

Hybrid Storage Resource (HSR) Model: Energy & Ancillary Services

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Agenda

- **Project Scope**
- **HSR Participation**
 - Energy Market Rules
 - Ancillary Services
- **Planned Timeline & Next Steps**
- **Appendix: Background & Reference Material**

Project Scope

- **This project will explore different aspects related to participation of hybrid resources, including:**
 - Participation in NYISO's Day-Ahead and Real-Time Energy markets
 - Provision of Ancillary Services, including Operating Reserves, Regulation, and voltage support
 - Participation in NYISO's Installed Capacity market
 - Settlement process
 - Modeling for interconnection, planning and operations
 - Metering requirements
- **The project will evaluate the changes required to enable hybrid storage aggregated resources to receive a single dispatch schedule.**

Today's Presentation Objective

- **Begin initial discussions**
 - Update Stakeholder's regarding the NYISO's current proposal
- **Solicit feedback and collect details of storage plus fossil fuel use cases**
 - Current proposal is mainly targeted for storage plus solar/wind cases
- **NYISO is considering storage plus thermal generation but requires more information related to specific use cases to further consider how they can fit into the HSR model**

HSR Participation

Proposed Definition

- **A Hybrid Storage Resource (“HSR”):**
 - A single Resource (and PTID) including storage and at least one other technology;
 - That is located behind a single Point of Interconnection; and
 - That cannot serve behind-the-meter Load at the facility.

HSR Participation Model

- **A HSR will have a single PTID/bid/schedule/settlement**
 - A HSR shall be represented by a single NYISO Market Participant as the Billing Organization and have a single bidding agent
- **A HSR must have a single Point of Interconnection at the NYS Transmission System or a distribution system**
- **HSRs will be able to provide Energy, Operating Reserves, Regulation Service or a combination if capable and qualified to do so**

Energy Market Rules

Energy Market Bidding

- **HSRs will be able to bid in both Day-Ahead and Real-Time Markets**
- **HSRs will be expected to manage all resource constraints**
 - Energy Storage Resource bidding and operating parameters, such as Beginning Energy Level, Roundtrip Efficiency, Lower and Upper Storage limits, will not be considered in the market optimization for a HSR.
 - Energy Level telemetry will be evaluated as a pre-optimization step to ensure that Reserve schedules meet reliability requirements and Energy schedules are feasible.
- **The HSR will be responsible for managing operating constraints through their offers and the operation of their Resource**

Dispatch Only

- **HSRs will not receive unit commitment from the NYISO and will instead be considered as a dispatch-only resource**
 - HSRs will not submit commitment parameters such as start-up costs, start-up time and minimum generation cost
 - This is consistent with other dispatch-only Resources (e.g., ESRs, DER Aggregations, etc.)

Energy Balancing

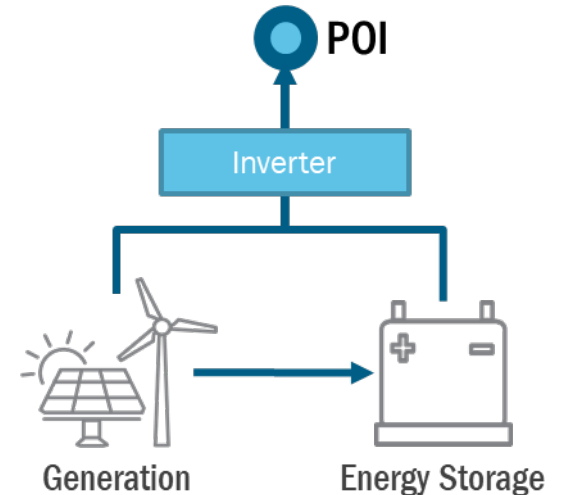
- **HSRs will be able to follow NYISO's dispatch utilizing any or all of the assets behind the Point of Interconnection**
- **An HSR may recharge its storage when Energy production at its location exceeds the NYISO dispatch, or pursuant to a schedule to withdraw Energy**

Scheduling

- **A single basepoint will be sent to the HSR**
 - Real-Time Dispatch will consider the HSR's upper capability, comprised of the stored energy and expected production when developing the HSR's schedule
- **HSRs will be expected to operate consistent with their ISO dispatch, and will be subject to balancing obligations and charges for being off-schedule**
- **HSRs will be scheduled consistent with their bids and operating parameters**
 - HSRs will be eligible to set prices

HSR Injection Limitation

- HSRs will not have CSR POI Scheduling Limits
- HSRs will be limited by the lower of:
 - The inverter (details on next slide) or
 - The HSR SOC + wind/solar forecast
- NYISO is not proposing a maximum size limit on the HSR at this time
- Possible minimum size: 1MW



