Clean Power Quarterly

2021 Q4

AMERICAN CLEAN POWER®

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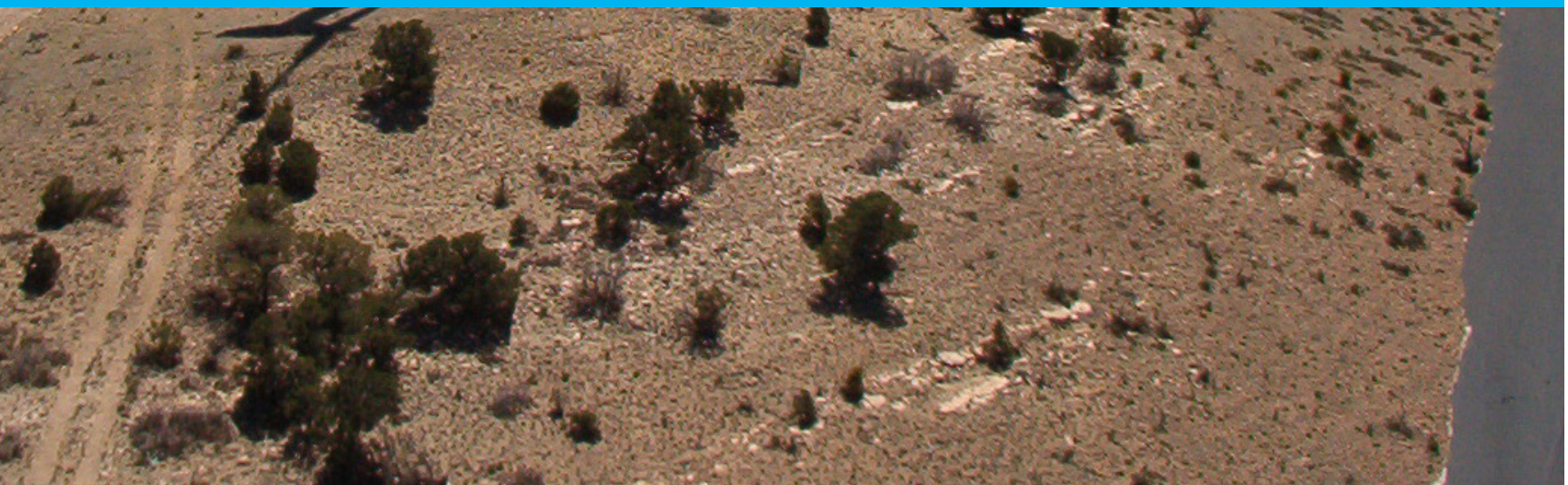
2021 Q4 Highlights



2021 Q4 Highlights

Clean Power Project Installations

- The clean power industry installed 27,723 MW of utility-scale clean power capacity in 2021 after adding 10,520 MW in the final quarter of the year. Annual installations were down 3% compared to 2020 volumes, placing the year second all-time in terms of new capacity additions.
- Project owners commissioned 606 new project phases in 43 states and DC in 2021, including 168 new phases in the fourth quarter. Texas led with 7,352 MW installed in 2021, followed by California (2,697 MW), Oklahoma (1,543 MW), Florida (1,382 MW), and New Mexico (1,374 MW).
- Wind led solar and battery storage power capacity quarterly installations with 5,409 MW brought online. In 2021, wind installations totaled 12,747. MW. The solar industry added 3,937 MW in the fourth quarter and 12,364 MW total in the year. Battery storage installations ramped up in the fourth quarter to 1,173 MW—the first quarter ever with battery storage installations over 1 GW. For the fullyear, battery storage installations totaled 2,599 MW, outpacing 2020 by over 1.5 GW.
- There are now over 200 GW of clean power capacity operating in the country, enough to power 56 million homes in the U.S.

Clean Power Capacity Under Construction and in Advanced Development

- As of the end of 2021, the near-term development pipeline consisted of 1,080 project phases with a total capacity of 120,171 MW. This includes 37,802 MW under construction and 82,369 MW in advanced development. For reference, the development pipeline is 47% (nearly 38,500 MW) larger than at the end of 2020.
- In the fourth quarter, 6,988 MW of projects began construction, and 14,803 MW entered advanced development status.
- The pipeline is comprised of 55% solar, 20% land-based wind, 15% offshore wind, and 10% battery storage.
- Texas is the top state in terms of capacity in the pipeline with 19,918 MW. California comes in second with 13,663 MW in the pipeline, then New York with 7,831 MW, Indiana with 5,874 MW, and finally Virginia with 5,836 MW.*
- This strong pipeline is not without challenges. Supply chain constraints continue to impede project timelines, rising costs pressure project economics, and long, slow interconnection queues slow progress. For solar, a so far elusive resolution to the Withhold Release Order (WRO) threatens to further delay projects or even lead to their cancellation.

Clean Power Procurement Activity

- The industry announced 5,765 MW of new Power Purchase Agreements (PPAs) in the fourth quarter, bringing full-year PPA announcements to 28,126 MW. Overall announcements in 2021 outpaced 2020 by 10%, or over 2,600 MW.
- Corporate customers continue to seek PPAs. This buyer pool announced 1,871 MW of corporate PPAs in the fourth quarter, bringing full-year corporate PPA announcements to 11,756 MW—a record. Corporate PPA activity in 2021 exceeded 2020 announcements by 21% (over 2,000 MW).
- Solar projects are dominating PPA announcements, accounting for over 70% of the PPAs announced in 2021, followed by wind with 18% and storage with 11%.
- For projects coming online in 2021, the majority, 17,208 MW, are operating with PPAs. Utilities directly own 4,438 MW of newly installed capacity while 1,052 MW are contracted under green tariff programs and 446 MW are selling directly into the merchant market. The remaining 4,526 MW have not disclosed an offtake mechanism to ACP.

* 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.

Solar capacity is reported in MWac units.

Clean Power Capacity Growth

Clean power installations near 28 GW in 2021

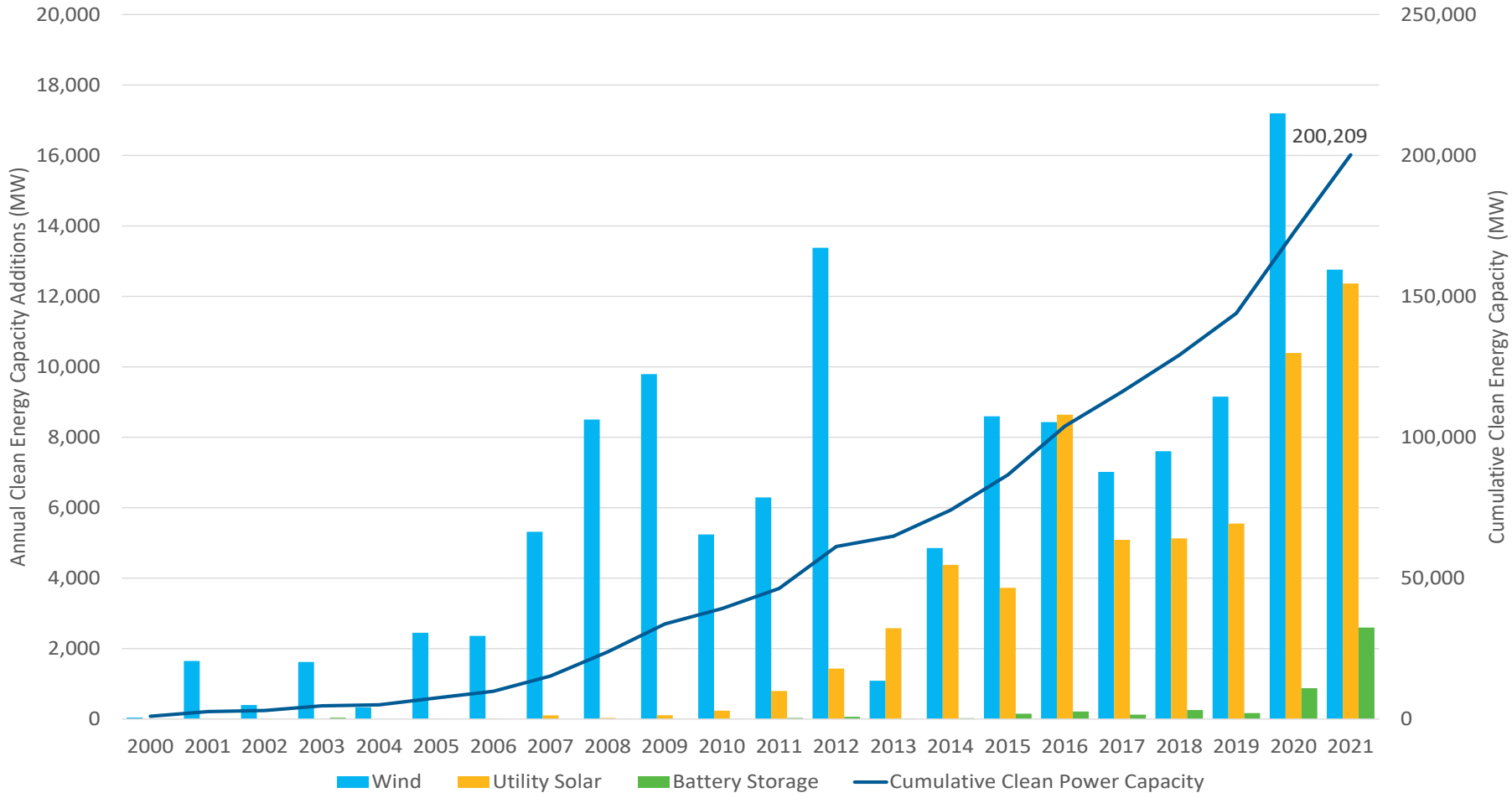
2021 installations

- In 2021, 27,723 MW came online, the second highest year for clean power installs after 2020. Newly installed capacity in 2021 is made up of 606 projects spread across 43 states and DC.
- 2021 utility solar and battery storage installations outpaced 2020 by a considerable margin, with solar installs increasing by 19% and storage by 196%. Wind installs were down by more than 25% compared to a record year in 2020. It was the third most active year for wind installation, behind 2020 and 2012.

