THE CO-LO CONUNDRUM

Protecting Customers in Nuclear-Data Center Colocation

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INTRODUCTION

This past April, we published a short paper identifying catalysts that would explain growing interest to interconnect data center loads “inside-the-fence” with existing nuclear units. This model – known as “colocation” – raised in our minds a number of serious implications for grid operators, regulators and consumers. Our paper explained why merchant ownership of nuclear generation in RTO markets is a necessary predicate to colocation and how the environmental benefits of the model claimed by proponents are illusory. We concluded by urging policymakers to question the representations offered to support colocation and to examine the downstream implications of the model.[1]

Since releasing the paper, we’ve been approached by Wall Street, the media and invited to testify on the topic before a Congressional Subcommittee. We’ve fielded questions on colocation from state and federal lawmakers, representatives from industry trade associations, state public utility commissions, consumer advocates, reliability standards organizations and countless engineers, lawyers and business leaders. While the Nuclear Energy Institute’s (“NEI”) recent publication, *The Co-Located Load Solution* is a welcome contribution to the debate,[2] ultimately its advocacy fails to acknowledge, much less address, vital questions we identified in April – questions of public interest and equity which, we can assure, are on the minds of many.

The central premise of the NEI Paper is that an interconnection of load is just that, whether connected to the grid in the traditional manner or inside-the-fence. Each form of interconnection causes similar cost and reliability impacts on the system.

Even accepting this premise – and we’ll explore the claim more carefully below – NEI ignores one critical distinction. Specifically, who, under each form of interconnection, will pay for the impacts that result? This distinction underpins the public policy and rate equity questions identified in our April paper. If connected in the traditional way, the data center pays alongside all other customers its share of the new transmission, new generation and overall higher prices its interconnection creates. Regulators know how to establish just and reasonable rates under those conditions. By connecting inside-the-fence, a collocating customer could attempt to avoid its share of these cost impacts, leaving them for other consumers to pick up.

NEI is almost silent on topics we know are troubling regulators and policymakers. For example, it ignores what we identify as a laundry list of charges and rates the colocating data center would

[1] We define “colocation” as a large user taking service inside-the-fence of an *existing* generation unit and sharing the interconnection facilities of the generator. Like NEI, we distinguish colocation at *existing* plants from models where new load connects with new on-site, purpose-built supply. The concerns we raised in April, and engage with NEI on here, involve existing plants and not situations where new supply is brought to the table. And while we focus on existing nuclear plants, very clearly colocation can occur and probably is occurring at existing fossil plants. Merchant gas plant owners are in colocation discussions with data center customers where availability and emissions are presumably less important. *See generally*, Q1 2024 Vistra Corp Earnings Call, (May 8, 2024). Even still, a creative data center could colocate with a recent model 6500 Btu/kWh heat rate combined cycle plant and claim its supply is cleaner than the average emission rate of grid-sourced supply where significant coal and older, less efficient gas plants remain part of the fleet.Given the volume of installed merchant generation of all types, FERC’s scheduled technical conference on this subject is timely. *Notice of Commissioner-Led Technical Conference this Fall on Co-Location of Large Loads at Generating Facilities*, (Aug. 2, 2024).

[2]MICHAEL KORMOS, The Co-Located Load Solution, NUCLEAR ENERGY INSTITUTE at 16 (July 2024) [hereinafter, *NEI Paper*]. NEI explains why nuclear generators are attracted specifically to inside-the-fence data center customers given their load profile.It also does a good job dispelling certain myths, which we agree can confuse the debate.

sidestep by colocating. Neither does it robustly analyze the reliability and market impacts of potentially thousands of megawatts of exceptionally valuable capacity departing the grid at the very moment load growth is surging.

In short, we'd suggest the case for colocation demands further investigation as to why the starkly different economic outcomes that results are nonetheless equitable and why a customer purportedly not using the grid should also be excused from paying, for example, a retail rate designed to recover the costs of state environmental programs. Any defense of these arrangements would do well to acknowledge and address obvious and valid questions policy makers are asking. Given the clamor of inquiry, we doubt a response that "there's nothing to see here," is going to cut it.[3]

THE HISTORY OF PUBLIC SUPPORT FOR NUCLEAR ENERGY, INCLUDING MERCHANT NUCLEAR

This paper won't cover all the points raised in the NEI Paper, but we'd be remiss if we did not briefly address history.

In justifying colocation, NEI's statements begin to appropriate the academic language and principles underlying public utility regulation, specifically, the doctrine of the "duty to serve" that most regard as a pillar of the public utility's regulatory compact.[4] It's curious to hear merchant generators invoke this obligation to defend inside-the-fence arrangements. If these generators were in fact public utilities charged with a duty to serve, they would be in no position to abandon the rest of the consumers they previously "served" – consumers who have provided and continue to provide essential support to their business – in favor of a data center customer.

