U.S. Solar Market
Overview & Trends

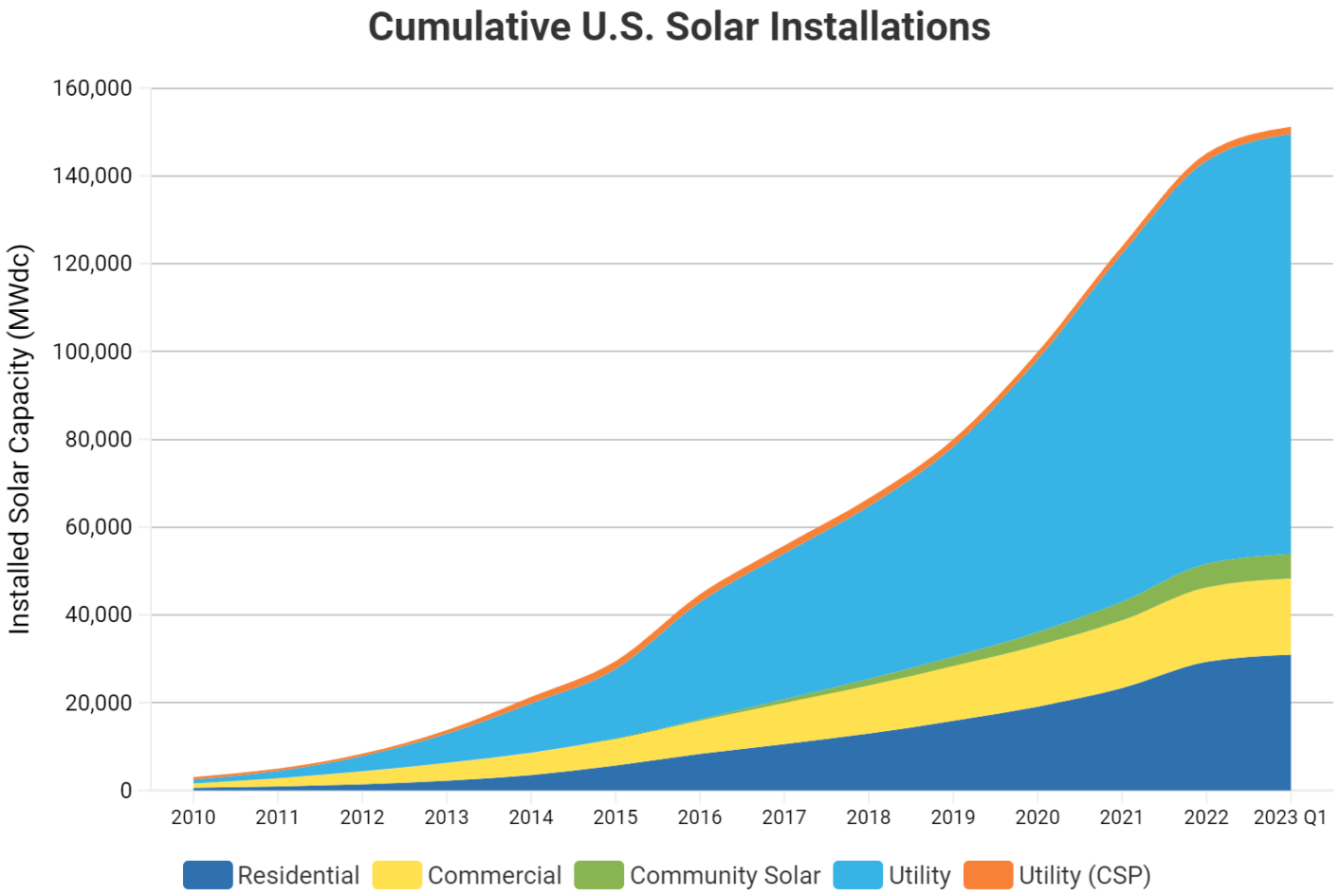
June 2023

Solar Energy Industries Association

SEIA Solar Energy Industries Association®

Powering the Solar+ Decade

Massive Growth Since 2000 Sets the Stage for the Solar+ Decade

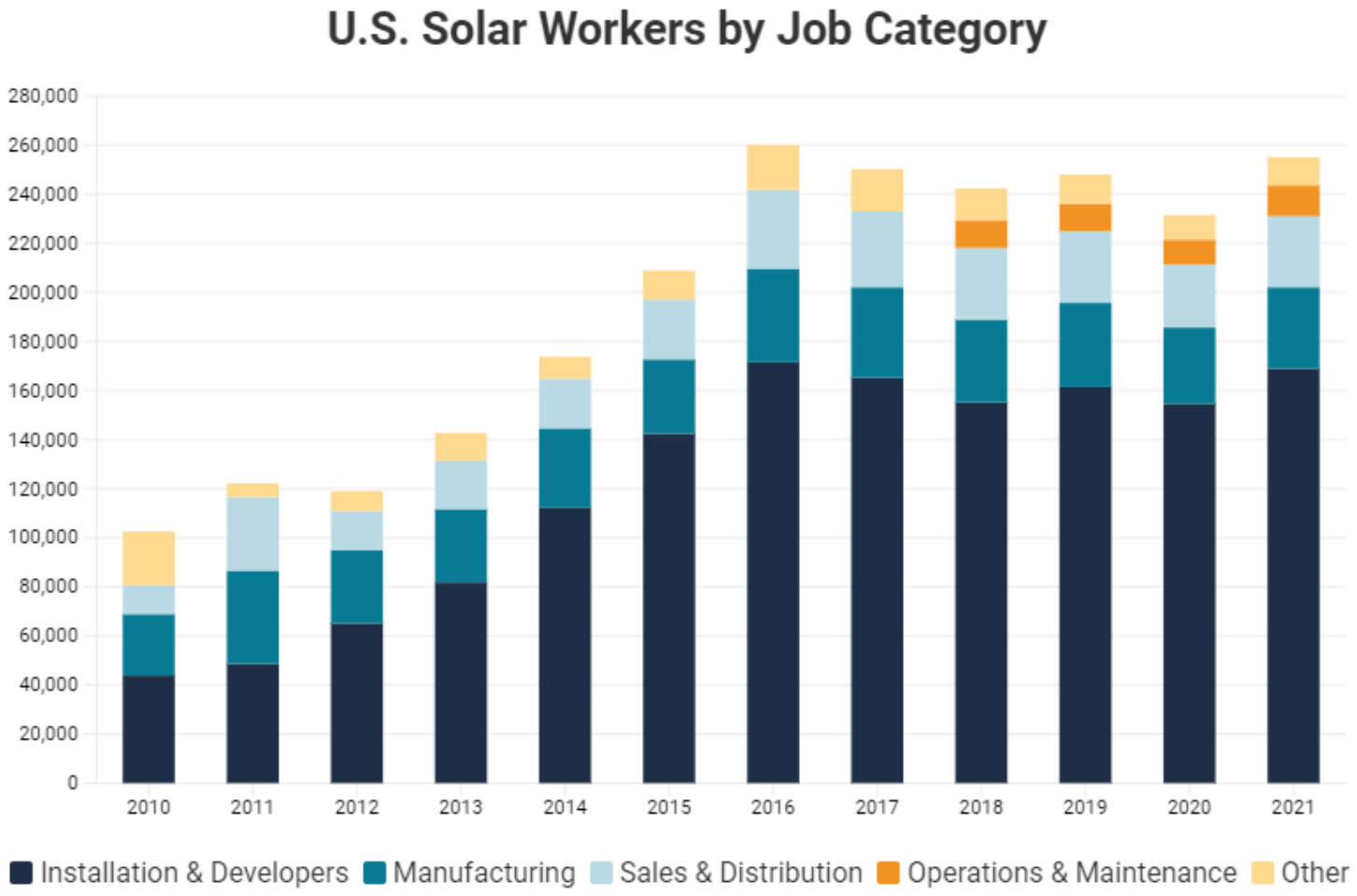


Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q2 2023

In the last decade alone, solar has experienced an average annual growth rate of 24%. Thanks to strong federal policies like the solar Investment Tax Credit, rapidly declining costs, and increasing demand across the private and public sector for clean electricity, there are now more than 149 gigawatts (GW) of solar capacity installed nationwide, enough to power 26 million homes.

