William P. Acker
Executive Director, NY-BEST
230 Washington Avenue Ext., Suite 101
Albany NY 12203
(518) 694-8474
www.ny-best.org

February 24, 2025

Submitted Electronically

TO: The Honorable Michelle L. Phillips, Secretary
New York State Public Service Commission
Three Empire State Plaza
Albany, NY 12223-1350

RE: Case 18-E-0130 – In the Matter of Energy Storage Deployment Program
Comments on the Joint Utilities' Study of Non-Market Transmission and Distribution Energy Storage Use Cases and Related Process Proposals

The New York Battery and Energy Storage Technology Consortium ("NY-BEST"), the Alliance for Clean Energy New York ("ACE-NY"), the Solar Energy Industry Association ("SEIA"), and the New York Solar Energy Industry Association ("NYSEIA"), collectively referred to as the "Commenters," are pleased to submit joint comments for consideration in the above referenced case in relation to the Study of Non-Market Transmission and Distribution Energy Storage Use Cases and Related Process Proposals ("Study") filed by the Joint Utilities of New York ("JU") on October 29, 2024.

We greatly appreciate the Commission's consideration of our comments and recommendations. If you have any questions about these comments or need additional information, please contact us at 518-694-8474 or by email at info@ny-best.org. Thank you.

Respectfully submitted,

Dr. William Acker	Marguerite Wells	Valessa Souter-Kline	Noah Ginsberg
Executive Director	Executive Director	Northeast Regional Director	Executive Director

ABOUT THE COMMENTERS

NY-BEST is a not-for-profit industry trade association with a mission to grow the energy storage industry in New York. We act as a voice of the energy storage industry for more than 180 member organizations on matters related to advanced batteries and energy storage technologies. Our membership includes global corporations, start-ups, project developers, leading research institutions and universities, and numerous companies involved in the electricity and transportation sectors.[1]

ACE-NY is a member-based organization with a mission of promoting the use of clean, renewable electricity technologies and energy efficiency in New York State to increase energy diversity and security, boost economic development, improve public health, and reduce air pollution. ACE NY's diverse membership includes companies engaged in the full range of clean energy technologies as well as consultants, academic and financial institutions, and not-for-profit organizations interested in our mission.

SEIA is leading the transformation to a clean energy economy, creating the framework for solar to achieve 30% of U.S. electricity generation by 2030. SEIA works with its 1,000 member companies and other strategic partners to fight for policies that create jobs in every community and shape fair market rules that promote competition and the growth of reliable, low-cost solar power. Founded in 1974, SEIA is the national trade association for the solar and solar + storage industries, building a comprehensive vision for the Solar+ Decade through research, education and advocacy. There are more than 730 solar companies based in New York across the entire solar value chain, including installers, manufacturers and service providers, as well as a variety of regional or national businesses with projects and operations in the Empire State.

NYSEIA is a statewide trade association dedicated to accelerating rooftop and community solar + storage adoption in New York. NYSEIA advances its mission through legislative and regulatory policy advocacy, public education, and member capacity-building. NYSEIA's 225 members employ thousands of workers in the rooftop and community solar + storage industry, supporting progress toward New York's ambitious clean energy and equity goals.

NY-BEST, ACE-NY, SEIA, and NYSEIA have been actively engaged in the State's implementation of the State's Climate Leadership and Community Protection Act ("CLCPA")[2], including through the development and implementation of the State's Energy Storage Roadmaps. The Commenters are committed to helping meet New York State's goal to deploy 6 GW of energy storage on the electric grid by 2030 and to direct 40% of the overall benefits of clean energy investments to Disadvantaged Communities. We recognize the tremendous opportunity for energy storage to

[1] NY-BEST comments represent the interests of the organization as a whole and not the views of any single member. Our members have diverse interests and the organization's views are intended to be reflective of the energy storage industry collectively.

[2] New York State Climate Leadership and Community Protection Act, Chapter 106 of the Laws of 2019. https://www.nysenate.gov/legislation/bills/2019/s6599.

support the State's goals and are eager to work with the Commission and the Joint Utilities to ensure energy storage is built strategically and efficiently across the State.

INTRODUCTION AND BACKGROUND

On June 20, 2024, the Commission issued the Order Establishing Updated Energy Storage Goal and Deployment Policy ("2024 Storage Order") which, among other rulings, directs the Joint Utilities to conduct a study of the non-market transmission and distribution ("T&D") services that energy storage can provide.[3] The 2024 Storage Order restates the four limited situations where utility ownership of energy storage may be considered, as contemplated by the original Reforming the Energy Vision ("REV") Framework Order issued in 2015:[4]

1. "Procurement of DER has been solicited to meet a system need, and a utility has demonstrated that competitive alternatives proposed by non-utility parties are clearly inadequate or more costly than a traditional utility infrastructure alternative;
2. A project consists of energy storage integrated into distribution system architecture;
3. A project will enable low or moderate income residential customers to benefit from DERs where markets are not likely to satisfy the need; or
4. A project is being sponsored for demonstration purposes."

The 2024 Storage Order then states:

> *"That notwithstanding, the Commission does recognize the potential of energy storage as a transmission and distribution asset. [Accordingly], consistent with the Roadmap's recommendation, the Commission directs the Joint Utilities to conduct a study of the non-market transmission and distribution services that energy storage projects can provide. This should include an in-depth engineering and economic review of the applications that energy storage could provide to the utility as it fulfills [its] obligations to provide safe and reliable service in the most efficient and effective manner."*

The JU Study of Non-Market Transmission and Distribution Energy Storage Use Cases and Related Process Proposals ("Study") filed in response to this directive on October 29, 2024 presents the following six use cases where the JU believes utility-owned and -integrated energy storage ("utility-integrated storage" or "UIS") could support or provide T&D services:

A. Flexible Transmission Capacity
B. Flexible Distribution Area Capacity
C. Distribution Resiliency and Reliability
D. Bridge-To-Wires (BTW)
E. Large-Scale Renewable Enablement
F. DER Integration and Hosting Capacity on Distribution Network

[3] Case 18-E-0130, *In the Matter of Energy Storage Deployment Program*, Order Establishing Updated Energy Storage Goal and Deployment Policy, issued June 20, 2024 ("2024 Storage Order"), p66-67 and 96-97.

[4] Case 14-M-0101, *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision,* Order Adopting Regulatory Policy Framework and Implementation Plan, issued February 26, 2015 ("REV Framework Order"), p70.

These use cases represent a significant expansion of scenarios where utility ownership may be considered. The Commenters respectfully request that the Department of Public Service ("DPS") convene a technical conference before reply comments are due to provide an opportunity for the JU to address questions from stakeholders. Further, while we agree that energy storage can provide significant T&D benefits, we encourage the Commission to exercise caution when considering the expansion of utility-ownership, as further discussed in our comments below.

COMMENTS ON THE JOINT UTILITIES' STUDY

The Commenters appreciate the work done by the JU to publish their Study, and strongly agrees with their analysis that energy storage resources ("ESRs") can provide significant critical benefits to the T&D grids, particularly to support reliability, reduce curtailment of renewables, and facilitate electrification. However, we do not believe that utility-ownership is required in all of the cases to capture the benefits energy storage can provide. To this end, we present the following recommendations for the Commission's consideration:

I. Convene a technical conference to provide further information

The Commenters understand the challenge of describing an in-depth engineering and economic review of all of the use cases in the filing. It is clear that further information is necessary to properly evaluate and consider the use cases presented. We request that DPS convene a technical conference, prior to the submission of reply comments, where the JU addresses stakeholder questions and provides further information on the use cases. We have included an initial list of questions in Appendix A.

