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CLEAN POWER QUARTERLY
Market Report



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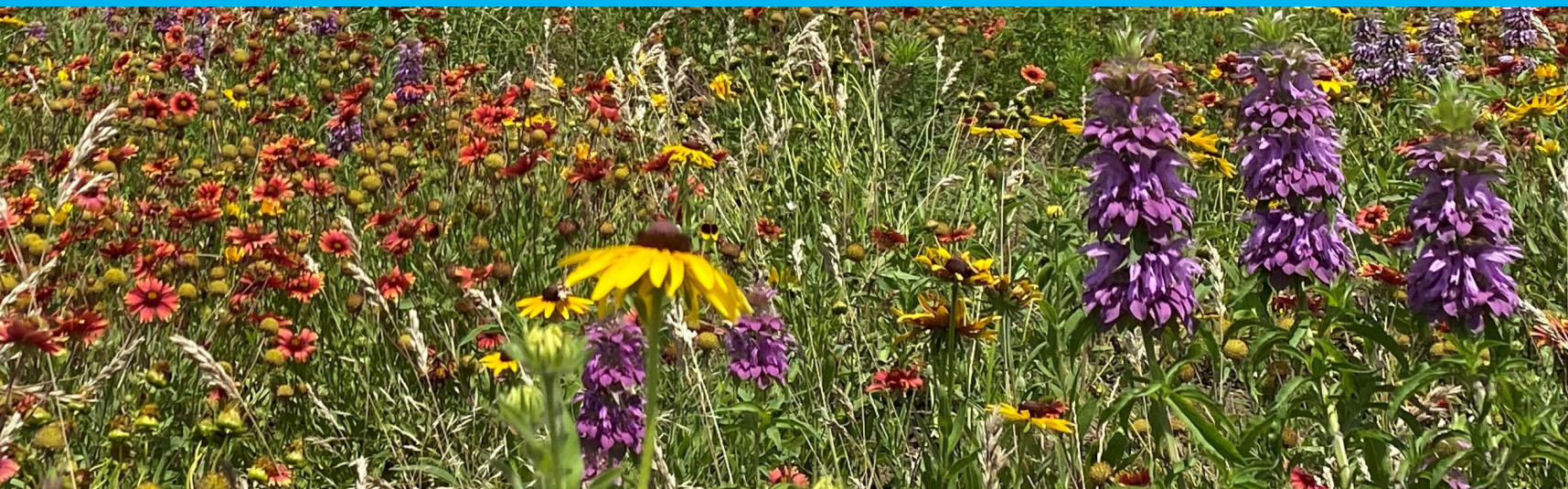
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2022 Q1 Highlights



2022 Q1 Highlights

Clean Power Project Installations

- In the first quarter of 2022, the industry installed 6,619 MW of utility-scale clean power capacity, enough to power 1.4 million American homes. This represents \$9.3 billion in capital investments.
- This quarter surpassed the first quarter of 2021 by over 11% to become the largest Q1 to date for new clean power installations. It was a record first quarter for both solar and storage, though wind installations were down 3% compared to 2021. Despite a record first quarter, the growth rate in clean power capacity has slowed. Between 2019 and 2021, first quarter installations increased by an average of 50% year-over-year.
- Developers commissioned 90 project phases across 24 states. Texas led the nation in clean power additions in the first three months of the year, installing 1,528 MW, followed by Oklahoma (998 MW), California (858 MW), Nevada (645 MW), and Florida (638 MW).
- Solar was the leading technology of the quarter, with 56 new projects coming online totaling 2,997 MW. Wind ranked second, with 10 new installs totaling 2,865 MW. Finally, 24 new battery storage projects were installed this quarter with a total capacity of 758 MW.
- Cumulatively, operating clean power capacity in the country is now nearly 208 GW.

Clean Power Capacity Under Construction and in Advanced Development

- Despite many obstacles facing the industry, a record amount of clean power projects are in the pipeline. The pipeline is made up of almost 1,100 projects with a total capacity of 125,476 MW. This includes 40,522 MW under construction and 84,953 MW in advanced development.
- Texas, with 21,974 MW in development, is the top state in terms of pipeline capacity. California sits in second with 14,114 MW, followed by New York (8,750 MW), and Virginia (6,439 MW).*
- Solar continues to be the leading technology in the pipeline, accounting for 56% of all clean power capacity in development. Land-based wind accounts for 19% of the pipeline, offshore wind an additional 14%, and storage the remaining 12%.
- The pipeline grew by just 4% from the end of 2021, much lower than the 12% quarterly growth the pipeline saw in 2021.
- Due to challenges such as trade and tariff concerns and lingering supply chain disruptions, the timelines and ultimate fates of many projects in the pipeline is in question. As of the end of the quarter, over 14.8 GW of clean power projects have experienced delays. On average project have been delayed seven months.

* Pipeline capacity in New York and Virginia includes offshore wind capacity. Offshore wind capacity is attributed to states based on the state that awarded ORECs or PPAs to the projects.

Clean Power Procurement Activity

- Companies announced 6,339 MW of new power purchase agreements (PPAs) in the first quarter, down 10% from last quarter and 12% from the first quarter of 2021. Uncertainties in project development prospects and timelines may have led buyers of clean power to be more cautious in signing new offtake agreements.
- Despite the drop in offtake capacity announced, the number of purchasers making announcements has been consistent over the past three first quarters at around 30 companies.
- Corporate buyers were among those most hesitant to sign on to new clean power PPAs. Corporate offtakers announced 3,309 MW of new PPAs this quarter, a notable 23% decline from the first quarter of last year.
- Utilities on the other hand increased PPA announcements by 82% compared to the same period last year, with 2,513 MW of new PPAs announced this quarter.
- Solar has dominated PPA announcements since 2019. The first quarter of 2022 was no exception. Solar made up almost three quarters (72%) of new announcements, followed by wind at 21%, and battery storage at 7%.
- Clean power projects that came online this quarter primarily have PPAs in place (53%). Direct ownership and use of clean power by utilities continues to be popular, accounting for 37% of the capacity that came online this quarter.

Solar capacity is reported in MWac units.





Clean Power Capacity Growth



Installs high, but growth slows

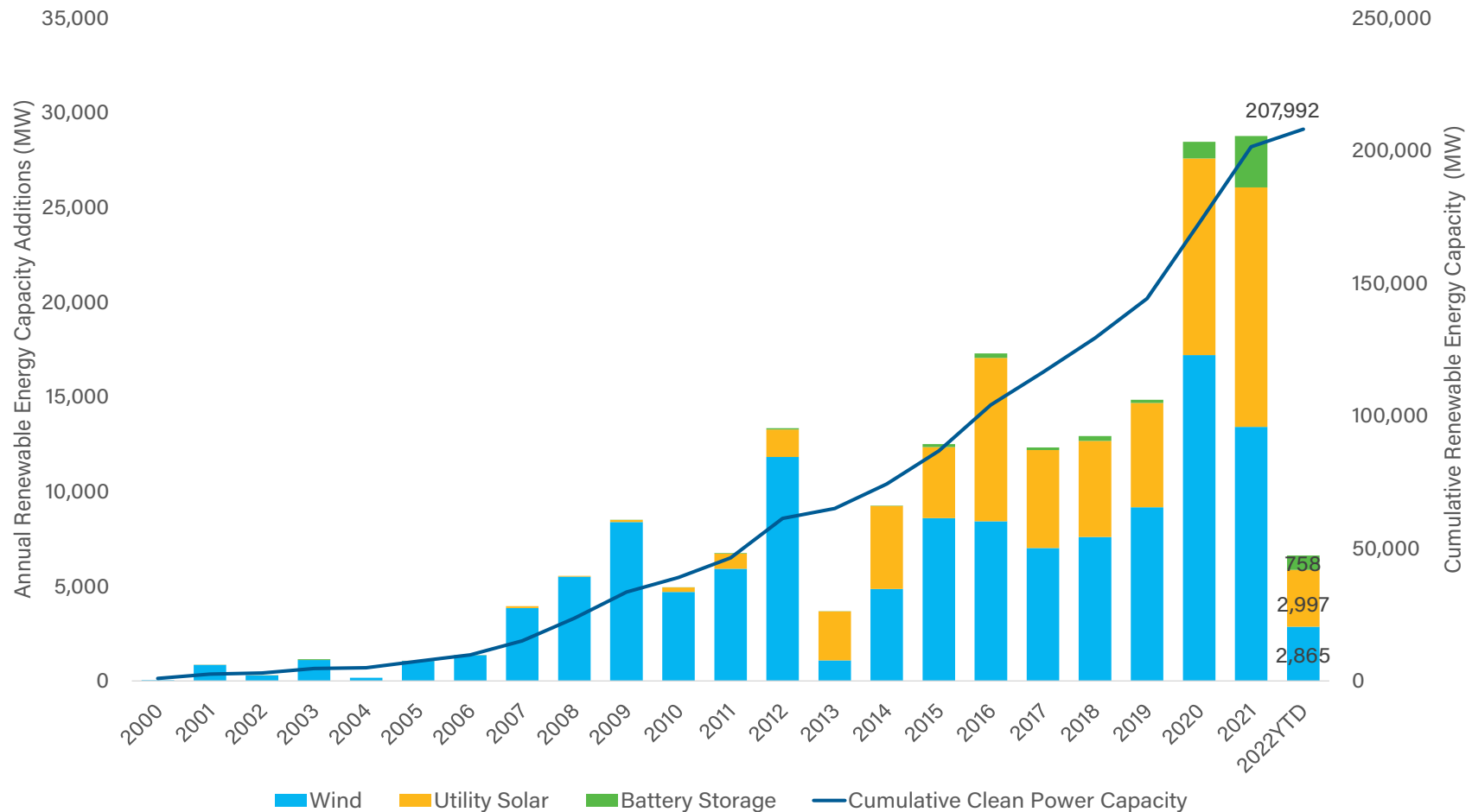
Q1 2022 installations

- In the first three months of the year, 6,619 MW of new clean power came online, an 11.5% increase from 2021 Q1 installations. In fact, this is the highest Q1 on record.
- Developers and owners installed 90 projects across 24 states.
- While this was a record first quarter, it is primarily due to the increase in battery storage capacity. Storage capacity installs were up by more than 170% compared to Q1 2021. Solar installs were up 11%, while wind installs fell 3%.

Cumulative operating clean power capacity

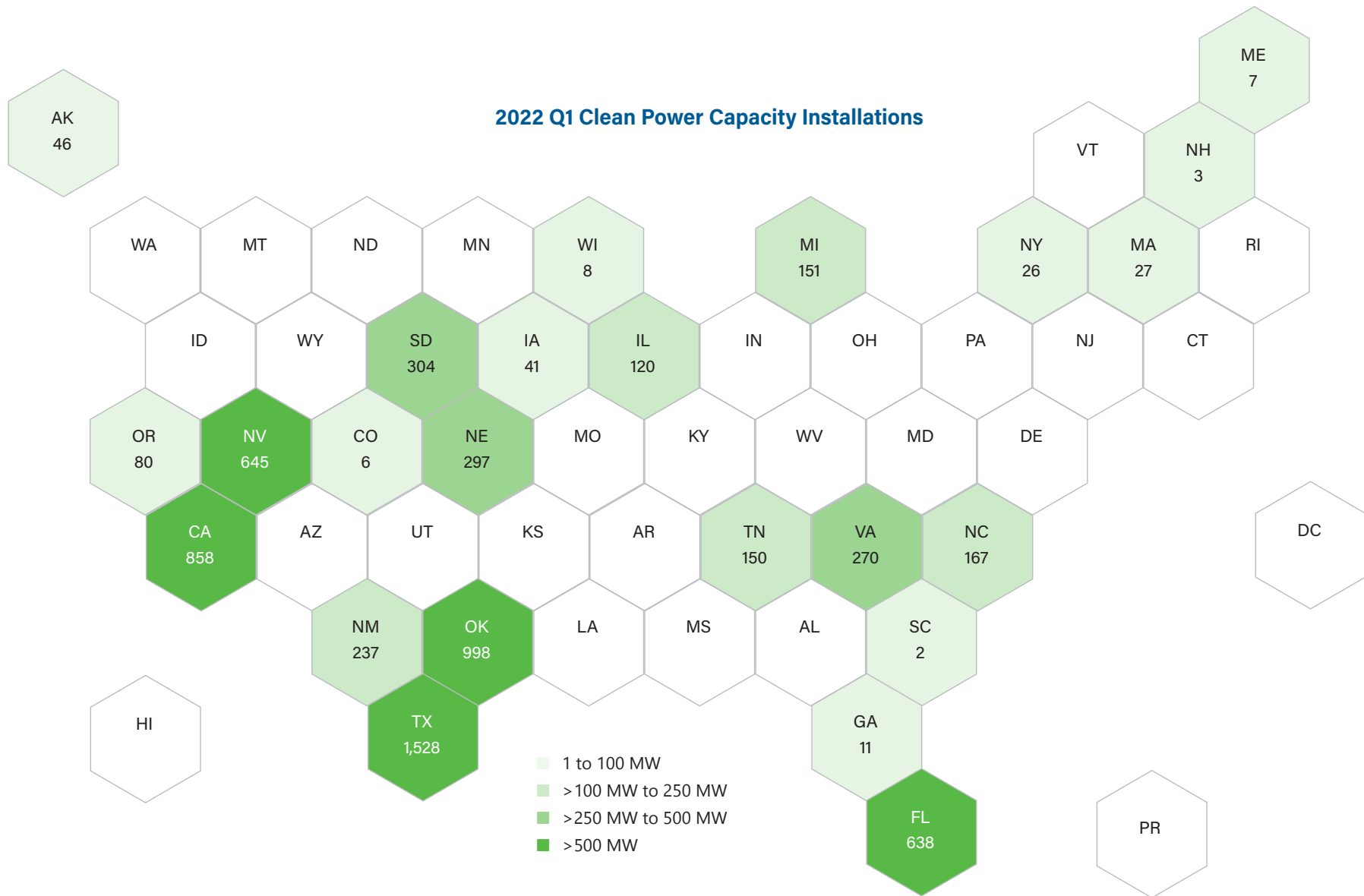
- Last year, the industry celebrated the installation and operation of the 200th GW of clean power. After the industry brought 6.6 GW of clean power capacity online this quarter, cumulative operating capacity climbed to 207,992 MW.
- Land-based wind remains the primary source of operating clean power with 138,629 MW online, accounting for 67% of total capacity. Solar makes up 31% of operational clean power (63,833 MW), and storage the remaining 3% (5,488 MW/13,911 MWh).

