BLACK & VEATCH

4 Ways to Optimize Distributed Energy Assets with Data-Driven O&M

Introduction

The growing number of distributed generation assets creates unique challenges for owners. The game has changed from the traditional operations and maintenance (O&M) model as geographically dispersed assets with razor-thin margins and strict reliability requirements leave little room for error. Data analytics helps owners detect issues before they become big problems, prioritize field responses, balance the costs and benefits of maintenance activities, and generate the greatest returns on investment (ROI).

Most cities are experiencing high growth rates of commercial solar, battery energy storage systems (BESS) and electric vehicle (EV) fleet charging depots. Due to these combined factors, the number of generation sites and data points are increasing exponentially, especially when compared to traditional power generation infrastructure. These numbers are only going to climb higher.

Energy research group Wood Mackenzie forecasts a 16 percent compound annual growth rate (CAGR) in distributed generation sources from now until 2026, making it a $49B **market**
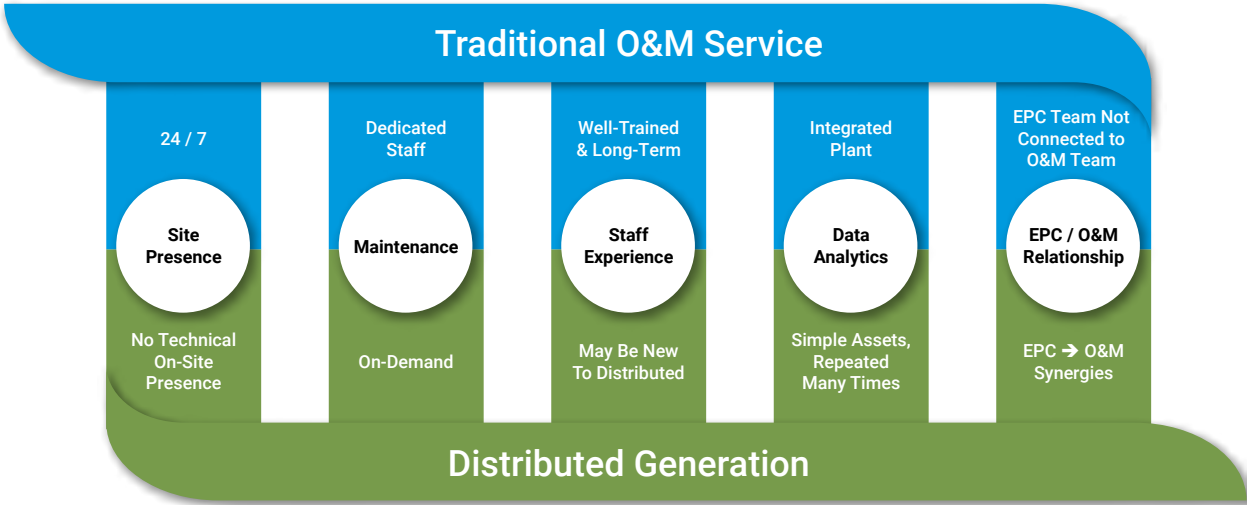
The question becomes, how do you efficiently manage so many dispersed "mini" assets and their data streams?

The answer lies within the strategic use of **data analytics.**

How is O&M on distributed projects different from traditional O&M?

Distributed generation complicates things for O&M because the assets tend to be relatively small, geographically distributed and often are located in urban environments with access challenges. Even though these assets may be simpler, the sheer number of sites makes providing cost effective O&M a complex problem.

The infographic at the right shows key differences between traditional O&M for conventional generation projects and O&M for renewables projects. This boils down to two key challenges, both of which can be addressed by leveraging data to make more strategic O&M decisions.

Traditional O&M Service

24 / 7	Dedicated Staff	Well-Trained & Long-Term	Integrated Plant	EPC Team Not Connected to O&M Team
Site Presence	**Maintenance**	**Staff Experience**	**Data Analytics**	**EPC / O&M Relationship**
No Technical On-Site Presence	On-Demand	May Be New To Distributed	Simple Assets, Repeated Many Times	EPC → O&M Synergies

Distributed Generation

Less on-site presence can be offset by remote data monitoring.

On conventional generation projects, owner's O&M staff are well-trained, experienced employees to be on-site 24/7; or at least have a prescribed schedule of site visits and inspections. For distributed projects, there likely isn't an on-site technical presence, and O&M may be provided by third parties with technicians that are new to distributed energy. Access to assets may also be complicated, such as in the case of a rooftop solar array located on a commercial retail building. Remote asset monitoring allows owners to identify underperforming and failing assets, make cost-effective O&M decisions, and proactively mitigate many of these challenges.

Smaller assets change perspectives for smart O&M decisions.

Whenever asset owners send a support technician to a site, this is referred to as a truck roll. Smart O&M decisions for distributed assets require careful consideration of costs and benefits. The cost of a truck roll varies depending on service call complexity, travel distance and regional labor rates -- but for illustrative purposes, let's say it costs about $1,000 per visit. For a relatively small rooftop solar generation asset that earns less than $1,000 per day (depending on local utility prices and seasonal conditions), a truck roll would quickly consume a rather large portion of its economic value. What may be a rather simple decision process becomes more complicated when managing hundreds or thousands of assets. Underperforming assets can severely impact your bottom line, but so can unnecessary truck rolls. Data analytics should be leveraged to obtain the optimal response.

