Large Load Tariff Whitepaper

Powered by Halcyon's Data

Sponsored by E3

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Energy+Environmental Economics

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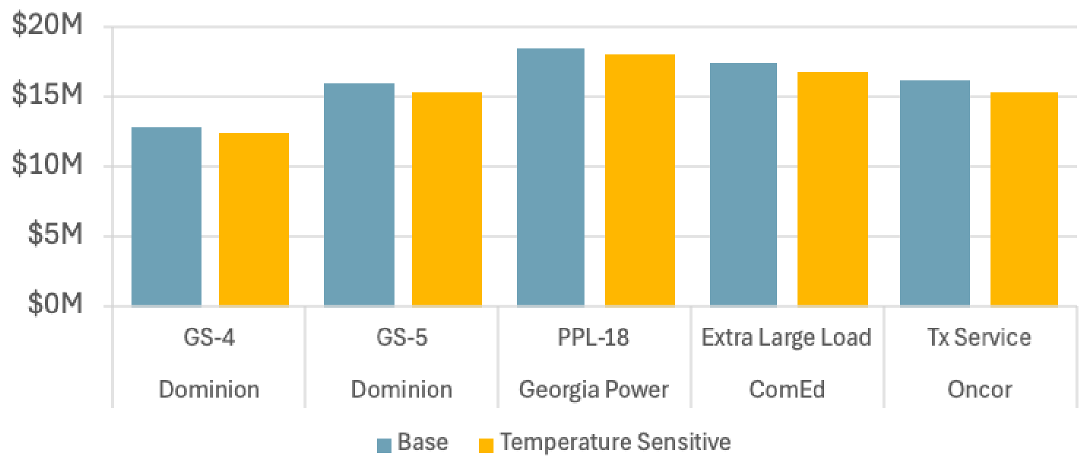
Executive Summary

Electric utilities across the United States are experiencing a rapid expansion in electricity demand driven by data centers and AI-enabled computing. This growth is occurring on systems largely planned for very slow demand growth, creating new challenges for infrastructure planning, forecasting, and cost allocation. In response, utilities are developing and revising large load tariffs to recover customer-driven costs, manage uncertainty, and protect existing customers from cost shifts.

Large load tariffs link assumed load growth to infrastructure investment through mechanisms such as contract demand, minimum billing, and ramp-up provisions. However, tariff designs vary widely across utilities, regions, and market structures, making it difficult to compare customer costs or assess cost responsibility consistently.

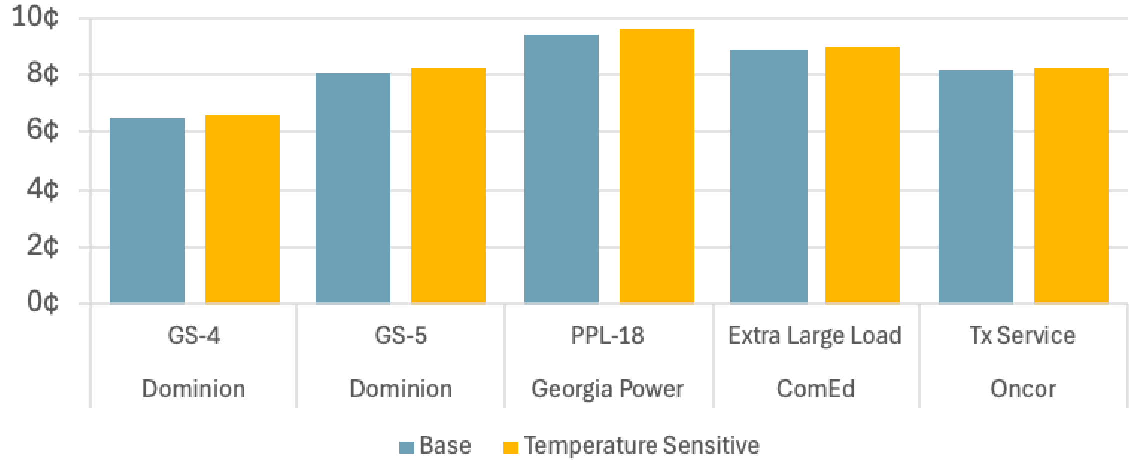
This study evaluates how large load tariffs translate into annual electricity costs for data center customers under realistic operating conditions. Numerous large load tariffs have been proposed or approved, often sharing common structural elements but differing in key design parameters. However, no prior analysis has systematically applied these tariffs to a standardized load profile to compare and benchmark electric bills. Using a representative set of tariffs that are currently in effect or recently approved, E3 models bills for a hypothetical 25 MW data center under two high-load-factor load shapes. The results show that customer costs differ materially across tariffs, driven by differences in demand charges, energy charges, minimum billing provisions, and exposure to wholesale market prices.[1]

Figure 1 Annual Bill in $MM/year for Identical Load Shapes



[1] There may be site specific/idiosyncratic costs that are not included in the tariff.

