IDC

SPOTLIGHT

Sponsored by: SAS

As regional power markets across the globe experience constantly changing market dynamics, there is an increased need for advanced AI-driven energy forecasting to help power and utility companies navigate the energy transition.

Advanced AI-Powered Energy Forecasting

July 2023

Written by: John Villali, Research Director, IDC Energy Insights

AT A GLANCE

KEY TAKEAWAYS

- The increase in intermittent and unpredictable output for DERs and renewable resources has fueled the need for advanced AI-powered energy forecasting models.
- AI-powered energy forecasting can help the power and utility sector in areas such as operations, trading, and integrated resource planning.
- AI-powered energy forecasting models also support core functions such as long-term capital planning, short- and long-term load forecasts, economic dispatch of generating units, bidding strategies for capacity markets, demand response events, load shedding, and load shifting.

Changing Market Dynamics Increase the Need for an Advanced Approach to Energy Forecasting

There is a need for advanced AI-powered energy forecasting tools to effectively manage the changing complexities of regional power markets. The constant and accelerating changes in regional power market dynamics worldwide are creating the need for more advanced energy forecasting models. More frequent extreme weather events, coupled with the influx of clean but intermittent and unpredictable energy resources, are driving utility and power market participants to rethink how they produce energy forecasts. There also continues to be steady changes in market regulations as the energy transition evolves, which has created the need for a more sophisticated approach to energy modeling to produce accurate results.

The transition from a traditional centralized power market system to a system that is decentralized has created greater complexity in forecasting power market supply and demand fundamentals. Energy transition initiatives are front and center in today's business environment in the power and utility sector. These initiatives encourage a movement away from fossil fuels such as coal, gas, and oil-fired generation and toward cleaner renewable and distributed energy resources (DERs), which are changing the makeup of many regional generation supply stacks. However, the ability to accurately forecast supply and demand is an increasing challenge for many power and utility companies, whether they use utility-connected renewables such as wind and solar farms or DERs such as rooftop solar, battery storage, or electric vehicles (EVs). Extreme weather events in recent years have also contributed to the difficulty in producing accurate energy forecasts.

To combat these challenges and navigate the changes taking place in many power markets, utilities are looking at advanced modeling products that leverage AI and machine learning (ML) to improve their forecasts. Over and above supply and demand forecasts, advanced AI and ML energy forecasting models can support power and utility companies in areas such as operations, trading, and integrated resource planning.

Benefits of AI-Powered, Cloud-Enabled Energy Forecasting Models

The power and utility sector is ready for energy forecasts that go beyond simple regression models. AI-powered, cloud-enabled energy forecasts can provide scalability and access to actionable insights for key stakeholders in power and utility organizations who need timely and accurate forecasts. AI-driven models that leverage neural networks, ML, and deep learning (DL) are proving to be highly accurate and are providing utilities with data and analysis to make better-informed decisions. When producing accurate demand forecasts, a plethora of variables must be considered, such as ambient temperature, wind speed, cloud cover, dew point temperature, and air pressure. For example, when forecasting electric demand, several variables can change by the day, hour, and even subminute. AI-driven models can address and capture these fluid market conditions to accurately predict sudden changes in these underlying variables, which can result in more accurate forecasts for key stakeholders throughout a utility or power company's organization.

In addition to load forecasting, utilities need accurate, utility-scale renewable generation supply forecasts as well as consumer renewable generation supply forecasts, which are highly dependent on predicting net demand when considering the amount of energy produced by behind-the-meter (BTM) DERs in a utility's footprint. Behind-the-meter DER output is one of the major blind spots when forecasting the electric load and a utility's energy delivery and demand obligations on any given day. Advanced analytical techniques can decouple BTM quantities and provide better models for load and renewable generation forecasts.

Advanced energy forecasting for short- and long-term load forecasts can greatly improve the power and utility decisioning process to support functions such as robust long-term capital planning, economic and reliable generating unit dispatch, sound bidding strategies for capacity markets, better-informed demand response events, load shedding, and load shifting.

Considering SAS When Investing in Advanced AI-Powered Energy Forecasting

The SAS Energy Forecasting Cloud offering is delivered as a service, helping to lower IT and maintenance costs for utilities and power organizations. Its forecasting models are built and run on the cloud, which lets power and utility organizations scale up or scale down as needed, thus providing more flexibility and reliability.

SAS Energy Forecasting Cloud automates data ingestion and AI/ML model building, enabling ease of use. It can also bridge the gap with regard to data scientist resources as well as eliminate the need to upskill employees to run and train AI-based models.