Clean Power surpasses 200 GW

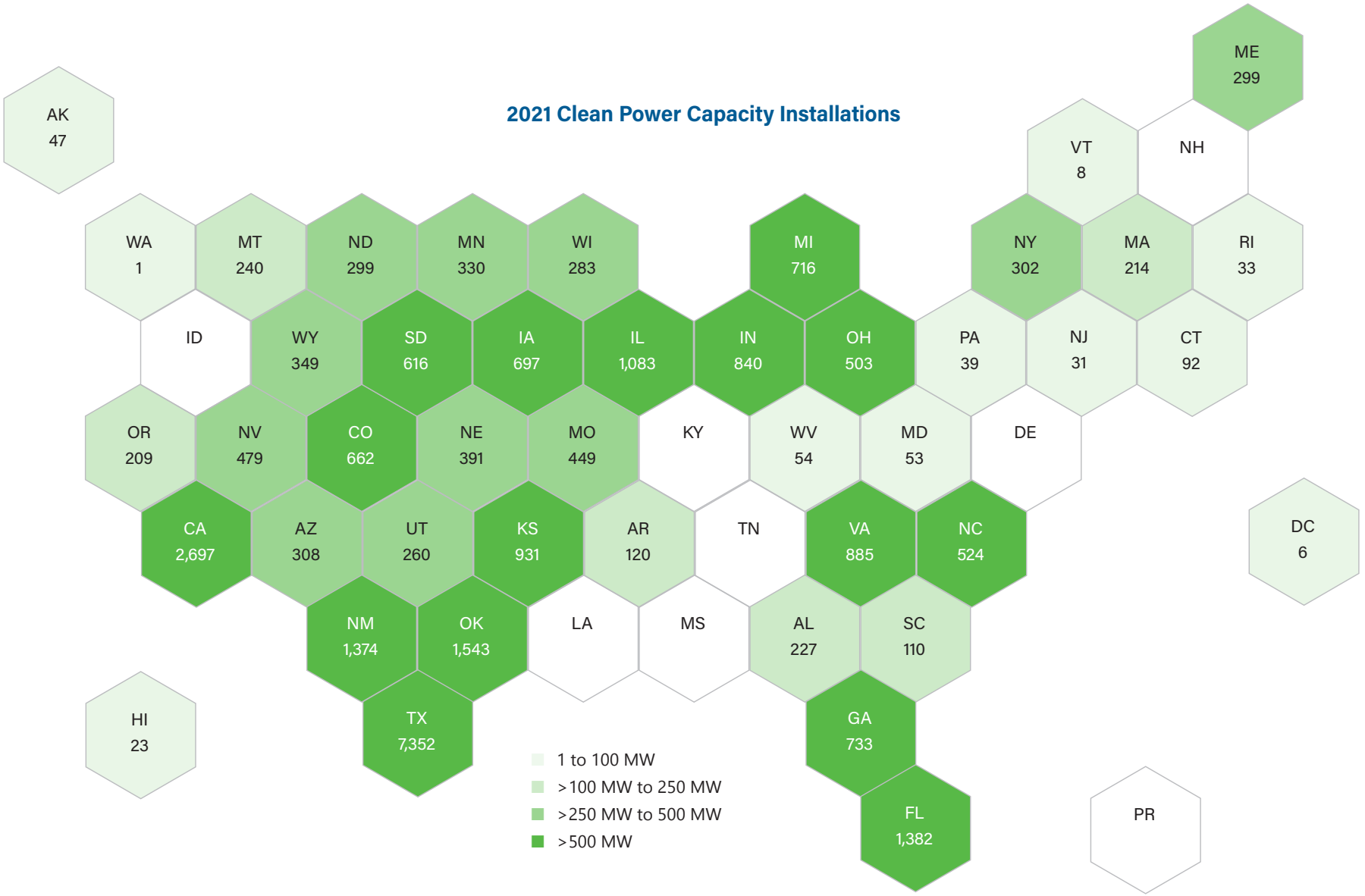
- As of the end of 2021, there is 200,209 MW of clean power operating in the U.S.
- Land-based wind makes up the largest share of online capacity, accounting for 67% (134,996 MW) of total online capacity. Solar represents 30% of installed capacity with 60,583 MW and battery storage captures the final 2%, or 4,588 MW (10,839 MWh).

U.S. Annual and Cumulative Clean Energy Capacity Growth



Nearly 28 GW of clean power added to the grid in 2021

- In 2021, 606 clean power project phases were commissioned, totaling 27,723 MW across 43 states and DC.
- Texas once again led clean power additions in 2021 with 7,352 MW coming online. California installed 2,697 MW this year, followed by Oklahoma with 1,543 MW, Florida with 1,382 MW, and New Mexico with 1,374 MW



Quarterly clean power capacity growth

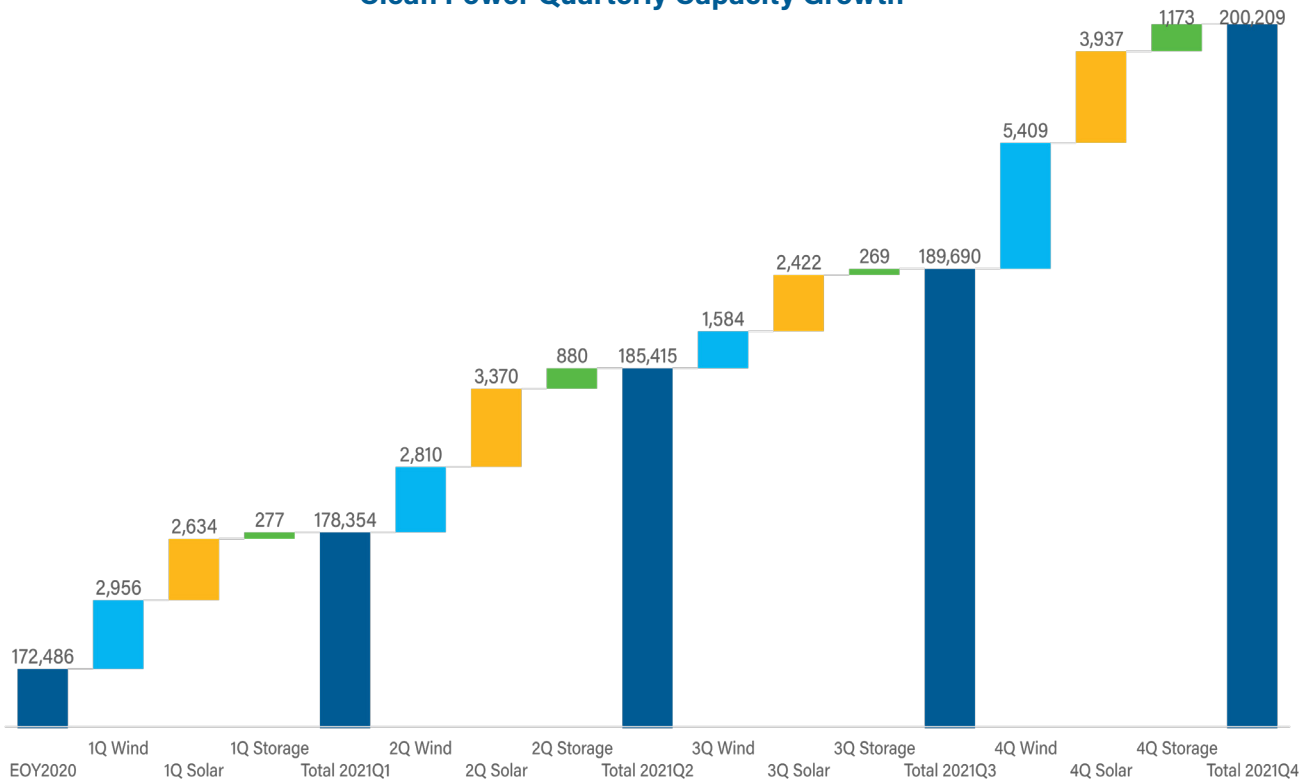
Fourth quarter installs down 34% compared to the same period in 2020

- Despite outpacing 2020 volumes through September, clean power installations slowed in the fourth quarter compared to the same period a year ago. The industry commissioned 10,520 MW of wind, utility solar, and battery storage capacity in the final three months of 2021, down 34% from the 15,864 MW built in the fourth quarter of 2020.
- Several projects simply pushed timelines and are expected online in early 2022. Others continue to battle supply chain constraints, trade barriers, rising costs, and other challenges.
- Land-based wind was the technology with the highest installs in 2021, with 5,409 MW coming online in the last three months, bringing 12,747 MW online for the full year.
- Utility solar finished the year with 3,937 MW coming online, bringing total 2021 installations to 12,364 MW.
- Battery storage finished the year with its highest quarterly installations to date—1,173 MW of battery storage came online in the fourth quarter. Total 2021 additions settled at 2,599 MW. By comparison, only 878 MW of battery storage capacity came online in 2020.
- This year-over-year decrease in fourth quarter deployment is primarily due to wind, which was down almost 50% compared to record fourth quarter installations in 2020. Fourth quarter solar installations also declined compared to 2020—off by 14%. Battery storage was the only technology to notch an increase, growing 176% over 2020 fourth quarter installations.

Top owners of Q4 installations

- Clean energy project owners brought 168 projects online in the fourth quarter of 2021. NextEra brought the most capacity online during the quarter, with 2,731 MW across 18 project phases. Canadian Pension Plan Investment Board came in second with 1,056 MW coming online, followed by Enel with 697 MW online and BP with 502 MW online this quarter.
- Four different clean power owners brought over 500 MW online this year, and 25 brought over 100 MW online.

