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Sherri L. Golden
Secretary of the Board
44 South Clinton Avenue, 1st Floor
Trenton, NJ 08609

December 18th, 2024

Dear Secretary Golden,

Solar Landscape respectfully offers comments to Docket No. QO22080540, regarding the updated New Jersey Energy Storage Incentive Program ("NJ SIP") Straw Proposal. Solar Landscape is a vertically integrated renewable energy company headquartered in Asbury Park, New Jersey. Specializing in front-of-the-meter distributed renewable energy on commercial and industrial properties, we develop, design, construct, own, and operate solar and energy storage projects. Having been awarded over 400 MWs of community solar through both the pilot and permanent community solar programs, we are proud to own and operate the nation's largest portfolio of community solar projects primarily serving low/moderate income ("LMI") households, the majority of which are based here in New Jersey.

Solar Landscape applauds the Board of Public Utilities ("Board") and the Murphy Administration for their commitment to an affordable clean energy future, and their goal to generate 100% of New Jersey's electricity from clean energy resources by 2035. As a national leader in solar energy deployment, New Jersey now has the opportunity to become a leader in energy storage. A robust energy storage program will be needed to support rapidly integrating renewable energy resources into the grid and to meet growing electricity demand. With over 200 community solar projects located near load centers throughout New Jersey, Solar Landscape sees tremendous opportunity to deploy energy storage alongside these facilities, providing the benefits of energy storage at scale near load centers where it is needed most.

To accelerate the deployment of energy storage and meet the legislative mandate in the Clean Energy Act to achieve 2,000 MWs of installed energy storage by 2030, **Solar Landscape recommends that the Board prioritize the deployment of Front-of-the-Meter (FTM) Distributed Generation (DG) energy storage** and offers recommended modifications to the SIP to unlock this market segment in a cost-effective manner. While FTM DG energy storage is theoretically eligible to participate in the NJ SIP as drafted in the straw proposal, it is a market segment that presents both unique opportunities and unique challenges as compared to the utility scale and Behind-the-Meter (BTM) market segments that are the focus of the current proposal. **Prioritizing front-of-the-meter distributed generation (FTM DG) energy storage enables the Board to unlock a rapidly scalable, cost-efficient market that delivers targeted benefits. This approach ensures optimized resource deployment and advances the strategic goals of grid resilience and sustainability.**

In our comments, presented below, we offer an overview of the benefits of front-of-the-meter distributed energy storage, recommendations for the creation of a successful program for front-of-the-meter distributed projects, feedback on proposed rules and program requirements, and responses to the questions posed to stakeholders by the Board. Our comments are supported by a technical study recently completed by the Brattle Group ("Brattle"), which is cited throughout these comments to provide quantitative support for the recommendations herein and is attached for the Board's review.

We greatly appreciate the opportunity to provide feedback on the NJ SIP and look forward to collaborating with the Board on a successful rollout of the Program in 2025 and beyond. Should there be clarifications that we can offer or additional information that we can provide, we are happy to be a resource.

Sincerely,

Mark Schottinger
President & Chief Legal Officer
Solar Landscape
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Enclosure: The Brattle Group, "Maximizing Value from New Jersey's Storage Incentive Program," December 2024

Executive Summary

Front-of-the-Meter (FTM) distributed energy storage can provide the same or greater benefits as Behind-the-meter (BTM) distributed storage, including reductions in transmission and distribution costs and investments, reduced energy and capacity costs, peak system load reduction, enhanced reliability, and reduced emissions; and importantly, FTM distributed storage is substantially more scalable and expedient than BTM distributed storage. Specifically, FTM energy storage is rapidly scalable with accelerated deployment timelines caused by quicker interconnection and permitting reviews, shorter procurement and construction schedules, and fewer hurdles from the perspective of real estate owners compared to BTM. In short, co-locating FTM distributed storage alongside New Jersey's hundreds of FTM distributed solar projects (i.e., community solar projects) is the most expedient and cost-effective path to hitting New Jersey's storage goals.

Accordingly, it is critical to modify the proposed Distributed program to allow FTM distribution connected energy storage projects to participate and to be compensated for the value that they provide to the Electric Distribution Companies (EDCs) and to New Jersey ratepayers. Supported by a recent report from the Brattle Group, which is attached alongside these comments, the below recommendations would ensure that the NJ SIP creates a successful and robust energy storage industry in New Jersey.

Feedback on the 2024 Straw Proposal

I. Benefits of Front-of-the-Meter (FTM) Distributed Energy Storage

Energy storage that is installed FTM on the distribution system benefits from shorter interconnection and permitting timelines compared to projects connected to the transmission[1] system and simpler, more scalable contracting mechanisms compared to BTM distributed projects while providing equivalent or greater benefits to EDCs and New Jersey ratepayers. Transmission

[1] The Brattle Group, "Maximizing Value from New Jersey's Storage Incentive Program," December 2024.

connected projects will continue to face long interconnection timelines and significant permitting obstacles that will see few projects able to move forward until 2028 or later, jeopardizing the potential to achieve the 2030 deployment target. Similarly, BTM projects will struggle to reach scale as each project is unique, requiring project specific designs directly targeting local loads and lengthy contract negotiations requiring counterparties to be educated on the value and opportunity of energy storage on an individual basis. By prioritizing FTM distributed storage, New Jersey will see immediate opportunities for rapid, cost-effective deployments of energy storage, with construction starting at scale as soon as 2026 across hundreds of ideally dispersed locations throughout the state.

An analysis from the Brattle Group completed this month determined that FTM energy storage connected to the distribution system is capable of providing the same or greater value as BTM energy storage systems[2]. By interconnecting on the distribution system, these assets are able to operate in a manner that produces value to the operation, maintenance, and long-term system planning for both the distribution and transmission systems. As is well documented in the Board's review of the capabilities of energy storage systems, the technology broadly supports grid reliability and resiliency and lowers costs for ratepayers. FTM storage is flexible and scalable. Projects can be sized to meet local needs, whether that be a targeted feeder or substation needing load relief, programmatic improvements to solar hosting capacity through managed operation of energy storage, or fine-tuning sizing to meet existing available hosting capacity. The value of energy storage is not limited to the cost savings and emissions reductions benefits solely from a single project but also comes from accelerating the addition of renewables onto the distribution system in areas of highest need (i.e., FTM distributed storage would open capacity for more FTM solar projects). Energy storage installed FTM on the distribution system can also be deployed more rapidly than any other market segment. At Solar Landscape, we are targeting deploying energy storage across our more than 200 existing commercial and industrial sites in New Jersey that have been awarded community solar projects. By leveraging existing infrastructure and deploying projects within the built environment, projects will be sited close to load and areas of grid need and will have shorter development cycles than any other class of energy storage projects.

Siting FTM distributed storage adjacent to FTM distributed solar presents the opportunity to align clean, renewable generation with peak demand, converting an intermittent resource to one that is optimized to address grid needs. By leveraging existing solar infrastructure, projects can be deployed more rapidly and more cost effectively to serve the needs of the electric system. Strategic deployment of storage alongside solar supports New Jersey's clean energy transition goals while leveraging grid modernization advancements, such as DERMS, to maximize ratepayer value.

FTM storage can be operated to prioritize grid needs during peak periods, maximizing operational, environmental and financial impacts[3]. This is opposed to BTM systems which are constrained by on-site demand, limiting their ability to serve grid needs while balancing the needs of the individual load customer. By flexibly discharging during coincidental peak periods, FTM systems optimize ratepayer value, strengthen grid resilience, and reduce infrastructure strain. This strategic deployment aligns with the broader vision of a clean, equitable energy future and maximizes the value received by NJ EDCs and ratepayers in return for incentive spend determined by the Board.

[2] Brattle, P. 3
[3] Brattle, P. 6

II. Recommendations

a. **We propose that the Board should modify the Distributed program to include FTM energy storage connected to the distribution system:** Expanding the Distributed program to allow for FTM energy storage connected to the distribution grid can unlock significant benefits for ratepayers, utilities, and the broader energy system. Aligning the incentives and addressing technical considerations will ensure the success of these projects.

   i. *Incentive Alignment:* While behind the meter (BTM) projects are proposed to benefit from upfront incentives, performance payments and on-bill savings, FTM distributed storage systems providing comparable or greater value currently do not have a pathway in the latest version of the SIP to receive revenue for the value they provide. The attached Brattle report outlines in detail the value of FTM distributed storage; and the SIP should be updated accordingly to compensate FTM distributed storage to incentivize this value creation. For example: FTM distributed storage can reduce system peaks (rather than only reducing building-specific demand in the case of BTM storage); and siting FTM distributed storage alongside existing community solar projects creates an unparallelled path for New Jersey to have a large-scale storage program quickly (i.e., by taking advantage of the hundreds of community solar sites that already have FTM interconnections, which are sited on properties of real estate companies excited to host storage projects)[4].

   ii. *Establishing a Distributed Storage MW Target and Performance Payment Uniformity:* To ensure a robust and predictable market for distributed storage, the BPU should establish a distinct MW target for FTM storage systems. We recommend establishing a goal of deploying 1,000 MW / 4,000 MWh of distributed FTM energy storage in the SIP. With 738 MW of community solar projects awarded to date across primarily commercial and industrial properties that would be ideal hosts for co-locating FTM distributed storage, a strong target of 1,000 MW provides ample opportunity to co-locate storage with existing and new projects. Taking advantage of this existing 738 MW of infrastructure is the most cost effective and expedient way to deploy energy storage through the SIP, with deployment at scale possible within the next two years. In the interest of achieving New Jersey's ambitious energy goals, and to capitalize on widespread willingness of commercial/industrial real estate companies to host these projects, the Board should launch the program no later than Q4 2025. Should additional time be needed to fully develop the performance incentive, a pilot program should be launched in 2025, followed by open market blocks in 2026. This staggered approach allows the EDCs time to develop a long-term program while allowing markets to open more quickly. The Board should also look to ensure program uniformity for the EDCs in the design of the performance incentives. Adding complexity between utilities in program design will slow market development and will complicate project financing. States such as Massachusetts in its SMART, Clean Peak and Connected Solutions programs, and New York in VDER, NY Sun, and the Retail Storage Incentive programs have demonstrated the value in such standardization. A well-defined framework for

[4] Brattle P.28

incentives and procurement provides market participants with the certainty needed to invest in and develop FTM storage projects[5].

b. **Create a wholesale distribution tariff to provide access to variable energy pricing and ensure equitable treatment for costs of charging energy storage systems.** Seen in a number of existing energy storage markets, this approach would create a tariff that provides fair treatment for energy storage systems in charging costs and in revenue opportunities. It would allow front-of-the-meter (FTM) storage systems to compete fairly with behind-the-meter (BTM) systems, which currently benefit from more robust revenue opportunities such as demand charge reductions and capacity payments, despite such BTM systems providing lesser or equal value to the grid and ratepayers when compared to FTM distributed storage. By enabling FTM storage systems to access similar incentives and to avoid prohibitive demand charges, the SIP would facilitate faster deployment, improve grid resilience, and achieve state goals for clean energy and emissions reduction. Equitable compensation for FTM distributed storage would also support the deployment of cost-effective energy solutions that address growing energy demand while attracting private investment (e.g., by creating additional capacity for community solar projects). Tariff treatment and revenue access are both intertwined. Each should consider the value provided by energy storage to the local and regional electric system and how storage, when charging from the grid, is differentiated from a traditional load customer[6].

c. **Future Grid Services Contracts / DERMS**: By deploying FTM distributed storage at scale on the distribution system, New Jersey will unlock a very-near-future opportunity to leverage storage for targeted services meeting the needs of the electric system. For example, through implementation of a Distributed Energy Resource Management System (DERMS), EDCs could call on a network of hundreds of FTM distributed storage projects spread throughout high load zones in New Jersey to manage rising peaks, thus making such battery network a Non-Wires Alternative (NWA) that would defer costly upgrades (e.g., new transformers or conductors) and bring extensive value to ratepayers[7]. With electrification of heating and transportation driving unprecedented load growth and rate surges, implementation of this solution is urgent. And notably, this DERMS NWA opportunity is uniquely available via FTM distributed storage, because transmission connected ESDs lack the ability to support distribution infrastructure directly, and BTM batteries are limited in their ability to reliably serve as a utility asset. New Jersey can look to states like New York and California which showcase the potential for this solution. In sum, expanding FTM distributed battery capacity immediately will give New Jersey utilities greater flexibility in the very near future to contract for direct load control and to use these assets as fully dispatchable resources integrated into utility infrastructure, bringing substantial value to ratepayers.