Notably, the JU's Advanced Technical Working Group (ATWG) aims to identify, discuss, and resolve technical barriers and challenges associated with deploying advanced technologies on the New York electric T&D system. While the ATWG has preliminarily begun to consider the role of ESRs on the T&D system, it has not yet done so in a forum with other stakeholders, nor has it provided in-depth analysis on the use cases proposed. A technical conference convened to review the JU's proposed use cases would provide a public forum to advance this conversation.

II. Consider the risks of broadly expanding utility ownership

The UIS use cases proposed by the JU represent a significant expansion of scenarios where utility ownership may be considered. The Commenters believe such an expansion poses critical risks that could increase costs to ratepayers while chilling private sector investment in energy storage, slowing progress toward the State's energy and affordability goals. Specifically, we recommend the Commission consider the following:

1. Broad utility ownership increases risks to ratepayers

Risk of increased costs: Utilities are not incentivized to keep costs low the way developers are in a competitive market. Indeed, utility projects often experience cost overruns that can be passed on to ratepayers. For example, the Con Edison Fox Hills Energy Storage System (7.5 MW / 30 MWh) ran $14.7M or 67% over-budget,[5,6] with a total cost of approximately $36.7M or $1,220/kWh—nearly double the average cost per kWh of projects typically reported by third party developers in New York City to date. For utility-owned projects, the risk of higher-than-anticipated project costs will be borne by average New Yorkers, rather than by developers and their investors. The impact this may have on ratepayers is concerning, particularly for low-income households, who can least afford to bear these risks. Utilities are currently allowed to develop renewables and ESRs through their unregulated subsidiaries, but the JU proposal to build these projects with ratepayer dollars would pass undue risk onto ratepayers.

Risk of poor performance: Utility projects pass the risk of non-completion or non-performance of projects onto ratepayers. Whereas third-party developers assume the risk and monetary loss of a project not being built (e.g. due to permitting challenges) or the risk of a project not performing (which results in non-payment of many incentives), the utility passes the risk of incurred expenses being unrecovered onto ratepayers.

Risk of community opposition: Given that New Yorkers are already experiencing high levels of energy cost burden, higher rates due to utility-owned ESR projects could contribute to community backlash against energy storage more broadly. This may be particularly pronounced in service territories with higher numbers of UIS projects. While the NYSERDA energy storage incentives are socialized across the State, with each utility contributing funding proportionally to their load share, the impacts of cost increases due to UIS projects

[5] Case 20-E-0197, *Proceeding on Motion of the Commission to Implement Transmission Planning Pursuant to the Accelerated Renewable Energy Growth and Community Benefit Act,* CECONY January 2025 Phase 1 Report, January 2, 2025.

[6] Case 22-E-0064, *Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consolidated Edison Company of New York, Inc. for Electric Service,* Report on 2024 Second Quarter Capital Expenditures, August 15, 2024, p22, 28-31.

would be specific to each service territory. This could cause bills in certain areas to increase more than others, driving perceptions of unfair burden of the energy transition.

2. <u>Broad utility ownership risks distorting the market</u>

Risk of impacting market prices: The Commenters encourage the Commission to clarify the meaning of "non-market T&D services" to ensure the proposed use cases not only do not participate in the market, but that they do not have a negative impact on market actors. Notably, even projects that are not operating in the market may unintentionally impact the market by unfairly competing with third-party assets, such as by purchasing and selling energy without regard to market prices. Given that one of the main drivers for ESR deployment is based on shifting energy from time of excess renewable generation to times of peak load or other load needs, if UIS performs the same function, whether in the market or not, it will suppress the economics of the market-based energy storage. Further, if UIS operates uneconomically in the market without regard to market prices, the utilities will presumably pass losses onto ratepayers, thereby distorting the market.

Risk of unfair competition: The phrase "non-market" should be defined to cover the entire lifetime of the proposed project, to avoid a slippery slope where utilities may originally propose a non-market use case, and later petition for it to participate in the market. This is, for example, what occurred with National Grid's East Pulaski Substation energy storage project, which was originally constructed to provide reliability benefits in 2018, but was subsequently approved to operate in the wholesale markets in 2021.[7] The perceived risk by developers and financers that utilities will be allowed to build market-participating projects could increase the cost of capital, particularly due to the perception of an uneven playing field. Notably, if UIS are allowed to compete with private sector projects, they would have an unfair competitive advantage for a number of reasons, including:

- Avoiding distribution tariffs and other costs that third parties are subject to;
- Benefitting from distribution interconnection information, processes, and control that third parties do not have access to; and
- Benefiting from market power dynamics at the wholesale level, as utilities would be buying and selling at the same time.

3. <u>Broad utility ownership risks slowing progress toward CLCPA goals</u>

Risk of chilling private development: Because UIS projects would pass the risk of cost-overruns onto ratepayers, utilities would be able to assume highly optimistic economics in bidding for sites or evaluating interconnection and other costs, thereby undercutting private sector opportunities. Further, expanded utility ownership, particularly inasmuch as it is understood to permit unfair competition between utilities and developers, is likely to heighten the risk of regulatory and market uncertainty perceived by developers and

[7] Case 18-E-0130, *In the Matter of Energy Storage Deployment Program*. National Grid, "East Pulaski Energy Storage System Wholesale Market Participation Annual Report." September 30, 2024.

financers. This could significantly slow investment in energy storage in New York State, threatening CLCPA targets. Beyond slowing investment, any perceived increased risk by financers will likely result in a higher cost of capital for private projects that will increase the cost of reaching the CLCPA goals. Thus, the Commission must be careful to ensure that opening up ESR development to utility-ownership does not unintentionally lead to lower project deployment than if it had not been allowed.

Risk of impacting private energy storage interconnection: It is not yet clear what the potential impact of the JU's proposal to private energy storage interconnection would be. For example, adding UIS to a congested network could risk diminishing hosting capacity for private ESR projects. We request the JU clarify how this potential impact would be analyzed and addressed during the proposed technical conference. Further, the Commenters are concerned that prioritizing UIS solutions could impact the JU's progress on reforms beneficial to private sector projects, such as improving hosting capacity transparency, streamlining interconnection processes, and reforming distribution tariffs for bidirectional resources. We recommend the Commission consider how expanding utility ownership authority could impact opportunities for market-based ESR projects in New York.

Risk of expanded utility responsibility: Significant wire-based T&D upgrades will be needed for a successful energy transition in New York State. The Commenters are concerned that a considerable expansion of utility oversight of ESR buildout could slow progress on other fronts, particularly as some transmission projects have already been subject to delays and cost overruns. We do not believe it is an appropriate time to significantly expand utility responsibility.

III. Establish principles for utility ownership

The Commenters are open to considering limited utility ownership of ESRs for certain use cases, but recommends that the Commission require that the utility demonstrate the following for each proposed project:

- The need is site-specific, and cannot be solved by using a fleet of ESRs responding to a signal from the utility;
- The need cannot be solved by signaling or controlling a third-party resource;
- The need cannot be addressed by modifying market or program rules (such as by modifying interconnection rules or introducing new program rules to compensate resources for responding to the need);
- The utility-owned ESR will not participate in the market, nor unintentionally quell market development and/or suppress market prices by unfairly competing with third party assets;
- The utility-owned ESR will be subject to the same rules as third-party assets, including not negatively impacting interconnection queues for third-party assets and rules, as well as responsibility for distribution rates.

- Further, in cases where the utility satisfies the above questions, the Commenters recommend the Commission consider whether utility procurement of an ESR developed by a third party, such as via a Utility Dispatch Rights ("UDR") contract, may be most appropriate to ensure the risk of cost overruns is not borne by ratepayers.