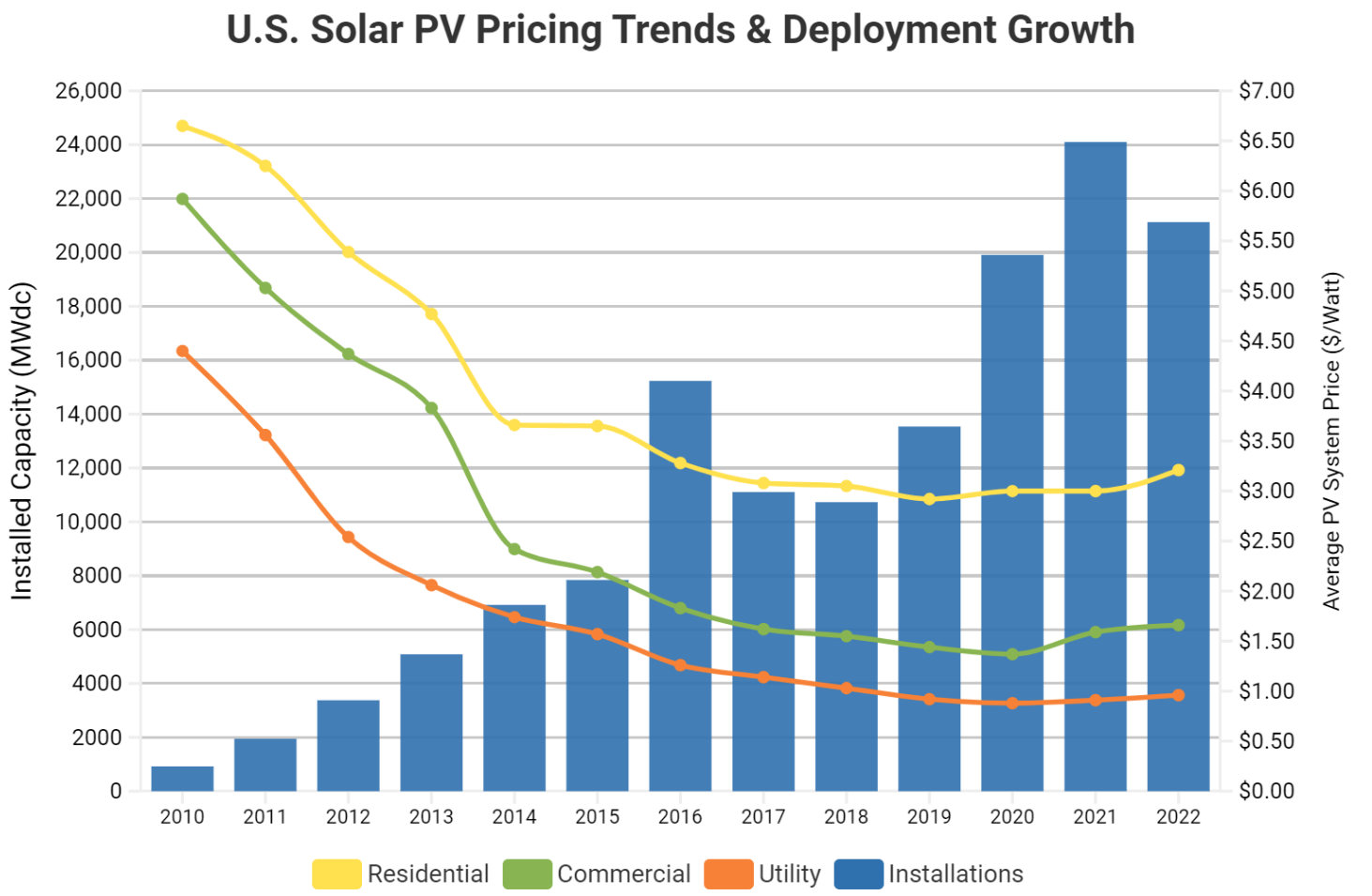
Solar as an Economic Engine

As of 2021, more than 255,000 Americans work in solar at more than 10,000 companies in every U.S. state. In 2022, the solar industry generated nearly $35 billion of private investment in the American economy.



Source: National Solar Jobs Census 2021

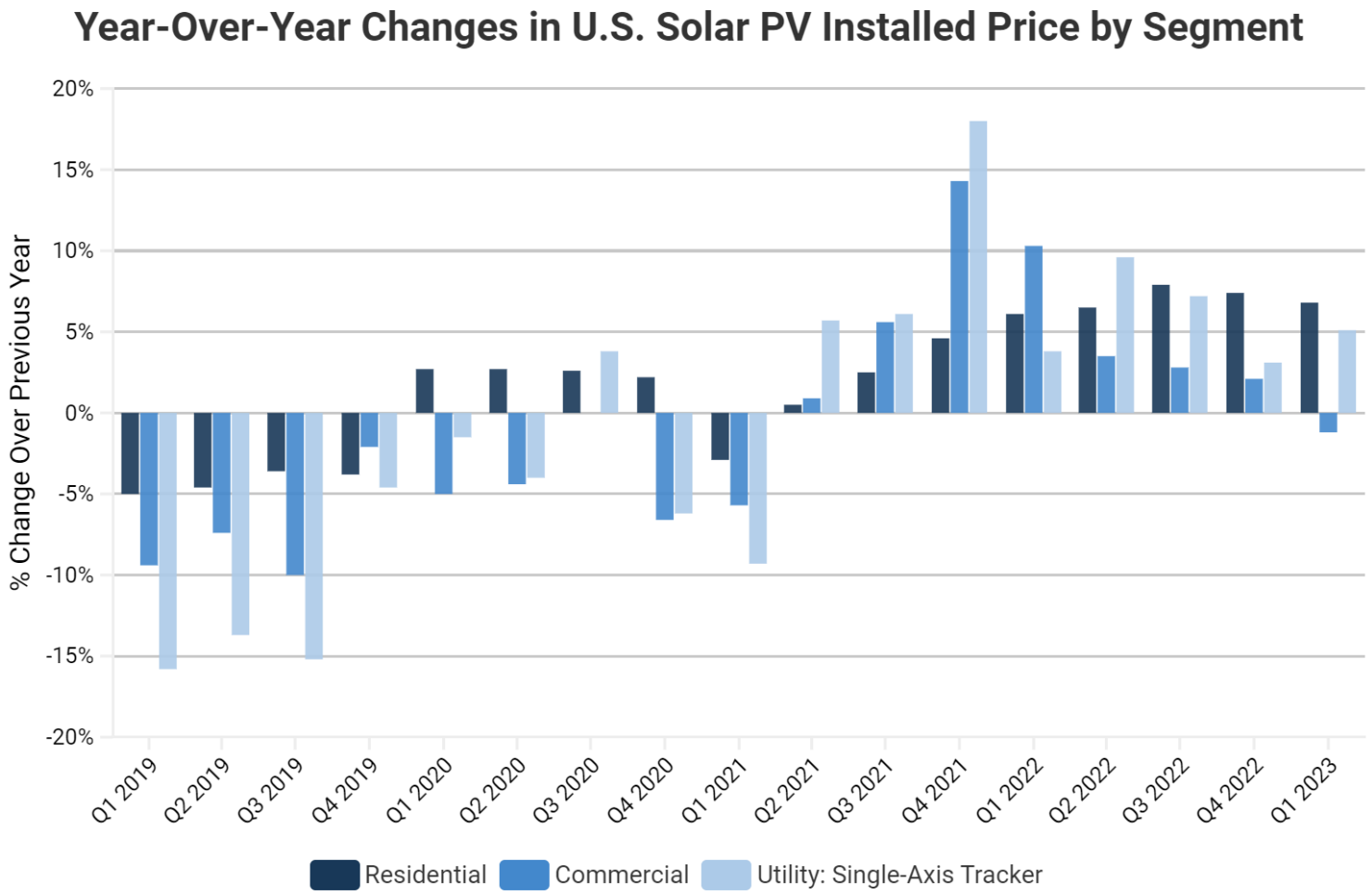
Growth in Solar is Led by Falling Prices



Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q2 2023

The cost to install solar has dropped by more than 50% over the last decade, leading the industry to expand into new markets and deploy thousands of systems nationwide. An average-sized residential system has dropped from a pre-incentive price of $40,000 in 2010 to roughly $25,000 today, while recent utility-scale prices range from $16/MWh - $35/MWh, competitive with all other forms of generation.

