

20
24 | Q2

CLEAN POWER QUARTERLY

Market Report



Photo credit: Evlio

Clean Power Definitions & Acronyms

Definitions

Advanced development: Projects not under construction, but with a PPA, firm equipment order, or moving forward with plans to be placed under utility ownership as of the end of the most recent quarter. For offshore wind, advanced development consists of projects that have secured offtake or have had successful bids in response to a state solicitation even if final offtake negotiations have not concluded.

Capacity: Project nameplate capacity. Unless otherwise stated, ACP reports capacity in MW-ac.

Clean power: For the purposes of this report, clean power includes land-based wind, offshore wind, utility-scale solar, and battery storage technology.

Decommissioned: Project is offline and is no longer delivering power to the grid on a permanent basis. Physical removal of equipment is not a requirement.

Duration: The amount of time, in hours, a battery can discharge its power capacity before depleting its energy capacity. For example, a 2 MW battery that has 4 MWh of energy capacity has a duration of 2 hours.

Full repowering: Full decommissioning of a utility-scale project. The original equipment is physically removed from the project site and replaced with new utility-scale equipment.

Inverter Loading Ratio (ILR): The ratio of installed DC capacity to the inverter's AC power rating. Also known as the AC-to-DC ratio.

Online: Project has reached commercial operation and is delivering electricity to the ultimate point of delivery.

Partial repowering, nacelle replacement: Complete replacement of a utility-scale wind turbine's nacelle, rotor, and blades. The tower and foundation are retained.

Partial repowering, major retrofit: Complete replacement of a utility-scale wind turbine's rotor and blades, along with the replacement of at least one major component within the nacelle, typically the gearbox or the generator.

Pipeline: Projects either under construction or in advanced development.

Repowered: Full or partial equipment replacement. Currently only wind repowering activity is tracked, but ACP will expand repowering activity tracked as the market progresses.

Under construction: Construction team has begun work on the ground at the project site. For offshore wind, under construction is defined as in-ocean construction.

Acronyms

AC	Alternating Current
C&I	Commercial & Industrial
CAISO	California ISO
DC	Direct Current
ERCOT	Electric Reliability Council of Texas
GW	Gigawatts
GWh	Gigawatt hours
ILR	Inverter Loading Ratio
IOU	Investor-Owned Utility
ISO	Independent System Operator
MISO	Midcontinent Independent System Operator
MW	Megawatts
MWh	Megawatt hours
NE-ISO	New England ISO
NYISO	New York ISO
OEM	Original Equipment Manufacturer
PJM	Pennsylvania-New Jersey-Maryland Interconnection
PPA	Power Purchase Agreement
RTO	Regional Transmission Organizations
SPP	Southwest Power Pool

2024 Q2 Highlights

U.S. developers installed 11 GW of clean power in Q2

- Developers brought 11,015 MW of utility-scale solar, wind, and energy storage projects online in the second quarter of 2024, up 91% from the 5,772 MW installed in Q2 2023.
- As of June 30, 2024, the U.S. had 283,578 MW of clean power capacity in operation, enough to power nearly 70 million homes.

Storage installations speed past 20 GW mark

- After adding 2,933 MW/10,431 MWh of new storage capacity in Q2, the U.S. now has 21,580 MW/60,387 MWh of grid-facing energy storage in operation.
- Nearly half of all storage in operation at the end of Q2 was installed in the last year, with 90% installed in the last 3.5 years.

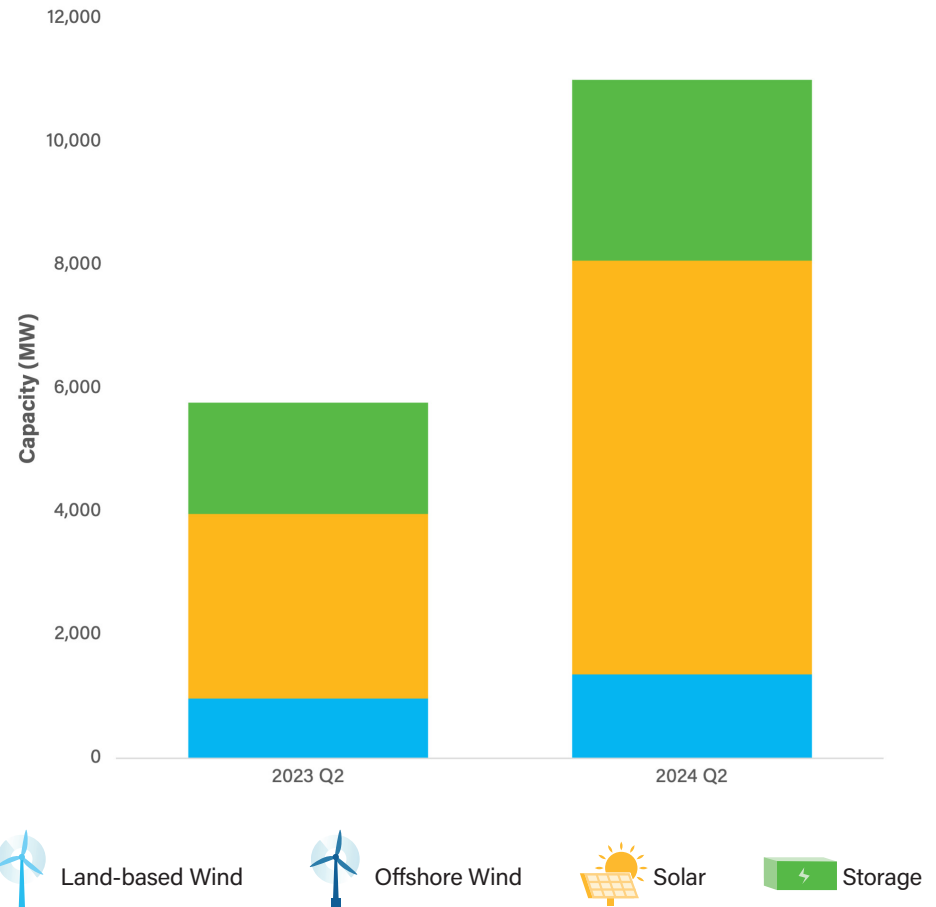
Texas dethrones California as top solar state

- Texas installed enough new solar capacity in Q2 to displace California as the state with the most utility-scale solar capacity installed.
- Texas added 3,293 MW of new solar year-to-date and is now home to 21,932 MW of capacity – 20% of the overall U.S. solar fleet.

H1 2024 outpaced 5-year average by over 10 GW

- At the mid-year point, the U.S. had added over 19 GW of new clean power capacity – more than 10 GW higher than the five-year average for H1, setting the stage for another record year.

Clean Power Capacity Additions by Quarter, Q2 2023 vs Q2 2024



Solar capacity is reported in MWac

U.S. Clean Power Deployments Surpass 283 GW

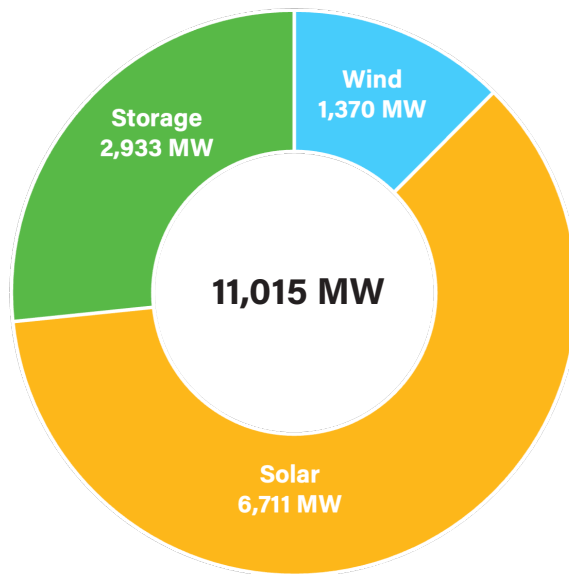
2024 Q2 installs

- Project developers commissioned 137 utility-scale solar, battery storage, and wind projects in the second quarter, adding 11,015 MW of clean power capacity to the grid.
- Clean power capacity installations increased 91% in the second quarter of 2024 compared to the same quarter in 2023, continuing the strong pace set in the first quarter and further supporting the possibility that 2024 will surpass the record-breaking 2023.
- While solar provided around 61% of quarterly clean power installations with around 6.7 GW deployed, storage installations climbed to 2.9 GW in Q2, accounting for 27% of the market.
- Land-based wind installations grew 41% year-over-year to reach 1,370 MW in Q2. The number of new onshore wind projects installed tripled in Q2 compared with Q1.

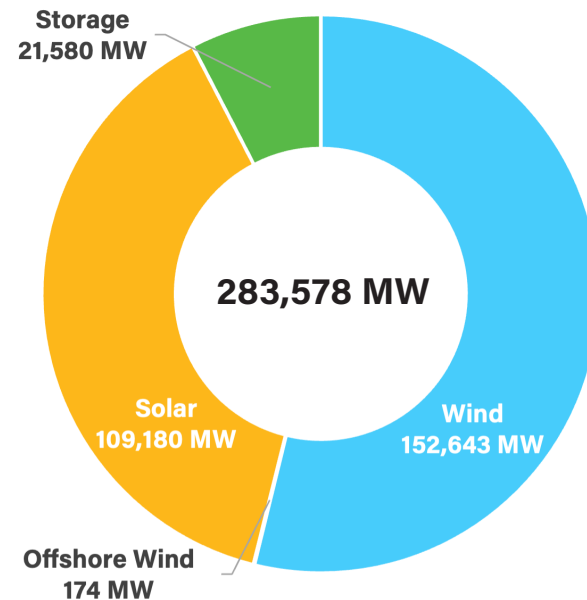
Cumulative operating clean power capacity

- As of the end of Q2 2024, 283,578 MW of clean power capacity had been installed in the U.S., enough to power almost 70 million American homes.
- While onshore wind remains the dominant technology in the operational clean power mix, installed solar capacity reached 39% in Q2, up from 26% at the start of 2020, after outpacing onshore wind installations for ten consecutive quarters.

