



SolarAnywhere® SystemCheck®

Solar Data Solutions & How Real-time Solar Data Can Help Maximize Solar Project Performance

Solar resource is a cornerstone of a PV project's profitability. Reliable and accurate solar data is critical in developing and operating PV power plants. Without quality solar data at each stage of the project lifecycle, investors, operators and financiers risk setting unrealistic expectations about PV plant operational efficiency and profitability.

Understanding which type of solar data meets your needs, and the attributes of the data service that will help your business scale, is critical to project success. To select the best solar data for your need, you need to first have a working knowledge of the types of commercial solar data available and where they apply. The following section outlines the types of solar data and the solutions available from Clean Power Research's SolarAnywhere® solar data product suite.



Understanding SolarAnywhere Solar Data Solutions

SolarAnywhere data is available for historical, real-time and forecast time periods. Table 1 lists the most common industry applications and users for each type of solar data.

Solar Data	Applications/Use Cases			Users
Historical	<p>Project feasibility and pre-construction resource assessment Obtain an initial, high-level assessment of solar resource availability at a potential project site and run energy simulations.</p>	<p>Ground tuning studies Long-term solar resource data can be optionally tuned to ground-based measurements to reduce the uncertainty of solar resource assessments. However, because SolarAnywhere Data offers the lowest-uncertainty solar resource data available on demand, ground tuning is not required.</p>		<ul style="list-style-type: none"> • Independent owners/engineers • Solar project developers • Investors • Solar energy consultants • Grid planners
Real Time	<p>Asset/portfolio management Benchmark the performance of residential and commercial PV fleets against original project financing expectations.</p>	<p>Increase investor confidence and track performance guarantees Weather-normalize system production and track PV performance metrics with independent data from SolarAnywhere SystemCheck® to ensure that the project is meeting its performance guarantee.</p>	<p>O&M planning Reduce solar project downtime and unnecessary truck rolls by accurately identifying and diagnosing PV system issues.</p>	<ul style="list-style-type: none"> • Asset owners and operators • O&M companies • Solar project financiers
Forecast	<p>Meet PPA requirements Many utility-scale solar plants with traditional power purchase agreements (PPAs) are required to deliver day-ahead forecasts. Off-takers may use these forecasts to schedule generation resources.</p>	<p>Support distributed energy resource management systems (DERMS) and utility operations Operate distributed energy resources (DERs) more intelligently and improve visibility into grid operations with SolarAnywhere Basic Forecast.</p>	<p>Inform energy trading decisions and operate dispatchable PV and solar + storage plants Operate dispatchable PV plants and inform energy trading. Predict variable output and optimize battery utilization with temporal and spatial resolutions down to 1-minute and 1-kilometer, respectively.</p>	<ul style="list-style-type: none"> • IPPs • Utilities • PV project developers • Grid operators and planners

Table 1. Solar data types, industry applications and users.

Sourcing High Quality Commercial Solar Data

To mitigate financial risk and ensure asset bankability, solar project stakeholders need to carefully evaluate the solar data for their projects. At Clean Power Research, we have identified key factors that define a quality commercial solar dataset based on input from SolarAnywhere customers.

- **Validated and Widely Accepted** – For successful solar projects, stakeholders need to have trust in the solar datasets and confidence that the solar data is bankable. SolarAnywhere data is [extensively validated](#) and trusted by hundreds of enterprise-class customers with 2000+ monthly downloads. Data validation is based on the highest quality measurements of the Baseline Surface Radiation Network (BSRN, known in the U.S. as the SURFRAD and SOLRAD networks). SolarAnywhere datasets are versioned to ensure repeatability and transparency of results.
- **High Accuracy and Known Uncertainty** – Inaccurate, or marginally accurate solar data for project development and financing can result in suboptimal decisions, eroding project profitability and causing unexpected project delays. Solar data should be comparable across different locations, time periods and resolutions. Even small discrepancies in input data can negatively impact project due diligence and financing. While solar data the accuracy can vary based on environmental factors at individual sites, SolarAnywhere irradiance data is shown to be [accurate to within +/- 4.5%](#) on an annual basis with 95% confidence across all locations covered. When comparing recent ground measurements to historical averages, consistent and current solar resource data is critical.
- **Long History and Current Data** – The solar data source should have a long history and be kept up to date. [A long history of data](#) can help mitigate financial and production risk by reducing the uncertainty of the long-term average solar resource and accurately estimating the likelihood of low insolation years (e.g.,



99th percentile probability of exceedance or P99). SolarAnywhere offers satellite irradiance data from 1998 through present hour to forecast, subject to geographic availability.