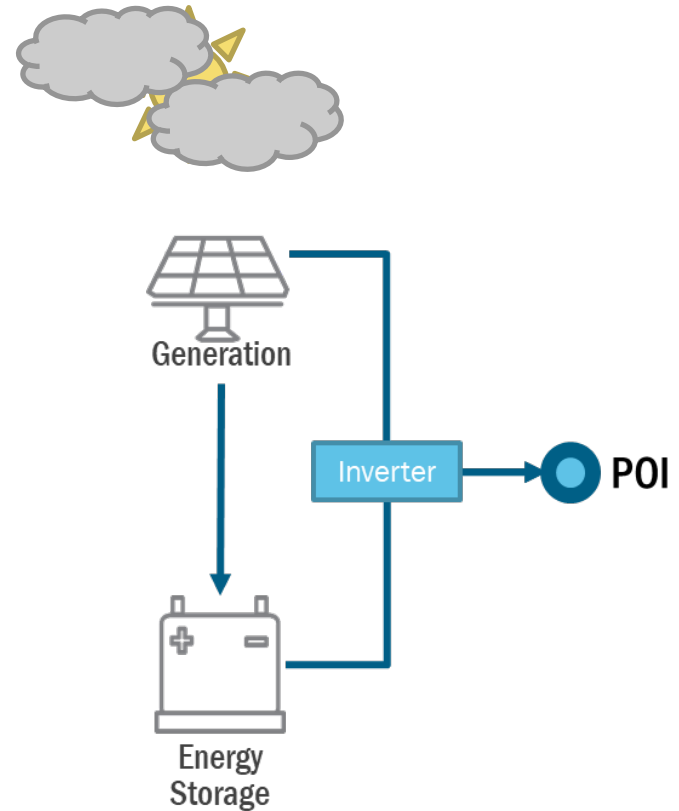
Wind/Solar Forecast

- **The NYISO will utilize its real-time forecasting capabilities to estimate the HSR's wind/solar output**
- **Forecast values used by RTC/RTD are blended with persistence power values over the optimization period at different blending percentages**
 - Specific blending percent depends on length of time between initialization and timestep
 - Blending percentages range from 100% persistence to 100% forecast
 - This helps to capture the impact of real time conditions and mitigate forecast uncertainty

Examples

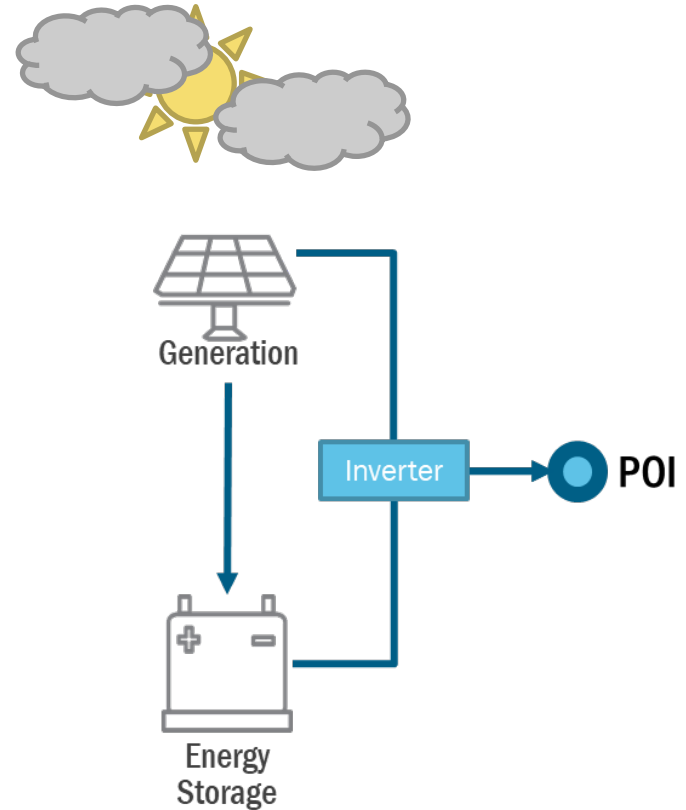
Example: Cloudy

- Inverter Nameplate: 10 MW
- Solar Nameplate: 10 MW
- Solar Forecast: 0 MW
- Storage SOC: 0MWh
- UOL: $\text{Min}(\text{Inverter, SOC} + \text{wind/solar forecast})$
 - $\text{Min}(10 \text{ MW}, 0 \text{ MW} + 0 \text{ MW}) = 0 \text{ MW}$
- Bid range, -10 MW to 0 MW (withdrawal only)