U.S. Annual and Cumulative Clean Energy Capacity Growth



Record Q1 capacity additions

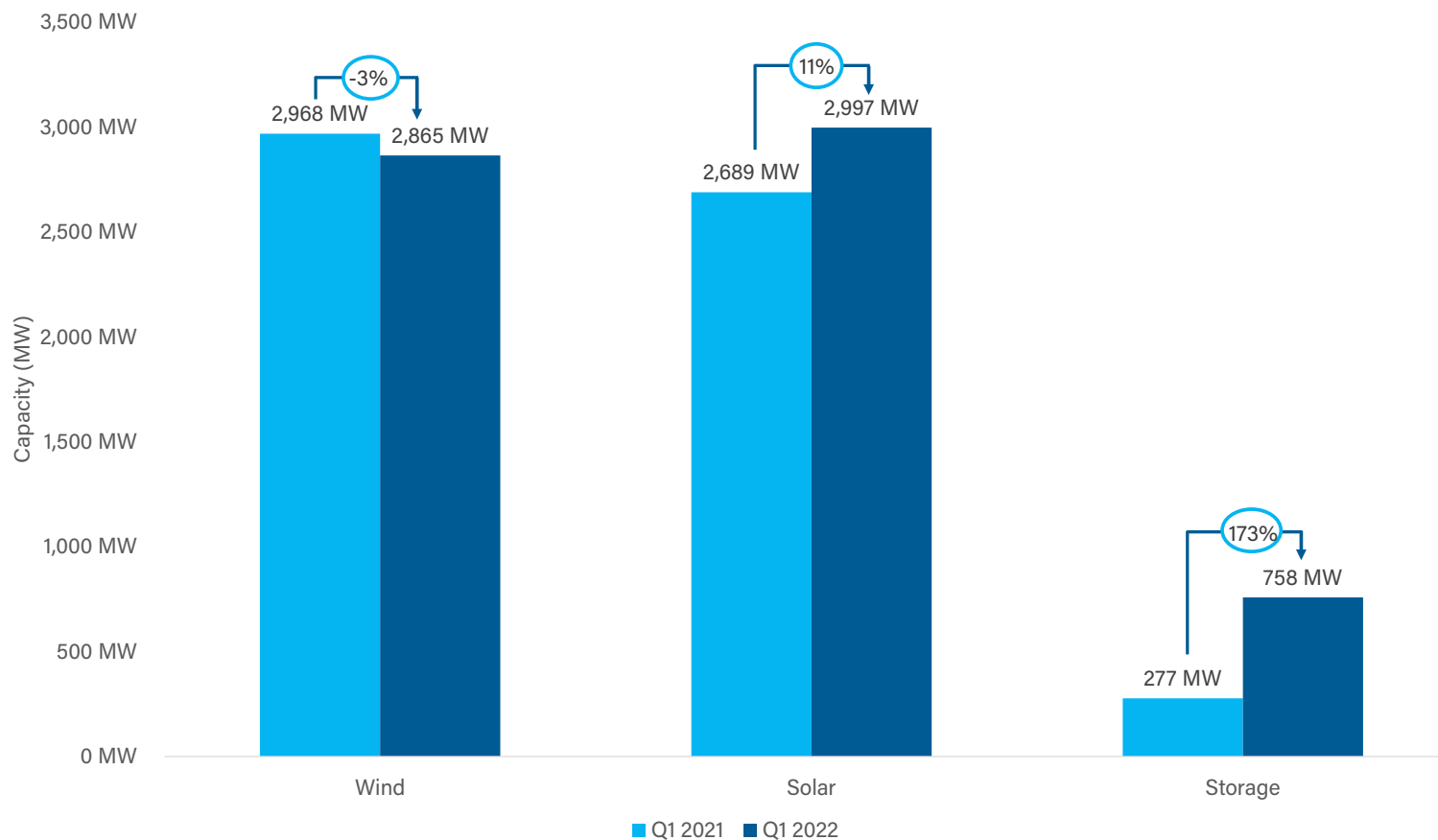
- In the first quarter of the year, 90 clean power project phases with a total capacity of 6,619 MW began operating. Projects are spread across 24 states.
- Texas continued its dominance in clean power capacity this quarter, installing more than 1.5 GW. Oklahoma ranks second in terms of quarterly installs (998 MW), all thanks to the Traverse Wind project that reached commercial operation. California comes in third, installing 502 MW of solar and 355 MW of battery storage capacity.



Quarterly clean power capacity growth

- Q1 2022 installs were the highest on record, due mainly to tremendous growth in battery storage. Clean power owners and developers commissioned 6,619 MW in Q1, compared to 5,934 MW in 2021 Q1. Battery storage installations were up 173%. Solar experienced a smaller 11% increase in additions compared to last year, while wind installs were down slightly (3% decrease).
- Despite being a record quarter, the growth rate of installs has slowed to just 11%. Between 2019 and 2021, first quarter installations increased by an average of 50% year-over-year.
- Solar was the most installed technology of the quarter with 2,997 MW coming online. Land-based wind was close behind with 2,865 MW coming online, and battery storage installed 758 MW/2,537 MWh.
- 90 new project phases came online during the quarter. Of those, 61 were standalone and 29 were part of hybrid projects.
- While wind was close behind solar in capacity installs this quarter, far fewer projects came online, 56 solar projects compared to 10 wind projects.
- NextEra Energy was the top owner for the quarter, bringing online 1,092 MW of solar and 105 MW of storage capacity for a total of just over 1.2 GW. AEP ranked second with the 998 MW Traverse Wind project coming online. Rounding out owners with more than 500 MW coming online is SB Energy with 640 MW of solar capacity installed.

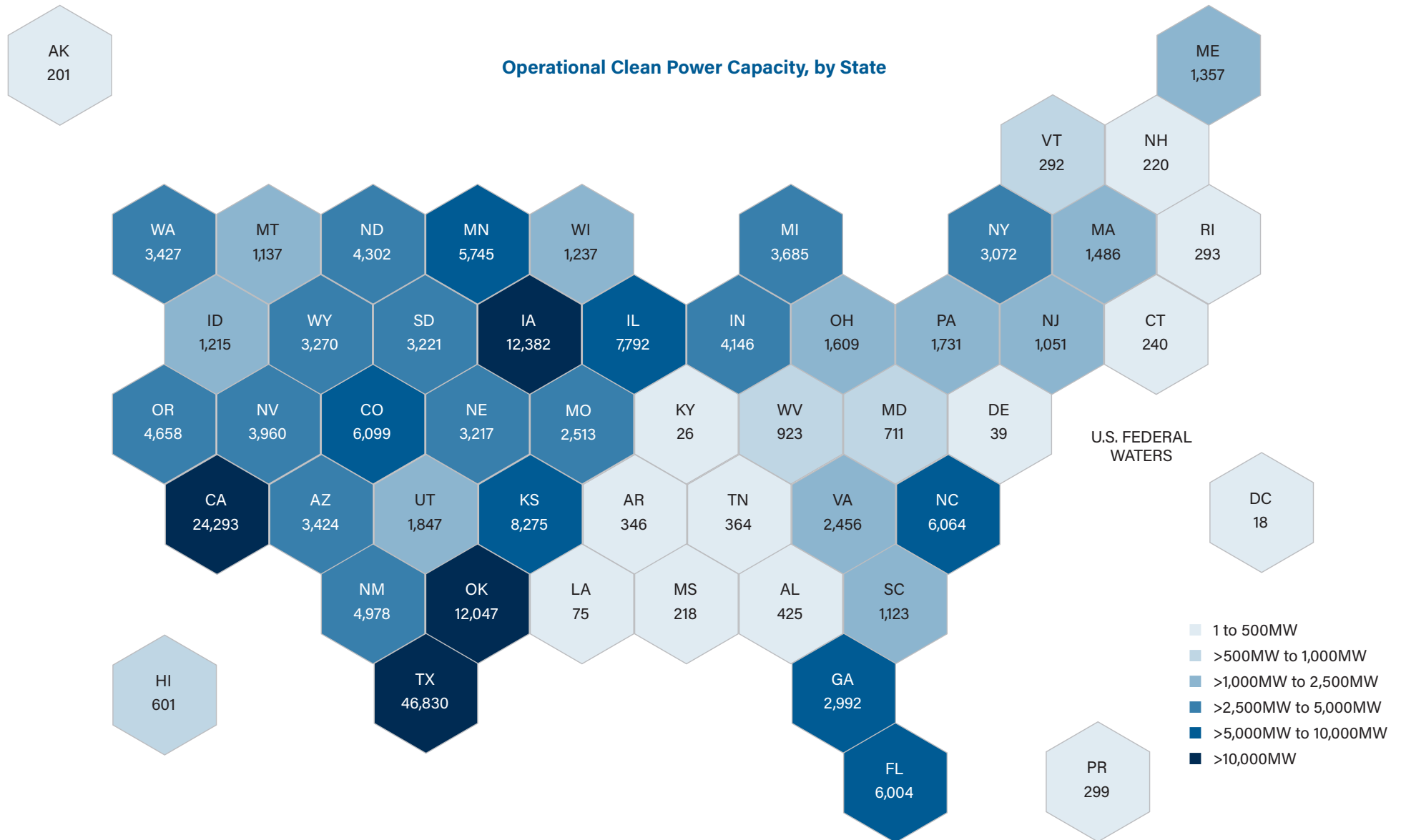
Clean Power Quarterly Capacity Growth



ACP has revised historical solar capacity addition amounts to reflect new information.

Operational clean power capacity

- Across 24 states, 6,619 MW of clean power capacity was installed in Q1, enough to power the equivalent of 1.4 million homes.
- Cumulative operating clean power capacity is now 207,992 MW.
- Texas leads the nation in total operating clean power capacity, with almost double the capacity online of any other state. California has the second most operating clean power at 24,293 MW, followed by Iowa (12,382 MW), and Oklahoma (12,047 MW).



Clean power project pipeline

Wind

- Land-based wind, the largest source of operating clean power, accounts for 18%, or 23,346 MW of the pipeline. Offshore wind makes up an additional 14% (17,458 MW) of the pipeline.
- Texas has the most wind in development, with 3,008 MW in advanced development and 3,655 MW under construction. Texas also had the highest capacity start construction or enter advanced development this quarter at 906 MW.
- Wyoming has the second most land-based wind in the pipeline at 3,000 MW, followed by Illinois (2,247 MW), and New York (1,446 MW).
- Numerous states along the coasts have offshore wind projects in development located in federal waters. Based on the state of power delivery, New York is leading the nation with 4,318 MW in development. New Jersey has 3,758 MW in development, ranking in second place. Massachusetts is in third with 3,242 MW, and Virginia in fourth (2,587 MW).

