avathon.

Use Case

ACHIEVE BESS OPTIMIZATION WITH AI-POWERED ASSET PERFORMANCE MANAGEMENT

HOW CAN RENEWABLE ENERGY OPERATORS MAXIMIZE OPERATIONAL EFFICIENCY OF THEIR BATTERY ENERGY STORAGE SYSTEMS (BESS) TO RELIABLY AND PROFITABLY DELIVER POWER AND MEET OFFTAKE COMMITMENTS?

PROBLEM

BESS assets are critical enablers of reliable renewable energy, but optimizing their performance requires advanced monitoring and predictive analytics capabilities.

SOLUTION

The Avathon Industrial AI platform is an asset performance management (APM) solution that leverages artificial intelligence (AI) capabilities like normal behavior models (NBM), machine learning (ML), and physics-based models (PBM) to detect anomalies and recommend maintenance actions for BESS owners and operators.

OUTCOME

The AI-enabled APM capabilities of our Industrial AI platform ensure that renewable energy operators profitably and reliably deliver electric power where and when it's needed most.

Renewable energy production is by its nature intermittent, and the locations where renewable generation is most prevalent are frequently not where the power is needed. For this reason, renewable owners and operators have, in recent years, undertaken the addition of significant battery energy storage systems to smooth delivery and improve reliability.

According to research firm Wood Mackenzie, the U.S. added 910 MWh of battery storage capacity in the first quarter of 2021 alone, a 252% increase over the same period a year earlier. With the rapid decline in battery prices, these implementation growth rates can only be expected to continue rising.

BESS GROWTH CREATES MANAGEMENT CHALLENGES

The rapid growth of BESS assets has created the need for more effective asset management capabilities. To deliver on their many benefits, BESS systems—like all technology assets—require continuous monitoring and occasional maintenance. The challenges of operating and maintaining a BESS include:

- Identifying degraded conditions and impending failures before they occur, e.g., voltage mismatches, thermal runaway, etc.
- Managing capacity and efficiency degradation
- Maintaining proper cooling systems
- Complying with warranty contract obligations
- Ensuring safety systems are available when needed
- Providing performance reports and other dashboard functions

The monitoring and analysis needed to effectively address these challenges depends on the ability to ingest and analyze large quantities of continuous, real-time performance data and use this data to deliver actionable recommendations. Thus, the challenge of effectively and economically maintaining complex BESS systems requires the capabilities of an AI-enabled APM system.

AI EMPOWERS BESS TO DELIVER ON PROMISES

The implementation of AI-enabled BESS performance management enhances operational effectiveness in several important ways. Operators can utilize these systems to maximize revenue, minimize operating costs, and improve round-trip (charge/discharge) efficiency, all while ensuring worker safety. Specific benefits of an AI-enabled BESS APM include:

- Proactive identification of performance problems, e.g., rack mismatch, thermal runaway risk, tripping offline, over- or under-charge, cell unbalancing, and voltage mismatches
- Reduced operating costs due to lower maintenance requirements and averted failures
- Greater operational efficiency from predictive maintenance capabilities and advance warning of impending problems, including alarm processing, reporting, and KPI automation
- Greater worker safety from enhanced risk identification and mitigation

- Less need for human intervention, saving time and operational cost
- Longer asset lifetimes due to improved targeting and effectiveness of maintenance actions
- Enhanced visibility into system status through the use of KPI dashboards and real-time performance tracking and fault identification
- Better information for energy traders, enabling them to do financially optimal deals confident that generation assets can deliver on commitments (using real data rather than OEM-provided specs)
- Enhanced planning for degradation through monitoring and analysis of degradation insights (real vs. expected by OEM)
- Monitoring in support of warranty contract parameters and operational restrictions, e.g., operating temperatures, SoC ranges, and charge/discharge rates

Unlike renewable generation assets, where the principal function is to simply maximize the quantity and efficiency of power output, BESS assets can provide a wide variety of services at various times:

- Grid frequency regulation
- Curtailment avoidance
- Arbitrage (charging and discharging at financially optimal times)
- Power smoothing and firming
- Load shifting
- Flexible ramping control
- T&D congestion relief (and hence Capex deferral)
- Black-start services

The value of these various services can change with time and with evolving grid/load states. As a result, maintaining and operating BESS requires a high degree of flexibility and awareness of the operating mode of the batteries and associated control systems, shifts that can have significant impacts on asset performance and lifespan.

To effectively achieve all of these challenging goals, a BESS APM system must provide the following capabilities:

- Ingesting and analyzing large quantities of real-time asset performance and status data (which is sometimes imperfect or incomplete)
- Generating insightful, actionable maintenance recommendations that mitigate performance degradation or asset failure
- Providing monitoring and reporting capabilities that can be widely shared across the organization
- Seamlessly integrating with other assets/systems to support augmentation and/or modification throughout the asset's lifetime

The AI-enabled APM capabilities of Avathon's Industrial AI platform ensure that BESS owners and operators are positioned to profitably and reliably store and deliver energy. The Industrial AI platform proactively identifies challenging operational issues and provides the information needed to remedy maintenance issues and ensure reliable, efficient system performance.

"Lithium battery pack prices achieved momentous declines since 2010, dropping from ~$1,200/kWh to $137/kWh. Non-battery component costs are also falling, and we believe that overall costs will reach $179/kWh by 2030."

SHELBY TUCKER
Power and Utilities Analyst, RBC Capital Markets

BESS GROWTH THROUGH AI-ENABLED MANAGEMENT

With the accelerating pace of renewable energy industry growth, rising complexity of hybrid power generation portfolios, increasing pressure on profit margins, and shifting demographics of the workforce, renewable operators are challenged more than ever to make the most of their expensive assets and highly-trained personnel. APM systems enable operators to maximize their teams' ability to spend more time fixing anomalies and less time identifying what needs fixing.

Avathon's Industrial AI platform is ready to deliver the full-feature APM solution that BESS owners and operators need to ensure continuously profitable operations, enabling them to deliver on PPA/offtake commitments while ensuring worker safety and the achievement of sustainability goals.

Renewable power generation and storage have seen dramatic growth in the past decade, but these achievements pale in comparison to what awaits in the coming 10-20 years. As the world races to unwind a century of fossil fuel-powered energy production, only storage companies that embrace technology will be adequately poised to scale their operations to match the industry's rapid growth while also maximizing profitability and playing a critical role in the evolution of a new sustainable world.

ABOUT AVATHON

Avathon, a leader in Industrial AI, extends the life of critical infrastructure while advancing the journey toward full autonomy. Avathon's Industrial AI platform empowers commercial and government customers with scalable, secure, and value-driven solutions that enhance efficiency and resilience across heavy industry.

To learn more about how Avathon's AI solutions can unlock the power in your data, visit www.avathon.com.