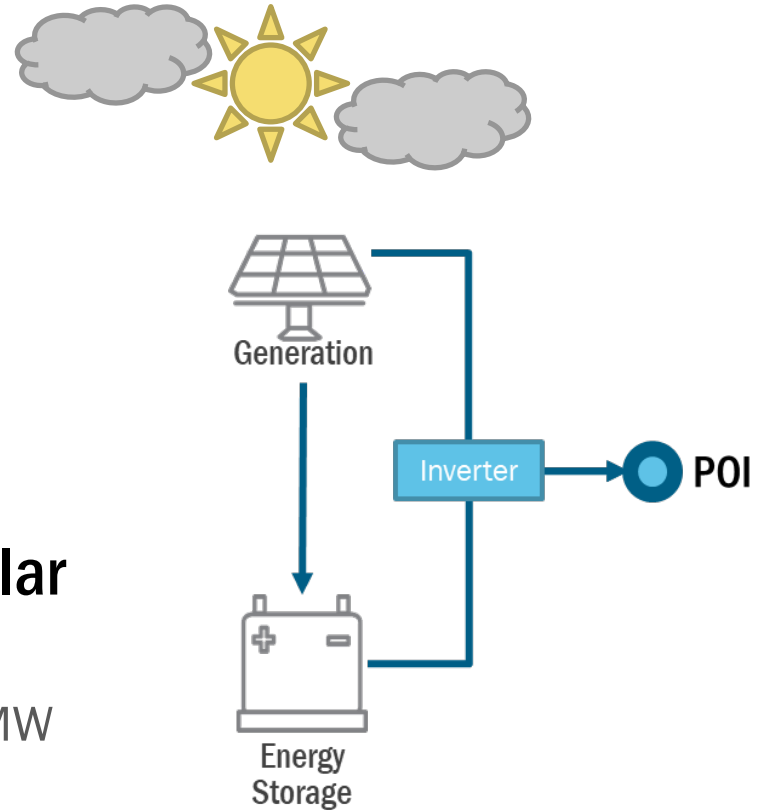
Example: Partly Sunny

- Inverter Nameplate: 10 MW
- Solar Nameplate: 10 MW
- Solar Forecast: 5 MW
- Storage SOC: 0MWh
- UOL: $\text{Min}(\text{Inverter}, \text{SOC} + \text{wind/solar forecast})$
 - $\text{Min}(10 \text{ MW}, 0 \text{ MW} + 5 \text{ MW}) = 5 \text{ MW}$
- Bid range, -10 MW to 5 MW



Example: Sunny

- Inverter Nameplate: 10 MW
- Solar Nameplate: 10 MW
- Solar Forecast: 10 MW
- Storage SOC: 0MWh
- UOL: $\text{Min}(\text{Inverter}, \text{SOC} + \text{wind/solar forecast})$
 - $\text{Min}(10 \text{ MW}, 0 \text{ MW} + 10 \text{ MW}) = 10 \text{ MW}$
- Bid range, -10 MW to 10 MW



Ancillary Services

Reliability Requirements

Reserve Sustainability Requirement

- **Northeast Power Coordinating Council (NPCC) 60 minute sustainability requirement from Directory 5:**
 - Sustainability of Operating Reserve
 - R6. A Balancing Authority's synchronized reserve, ten-minute reserve, and thirty-minute reserve, if activated, **shall be sustainable for at least one hour from the time of activation.**

Regulation Requirement

- **The NYISO establishes the regulation requirements consistent with criteria established by North American Electric Reliability Council (NERC), which may vary by hour and by season.**
 - Regulation requirements are established to address the variability of net load that may occur within a 5-minute dispatch interval.
 - This service is accomplished by committing qualified resources whose output or demand is raised or lowered (using Automatic Generation Control (AGC)) as necessary to follow moment-by-moment changes in Area Control Error (ACE).
- **The NYISO runs RTD and produces basepoints for resources to follow in order to meet load and procure regulation to cover the variability**
 - within the 5 minute dispatch window for load and
 - based on a 10 minute window for wind and solar variability

Proposed Rules

Reserves and Regulation

- **All HSRs will be eligible to provide 10-Minute Spinning Reserve**
 - Reserve Capacity will be limited to the lower of the HSR SOC and storage inverter size
 - The Reserve amount must be sustainable for an hour
- **All HSRs will be eligible to provide Regulation**
 - Regulation Capacity will be limited by the HSR SOC and storage inverter size

Regulation Revenue Adjustments

- **HSRs may be eligible to receive a Regulation Revenue Adjustment Payment (RRAP) or be required to pay a Regulation Revenue Adjustment Charge (RRAC), consistent with existing regulation service providers**
 - HSRs will be eligible for RRAC/RRAP when:
 - Scheduled by RTD to provide Regulation Service and;
 - Regulating up or down from their RTD basepoint
 - RRAP and RRAC will be evaluated for both payments and charges based on total response
 - Actual Energy Injections + Actual Energy Withdrawals = total response

