New York ISO
Independent System Operator

Hybrid Storage: Proposal for participation options

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ICAPWG/MIWG
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WebEx

Discussion goals

- Present NYISO proposal on pursuing participation options for hybrid storage resources
  - Get feedback on the proposal
- Introduce a new participation option for Hybrid Storage Resources participation and get stakeholder's feedback on it

Previous Presentations

Date	Working Group	Discussion Points and Links to Materials
01-13-20	ICAPWG/MIWG	Hybrid Storage Model Project Kick-Off https://www.nyiso.com/documents/20142/10252714/Hybrid%20Storage%20Model_MIWG_Jan%2013%202019.pdf/caf29abe-a431-a2d1-358d-43326153824a
04-14-20	ICAPWG/MIWG	Hybrid Storage Model – Initial Market Design Concept Overview https://www.nyiso.com/documents/20142/11904936/Hybrid%20Storage%20Model%20MIWG%2004142020%20Final.pdf/08841944-5251-4497-c52b-105151f150ad
05-11-20	ICAPWG/MIWG	Hybrid Storage Interconnection Proposal https://www.nyiso.com/documents/20142/12465245/Hybrid%20Storage%20Interconnection_0511%20MIWG_ICAPWG_FINAL.pdf/0740db02-ac07-e7f4-42b4-0b17da0e82eb

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Project Background

A Grid in Transition – The Plan

- **Carbon Pricing**
- **Comprehensive Mitigation Review**
- **DER Participation Model**
- **Energy Storage Participation Model**
- **Hybrid Storage Model**

Aligning Competitive Markets and New York State Clean Energy Objectives

- **Enhancing Energy & Shortage Pricing**
  - Ancillary Services Shortage Pricing
  - Constraint Specific Transmission Shortage Pricing
  - Enhanced Fast Start Pricing
- **Review Energy & Ancillary Services Product Design**
  - More Granular Operating Reserves
  - Reserve Enhancements for Constrained Areas
  - Reserves for Resource Flexibility

Valuing Resource & Grid Flexibility

- **Enhancements to Resource Adequacy Models**
- **Revise Resource Capacity Ratings to Reflect Reliability Contribution**
  - Expanding Capacity Eligibility
  - Tailored Availability Metric
- **Capacity Demand Curve Adjustments**

Improving Capacity Market Valuation

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Project Background

- **This project seeks to explore market participation option(s) for co-located front-of-the-meter generators and energy storage resources (i.e. Hybrid Storage Resources)**
  - Incentives along with improvements in flexibility and availability are motivating developers to couple generation resources with storage resources
- **If modifications to existing market rules are required, these will be developed for a potential vote at the BIC by the end of 2020**
  - It is reasonable to expect that the design could be multifaceted, where some elements of the design are advanced faster than others

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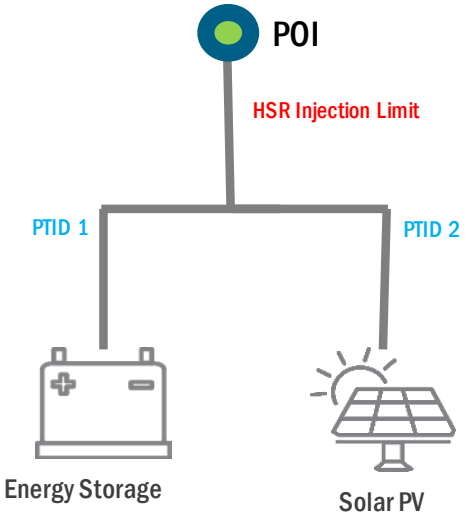
Proposal for Participation Options

Proposal for Hybrid Storage Resources (HSR) Participation Options

- **Option 1 (Co-located HSR) : Each resource component within the HSR will have a distinct PTID/bid/schedule/settlement[1]**
  - Enable this option to accommodate HSR projects with an injection limit that is less than the combined capability of its component resources.
    - Confirming the feasibility of implementing the scheduling constraint, and identifying the associated implications is in progress
- **The NYISO proposes to pursue this option for Market Design Complete in 2020**
  - This option supports capabilities and features that developers have told NYISO they value

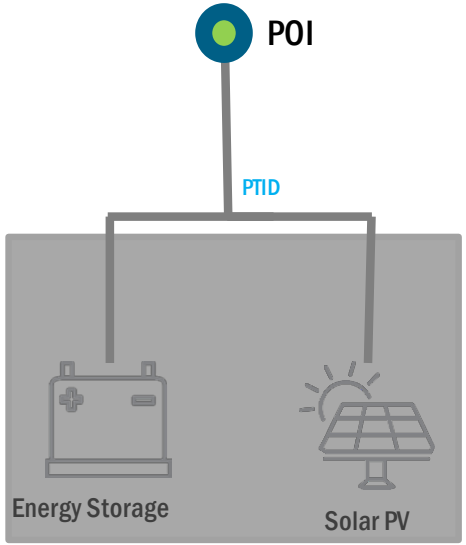


Option 1: Co-located HSR (with Scheduling constraint)