Figure 2 Annual Bill in ¢/kWh/year for Identical Load Shapes



Tariffs with minimum demand or contract capacity requirements can lead to high costs during ramp-up periods, while tariffs without such provisions scale directly with realized load. In deregulated markets, lower utility charges may be offset by greater exposure to wholesale price volatility. These differences have important implications for data center siting decisions, utility cost recovery, and regulatory oversight.

To support more transparent comparison, the paper introduces a standardized benchmarking framework for large load tariffs. The framework combines standardized load assumptions with bill-based cost metrics, charge composition analysis, infrastructure cost recovery treatment, and regulatory context to translate diverse tariff designs into comparable cost and risk indicators.

A standardized benchmarking framework benefits all stakeholders. Utilities can assess tariff design choices and demonstrate cost causation. Data center customers gain clearer insight into cost drivers across potential sites. Regulators and policymakers can more effectively evaluate cost responsibility and cross-subsidization. As large load growth continues to evolve, a consistent benchmarking framework provides a practical foundation for informed decision-making in an increasingly complex electricity landscape.

Introduction

Electric utilities across the United States are confronting a scale and pace of load growth not seen in decades, driven primarily by the rapid expansion of data centers and AI-enabled computing. This growth presents material challenges for system planning, infrastructure investment, and cost recovery.

In response, utilities are developing and revising large load tariffs to manage the cost, risk, and planning implications of serving these customers. Tariffs and rate structures are the primary mechanisms through which utilities recover the costs of service. Determining how much cost should be recovered from data centers is central to ensuring that new load does not shift costs onto other customers. E3's recent forecasting whitepaper[2] highlights that accurate large load forecasts are critical for resource and infrastructure planning, and that same accuracy is equally important for customer cost allocation and rate design.

Large load tariffs sit at the intersection of forecasting, planning, and cost recovery. Rather than relying on legacy tariffs or case-by-case negotiations, these tariffs translate uncertain future load growth into explicit financial and operational commitments. In practice, tariffs often:

Lock in assumed load levels through contract demand or minimum billing provisions
Shift forecasting risk from utilities to customers through take-or-pay structures
Create explicit links between forecasted load growth and infrastructure investment

At their core, large load tariffs are designed to align incentives and risks between utilities and customers. When well designed, large load tariffs protect existing customers, support efficient infrastructure investment, and provide large customers with a clear and predictable cost framework.

Large load tariffs present several challenges:

They are highly diverse and evolving rapidly. As utilities respond in real time to unprecedented forecasts increases of new load, material differences in cost allocation and risk exposure are emerging across jurisdictions. These differences have significant implications for cost responsibility, the potential for cross-subsidization, and long-term infrastructure planning.

They are difficult for data center customers to understand and compare. Rate structures vary widely across utilities in form, terminology, and underlying cost drivers, making it challenging to estimate total annual electricity costs across potential sites. This complexity is especially acute when evaluating multiple regions with fundamentally different regulatory and market structures, further complicating data center siting and investment decisions.

E3 undertook this study to evaluate how large load tariffs translate into annual electricity costs for data center customers under realistic operating conditions, and how those costs vary across regions, utility types, and rate structures. The analysis has several components:

- **Collect tariff data.** E3 leveraged Halcyon as a centralized source of large load tariff information across U.S. utilities. Halcyon's Large Load Tariff Tracker consolidates tariff provisions, eligibility criteria, and rate components and links them to underlying regulatory source documents.
- **Select representative tariffs.** Using Halcyon's data and a defined benchmarking framework, E3 identified a representative set of large load tariffs that are currently in effect or that were recently approved by state public utility commissions.