And this highlights the conundrum that is the "merchant nuclear plant." Like the nuclear industry as a whole, merchant plants are beneficiaries of extensive public support.[5] This goes back to the incipiency of the industry where nuclear development was supported through loan programs, grants and tax relief. They continue to receive federal support, such as liability limitations of the Price-Anderson act and in recent years, the $6 billion Civil Nuclear Credit Program and production tax credits under the Infrastructure Investment and Jobs Act and the Inflation Reduction Act, respectively. At the state level, these plants have enjoyed a long history of favorable regulatory treatment such as accelerated depreciation, recovery of stranded investment, and lately Zero-Emission Credit ("ZECs") and similar programs.

We raise this not to criticize policy choices or question the need for these support programs. Rather, appreciate that all this support is, and has been, funded by taxpayers and ratepayers.

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[3] NEI's tactic here dovetails with the line of argument presented to FERC by NEI members Talen, Constellation and Vistra in a case considering the amended interconnection service agreement ("ISA") for the Susquehanna Nuclear plant. *See, e.g., Vistra Motion For Leave And Answer To Protest*, Docket ER24-2172, p.1 (July 29, 2004) ("Notwithstanding the breathless rhetoric in some of the pleadings, this proceeding involves an ordinary submission of a non-conforming interconnection agreement.") [hereinafter, *Susquehanna Docket*].

[4] In introducing its paper, NEI quotes Constellation's Executive Vice President Kathleen Barron stating, "we cannot NOT fill this load. . .it's not an option to say we can't accommodate it." *See also*, NEI Paper at 16 ("Policymakers, regulators and industry have a basic obligation to serve load.").

[5]*See, e.g.*, Nuclear Power: Still Not Viable Without Subsidies, UNION OF CONCERNED SCIENTISTS (Feb. 2011), (detailing 50 years of subsidies exhaustively before introduction of most recent set of state and federal programs).

From this perspective, nuclear generation is uniquely imbued with the public interest, making it unsettling if not unseemly for units, once the first data center comes knocking, to pull up stakes and desert customers that for decades have had their back.[6]

Despite all this historical and continuing public support, NEI invokes the specter of a "new wave of nuclear retirements (beginning early next decade) far exceeding generating capacity over the last decade" as reason to back colocation.[7] NEI's rhetoric can't be reconciled with what the nuclear industry is saying and doing. For example, while the federal PTC is set to expire in 2032, the industry is publicly assuring Wall Street the subsidy has bi-partisan support and is "durable."[8] There's little to suggest it won't enjoy extensions, much as the PTC for wind generation has. Nuclear owners are aggressively seeking opportunities to invest in uprates and prepare relicensing applications to ensure units survive until "2060 and beyond." Then there's the advances well underway to restart the Palisades plant, the announcement last week that Three Mile Island will be returning, the reality setting in that Diablo Canyon is not going anywhere, and credible talk that Duane Arnold might be returned to service. What's next? Shoreham – just kidding (we think).

There's no wave of impending retirements – and that's good news. To the contrary, the country is embracing a nuclear renaissance. To repeat, that's good news. Nuclear' s bright future is evident from both public support expressed in the form of state and federal subsidy and tax credit programs, coupled with commercial support given its zero-emission and high capacity factor profiles and macro industry trends affecting supply and demand. And it's apparent Wall Street and nuclear owners are investing tremendous capital on this basis. There is no reason to believe that , without evading grid charges, nuclear operators will be unable to secure the long-term PPAs the NEI paper regards as so important. And, to suggest that, without colocation, merchant nuclear owners will return to the bread line beggars belief.

IMPACT ON THE GRID CAUSED BY COLOCATION AND WHO PAYS TO ADDRESS THESE IMPACTS?

Will colocating data centers at existing nuclear plants create a need for transmission system upgrades? The answer NEI offers isn't clear. In places, NEI suggests that the colocating "data center does not cause grid costs to be incurred."[9] Elsewhere, it suggests any impacts would be less than if the customer connected in the traditional manner. But, in the end, the intimation is that it really doesn't matter what impacts are wrought because the costs that result fall on others – not the inside-the-fence data center or its compatriot nuclear plant. Why not? Because the data center is purportedly not grid connected and not taking transmission service.

[6] The interests of everyday consumers were central to the lobbying push behind public support for the nuclear plants in New Jersey and Illinois. *See, e.g.*, *Citing Urgency of Climate Change, New Jersey Board of Public Utilities Award ZECs to Preserve Salem One and Two and Hope Creek*, NEW JERSEY BOARD OF PUBLIC UTILTIES, (2019); AARON LARSON, *Exelon Gets Its Christmas Wish – Illinois Legislation Will Save Nuclear Plants*, POWER, (Dec. 2, 2016) ("[t]his has always been first and foremost about doing the right thing for our customers, the talented men and women who operate the plants, and the communities we serve.").

[7] *NEI Paper* at 4.

[8] Constellation Chief Executive Officer, Joseph Dominguez states that "in a sharply divided political world where the parties don't seem to agree on much, each party recognizes the unique and critical nature of nuclear energy and how essential it is to our country. So, as a consequence, we believe that the policy (the PTC) is durable now and into the future." Constellation Energy Corporation Q1 2024 Earnings Call Transcript (May 10, 2024).

