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How Should Utilities Prepare for Rapid Data Center Load Growth?

Rapid data center-driven load growth is reshaping electricity demand across North America. For utilities, data center expansions create large load increases, likely to occur soon, that materially affect system reliability, resource planning and rates. Data centers will challenge utility decarbonization plans by delaying decisions to retire older fossil fuel plants needed to support increasing demand.

In this context, traditional planning frameworks built around gradual load increases and long development timelines have become increasingly misaligned with the speed and uncertainty of today's data center interconnection requests. For utilities, adequately accounting for the impacts of data centers presents serious consequences. Inaccurate load growth assumptions will affect all aspects of utility planning processes, including resource adequacy, transmission, and, above all, rate impacts.

Utilities preparing for data center-driven market changes increasingly rely on advanced planning tools that connect forecasted load growth with long-term system decisions. Ascend Analytics provides an integrated modeling environment that combines correlated load and renewables, detailed power market simulations, and resource portfolio optimization to support utility resource planning. By using a software suite such as Ascend's to evaluate multiple demand and market scenarios, utilities can assess trade-offs across generation, storage, transmission, and procurement strategies, quantify risk, and select portfolios that minimize system cost while remaining resilient under a wide range of future outcomes.

Here are other critical areas of consideration as utilities prepare for rapid load growth from data centers.

Why Are Data Centers a Different Type of Load?

As AI infrastructure develops at an accelerated pace across North America, data center-driven electricity demand is entering uncharted territory, with load estimated to grow between 37-66 GW during the next few years alone. In this environment, data centers differ from traditional commercial or industrial load in three critical ways:

- **Speed:** Load can materialize within 18-36 months, not 5-10 years
- **Scale:** Individual facilities approaching and above multi-GW scale
- **Shape:** Data centers can have highly dynamic load profiles, with fast ramps that can pose reliability problems, leading utilities and systems operators to explore mitigation options such as on-site storage, while some regulatory bodies are exploring implementing ramping rules

These dynamics strain conventional forecasting, transmission planning, and resource adequacy frameworks, especially when multiple projects cluster within the same geographic areas, which have historically been fiber-rich, low-latency locations close to coastal urban population centers. However, new development will transition toward regions like ERCOT, SPP, and MISO that offer lower-cost, low-emissions generation resources near existing fiber routes. Even with this expansion away from the east coast, however, data center load will still naturally seek density and will mirror the issues that exist today in data center-heavy regions such as Northern Virginia.

How Reliable Are Current Data Center Load Forecasts?

Reliable data center forecasts are rare, due primarily to limited publicly available data, multiple inputs, varying assumptions, and a lack of transparency about data center energy use.

In addition, utilities face a number of other forecasting challenges. Headline interconnection requests often significantly overstate realized load, while still underestimating timing risk. Projects are frequently speculative or contingent on power availability and cost. Demand estimate ranges are too wide for effective planning, and interconnection queue backlogs – combined with hyperscalers' desire for speed – exacerbates the issue. Utilities that fail to appropriately model uncertainty risk overbuilding or investing in the wrong assets.

Given these dynamics, best practices for utilities are shifting toward:

- Forecasting multiple scenarios of load ramp, including those that fall short of committed load from data centers.
- Emphasizing use of bridge capacity, before large, irreversible capital investments are made ahead of uncertain load futures.
- Forecasting how nodal price shapes will change when adding large loads at specific locations.
- Modeling load flexibility at interconnection locations to avoid new high-cost investment when the grid is only stressed a few hours of the year.
- Revising regulations so that higher costs are incurred for holding queue positions on the load side, and additional data requirements to file.
- Revised tariff structuring – for example, take or pay interconnection.

What Planning Processes Do Utilities Need to Change?

Static, compliance-driven planning is no longer sufficient for utilities. Even though immense variability exists with regard to the exact level of growth (and in terms of where, exactly, data centers will site), utilities everywhere must prioritize upgrades to three key planning areas.

- Integrated resource planning (IRP): Load growth scenarios must be tightly linked to generation, storage, and transmission expansion, especially for regions facing resource adequacy constraints.
- Transmission and interconnection planning: Queue backlogs, restudies, and network upgrade cost uncertainty demand more dynamic planning tools and faster iteration cycles.
- Financial and rate impact analysis: Large loads can either support cost recovery or introduce stranded-asset risk, depending on contract structure and realization timing.

Improved planning also helps put utilities in a position to proactively seek opportunities when negotiating with hyperscalers because access to power is a scarce resource, and because speed to market is currently prioritized above all else.

How Should Utilities Think About Reliability Risk?

As data centers enter the picture, reliability planning must extend beyond planning reserve margins to operational stress testing under extreme conditions. This is because data centers introduce – and magnify – correlated reliability risks, including high coincidence with system peaks, limited load flexibility (unless explicitly contracted otherwise), and increased exposure to extreme weather and outage events.