SAS' AI-powered models can use hundreds of variables to train forecasting models. When using quality data to train models over time, SAS' AI data–driven approach to modeling can produce mean absolute percentage errors (MAPEs) of 2% or less, according to the company. With these types of results and the fact that many utilities already produce forecasts using multiple processes for comparison, adding another forecast — especially as a service — could help drive the needed change and innovation within the load forecasting process.

SAS Energy Forecasting Cloud can forecast the rapidly growing renewable and distributed energy resources coming online and their predicted output, which can provide utilities with accurate net load forecasts at subhourly levels. This information can help utilities and renewable energy owners and operators to have more confidence in their day-ahead and real-time bidding strategies.

SAS Energy Forecasting Cloud can also support utilities in departments throughout the organization, from plant operations to energy trading to integrated resource planning. It can also deliver a variety of benefits to power and utility companies by producing short-term, midterm, and long-term forecasting.

Challenges

As with any forecasting model or tool, the forecast output will only be as good as the model input. End users of a forecasting tool, such as SAS Energy Forecasting Cloud, will require power and utility companies to have access to clean, quality data from both internal and external sources.

In addition, as AI, ML, and other advanced analytics algorithms are new concepts to many, any forecasting tool must be transparent about what data is being used and how results were achieved. Providing information and transparency that can be audited and having repeatable processes so that end users clearly understand the logic and output will be key in helping organizations gain confidence in investing in, using, and trusting advanced forecasting tools and results. Last, cloud adoption in the power and utilities sector has been slower than other in asset-intensive industries. The three main barriers to cloud adoption for utilities are cost, skill sets, and security. In addition, large investor-owned utilities (IOUs) and others have been challenged by how to best capitalize on cloud investments and roll these costs into the rate base. However, the adoption of cloud technologies in the power and utility space is on the rise as companies realize that the benefits of cloud outweigh the barriers of investing in cloud products and services.

Conclusion

As regional power market supply and demand fundamentals continue to change at a steady pace, there will be a need for more advanced forecasting models. The move from a centralized power system to a system that is decentralized with dispersed renewable energy resources and DERs will make energy forecasting more challenging for power and utility companies. The intermittency of clean energy resources coupled with the increase in extreme weather events has also made energy forecasting a more difficult task.

AI-driven models can address these complexities and changing market dynamics. Such models can provide benefits in areas such as operations, trading, and integrated resource planning. Proper utilization of AI-powered energy forecasting models can help power and utility companies produce a significant ROI.

As regional power market dynamics and supply and demand fundamentals continue to change, IDC expects investment in cloud-enabled, AI-powered forecasting tools to grow in the power and utilities sector. In addition, energy forecasting tools that are cloud enabled and offered as a service can provide a sizable cost savings for small and medium-sized utility organizations by addressing the data scientist gap and freeing IT staff to work on other high-priority projects. To the extent that SAS can address the challenges in this paper, IDC believes that with time, users of advanced energy forecasting models will recognize positive operational, business, and financial outcomes from using such tools.

About the Analyst

John Villali, *Research Director, IDC Energy Insights*

John Villali is a research director for IDC Energy Insights, primarily responsible for thought leadership in the areas of digital strategies and smart operations in the power and utilities sector. Mr. Villali's expansive experience within the energy industry allows him to provide superior market insight, having firsthand experience and understanding and meeting the needs of professionals in the energy industry. Mr. Villali's core research coverage includes but is not limited to distributed energy management, asset management, energy policy, demand response, mobile workforce management, energy trading, and energy transition.

MESSAGE FROM THE SPONSOR

Utilities large and small can operate more efficiently and effectively at all levels of decision making with the broad range of automation, scalability, statistical sophistication, and transparency built on SAS' experience working with hundreds of utilities worldwide. SAS has been providing repeatable, traceable, and defensible forecasts through an on-premises model for more than a decade — from generation to distribution, whether for the next few hours or for the next 20 years.

With SAS Energy Forecasting Cloud, utilities can optimize decisions with high-quality short- and very-short-term forecasts in the cloud, while reducing computing requirements and unburdening their IT organizations as they operate, trade, and plan. Customers enjoy all the forecasting capabilities they expect from SAS, plus powerful AI and machine learning support the complex forecasting needed for an expanding, diverse energy grid, including renewable generation. There is no software to maintain — scale up and down depending on your business requirements.

Learn more at www.sas.com/energy-forecasting-cloud.

IDC Custom Solutions

The content in this paper was adapted from existing IDC research published on www.idc.com.

IDC Research, Inc.
140 Kendrick Street
Building B
Needham, MA 02494, USA
T 508.872.8200
F 508.935.4015
Twitter @IDC
idc-insights-community.com
www.idc.com