Advanced Analytics: How AI/ML Can Optimize Assets

Data Optimization

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We have all very likely interacted with artificial intelligence and machine learning (AI/ML) during the past year, whether it was to ask "Alexa" for a local weather forecast or "okay Google" who the first person was to step foot on the Moon. These examples underscore how easy it is to interact with AI/ML technologies today. We can simply ask an omniscient presence and it will respond immediately with the answer.

While it is not exactly that simple, these technologies clearly offer significant potential. Before exploring that further, it is important to reference the second article in this series about data integrity. AI/ML requires tremendous amounts of data. **The reliability and value of**

the output of an AI/ML solution directly correlate to the quality of the data it accesses as input. That will be important to remember as we discuss several areas AI/ML that can help optimize assets and investments.

A very common requirement for renewable assets is accurate weather forecasting. Decreasing costs of energy storage continue to provide opportunities to firm up wind, solar, and other intermittent resources. In fact, the combination of these technologies allows them to be "dispatchable" just like a natural gas plant, as described in our previous article about portfolio mix. That said, wind and solar are still heavily dependent upon the weather.

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To help owners and operators of wind and solar assets navigate the effects of weather, there are several established weather forecast services—with dozens more starting up each year. They all leverage historical weather data plus a network of IoT weather stations and sensors. They also use machine learning to provide very granular forecasts for up to 18 hours and can plan forecasts up to a week in advance. Such wide availability of weather forecasts makes it unlikely that an owner would build a dedicated system for this purpose. However, all owners do need the capability to integrate with a reputable forecast service to properly understand and operate their assets.

AI/ML is being used to create virtual models of assets that can predict performance.

Virtualization is another area in which AI/ML will have an increasing impact on the renewables industry. **Widely deployed in the IT arena for a number of years, this technology creates multiple virtual server machines on a single set of server hardware.** Combined with AI/ML, it can create virtual models of assets that that can predict performance based on various configurations and operational modes.

The Virtual Power Plant (VPP) expands on the asset model concept. The VPP is a cloud-based capability which aggregates capabilities of DERs such as solar and battery storage. This capability enhances existing generation technologies and enables the commercial participation in ancillary markets. Again, in our previous article, we pointed out that this market is often more valuable to owners than a PPA-only approach because it provides the ability to adjust to multiple rate changes.

A further area of opportunity is the development and placement of DERs within the grid. As an example, a battery that is located on a constrained distribution line is more valuable than one that is used only to firm solar. In this case, the battery can provide multiple value propositions to both the grid operator and the solar power investor or owner. These additional opportunities comprise the value sought by investors and owners.

Rather than focusing on a single plant, a Virtual Power Plant treats distributed energy resources (DERs) as an interoperable network of assets.

Finally, what is the single most crucial factor to the successful deployment of every AI/ML solution? Readers of our prior articles know the answer. It is the availability of quality data working in conjunction with high performance, scalable automation technologies. The ability to maximize intelligence emphasizes how a standardized automation platform can unlock the potential of renewable assets.

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