AMERICAN CLEAN POWER®

CLEAN POWER ANNUAL MARKET REPORT 2022

Building The Clean Energy Economy

ACP sincerely thanks its member companies and other organizations for their contributions to the industry data provided in this report. ACP strives to provide the best information on the clean power industry—for the industry and by the industry—and therefore welcomes your comments.

We united the power of the renewable energy industry.

The American clean power sector is providing cost-effective solutions to the climate crisis while creating jobs, spurring investment, and driving innovation.

The American Clean Power Association enables the transformation of the U.S. power grid to a low-cost, reliable and renewable power system. By uniting the power of wind, solar, transmission, and storage companies and their allied industries, both public and private, we are championing policies that enable the continued and aggressive growth in renewable energy in the United States.

Clean Power 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.

Clean Power Acronyms

AC	Alternating Current
C&I	Commercial & Industrial
CAISO	California ISO
CES	Clean Energy Standard
CO_2	Carbon Dioxide
DC	Direct Current
EPA	Environmental Protection Agency
ERCOT	Electric Reliability Council of Texas
FERC	Federal Energy Regulatory Commission
FRCC	Florida Reliability Coordinating Council
GHI	Global Horizontal Irradiance
GW	Gigawatts
GWh	Gigawatt hours
ILR	Inverter Loading Ratio
IOU	Investor-Owned Utility
ISO	Independent System Operator
ISO-NE	ISO New England
LCOE	Levelized Cost of Energy
MISO	Midcontinent ISO
MRO	Midwest Reliability Organization
MW	Megawatts
MWh	Megawatt hours
NERC	North American Electric Reliability Corporation
NO_x	Nitrogen Oxides
NPCC	Northeast Power Coordinating Council
NYISO	New York ISO
OEM	Original Equipment Manufacturer
OREC	Offshore Renewable Energy Credit
PM2.5	Particulate Matter
PPA	Power Purchase Agreement
REC	Renewable Energy Credit
RFC	Reliability First Corporation
RPS	Renewable Portfolio Standard
RTO	Regional Transmission Organization
SREC	Solar Renewable Energy Credit
SERC	Southeast Reliability Corporation
SO_2	Sulfur Dioxide
SPP	Southwestern Power Pool
TRE	Texas Reliability Entity
TW	Terrawatts
TWh	Terrawatt Hours
WECC	Western Electricity Coordinating Council
WRO	Withhold Release Order

Introduction

Photo Credit: AES

Dear ACP Members,

The clean energy revolution is underway. Last year, Congress made historic investments to modernize our energy systems. The Bipartisan Infrastructure Law and Inflation Reduction Act are motivating hundreds of billions of dollars of private investment that will increase our nation's security, strengthen our global competitiveness and confront the risks of climate change. This legislation is already supercharging clean energy deployment and increased investment is projected to more than triple annual installations of wind, solar, and energy storage by 2030.

Our 2022 *Clean Power Annual Market Report* charts both our achievements and challenges as the industry prepares for a decade of rapid growth.

2022 ended as the third-largest year for clean power installation, with over 25 gigawatts (GW) of new clean energy capacity added, accounting for nearly 80 percent of all new power added to the grid. With these additions, the U.S. has nearly 228 GW of wind, solar, and energy storage capacity online, producing 15 percent of U.S. electricity and powering the equivalent of over 62 million homes.

However, 2022 also saw a decline in deployment for the first time in five years. Trade barriers, supply chain issues, permitting delays and regulatory challenges resulted in a 15 percent slowdown in installations compared to 2021. ACP is working with bipartisan Congressional leaders, Governors and the Administration to develop the innovative and durable solutions needed to drive progress.

The clean power industry currently employs close to 450,000 American workers across the wind, solar, and energy storage sectors – with plans to more than double domestic employment by 2030. We've also announced nearly 50 new clean energy manufacturing facilities or expansions in the last ten months, bringing more than 18,000 new American jobs and representing over $150 billion in private investment.

Clean power benefits all Americans. Our industry is deploying projects in all 50 states and 93 percent of congressional districts, with 80 percent of projects located in low-income communities.

This is an exhilarating time for our country and the future of American clean energy. It is vital to learn from our challenges while celebrating our victories. This *Clean Power Annual Market Report* reflects our industry's tenacity, creativity, and commitment to a cleaner, healthier future. I invite you to read the report and join us in unlocking our nation's clean energy potential.

Together in progress,

Jason Grumet
CEO, American Clean Power Association

Key 2022 Highlights

1. **Third-Largest Year**
   25.5 GW of new clean power was commissioned in 2022, making it the third-largest year on record and bringing the total amount of American clean power online to nearly 228 GW.
2. **Leading Source of New Power**
   Clean power represented 79% of all new capacity added.
3. **Powering More of America**
   The country now produces 15% of its electricity from wind and solar, equivalent to powering over 62 million homes.
4. **Net-Zero Progress**
   Maintaining last year's project installation volume would provide only 30% of what is needed to reach a net-zero grid by 2035.
5. **Significant Delays**
   53 GW of projects experienced delays due to ongoing regulatory, supply chain and interconnection challenges.
6. **Development Pipeline**
   137 GW of clean energy projects were under development at the end of 2022.
7. **Storage Soars**
   In 2022, energy storage witnessed a record year with 4 GW/12 GWh commissioned, representing an 80% increase in total operating storage capacity.
8. **Growing Workforce & Investment**
   Clean power industry employs 443,000 workers and invested $35 billion in projects in 2022.
9. **United States of Clean Energy**
   Clean power is red, white, and blue with projects or manufacturing facilities in 93% of Congressional districts. Projects can be found in all 50 states.
10. **Booming Manufacturing**
    There are 550 U.S. manufacturing facilities dedicated to producing components and parts for wind, solar, and storage projects in the clean power industry – and since the passage of the Inflation Reduction Act, 47 new clean energy manufacturing facilities or expansions have been announced, bringing more than 18,000 new American jobs.

Clean Power in America

Nearly 228 GW
of **WIND, SOLAR,** and **BATTERY STORAGE** capacity online.

WIND, SOLAR, and **BATTERY STORAGE** represent **68%** of new power additions to the grid over the past five years.

WIND & SOLAR POWER were the **top 2 choices** of utility-scale power generation across all technology types in 2022.

2022 was a record year for **BATTERY STORAGE** with **4 GW/12 GWh** commissioned, representing an **80% increase** in total operating storage capacity in 2022.

There's nearly **228 gigawatts** of clean power operating in the U.S.

That's enough to power:

3 out of 5 light bulbs in U.S. homes
more than **62 million** homes

Three **OFFSHORE WIND** lease sales in 2022 resulted in **13 new leases** across the NY Bight, Carolina Long Bay and California

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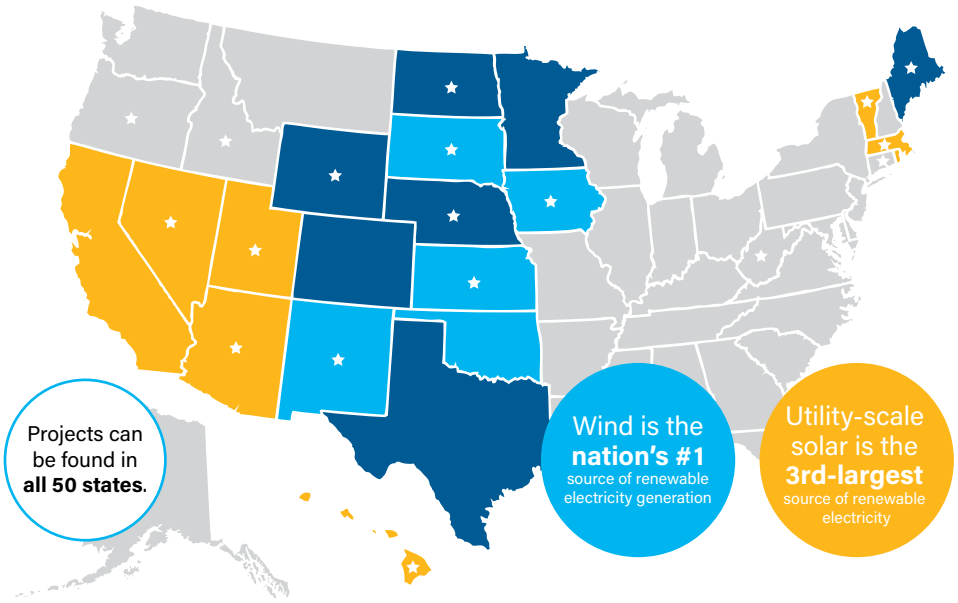
The U.S. has enough installed utility-scale **WIND AND SOLAR** capacity to power more than **62 million homes**.

25.5 GW of clean power was installed in 2022, enough to power **406 million LED light bulbs**.

Clean power prevents **426 million** metric tons of CO_2 from being released into the atmosphere each year, equivalent to removing **93 million cars from the road**.



Clean power is **red, white, and blue** with projects or manufacturing facilities in **93% of Congressional districts**.

WIND & SOLAR projects produced the same amount of electricity used in these states combined in 2022:
AZ, CT, HI, IA, ID, KS, MA, ME, ND, NE, NM, NV, OR, RI, SD, UT, VT, WV, WY

States where **SOLAR** energy delivers **more than 10%** of the electricity:
AZ, CA, DC, HI, MA, NV, RI, UT, VT

States where **WIND** energy delivers **more than 20%** of the electricity:
CO, IA, KS, ME, MN, ND, NE, NM, OK, SD, TX, WY

States where **WIND** was the **largest source of electricity** in 2022:
IA, KS, NM, OK, SD

550 manufacturing facilites across the U.S. dedicated to producing components and parts for **wind, solar, and storage** projects.

443,000 good-paying jobs in **wind, solar, and storage** to employ Americans across the country.

Since the passage of the IRA, **47 new utility-scale clean energy manufacturing facilities** were to have been announced, bringing an expected **18,000+ new American jobs**.

The passage of the IRA has led to **$150 billion of capital investment** announced for clean energy projects and manufacturing facilities.

Corporations are rapidly signing onto the clean energy revolution after announcing a record **16 GW** of new **Power Purchase Agreements** in 2022.

WIND & SOLAR deliver over **$2.9 billion** every year in state and local tax payments and landowner lease payments to local communities.

81% of operating clean power is located in low-income communities where projects create jobs, revenue, and foster economic growth.

2022 Clean Power Activity

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Photo Credit: Nextracker

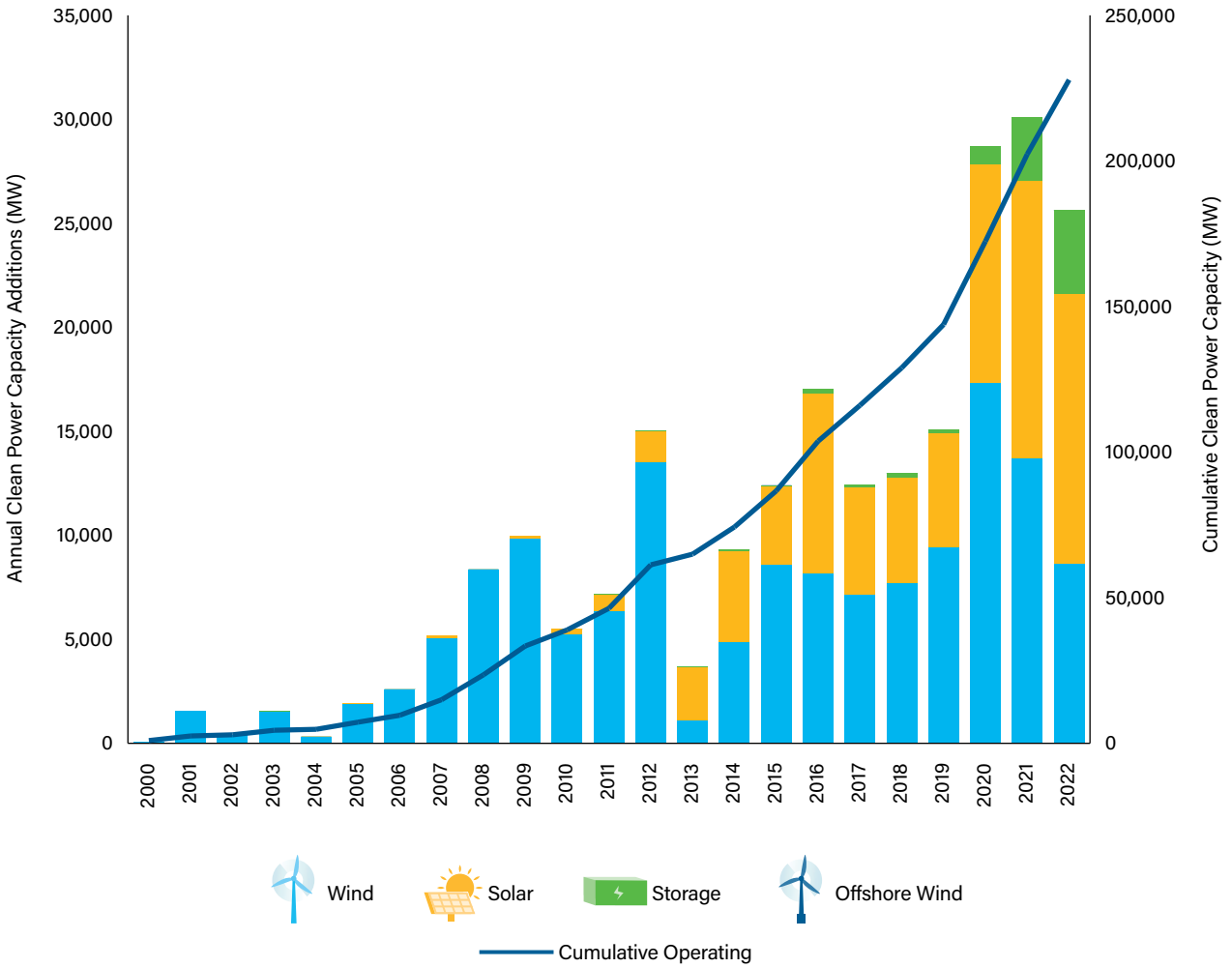
2022 Clean Power Activity

Annual and Cumulative Clean Power Capacity

More than 25.5 GW of clean power installed in 2022

- In 2022, clean power developers commissioned 25,538 MW of new clean power capacity. This represents enough electricity to power more than 5 million American homes.
- Despite years of consecutive growth in annual clean power installations, there was a 15% decrease in 2022 compared to the record year of 2021. As a result, 2022 is now only ranked as the third highest year for annual installations to date.
- The level of 2022 clean power installations has been affected by delays in nearly 53 GW of projects since the final quarter of 2021. The delays were caused by several factors, including challenges in sourcing solar panels, supply chain constraints, interconnection issues, and policy uncertainty related to the previous phase-down schedule of the PTC. These factors proved to be significant barriers for many clean power projects.
- In total, 227,852 MW of clean power is operating and powering American homes and businesses. Land-based wind, which dominated clean power installations through 2015, accounts for 63% of all operating clean power. Solar makes up 33% of operating capacity, and battery storage 4%.
- The nearly 26 GW of clean power capacity installed in 2022 represents a sizable capital investment of nearly $35 billion. Cumulative clean power capital investment has now exceeded $434 billion.

U.S. Annual and Cumulative Utility-Scale Clean Power Capacity Growth

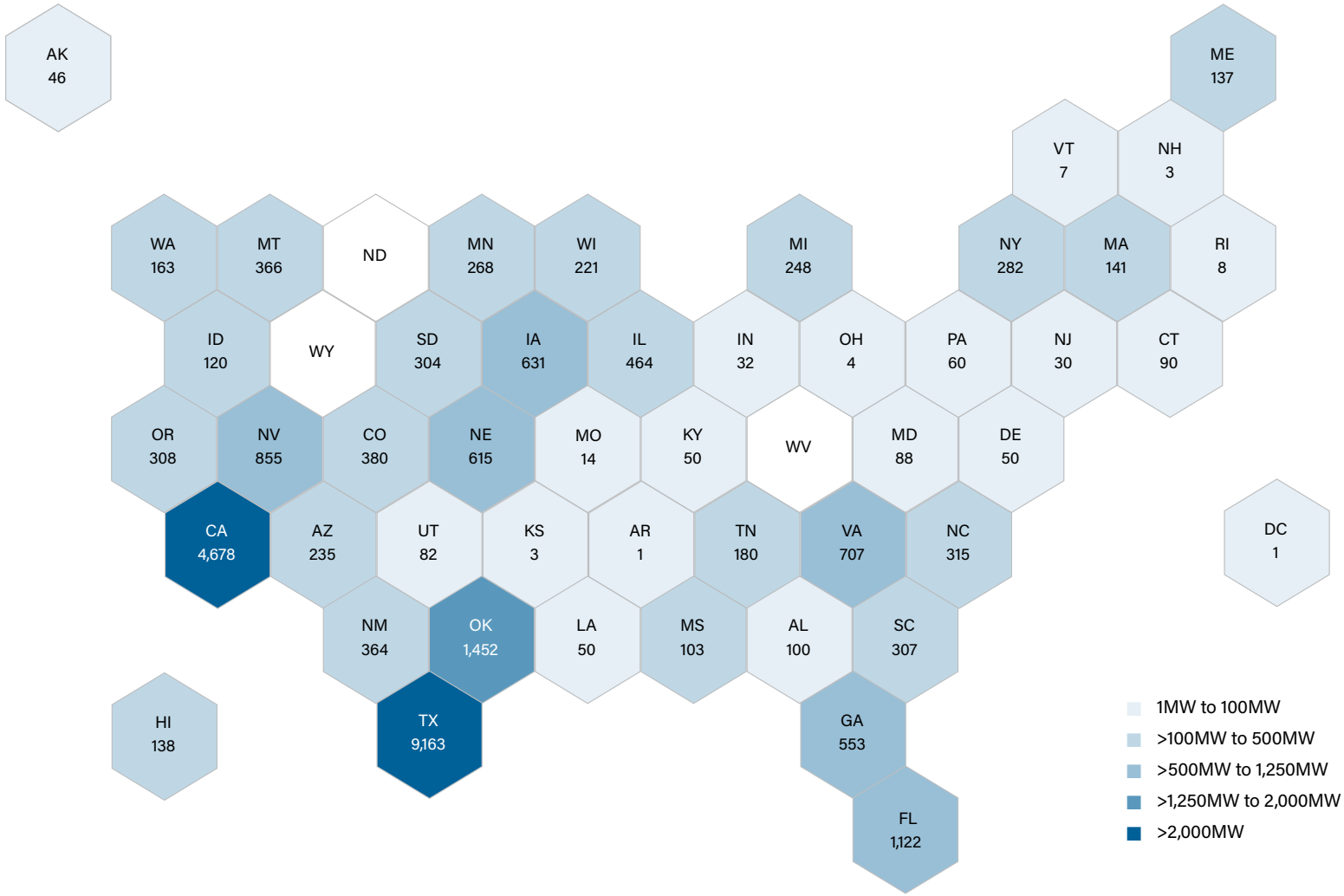


2022 Clean Power Activity

Clean Power Capacity Installations in 2022 by State

Industry built 531 clean power projects across 47 states, totalling 25.5 GW

Clean Power Projects Installed in 2022

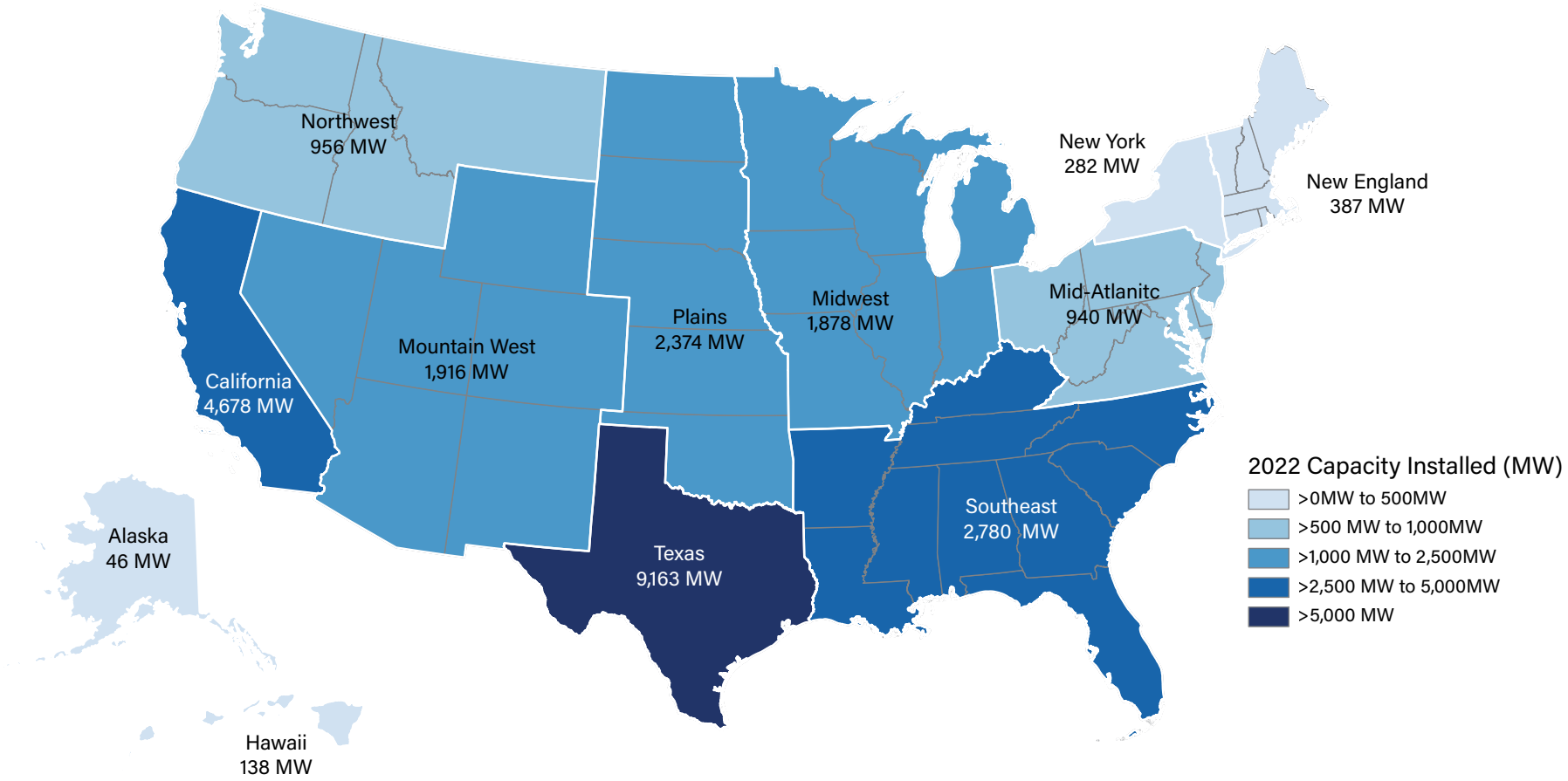


2022 Clean Power Activity

2022 Installations by Region

Industry built clean power projects across all regions, with Texas experiencing the highest increase in capacity

