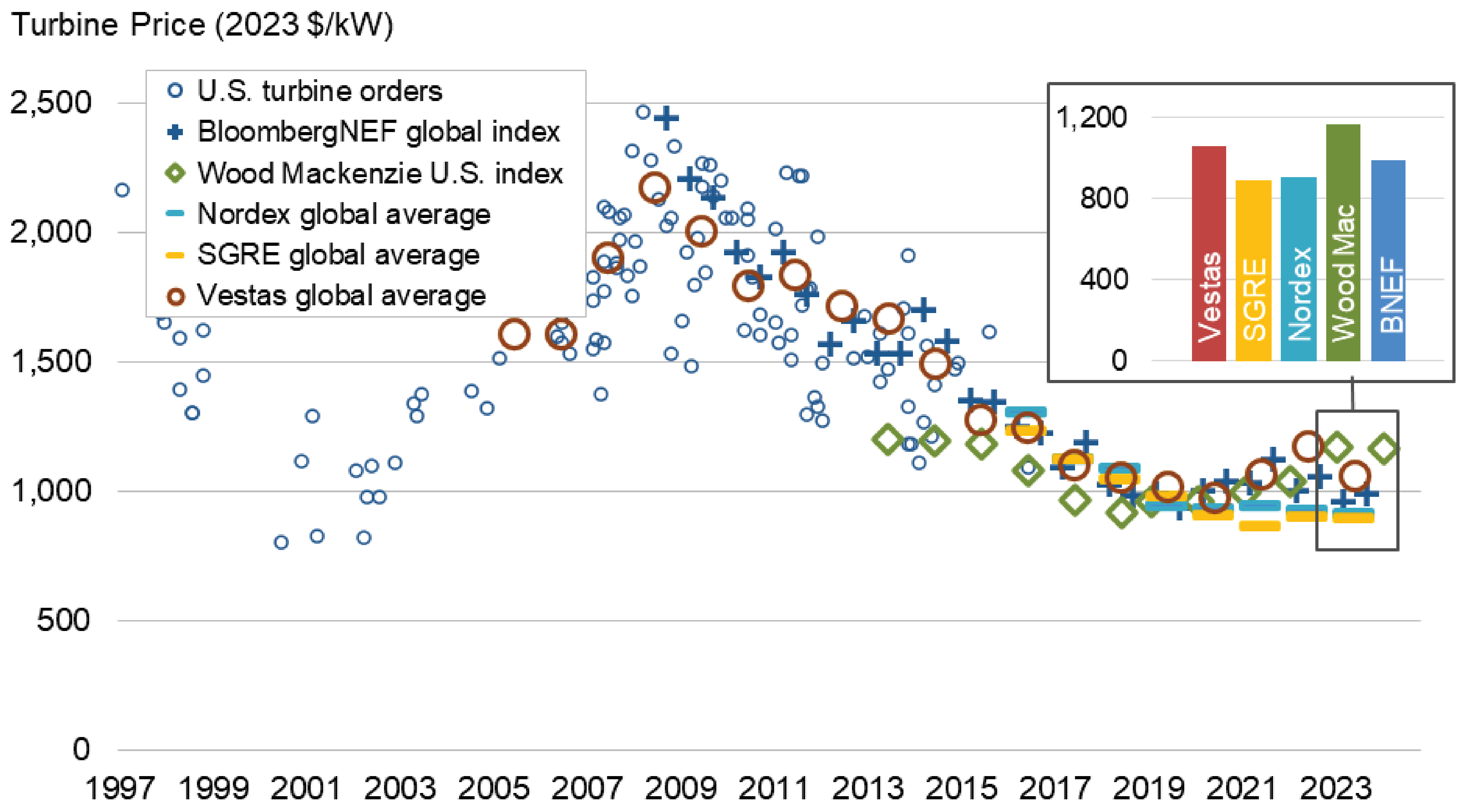


Source: EIA, FERC, Berkeley Lab

For more analysis on wind project performance with plant age, see: https://emp.lbl.gov/publications/how-does-wind-project-performance

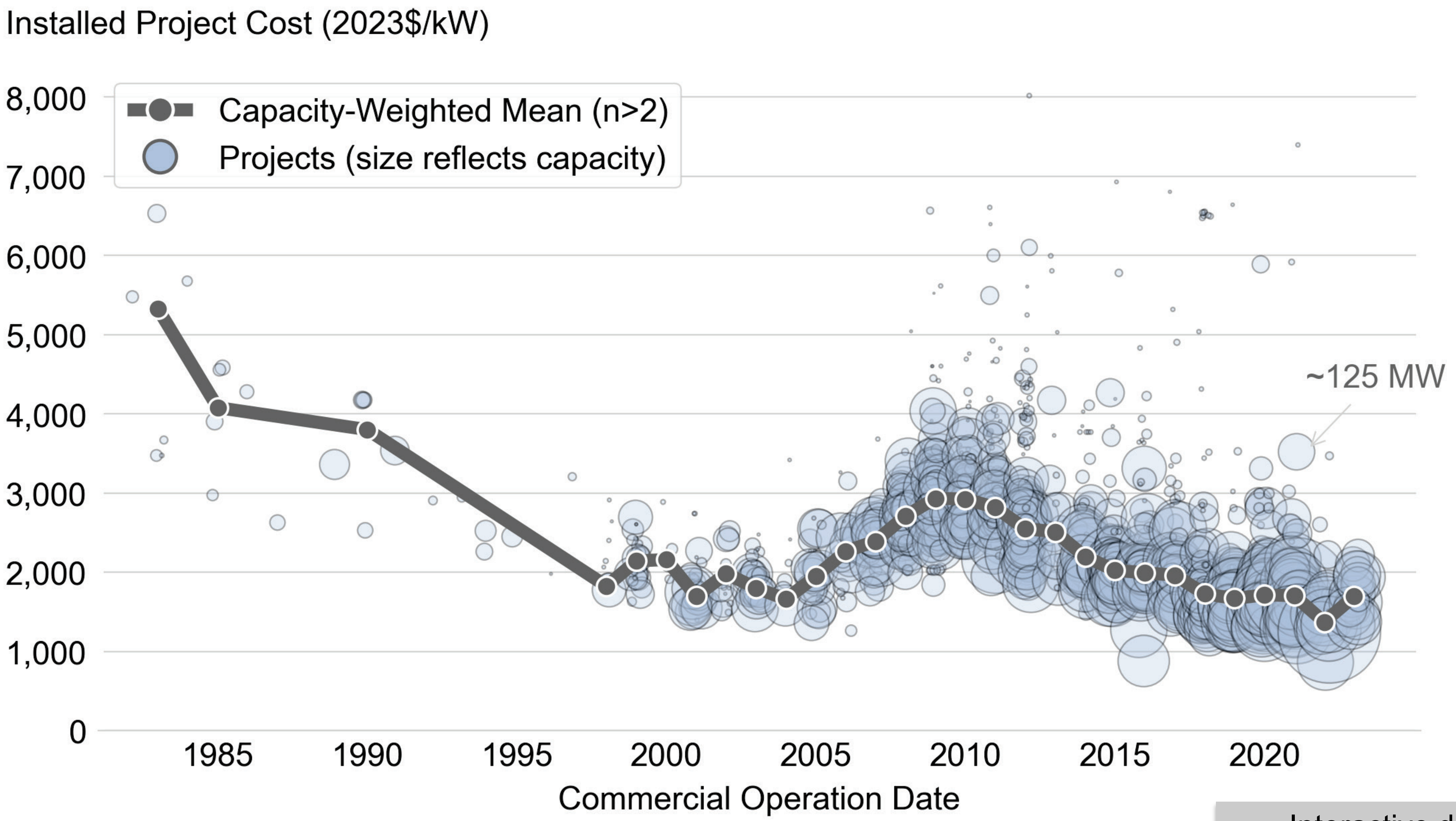
Cost Trends

Wind turbine prices declined in 2023, averaging roughly $1,000/kW



Sources: Berkeley Lab, annual financial reports, forecast providers

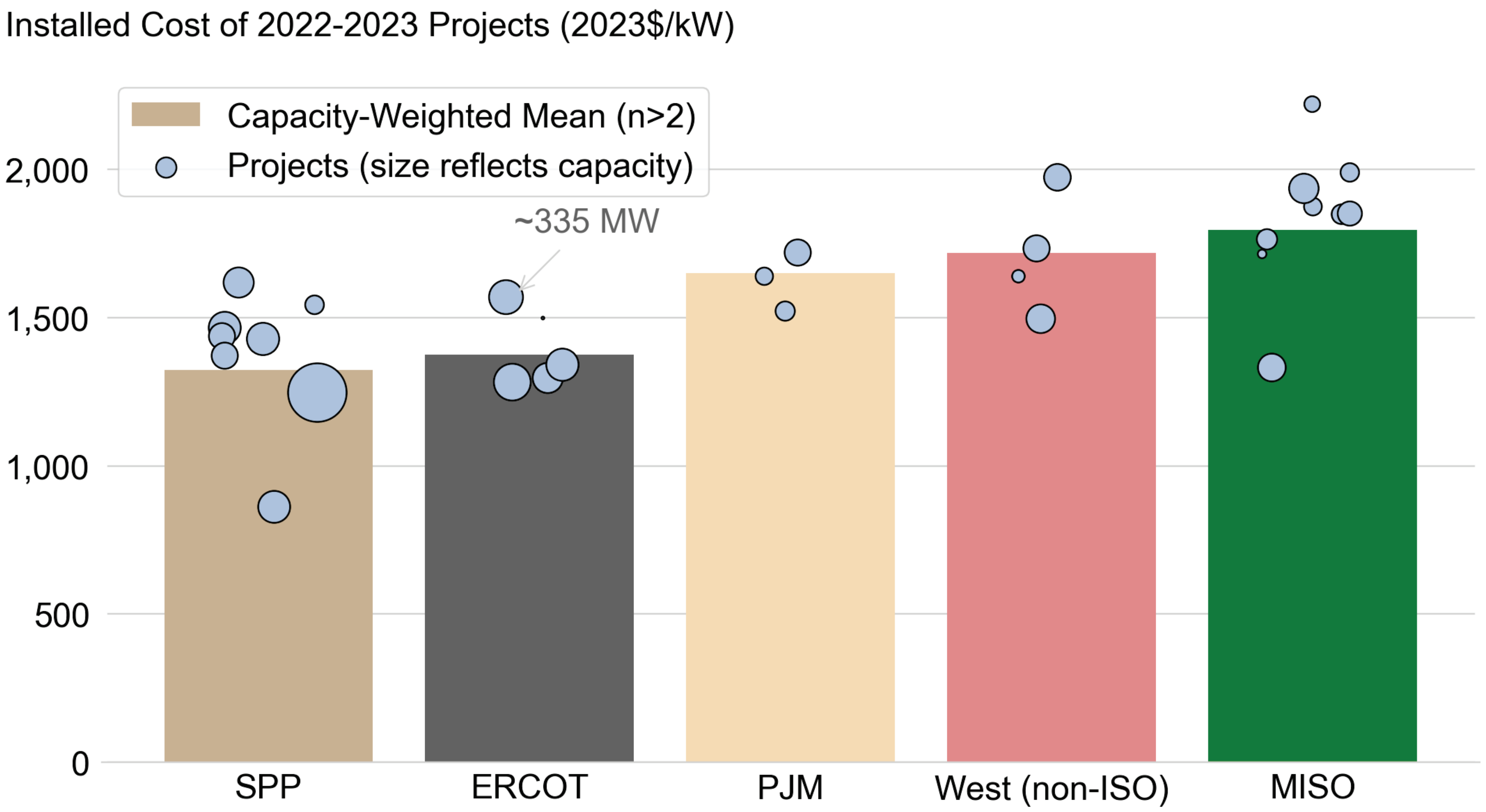
Despite recent fluctuations in turbine prices, average reported installed project costs have held surprisingly steady since 2018