Q2 2024 Clean Power Installs by Technology

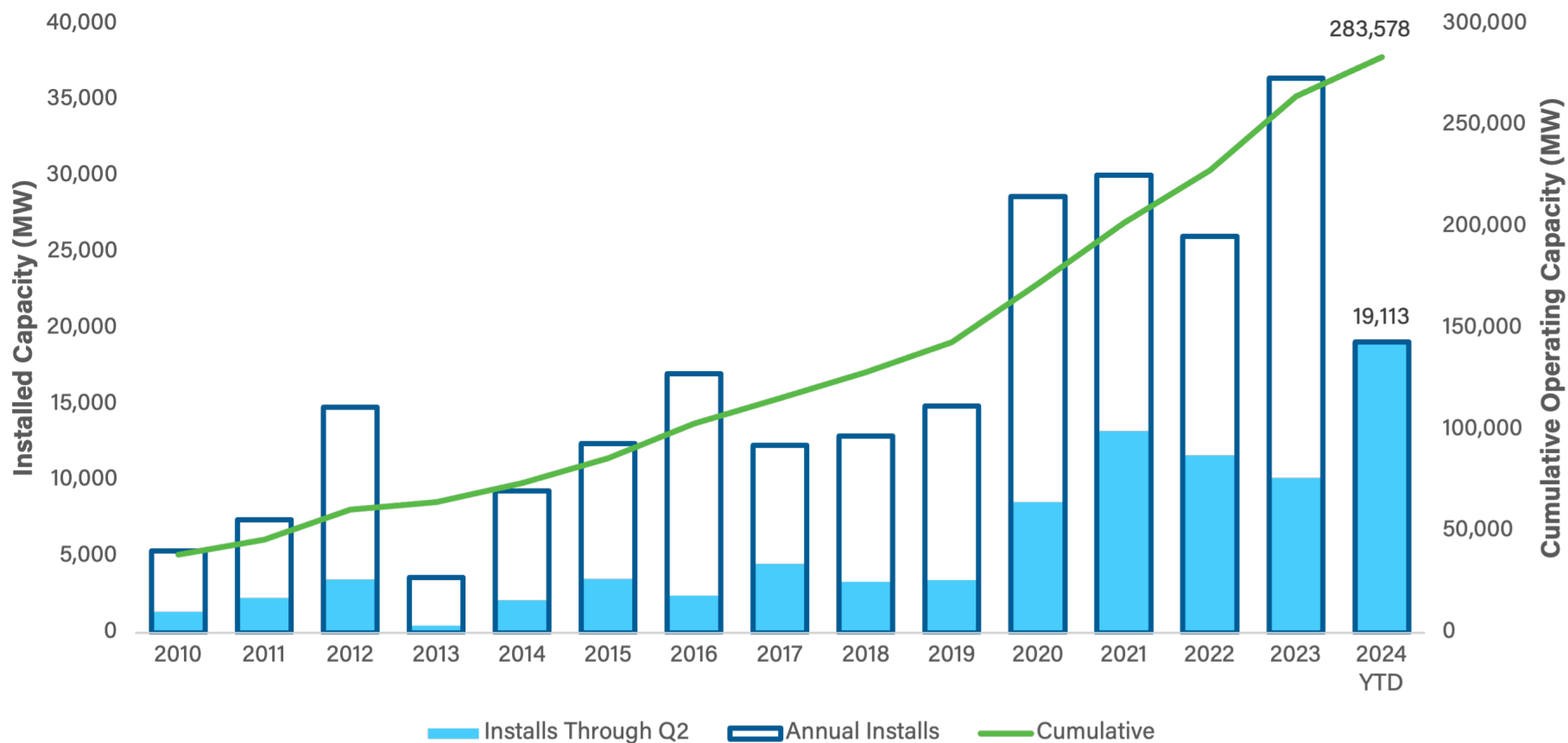


Total Operating Clean Power Capacity by Technology



U.S. Clean Power Deployments Surpass 283 GW (continued)

U.S. Annual and Cumulative Clean Power Capacity Growth

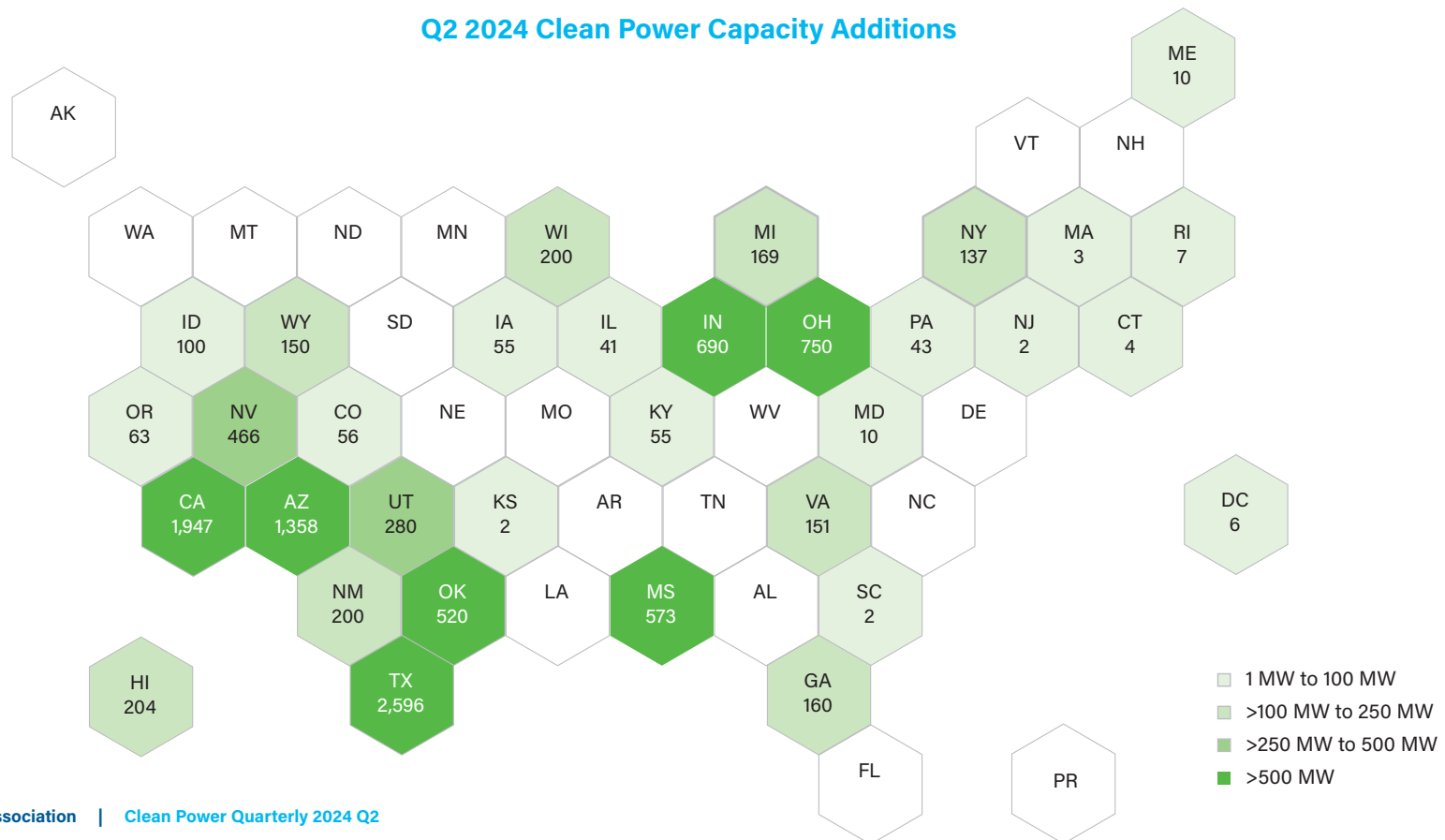


CLEAN POWER CAPACITY GROWTH

Texas Leads as Top Clean Power Installer in Q2

- Texas came in first for quarterly clean power installations in Q2, adding 2,596 MW of new utility-scale solar, wind, and storage capacity. The Lone Star State brought online more than 1.6 GW of new solar in the second quarter, propelling it to surpass California as the top solar state for the first time. Texas also installed 574 MW of storage and 366 MW of onshore wind.
- Next, California installed 1,947 MW of new clean power capacity in Q2, nearly 70% of which was energy storage. Long a solar powerhouse, California has pivoted toward storage in recent quarters: storage accounted for 60% of the state's year-to-date clean power installations. The trend is set to continue, with storage providing 64% of California's clean power capacity in the pipeline.
- Arizona, in third, installed 1,358 MW of clean power in the second quarter, with storage its top installed technology at 560 MW. Arizona's operational clean power capacity has grown 27% year-over-year.
- Ohio and Indiana rounded out the top five, at fourth and fifth, respectively. Both states saw a surge of new solar capacity come online in Q2.
- Thirty-two states and the District of Columbia added new clean power capacity to the grid in Q2 2024, up from 27 states in the first quarter of the year.