[9] NEI Paper at 7.

A. IMPACT ON THE GRID CAUSED BY COLOCATION AND WHO PAYS TO ADDRESS THESE IMPACTS?

Let's be clear. Colocation, from the system operator's perspective, means losing the injection and provision of electricity and capacity previously provided by the generator for the benefit of the rest of the grid. Nuclear plants play an operationally important role on the system. First and foremost, they are large and reliable providers of energy and capacity to the system. Additionally, they usually interconnect at the 345kV or 500kV level to a transmission network designed specifically over many decades to deliver the output of these facilities to customers. Grid reliability and security watchdog, Reliability First, cautions that these plants are relied on by the system operator to support the high-voltage backbone corridors on which the rest of the network hangs.[10] They are relied on by the system operator to support the high-voltage backbone corridors on which the rest of the network hangs. And as illustrated by PJM's $275 million Artificial Island transmission upgrade, completed in 2021, system planners continue to invest in a grid designed around the delivery of these resources to important load centers, and to ensure the grid can operate reliably with these generators interconnected.[11]

As engineers would say, the electrical locations of plants like Peach Bottom, Calvert Cliffs, Salem and Hope Creek are much more far-reaching than their physical location. This being the case, one can reasonably expect that removing chunks of this output from the grid will effect a major change in grid topology, creating the need for (i) transmission upgrades to offset grid services previously provided by the plant and relied on by the system operator (ii) new transmission to deliver replacement generation to serve customers that have relied on the departing nuclear capacity for many years.[12]

Presently, however, all we have is an educated guess. We lack an empirical examination of the question because system operators like PJM have not yet performed rigorous power flow studies to forecast what operational challenges and other consequences would arise if 25% or 50% or 75% of the merchant nuclear fleet were to disappear to serve new on-site data center load.

NEI makes multiple references to something in the PJM world called a "necessary study." It's easy to misunderstand what this study is, and importantly, what it is not. PJM's necessary study considers whether the nuclear unit reducing its grid injections on account of a colocated load can continue to reliably inject its remaining output onto the grid. Since the nuclear plant and inside-the-fence data center remain synchronous to the overall grid, PJM evaluates the interconnect to ensure it does not present risks for grid perturbations. The necessary study is not an impact study. It doesn'tlook beyond the feasibility of the reduced injections and the immediate modification of the

[10] RELIABILITY FIRST, *Re: Administrative Docket No. PC 61—Comments of Reliability First Corporation Regarding Co-Located Load Configuration*, p.2, Maryland Public Service Comm. (July 25, 2024) ("Depending on their operation and interconnection type, co-located facilities may or may not be visible to the system operator, and if they fluctuate back and forth during faults or switching, this could cause issues with voltage support, frequency response, harmonics, stability of neighboring resources, or protection system coordination.").

[11] The Artificial Island project was required to ensure the Salem and Hope Creek nuclear units in New Jersey could continue to be delivered reliably throughout the mid-Atlantic. This kind of investment, ordered by PJM and supported by homes and business in New Jersey, Pennsylvania, Maryland and Delaware illustrates the integral role these plants play in the overall grid and the expectation they will remain grid resources going forward.

[12]*NEI Paper* at 4 (referring to these customers as "distant load centers". A quick look at the map attached in Appendix A makes clear many of these "distant load centers" are major metropolitan areas like Washington DC, Baltimore and Philadelphia, each of which have nuclear plants within a 50-mile radius.).

interconnection to examine larger impacts these changes have on grid operations elsewhere.

For instance, PJM is spending over $5 billion to reinforce the transmission system in the mid-Atlantic to account for (i) load growth primarily resulting from grid-connected data centers in Northern Virginia and (ii) the loss of supply due to the retirement of several large fossil plants. In our April paper, we doubted this bill would be materially reduced if the grid-connecting data centers had found a way to colocate.[13] The transmission NEI identifies as avoided – "transmission upgrades required to get power to the new substation built for that customer (the data center)" – would simply reappear as transmission needed to deliver electricity to grid customers from other generation sources on account of the supply lost to the inside-the-fence data center.[14] Given its limited scope, such implications aren't identified by PJM's necessary studies. But there's no escaping that new data centers, whether connected at the front of the meter or behind, will require additional generation and new transmission infrastructure. The only difference is whether the new data center is going to share in these costs.[15]

Hang on a minute, says NEI. By withdrawing an important generator, colocation will "free up" transmission headroom that can be made available to new generation sources, including renewables.[16] A couple aspects of this claim warrant scrutiny.

First, don't think the nuclear plant is abandoning its point of interconnection ("POI"). As NEI points out, a colocating nuclear unit will still "remain connected to the network, as required by law."[17] Given NRC regulation and the normal geographic constraints limiting feasible sites to build wind and solar, it seems optimistic to expect much new supply interconnecting under some kind of facilities sharing arrangement with the nuclear plant at its POI.