2022 Clean Power Installations by Region



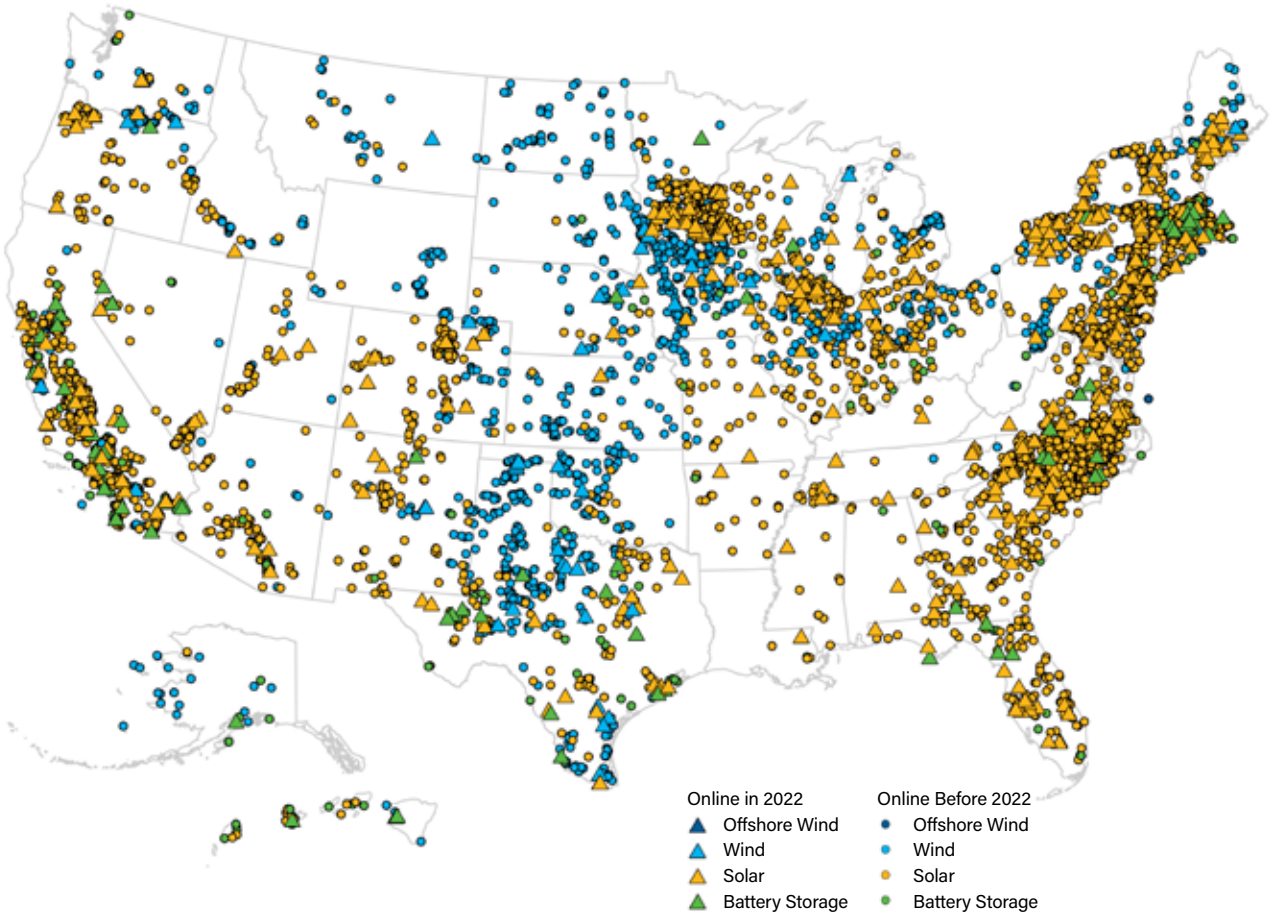
2022 Clean Power Activity

U.S. Clean Power Projects

Projects generate renewable energy in all 50 states

- The Great Prairie Wind (Firewheel Wind) took the top spot for the largest wind project built in 2022 at over 1 GW across 4 phases. This was followed by the 996 MW Traverse Wind project in Oklahoma, and the 499 MW Young Wind project in Texas.
- The top solar project phase to come online in 2022 was the 430 MW Old 300 Solar project located in Texas. The 350 MW Fighting Jays Solar Project also located in Texas and the 300 MW Slate Solar project in California round out the top three spots.
- The 350 MW/1,400 MWh Crimson Storage project phase built in California took the top spot in terms of capacity and energy in 2022. In capacity terms, this was followed by the 260 MW DeCordova Energy Storage project in Texas and the 230 MW Desert Sunlight Storage project located in California.
- The DeCordova Energy Storage project has a duration of one hour (260 MWh total energy) while the Desert Sunlight Storage project has a four hour duration (920 MWh total energy).

Operating U.S. Clean Power Projects

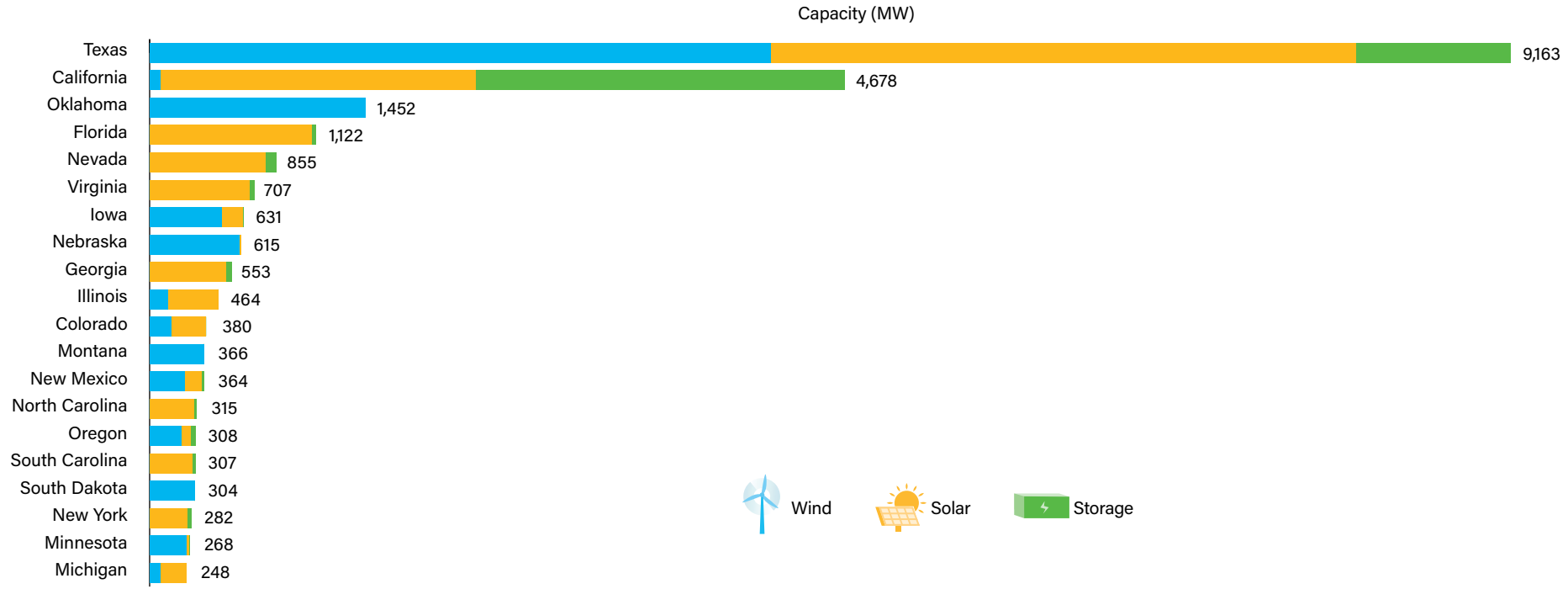


2022 Clean Power Activity

Clean Power Additions, Top States

Texas maintains position as clean power leader

Top States for Clean Power Additions in 2022



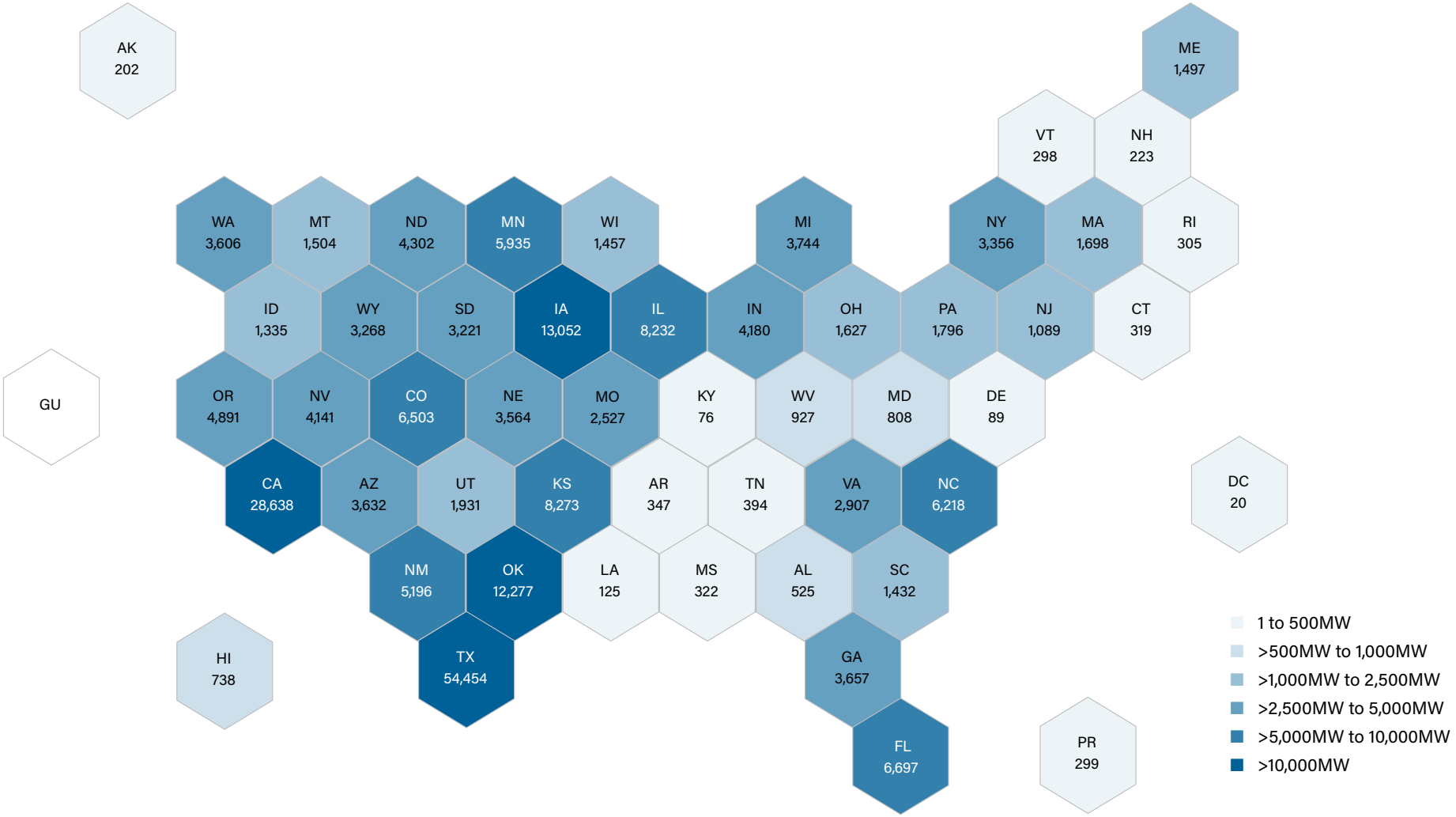
- Texas has led the nation in annual clean power installations since 2017. In 2022, Texas installed nearly twice as much capacity as any other state.
- Despite an overall decline in installations, Texas and California, along with 16 other states, set new annual commissioning records in 2022.
- By technology, Texas leads for both wind and solar capacity, with approximately 4 GW of each technology online. California leads the nation for operating battery storage capacity, at nearly 2.5 GW.

2022 Clean Power Activity

Clean Power Capacity, by State

Clean power is present in all 50 states; 11 have 5 GW or more installed

Operational Clean Power Capacity, by State



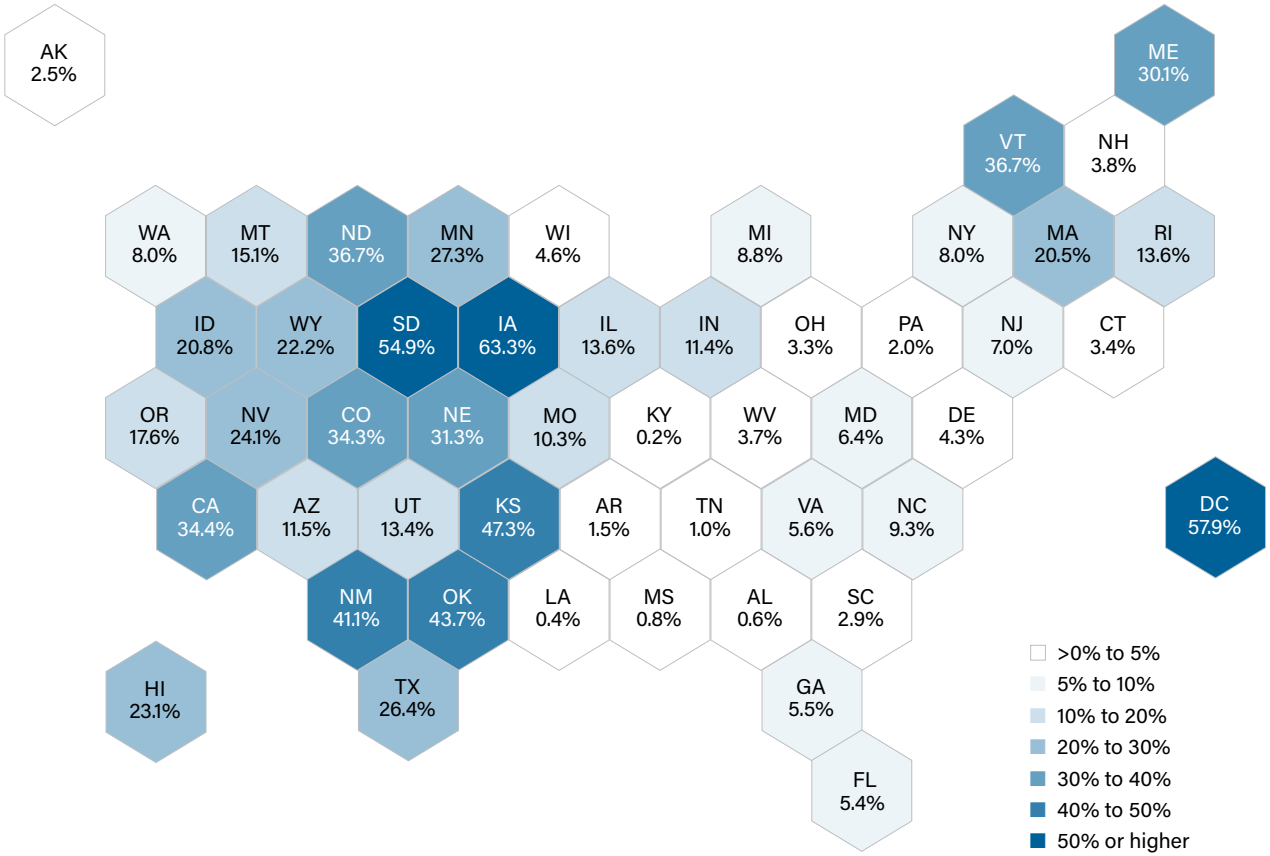
2022 Clean Power Activity

Clean Power's Share of Electricity Generation

Wind and solar provided 15% of the nation's electricity in 2022

- By the end of 2022, 27 states were generating at least 10% of electricity from wind, utility-scale solar, and small-scale solar.
- Iowa remains the leader in clean power share at 63%, up from 56% last year. South Dakota follows at 55%. The District of Columbia, buoyed by large amounts of distributed solar and limited overall generation, generated nearly 58% of electricity from clean power.
- Kansas (47%) and Oklahoma (44%) are joined for the first time by New Mexico (41%) as the only other states above 40%. In 2021, 36% of electricity generated in New Mexico was from wind and solar, marking a sizeable increase.
- Additionally, there are six other states above a 30% clean power share of electricity generation and another six states between 20% and 30%.
- The pattern of top performers generally coincides with windy Midwestern states where there are significant amounts of wind capacity installed.

Wind + Solar Share of State Electricity Generation



Source: EIA

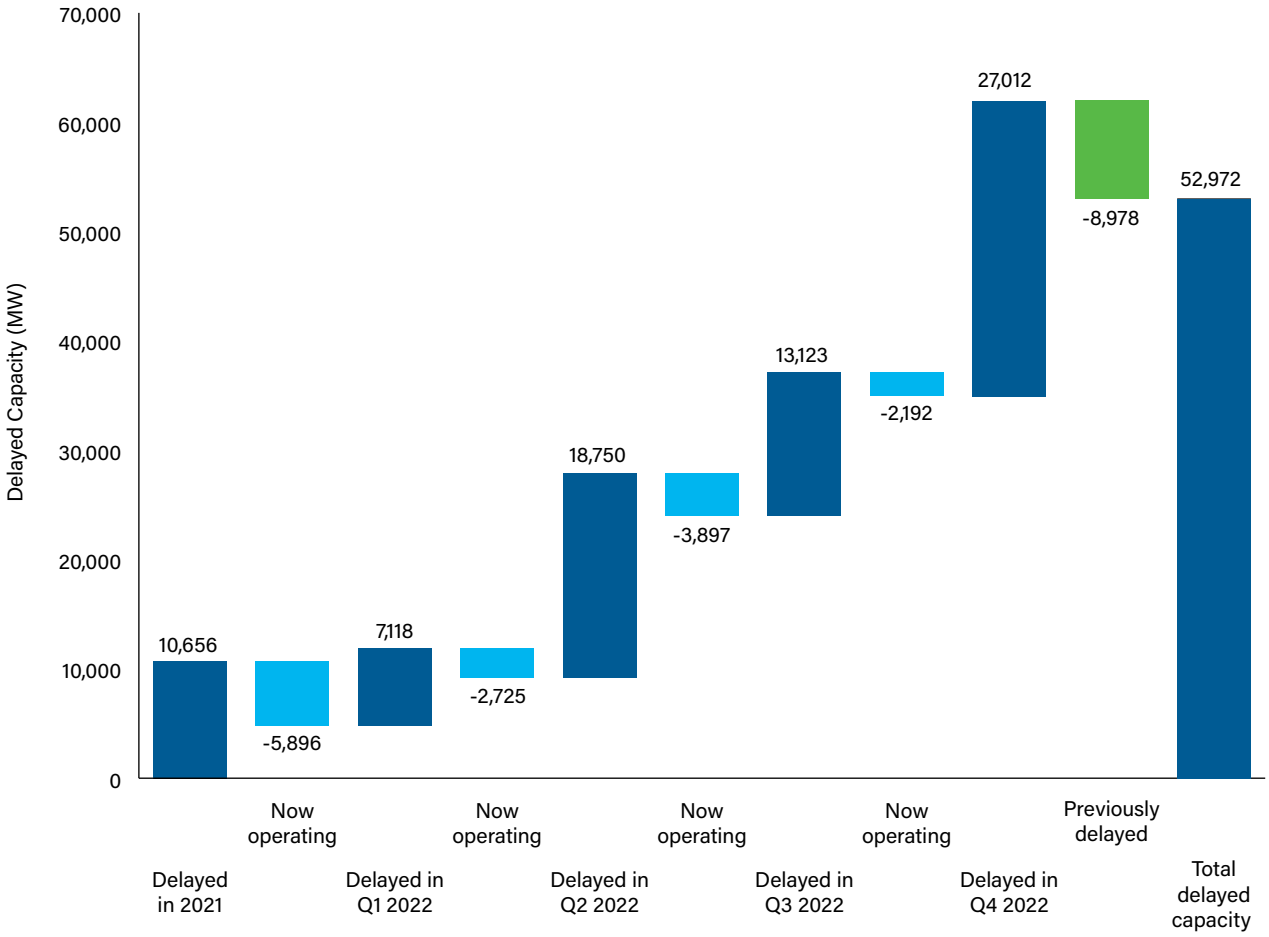
2022 Clean Power Activity

Clean Power Delays

More than 53 GW of clean power capacity experiencing delays

- Delays in clean power projects were prominent throughout 2022 and help explain the decline in 2022 clean power installations compared to 2021.
- At the end of 2021, nearly 11 GW of clean power projects experienced delays, more than half of which have since come online. In 2022, 66 GW of clean power experienced delays. Nearly 9 GW of those delayed projects are now operating, and another 9 GW have experienced multiple delays. In total, since the end of 2021, nearly 53 GW of clean power has experienced delays and has been unable to come online.
- Solar accounts for 68% of delayed clean power capacity, due primarily to difficulty sourcing panels as a result of trade restrictions.
- Wind represents 18% of total delays. Causes of wind delays range from ongoing supply chain constraints to grid interconnection delays.
- Battery storage projects are the least affected, making up just 14% of delays. Most delayed storage projects are co-located with delayed solar projects.