> **Without using data and analytics to streamline and optimize O&M processes and decisions, it's difficult to achieve long-term benefit from the advantages of renewable energy systems.**

How can asset owners leverage data to manage the chaos?

1

Use data visualization to drive action.

While distributed assets tend to be relatively small, managing large quantities of assets creates equally large quantities of data points that need to be organized and structured for effective analysis. In order to optimize the hierarchical view of hundreds or thousands of assets, you must break it down into manageable zones of asset location (for example, by state or organization structure). It doesn't have to be the same type of asset, as they're still electrical in nature and similar in terms of the maintenance response. When organized properly, issues are much easier to see. Consider outliers in your data, address as needed, and integrate a feedback loop into your system based on these data analytics.

2

Implement alarm management strategies.

For many distributed generation assets, issues can be straightforward: either the asset is on or it's not. It's generally a best practice to use the simplest algorithm possible for identifying simple and discreet asset faults. Some equipment, like inverters and EV chargers, automatically generates alarms and trouble codes that can be remotely monitored to accelerate detection and understanding of equipment faults and other problems. However, the volume of such alarms can be large. Effective alarm management strategies are necessary to filter, aggregate and prioritize to prevent remote operators and technicians from becoming overwhelmed. Many of these equipment suppliers also provide access to their cloud services platforms to support remote diagnostic efforts.

Use AI-based data analytics to prioritize responses.

Artificial intelligence (AI) analytic methods are very useful to identify more complex items like soiling (accumulation of dust), pollen loads, snow cover or nuanced indicators of degrative performance. Even for assets with limited data, peer and cluster analyses can be used to quickly identify sites requiring attention. These methods also help with effective management of the asset O&M decisions. Data analytics can identify all three primary issue types:

- **Health:** Is the equipment operating at all, or running or in a significantly altered state?
- **Performance:** Is the asset operating at significantly reduced performance?
- **Reliability:** How often does the issue arise? Is it more cost-effective to repair or replace?

When managing thousands of assets, AI-based analytics along with effective visualization techniques are key to a streamlined and optimized diagnostic process.

The Diagnostic Heat Map shows there is a Health issue in the Southeast region

This correlates to the Southeast bubble on the Cluster Explorer

Transform hundreds of thousands of assets into a simple visualization. These charts show health, performance, and reliability. Rather than organizing data in a table that requires scrolling through hundreds of lines, a bubble analysis is more streamlined even when filtered by impact.

4 Align your costs and level of efforts to match the asset value.

Since every activity must be proportional to the value of the asset, you'll need to prioritize activities as part of your strategy. Sometimes addressing issues in the field delivers a positive ROI, and other times the data reveals that costs associated with fixing the problems just aren't worth it. Once you have data organized in a way to give you effective information, you need to be able to weigh the costs and benefits. For example, if you're seeing an inverter communication card that is not reporting on a site that is still generating power, or an optimizer that is losing 5 to 10 percent, it probably doesn't warrant a site visit because the output wouldn't cover the cost of a truck roll. When designing your strategy, it's important to think of service level agreement (SLA) expectations. O&M with SLAs written for utility-scale operations may have an expectation of a three-hour response or an eight-hour visit to site. For distributed assets, that kind of SLA will destroy the value.

Having the right data analytics tools empowers facility owners and operators to make smart decisions with their maintenance dollars.

Two examples from recent Black & Veatch projects demonstrating these different outcomes:

On a rooftop solar site in Michigan, data analytics detected an underperforming inverter by comparing the monthly yield to neighboring sites. This contextual data showed the inverter was consistently performing at about 25 percent of its rated power. It was revealed that the inverter had been activated as the wrong model type, which our team was able to fix remotely at zero cost to our client. Upon resolution, power output quadrupled. Unless data analytics strategies were being used, this issue never would have been detected and the asset would have continued to underperform unnoticed.

On a rooftop solar project in California, we compared key performance indicators (KPIs) to various other sites in the same region to detect outliers. Based on a gradual decline in KPIs, our team suspected soiling on the solar panels. This suspicion was confirmed by photos from site personnel. ROI calculations determined that cleaning costs wouldn't be worth the improved performance, and it would be more strategic to wait for the predicted upcoming rain event. After the rain event, performance increased by 30 percent at no cost to the client.

What are the 'big picture' takeaways for optimizing O&M with data analytics?

When it comes to O&M for distributed generation, the power is in your data.

Geographically dispersed sites with relatively small generation capacities make it difficult to maintain operating assets in a cost-effective way, creating unique challenges for owners and their staff. However, these challenges often can be addressed appropriately through remote data monitoring and AI modeling.

Data analytics allows owners to use a light touch when organizing and prioritizing appropriate maintenance responses, and it can even catch costly issues that you wouldn't notice otherwise.

The right O&M solution allows you to balance service costs with the value of your assets, which is the key to long-term viability for a fleet of any size.

Exponential growth of the distributed asset market is on the horizon, so there's no time better than the present to implement best practices for efficient O&M.

Contact us

Learn more about Black & Veatch's operating asset expertise and connect with us about your next project.