

# Solar capacity factor by state





## Overview

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In 2023, the United States generated approximately 4.18 trillion kilowatt-hours of total electricity at utility-scale power generation facilities, with renewable energy sources contributing roughly 21% of this total and solar power making up 3.9%. Since 2010, solar power capacity in the United.

Data from 2007 through 2023. Source: Berkeley Lab, Utility-Scale Solar 2024 Copyright (c) 2024, The Regents of the University of California, through Lawrence Berkeley National Laboratory (subject to receipt of any required approvals from the U.S. Dept. of Energy). All rights reserved. This work is.

Capacity factor is estimated for 10 resource classes, binned by mean global horizontal irradiance (GHI) in the United States. The 2023 ATB presents capacity factor estimates that encompass a range associated with advanced, moderate, and conservative technology innovation scenarios across the United.

On average, utility-scale solar photovoltaic (PV) power plants in the United States operated at about 25% of their electricity generating capacity, based on an average of annual values from 2014 through 2017. This measurement, known as a plant's capacity factor, is based on the plant's electricity.

\* The Desert Southwest continues to dominate top-ranked states by solar capacity factor, and as well as its solar-energy-friendly climate, now offers the added benefit of many areas qualifying as energy communities under the Inflation Reduction Act of 2022. \* Independent System Operators, or ISOs.

Residential solar PV capacity reached roughly 11.7 gigawatts in California in 2023. The state ranked first among all U.S. states by a wide margin in terms of residential solar capacity. In total, California had almost 48.5 gigawatts of



solar power installed as of June 2024. Get notified via email. What factors determine a solar PV power plant's capacity factor?

A solar PV power plant's capacity factor is largely determined by three main factors: resource quality, tracking capabilities, and inverter-sizing considerations. Sunnier locations, such as those in the southwestern United States, have more hours of direct, high-angle sunlight per year, allowing the solar PV modules to capture more sunlight.

How much solar power does California have?

Solar power capacity is steadily expanding throughout the United States, as more than half of the states now boast 1 gigawatt (GW) or greater of installed solar. California has set an ambitious goal of achieving 100% clean energy by 2045. The state has been at the forefront of renewable energy generation and solar power generation in particular.

What is the average solar PV capacity factor?

Earlier I noted that the average solar PV capacity factor of approximately 18% at 1MW is also broadly comparable to the 16% estimate in my previous post, which was based dominantly on plants less than one MW in size. Figure 4 superimposes the capacity factors from the previous post on the EIA data out to 10MW.

How much solar power does Massachusetts have?

Small-scale solar PV systems made up nearly 66% of the state's total solar capacity that year. On the other hand, more than 190 MW of capacity have been added from utility-scale facilities since January 2021. In July 2023, Massachusetts was ranked as the tenth state in net solar PV power generation.

What is a good solar capacity factor?

These four sources have an overall capacity factor of  $(27.5+18.4+17.5+15.1)/4 = 19.6\%$ . Twenty percent would therefore be a good round number for planning purposes, always assuming that US solar subsidies are maintained at the levels necessary to support further PV expansion.

What percentage of State Electricity is generated by solar energy?



In 2022, solar energy contributed 19% of the state's utility-scale electricity net generation. When adding small-scale generation, solar energy accounted for 27% of the state's total electricity generation. The solar industry employs more than 78,000 throughout the state.



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### Utility-Scale PV , Technologies , Electricity , ATB , NREL

Base Year: Click here and select Tech Detail = All to add filters to the initial figure on this page to display a range of capacity factors based on variation in solar resource in the contiguous ...

### US solar capacity factors retreat in 2023, break multiyear streak ...

Solar capacity factors fell across all US independent system operators in 2023, sending the weighted US average below the 24% mark for the first time in at least five years. The pullback ...



### Behind-the-Meter Solar

State-level solar profiles were developed by weighting the individual city profiles by their population. A region-wide profile for the Northwest was calculated by weighting the individual state profiles by population. Overall, Idaho has the ...

### [Utility-Scale PV , Electricity , 2023 , ATB , NREL](#)

States in the Southwest United States tend to have better solar resources--and higher capacity factors--than those in the Southeast or Northeast. Arizona's utility-scale solar PV plants



performed better than those in ...



Utility-Scale Solar , Energy Markets & Policy

Berkeley Lab's "Utility-Scale Solar, 2024 Edition" presents analysis of empirical plant-level data from the U.S. fleet of ground-mounted photovoltaic (PV), PV+battery, and concentrating solar-thermal power (CSP) plants with ...



Status Update on New York Wind and Solar Capacity ...

As shown here, that information can be used to calculate the capacity factors for wind and solar resources in New York. The annual capacity factors observed are consistently lower than the values used in the Integration ...



Texas likely to add record utility-scale solar capacity in ...

Other factors driving solar investment in Texas include lower solar technology costs and plentiful sunlight, particularly in West Texas's Permian Basin, where about 30% of the state's planned solar capacity will be built. In ...





## Electricity generation, capacity, and sales in the United States

Estimates of small-scale solar PV capacity and generation by state and sector are included in the . As of the end of 2023, California had about 35% of total U.S. small-scale solar PV electricity ...



## 2022 monthly US solar capacity factors underscore winter doldrums

The average annual US solar capacity factor tracked closely to the norm in 2022, hovering near the mid-20% mark. But with a gap of more than 20 percentage points between apex and nadir, ...

## What Is the Solar Capacity Factor?

Solar capacity is a fundamental metric in the world of solar energy, representing the actual output of a solar photovoltaic (PV) system relative to its potential output under ideal conditions. While determining the installed capacity of a solar ...



## Usual sun states shine bright at top of US solar capacity factor

In 2021, the solar capacity factors of more than a third of the states operating in excess of 100 MW of solar capacity -- including U.S. Desert Southwest states Arizona, New Mexico, Nevada and ...



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### [Status Update on New York Wind and Solar ...](#)

As shown here, that information can be used to calculate the capacity factors for wind and solar resources in New York. The annual wind capacity factors observed are consistently lower than the values used in the ...



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