THE RISKS OF COST SHIFTS IN SERVING LARGE LOADS UNDER A FRAMEWORK WITH DIRECT ALLOCATION OF TRANSMISSION COSTS

PREPARED FOR:
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EXECUTIVE SUMMARY

Rapid growth in large loads—particularly data centers—is placing unprecedented demands on the U.S. electric system. This dynamic is unfolding at a time when affordability is at the forefront and there are concerns that the investment needed to serve these large loads will exacerbate financial strains on other customers. Policymakers are considering alternative approaches to timely and efficiently serving these loads, including framework principles presented in the Federal Energy Regulatory Commission/Department of Energy ("FERC"/"DOE") Advance Notice of Proposed Rulemaking ("ANOPR") on interconnection of large loads. Among these principles is the suggestion that the cost of certain transmission projects needed to serve new large load customers – referred to as "network upgrades" – should be directly assigned to the large load customers.

While there is a surface-level appeal to directly assigning the cost of network upgrades to large load customers, deeper examination is warranted. FERC's transmission pricing policy allows the transmission owner to charge the higher of an incremental or "rolled-in" (a.k.a. "embedded" or "average") rate. It also generally prohibits what is called "and" pricing, representing the notion that a customer may not be charged both the rolled-in and incremental rate. A prohibition on "and" pricing might allow the same large load customers, having paid for their network upgrades, to argue that they should be exempt from the rates that fund the ongoing development, maintenance, and operation of the broader transmission system, called Network Integration Transmission Service ("NITS") charges. This could result in cost shifts between large load customers and other customers.

This report seeks first to explain the mechanics of the cost shift associated with direct assignment of network upgrades to large load customers when there is no other contribution to the costs of owning, operating and maintaining the transmission system. It then evaluates whether direct assignment of network upgrade costs as the means of paying for transmission service costs leads to a material shift of transmission costs from new large load customers to other customers, and the extent of that shift.

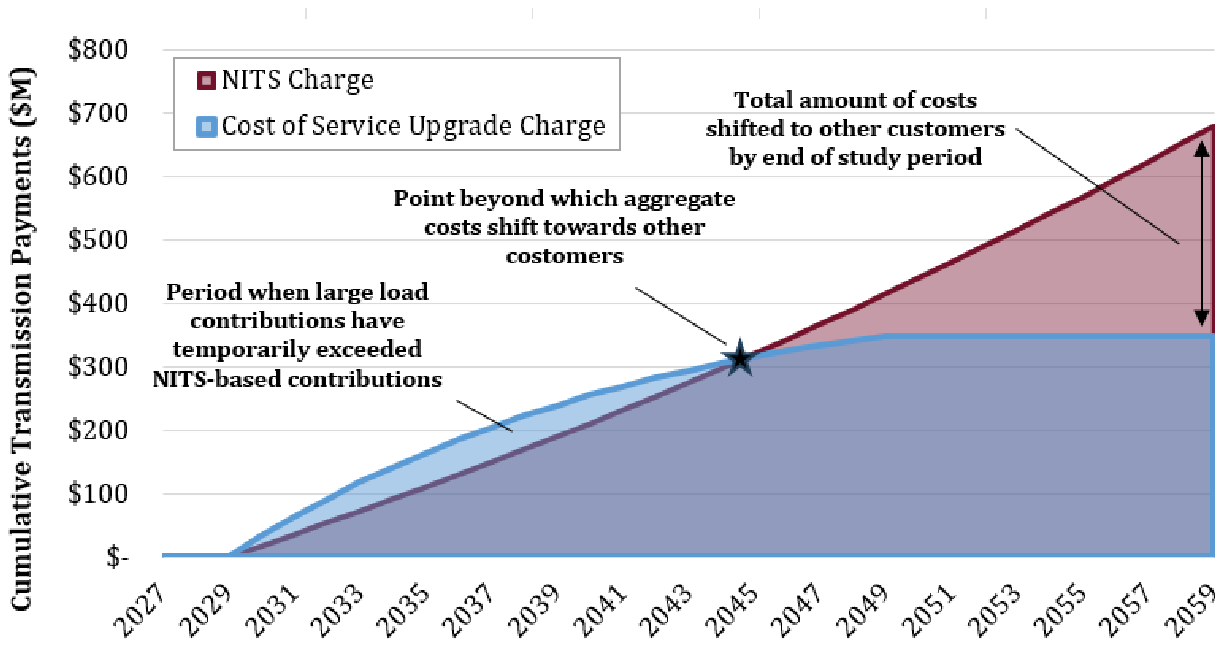
Our core finding is that direct assignment of network upgrade costs, with accompanying excusal from paying NITS charges, results in significant transmission cost shifts away from the large load customers and onto other customers. This outcome holds under two direct assignment approaches studied: upfront payment structures (Scenario A) or cost-of-service recovery structures (Scenario B). Table 1 shows that, over time, these cost shifts could amount to $33-47 billion in present value terms for just the volume of large loads expected to be developed in PJM from 2025-2030.

Table 1: Magnitude of Transmission Cost Shifts over a 30-Year Period (2026$)

	Scenario A	Scenario B
Cost Shift per MW Large Load	$2.3 million	$1.7 million
Single 200 MW Large Load Customer	$0.5 billion	$0.3 billion
PJM Large Loads (20 GW, 2025 -30)	$47 billion	$33 billion
Nationwide Large Loads (73 GW, 2025-30)	$169 billion	$120 billion

The intuition behind the cost shift in either scenario is that, if payments made by the large load customers were set based only on the costs of "but for" network upgrades, those payments would eventually fall below what they would contribute to system costs by paying NITS over time. The specific magnitude and timing of the cost shift depend on various assumptions, but, in nearly all cases, other customers are disadvantaged relative to a case in which new large load customers are treated like all other customers and charged for transmission service accordingly. This dynamic is illustrated in Figure 1, which compares the cases in which a large load customer pays NITS over time as compared to direct assignment of costs under Scenario B.

Figure 1: Annotated Representation of Cumulative Transmission Payments Comparing NITS Payments and Direct Assignment of Network Upgrades Under Scenario B (2026$)



Transmission cost shifts of this scale translate into very meaningful customer impacts, even when employing assumptions selected to lead to a more conservative result. For a typical PJM residential customer, the analysis indicates an increase of approximately 8–11% in the transmission portion of the electric bill, equivalent to customers paying roughly an additional $23–$33 per year in 2026 dollars. The magnitude of the cost shifts resulting from reliance on payment for "but for" upgrades as the means of recovering transmission service costs would be much greater when extrapolated nationwide, and/or when extrapolated to large load development expected beyond 2030.

We conclude that policies that rely solely on direct assignment transmission network upgrades to large load customers, with accompanying excusal from paying NITS charges, are likely to shift significant costs onto other customers. Thus, defining transmission cost responsibility through direct assignment should be approached cautiously.