Q2 2024 Clean Power Capacity Additions

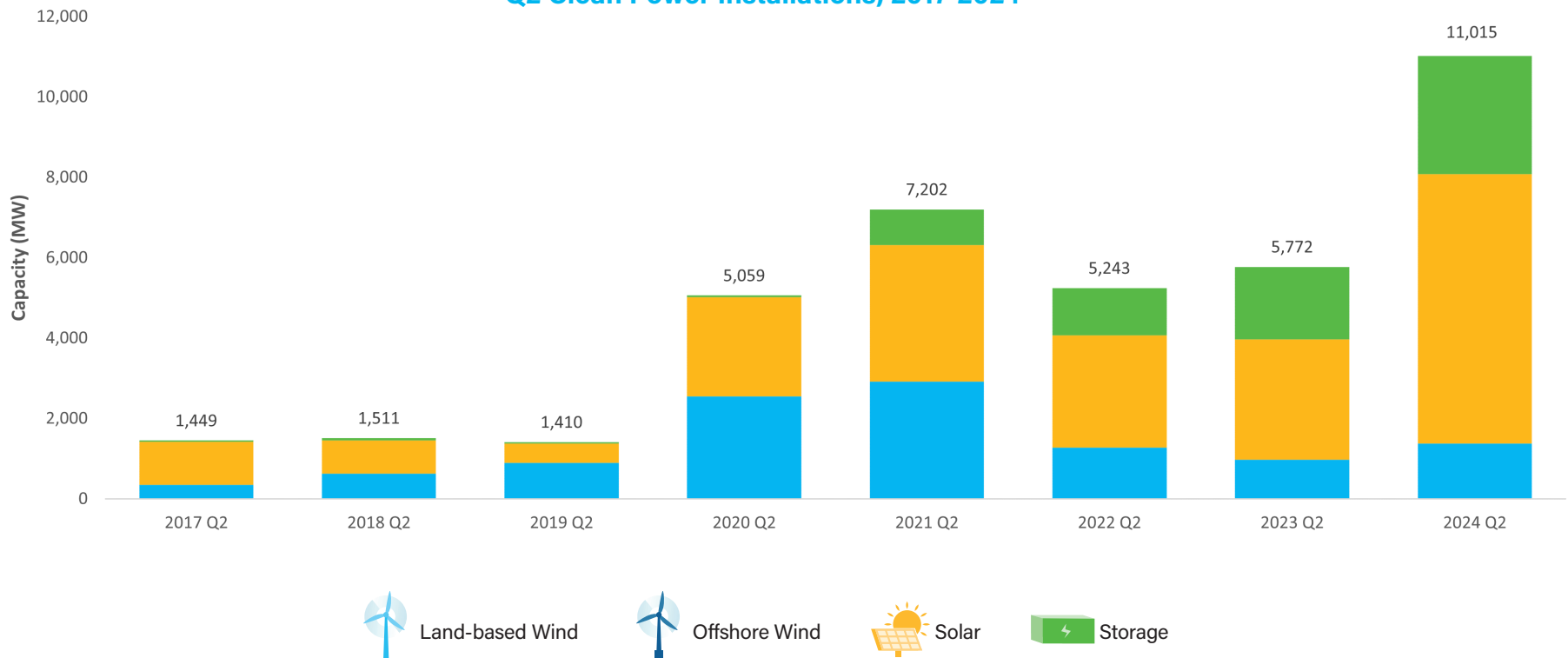


CLEAN POWER CAPACITY GROWTH

Quarterly Clean Power Capacity Growth

- Q2 2024 was the strongest second quarter for clean power installations on record. The second quarter of 2024 also set a record for being the largest non-Q4 quarter for clean power capacity additions. Historically, the fourth quarter of the year is typically the strongest for clean power deployments.
- Utility-scale solar continued to provide the largest share of clean power additions in the second quarter, with 95 new projects commissioned, accounting for 61% of the total capacity installed. Twenty-seven of those new solar projects were 100 MW or larger, with Repsol's 500 MW Frye Solar in Texas the quarter's largest project added.
- Energy storage also had a strong second quarter for installations, with 33 new projects bringing more than 2.9 GW of new online capacity. Eight of the 33 projects were 200 MW or larger.
- Land-based wind installations grew in Q2 2024, both compared to the first quarter of the year and to the same quarter in 2023. Developers brought nine new wind projects online, several of which were full repowering projects, and completed one partial repowering project. The two largest new onshore wind projects to come online in Q2 were RWE's Montgomery Ranch Wind Farm (202.5 MW) and TransAlta's Horizon Wind Farm (200 MW).

Q2 Clean Power Installations, 2017-2024

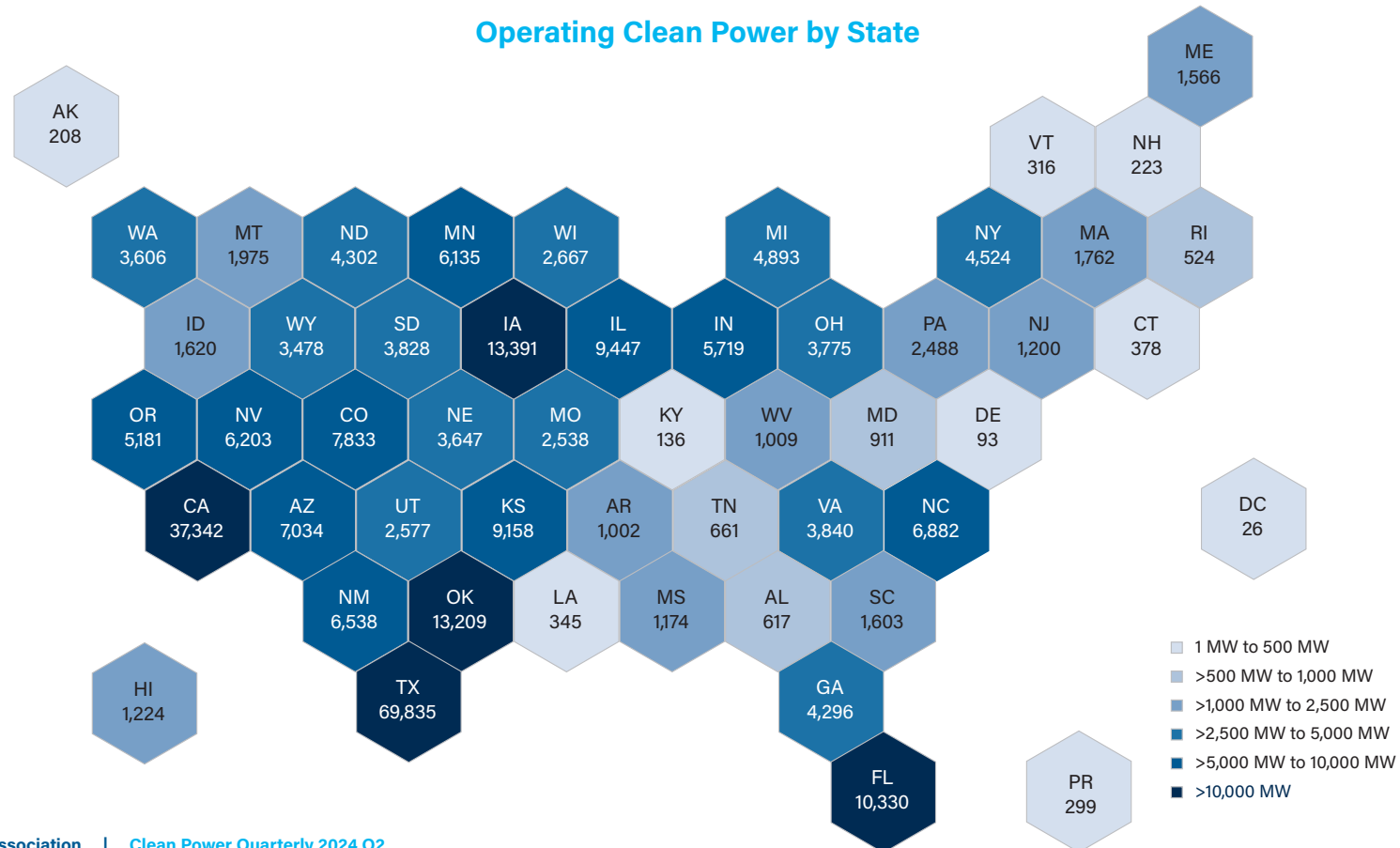


CLEAN POWER CAPACITY GROWTH

Operational Clean Power Capacity

- Operational utility-scale solar, wind, and battery storage capacity is present in all U.S. states as well as D.C. and Puerto Rico, powering American homes and businesses.
- As of June 30, 2024, operational clean power capacity stood at 283,578 MW, enough to power nearly 70 million American homes.
- With 69,835 MW online, Texas hosts the country's largest operational clean power fleet. While the backbone of Texas's clean power portfolio remains wind, Texas consistently brings substantial amounts of new solar and storage capacity online each quarter. Texas ranks first for total operating wind capacity and total operating solar capacity, as well as second for operating storage capacity.
- California remains in second for total clean power in operation, with 37,342 MW online. The state ranks first for installed energy storage capacity at nearly 10 GW installed but slipped to second for installed solar capacity in Q2.
- Five states have more than 10 GW of clean power in operation and 15 states have more than 5 GW installed.
- In percentage terms, Mississippi has seen some of the most dramatic year-over-year growth, with new solar additions driving a 175% increase since Q2 2023.

Operating Clean Power by State

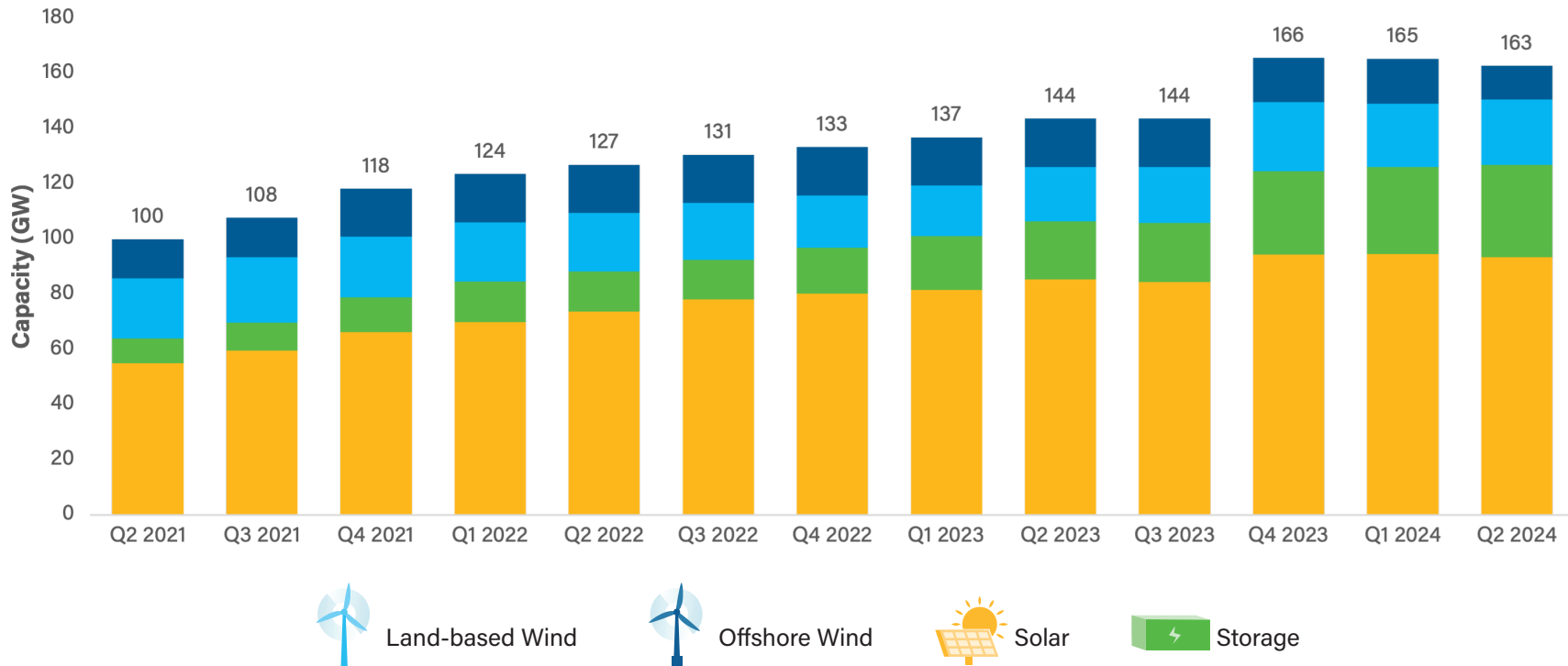


CLEAN POWER CAPACITY GROWTH

Clean Power Pipeline Over Time

- The clean power pipeline tallied 162,817 MW at the mid-year point of 2024, up 13% year-over-year from mid-2023. The pipeline has grown at an average rate of 5% per quarter over the last two years.
- The steady expansion of the pipeline can be attributed primarily to energy storage and solar, which have grown at an average rate of 12% and 3% per quarter since Q2 2022.
- On a quarter-on-quarter basis, the clean power pipeline contracted 1.5% from the first quarter, as projects left the pipeline and began operating.
- The cancellation of New York's third offshore wind solicitation in April also contributed to the quarter-on-quarter dip in the overall pipeline number. The decrease looks to be short-lived, with 8-12 GW of new offshore wind capacity set to join the pipeline in H2 2024 as ongoing state solicitations are finalized. Focusing on the larger pipeline number also obscures major industry progress: Q2 2024 set a record for the most offshore wind capacity under construction.
- Finally, the land-based wind pipeline has remained relatively steady, growing at 2% per quarter over the last two years.

