Decision-making through data

According to a study conducted by Massachusetts Institute of Technology, companies that use data-driven decision-making are 5% more productive and profitable than their competitors. Jean-Yves Bellet, cofounder and VP-CTO of QOS Energy asks, "Can we apply the results of this study to solar PV operations and maintenance?" Today, solar plant owners expect to generate value from their data using real-time decision-making tools, analytics, and machine learning models.

The operations and maintenance (O&M) of solar PV plants has evolved greatly in recent years, to become both more professional and more effective. The industry widely recognizes the essential role played by quality O&M services in ensuring the long-term, sustainable performance of solar power plants, improving their levelized cost of energy (LCOE) and positively impacting the return on investment for solar asset owners and operators.

QOS Energy's software solution aims to help renewable energy asset owners to increase their return on investment.

Photos: DHYBRID

Operations teams make decisions based on data that they receive from monitoring providers, SCADA systems, dataloggers, inverters, satellite irradiation data, weather forecast services, and other sources. Analysts use a variety of benchmarking tools to compare current performance with historical data, or that of other plants, in order to identify trends and maximize the performance of these assets.

Investors and asset managers are well aware that the profitability of a capital investment such as a solar PV plant can be put in jeopardy if all operational factors are not well managed.

For solar analysts, identifying optimal benchmarking tools can be quite a long and tedious process, considering the myriad factors that must be carefully evaluated in order to accurately assess PV plant performance.

Communications failures, sensor miscalibrations, excessive soiling, or even cloud cover, can alter the accuracy of the chosen benchmarks, making them irrelevant.

Reliable decision-making

Data quality is critical for reliable renewable asset operations and effective decision-making. Can decision-making be based on erroneous or missing values? Would you build your smart home on an unstable foundation?

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Data quality must be given serious consideration by PV power plant operators. This important piece of the O&M equation is sometimes overlooked by operators, willing to cut corners in favor of cutting edge features. Not giving attention to data reliability can be a costly mistake, since even minor errors in the data will lead to false conclusions, biased decisions, and potentially significant losses in performance, which then incur additional O&M costs.

The topic of data quality becomes even more critical as solar portfolio owners find themselves with an increasingly disparate collection of different dataloggers,

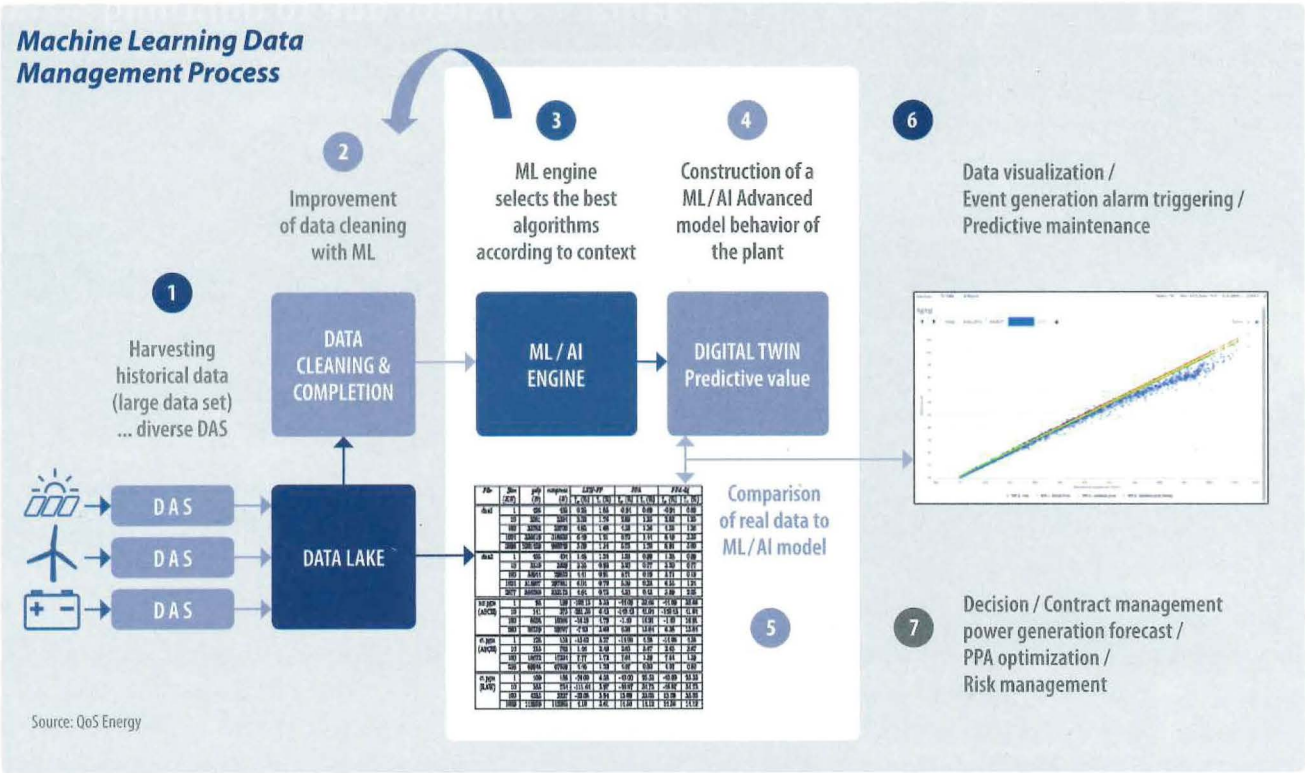
QOS Energy's software comprises more than 250 protocols to communicate with all types of data acquisition system.

databases, and data acquisition systems, each using a distinct set of communication protocols, data sets, time scales, and instrumentation.