[2] https://www.ethree.com/wp-content/uploads/2025/12/E3Whitepaper_DataCenterForecasting.pdf

- **Bottom-up bill modeling.** For each selected tariff, E3 reviewed the applicable tariff sheets and calculated expected customer bills from the "bottom up" (i.e., at the level of the large load site and for a specific single customer) under the same assumptions about load size and operating profile.
- **Standardized benchmarking framework.** E3 developed a consistent analytical framework that translates diverse tariff structures into standardized cost metrics. This approach enables direct comparison across utilities and regions and makes differences in rate design and risk allocation more transparent and actionable for data center customers evaluating potential sites. As utilities continue to revise tariffs in response to evolving forecasts and regulatory priorities, this framework is designed to be updated over time to reflect new tariff designs and emerging cost drivers.

Major Large Load Tariffs and Bill Impacts

E3 identified a representative set of large-load tariffs that are either currently in effect or were recently approved by state public utility commissions. These tariffs were selected to illustrate a range of tariff designs for which E3 would then assess potential bill impacts for participating customers. The selection is intended to reflect diversity in rate structure and vintage and reflects the primary U.S. data center markets, thereby supporting a more comprehensive and representative analysis. The tariffs and corresponding utilities consist of the following:

- Large General Service Rate (GS-4) and (GS-) | Dominion Energy Virginia, VA
- Large Power & Light Tariff (PLL-18) | Georgia Power, GA
- Extra Large Load Tariff | Commonwealth Edison (ComEd), IL
- Transmission Service Tariff | Oncor Texas, TX

In this process, E3 collaborated with Halcyon and leveraged Halcyon's AI-powered Large Load Tariff Tracker database to review applicable tariff provisions and conditions and to identify the original source documents for the associated rate sheets.

Introduction to Representative Large Load Tariffs

Dominion Energy Virginia – Large General Service Rate (GS-4)

Dominion Energy Virginia is the primary utility supporting Northern Virginia, the largest data center market in the United States. For more than a decade, Dominion's Large General Service Rate (GS-4) has been the standard tariff for data centers and other large-load customers taking service at primary or transmission voltage levels. The GS-4 rate consists of three principal charge components: a monthly customer charge ($/month), on-peak and off-peak demand charges ($/kW), and an energy charge ($/kWh).

Dominion Energy Virginia – Very Large General Service Rate (GS-5)

In response to the continued growth of hyperscale data centers and other exceptionally large industrial loads, the Virginia State Corporation Commission recently approved Dominion Energy's Very Large General Service Rate (GS-5). The GS-5 tariff is scheduled to take effect on January 1, 2027. The GS-5 rate is structurally similar to GS-4 but incorporates additional eligibility and contractual requirements, including a higher minimum qualifying demand and a longer minimum contract term. These provisions are intended to address the substantial upfront infrastructure and system preparation costs associated with serving ultra-large customers. As summarized in Table 2, the GS-5 tariff also includes a four-year ramp-up period, during which Dominion will ramp up the power supply gradually to 100% of the contracted demand. The GS-5 rate includes a minimum generation, transmission, and distribution charge based on the contracted capacity.

Georgia Power – Large Power & Light (PLL-18)

Georgia has emerged as one of the largest data center markets in the southeastern United States, with Georgia Power serving as the dominant electric utility in the region. Georgia Power's Large Power & Light tariff (PLL-18) has been in effect for more than a decade and remains the primary rate option for large data center customers. Unlike many large-load tariffs, PLL-18 does not include a separate demand charge. Instead, the rate structure consists of a monthly customer charge and a tiered energy charge. Energy rates decline as total kWh consumption and billing demand increase, providing economies of scale for high-usage customers.

Commonwealth Edison (ComEd) – Extra Large Load

ComEd does not currently offer a dedicated tariff for transmission-connected data centers; therefore, the Extra Large Load Delivery Class was used as a proxy for bill comparisons. In practice, a transmission-interconnected data center may directly participate in PJM transmission services and negotiate certain transmission-related rates. As Illinois is a deregulated electricity market, data centers can procure energy and capacity from competitive suppliers rather than the utility. Generation related energy and capacity charges were derived using historical PJM energy and capacity prices.