IV. Consider how third-party development can achieve the stated goals

In most cases, the Commenters believe that third-party (non-utility) development of ESRs can achieve the T&D goals that the JU describe in their Study without the need for utility-ownership. Notably, at the wholesale level, the NYISO queue has a significant quantity (>30GW) of ESRs in the current transition cluster, and at the distribution level, the Con Edison queue alone has 800 MW of projects that have already made a partial or full interconnection payment, with that number expected to increase due to the imminent release of new funding via the NYSERDA Retail Storage Incentive Program. This ESR development on both the transmission and distribution systems will not only help reach the CLCPA targets, but if leveraged appropriately, can also meet many of the T&D service needs alluded to by the JU. We recommend the Commission consider the following:

Coordinated ESR fleets can provide more efficient T&D services than UIS: While the JU proposes use cases where ESR can support an identified need, it does not appear that the majority of these are so site-specific as to be resolved by a single project. Instead, it would likely be more efficient for the grid to use a fleet of ESRs to address the need. Indeed, a fleet of electrically-proximate third-party ESRs could respond simultaneously to a utility and/or market signal, enabling the benefits to the T&D grid (such as providing flexible T&D capacity and avoiding renewable curtailment), to be optimized and amplified. Relying on coordinated fleet signals would also avoid the potential for a utility-integrated ESR to unintentionally operate in opposition to nearby third party ESRs (e.g. charging when the others are discharging), which would be extremely inefficient for the grid. This risk would be particularly significant if utilities are setting seasonal schedules for UIS operation, as described below. The Commenters recommend the JU clarify in the technical conference the circumstances under which UIS would provide the desired service more efficiently than coordinated ESR fleets.

Market signals are more efficient than static dispatch: To ensure efficient optimization of resources, market signals (such as those provided by the NYISO market, VDER tariffs, and DLM programs) should incentivize the desired ESR operation to maximize the T&D benefit for a number of use cases. While opportunities remain to improve NYISO signals, the VDER tariffs, and utility programs, coordinated market signals will often be preferable from a grid optimization perspective than, for example, the JU's proposal to use a fixed seasonal schedule for ESR dispatch that would be static within a given season (p A-3 of the JU Study). Indeed, this static approach is a concerning indication that, for transmission resources, the

JU may not be planning to appropriately optimize the dispatch of their UIS resources to reflect actual system need. While the JU points out that for certain use cases, price signals in the market do not adequately incentivize ESRs to perform as desired, the Commenters encourage the Commission to explore other ways to resolve this issue (e.g., ensuring sufficient NYISO and/or VDER market price signals are present), without relying on utility ownership as the primary solution.

In some cases, new utility procurement programs could be considered: the Commenters believe many questions remain to be answered to better define the specific use cases where utility-ownership is required, such as those posed in Appendix A. If there are limited use cases where utility ownership makes sense, in line with established principles such as those proposed in Section III above, new programs could be developed to enable utilities to buy ESR projects, rather than develop them. Examples of programs in place in other States include:

- Build Transfer Agreements (BTAs): Utilities would buy ESRs from private developers, a model that is more common in the Western Interconnection. This would facilitate private sector financing by ensuring a project buyer while enabling private developer competition to keep costs down. Notably, this is a model that the New York Power Authority (NYPA) is considering.
- Resource Adequacy contracts: Similar to a model used in California, utilities would procure ESRs for Resource Adequacy to satisfy their needs for reliability, with projects capped at 50% utility ownership. This would allow private developers to have an assured contract to enable projects to be sold, financed, and built, while ensuring utilities solicit projects competitively and prove to the Commission that they have chosen the most cost-effective project.

Notably, while these structures could alleviate some of the concerns of utility ownership around heightened risks to ratepayers and unfair competition, they would not address the grid efficiency question of how utility-owned ESRs interact with third-party fleets operating in the market or concerns around the lack of incentives for the JU to optimally dispatch ESS they own. Further, while arrangements for utility-ownership of ESRs may make sense in certain limited circumstances, the Commenters encourage the Commission to establish strict principles to define when and how this may be appropriate, as discussed in Section III above.

V. Support pathways to enhance energy storage as a Transmission asset

The Commenters encourage the Commission to work with the JU, the NYISO, and other stakeholders to advance broader solutions to enable Storage as a Transmission Asset (SATA), beyond utility ownership.

Notably, NY-BEST member Zenobe submitted a whitepaper (included in Appendix B) to the JU ATWG demonstrating that addressing Power Quality needs on the Transmission system can be most economically solved by market-participating SATA with Grid-Forming capability. The JU UIS paper has characterized these Power Quality services as "Tier 2" or "Tier 3" use cases, meaning that the service does not individually provide enough benefit for the utility to consider deploying an ESR. However, Zenobe's whitepaper shows the evidence and precedents for market-participating ESRs to stack the Tier 2 & 3 Power Quality services, alongside normal capacity, energy and ancillary services, thereby providing significant ratepayer savings. Thus, the Commenters recommend the Commission direct the JU to explore opportunities, in collaboration with stakeholders as part of the ATWG discussions, to integrate market-participating SATA.

Additionally, to ensure SATA is included as part of the State's broader grid planning efforts, the Commenters recommend that the Commission establish a working group as part of the Coordinated Grid Planning Process (CGPP) to consider how SATA should be included in the CGPP modeling that will inform the selection of transmission-level solutions. The working group should include a balance of stakeholders, including developers, following a model similar to the State's interconnection working groups.

VI. Support pathways to enhance energy storage as a Distribution asset

The Commenters also encourage the Commission to advance broader solutions to enable storage as a distribution asset, beyond utility ownership. Notably, in New England, some distribution utilities are working to implement Distributed Energy Resource Management Systems (DERMs), which can communicate with local DERs about local distribution-level constraints and needs. By providing real-time information to inform battery charging and discharging behavior, the utility can optimize ESRs to maximize benefits to the distribution system, without necessitating utility ownership or direct control.

The Commenters have been advocating for DERMs to be included in the Flexible Interconnection proceeding and DISPs; we strongly recommend the Commission direct the JU to accelerate the development and integration of DERMs. Further, we request the JU provide additional analysis in the proposed technical conference on how DERMs may be able to address some of the use case needs described in their Study for Nonmarket T&D Services. Finally, the Commenters recommend the Commission direct Staff to develop improved compensation/control mechanisms for fleets of distributed ESRs as part of the VDER proceeding.

CONCLUSION

NY-BEST, ACE-NY, SEIA, and NYSEIA appreciate the work by the Commission and the JU to support energy storage development in New York State. As discussed in our above comments, we strongly

agree that energy storage should play a critical role as a T&D asset in support of New York's energy transition. However, we encourage the Commission not to rely on utility-ownership as the primary solution to achieve the T&D benefits energy storage can provide, and not to approve the JU's proposed broad expansion of UIS use cases without significant guardrails, particularly given the potential impact to ratepayers and to private investment in energy storage in New York. Instead, we encourage the Commission to advance the development of alternative pathways to enable fleets of ESRs to efficiently meet T&D needs across the State. We stand ready to assist with any questions you may have on these comments. Thank you for the opportunity to share our input and feedback.

APPENDIX A: Questions for the JU

The Commenters respectfully request that DPS convene a technical conference, prior to the submission of reply comments, where the JU addresses stakeholder questions and provides further information on the use cases.