Given these dynamics, utilities must proactively evaluate how best to manage:

- On-site generation and storage requirements
- Bring-your-own-generation for grid-connected loads
- Demand response contracts
- Interruptibility contracts
- Coordinated outage planning with large-load customers

Can Data Centers Support Decarbonization Goals?

There is no doubt that clean energy remains a priority for hyperscalers. In fact, access to carbon-free generation remains a consideration second only in importance to speed, and ahead of cost. Under optimal circumstances, data centers can become anchor customers for clean energy investment, accelerating grid modernization rather than hindering it. Hyperscalers have the opportunity to become leaders in deploying long-duration storage and clean firm generation.

However, speed to market is still king for hyperscalers. Thus, without careful planning, rapid load growth can increase near-term fossil dispatch, delay coal retirements (especially in areas where state and/or federal policy supports it), and drive emergency thermal capacity additions.

The difference, then, lies both in timing and tools. Utilities must be able to compare scenarios quickly using different load forecasts, in order to quantify the least-cost scenario given market uncertainty and risk-premium valuation. Thus, choosing the right forecast and portfolio optimization software becomes a matter of vital importance.

What Analytical Capabilities Do Utilities Need Right Now?

Rapid, large-scale data center load growth exposes a fundamental limitation in many utility planning environments: critical decisions are still evaluated through disconnected analytical lenses. Load forecasting, resource planning, transmission studies, and financial analysis are often performed sequentially, with simplifying assumptions carried forward rather than tested. Under conditions of highly uncertain, time-compressed load growth, this approach increases risks related to capital efficiency, reliability, and rate setting.

Utilities that want to respond most effectively to data center dynamics must strengthen analytical capabilities that allow uncertainty, system fundamentals, and financial outcomes to be evaluated together across time, scenarios, and planning functions.

Thus, utilities need access to the following core capabilities:

- Realistic resource adequacy and reliability stress testing: Utilities need to be able to assess whether portfolios remain reliable under adverse – but plausible – combinations of load, outages, weather events, and fuel constraints, rather than relying solely on planning reserve margins.
- Financial risk and rate impact analysis tied to physical constraints: Utilities must quantify how uncertain load growth affects capital deployment, operating costs, revenue efficiency, customer rates, and stranded-asset exposure, with direct linkage to grid behavior and market outcomes.

Ultimately, physical grid operations, market dynamics, and financial performance must be evaluated within a unified analytical framework. This integrated approach enables utilities to test tradeoffs, identify tipping points, and make planning decisions that remain defensible as data center growth evolves from forecast to reality.

What Else Should Utilities Understand in Order to Adapt Effectively?

There are three key realities that utility leaders need to understand as data center driven load growth evolves rapidly.

The first involves understanding that data centers are not just more load. In reality, hyperscalers represent a complex new class of customer that is both a source of system risk as well as a potential catalyst for long-term grid transformation.

The second reality is that speed matters for utilities, too. Utilities that act early – by improving forecasting, accelerating scenario analysis, and aligning planning across departments – improve the probability of being able to proactively manage uncertainties associated with data center expansions. Utilities also must reduce the time involved with acquiring new resources, especially when growth rates can just as quickly begin to slow down. Solutions, such as Ascend Power Procurement, that give utilities the ability to significantly reduce the time and costs associated with planning and procurement, can prove vital. Those that wait will be forced into reactive, high-cost decisions.

Finally, preparing for data center-driven load growth requires more than just predicting a single outcome. For utilities, preparing well is about building planning and decision-making processes that remain robust under uncertainty.

Ultimately, utilities that succeed will:

- Move faster than traditional planning cycles
- Evaluate risk probabilistically, not optimistically
- Treat large-load growth as a strategic system issue, not a tactical interconnection problem

Interested in Learning More About How Ascend Can Help Utilities Prepare for Rapid Data Center Load Growth?

Ascend offers a scalable, unified ecosystem of powerful software and market intelligence that enables utilities to confidently plan, procure, and manage power portfolios. In addition, Ascend provides expert consulting services that deliver strategic guidance, hands-on modeling support, and customized implementation to maximize value at every stage of the asset lifecycle. Whether a large IOU or a small municipal utility, Ascend's solutions are fully scalable and designed to support confident rate setting and ongoing business growth. Please contact us to learn more.

About Ascend Analytics

Ascend Analytics is the leading provider of market intelligence and analytics solutions for the power industry.

The company's offerings enable decision makers in power development and supply procurement to maximize the value of planning, operating, and managing risk for renewable, storage, and other assets. From real-time to 30-year horizons, their forecasts and insights are at the foundation of over \$50 billion in project financing assessments.

Ascend provides energy market stakeholders with the clarity and confidence to successfully navigate the rapidly shifting energy landscape. Visit us at ascendanalytics.com