Voltage Support Service (VSS)

- **Subject to the existing supplier qualification criteria, the HSR may be eligible to provide Voltage Support Service**
- **The total MVAR capability from the HSR shall be based on the reactive power capability at the Interconnection Point and not the sum of individual units' capabilities**
 - For this service, metering/telemetry to measure the MVAR flows at the units and the Interconnection Point shall be required
 - Testing requirements and performance measurement details for HSR will be incorporated into the Ancillary Services Manual

Planned Timeline & Next Steps

Stakeholder Engagement Plan

■ Q2 & Q3 2021

- Continue to solicit and share feedback from stakeholders
- Consider concepts based on feedback provided
- Develop market design and discuss tariff revisions

■ Q4 2021

- Present Market Design to Stakeholders at BIC

Next Steps

- **NYISO would like to hear from Stakeholders if there are other areas to explore in this project.**
 - NYISO is specifically requesting additional details for use cases that involve potential storage and thermal hybrids.
- **NYISO will continue discussions with stakeholders on different use cases.**

Questions?

Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policymakers, stakeholders and investors in the power system



Appendix: Background & Reference Material

2021 Approved Market Project

- The 2021 Hybrid Aggregation Model project deliverable is a Q4 Market Design Complete.
- [2021 Project Schedule Milestone Update](#)
- [2021 Approved Market Projects Product and Project Management](#)
 - See Project 14 (Page 17 of 26)

Grid in Transition – A Path Forward in 2021

- **The NYISO’s wholesale markets can serve as an effective platform for achieving New York State environmental objectives.**
 - Through active engagement with stakeholders and policymakers, the NYISO is developing design improvements to meet the future challenges expected to arise with high levels of intermittent renewable and distributed energy resources.
- **The plan includes a set of enhancements that work together coherently and efficiently to satisfy New York’s changing grid reliability needs.**
 - These opportunities are organized across three main points of focus (discussed on the next slide)
 - Some opportunities will require immediate attention while others might be something to consider as more information and experience becomes available.



Grid in Transition – A Multifaceted Approach

• **Aligning Market Incentives**

- Carbon Pricing
- Comprehensive Mitigation Review
- **Prepare for New Technologies**
 - DER Participation Model
 - Energy Storage Participation Model
 - Hybrid Co-Located Model
 - **Hybrid Aggregation Model**
 - Large Scale Solar on Dispatch
- And more....

Aligning Competitive Markets and New York State Clean Energy Objectives



• **Review Energy & Ancillary Services Design for Incenting Flexibility**

- More Granular Operating Reserves
- Regulation Up & Down Services
- Ramping Services
- Grid Services from Renewable Generators
- **Evolve the Day Ahead and Real-Time Markets to improve managing Forecast Uncertainty**
- **Track certain market metrics to evaluate incentives for flexible resources**
- And more...

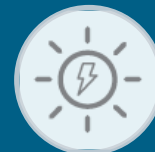
Valuing Resource & Grid Flexibility



• **Enhancements to Resource Adequacy Modeling**

- **Improving Installed Capacity Market Incentives**
- **Review Capacity Market Resource Ratings to Reflect Reliability Contribution**
 - Expanding Capacity Eligibility
 - Tailored Availability Metric

Improving Capacity Market Valuation



Background / Project Justification

- The NYISO's market rules currently allow an Energy Storage Resource (ESR) and a Wind or Solar Generator to be co-located at a single point of interconnection and share a common injection limit. These rules were introduced in the Co-located Storage Resource (CSR) market participation model.
- However, those rules do not permit these resources to share the same point identifier (PTID). Instead, each resource type must be separately metered, bid, and scheduled.
- State and Federal initiatives such as REC procurements provide incentives for developers to couple storage and intermittent renewable assets. Such programs are aimed at improving the availability of intermittent resources and firming their output.

Hybrid Storage Resource (“HSR”) Participation Model

- This project is distinct from the DER and ESR Integration initiatives, but it will build on work completed as part of those initiatives. This project is a continuation of the 2020 Hybrid Storage model effort and will develop market rules that allow at least one ESR and other Generator(s) to be co-located behind the same point of interconnection, share a single PTID, and act as a single market resource.
- It is reasonable to expect that the design could be multifaceted, where some elements of the design are advanced faster than others.
- The 2021 project deliverable is a Q4 Market Design Complete.

Previous Presentations

Date	Working Group	Presentation Title
03/11/21	ICAP/MIWG/PRLWG	Hybrid Storage Aggregation Resource (HSR) Model: Project Kick-Off