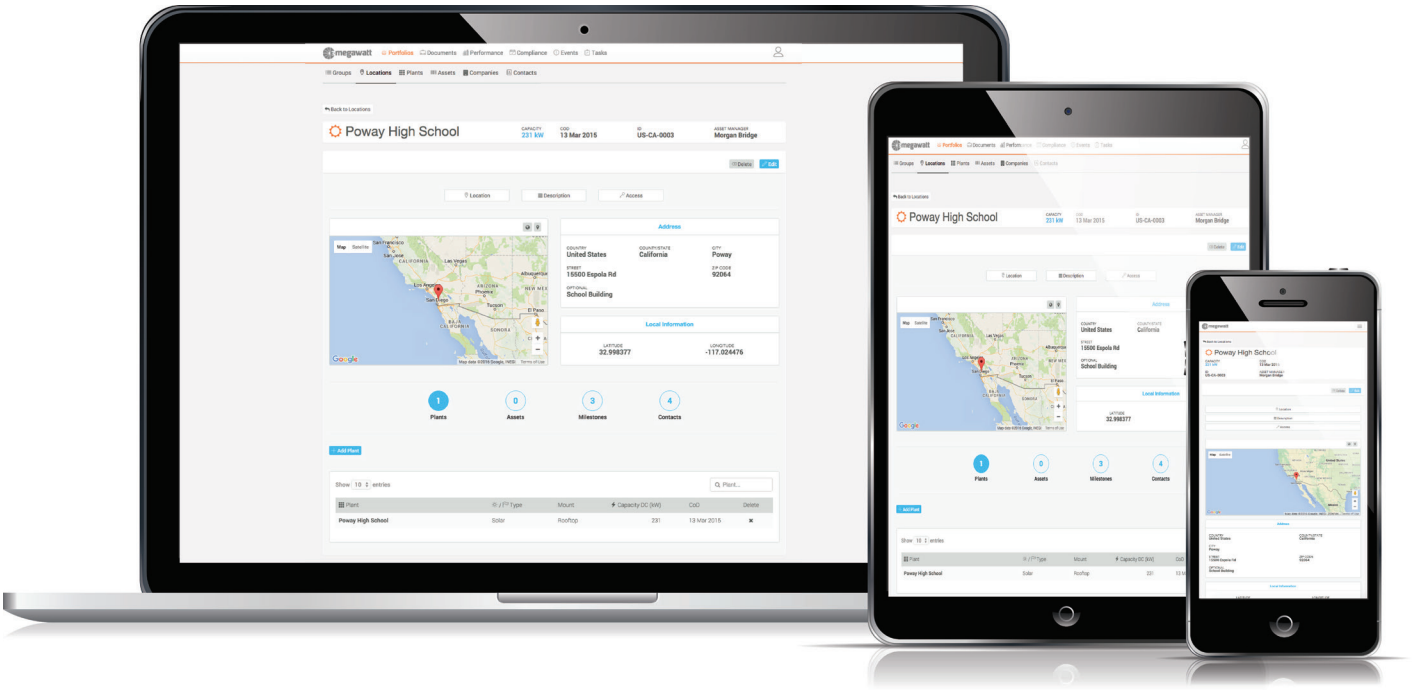
Proactive monitoring in effective PV asset management

Monitoring | Datasets from multiple sources allow PV power plants to be monitored more closely than ever before, but how best to use this data is another ball game. Edmée Kelsey and Gwendalyn Bender look at how data should best be stored, managed and mined for effective solar asset management



Credit: 3megawatt

There is an ever-increasing amount of data available for PV plants and the data source that immediately jumps to everybody's mind is the PV monitoring system. Monitoring systems display data captured from the many measuring devices on a solar plant. These systems not only produce masses of performance data, but also a vast array of fault detections and other alarms.

However, this is not the only data source that is relevant for operators to manage and analyse their plants. Increasingly the industry is looking at parallel datasets that can either validate monitoring datasets or replace missing or erroneous data.

Data sources

One key input is independent weather data, which validates measurements from pyranometers, or provides an alternate information source when a weather station is not available at a plant. While considered "ground truth" and the best source of site conditions, pyranometer accuracy is highly dependent on the type of equipment and how well it is maintained. Additionally, unfavourable weather conditions, such as heavy snow or hail, can impact measurement equipment performance.

For these reasons, having an independent data feed helps validate or substitute on-site irradiance measurements. If you have many remotely operated sites, these data feeds also provide a consistent source of information across a fleet of projects that you may have acquired or that use varying measurement equipment. This gives you an "apples to apples" baseline across your portfolio to evaluate weather-adjusted performance.

Weather data can come from a variety of sources and with varying quality and price tags. The industry standard would be a satellite-derived solar irradiance dataset. However, just as important as data quality is availability. Does your vendor offer data coverage across your entire existing and potential project network? Can they guarantee data will be available on a reliable basis 365 days a year? If you are making operational decisions based on this information, you will want to make sure it is consistent across your sites, again for apples-to-apples comparisons, and that it is always available when you need it. To make sure the information is best leveraged, you'll also want to consider ease of integration with your existing performance monitoring platform.