Note: Smallest bubble size reflects smallest wind project (< 1 MW), whereas largest bubble size reflects largest wind project (> 1,000 MW)
Sources: Berkeley Lab, EIA (some data points suppressed to protect confidentiality)

Interactive data visualization:
https://emp.lbl.gov/wind-energy-capital-expenditures-capex

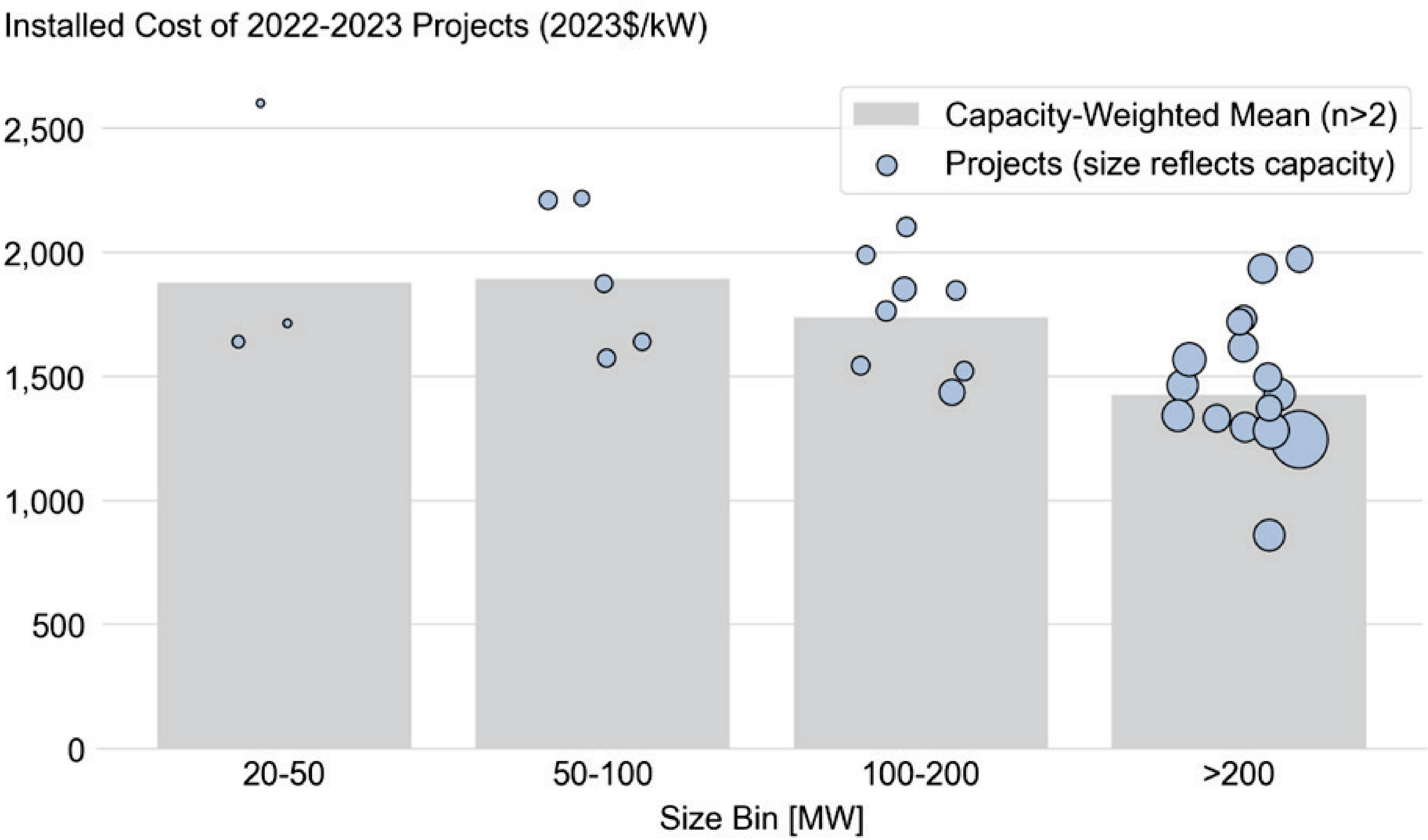
Considering projects installed in 2022 and 2023, ERCOT and SPP are the two lowest-cost regions



Note: Bubbles reflect projects that range from roughly 2 MW to 1,000 MW
Source: Berkeley Lab

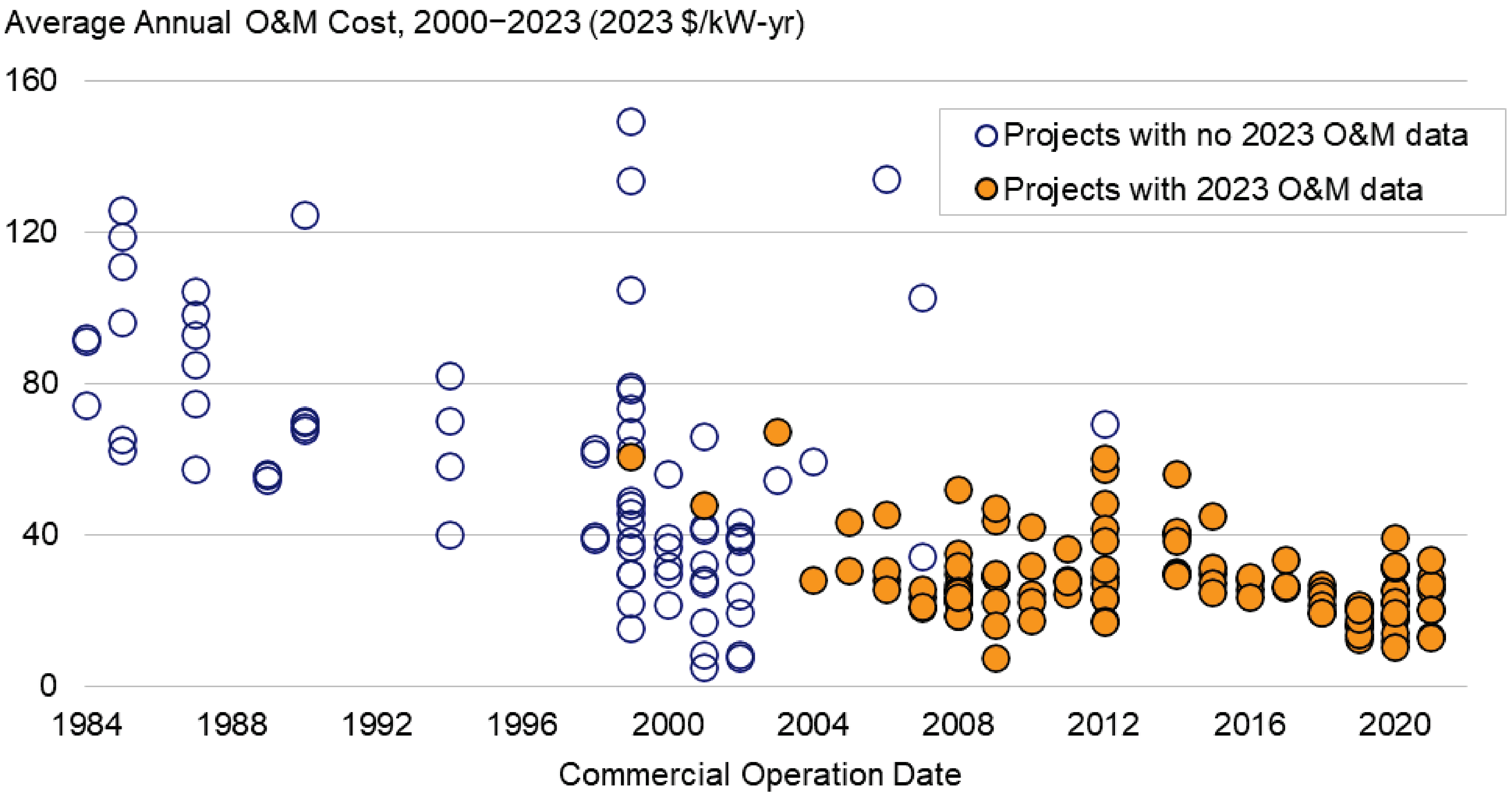
Interactive data visualization: https://emp.lbl.gov/wind-energy-capital-expenditures-capex

Installed costs (per megawatt) generally decline with project size, are lowest for projects over 200 MW



Note: Bubbles reflect projects that range from roughly 2 MW to 1,000 MW
Source: Berkeley Lab

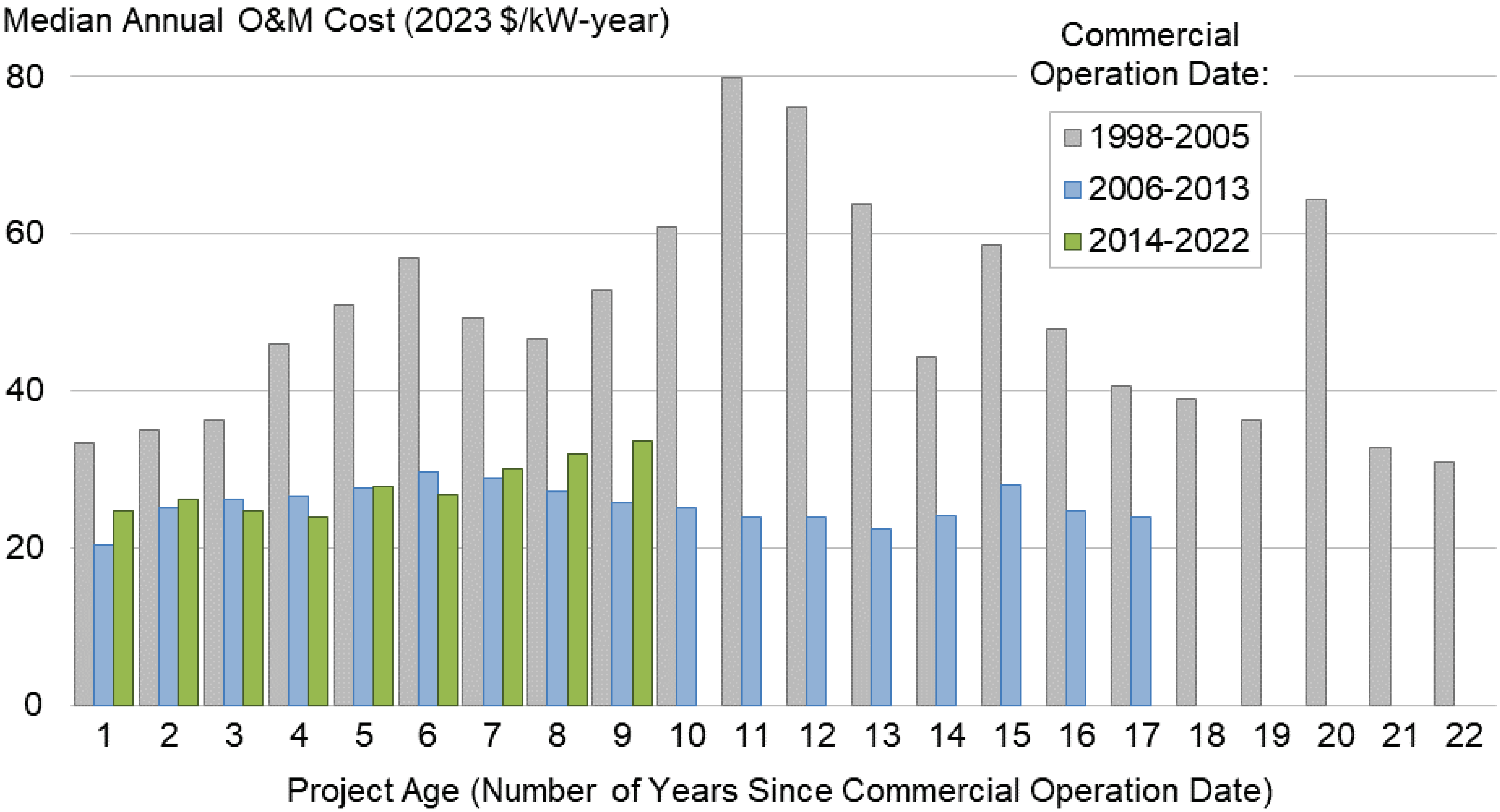
Operations and maintenance (O&M) costs vary by commercial operations date and project age



Source: Berkeley Lab; some data points suppressed to protect confidentiality

Note: Sample is limited; few projects in sample have complete records of O&M costs from 2000-23; O&M costs reported here do not include all operating costs.