For each use case, we recommend the JU address the following questions:

1. What specific functions will the energy storage resource (ESR) be performing in the use case? (e.g. energy shifting, capacity for N-1 contingencies, power quality – reactive power, voltage support, etc)
2. If the ESR is shifting energy, typically how long a duration would the use case require?
3. How site-specific is the need for each use case?
    a. Given the high expected deployment of ESRs, what are the benefits you expect to be provided by a single utility-integrated ESR, rather than a fleet of coordinated ESRs responding to the same signal?
    b. If multiple 3rd party ESRs were electrically proximate, would they be able to provide the service with appropriate utility control?
    c. Is there a potential for a utility-integrated ESR to operate in opposition to 3rd party ESRs that are electrically proximate (e.g. charging when the others are discharging)?
4. How will the economic assessment of the use cases and projects be performed? Please provide an example analysis for each use case.
5. Please describe how the asset will interact with markets, and particularly, how the asset will interact with the NYISO energy market.
6. Will the use case affect interconnection for other energy storage resources?
7. Some of the use cases sound like an NWA. How are they different from an NWA?

For specific use cases, the Commenters recommend the JU address the following questions:

A. **Flexible Transmission Capacity:** "Energy storage is integrated with utility substations or lines to provide flexible capacity to areas of the transmission grid sensitive to acute forecast increases due to electrification or other loads; provide contingency, resilience, or stability support; and help manage grid congestion. This also offers the ability to strategically use UIS in specific locations to reduce local emissions."
    - Will these projects go through the NYISO interconnection process?
    - Can the services (e.g. contingency, resilience, stability support, manage grid congestion) being sought under this use case be disaggregated or must they all be provided by a single UIS system?
    - Why wouldn't third-party owned ESS perform these functions efficiently by responding to NYISO price signals?
    - How would UIS planning be integrated with NYISO's reporting/outlook?

- The JU states that they can use the UIS to manage pre-contingency issues. However, the NYISO already does this in their dispatch. Can the JU clarify how this would be different?
- It is not clear how the JU would actually coordinate pre-planning operation of the UIS with the NYISO to prevent unintended consequences where the NYISO is managing issues that may have counter-vailing impact on the same network. How would this work in practice?
- How would NYISO interconnection of UIS work? It is not clear how the JU can "fast track" their network needs for interconnecting UIS, as they have historically fallen behind on the NYISO interconnection study requirements. How will these two areas of network changes be managed?

B. **Flexible Distribution Area Capacity:** "Energy storage is integrated with utility distribution lines to provide flexible capacity to areas of the grid sensitive to acute forecast increases due to EV charging or other beneficial electrification or customer loads, and provide contingency, resilience, and reliability support."
    - Is there a risk that the hosting capacity of the network to support third-party DERs will be reduced due to the UIS project? If the UIS operation involves charging at the same time as third party ESRs, would this reduce ESR hosting capacity?

C. **Distribution Resiliency and Reliability:** "Energy storage is integrated with utility distribution lines or networks to increase the reliability and resiliency of the local grid and temporarily restore electricity delivery or reduce demand for grid operations in areas of the system susceptible to interruption and weather events."
    - How will reliability and resiliency benefits be valued in a cost benefit analysis of the use case?
    - How will energy storage systems be sized given the uncertainty of outage durations?

D. **Bridge-To-Wires (BTW):** "Energy storage is integrated and sited with utility distribution lines or networks to proactively support infrastructure in areas of the grid subject to a greater rate of change related to accelerated and large customer load growth due to electrification, EV concentration, or economic development."
    - One example of a BTW use case provided by the JU is using energy storage as a support to Electric Vehicle Supply Equipment (EVSE). However, in this use case, it is not clear how a utility-owned battery would integrate into and respond to signals from the EVSE to ensure that EVs only charge when the battery has available power. This could require a special interconnection agreement that is not currently available in New York State. How does the JU envision this would work?

E. **Large-Scale Renewable Enablement:** "Energy storage is integrated with utility substations or transmission lines to increase the deliverability of renewable energy resource(s) by managing variable transmission system capability and voltage, in addition to mitigating curtailment of renewable resource(s)."

- How will the UIS be analyzed to ensure that this large-scale curtailment mitigation will not influence prices and suppress arbitrage revenues for third party energy storage assets? This could unintentionally increase the cost of the NYSERDA Index Storage Credit (ISC) program contract by reducing the Reference Energy Arbitrage Price (REAP), thereby increasing settlement payments to developers.
- How would the JUs' use of ESR for voltage support differ from the NYISO's dispatch of ESS for voltage support purposes, such as under the Voltage Support Service (VSS) program?
- Given that achieving 0% curtailment may not always be an optimal solution from an economic perspective, how will the JU balance costs with curtailment reduction goals?

F. **DER Integration and Hosting Capacity on Distribution Network:** "Energy storage is integrated with utility distribution infrastructure to increase the capacity of system areas or load pockets to host additional renewable and distributed energy."
    - Given the static nature of the interconnection studies, would the SIR process need to change to take advantage of this use case? Specifically, how would the energy storage device in this use case be incorporated into the CESIR interconnection study?
    - Would there be cases where the UIS limits hosting capacity or would priority always be given to the DERs? Examples where the UIS could limit hosting capacity:
        i. Circuit hosting capacity is limited by load during light load shoulder season and a UIS is deployed to provide load during that time. Post deployment of the UIS, the hosting capacity constraint shifts to thermal limit for generation during peak load time, i.e. DER + UIS generation at peak load times is limited. Would DERs have priority and the UIS backed down? Would interconnection model the system in that manner or would the generation of the UIS be included and limit hosting capacity?
        ii. How would UIS load be modeled in the interconnection process and would this affect the hosting capacity for other loads such as EVSE and energy storage resources? Would those resources have priority in load hosting capacity over the UIS?

APPENDIX B: Zenobe Whitepaper

Opportunity for Storage As Transmission (SAT) to ensure Power Quality in New York

February 2025

Zenobē Americas Inc.
1177 Avenue of the Americas, 5th Floor - Suite #5087
New York, NY 10036

Opportunity for Storage As Transmission (SAT) to ensure Power Quality in New York

Executive Summary

Storage As Transmission (SAT) with Grid-Forming (GFM) capability is a powerful existing technology that has a crucial role in ensuring Power Quality on the NY Transmission Network as the deployment of wind and solar rapidly increases.

GFM technology is sufficiently developed to be deployed with battery storage on the Transmission Network. Recent precedents in other US grids, as well as internationally, have shown the technology to be effective and, in comparable networks to New York, are estimated to save $bns of cost for ratepayers.

The current moment presents a unique window of opportunity for SAT in NY. Firstly, large-scale, Transmission-connected storage is commencing, following the Public Service Commission (PSC) approval of support for 3GW of bulk-storage under the Index Storage Credit (ISC) program. Enabling GFM capability for storage built under this ratepayer-supported program will maximize system benefits. Secondly, GFM will be crucial to maintain Power Quality in the next 10 years as the deployment of Grid-Following (GFL) Inverter-Based Resources (IBRs), mostly wind and solar, rapidly increases. As stated in the PSC's *Order Establishing Updated Energy Storage Goal and Deployment Policy*[1] ("The PSC Order"), published June 2024, the state's energy storage deployment policy is required to consider the following:

> 1) avoided or deferred costs associated with transmission, distribution, or generation capacity;
>
> 2) minimization of peak load in constrained areas;
>
> 3) systems that are connected to customer facilities and systems that are directly connected to transmission and distribution facilities;
>
> 4) cost-effectiveness;
>
> 5) the integration of variable-output energy resources;
>
> 6) reducing GHG emissions;
>
> 7) reducing demand for peak electrical generation;
>
> 8) improving the reliable operation of the electrical transmission or distribution systems; and
>
> 9) any other issues deemed appropriate.