Supply Chain Constraints Lead to Price Increases

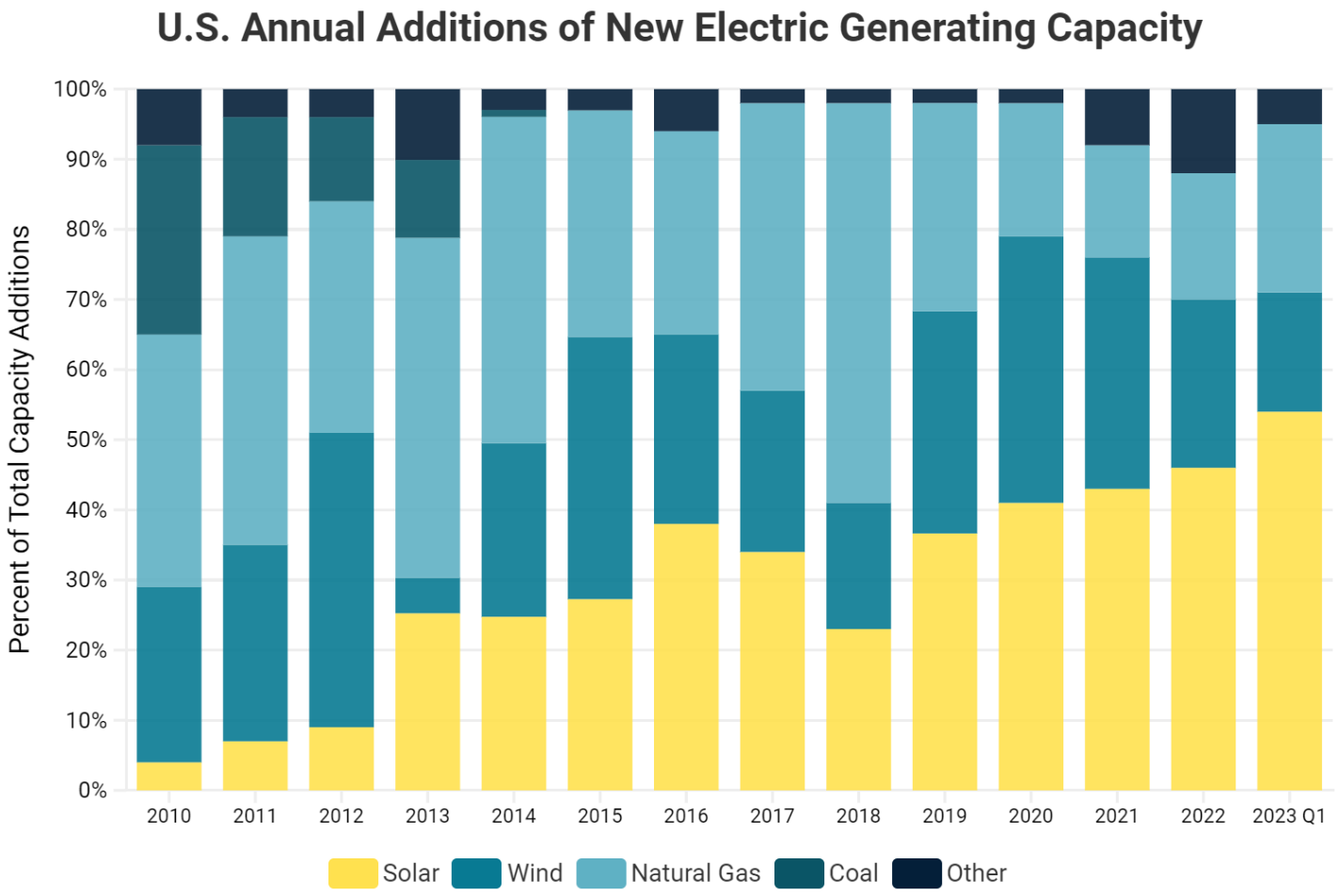


However, over the last two years, shipping constraints and other supply chain challenges stemming from the global pandemic and trade instability have led to price increases across the U.S. solar industry. For the eighth consecutive quarter, year over year prices have increased across the utility and residential market segments. However, signs of supply chain easing are beginning to show. Importers are more able to provide documentation showing compliance with the Uyghur Forced Labor Prevention Act, and subsequently are having module shipments released from customs. In conjunction with the moratorium on solar tariffs issued by the Biden Administration, more modules have been able to enter the U.S., leading to a flattening of price increases in Q1 2023.

Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q2 2023

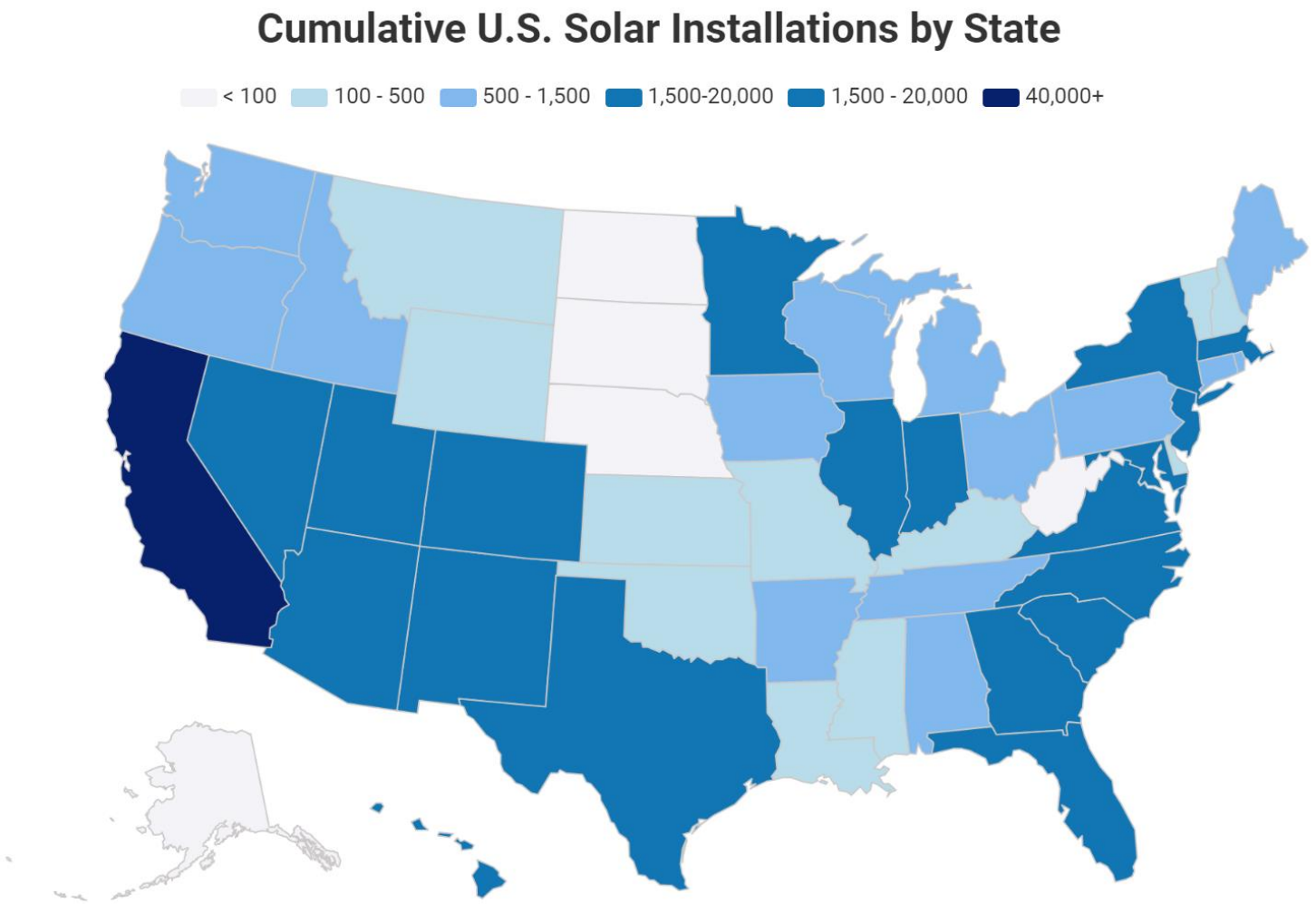
Solar's Share of New Capacity Has Grown Rapidly

Solar has added the most generating capacity to the grid each of the last four years and did so again in Q1 of 2023. 54% of all new electric capacity added to the grid this quarter came from solar. Solar's increasing competitiveness against other technologies has allowed it to quickly increase its share of total U.S. electrical generation - from just 0.1% in 2010 to nearly 5% today.



Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q2 2023; FERC

The U.S. Solar Industry is a 50-State Market

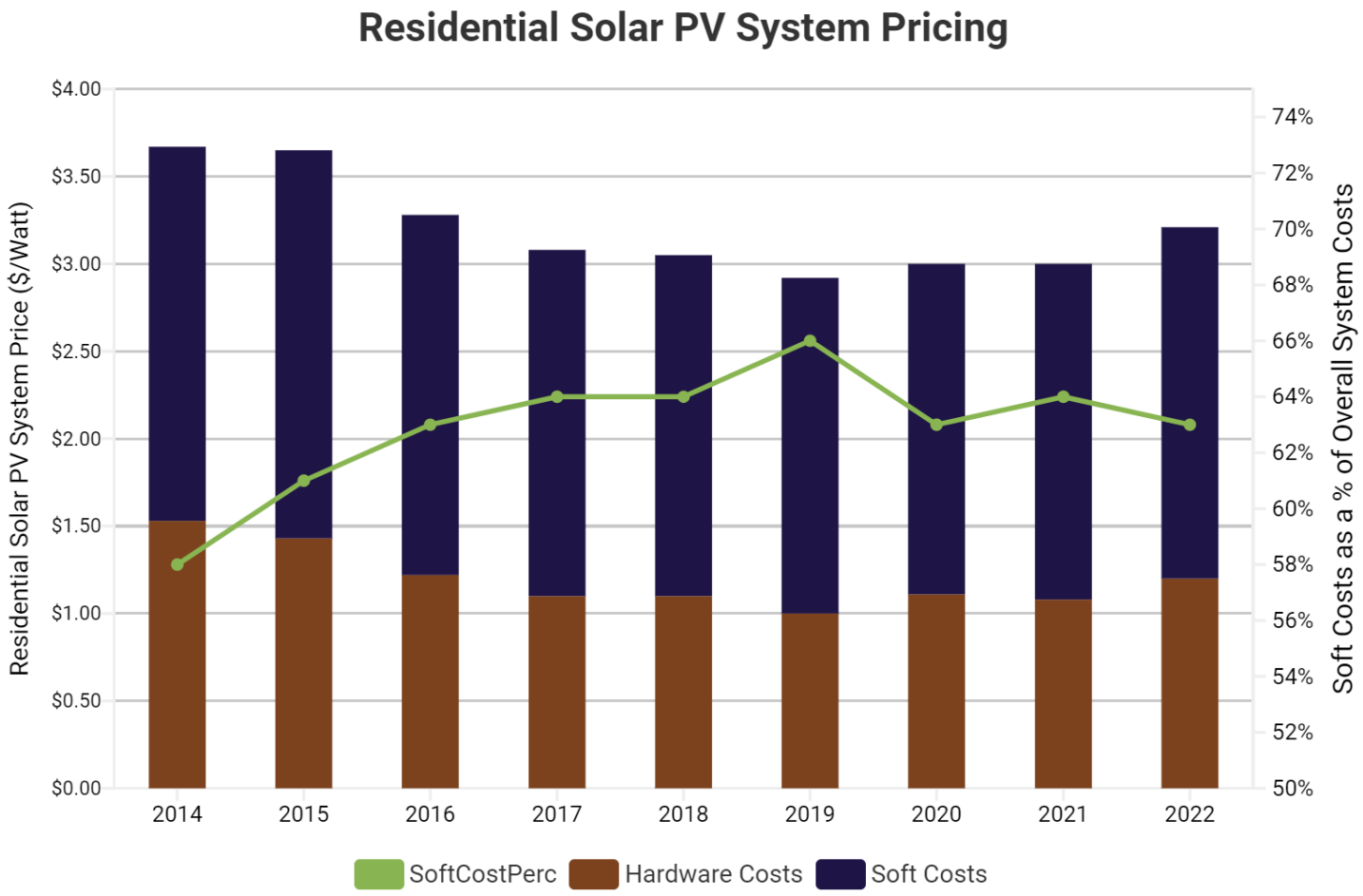


While California has traditionally dominated the U.S. solar market, other markets are continuing to expand rapidly. States like Texas, Florida, and New York all saw major growth in 2022. In addition, now half of U.S. states have installed 1 GW or more of solar, compared to only 3 a decade ago. As demand for solar continues to grow, new state entrants will grab an increasing share of the national market.

Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q2 2023

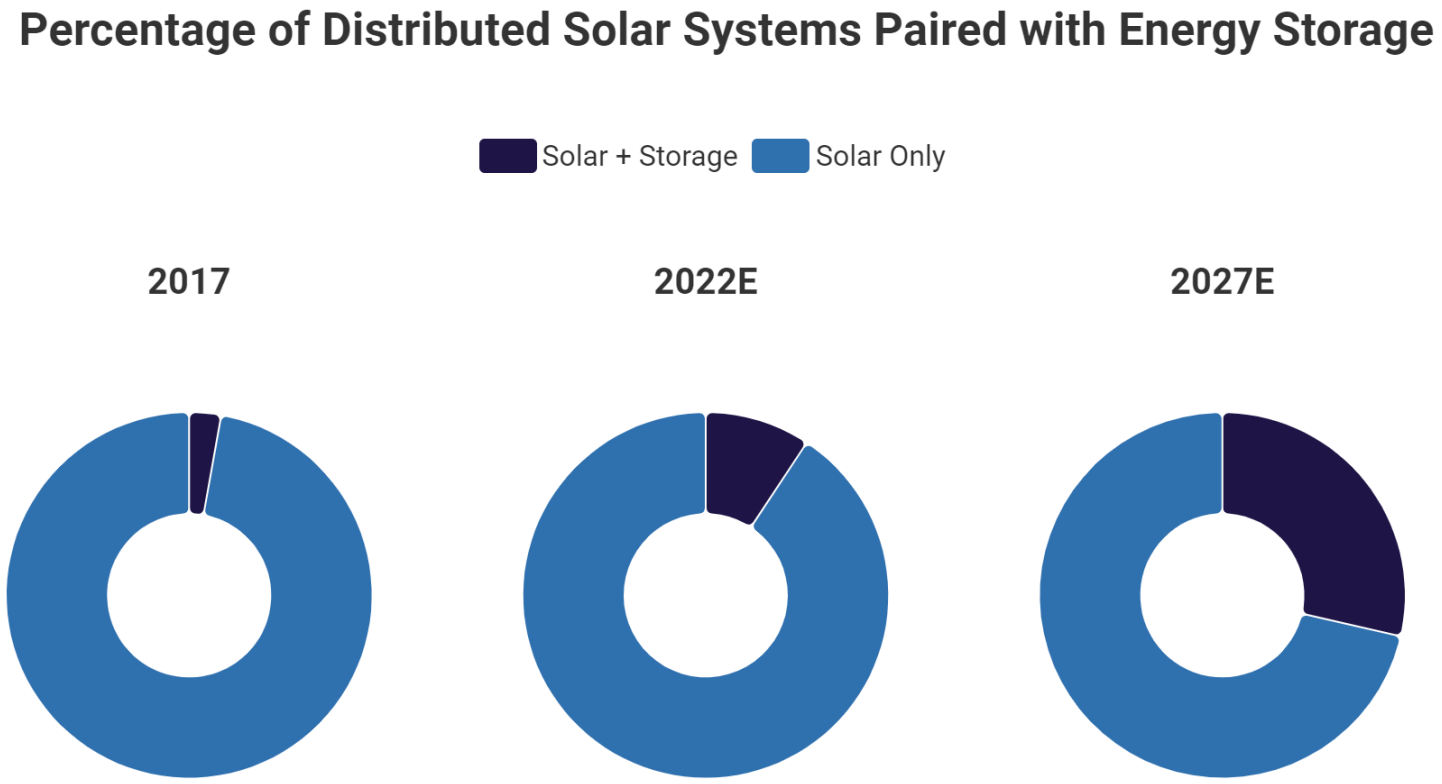
Prices Decline for Rooftop Solar, but Higher Soft Costs Remain

Residential price increases are not only driven by supply constraints leading to higher module and other hardware pricing, but also increasing soft costs, which include installation labor, customer acquisition, and permitting/inspection/interconnection. For much of the 2010s, total cost savings failed to keep up with rapidly declining module and inverter prices due to flatter soft costs. Recent price increases on the hardware side have been accompanied by continued soft cost increases. U.S. solar soft costs continue to be much higher than those of other developed solar markets around the world. Through programs like Solar Automated Permit Processing (SolarAPP) and SolSmart, SEIA and our partners are working to reduce local barriers to going solar.



Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q2 2023

Storage is Increasingly Paired with All Forms of Solar

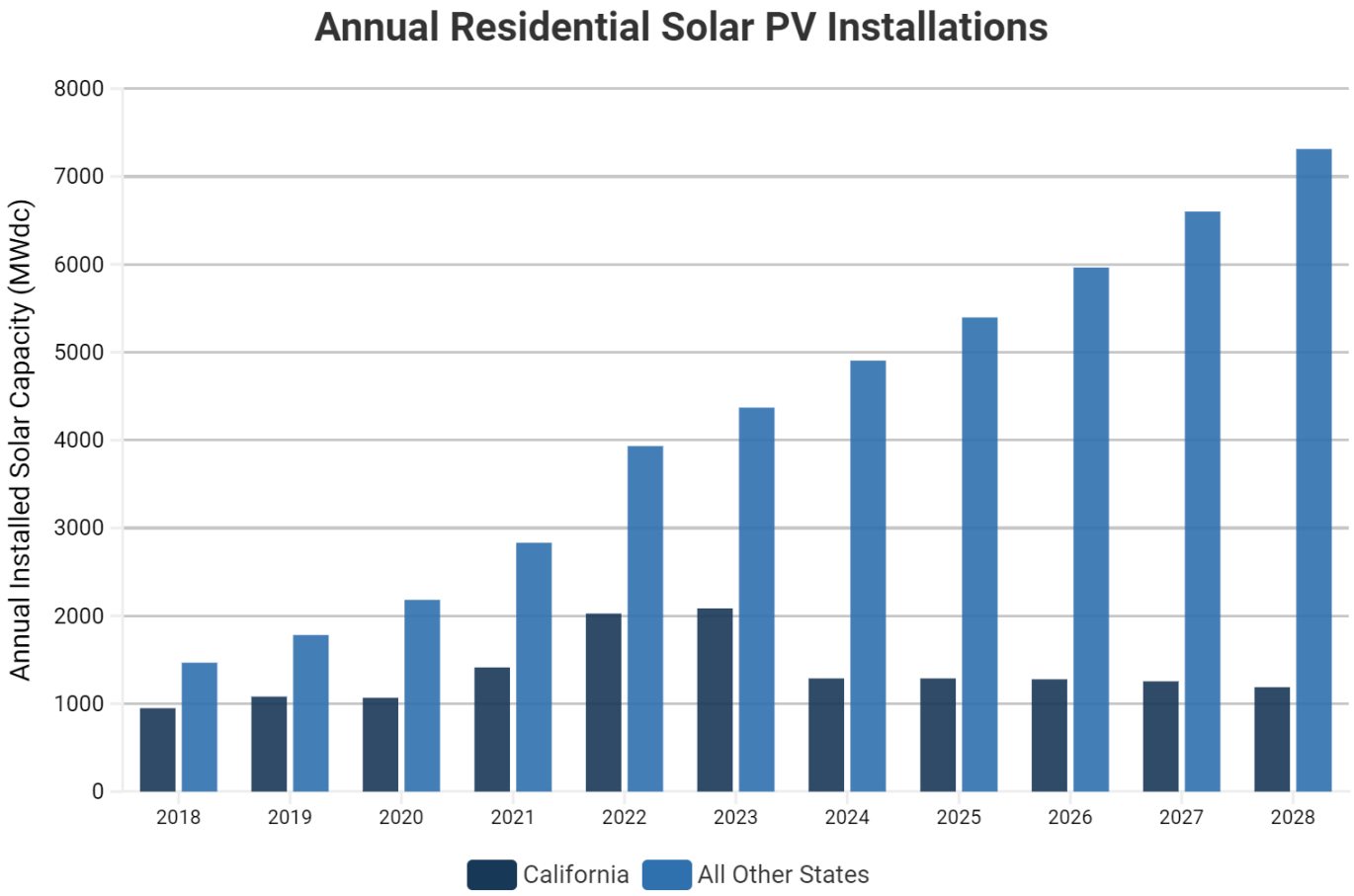


Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight 2022 Year in Review

Homeowners and businesses are increasingly demanding solar systems that are paired with battery storage. While this pairing is still relatively new, the growth over the next five years is expected to be significant. By 2027, nearly 30% of all new behind-the-meter solar systems will be paired with storage, compared to under 10% in 2022. The utility-scale market is also recognizing the benefits of pairing solar with storage, with over 45 GW of commissioned or announced projects paired with storage, representing over 50 GWh of storage capacity.

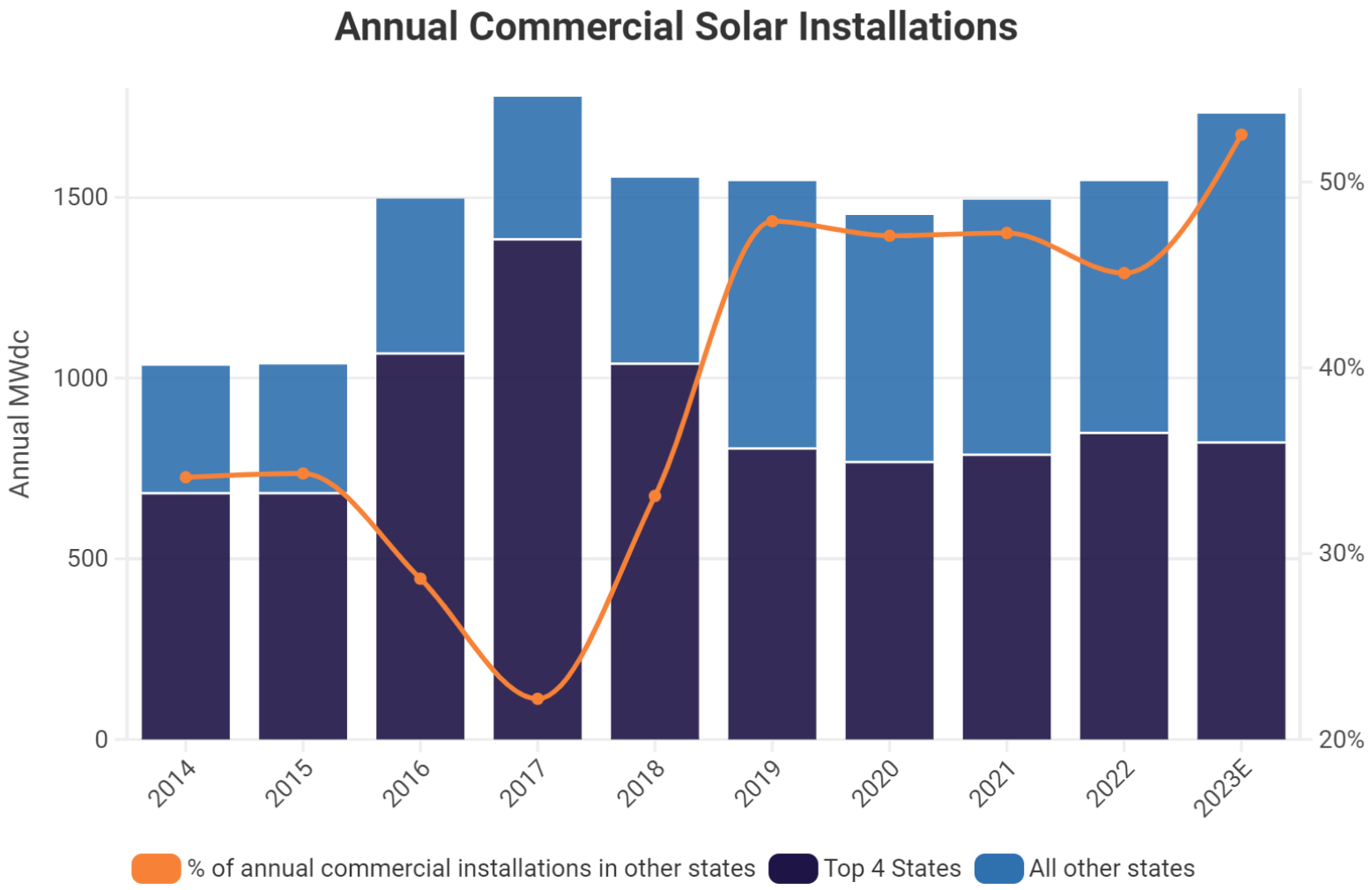
Residential Market Continues to Diversify

The residential solar market experienced its 6th consecutive record year in 2022, growing 40% over 2021 with 5.9 GW installed. Customers continue to be motivated by increasing household electricity bills brought on by the pandemic, power outages and low financing costs. That growth is threatened however, by proposed changes to Net Metering rules in multiple states. In California, NEM 3.0 is expected to bring about significant contraction in the future. Projects contracted under the current Net Metering rules will keep the California market growing through 2023, but 2024 projects to see a contraction of nearly 40% in California's residential market.



Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q2 2023

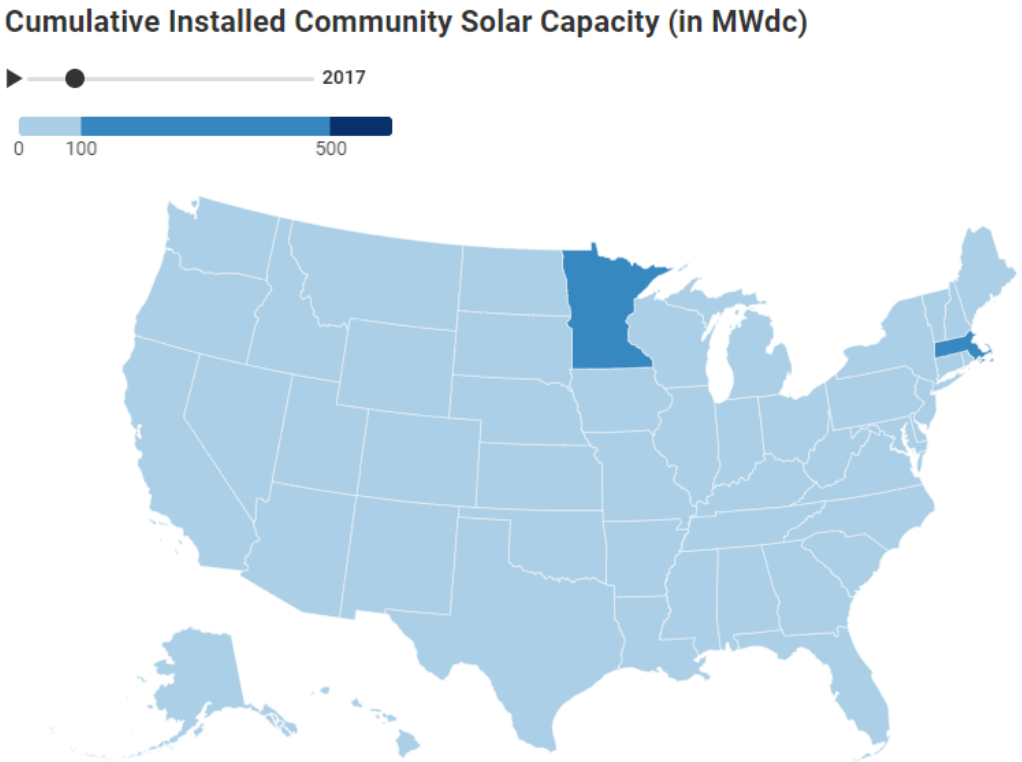
Corporate Clean Energy Goals Boost Commercial Solar