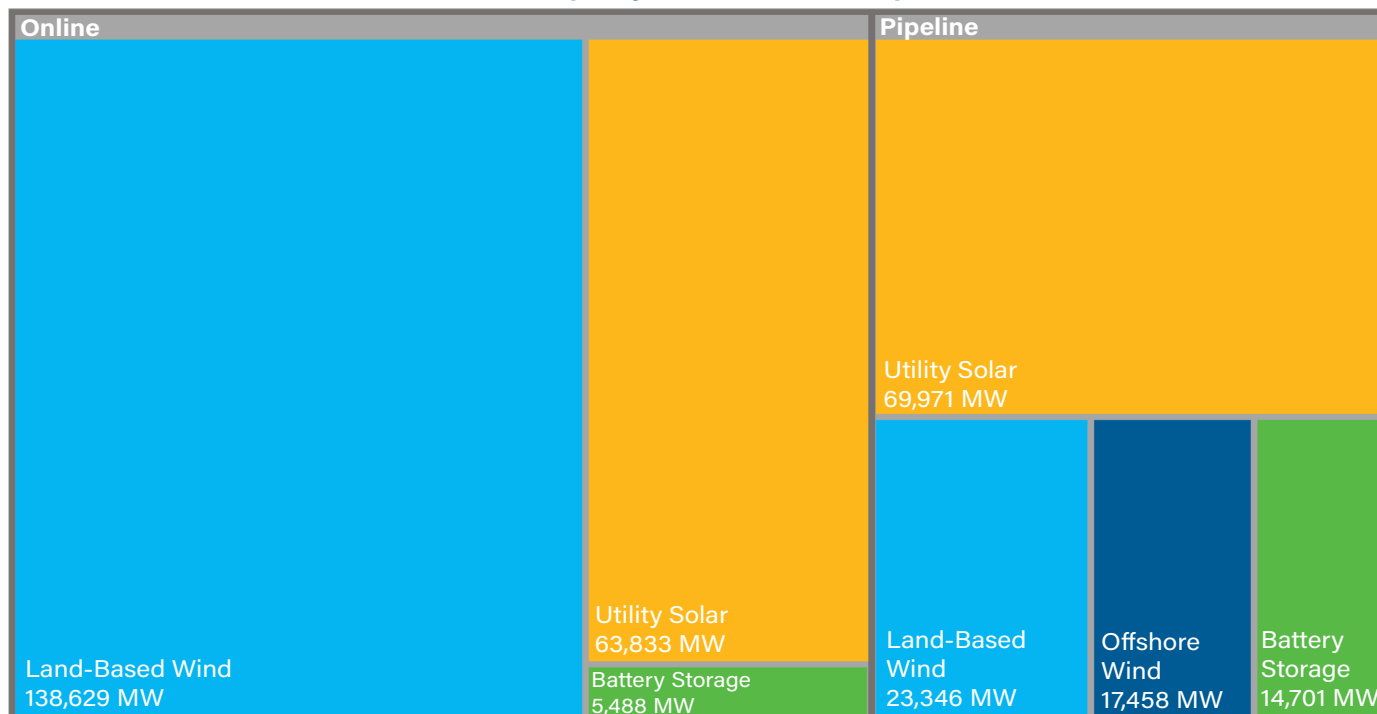
Solar

- Despite the numerous headwinds facing the industry, solar still makes up more than half of the development pipeline (56%), with 21,497 MW under construction and 48,492 MW in advanced development.
- Texas ranks first for solar capacity in development as well, with nearly 12.8 GW, accounting for almost 20% of the total solar pipeline. California is a distant second, with 7,943 MW of solar in the pipeline. Indiana rounds out the top three with 5,234 MW.
- Growth in the solar pipeline has slowed, however. Since the end of 2021, the solar pipeline has increased by just 5%. Between quarters in 2021, solar capacity in the pipeline increased by an average of nearly 15%. In addition to this slower growth, project developers are delaying expected commissioning dates and have expressed uncertainty about the future of many projects, with some reporting all solar project in the pre-construction phase as "on-hold."

Storage

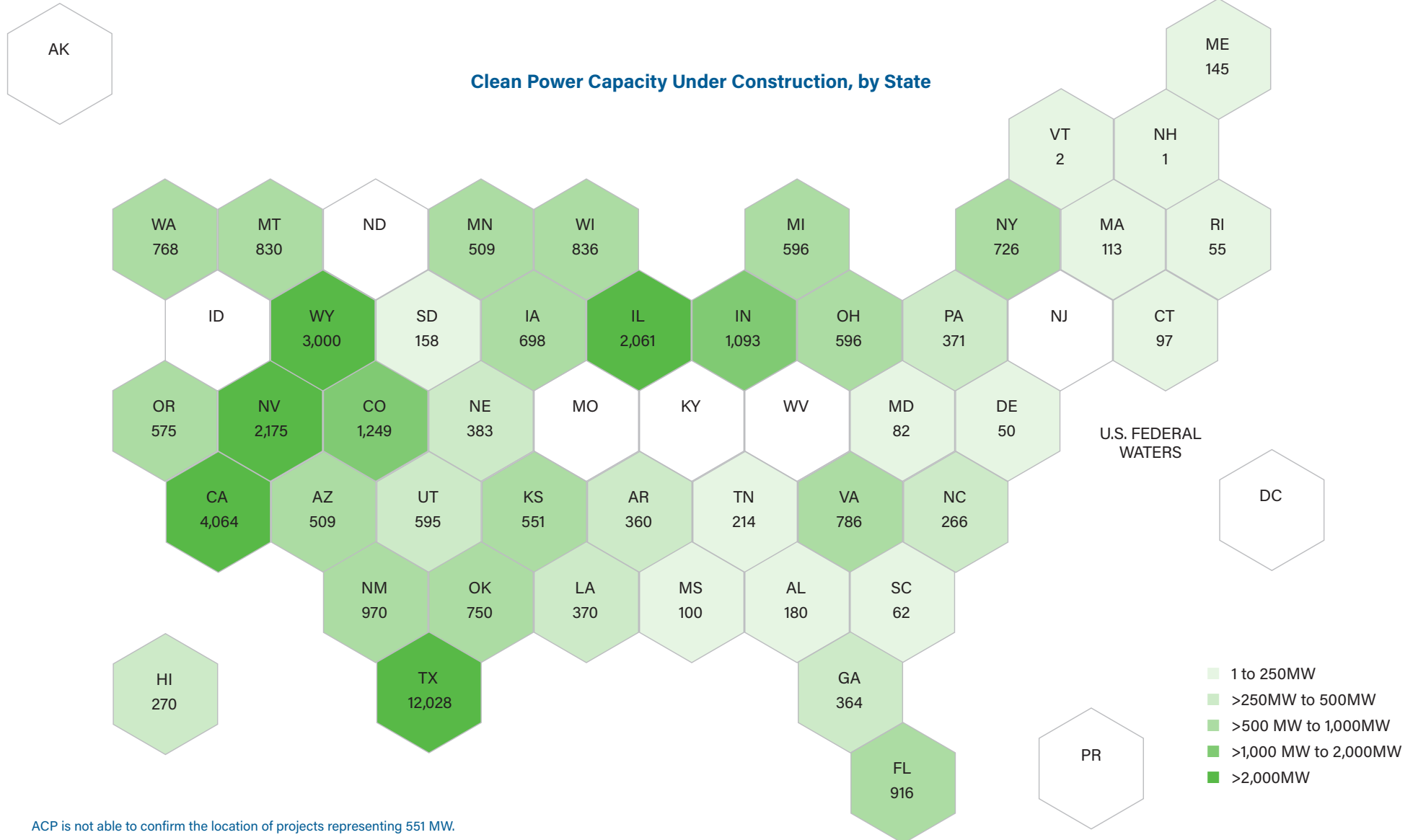
- The battery storage pipeline continues to reach historic heights. As of the end of the quarter, 14,701 MW/36,533 MWh of storage capacity is in development. This is an 18% increase since the end of 2021. On average, the storage pipeline has grown by 20% each quarter over the last four quarters.
- Hybrid projects have played a significant role in the growth of battery storage across the country. Of the 14,701 MW in development, 66% is part of a hybrid project, and 34% is standalone.
- California, due to its high solar penetration rate and need to shift electricity generated by solar to other periods of the day, leads the storage pipeline with 5,941 MW, or 42% of the total pipeline. Texas sits in second but has more than 3,400 MW less in development. Nevada ranks third with 1,473 MW, and Arizona fourth with 1,316 MW.

Clean Power Capacity Online and in the Pipeline



Project construction pipeline

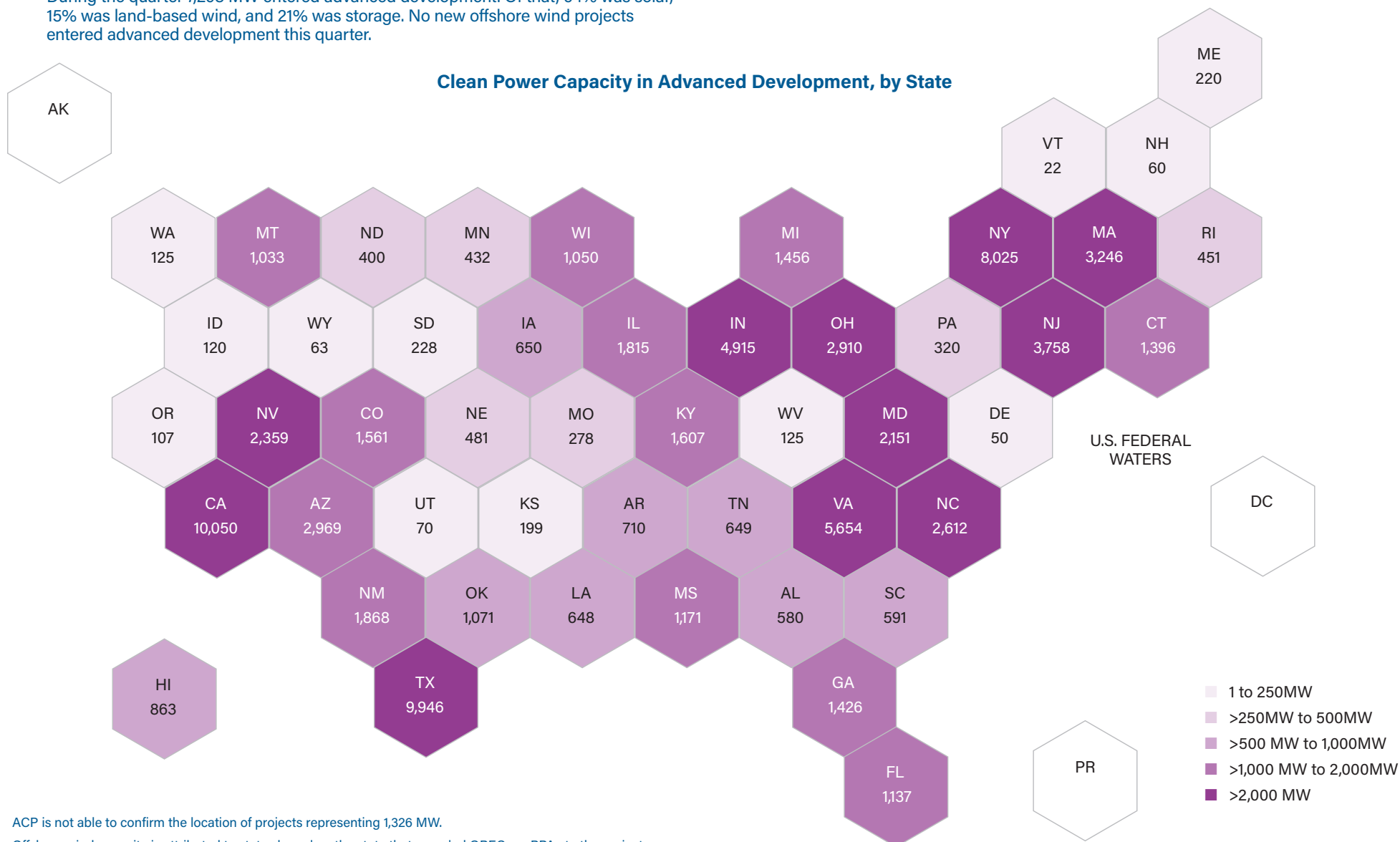
- As of the end of the first quarter 40,522 MW of wind, solar, and battery storage projects are under construction.
- Construction activity is spread across 43 states and includes over 400 project phases.
- Construction began on 58 project phases in the first quarter with a total capacity of 4,477 MW.
- Projects under construction are 53% solar, 35% wind, and 12% storage. Currently no offshore wind projects meet ACPs under construction definitions (in-water construction commenced).
- Texas leads the nation across all three technologies for capacity under construction with a total of 12 GW, after starting construction of 1,257 MW this quarter. California is second for total capacity under construction and for solar and storage capacity under construction. Wyoming sits in third overall and second for land-based wind.