It bears emphasizing that this report focuses only on the implications of transmission pricing policies that rely solely on direct assignment and does not explore the implications of other possible approaches.

SECTION 1: BACKGROUND AND INTRODUCTION

The United States is facing a range of challenges associated with efforts to rapidly integrate significant volumes of new large load customers – especially data centers – into the electric grid. Implicated issues extend to transmission planning, generation resource adequacy, and reliable operations. Especially in light of acute affordability concerns, considerable attention is owed to the equitable allocation of the ensuing costs and the potential for cost shifts between new large load customers and all other customers, new and existing.

The issue of transmission development cost assignment arises, among other places, in the ANOPR on Interconnection of Large Loads to the Interstate Transmission System being advanced by the U.S. DOE's and FERC.[1] This docket seeks to address a range of issues associated with the rapid expansion of large load customers. Certain concepts discussed in the proposal represent a departure from long-standing transmission rate design and cost allocation principles. Accordingly, the alternative approaches to network upgrade funding and transmission service rate treatment for large loads warrant careful examination to understand their potential impact on transmission customers and retail rates. For the purposes of this report, we use the term "network upgrades" to refer to transmission projects necessary to reliably serve new large loads. These network upgrades are integrated parts of the transmission system and include both local enhancements necessary to integrate the large load and regional development needed to maintain broader system reliability. FERC has generally viewed such assets as benefitting all users of the transmission system.[2]

The ANOPR introduces rate design concepts that could materially shift transmission costs among customer types in response to new large load customers connecting to the electric grid on a standalone basis as well as when they connect in configurations co-located with generators. Specifically, the ANOPR advances the principle that such customers "should be responsible for 100% of the network upgrades that they are assigned."[3] This principle, paired with the Commission's prohibition on "and" pricing would have the distinct potential to relieve such customers from paying for ongoing costs of reliance on the integrated network.[4] Put another way, if large load customers are only responsible for network upgrades required for their reliable integration into the transmission system, they may then be relieved from paying for the cost of other transmission infrastructure, the use of which also benefits them. If large load customers are not responsible for

1 FERC Docket No. RM26-4.

2 These may be distinguished from "interconnection facilities," which are facilities found downstream of the point at which the customer connects to the integrated transmission system.

3 ANOPR Principle eight.

4 Direct assignment of network upgrade costs to load that also pays for transmission service could be interpreted as running afoul of the Commission's "and" pricing policy precedent. Generally, this policy holds that it is discriminatory and duplicative to charge a customer for both its network upgrade costs (cost responsibility for specific assets that are part of the integrated transmission network) and a rolled-in transmission rate (reflecting the costs of the rest of the integrated system). The Commission's policy has been that all customers use the integrated transmission system and all should contribute to the costs of developing, owning, operating, and maintaining that system.

paying ongoing transmission service charges, the fixed costs of the transmission system, including both capital costs (embedded and prospective) and ongoing operation and maintenance ("O&M") expenses, would necessarily be recovered from other customers.[5]

This report first illustrates the mechanics of this cost shift using a representative example of a single 200 MW large load customer located in the PJM region taking service under standard NITS.[6] This example is compared to two alternatives for the direct assignment and recovery of network upgrade costs:

- **Alternative Scenario A – Upfront Payment for Network Upgrades:**

  Large loads pay the full upfront capital cost of any network upgrades identified in the interconnection study. This scenario is akin to a Contribution in Aid of Construction ("CIAC") framework.[7] Once connected, however, the large loads are not assessed NITS charges nor are they responsible for any further charges associated with owning or maintaining the network upgrade assets.

- **Alternative Scenario B – Cost-of-Service Network Upgrades:**

  Large loads pay for utility-funded network upgrades over time on a cost-of-service basis through a customer-specific formula rate for network upgrade charges. Such a formula rate would be designed to recover, from a large load customer, the costs of the asset over time (i.e., depreciation), plus a rate of return, the cost of maintaining the facilities, etc. This scenario is akin to the Network Upgrade Funding Agreement ("NUFA") approach proposed by the PJM Transmission Owners for generator interconnection customers. As in Scenario A, once the large loads are connected, they are not assessed NITS charges.

Having established these two alternatives, the report then analyzes and presents estimates of the potential magnitude of transmission cost shifts that would result from exempting large load

5 We note that this is distinct from other parts of the Commission's transmission pricing policy, which allows the transmission owner to charge the higher of an incremental or embedded – or "rolled-in" – rate. Underlying the higher of policy was the notion that existing customers (e.g., native load and other customers) should be held harmless from new requests for service and the costs associated with providing that incremental service.

6 NITS service is one of two primary types of transmission service offered by transmission providers in the US. NITS service – as compared to point-to-point service – is comprehensive service that allows load serving entities to use the entire transmission network to deliver power to load that it serves. For our purposes, we recognize that transmission cost recovery from customers may, depending on the region, be done through NITS as well as other charge categories. Here, we use "NITS" as a catch-all to cover all charge categories for customers taking comprehensive transmission service. Excluding any such charges from cost allocations to large load customers would, absent other mechanisms, result in potential further cost shifts.

7 CIAC refers to money paid to a utility by a customer or project to directly cover the cost of utility infrastructure needed to serve that customer or project. CIACs are generally paid up front during the construction period to cover construction expenses. They are generally employed when the assets in questions do not benefit the broader electric system and are therefore not appropriately paid for by other ratepayers. By definition, network upgrades benefit the broader electric system.

customers from NITS charges at the PJM regional as well as the national levels. Finally, the report presents estimates of the resulting impacts of these cost shifts on residential electric bills.

On the general topic of the cost implications of integration of large loads into the electric system, there are numerous issues and forms of risks to existing customers. These include cost allocation risk (i.e., cost shifts between customer classes and types), stranded asset risk (i.e., possibility that assets are developed for customers that do not materialize or demand less than expected), and risk with respect to the proper alignment of incentives related to site selection. Here, while acknowledging the importance of addressing stranded asset risk[8] and other concerns, we focus solely on the cost allocation risk associated with a framework that would solely direct-assign the cost of network upgrades to large load customers. Our attention here is not on other pricing solutions or a fuller suite of solutions related to cost and risk allocation for large load customers.

Ultimately, the analysis finds that, under the specific pricing approaches analyzed, a significant portion of costs may be shifted away from large load customers and borne by other customers.

8 There are, of course, approaches available to address stranded asset risk, which may be achieved through rate design or contract structures like the Transmission Security Agreement framework being employed by the Exelon Utilities. https://www.exeloncorp.com/grid/setting-a-national-standard--how-Exelon-is-protecting-customers-and-powering-growth

SECTION 2: UNDERSTANDING COST SHIFT MECHANICS

Under the status quo, network upgrade costs incurred to serve end-use customers are included in a transmission owner's rate base and recovered from all transmission customers, including large load customers, through standard transmission service charges such as rates for NITS. NITS charges reflect the full costs of developing, owning, operating, and maintaining the transmission system and are generally assessed based on each customer's contribution to system peak load. Supported by longstanding precedent, this approach of rolling the cost of upgrades into broader system costs, while charging all customers for the use of the full system, has ensured that customers pay a proportionate share of transmission costs consistent with their use of the transmission system and the facilities built to serve them.