Oncor Texas – Transmission Service

Texas has attracted significant data center investment in recent years, particularly within Oncor Electric Delivery's service territory. As Texas operates under a deregulated electricity market structure, Oncor provides only transmission and distribution services under this tariff. Large-load customers procure electric supply separately through the wholesale market or from competitive retail electric providers and independent power producers. E3 estimated energy supply charges using historical ERCOT day-ahead energy prices.

A summary of demand threshold, voltage threshold, and minimum requirements for each tariff can be found in Table 1.

Table 1. Utility Large Load Tariff Summary

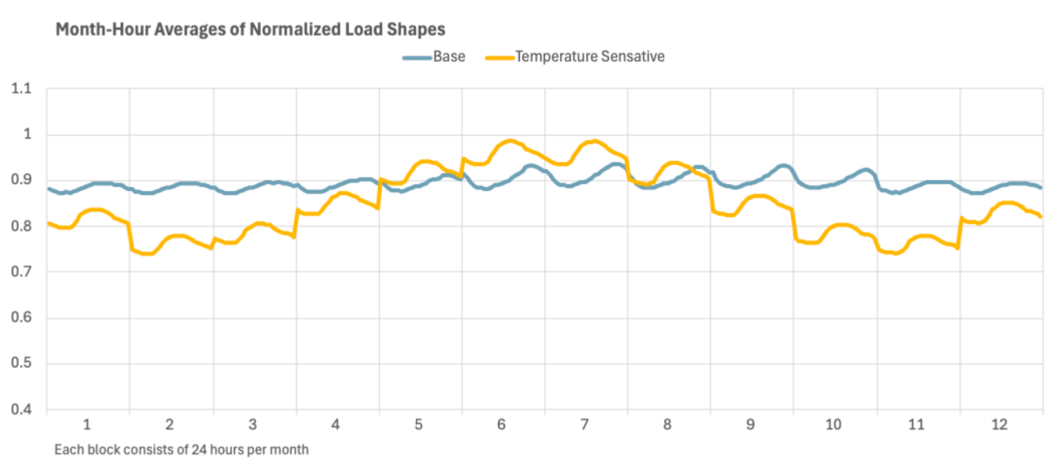
Tariff Name	Dominion Energy GS-4	Dominion Energy GS-5	Georgia Power PLL-18	ComEd Extra Large Load	Oncor Transmission Service
Qualifying Demand Threshold (kW)	500	25,000	500	N/A	N/A
Voltage Threshold (kV)	4	69	N/A	69	60
Minimum Billing	N/A	Yes	N/A	N/A	N/A
Minimum Capacity Factor (%)	N/A	75%	N/A	N/A	N/A
Utility Ramp Period in Years	N/A	4	N/A	N/A	N/A
Minimum Contract Years	1	14	5	N/A	N/A

Bill Comparison

This section compares annual electricity bills for a hypothetical data center under different tariff structures. The analysis assumes a 25 MW data center interconnected at the transmission level. E3 evaluated two representative load shapes: a baseline load shape and a temperature-sensitive load shape. The baseline load remains relatively stable throughout the year, while the temperature-sensitive load shape reflects higher electricity demand during summer months and lower demand during shoulder seasons. Both load shapes have high load factors. The baseline load shape has a load factor of 89%, while the temperature-sensitive load shape has a load factor of 85%.

E3 created load shapes based on reporting from multiple data center owners and facilities. A large global data center operator published seasonal load data for facilities at different locations across the United States. This data, combined with temperature records for those locations, were used to estimate the load sensitivities of data centers in response to temperature fluctuations. Facility-level hourly telemetry from a different set of facilities were used to estimate the temperature-independent hourly, daily, and weekday-weekend effects of user behavior on load. These two methods were combined to create the annual composite data center load shape.

Figure 3. Month-Hour Averages of Normalized Load Shapes



While designs and structures vary among tariffs, tariff charges can be summarized as three main components:

- **Customer charges**: these are default charges for a customer even if the customer consumes no electricity. The charges can be monthly or annual charges and expressed in $/customer.
- **Demand charges**: these charges are based on the customer's peak demand over a specified period and typically scale in $/kW-month or $/kW-year.
- **Energy charges**: these charges are based on the total amount of electricity consumed and are typically expressed in $/kWh.

Table 2 compares charge components across each tariff. All tariffs include customer charges. Notably, Georgia Power's PPL-18 does not include demand charges and instead relies solely on tiered energy charges. GS-4 and GS-5 are the only tariffs that differentiate charges between summer and winter seasons. While ComEd's and Oncor's tariffs do not include time-of-use rates, customers would still be exposed to price variability through changes in wholesale market conditions.

