ALLIANCE FOR CLEAN ENERGY NEW YORK, INC.

ACE Summary of ~
New York's 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage.

The 6 GW Roadmap was filed in NYS PSC Case 18-E-0130, *In the Matter of Energy Storage Deployment Program*, on December 28, 2022. See https://documents.dps.ny.gov/public/MatterManagement/MatterFilingItem.aspx?FilingSeq=297549&MatterSeq=55960

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Executive Summary… the document

- Energy storage will play a critical role in New York's electricity transition by enabling renewables, reducing curtailment, and storing power for use later.
- This Roadmap, which updates the 2018 Roadmap, is the plan to double NYS deployment, achieving at least 6 GW of storage by 2030.
- The Roadmap summarizes needed market reforms, proposes procurement mechanisms, and identifies necessary R&D, especially for long-duration storage.
- Section 2 analyzes the current market and progress in NYS. In short, about 1.3 GW has been awarded or contracted, so 4.7 GW is need to meet the 6 GW goal. 130 MW has been installed.
- The analysis developed for this document ("Roadmap Analysis") indicates that "about 12 GW of energy storage by 2040 and 17+ GW by 2050 would be part of a cost-effective decarbonized electric grid"
- There are serious barriers to storage development in New York. Due to inflation and supply-chain constraints, there has been serious cost increases. At the same time, the market revenue for storage projects is not adequate, as it reflects current market conditions and not the future market that will need storage. On the other hand, the ITC in the IRA has improved things. Still, a NYSERDA support program is needed.

Executive Summary .. the recommendation

- **BULK:** 3 GW of bulk storage projects should be procured through a new **Index Storage Credit** mechanism using long-term contracts.
- **COMMERCIAL & RESIDENTIAL:** The Roadmap proposes to extend funding for the commercial and residential storage programs using region-specific blocks of funding similar to that used to-date. New program should include 1.5 GW of program blocks for retail projects and 200 MW for residential storage programs.
- The total cost of these proposed procurement programs is estimated at $1.0 - $1.7 billion, an est. increase in customer electric bills of 0.32% – 0.54% (or $0.34 – $0.58 per month for the avg. residential customer).
- The Roadmap also recommends that the Joint Utilities be directed to study the potential of energy storage to provide non-market transmission and distribution services and identify projects that provide cost-effective services when compared to traditional alternatives, and that any storage projects developed as a result should count toward the 6 GW target.
- NYSERDA programs should support RD&D for long-duration storage technologies.

Section 1: Introduction

- The Introduction provides a background on the first NY Storage Roadmap in 2018.
- The 2018 Roadmap had two important findings: there was a heavy preference for storage development downstate, and there were synergies with solar development.
- The 2018 Roadmap established goals of 1.5 GW by 2025 and 3 GW by 2030.
- The result was the Market Acceleration Bridge Incentive.[1]
- Since that 2018 Roadmap, NY's climate act was passed, other renewable energy goals were put in place (*e.g.*, 10 GW solar), and the Inflation Reduction Act was passed.
- The new 6 GW Roadmap was drafted by DPS and NYSERDA staff, and this section also reviews the organizational structure of the rest of the document.

Section 2: Current Progress & Market Overview

- 1,301 MW of storage projects have been awarded; 130 MW have been installed
- The Bridge Incentive program awarded 810 MW under three program types:
  - The bulk program is an upfront incentive and has awarded $113 million in market acceleration funding to 12 projects (480 MW). The contracted projects are expected to be completed before the end of 2025. The program had significant attrition.
  - The Retail Storage Incentive Program is a declining block program that has deployed $193 million and procured 320 MW of storage. In New York City 112.2 MW; in Westchester 23.5 MW; in Long Island 9.1 MW; and in Rest-of-State 175 MW.
  - The Long Island residential program is NY's first residential program and committed $5.6M for 1,125 projects, totaling 11 MW.
- The Renewable Energy Standard Program has awarded 250 MW of storage.
- The balance of MW resulted from the Utility Bulk Storage Dispatch Rights procurement (120MW), NYPA North Country project (20MW), utility demos & NWAs (56 MW), and w/o state funding (54 MW)
- Section 2.3 covers Storage Use Cases and State of the Market

Section 3: Role of Storage Targets

- 3.1 discusses the services& value provided by storage, *e.g.*, system and local reliability that will be needed with higher peaks and more intermittent resources, augmentation of resource adequacy, and renewables integration.
- 3.2 discusses that the Roadmap Analysis suggests that about 12 GW of short-duration storage by 2040 and more than 17 GW by 2050 will be needed. The Roadmap analysis also estimates that deployment of 6 GW of storage by 2030 will yield an estimated $1.94 billion (net present value) in net societal benefits, due to increased delivery of renewable energy and reduced reliance on other more expensive firm capacity resources. This Roadmap analysis finds that nearly all the 12 GW of storage chosen in the modeling is deployed by 2035, to capture the ITC.