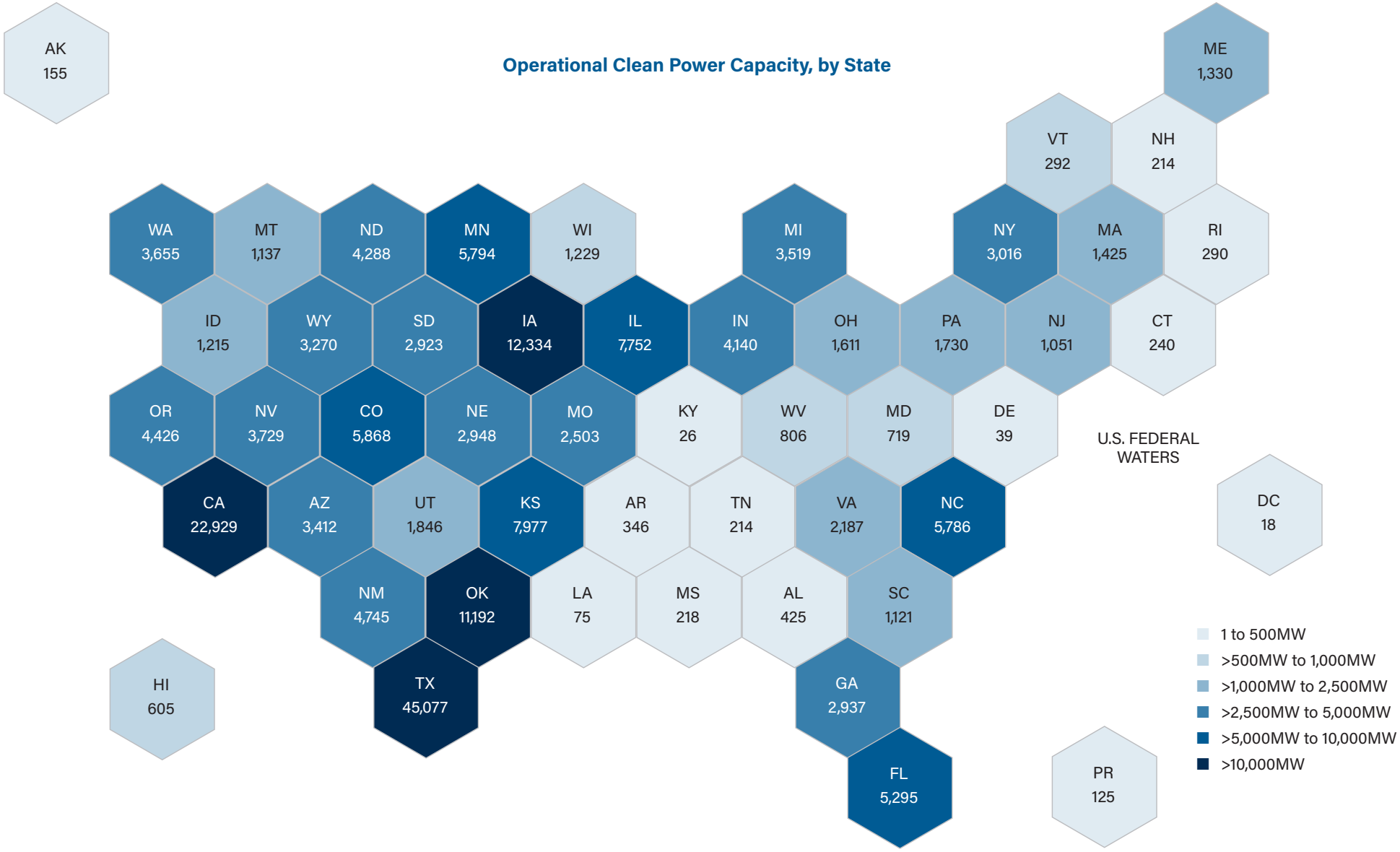
Clean Power Quarterly Capacity Growth



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

Operational clean power capacity

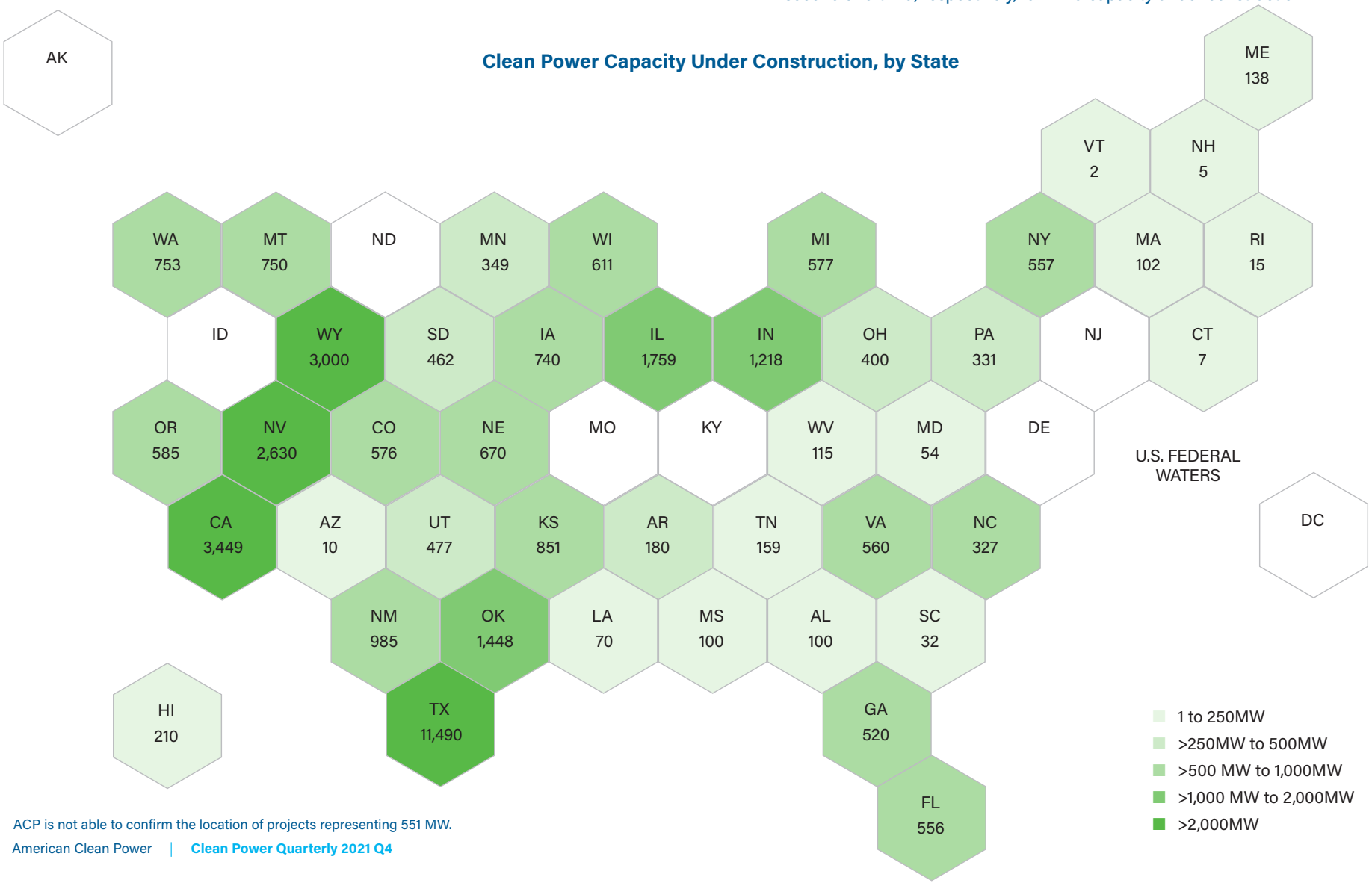
- Over 27.7 GW of clean power capacity was installed in 2021, bringing total online capacity to 200,209 MW, enough to power the equivalent of 56 million homes.
- Currently 4 states have over 10,000 MW installed, 10 have over 5,000 MW, and 35 have over 1,000 MW online.



Project construction pipeline

- There were 37,802 MW of clean power projects under construction as of the end of 2021.
- Total construction activity spans 390 project phases in 43 states.
- In the fourth quarter, 93 project phases totaling 6,988 MW across 24 states started construction.
- Of the 6,988 MW that started construction this quarter, 62% were solar, 29% were wind, and 9% were storage.
- While Texas is the leading state for total capacity under construction (11,490 MW), California saw the largest uptick in projects entering the construction phase in the fourth quarter, adding 1,153 MW. California is also second in terms of total capacity under construction with 3,449 MW. Wyoming is a close third with 3,000 MW under construction, followed by Nevada with 2,360 MW under construction.
- Texas leads the country across all three technologies for capacity under construction, with California coming in second for solar and storage. Nevada sits in third in terms of both solar and storage capacity under construction. Wyoming and Oklahoma come in second and third, respectively, for wind capacity under construction.

Clean Power Capacity Under Construction, by State

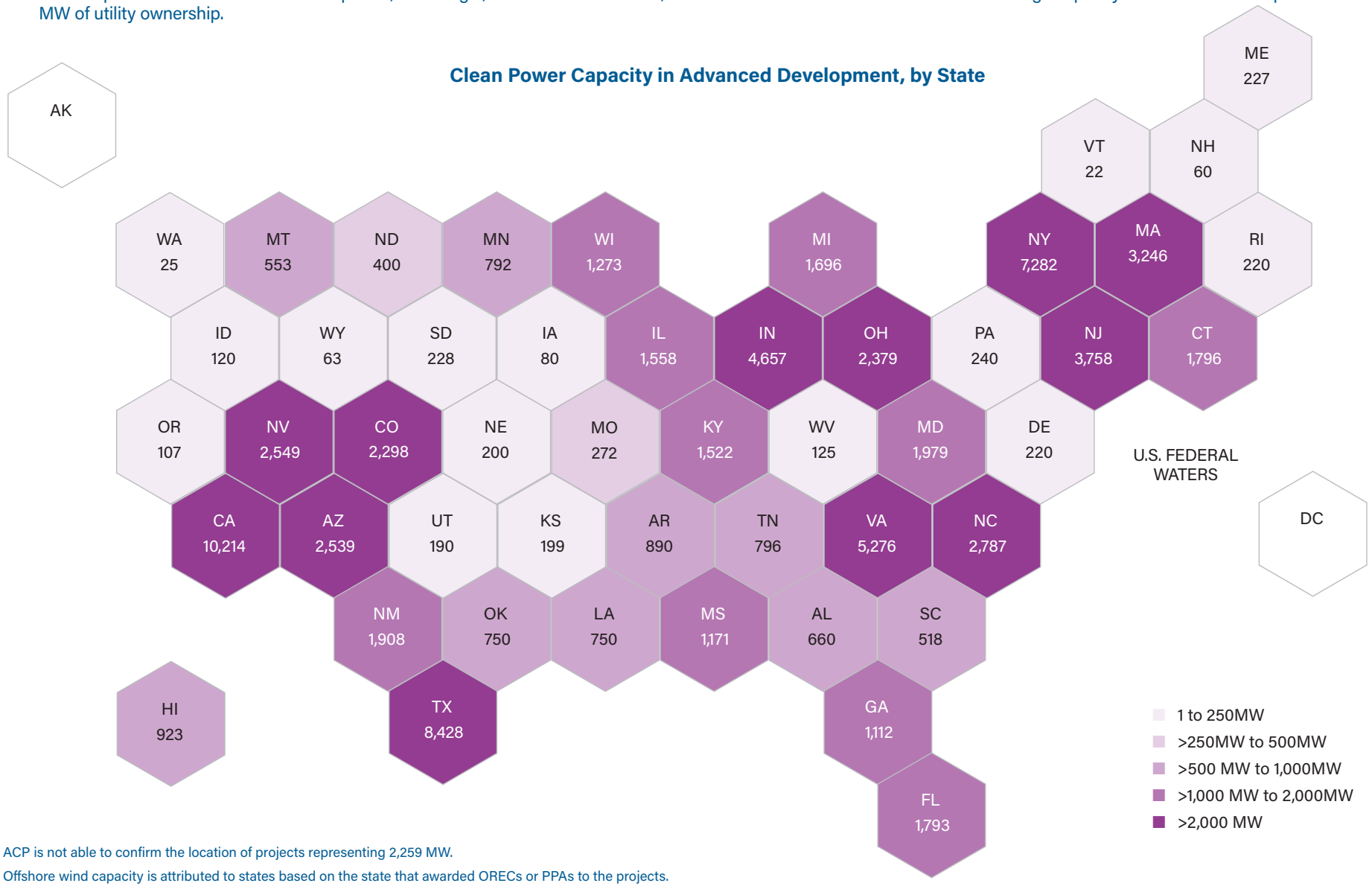


ACP is not able to confirm the location of projects representing 551 MW.

Advanced development activity

- As of the end of December, project developers reported 82,369 MW of clean power capacity in advanced development.
- In the fourth quarter, 14,803 MW entered the advanced development phase, a 4,810 MW (48%) increase from the third quarter. This was driven in part by the large volume of clean power offtake announced this quarter, including 5,765 MW of PPAs and 3,536 MW of utility ownership.
- Solar continues to dominate the pipeline, accounting for 56% of capacity in advanced development, followed by offshore wind (19%), land-based wind (13%), and battery storage (12%).
- Texas is still leading the country for wind capacity in advanced development, but California leads for solar and storage capacity in advanced development.

Clean Power Capacity in Advanced Development, by State



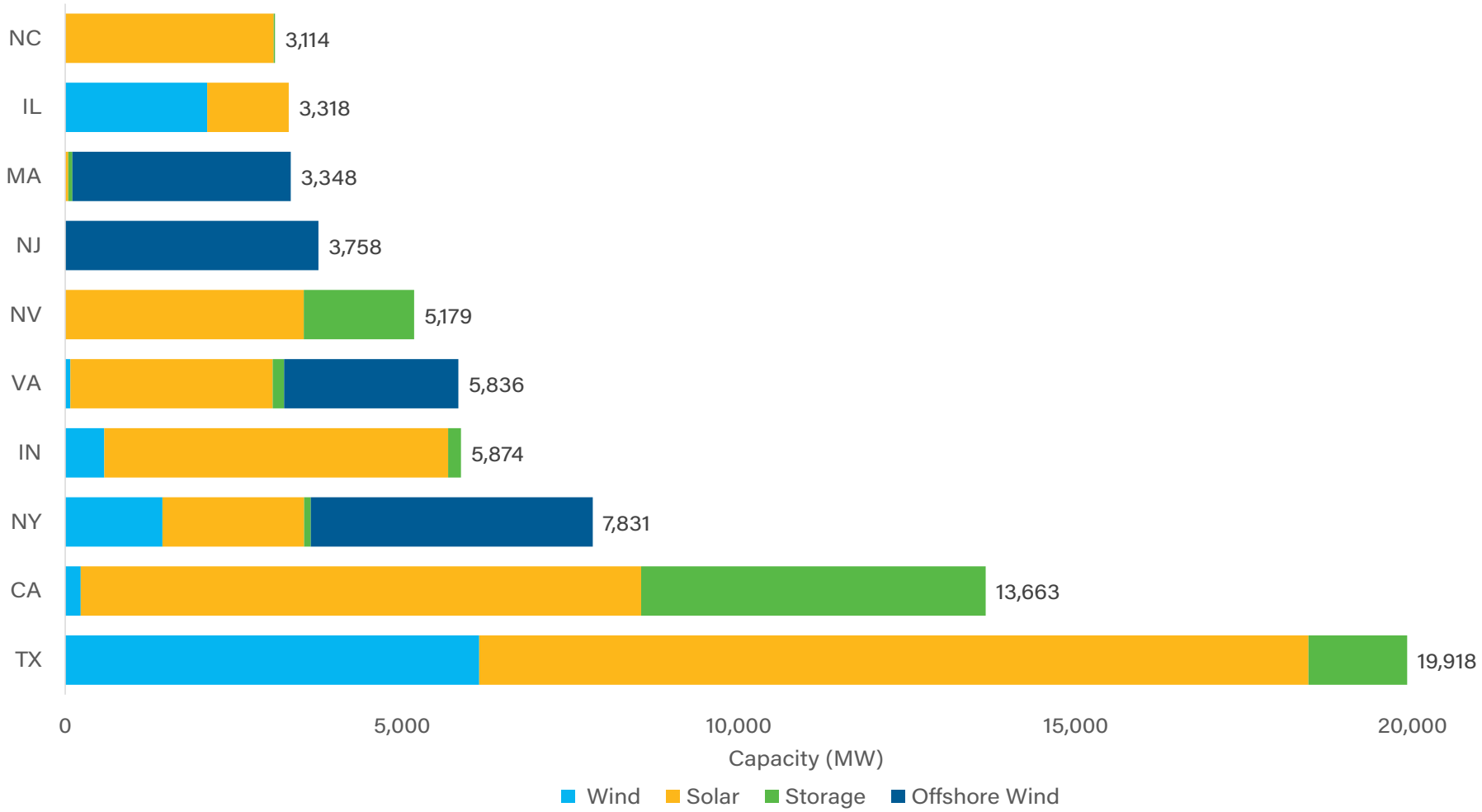
ACP is not able to confirm the location of projects representing 2,259 MW.