O&M costs are higher for projects built before 2006



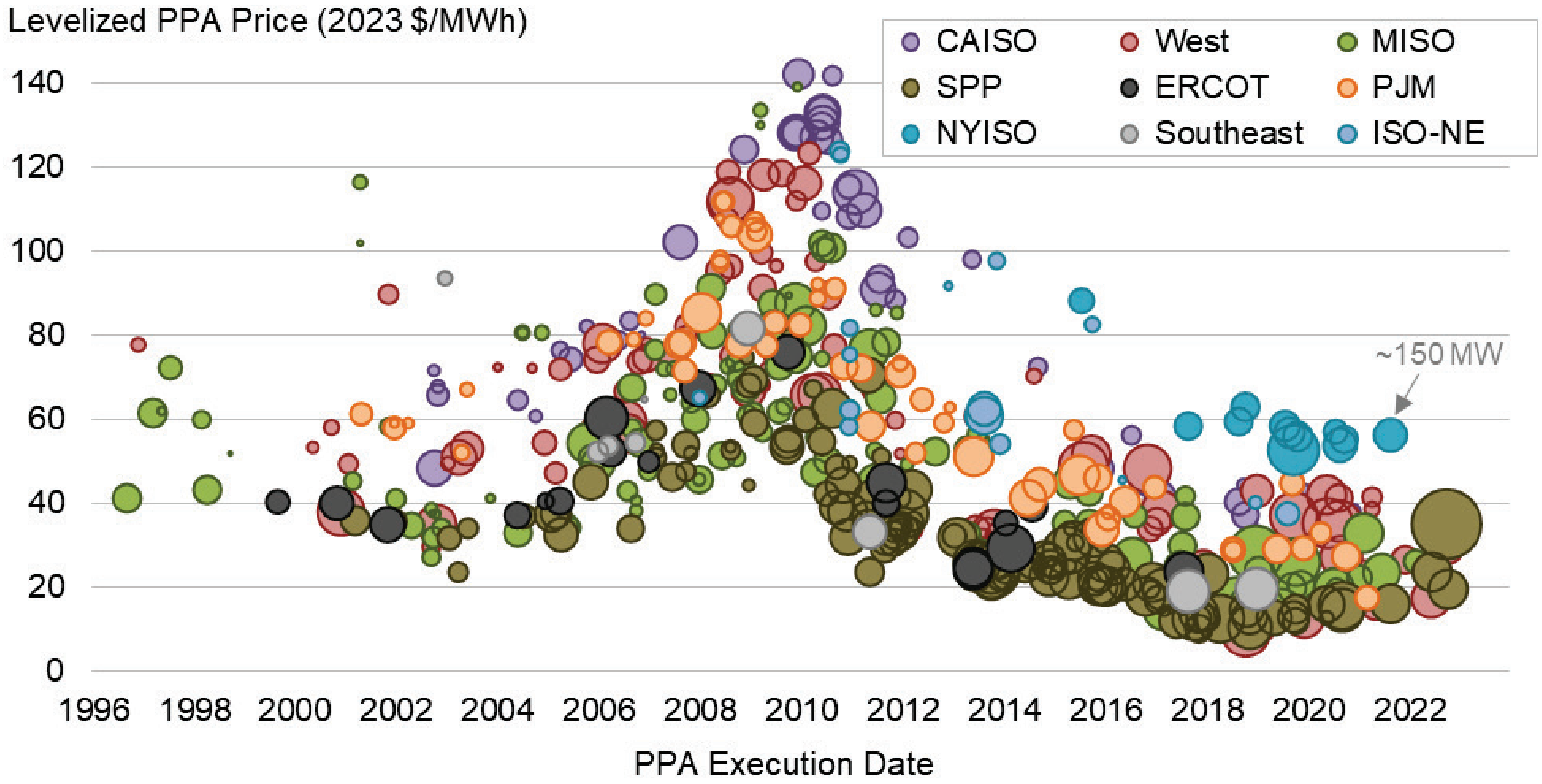
O&M reported here does not include all operating costs: all-in operating costs for the most recent wind projects average >$40/kW-year

Source: Berkeley Lab; medians shown only for groups of two or more projects, and only projects >5 MW are included

Note: Sample size is limited, especially after year 15

Power Sales Price and Levelized Cost Trends

Wind power purchase agreement (PPA) prices have drifted higher since about 2018: recent range from <$20/MWh to >$40/MWh

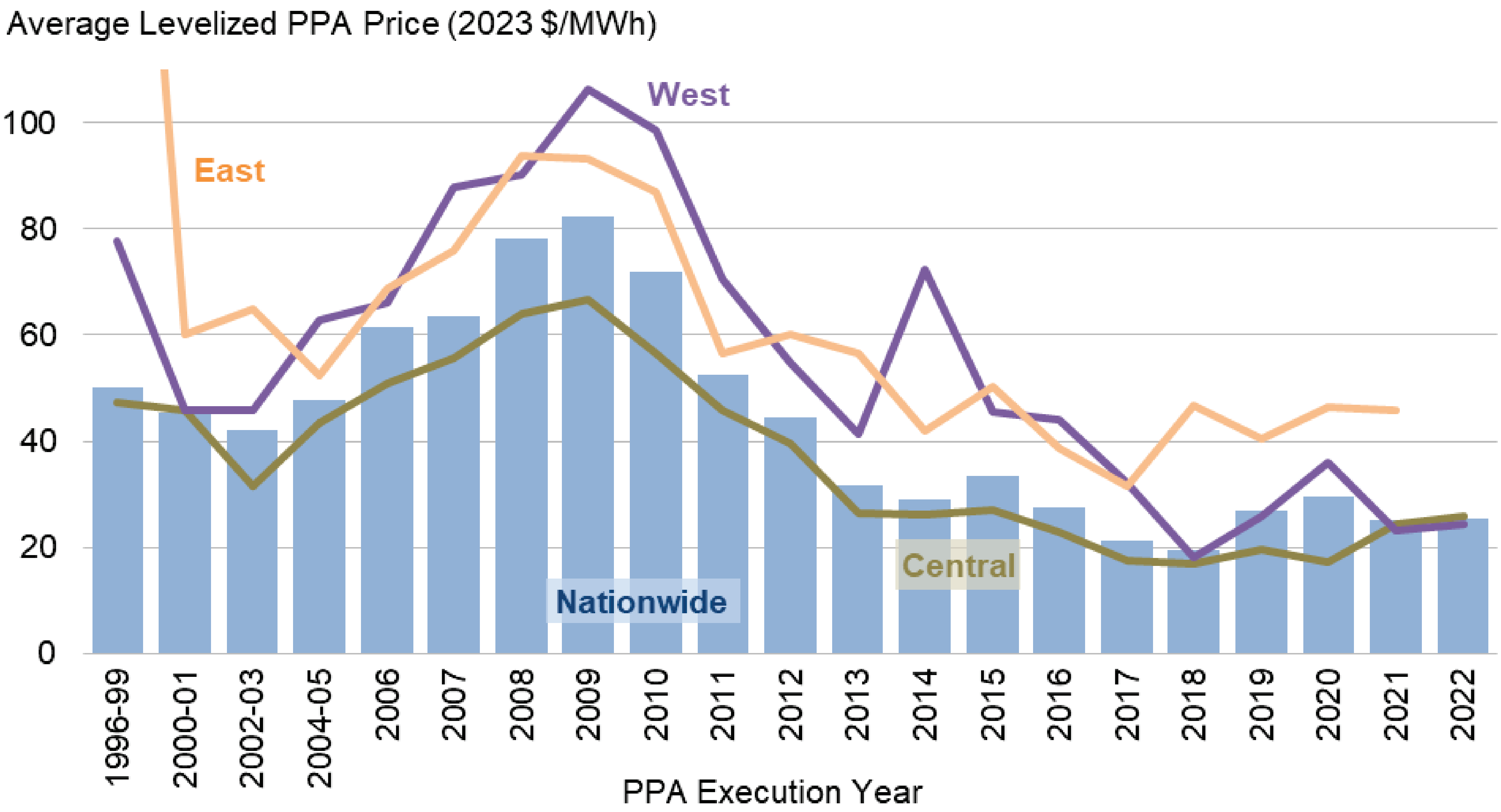


Note: Smallest bubble sizes reflect smallest-volume PPAs (<5 MW), whereas largest reflect largest-volume PPAs (>500 MW)

Source: Berkeley Lab, FERC

Interactive data visualization: https://emp.lbl.gov/wind-power-purchase-agreement-ppa-prices