This report shows that a cost shift occurs under the two alternative scenarios – described above – in which the large loads are exempt from NITS charges and instead bear only the network upgrade costs assigned to them through an envisioned large load study process.[9] In either scenario, the cost shift – to the advantage of large load customers that are directly assigned costs – takes place when the total cumulative payment by the large load customer, regardless of how they are charged, eventually fall below what they would contribute to the cost of owning and operating the system by paying NITS over time. The specific magnitude and the timing of the cost shift depend on various assumptions, but in the scenarios studied, other customers are disadvantaged relative to a case where new large load customers are charged for their use of the transmission grid like all other customers.

To illustrate how the cost shift occurs under these scenarios, we calculated the costs to a hypothetical 200 MW large load customer under three scenarios with an in-service date of 2030. The full quantitative cost shift analysis is conducted over a 30-year horizon; however, for ease of presentation, some of the charts in this section focuses on the 2027–2050 period.

- **Status Quo – Standard NITS Charges**: Customer pays NITS charges based on its peak load, which here is set equal to its maximum demand of 200 MW. NITS charges are based on the PJM weighted-average NITS rate and are assumed to grow in perpetuity at the estimated growth rate for the 2025-2030 period.[10]

- **Scenario A - Upfront Payment for Network Upgrades**: Customer pays upfront for necessary network upgrade facilities, assumed to be developed over a 4-year period before the in-service date and costs are spread evenly over the construction period for simplicity.

[9] See, e.g., FERC ANOPR at PP 20-21.

[10] We roughly estimate a NITS growth rate based on the 2025 PJM Transmission Owner revenue requirements plus the revenue requirement impact of transmission projects expected to enter service before 2030. For this value, we calculate an approximately 5% CAGR. This is conservative relative to the CAGR for PJM Transmission Owner NITS rates, which have experienced a weighted average CAGR of approximately 7% in the 2021-2026 period. With the structure of our analysis, the more the NITS rate is expected to increase, the higher the calculated cost shift.

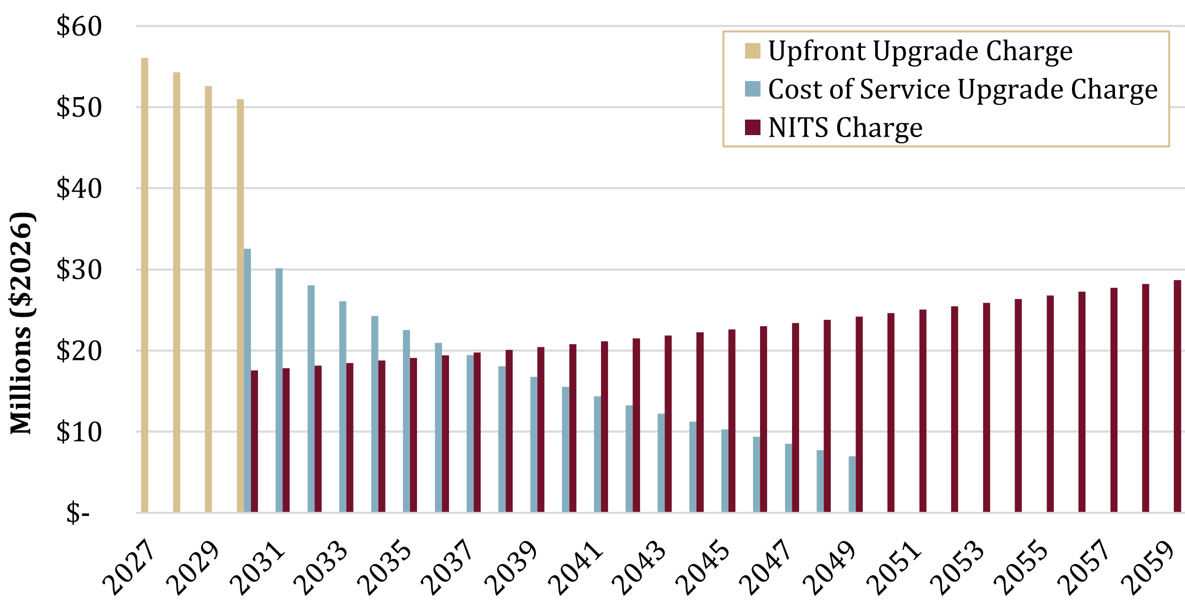
The size of the network upgrade costs is assumed to be approximately $1.16 million per each MW of load, with the reasoning for this number described later in this report.

- **Scenario B - Cost of Service Network Upgrades**: Customer pays directly for network upgrades over time, assuming a 20-year asset life and standard treatment of depreciation, taxes, and return for transmission assets (approximately aligned with the PJM NUFA structure). Annual O&M is assumed to be 1% annually of initial capital cost. The capital cost of the network upgrade costs is treated the same as in Scenario A.

We compared the scenario where the customer pays status quo NITS to the alternative direct assignment Scenarios A and B. This is done on both an annual and cumulative basis. The methodology and numerical results are described in greater detail in the following section and the appendix.