Clean Power Project Capacity Delayed



U.S. Electricity Sector

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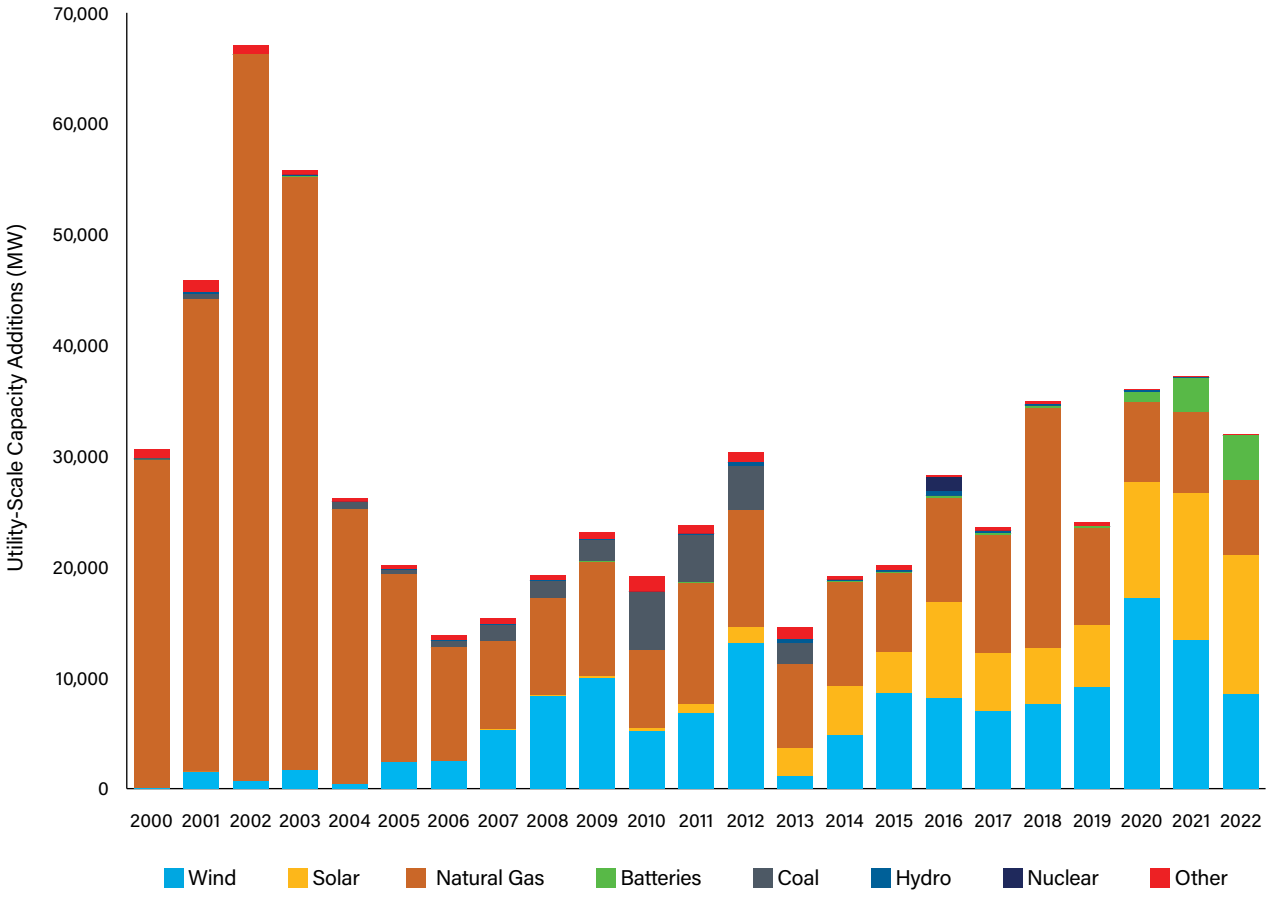
U.S. Electricity Sector

Annual Utility-Scale Power Capacity Additions

Grid adds 32 GW of utility-scale capacity additions, down 14% from 2021

- Project developers added 32,485 MW of new power capacity to the electric grid in 2022. This is down 13% from the 37,374 MW added in 2021. It is the fourth highest year in the last decade.
- For just the second time, solar capacity additions outpaced land-based wind, capturing 40% of the market. Land-based wind followed in second with 26% of new additions. Utility-scale battery storage captured 12% of the market, leaving clean power resources with 79% of 2022 installations.
- Natural gas projects totaling 6,742 MW were added to the grid in 2022. Gas-fired capacity continues to be added to the grid in significant quantities, but natural gas additions haven't exceeded renewable additions since 2014.
- Clean power technologies – wind, solar, and battery storage, coupled with gas, captured essentially the entire market in 2022. This has been the case every year since 2014.

Utility-Scale Power Capacity Additions



Souce: ACP, EIA

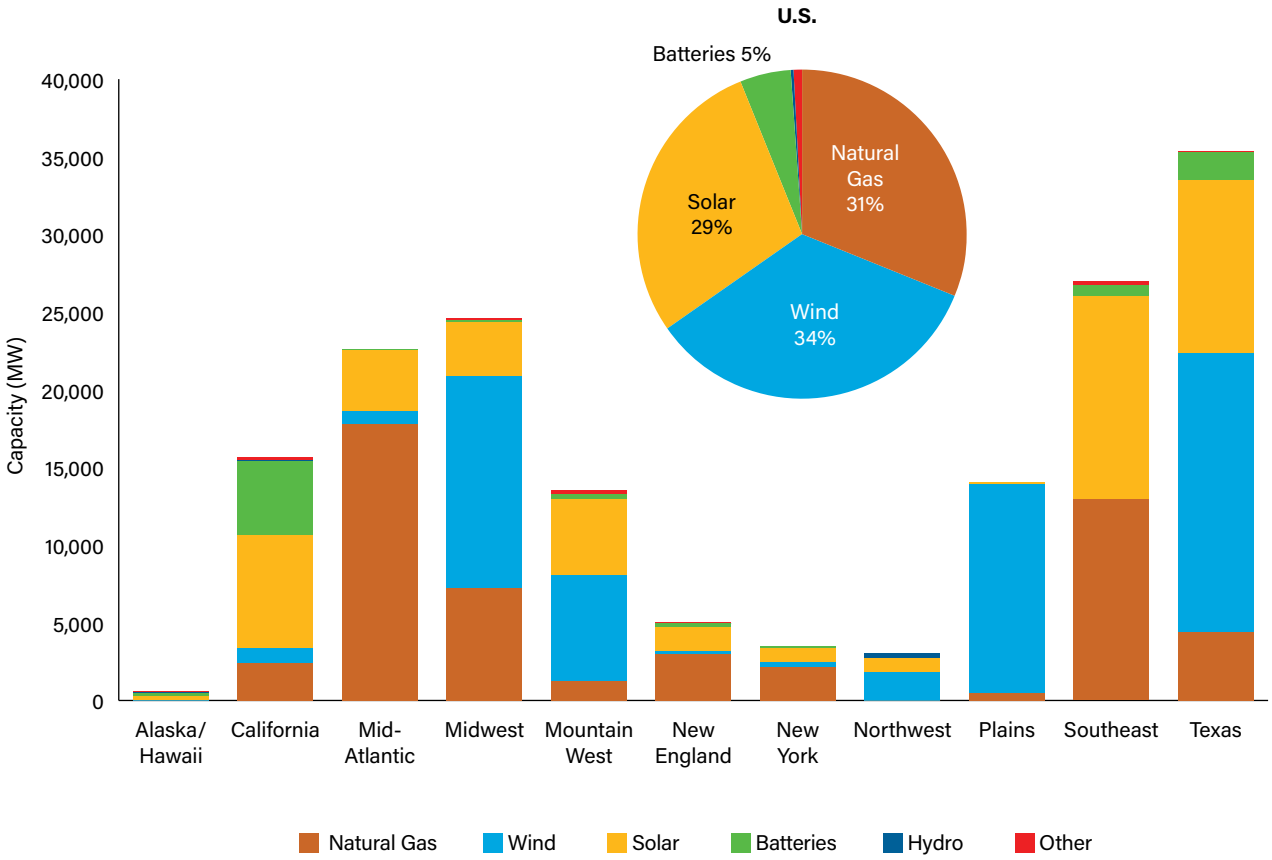
U.S. Electricity Sector

Regional Capacity Additions, 2018-2022

Clean power represents 68% of the five-year market

- Utilities and power customers across the country increasingly prefer clean power resources over other generation technology. In eight out of 11 regions, clean power represents the majority of capacity installations over the past five years.
- The Plains led all regions with wind, solar, and storage representing over 96% of the 14 GW added in the region since 2018. The Northwestern states follow with 90% and the Mountain West comes in third with 89%.
- Solar and battery storage additions in the Southeast surpass natural gas additions over the last five years, with 51% of total additions.
- The Mid-Atlantic states saw the lowest share of clean power additions at just 21%. Natural gas was the overwhelming choice for new capacity in that region.
- Wind made up 96% of installations in the Plains states while solar captured 46% of installations in California. Battery storage captured the most market share, 34%, in Alaska and Hawaii, followed closely by California at 31%.

Regional Capacity Additions, 2018-2022



Souce: ACP, EIA

U.S. Clean Power Policy

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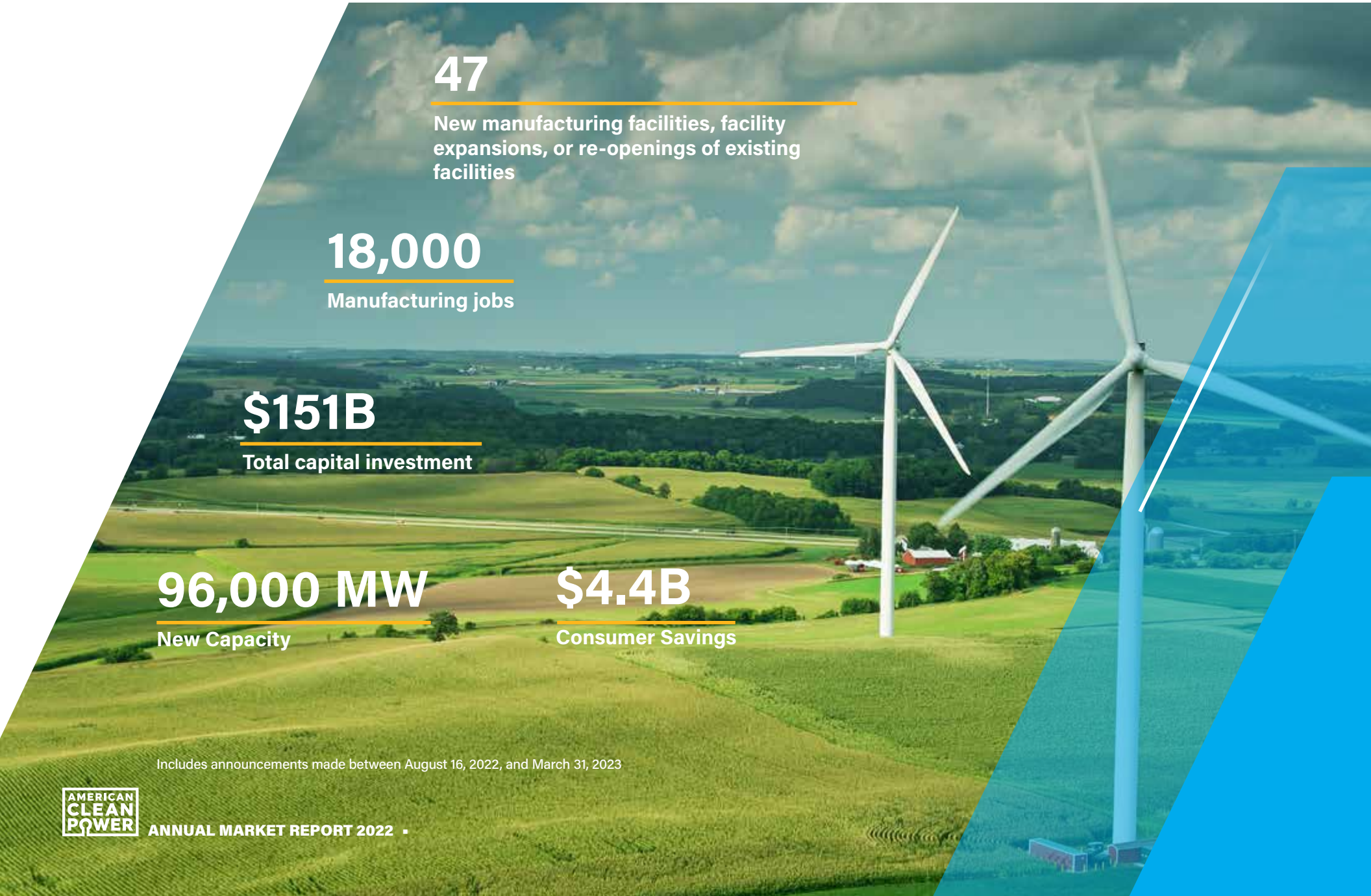
Clean Energy Investment in America

Since August 16, 2022, the U.S. utility-scale clean energy industry has announced:



47

New manufacturing facilities, facility expansions, or re-openings of existing facilities

18,000

Manufacturing jobs

$151B

Total capital investment

96,000 MW

New Capacity

$4.4B

Consumer Savings

Includes announcements made between August 16, 2022, and March 31, 2023

Clean Power Policy Impact

Passage of an unprecedented national commitment to clean power – the Inflation Reduction Act

Signed into law on August 16th, the Inflation Reduction Act represents the single largest investment in renewable power in the history of this country, and the largest investment in climate action to date.

The bill extends the production tax credit and investment tax credit for wind and solar through 2024 before transitioning to a technology-neutral tax credit that will remain in place until 2032 or when electric-sector emissions fall to 75% of 2022 levels, whichever is later. Energy storage, for the first time, is made eligible to qualify for the investment tax credit, while domestic manufacturing of clean energy components is incentivized through component-specific production tax credits and an expansion of the 48(c) advanced manufacturing tax credit. ACP's preliminary assessment of the IRA is that its policies will deliver an estimated 525 to 550 gigawatts (GW) of new, utility-scale clean power from 2022-2030. As a result, we now expect there will be roughly 750 GW of operating clean power capacity in 2030. With stable policies in place, we expect annual wind, solar, and energy storage capacity installations to grow to over 90 GW by the end of the decade, more than tripling the 28 GW installed in 2021.

It is anticipated that the implementation of the IRA's regulations will accelerate the rate of clean energy installations throughout the decade. By mid-decade, it is projected that annual installations will exceed 50 GW, and they will continue to increase to more than 90 GW by the end of the decade. For comparison, the average industry forecast under business-as-usual circumstances predicts that the most productive year will generate just under 50 GW, resulting in a total addition of 335 GW to clean energy capacity.

Building 525 to 550 GW of new clean power capacity will generate $550 to $600 billion in capital investment. More broadly, construction of these projects is expected to generate over $900 billion in economic activity and add nearly $500 billion to U.S. GDP across the decade. After construction, ongoing maintenance and operations will contribute over $14 billion to U.S. GDP each year while generating nearly $29 billion in annual economic activity.

The Inflation Reduction Act *(continued)*

Investment Tax Credit

Wind, solar, energy storage

- Credits available for 30% of project cost
- Phase-out begins in latter of 2032 or when emissions fall to 75% of 2022 levels
- Projects must meet prevailing wage and apprenticeship requirements

Production Tax Credit

for renewable or zero-carbon electricity

- Available for the first 10 years of asset operating life
- $27.50/MWh for wind and solar
- Phase-out begins in latter of 2032 or when emissions fall to 75% of 2022 levels
- Projects must meet prevailing wage and apprenticeship requirements

PTC & ITC Bonus Credits

ENERGY COMMUNITIES
10% bonus for projects located on brownfield sites or fossil fuel communities with high unemployment

DOMESTIC CONTENT
10% bonus for meeting certain domestic content requirements

LOW-INCOME COMMUNITIES
10% bonus for projects <5 MW located in low-income communities or on tribal lands

Bonus credits are stackable

Manufacturing Credits

PTC for specific solar, wind, and battery storage components

Clean Hydrogen PTC

Up to $3 per kilogram depending on carbon intensity. Available for first 10 years of operating life

Transferability

Monetization of tax credits is enabled by allowing entities to sell the credits to unrelated parties

$5 BILLION
to DOE to support retooling and repowering of generation and transmission facilities

$2 BILLION
to DOE for loans financing transmission projects of national interest

$760 MILLION
to DOE for state grants targeting transmission line siting

$395 MILLION
across DOE, FERC, DOI, and NOAA to hire personnel to permit projects

$100 MILLION
to DOE to study interregional and offshore wind transmission

OCSLA extended to U.S. territories for offshore wind

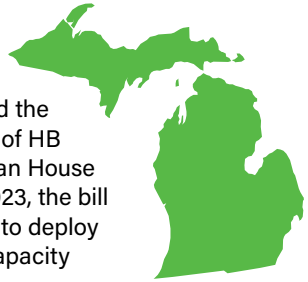
U.S. Clean Power Policy

State Policy Highlights

Illinois

Governor J.B. Pritzker signed into law the Illinois Siting and Permitting Reform Bill in January 2023. The law blocks county governments in Illinois from enacting ordinances that would serve as an outright ban on clean power projects. The law also sets standards for zoning and siting, preventing local governments from putting in place overly restrictive standards for wind and solar projects.

Michigan



Governor Gretchen Whitmer announced the MI Healthy Climate Plan, which established the framework for the introduction of HB 4256. Introduced in the Michigan House of Representatives in March 2023, the bill establishes a goal for the state to deploy 2,500 MW of battery storage capacity by 2029.

Indiana

The Indiana General Assembly passed SB 411 in March. The bill established siting standards that county governments could adopt on a voluntary basis. Adopting the standards would designate the county as a wind or solar-ready community.

California

The state of California took major strides in 2022 to advance the clean energy transition. The state capitalized on a historic budget surplus to pass a five-year climate package, authorizing $54 billion to commercialize critical clean power technologies such as long-duration storage and green hydrogen. Governor Gavin Newsom spearheaded an effort in the final month of the legislative session to codify the state's goal to reach net-zero emissions by 2045 as well as to accelerate California's zero-carbon electricity targets.

New York

In December 2022, the State of New York's Climate Action Council adopted the Climate Scoping Plan in order to implement the 2019 Climate Leadership and Community Protection Act. The Scoping Plan outlined an ambitious roadmap to help the state meet its goals to generate 70% of electricity from renewable sources by 2030 and 100% of power from zero-emissions sources by 2040. The plan would lead to a significant reduction in emissions and prime the state for the energy transition.

Massachusetts

In August 2022, Governor Charlie Baker signed into law H 5060, also known as the omnibus climate bill. The law, titled An Act Driving Clean Energy and Offshore Wind, contains provisions that would decarbonize the state's economy, encourage the deployment of clean energy, and codify Massachusetts' goal to procure 5,600 MW of offshore wind energy by 2030.

New Jersey

Governor Phil Murphy issued Executive Order No. 307 in September 2022, raising the State's offshore wind energy goal from 7,500 MW to 11,000 MW by 2040. The Executive Order also instructed the New Jersey Board of Public Utilities to conduct a feasibility study on increasing the offshore wind target, signalling that the target may expand again in the future.

Maryland

The Maryland General Assembly passed the Climate Solutions Now Act of 2022 in April 2022. The law established ambitious goals to cut greenhouse gas emissions by 60% by 2031 and to reach net-zero greenhouse gas emissions by 2045.

Clean Power + Transmission

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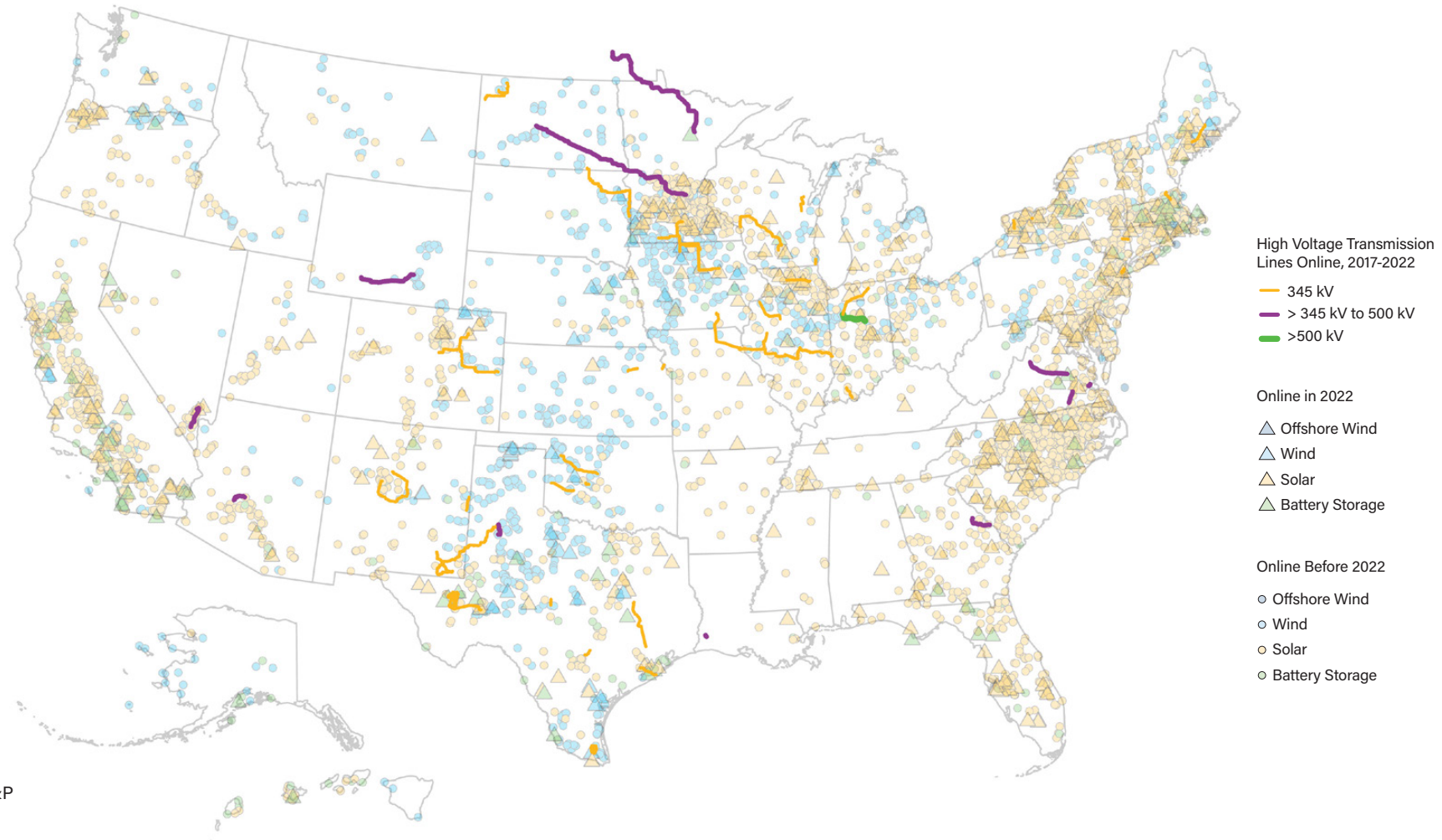
Clean Power Projects and Transmission Built Since 2017

Only 675 miles of high-voltage transmission lines delivered across the U.S. in 2022—a record low

High-Voltage Transmission Lines Built 2017-2022



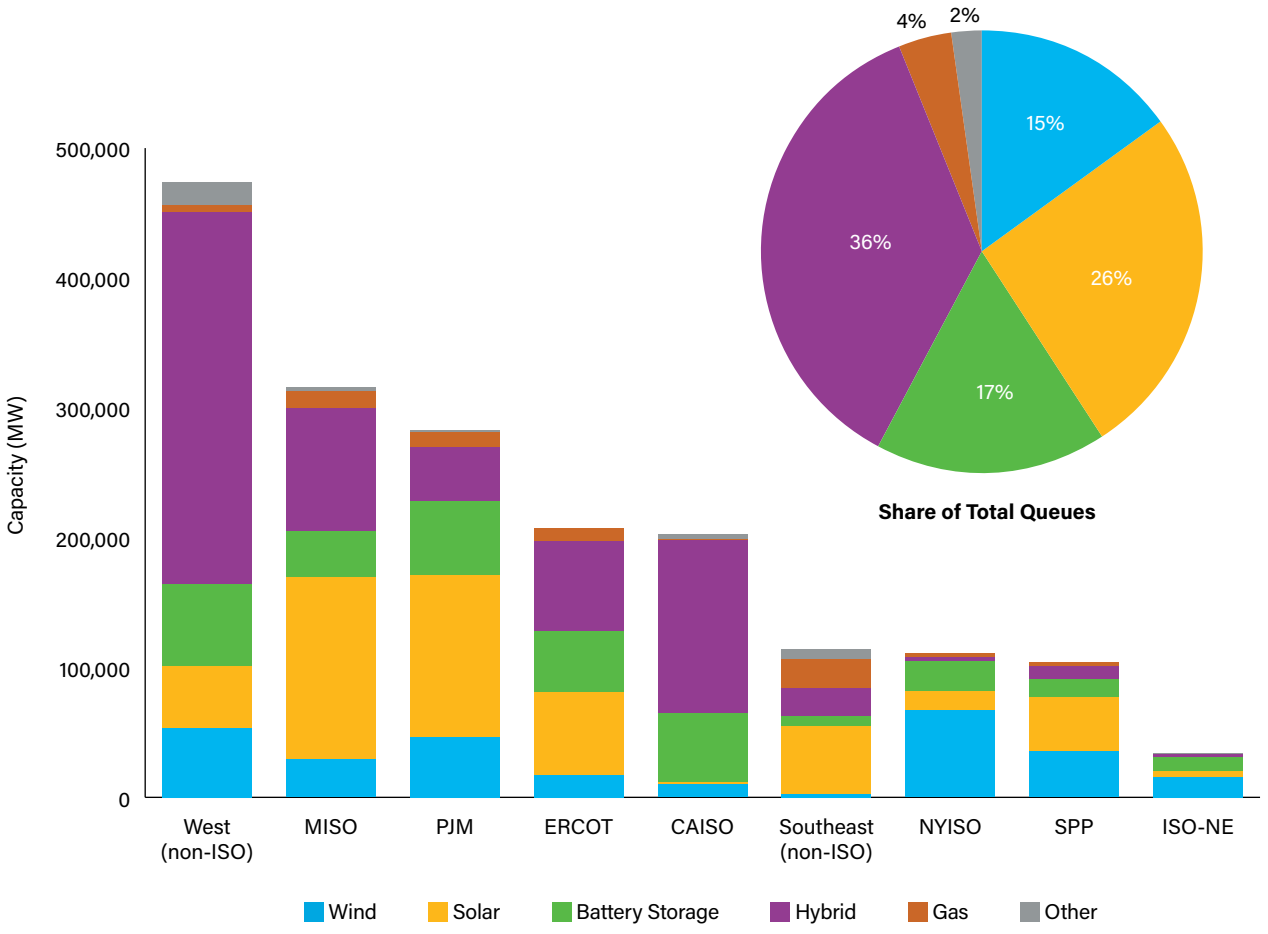
Source: S&P

Interconnection Queues

Hybrid and standalone solar projects continue to dominate the queues

- Interconnection queues are essentially a waiting list of proposed power projects seeking a grid connection in the coming months and years. While most projects that apply for interconnection are not subsequently built, data from these queues provides a good general indicator for mid-term trends in market, developer, and investor interest.
- Hybrid projects make up 36% of all capacity in interconnection queues across the U.S., while standalone solar projects represent roughly 26%. Solar combined with battery storage makes up roughly 85% of hybrid projects in the queues.
- Hybrid solar plus battery projects represent nearly 57% of capacity in the CAISO queue. This is most likely driven by the fact that California already has a high solar penetration rate and developers are seeking to shift electricity generated by solar to other periods of the day.
- Standalone solar makes up about 44% of capacity in both PJM and MISO's queue. Wind makes up the majority of the queue in NYISO and ISO-NE, primarily due to offshore wind projects.