SAT with Grid-Forming (GFM) capability for Power Quality use cases is key to achieving multiple criteria:

- Avoid / defer expensive transmission equipment such as synchronous condensers
  - *1) Avoided or deferred costs associated with transmission, distribution, or generation capacity*
  - *4) Cost-effectiveness*
- Maintain / improve Power Quality to enable more wind and solar IBRs to connect to the grid
  - *5) The integration of variable-output energy resources*
  - *6) Reducing GHG emissions*
  - *8) Improving the reliable operation of the electrical transmission or distribution systems*

[1] PSC Order CASE 18-E-0130 - In the Matter of Energy Storage Deployment Program - Order Establishing Updated Energy Storage Goal and Deployment Policy

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To seize this opportunity during this unique window of time, Zenobe recommends:

1. The opportunity for SAT with GFM capability for Power Quality use cases should be prioritized and progressed by a newly established GFM task force
2. The PSC should ensure that SAT opportunities identified by the Joint Utilities ATWG should not be exclusive for Utility ownership

See Section 5 for the full description and explanation of the above recommendations.

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Section 1: Definitions of SAT and GFM

As defined by NYISO, SAT is the use of energy storage to meet a Transmission System need. In a practical sense, this means utilizing storage as an alternative or supplement to traditional Transmission assets such as wires and equipment (e.g. synchronous condensers, STATCOMS, shunt reactors etc.).

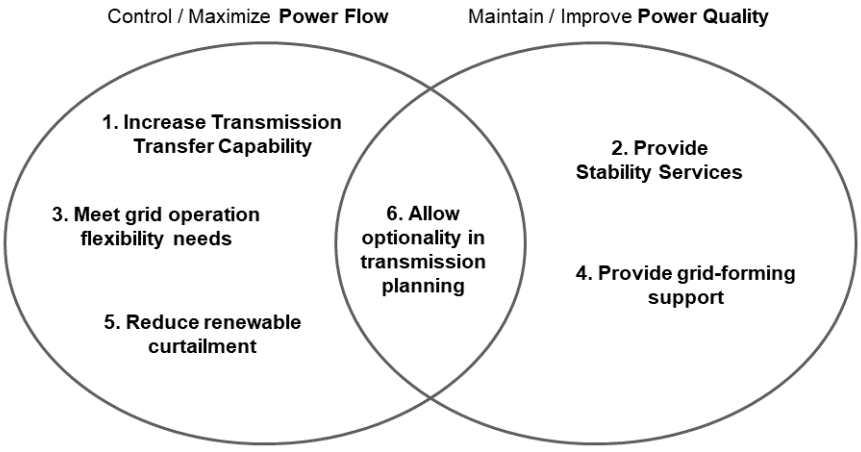
Like any other Transmission asset, SAT can be utilized to solve issues relating to either Power Flow or Power Quality, or both:

- Power Flow = The **volume and dependability** of power that can be transferred across the Transmission Network
- Power Quality = How well the **electricity matches the desired characteristics** (voltage, current) of plant and equipment, as defined in International Standard IEC 61000-4-30

Power Flow use cases for SAT typically require utilizing the energy capacity (MWh) of the storage asset and therefore more complicated, but not impossible e.g. Utility Dispatch Rights contracts, to stack alongside traditional generation asset operational behaviour in energy and frequency services (DA and RT trading) and ICAP participation. This means that Power Flow use cases are often explored through the lens of Storage As Transmission Only Asset (referred to as, SATOA) and exclusive for utility ownership, or through Utility Dispatch Rights contracts that give a Utility priority to utilize the asset during specified events / times.

On the other hand, **Power Quality** use cases are seamlessly stackable with traditional generation asset operational behaviour. As shown in the Section 2 example with the UK Stability Pathfinder services, it is extremely cost effective for SAT to provide Power Quality services on the Transmission Network (e.g. inertia, short-circuit current) if stacking is enabled with traditional generation services.

NY-BEST commissioned Quanta Technology, an independent technical consultancy, to write the *Storage As Transmission Asset Market Study*, published in January 2023. The paper defines six potential use cases for SAT. In the Venn diagram below, Zenobe has grouped these use cases using this distinction between Power Flow and Power Quality:

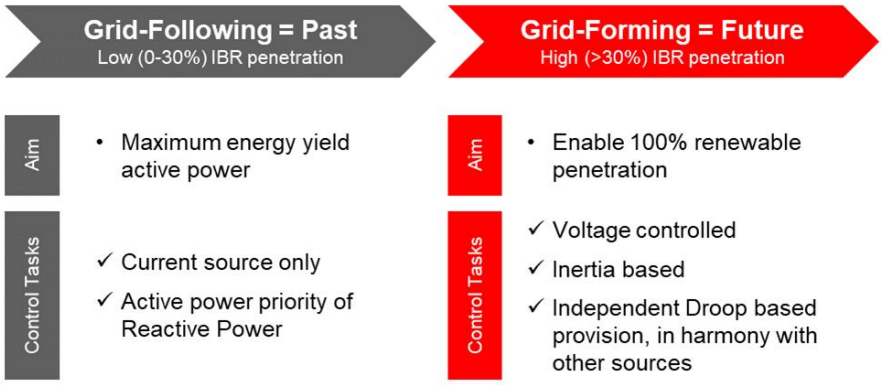


SAT potential use cases: identified in NY-BEST Study and categorized by Zenobe

This distinction between Power Flow and Power Quality is helpful as SAT can refer to a wide range of use cases. As described in Section 3 of this paper, the Joint Utilities in NY are focusing on the application of SAT for Power Flow use cases. However, Zenobe sees a large, but mostly ignored, role for SAT using GFM

for Power Quality use cases in NY. This could unlock $bns of NY ratepayer cost by enabling the integration of more wind and solar IBRs and deferring the expected need for expensive investment on Transmission equipment e.g. synchronous condensers. Stated more directly, the Joint Utilities' plans for SAT in Power Flow applications would likely increase costs to ratepayers, while using SAT for Power Quality would lead to lower ratepayer costs.

This paper utilizes the high-level definition of GFM from SMA, a leading supplier of inverter equipment, as shown below in the distinction between Grid-Following and Grid-Forming.



Source: Description from SMA presentation at ESIG Spring 2024 Technical Conference[2]

For more detailed technical information on GFM, this paper refers to definitions and explanations provided by UNIFI[3] and National Grid ESO[4].

[2] SMA presentation at ESIG 2024 Spring Conference https://www.esig.energy/download/opening-plenary-grid-forming-inverters-fundamentals-and-stability-services-specifications-frank-berring/?wpdmdl=11316&refresh=660c1ab1879371712069297
[3] UNIFI Specifications for Grid-forming Inverter-based Resources v2 https://unificonsortium.org/wp-content/uploads/UNIFI-Specs-for-GFM-IBR-Version-2.pdf
[4] National Grid ESO Power Quality in the GB Transmission Network https://www.nationalgrideso.com/document/277891/download

Section 2: SAT for Power Quality – Review of recent developments

Multiple power systems engineering organizations and reliability councils in the US have been advancing research on the application of SAT with GFM capability on the Transmission Network.

The North American Electric Reliability Corporation (NERC) White Paper, *Grid Forming Functional Specifications for BPS-Connected Battery Energy Storage Systems*[5], published in September 2023, states that it is *"expected that the need for GFM technology will accelerate with the rapid growth of Inverter Based Resources (IBRs) across North America"* and that *"GFM technology is commercially available but has not yet been widely deployed…this technology has great potential to help improve stability and reliability in areas with high IBR penetration or low system strength"*.

The Energy Systems Integration Group (ESIG) published a White Paper, *Capturing the Reliability Benefits from Gird-Forming Batteries*[6], in March 2023, that makes the key point that there is a *"unique window of opportunity to procure, test, and gain experience with GFM technology now, before the need for wind, solar, and battery storage to contribute to grid stability becomes acute. Areas that take advantage of this opportunity will be able to maintain grid reliability through the less expensive, more efficient means of having GFM batteries and renewables provide stability advantages themselves"*.