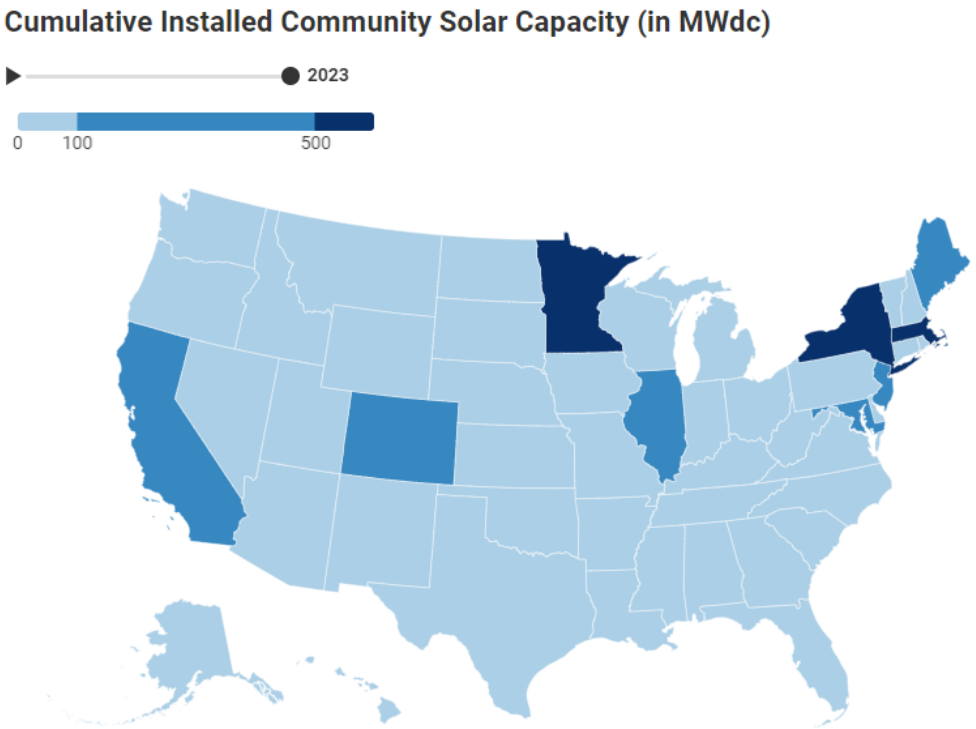


Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q2 2023

The commercial solar market, which consists of on-site solar installations for businesses, non-profits and governments, has historically been dominated by a handful of markets: California, Massachusetts, New Jersey and New York. Because of their outsized portion of the market, policy and incentive changes in any of those states could rattle the market and stymie national growth. However, the IRA, through provisions on transferability, direct pay, and the various adder credits, will lead to growth in emerging commercial markets.

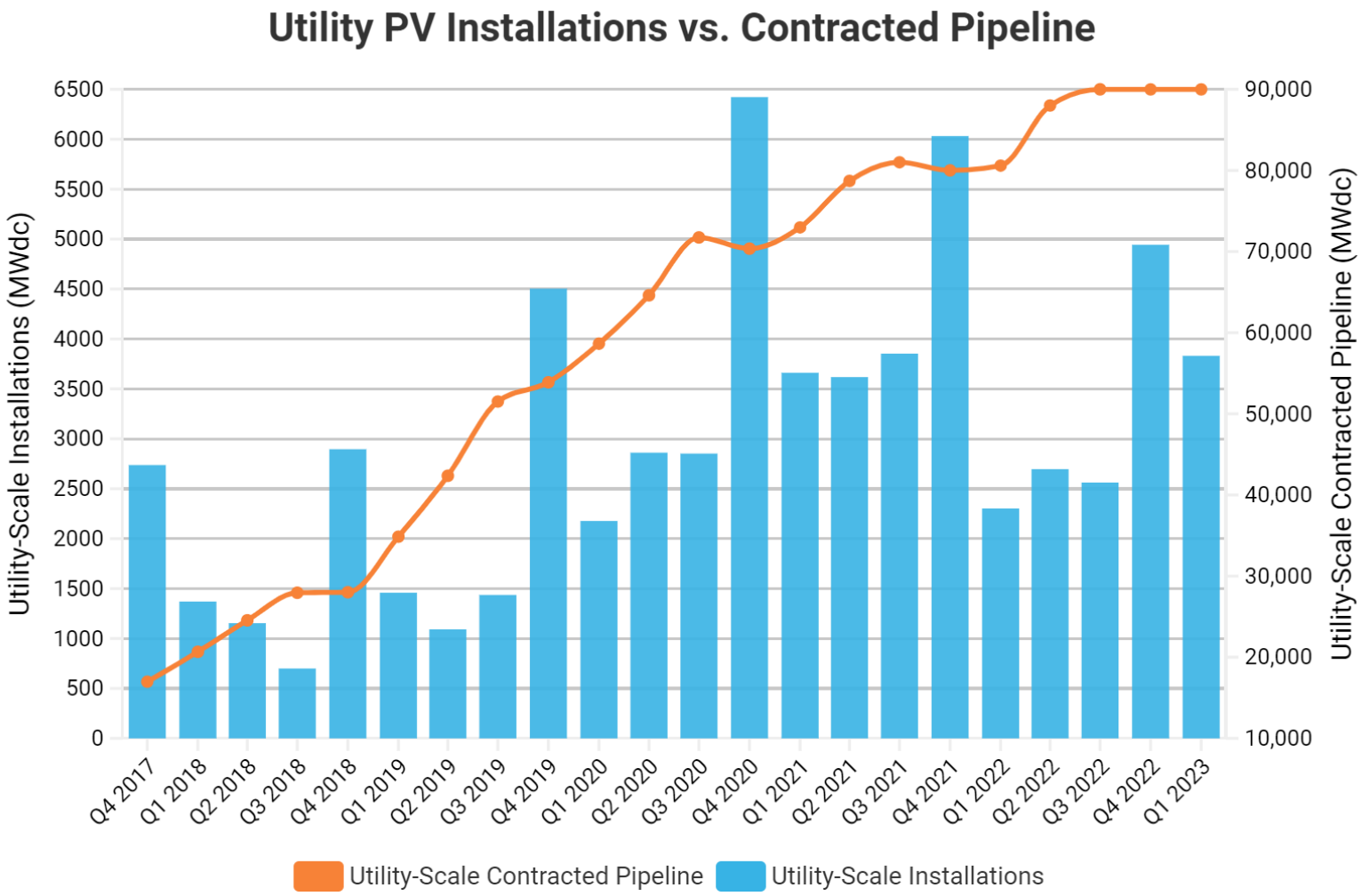
Community Solar Expansion





While early growth for community solar installations was led primarily by three key markets – New York, Minnesota, and Massachusetts – a growing list of states with community solar programs have helped diversify the market. Community solar programs in Maine and Illinois made strides in 2022, and programs in Maryland and New Jersey are expected to expand significantly in 2023 and beyond. As more states and utilities create and expand community solar programs, access to solar will expand to all types of households and businesses.