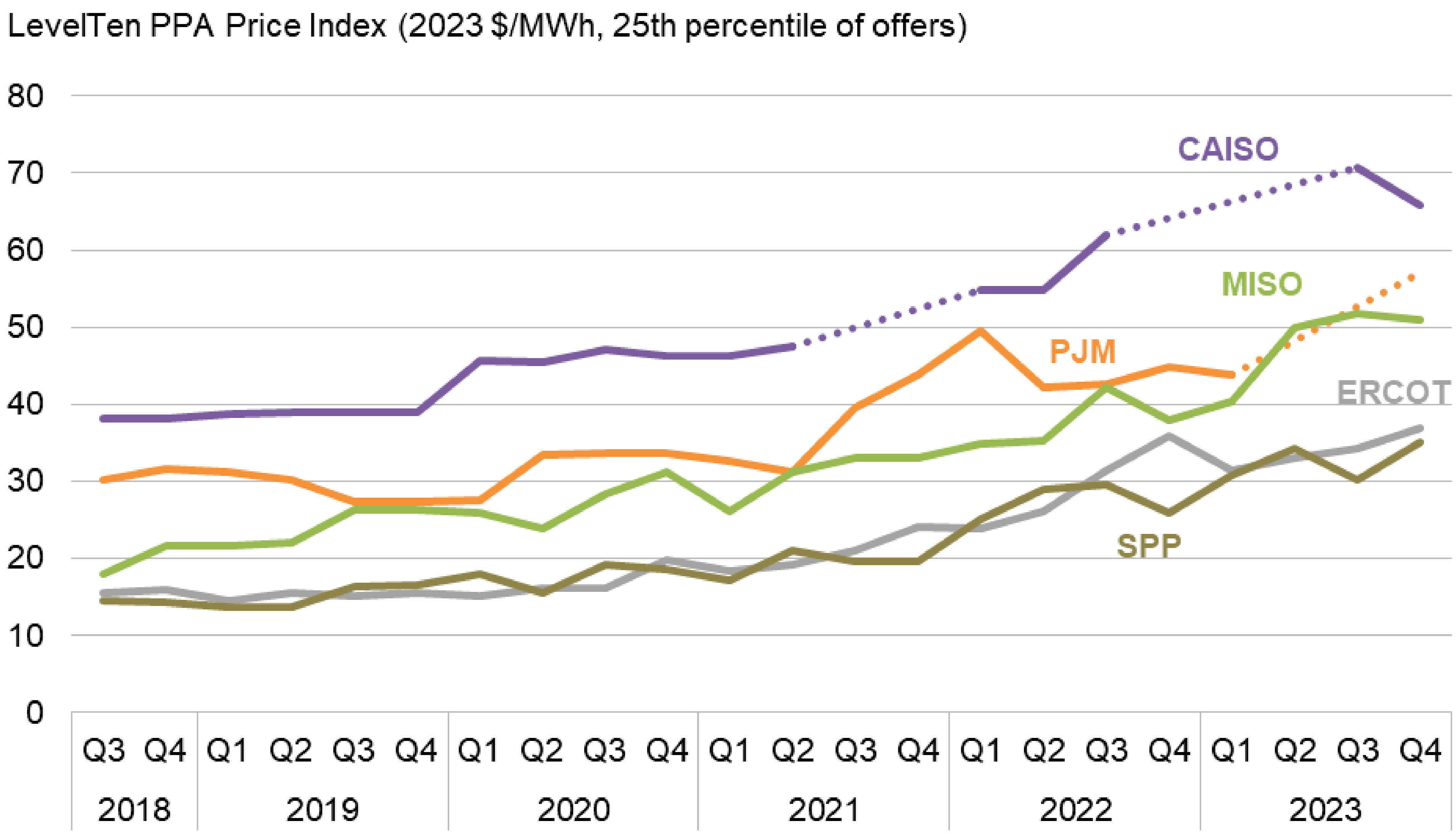
Average PPA prices have steeply declined since 2009 but risen in more recent years; prices lowest in central region



Source: Berkeley Lab, FERC

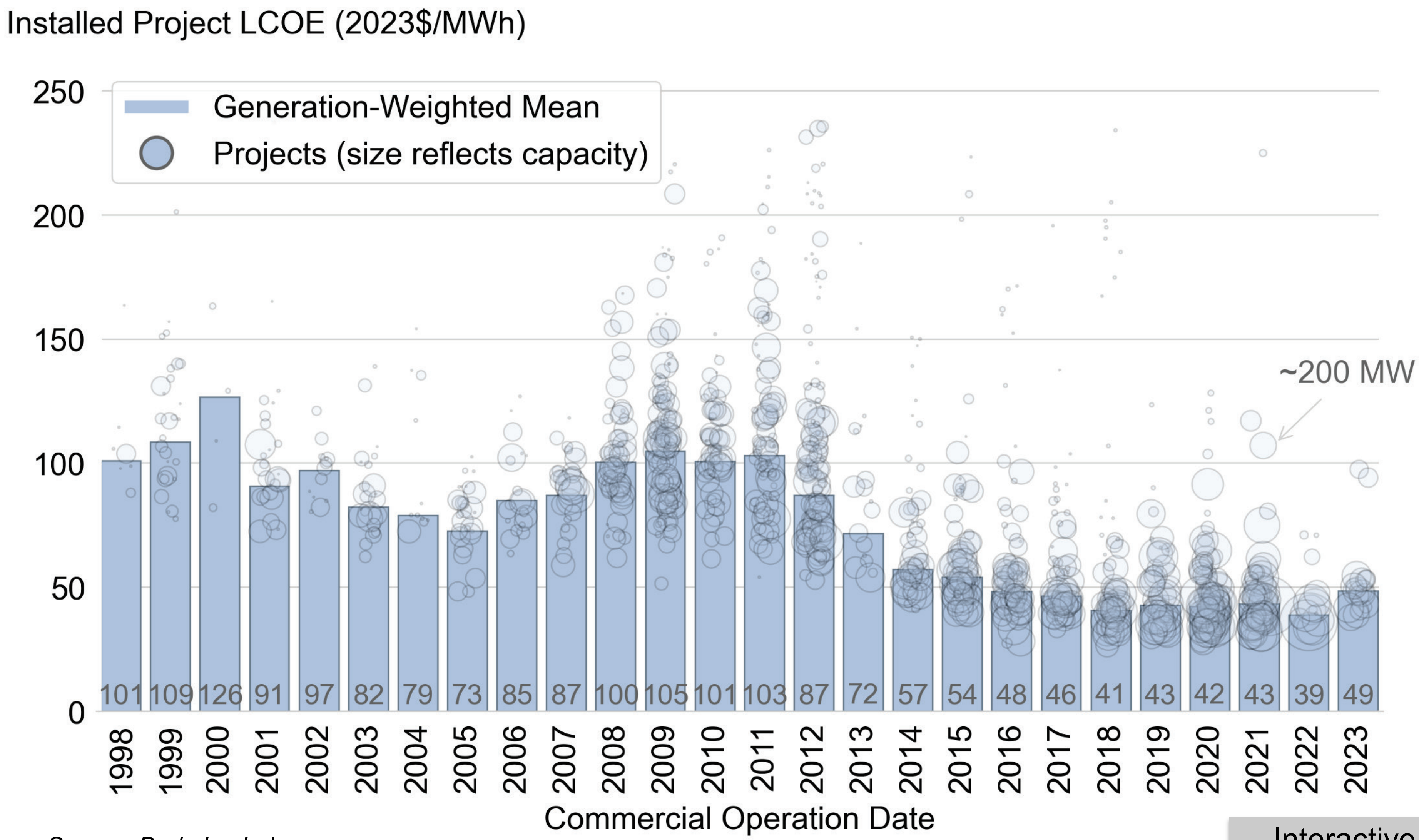
Note: West = CAISO, West (non-ISO); Central = MISO, SPP, ERCOT; East = PJM, NYISO, ISO-NE, Southeast (non-ISO)

LevelTen Energy's PPA price indices confirm rising PPA prices and regional variation



Source: LevelTen Energy
Notes: See full report for approach to converting nominal dollar LevelTen data to levelized real 2023$ as reported in figure above. Dashed lines represent interpolations between data points where intermediate data are missing.

Levelized cost of wind energy (LCOE): nationwide average of $49/MWh for limited sample of projects installed in 2023



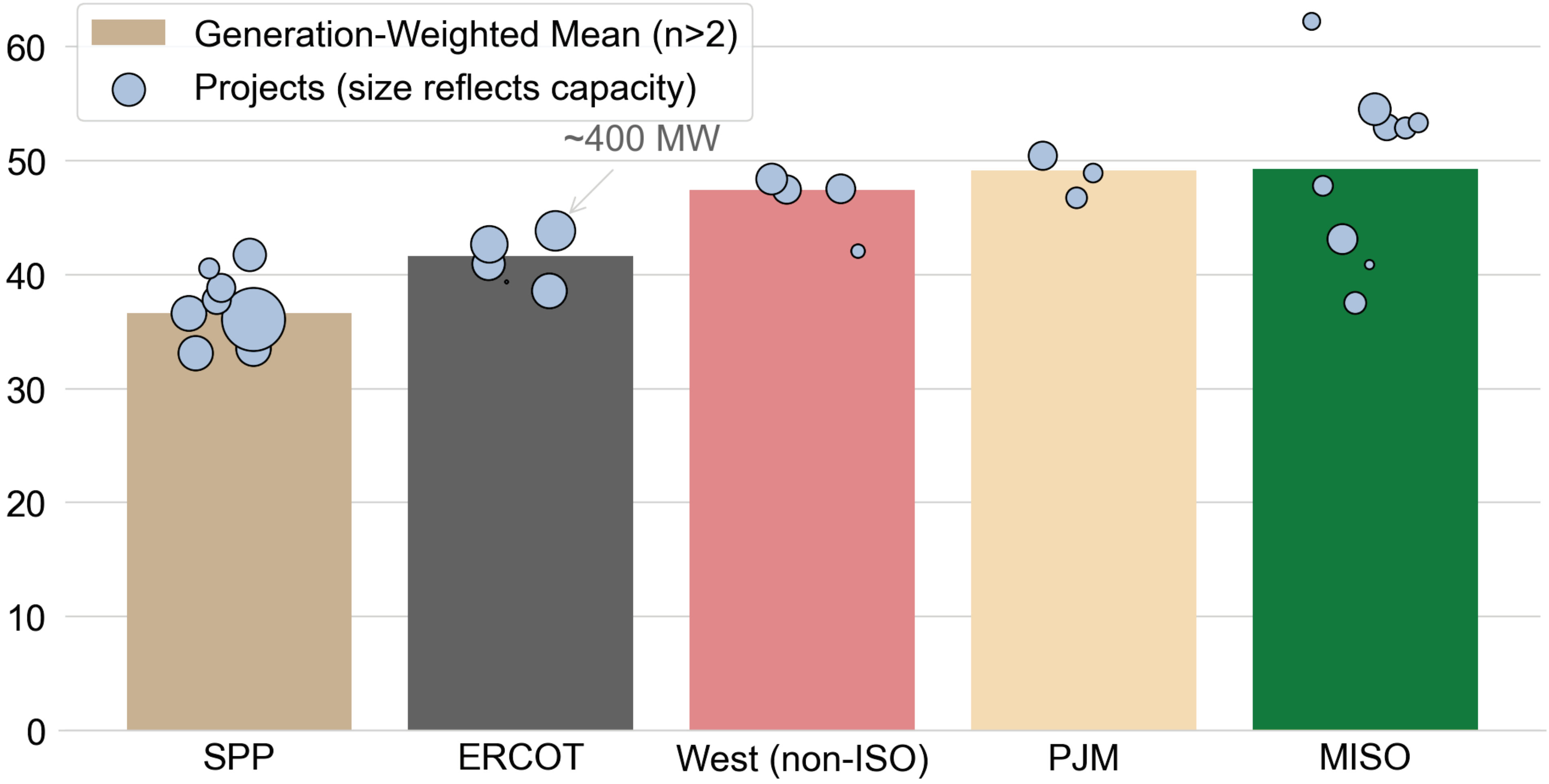
Source: Berkeley Lab

Note: Yearly estimates reflect variations in installed cost, capacity factors, operational costs, cost of financing, and project life; includes accelerated depreciation but excludes PTC. See full report for details.