There are multiple successful precedents, both national and international, for the deployment of GFM technology with battery storage, summarized below:

UK:

- From 2019-22, the system operator (National Grid ESO) ran Stability Pathfinder tenders to procure Power Quality services (inertia, short-circuit current, dynamic reactive power) on the Transmission Network
- Five GFM battery storage projects won contracts in Stability Pathfinder Phase 2, including three projects from Zenobe, one of which that is now operational (Blackhillock 200MW)
- ESO estimates[7] that all three Stability Pathfinder phases will produce total savings worth £15bn ($19.5bn) across 2022-35, from the reduction of thermal generation that would otherwise need to be supported to ensure system stability and the optimization of future Transmission upgrades
- Stability Pathfinder Phase 2, where GFM battery storage was able to compete, showed that procuring Power Quality services from GFM battery storage was significantly more competitive than from synchronous condensers. See Appendix for further details on the tenders and competitiveness of GFM battery storage
- These projects all provide traditional generation and ancillary services alongside the contracted SAT capabilities.

Hawaii:

- Hawaiian Electric mandating GFM models for all IBRs[8]
    - Since 2021, each IBR is required to submit both GFL and GFM models as part of the project interconnection studies, for review prior to the System Impact Study
    - Hawaiian Electric's latest *Integrated Grid Plan*[9] states *"system stability performance is highly dependent on future grid-forming resources… It is strongly recommended to*

[5] NERC White Paper https://www.nerc.com/comm/RSTC_Reliability_Guidelines/White_Paper_Grid_Forming_Technology.pdf
[6] ESIG White Paper https://www.esig.energy/grid-forming-technology-in-energy-systems-integration
[7] ESO Pathfinder savings (p33) https://www.nationalgrideso.com/document/318521/download
[8] Hawaiian Electric mandating GFM requirement https://www.hawaiianelectric.com/documents/clean_energy_hawaii/selling_power_to_the_utility/competitive_bidding/20210901_cbre_rfp/20210825_redline_lmi_appxb_att3.pdf
[9] Hawaiian Electric 2024 Integrated Grid Planhttps://hawaiipowered.com/igpreport/03_IGP-Report.pdf

continue to procure resources with grid-forming capability and provide specific control recommendations during project interconnection requirement studies"

  - 185MW Kapolei Energy Storage project, operational as of Jan-24, has GFM capability and is replacing thermal generation to enable decarbonization targets. The project provides traditional generation and ancillary services alongside the contracted SAT capabilities
- Kauai, Utility Solar Grid Forming Technology (USGFT) project[10]
  - Addition of GFM battery storage to 2x 12MW existing solar PV plants
  - Received $16.25m of federal funding from the bipartisan Grid Resilience and Innovation Partnerships (GRIP) program
  - US DOE Grid Deployment Office report states the benefits of, *"Immediate estimated economic savings of $300,000 by replacing grid services provided by fossil fuels with renewable energy and long-term economic benefits"*

Australia:

- In 2022, Australian Renewable Energy Agency (ARENA) provided AUS$176m (USD$115m) of funding for 8x battery storage projects (2 GW / 4.2 GWh), in areas with high IBR penetration, to adopt advanced GFM capability
- All projects will provide traditional generation and ancillary services alongside the contracted SAT capabilities

MISO:

- MISO published the draft *GFM BESS Performance Requirements* Whitepaper[11] in June 2024
- The proposal is to mandate GFM requirement for all battery storage projects, such that they are capable of surviving grid disturbances
- This GFM mandate will be for a relatively lower level of capability compared to the UK and Australia tenders, which have procured higher levels of Power Quality services from GFM battery storage in specific locations where the need is most acute
- These projects will still provide traditional generation and ancillary services alongside the mandated SAT capabilities

ERCOT:

- ERCOT is working on GFM requirements including performance, models, studies, verification, through its Inverter-Based Resource Working Group (IBRWG)
- ERCOT has committed $893m[12] for 6x 350MVA synchronous condensers in West Texas
- The IBRWG recently concluded[13] of the need for energy storage resources with "Advanced Grid Support Inverter-based", i.e. advanced grid-forming capability, to maintain grid reliability as IBR penetration continues to grow. These projects would provide traditional generation and ancillary services alongside the mandated SAT capabilities

Western Interconnection

- Western Electricity Coordinating Council published *Grid Forming Inverters* in November 2023
- The report recommends that *"Planning Coordinators should strongly consider using GFM technology when replacing synchronous generators with IBRs"*
- These projects all provide traditional generation and ancillary services alongside the mandated SAT capabilities.

[10] Kauai USGFT project https://www.energy.gov/sites/default/files/2023-10/DOE-GRIP-Hawaii-Dept-of-Business-Econ-and-Tourism.pdf
[11] MISO Grid-Forming Battery Energy Storage Capabilities, Performance, and Simulation Test Requirements Proposal https://cdn.misoenergy.org/20240604%20IPWG%20Item%2004b%20Draft%20GFM%20BESS%20Performance%20Requirements%20Whitepaper%20%28PAC-2024-2%29633112.pdf
[12] https://www.ercot.com/files/docs/2023/12/11/14.2%20West%20Texas%20Synchronous%20Condenser%20RPG%20Project.pdf
[13] ERCOT Advanced Grid Support Energy Storage Resource (AGS-ESR) Functional Specification and Test Framework for the ERCOT Grid v1 https://www.ercot.com/files/docs/2024/09/16/ERCOT%20Advanced%20Grid%20Support%20ESR%20Test%20Requirement_.pdf

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Section 3: SAT for Power Quality – Current status in New York

New York is lagging other US grid areas in enabling storage with GFM capability. This is partly due to the relatively low proportion of IBR generation in NY, meaning that Power Quality is not an immediate concern until this proportion increases. Also, the low deployment of utility-scale battery storage (c.400MW) in NY to date has limited the consideration for requiring or incentivizing GFM capability.

NYISO acknowledges the important role for GFM technology in the energy transition. The NYISO 2023-32 *Comprehensive Reliability Plan*[14] states, *"New technology is being developed to allow for a reliable transition to a clean grid. For instance,* ***grid-forming inverter capabilities****, as well as DEFRs, will likely be part of the transformation"*. In addition, the report states, *"NYISO has identified weak portions throughout the New York grid that are likely to experience system performance issues without mitigation measures, such as the implementation of control systems,* ***grid-forming inverters****, and synchronous compensators"*. NYISO commissioned the *NYISO IBR Roadmap Project*[15] from GE Energy Consulting, published in November 2022, recommending GFM as a risk mitigation solution to weak areas of the NY grid where IBR penetration is high. The report also recommends GFM is represented properly in Dynamics Models and identifies GFM for a *"piloting opportunity"*.

The PSC Order commented on SAT and states, *"The Commission supports the NYISO's efforts to evaluate potential new participation options for energy storage resources. For example, the Storage as Transmission project… that will further allow energy storage resources to provide services to the grid beyond generation"*. Zenobe welcomes the PSC's clear support for energy storage providing services to the grid beyond generation. Energy storage that can **stack both generation and SAT capabilities to the grid** represents highly compelling use cases for ratepayer savings in NY. This opportunity for stacking with Power Quality use cases is detailed further in the next section (4).