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

Clean power project pipeline

- The pipeline of 120,171 MW is geographically diverse, spread across 49 states.
- On a regional basis, Texas has the most capacity in the pipeline, accounting for 17% of the total pipeline (19,918 MW). The Mountain West makes up 14% (17,225 MW) of the pipeline, followed by the Midwest with 13% (15,582 MW), and the Mid-Atlantic with 13% (15,436 MW).
- Currently, six states—Texas, California, New York, Indiana, Virginia, and Nevada—have more than 5,000 MW in the pipeline.

Top States of Projects Under Construction and in Advanced Development



Clean power project pipeline

Wind

- Land-based wind makes up 20%, or 23,868 MW, of the pipeline. Offshore wind makes up an additional 15% (17,458 MW) of the pipeline.
- Texas is the leading state for total land-based wind in the pipeline (6,145 MW), as well as the highest increase in pipeline capacity in the fourth quarter (1,592 MW).
- Wyoming has the second most land-based wind capacity underway with 3,000 MW, followed by Illinois with just over 2,100 MW, and Oklahoma with 1,748 MW.
- While most offshore wind projects are based in federal waters, the power from these projects will be delivered to multiple states along the East Coast. Based on state of power delivery, New York has the most offshore capacity in advanced development with 4,186 MW. New Jersey comes in second with 3,758 MW, Massachusetts is third with 3,242 MW, and Virginia sits in fourth with 2,587 MW.

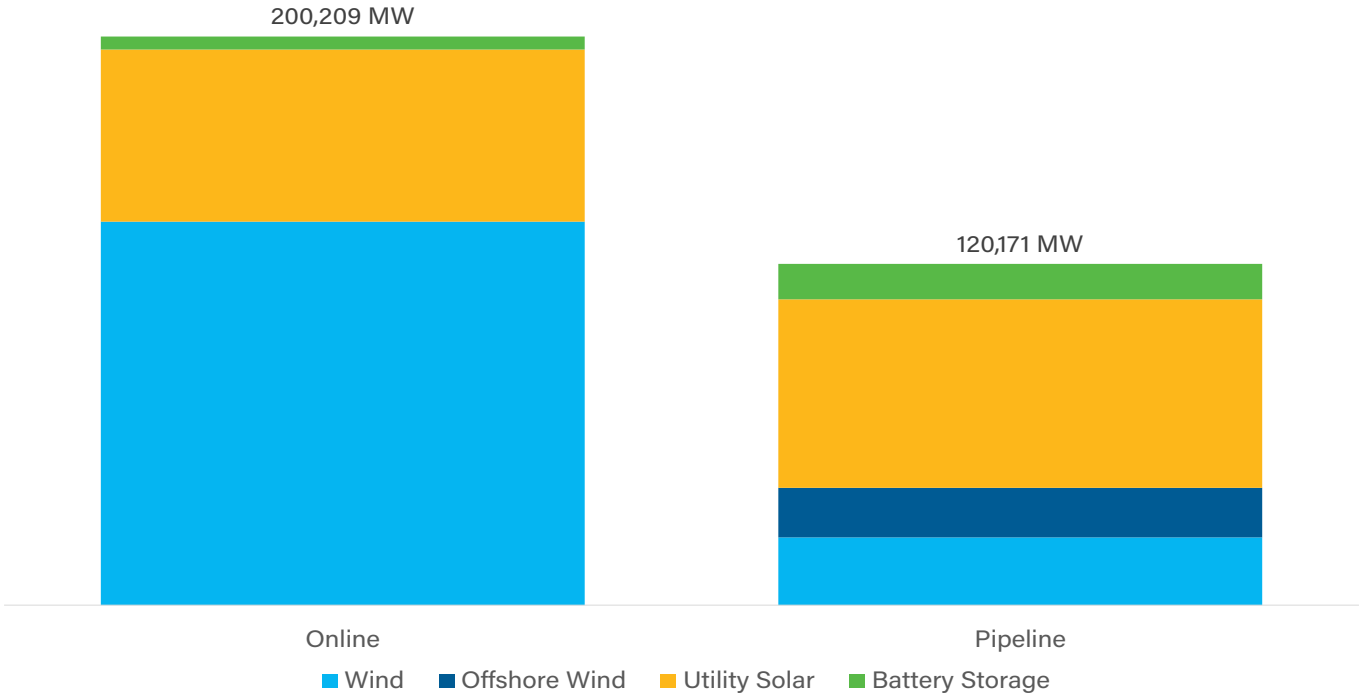
Solar

- Utility solar makes up the largest portion of the pipeline, 55%, with 66,344 MW under construction or in advanced development.
- Texas is now home to the most utility solar in development with 12,308 MW. California has 8,318 MW of utility solar capacity in the pipeline, followed by Indiana with 5,104 MW and Nevada with 3,541 MW.
- The solar pipeline increased 11% from the third quarter. Nonetheless, supply chain and trade barriers continue to threaten to significantly delay or even lead to the cancellation of projects, especially those unable to take delivery of modules due to product detainment at ports.

Storage

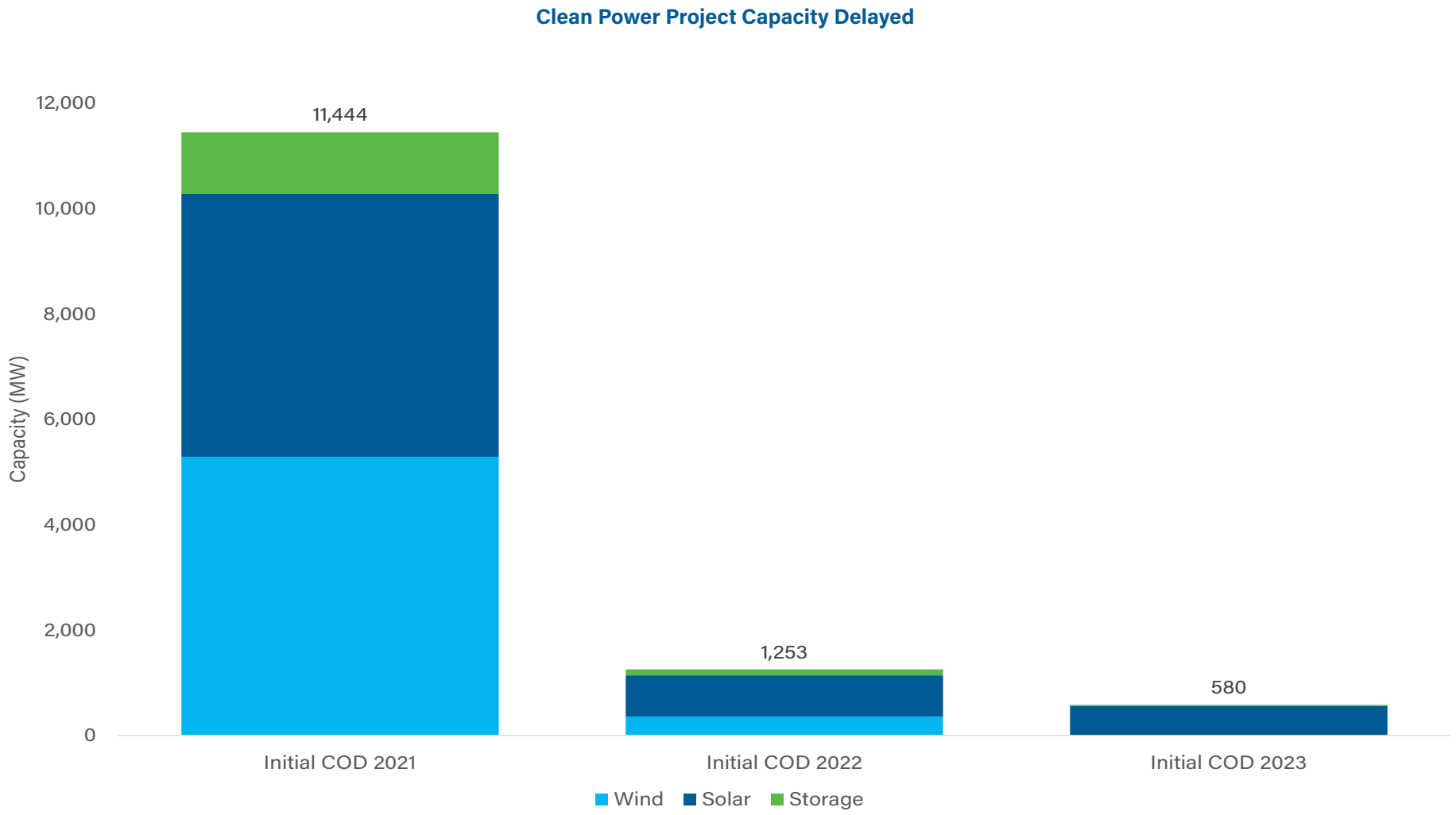
- As of the end of the year, there is 12,501 MW, or 32,127 MWh, of battery storage capacity in development, representing 10% of the total pipeline. Approximately 30% of the battery storage pipeline is under construction, and 70% is in advanced development.
- There are 187 storage project phases in the pipeline spread across 20 states. 48 of the pipeline storage projects are standalone storage, and 139 are hybrid storage projects.
- California has the most storage capacity in the pipeline with 5,114 MW, followed by Nevada (1,638 MW), Texas (1,465 MW), Arizona (1,206 MW), and Hawaii (570 MW).