Evaluating the quality and integrity of all of these data is a crucial step in building a strong foundation for reliable asset performance analytics.

This process may seem straightforward, but can in fact be extremely complex, as each individual data acquisition system (SCADA, datalogger, sensor, database, etc…) has its own unique collection method, communication protocol, and data source.

For more than a decade, QOS Energy has been helping renewable asset owners and operators to address problems arising from the complexity of asset performance data acquisition, by offering a hardware agnostic, cloud-based asset performance management solution.



> *"Acquisition is only the first step of the process to sort, qualify and transform this data into operational insights"*

A dedicated team

QOS Energy has an entire team of dedicated data acquisition specialists in charge of developing, configuring, and maintaining more than 250 connection protocols to communicate with all types of SCADA systems, dataloggers, and databases.

With over 5,000 plants under management, we have gained extensive knowledge and understanding of all communication protocols in the solar industry and beyond. Our solution is capable of collecting data from wind turbines, substations, storage facilities, or third-party databases. But data acquisition is only the first step of the process to sort, qualify, and transform these data into operational insights.

Managing storage performance

Energy storage systems (ESS) are increasingly becoming a part of the mix for many renewable portfolio owners and operators, as today's storage technologies provide multiple opportunities to help manage production intermittencies, ensure a reliable energy supply, and increase asset profitability.

With the significant advantages of fast charge/discharge times, long-life expectancy, and immediate availability for deployment, lithium-ion battery-based systems have become the storage technology of choice for many renewable operators.

However, the significant additional investment the inclusion of an ESS represents, can significantly increase risk to renewable asset profitability. Battery technologies used for the storage of production from renewable energy sources are new to the energy grid, require more advanced configuration, and have complex needs – they carry some risk of specific failures. It is therefore essential to monitor the performance of each ESS asset accurately and effectively to ensure that this extra investment leads to the expected rate of return.

Some of our customers, such as Neoen, Dhybrid, and SolarAfrica, monitor specific indicators daily on their storage facilities such as the cell temperature, inside humidity level, state of charge, and total discharged power. Each customer has their own objectives and way of working. As such, each has developed their own custom performance indicators to monitor relevant performance values. Our clients have made significant investments in their storage facilities and we want to ensure that they can accurately track the performance and profitability of these assets on a flexibile, centralized, cloud-based platform.

Improved data acquisition and management is seen by many as a key element in future energy infrastructure.

The solar data deluge

Not long ago, monitoring a handful of parameters from each inverter was considered sufficient for managing the health of a solar PV asset. With the advent of cloud computing, it has become feasible to gather all available data from solar PV plants.

Nowadays, operators are able to integrate data from weather forecasts, enterprise resource planners (ERPs), and energy markets, as well as co-located energy storage facilities. This exponential increase in the volume of data poses the challenge of collecting data from these disparate systems, making sense of these data, and ensuring their security and integrity. Across the renewables industry, it is well understood that mastering this data deluge would provide the competitive advantage of identifying valuable insights from these data.

Solar asset operators now tend to monitor and store all available parameters with the goal of achieving optimal asset performance. This only makes sense if there are personnel capable of managing the complex task of extracting operational insights from this "data deluge." How many of these O&M service providers are able to hire data scientists to handle this task? We have observed that the volume of data monitored per megawatt has multiplied by a factor of 1,000 over about two years. It is not uncommon that we monitor more than 25,000 parameters on plants smaller than 10 MW. More and more asset operators are eager to discover opportunities to optimize system performance through the analysis of greater volumes of data and greater granularity of parameters. We do not foresee this trend stopping in the near future – quite the contrary.

Predicting the future

Solar asset operators and owners now demand more from analytical toolsets than simply evaluating the operational status of their renewable portfolios via real-time and historical benchmarks. They are now able to extract significant operational insights and increased asset value by leveraging cloud computing and data science.

Data collected by sensors are sometimes missing, incoherent, or inaccurate. Equipment undergoes slight changes in behavior over time that might indicate a future failure but are too minor to be detected by humans. Predicting production for the forthcoming day can be challenging, as plants are becoming more and more complex, not to mention accounting for planned or unplanned maintenance. Data science technologies, such as machine learning, can facilitate the management of such complexity by delivering accurate, reliable, and actionable insights.

Today, combining data analytics and machine learning enables operators to reduce downtime, increase benchmark reliability, and better forecast energy productions.

Case studies and applications are numerous. Data science models such as the Digital Twin, a virtual replica of a plant working at top performance, enable the creation of accurate benchmarks and thereby assess precisely if a plant is operating as planned or is underperforming.

Our clients are energy engineers and operations managers, not data scientists. Our goal is to deliver turnkey analytical tools which can be used by our client without having to be an expert in data science. We believe that providing machine learning as a service (MLaaS), easily accessible to any energy analyst, will further help our clients to reduce LCOE and facilitate the development of renewable projects around the world.

Jean-Yves Bellet

About the author

Jean-Yves Bellet is cofounder and VP-CTO of QOS Energy. He has extensive experience in monitoring systems and software design and is the functional designer of the Qantum platform which monitors 8 GW of renewable power.
QOS Energy is an innovative independent software vendor specialized in data intelligence cloud solutions for renewable energies. QOS Energy enables clients to increase power production and maximize returns for more than 5,000 facilities worldwide.