Hybrid Aggregated Storage (HSR) Model – Capacity Tariff, Capacity Mitigation Tariff, Interconnection Tariff, CSR Updates Tariff, Enhanced Fast Start Resources Tariff, and Metering and Telemetry

Francesco Biancardi and Katherine Zoellmer

New Resource Integration

MIWG/ICAPWG

October 20, 2022

Agenda

- Project Background
- Overview of Tariff Changes
- Proposed HSR Tariff Changes
  - MST Section 5.12
  - OATT Section 30
  - OATT Appendices
  - MST Section 23.2
- Proposed Enhanced Fast Start Resources Tariff Changes
  - MST Section 2.6
- Proposed CSR Tariff Changes
  - MST Section 2.23
- HSR Metering, Telemetry, and Component-level Operating Limit Requirements
- Next Steps

New York ISO

Previous HSR Presentations (2022)

Date	Working Group	Topic/Links to Materials
March 25th, 2022	MIWG/ICAPWG	Hybrid Storage Model – Energy and Capacity Market Design Proposal
May 11th, 2022	MIWG/ICAPWG	NYISO Hybrid Aggregated Storage Resource (HSR) Model Use Case and Proposal Update
July 15th, 2022	MIWG/ICAPWG	Hybrid Aggregated Storage (HSR) Model – Energy and Ancillary Services Market Design Proposal Update
August 9th, 2022	MIWG/ICAPWG	Hybrid Aggregated Storage (HSR) Model – Energy and Capacity Market Design Proposal
August 24th, 2022	MIWG/ICAPWG	Hybrid Storage Model – CSR Market Design Proposal Updates
September 12th, 2022	MIWG/ICAPWG	Hybrid Aggregated Storage (HSR) Model – CSR Market Design Proposal Updates (Settlements/Metering and Telemetry)
September 12th, 2022	MIWG/ICAPWG	Hybrid Aggregated Storage (HSR) Model – Tariff Modifications, Energy and Settlements
September 20th, 2022	MIWG/ICAPWG	Hybrid Aggregated Storage (HSR) Model – Tariff Modifications: Interconnection, ERIS, CRIS
October 4th, 2022	MIWG/ICAPWG	Hybrid Aggregated Storage (HSR) Model – Tariff Modifications: Energy and Settlements

Overview of Tariff Changes

Review of Previously Proposed Tariff

- **Editorial updates have been made to sections with revisions prosed at the October 4 MIWG presentation, "Hybrid Aggregated Storage (HSR) Model – Tariff Modifications, Energy and Settlements" to address stakeholder comments. These sections are posted for review with today's meeting materials.**
  - MST 2.3, MST 2.5, MST 2.8, MST 2.15, MST 4.2, MST 4.4, MST 15.3A, MST 15.4

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Overview of Proposed Tariff Changes

- The NYISO proposes to update the following Sections to allow Hybrid Storage Resources to participate in the wholesale markets as ICAP Suppliers:
  - MST Section 5.12.1
  - MST Section 5.12.1.11.2
  - MST Section 5.12.5.5
  - MST Section 5.12.6.2
  - MST Section 5.12.7.1
  - MST Section 5.12.12.2
- The NYISO proposes to add a new subsection to Section 5.12, which discusses Bid/Schedule/Notify rules for Hybrid Storage Resources:
  - MST Section 5.12.7.2
- The NYISO proposes changes to the definition of Examined Facilities in Section 23.2 of the MST

New York ISO

Overview of Proposed Tariff Changes, cont.

- The NYISO proposes additional updates to the following section to address the enhanced Fast-Start Resource model and the application of the Wind and Solar Output Limit to landfill gas IPRs and RoR resources that participate as CSR
  - MST 2.6 – Definitions, F
  - MST 2.23 – Definitions, W
- The NYISO proposes revisions to the Large Facility Interconnection Procedures to address (1) modifications to co-located facilities wishing to reconfigure as a CSR or HSR; and (2) specific technical data to be included with the Interconnection Request forms.