Interactive data visualization: https://emp.lbl.gov/levelized-cost-wind-energy

Levelized costs vary by region, with the lowest costs in SPP and ERCOT for recently (2022-2023) built projects

LCOE of 2022-2023 Projects (2023$/MWh)

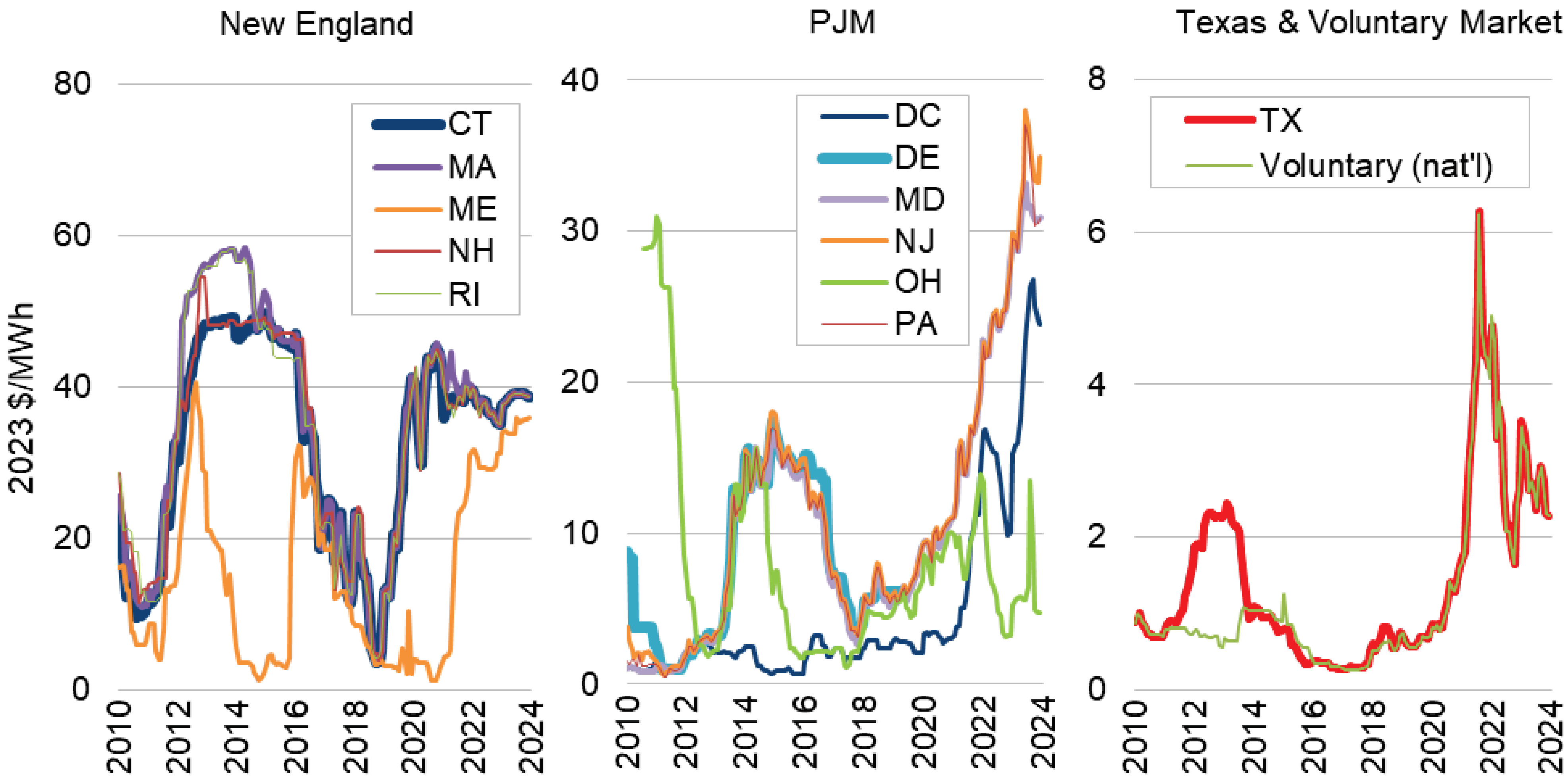


Note: Bubbles reflect projects that range from roughly 2 MW to 1,000 MW

Source: Berkeley Lab

Interactive data visualization: https://emp.lbl.gov/levelized-cost-wind-energy

Renewable Energy Certificate (REC) prices continue to vary substantially across markets and time

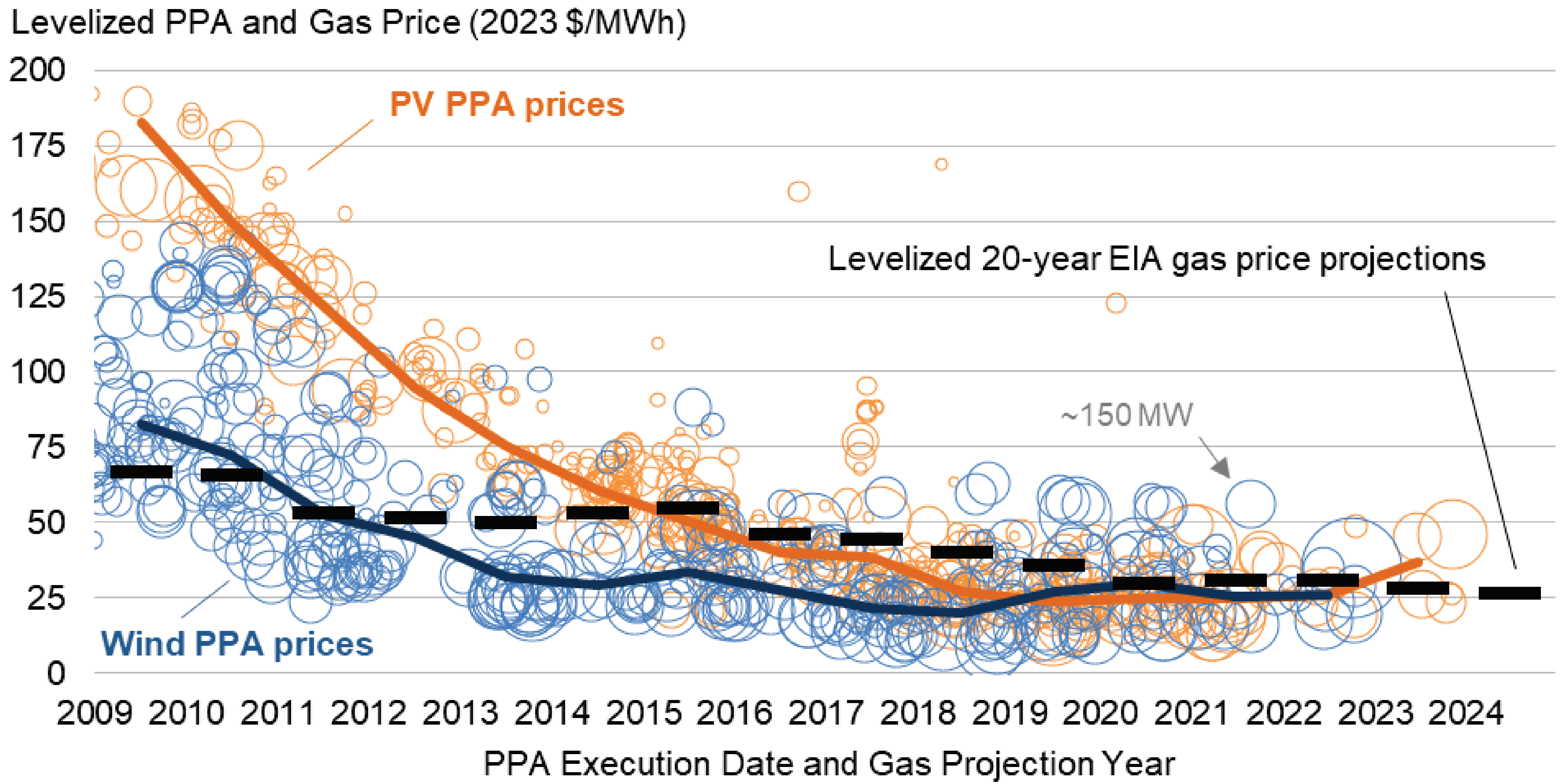


Source: Marex Spectron

REC prices vary by: market type (compliance vs. voluntary); geographic region; specific design of state RPS policies.

Cost and Value Comparisons

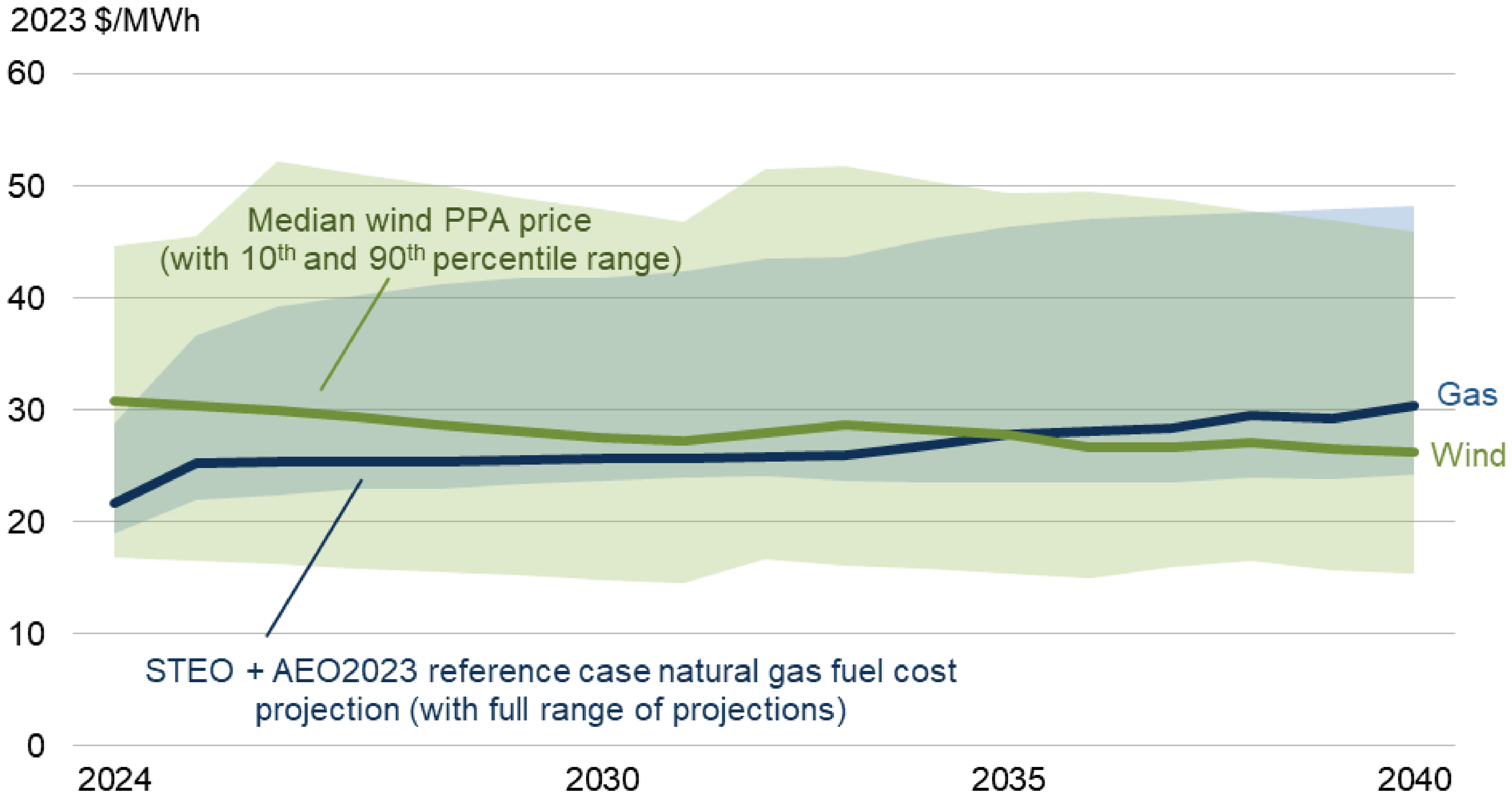
Despite relatively low PPA prices, wind faces competition from solar and natural gas



Source: Berkeley Lab, FERC, EIA

Note: Smallest bubble sizes reflect smallest-volume PPAs (<5 MW), whereas largest reflect largest-volume PPAs (>500 MW)

Recent wind prices are comparable to the expected future cost of burning fuel in natural gas plants