Clean Power Development, Q2 2021 - Q2 2024



Note: ACP has corrected the historical pipeline for onshore wind and offshore wind, following a thorough data validation process. The offshore wind pipeline correction affected Q4 2023 and Q1 2024 data, while the onshore wind pipeline revision adjusted values dating back to 2020.

Clean Power Pipeline Growth

Wind

- At the end of Q2 2024, the land-based wind pipeline totaled 23,734 MW, up almost 4 GW from the 19,760 MW observed in Q2 2023. This marks a 20% expansion year-over-year for the wind pipeline.
- Year-on-year, land-based wind under construction increased by 5.5 GW, while the volume that met ACP's definition of advanced development decreased by almost 1.6 GW.

Solar

- The utility-scale solar pipeline reached 93,454 MW by the end of Q2 2024, up over 8 GW from 85,328 MW the year prior. With such a vast pipeline, solar is expected to provide the majority of 2024 clean power deployments.
- Further supporting the expectation of a large near-term solar build-out, the amount of solar that is under construction increased by over 5 GW year-on-year, while the advanced development pipeline increased by almost 3 GW.

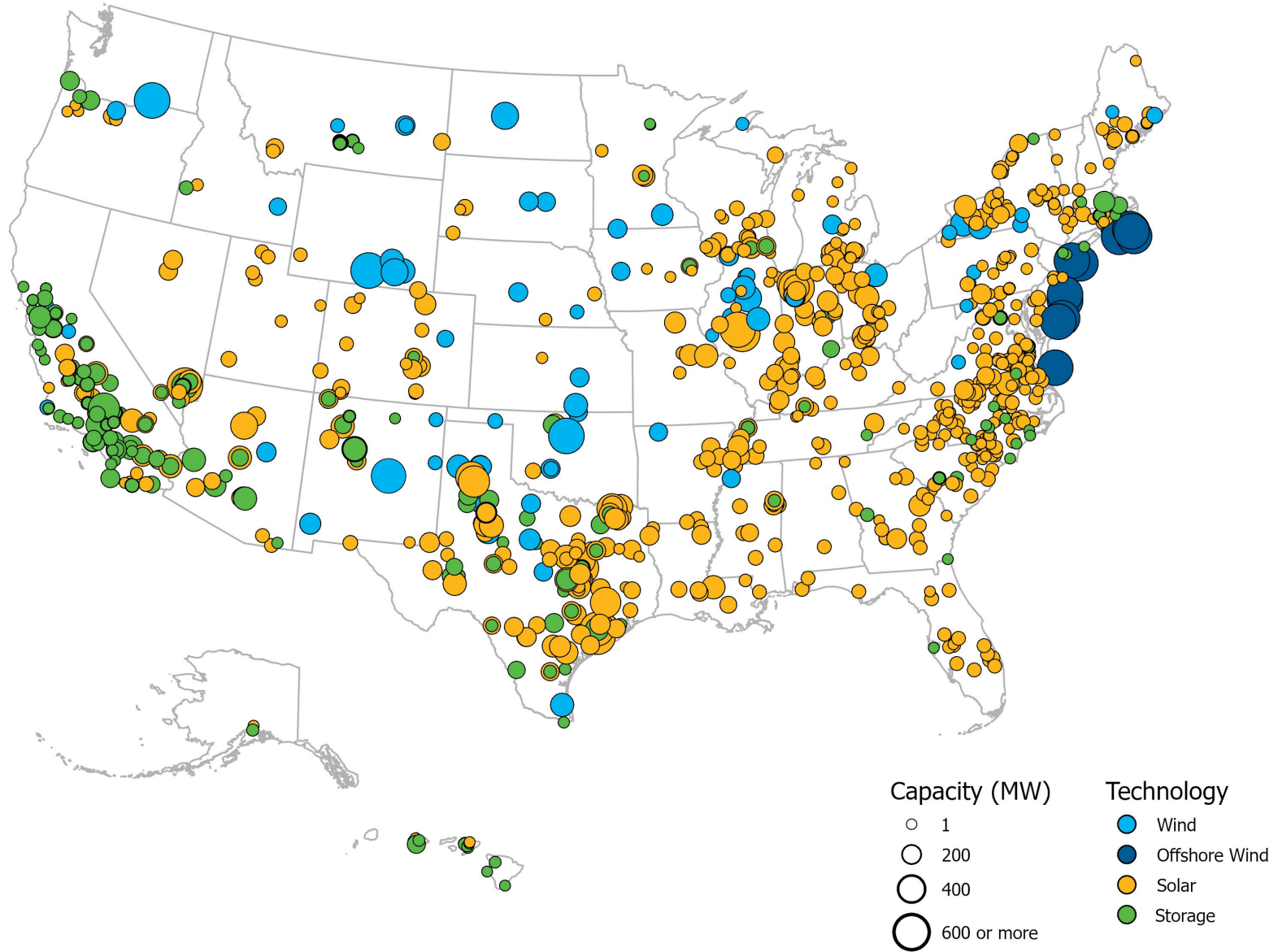
Battery Storage

- The pipeline for energy storage grew to 33,401 MW as of Q2 2024, up from 21,069 MW in Q2 2023.
- The energy storage pipeline expanded by 59% year-over-year, seeing the most annual growth out of the four technologies. This marks an acceleration of an existing trend: the storage pipeline has grown by an average of 12% each quarter since 2022.
- Both advanced development and under construction categories have seen substantial growth year-over-year, with advanced development volumes up 69% and under construction up 46%. The growth in under construction projects supports the near-term outlook for additional storage buildout, while the swelling number of advanced development projects signals that storage's momentum could carry through the next three to five years.

Offshore Wind

- While the U.S. offshore wind sector has experienced some turbulence in development schedules over the last year, the pipeline remained robust with 12,229 MW in Q2 2024. More capacity is expected to enter advanced development in late 2024 with five offshore wind solicitations to be finalized.
- With ACP's criteria for advanced development status hinging in part on procurement, the revision of offshore wind offtake agreements in recent quarters has led to a drop in ACP's advanced development pipeline number. In contrast, capacity under construction has risen drastically, up 300% higher in Q2 2024 than Q2 2023.

Projects in Pipeline

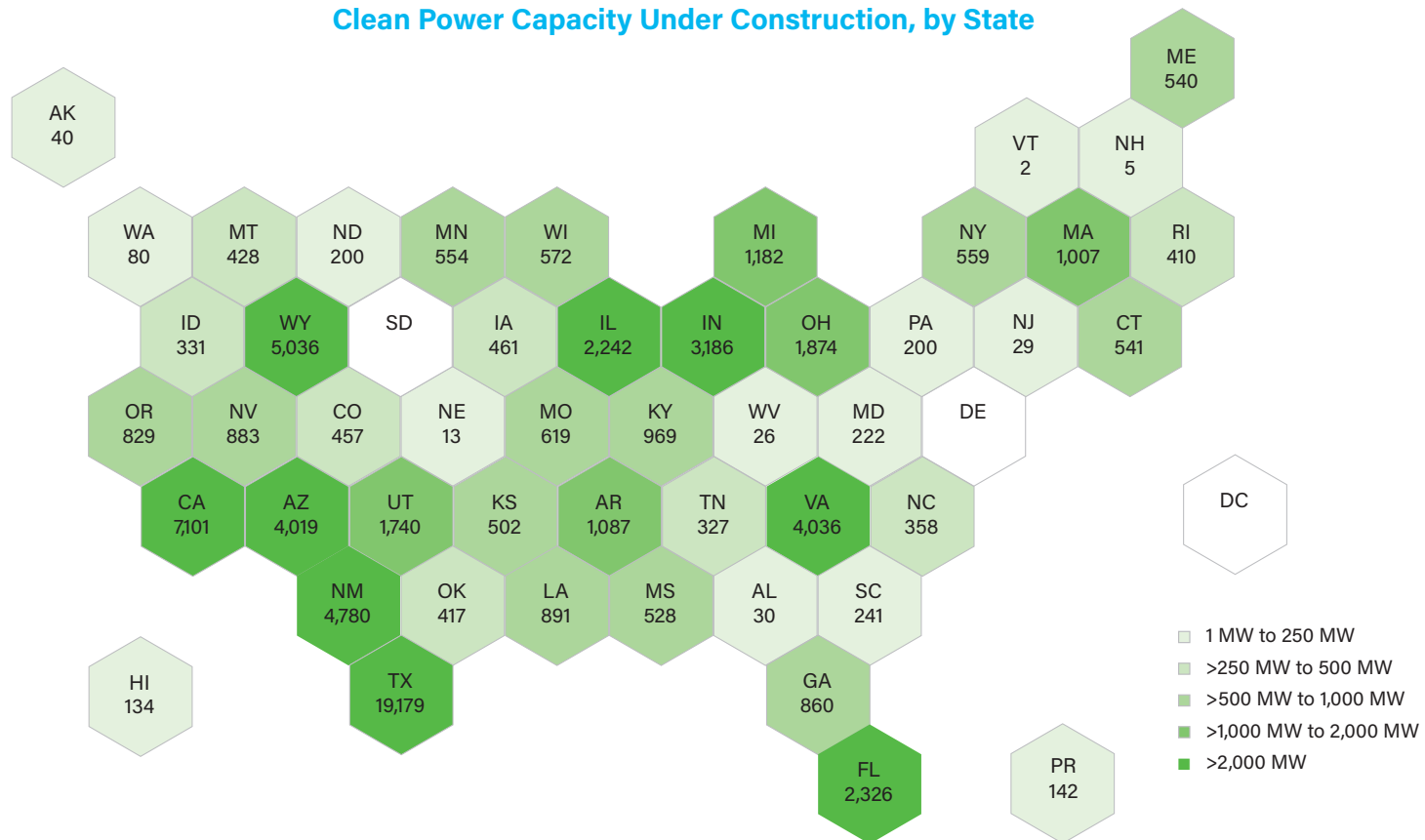


CLEAN POWER CAPACITY GROWTH

Clean Power Construction Activity

- At the end of the second quarter of 2024, developers reported that 73,699 MW of clean power capacity was under construction. This includes 569 projects across 48 states. Delaware and South Dakota were the only states with no projects under construction.
- At 56% of construction activity, utility-scale solar remains the dominant technology among under construction clean power projects. Battery storage's share of under construction projects continues to stay strong, reaching 19% at the end of Q2 2024. Land-based wind capacity under construction also remains steady at 19%. Finally, with three projects under construction, offshore wind made up 6% of capacity in the under construction pipeline.
- Texas and California were the top two states for under construction projects, with 19.2 GW and 7.1 GW, respectively. Wyoming (5 GW), New Mexico (4.8 GW), and Virginia (4 GW) round out the top five states for under construction clean power capacity.
- Texas was the top state for under construction solar (12.7 GW) and storage projects (4.3 GW), though California was a very close second for under construction storage (4.2 GW). Wyoming leads the nation for land-based wind projects under construction (5 GW), and Virginia is the top state for under construction offshore wind (2.6 GW).