New York ISO

HSR Project Background

HSR Project Background

- **An HSR consists of an Energy Storage Resource (ESR) and at least one Intermittent Power Resource (IPR) and/or Run-of-River (RoR) Hydro Resource**
  - This model will support several Wind, Solar, Landfill Gas, RoR Hydro, and ESR(s) resources that aggregate, and share a POI, and operate as a single dispatchable resource

New York ISO

Interconnection: OATT Section 30

OATT Section 30.3.2.2

- **The NYISO proposes to further revise the material modification rules as they pertain to multi-unit facilities/Projects:**
  - Prior to entering a Class Year Study, the Developer may modify its interconnection service evaluation election (whether the Large Facility requests ERIS or ERIS and CRIS) and, for Large Facilities comprised of multiple Generators, the requested MW of ERIS and or CRIS of any of its multiple units, to the extent the modification is not a Material Modification under Section 30.4.4 of this Attachment X to the OATT, when it submits the Class Year Study Agreement for its project in accordance with Section 30.8.1 of these Large Facility Interconnection Procedures.
  - Permissible modifications prior to entering a Class Year Study include modifying the requested ERIS and CRIS for individual Generators within the multi-unit facility being evaluated in the same Interconnection Request; provided however, the total requested ERIS and CRIS for the Interconnection Request may not increase. The Developer can reduce the number of MW it initially requested to be evaluated for ERIS or CRIS, and such a reduction shall not constitute a Material Modification.

New York ISO

OATT Section 30.4.4.2

- **The NYISO proposes minor editorial revisions to language initially presented in September:**
  - For a Project in the Interconnection Queue with a validated Interconnection Request on or before [effective date of HSR tariff revisions], the Developer may, prior to the return of the executed Interconnection Facility Study Agreement to the ISO, modify the Project by combining it with one or more Projects – both projects having validated Interconnection Requests in the Interconnection Queue on or before [effective date], regardless of whether the Projects are different technologies and regardless of whether the combined Project's requested ERIS or CRIS increases as a result of combining the queue positions

New York ISO

Appendix 1 to LFIP – Interconnection Request

- **The NYISO proposes the following modifications:**
  - To line item #2 the addition of several selectable options for facility type:
    - A proposed Co-located Storage Resource
    - A proposed Hybrid Storage Resource
    - A proposed multi-unit Large Generating Facility not seeking to participate as a Co-located Storage Resource or Hybrid Storage Resource
  - To line item #4 the addition of several datapoints that will be used to determine the facility's location, in addition to the POI:
    - Quadrants
    - Alternate POI
  - To line item #5, additional detail regarding temperature-affected nameplates:
    - MW nameplate rating (at x degrees F, if applicable)
  - To line item #6, clarification regarding requested ERIS:
    - Clarifying that MW of Requested ERIS is measured at the POI, and is the greater of the max summer or max winter net MW
    - Clarifying that multi-unit facilities must specify the ERIS they are requesting for each Generator

New York ISO

Large Generating Facility Preliminary Data

- **The NYISO proposes the following modifications:**
  - To line item #4, new language and several clarifications/additions:
    - Note indicating that a: completed Siemens PTI PSSE power-flow and dynamics models or other compatible formats, such as IEEE and PSLF models, and Aspen short circuit model must be supplied at a later stage of the interconnection study process.
    - Maximum and Minimum Reactive Power (Leading/Lagging MVARs) have been separated into two distinct fields
    - Additional information requested for solar facilities:
      - # of panels in solar farm
      - Inverter manufacturer, model, number, and version
    - Additional information requested for wind facilities:
      - Wind Model Type
    - Generalization of the Energy Storage Resource and Energy Duration Limited Resource sections

New York ISO

Attachment B to Appendix 2 – Interconnection Facilities Study Agreement

- **The NYISO proposes the following modifications:**
  - To line item #2:
    - Clarifying that ERIS is measured at the POI
    - Requirement that multi-unit facilities must specify the ERIS they are requesting for each Generator
    - New language regarding CRIS transfer requests:
      - If requesting a CRIS transfer, indicate the transferor PTID(s), MW amount and, for a multi-unit Large Generating Facility, the specific Generator from which and to which the transfer is proposed:

New York ISO

Appendix 3 to LFIP – Large Facility Modification Request

- **The NYISO proposes the following modifications:**
  - To line item #1:
    - The undersigned Developer submits this request to modify an Interconnection Request for a Large Facility ~~Generating Facility or Class Year Transmission Project currently~~ with an Interconnection Request in the NYISO's Interconnection Queue or an existing Large Facility.
    - To line item #2:
    - In addition to the project name and queue number (if applicable), will also be required to provide:
      - PTID (if existing)
      - Facility Name
  - To line item #3:
    - Several changes to more consistently reflect ERIS rules for multi-unit facilities
    - Revise reference to "technological change or advancement" to use the defined term "Permissible Technological Advancement"
    - Addition of field: Other technological change
  - To line item #6:
    - If the modification is a decrease in the facility capacity or requested interconnection service, provide an explanation for the decrease, including a description of the injection-limiting equipment with all the necessary parameters of such equipment, as applicable, provided however, if the modification is an increase in the facility capacity or requested interconnection service, provide an explanation for the increase, including a description of any corresponding modifications to the facility:

New York ISO

Appendix 3 to LFIP – Large Facility Modification Request cont;

- **Several parameters added to the table in line item #7b:**
  - Manufacturer
  - Model
  - # of Units
  - MVA/Unit transformer
  - kV/Unit transformer
  - Impedance/Unit transformer: (Z1%, Z0%, X/R)
  - Number of Main Transformers

New York ISO

Appendix 3 to LFIP – Large Facility Modification Request cont;

- **Several more parameters added to the table in line item #7b:**
  - MVA/Main transformer
  - kV/Main transformer
  - Impedance/Main transformer two-winding: (Z1%, Z0%, X/R)
  - Impedance/Main transformer three-winding if applicable:
    - Z1(H-L)%, Z1(H-T)%, Z1(T-L)%, X/R
    - Z0(H-L)%, Z0(H-T)%, Z0(T-L)%, X/R
  - Short Circuit Model Data:
    - (Generator, Machine) Reactance pu:
      - X”
      - X’
      - X2
      - X0
    - Max fault current contribution in pu of FLC

New York ISO

Appendix 3 to LFIP – Large Facility Modification Request cont;

- One parameter removed from the table in line item #7b:
  - ~~Subtransient Impedance (R" + jX") or equivalent fault current limit for inverter-based technology~~

New York ISO

Capacity: MST Section 5.12

MST Section 5.12.1

- **The NYISO proposes several modifications to Section 5.12.1 regarding HSR ICAP Qualification Requirements and compliance with ICAP Supplier rules**
  - Generators that ~~are~~ participate in the markets as Co-located Storage Resources or Hybrid Storage Resources must each, independently, obtain CRIS in order to qualify as Installed Capacity Suppliers.
  - Generators that ~~are~~ participate in the markets as Co-located Storage Resources must each, independently, comply with all applicable market rules contained in this Services Tariff Section 5.12 as an Energy Storage Resource, ~~or as an~~ Intermittent Power Resource, Limited Control Run-of-River Hydro Resource, or as a Fast-Start Resource (a Generator), as appropriate. Generators that participate in the markets as components of a Hybrid Storage Resource must comply with all applicable market rules contained in this Services Tariff Section 5.12 as an Energy Storage Resource, Intermittent Power Resource or Limited Control Run-of-River Hydro Resource, unless an exception applies.

New York ISO

MST Section 5.12.1.11.2

- **The NYISO proposes to more specifically reference the ISO Tariff in Section 5.12.1.11.2:**
  - Units that have demonstrated to the ISO that they are subject to environmental, contractual, ISO Tariff, or other legal or physical requirements that would otherwise preclude them from providing 10-Minute NSR.

New York ISO

MST Section 5.12.5.5

- **The NYISO proposes modifications to Section 5.12.5.5 to incorporate HSRs into the ISO's Data Reporting requirements:**
  - Generators that participate as Co-located Storage Resources or Hybrid Storage Resources must each, individually, comply with the requirements of Section 5.12.5.1 of this Services Tariff.
  - Generators that participate as Co-located Storage Resources must submit outage data or other operational information in accordance with ISO Procedures that will allow the ISO to validate the CSR Scheduling Limits associated with the Co-located Storage Resources CSR Scheduling Limits will be incorporated into each CSR Generator's UCAP calculation (see Services Tariff Section 5.12.6.2).
  - Generators that participate as part of a Hybrid Storage Resource must submit outage data and other operational information in accordance with ISO procedures that will allow the ISO to validate the UOL and LOL of the Hybrid Storage Resource and the Operating Limits of its components. The UOL and LOL of a Hybrid Storage Resource will be incorporated into each component Generator's UCAP calculation (see Services Tariff Section 5.12.6.2).