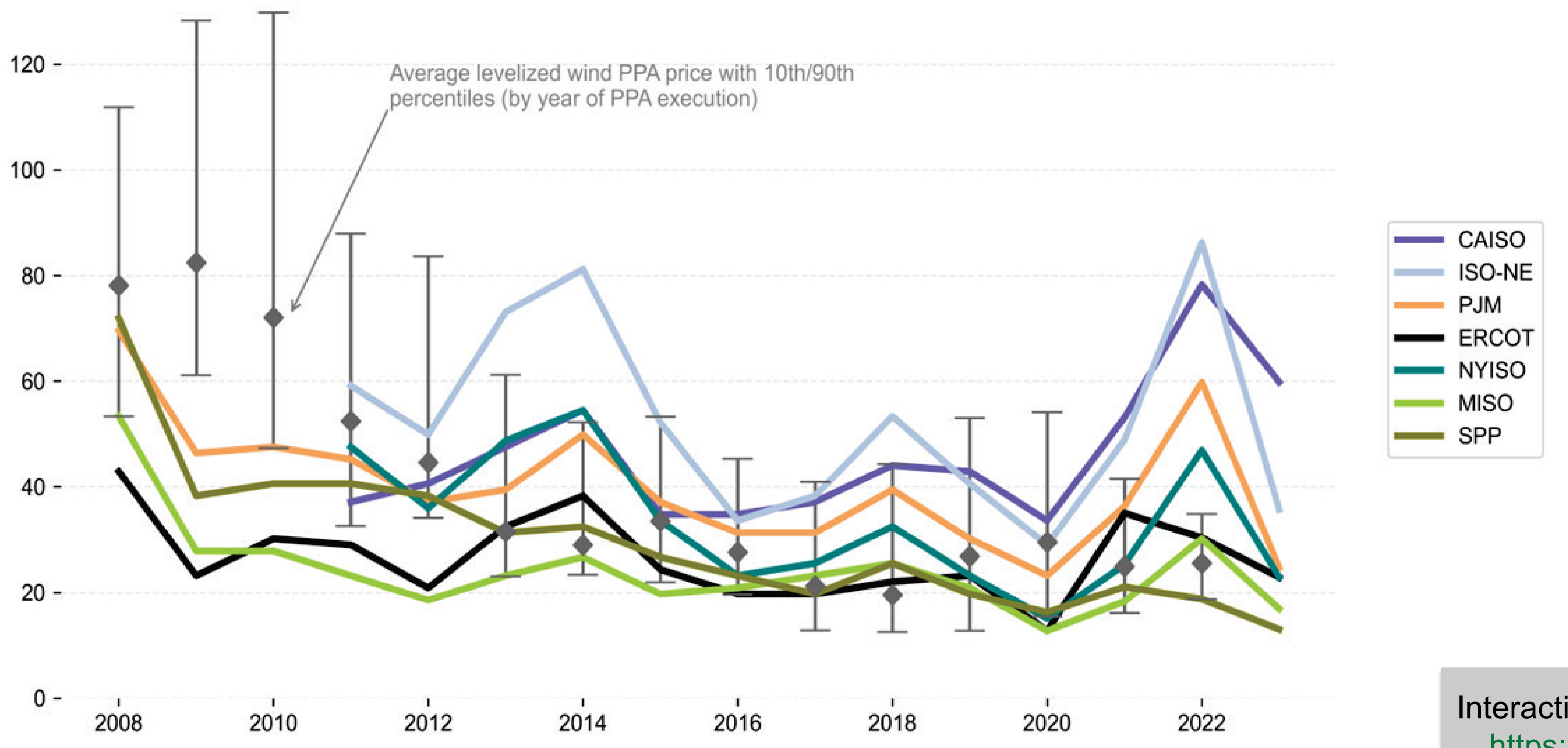
Source: Berkeley Lab, FERC, EIA

Notes: Price comparisons shown are far from perfect—see full report for details

STEO = EIA's Short-Term Energy Outlook; AEO = EIA's Annual Energy Outlook

The grid-system market value of wind declined in 2023 across all regions and was lower than recent PPA prices in several regions

Wholesale Market Value and PPA Prices (2023 $/MWh)

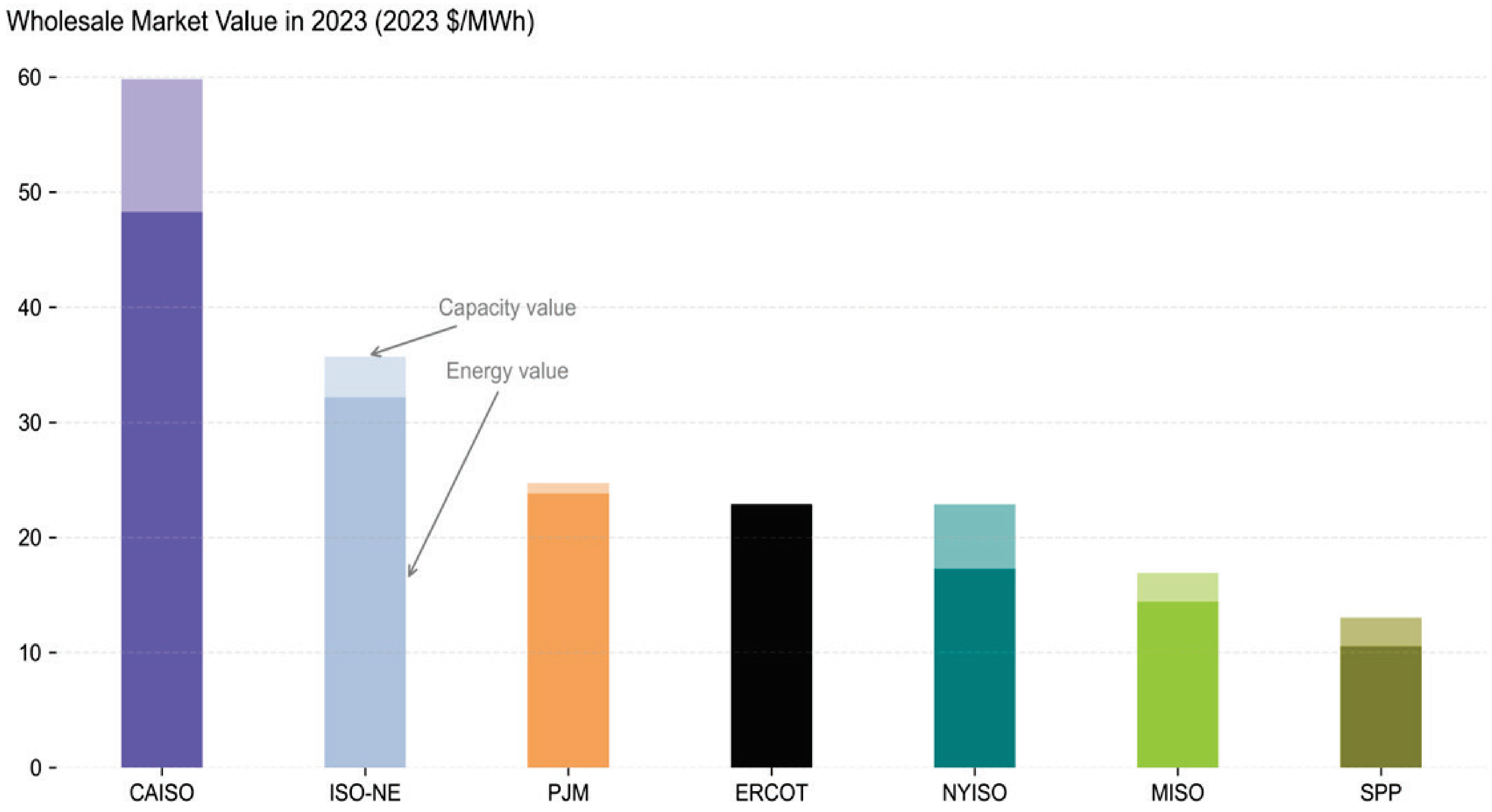


Wholesale market value considers hourly local wholesale energy price and hourly wind output, along with capacity value where available

Interactive data visualization: https://emp.lbl.gov/wind-energy-market-value

Sources: Berkeley Lab, Hitachi, ISOs
Note: Data on contract-specific 2023 PPA prices not available

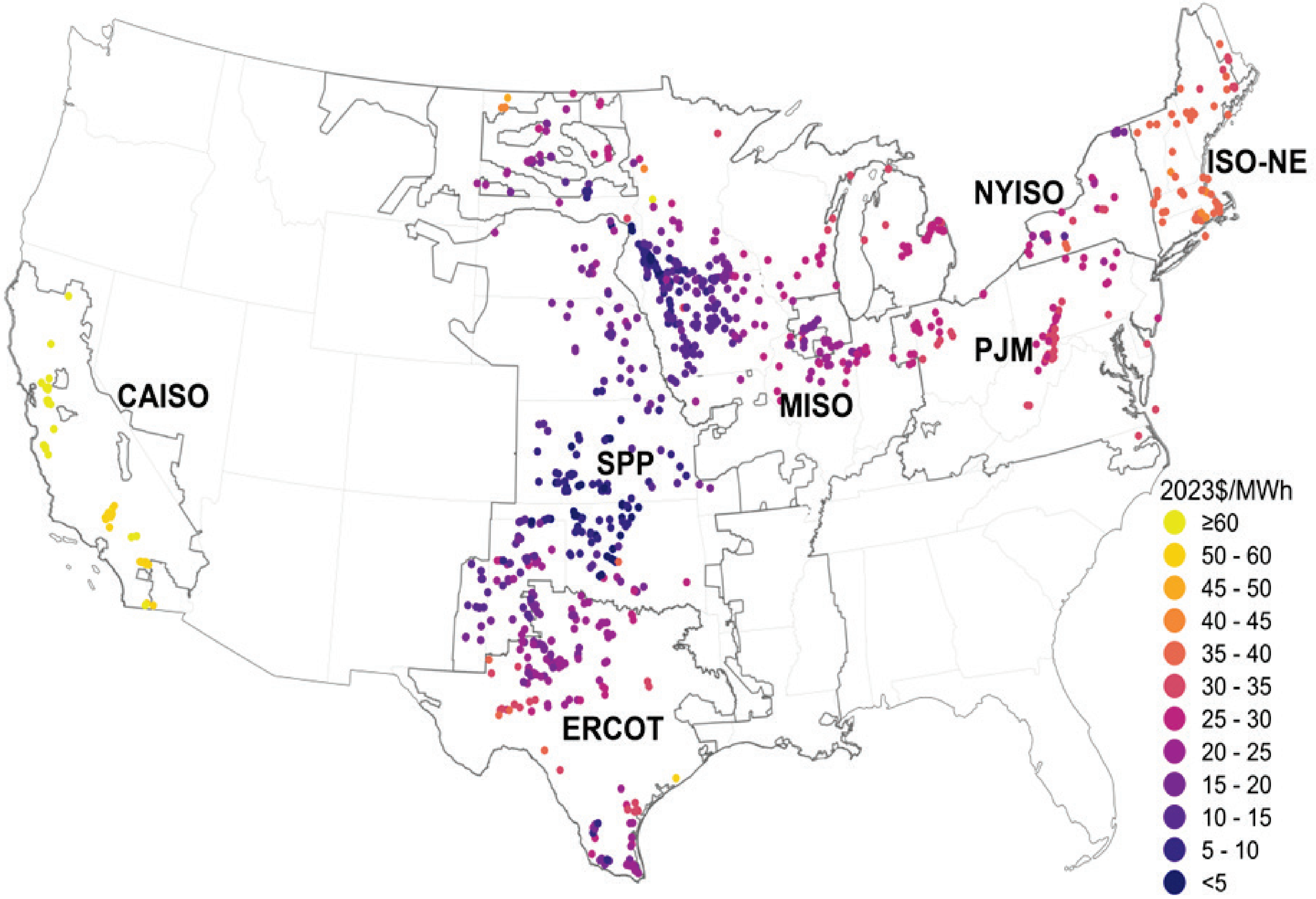
The grid-system market value of wind in 2023 varied strongly by location, from an average of $13/MWh in SPP to $60/MWh in CAISO