- **Spatial Precision** – Weather and solar resource measurements should be representative of the microclimate behavior at the project location. Nearby weather stations that are not co-located with the actual PV project can add unknown uncertainty to financial projections. With [spatial resolutions](#) as detailed as 1 km, SolarAnywhere is not site restricted, which enables an accurate representation of irradiance at project sites where weather station data is not readily or accurately available. This is particularly important for coastal, mountainous and island locations that often exhibit sharp spatial gradients in solar resource.

“Clean Power Research has been a trusted resource for solar irradiance datasets for numerous years. We’ve found SolarAnywhere® Data to be technically rigorous and provide deeply independent site irradiance assessments. Research has been a trusted resource for solar irradiance datasets for numerous years. We’ve found SolarAnywhere® Data to be technically rigorous and provide deeply independent site irradiance assessments.”

– MICHAEL G., VP Conventional and Emerging Technologies , Leidos

- **Built for Solar** – Solar resource assessments are improved when they rely on data produced by a broad team of experts focused solely on solar energy assessments. Working in partnership with SUNY Albany and the lab of Dr. Richard Perez, [Clean Power Research’s team of scientists and engineers](#) continue to innovate and offer industry-leading solar data ranging from historical and real-time to forecast solar data.

While all three types of commercial solar data (historical, real-time and forecast) should be assessed based on these criteria, there are unique considerations when selecting a real-time solar dataset for efficient performance benchmarking and asset management.

Reduce Solar O&M Costs and Maximize Profitability

Selecting an Optimal Real-time Solar Data Solution

The global annual solar PV O&M market is projected to hit \$9 billion by 2025, with nearly 36 GWDC of solar assets estimated to run into premature failures.^[1] NREL reported that 15-20% of residential and commercial solar projects were missing their expected energy production by 10% or more.^[2] Solar energy production shortfalls can lead to unhappy customers and project stakeholders, causing revenue losses over a project’s lifetime due to low production and high O&M costs. They can also lead to higher financing costs on future projects since investors will base revenue projections on conservative energy estimates, citing asset underperformance as a significant risk.

To maximize portfolio value, operators and solar stakeholders, such as project financiers, need efficient and scalable methods for measuring the health of individual solar assets and entire portfolios. There are three key considerations for a scalable distributed generation asset management strategy:

✓ How to evaluate asset performance if on-site meteorological data is missing or unreliable

✓ How to maximize the ROI of a scarce O&M budget across a diverse portfolio of assets

✓ With variable weather and revenue, how asset owners and operators can assure investors that their investments are healthy