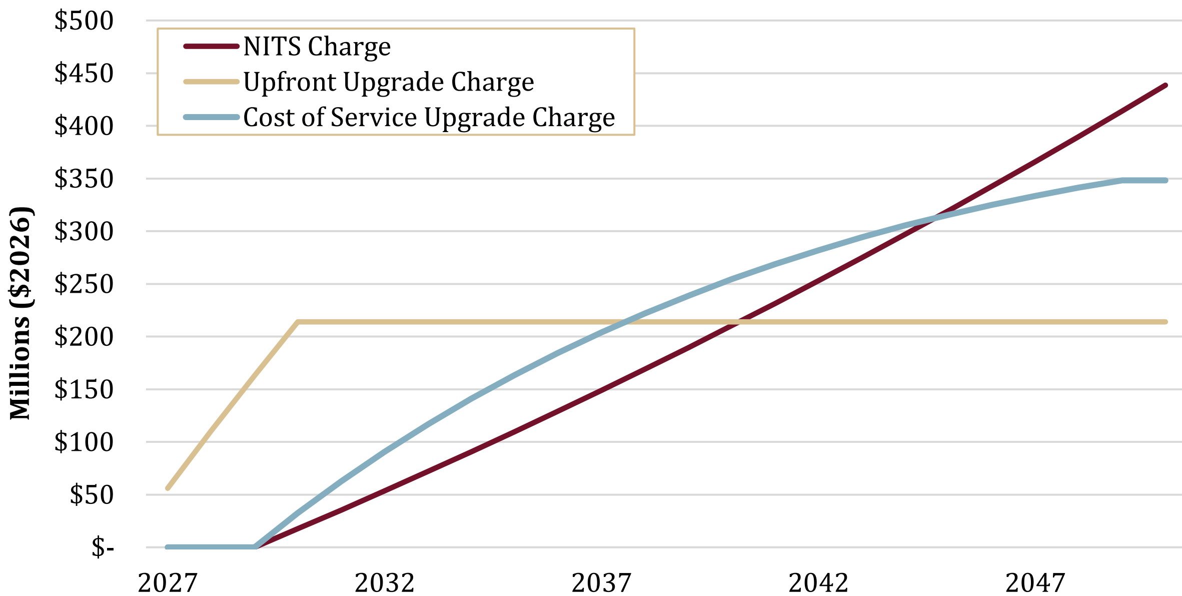
As shown in Figure 2, when the customer pays NITS, its contribution to the overall transmission revenue requirement is generally consistent across time and rises with the expected increase in the NITS charge less present-value adjustments. In the upfront charge case, the customer pays for a quarter of the cost of the network upgrades during each of the four years of the construction period and then pays nothing thereafter. In the cost-of-service case, the customer will make payments aligned with the formula to calculate the revenue requirement for the network upgrades. As the asset depreciates and is eventually fully amortized, the associated payment amounts would decline over time and then cease entirely. At that point, the customer would not pay any additional charge for use of the system (e.g., NITS) nor would it incur any meaningful transmission service charges related to the network upgrade assets.

Figure 2: Annual Charges for Hypothetical Customer for Three Scenarios (2027-2059)



With the understanding of how these various payment scenarios evolve across time, Figure 3 illustrates how the cost shift evolves over time between existing and large load customers depending on the rate structure applicable to the large load customers. The figure depicts the cumulative financial contributions to the transmission system over time for each scenario. In the NITS case, cumulative payments for the transmission system accumulate steadily across time without abatement. For the upfront payment case, contributions accumulate in each of the construction years and then plateau as no further transmission charges are levied. For the cost-of-service case, the cumulative network upgrade charge contribution increases with each annual payment and plateaus after year 20 when the network upgrades are fully amortized.

Figure 3: Cumulative Cost Contributions for Hypothetical Customer for Three Scenarios (2027-2050)



The cost shift can be conceptualized as the difference in cumulative payments to the transmission system, as all costs ultimately need to be recovered by transmission owners from customers. While in early years large load customers under the direct assignment scenarios studied here have contributed relatively more, over time and in each case the total contribution to the system falls below what they would have paid if treated as a regular customer paying the equivalent of NITS charges, assuming that the large loads remain a customer over the expected life of the assets. In the upfront charge case, by approximately year seven of operation the large load customer will have paid less than it would otherwise have as a NITS customer. Over time the cost shift onto other customers will grow. For the cost-of-service upgrade charge case, by approximately year fifteen of operation the large load customer will have paid less than the customer would otherwise have as a NITS customer, with the gap widening over time from there.

In both scenarios, the large load customer's contribution to network upgrade costs as described above, whether paid upfront or over time, does not fully offset the share of transmission system costs that the customer would otherwise pay under the status quo. As a result, absent other pricing structures, a portion of these transmission costs must be recovered from other transmission customers, resulting in a cost shift.

It is noteworthy that this example is intentionally conservative as it assumes a relatively high level of network upgrade capital costs per MW of large load demand. This conservative example has two advantages: it produces graphics that clearly illustrate the cost shift dynamics, and it mitigates concerns that the results are driven by aggressive or overstated assumptions. Importantly, higher assumed network upgrade costs *reduce* the magnitude of the calculated cost shift, making this example a lower-bound illustration rather than a worse-case outcome.

To demonstrate how these dynamics change under less conservative assumptions, Figure 4 and 5 present results for a case in which network upgrade charges are reduced by half, to approximately $575K per MW. As shown in Figure 4, under this assumption, customer payment in Scenario B (Cost of Service Upgrade Charge) are lower in every in-service year than the contribution the customer would make to system costs if charged solely under NITS. Figure 5 further illustrates cost shifts not only become more pronounced over time but also begin significantly earlier. Specifically, in this example, costs are shifted towards other customers by approximately 2035 under Scenario A (Upfront Upgrade Charge), and almost immediately upon the commencement of service under Scenario B (Cost of Service Upgrade Charge).

Figure 4: Annual Charges for Hypothetical Customer for Three Scenarios with Lower Level of Network Upgrade Costs (2027-2059)