Sources: Berkeley Lab, Hitachi, ISOs

Interactive data visualization: https://emp.lbl.gov/wind-energy-market-value

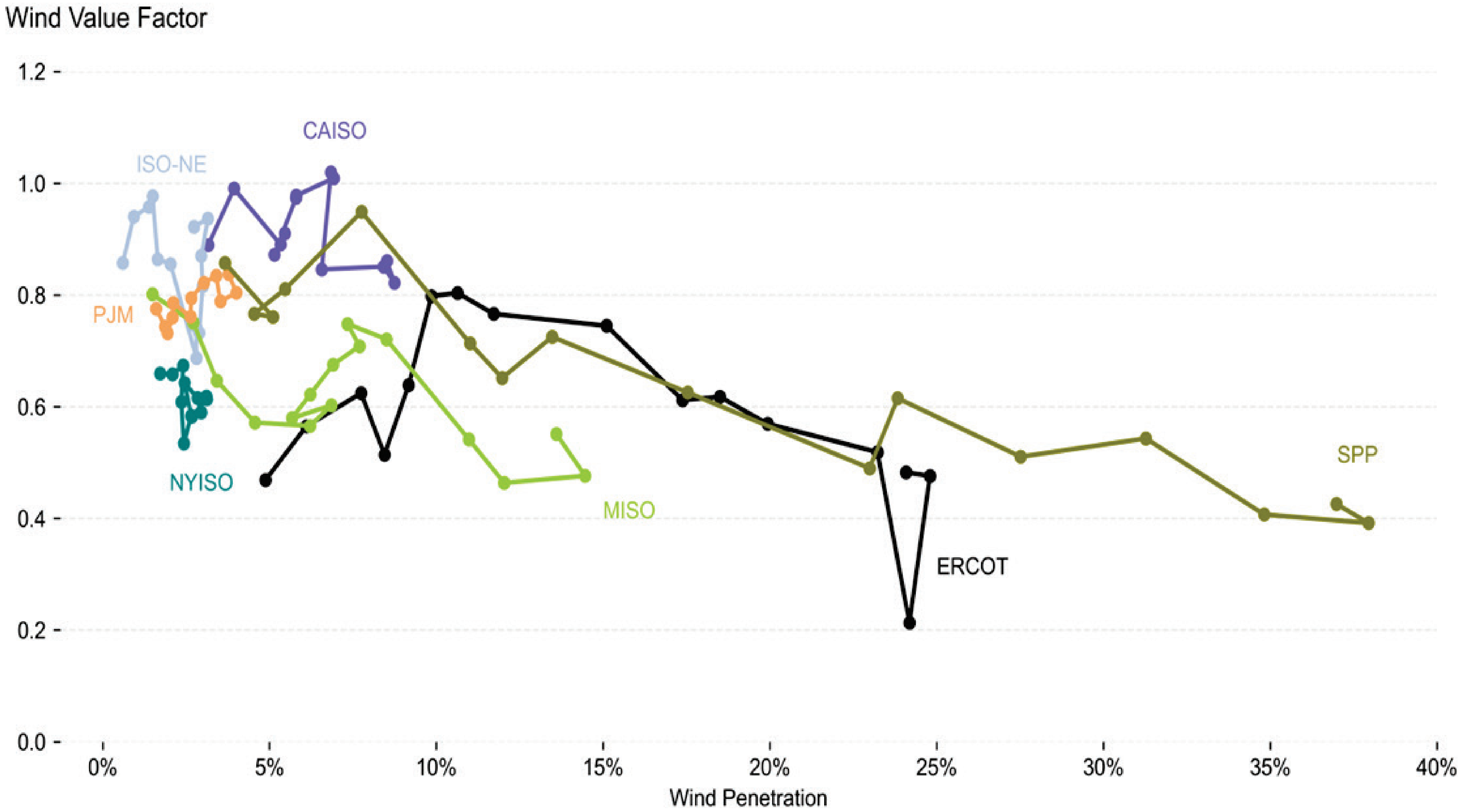
The grid-system market value of wind varies substantially by project location



Sources: Berkeley Lab, Hitachi, ISOs

Interactive data visualization: https://emp.lbl.gov/wind-energy-market-value

Average "value factor" of wind (value relative to flat block) is highly variable across regions, and tends to decline with penetration

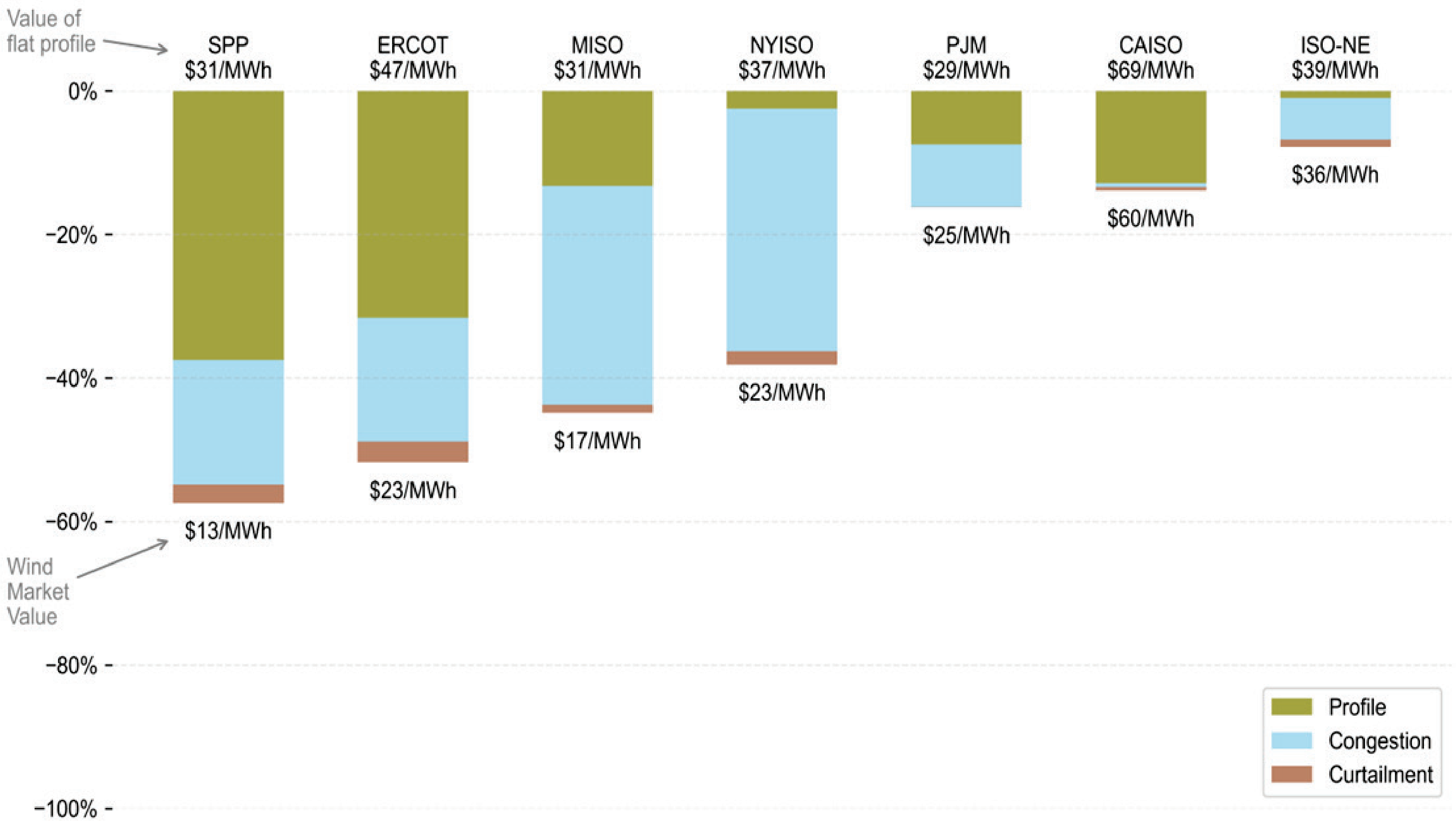


Sources: Berkeley Lab, Hitachi, ISOs

Value factor = wholesale market value of wind relative to generalized flat block of power in region; generalized flat block is 24x7 average price across all pricing nodes in region

Grid-system market value of wind tends to decline with penetration, impacted by output profile, transmission congestion, and curtailment

Average market value de-rate of wind in 2023 relative to a flat block varied by region: dominated by wind's output profile in some regions and congestion in others

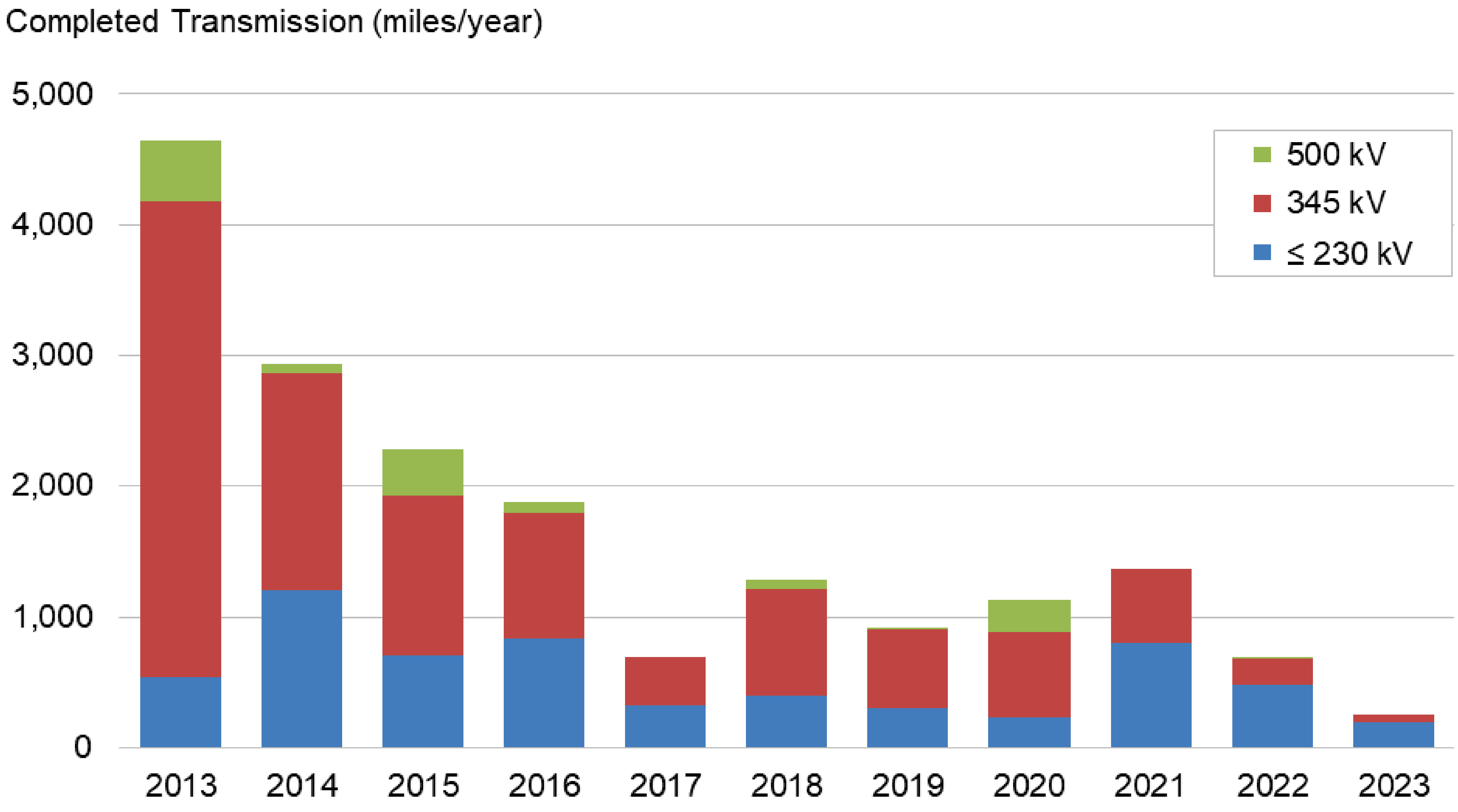


Sources: Berkeley Lab, Hitachi, ISOs

Note: generalized flat block is 24x7 average price across all pricing nodes in region