Clean Power Capacity Online and in the Pipeline



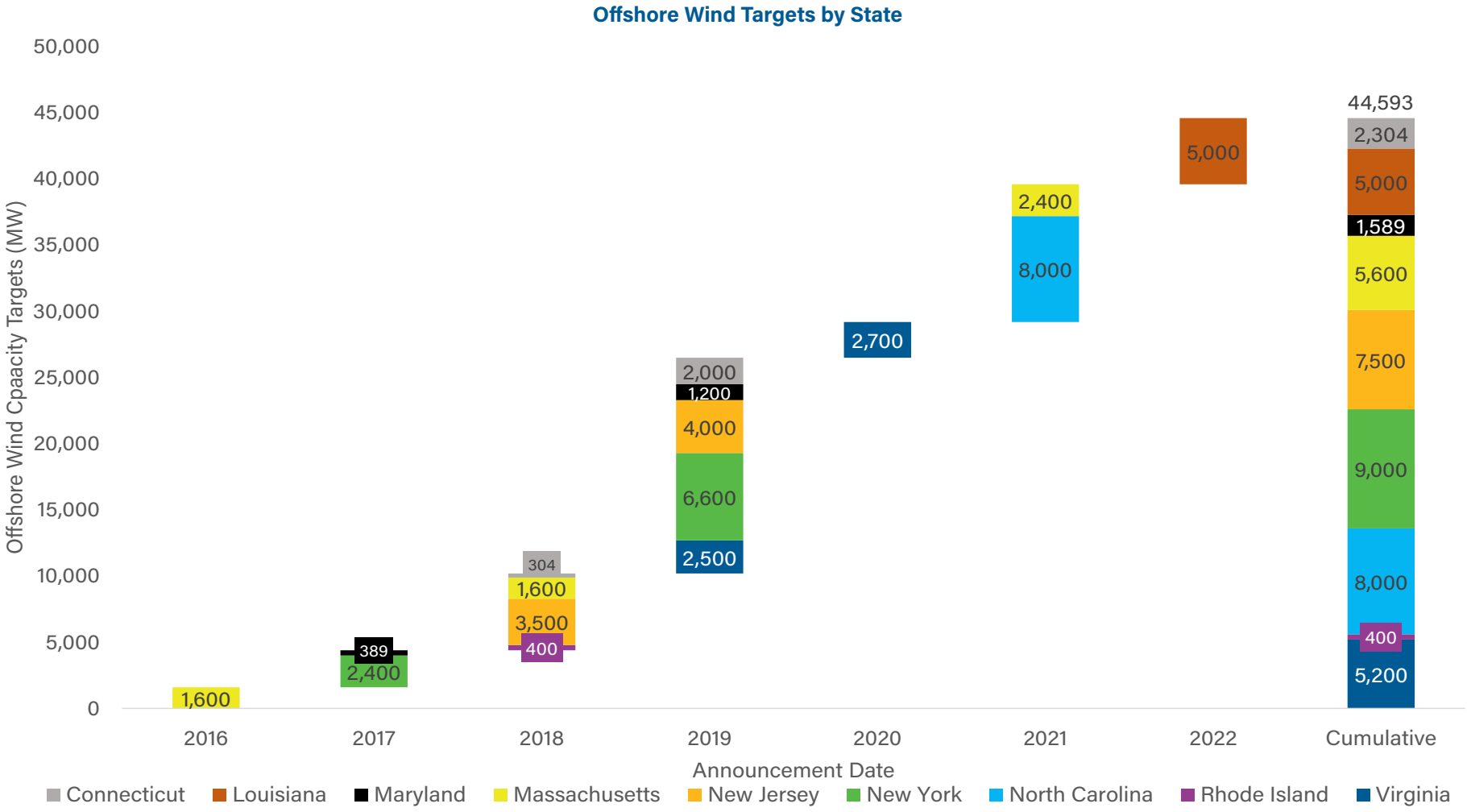
Clean power pipeline delays

- In the fourth quarter, project owners and developers reported over 13.2 GW of project capacity where the expected commissioning date was moved back. Almost half (48%) of the delayed capacity was solar projects, while 42% was wind, and 10% was battery storage.
- 11,443 MW of capacity expected online in 2021 was delayed. 7,990 MW was delayed to 2022, in many cases to the first quarter of the year. 653 MW is now expected to come online in 2023, and 180 MW in 2024. A further 2,202 MW were indefinitely delayed.
- Projects with expected commissioning dates in 2022 and 2023 were also impacted. Over 1,250 MW of clean power capacity that was excepted online in 2022 was delayed to either 2023 or 2024, and 580 MW expected online in 2023 experienced delays.



Solicitation Updates – A Record Year for OSW Procurement

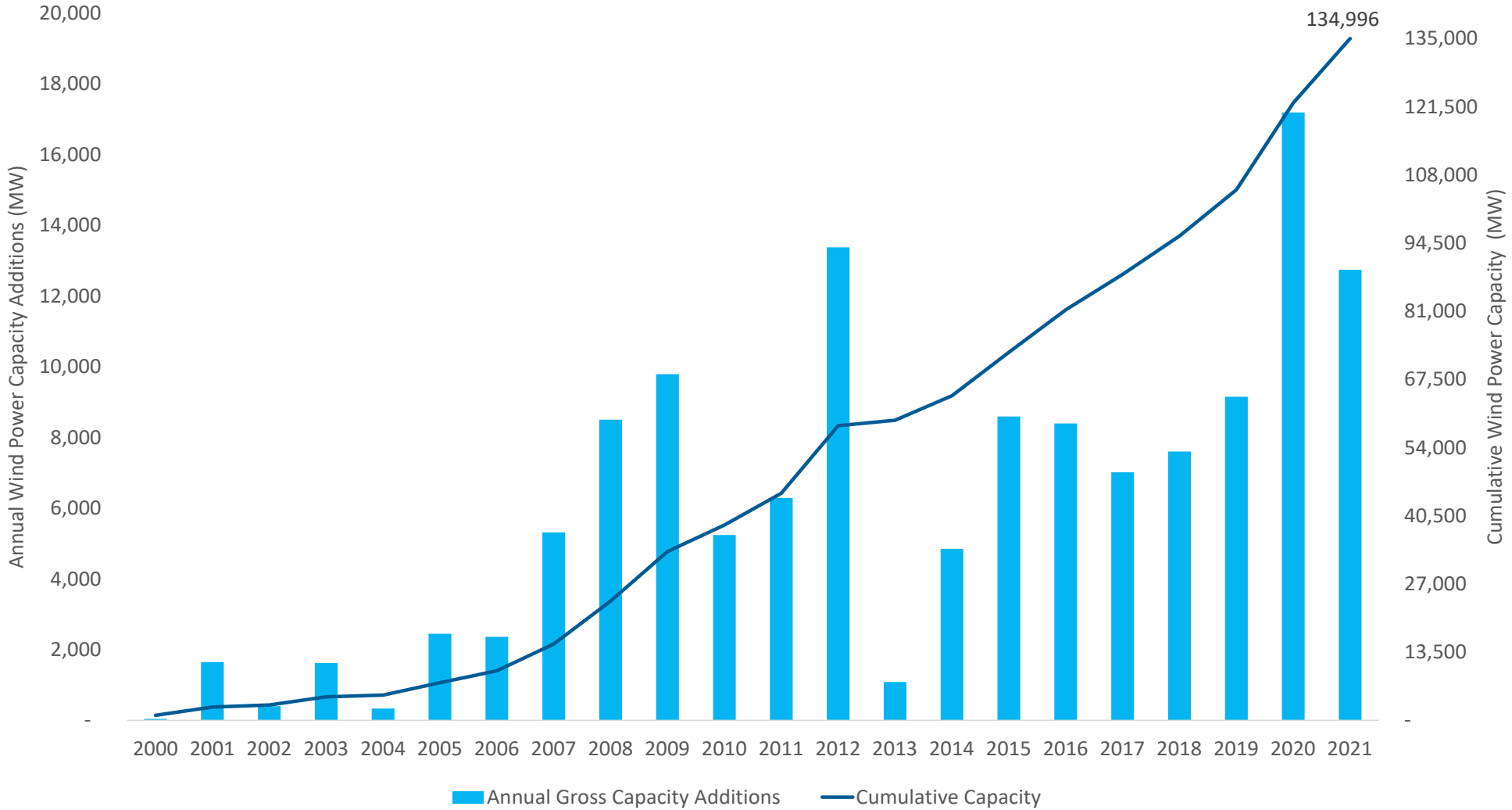
- Ørsted's 846 MW Skipjack Wind 2 project will power 250,000 Delmarva (Delaware-Maryland-Virginia) homes and will be constructed with the developer's previously awarded Skipjack Wind 1 project (120 MW). The project is expected to come online in 2026. Skipjack Wind 2 brings a commitment from Hellenic Cables to construct the US's first fully integrated subsea array cable manufacturing facility in Maryland and will facilitate the construction of an offshore wind tower manufacturing facility in the state. US Wind's 808.5 MW Momentum Wind project will provide significant benefits to Maryland through the establishment of Sparrows Point Steel, the state's first permanent offshore wind component factory, which will manufacture monopile foundations at the site of the historic Bethlehem Steel plant, once the largest steel production facility in the world.
- States continue be the main drivers of offshore wind development in the United States. In the first quarter of 2022, Louisiana announced a offshore wind goal of 5GW 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 (44,593 MW).



Over 5 GW of land-based wind installed in Q4

- 25 land-based wind projects came online in the fourth quarter with a total capacity of over 5.5 GW. In total, 61 projects with a total capacity of 12,747 MW were installed in 2021, making it the third-biggest year for wind installations after 2020 and 2012.
- Fourth quarter installations were down compared to the record fourth quarter of 2020 (nearly 10.9 GW installed) but were higher than any other quarter of the year by nearly 2.5 GW.
- The average size of projects installed in the fourth quarter was 92 MW.
- The largest project to come online this quarter was the 1,055 MW Western Spirit in New Mexico, owned and developed by Pattern Energy. It is the largest operating wind project in the country.