Interconnection Queue Backlog



Source: LBNL

Clean Power Procurement

AMERICAN CLEAN POWER

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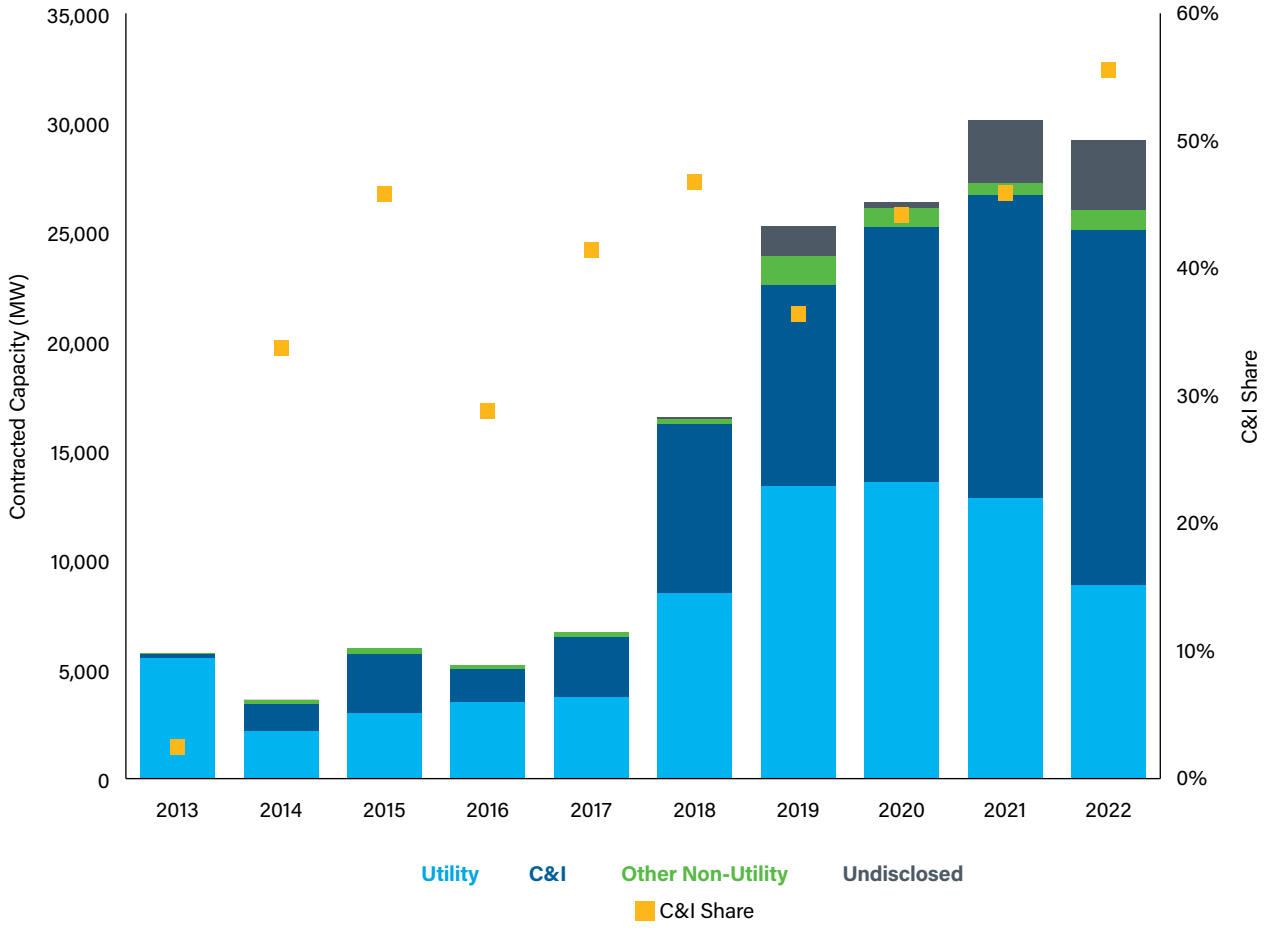
Clean Power Procurement

Power Purchase Agreement Announcements by Buyer Type

Corporate buyers are becoming an increasingly important clean power buyer group

- ACP monitors and analyzes the adoption of clean power offtake agreements as they are announced, as well as procurement trends for operational clean power projects. This chart displays the annual capacity of clean PPAs, categorized by the type of purchaser. It's important to note that many of the projects depicted in this chart are still in the development stage.
- Long-term PPAs have long been the dominant offtake mechanism form. The 29.2 GW of PPAs announced in 2022 falls short of the record set in 2021 by 3%. This is due to a decline in utility PPA announcements. Corporate buyers, on the other hand, set a record for PPA announcements in 2022, announcing more than 16 GW of new PPAs.
- The percentage of annual PPA announcements made by corporate buyers has fluctuated over time. In years with low overall announcement numbers, the corporate share of annual announcements is notably higher. Over the past four years, the C&I share has risen from 36% to 56% as corporations work towards sustainability goals.
- Utilities used to dominate PPA announcements, accounting for between 50% and 70% of announcements between 2014 and 2020. In recent years, the utility share has dropped, reaching a low of 30% in 2022.

Power Purchase Agreements Signed Over Time, by Power Purchaser Type



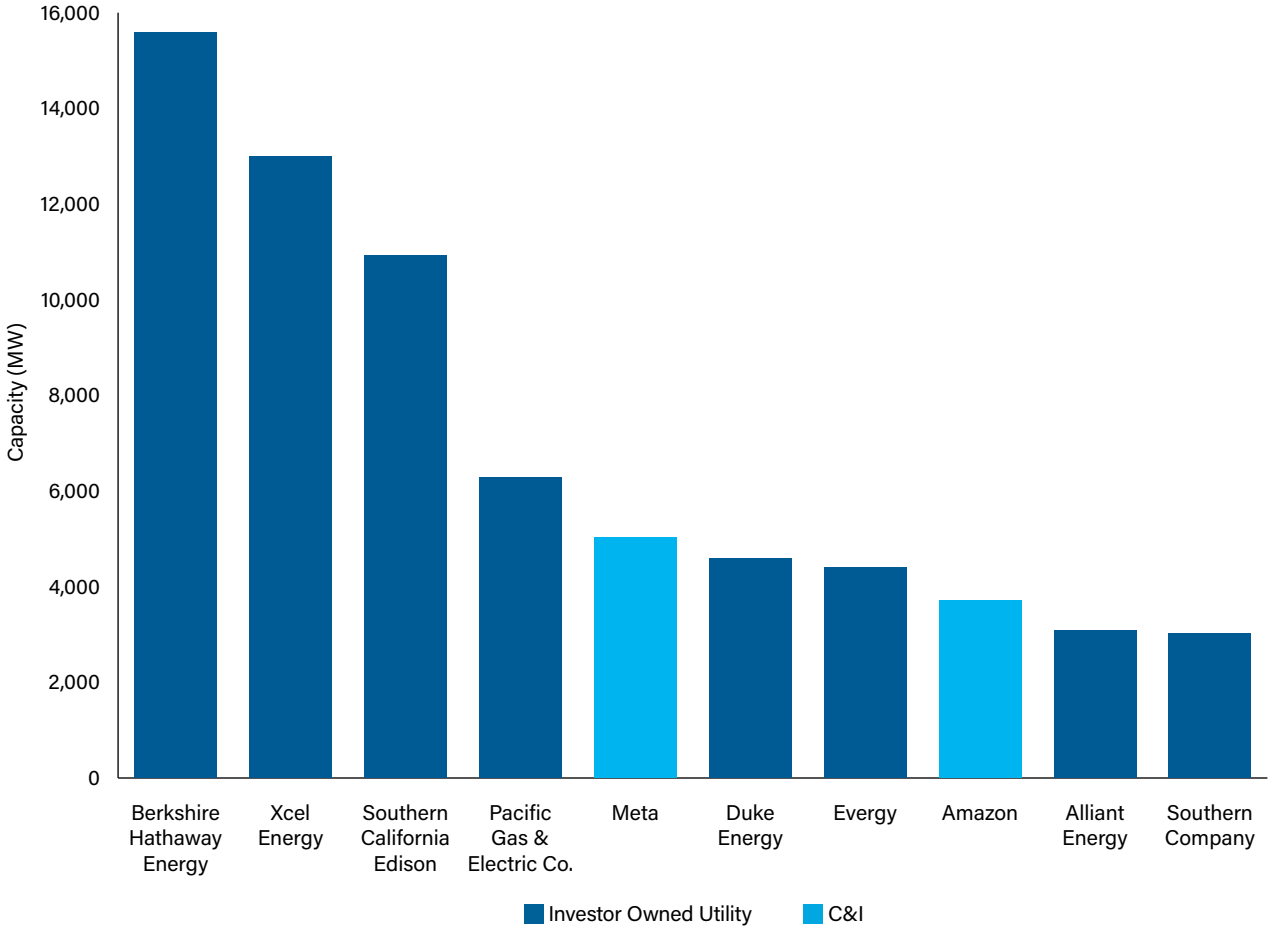
Clean Power Procurement

Top Buyers of Operating Clean Power

Investor-owned utilities dominate the top ten, with Berkshire and Xcel maintaining the top spots

- This chart showcases the top ten purchasers of wind and solar power capacity in the nation. These buyers obtain these clean energy resources through offtake contracts or direct ownership of the assets.
- As pressure on utility and non-utility entities alike to decarbonize mounts, demand for clean energy has risen. IOUs dominate the top buyers of operating clean power rankings, though a few corporate buyers are moving up in the ranks.
- Berkshire Hathaway Energy ranks first with nearly 15.6 GW of clean power operating and serving customers across the West and Midwest.
- Xcel Energy ranks second with nearly 13 GW operating, an approximately 1 GW increase from 2021.
- Southern California Edison maintained the third place ranking the utility held in 2021, with just shy of 11 GW of clean power online.
- Meta is the first corporation to appear in the rankings, thanks to the company's early adoption of clean power PPAs.
- Amazon is the only other corporate buyer to appear in the list. With the large volume of PPAs that Amazon has announced in recent years, it is likely to move up the rankings as those projects commission.

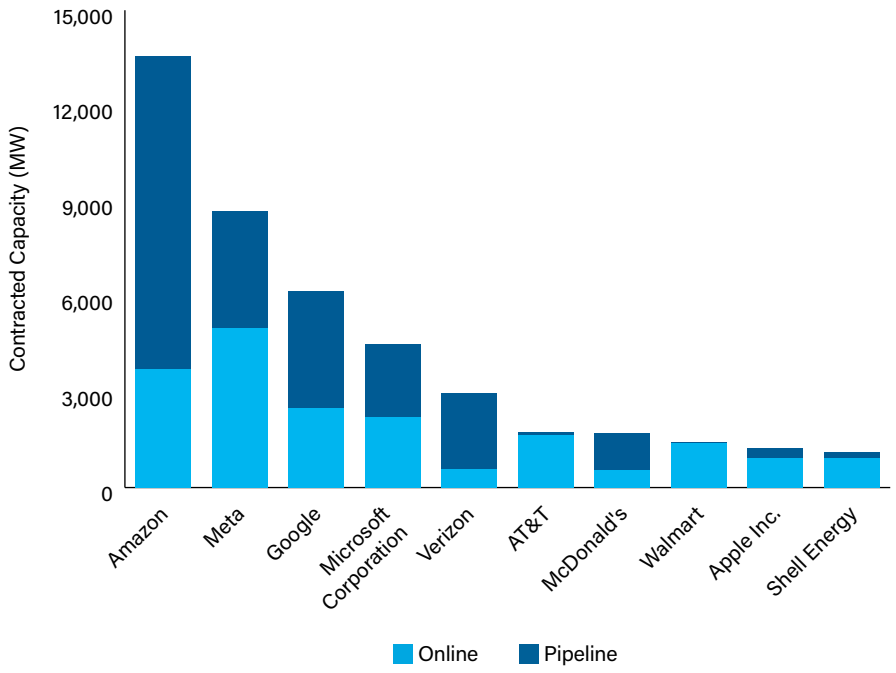
Top Purchasers with Operating Clean Power



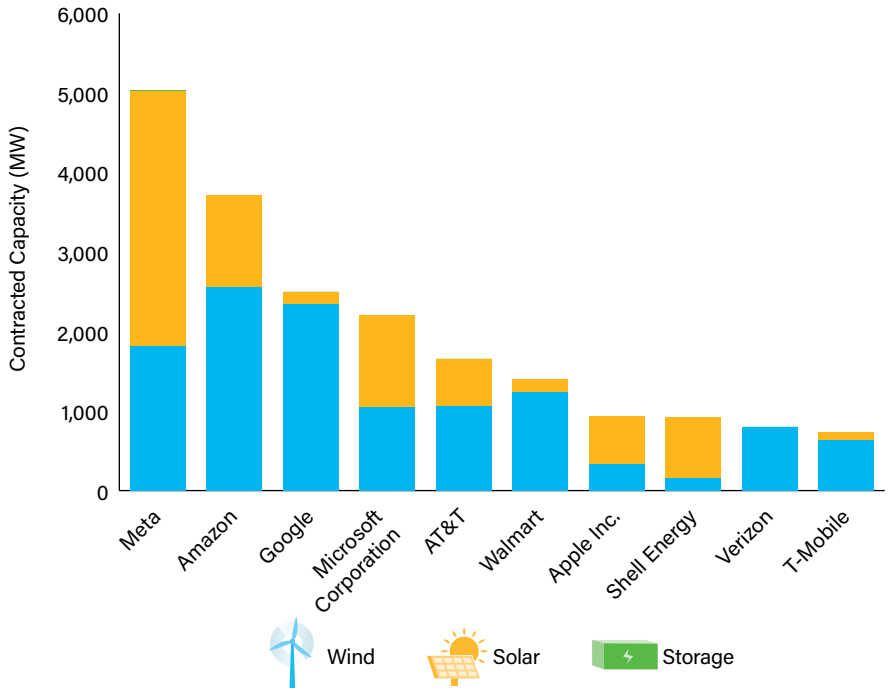
Top 10 Commercial & Industrial Buyers of Operating Clean Power

Meta leads C&I buyers with the most operating clean power, Amazon leads in total contracted capacity

Top 10 Commercial & Industrial Buyers of Clean Power



Top 10 C&I Purchasers of Operating Clean Power



- Corporations are increasingly turning to clean energy to power their business activities—delivering products, services, and experiences that are clean powered.
- Amazon has contracted the most clean power to date after rapidly increasing procurement activity over the past two years. Meta and Google, who were earlier adopters of clean energy, rank second and third in terms of total operating capacity.
- Much of the C&I contracted capacity is for clean power projects still in development. Meta has the most operating clean power contracted and operating its business. Amazon ranks second for operating contracted capacity.
- Google kicked off the modern era of large-scale C&I deals in 2010 and now ranks third for total operating contracted capacity.

Clean Power Economic Benefits

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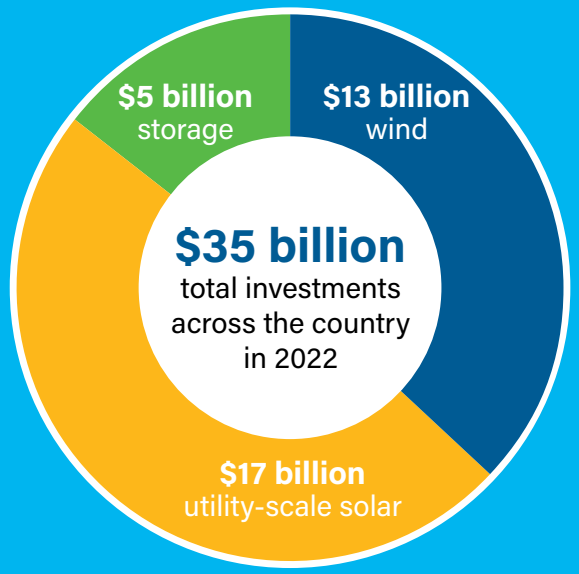
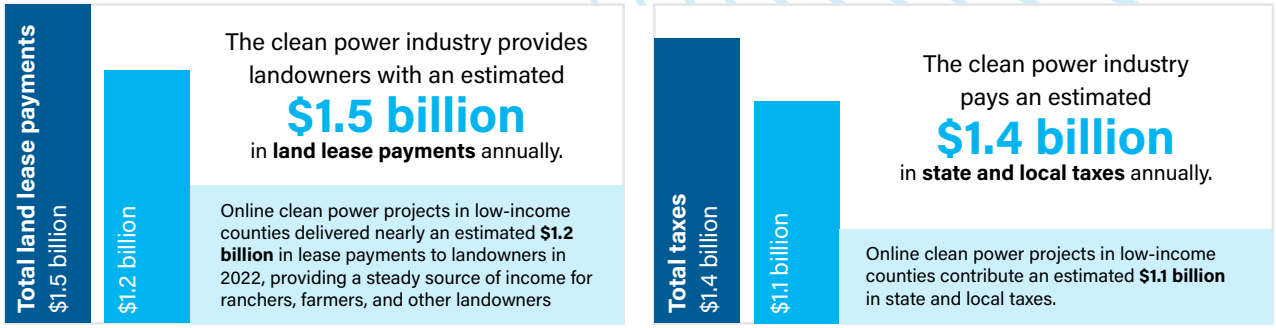
Clean Power Economic Benefits

Investing in clean power is a potent catalyst for economic growth throughout the United States, fueling new development



Clean Power Lifts Up Communities

Clean power expands the tax base in American communities and provides extra revenue from drought-proof land lease payments to landowners that host projects.



The clean power industry provides landowners with an estimated

$1.5 billion

in **land lease payments** annually.

Online clean power projects in low-income counties delivered nearly an estimated **$1.2 billion** in lease payments to landowners in 2022, providing a steady source of income for ranchers, farmers, and other landowners

The clean power industry pays an estimated

$1.4 billion

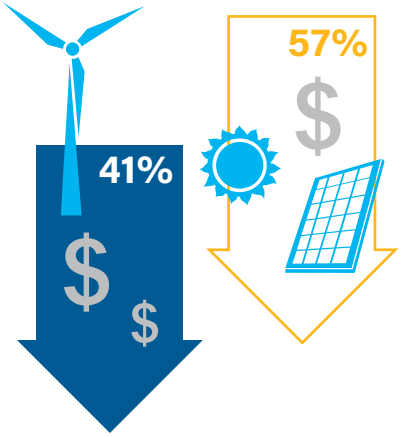
in **state and local taxes** annually.

Online clean power projects in low-income counties contribute an estimated **$1.1 billion** in state and local taxes.

Nearly 81% of U.S. clean power capacity is installed in low-income counties, or counties where the median household income falls below the national median household income of $69,717.

Clean Power is a Cost-Effective Solution to Combat Climate Change

WIND & SOLAR costs have fallen **41%** and **57%** over the last decade, making them the most affordable new electricity sources in most of the U.S.



When generating electricity, **WIND AND SOLAR power produce**

zero emissions.

Emissions avoided by operating wind and solar projects in the U.S. generate health benefits with an economic value between

$20 and $51 billion.