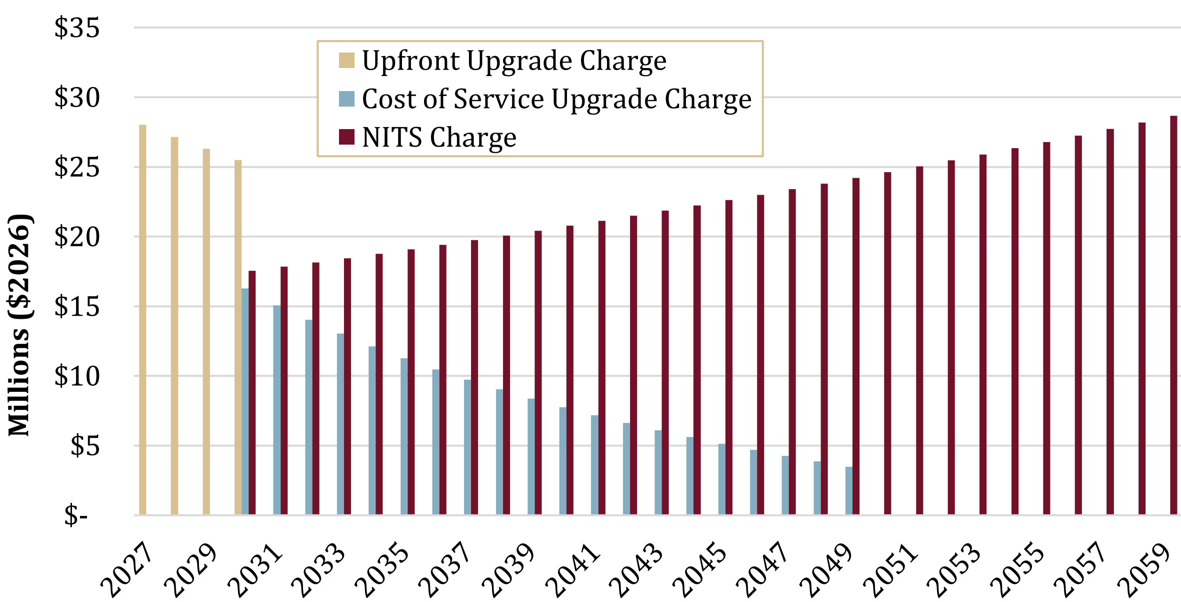
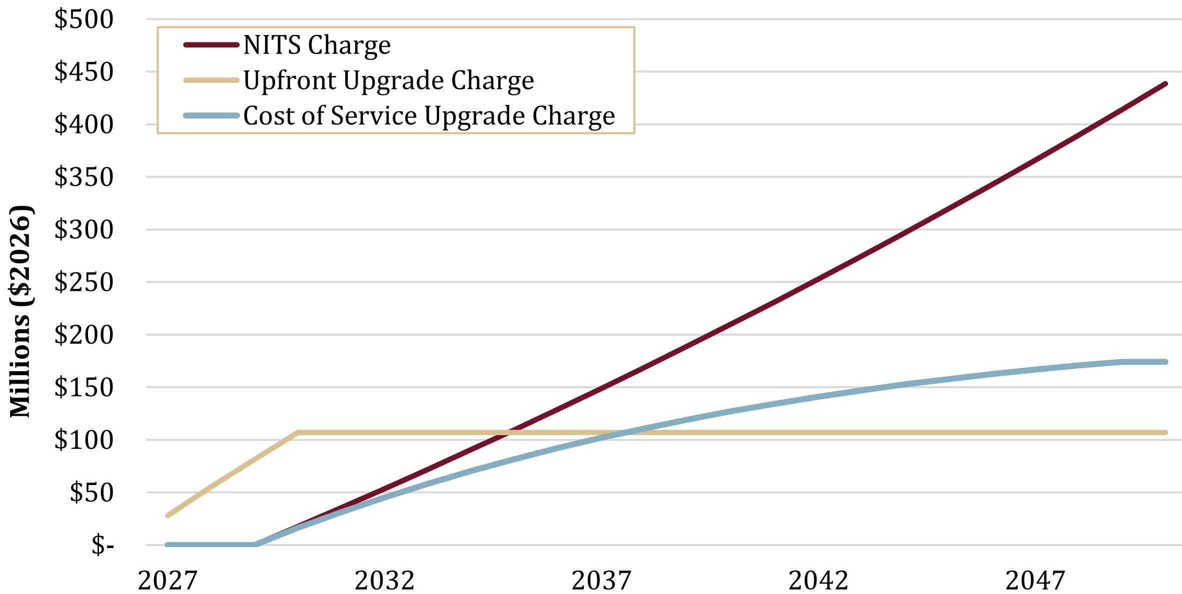


Figure 5: Cumulative Cost Contributions for Hypothetical Customer for Three Scenarios with Lower Level of Network Upgrade Costs (2027-2050)



As illustrated in the graphics, in either case – high or low network upgrade costs, over the long run, the direct assignment of network upgrade costs eventually leads large load cost responsibility to fall below what they would otherwise contribute to the transmission system if they were charged NITS like all other customers and take service over the same expected term as other customers. The lower the network upgrade costs paid by a large load customer, the earlier the cost shift occurs and the greater the magnitude of that cost shift over time. This approach creates a problematic cost shift from an equity and policy standpoint. Furthermore, such rate treatment ignores the reality that the transmission system is an evolving investment. As customers take service from the integrated grid, the system requires ongoing maintenance to ensure reliability, resilience, and quality of service, all of which incur continuous costs. Allowing a cost allocation framework where the contribution only to a certain portion of the system, and only for a certain period of time, can absolve large load customers from the financial contributions associated with the on-going use of the system and leave other customers to bear an outsize burden over time.

SECTION 3: ANALYSIS RESULTS

The analysis forecasts future NITS payments and payments under alternative transmission cost responsibility frameworks for a hypothetical large load customer. The analysis then compares payments between the status quo cost responsibility structure and the direct-assign cost responsibility structure to quantify the resulting cost shifts over a 30-year period. This result is then scaled up to the PJM region and nationally to the projected levels of large load development. Importantly, as discussed in the Appendix, we make conservative assumptions where appropriate to avoid overstatement of cost shifts, by assuming network upgrade costs of $1.16 million per MW of large load customer interconnection. The details of the cost shift calculation methodology and the input assumptions are discussed more fully in the Appendix.

The cost shift analysis is limited to the expected large load customer development over the 2025-2030 period and evaluates the resulting cost shift attributable to that vintage of customers over the 2030-2059 study period. Future data center development is not quantified in this analysis; any associated cost shifts would be incremental to those reported here. However, the analysis does present cost shifts on a dollar-per-MW basis, which may be used to extrapolate potential cost shifts associated with future large load development. Furthermore, for illustrative purposes, the analysis assumes that the direct-assign rate structures under consideration in certain policy initiatives are implemented beginning in 2026 and remain in effect thereafter.

Cost Shift Magnitude

Our analysis finds that the magnitude of the transmission cost shift associated with a representative 200 MW large load customer is approximately $1.1 billion over a 30-year period under Scenario A, and approximately $0.8 billion under Scenario B, all in nominal terms. On a per-MW basis, each incremental large load addition results in an estimated cost shift of $5.4 million under Scenario A and $4.1 million under Scenario B over the 30-year study period.

The lower cost shift magnitude observed under Scenario B reflects the fact that large load customers in this scenario pay the full cost-of-service for network upgrades over time, including ongoing O&M and other related expenses. By contrast, under Scenario A, customers pay only the capital-related costs of the network upgrades, resulting in a larger portion of remaining costs being shifted to other customers.

We apply these per-MW cost shift estimates to: (1) the projected 20 GW of PJM large load additions over the 2025–2030 period and (2) an aggregate 73 GW of nationwide large load additions, as forecasted by S&P Global,[11] over the same period. This scaling yields the aggregate cost shift results presented in Table 2.