Advanced development activity

- The advanced development pipeline has grown by 3% since the end of 2021. 84,953 MW of clean power projects are now in advanced development, meaning they have secured an offtake agreement or equipment order, but have not yet begun construction.
- During the quarter 7,298 MW entered advanced development. Of that, 64% was solar, 15% was land-based wind, and 21% was storage. No new offshore wind projects entered advanced development this quarter.
- Accounting for 57% of capacity in advanced development, solar is the leading technology in the advanced development pipeline.. Offshore wind makes up the next largest share (21%), and this quarter storage surpassed land-based wind to make up 12% of capacity in advanced development, with wind making up the remaining 11%.

Clean Power Capacity in Advanced Development, by State



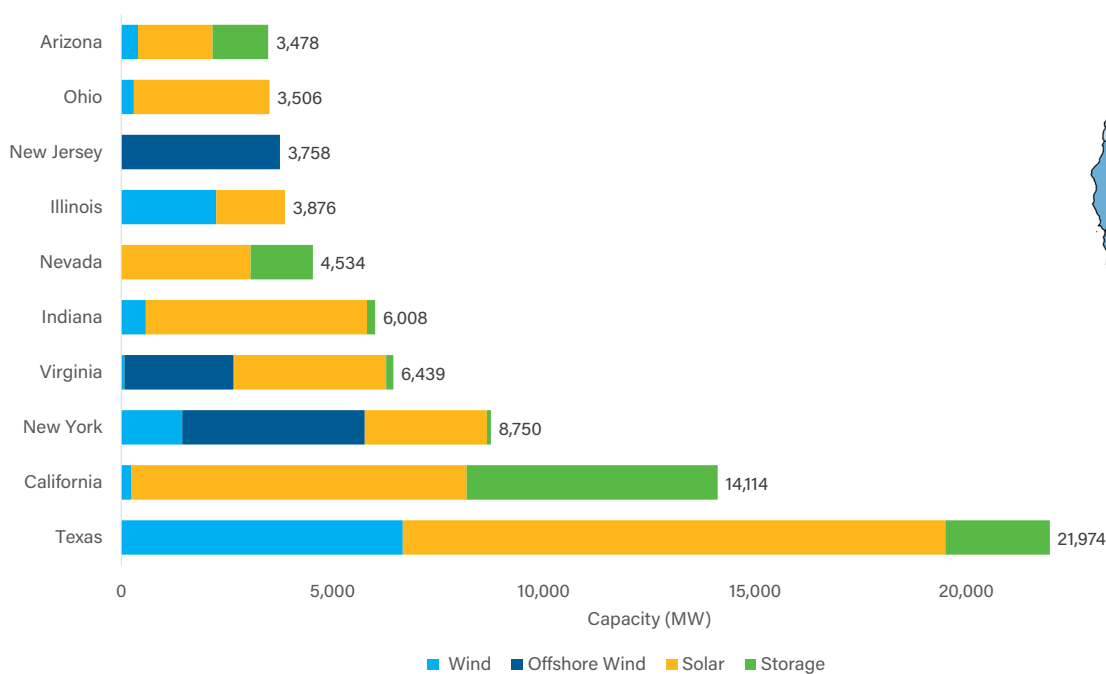
ACP is not able to confirm the location of projects representing 1,326 MW.

Offshore wind capacity is attributed to states based on the state that awarded ORECs or PPAs to the projects.

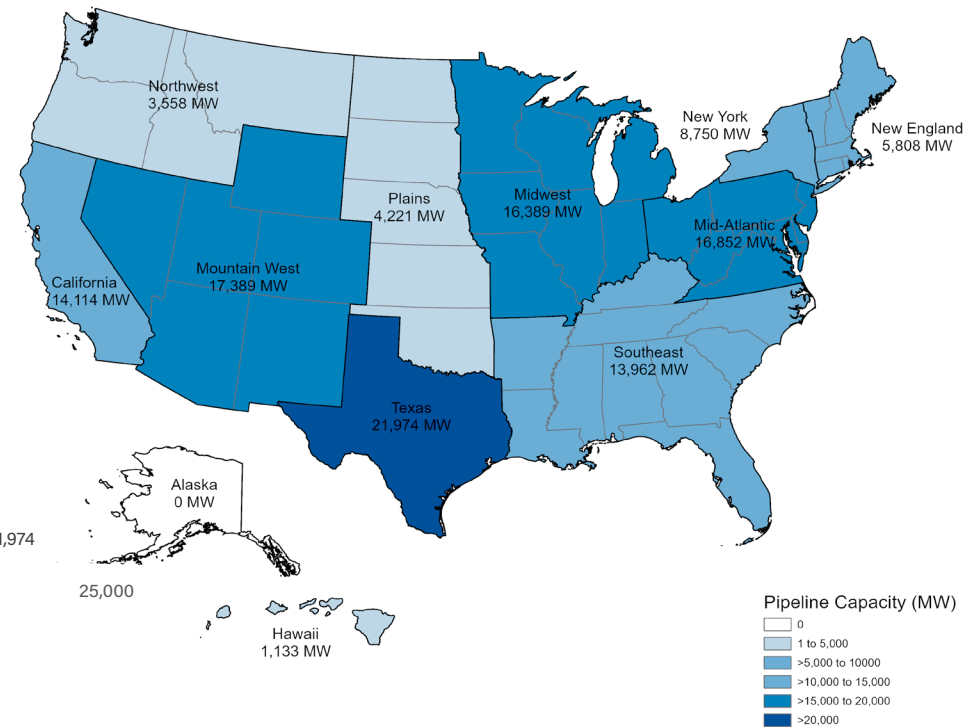
Clean power project pipeline

- The clean power pipeline of 125,476 MW is spread across the nation, encompassing all but two states, Idaho and Alaska.
- Regionally, capacity in development ranges from 21,924 MW in Texas to 1,133 MW in Hawaii. Texas and the Mountain West have the most capacity in development, followed by the Mid-Atlantic and Midwest.
- There are five states (Texas, California, New York, Virginia, and Indiana) with more than 5,000 MW in the pipeline, and an additional 25 states with more than 1,000 MW.
- Nearly 30,000 MW, or 24% of clean power capacity in development is part of a hybrid project.

Top States of Projects Under Construction and in Advanced Development



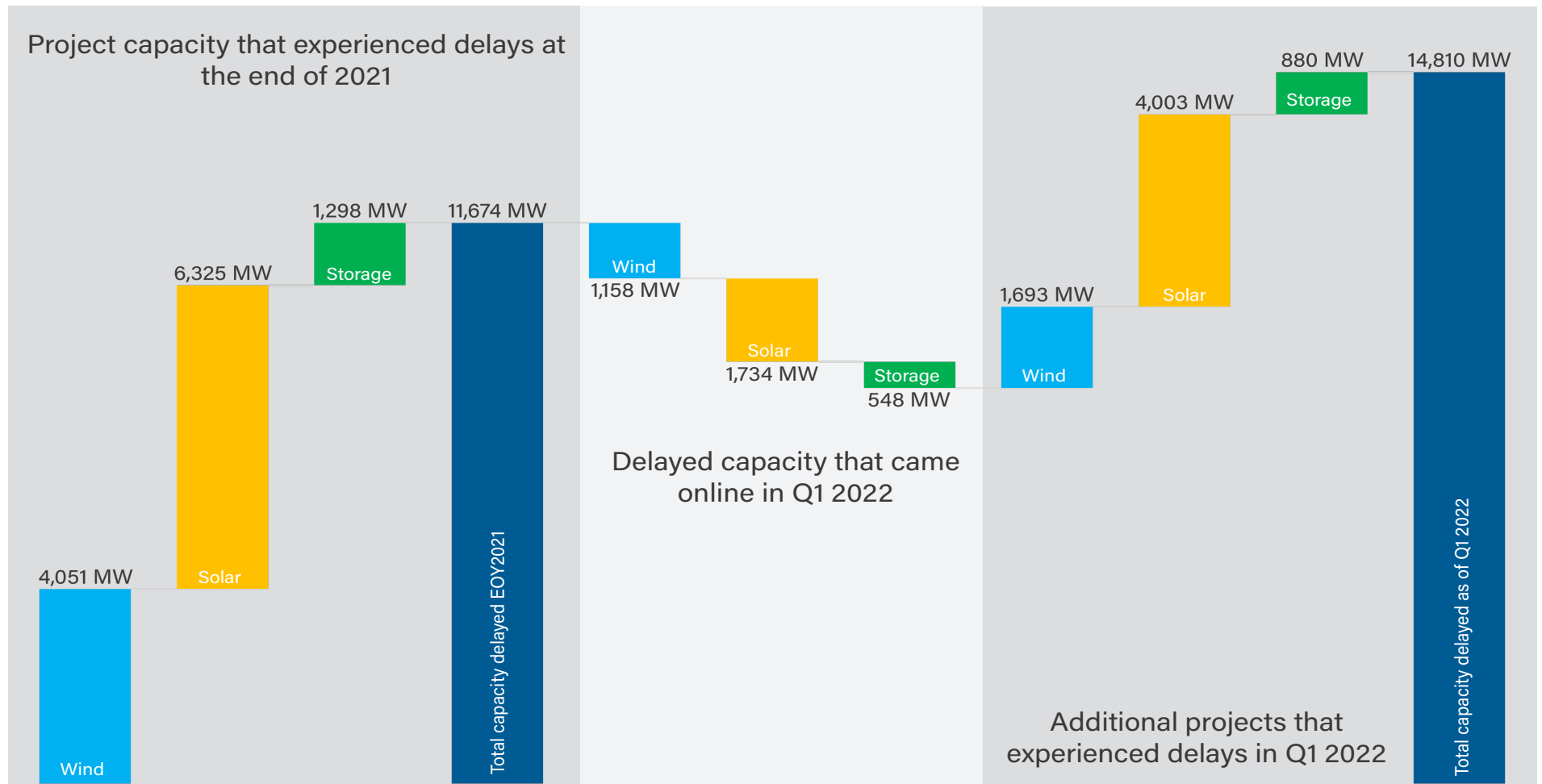
Capacity Under Construction and in Advanced Development by Region



Clean power pipeline delays

- At the end of 2021, 11.7 GW of clean power project experienced delays. Of that, 3,440 MW have since come online. However, an additional 6,576 MW of clean power projects experienced delays this quarter. In total, 14.8 GW of capacity has been delayed as of the end of the quarter.
- On average, these projects have been delayed by seven months.
- 4,718 MW of clean power capacity expected to begin operation this quarter was delayed. More than 80% of that capacity was delayed only slightly and is now expected to come online later this year, but over 650 MW is now expected to come online between 2023 and 2025.
- In total, 6,005 MW of capacity expected online in 2022 experienced delays, along with 310 MW expected online in 2023, 60 MW expected to commission in 2024, and 201 MW expected online in 2025 and 2026.
- The major challenges facing the solar industry are likely the driving factors in nearly 8.6 GW of solar projects being delayed. Solar accounts for 58% of all projects delayed and 60% of projects delayed that were expected online this quarter. Wind makes up 31% of total delays, and battery storage 11%.