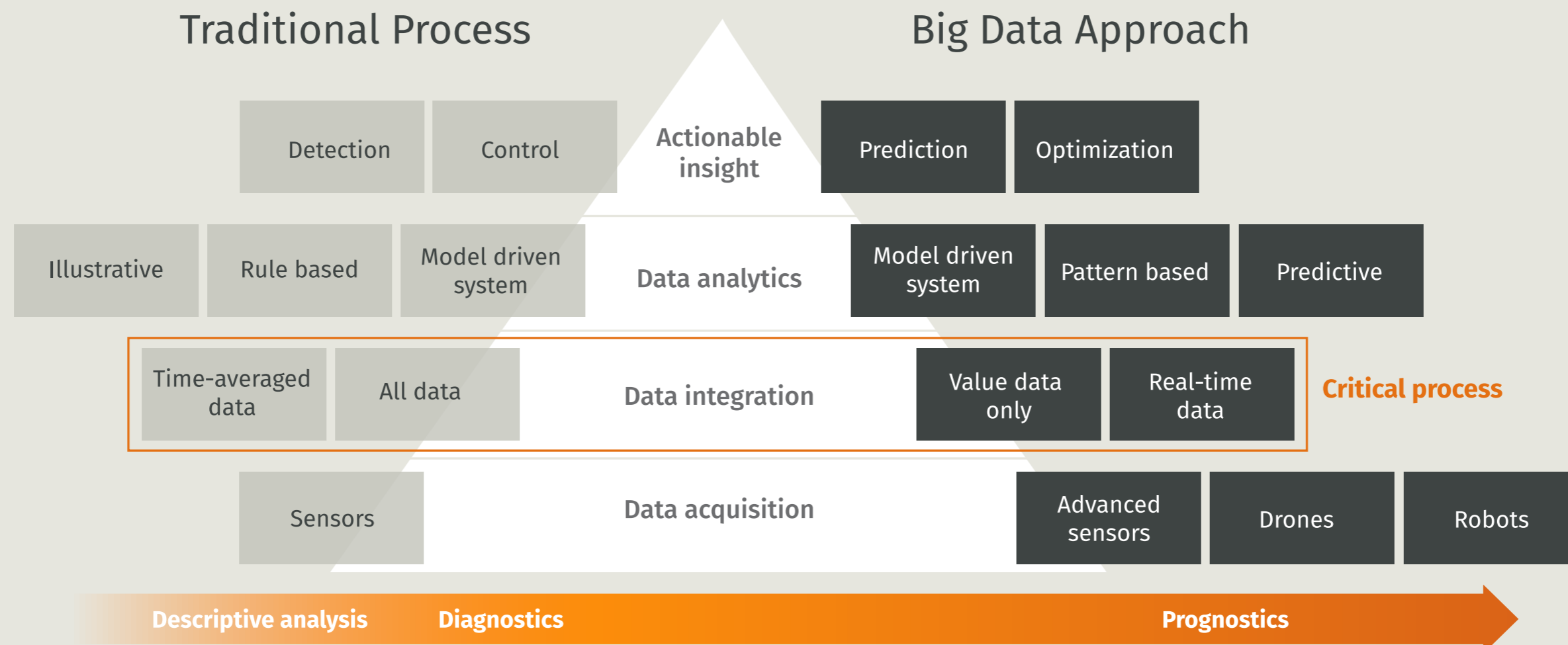
A distributed generation (DG) solar portfolio contains energy expectations that are based on many irradiance datasets. Baseline energy estimates often incorporate outdated solar resource data that can have spatial and temporal inconsistencies, making it difficult to compare different projects on a level playing field. Weather is inherently variable and makes it difficult to benchmark projects across a broad portfolio. For instance, the years 2018 and 2019 had less sunlight (or insolation) than the long-term normal in some locations, leading to significant system underproduction. Therefore, it is important that asset managers weather-normalize project performance by incorporating a mechanism for tracking recent insolation in addition to the energy production.

To address the challenges associated with cost-effectively scaling O&M processes, asset managers and system owners are increasingly adopting automated solutions

and advanced analytics for PV O&M.^[3] As demonstrated in Figure 1, solar PV O&M offerings have evolved in recent years from a traditional process of looking at real-time diagnostics, to leveraging big data techniques that help predict overall plant performance. Automated solutions can help businesses scale effectively and quickly by reducing operational costs and increasing data quality.

Whether using a traditional set of O&M solutions or more advanced prognostics, data acquisition and data integration is key to generating actionable insights. The accuracy and efficiency of real-time O&M solutions is largely driven by input data accuracy. Discrepancies in project data such as late, missing or flatlined data can waste valuable time and resources.

Figure 1. Solar PV O&M evolution, Source: GTM/ Wood Mackenzie, 2019



In addition to the commercial solar data criteria already discussed, asset managers and project stakeholders should consider other factors when creating an efficient and scalable solution for holistic performance management and O&M process automation^[4]:

- **Useful Metrics** – Performance metrics used for PV O&M should be clear and comparable across projects to enable asset managers to make important O&M decisions. Certain metrics such as performance ratios are not consistent between projects—often changing with time and technology type—which can make it difficult to compare projects across a portfolio. Other metrics such as performance index (ratio of actual energy to expected energy) and lost generation are useful key performance indicators (KPIs) for performance benchmarking since they are consistent across different projects and can be easily translated to revenue to prioritize issues. Using a consistent KPI with [high-quality input data](#) can allow faster identification of system issues than using production data alone.
- **High Quality Input Data** – For many commercial projects, on-site data from pyranometers may be available. However, ground-data quality depends on system age, data acquisition methodology and available maintenance. Ground instrumentation requires frequent cleaning and maintenance, which is typically done on a weekly, bi-weekly or monthly basis. The cost of maintenance, data acquisition and data quality control can make on-site measurements impractical—NREL states that “satellite measurements can be more accurate than an on-site pyranometer that is dirty, out of calibration, or installed incorrectly.”^[5] Satellite data such as SolarAnywhere data can be a useful alternative to ground-measured data due to its consistency, high availability, data quality and low integration costs.
- **Setting Appropriate Performance Thresholds** – For a broad range of distributed solar projects, relying on a handful of personnel to evaluate