d. **Distributed Program Incentive Value**: Current proposed incentive levels are too low to meet the Board's goal of promoting battery storage deployment, particularly for FTM distributed resources. Costs to construct FTM DG projects are expected to range between $450-550/kWh, prior to accounting for interconnection and permitting costs as well as long-term operating costs for the projects. In order to compensate FTM projects for the value that they provide to

[5] Brattle, P. 17

[6] Brattle, P. 4

[7] Brattle, P. 22

the distribution and transmission system, the NPV for a 20-year project life of the combined upfront and performance-based incentive would need to be approximately $500/kWh. This amount compares favorably to the benefits provided to the electric system and NJ ratepayers. The Connected Solutions program in MA, which carries a $200/kW-year performance-based incentive, equates to over $425/kWh on a NPV basis over a 20-year project life. The Retail Storage Incentive program from NYSERDA features an upfront incentive that currently is between $125-175/kWh, depending on location; but notably, this is for a mature market that has been active for over 5 years. In both cases, these individual programs are not enough to support projects on their own, with projects in MA also relying upon Clean Peak Standard and other revenue streams and NY projects relying on VDER. The length of the performance payment term and the degree to which the rate is fixed and contracted will also determine the level of payment needed to ensure project viability[8].

e. **Overburdened Communities Adder Eligibility**: FTM distributed Storage Systems uniquely promote equity and environmental justice while accelerating the energy transition by directly displacing the need for fossil fueled peaking generation and enabling further integration of renewables. Incentives for projects located in overburdened communities can address historical inequities, mitigate environmental harms, and deliver substantial economic and public health benefits by reducing greenhouse gas emissions. Due to this, the Board should expand program eligibility to include projects located in these communities, with a second tier of incentive for these projects separate from the incentive for storage devices that directly serve off takers located in these communities. Additionally, for projects co-located with community solar supporting LMI households, there is the potential for further incentives tied to providing On-Bill Credit Adders to community solar subscribers to enhance savings and promote equity.

f. **PJM Queue Reforms**: With a transition to "first ready, first served" model and clustering studies aimed to accelerate the IX process, there will be continued delays which will disadvantage transmission connected storage projects. With a backlog of 37 GWs[9] in New Jersey's transmission-level queue, many transmission-connected storage projects face year-long delays, limiting their ability to contribute to immediate grid needs. FTM distributed storage can bypass these issues by leveraging existing infrastructure, enabling faster deployment to meet looming demand increases[10].

[8] Brattle, P. 17

[9] Brattle, P. 24

[10] Brattle, P. 28

III. Responses to Questions posed by the Board

a. Grid Supply

1. *Should a performance incentive based on net avoided emissions be proposed only if PJM or another entity produces a day-ahead, marginal emissions signal?*

   Solar Landscape defers to the feedback offered by SEIA on this question on behalf of the industry.

2. *In the absence of a day-ahead emissions signal, should the SIP institute another form of performance incentive for Grid Supply projects?*

   The creation of a dedicated program for front-of-the-meter, distribution connected projects that contemplates the full range of grid services and environmental benefits that energy storage can provide when tied to the distribution system should be a priority to meet the goals of the SIP. This market segment is the most scalable and expedient, and thus, the most capable of meeting the 2030 goals of the program.

3. *What other changes or alternatives would you propose to the GHG Performance Incentive?*

   Solar Landscape defers to the feedback offered by SEIA on this question on behalf of the industry.

4. *How can the Board mitigate the risk of Grid Supply projects not operating/performing after receiving upfront incentives?*
   a. *Are the reporting requirements proposed herein sufficient?*
   b. *Should there be a claw back clause to recover fixed incentive payments from energy storage systems that cease operating shortly after coming online?*
   c. *What should be the metric of success for a specific project be (e.g., discharging power during peak demand periods) for Grid Supply energy storage systems? In other words, what metrics should the Board consider when evaluating operation?*

   Solar Landscape defers to the feedback offered by SEIA on this question on behalf of the industry.

5. *Should Grid Supply energy storage projects that replace or demonstrably reduce the runtime of fossil-based peaker plants in overburdened communities be evaluated solely on price or receive additional weight or a preference in competitive solicitations? If additional weight or preference is warranted, please specify how.*

   There should be locational value ascribed to projects within OBCs, whether directly or indirectly reducing the runtime and emissions produced by traditional generation and traditional peaking units. Integrating projects within the distribution system reduces needs for traditional generation to serve load during peak periods and boosts hosting capacity for expanding renewables deployment. Locating these projects within OBCs

prioritizes locating clean energy in communities that have traditionally been most impacted by emissions from the power sector.

b. Distributed

6. The distributed incentive level breakdown provides varying incentive levels for different sized energy storage systems to account for cost differences. Are the proposed incentive levels appropriate?

The proposed incentives for distributed systems fall below expectations for costs to construct and operate BTM projects. If the 40% of installed cost metric were held, expectations for the NPV of upfront and performance-based incentives for large projects would be in the range of $215-240/kWh, though the 40% figure may not be an appropriate target. The incentives as they stand fall short in addressing disparities between BTM and FTM storage if the program is extended to FTM projects. FTM systems face significant barriers, including revenue shortfalls of $45-$62/kWh annually[11] compared to BTM systems. Additionally, larger FTM storage must compete with grid-supply storage projects that have greater cost efficiencies, limiting their ability to secure program incentives despite their benefits to the electric system. To maximize the value of distributed storage, incentives must be aligned with the value provided by FTM systems while mitigating economic and operational disadvantages. The value of these projects would exceed the cost according to the attached report from Brattle. Additional context on recommendations for incentive levels can be found in Section II of this document.

7. Are the incentive adders for OBCs too high, too low, or should the proposed OBC incentive otherwise be modified?

The OBC adders should be updated to include two tiers of incentives, one being a lower level of incentives for projects that are located within overburdened communities that are not directly serving load for entities in those areas. Distributed storage can provide benefits such as grid resiliency, providing energy to offset peak demand, and emissions reductions in these areas, where residents are more likely to suffer from associated health detriments[12].

8. How far along are the EDCs in implementing the technology needed to issue calls for the performance incentive portion of the SIP? Will this affect the design of the performance incentive?

The ongoing Grid Modernization proceedings do not include developer participation, so it is difficult to say where the utilities stand in implementing new technologies. We encourage and would be happy to participate in these proceedings.

We encourage the Board to consider accelerating the timeline for the rollout of the Distributed program to allow for the maturation of an energy storage market in New Jersey. There are administrative pathways to issue calls for the performance incentives that can be taken in advance of more sophisticated technologies. Ultimately, future

[11] Brattle, P. 17
[12] Brattle, P. 28

value maximization to ratepayers will depend upon technology improvements, but that should not hold up the realization of positive value in 2025 and 2026 from a prompt program rollout[13].

9. *Should the Board require EDCs to implement a designated distributed energy resources management system (DERMS) to effectively manage and dispatch resources across their systems*

The program should begin as soon as EDCs can implement a basic administrative "call mechanism," rather than waiting for a fully developed DERMS system. This could accelerate the timeline ahead of the current 2026 target. New Jersey lags behind other states in energy storage deployment, which is also delaying progress on related energy policies. Future value maximization will require the rollout of DERMS to unlock feeder and substation level benefits and allow infrastructure deferments through planned NWA mechanisms[14]. We recommend that the BPU require EDCs to implement DERMS by the end of 2026.

c. Other

10. *Do any aspects of this program need to be modified to address NJ Legislature Bills S225/A4893, should the bill be signed into law?*

We offer the following recommendations as it pertains to the proposed legislation before it reaches Governor Murphy's desk for signature,

- Creation of a dedicated program for FTM distribution connected storage devices, with a carveout for storage projects 500kW to 10 MW.
- Allocate funding for this through the societal benefits fund
- Move up timelines outlined in legislation to reflect the completion of the straw proposal
- Allow front of the meter projects to be compensated the same as other distributed level projects
- Direct the EDCs to develop specialized rates for storage devices charging from the grid, specifically ensuring there are no demand charges, incorporating dynamic price signaling, and excluding any non-bypassable charges.
- Adjust incentives to be distributed over the life of the system, in order to take advantage of federal tax incentives
- Adjust commercial operation requirements to account for interconnection, permitting, and construction timelines.
- Clear direction to the EDCs to allow for third party aggregation for distributed connected front of the meter storage devices, and for consistent program design for model tariffs to all the EDCs to ensure uniformity and fewer areas of differentiation between the different services areas, to provide more clarity for project financing and development.

[13] Brattle, P. 7
[14] Brattle, P. 21

Maximizing Value from New Jersey's Storage Incentive Program

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12/16/2024

Brattle

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4. Timing Analysis

Summary

Front-of-the-meter (FTM)[1] storage presents a high value opportunity for New Jersey ratepayers because it can be deployed rapidly and leverage existing infrastructure to unlock its full value

- Solar Landscape retained The Brattle Group (Brattle) to evaluate the treatment of FTM storage under New Jersey's proposed Storage Incentive Program (SIP)
- Our assessment finds that FTM distributed storage can provide the same or greater benefits as BTM distributed storage, but would only be compensated with **20% to 33%** the revenue
  - FTM storage can be deployed ***quickly***, as developers can use existing interconnection rights to connect to the distribution system without requiring a large customer to operate it behind their meter
  - In the near-term, distribution-connected FTM storage can provide ***the same benefits*** as BTM storage, responding to price signals to lower energy costs and decrease system peaks - participation in the distribution level performance incentive program will ensure that system benefits are maximized for ratepayers
  - In the long-run, FTM storage has the potential to provide ***additional value*** since it could be dispatched by the utility to maximize ratepayer benefits, whereas BTM systems have to account for onsite loads and balance customer requirements
- By overlooking opportunities for FTM storage, the 2024 Straw misses out on an important technology for helping New Jersey achieve its policy goals

1. *Front-of-the-meter storage describes batteries that are connected directly to the distribution system and not co-located with load. In some cases, FTM storage may be co-located with existing community solar, leveraging existing infrastructure and interconnection rights.*

Recommendations

To create a level playing field and ensure distribution connected storage can be deployed efficiently and realize its full potential we recommend:

1: SIP provides equivalent compensation FTM resources relative to BTM resources through a FTM performance payment

- The performance payment is needed to compensate FTM batteries for services that they can provide to the wholesale grid but are unable to realize at this time: **capacity revenues / value for avoided transmission / demand charge reductions and performance incentives**

2: SIP retains an option for utilities to dispatch FTM resources so that they can be utilized in a way that maximizes distribution value

- Utilities may still need to deploy Distributed Energy Resource Management Systems (DERMS) in order to provide the granular dispatch signals to maximize distribution connected storage, but once these systems are in place the program should facilitate utility dispatch to realize this additional value

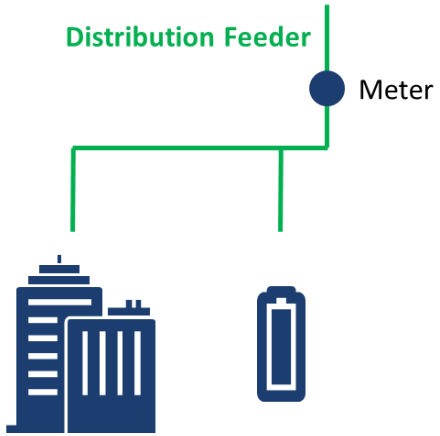
3: BPU work with EDCs to develop a Tariff that would ensure distribution connected batteries are eligible for incentives available to BTM batteries and not subject to demand charges

NJ Storage Incentive Program (SIP) Incentive Design

The proposal categorizes distributed FTM storage as "Grid-Supply" resources, limiting their ability to access several key revenue opportunities