U.S. Annual and Cumulative Wind Power Capacity Growth

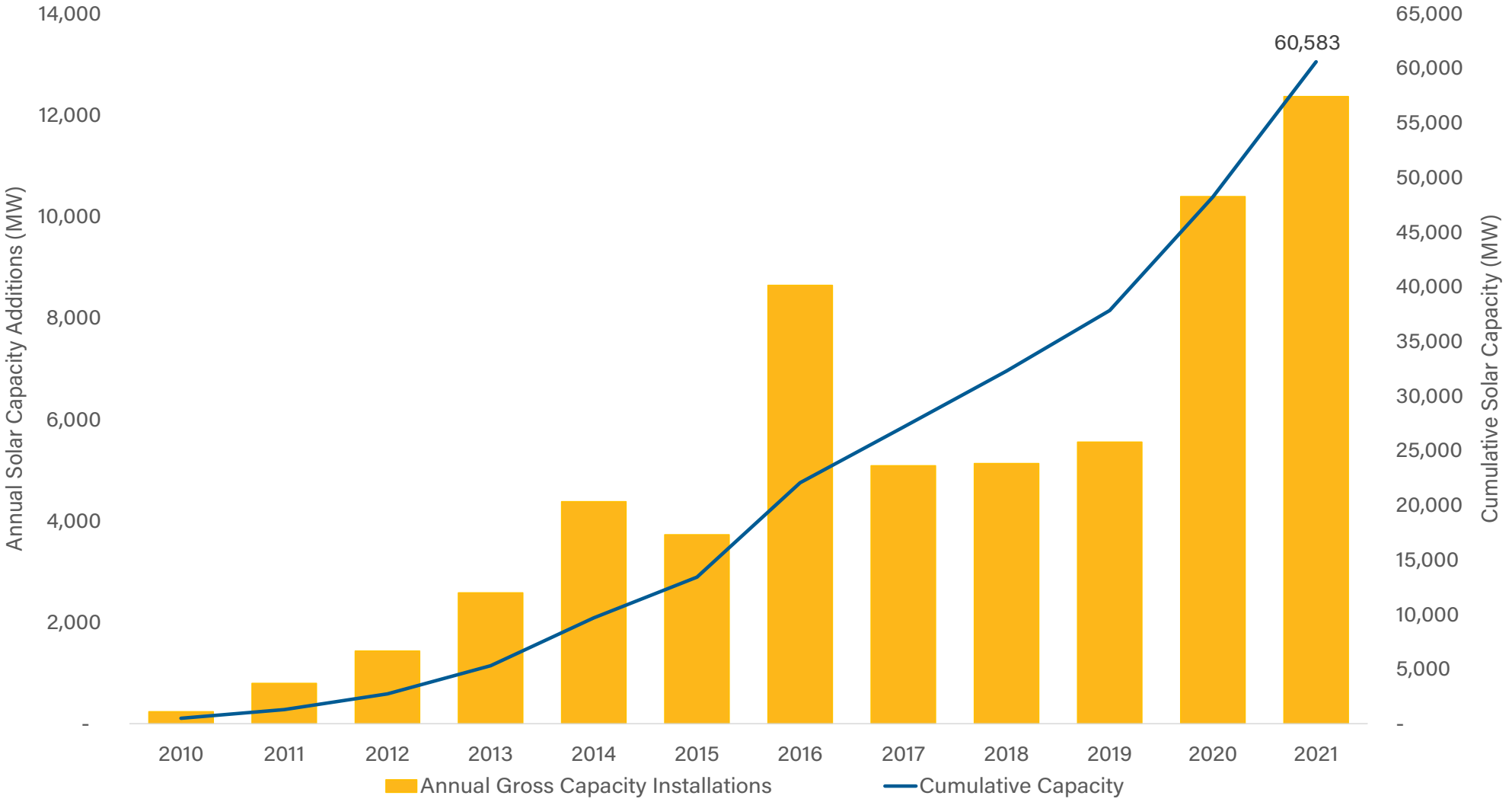


UTILITY-SCALE SOLAR

Over 60 GW of utility-solar capacity online

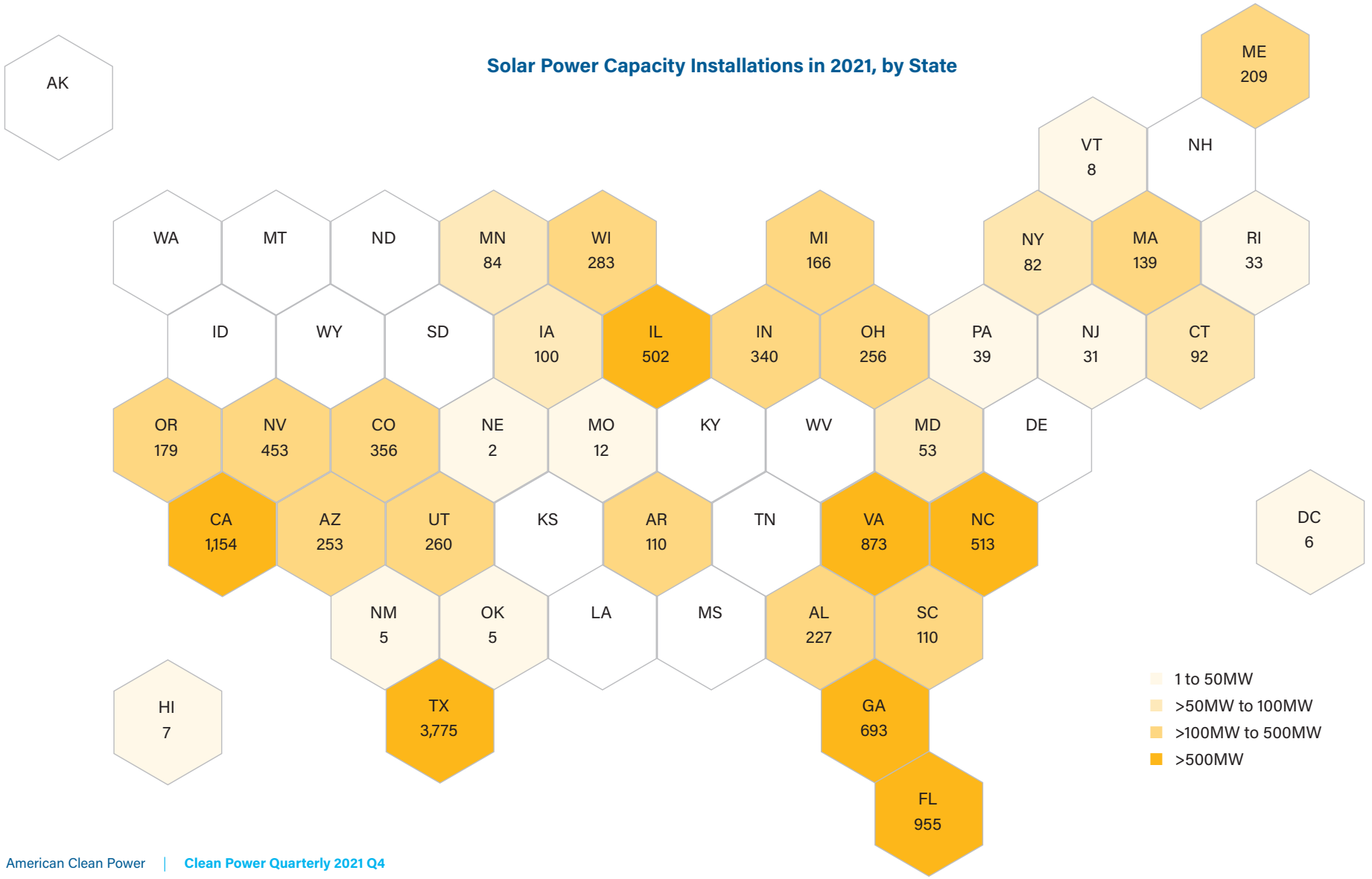
- In the fourth quarter, 3,937 MW of utility-solar capacity was installed, bringing 2021 total installations to 12,364 MW.
- Year-over-year, solar capacity installations grew 19% as the industry added nearly 2,000 MW more compared to 2020.
- While 2021 was a record year for utility solar installations, the industry did see several projects totaling over 6 GW push beyond their expected commissioning in 2021. Supply chain constraints and trade barriers are among the major culprits and are expected to continue to hamper the growth of the industry for the foreseeable future.
- Texas is looking to become the undisputed clean power hub after leading solar installations in 2021 with 3,774 MW built. California followed in a distant second with 1,154 MW. Florida claimed third (955 MW), while Virginia placed fourth (873 MW), and Georgia placed fifth for the year (693 MW).

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



Half the country installs new solar capacity in 4Q

- In the fourth quarter, 109 solar project phases were installed across 26 states with a total capacity of 3,937 MW.
- Texas once again led solar capacity installations with 1,088 MW coming online in the fourth quarter, representing almost a quarter of all installs. Half of newly installed capacity in Texas is due to two projects: Azure Sky Solar (225 MW) and Galloway 1 Solar Farm (250).
- Galloway 1 Solar Farm was the largest solar project to come online this quarter. The 250 MW project is located in Concho County, Texas and was acquired by Skyline Renewables from 8Minute Solar Energy in October 2020.
- California installed the second highest capacity with 512 MW of utility-scale solar coming online, followed by Georgia (500 MW), and Colorado (245 MW).

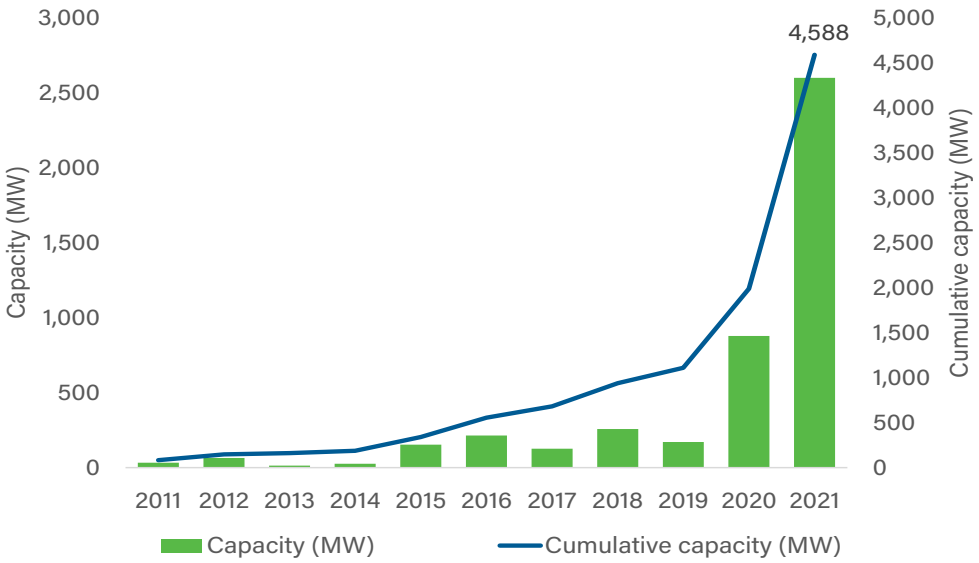


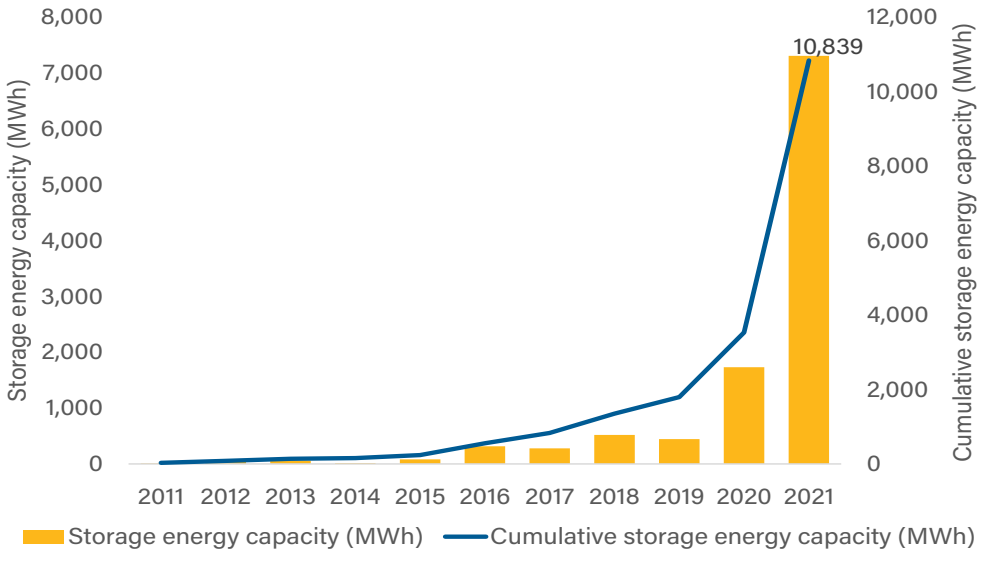
UTILITY-SCALE BATTERY STORAGE

Over 4.5 GW and 7.3 GWh of battery storage online

- In the fourth quarter, 1,173 MW of new battery storage power capacity came online, bringing 2021 total installations up to 2,599 MW. Installed annual capacity increased 196% compared to 2020 volumes.
- In terms of storage energy capacity, 7,309 MWh came online in 2021. For scale, 67% of all currently operating storage energy capacity was built in 2021.
- Developers added 34 battery storage project phases in the fourth quarter across 12 states. Florida installed the most capacity this quarter with 427 MW coming online. Texas came in second with 380 MW, followed by California with 203 MW, and Alaska with 47 MW.
- California has the most battery storage capacity online (1,254 MW), followed by Texas (579 MW), Florida (427 MW), and Massachusetts (75 MW).
- California was also the lead installer in 2021, bringing 2,160 MW of battery storage capacity online. Texas again came in second (832 MW), followed by Florida (456 MW), and Massachusetts (149 MW).
- 34 standalone battery storage projects with a total capacity of 995 MW/2,347 MWh came online in 2021. 64 of the battery storage projects that came online in 2021 are part of hybrid projects. The battery storage portion of these projects have a total capacity of 1,604 MW, or 4,962 MWh.
- Moss Landing, which had its first phase come online in late 2020 and second phase in 2021, is the largest standalone battery storage project in the country with a total capacity of 400 MW and 1,600 MWh.
- AES's Alamitos Energy Center was the largest standalone storage project to come online in 2021 in terms of MWh capacity. The California project has a 100 MW lithium battery with 4-hour storage duration, and therefore a total storage energy capacity of 400 MWh. Tesla's Gambit Energy Storage project was the largest standalone battery storage project to come online in 2021 in terms of MW capacity. The project uses 102.4 MW Tesla Megapacks with a 2-hour storage duration, and therefore total storage energy of 204.8 MWh.
- In total, there is 4,588 MW, or 10,839 MWh, of battery storage capacity online in the U.S.