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Table 3. New Program Procurement Schedule

New Program Procurements	2023	2024	2025	2026	2027	2028	2029	2030
Bulk (3,000 MW)	0	1,000	1,000	1,000	0	0	0	0
Retail (1,500 MW)	0	375	375	375	375	0	0	0
Residential (200 MW)	13	27	27	27	27	27	27	27
Annual Total	13	1,402	1,402	1,402	402	27	27	27
Cumulative Total	13	1,415	2,817	4,218	4,620	4,647	4,673	4,700

Section 4: Storage Deployment Barriers

- 4.1 discusses supply chain and material costs as a barrier, citing, for example, a 500% increase in lithium carbonate prices since July 2021.
- 4.2. discusses market rule changes, either planned or needed, at the NYISO. Current wholesale market revenue is insufficient to support energy storage deployment without public incentives. This section discusses several ISO rule issues, including storage as a transmission asset, capacity market rules, and ancillary services rules that could change and affect wholesale market revenue.
- 4.3 covers financing barriers[1]. In short, uncertain revenue makes it difficult to get financing for projects.

Section 5: Bulk Storage Program Design

- While experience with standard offer upfront rebates has been positive for retail and residential programs, this option has not proven to be the optimal approach for large-scale project procurement.
- Significant upheaval in the supply chain and markets for bulk storage has created new pressures on projects with a fixed initial support level.
- Section 5 presents options for a procurement of bulk storage, and a recommended option.
- The 6 **Bulk Storage Procurement Structure Options (section 5.1) are:**
    1. Upfront Rebate/Standard Offer Incentive
    2. Index Storage Credit - **RECOMMENDED**
    3. Preset Hourly Revenue Support/ “Clean Peak Credit”
    4. Utility Ownership with Traditional Market Participation
    5. Utility Dispatch Rights Contracts
    6. Utility Ownership for Transmission & Distribution (T&D) Services

Section 5: Bulk Storage Program Design, Assessment Criteria (5.2)

- The Roadmap presents **four criteria** used to evaluate the six procurement options
- Implementation Feasibility: The ease and risks of implementation and administration of the procurement option, and the likelihood that the option can drive accomplishment of state goals.
- Development Effectiveness: The extent to which the option meets developer needs for project development, ensures that projects complete construction (minimizing attrition), and maximize their operating lifespan.
- Efficiency: The extent to which policy options drive storage deployment at lower program costs and thus ratepayer impacts than other policy options. In many cases, efficiency directly relates project risk reduction & financing cost.
- Compatibility and Acceptability: The compatibility of each option with wholesale market dispatch signals and reasonableness of locational signals recognizing prices and transmission constraints. It also evaluates cost uncertainty and risk to which ratepayers may be exposed.

Section 5: Bulk Storage Program Design, Procurement Options Assessment (5.3)

	Implementation Feasibility	Development Effectiveness	Efficiency	Compatibility & Acceptability
Upfront Incentive	Limited implementation challenges, low admin burden	No hedging available, no longterm revenue support	Higher-cost financing/ratepayer costs than alternatives	Retains market signals
Index Storage Credit	Some implementation challenges, but familiar concept	Significant hedging benefits attractive to developers and reduces attrition	Low financing cost due to high (but not perfect) level of hedging	Maintains local value and market signals, ratepayers exposed to upside and downside of commodity prices
Clean Peak Credits	Complexity in setting peak hours and eligible resources	Highly certain revenue, simple operations	Inability to operate based on market signals may drive higher bid prices	Incompatible with markets, may conflict with NYISO dispatch
Utility Market-based Ownership	Regulatory changes required, raises market concerns	Low expected risk of attrition	Low cost of financing	Reduces market participation/ opportunity for private sector
Utility Dispatch Rights	Time-consuming processes, risks of delay and limited awards in current model	Attrition risk due to contract requirements, uncertainty in post-contract value	Contract requirements raise costs	Projects follow NYISO market signals
Utility T&D Ownership	Time-consuming process to launch, unlikely to drive realization of 6 GW target if sole mechanism	Very low attrition risk after identification and approva	Provides grid services at least cost, often where upgrades are already needed	Non-market operations, but projects serve existing needs