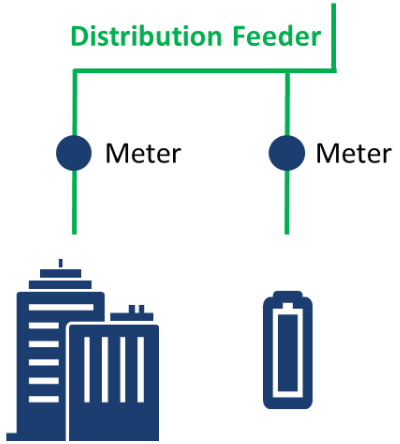
- The proposed incentive framework would allow customers with *BTM* batteries to stack multiple revenue steams, incentivizing private investment in distributed battery storage
  - In addition to receiving direct programmatic incentives and being able to use their batteries for energy arbitrage, BTM customers can also use their battery to reduce their generation capacity obligation and lower their monthly demand charge
- By contrast, FTM customers only receive the fixed portion of the incentive, and have limited ability to receive payments for providing capacity value to PJM

Behind-the-Meter Storage



- ✓ Demand Charge Reduction
- ✓ Performance Based Incentive
- ✓ Reduced Capacity Charge
- ✓ Reduced Transmission Charge
- ✓ Energy Arbitrage
- ✓ Fixed Incentive

Front-of-the-Meter Storage



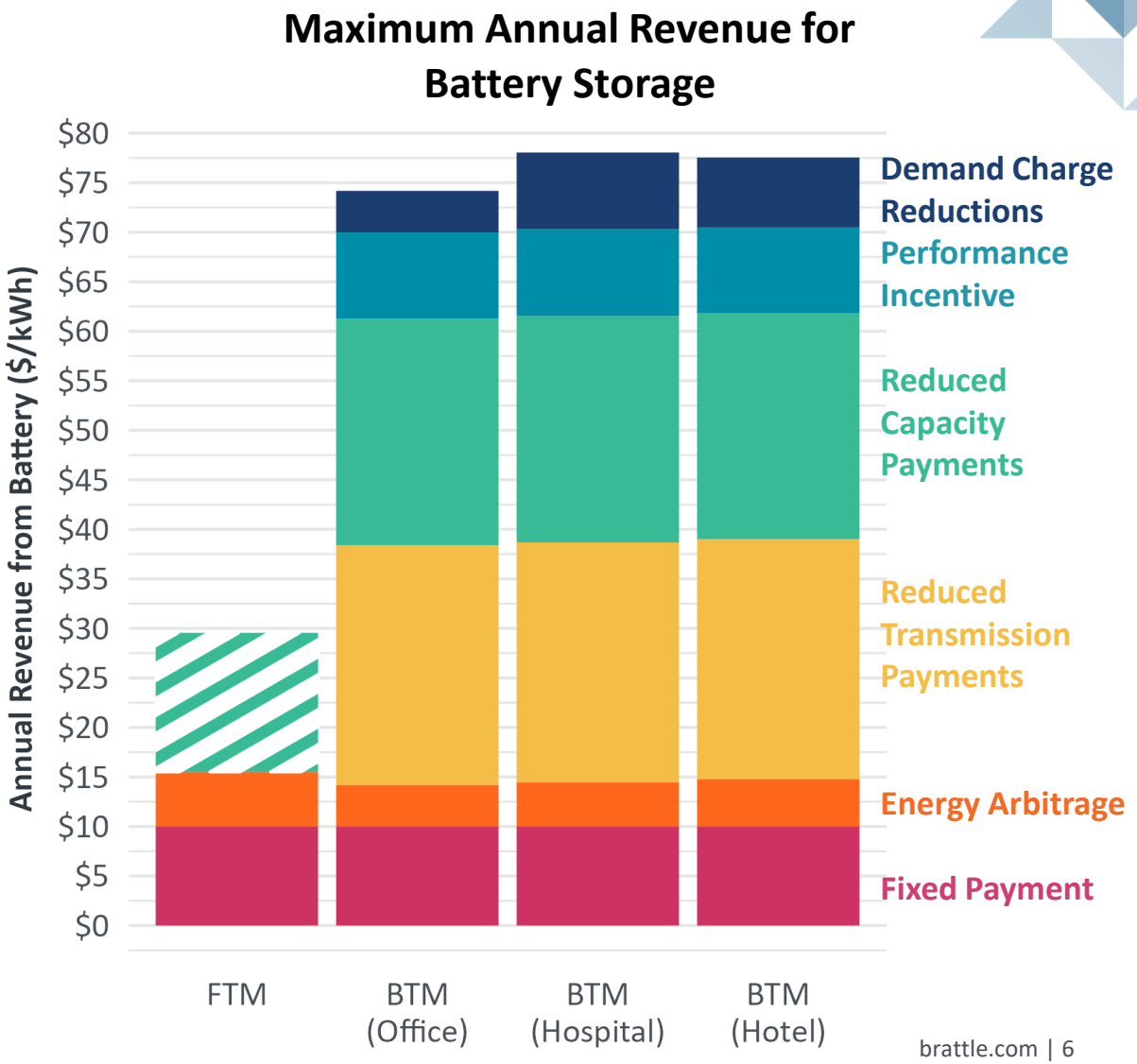
- ✗ Demand Charge Reduction
- ✗ Performance Based Incentive
- ? Reduced Capacity Charge
- ✗ Reduced Transmission Charge
- ✓ Energy Arbitrage
- ✓ Fixed Incentive

Compensation Disparity

Despite providing equivalent grid value, FTM will be severely disadvantaged relative to BTM storage based on the current SIP proposal

- We estimate that FTM storage faces an annual revenue shortfall of $45-$62 per-kWh (57-80%) relative to BTM storage, depending on the FTM battery's ability to earn revenue through PJM's capacity market.
- This will likely make it prohibitively expensive for private developers to build FTM storage that could be used to provide valuable energy services to New Jersey ratepayers.
- Furthermore, by not providing FTM storage with an incentive to inject power during distribution system peaks, New Jersey EDCs will not extract the maximum value from these assets.

Note: BTM storage can realize value by reducing a customer's capacity payments under PJM's 5CP pricing. FTM Storage is only able to realize capacity value by participating in PJM's market as part of an aggregation, creating an additional hurdle. In addition, PJM's interconnection queue issues mean distributed storage resources face many years of delays in order to connect to the grid.



Expected Benefits

Effective deployment of distributed connected storage would provide many benefits to the New Jersey grid and broader economy

Achieve State Policy Goals	• New Jersey has a statutory mandate to achieve 2,000 MW of installed energy storage capacity by 2030. Appropriately incenting FTM storage deployment could fast track storage development by over 5 years compared to storage at the wholesale level given interconnection delays.
Reduced Emissions	• Providing the right incentives to distribution connected storage has the potential to decrease emissions by over 3 million metric tons of CO2 equivalent annually.
Reliability	• The rapid deployment of distribution connected storage means it is one of the few resources to meet rapidly growing demand.
Support Clean Energy Economy Goals	• Provide additional resiliency and reliability to attract new investment in growing sectors of the economy such as data centres.

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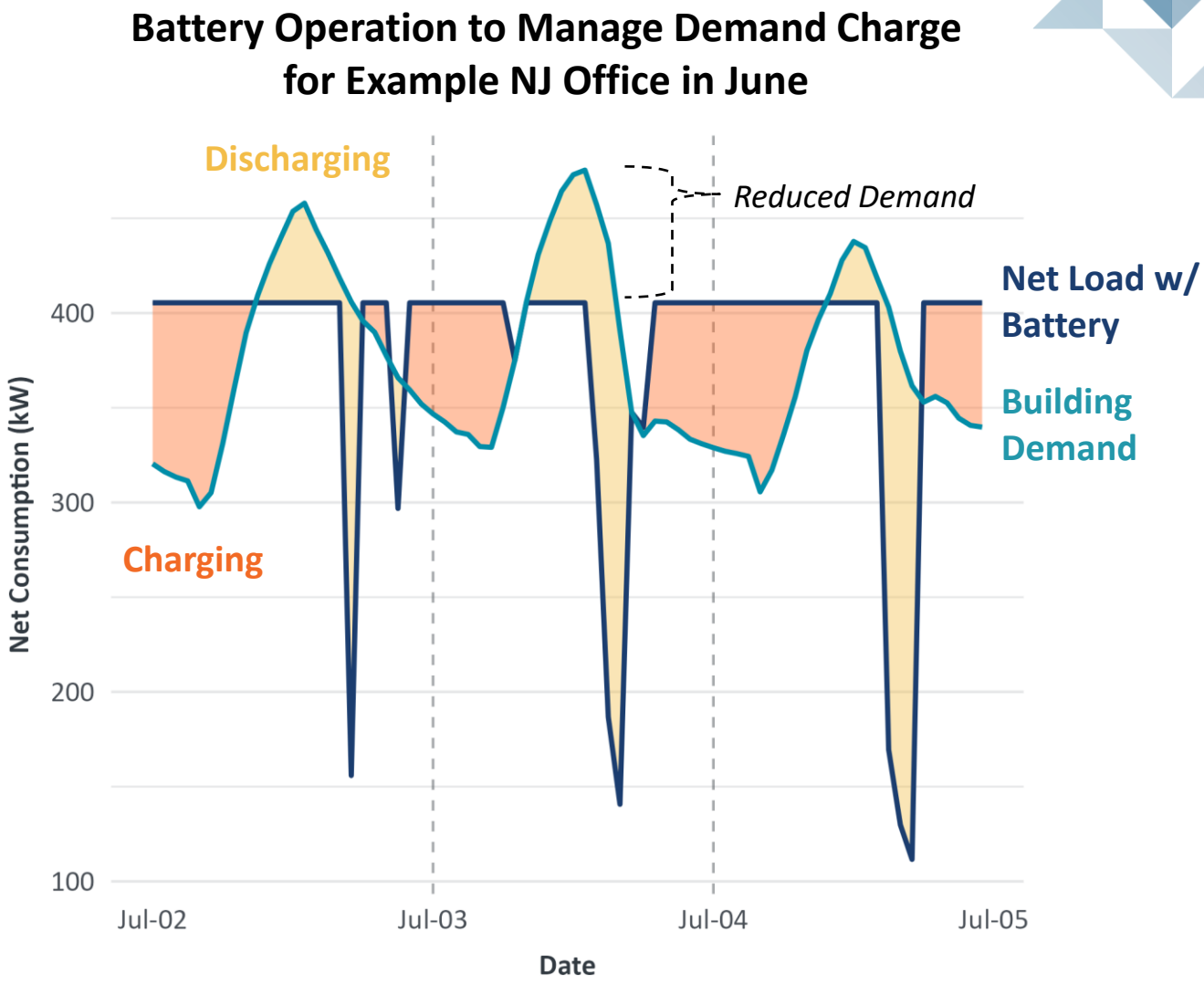
Approach

Brattle assessed the economic opportunities available to behind-the-meter (BTM) vs. front-of-the-meter (FTM) distributed storage under New Jersey's proposed Storage Incentive Program (SIP)