Clean Power Project Capacity Delayed



DOC Investigation Delays Projects

Solar Projects Delayed by Intial and New Expected Online Year

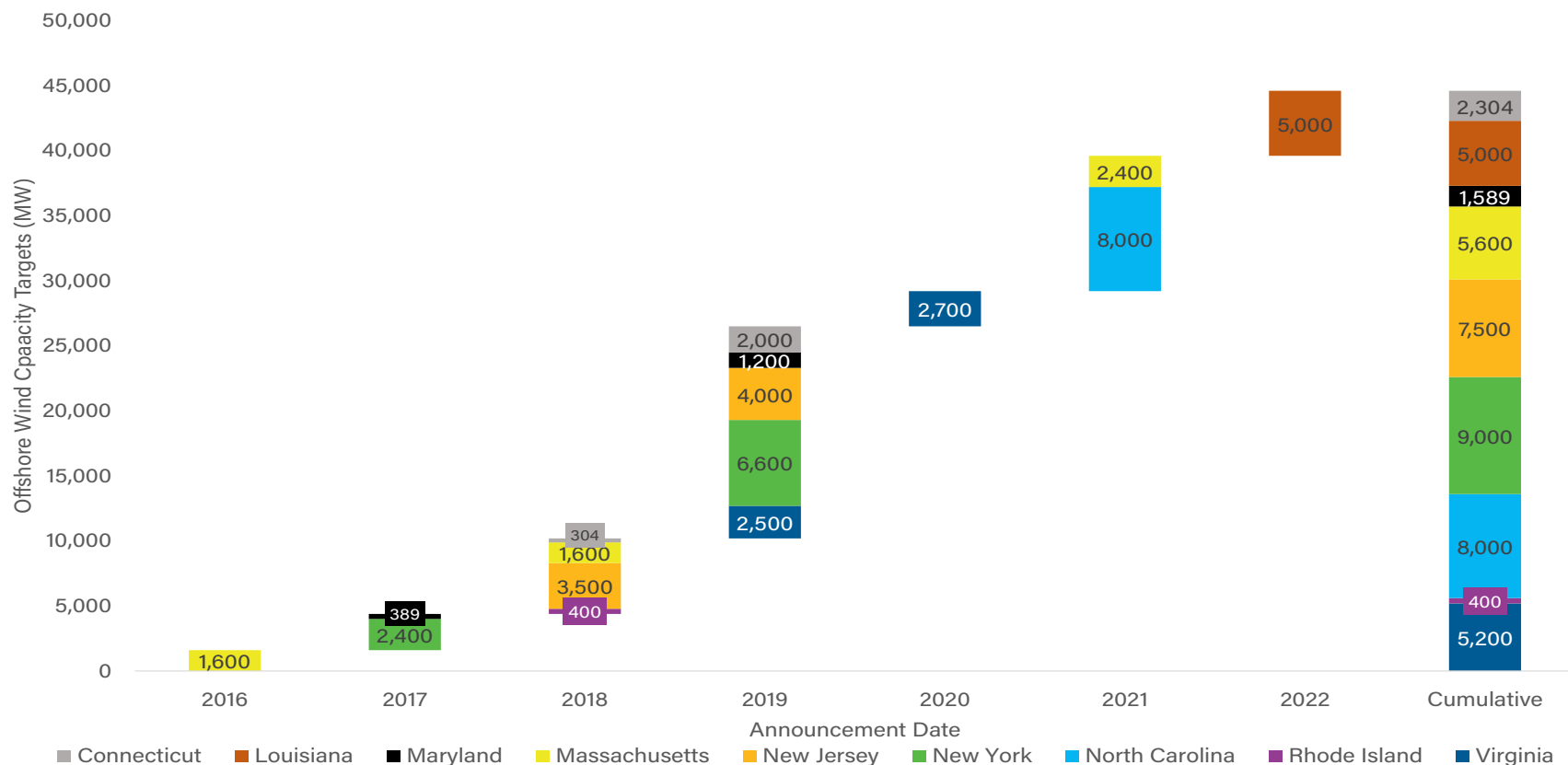
- The Department of Commerce's decision to initiate a review of Auxin's petition to apply anti-dumping and countervailing duties against solar module manufacturers located in Southeast Asia has had an immediate, chilling effect on the U.S. solar industry.
- ACP issued a market impact survey to gather a sample of the impacts this inquiry is already having on crystalline-silicon PV projects. The survey results include data from leading utility-solar developers representing over 150 active projects.
- Prior to Commerce's decision to initiate this inquiry, market researches anticipated 17 GWdc of utility-scale crystalline silicon (c-si) solar capacity to be added to the grid in 2022 and nearly 20 GWdc in 2023. ACP's market impact survey indicates at least 65% of the projected c-si market across 2022-2023 is already at risk of cancellation or delay. The most common reason for delay/cancellation is a lack of module availability.
- Given the timing of Commerce's decision announcement, we don't expect to see an effect on quarterly deployment volumes until later in the year. This report covers January through March and Commerce's decision became official on April 1st.



State and Industry Updates

- On January 31, Louisiana announced an offshore wind goal of 5 GW installed by 2035 as part of the state's first ever Climate Action Plan. To date, nine states have set offshore wind procurement targets totaling nearly 45 GW.
- On February 11, New York State broke ground on the 130 MW South Fork Wind Project as Ørsted and Eversource's joint venture announced the approval of the final investment decision for the project. South Fork Wind Farm is expected to be operational by the end of 2023.
- On February 28, EnBW announced it will sell its EnBW North America subsidiary and its wind operations in the US to TotalEnergies. The acquisition includes the New York and New Jersey offshore wind lease area that was recently awarded to EnBW and TotalEnergies in the February lease auction. Additionally, under the acquisition, TotalEnergies will acquire the shares held by EnBW in Castle Wind LLC, a joint venture with Trident Wind to develop the 1,000 MW wind project off the coast of California at Morro Bay.
- In March, Equinor, BP, and Sustainable South Brooklyn Marine Terminal, L.P. announced that they will upgrade and build out the South Brooklyn Marine Terminal as an offshore wind operations and maintenance base that will support the Empire Wind and Beacon Wind projects. The terminal will also become a power interconnection site for the Empire Wind 1 project. Heavy lift platforms will also be built for wind turbine staging and installation for developers.
- At the end of March, the House of Representatives passed a bill which creates citizenship-based restrictions for crews on foreign-flagged vessels working on offshore wind facilities that could create a serious impediment for domestic offshore wind construction.

Offshore Wind Targets by State

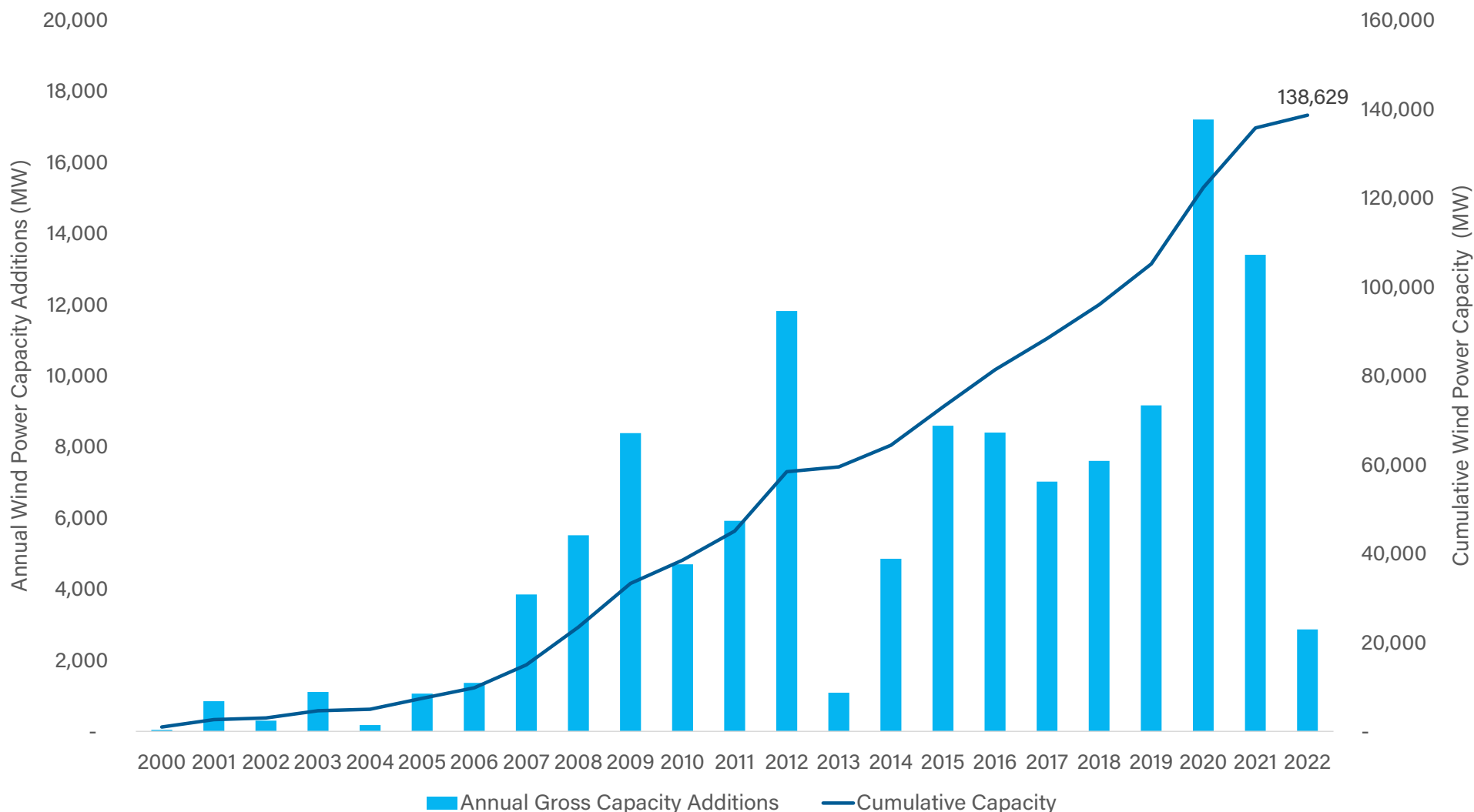


LAND-BASED WIND ACTIVITY

Nearly 3 GW of land-based wind capacity added to the grid

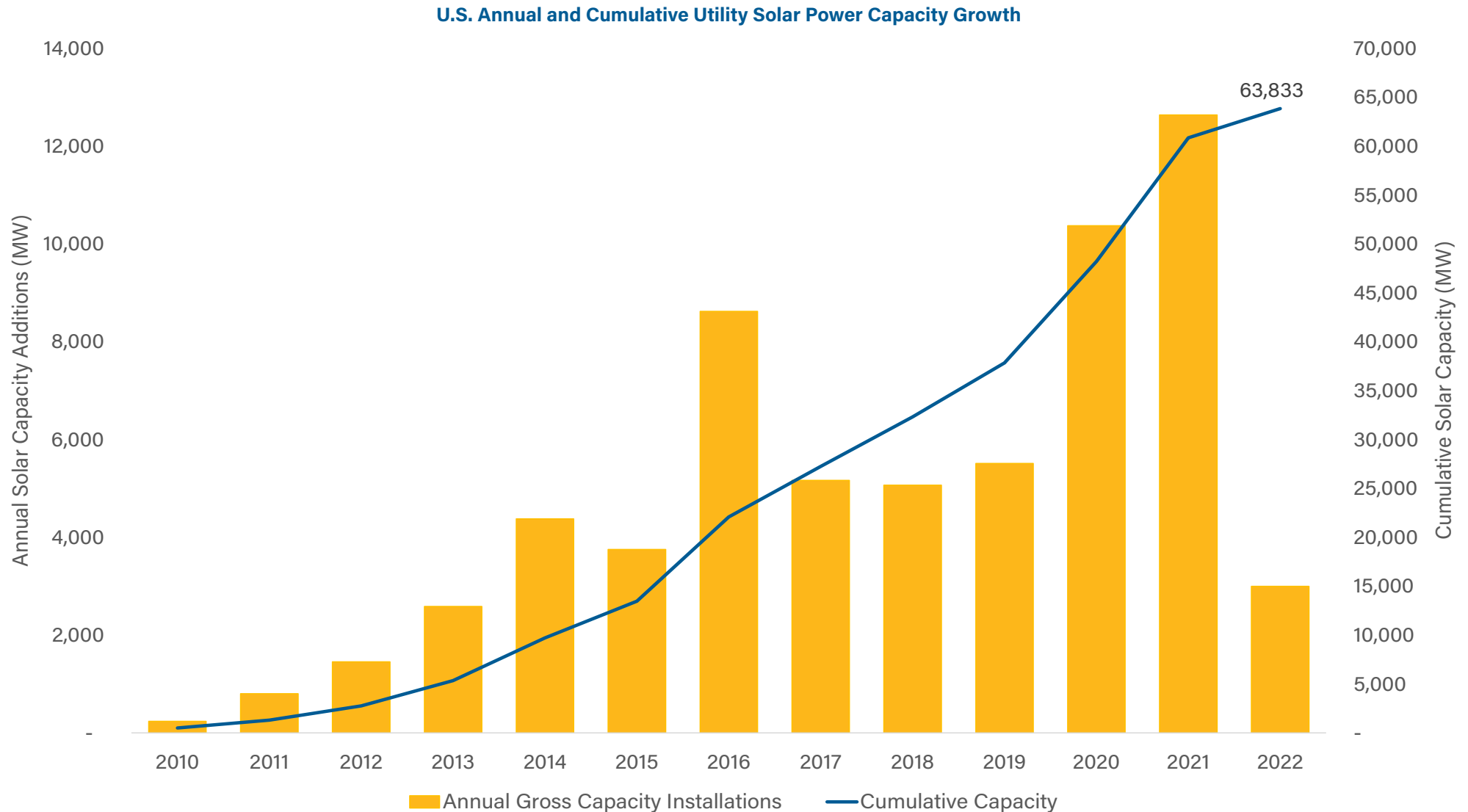
- 10 land-based wind projects came online in the first quarter with a total capacity of 2,865 MW.
- First quarter installations were down 3% compared to the first quarter of 2021 (2,956 MW installed).
- The capacity-weighted average size of project phases installed in the first quarter was 513 MW. This is an increase from the capacity weighted average size of 312 MW over the course of 2021, and 255 MW across 2020.
- The largest project to come online in the first quarter was the 998 MW Traverse Wind in Oklahoma. Traverse was the largest and final phase to start operations as part of the 1,484 MW North Central Energy Facilities. The other two phases of the Facilities are the 199 MW Sundance Wind and 287 MW Maverick Wind projects, both of which started operations in 2021. AEP acquired the Facilities from Invenergy, who developed the project.