NEI is correct when it says reduced nuclear grid injections could free up space elsewhere on the high voltage network, thereby enabling development of new POIs to interconnect new generation with no or lower network upgrade responsibility. And this brings us to our second point. NEI's assumption rests on the nuclear owner surrendering rights to sell the full capacity output of its units into the RTO's market. In PJM, these rights are known as capacity interconnection rights, or "CIRs," and current rules require a plant serving load inside-the-fence to reduce its CIRs to the extent of this load. However, the nation's largest nuclear generator, Constellation Energy, and others object to this rule. If they can immediately curtail their data center customer when PJM calls on them in an

[13] NEI notes that no data centers have co-located in Northern Virginia, intimating perhaps that this $5 billion bill for transmission wouldn't exist if data centers in Northern Virginia had instead co-located at nuclear stations.

[14] If somehow more of the data centers in Northern Virginia had connected inside the nuclear fence as opposed to in front of the meter, the portion of PJM's $5 billion bill attributable to data centers would reduce, but, like squeezing a ballon, the portion attributable to lost supply (retirements) would increase. *See, e.g.* JAMES DOWNING, *Data Center Load Growth Driving PPL's Plans*, RTO INSIDER, (May 1, 2024), noting statements made during a PPL's first-quarter earnings call how rising demand from data centers will lead to increased investment in transmission in PPL's utility territories. PPL is in the business of building the transmission needed due to Talen's decision to dedicate a sizeable portion of the Susquehanna Nuclear plant (interconnected to PPL) to a data center. PPL has signed and supports the amended ISA which is the subject of the *Susquehanna Docket* at FERC.

[15] Our position is shared by PJM's market monitor, Monitoring Analytics: "The gains for the specific co-located loads come at the expense of other customers in the PJM markets. The core benefit to the specific co-located loads is avoiding the costs associated with both state and federal regulation." *State of the Market for PJM*, MONITORING ANALYTICS, LLC, at 1, (August 8, 2024).

[16] *NEI Paper* at 11.

[17] *NEI Paper* at 10.

emergency, they argue they should then be permitted to retain and sell their full CIR value into PJM's capacity market. Putting aside the merits, Constellation's position means no transmission is "freed up" by colocating because the nuclear plant isn't releasing any of its CIRs. In turn, this means the transmission capability to deliver the full plant output to the grid must be retained for that purpose.[18]

NEI obscures the fact that colocation will create new challenges to grid operations and hesitates to admit these arrangements represent the loss of a supply resource to the grid with potentially grave resource adequacy and energy market implications. Anyway, it sees no cause for alarm because we have "tools already in place . . . to bring on any new resources needed to serve network load."[19]

These "tools" – market prices to incent generation investment and system planning to order the construction of transmission when needed – are the same tools NEI spurns as inadequate for connecting data centers in the traditional front-of-the-meter manner like all other industrial, commercial and residential customers. NEI argues we can't require data centers to wait in line while it takes "up to a decade to plan, design, permit and construct new transmission."[20] This invites an inquiry NEI avoids: where's the equity in having all other customers (new and existing) wait in the cold or give up their good seats so that data centers can be whisked to the front of an increasingly crowded theater?

We agree the market and system planning tools used in RTO regions are struggling to interconnect new generation, attract and retain dispatchable and highly-available generation and plan and develop transmission. The question is whether one type of customer can avoid facing the consequence of these challenges, take action that amplifies these challenges, and in so doing, evade its share of costs it causes, thus further compounding the problem for others.

B. THERE IS BOTH A REGULATORY BASIS AND POLICY RATIONALE TO ALLOCATE THE COST OF TRANSMISSION REINFORCEMENT CAUSED BY A GENERATOR'S COLOCATION ARRANGEMENT TO THE GENERATOR

Despite its soft shoeing, the NEI paper is fairly read to concede colocation will cause a need for new infrastructure. We can argue whether one interconnection configuration creates a greater need than the other. And we can debate whether data centers and their AI customers are so critically important to our national interest that they deserve expedited treatment relative to others. But we should not push to the side legitimate questions as to the fairness of financially advantaging data customers over other grid customers that have and continue to financially underwrite these plants. Supporters of colocation arrangements will need to better explain why it's acceptable for them to avoid assuming their share of whatever infrastructure costs do result from their arrangement. The NEI paper instead offers a rather cursory dismissal that because the colocated data center "is not a customer of the transmission owner" and because it is "not taking service . . . no one can reasonably expect it to share costs."

[18] The cryptic disclaimer found in footnote 14 of the NEI Paper suggests PJM's CIR colocation forfeiture rules "could evolve in a way that enables the generator to retain such rights." Should this occur, it will be at the behest of Constellation and other generators and would impeach any agreement that colocation "frees up" transmission capability for others (at least in PJM); *See NEI Paper* at 14.

[19] *NEI Paper* at 6.

[20] *NEI Paper* at 2-6 (applauding the data center getting "the carbon-free electricity it wants without lengthy delays," and "recognizing the challenges of integrating new generation resources to replace retiring fossil generation.").