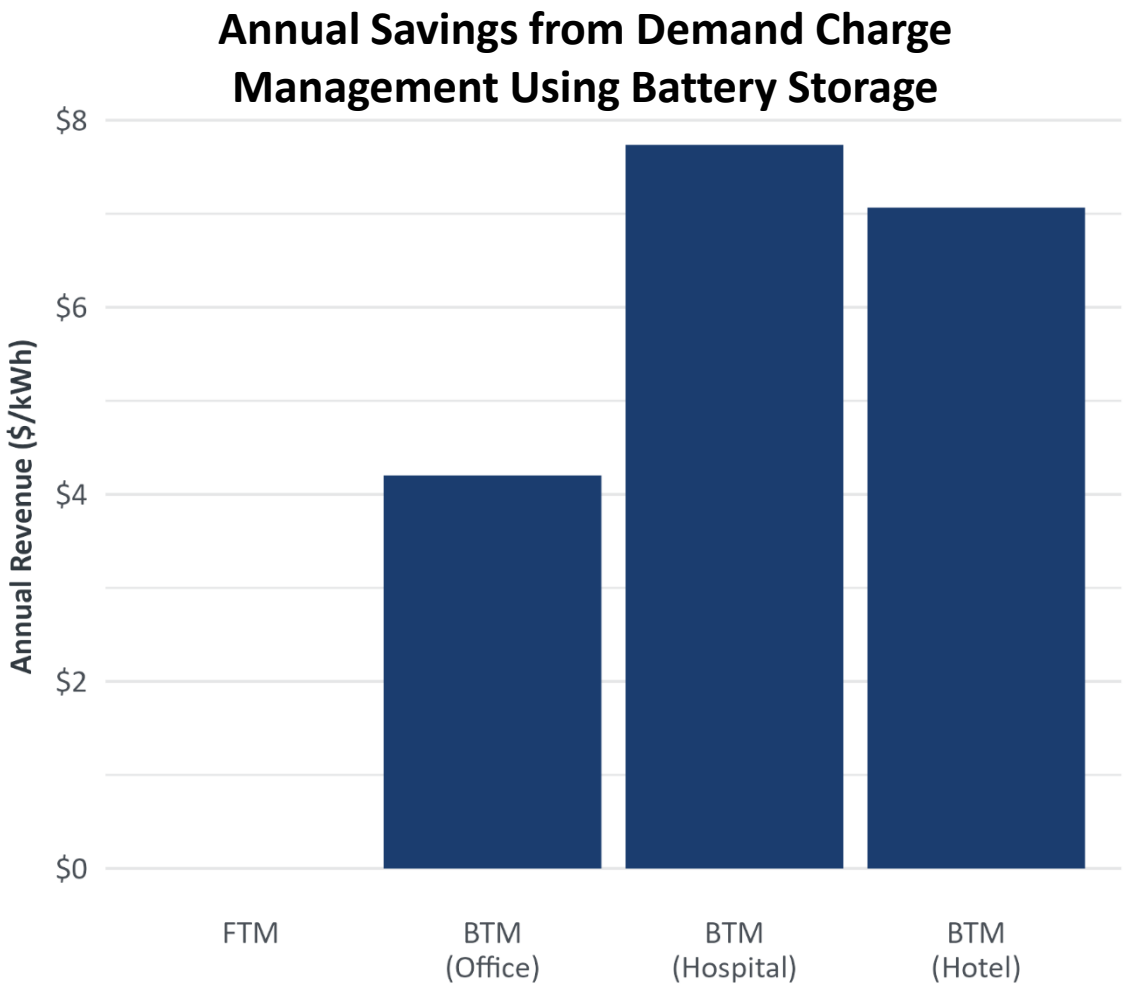
- Brattle identified potential revenue streams available to customers adopting BTM storage, then employed an in-house optimization model called REACT (Retail Energy Adjustment and Cost Tool) to estimate the maximum annual revenue available to these customers
- Brattle compared these opportunities to those for customers building FTM storage and identified several gaps in potential revenue for these customers
- We also reviewed the interconnection issues in PJM and the New Jersey grid in particular to understand a) the prospect of FTM distribution connected batteries achieving connection to the grid; and b) the potential implications for the New Jersey storage policy goal of 2,000MW by 2030

Demand Charge Reductions (1)

- Demand charges are determined each month based on a customer's highest consumption during a short interval (typically over 15 minutes or 1 hour)
- A customer that reduces their monthly peak demand is effectively compensated by the utility for the value they create by reducing load on the distribution system
- Behind-the-meter batteries can be dispatched to flatten net loads, allowing these customers to lower their demand charges



Demand Charge Reductions (2)

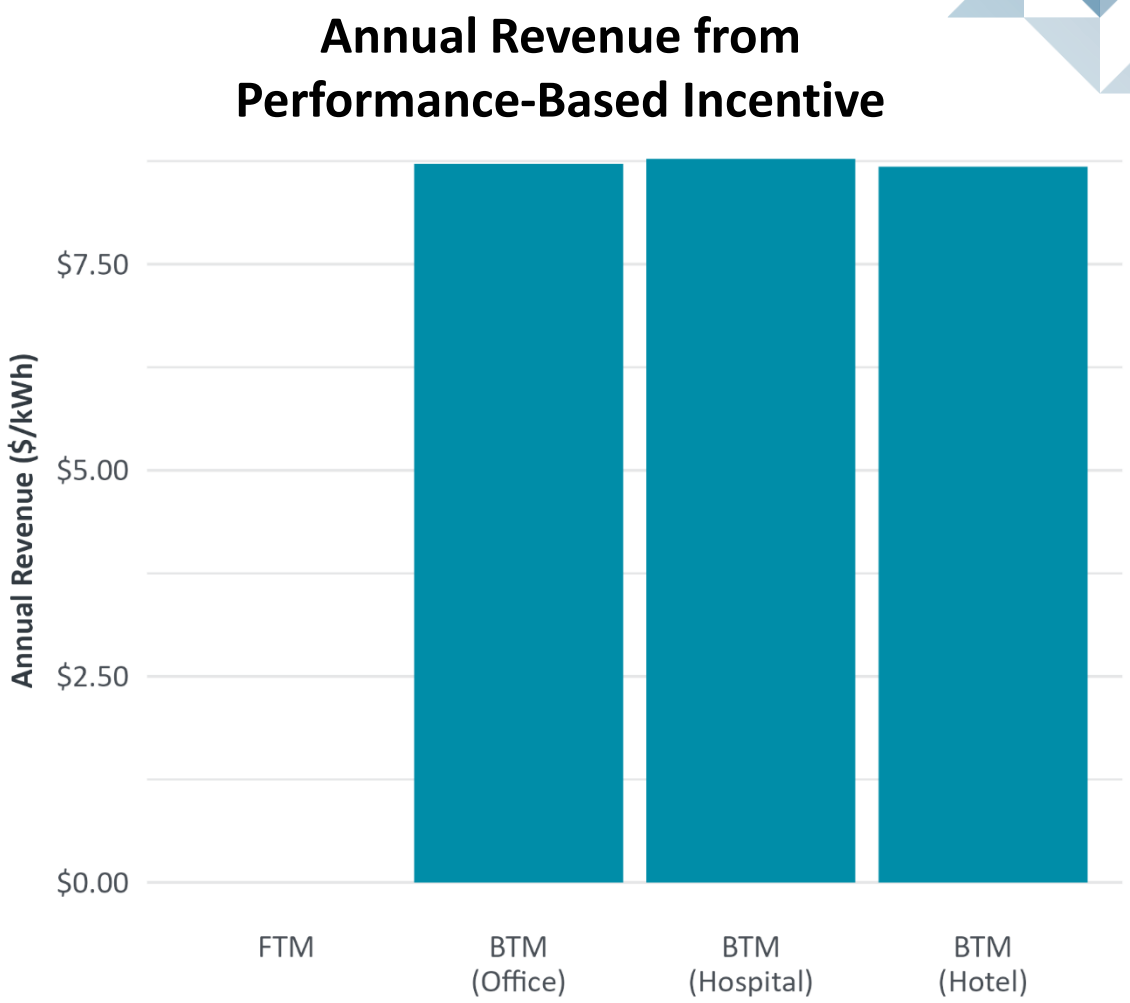


- We analyze three type of New Jersey commercial customers (offices, hospitals, and hotels), and find that the value derived from demand charge management varies from approximately $4 to $8 per-kWh, annually
- The extent to which batteries help a customer manage their demand charge depends on that individual customer's hourly load profile
- FTM resources do not have access to this revenue stream

Note: Dollar per-kWh figures describe annual revenue per-unit of storage capacity, not per unit of energy discharged to grid.

Performance-Based Incentive (PBI)

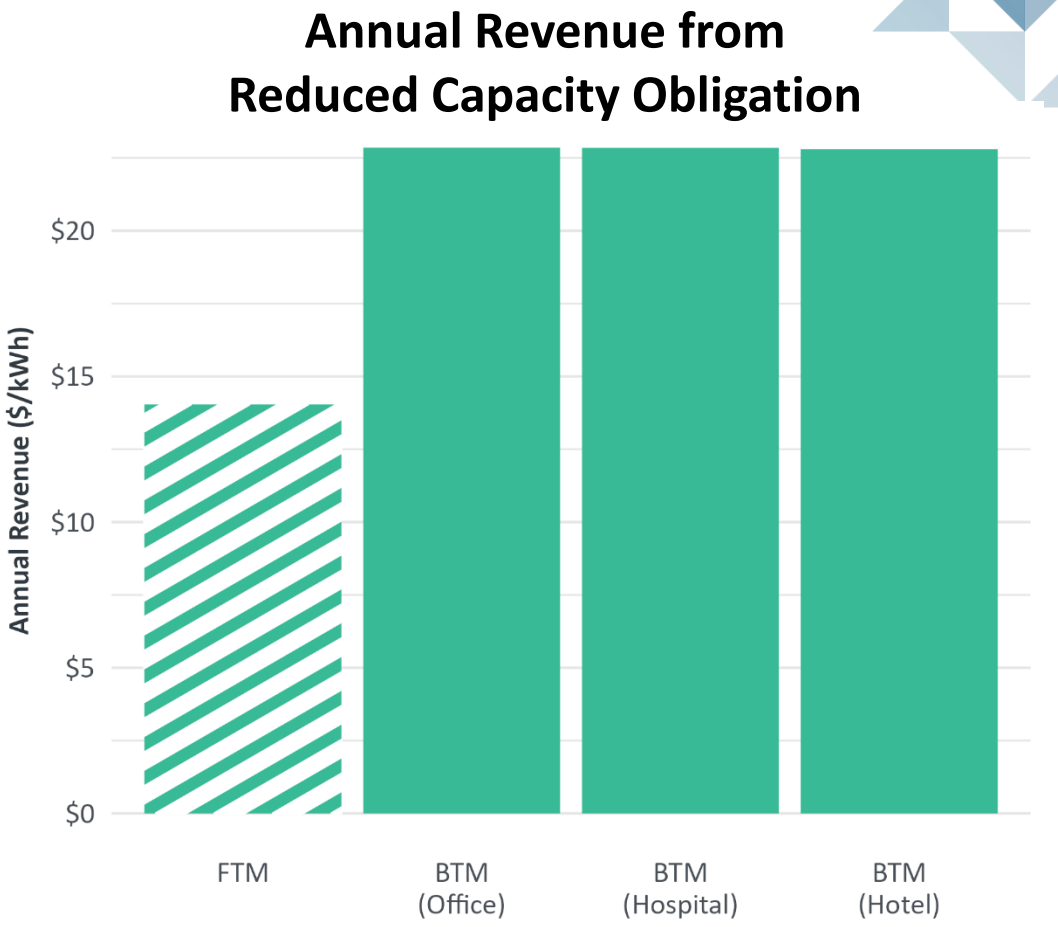
- BTM customers would also be able to collect revenue from the proposed performance-based incentive (PBI)
- While the final implementation of the incentive will be left to the electric distribution companies (EDCs), the Straw suggests a program in which customers are compensated for voluntarily discharging their batteries during 4-hour afternoon call windows on 10 peak days selected by the EDC
- We model the PBI as described in the Straw, and find that all customer types are able to earn approximately 85% of the maximum possible revenue[1]



1. *These earnings are mediated by constraints on the minimum and maximum state-of-charge on the batteries, which are determined based on manufacturer specifications*
2. *The fixed incentive is assumed to be $10 per-kWh for both BTM and FTM batteries. FTM batteries, competing in a competitive bidding process, may ultimately receive larger or smaller fixed incentives.*