Clean Power Creates Climate-Friendly and Family-Sustaining Jobs

According to the Department of Energy's United States Energy and Employment Report 2022, wind, distributed and utility-scale solar, and battery storage sectors employed nearly **443,000** people supporting project development and operations, construction, maintenance, manufacturing, and other supply chain activities.*

Clean energy is set to have nearly **200,000** domestic workers in the manufacturing sector alone by 2030 as part of achieving a majority renewable electric grid

U.S. offshore wind growth will support up to **83,000 jobs** by 2030

*As of the end of 2021

Renewable energy workers are paid **25-35%** more than the national median wage and **10%** of the workforce is unionized

Wind turbine technician and solar installer are **2 of the fastest-growing jobs** in the country

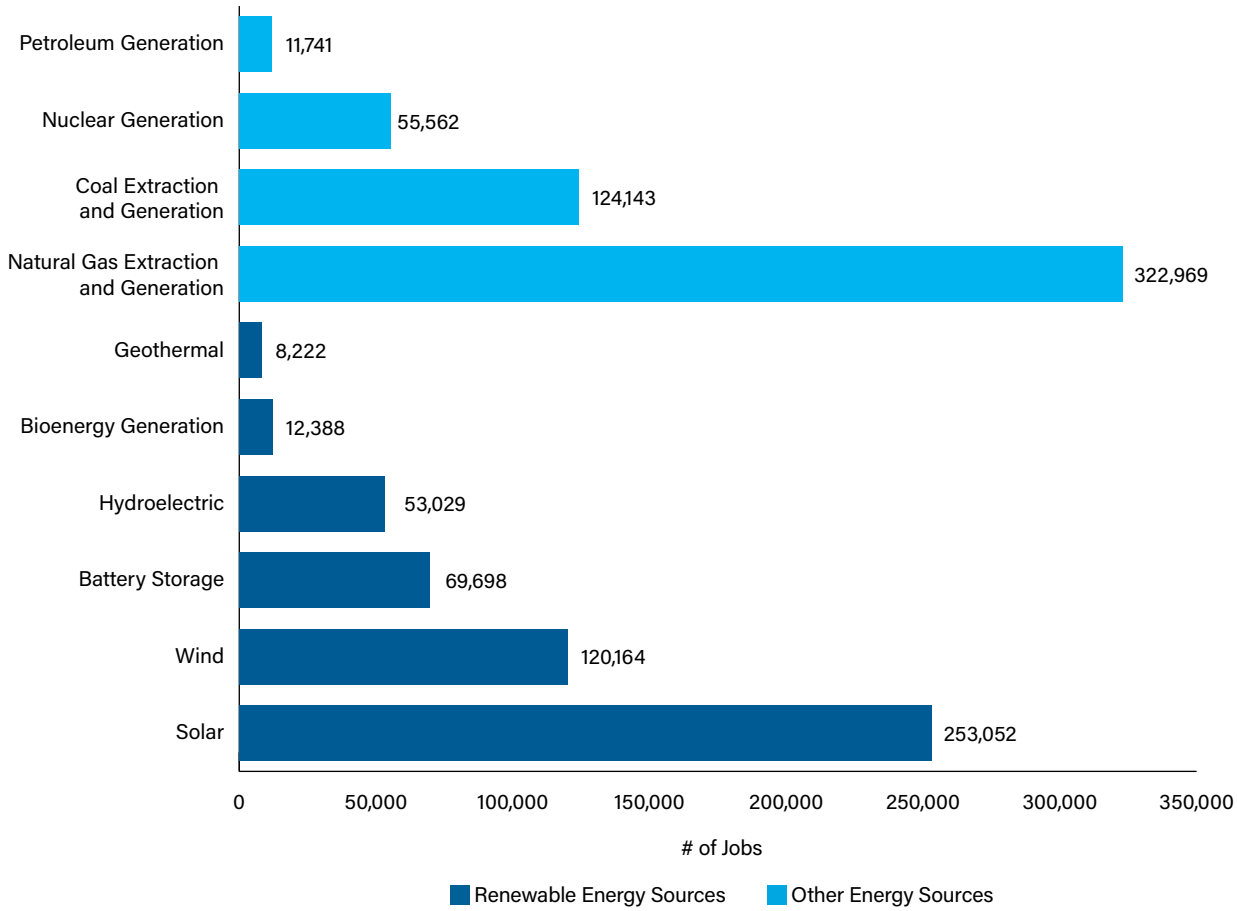
Economic Benefits

Clean Power Jobs

Wind, solar, and energy storage employ 443,000 Americans

- According to a report issued by the Department of Energy titled *United States Energy and Employment Report 2022*, wind, distributed and utility-scale solar, and battery storage sectors employed nearly 443,000 at the end of 2021 supporting project development and operations, construction, maintenance, manufacturing, and other supply chain activities.
- The solar sector makes up the largest share of clean power employment with 253,052 estimated majority time workers. This is an increase of nearly 20,000 from 2020.
- The wind sector employed 120,164 workers in 2021, up from 116,801, while battery storage sector employment increased from 66,749 in 2020 to 69,698 in 2021. These estimates include both direct and indirect (supply chain) employment.
- The are nearly as many workers employed by U.S. clean power than in the coal extraction and generation, natural gas extraction and generation (including advanced natural gas) sectors combined.
- The 2023 update of the Department of Energy's U.S. Energy and Employment Report is due to be released in June 2023.

Energy Sector Jobs in 2021



Source: DOE USEER
Note: Jobs are as of the end of 2021; The 2023 update of the Department of Energy's U.S. Energy and Employment Report is due to be released in June 2023.

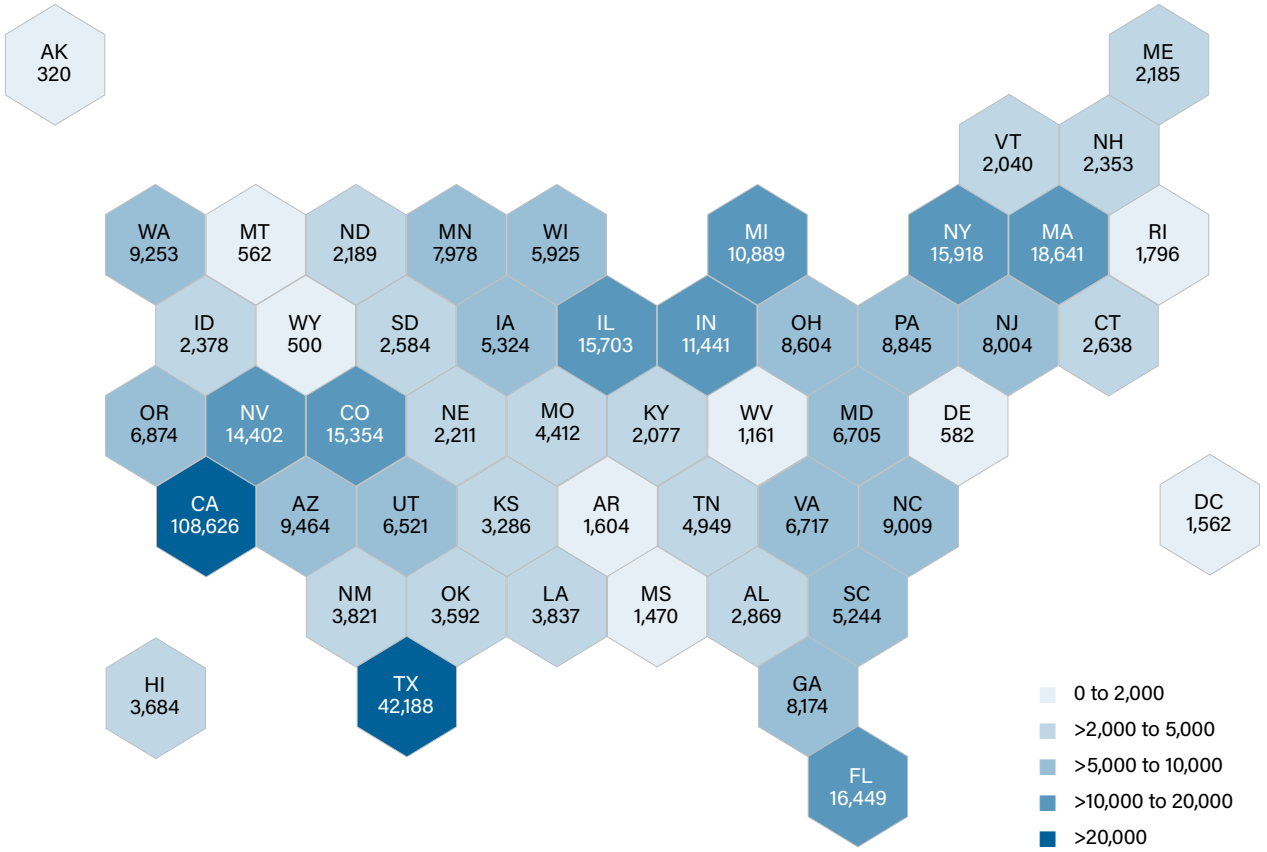
Economic Benefits

Clean Power Jobs by State

Clean power employs workers across the country in all 50 states

- American clean power is red, white, and blue with jobs spread across all 50 states.
- While jobs are often concentrated in states with high solar and wind resources, such as California and Texas, clean power employment is distributed fairly evenly across the states on a per capita basis.
- More than a third of total solar industry employment is found in California – roughly 87,200 full-time jobs. As a proportion of total state employment, solar employment in California is comparable to many other states including Hawaii, Nevada, and Vermont.
- Similarly, Texas hosts roughly 21% of total wind energy employment, or more than 25,500 jobs. However, per capita, Colorado, Indiana, Iowa, Maine, North Dakota, and South Dakota have a greater share of wind energy jobs.

Clean Power Jobs in 2021



Note: Jobs are as of the end of 2021; the 2023 update of the Department of Energy's U.S. Energy and Employment Report is due to be released in June 2023.

Source: DOE USEER

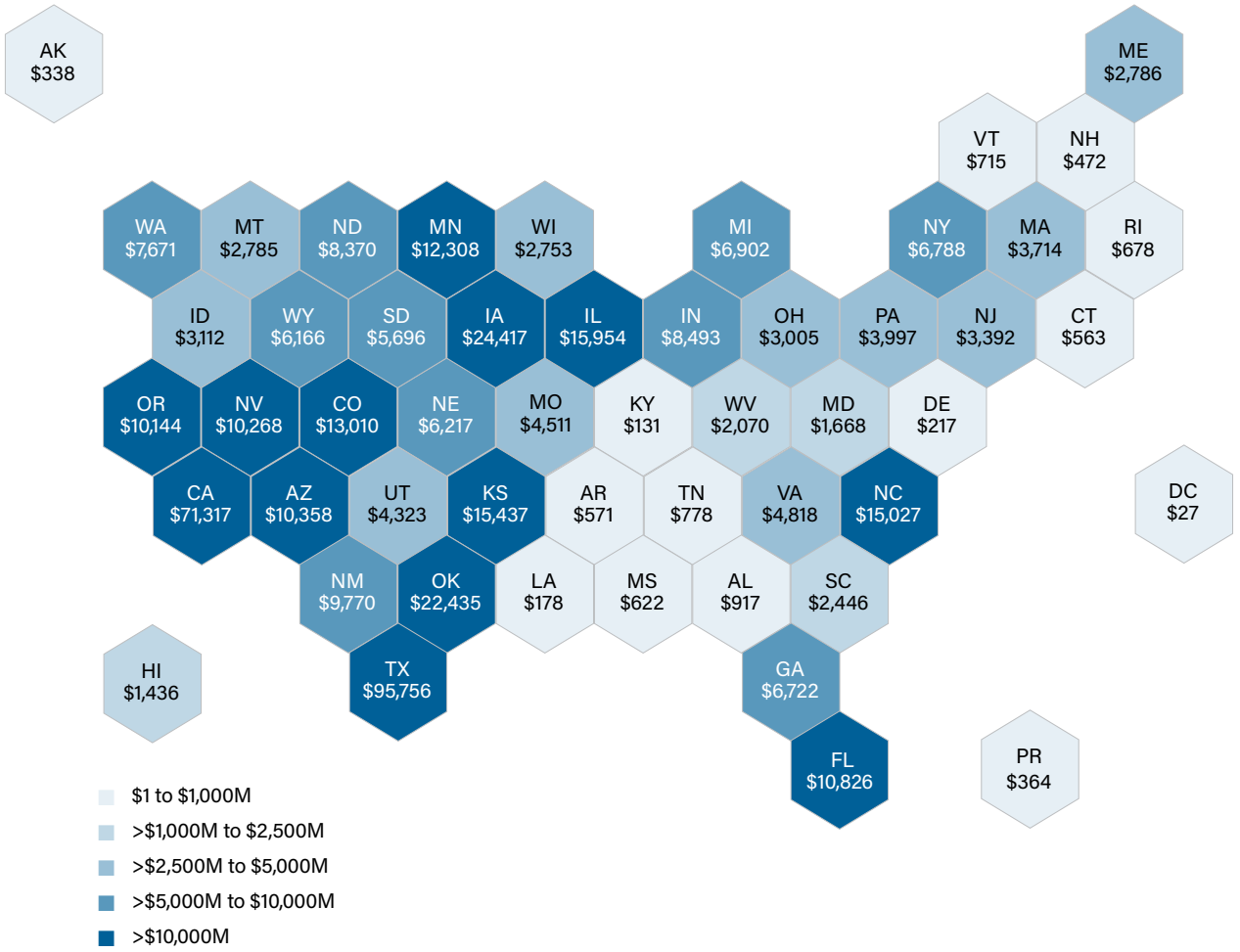
Economic Benefits

Capital Investment by State

Texas leads with nearly $96 billion in cumulative clean power project investment, followed by California

- Developers in Texas installed a nation-leading 9.2 GW of clean power in 2022, representing over $12.7 billion in project investment. Nearly half of this was driven by wind development with $6.3 billion of total project investment in that state. Solar project investment was slightly lower at $5.2 billion, while storage project investment came it at $1.2 billion. The 54.5 GW of clean power operating in Texas represents a total capital investment of nearly $95.8 billion.
- California, at nearly $5.9 billion of total clean power investment in 2022, follows Texas. This was driven largely by solar and storage capacity. Just under $3.0 billion worth of storage projects and just over $2.8 billion worth of solar projects came online in California in 2022. Wind projects represented over $100 million in capital investment in the state. Total capital investment in California surpassed $71.3 billion in 2022.
- Three other states had more than $1 billion worth of clean power projects come online in 2022.

Cumulative Capital Investment ($millions)



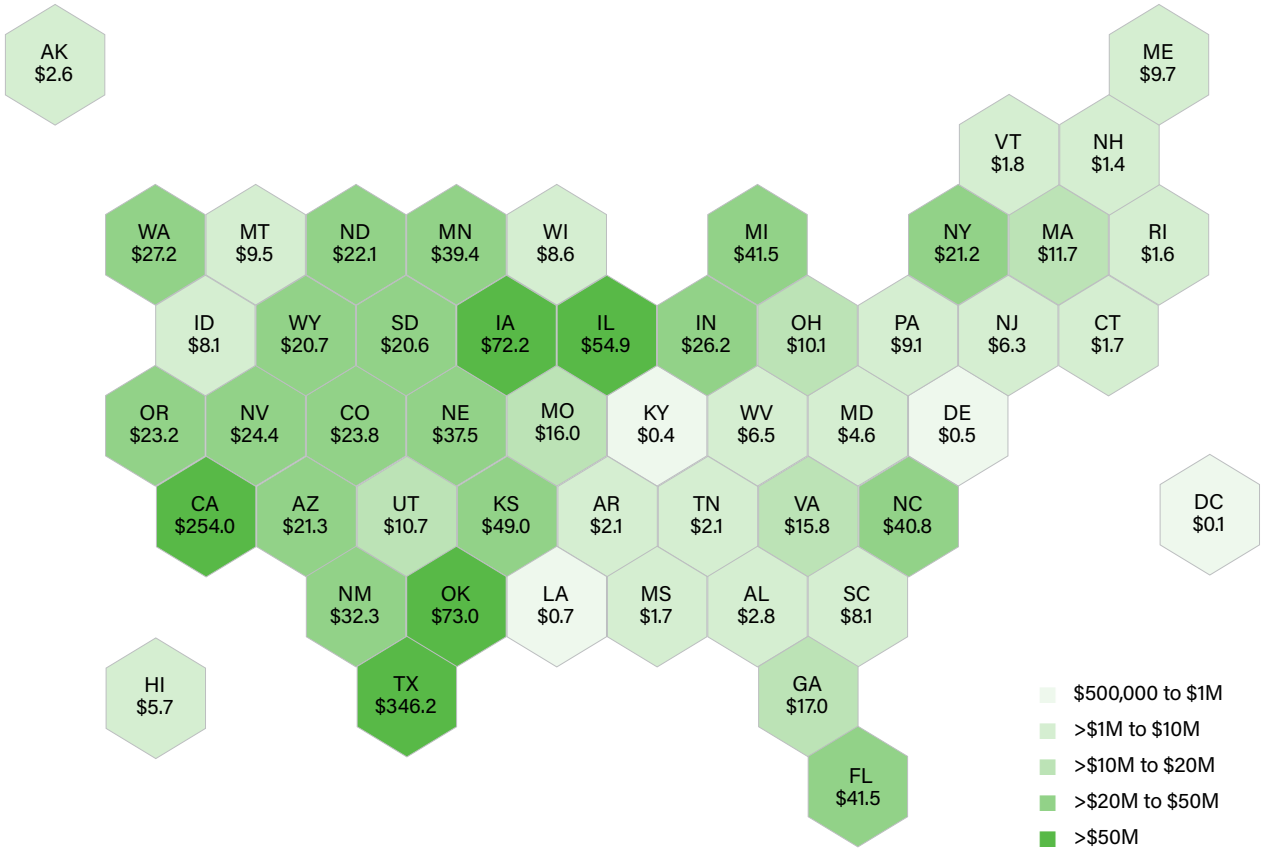
Economic Benefits

Annual Land Lease Payments

The clean power industry provides nearly $1.5 billion in annual land lease payments

- Clean power projects contribute directly to local communities through annual tax payments and landowner lease payments. Land lease payments from clean power projects provide communities with additional income, stimulate local economies, diversify revenue sources, and support public services, all of which contribute to the overall well-being and sustainability of the community.
- In 2022, the clean power industry paid an estimated $1.4 billion in state and local taxes and nearly $1.5 billion in land lease payments to landowners across the U.S. That means that each year, the industry contributes at least $2.9 billion to local communities.
- With the most clean power capacity installed, Texas leads the U.S. with an estimated $346 million in annual land lease payments, followed by California with an estimated $254 million.

Estimated Land Lease Payments in 2022 ($millions)



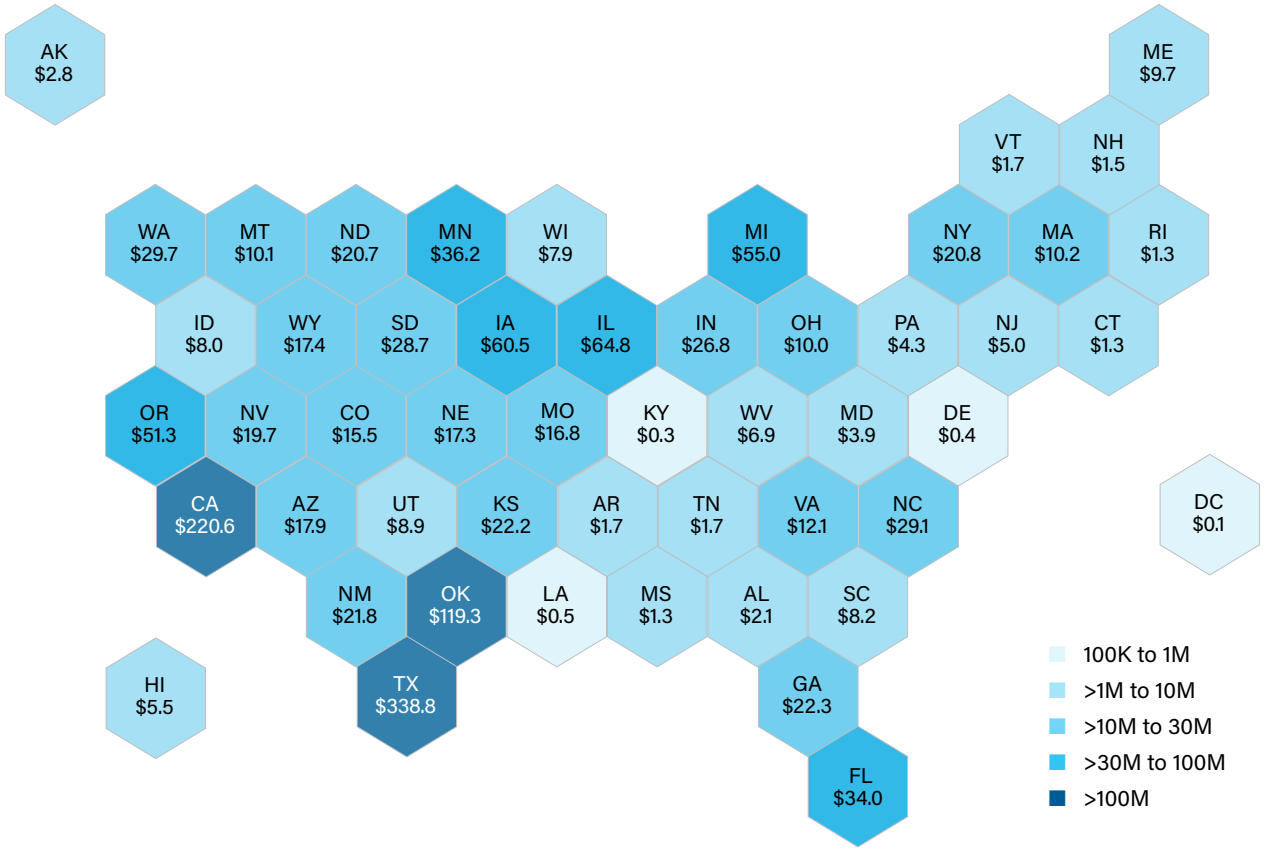
Economic Benefits

State and Local Tax Payments

In 2022, the clean power industry paid an estimated $1.4 billion in state and local taxes

- Texas leads all states with an estimated $339 million in state and local taxes paid in 2022. California follows with an estimated $221 million.
- There are five other states with estimated state and local tax revenues from clean power exceeding $50 million.
- In addition to capital investment and lease payments, annual property, income, and sales tax payments provide valuable revenue for local school districts and other government services.
- For example, in Minnesota, where there is a wind production tax, Murray County has put revenue from wind projects to good use. In 2020-21, the county replaced the HVAC system in the courthouse using $750,000 of wind production tax revenue. In 2019, the county contributed $100,000 of wind revenue to help bring broadband internet to roughly 100 previously unserved locations.

