

Hybrid Storage: Market Design for Co-located Storage Resources

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August 10, 2020

WebEx

Agenda

- **Project Background**
- **Definitions**
- **Energy Market participation rules update**
 - Design Overview
 - CSR Scheduling
 - CSR Metering and Settlement
- **Capacity Market participation rules update**
 - ICAP mitigation measures
- **Next Steps and Timeline**
- **Appendix A – Energy, Interconnection and Capacity rules presented on July 22
ICAPWG/MIWG**
- **Appendix B – Stakeholder Feedback Summary**

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%20MIWG%20Jan%202013%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%200511%20MIWG%20ICAPWG%20FINAL.pdf/0740db02-ac07-e7f4-42b4-0b17da0e82eb
06-30-20	ICAPWG/MIWG	Hybrid Storage: Proposal for participation options https://www.nyiso.com/documents/20142/13434223/Hybrid%20Storage%206.30.2020%20ICAPWG%20MIWG%20draft%20v5%20final.pdf/176a272a-cc21-08ef-749a-c4a157fe2bc3
07-22-20	ICAPWG/MIWG	Hybrid Storage: Energy Market Participation rules for Co-located Storage Resources https://www.nyiso.com/documents/20142/13960166/Hybrid%20Storage%20ICAPWG%20MIWG%2007.22.20%20Energy%20Market%20Rules%20%20final.pdf/89700275-108e-8002-1e44-aaffe1712f0e

Previous Presentations

Date	Working Group	Discussion Points and Links to Materials
07-22-20	ICAPWG/MIWG	Hybrid Storage Model: Interconnection and Capacity https://www.nyiso.com/documents/20142/13960166/Hybrid%20Storage%20Interconnection%20and%20Capacity_07222020%20MIWG_FINAL.pdf/e3ba434d-a7ac-21d2-855d-c9cb249da614

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



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
- **The NYISO identified three participation options at the June 30, 2020 MIWG/ICAPWG:**
 - Option 1 – Co-Located Storage Resources
 - Option 2 – Aggregated Hybrid Storage Resources
 - Option 3 – Forecasted Hybrid Storage Resources
- **Modifications to existing market rules will be developed to accommodate Co-Located Storage Resources by the end of 2020**