As a location-dependent resource, wind power often requires or benefits from new transmission

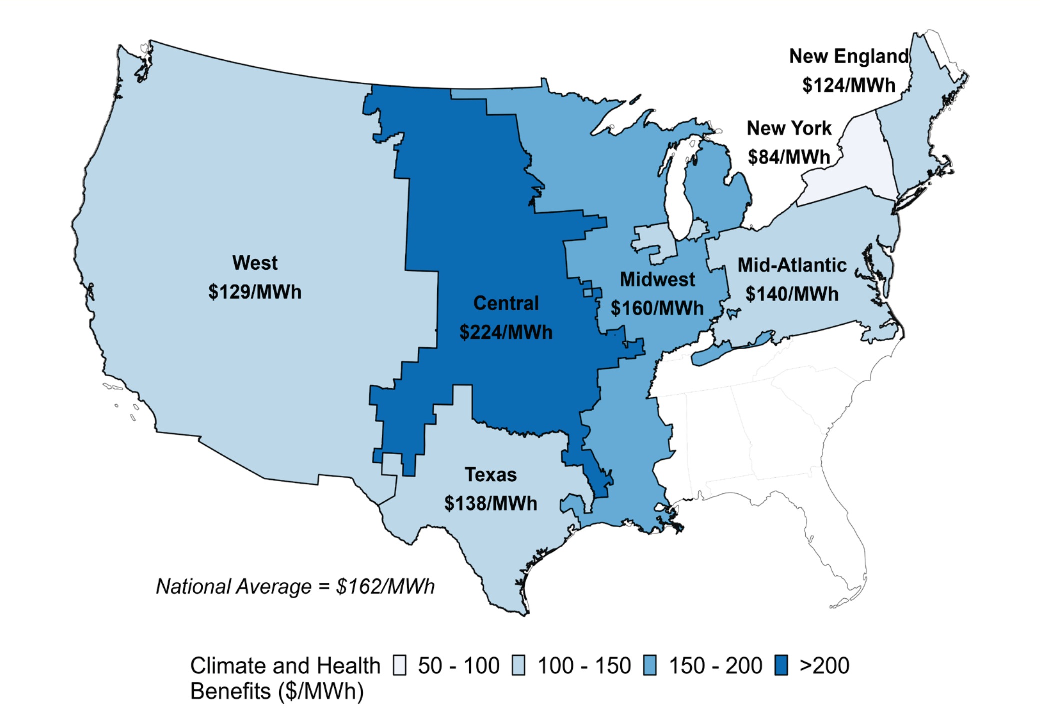
New transmission build has been relatively modest in recent years



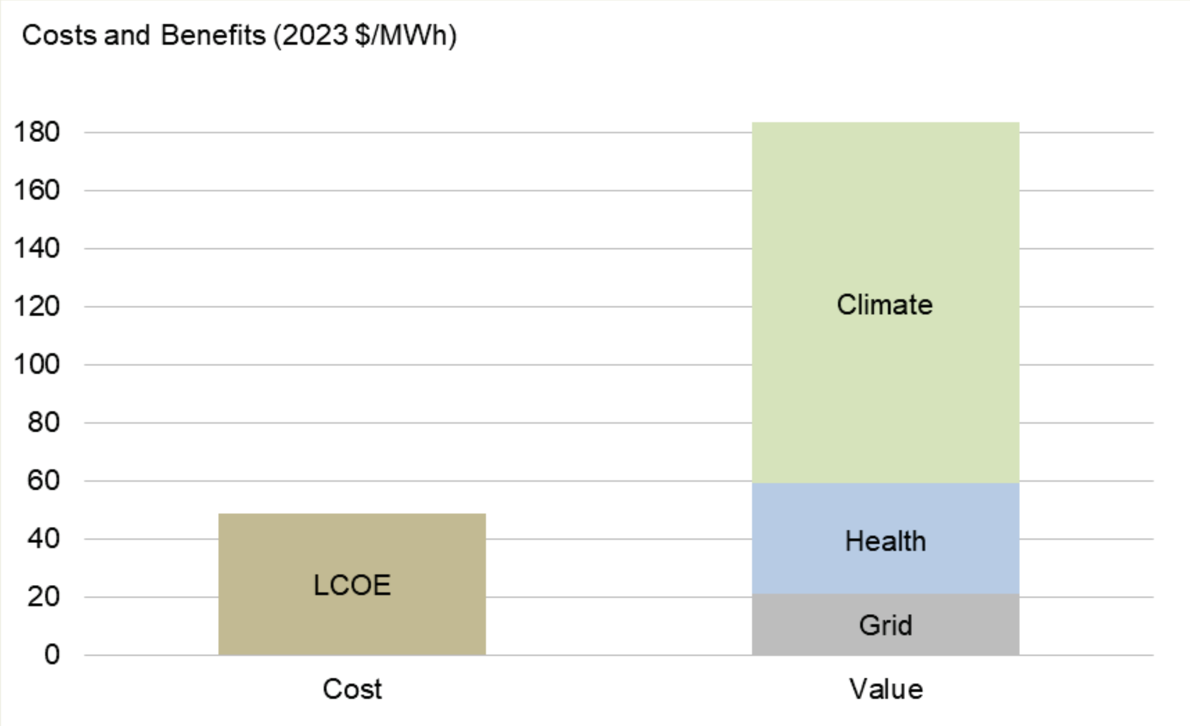
Source: FERC

The health and climate benefits of wind are larger than its grid-system value; combination of all three far exceeds the levelized cost of wind

Health and Climate Benefits of Wind in 2023 Vary Regionally, Average $162/MWh Nationally



Grid, Health, and Climate Benefits of Wind Plants in 2023 Far Exceed Recent Wind Project LCOE



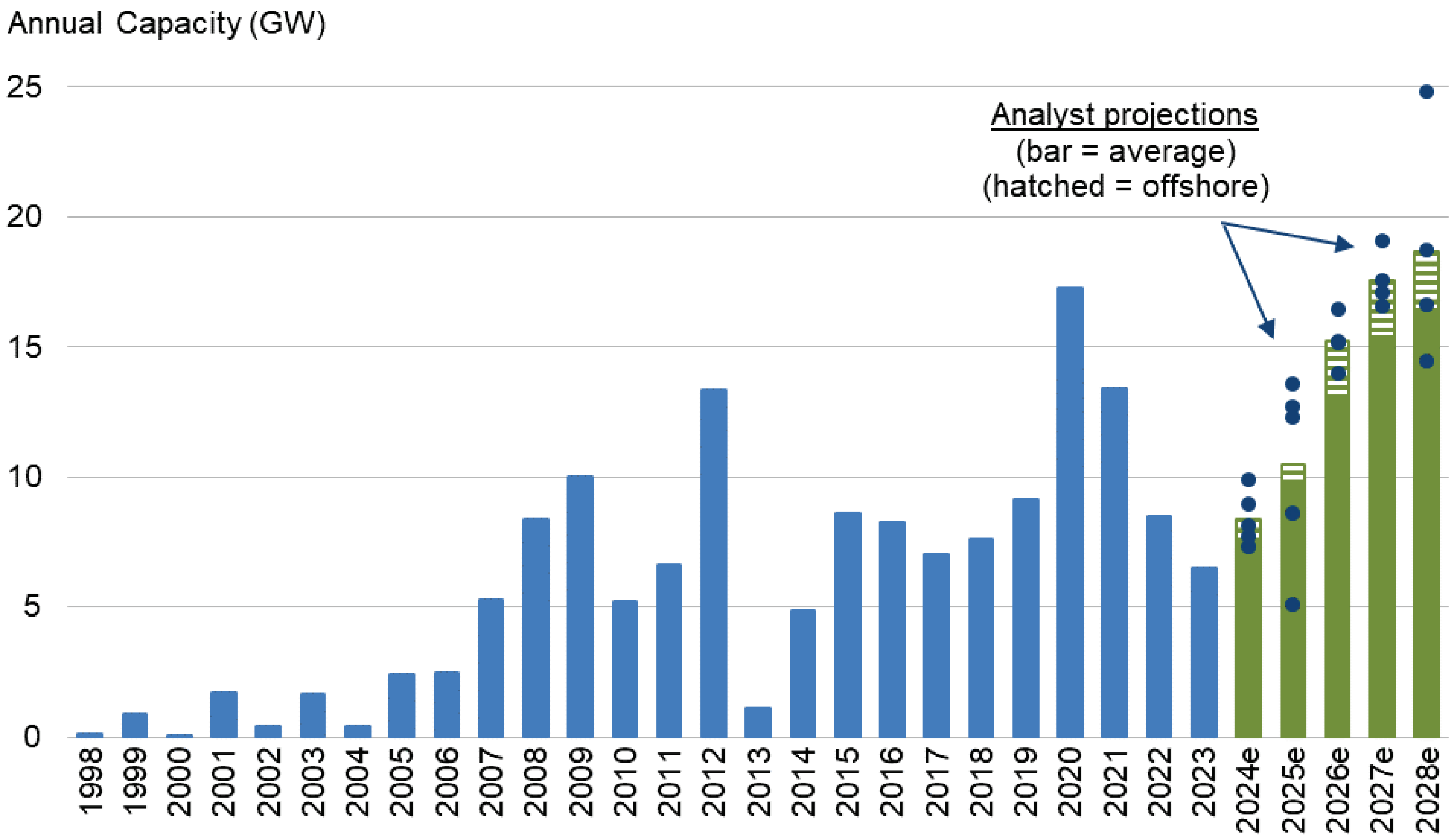
Note: Estimates not provided for Southeast due to small number of wind plants in that region.

Sources: Berkeley Lab, EIA Form 930

Future Outlook

Analysts project growing wind deployment, spurred by incentives in the Inflation Reduction Act (IRA)

- IRA extended PTC at full value for at least ten years for projects that meet wage & apprenticeship requirements
- Two 10% bonuses on top of PTC, for meeting domestic content requirements or for location in energy community
- Additional tax credits for domestic clean energy manufacturing, including for nacelles, blades & towers



Sources: ACP, independent analyst projections

- IRA has resulted in both higher expectations for future capacity growth and a growing number of announcements for new, expanded, and re-opened manufacturing facilities
- But, limited transmission, interconnection costs and timeframes, siting and permitting challenges, inflation and interest rates, and competition from solar may dampen growth

The underlying report, an accessible data file, and multiple visualizations can be found at:

- windreport.lbl.gov

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