As instructed by the PSC Order, the Joint Utilities published a *Study of the non-market transmission and distribution energy storage use cases and related process proposals*, on October 29th, 2024. This study builds upon work progressed by the Joint Utilities Advanced Technologies Working Group (ATWG), since it was established in 2020[16]. The ATWG Energy Storage Task Force subgroup has the goal to progress SAT use cases and new technologies such as GFM. However, from the evidence of work being prioritized by the task force in recent years, GFM and Power Quality use cases have not been prioritized. In addition, the Joint Utilities study does not adequately address the potential of SAT for Power Quality use cases. Only one of the six presented use cases specifically integrates storage with GFM capability, which is for an application in a Distribution-level microgrid. The two Transmission-level use cases (A, E) are both primarily solving Power Flow issues, requiring the MWh throughput (scheduled charging and discharging) of an energy storage asset to balance variable power flow (A) and manage variable system capacity (E). This lack of focus on SAT with GFM capability is not surprising as the PSC Order instruction was to study "non-market" energy storage use cases and, as shown in international precedents, SAT with GFM capability for Power Quality use cases requires stacking alongside full market access. It is simply not economic to build a single-use SAT project to only solve a Power Quality issue. As the Utilities are prohibited from market participation, they cannot economically justify SAT for Power Quality use cases and therefore are prioritizing **single-use (SATOA) Power Flow use cases, e.g. congestion management and renewable curtailment avoidance.**

Overall, the PSC Order framing of SAT on non-market use cases and the Joint Utilities' incentives being aligned to only explore single-use, non-market applications suitable for utility ownership, means that

[14] NYISO CRP 2023-32 https://www.nyiso.com/documents/20142/2248481/2023-2032-Comprehensive-Reliability-Plan.pdf
[15] GE Energy Consulting NYISO IBR roadmap https://www.nysrc.org/wp-content/uploads/2023/04/NYISOIBRRoadmap_GEEnergyConsulting_NYSRCPresentation30Nov22_R1.pdf
[16] https://jointutilitiesofny.org/sites/default/files/Advanced%20Technologies%20Working%20Group%20Report%2C%20October%2029%2C%202020%20(1).pdf

Zenobe does not expect the Joint Utilities ATWG to sufficiently advance progress (studies, recommendations, approval processes etc.) **on the large opportunity for SAT for Power Quality use cases, unless directed to do so**. To progress this opportunity, both the framing of the conversation and the economic incentives for adoption need to change.

Though this paper is focused on SAT for Power Quality use cases, there is also an opportunity for SAT that can stack Power Flow use cases with market access. An example from New York is National Grid's East Pulaski 2MW storage project[17] that was built exclusively for a non-market Power Flow use case but subsequently authorized by the PSC to participate in wholesale markets[18]. This decision was made to maximize the system value of the asset that annually was only being utilized on certain summer days. This example clearly demonstrates the risk of single-use SAT projects being vastly under-utilized, and the potential to unlock greater system value from enabling stacking with market access.

[17] National Grid East Pulaski project description https://www.nationalgridus.com/news/2019/06/national-grid-launches-first-of-its-kind-battery-storage-system/
[18] https://www.utilitydive.com/news/new-york-authorizes-national-grid-to-serve-retail-bid-into-wholesale-marke/606741/

Section 4: SAT for Power Quality – Benefits and ratepayer savings in New York

As stated in the NYISO 2023-32 *Comprehensive Reliability Plan*, there will be a growing need for GFM during the transition to a clean grid. There is a large opportunity for ratepayer savings from SAT for Power Quality use cases if these services can be stacked alongside traditional generation and ancillary participation. This will enable the state-supported ISC procurements to also provide these services.

Based on comparable programs, for instance in the UK, and studies on the potential for SAT in NY, this opportunity is worth on the scale of **billions of dollars in quantifiable ratepayer savings** over the transition. Further benefits, such as more rapid integration of renewable generation, are harder to quantify but arguably even more valuable to ratepayers.

There is a quantifiable benefit from SAT for Power Quality use cases in avoiding / deferring expensive traditional transmission equipment (e.g. synchronous condensers) that are being proposed by the Joint Utilities. As the proportion of IBRs on the NY grid rapidly increases, the number and costs for proposed synchronous condensers by the Joint Utilities will increase significantly. Zenobe has the understanding from ongoing conversations with the Joint Utilities that several of these projects are being currently designed, to be proposed in the future. Below summarizes synchronous condensers that have been proposed to date by Joint Utilities in NY.

National Grid:

- The 2023 *Local Transmission Plan*[19] proposes synchronous condensers in the Northern region, at Taylorville and Coffeen substations, with 2030 in-service dates. There is no cost indicated for these assets by National Grid.

LIPA:

- In 2021, LIPA proposed[20] new synchronous condensers at $200m estimated project cost to improve system stability due to the offshore wind.
- With the amount of energy storage anticipated to connect to the LIPA transmission system, the needs could be met with GFM capabilities while reducing overall ratepayer costs.

Beyond the Joint Utilities public plans, the NYISO 2023-2042 System & Resource Outlook[21] states, *"To fully utilize the transmission facilities already in place,* ***additional dynamic reactive power support must be added to the grid in upstate New York****... Reactive power supports the overall voltage performance of the grid and may be provided by* ***generators, dedicated dynamic reactive power devices such as synchronous condensers or other power electronics (e.g., STATCOMs)****, or potentially other specialized Grid-Enhancing Technologies (GETs). The Outlook finds that by replacing the dynamic support services from these fossil-fuel generators to support the Central East interface voltage performance, the future potential congestion across* ***Central East could be largely eliminated and curtailment of renewable energy reduced by approximately 40-220 GWh in 2035*** *and more in years beyond"*. This is a clear statement for the need for additional dynamic reactive power support, which is a SAT Power Quality use case, in Upstate New York.

Avoiding / deferring / reducing the costs for synchronous condensers should be a key target when considering the use case of SAT with GFM in New York. These synchronous condensers are being announced, but not yet built, and not planned to be cost-recovered through NYISO. This could be

[19] National Grid LTP 2023 https://www.nationalgridus.com/media/oasis/filings-and-studies/national_grid_ny_2023_november_local_transmission_plan.pdf
[20] LIPA Transmission & Distribution Planning for Climate Act https://www.lipower.org/wp-content/uploads/2021/02/13.-Briefing-on-Grid-Planning-Climate-Ladership-Community-Protection-Act.pdf
[21] NYISO 2023-2042 System & Resource Outlook (The Outlook) https://www.nyiso.com/documents/20142/46037414/2023-2042-System-Resource-Outlook.pdf/8fb9d37a-dfac-a1a8-8b3f-63fbf4ef6167

achieved by a combination of mandating GFM battery storage and more targeted storage with higher GFM capability in specific locations. Large-scale, battery storage projects contracted through the ISC program that are in the general vicinity of these substations could provide the services if sufficient GFM capability is enabled. GFM battery storage projects can provide these Power Quality services, continuously and uninhibited, for the fraction of the cost of new-build synchronous condensers, while still maintaining uninhibited participation in the ISC contract.

In the UK, a grid 2.3x the size of NY in terms of total annual load and 1.5x peak load, the full program to competitively procure Stability services (inertia, short-circuit level) is estimated by National Grid ESO to **save ratepayers c.$19bn (£15bn[22]) from 2022-35**. The program procured a combination of GFM battery storage and synchronous condensers (see appendix for details) in highly competitive tenders that controlled the cost and number of synchronous condensers. The $19bn savings is based on the cost optimization of transmission upgrades and the improved reliable operation of the transmission system.

NY-BEST published the *Storage as Transmission Asset Market Study*[23] in January 2023 that modelled three example use cases.

- Use Case 1 demonstrates that SATA is a viable alternative to transmission wire solutions because it reduces congestion and cost-effectively improves transfer capability.
- Use Case 2 demonstrates that SATA is beneficial because it provides the technical advantage of grid voltage support, improving transmission capability and renewable energy deliverability.
- Use Case 3 demonstrates that SATA can improve capacity deliverability and reduce local capacity requirements beyond its role as a transmission asset.