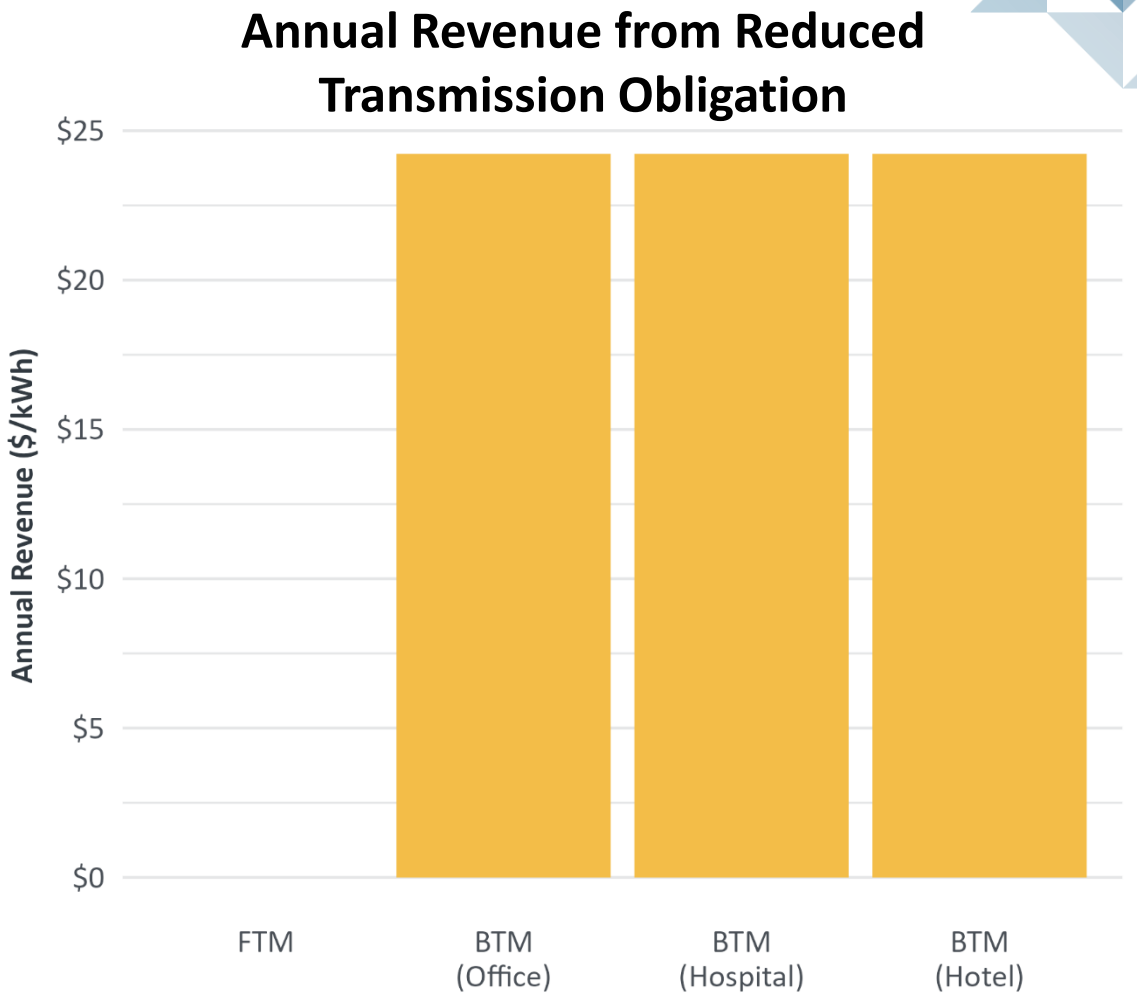
Generation Capacity

- BTM batteries can be used to reduce a customer's Generation Obligation under PSEG's Basic Generation Service contract
  - The customer's Generation Service obligation is determined based on their consumption during PJM's peak 5 hours
- While FTM batteries can theoretically earn payments be enrolling in an aggregation and participating in PJM's capacity market, this produces less revenue than for BTM customers:
  - Payments for battery storage resources enrolled in the PJM Capacity market are de-rated by the ELCC for battery storage (currently 57%), whereas BTM resources can reduce Generation Capacity Obligations based on directly on their performance
  - A BTM customer reducing their Generation Obligation by 1 kW is also able to reduce their share of associated reserves, further enhancing compensation
- In addition, PJM Interconnection issues mean that FTM storage resources are unlikely to connected any time soon (See Section 4, Timing Analysis)



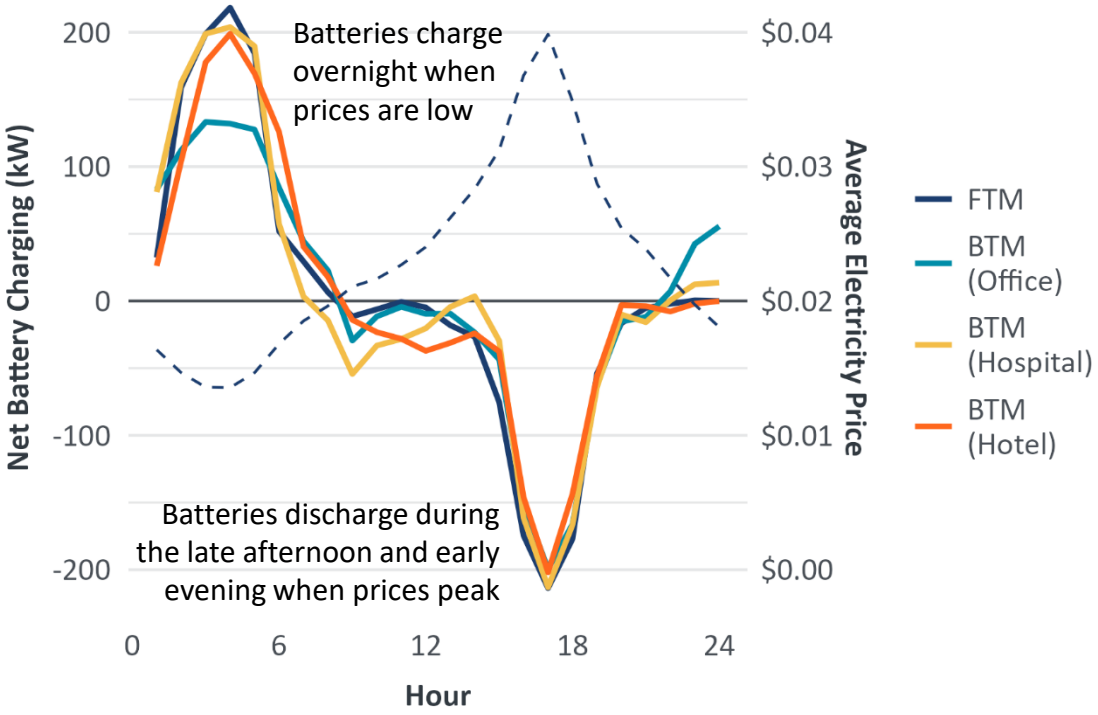
Transmission Capacity

- BTM batteries can be used to reduce a customer's Transmission Obligation under PSE&G's Basic Generation Service contract
  - The customer's Transmission Service obligation is determined based on their consumption during PSEG's peak 5 hours
- These customers are effectively compensated for reducing PSE&G's transmission obligations
- This benefit is not available to FTM storage applications



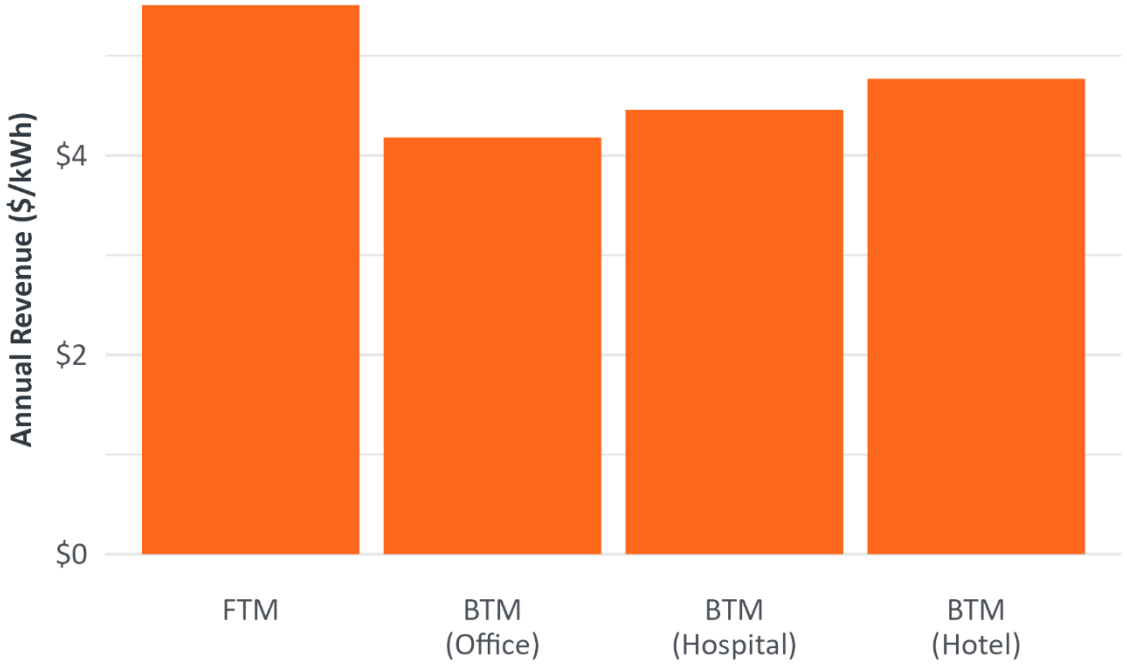
Energy Arbitrage Opportunity

Average Summer Charging Profiles



Both BTM and FTM customers are able to realize value through charging at low energy prices and discharging when prices are high[1]

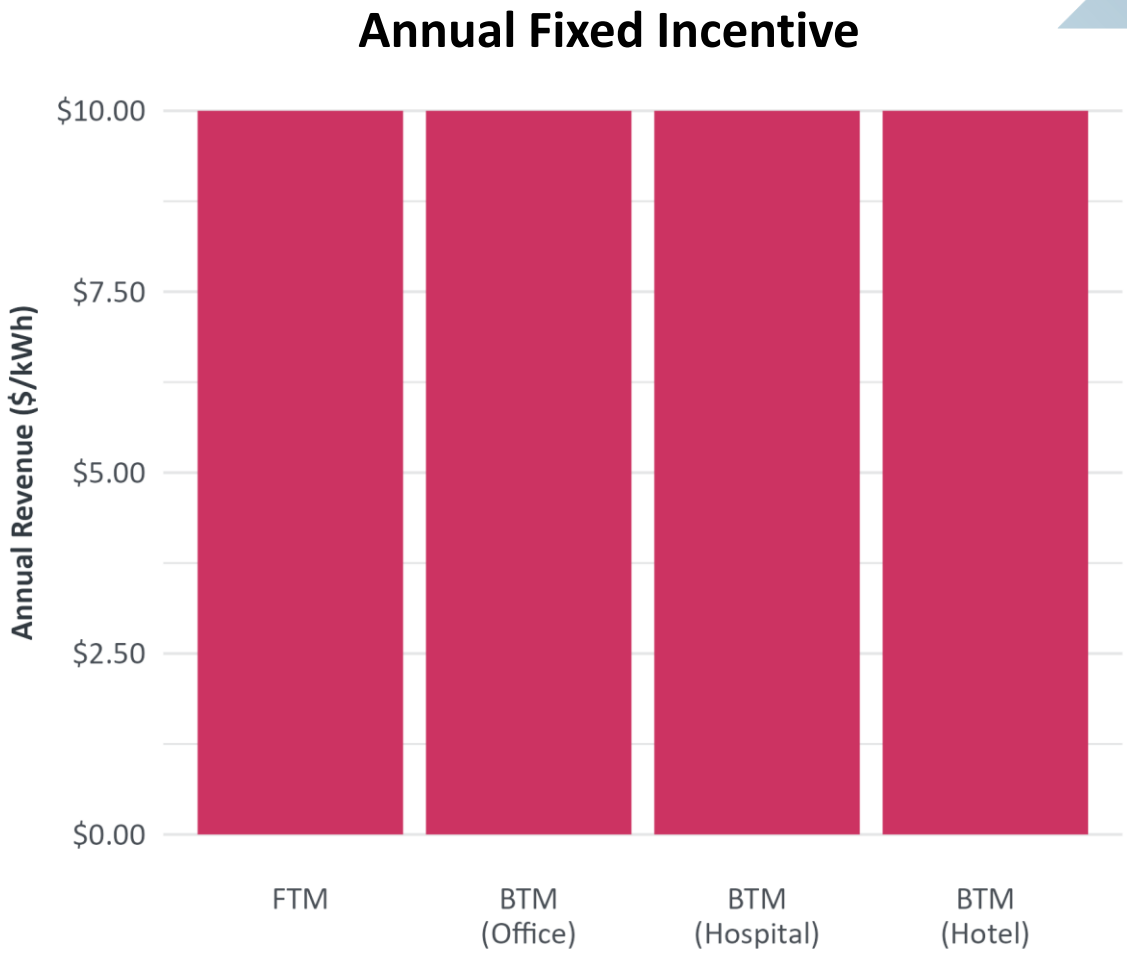
Annual Revenue from Energy Arbitrage



FTM batteries are able to create (and realize) greater value from energy arbitrage because they are not also managing other price signals, including demand charges