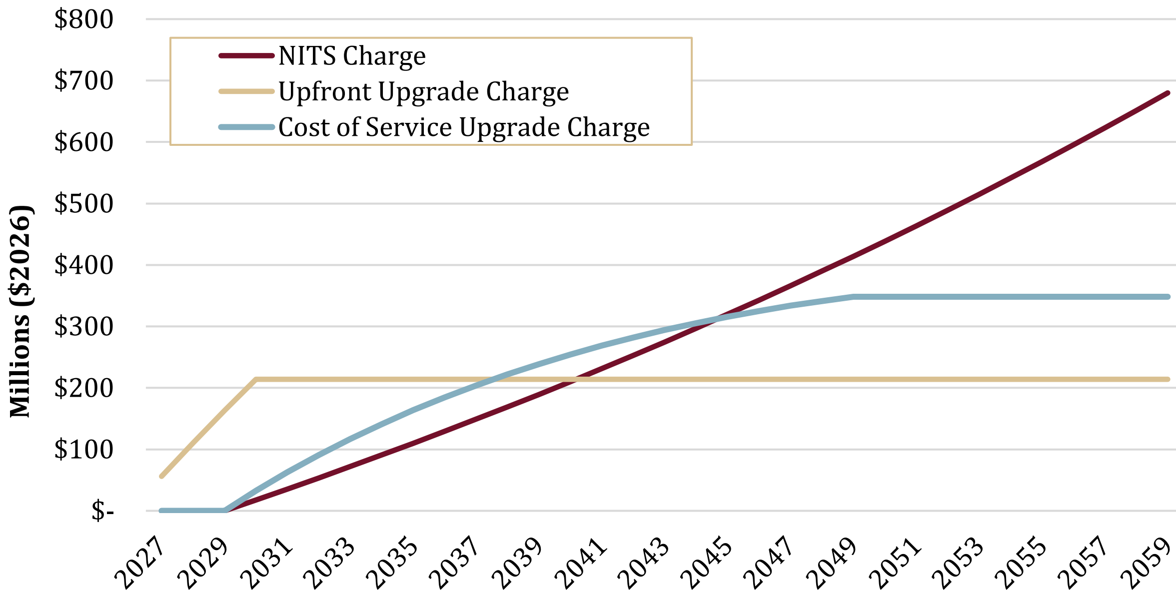
Table 2: Magnitude of Transmission Cost Shifts over a 30-Year Period

	Scenario A	Scenario B
Cost Shift per MW Large Load	$5.4 million (nominal) $2.3 million (2026$)	$4.1 million (nominal) $1.7 million (2026$)
Single 200 MW Customer	$1.1 billion (nominal) $0.5 billion (2026$)	$0.8 billion (nominal) $0.3 billion (2026$)
PJM Large Loads (20 GW, 2025-30)	$109 billion (nominal) $47 billion (2026$)	$82 billion (nominal) $33 billion (2026$)
Nationwide Large Loads (73 GW, 2025-30)	$395 billion (nominal) $169 billion (2026$)	$297 billion (nominal) $120 billion (2026$)

For the single customer case, the cumulative cash flows are shown graphically in Figure 6 for the full study period of 2030-2059. This reflects the network upgrade construction period (4 years) for transmission prior to the large load in-service date of 2030. When the customer is charged NITS rates (red line), it steadily contributes to the cost of the transmission system over time after it enters service. In Scenario A (gold line), the large load customer only pays for the network upgrades during construction, and then its cumulative contribution to transmission halts, reflected in a flat line after in-service. By approximately 2040, this contribution falls below what it would have contributed had it been responsible for NITS charges. In Scenario B (blue line), the customer begins to pay for its network upgrades through the cost-of-service rate in 2030 when it takes service, and thereafter the amount it contributes annually declines as the network upgrades are depreciated across time. Eventually, payments drop to (or near) zero as the assets are fully amortized. By approximately 2045, this contribution falls below what it would have contributed had it been responsible for NITS charges. The total cost shift over the 30-year study period is the distance between cumulative cost contribution lines at the end of the period. Again, we emphasize that our primary analysis case likely understates cost shifts by the selection of a network upgrade cost assumption ($1.16 million per MW of load) that is likely on the high end of what may be expected.

[11] According to S&P Global, large load demand nationwide was approximately 61.8 GW in 2025 and is forecast to increase to 134.4 GW by 2030. This represents a nationwide large load addition of 72.6 GW over the 2025–2030 period. (Source: S&P Global, https://www.spglobal.com/energy/en/news-research/latest-news/electric-power/101425-data-center-grid-power-demand-to-rise-22-in-2025-nearly-triple-by-2030)

Figure 6: Cumulative Cost Contributions for Hypothetical Customer for Three Scenarios Across Full Study Period (2027-2059)



Bill Impact

Our analysis also estimates the cost shift impact on an average PJM residential customer's monthly electricity bill. We assume an average residential bill of $200 per month in 2026, with transmission charges accounting for approximately 12% of the total bill.

We convert the 30-year transmission cost shift associated with PJM's projected 20GW large load additions into net present value (NPV) 2026 dollars and allocate the residential portion of this amount across the residential customer base. Based on this approach, as shown in Table 3, the estimated bill impact for a typical residential customer is approximately $2.73 per month or $33 per year (an 11% increase in the transmission portion of the bill) under Scenario A. The estimated bill impact for a typical residential customer is approximately $1.94 per month or $23 per year (an 8% increase in the transmission portion of the bill) under Scenario B.

Table 3: Estimated Annual Bill Impact on an Average Residential Customer from PJM Large Load Cost Shifts for Loads Developed 2025-2030

	Scenario A	Scenario B
Annual Customer Bill Impact from PJM Large Load Cost Shifts (2026 $)	$33	$23
Residential Transmission Bill Impact (%)	11%	8%

Network Upgrade Costs Sensitivity

Network upgrade costs vary significantly by project and region, reflecting differences in location, interconnection voltage, the status of other service requests, and the resulting extent of required network reinforcements. For purposes of the cost shift analysis, we assume a large load's network upgrade cost contribution of approximately $1.16 million per MW,[12] based on calculations derived from PJM large load growth projections and the estimated costs of planned transmission projects to reliably serve that load growth, as described in the Appendix.

To illustrate sensitivity to this assumption, and to analyze the impacts of less conservative inputs, we also estimate cost shifts under cases in which network upgrade cost contributions are materially lower.[13] Specifically we perform one case that is half of the reference case, or approximately $578,000 per MW, and another case that is aligned with recent costs of new generator interconnection network upgrades, or approximately $220,000 per MW.[14] Under these scenarios, the cost shift per MW of large load addition increases substantially, as large load customers are responsible for a smaller amount of transmission system costs (i.e., their network upgrade costs) and a greater portion of costs they otherwise would be responsible for – were they responsible for full NITS charges –are socialized to the broader customer base. As large load network upgrade cost contributions decline, per-MW cost shifts increase, reinforcing the idea that the base assumption of $1.16 million per MW likely understates the magnitude of cost shifts that may arise in many future interconnection scenarios.

12 The estimated network upgrade cost of $1.16 million per MW is derived by dividing approximately $23.3 billion of network upgrades identified on the PJM website as supporting large load interconnections by an estimated 20 GW of projected large load additions from 2025 to 2030.

