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Independent System Operator

HSR Model:
Energy & Ancillary Services Update

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Agenda

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

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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.**

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Today's Presentation Objective

- Review initial discussions from May 19, 2021
- Update Stakeholders with NYISO's current proposal

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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, 10-Minute Spinning Reserves, Regulation Service or a combination if capable and qualified to do so**

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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
- The HSR will be responsible for managing operating constraints through their offers and the operation of their Resource

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Energy Level Mode

- **HSRs will be Self-Managed Resources**
- **The market software will use the other physical and economic characteristics provided to make dispatch decisions for HSRs**
  - e.g.: Upper Operating Limit (UOL), Lower Operating Limit (LOL), Incremental Bid Curve, Response Rates, etc.
  - Energy Level constraints will not be considered in SCUC's 24-hour optimization period

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Unit Operation Mode

- **HSRs may offer as ISO-Committed Flexible, Self-Committed Flexible, or Self-Committed Fixed**
  - HSRs that bid using Self-Committed Fixed will not be eligible to provide any Operating Reserves, consistent with treatment of other Resources
- **ISO-Committed Fixed will not be an available bid mode for fully dispatchable resources**
  - The purpose of ISO-Committed Fixed is to accommodate the real-time operation of relatively inflexible resources that cannot follow 5 minute schedule changes

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HSR Scheduling

- **HSRs will be scheduled consistent with their bids and operating parameters**
  - A single basepoint will be sent to the HSR
- **The NYISO will determine energy, reserves and regulation schedules for an HSR based on constraints**
  - $LOL \leq Energy_{HSR} + Reserves_{HSR} + Regulation_{HSR}$
  - $Energy_{HSR} + Reserves_{HSR} + Regulation_{HSR} \leq UOL$
- **HSRs will be expected to operate consistent with their ISO dispatch, and will be subject to balancing obligations and charges for being off-schedule**
  - NYISO may propose enhancements to ensure HSRs provide accurate operating parameters to the NYISO in order to prevent infeasible dispatch

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Real-Time Dispatch Schedules

- RTD will develop Real-Time energy schedules based on bids and HSR Real-Time LOL/UOL updates
- Schedules for each market interval (5 minutes in RTD, 15 minutes in RTC) will be consider the last physical base point, Response Rate, physical LOL/UOL and Energy Level constraints
- HSR Real-Time LOL/UOL updates will be critical to ensure HSRs receive feasible energy schedules

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Real-Time Submission of Updated Operating Limits

- **NYISO is considering allowing MPs to provide an updated LOL/UOL for the HSR after the hourly market close to ensure NYISO does not over-schedule the HSR**
  - This capability would likely be paired with updated penalties for failing to achieve ISO-issued dispatch, and mitigation measures to address withholding (more detail in future slides)
- **NYISO is interested in obtaining stakeholder input on this concept**

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Ancillary Services

Operating Reserves

- **All HSRs will be eligible to provide 10-Minute Spinning Reserve**
  - The scheduled Reserve amount must be sustainable for an hour
- **Energy Level telemetry, from the ESR component of the HSR, will be evaluated in RTD to ensure that Reserve schedules are feasible to meet reliability requirements**
  - Reserve Capacity will be limited by the real-time SOC the NYISO receives via telemetry and storage inverter size
    - Schedules will consider submitted operating parameters and any Energy dispatch
    - Any remaining SOC can be eligible for 10-Minute Spinning Reserves
  - Reserve Capacity = SOC – Energy Dispatch – Regulation

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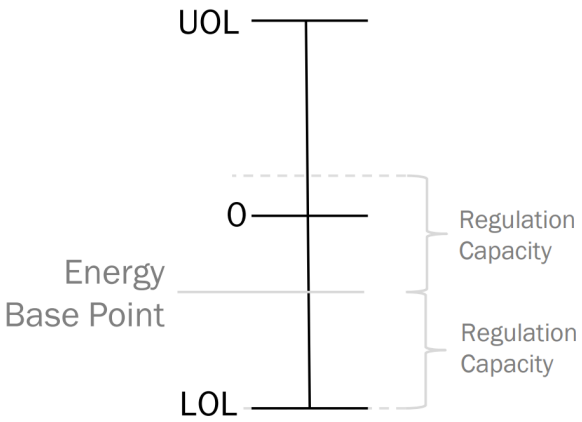
Regulation Service

- **All HSRs will be eligible to provide Regulation**
  - Regulation Capacity will be limited by the HSR real-time SOC the NYISO receives via telemetry and storage inverter size
  - Regulation Capacity = MIN (UOL – Energy Dispatch – Reserves, SOC – Energy Dispatch – Reserves, Energy Dispatch – Reserves – LOL)



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Undergeneration and Overgeneration Charges

- **Under/overgeneration settlement structure was devised to deter suppliers from deviating from the NYISO's real-time dispatch instructions**
  - Each energy provider is expected to operate within a 3% of Upper Operating Limit (UOL) tolerance from its Base Point
  - Deviations from this tolerance band result in charges
- **NYISO is reviewing the current undergeneration and overgeneration charges and considering if updates are appropriate**

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Planned Timeline & Next Steps

Stakeholder Engagement Plan

- **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

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Next Steps

- **Based on feedback received from stakeholders and developers, NYISO will bring more details on the HSR participation rules to future stakeholder discussions**
  - NYISO will continue discussions with stakeholders on different use cases

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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

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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)

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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.

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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

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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.

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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.

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Previous Presentations

Date	Working Group	Presentation Title
03/11/21	ICAP/MIWG/PRLWG	Hybrid Storage *Aggregation* Resource (HSR) Model: Project Kick-Off
05/19/21	ICAP/MIWG/PRLWG	Hybrid Storage Resource (HSR) Model: Energy & Ancillary Services

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