Estimated State and Local Taxes Paid in 2022 ($millions)



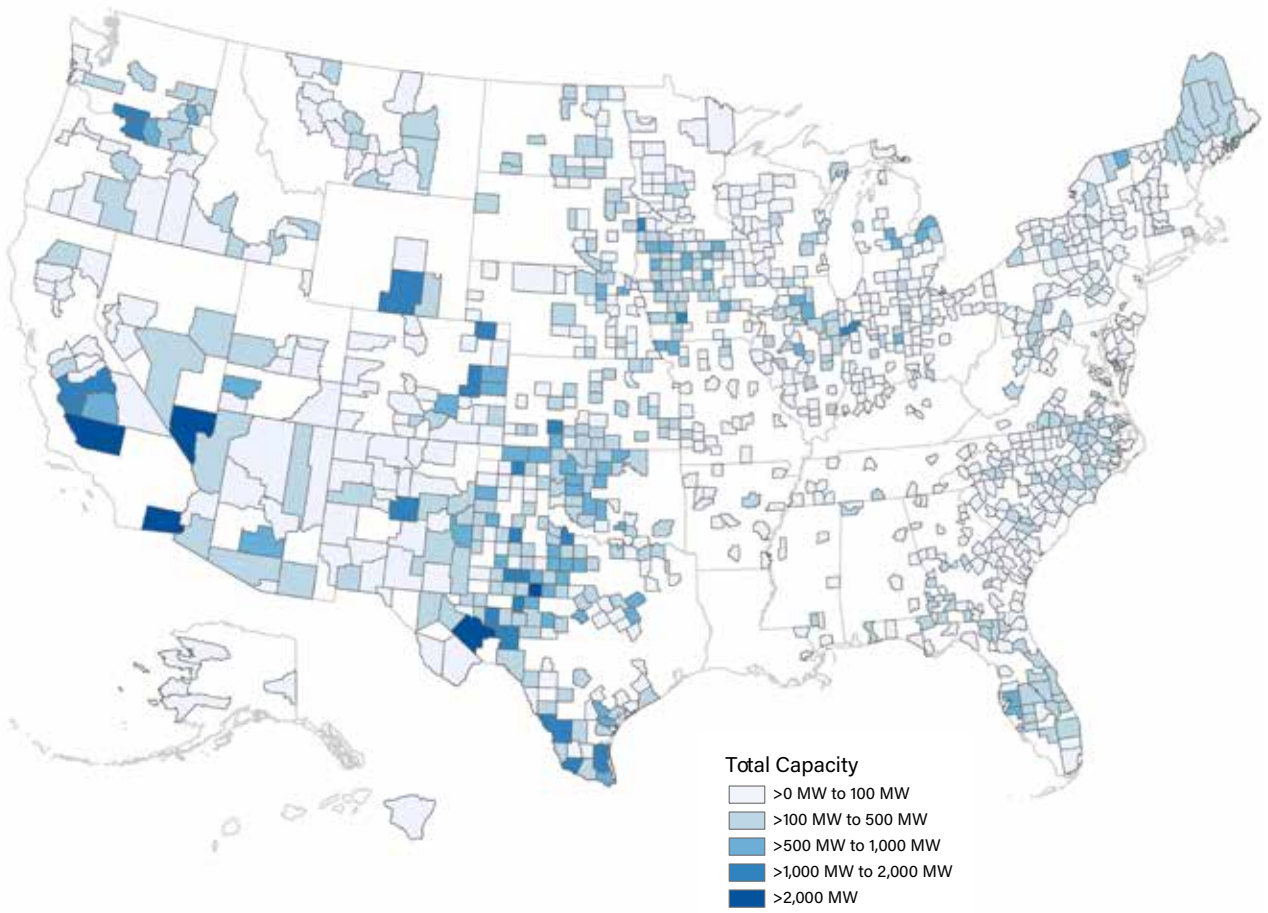
Economic Benefits

Clean Power Installed in Low-Income Counties

Nearly 81% of U.S. clean power is installed in low-income counties

- Nearly 81% of U.S. clean power capacity is installed in low-income counties, or counties where the median household income falls below the national median household income of $69,717. These projects create economic opportunities in the communities that need it most, providing local employment, land-lease payments, as well as property, income, and sales tax revenue.
- Online clean power projects in low-income counties delivered nearly an estimated $1.2 billion in lease payments to landowners in 2022, providing a steady source of income for ranchers, farmers, and other landowners.
- In addition, online clean power projects in low-income counties contribute an estimated $1.1 billion in state and local taxes.
- These projects represent a cumulative $356 billion in private capital investment. Approximately 57% of land-based wind, solar, and battery storage capacity under construction or in advanced development is in low-income counties, representing an additional $109 billion in new project investment.

Clean Power Installed in Low-Income Counties



Clean Power Environmental Benefits

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Clean Power Technologies Help Our Economy and our Planet

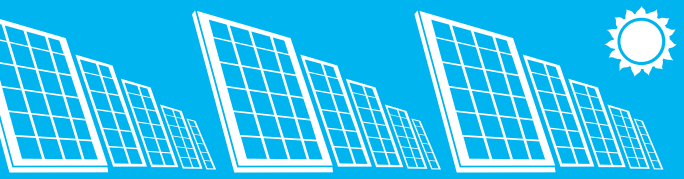
Clean energy sources like **WIND & SOLAR** are critical parts of reducing greenhouse gas emissions and combating climate change.

Transitioning to majority zero-carbon energy sources like land-based wind, offshore wind, and solar will help drive the clean energy economy forward while benefiting our planet.

When generating electricity, **WIND & SOLAR power produce zero carbon emissions,** the greenhouse gas primarily responsible for climate change

The carbon footprint of a typical **SOLAR** pv plant is **11x smaller** than a natural gas plant and **21x smaller** than a coal plant

A typical **WIND** project repays its carbon footprint from construction in **six months or less**, providing decades of zero-emission energy



Clean Power Reduces Carbon Emissions

WIND & SOLAR power avoid emitting **426 million** metric tons of carbon dioxide per year.

That amount is the emissions equivalent of:

Taking more than **93 million** cars off the road each year

435 million one-way trips down scenic Route 66

Would equal the amount of carbon sequestered by planting **20 billion** trees

The carbon emissions saved is equivalent of not using more than **48 billion** gallons of gasoline

The carbon emissions savings can prevent over **$22 billion** in future climate-related damages each year

Driving **1 trillion** miles in your average car.

That's the equivalent of:

43 million trips around the Earth

19 trillion football fields long

16 trillion trips around the bases on a baseball diamond

Clean Power Makes Communities Healthier by Improving Air Quality

Generating electricity using clean power provides public health benefits. **WIND & SOLAR** power cut significant amounts of harmful air pollutants that impair the respiratory system and exacerbate asthma, like **sulfur dioxide (SO2)** and **nitrogen oxides (NOx)** from entering the Earth's atmosphere.

Decreasing these pollutants helps to reduce smog and the rates of asthma attacks and other respiratory issues

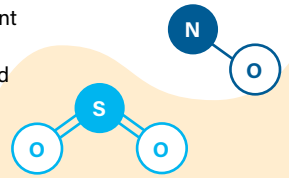
Emissions avoided by clean power generate health impacts with an economic value between $20-$51 billion

WIND & SOLAR power avoid **321,000 metric tons** of nitrogen oxides from being emitted into the Earth's atmosphere

That's the same amount of NOx emitted by an average tractor trailer driving nearly **35 billion** miles

11.7 million tractor trailers driving across the country

WIND & SOLAR power prevent **282,000 metric tons** of sulfur dioxide from being emitted into the Earth's atmosphere



Clean Power Saves Water

Because clean power does not require water for cooling like conventional power plants, **WIND & SOLAR** projects save **210 billion** gallons of water each year.

That amount of water is enough to fill:

318,000 Olympic-sized swimming pools

1.6 Trillion bottles of water

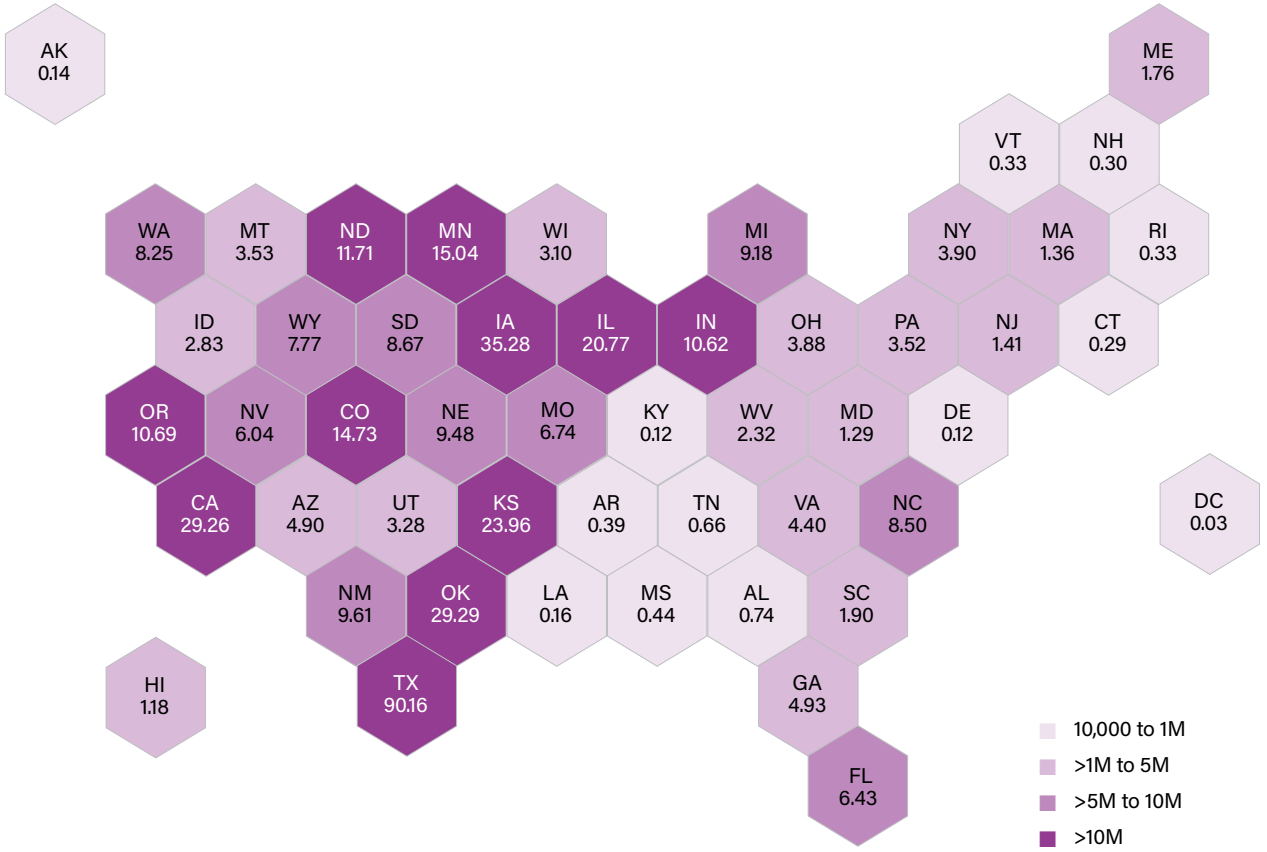
Clean Power Environmental Benefits

Carbon Dioxide Emissions Avoided by Wind and Solar Power in 2022

Installed wind and solar capacity can avoid the equivalent of 93 million cars' worth of carbon emissions

- Wind and solar power have some of the lowest environmental impacts of any source of electricity generation. These technologies do not burn fuel and therefore do not emit any air pollution such as carbon dioxide (CO_2), sulfur dioxide (SO_2), nitrogen oxides (NO_x) or particulate matter (PM2.5).
- Wind and solar power generation often leads to a corresponding decrease in electricity production from other power plants, as the low marginal costs of wind and solar energy make them competitive and capable of displacing generation from fossil-fuel powered plants.
- Based on 2021 emissions rates from the Environmental Protection Agency's (EPA) Emissions & Generation Resource Integrated Database (eGRID), wind and solar capacity installed through 2022 can reduce annual CO_2 emissions by an estimated 426 million metric tons, or roughly 93 million cars' worth of carbon emissions.
- The roughly 37 GW of wind, offshore wind, and solar power capacity under construction at the end of 2022 can reduce CO_2 emissions by an additional 61 million metric tons once operational. That would bring total emissions reductions from U.S. wind and solar energy to around 487 million metric tons per year.

Avoided CO_2 Emissions (Million Metric Tons)



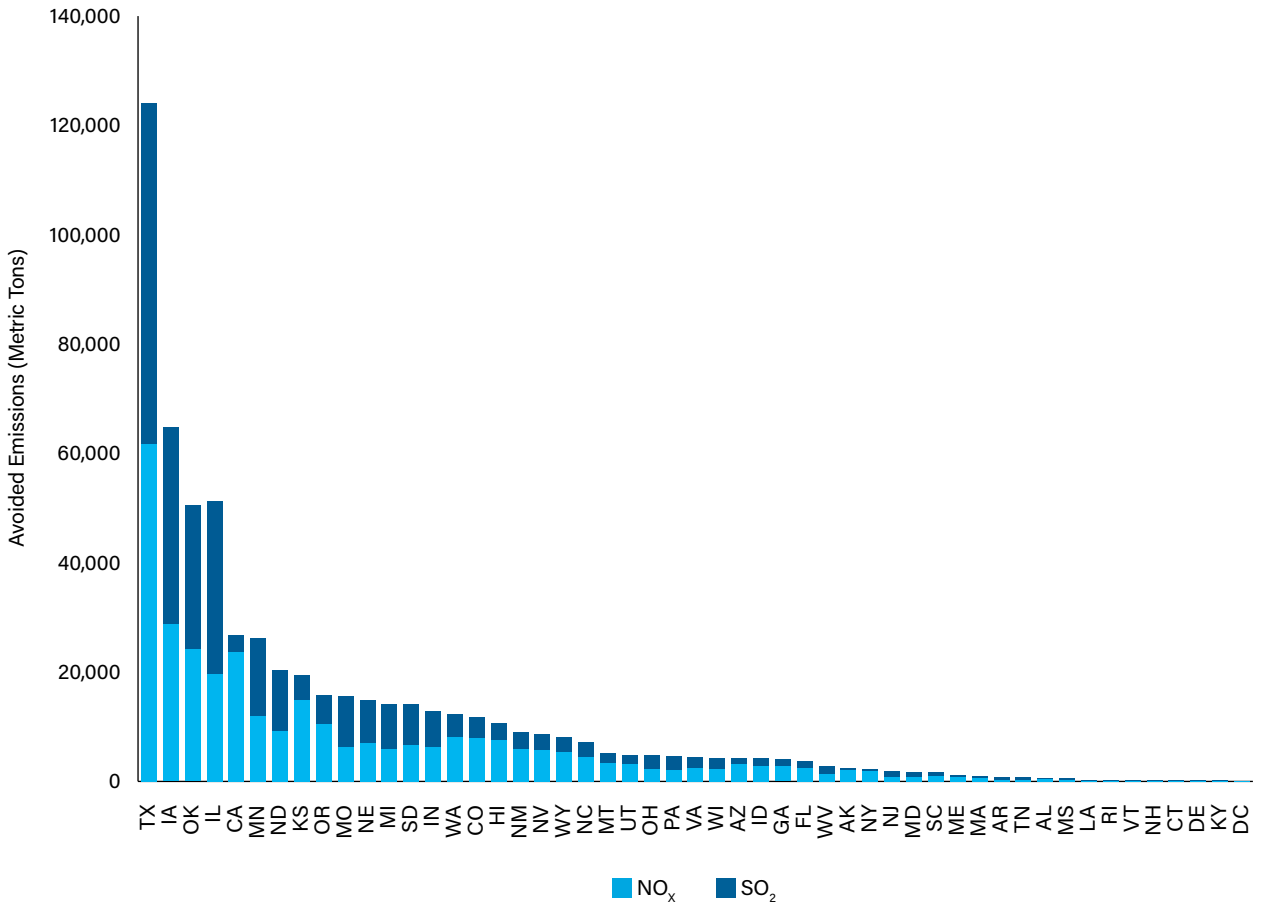
Clean Power Environmental Benefits

NO_x and SO_2 Emissions Avoided By Wind and Solar Power in 2022

Over 600,000 metric tons of NO_x and SO_2 emissions can be avoided by installed wind and solar

- Installed wind and solar capacity as of 2022 can prevent the release of roughly 13,400 metric tons of PM2.5 on an annual basis.
- PM2.5, as defined by the EPA, refers to tiny particles that are 2.5 micrometers or smaller, and can be easily inhaled. These fine particles not only contribute to haze, but can also penetrate deep into the lungs and, in some cases, even enter the bloodstream.
- Additionally, wind and solar power can prevent the release of roughly 321,000 metric tons of NO_x and 282,000 metric tons of SO_2.
- According to the EPA, NO_x and SO_2 emissions undergo chemical reactions in the atmosphere, resulting in the formation of small solid particles that can travel over long distances. Both NO_x and SO_2 are known to have detrimental effects, including contributing to respiratory illnesses like asthma and chronic bronchitis. Additionally, these emissions can lead to acidification of surface water, leading to fish mortality, and can also damage forest ecosystems by causing soil acidification and depletion of vital soil nutrients.

Avoided NO_x and SO_2 Emissions (Metric Tons)



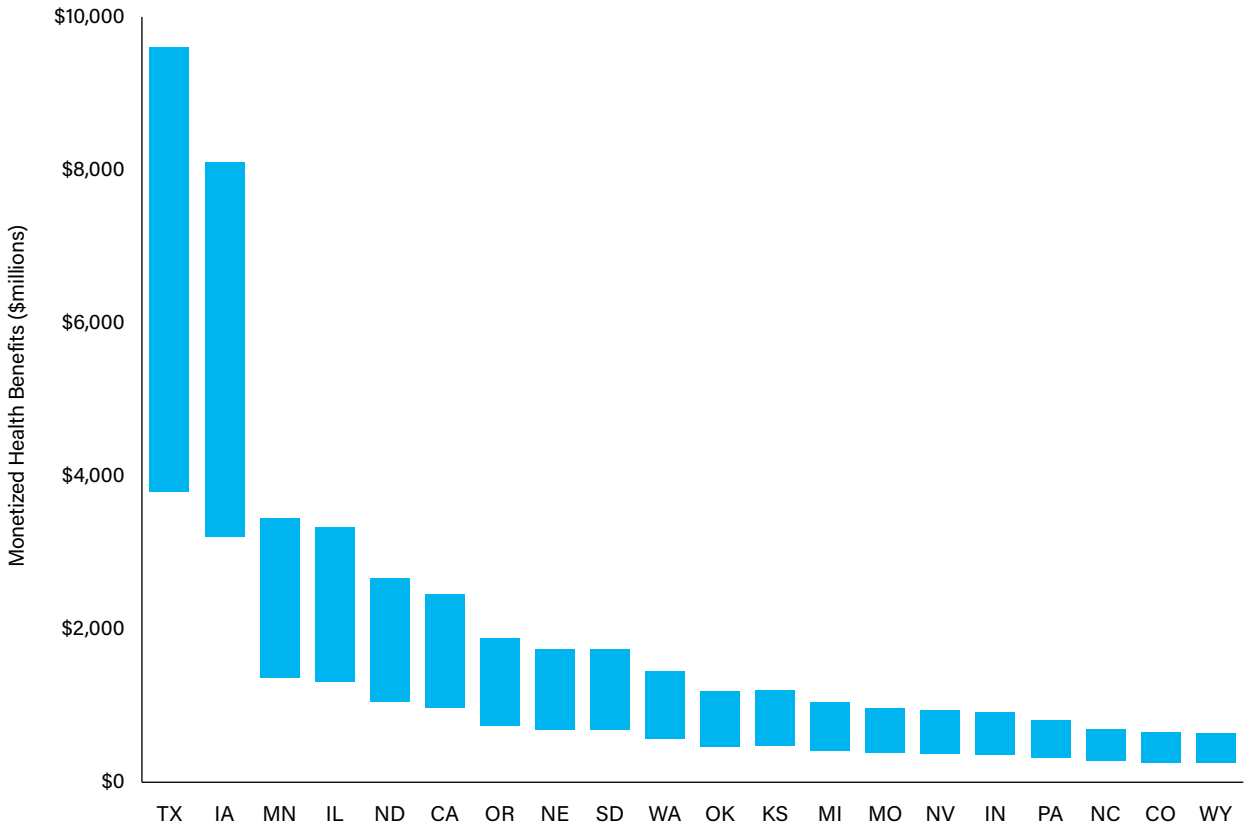
Clean Power Environmental Benefits

Health Benefits

Emissions avoided by clean power generate health impacts with an economic value between $20-$51 billion

- The EPA's CO-Benefits Risk Assessment (COBRA) model estimates the economic value of the health benefits associated with reductions in PM2.5, SO_2, and NO_x, among other pollutants. These health benefits encompass various factors such as avoided deaths, reduced asthma-related emergency room visits, fewer work loss days, and other health impacts associated with pollution. The model estimates the present value of these benefits over a 20-year period resulting from a single-year reduction in emissions.
- Emissions of PM2.5, SO_2, and NO_x that can be avoided due to the total wind and solar capacity installed through 2022 are expected to generate health benefits with an economic value between $20-$51 billion, based on EPA COBRA modeling using a 3% and 7% discount rate.
- As part of the monetized benefits, the model predicts a decrease in mortality between 2,100 and 4,800 cases, as many as 3,300 fewer non-fatal heart attacks, 60,000 fewer cases of asthma exacerbation, and 282,000 fewer work loss days.

Estimated Range of Annual Health Benefits from Emissions Reductions, 2022 Installed Capacity



Source: ACP, EPA COBRA

Clean Power Manufacturing and Trade

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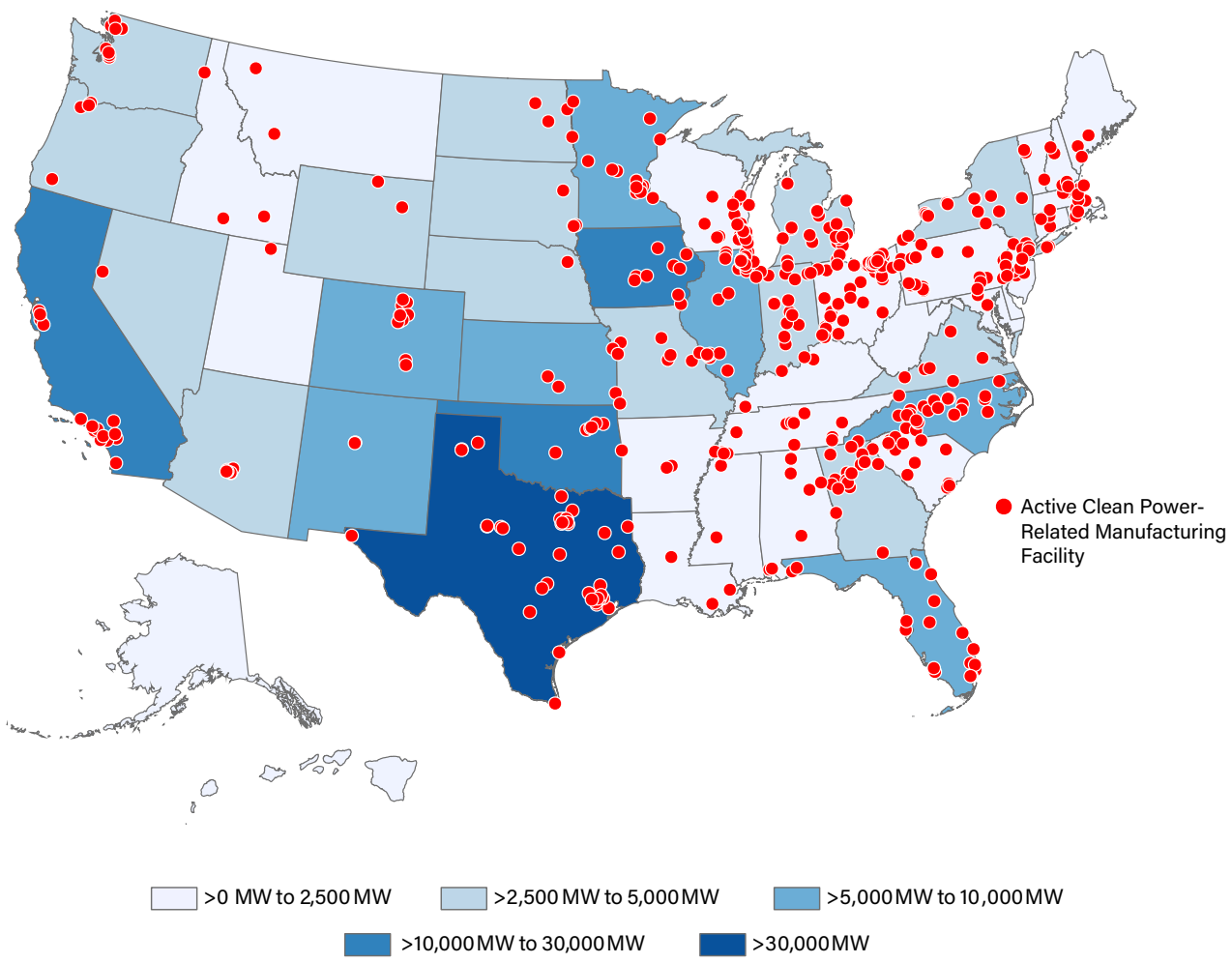
Clean Power Manufacturing and Capacity

There are over 550 active clean power-related manufacturing facilities across the U.S.