1. For more details on the options, please refer to 4.14.20 ICAPWG/MIWG discussions on "Hybrid Storage Model – Initial Market Design Concept Overview" https://www.nyiso.com/documents/20142/11904936/Hybrid%20Storage%20Model%20MIWG%2004142020%20Final.pdf/08841944-5251-4497-c52b-105151f150ad

Proposal for HSR Participation Options

- **Option 2 (Aggregated HSR): HSR will have a single PTID/bid/schedule/settlement[1]**
  - Evaluate the feasibility of allowing an HSR comprising of a combination of Intermittent Power resource (IPR) and Energy Storage Resource (ESR) to provide ancillary services
- **The NYISO proposes to pursue this option for Market Design Concept Proposal in 2021**
  - NYISO would be able to support this option, following the deployment of DER model



Option 2: Aggregated HSR

1. For more details on the options, please refer to 4.14.20 ICAPWG/MIWG discussions on "Hybrid Storage Model – Initial Market Design Concept Overview" https://www.nyiso.com/documents/20142/11904936/Hybrid%20Storage%20Model%20MIWG%2004142020%20Final.pdf/08841944-5251-4497-c52b-105151f150ad

Proposal for HSR Participation Options

- **Other participation options, including those discussed during previous presentations, were evaluated, but are not being proposed**
  - Developers have indicated limited usability of these for their business needs
  - Evaluations have revealed operational and other issues associated with them

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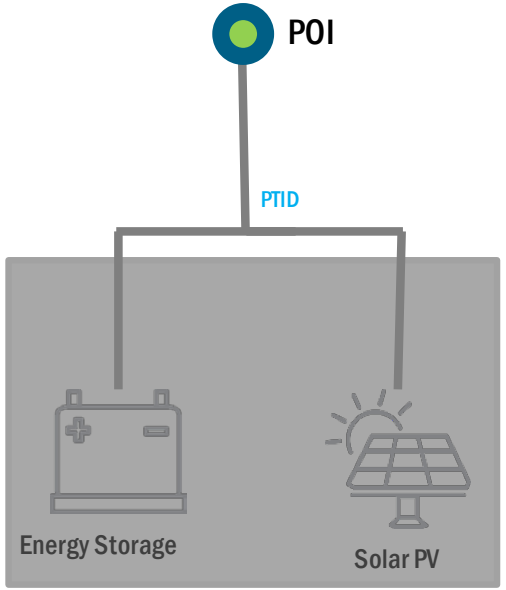
New Participation Option – Forecasted HSR

New Participation Option: Forecasted HSR

- In response to stakeholder input, NYISO has recently been considering a new option targeted towards use cases where a large IPR is coupled with a small ESR.
- HSR would have a single PTID/ bid/ schedule/ settlement
- NYISO would provide forecasting for the IPR component and HSR schedules will be derived in part, based on the NYISO forecast
  - HSR would be expected to follow NYISO dispatch signal at all times or be subjected to over/under generation charges
- Decision to pursue this option is currently uncertain, thus there is no timeline



Forecasted HSR

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Next Steps and Timeline

Next Steps

- **NYISO will pursue Co-located HSR (Option 1) for Market Design Complete in 2020**
  - Bring more details on the Co-located HSR participation rules to future stakeholder discussions.
- **NYISO will pursue Aggregated HSR (Option 2) for Market Design Concept Proposal in 2021**

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Timeline

- **Q3 2020**
  - Present Market Design Concept Proposal (for Co-located HSR participation option) to stakeholders
  - Present consumer impact analysis to stakeholders
  - Present Market Design Complete (for Co-located HSR participation option) to stakeholders and seek BIC vote

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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

Stakeholder Feedback Summary

- **Below is a summary of stakeholder questions from previous working groups and NYISO's response to them. Some of these are addressed in today's presentation (as marked) and others will be addressed at a future working group**
  - Request for additional information about NPCC reserve requirements
    - Please refer to ICAPWG/MIWG presentation on "Uses of Reserves and Impacts to ESR" dt. April 27, 2020 for a detailed discussion on NPCC reserve requirements.
  - Request for clarification on "front-of-the-meter" definition
  - Request for exploration of possible thermal + storage model
    - Addressed in today's presentation
  - Request for examples with numbers to understand how many MW can participate under each market (Energy, Reg, Reserves, Capacity) under each proposed option
  - Request for clarification on which option(s) the NYISO will pursue
    - Addressed in today's presentation
  - Request for examples on CRIS and ERIS allocation
  - Request for examples on UCAP calculations

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