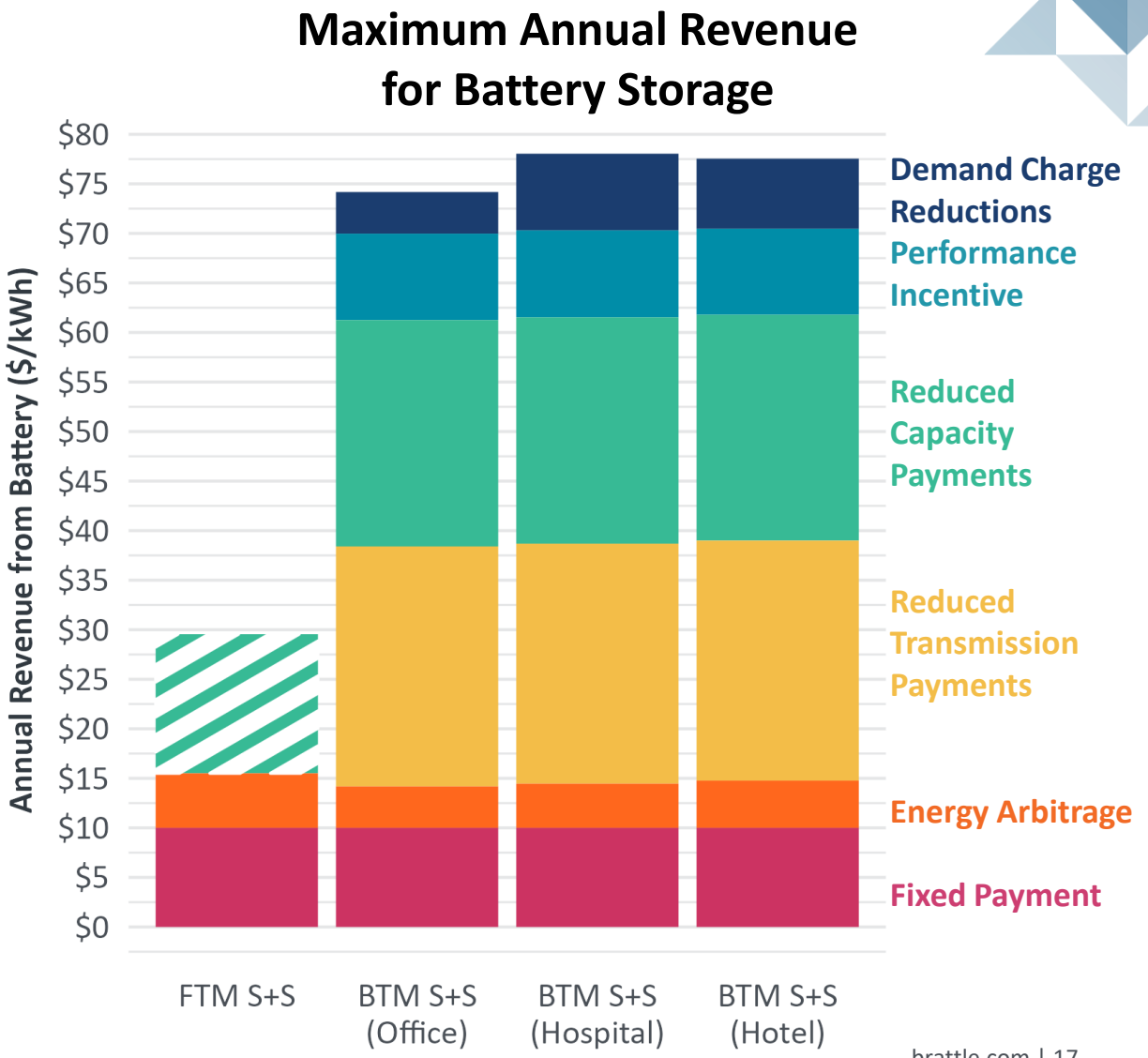
Fixed Incentive

- Both BTM and FTM customers should be able to receive the fixed incentive under the NJ SIP program
- As proposed, medium-scale distributed FTM customers would have to compete with larger grid-supply storage developers, who are able to benefit from greater economies of scale. This makes their ability to capture this revenue uncertain.



Summary

- In aggregate, we estimate that FTM storage faces an annual revenue shortfall of $45-$62 per-kWh (57-80%) relative to BTM storage[1]
- This will likely make it prohibitively expensive for private developers to build FTM storage that could be used to provide valuable energy services to New Jersey ratepayers
- Furthermore, by not providing FTM storage with an incentive to inject power during distribution system peaks, New Jersey EDCs will not extract the maximum value from these assets.



1. *This range is determined by including/excluding capacity value, which depends on the FTM battery's ability to earn revenue through PJM's capacity market*

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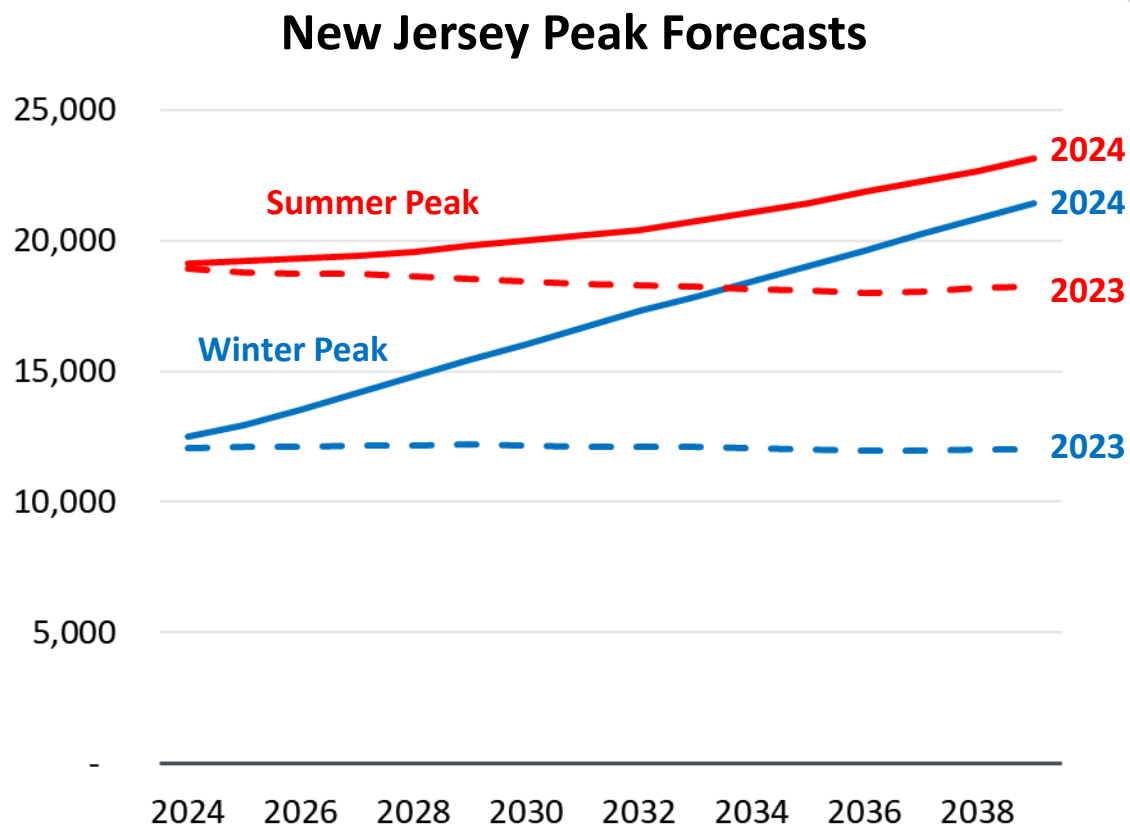
3. Value of FTM Storage as NWAs
4. Timing Analysis

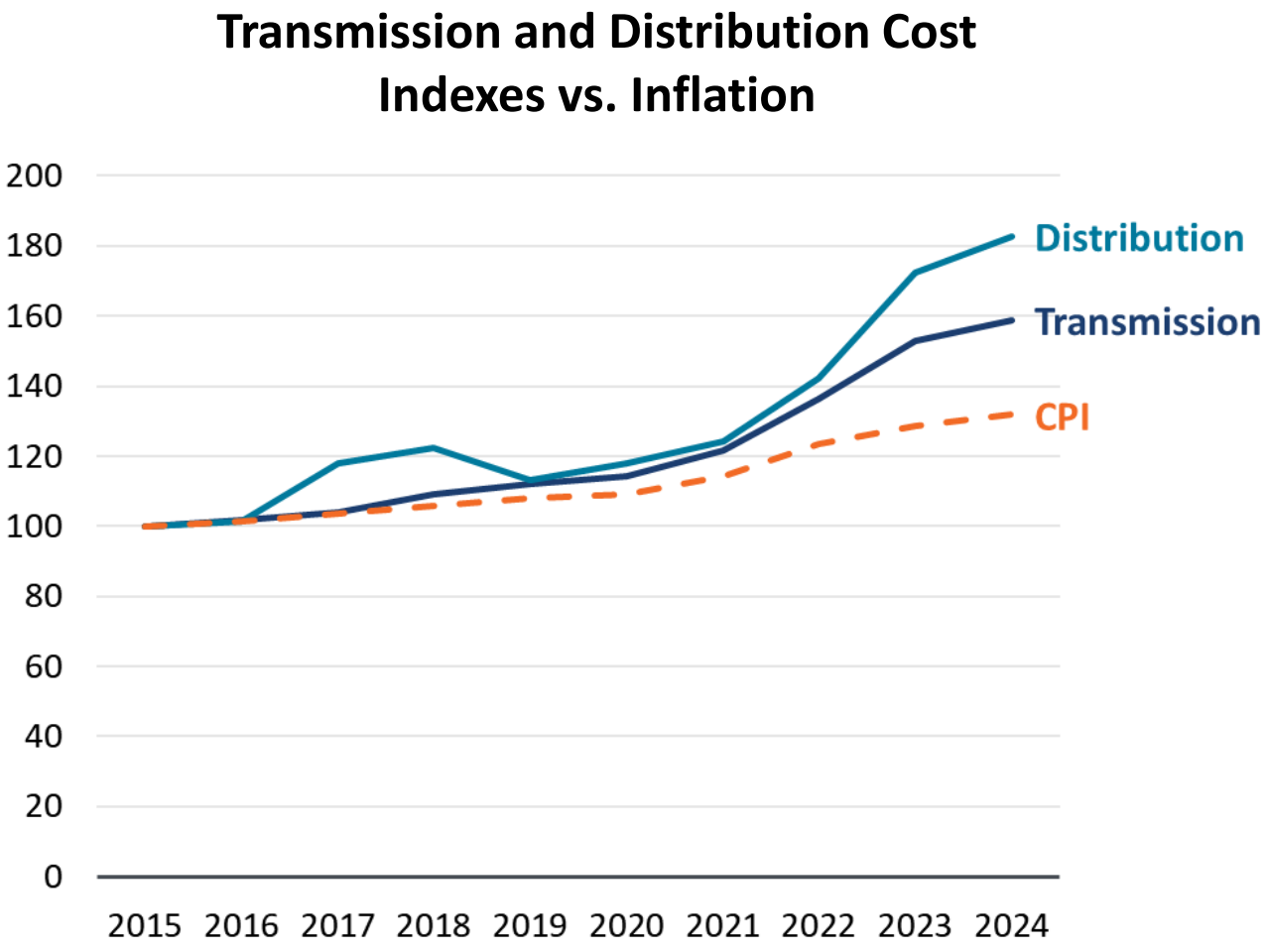
New Jersey is Facing Steep Load Growth

- PJM recently revised its 15-year load forecast to account for increasing load growth from electrification and data centers
- The RTO is now expecting New Jersey peaks in 2039 to grow by:
  - **Summer Peak to grow by 4 GW**
  - **Winter Peak to grow by nearly 9 GW**
- As load in New Jersey continues to grow, the distribution system will need to be reinforced to accommodate increased peaks



Source: PJM Load Forecast.