U.S. Annual and Cumulative Wind Power Capacity Growth



Record Q1 solar installations

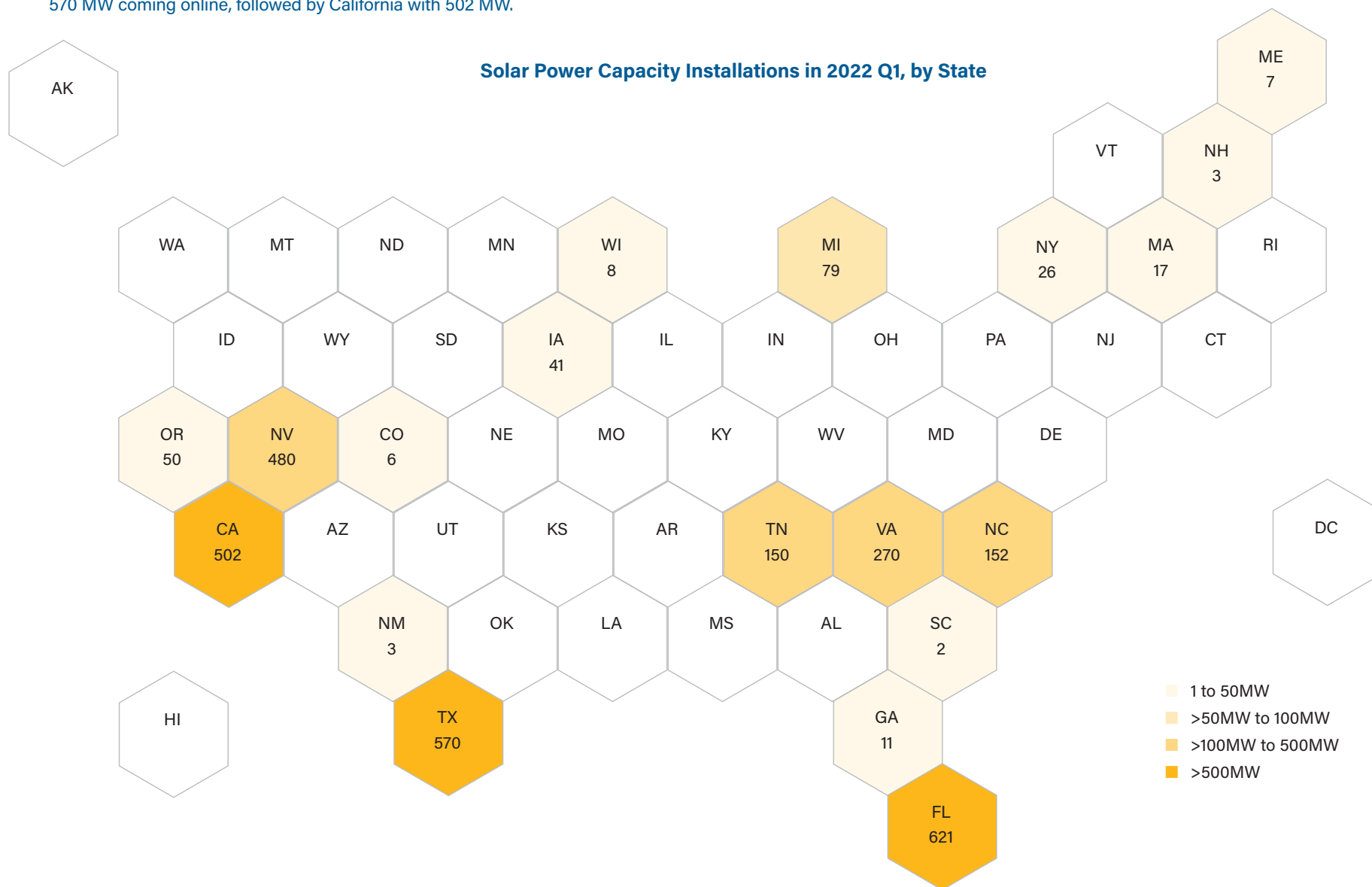
- In the first three months of the year solar developers installed 2,997 MW. Total online solar capacity is now 63,883 MW, a 5% increase from the end of 2021.
- Solar installs were up by 11% compared to the first quarter of 2021. In fact, this quarter is the highest first quarter for solar installs on record.
- Despite the increase in installs, over 2.8 GW of projects expected to come online in the first quarter were delayed. 86% were delayed to later in 2022, but the remaining 14% were pushed out into 2023 or later.



Nearly 3 GW of solar commissioned across the country

- Across 19 states 2,997 MW of solar capacity was installed in the first quarter. This includes 56 new projects.
- Florida overtook Texas, the typical leader, this quarter with more than 620 MW of new solar capacity coming online. Florida Power & Light, Gulf Power, and Tampa Electric Company brought 9 projects online in Florida in the quarter. Texas ranked second with 570 MW coming online, followed by California with 502 MW.
- Goldman Sachs' Slate solar was largest solar project to come online this quarter. The 300 MW project, developed by Recurrent Energy, is located in California and is paired with a 140 MW/561 MWh battery.

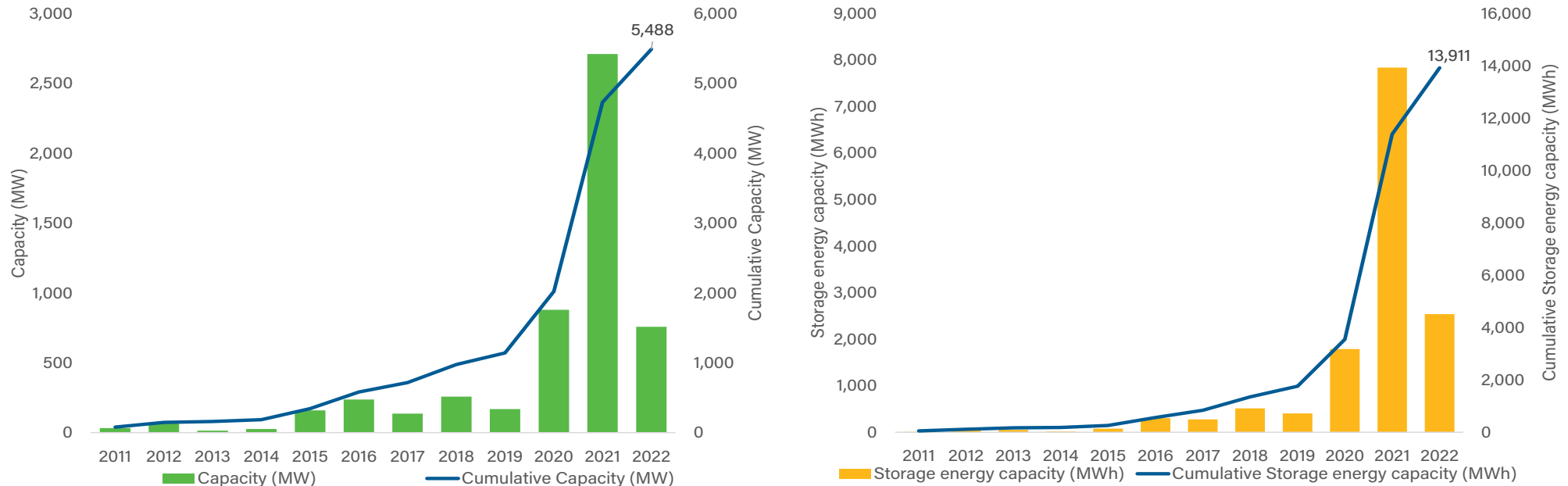
Solar Power Capacity Installations in 2022 Q1, by State



Rapid growth of battery storage industry continues

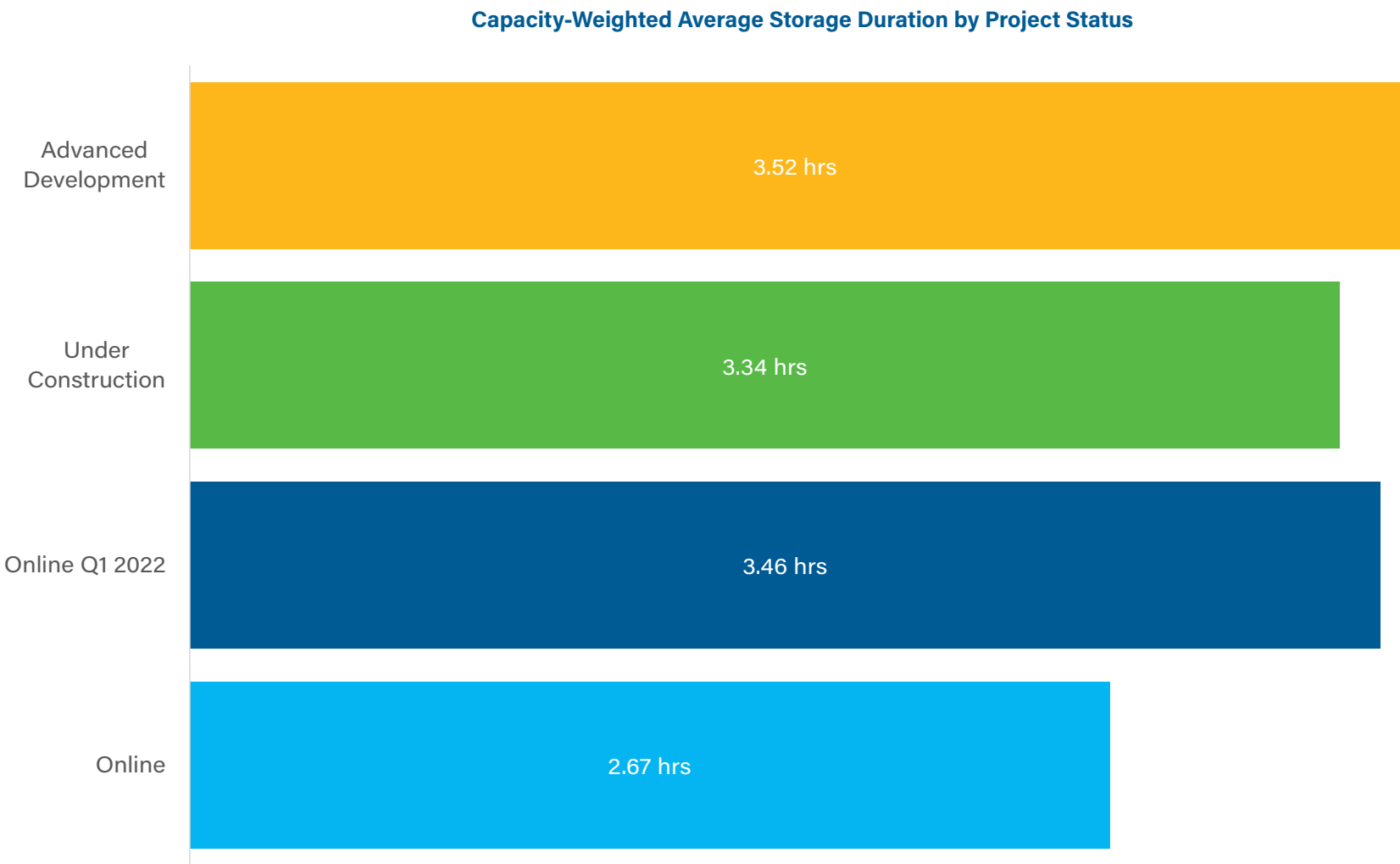
- 758 MW/2,537 MWh of new battery storage power capacity came online in the first quarter, bringing total operating capacity to 5,488 MW/13,911 MWh.
- First quarter 2022 installs represent a 173% increase compared to the same period last year. The storage industry has been experiencing the most rapid growth of any clean power technology, with an average of an over 50% increase in installed capacity annually over the last decade.
- Cumulatively, California has the most battery storage capacity online (2,632 MW), representing almost half of total operational storage capacity across the country. Texas is a distant second with 942 MW of battery storage capacity operating, followed by Florida with 469 MW.
- 34 standalone battery storage projects came online in the first quarter. 55% of the battery storage capacity that came online in the first quarter is part of a hybrid project. 47% of all operational storage capacity is part of a hybrid project.
- The Valley Center Battery Storage Project, owned and developed by Terra-Gen, was the largest stand-alone battery project to come online this quarter. Located in California, the project has a 140 MW battery system with a storage energy capacity of 560 MWh.