New York ISO

MST Section 5.12.6.2

- **The NYISO proposes modifications to 5.12.6.2 to describe HSR UCAP Calculations and Methodologies:**
  - The amount of Unforced Capacity that an Energy Storage Resource that is participating as a part of a Co-located Storage Resource or Hybrid Storage Resource is authorized to supply in the NYCA shall account for reductions to the CSR Scheduling Limits or the UOL or LOL of a Hybrid Storage Resource, or the unavailability of the associated facilities, in accordance with ISO Procedures.
  - The amount of Unforced Capacity that an Intermittent Power Resource or Limited Control Run-of-River Hydro Resource that is participating as part of a Co-located Storage Resource or a Hybrid Storage Resource is authorized to supply in the NYCA shall account for reductions to the CSR Scheduling Limits or the UOL or LOL of a Hybrid Storage Resource, or the unavailability of the associated facilities, in accordance with ISO Procedures.

New York ISO

MST Section 5.12.7.1

- **The NYISO proposes modifications to 5.12.7.1 to incorporate LCROR and Fast Start Resources into existing CSR rules:**
  - The sum of the CSR injection Scheduling Limit and the derate or outage must equal or exceed the sum of the Installed Capacity Equivalent of the Unforced Capacity supplied by the Intermittent Power Resource, Limited Control Run-of-River Hydro Resource, or Generator and the applicable Section 5.12.7 hourly Bid, Schedule, or Notify obligation of the Energy Storage Resource.

New York ISO

MST Section 5.12.7.2

- **The NYISO proposes to add a new tariff Section to discuss the Availability Requirements for HSRs:**
  - The total amount of Energy that a Hybrid Storage Resource schedules, bids, or declares to be unavailable on a given day must equal or exceed the Installed Capacity Equivalent of the Unforced Capacity that its Energy Storage Resource supplies. A Hybrid Storage Resources must satisfy the Availability Requirements for its Energy Storage Resource, in accordance with Section 5.12.7. Intermittent Power Resources and Limited Control Run-of-River Hydro Resources that participate as part of a Hybrid Storage Resources are not required to be scheduled, Bid, and/or declared to be unavailable in accordance with Section 5.12.7.

New York ISO

MST Section 5.12.12.2

- The NYISO proposes modifications to Section 5.12.12.2 to address financial penalties that an HSR will incur when it fails to meet its B/S/N obligation:
  - An Installed Capacity Supplier offering an Energy Storage Resource as part of a HSR may also be subject to financial sanction for failure to comply with Services Tariff Section5.12.7.2.

New York ISO

Capacity Mitigation: Attachment H

Section 23.2

- **The NYISO proposes changes to the definition of Examined Facilities in Section 23.2 of the MST, which clarifies the Buyer-side Mitigation treatment of Landfill Gas or Fast Resources within a Co-Locates Storage Resource, and Landfill Gas Resource within a Hybrid Storage Resource**
  - "Examined Facility" shall mean (I) each proposed new Generator and proposed new UDR project, and each existing Generator that has ERIS only and no CRIS, that is a member of the Class Year Study, Additional SDU Study or Expedited Deliverability Study that requested CRIS , or that requested an evaluation of the transfer of CRIS rights from another location in the Class Year Facilities Study commencing in the calendar year in which the Class Year Facility Study determination is being made (the Capability Periods of expected entry as further described below in this Section, the "Mitigation Study Period"), and (II) each (i) existing Generator that did not have CRIS rights, and (ii) proposed new Generator and proposed new UDR project, provided such Generator under Subsection (i) or (ii) is an expected recipient of transferred CRIS rights at the same location regarding which the ISO has been notified by the transferor or the transferee of a transfer pursuant to OATT Attachment S Section 25.9.4 that will be effective on a date within the Mitigation Study Period ("Expected CRIS Transferee"). The term "Examined Facilities" does not include any facility exempt from an Offer Floor pursuant to the provisions of Section 23.4.5.7.7; or any Generator or UDR project that meets the definition of Excluded Facilities below. In the case of a Project that is Co-located Storage Resources comprised of either a landfill gas Intermittent Power Resource or a Fast Start Resource, plus an Energy Storage Resource, or a Project that is a Hybrid Storage Resource that has a landfill gas Intermittent Power Resource as a component, the landfill gas or Fast Start Resource shall be treated as a separate Examined Facility unless the Developer of the Project certifies that the component facility qualifies as an Excluded Facility, as defined in this Services Tariff, and it is determined to meet the criteria provided in that definition.