Clean Power Capacity Under Construction, by State

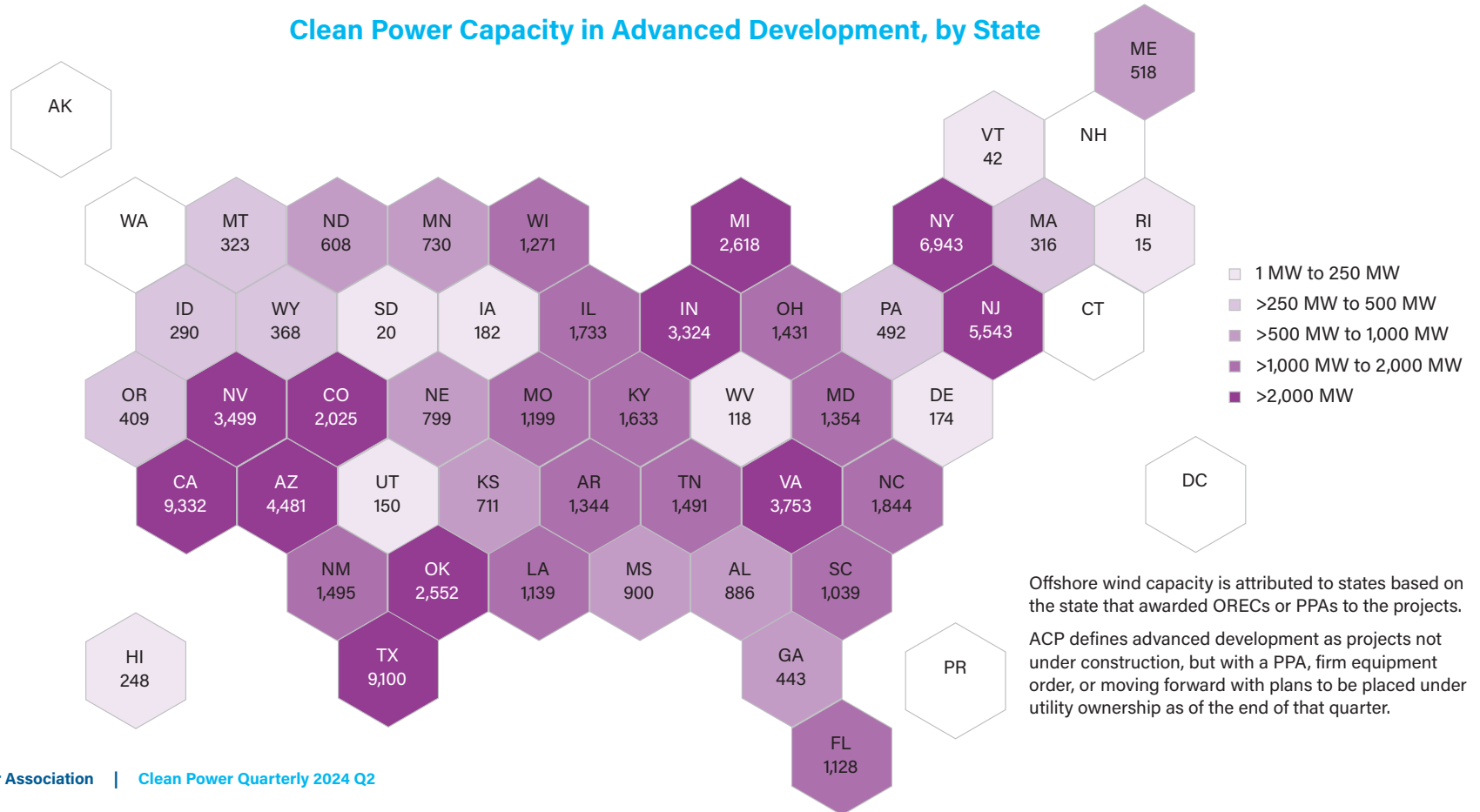


CLEAN POWER CAPACITY GROWTH

Clean Power Advanced Development Activity

- Developers reported that 89,119 MW of projects were in the advanced development pipeline at the end of Q2 2024. This marks a drop from the 93,217 MW in advanced development in Q1 2024, signaling that more projects are beginning construction or starting operations than entering the pipeline.
- There were 788 projects in advanced development spanning 46 states. Alaska, Connecticut, New Hampshire, and Washington were the only states with no clean power projects in advanced development.
- California leads the nation with 9.3 GW of capacity in advanced development. Texas follows closely with 9.1 GW, and New York comes in third with 6.9 GW.
- By technology, utility-scale solar makes up 59% of the advanced development pipeline, followed by storage (22%), land-based wind (11%) and offshore wind (9%).
- Different states lead the rankings for advanced development capacity when broken down by each technology. Texas is the top state for solar (5.8 GW), while California remains the top state for battery storage (6.2 GW). New York (1.5 GW) and New Jersey (5.3 GW) are the national leaders for land-based wind and offshore wind, respectively.

Clean Power Capacity in Advanced Development, by State

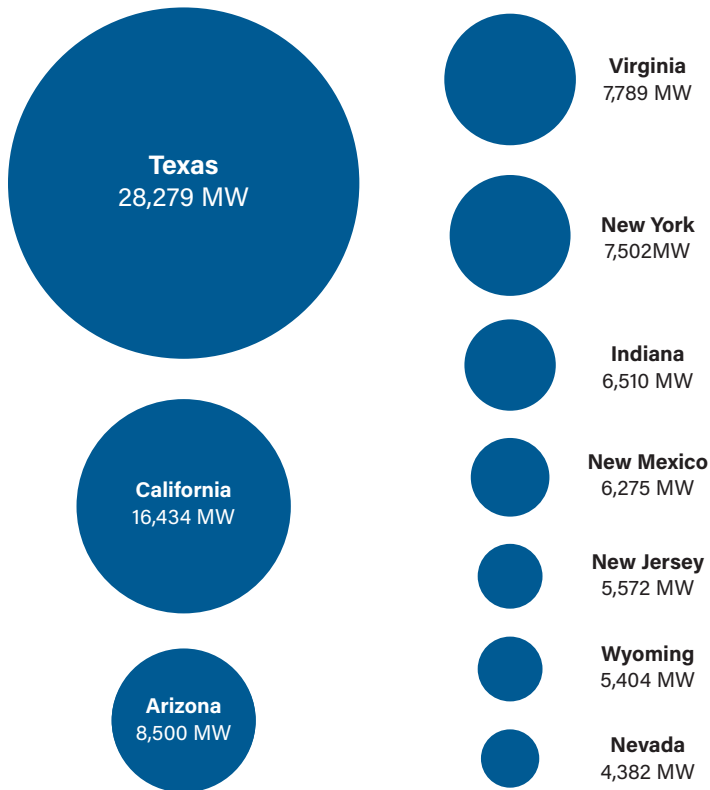


CLEAN POWER CAPACITY GROWTH

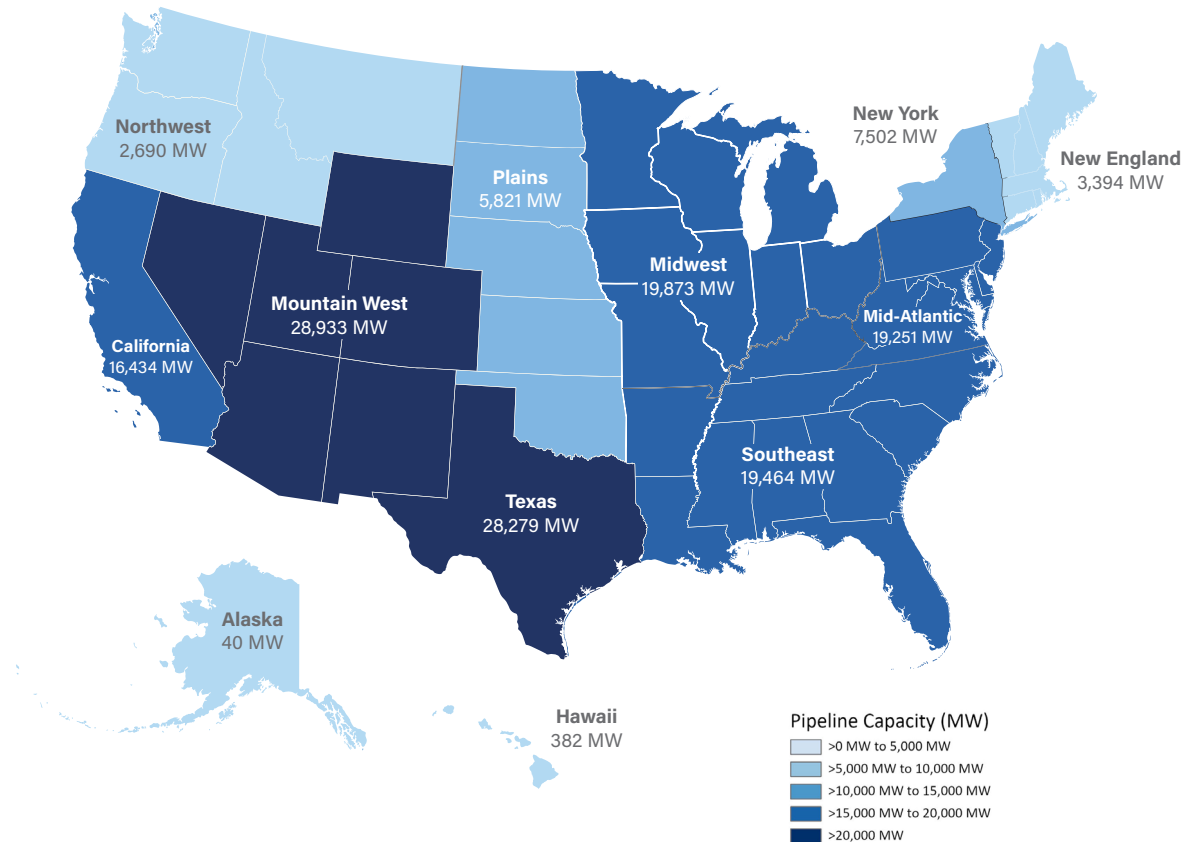
Clean Power Pipeline by State and Region

- The clean power pipeline consists of 162,817 MW of capacity in development across all 50 states.
- Texas and California, the nation’s leaders in operational clean power capacity are also the leaders in capacity under development. With almost 28.3 GW in advanced development or under construction, Texas continues to rank first, while California places second with over 16.4 GW in the state’s project pipeline.
- Kentucky is set to expand its clean energy capacity drastically. With just 136 MW of operating capacity at the end of the second quarter of 2024, it ranks as one of the lowest states for operational capacity. However, it has more than 2.6 GW in its pipeline.
- Five states are set to expand their clean energy capacity by over 200% based on Q2 2024 pipelines: Louisiana, New Jersey, Tennessee, Arkansas, and Virginia.
- Regionally, the Mountain West maintains its ranking as the region with the largest project pipeline. At the end of Q2 2024, there was 28.9 GW of clean power capacity in development in the Mountain West. Texas and the Midwest follow with 28.3 GW and 19.9 GW in their pipelines, respectively.