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

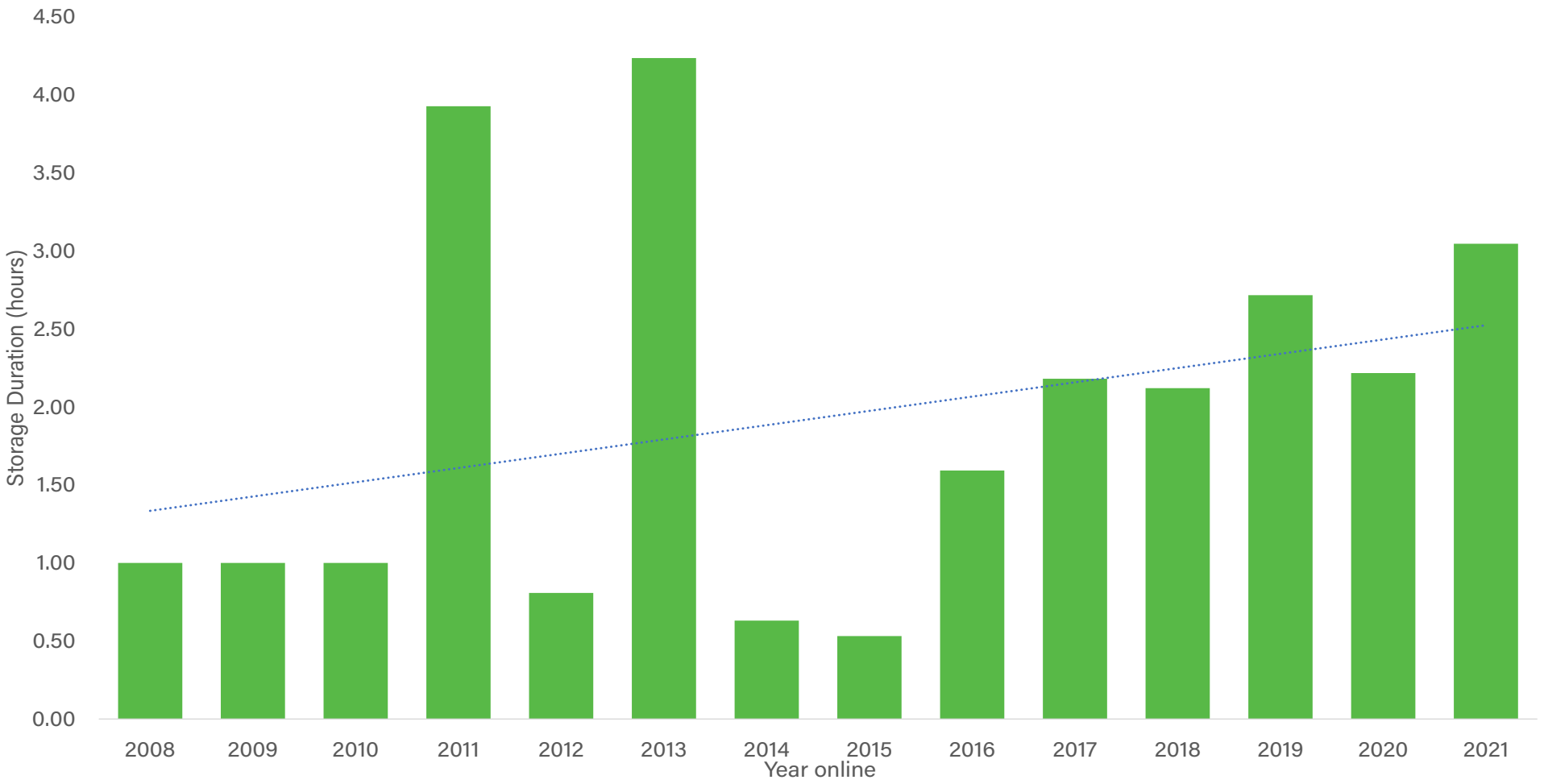




Storage duration increasing over time

- The average storage duration has increased from 1 hour in 2008 to over 3 hours for newly operational projects in 2021.
- A few projects with higher storage durations increase the average duration of projects installed in 2011 and 2013. In 2011, Laurel Mountain Storage was installed with a 4-hour storage duration, and in 2013 Laverne Battery was installed with a 6-hour storage duration, and Vaca Dixon Battery Storage System and Yerba Buena were installed, each with 7-hour storage durations. Otherwise, most energy storage systems installed in those years had an average duration of 1 hour.
- Projects in the pipeline have an average storage duration of 3.11 and 3.88 hours for projects under construction and in advanced development, respectively.

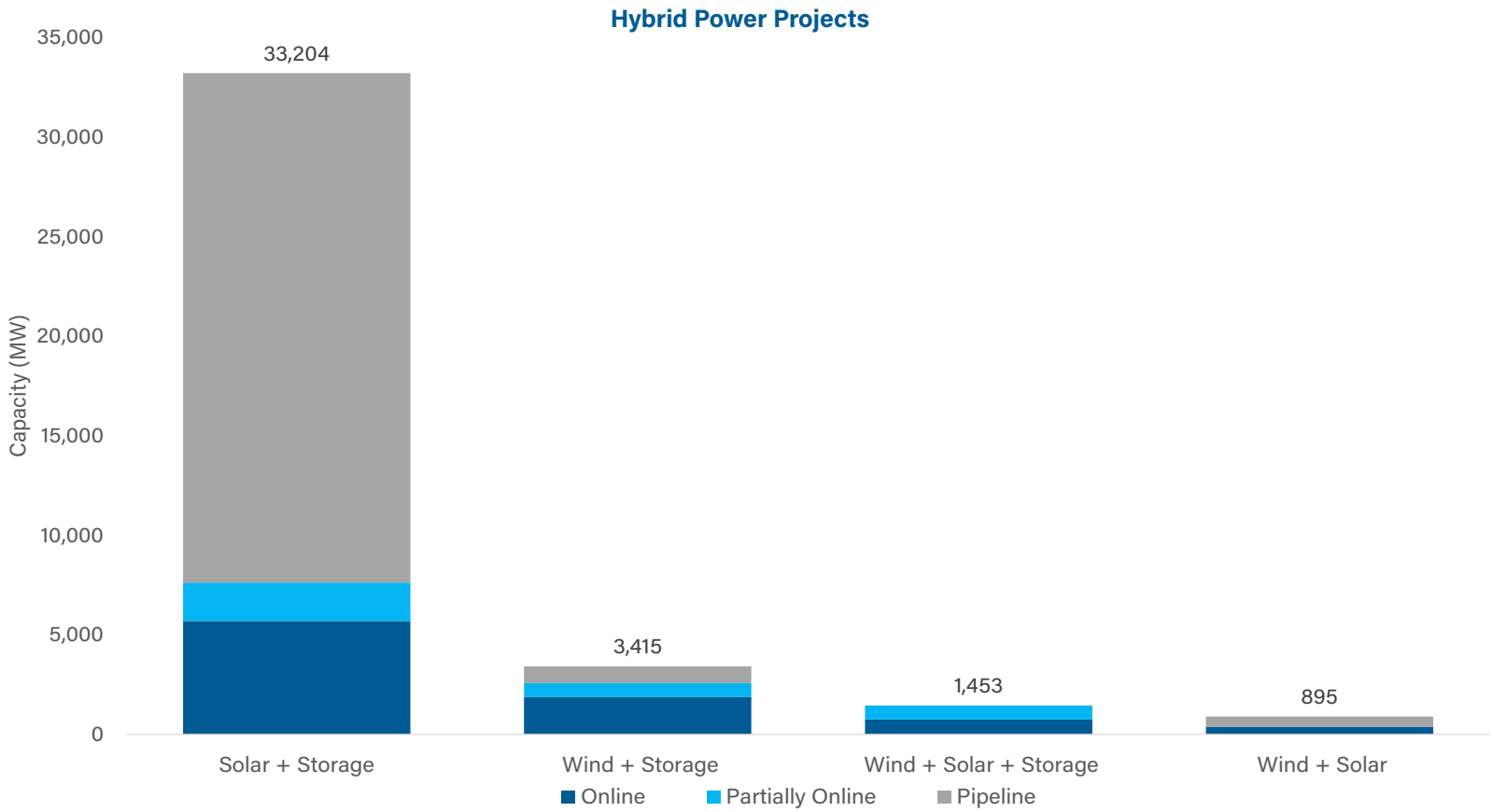
Capacity-Weighted Average Storage Duration by Date Installed



Hybrid Projects

Nearly 5 GW of hybrid projects installed in 2021

- Developers placed 2,238 MW of hybrid project capacity online in the fourth quarter, bringing 2021 total installations to 4,967 MW. This is nearly a 14-fold increase from 2020 installs (357 MW).
- Solar + storage projects dominate hybrid installations. In the fourth quarter, 1,858 MW of solar + storage projects came online, adding to a total of 4,478 MW of solar + storage capacity built in 2021, compared to only 163 MW in 2020. Over 5.9 GW of solar + storage capacity is now operating in the U.S.
- 380 MW of wind + solar + storage capacity came online in the final quarter of the year, bringing total 2021 installations to 488 MW. Total operating capacity from wind + solar + storage projects is now 752 MW.
- No new wind + solar or wind + storage hybrid project capacity came online in 2021. Total operating capacity is 377 MW and 1,892 MW, respectively.
- At the end of the year, 3,320 MW of hybrid capacity was partially online, meaning at least one technology is online and other technologies are still under construction or in advanced development. Looking at the pipeline, 26,937 MW of hybrid capacity is currently underway with 95% (25,582 MW) made up of solar + storage projects.
- Florida Power & Light (a subsidiary of NextEra) brought the Manatee Solar Energy + Storage Center online in 2021, making it the largest solar-connected battery facility in the country. The Florida-based project includes 74.5 MW of solar capacity and 409 MW (900 MWh) of battery storage capacity.
- Two storage phases, totaling 130 MW/920 MWh, at NextEra's California-based Blythe project came online in 2021. The project has an existing solar capacity of 393 MW, making it the largest solar + storage project operating in the country.