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



Storage duration increasing over time

- The average storage duration has increased by almost 2.5 hours over the past decade, increasing from 1 hour in 2012 to 3.46 hours in the first quarter of 2022.
- Projects in the pipeline have an average storage duration of 3.34 and 3.52 hours for projects under construction and in advanced development, respectively.
- There are now five projects online that have a storage duration of 8 hours: East Hampton Energy Storage Center (5 MW/40 MWh), ETT Presidio NaS Battery (4 MW/32 MWh), Montauk Energy Storage Center (5 MW, 40 MWh), Nantucket Storage (6 MW/ 48 MWh), and Northwest Ohio Storage (0.8 MW/ 3.4 MWh).





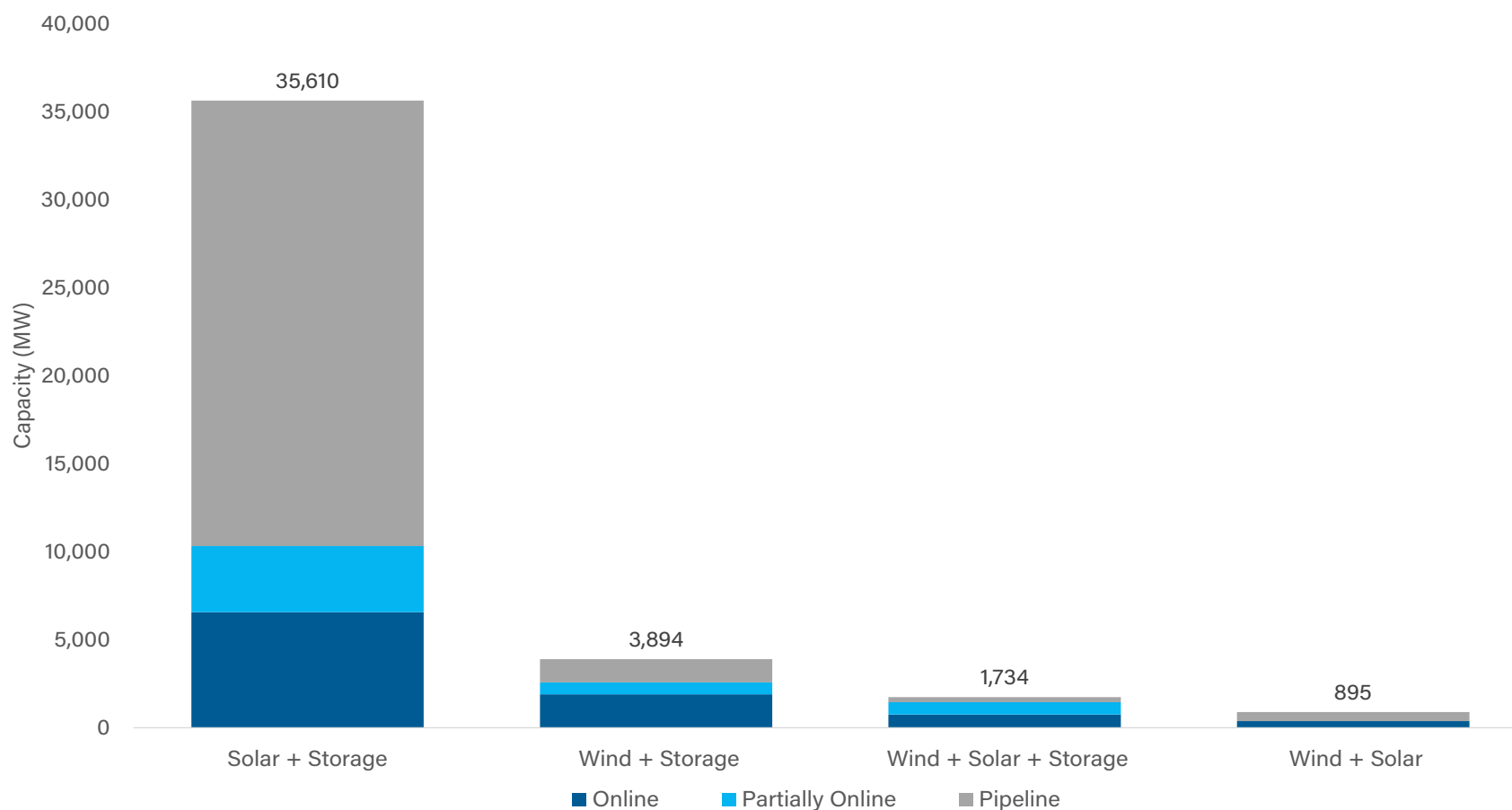
Hybrid Projects



Nearly 1.4 GW of hybrid projects installed in Q1

- This quarter 1,375 MW of hybrid project capacity came online. The vast majority, 1,295 MW, was from solar + storage projects. This is a significant jump from Q1 of last year when only 92 MW of hybrid projects came online.
- 9,584 MW of hybrid projects are fully operational, meaning all technologies and phases are online. 5,141 MW sit in the partially online stage, meaning one or more technologies is operating, but other phases are still in development. Finally, there is over 27,400 MW of hybrid capacity in the pipeline.
- Slate Solar + Storage was the largest hybrid project to come online this quarter. Owned by Goldman Sachs and located in Kings County, California, the project includes 300 MW of solar capacity and 140 MW/561 MWh of battery storage capacity.
- The solar and storage portions of NextEra's Wheatridge hybrid project located in Oregon came online this quarter. The nearly 300 MW wind portion of the project came online at the end of 2020 and is now paired with 50 MW of solar and 30 MW/120 MWh of battery storage.