Table 2. Large Load Tariff Charge Components

Charge Component					
Tariff Name	Dominion Energy GS-4	Dominion Energy GS-5	Georgia Power PLL-18	ComEd High Voltage	Oncor Transmission Service
Energy Charge	Y	Y	Y	N	N
Demand Charge	Y	Y	N	Y	Y
Customer Charge	Y	Y	Y	Y	Y
Time of Day Variation	Y	Y	N	N	N
Seasonal Variation	Y	Y	N	N	N
Tiered	N	N	Y	N	N

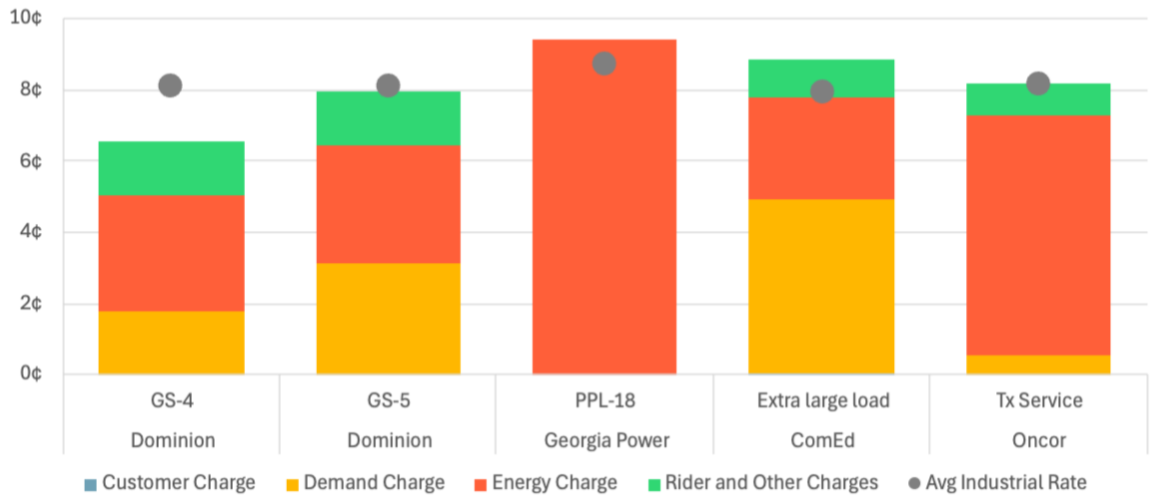
Bill calculations reflect all major rate components, including customer charges, demand charges, energy charges, and riders.

Illinois and Texas are deregulated electricity markets in which energy and capacity costs are determined through competitive wholesale markets, while utilities charge only for delivery services. To estimate generation related charges for these two regions, E3 used three-year averages of PJM ComEd zone and ERCOT North day-ahead energy prices to derive resource energy charges. E3 used the most recent PJM capacity auction prices for capacity costs for Illinois. The ERCOT market in Texas does not have a capacity market.

Figure 1 compares annual electricity bills across tariffs for both the baseline load shape and the temperature-sensitive load shape. Annual bills for the temperature-sensitive load shape are slightly lower than those for the baseline load shape. Although the temperature-sensitive load shape has higher peak demand, its total annual energy consumption is lower. Overall, the decrease in energy charges offsets the increase in demand-related costs.

The annual bill is highest under the ComEd tariff because the tariff is designed for distribution-connected data centers and includes distribution facilities charges. Dominion's GS-5 rates are higher than GS-4 rates, driven primarily by higher transmission and distribution demand charges.

