

Utility-Scale Solar Data File for Generation and Market Value

Background

Lawrence Berkeley National Laboratory (Berkeley Lab) estimates hourly project-level generation data for utility-scale solar projects in the seven organized wholesale markets and 23 additional Balancing Areas. The public project-level dataset is updated annually with data from the previous calendar year. To encourage its broader use, Berkeley Lab makes a comprehensive data files public at the Open Energy Data Initiative (OEDI) at <https://data.openei.org/submissions/8541> and summary data files at <https://emp.lbl.gov/utility-scale-solar>.

Annual solar summary statistics by plant (UPV)

We provide project-level (UPV) annual summaries of the solar generation, curtailment, average wholesale energy value, average capacity value (both in \$/MWh and \$/kW-yr), combined energy and capacity value, and value factor in *Annual_Solar_Value_by_plant.xlsx*. For more information on methods, data, and validation see Appendix A and C in the technical Solar to Grid report: <https://emp.lbl.gov/publications/solar-grid-trends-system-impacts-0>.

Hourly generation data

In addition to the annual solar summary statistics Berkeley Lab provides hourly generation estimates for 6167 utility-scale solar projects, starting at the project's commercial operation date (or 2012 for older projects) until the end of 2024. A separate .csv file is listed for each UPV project, using the EIA plant ID as its filename. Records are indexed by UTC-Hour-Beginning datetimes. Here we summarize the data by column:

SAM_gen: Modeled generation estimates using NREL's [System Advisory Model](#) (SAM) with project-specific system characteristics reported in EIA Form 860 (augmented by data collected for our [Utility-Scale Solar Series](#)) and historical irradiance estimates in NREL's [National Solar Radiation Database](#) (NSRDB, 2012-2020) and NOAA's [High-Resolution Rapid Refresh](#) model (HRRR, 2021 forward).

gen_bias: Modeled generation estimates for a debiasing process that are for the most part identical with *SAM_gen*. Minor deviations occur for projects where system characteristics were updated after the debiasing process was run, resulting in updated *SAM_gen* records.

gen_bias_corrected: Debaised generation estimates where the modeled generation was scaled to fit the (1) project-specific solar generation reported by EIA Form 923 (based on annual generation for the years 2012-2014 and based on monthly generation starting in 2015) and (2) hourly system-wide solar generation for a subset of ISOs/RTOs and Balancing Areas. For a subset of projects in ERCOT, we directly report project-specific hourly generation that is publicly available 60 days after operations day. This is raw data that may contain commissioning data and telemetry errors.

gen_clean: Hourly generation estimates that are used as basis for value and system impact calculations throughout the report. Where feasible, we default to *gen_bias_corrected* estimates. When that data is not available, we use *SAM_gen* estimates. If curtailment is reported in the column *gen_curtailed*, *gen_clean* represents post-curtailment output. The file *UPV_generation_overview_by_plant_year.csv* summarizes which generation estimates are reported in this column by project and year.

gen_curtailed: Estimated hourly curtailment for projects in CAISO and ERCOT.

Who to Contact with Questions?

Questions or comments may be directed to Joachim Seel (jseel@lbl.gov).

Disclaimer and Copyright Notice

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor The Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or The Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof, or The Regents of the University of California. Ernest Orlando Lawrence Berkeley National Laboratory is an equal opportunity employer.

This manuscript has been authored by an author at Lawrence Berkeley National Laboratory under Contract No. DE-AC02-05CH11231 with the U.S. Department of Energy. The U.S. Government retains, and the publisher, by accepting the article for publication, acknowledges, that the U.S. Government retains a non-exclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this manuscript, or allow others to do so, for U.S. Government purposes.