Section 5: Bulk Procurement Recommendation

Index Storage Credit - RECOMMENDED

- **Implementation Feasibility:** This option builds on recent experience in the Clean Energy Standard (including the Tier 1, Tier 4, and offshore wind programs), though significant effort may still be required to structure solicitations and long-term contracts.
- **Development Effectiveness:** The long-term certainty and financeability of this option are both supportive of, and supported by developers, as indicated by the findings from NYSERDA's stakeholder survey and engagement process, discussed in Appendix C of the Roadmap. For projects that bid responsibly, this approach is likely to ensure that projects enter construction even in the event of changing market conditions. Pursuing this option would thus increase the likelihood of meeting procurement and deployment goals.
- **Efficiency:** This option provides greater revenue certainty to developers through financial hedging, which lowers project risks and thus project costs. Reduced project cost translates to lower bid prices because a lower level of support payments is needed and therefore ratepayer costs are reduced. Using a competitive solicitation structure would further encourage projects to minimize strike prices and propose non-price benefits to be factored during project evaluation and selection, compared to solely project maturity.
- **Compatibility and Acceptability:** This option is fully compatible with markets, leaving market signals intact. However, as a corollary to reducing developer risk by providing revenue hedging, if energy/capacity prices were to drop significantly and maintain low levels persistently, the Index Storage Credit would pay higher support amounts to projects; this ratepayer risk is balanced by the fact that ratepayers would experience lower energy and/or capacity prices.

Section 5: Index Storage Credit Design Issues (5.4)

Section 5.4 considers a number of design choices relevant to the creation of a new bulk storage program using an Index Storage Credit mechanism and provides recommendations. Table 5 on page 56 of the Roadmap has a summary of the recommended design choices.

- Definition of Index Storage Credits
- Contract Term
- Eligible Technologies & Storage Duration
- Reference Price Components in the ISC Calculation
- Payment Caps & Inflation Adjustment
- Reference Energy Arbitrage Price (REAP): Market Choice
- Reference Energy Arbitrage Price: Location/Geographic Precision
- Reference Energy Arbitrage Price (REAP): Arbitrage Calculation
- Reference Capacity Price (RCP): Market Choice
- Reference Capacity Price: Geographic Precision
- Reference Capacity Price: Adjustment Factors
- Settlement Period
- Future Wholesale Market Rule Changes
- Bid Evaluation Criteria
- Maximum Bid Prices

Section 5: Bulk Storage in CES (5.5)

- NYSERDA intends to maintain the eligibility of co-located and separately located energy storage projects in Tier 1 and OSW solicitations in current and future solicitations of the Clean Energy Standard.
- Projects would not be compensated through Tier 1 and/or OSW solicitations AND ISC bulk storage procurements, only through one of those programs.

Section 6: Retail & Residential Program Design

NYSERDA and DPS Staff propose that NYSERDA conduct further storage procurements in the retail and residential sectors by continuing and expanding existing programs. (**6.1 Retail Storage)**

- While fixed-rate incentives are less robust to changes in markets and costs than other procurement options, the certainty of funding availability and amounts has proven to be valuable to developers in this market segment.
- Since the initial programs launched, the Allocated Cost of Service proceeding has enabled a reduction in demand charge costs to distribution-sited storage projects, and the ITC was authorized. These improvements help provide certainty and allow NY to maintain the existing declining-block funding mechanism.

Section 6: Retail Storage Program

- NYSERDA and DPS Staff recommend continuing Retail Storage Incentive funding to procure a further 1,500 MW of retail storage by 2030, using declining blocks.
- Funding needs are expected to be at similar rates as the latest iterations of past programs
- NYSERDA and DPS Staff recommend keeping regional block structure
- Project maturity requirements should be high to reduce project attrition and time to commissioning.
- Different region's size and funding rate should be based on need and system benefits in that region.
- Size of the first block should reflect the backlog of highly mature projects to avoid boom-bust cycles and attrition
- NYSERDA and DPS Staff recommend that future regional allocations in the block structure of the program be sized in a way to maximize benefits to constrained areas and disadvantaged communities.
- With respect to communication of the program, NYSERDA should:
  - provide a detailed analysis to the public of region-specific incentive rates, as well as a forecast of potential future block rates;
  - continue to communicate adjustments to incentive rates early in the process; and
  - build on the success of the standalone storage value stack calculator that is currently available for projects in Con Edison's service territory and develop a similar public-facing calculator for VDER storage projects statewide.