Top States, Clean Power Development Capacity



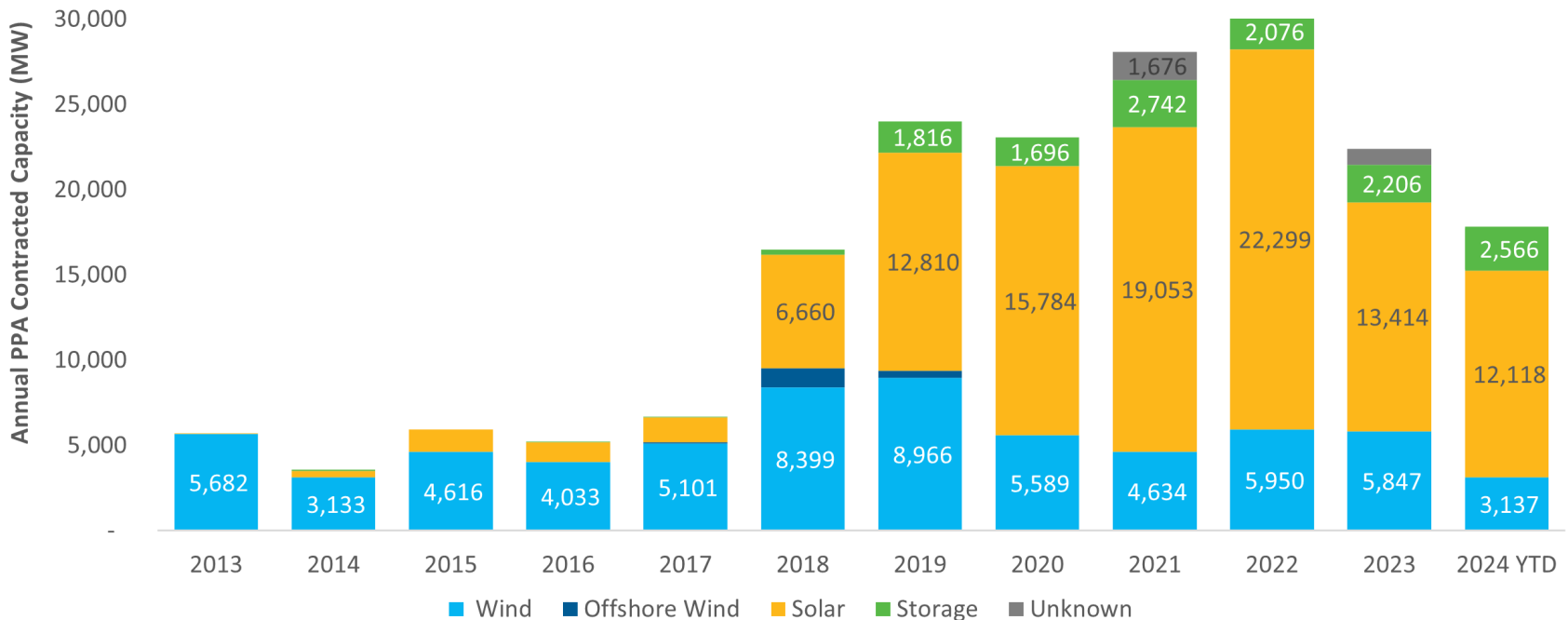
Clean Power Development Capacity by Region



PPA Announcements Rise for All Technologies

- Clean power purchasers announced a total of 9,624 MW of PPAs in Q2 2024. Broken down by technology, the PPAs were for 5,959 MW of solar, 2,069 MW of land-based wind, and 1,596 MW of battery storage. This brings the total volume of PPA announcements in the first half of 2024 to 17,821 MW.
- PPA announcements this quarter were up by 109% compared to the same quarter in 2023. While PPA announcements for land-based wind, solar, and battery storage all went up, solar PPAs were the main driver of the growth, notching a 138% growth compared to Q2 2023. Although battery storage PPAs make up 17% of announcements this quarter, it is becoming a larger slice of the pie. Battery storage PPA announcements in Q2 2024 are 240% higher compared to Q2 2023.
- The reason PPAs for land-based wind power have not grown at the same rate as solar or battery storage can be explained in part by the differences in PPA prices. According to data from LevelTen Energy, PPA prices for land-based wind and solar were roughly at parity between 2019 and early 2021. Starting in Q2 of 2021, wind PPA prices have grown at a much higher pace than solar PPA prices. At the end of Q2 2024, the national wind PPA prices was almost 23% higher than the national PPA price for solar. Further, early purchasers of wind power have sought to balance their clean energy portfolios with more solar.
- The surge in solar and battery storage PPAs since 2019 have contributed to a dramatic rise in solar and battery storage installations in recent years. The healthy pace of PPA announcements in 2024 is likely to fuel more clean power deployments in coming years.

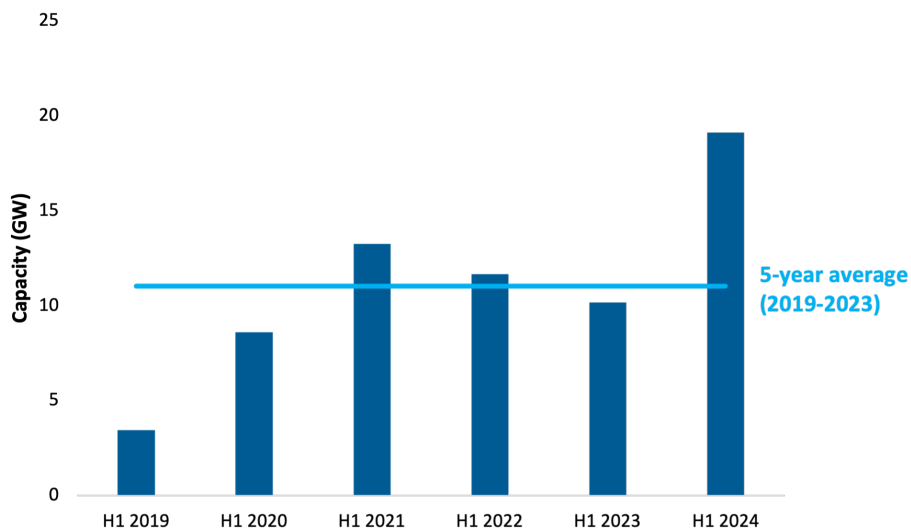
Annual Clean Power Purchase Agreements, By Technology



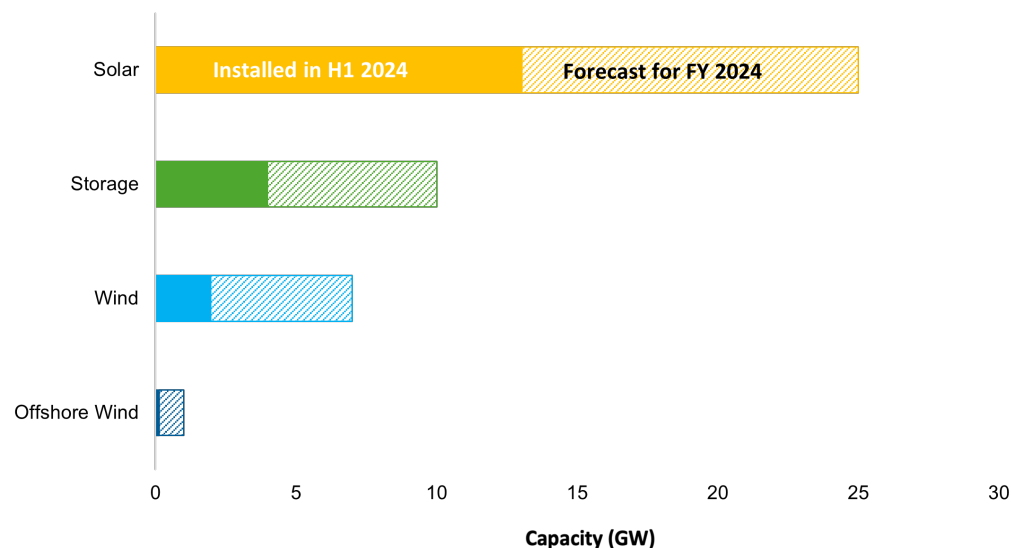
H1 2024 Installations vs. Forecasts

- At the start of 2024, clean power consultants expected the US to add more than 40 GW of new clean power capacity in 2024, according to an average of forecasts published in ACP’s 2023 Annual Report.*
- By the end of Q2 2024, developers had brought online more than 19 GW of new clean power year-to-date. Over the last five years, clean power installations averaged 9.4 GW at the mid-year point – with H1 2024 installations over double that average, the US is on track to potentially meet or exceed expectations of a record year for new clean power added.
- The three forecasts all expected that solar, storage, and offshore wind would see record-setting years for deployments in 2024, while onshore wind would see the pace of installations continue to lag the five-year average.
- The forecasts universally predicted that solar would be the dominant clean power technology installed in 2024, which has proven correct so far. New utility-scale solar capacity has accounted for 68% of all new clean power deployed in the first half of 2024. According to the EIA, solar accounted for more than half of all new capacity added to the grid in H1 2024, surpassing new natural gas generation.