13 Network upgrade costs for large load interconnections are generally not publicly available. As a point of reference, a 2024 report indicates that the average estimated network upgrade cost for generation interconnection projects submitted between 2012 and 2020 was approximately $184,500 per MW. (Source: AEI 2024 Generator Interconnection Scorecard)

14 https://gridstrategiesllc.com/wp-content/uploads/2024/03/AEI-2024-Generation-Interconnection-Scorecard.pdf (Table 5, page 33)

Table 4: Per MW Cost Shift Comparison for High, Medium, and Low Network Upgrade Cost Contributions

Network Upgrade Costs	Scenario A Per-MW Cost Shift	Scenario B Per MW Cost Shift
High: $1.16 million/MW	$5.4 million (nominal)	$4.1 million (nominal)
Medium: $578,000/MW	$6.0 million (nominal)	$5.3 million (nominal)
Low: $220,000/MW	$6.4 million (nominal)	$6.1 million (nominal)

SECTION 4: CO-LOCATED LOAD CASE AND ADDITIONAL CONSIDERATIONS

Co-located Large Loads

Although not separately called out in the analysis, cost responsibilities for co-located load arrangements bear similarities to the scenarios discussed above, with similar cost shift concerns. Given the direction that FERC appears to be heading regarding co-located load rates,[15] a large load customer in a co-location arrangement (1) may not be responsible for the allocation of transmission charges owing to arguments that, after paying for network upgrades to facilitate the co-location arrangement, such charges would violate the Commission's prohibition on "and" pricing and (2) may not be responsible for NITS charges regardless of network upgrade cost responsibility due to the netting of generation from load. Under such conditions, consistent with the load cost responsibility issues modeled in this report, the customer's only contribution toward embedded transmission system costs would be through the payment of any required network upgrade costs. As a result, we would expect the cost shifts to be similar in magnitude to those modeled for standalone loads.

Some stakeholders have suggested that a co-located load configurations may reduce the need for network upgrades associated with interconnection and, all else being equal, lower the cost of expanding the transmission system to reliably serve load. This outcome may occur under certain system conditions. However, the details about how the co-located load arrangements would be studied, would operate, and would impose demand on the system, remain under active discussion among stakeholders. Given the evolving discussion, we cannot conclude that co-located load configuration results in lower network upgrades requirements. Co-located load cost shift effects are examined in more detail in the Concentric analysis submitted to FERC in the co-located load dockets.[16]

Crediting Mechanism

In estimating large load contributions to network upgrade costs, the analysis assumes that large loads pay the full network upgrade costs and do not receive any refunds of, or credit for, those payments in the future regardless of the rate design. The ANOPR raises the question of whether large loads should initially fund network upgrades and subsequently receive reimbursement. However, establishing a crediting mechanism for large load customers would effectively reimburse them for any network upgrade costs that they were responsible for. Once they have been fully reimbursed,

[15] See FERC Docket Number EL25-49.

[16] See, e.g., Reed/Powers Declaration, submitted as attachment to Protest of Exelon Corporation and American Electric Power Service Corporation in Docket No. ER24-2172.

they would presumably then be responsible for NITS obligations like any other customers. Practically, at least in nominal terms, this setup would probably be designed to leave the customer financially no worse off than if it has paid NITS all along. As such, this would likely eliminate any cost shift, but it would also not achieve any intended policy-driven objective of directly assigning network costs to the large load customers in a durable way to prevent cost shifts to other customers. Such an approach could amount to a logistically intensive pathway back to something approximating the status quo. Accordingly, while we offer this observation about such a policy, we did not perform any additional modeling of such a case.

Discount Rate

Given the long time series of cash flows underlying the cost shift analysis and the efforts to evaluate impacts over a 30-year horizon, the choice of discount rate can materially affect the conversion of future cash flows to present-value terms. For this analysis, the discount rate is set equal to the historical average rate of inflation (i.e., 3.22%) in order to avoid unduly constraining the treatment of intergenerational equity. Importantly, the overall conclusions and directional findings regarding cost shifts under direct-assignment approaches remain unchanged even when discount rates are increased to 10% or higher.

NITS Rate Changes

To avoid introducing additional variability unrelated to the core comparison of cost responsibility, the NITS rate is assumed to grow at a fixed rate across all modeled scenarios. In practice, the NITS growth rate may be affected by a wide range of factors. For example, the interconnection of a large quantity of large loads could, if they significantly grow the pool of payers for the transmission network, put downward pressure on transmission rates by effectively "increasing the denominator." Alternatively, under certain direct assignment structure, certain network upgrades could be netted or credited against the revenue requirement, thereby "reducing the numerator." These dynamics are more complex and inherently uncertain to model and were therefore excluded from the analysis for simplicity. Instead, the analysis assumes that historical trends of rising NITS rates continue, at least approximately. Importantly, we tested the sensitivity of the results to this assumption. Even when the NITS growth rate is reduced to 0%, the cost shift results hold directionally, although the magnitude of the cost shift naturally declines as the NITS growth rate declines.

SECTION 5: KEY FINDINGS

Our analysis of a transmission cost allocation policy requiring sole use of direct assignment yields the following key findings:

1. When direct assigned to large load customers, network upgrade cost contributions do not offset avoided NITS charges.

   When large loads are exempted from paying NITS charges and are responsible only for network upgrade costs, their contributions to transmission system cost recovery are, over time, insufficient to replace the NITS payments they would otherwise make if treated like all other customers.[17] This conclusion holds whether the large loads pay network upgrade costs upfront or are charged on a cost-of-service basis.

2. A policy that requires direct assignment of network upgrades to large loads as the sole means of recovering transmission costs creates substantial long-term transmission cost shifts.

   We estimate that, on a per-MW basis, each incremental large load addition subject to direct assignment results in a transmission cost shift of approximately \$4.1 million to \$5.4 million over a 30-year period in nominal dollars, and approximately \$1.7 million to \$2.3 million in 2026 dollars. Applying this result:

   a. A single 200 MW large load would shift approximately \$1.1 billion in nominal dollars (\$0.5 billion in 2026 dollars) in transmission costs to other customers over a 30-year period when network upgrade costs are paid upfront. When network upgrades are recovered through cost-of-service charges, the same load would shift approximately \$0.8 billion in nominal dollars (\$0.3 billion in 2026 dollars) in transmission costs to other customers over the same period.

   b. Near-term large load growth projected in PJM is approximately 20 GW. If this incremental load is exempt from NITS charges and instead pays only network upgrade costs, our analysis indicates that roughly \$109 billion in nominal dollars (\$47 billion in 2026 dollars) in transmission costs would be shifted to other customers over the next 30 years when network upgrade costs are paid upfront. When network upgrades are recovered through cost-of-service charges, the same load would shift

17 As noted earlier, this report is limited to assessing the potential for cost shifts under a requirement to solely use direct assignment.

approximately $82 billion in nominal dollars ($33 billion in 2026 dollars) in transmission costs to other customers over the same period.

   c. At the national level, one estimate puts near-term large load additions at approximately 73 GW. Scaling the analysis accordingly suggests a potential transmission cost shift of roughly $395 billion in nominal dollars ($169 billion in 2026 dollars) to other transmission customers over a 30-year period when network upgrade costs are paid upfront. When network upgrades are recovered through cost-of-service charges, the same load would shift approximately $297 billion in nominal dollars ($120 billion in 2026 dollars) in transmission costs to other customers over the same period.

   d. The magnitude of total transmission cost shifts to other customers would increase as the assumptions and results of this analysis are extended to large load additions occurring beyond 2030

3. Residential customers experience meaningful bill impacts.

   These near-term transmission cost shifts translate into an increase of approximately 8 to 11% in the transmission portion of the average residential customer's electricity bill, representing a non-trivial customer impact.