Section 6.2: Residential

- NYSERDA and DPS Staff are launching an extensive residential energy storage program statewide, with funding for 200 MW, available until 2030, and that emphasizes maximizing local benefits and benefits to Disadvantaged and Environmental Justice communities.

- In the first round of storage incentive programs in New York, funding for residential projects has been limited to projects pairing with solar power and located on Long Island. The focus on Long Island was driven by the adoption of the DLM tariff in LIPA's service territory, enabling system services to be provided by storage located at residential homes. Given the small size of residential storage projects, however, the total magnitude of achievable deployment out to 2030 is expected to be only up to a few hundred MWs, spread across the state.

- *Residential Program Design Considerations include the need for* long-term visibility regarding the availability of incentive funding and simple purchasing. Therefore, NYSERDA and DPS Staff recommend designing a program with large blocks of funding at stable incentive rates, likely sized to last a year or multiple years at a time. And, that the incentive be provided to the project installer upfront so as to directly drive down the cost of the project to the consumer.

Section 7: General Design Considerations

7.1 – Geographic Distribution of Procurement

- Resources located in different areas will have different values to the system - geographic considerations include cost, emissions Impacts, and reliability. Energy storage can be used in constrained areas to reduce renewable curtailments, allowing incremental clean MWh to be delivered to the grid.
- Downstate New York is one of the highest-value deployment opportunities for energy storage, as the NYISO and utilities will require dispatchable capacity to maintain reliability, both in terms of resource adequacy and transmission security, as fossil fueled power plants reach their end-of-life and move to retire.
- Analysis in a least-cost scenario found that 2/3 of all energy storage deployment was in downstate New York, and therefore **NYSERDA and DPS recommend that a significant portion of incoming storage be located downstate.**
- Furthermore, the program should target areas where fossil fuel peaking power plants exist so that storage capacity developed in the area can provide an alternative source of clean peak.

Section 7: General Design Considerations

7.2 – Disadvantaged Communities and Environmental Justice Considerations

- All programs will comply with the Climate Act Disadvantaged Communities requirements
- At least 35% of program funding be utilized to support projects in areas of the state with the highest benefits to DACs and Peaker reductions. **NYSERDA and DPS expect Zone J (NYC) to receive particular focus.**
- Benefits of bulk and off-site retail projects will be considered a statewide benefit.
- On-site retail and residential projects primarily provide value to the site owners. NYSERDA and DPS deem these local benefits, and 35% of funding and benefits will be sited in DACs.

Section 7: General Design Considerations

7.3 – Prevailing Wage

- Commercial Storage systems with a capacity of 1MW-AC or larger are eligible for the ITC in the Inflation Reduction Act: automatically qualifying for a base rate of 6%, which increases to 30% if all prevailing wage and apprenticeship requirements are followed.
- **NYSERDA and DPS recommend** that energy storage projects with a capacity of 1 MW-AC and greater participating in any NYSERDA energy storage incentive program pay New York State Prevailing Wage as a programmatic contractual requirement.

Section 8: Cost

8.1 – Program Cost Estimates

Retail and Residential Program Costs:

Program	MW	Estimated Program Cost (2022$ Net Present Value)
Retail	1,500	$438,000,000
Residential	200	$72,000,000
Total	**1,700**	**$510,000,000**

Bulk Procurement Program Cost Estimates:

Program	MW	Estimated Program Cost (2022$ Net Present Value)
Bulk – Low Estimate	3,000	$474,000,000
Bulk – High Estimate	3,000	$1,186,000,000

The range of these projections reflects future uncertainties, most notably those associated with energy and capacity prices.

Section 8: Cost

8.2 – Other Funding and Costs

Separate Funding Categories:

	Residential and Retail	Bulk Startup	Total	Legacy Funds Available	Additional Requested
Program Administration	$24,502,706	$4,537,071	$29,039,778	$14,500,000	$14,539,778
Implementation Support	$13,430,000	$1,600,000	$15,030,000	$1,882,768	$13,147,232
Program Evaluation	$3,000,000	-	$3,000,000	-	$3,000,000
NYS Cost Recovery Expense	-	-	-	-	$8,961,130
Total	**$40,932,706**	**$6,137,071**	**$47,069,778**	**$16,382,768**	**$39,648,139**

Section 8: Cost

8.3 - Total Cost Estimate for Programs to reach 6GW by 2030

- The **Total Cost** for all three programs of a combined 4,700 MW is expected to be **1.0-1.7 billion**, paid out over 22 years.
- This equates to an estimated increase in customer electric bills of **0.32% – 0.54%** (or $0.34 – $0.58 per month for the average residential customer) on average across New York for the 22-year period of payments under these programs.
- Retail and residential project payments will begin soon after the start of any new programs and end in 2030, since incentive payments for these projects are paid out at commissioning.
- Bulk project payments are spread out over 15 years, beginning when projects are operational, which may not occur for four to five years after procurement, and ending in 2044 at the latest for projects operational in 2030.