Figure 4. Steady Baseline Load Shape Annual Bill Comparison in ¢/kWh/year



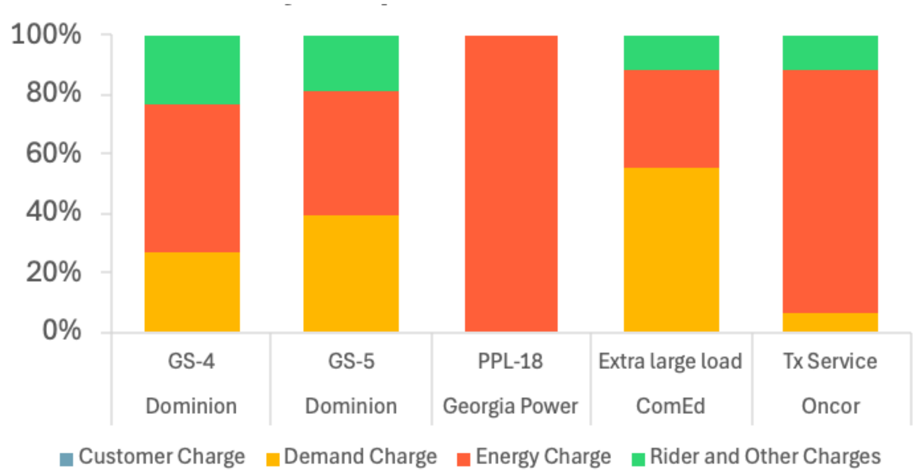
As shown in Table 3, average charges vary significantly across tariffs. Although customer charges exhibit the greatest variation among tariffs, they contribute little toward total annual bills, as illustrated in Figure 5. The relative contributions of demand charges and energy charges differ widely across tariffs. PPL-18 includes only energy charges, while ComEd has the highest demand-related charges. Oncor's transmission service charges are also small relative to the energy costs derived from ERCOT market prices.

Table 3. Average charges across tariffs

Utility	Tariff	Customer Charge	Demand Charge	Energy Charge	Rider and Others Charge
		$/month	$/kW-yr	¢/kWh	¢/kWh
Dominion	GS-4	$199	$140	3.26 ¢	1.49 ¢
Dominion	GS-5	$552	$244	3.36 ¢	1.49 ¢

Georgia Power	PPL-18	$290	$-	9.43 ¢	$-
ComEd	Extra Large Load	$2,333	$383	2.91 ¢	1.04 ¢
Oncor	Tx Service	$551	$44	6.67 ¢	0.92 ¢

Figure 5. Composition of annual bills



While bill levels are important, regional market structure also matters. Data centers in Illinois and Texas face wholesale-market risks that are largely avoided in vertically integrated utility service territories. In PJM, capacity prices recently reached record levels, driven by rapid load growth from data centers and delays in new generation projects.[3] Although the wholesale market costs of capacity are one of the main determinants of the supply costs of customer bills, the specific impacts vary by how the retail supplier has contracted or hedged these capacity costs. Energy prices in ERCOT were relatively stable in 2025, but they have been volatile in prior years due to extreme weather. Both load growth and new resource development are accelerating in ERCOT. The resulting balance between load and supply remains uncertain, and so are future rates.

[3] https://www.utilitydive.com/news/pjm-interconnection-capacity-auction-data-center/808264/

Dominion GS-5 is the only tariff studied with a minimum-demand requirement. During the ramp period, billing demand is determined based on the contracted demand schedule established in the Agreement for Electric Service (ESA). For example, for a 100 MW data center with contracted capacity increasing by 25 MW annually, billing demand would be based on the applicable contracted demand for each year (i.e., 25 MW in Year 1, 50 MW in Year 2, etc.), rather than on the full 100 MW installed capacity during the ramp period.

Benchmarking Framework

The bill comparisons presented in Section 2 demonstrate that differences in large load tariff design lead to materially different cost outcomes for data center customers, even under consistent assumptions for load size and load shape. While these results highlight key cost drivers within individual tariffs, they also underscore the difficulty of comparing tariffs that differ fundamentally in structure, eligibility, and risk allocation. To enable more systematic evaluation, this section introduces a standardized framework for benchmarking large load tariffs. The objective is to support transparent, comparable assessment of costs and risks across utilities and regions.

The proposed benchmarking framework is guided by three core principles. These principles serve as gating conditions for comparing costs and risk allocation.

First, it prioritizes quantitative, bill-based metrics that provide the most direct and comparable measures of potential customer costs. Metrics such as total annual bills and average charges reflect the financial exposure faced by large load customers and allow for consistent comparison across tariff designs.

Second, the framework incorporates a limited set of semi-quantitative metrics that remain meaningfully comparable across utilities. These metrics typically include minimum operating requirements, such as minimum load factors or utilization thresholds. The stringency of these requirements directly affects the level of operational and financial risk borne by a data center. Less restrictive requirements generally mean lower risk exposure.