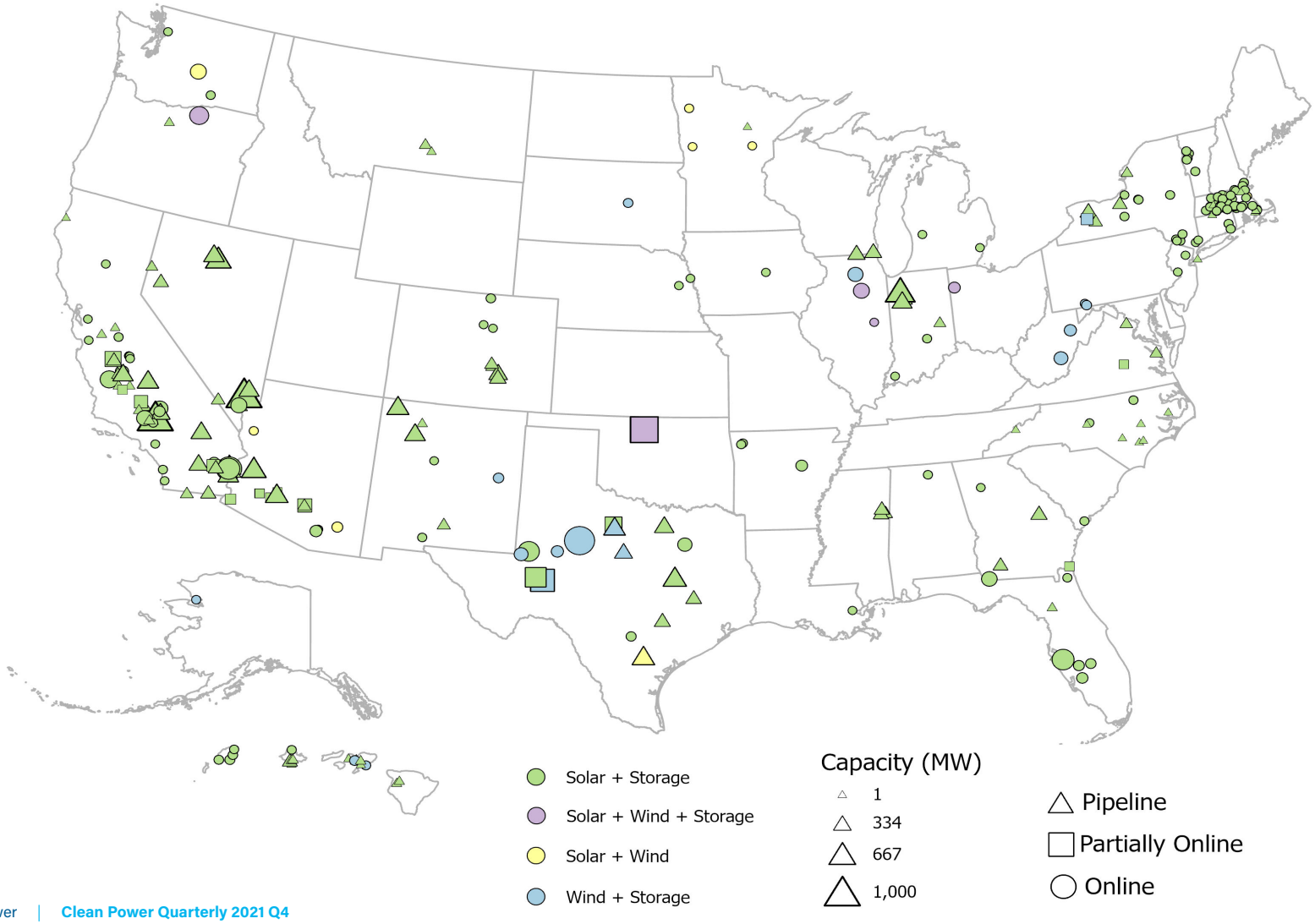
Operating hybrid capacity grows by over 130%

- Cumulative operational hybrid capacity is now 8,710 MW, a 133% increase from total online capacity at the end of 2020 (3,744 MW).
- Nearly 5,960 MW of solar + storage project capacity is online, along with 1,892 MW of wind + storage, 752 MW of wind + solar + storage, and 377 MW of wind + solar.
- 4,967 MW of hybrid capacity came online in 2021. The fourth quarter had the highest activity with 2,238 GW coming online, followed by the second quarter with 2,133 MW coming online.

Hybrid capacity grows nationwide

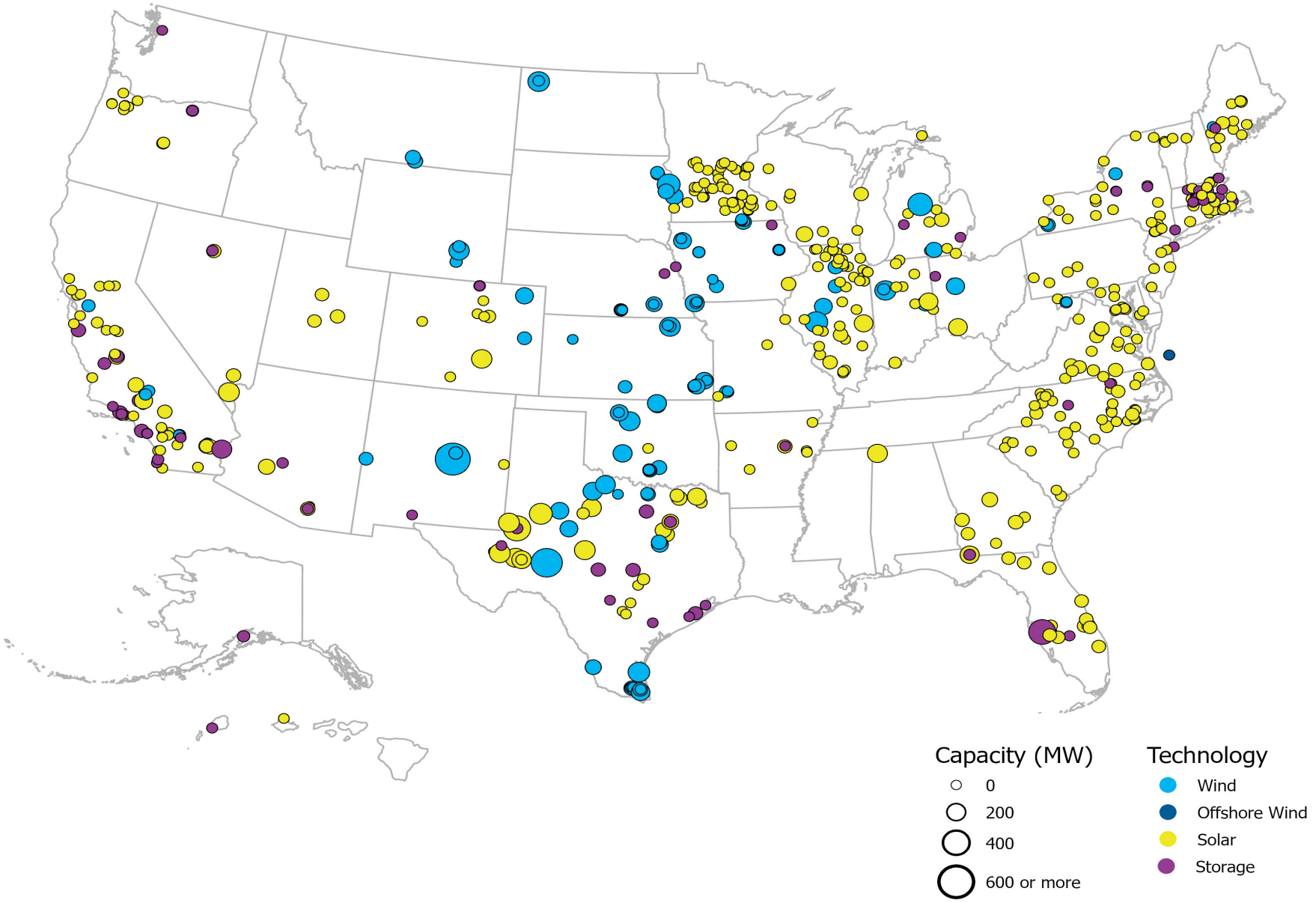
- California continues to lead the nation with 2,740 MW of hybrid capacity installed—all comprised of solar + storage projects.
- Texas follows California with 2,002 MW of hybrid project capacity online, including 888 MW of solar + storage and 1,114 MW of wind + storage capacity.
- California also leads the pipeline with nearly 7.8 GW of solar + storage expected to come online in the near term. Nevada comes in second with over 3.6 GW of solar + storage in the pipeline.
- Texas and New York are the only states with wind + storage projects in development, and Texas is the only state with wind + solar in the pipeline.

Cumulative Operational Hybrid Project Capacity

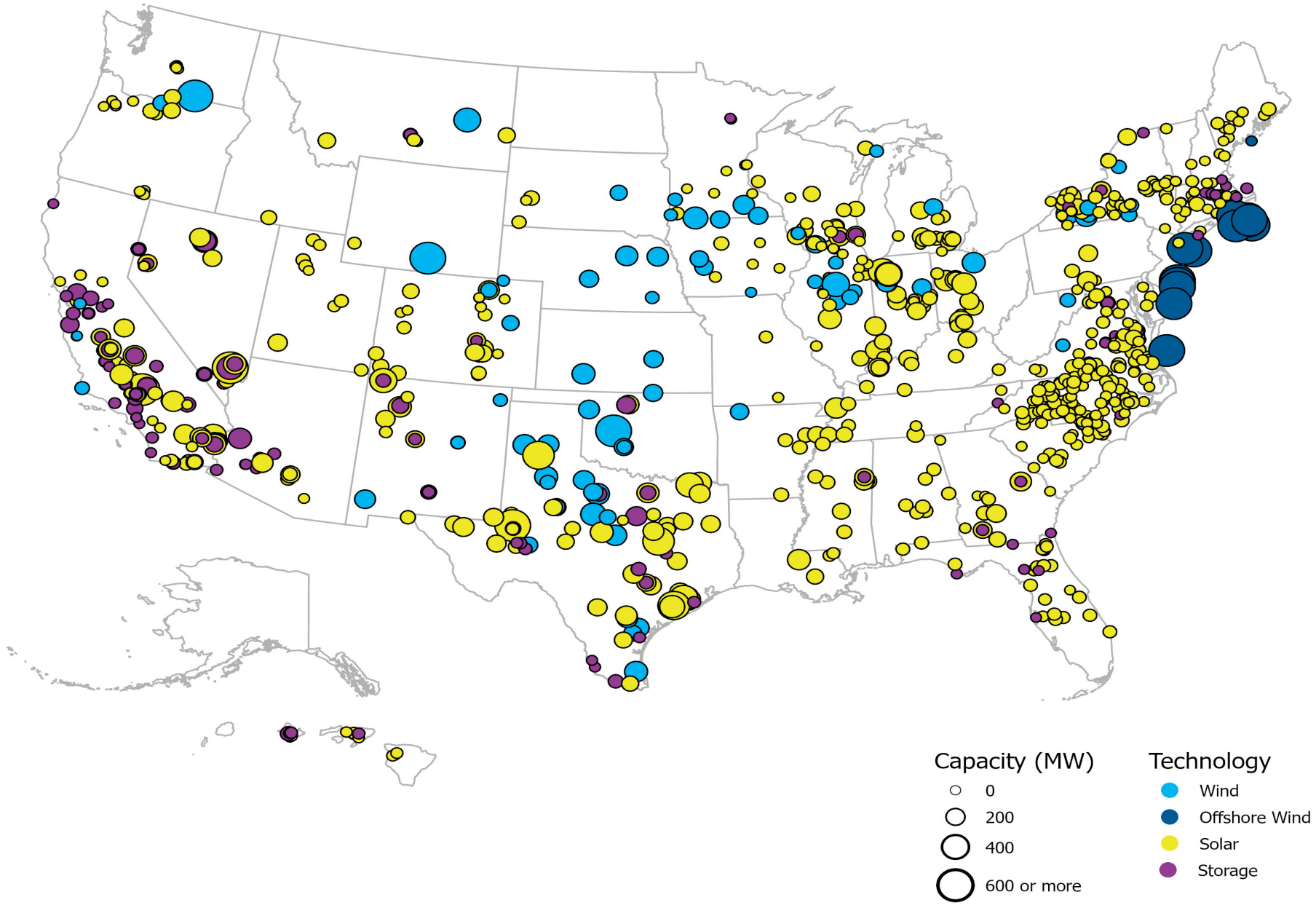


Appendices

Projects Online in 2021



Projects in 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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