4. Cost shift magnitude is sensitive to network upgrade cost levels.

   Network upgrade costs vary significantly by project. Sensitivity analysis demonstrates that, transmission cost shifts increase materially as per MW large load network upgrade cost contributions decline, underscoring the importance of cost allocation frameworks that reflect long-term system use.

APPENDIX: ANALYSIS METHODOLOGY

Modeling Approach

Our analysis evaluates potential cost shifts that stem from transmission network upgrade cost recovery frameworks that exempt large loads from paying NITS charges that they currently pay under the status quo transmission cost recovery framework. In these scenarios, policies change to require large load customers to instead pay for transmission costs under the two direct assignment scenarios described. As a result, the respective cost recovery frameworks lead to shifts in the amount of the transmission costs currently borne by large loads to other transmission customers. The analysis is designed to quantify these costs at the level of a single customer first, then scaled to the PJM region as a whole, and then extrapolated to nationwide levels of expected large load (i.e., data center) development. Cost shifts are defined as the difference between each direct-assign scenario as compared to the status quo case.

Our cost shift modeling followed four steps:

1. **Forecast "Status Quo" PJM NITS Rates for the 30-Year Study Period**

   Our 30-year study period begins in 2030. We first estimated the 2030 NITS rate in PJM using (1) the 2026 PJM load forecast[18] and (2) expected transmission capital additions expected in service by 2030, based on publicly available PJM planning process documents.[19]

   Using the projected 2030 NITS rate and the actual 2025 NITS rate, we calculated an average annual growth rate over the 2025–2030 period. This annual growth rate of 5% is then applied as an escalation factor to estimate future NITS rates for the years 2031 through 2059, based on the rough assumption that current trends are likely to persist prospectively.

   It is worth noting that this growth rate is conservative relative to historical NITS rate growth. For example, in the 2021-2026 period, weighted average NITS rates in PJM grew approximately 6.6% annually.[20]

2. **Calculate A Single Large Load Customer's Contribution Under the Status Quo**

   Under the status quo, the contribution of a single large load customer to the recovery of transmission costs is its payments for NITS. These payments are calculated as the large load's contribution to system peak load as measured in megawatts multiplied by the dollar-per-MW NITS rate.

[18] https://www.pjm.com/planning/resource-adequacy-planning/load-forecast-dev-process.aspx
[19] https://www.pjm.com/planning/m/project-construction
[20] https://www.pjm.com/markets-and-operations/billing-settlements-and-credit

3. **Estimate A Single Large Load Customer's Contribution Under Two Scenarios**

For each scenario, we assume that a large load's contribution to transmission cost is equal to the payments it makes for the network upgrades required to serve that load consistent with the rate structure of that scenario. We derive a network upgrade cost on a per-MW basis using PJM data, which is done by assessing the amount of transmission investment planned to serve new large loads in the 2026-2030 period[21] divided by the amount of new large load over the same period.[22] We then multiply this unit cost by the large load's MW to determine the network upgrade costs for which a customer would be responsible.

Under Scenario A, network upgrade costs are paid upfront. Accordingly, the full network upgrade cost payment associated with the large load is assumed to occur ahead of a 2030 in-service date, the first year of the study period, with a four-year construction period and the assumption of equal payments during the construction period.

Under Scenario B, network upgrade costs are recovered over time. We calculate the annual revenue requirement associated with the transmission upgrades supporting the large load and treat this amount as the large load's annual transmission contribution for a 20-year contract term. We assume annual O&M equal to 1% of the initial capital costs of the project and an 8% weighted average cost of capital. Payments cease after year 20, reflecting the typical term of network upgrade cost recovery agreements.

4. **Measure the Cost Shift for a Single Large Load Customer**

Finally, we compared the amount paid by the single large load customer towards the recovery of transmission costs in each scenario against the corresponding amount paid by the large load under the status quo rate framework. The difference over time between what the large load would contribute under the status quo and what it contributes under each scenario represents the cost shift. This is calculated on both nominal terms and in 2026 time- adjusted dollars (i.e., real 2026 dollars) using historical average inflation rates as the discount rate.

5. **Estimate Cost Shift in PJM and Nationwide**

Based on the 30-year cost shift estimated for a representative 200 MW large load customer, we calculated a per MW cost-shift metric. This per MW value was then applied to projected large load additions in PJM—approximately 20 GW from 2025 through 2030—to extrapolate

21 We rely on the PJM database of "Project Status & Cost Allocation" and sum all costs for projects estimated in service by 2030 under the categories of Baseline with load growth as a driver and Supplemental under the customer service driver.

22 We start with the 2026 PJM load forecast, look at all peak load growth expected by 2030, and conservatively assume that 90% of that load growth is a result of new large load customers.

the potential magnitude of cost shifts associated with near-term large load growth in the region.

Using the same per MW extrapolation approach, we also estimated the magnitude of cost shifts associated with projected nationwide large load growth of approximately 73 GW over the 2025–2030 period.

Conservative Modeling Assumptions

The analysis adopts a deliberately conservative approach in selecting inputs for the cost shift calculation. The objective is to avoid overstating the magnitude of any potential cost shift and to ensure that resulting estimates err on the side of understatement rather than overstatement.

First, in forecasting the status quo NITS rate, the analysis relies on the estimated costs of announced transmission projects published on the PJM website. It is expected, however, that additional Supplemental Projects will be added towards the latter end of the 2026-2030 period as needs dictate for projects with faster execution periods. Using only currently published project costs therefore results in a lower projected NITS growth rate and, in turn, a lower estimate of cost shifts than would likely occur in practice.

Second, in projecting the NITS rate used in the model, the analysis applies the NITS growth rate from 2025 through 2030 as a constant escalation factor over the subsequent 30-year analysis period. This assumption is likely also conservative. Future NITS rate growth could reasonably be expected to exceed historical trends due to accelerating load growth, particularly from AI-driven data center development and associated transmission expansion needs, as well as resulting from trends in increasing equipment costs.

Finally, the large load forecast underlying the analysis includes only near-term large load additions projected between 2025 and 2030 - approximately 20 GW within PJM and 73 GW nationwide. Over a 30-year time horizon, it is a near certainty that substantially greater levels of large load additions will materialize. To the extent such future loads are exempted from paying NITS charges, excluding them from the cost shift analysis purposefully excludes any cost shifts resulting from post-2030 large load development and associated transmission costs. Thus, the full long-term implications of any policy that would drive a cost shift would need to be extrapolated to future load growth levels to get a more complete picture of the impact on existing customers over time.