Finally, the benchmarking framework intentionally excludes metrics that are not directly comparable across tariffs. These include exit costs and termination provisions, collateral requirements, and interconnection timelines. While such factors can materially influence project feasibility and customer risk, their structure and application vary too widely across utilities to support consistent benchmarking. Excluding these elements from the benchmark does not diminish their importance. Rather, it reflects a deliberate effort to focus the metrics that can be evaluated systematically and transparently across jurisdictions.

The tariff benchmarking framework in Table 4 aims to compare the five tariffs based on their alignment with large-load customers' preferences. A comparison across Halcyon's full data set would yield different results. This benchmarking does not characterize any tariff as favorable or unfavorable, nor does a higher degree of alignment imply that a tariff is inherently "good" or "bad." Differences across tariffs are expected, as each jurisdiction operates within its own historical ratemaking framework, stakeholder processes, and regulatory priorities. Instead, the framework is intended to highlight relative attributes and trade-offs across six key metrics: minimum contract term, ramp-up period, annual bill, average demand charges, and average energy charges.

Table 4 Tariff Benchmarking Framework and Key Metrics Summary

	Dominion	Dominion	Georgia Power	ComEd	Oncor
	GS-4	GS-5	PPL-18	Extra Large Load	Tx Service
Minimum Contract Years	1	14	5	0	0
Ramp Up Period	0	4	0	0	0
Annual Bill (¢/kWh-yr)	6.54 ¢	7.96 ¢	9.43 ¢	8.86 ¢	5.44 ¢
Average Demand Charges ($/kW-yr)	$140	$244	$-	$383	$5.75
Energy Charges ($/kWh)	3.26 ¢	3.36 ¢	9.43 ¢	2.91 ¢	6.67¢

Taken together, these elements form a standardized benchmarking framework that enables meaningful comparison of large load tariffs across utilities and regions.

- **For utilities**, a framework provides a tool to evaluate tariff design choices, cost recovery, and risk allocation relative to peers while demonstrating protection of existing customers.
- **For data center customers**, a framework improves transparency and strategy by translating complex and varied tariffs into comparable cost and risk metrics that can inform site selection, contracting, and long-term planning.
- **For regulators and policymakers**, a consistent benchmark supports more informed review of tariff proposals by clarifying cost responsibility, risk treatment, and alignment with objectives related to reliability, economic development, and consumer protection.

As large load growth continues to reshape electricity demand, a common benchmarking framework can help ground discussions around fairness, efficiency, and accountability in an increasingly complex tariff environment.

Conclusion

The rapid expansion of data centers and AI-driven computing is reshaping electricity demand in ways that challenge traditional utility planning, forecasting, and rate design. Large load tariffs have emerged as a central mechanism for addressing these challenges by allocating costs, managing risk, and enabling utilities to serve unprecedented levels of new demand without shifting costs to existing customers. At the same time, the pace of tariff development and the diversity of approaches across utilities have made it increasingly difficult to understand how these structures perform in practice and relative to each other.

This study demonstrates that differences in large load tariff design lead to materially different customer cost outcomes, even under consistent assumptions for facility size and load shape. Bill impacts vary widely based on the balance of fixed, demand, and energy charges; the presence of minimum billing or ramp-up provisions; and exposure to wholesale market prices. These differences have important implications for cost responsibility, forecasting risk, and customer decision-making, particularly during ramp-up periods when load uncertainty is highest.

By combining detailed bill modeling with a standardized benchmarking framework, this paper provides a practical approach for translating complex tariff designs into comparable cost and risk metrics. The benchmarking framework developed here offers utilities a way to evaluate tariff design choices relative to peers and demonstrate defensible cost recovery. For data center customers, it provides a clearer basis for comparing sites, understanding long-term cost exposure, and incorporating electricity costs into investment decisions. For regulators and policymakers, it supports more transparent evaluation of tariff proposals by clarifying how costs and risks are allocated and how design choices align with broader objectives related to reliability, economic development, and consumer protection.

As large load growth continues to evolve and forecasts are revised in real time, large load tariffs will remain dynamic. A consistent, updateable benchmarking framework can help anchor discussions around fairness, efficiency, and accountability, supporting more informed decision-making as utilities, customers, and regulators navigate a rapidly changing electricity landscape.