Large Utility-Scale Pipeline Outpaces Installs

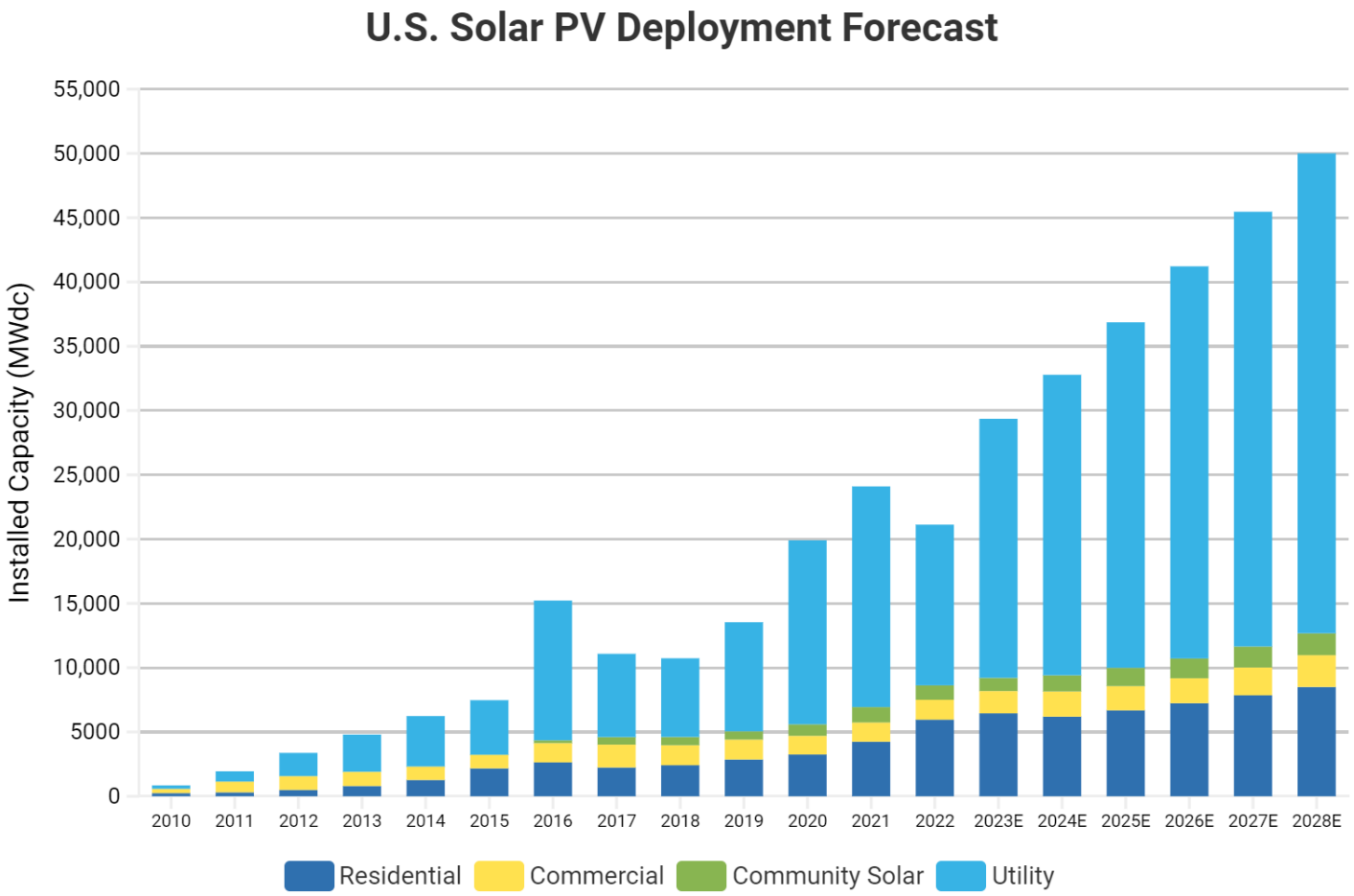


The utility-scale solar market has experienced many ups and downs in recent quarters, including trade disputes that were eased by a two year tariff moratorium enacted by the Biden Administration last June, the implementation of the Uyghur Forced Labor Prevention Act, and upward pressure on prices due to inflation. These challenges led to insufficient module supply and project delays. However, even as uncertainty affected procurement, increased demand by utilities and corporate off-takers helped maintain a robust, 90 GW pipeline of contracted utility scale projects. Demand was strong in Q1 of 2023, as newly signed contracts kept up with the largest Q1 for deployment in industry history. Going forward, continued demand and additional certainty provided by the easing of supply chain constraints and release of IRA guidance will position the utility-scale segment for rapid growth.

Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q2 2023

Solar PV Growth Forecast

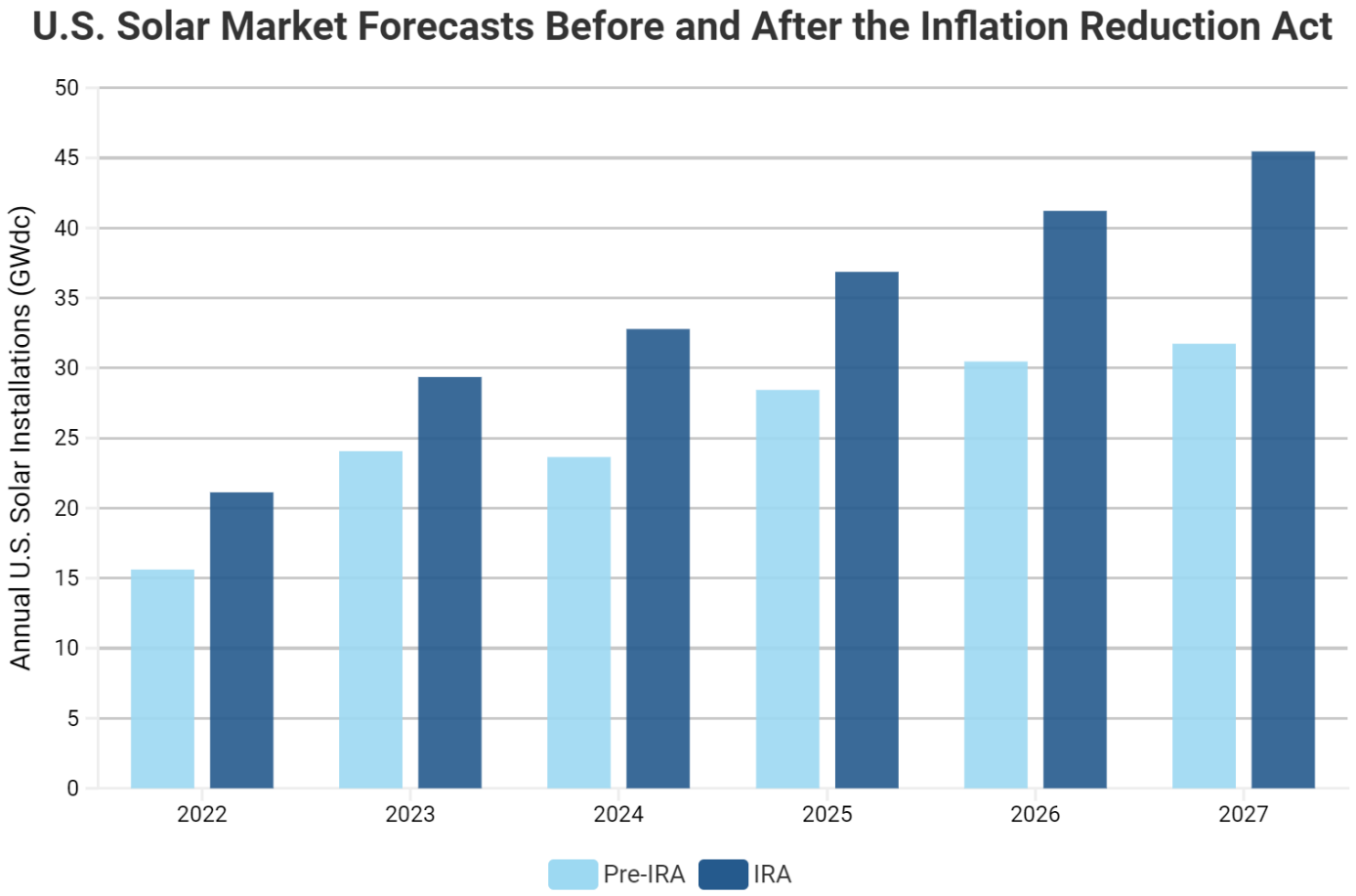
Due to pricing and procurement challenges, solar growth slowed in 2022, with annual deployment 13% lower than in 2021. However, the industry is expected to rebound in 2023, and Q1, the largest ever non-Q4 by deployment, puts the industry on track for another record-breaking year, with nearly 30 GW of projected solar installations. The solar industry is expected to nearly triple in cumulative deployment by 2028, as the Inflation Reduction Act provides key tax incentives and long-term certainty that will spark demand for solar and storage and accelerate the transition to renewable energy.



Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q2 2023

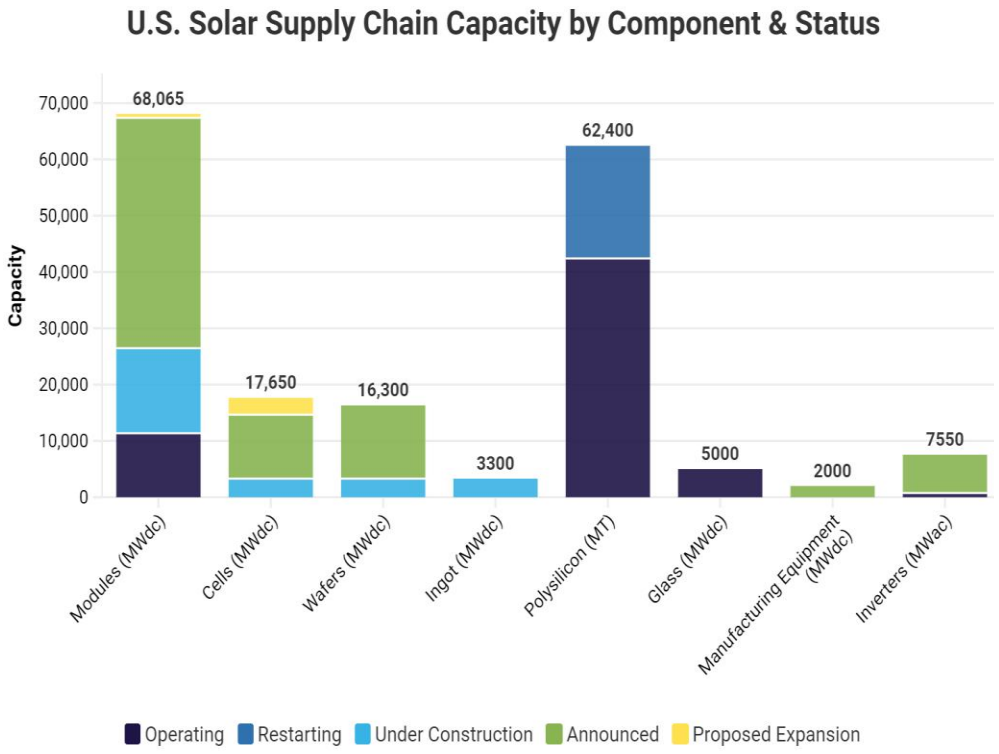
Inflation Reduction Act Boosts Solar Outlook

The passage of the Inflation Reduction Act has drastically improved baseline projections for the solar industry over the next five years. In the next half decade, the long-term tax incentives and manufacturing provisions in the IRA provide the market certainty needed to boost expected solar deployment by 34% compared to pre-IRA projections. Still, the industry awaits guidance from the Biden Administration on key provisions of the law. The specifics of this guidance will have massive implications for the industry's ability to maximize the potential of the IRA, and could unlock further growth in years to come.

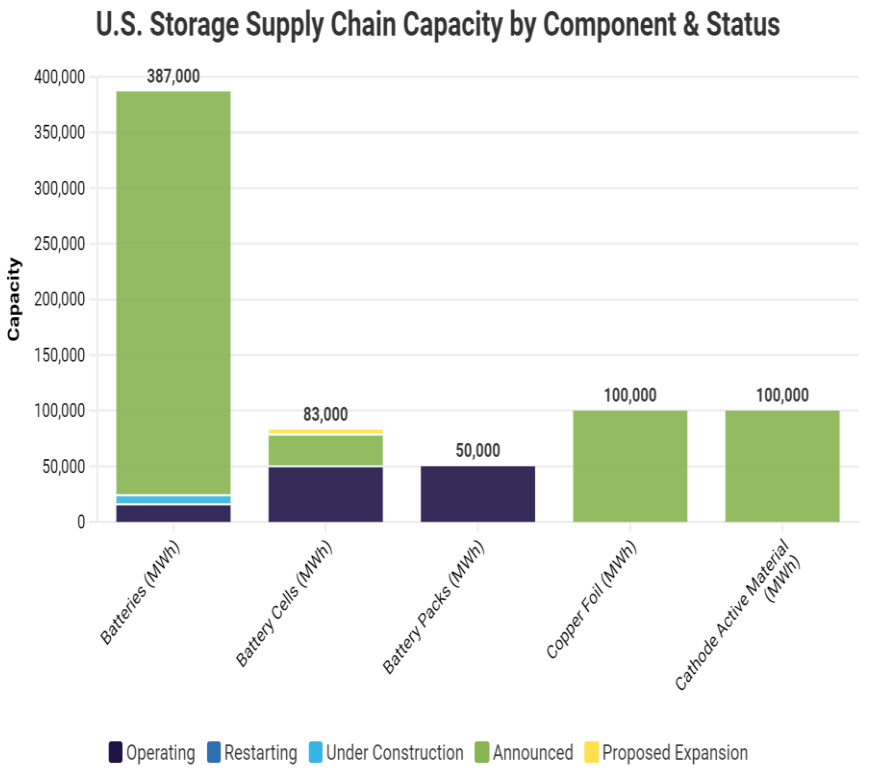


Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q2 2023

New Manufacturing to Secure Supply Chain



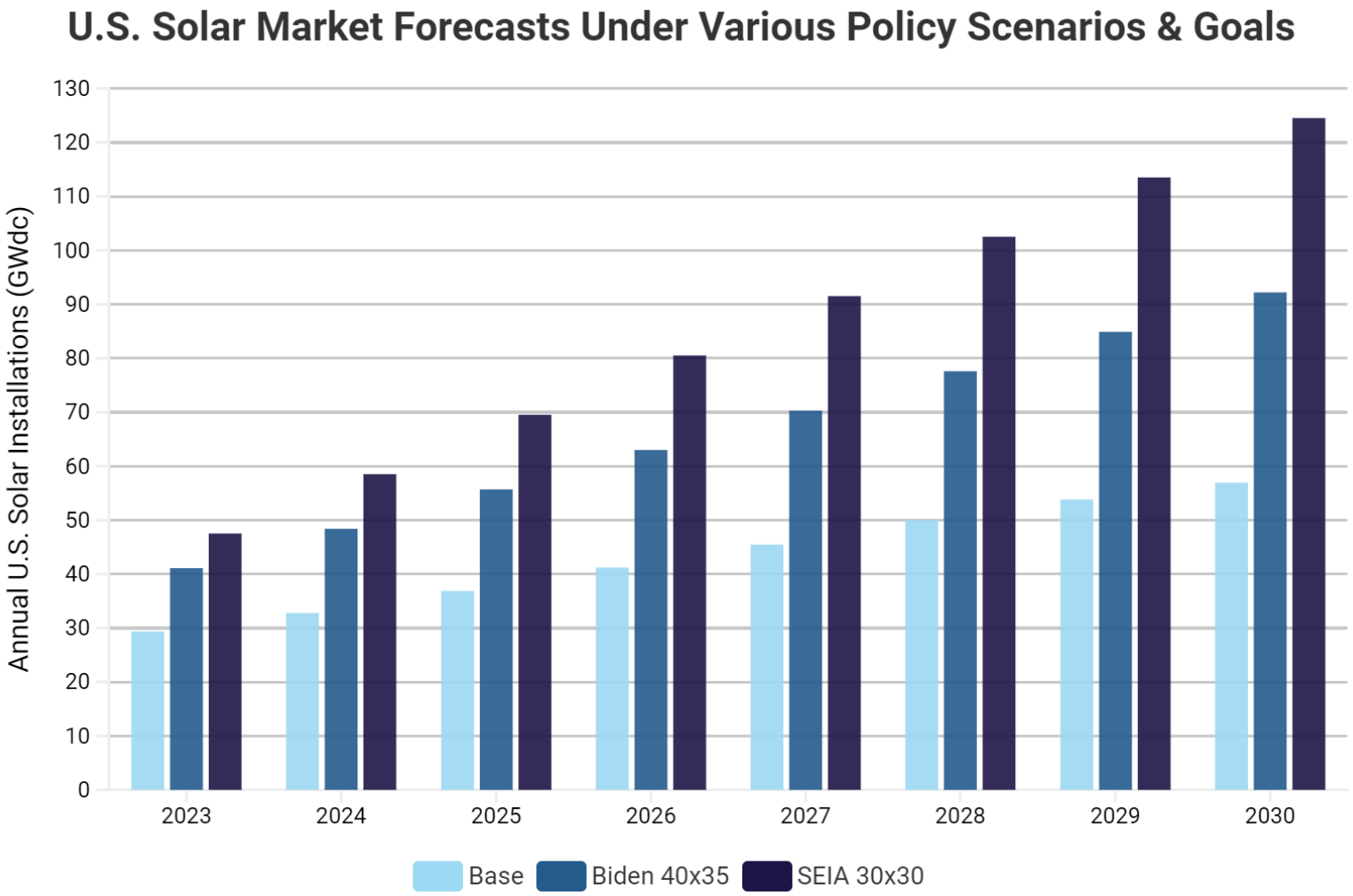
Source: SEIA Solar & Storage Supply Chain Dashboard



Source: SEIA Solar & Storage Supply Chain Dashboard

In addition to spurring massive deployment of solar energy, the IRA will bring about a renaissance of U.S. solar manufacturing. More than 50 GW of solar module manufacturing capacity has been announced, over 15 GW of which is already under construction. This will be a boon for the industry, as it will increase supply chain reliability, create jobs, and spur investment in clean energy. In addition, massive investment in battery storage manufacturing has been announced, and these manufacturing facilities will ensure that the solar and storage industries have access to reliable, domestic supply for future growth.

More Aggressive Growth Needed to Reach Climate Goals



Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q2 2023, SEIA 30x30 Analysis

While projected growth over the next 10 years spurred by the IRA puts the solar market in reach of ambitious clean energy goals set by the industry and the Biden administration, more work is needed to achieve the pace required for a 100% clean energy electricity system. Annual installs will need to grow from less than 22 GW in 2022 to more than 90 GW by 2030, with cumulative totals over 700 GW by the end of the decade. A combination of private sector innovation and stable, long-term public policy will set the solar industry on a path to achieving these more aggressive goals to address climate change and decarbonize the economy.