	Lifetime Program Cost, NPV (2022$ Million)	Lifetime Levelized Bill Impact (%)	Peak Year Bill Impact (%)
Bulk	$474 – $1,186	0.15% - 0.37%	0.63% - 0.91% (2030)
Retail/Residential	$535	0.17%	0.69% (2027)
Total	$1,009 - $1,721	0.32% - 0.54%	1.32% - 1.60% (2030)

Section 8: Cost

8.4 – Funding Mechanisms

- **NYSERDA and DPS recommend different funding programs for Bulk vs. Retail and Residential**
- For Bulk, the recommendation is similar to Tiers 2, 3 (Zero Emission Credit requirement), and 4 of the Clean Energy Standard and the Offshore Wind Standard; i.e., a payment obligation for jurisdictional Load-Serving Entities (LSEs) in proportion to their share of Statewide load. NYSERDA and DPS Staff also recommend that NYPA and LIPA, as non-jurisdictional LSEs, agree to participate voluntarily and accept ISC obligations in proportion to their share of Statewide load.
- Residential and Retail: These programs are proposed to pay projects the full contract amount at, or very near, the time of commissioning, using a fixed-rate incentive approach, allowing higher certainty in budget needs and timing. For these reasons, **NYSERDA and DPS Staff recommend** a CEF-style collection, with a transparent pay-as-you-go methodology utilized in other recently approved programs such as NY-Sun, also collected on a statewide MWh load ratio share basis. This Roadmap recommends that NYPA and LIPA participate in collections on a MWh load share basis as well, consistent with previous programs.
- **NYSERDA and DPS Staff recommend** $814.6 million of funding be approved for the procurement of 1,700 MW of retail and residential storage projects between 2023 and 2030. Of this total, $775.0 million is dedicated to incentives and $39.6 million supports administration of the retail and residential storage programs.

Section 9: Long-Duration Storage & Innovation

- The primary role of long-duration energy storage resources in deeply decarbonized electric grids is to provide power during infrequent but critical multi-day-long periods when electric demand is high and when contributions from renewables and existing clean firm resources are not sufficient to meet demand.

- The Roadmap analysis identifies a need for **24 GW of 100-hour battery-type storage with 50% round-trip efficiency** to replace the contributions of 18 GW of a fully dispatchable hydrogen- resource, and 13 GW of incremental in-state renewable resources to provide additional energy to charge this storage resource.

- Importantly, the focus should be on resources that are scalable and able to be sited in New York State. **The analysis for this Roadmap indicates that 5 GW or more of these resources could provide near-perfect capacity** in a fully decarbonized energy system. T

- The Roadmap recommends that NYSERDA's Innovation program prioritize those long duration storage resources.

Questions for Stakeholder Comment

Section 5: Bulk Storage Program Design

- Should action be taken on the remaining JU Bulk Storage Dispatch Rights procurement requirement? Numerous utilities have yet to fulfill their requirement from the 2018 Storage Order and NYSERDA and DPS Staff are currently assessing the ramifications of future programs on these procurements.
- What methods should be used in each program to attract storage projects in preferred locations and durations? For example, should procurements seeking 8-hour duration assets utilize a TB8 mechanism, or should all resources compete with the same reference prices in the same solicitations? What impacts do duration or location carve-outs have on competitive procurements?

Section 7: General Storage Program Design Considerations

- For programs supporting bulk and off-site retail projects, how should incentive programs and procurements be best designed towards ensuring that at least 35% of proposed program funding is utilized to benefit disadvantaged communities and drive peaker plant emissions reductions, beyond a program focus on Zone J as proposed in Section 7.2?
- For programs supporting on-site retail and residential projects, how could programs be optimally designed so as to ensure that at least 35% of the funding and associated benefits of these projects are directed to projects sited in DACs?

Section 9: Long-Duration Storage and Innovation

- What type and size of LDS demonstration projects should be considered in future programs, and how should the program be designed to maximize value and learning?
- What mechanisms need to be considered when evaluating options for operating and compensating LDS projects on the grid?