Electricity Demand Growth and Forecasting in a Time of Change

PREPARED BY

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After more than two decades of stagnant electricity sales and peak load growth – and corresponding anemic growth forecasts – electricity growth rates are higher today than at any point in the two decades.

Contributing to this change are a host of new and emerging demand drivers, including data centers, onshoring and expansion of manufacturing and industrial processes, the electrification of transportation and buildings, and cryptocurrency mining. Through 2030, these and other new load drivers could trigger load growth more than twice the summer peak load of the entire state of New York today.

Beyond the sheer magnitude of future load growth, the characteristics of some of these new demand drivers further complicate the process of forecasting and planning. The electricity needs of data centers, industrial facilities, cryptocurrency mining, and the electrification of vehicle fleets and buildings are often quite large and discrete in size. Though distributed energy resources, energy efficiency, and demand response will help offset the projected rapid increase in load growth, significant net load growth is still very likely.

Additionally, some of these new loads seek service within a matter of months, while planning cycles for utilities and the grid are typically measured in years. The mismatch between the rates of growth and most planning processes calls for a more proactive approach to resource planning and expansion.

The rapidly changing picture of demand drivers and evolving supply options, along with the changing nature and flexibility of loads, warrants looking at load forecasting and planning from a different perspective. In today's world, where much of this new load growth as well as many supply resource choices are policy-driven, the risk of under- versus over-forecasting is asymmetric. Simply put, *the cost and long-lasting effects of under-forecasting may be much larger than those of over-forecasting.*

Entering an era in which the balance of forecasting risks tilts toward underestimates, we must evolve our thinking and practice when it comes to load forecasting and grid planning. We should:

- Recognize and comprehensively include the various drivers in load forecasts, even without sophisticated, complex techniques for assessing their impacts

- Where appropriate, conduct more spatially (i.e., geographically and electrically) granular forecasting of key load drivers

- Account for different load characteristics for system planning

- Strongly leverage existing technologies, such as distributed energy resources, and adopt new ones that allow greater utilization of the networks (e.g., grid-enhancing technologies)

- Proactively and collaboratively expand the transmission and distribution networks to reduce the uncertainty in the availability of new supplies and the nature and timing of new demand while adding benefits of geographical diversity to the supply resources

Adopting these recommendations will help bring about a future electric system that is reliable, safe, and affordable, and ready to support a decarbonized and growing economy.

SCAN TO READ THE FULL REPORT

This is a summary of "Electricity Demand Growth and Forecasting in a Time of Change," The Brattle Group, May 2024. The report was authored by Bruce Tsuchida, Long Lam, Peter Fox-Penner, Akhilesh Ramakrishnan, Adam Bigelow, Sylvia Tang, and Ethan Snyder.

DATA CENTERS

Data centers underpin the online economy technology sector and support the growth of artificial intelligence.

Current capacity: ~19 GW
Estimated electricity demand increase by 2030: +16 GW

ONSHORING & INDUSTRIAL ELECTRIFICATION

Electrification of the industrial sector is a major pathway to reduce emissions. New sources of electric demand are triggered by the onshoring of manufacturing activity, hydrogen production (e.g., electrolyzers), indoor agriculture, and carbon dioxide removal.

Current capacity: ~116 GW
Estimated electricity demand increase by 2030: +36 GW

CRYPTOCURRENCY MINING

Cryptocurrency mining is the process by which networks of computers generate and release new currencies and verify new transactions. Load from cryptocurrency mining is challenging to estimate because of its unique operational characteristics.

Current capacity: ~10–17 GW
Estimated electricity demand increase by 2030: +8–15 GW

TRANSPORTATION ELECTRIFICATION

A growing number of customers purchase electric passenger vehicles as a more climate-friendly alternative to gas vehicles; medium- and heavy-duty vehicles, motorcycles, and ferries can all operate on electricity.

Current capacity: ~7 GW (electric vehicles)
Estimated electricity demand increase by 2030: +8 GW

BUILDING ELECTRIFICATION

Electrification is a major pathway to decarbonize buildings and can include space heating (e.g., heat pumps), water heating (e.g., heat pump water heaters), and cooking (e.g., electric/ induction cook stoves).

Current capacity: ~50 GW
Estimated electricity demand increase by 2030: +7 GW