Considering whether the load is "taking service" is more complicated than might appear on its face. And we'll get to that. But, to accept for the moment NEI's summary conclusion that inside-the-fence load can't be treated as a transmission customer, two points remain unassailable: (i) the generator is still taking service as an interconnection customer under its interconnection service agreement; and, (ii) the costs and cost responsibility questions here are playing out presently before the FERC in a docket involving the amendment of an interconnection service agreement (i.e. the *Susquehanna Docket*).

In the context of generator interconnection, the long-accepted approach to cost allocation is the principle of "but for" causation. In most RTO regions, any costs needed to reinforce the grid occasioned by the interconnection are borne by the interconnecting generator. These costs are then passed on either in the generator's PPA with its customer or recovered through revenues from the wholesale market.

In cases of colocation, we have a "disconnecting" generator, or more precisely a partially disconnecting generator. The logic underlying the "but for" test applicable in interconnection service contexts offers FERC a basis to allocate grid costs to the generator arising from its partial disconnection.[21] We would not advocate assigning to the colocating generator the full cost impact of its withdrawal (as is done under the "but for" test for new interconnections). Nevertheless, the underlying principle – rooted in cost causation - offers a path to assign to the colocation arrangement its share of these cost impacts, thus restoring them to the position they would be in had they connected in the traditional manner. Assigning to the generator costs caused by its actions (which in turn could inform the terms of its PPA with the data center) would not represent the kind of "fundamental market redesign" that NEI warns would disrupt long-established norms, but instead represents an extension of a long-standing body of FERC interconnection jurisprudence.

C. COLOCATION ARRANGEMENTS TAKE GRID SERVICES

Relying on the "but for" principle to impose a share of grid reinforcement costs on the generator that choses to dedicate some of its plant to colocation assigns indirect (but causally connected) costs. It's also true, however, that direct costs are caused by colocation arrangements in the form of continuing services the grid must provide to enable the arrangement.

These continuing grid services – like load following, reactive support, operating reserves, and black start service - dwell in the technical realm of power system engineering. What they are and how colocation arrangements continue to rely on them is explained in the *Susquehanna Docket*.[22] The NEI Paper accepts (to a degree) that these costs result from colocation. However, as NEI notes, these types of costs have historically been assigned to load as the transmission customer and not generation under FERC's Order No. 888 regime. Furthermore because, from NEI's perspective, colocated load cannot be considered a transmission customer, and perhaps not even a retail customer, there's no place in NEI's world to assign these costs.

[21] Whether colocated load is taking service or not, the partially withdrawing generator certainly still is. Specifically, it is taking interconnection service. Holding the generator accountable for a share of the grid impacts that result from its reduced injections raises the question of the retiring generator that ceases all operation. Surely, we shouldn't hold this generator responsible for the grid impacts attendant to its departure? Recognizing that a retiring generator is no longer synchronous to the grid and injecting onto the grid, NEI's own logic answers this question: "no one can reasonably expect (the departing generator) to share costs as it is no longer taking (interconnection) service." The real point here is that FERC has jurisdiction over interconnection service and a responsibility to consider these novel questions contrary to assertions of Talen, Vistra and Constellation in the *Susquehanna Docket*.

[22] Declaration of David Weaver, PE, Susquehanna Docket.

Not only does this "shrug of the shoulders" response result in an unfair and unsatisfying rate outcome, but it demonstrates the limits in applying historical regulatory definitions, such as "transmission customer" to novel arrangements such as these. Both generator and load remain synchronous and thus physically connected to the grid and dependent on certain grid services. Whether this amounts to "taking transmission service" in the typical sense is a fair question, but not one we find offers much help to a rate regulator seeking a just and reasonable outcome. Again, we suggest a sounder approach to assigning costs in these cases is to start with causation, rather than assuming historical regulatory definitions when applied to novel arrangements will yield just and reasonable outcomes.[23]

D. ANALYZING OUTAGE RISKS FACING THE COLOCATING DATA CENTER

NEI argues it would be unfair to impose grid costs on colocation customers because they are taking a riskier, inferior service to customers that connect in front of the meter. In our April paper, we hypothesized that colocation at a nuclear station arguably offered the data center a more reliable level of service. Our reasoning was that taking out of the equation most of the transmission and distribution facility outage risk would mean greater supply availability for the customer. In places, NEI seems to agree: "The further the generation is from the load . . . the more at risk the system is to overloading existing transmission lines."[24]

NEI's assertions about supply risk to colocated loads conveniently focus on the average availability of a single supply source (a nuclear unit) as compared to availability from the diverse portfolio of supply sources that comprise the grid. Through this lens, NEI claims a grid customer enjoys supply certainty exceeding 99% as compared to 93% for a customer colocated at "well run nuclear resource." Note, however, that company disclosures (PSEG and Constellation) report nuclear availability in recent quarters that trend higher than DOE's number.

In any event, NEI largely ignores both the delivery risks assumed by grid customers as well as the specifics of the colocation arrangement. Given how colocation arrangements are described nuclear operators are offering a fixed megawatt quantity of supply to the inside-the-fence data center, not unit-specific supply.[25] In other words, a data center contracting for 500 MWs from a nuclear station with two 1000 MW units would enjoy priority service relative to grid customers. Under this kind of arrangement, any derate or outage will affect grid customers first and, in our illustration, only if the last 500 MWs of the 2000 MW station is lost, would the data center be curtailed.