PV system monitoring produces large volumes of data that must be stored and used effectively for optimal management of assets.

Another critical dataset for many asset management activities would be utility data for the plant. Depending on the country and the utility, this data can be hard to obtain and this is why in certain markets third-party providers are offering these datasets in an 'easily digestible format' for a fee.

Detailed field information is an often overlooked operational input. Field technicians on the ground are usually the personnel closest to actual operations and frequently have very interesting observations. Their insights could allow operators to safeguard or improve the long-term performance of the plant long before monitoring systems signal a problem.

Keeping data

But with so many different data inputs into performance, what kind of data should you collect? How granular should it be? What are the key time intervals? Finally, how long should you hold on to all of this information?

The safe bet is to keep everything. That will not get you fired and perhaps one day in the future there will be some new ingenious analytic tool with a magic formula that optimises your plant by 100%. No one wants to be the fool who threw data away that is needed later on down the road.

But although data storage is cheap, it is expensive if you are storing unusable rubbish you don't know what to do with. In order to make a more informed decision about which data to collect and keep, it might be more practical to look at some of the main use cases for performance data that we know of today:

Performance analytics: The most cited use case for plant data is analytics for performance enhancement. If you can separate production impacts from weather and production impacts from equipment, you can reconcile recent performance and identify and fix performance issues. You can also avoid wasting time chasing down equipment problems that don't exist. To complete this analysis, at minimum you need access to concurrent power meter information and weather inputs.

Performance reforecasting: An increasingly important use case for plant data is the evaluation of a plant by a potential buyer or for bank refinancing. Investors and financial institutions may send in a technical advisor to assess the health of the plant. Bringing in a technical advisor report is no longer only a check mark on due diligence lists; it directly affects transaction value or refinancing conditions.

Financial forecasting: Cuts or changes in feed-in tariffs in some countries have created a need for owners and operators to perform detailed liquidity analyses and assess if they will be able to meet debt service during low irradiation months. For this use case, it is more relevant to look at the actual historical performance of the plant, rather than at the theoretical P50 forecast data.

Meeting regulatory requirements: Regulators require storage of specific datasets to prove compliance with national and federal energy regulations. Operators will want to track revenue loss and potential compensation for lost output events, such as curtailment instructions by the energy buyer or transmission operator. These lost output events will need to be documented in detail and stored for a considerable period.

Plant enhancements: Solar assets may at some stage be repowered as part of a micro-grid or have storage added to them. In these cases, detailed historical performance data will be critical for making sound engineering and financial decisions.

Using data

After deciding which use cases are relevant and therefore what data to collect, the next step is to ensure that the data is actually useable. Analytics will be relatively useless if the underlying data is missing or incorrect. To ensure that the data is of sufficient quality, here are a few best practices for operators to follow:

Validate data: Data quality will be significantly improved if operators have a data validation process in place. Data validation processes could be comparisons of two similar datasets, such as inverter data against utility meter data, with automated algorithms or manual validations. The most important thing is that this process can be audited. For example, if some data are altered, approximated, or backfilled the organisation should have a record of who made the change, when the change was made, why it was made and what data source was used.

Fill data gaps: If data is missing, incomplete or corrupted the asset manager should attempt to create an alternate dataset as a proxy and be sure to flag it as such.

Keep consistent records: Detailed record keeping for alarms, alerts and events are important. This does not only include events tracked by the monitoring system, but also a detailed log of external events such as grid outages, curtailments and any other external events that have direct or indirect impact on the performance of the plant

Maintain field records: Record keeping for field observations and interventions is critical, but often harder than it sounds. Many owners are struggling with incomplete records because they switched O&M service providers, or their O&M provider has gone out of business. These records may have been lost or simply never kept in a professional manner.

Integrate data into one platform: A great best practice is to "free" the respective datasets from their silos. Often monitoring data lives in one or more monitoring platforms while weather data resides in weather portals. Meanwhile events and work orders live in CMMS systems, spreadsheets or email correspondence, and the utility data lives on a utility portal, a spreadsheet or even just a piece of paper. In order to do be able to do any meaningful analytics or data validation, the data needs to be easily accessible and comparable. This will involve standardising, normalising and storing the datasets in a centralised data warehouse.

Future benefits

Tracking all of these project data points and following these best practices may seem like a lot of effort at first sight, but future benefits are considerable.

So let's be practical. The requirements at every site are going to vary in terms of the information you need to gather and keep for making different decisions. Knowing this, it is best to begin with the end in mind. What are the most important decisions you need to make now or foresee needing to make in the future? After a close evaluation of top priorities, you can determine the performance monitoring information and platform that will best address your core obstacles and concerns. ■

Authors

Edmée Kelsey is founder and CEO of 3megawatt, a provider of solar asset management software. She was the former CFO of Main Street Power, where she closed project financing for over 100 distributed solar PV projects and was responsible for the asset management of those solar assets. She was also formerly a VP at the investment bank JP Morgan and managing director of a clean energy corporate finance advisory firm.

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