Definitions

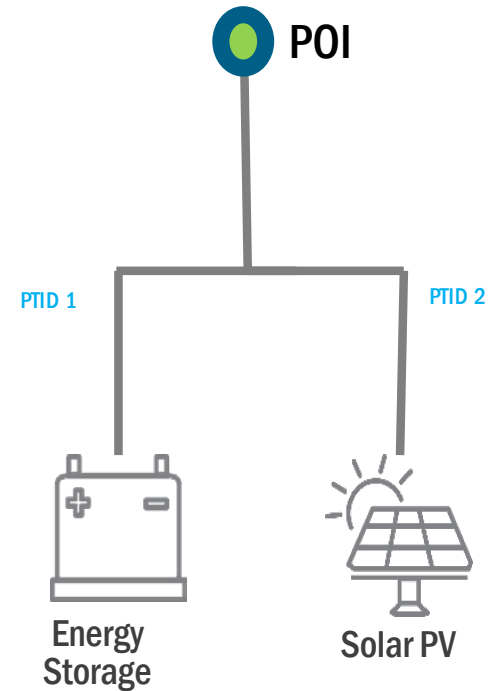
Definitions

- **Hybrid Storage Resource (HSR):** A combination of generation and energy storage units co-located behind a single Point of Interconnection, that participates in the wholesale market as a single resource with a single PTID. Resources co-located with load shall not qualify as a HSR.
- **Co-located Storage Resource (CSR):** A combination of a single intermittent renewable generation unit and a single energy storage unit co-located behind a single Point of Interconnection, that participates in the wholesale market as distinct resources. Resources co-located with load shall not qualify as a CSR.
- **Other definitions:**
 - **Units:** Resources within the HSR and CSR are referred as units. Each unit shall only consist of resources that have common operating characteristics and use a common fuel type
 - **Unit Injection Limit (Unit IL):** It is the maximum AC output available from the unit. Registered UOL for each unit should be equal to or less than its individual injection limit
 - **CSR Injection limit (CSR IL):** It is the maximum output of the Co-located Storage Resource (CSR) at the AC point of interconnection
 - **CSR Scheduling constraint:** It is the software constraint to determine Energy, Operating Reserve, and Regulation Service schedules for different units in a CSR. The sum of Energy, Operating Reserves and Regulation Service schedules for all units shall be less than or equal to the CSR Injection Limit

Energy Market Participation rules updates

Co-located Storage Resource (CSR): Design Overview

- Each unit within a CSR will have a distinct PTID/bid/schedule/settlement
- The NYISO proposes to require a CSR to be represented by a single Billing Organization and to have a single bidding agent
- Units will participate under their own participation model. In the illustrative example shown here, Solar PV will participate as an Intermittent Power resource (IPR) and Energy Storage will participate under Energy Storage Resource (ESR) model
- The NYISO plans to utilize a CSR scheduling constraint to determine feasible energy and reserve schedule for units within the CSR
- All units within a CSR will be settled at the LBMP at POI



Co-located Storage Resource (CSR): Design Overview

- **Only the ESR unit will be eligible to provide Reserves and Regulation**
- **Voltage Support Service (VSS)**
 - Subject to the existing supplier qualification criteria, both the ESR and IPR unit may be eligible to provide Voltage Support Service
 - The total MVAR capability from the CSR shall be based on the reactive power capability at the Interconnection Point and not the sum of individual units' capabilities
 - For providing this service, necessary metering/telemetry to measure the MVAR flows at the units and Interconnection Point shall be required
 - Testing requirements and performance measurement details for CSR will be incorporated into the Ancillary Services Manual
 - Proposed manual revisions will be discussed in future meetings

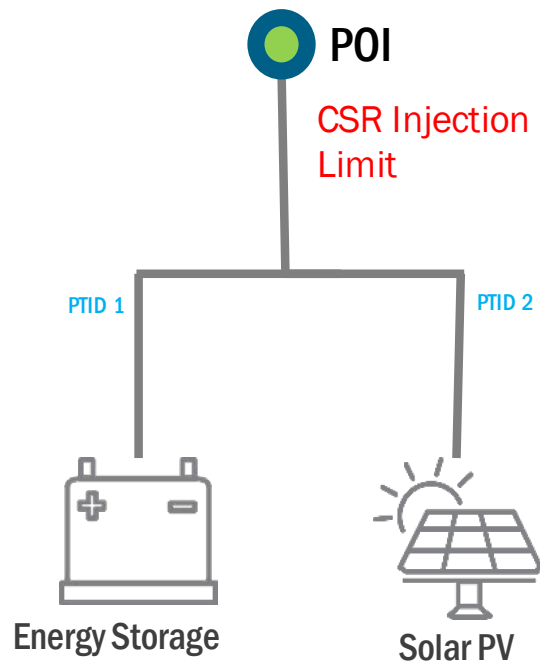
CSR Energy Market Scheduling

Energy Market Scheduling for CSR

- Basepoints will be sent to individual units
- NYISO will determine energy and reserve schedule for units within the CSR
 - The NYISO will use a CSR scheduling constraint to determine energy and ancillary services schedules for different units within the CSR

$$\sum_{\text{unit}=1}^2 (\text{Energy}_{\text{unit}} + \text{Reserve}s_{\text{unit}}^* + \text{Regulation}_{\text{unit}}^*) \leq \text{CSR Injection Limit}$$

- Other scheduling constraints applicable to each generation unit shall continue to apply



