Load Forecasting Critical to Prepare for Increasing Electricity Demand

After a decade of nearly zero growth, electricity demand is increasing and is expected to accelerate over the next decade. The nationwide forecast of electricity demand sharply increased from 2.6% in 2022 to a 2024 projection of 4.7% over the next five years, as reflected in 2023 Federal Energy Regulatory Commission (FERC) filings.

According to the Department of Energy, U.S. electric demand is driven by expansion of industries like data centers, robust investment in new and existing manufacturing sectors like semiconductors and batteries, and electrification, such as the deployment of electric vehicles. A Grid Strategies report, The Era of Flat Power Demand is Over, warns power system infrastructure in the U.S. is not prepared for such significant growth.

Key for many grid decisions is load forecasting. For an electric sector undergoing transformative change, improved load forecasting can drive more efficient investment decisions, better grid performance, and reduced operating costs. Better projections regarding large loads as well as more accurate techniques for making decisions—to build or not build long lead-time infrastructure for example—are becoming increasingly important.

Load Forecasting is Key for Many Grid Decisions...

Improved forecasts will drive more efficient investment decisions and grid performance across timescales

Simultaneously, load forecasting is becoming more complicated. In addition to electrification and a resurgence in onshore manufacturing, the variability inherent in distributed energy resources (DERs), energy storage, and demand response, coupled with the increase in extreme weather, are creating additional challenges for system stability. For example, short-term forecast errors were rampant in Winter Storm Elliott because of a lack of historical data for similar extreme conditions and load levels.

Drivers Complicating Electric Demand Forecasting

- ▲ Electrification
- ▲ Decarbonization (H_2, heat)
- ▲ Weather (extreme temps)
- ▲ Re-industrialization/On-shoring
- ▲ Digitalization (data centers, crypto)

- ▼ End-use efficiency
- ▼ Customer generation/storage
- ▼ Customer behaviors/rate structures

EPRI'S LOAD FORECASTING INITIATIVE

EPRI has launched a 2-year initiative to address critical needs in load forecasting, organized into three work-streams:

- **Industry coordination**: Participants in the load forecasting interest group attend periodic webcasts, engage in discussions, and will survey load forecasting practices to help determine optimal approaches, resulting in a 2024 guidebook. There is no fee for members to join the interest group.
- **Long-term forecasting for planning**: This workstream is prioritizing the development of methodologies and guidance to incorporate new loads. It will clarify the data and modeling enhancements needed to factor in large load drivers such as behind-the-meter solar and batteries, electric vehicles, heat pumps, data centers, and new manufacturing, factoring in potential sources of load flexibility. Another priority is to close gaps between distribution and transmission forecasts.
- **Short-term forecasting for operations**: The focus is on the development of methodologies and guidance to mitigate changes in short-term forecast accuracy, including during extreme weather events. The workstream will evaluate ways to use uncertainty in decision making, explore modeling changes to improve forecast accuracy for DERs, and assess how electrification of end-use technologies affect load.

The project will adhere to an iterative process, with regular feedback from members to guide the direction of the deliverables. EPRI will work with data partners, which may be energy companies, regional transmission organizations, and independent system operators, to validate the ongoing research on actual operating systems.

Results will be available to all EPRI members, with some public deliverables available to nonmembers. See more information at https://msites.epri.com/lfi.

About EPRI

Founded in 1972, EPRI is the world's preeminent independent, non-profit energy research and development organization, with offices around the world. EPRI's trusted experts collaborate with more than 450 companies in 45 countries, driving innovation to ensure the public has clean, safe, reliable, affordable, and equitable access to electricity across the globe. Together, we are shaping the future of energy.

EPRI CONTACT

DAVID LARSON, *Technical Leader*
650.855.2318, dlarson@epri.com

For more information, contact:

EPRI Customer Assistance Center
800.313.3774 • askepri@epri.com

July 2024

EPRI
3420 Hillview Avenue, Palo Alto, California 94304-1338 USA • 650.855.2121 • www.epri.com