NY-BEST *Storage as Transmission Asset Market Study*: Modelled example use cases

Use Case 1 & 3 are Power Flow use cases as they require the MWh capacity of energy storage for congestion management and contingency line capacity management. Use Case 2 is a Power Quality use case as it only requires the reactive power capability of the storage asset, therefore seamlessly stackable with generation and ancillary services. As the paper states, *"Because the primary focus is to regulate the bus voltages automatically, the requirements for the real power in MW and storage durations for the battery are less important"*. The three modelled use cases alone are estimated to provide $177.2m in annual savings vs $490m of capital cost outlay, therefore achieving $2.2-$3.0bn over a 15-20yr project lifetime. The paper also states, *"SATA has the potential to reduce the grid upgrade effort, completion time, and cost, **estimated to be on the order of several billion dollars in the coming decades**"*.

Finally, there is a real risk that if Power Quality issues are left to Utilities to solve, their cautious and reactive grid-planning processes will hold back the deployment of renewable capacity. For instance, if Power Quality issues are not effectively forecasted and solved, renewable projects will receive less favorable interconnection costs, due to Power Quality issues identified in System Impact Studies requiring later interconnections and triggering more upgrades. In contrast, grid-connected storage assets, supported by the approved ISC funding, will be coming online alongside increasing renewable capacity. Therefore, stacking SAT for Power Quality from these ISC storage assets will provide an **aligned transition to higher renewable penetration whilst maintaining Power Quality**. This ratepayer benefit is harder to quantify but increasing the speed and ease of deploying lower-cost renewable projects will be incredibly substantial.

[22] National Grid ESO Balancing Costs: 2024 Annual Report and Future Projections https://www.nationalgrideso.com/document/318521/download
[23] NY-BEST Storage as Transmission Asset Market Study https://cdn.ymaws.com/ny-best.org/resource/resmgr/reports/SATA_White_Paper_Final_01092.pdf

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To conclude, SAT with Grid-Forming (GFM) capability for Power Quality use cases is key to achieving multiple criteria in New York state's energy storage deployment policy:

- *1) Avoided or deferred costs associated with transmission, distribution, or generation capacity*
- *4) Cost-effectiveness*
- *5) The integration of variable-output energy resources*
- *6) Reducing GHG emissions*
- *8) Improving the reliable operation of the electrical transmission or distribution systems*

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Section 5: Recommendations

Zenobe believes that the State government of NY can take the SAT opportunity into its own hands and realize significant ratepayer benefits. To do this, Zenobe makes the following recommendations:

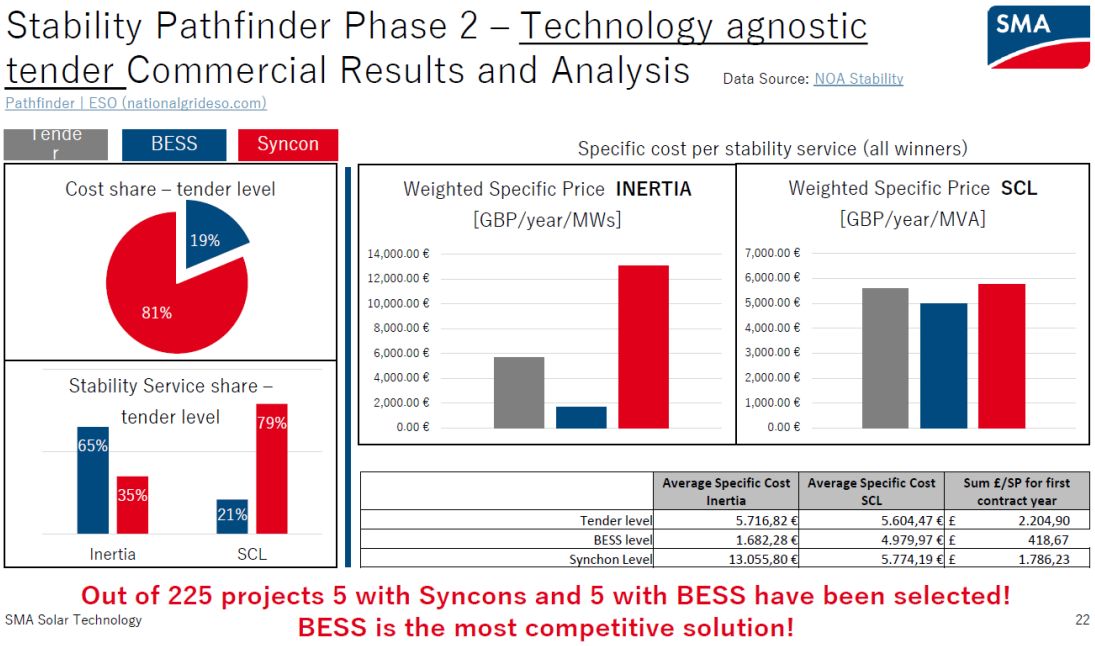
1. The opportunity for SAT with GFM capability for Power Quality use cases should be progressed by a **newly established GFM task force,** responsible for:
    a. Assessing regulatory challenges that could prevent market participant assets from adopting GFM capability and providing Power Quality solutions
        i. Enable stacking for the ratepayer-supported ISC storage projects to simultaneously provide Power Quality solutions on the JU's distribution and transmissions systems
        ii. Remove regulatory barriers that prohibit suitable assets from stacking Power Quality solutions with participation in NYISO's energy, ancillary and capacity markets
    b. Develop suitable incentive structures and approval processes to deploy SAT with GFM capability for Power Quality use cases
        i. Creating a process to allow GFM energy storage connected to the JU's transmission and distribution systems to provide Power Quality solutions and allow the costs borne by the JUs for contracting and administering these SAT resources to be rate-based
        ii. Coordinating with teams within the JUs and NYISO to ensure GFM is represented properly in Dynamics Models.
        iii. Collaborating with the JUs to study GFM capability for all Transmission-connected battery storage and competitively procure GFM

2. **The PSC should ensure that SAT opportunities identified by the Joint Utilities ATWG should not be exclusive for Utility ownership**
    a. Open these opportunities for competitive procurement from all market participants and allow the costs borne by the JUs for contracting and administering these SAT resources to be rate-based

Appendix

UK Stability Pathfinder results details:

- Zenobe won Stability Pathfinder Phase 2 contracts for GFM battery storage to deliver 4.9GVA.s of inertia and 1,560MVA of short-circuit fault current across three sites totalling 900MW of battery storage capacity. Zenobe's projects represented 65% of the inertia procured in Phase 2 tender and 13% of the total inertia procured across the three phases
- These figures are only the contracted capability of stability services and the 900MW of GFM battery storage has the combined capability of delivering 2,160MVA of short-circuit fault current and c.26GVA.s of inertia. These additional capabilities will enter future stability year-ahead tenders or day-ahead markets that ESO is planning to implement from 2026.
- SMA analysis[24]of Phase 2 results and competitiveness of GFM vs synchronous condensers is shown below.



	Average Specific Cost Inertia	Average Specific Cost SCL	Sum £/SP for first contract year
Tender level	5.716,82 €	5.604,47 €	£ 2.204,90
BESS level	1.682,28 €	4.979,97 €	£ 418,67
Synchon Level	13.055,80 €	5.774,19 €	£ 1.786,23

[24] SMA presentation at ESIG 2024 Spring Conference https://www.esig.energy/download/opening-plenary-grid-forming-inverters-fundamentals-and-stability-services-specifications-frank-berring/?wpdmdl=11316&refresh=660c1ab1879371712069297