What's also interesting about data centers is that, with notice, they have the potential to shift computational functions over their communication networks to back-up or alternate data centers, which may be located next door or on another continent. This flexibility (which admittedly is still developing) could serve to mitigate the interruption risk to the business associated with planned outages. Finally, consider that data centers, including those connected inside-the-fence, will have back-up supply sources, such as dedicated generation, firm fuel back-up contracts and possibly storage.

[23] *See, e.g., KN Energy, Inc. v. FERC*, 968 F.2d 1295, 1300 (D.C. Cir. 1992) ("it has been traditionally required that all approved rates reflect to some degree the costs actually caused by the customer who must pay them.").

[24] NEI Paper at 8.

[25] See Public Service Enterprise Group Incorporated (NYSE:PEG) Q1 2024 Earnings Call Transcript, PUBLIC SERVICE ENTERPRISE GROUP, (May 1, 2024) (discussing the value of a three-unit merchant nuclear to back up supply to a data center); see also, Q1 2024 Vistra Corp Earnings Call, VISTRA CORP, (May 8, 2024), ("The two unit sites have more desirability for what their redundancy can provide.").

Once (i) delivery risk (transmission or distribution outages), (ii) the multi-unit back up offered by most nuclear stations, (iii) the promise to flexibly manage planned outages by moving computational functions to other data centers, and (iv) back-up supply are taken into account, it's by no means clear that the on-site data center faces any greater risk of interruption than its traditionally connected counterpart. The apparent enthusiasm by data centers to go inside-the-fence suggests otherwise.

AVOIDING SO-CALLED NON-BYPASSABLE CHARGES THAT HAVE NO REAL NEXUS TO TAKING TRANSMISSION OR DISTRIBUTION SERVICE

We agree with NEI that while the interconnection of colocated load will (all things being equal) drive up energy and capacity prices in the wholesale market; this is a function of supply and demand and no different from load connecting in the traditional manner. We further agree that truly self-sufficient, inside-the-fence customers (such as the configuration where generation and load are "islanded" off the grid) are properly excused from actual "wires" charges – charges to pay for transmission service and distribution delivery.

We've already laid out above a case for holding colocation participants responsible for their share of any transmission system reinforcements resulting from their continued interconnection. This would put them on an equal footing with data centers connecting in the traditional manner. We also suggest regulatory principles of cost causation and equity serve as starting points to properly allocate to colocating parties those grid services described in the *Susquehanna Docket* on which their arrangements depend.

A wide set of other costs, however, are noticeably absent from NEI's discussion. Our April Paper identifies some (by no means all) wholesale billing line items passed through to retail customers and retail billing line items charged to retail customers.[26] We point to a selection of other billing line items attendant to the electric industry in its broadest sense where regulators should consider the equity of excusing inside-the-fence load.

Obvious examples would include any elements of electric rates which are, in substance, taxes funding programs and institutions essential for anyone consuming electricity. A conspicuous example would be the cost of programs funded by electric consumers to support the continued viability of nuclear plants, as described in Section 2 of this paper. It's also compelling to argue that colocated customers should pick up their share of non-bypassable charges to fund sustainability, conservation, energy justice and similar programs. Then there's the category of administrative charges collected in rates to fund the operations of FERC, NERC, the RTO and state public utility commissions - institutions, by the way, all presently grappling directly and indirectly with the question and consequences of colocation.

Reliability must run ("RMR") contracts present another interesting wrinkle. These contracts are administrative procurements made by the RTO outside of its market structures to retain generation that would otherwise retire. RMR contracts arise because the plants in question are still needed by

[26] A sample PJM bill contains upwards of 70 individual line items. Retail bills bucket and pass through most of these charges and then add distribution delivery charges, state surcharges and taxes to recover administrative costs and the costs to fund state legislatively created energy programs, like ZEC programs for example. See PJM *Monthly Billing Statement Example*.

the system operator to ensure transmission system reliability until new generation or transmission can be put in place.[27] These arrangements to keep generators online are costly and are allocated to network customers, and indeed may become more common in the years to come as thermal generators seek to retire in an environment where there is little headroom on the transmission system.

At least two RMR-related issues arise in the colocation context. The first is that NEI's position would have colocation customers avoid yet another class of wholesale costs borne by customers and necessary to ensure system reliability. The second is that colocation arrangements themselves will very likely exacerbate the frequency and magnitude of future RMR expense, all while avoiding the associated costs.

NEI's position is that these are problems for others, and not the colocating data center. The "lengthy delays" and "unworkable timelines" that NEI sees afflicting existing RTO planning tools and "standard utility models" is NEI's way of saying certain customers can jump the queue to take service from an existing resource, and in so doing affect the transmission system without full planning considerations. Removing thousands of megawatts of existing plant to meet inside-the-fence demand will of course compound the RTO's infrastructure woes and heighten its dependence on remaining generation. As other remaining fossil plants seek to retire, colocation will make future RMRs, and their associated customer costs, more likely. This being the case, shouldn't a co-locating load at least contribute to remediating problems it is aggravating?