Clean Power Installations at H1 2024



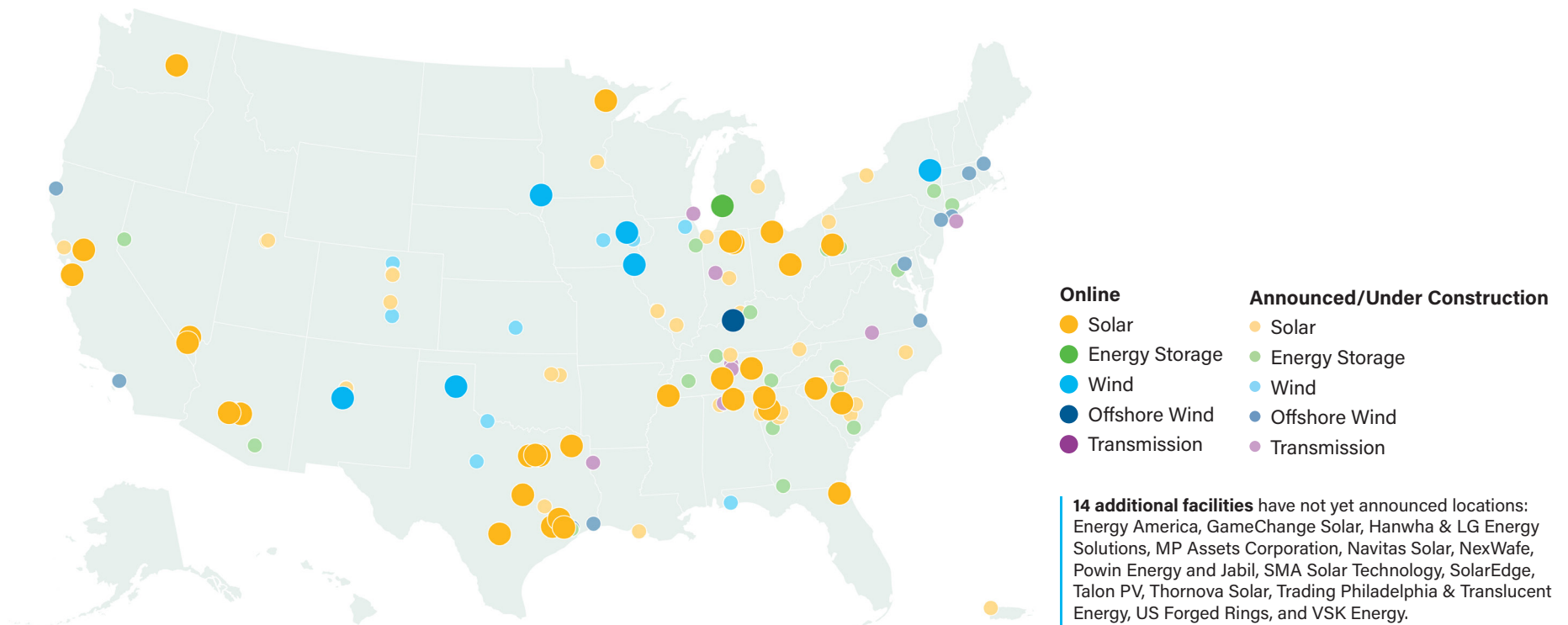
H1 2024 Deployments vs. Forecasts for FY 2024, by Technology



*Forecast average included BNEF, S&P Global, and Wood Mackenzie.

Manufacturing Announcements

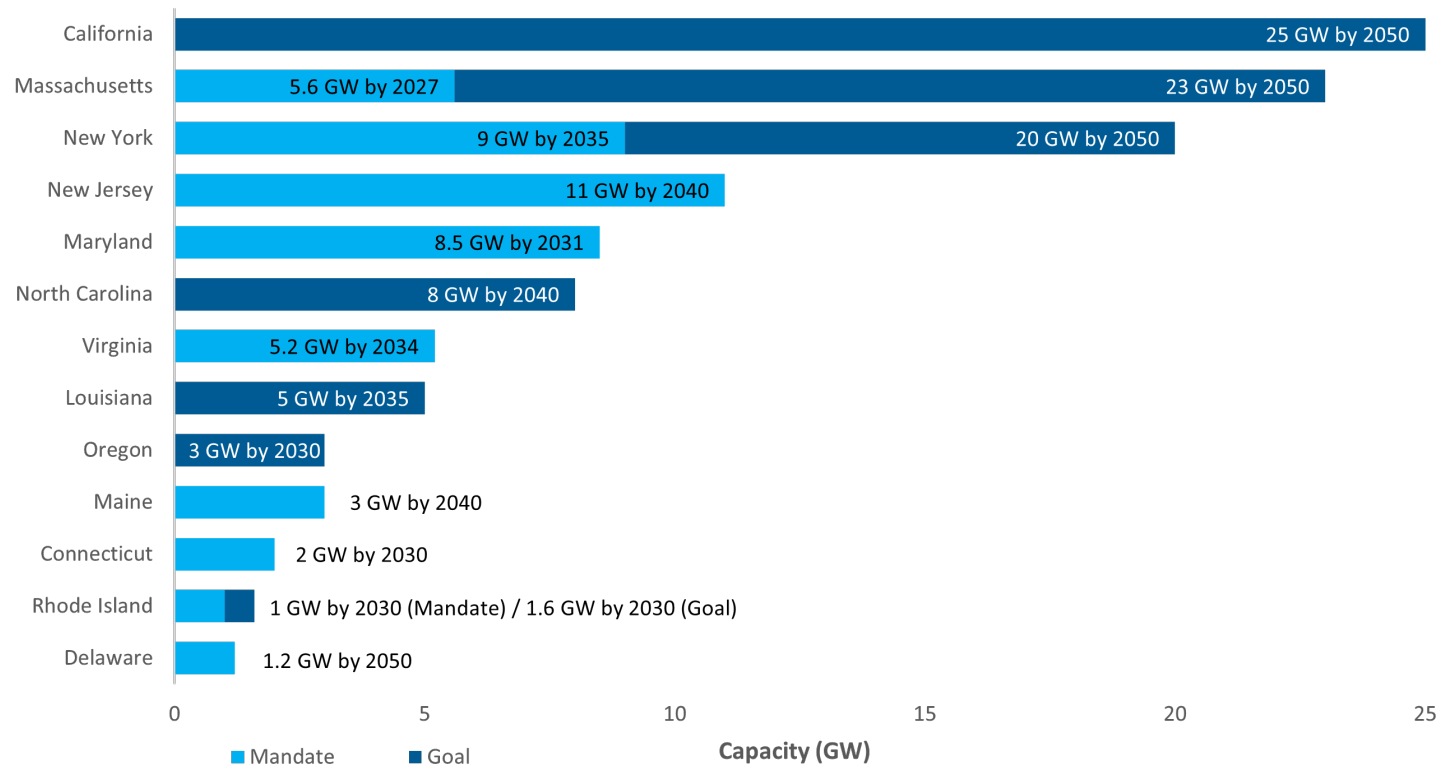
- Following passage of the IRA in August of 2022, the industry continues to share new manufacturing facility announcements aimed at reshoring the clean energy manufacturing supply chain.
- Within 2024, companies announced 34 new manufacturing facilities or expansions to support the utility-scale clean energy industry. Announcements included 16 solar, 2 onshore wind, 7 offshore wind, 5 battery storage, and 4 transmission manufacturing facilities.
- From August 2022 through the end of Q2 2024, there have been over 160 new or expanded manufacturing facilities announced. These facilities are estimated to create over 100,000 new manufacturing jobs.
- Within the total announcements, 42 facilities have been built or expanded as of Q2 2024, representing more than 20,000 new jobs.
- These facilities are set to play a crucial role in supporting clean energy technologies and expanding the U.S. domestic supply chain. They will produce a diverse array of components across solar, battery storage, land-based wind, offshore wind, and transmission technologies.
- For further information on new manufacturing activity, see ACP's [Clean Energy Investing in America](#) site.



State Procurement Activity

- New England multistate solicitation:** After the signing of a Memorandum of Understanding in October 2023 to maximize the efficiency and economic impacts of offshore wind, Massachusetts, Rhode Island, and Connecticut held a coordinated offshore wind solicitation for up to 6,800 MW of capacity. Bids were due in March 2024, and contracts were expected to be awarded in August. However, after receiving a \$389 million Department of Energy infrastructure grant, the states have pushed back decisions until September.
- New Jersey:** Close on the heels of its third offshore wind solicitation, New Jersey opened its fourth solicitation for between 1,200 and 4,000 MW of offshore wind capacity on April 30, 2024. Bids were due July 10, and awards are expected to be announced in December.
- New York:** NYSERDA launched its fifth offshore wind solicitation with a Request for Proposals (RFP) on July 17, 2024. Bid submissions opened in August. The proposal submission deadline for non-price information is September 9 and for offer pricing is October 18. Provisional awards are expected to be announced in November.
- Delaware:** As of June 30, the Delaware Energy Solutions Act authorizes the state to procure between 800 and 1,200 MW of offshore wind. This marks Delaware's first mandate for offshore wind procurement.

State Offshore Wind Mandates & Goals

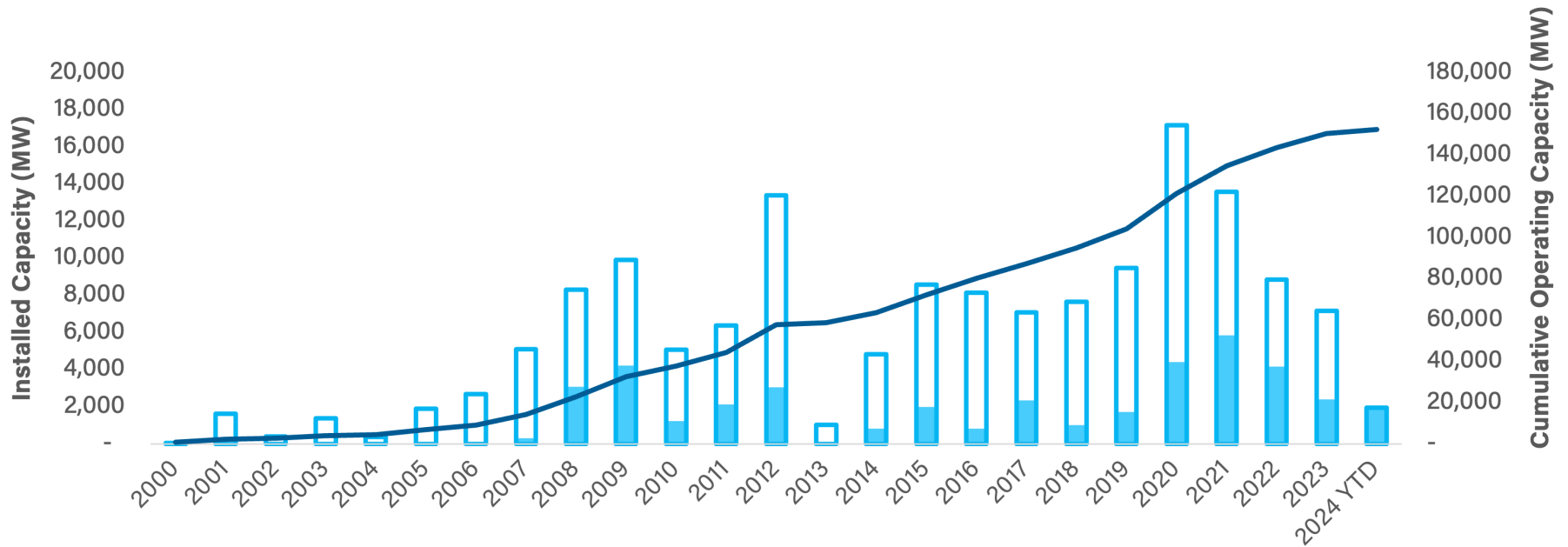


LAND-BASED WIND ACTIVITY

1,370 MW of Land-Based Wind Capacity Commissioned

- In the second quarter of 2024, developers commissioned nine land-based wind project phases, adding 1,370 MW of new wind power to the grid. A total of 1,971 MW of new land-based wind capacity came online in the first half of 2024.
- Second quarter installations increased by 41% year-over-year, with 402 MW more capacity added in Q2 2024 than Q2 2023. This was the most additions in Q2 the wind industry has seen since 2021. In addition, land-based wind installations increased 230% compared to the previous quarter, when 595 MW of new capacity was brought online.
- The capacity-weighted average size of projects added in the second quarter of 2024 was 172 MW.
- The largest project phase to start commercial operations in the second quarter was RWE Renewables Americas' Montgomery Ranch Wind Farm project in Texas. The project has a nameplate capacity of 202.5 MW.
- New projects were commissioned in five states, with over half of the installed capacity in the second quarter in Oklahoma and Texas. Oklahoma had the highest capacity installed in Q2 2024, adding 3% to their current operating capacity of 13,033 MW land-based wind.
- Despite a relatively strong second quarter, year-to-date installations are lower than recent years. This trend can be primarily attributed to supply chain issues, siting and permitting, as well as long interconnection queue wait times.