- As the most mature clean power sector in the U.S., there are nearly 450 wind-related manufacturing facilities in the U.S. Aside from providing major components such as blades, towers, and nacelles, there are hundreds of smaller manufacturers providing other components such as coatings, lubricants, power transmission components, and other raw materials to the wind sector.
- There are over 90 utility-scale solar-related manufacturing facilities in the U.S. including 10 module manufacturers, 20 racking manufacturers, and dozens more manufacturers of other components. In addition, there are 10 major battery manufacturing facilities across the country.
- The Inflation Reduction Act has unleashed a wave of investment in domestic clean power manufacturing. As of March 31, 2023, companies have announced 47 new or expanded manufacturing plants serving wind, solar, and energy storage technologies.

Operating Clean Power Capacity & Manufacturing Facilities by State



Pricing and Cost

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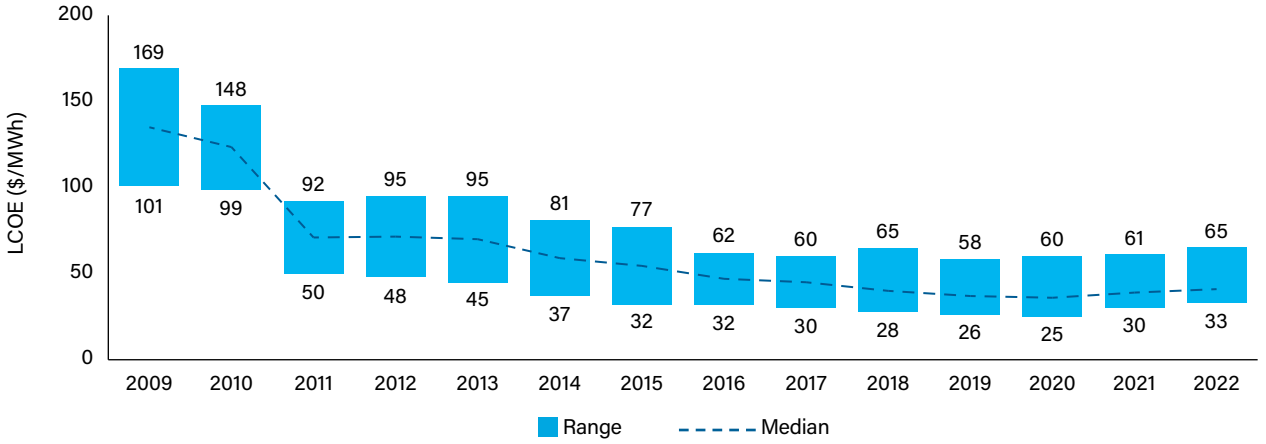
Wind and Solar Levelized Cost of Energy

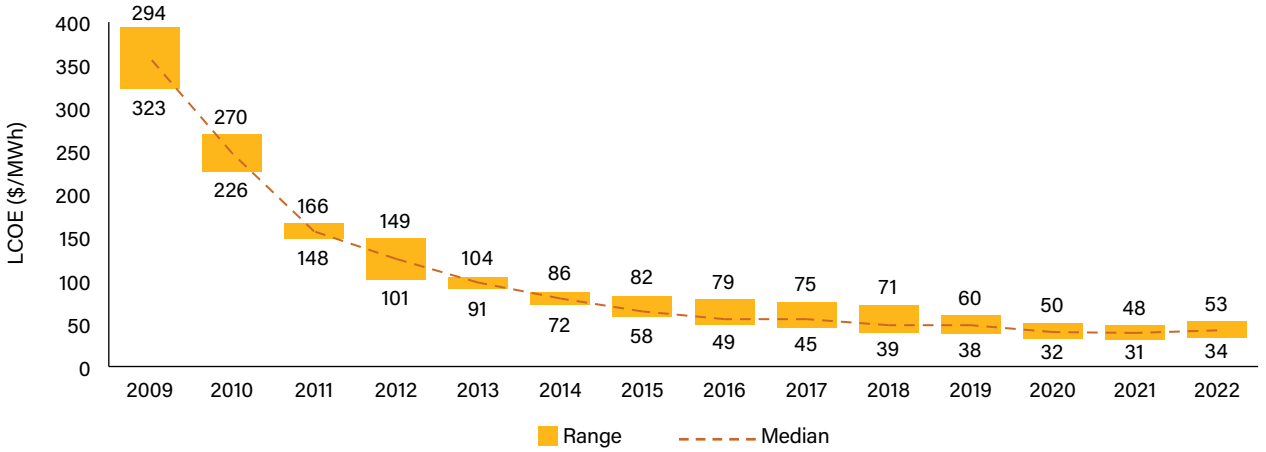
Despite recent cost increases, wind and solar costs remain competitive

- Levelized cost of energy (LCOE) is the lifetime price level that developers/owners of renewable energy projects need to secure to cover project and operational costs and receive a reasonable profit margin for their work bringing the project to market. As generation technologies that do not rely on fuel to produce electricity, technological advances that lead to falling turbine and solar module costs translate quickly to reductions in LCOE.
- The unsubsidized (not considering tax credits) LCOE of wind power plants has dropped 42% in the last decade to $41/MWh. Larger and more efficient turbines that capture the blowing winds have contributed to an increase in the overall output of wind projects, bringing down the incremental cost of energy production. Operational expertise and efficiency complement capital cost reduction and performance improvements.
- The cost of producing electricity from solar has declined 57% in the last 10 years thanks to advances in module efficiency, increasing project size and scale, advances in operations and maintenance strategies, and better output performance.
- Both technologies suffered cost increases over the last two years as supply chain challenges, logistics cost increases, higher commodity prices, and macroeconomic inflationary pressure impacted the industry. Despite the increase, wind and solar remained economically competitive.
- When including tax benefits, the realized cost of clean power is even lower, ranging from $19-$44/MWh for wind and $26-$40/MWh for solar.

Wind Levelized Cost of Energy



Solar Levelized Cost of Energy



Source: BNEF, Lazard
Does not include tax benefits

Land-Based Wind Power

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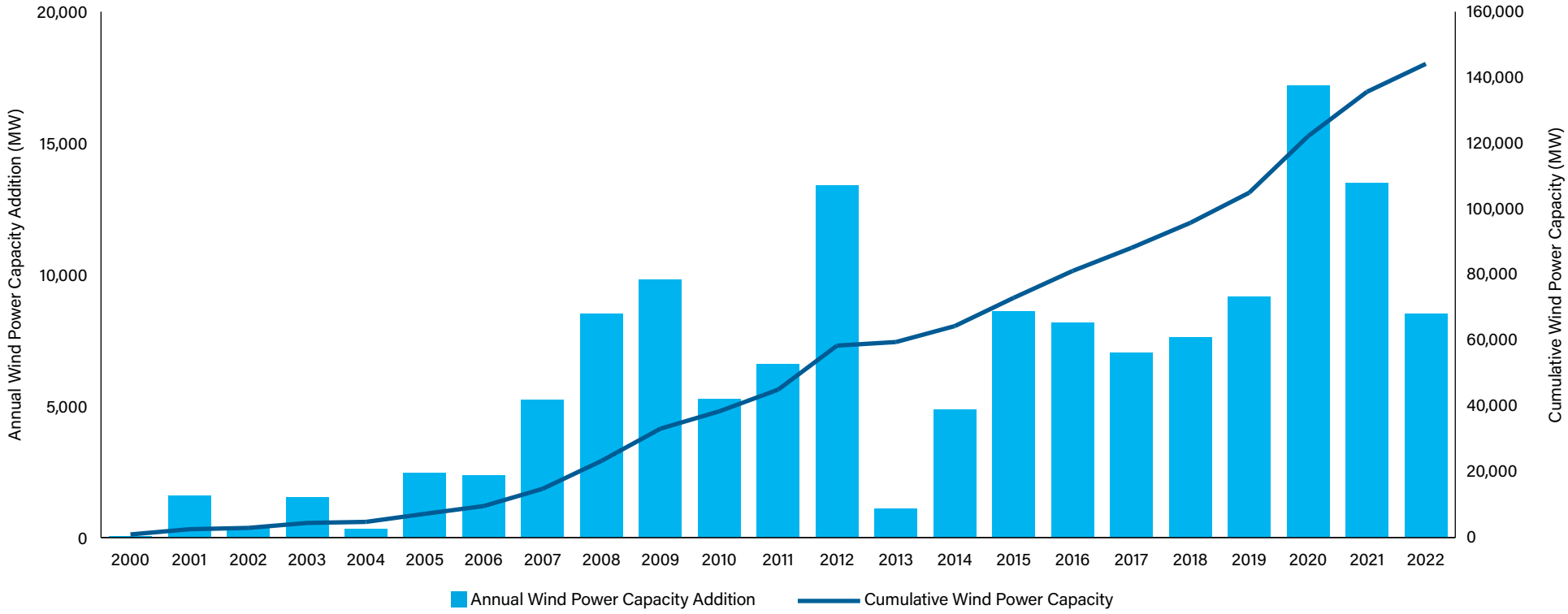
Land-Based Wind Power

Annual and Cumulative Wind Power Capacity

8.5 GW installed in 2022 brings the cumulative year-end capacity to 144 GW

U.S. Annual and Cumulative Wind Power Capacity Growth



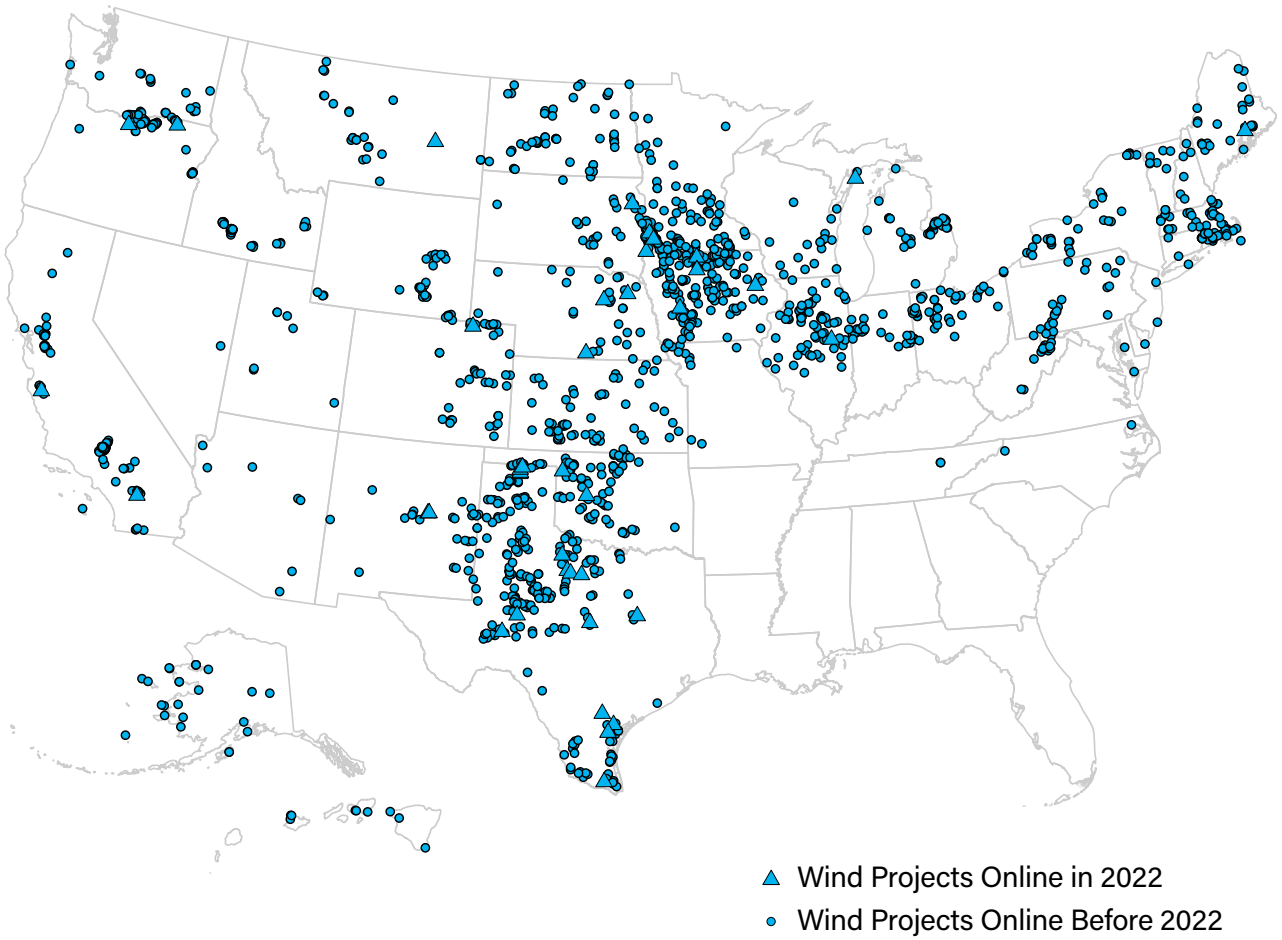
- 2022 saw a significant decrease in wind capacity installations compared to 2021, marking the lowest year since 2018. The U.S. wind market installed 2,696 wind turbines with a total capacity of 8,511 MW, down from 13,400 MW installed in 2021.
- The cumulative operating wind power capacity rose to 144,132 MW at the end of 2022.
- Although the land-based wind market finished 2022 with its strongest quarter, the annual decline in wind capacity installations was primarily due to the sluggish growth seen in Q2 and Q3 of 2022.
- Wind installations were down due to market saturation, policy changes, economic challenges, permitting delays, and development timelines. Factors such as changes in incentives, fluctuations in costs, and delays in permitting and regulatory approvals may have influenced the reduced number of commissioned wind projects.

Land-Based Wind Projects

Over 8.5 GW of land-based wind power projects added to the grid in 2022

- Wind developers brought 40 project phases online, including repowers, totaling over 8.5 GW in 2022. These projects were spread across 14 states, including three states that added 500 MW or more.
- Texas led all states in new wind power, installing nearly 4.2 GW. Oklahoma followed with over 1.4 GW and Nebraska placed third with over 600 MW.
- The Great Prairie Wind (Firewheel Wind) took the top spot for the largest wind project project built in 2022 at over 1 GW across four phases. This was followed by the 996 MW Traverse Wind project in Oklahoma, and the 499 MW Young Wind project in Texas.
- Developers commissioned nearly 4.9 GW less wind power in 2022 compared to 2021, which itself was a down year compared to a record 2020. Year-over-year, wind installations declined by nearly 37% in 2022.
- Despite a down year, U.S. wind power capacity has increased more than two-fold in the last ten years and is 49 times larger than it was in 2002.

Land-based Wind Power Projects



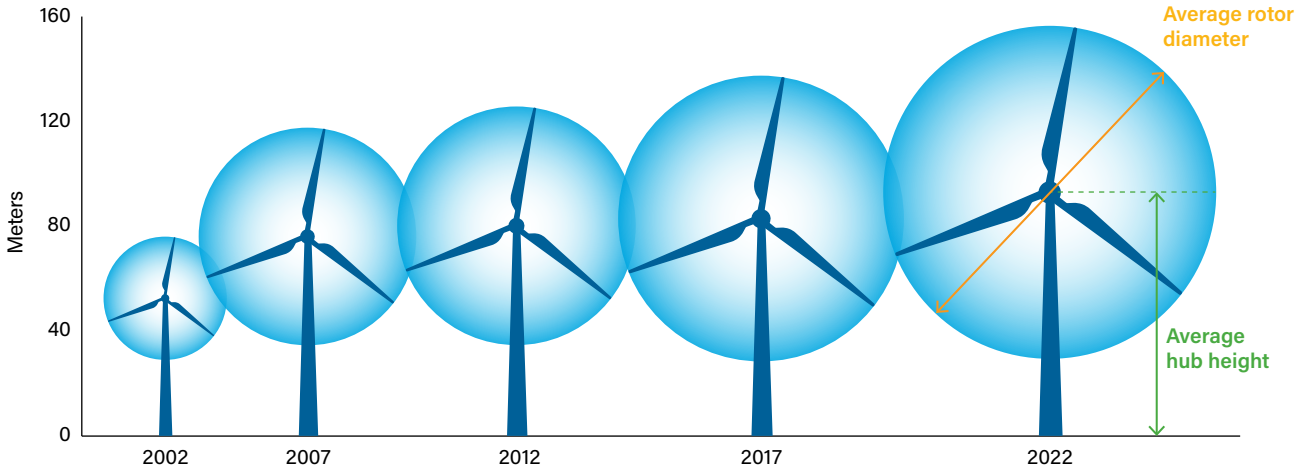
Land-Based Wind Power

Average Wind Turbine

In 2022 the average wind turbine had a 94m hub height, 127m rotor diameter, and 3.1 MW capacity

- Nearly 2,700 turbines were brought online in 2022, bringing the total operating turbine fleet to nearly 70,900 turbines.
- Over the past decade, the average hub height of land-based wind turbines has increased by 16%, reaching 94m in 2022.
- The average rotor diameter has experienced an even more significant increase, outpacing hub height growth. In 2022, turbines installed had an average rotor diameter of 127m, a 40% increase from 2010 and a 170% increase since 2002.

Evolution of the "Average" Utility-Scale Turbine



YEAR	2002	2007	2012	2017	2022
Average Hub Height	53m	77m	81m	84m	94m
Average Rotor Diameter	47m	83m	91m	109m	127m
Homes Powered	160	378	509	748	1,008

Offshore Wind

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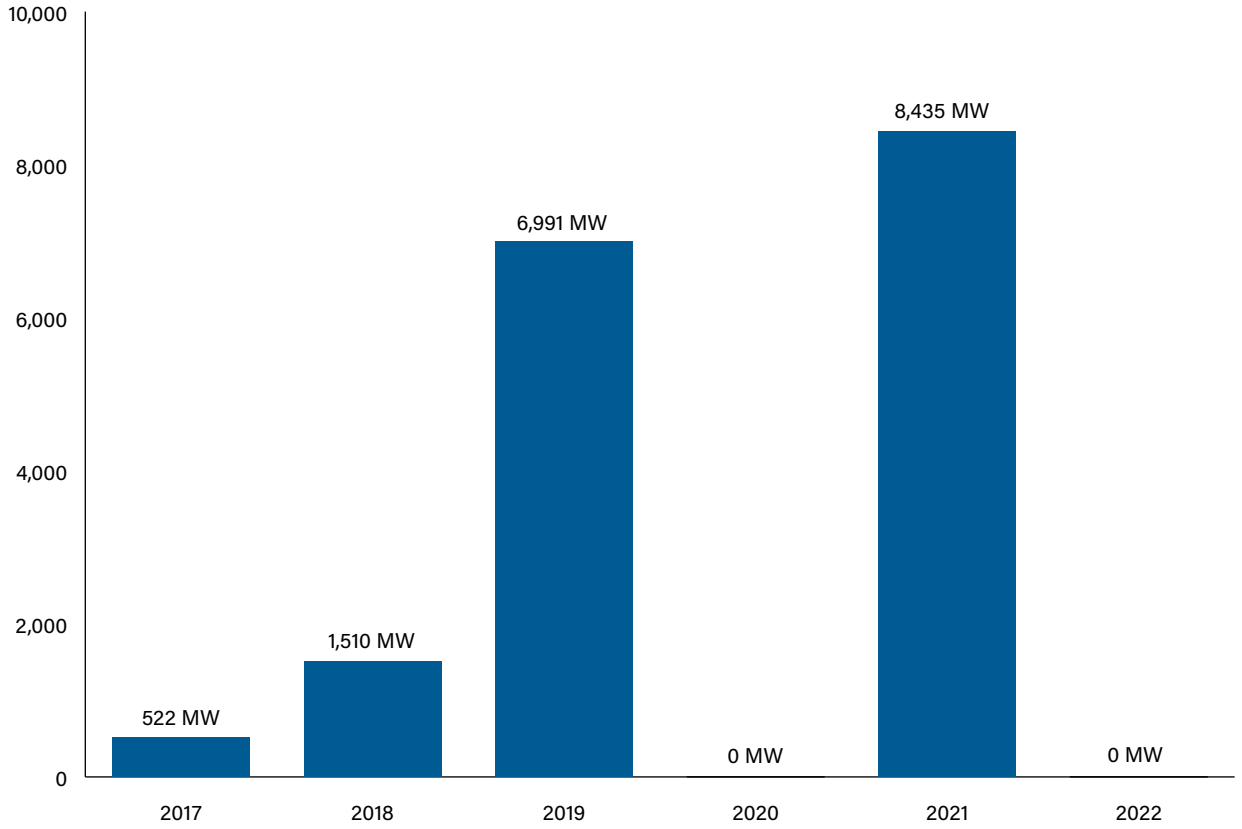
Photo Credit: Ørsted

Offshore Wind Procurement

No new capacity was procured in 2022

- While 2021 was a record-setting year for offshore wind procurement, no new capacity was procured in 2022. There were, however, two new solicitations that are expected to procure new offshore wind capacity in 2023.
- The state of New York issued its third large-scale solicitation in July 2022, seeking to procure at least 2 GW of offshore wind. Proposals were due January 26, 2023. Winners are set to be announced in Q2 2023.
- In October 2022, Rhode Island's largest utility, Rhode Island Energy, released the state's largest RFP to date, seeking at least 600 MW and up to 1 GW of new offshore wind capacity. Proposals were due March 13, 2023, and the winner(s) are expected to be announced on June 21, 2023.