performance metrics for each PV project can be a time consuming and inefficient method for PV O&M. A scalable solution leverages digital technology to identify and alert the user to required human intervention. However, exception-based monitoring requires setting appropriate thresholds. Thresholds should be sensitive enough to detect performance issues, but not overly sensitive as to create nuisance/false alarms. Performance thresholds should also consider measurement/modeling accuracy, weather variability and a buffer.

- **Consistent Analysis** – Taking a consistent approach can enable asset owners to identify which projects are under-performing over a longer time period. As a result, they can dispatch scarce resources for high-value corrective maintenance and make efficient portfolio level decisions.

A holistic solution for automating solar performance assessment can help to quickly identify equipment and maintenance issues and reduce unnecessary O&M expenditure—all at a fraction of the cost of using ground data. Implementing a robust automation solution for performance benchmarking can help asset owners and operators:

- ✓ Scale efficiently by reducing support time and cost.
- ✓ Quickly identify issues affecting energy production and make appropriate O&M decisions.
- ✓ Minimize the cost of on-site work by utilizing accurate remote diagnostics such as snow and soiling loss detection.
- ✓ Increase project profitability and portfolio value by identifying high-value corrective maintenance.
- ✓ Increase investor and stakeholder confidence in reported production estimates.

Today, [SolarAnywhere SystemCheck](#) is used to evaluate the performance of individual and fleets of PV systems for hundreds of thousands of PV projects. SystemCheck reduces project risk, is proven to be bankable and is available on-demand for locations across North America, Europe and South America.

Our team’s mission is to deliver the most accurate irradiance data and intelligence to our customers. SolarAnywhere operates independently of ongoing ground data measurements—and unlike ground-data, SystemCheck data never needs the user to perform calibration or quality control, saving countless hours spent on data issues. Moreover, customers can scale business operations from a single system to an entire fleet of PV systems by calling into the SolarAnywhere Application Programming Interface (API) with existing software tools for portfolio monitoring and asset management.

Case Study

Learn how Omnidian is using [SolarAnywhere SystemCheck](#) real-time irradiance data to automate O&M—delivering “solar without fear” to a portfolio of more than 1.5 GW of residential and commercial assets located across the U.S.

[Download Omnidian Case Study](#)

- 1 Wood Mackenzie News Release, “Annual solar repairs and maintenance spend to grow to \$9 billion by 2025”. Accessed at [https://www.woodmac.com/press-releases/annual-solar-repairs-and-maintenance-spend-to-grow-to-\\$9-billion-by-2025/](https://www.woodmac.com/press-releases/annual-solar-repairs-and-maintenance-spend-to-grow-to-$9-billion-by-2025/)
- 2 PV Field Reliability Status, NREL accessed at <https://www.osti.gov/biblio/1659924>
- 3 GreenTech Media, “The State of the digital O&M for the solar market”, accessed <https://www.greentechmedia.com/articles/read/the-state-of-digital-om-for-the-solar-market1>
- 4 Webinar –“How to reduce solar O&M costs and maximize profitability with efficient benchmarking, P.Keelin, A. Atkins; accessed <https://go.cleanpower.com/maximizing-solar-portfolio-value.html>
- 5 NREL, Best Practices for O&M of PV & Energy Storage Systems; 3rd Edition, Dec. 2018, Accessed at <https://www.nrel.gov/docs/fy19osti/73822.pdf>



Comprehensive, on-demand data for distributed solar performance evaluation

[SolarAnywhere SystemCheck](#) offers independent estimates of distributed PV energy production in real time, giving owners and operators a critical tool for benchmarking system performance.

SystemCheck makes it possible to evaluate performance of individual PV systems or a fleet of systems to make better asset management and O&M decisions—all at a fraction of the cost of lost energy production, high operational risk or unnecessary truck rolls. Solar owners and operators can easily integrate SystemCheck’s API into existing software and tools to scale monitoring across the portfolio.