In considering non-bypassable charges, RMR charges and the like, it's clear electricity consumers face many charges that have no nexus (or a weak nexus at best) to the actual taking of transmission service or receiving service from the local utility.[28] Identifying billing line items that are fixed costs socialized in rates or identified in ancillary adders is a good starting point in finding these charges. We remain convinced, as we were in April, that the economic advantage that comes from evading rates is a powerful force behind colocation arrangements.

POLICYMAKERS SHOULD SCRATCH BENEATH-THE-SURFACE CLAIMS THAT "SPEED TO MARKET" IS DRIVING COLOCATION

In April we said, "the trending towards colocation tells us that it's quicker and easier to build a data campus with inside-the-fence interconnection facilities to existing generation, than it is to build the new generation and transmission needed to support the data center if it were to interconnect in the more traditional manner." On this point we agree; with NEI there's little question that "speed to market" – finding the quickest way to get these hyperscale data centers powered – encourages colocation.

[27] Recent examples in PJM include the effort by PJM to negotiate RMR contracts to retain the Wagner and Brandon Shores plants that their owner, Talen Energy, has decided to retire; Ethan Howland, *Replacing a Talen Energy coal-fired power plant with battery storage is infeasible*: PJM, UTILITY DIVE (May 6, 2024). Talen, of course, is also the party that plans to remove up to 960 MW from the grid at the Susquehanna nuclear facility to support a data center campus now owned by Amazon; *Amazon buys nuclear-powered data center from Talen, American Nuclear Society*; NUCLEAR NEWSWIRE, (Mar. 7, 2024).

[28] NEI won't take up whether these types of charges should (as a matter of fairness) be charged to data center colocation arrangements. Instead, it's happy to accept that embedded regulatory, rate and institutional structures are slow to change and just don't provide a ready mechanism to assign these costs to novel configurations like data center colocations.

It's important, however, to unpack this driver and to examine consequences.[29]

We've described inside-the-fence interconnection as lacking in transparency and essentially unregulated. It's the avoidance of this kind of friction (regulatory oversight, requirements to wait in a queue, community input and opposition, and confronting the many operational and cost implications we've identified) that in short form is meant by "speed to market."

Data centers are plainly critical to our world today and to future innovation and economic expansion. That doesn't mean everyone likes them or that the public is prepared to subsidize their energy-related costs and assume the resource adequacy and transmission burdens they create without having debate over pros and cons. After all, having adequate generation and transmission for grid customers is equally critical and necessary to future innovation and economic expansion.

A data center connecting in the traditional manner allows for a debate that colocating data centers would like to avoid. Some local governments have outright banned the development of hyperscale data centers. A more nuanced approach is evidenced in a recent paper *Loudoun County Virginia: Data Center Capital of the World -"A Strategy for a Changing Paradigm"* published last month by Mike Turner, a current member of the Loudoun County (Virginia) Board of Supervisors. Mr. Turner identifies the evolving challenges facing data center interconnection, including: community opposition, generation/carbon consequence, new transmission needs and siting difficulties involving conservation and historic areas. He proposes several possible solutions, including a model that would have data centers developed alongside new purpose-built on-site and micro-grid generation. What he doesn't propose is cannibalizing Virginia's existing nuclear generation, allowing data centers to connect in a way that avoids dealing with the many challenges he describes, and leaving this infrastructure development and siting mess for the rest of Virginia to solve.

Policymakers must understand that "speed to market" doesn't mean the intractable supply/demand and infrastructure consequences inherent in large loads connecting at scale go away. They are just pushed back in the colocated model to the grid, which is to say pushed to all other electricity consumers.

CONCLUSION

Advocates, including NEI, claim colocation is driven by a need for:

- highly available supply
- zero emission supply, and,
- an approach that allows "speed to market."

On availability, one moment NEI extolls the high-capacity factor of nuclear generation and how well it matches with inside-the-fence data centers and in the next claims grid-connected data centers enjoy better availability and face less curtailment risk. The statistics suggest availability in each configuration is probably a push and regardless, not sufficiently divergent to really drive the decision.

[29] It's also important not to overstate its influence. After all, the same inside-the-fence substation the NEI Paper depicts in a diagram on page 3 could instead be built right outside the nuclear plant but not dependent on delivery over miles of transmission lines.

We didn't respond to claims that a data center/nuclear pairing is "symbiotic. . . for anyone with an interest in the promises of a digital age and a sustainable future."[30] However, at this point, it should be crystal clear to anyone watching that colocation doesn't advance societal goals towards zero emission sustainability; it simply takes zero emissions supply from others. We're talking after all about an existing zero emission source that isn't going anywhere. Once a data center shows up, bringing with it its own new source of zero-emission supply, we'll be the first to applaud them as "sustainable corporate citizen of the year." As we called it in April, the claim of sustainability in this context is purely a shell game.