New York ISO

Enhanced Fast-Start Resources Model: MST Section 2.6

Enhanced Fast Start Background

- At the May 11, 2022, MIWG presentation titled "NYISO Hybrid Aggregated Storage Resource (HSR) Model Use Case and Proposal Update", the NYISO proposed the current scope of the HSR project
- This scope includes updates to the definition of Fast-Start Resources (FSRs) to accommodate an FSR and an ESR that are hybridized in a manner that both are controlled by a single control system and will be treated as an FSR
  - This can improve FSR characteristics, such as decreasing startup time or improving ramp rates
  - This resource will be scheduled considering FSR parameters, e.g., minimum runtimes

New York ISO

MST Section 2.6

- **To accommodate enhanced FSRs, the NYISO proposes to add the following language to the definition of "Fast-Start Resource" in MST 2.6:**
  - "A Fast-Start Resource may be enhanced by an integrated battery component or the addition of a battery, so long as the battery is integrated into the Fast-Start Resource's control system. Such an enhancement may only be used to: (a) decrease start-up time, (b) increase ramp rate, (c) smooth ramp rate, and/or (d) enable the Fast-Start Resource to provide 10-Minute Non-Synchronized Reserve. An enhanced Fast-Start Resource that has not started-up and is not already fully synchronized to the NYS Power System is not eligible to provide Spinning Reserve. An enhanced Fast-Start Resource that is a Fixed Block Unit may not use its battery to become a Dispatchable Resource. An enhanced Dispatchable Fast-Start Resource that has started-up and is fully synchronized to the NYS Power System is eligible to use its battery to supplement the Spinning Reserve it can provide, but must ensure the Spinning Reserves will be sustainable for at least one hour if they are converted to Energy. The battery may not be used to increase the Upper Operating Limit of the Fast-Start Resource. An enhanced Fast-Start Resource is not permitted to be a Withdrawal-Eligible Generator, nor may it use Station Power to charge its battery. Finally, except as set forth above, an enhanced Fast-Start Resource is subject to the same market participation rules and requirements as other Fast-Start Resources."

New York ISO

CSR Model Updates: MST Section 2.23

CSR Updates Background

- **As part of the HSR project, the Co-located Storage Resource (CSR) model will be updated to allow for:**
  - An ESR + a Landfill Gas Generator
  - An ESR + a RoR Hydro Generator
  - An ESR + a Fast-Start Resource

New York ISO

Section 2.23

- **The NYISO proposes adding the following to the definition of Wind and Solar Output Limit to extend to application to landfill gas IPRs and RoR resources that participate as CSR:**
  - "Intermittent Power Resources depending on wind or solar energy or landfill gas as their fuel, or a Limited Control Run of River Hydro Resource, that participate as Co-located Storage Resources shall be eligible to receive a Wind and Solar Output Limit to address the real-time variability of their Energy deliveries consistent with the rules specified for implementing CSR Scheduling Limits."

New York ISO

MST 2.3 – CSR Scheduling Limit Review

- **This proposed modification presented at the September 12 MIWG[1] extends the application of the Wind and Solar Output Limit to landfill gas IPRs and Limited Control Run-of-River Hydro Resources that participate as CSR**
- **A Wind and Solar Output Limit will only apply to a landfill gas IPR or a Limited Control Run-of-River Hydro Resource under the circumstances described below**
  - To address the real-time variability of Energy deliveries from ~~wind and solar~~the Intermittent Power Resource~~s~~ or Limited Control Run-of-River Hydro Resource that participate as Co-located Storage Resources, when the participating Energy Storage Resource has a non-zero Regulation and/or Operating Reserves schedule or is dispatched to inject Energy, and the sum of the participating Energy Storage Resource's and the participating ~~wind or solar~~ Intermittent Power Resource's or Limited Control Run-of-River Hydro Resource's Energy, Regulation Service and Operating Reserves Schedules is greater than or equal to a specified percentage of the CSR injection Scheduling Limit, then the ISO will issue a Wind and Solar Output Limit to the Intermittent Power Resource or Limited Control Run-of-River Hydro Resource to not exceed its Base Point Signal. The specified percentage that is ordinarily used will be posted on the ISO's website.