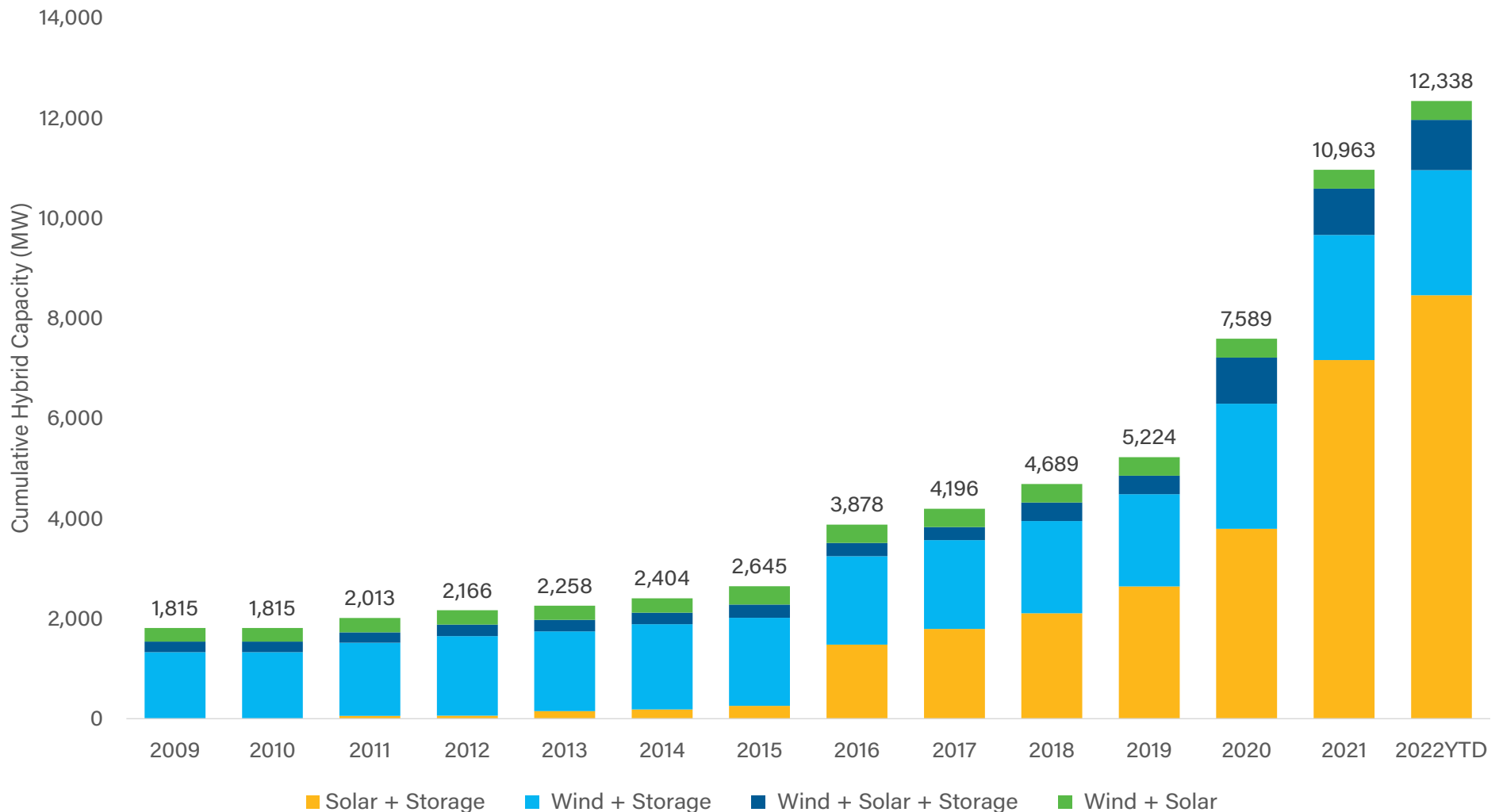
Hybrid Power Projects



Operating hybrid capacity tops 12 GW

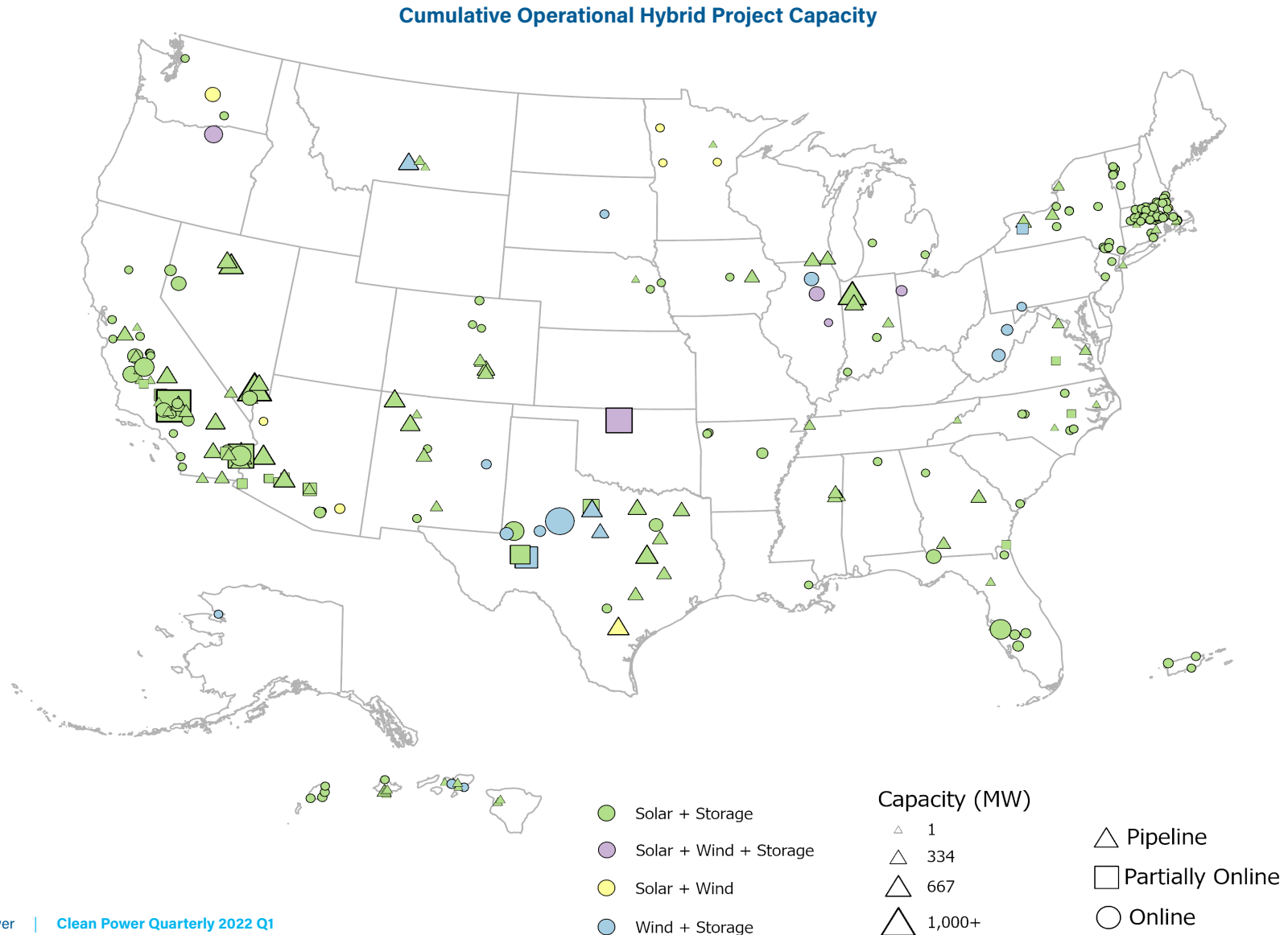
- There are now 12,338 MW of hybrid project capacity operating across the country, a 13% increase from the end of 2021. This includes fully operational hybrid projects and the operational portions of partially online projects.
- Initially, wind paired with storage was the most common type of hybrid project, until 2017 when solar + storage stole the first-place ranking. No new wind + storage projects have come online since 2020.
- There is currently 8,458 MW of solar + storage project capacity operating, 2,500 MW of wind + storage, just over 1,000 MW of wind + solar + storage, and 377 MW of wind + solar.

Cumulative Operational Hybrid Project Capacity



35 states with operational hybrid projects

- California, with 3,809 MW of solar + storage capacity online, leads the nation for operational hybrid projects. Texas is a close second with 3,127 MW of hybrids online and has both solar + storage and wind + storage projects operating. Nevada, another exclusively solar + storage state, sits in third with 771 MW.
- California also leads the pipeline, with 9,334 MW in development. Nevada outranks Texas in the pipeline by only 12 MW, with 3,866 MW of solar + storage in development.
- Only three states, Montana, Texas, and New York, have wind + storage projects in development, and only two, Arizona and Oklahoma, have wind + solar + storage projects in the pipeline. Texas is the only state with wind + solar projects in development.





Appendices



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 off-take 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.

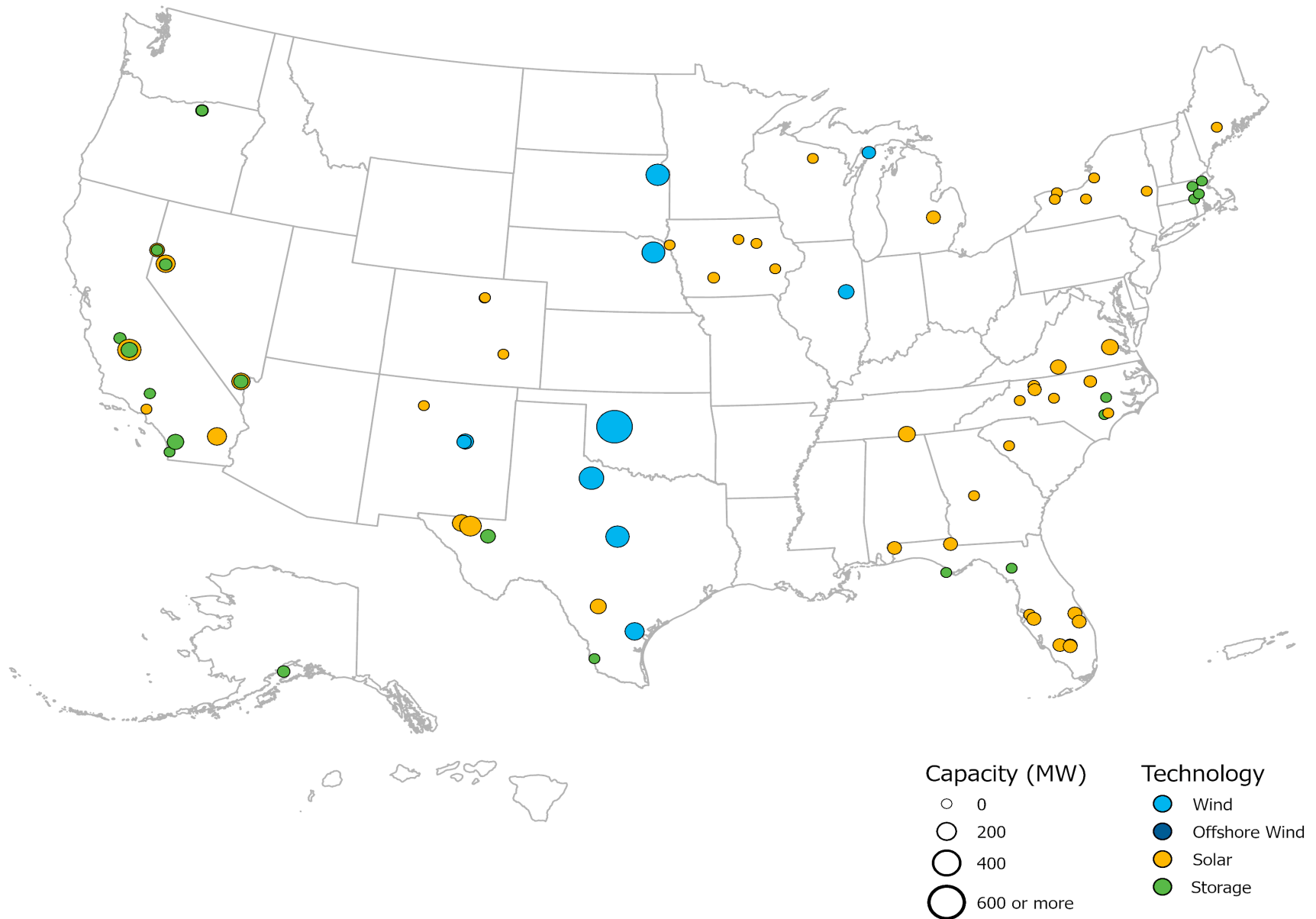
Repowered: Full or partial equipment replacement. Currently only wind repowering activity is tracked, but ACP will expand repowering activity tracked as the market progresses.

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.

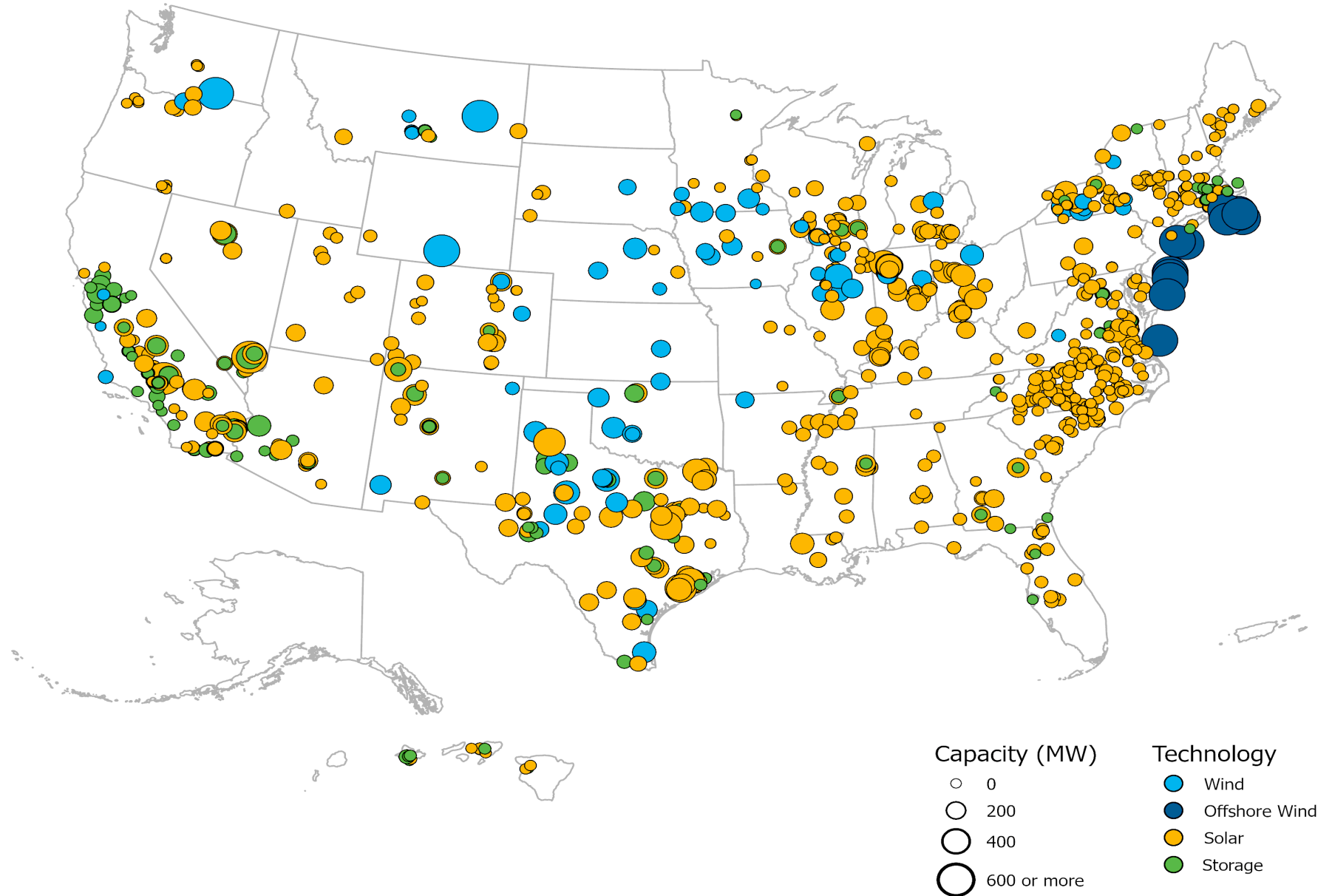
Acronyms

| | |
|----------------|---------------------------------|
| AC | Alternating Current |
| C&I | Commercial & Industrial |
| DC | Direct Current |
| GW | Gigawatts |
| GWh | Gigawatt hours |
| ILR | Inverter Loading Ratio |
| IOU | Investor-Owned Utility |
| MW | Megawatts |
| MWh | Megawatt hours |
| OEM | Original Equipment Manufacturer |
| PPA | Power Purchase Agreement |

Projects online in 2022 Q1



Projects in the pipeline





American Clean Power is the voice of companies from across the clean power sector that are powering America's future, providing cost-effective solutions to the climate crisis while creating jobs, spurring massive investment in the U.S. economy and driving high-tech innovation across the nation. We are uniting the power of America's renewable energy industry to advance our shared goals and to transform the U.S. power grid to a low-cost, reliable, and renewable power system. Learn more about the benefits clean power brings to America at www.cleanpower.org.



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