Increasing Transmission and Distribution Costs



Source: Handy Whitman Index January, 2024. CPI data from FRED.

- As the need for upgraded transmission and distribution equipment rises, capital costs associated with this infrastructure have shot up over the last decade, significantly outpacing inflation
- This is explained by a combination of supply chain constraints and increased global demand for similar components
- Current trends are expected to continue given policy commitments to electrification and decarbonization

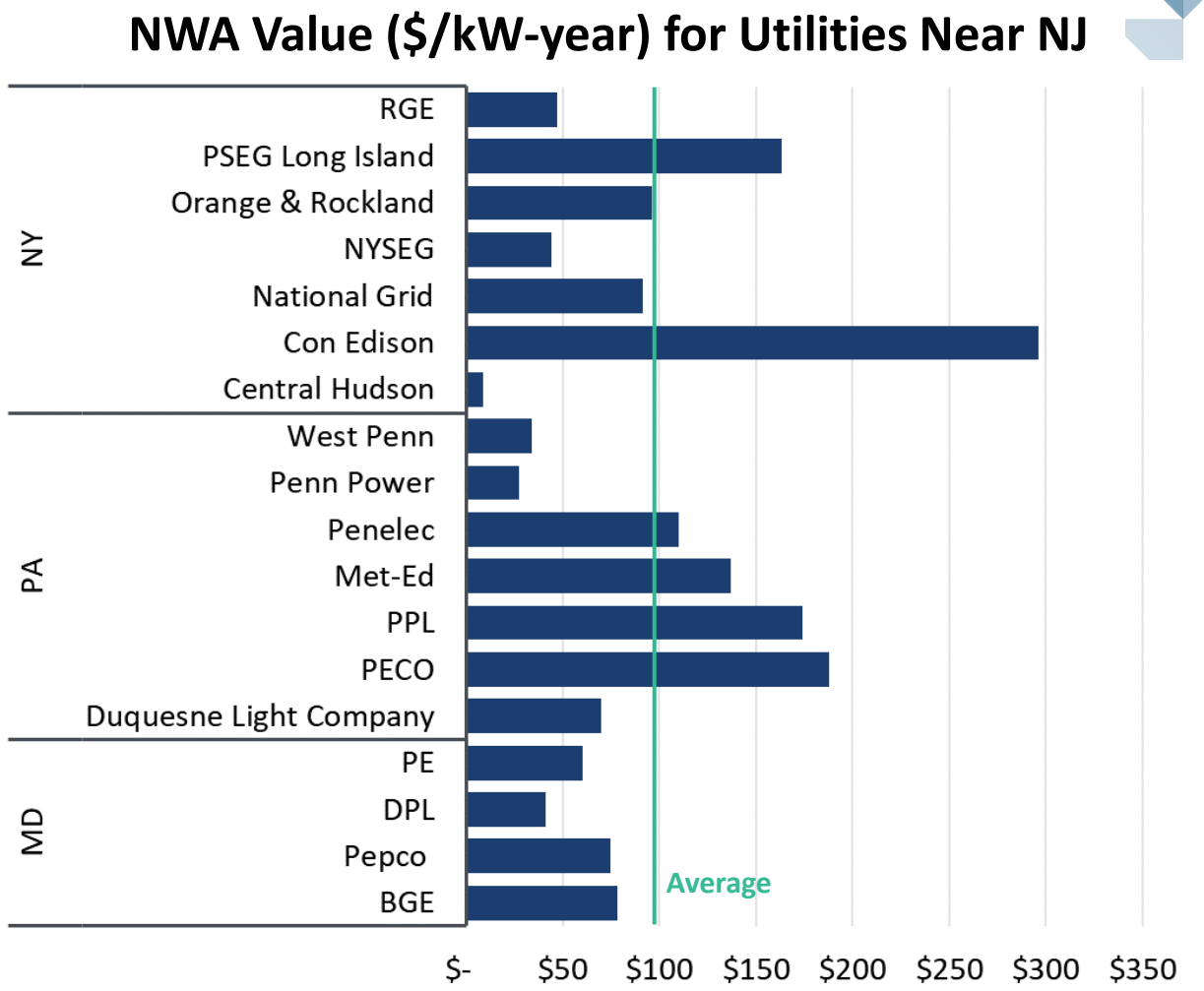
Non-Wires Alternatives

- Non-Wires Alternatives (NWAs) can allow utilities to **defer or even avoid costly distribution system upgrades** using distributed resources located at the grid edge
- A FTM battery that is directly controlled and dispatched by an electric distribution company could be operated as part of a NWA, creating value for NJ ratepayers
  - Upstream transmission-connected batteries are not able to create this value, while BTM batteries provide limited visibility/load control opportunities to utilities, thereby mitigating their value
- There are several notable examples[1] of utilities using battery storage as part of NWAs, including in Arizona, New York, Maine, and California

1. *PLMA. "Non-Wires Alternatives: Case Studies from Leading U.S. Projects," November 2018. https://www.peakload.org/assets/38thConf/Non-Wires-Alternatives-Projects.pdf.*

NWA Value

- Brattle's survey of Marginal Cost of Service studies finds that the average value of deferring or avoiding T&D upgrades for utilities in nearby states is **$97 [1] per-kW-year**
- These values range significantly between utilities and even within utilities
  - For example, in Consolidated Edison's service territory, Brattle estimates that the value of deferring T&D upgrades ranges from $89 - $364 per kW-year (2024 $)[1]
- Creating a market for FTM battery developers creates two key opportunities:
  - Some batteries may prove useful as NWAs in the future, at which point EDCs can contract for direct load control with the battery owner
  - Growing the pool of private FTM battery developers operating in the state today will ensure a competitive marketplace for future NWAs



1. *Adjusted to 2024 using the Handy-Whitman index.*

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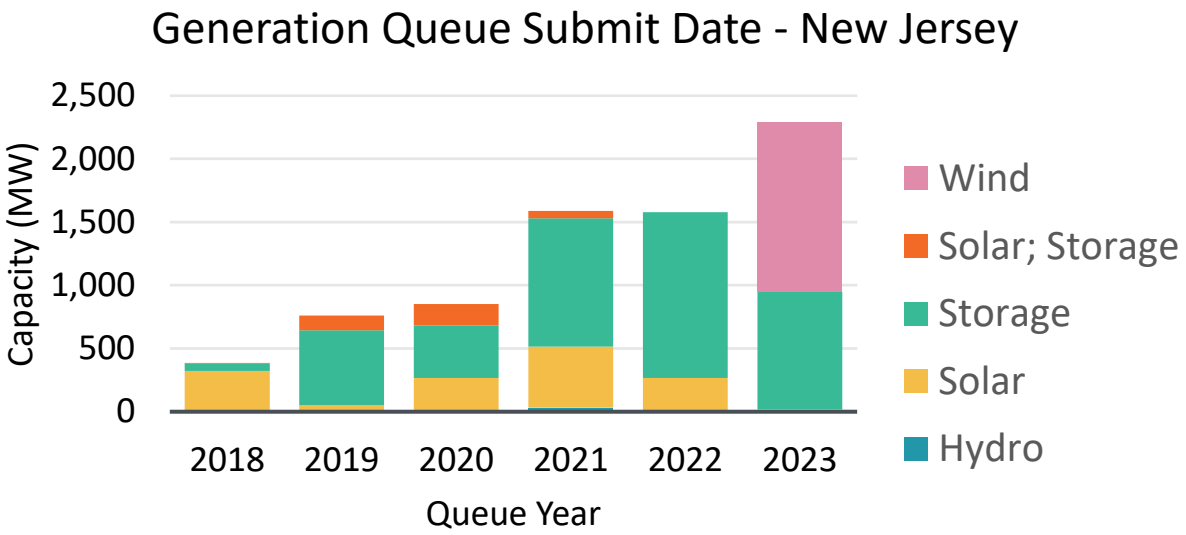
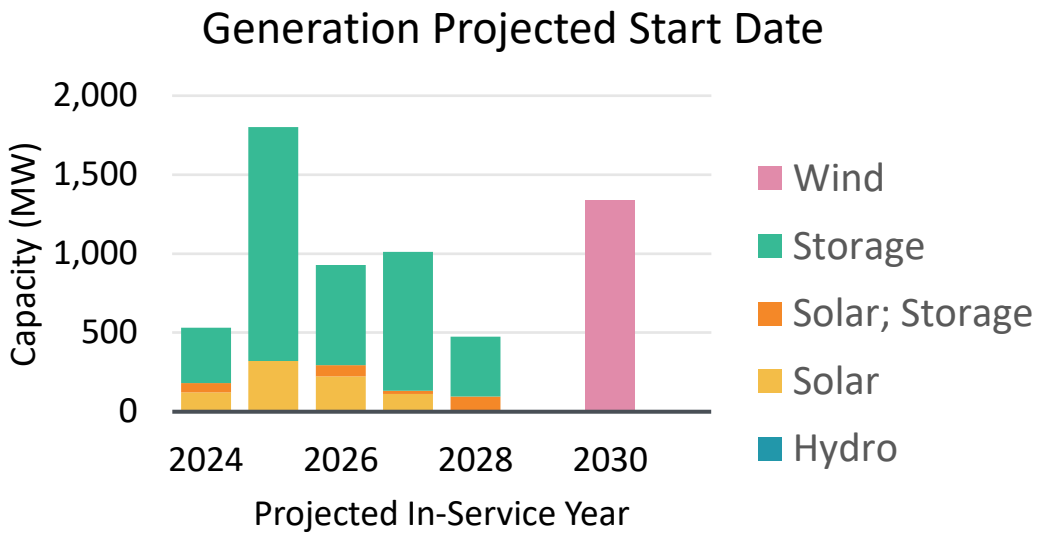
PJM Interconnection Queue Analysis

The current status of the PJM Interconnection Queue shows extensive build of resources with increasing additions of storage and offshore wind