Offshore Wind Procurement by Year



Utility-Scale Solar

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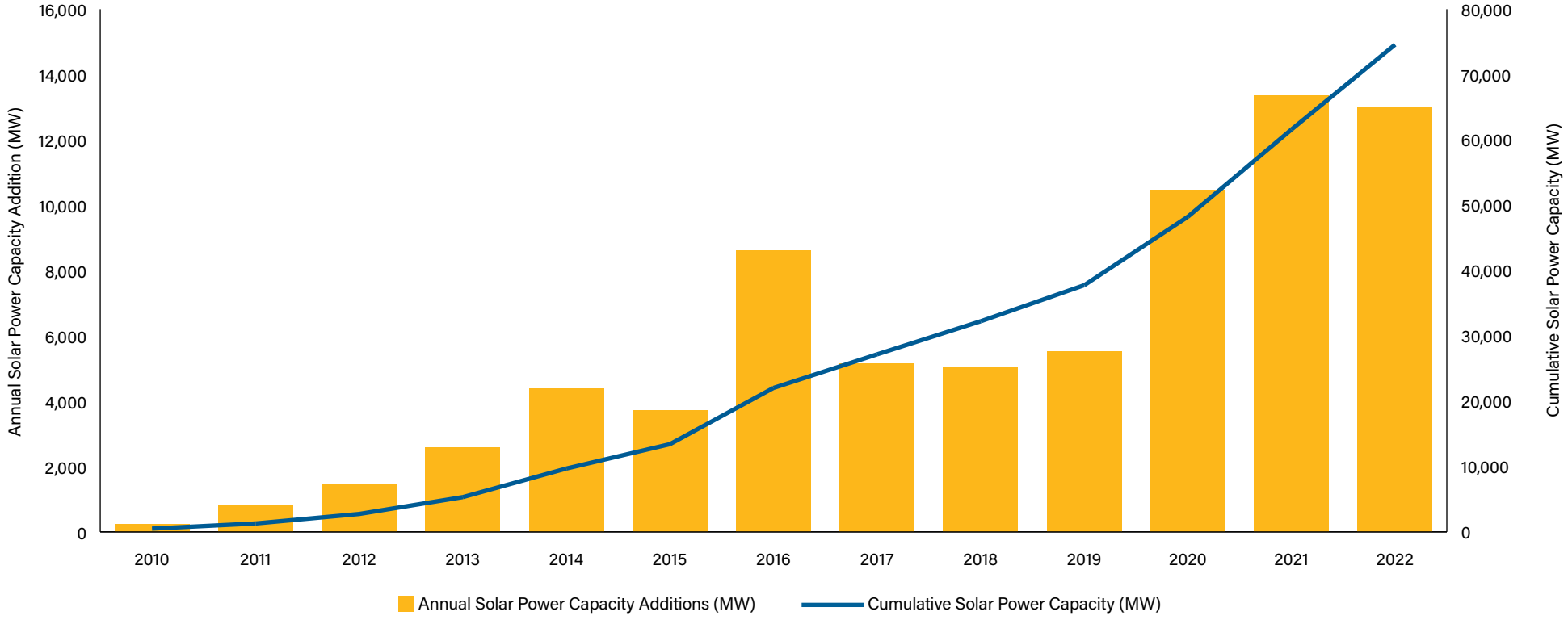
Utility-Scale Solar

Annual and Cumulative Solar Power Capacity

Just under 13,000 MW of utility-scale solar added to the grid

U.S. Annual and Cumulative Solar Power Capacity Growth



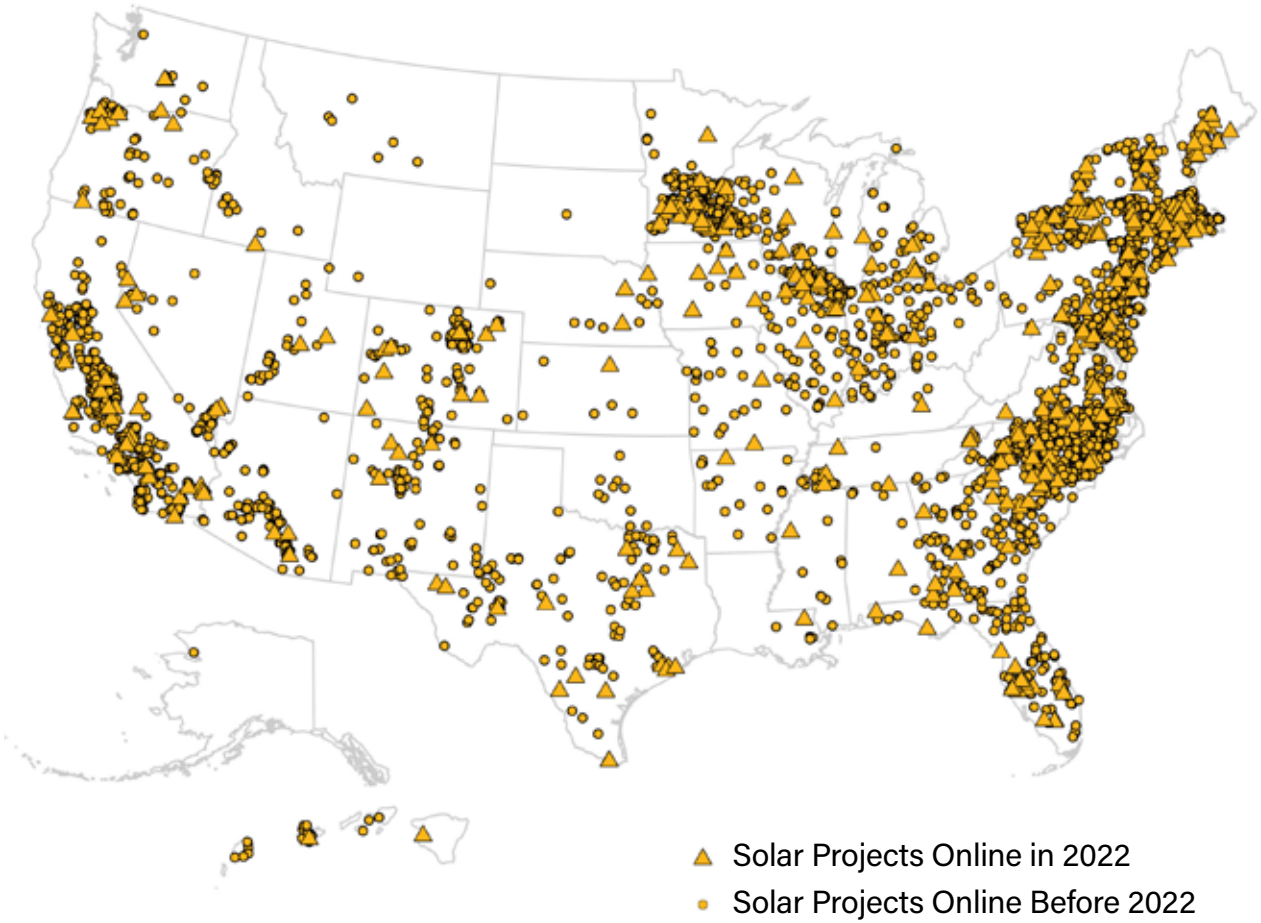
- The U.S. solar industry installed 12,993 MW of utility-scale solar power capacity in 2022. This brings the cumulative operating capacity to 74,576 MW.
- The capacity installed in 2022 marked a slight decrease from 2021. Year-over-year, solar capacity installations fell by 3%, as the industry added 354 MW less compared to 2021.
- After two years of rapid growth, utility-scale solar capacity additions decelerated in 2022. This was likely due to supply chain issues, interconnection queues, uncertainty over IRA implementation, and trade restrictions resulting in developers struggling to procure solar panels.

Utility-Scale Solar Projects

Nearly 360 utility-scale solar projects added to the grid in 2022

- Solar developers brought 354 utility-scale solar projects online in 2022, totaling nearly 13 GW in 2022. These projects were spread across 43 states and the District of Columbia, including six states that added 500 MW or more.
- Texas led all states in new utility-scale solar power, installing over 3.9 GW. California followed with over 2.1 GW. Florida placed third, adding nearly 1.1 GW.
- The largest solar project phase to come online in 2022 was the 430 MW Old 300 Solar project located in Texas. The 350 MW Fighting Jays Solar Project also located in Texas and the 300 MW Slate Solar project in California round out the top three spots.

Utility-Scale Solar Power Projects



ACP reports solar capacity in MWac

Battery Energy Storage Systems

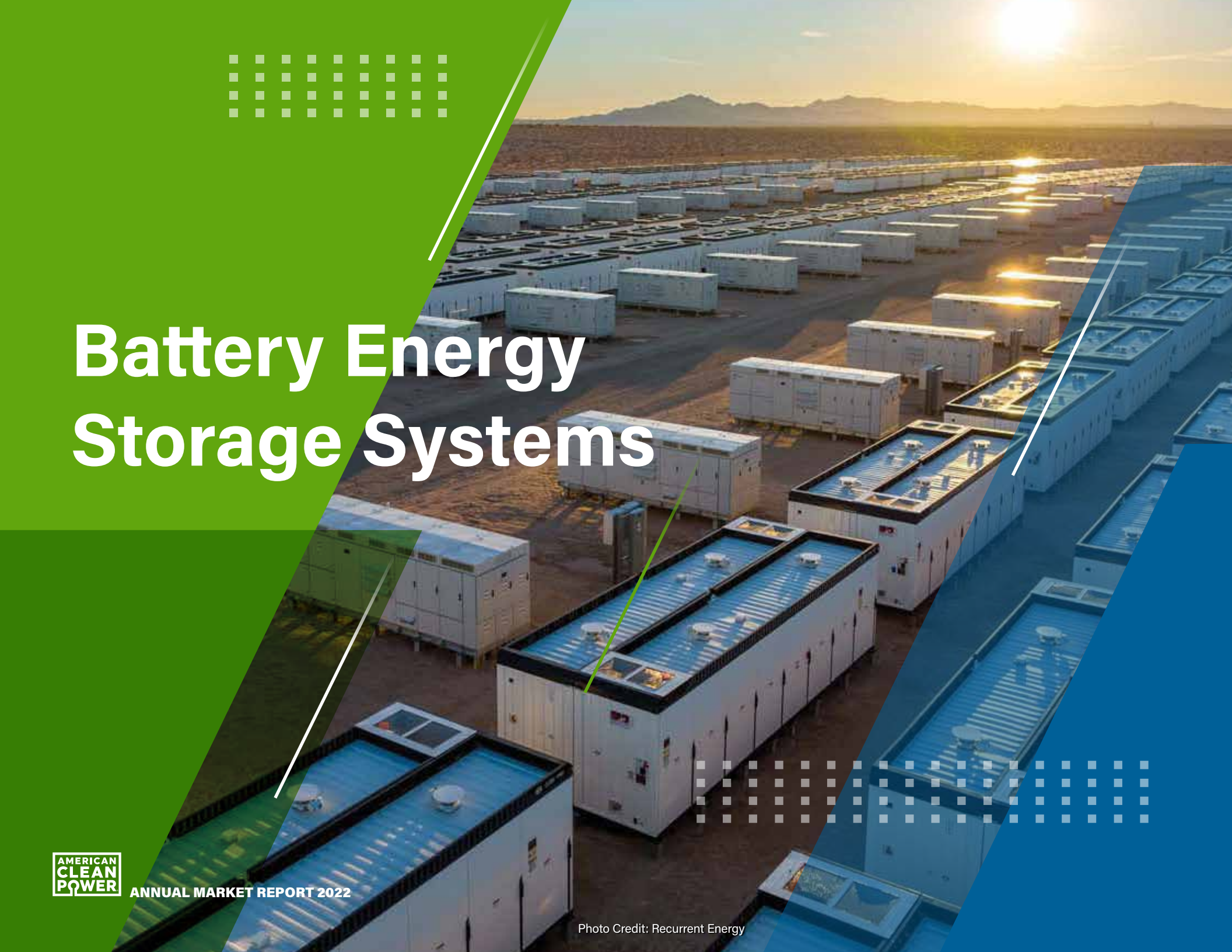


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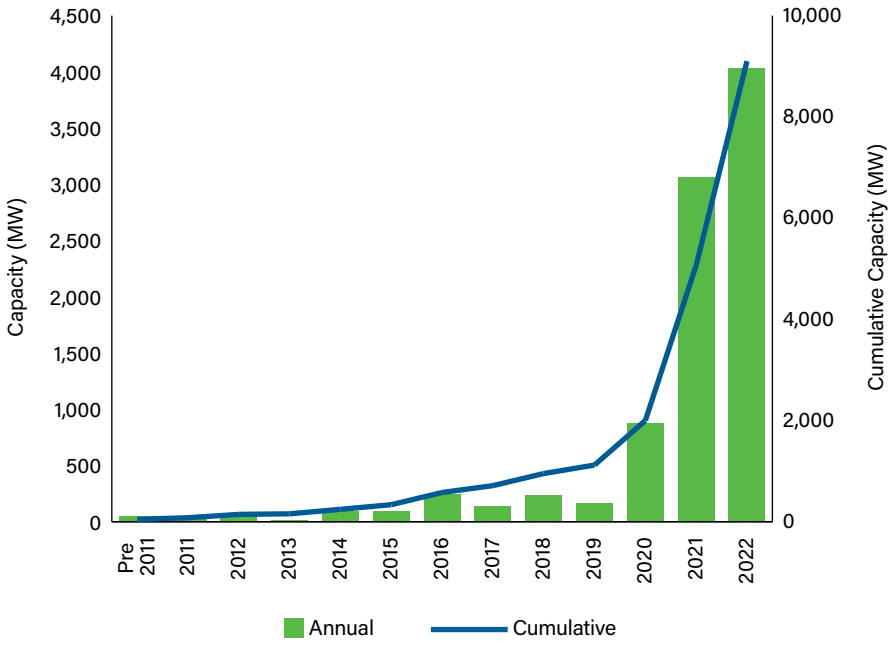
Photo Credit: Recurrent Energy

Battery Energy Storage Systems

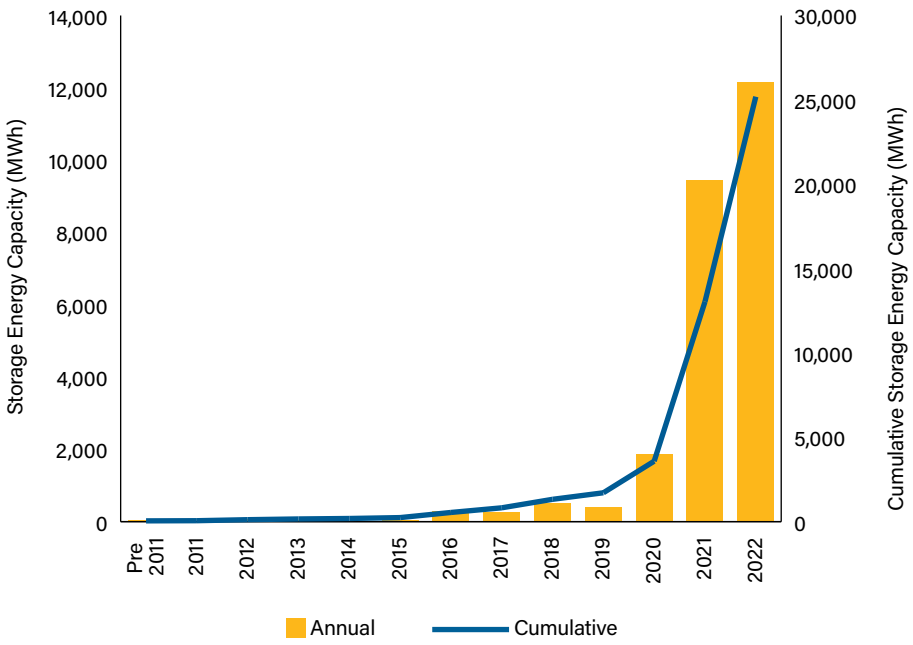
Annual and Cumulative Energy Storage Power Capacity

Record year for battery storage installations

U.S. Annual and Cumulative Battery Storage Capacity Growth (MW)



U.S. Annual and Cumulative Battery Storage Capacity Growth (MWh)



- ACP tracks the U.S. utility-scale battery storage market in terms of power capacity (MW), which is the total possible instantaneous discharge capability, and energy capacity (MWh), which is the maximum amount of stored energy.
- Battery storage has been on a rapid upward trajectory over the past few years. 2022 represents a record year for battery storage, with 4,034 MW/12,149 MWh commissioned. Cumulative operating capacity, in MW, increased by 80% in 2022 and cumulative energy storage capacity, in MWh, increased by 93% in 2022.

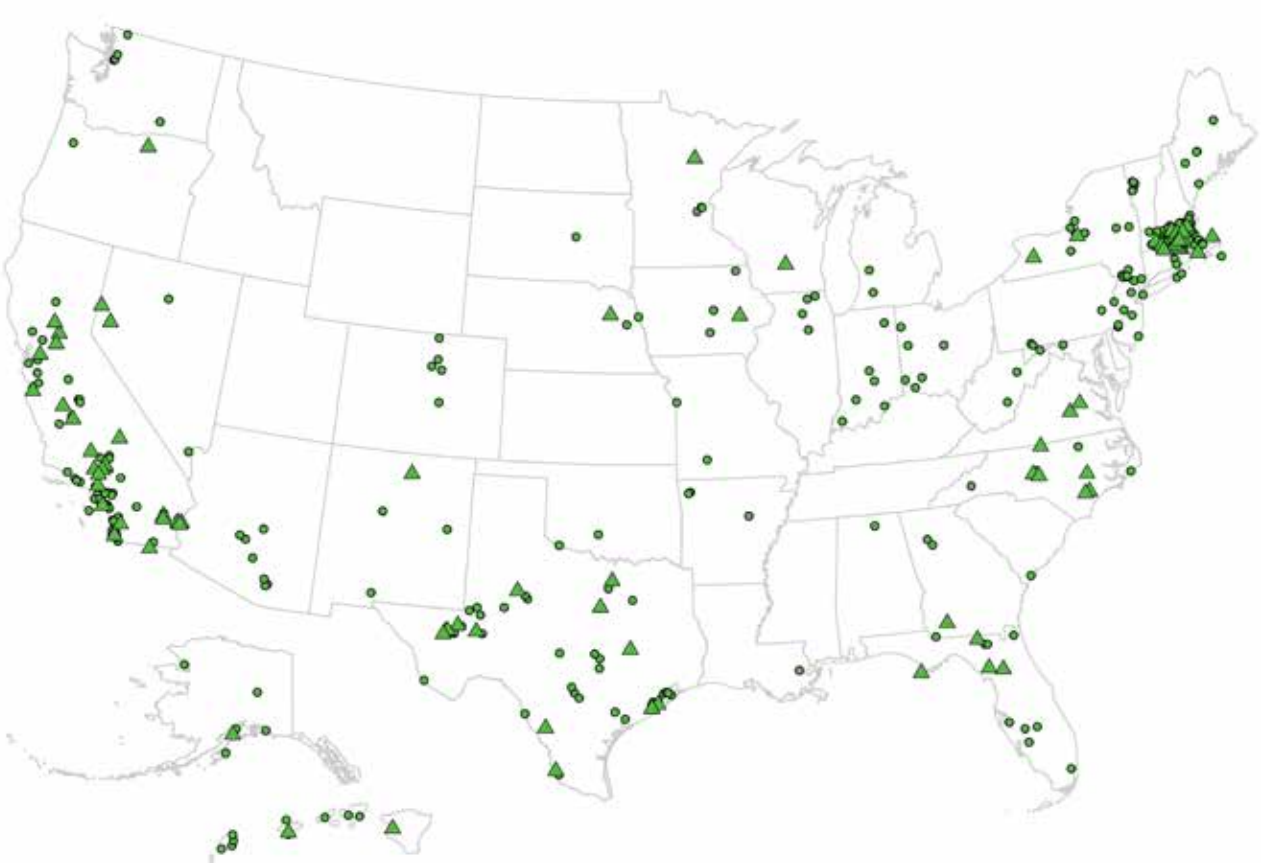
- Battery storage installations in 2022 outpaced 2021, the previous record year, by 32%.
- In total, there is 9,101 MW/25,187 MWh of battery storage operating across the country.

Battery Storage Projects

Developers installed over 4 GW of battery storage projects in 2022

- Battery storage developers brought 95 projects online, totaling nearly 4,034 MW in 2022. These projects were spread across 21 states, but much of the capacity was installed in California and Texas.
- California led all states in new utility-scale battery storage capacity, installing nearly 2.5 GW. Texas followed with over 1 GW and Massachusetts placed a distant third and just over 70 MW.
- The 350 MW/1,400 MWh Crimson Storage project built in California takes the top spot in terms of capacity and energy in 2022. In capacity terms, this was followed by the 260 MW DeCordova Energy Storage project in Texas and the 230 MW Desert Sunlight Storage project located in California.
- The DeCordova Energy Storage project has a duration of one hour (260 MWh total energy) while the Desert Sunlight Storage project has a four hour duration (920 MWh total energy).

Operating Utility-Scale Battery Storage Projects

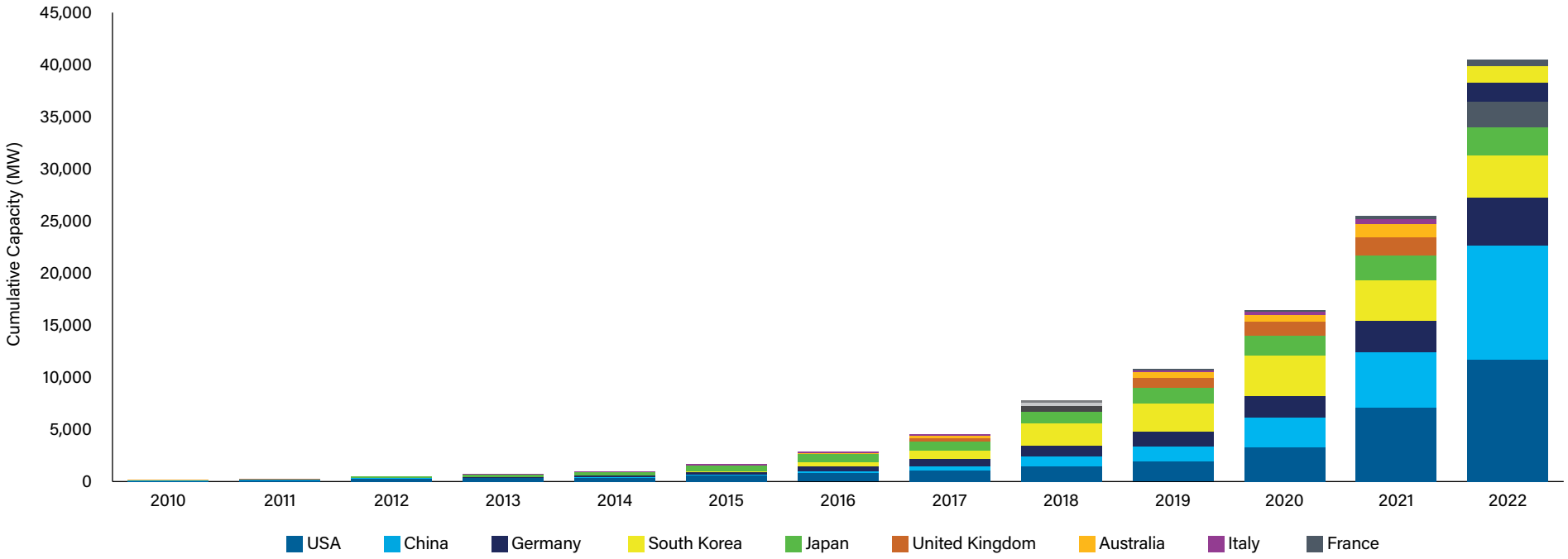


Battery Energy Storage Systems

Global Storage Capacity

The U.S. leads in global battery storage capacity

Cumulative Global Utility-Scale Storage Capacity by Country



- In 2010, only 120 MW of battery storage capacity was operating globally. Just 12 years later, cumulative operating capacity is nearly 40,500 MW.
- Battery storage capacity surpassed 1 GW in 2015 and has grown at an average of 58% every year since.
- The United States is the global leader in operating battery storage capacity. The U.S. has consistently been in the top five since 2010, fighting for the top spot with Japan and South Korea.
- China moved up from fifth to third in 2019 after installing more than 500 MW in 2019. Since then, China added nearly 9.5 GW of battery storage capacity to claim second place after the U.S.
- The U.S. and Japan were among the earliest adopters of battery storage. Over the past five years Japan has increased its total operating capacity by an average of 24% each year, but has not kept up with the installation rates of the U.S., China, Germany, and South Korea.

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