U.S. Annual and Cumulative Land-based Wind Capacity Growth

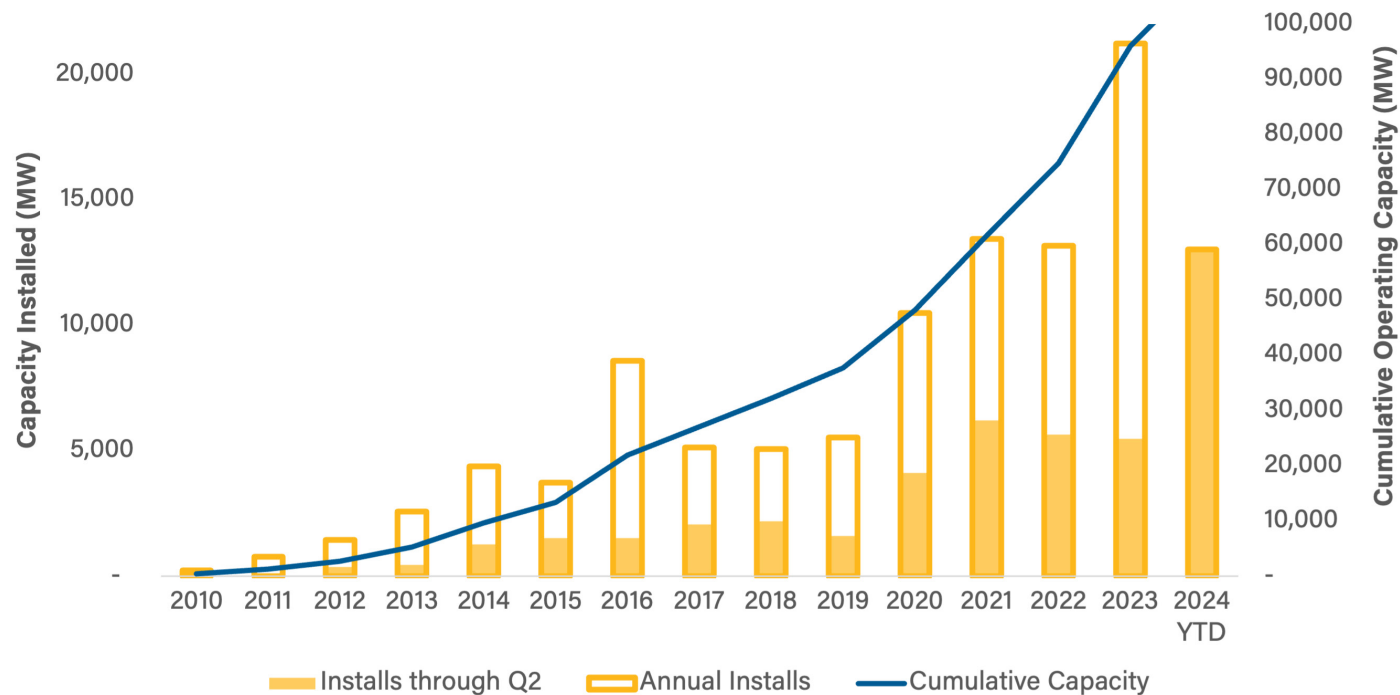


UTILITY SCALE SOLAR

Q2 2024 Solar Deployments

- Utility-scale solar capacity additions continued their strong growth from Q1 during the second quarter of 2024, making Q2 2024 the greatest Q2 for solar installations on record.
- A total of 6,711 MW of solar capacity was added to the grid in the second quarter, representing a 124% increase compared to the same period in 2023. Compared to the first quarter of 2024, solar installations increased by 6%.
- In the first half of 2024, a total of 13,033 MW of solar came online, more than double the 5,487 MW that came online in the first half of 2023.
- Cumulatively, there are now 109,180 MW of utility-scale solar operating in the U.S. All 50 states and the District of Columbia are home to at least one operating utility-scale project.
- The largest solar projects to come online during the second quarter were located in Texas. The first was Repsol's 500 MW Frye Solar project, which has a PPA with Amazon. The second largest solar project to come online during the quarter was Acciona Energy's 350 MW Red-Tailed Hawk Solar Project.

U.S. Annual and Cumulative Utility Solar Power Capacity Growth



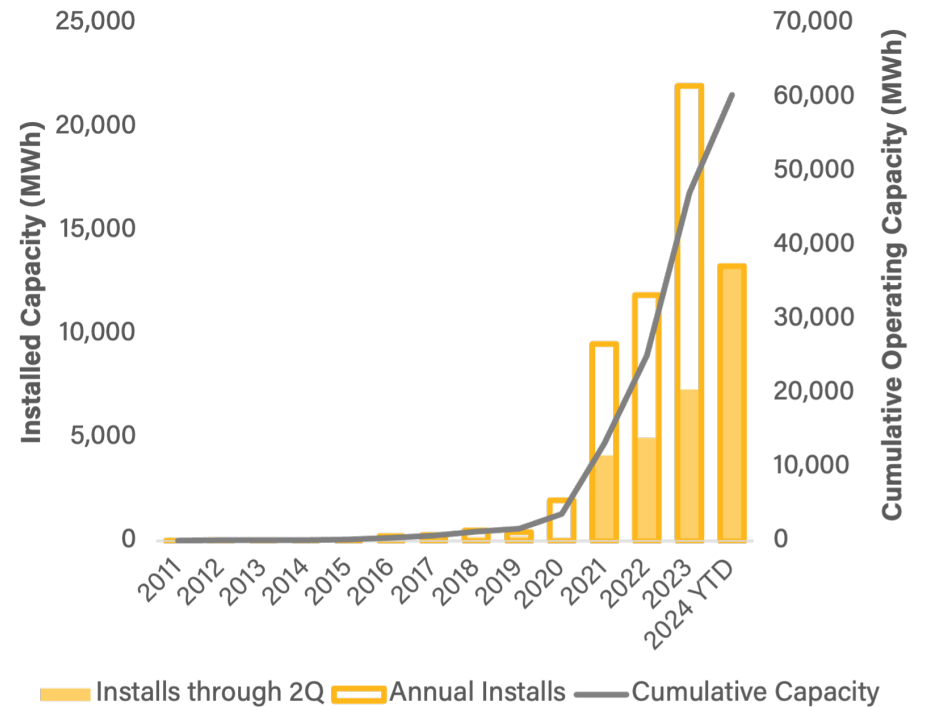
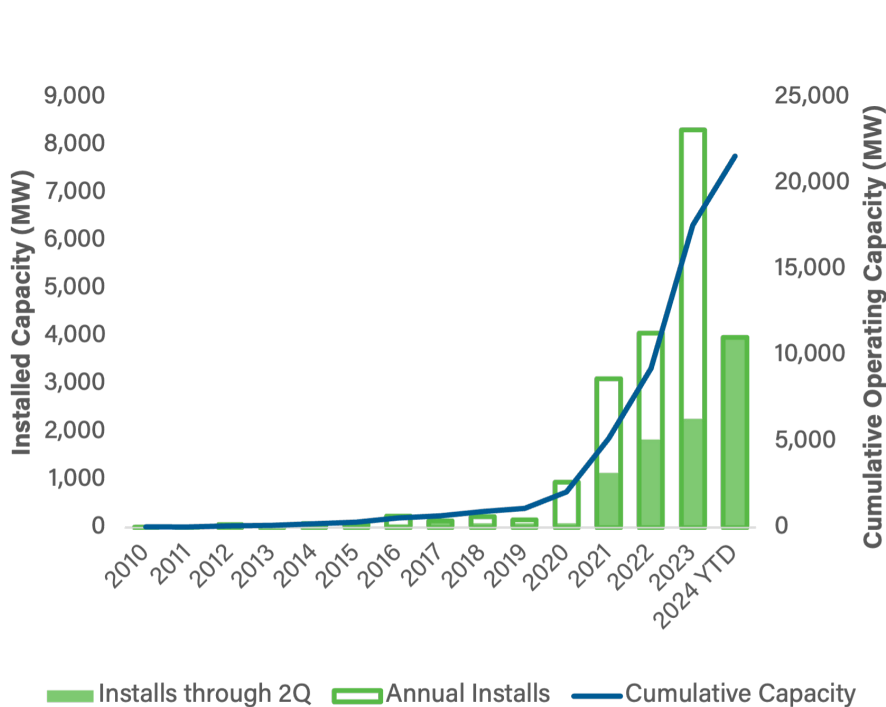
Solar capacity is reported in MWac

UTILITY-SCALE BATTERY STORAGE

Q2 2024 Storage Installations

- Battery storage capacity is tracked in terms of rated power capacity (MW), the maximum possible instantaneous discharge, and energy capacity (MWh), the maximum amount of stored energy.
- Installed U.S. energy storage capacity reached a fresh milestone during the second quarter, surpassing the 20 GW mark to end the quarter at 21,580 MW/60,387 MWh. The country had just over 1 GW installed at the start of the decade but has rapidly ramped up in the four and a half years since.
- With 2,933 MW of capacity added to the grid, battery storage experienced its second strongest quarter on record. Battery storage installations in Q2 2024 were 177% higher than the previous quarter and 62% higher compared to Q2 of 2023.
- Developers commissioned a total of 33 battery storage projects in Q2 2024, including 15 standalone projects and 18 phases paired with wind or solar capacity.
- With a capacity of 250 MW/1,000 MWh, Plus Power’s Sierra Estrella Energy Storage project was one of the largest battery storage projects to begin commercial operations in Q2 2024.

U.S. Annual and Cumulative Utility Battery Storage Capacity Growth



The American Clean Power Association (ACP) is the leading voice of today's multi-tech clean energy industry, representing over 800 energy storage, wind, utility-scale solar, clean hydrogen, and transmission companies. ACP is committed to meeting America's national security, economic and climate goals with fast-growing, low-cost, and reliable domestic power.

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