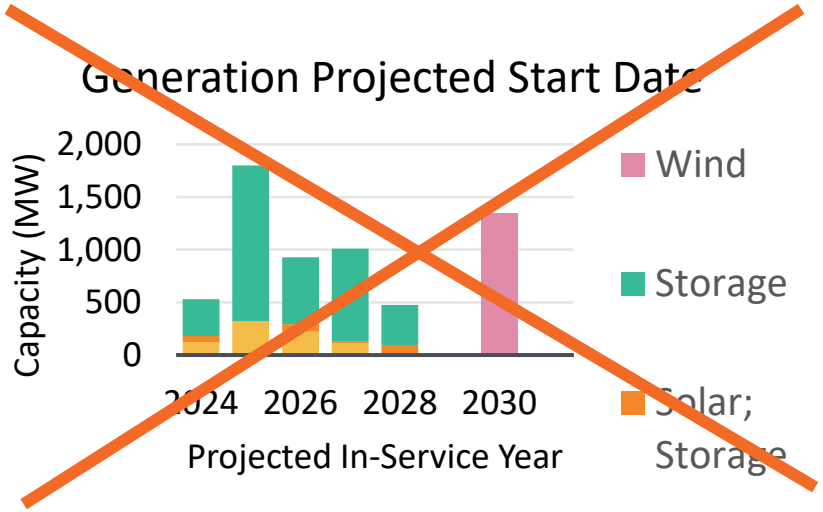


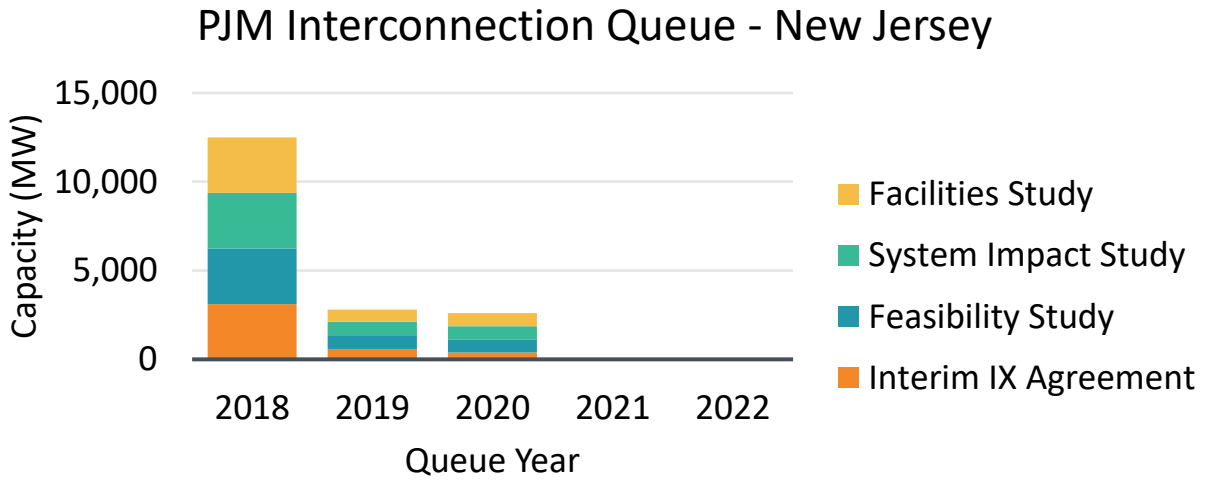
- **37,218 MW** of generation resources are currently in the PJM New Jersey interconnection queue
- **6,815MW** of solar and storage is in the queue
- Some resources have been in the queue for decades, storage has been in the queue since 2018

- Solar and storage projects are projected to come on-line between 2025 and 2030 (wind)

PJM Interconnection Queue - Issues

PJM has effectively placed a pause on new interconnections ensuring that new generation projects are unlikely to connect as planned.





- According to most analysts projects are unlikely to connect in the near term, ***"The country's largest grid operator, PJM Interconnection (PJM), has experienced the most severe delays and backlog in new generation—projects entering the queue today have little chance of coming online before 2030." ****
- Only 20% of projects have completed at least one of the studies required to complete the Interconnection Process and no projects after 2020 have initiated the studies needed to interconnect

*https://www.energypolicy.columbia.edu/publications/outlook-for-pending-generation-in-the-pjm-interconnection-queue/

PJM Interconnection Queue - Reforms

PJM is reforming its interconnection process, partly in response to FERC Order 2023, and transitioning to a "first ready, first served", rather than "first come, first served"

- The new approach will entail "clustering" projects that are seeking to connect and using a cycle approach rather than a one behind the other queue approach
- In theory the cluster study approach should speed up the interconnection process by assessing requests in batches rather than on an individual basis
- However, PJM has also initiated the **PJM Reliability Resource Initiative: Interim Accelerated Interconnection Process** that would allow 50 large, new and unqueued generation projects (about 20 GWs) to be inserted into Transition Cluster #2 ("TC#2").
  - This process would target resources that are **not currently** in the interconnection queue
  - PJM initially stated it plans to allow 100 projects to participate in the IAIP, subsequently reduced to 75 projects, and most recently just 50
- Adding 20 GW to TC#2 will add even more delay to the study process for existing projects and may impact these project economics if network upgrade costs are higher than originally anticipated.

Sources: 20241121-item-04a---1-member-consultation-regarding-reliability-resource-initiative---presentation.ashx

PJM Interconnection Queue - Reforms

PJM's proposed Interim Accelerated Interconnection Process will reward conventional generation with high UCAP and ELCC values and already constructed or under construction

- PJM proposes to allow any project to submit a request and be part of the 50 projects that are evaluated, but in reality, the eligibility criteria PJM intends to apply will skew the results to projects with a high UCAP and ELCC value consistent with natural gas and coal fired generating units that otherwise would have been mothballed or retired
- Should the PJM's proposed process be approved it will further delay storage and renewable deployment in PJM and New Jersey markets

RRI Formula Proposal:

UCAP (35 points)	**In-Service Date Viability** (35 points)	**ELCC** (20 points)	**Location** (10 points)
Rank highest to lowest UCAP	Critical path construction schedule validate by PJM (target is June 1, 2029 or sooner)	ELCC ranking	Adder for locating in a zone that cleared above the rest of the RTO in the 2025/26 BRA

ELCC Class	2028/2029 Preliminary ELCC Class Rating
Landfill Intermittent	56%
4-hr Storage	51%
6-hr Storage	61%
8-hr Storage	64%
10-hr Storage	72%
Nuclear	96%
Coal	85%
Gas Combined Cycle	83%
Gas Combustion Turbine	68%
Gas Combustion Turbine Dual Fuel	80%
Offshore Wind	47%
Diesel Utility	92%
Steam	75%
Onshore Wind	28%
Fixed-Tilt Solar	5%
Tracking Solar	7%
Hydro Intermittent	37%

ELCC ratings of storage versus coal and gas

SUMMARY

Achieve Policy and Reliability Goals

Creating the right incentives for Front-of-the-Meter, co-located storage can deliver on many of the stated program goals and help meet emerging reliability concerns

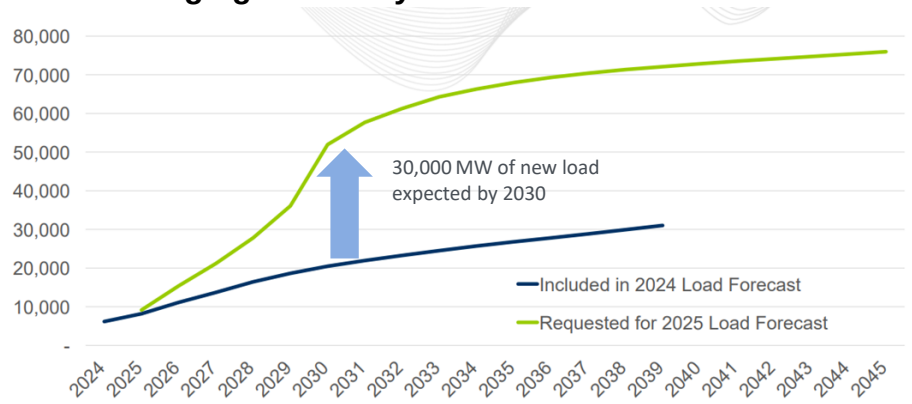
Program Goals

Meet Energy Storage Incentive Program goals

- Support deployment of 2,000 MW of additional energy storage systems by 2030, growing a sustainable energy storage industry;
- Encourage storage deployment that accelerates the clean energy transition;
- Decrease Greenhouse Gas ("GHG") emissions;
- Promote deployment of low-cost private capital into New Jersey storage projects;
- Support overburdened communities with energy resilience, environmental improvement, and economic benefits derived from energy storage;
- Establish a Program Administrator at the BPU who would oversee the efficient implementation of the program.

Grid Reliability

Address Emerging Reliability Concerns



FTM Dx connected storage can:

- **Accelerate storage deployment by over 5 years compared to storage at the wholesale level given interconnection delays**
- **Provide the same wholesale grid services and social benefits as BTM energy storage resources**
- **Potential to decrease emissions by over 3 million metric tons of CO2 equivalent***

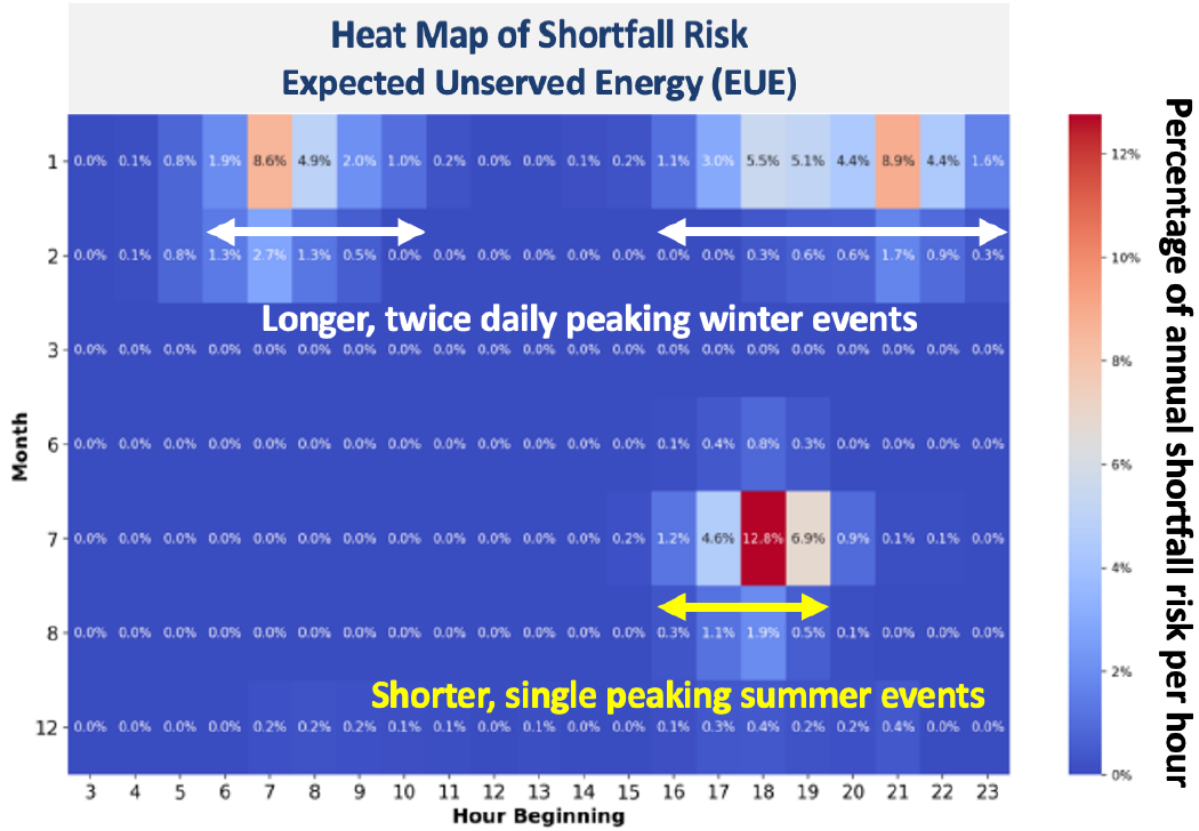
PJM recently updated its load forecast and is projecting materially higher demand in the near term

- **FTM Dx connected storage can be one of the few resources to meet the need for urgent deployment of capacity resources to meet growing demand**
- **Provide additional resiliency and reliability to attract new investment in growing sectors of the economy such as data centres.**

* Assume 2,000MW of installed distribution connected storage displacing 500lb/MWh C02 per cycle over 5 years

Capacity Value

- In order to earn capacity value, FTM batteries participating in PJM's capacity market must respond to three calls: a pair of coupled winter peaks consisting of two 4-hour blocks in the morning and evening on the same day, and a 5-hour summer peak in the late afternoon
  - Batteries must fully charge in advance of each peaks, then fully discharge over the course of the call window
  - This modeling is consistent with PJM's analysis of hourly capacity shortfall risk



This heat map was assembled by PJM as part of their 2023 capacity market reform proposal. It assesses resource adequacy risk on an hour-by-hour basis across a full calendar year. The month of January includes two longer duration periods where RA risk is high. This is in contrast to the month of July, where RA risk is limited to a single, shorter duration period.

Source: Capacity Market Reform: PJM Proposal," PJM, accessed August 12, 2024, https://www.pjm.com/-/media/committees-groups/cifp-