"Speed to market" no doubt motivates colocation, particularly for the data center. But it seems to have more to do with avoiding difficult questions and punting inevitable infrastructure resource challenges to others. Although the processes and institutional hurdles involved in bringing new generation and transmission online are messy, slow, and could be improved, they're transparent and allow for a full consideration of implications. More importantly, they're the rules of the game for everyone and every industry electrifying, onshoring their manufacturing or otherwise pressing for more power. Treating data centers equitably alongside others isn't discriminatory, it's the opposite.

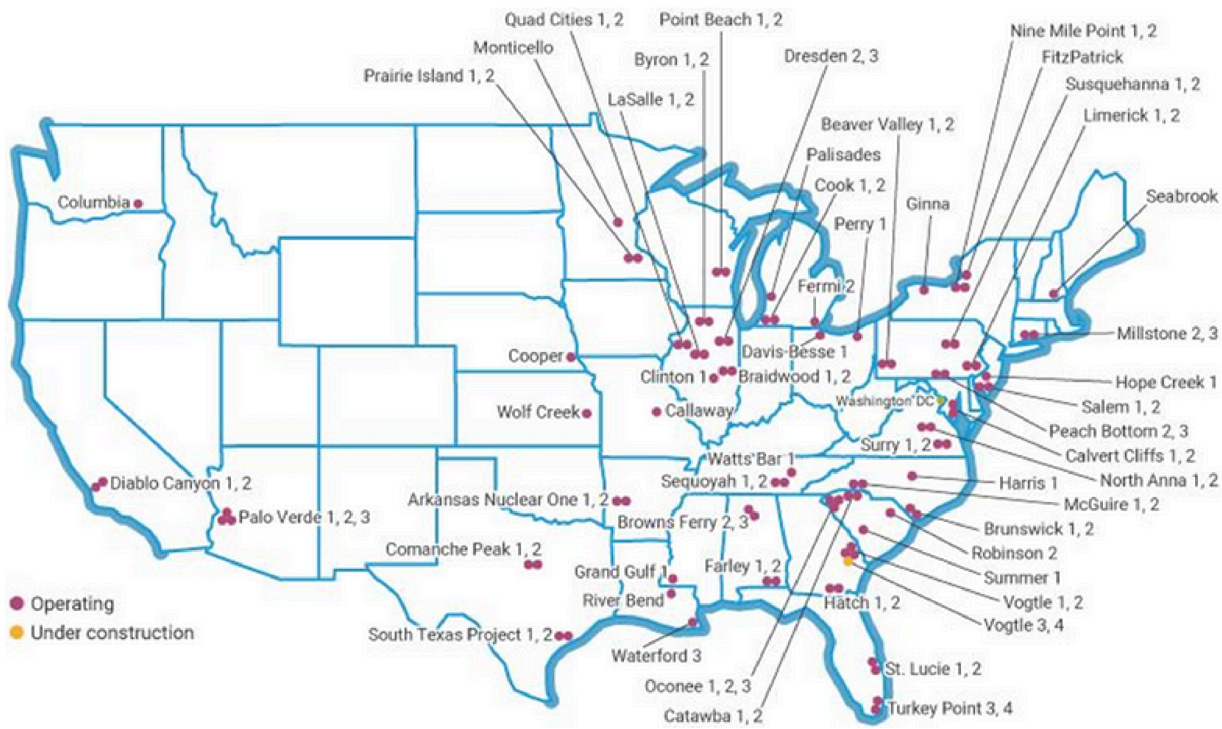
What's unspoken and inextricably ties together the three-bullet list above is economics. At the end of the day, we suspect economics is the driving force behind colocation. These economic motivations likely overlap, but are not identical, for the merchant nuclear operator and their colocated data centers. Our April paper hypothesized that both parties would benefit from a colocated load PPA - one that provides a higher-price (and less volatile) revenue stream to the nuclear plant as compared to wholesale RTO revenues, while also offering power supply costs for the data center at a discount to industrial retail rates that it would pay if grid-connected. Indeed, it is hard to imagine these conditions don't exist given the willingness of merchant nuclear to supply, and data centers to take, inside-the-fence.

However, focusing on the economic incentives tied up in electric rate considerations almost certainly neglects other material, but more subtle, economic consequences of colocation. Avoiding the delays – the numerous drivers of which have been described above – required to connect in front of the meter is an irresistible value proposition for data centers. These companies, many focused on AI development, are engaged in intense corporate competition where the ability to bring on more processing power, in more places, more quickly, is critical to gaining and maintaining a competitive advantage in a fast-moving technology space. Delay not only costs money in the direct sense, but the value of speed to market likely has broader, more significant, more enduring competitive implications to data center customers. Thus, both directly and indirectly, colocation is about money, and all of us should think critically and thoughtfully about who benefits and who pays.

[30] *NEI Paper* at 16.

APPENDIX A

Nuclear Plant Locations in the United States [31]



[31] Nuclear Power in the USA, WORLD NUCLEAR ASSOCIATION, https://world-nuclear.org/information-library/country-profiles/countries-t-z/usa-nuclear-power. (Vogtle Units 3 and 4 have since become operational).