[1] See: https://www.nyiso.com/documents/20142/33125427/Hybrid%20Storage%20Model%20-%20Energy%20and%20Settlements%20Tariff%20Updates.pdf/312fcf48-631a-82c0-11df-a971dabaed3b

New York ISO

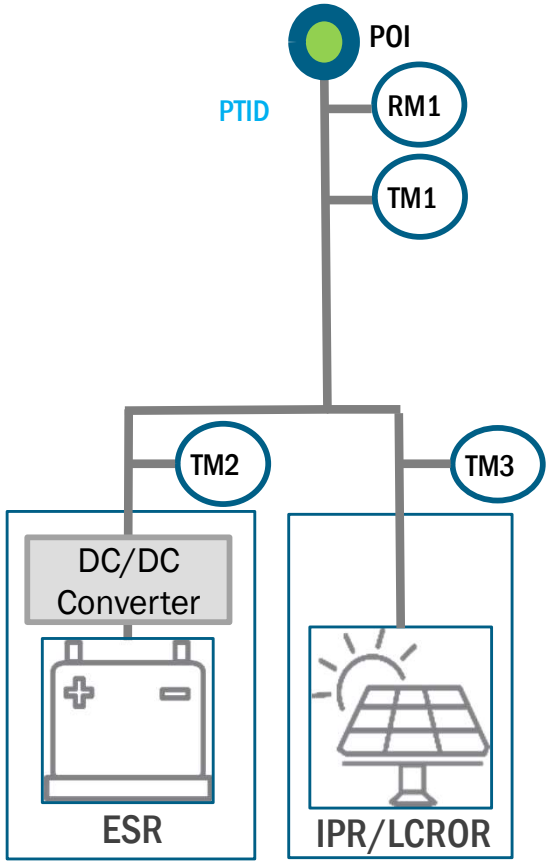
HSR Metering, Telemetry, and Component-level Operating Limit Requirements

New York ISO

HSR Metering and Telemetry Proposal

Meter Designation	Meter Requirements	Data flows
RM1	Revenue grade; dual – channel meter; reported by a Meter Authority	Hourly data
TM1	SCADA data	6 second output telemetry from HSR
TM2	SCADA data	6 second SOC telemetry measuring of ESR component
TM3	SCADA data	6 second output telemetry measuring performance of IPR/LCROR Hydro component(s)

- TM1 and RM1 will inform HSR scheduling, dispatch, and settlement
- TM2 and TM3 will provide the operating data needed to calculate an HSR components' ICAP/UCAP



New York ISO

HSR Component Operating Limits

- **HSRs will need to provide the following Component-level Operating Limits to inform component ICAP/UCAP calculations:**
  - ESR component Upper Operating Limit
  - ESR component Lower Operating Limit
  - ESR component Lower Storage Limit
  - ESR component Upper Storage Limit
- **Limits will be reported to the NYISO at a 5-minute granularity, as after-the-fact data**
- **HSRs must submit these limits to the NYISO according to the GADs data entry timeline, which requires operating data from a given operating month to be submitted by the 20th of the next month.**
  - Operating Limits collected on 10/22 must be submitted to the NYISO by 11/20

New York ISO

Next Steps

- **Upcoming MIWG Topics:**
  - Generator Deactivation Tariff
  - HSR Energy Mitigation Tariff
  - HSR Metering and Telemetry Tariff
  - HSR Capacity Tariff Follow – up
  - Address other outstanding stakeholder feedback

New York ISO

Our Mission & Vision

Mission

Ensure power system reliability and competitive markets for New York in a clean energy future

Vision

Working together with stakeholders to build the cleanest, most reliable electric system in the nation

New York ISO

Questions?