*Please note that IPRs are not eligible to provide reserves and regulation

Energy Market Scheduling for CSR

- **When the total CSR schedules are near its injection limit, the solar or wind IPR unit shall not exceed its real-time dispatch schedule**
 - The purpose of this treatment is to ensure that reliability services, such as operating reserves and regulation service, are deliverable by the ESR at times when the schedules of the CSR are near or equal to the CSR injection limit
 - This Do not Exceed functionality exists for wind IPRs today as the Wind Output limit
 - Settlement rules that would be applicable when such limit is in effect are consistent with current provisions for wind generators:
 - IPR unit will not be eligible for compensation for generation greater than Real-Time Scheduled Energy Injection (except for 3% tolerance)
 - IPR unit will be eligible for over generation charges, when such output limit is in effect
 - Details on the proposed new conditions to determine the applicability of Do not Exceed Limit are available on next slide
- **Therefore, IPRs that are part of a CSR must be dispatchable by the ISO**
 - The NYISO will only be able to support the eligibility of reserves and regulation from the ESR unit or respect the CSR injection limit if the co-located intermittent unit is also on dispatch

Energy Market Scheduling for CSR

- Do not Exceed limit on the IPR unit would be set if certain conditions are met:

- Condition 1: ESR unit either has a non-zero ancillary services award or a positive energy schedule ; And
- Condition 2: The sum of total units' schedule is greater than or equal to X % of the CSR Injection Limit
 - It is expected that X would be a relatively small quantity and would be updatable by the system operators based on experience of IPR output variability
 - For the examples below, X is assumed to be 95%

- Example of when Do not exceed Limit is set:

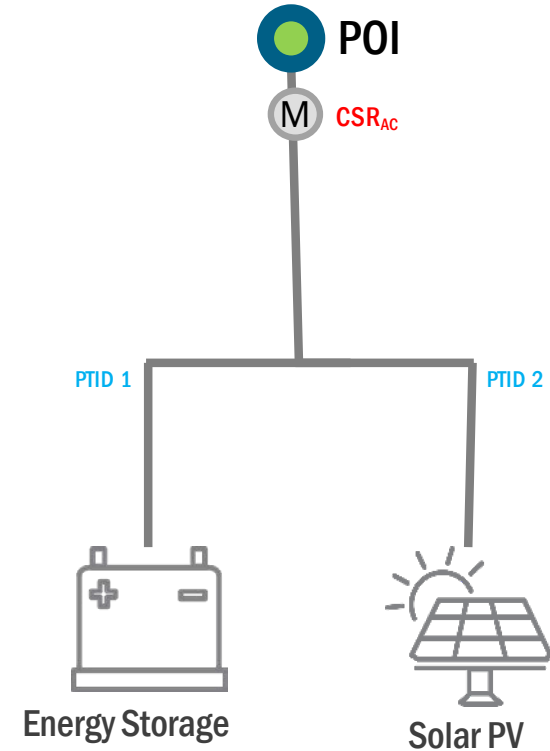
- CSR IL = 100MW; PV nameplate = 120MW; ESR nameplate = 50 MW
 - $0.95 * \text{CSR IL} = 95\text{MW}$

Units' Schedules					Total units' schedule	Whether Condition 1 is met	Whether Condition 2 is met	Do not exceed limit set
ESR Energy (MW)	ESR Reserve (MW)	ESR Reg (MW)	IPR Energy (MW)					
10	5	5	70	90	Yes	No	No	
10	5	5	75	95	Yes	Yes	Yes	
-10	5	5	95	95	Yes	Yes	Yes	
0	0	0	96	96	No	Yes	No	
-10	0	0	105	95	No	Yes	No	

CSR Metering

CSR Metering

- **CSR will be required to have a dual channel Revenue Grade Meter (AC) at the Point of Interconnection**
 - Meter must be capable of separately recording Energy injections and Energy withdrawals
- **CSR shall provide 6 second telemetry at the Point of Interconnection**
 - Telemetry data must reflect the total Energy injections and Energy withdrawals of the CSR
- **Each unit shall provide 6 second telemetry for output and control signals**
 - For the ESR unit, 6 second Energy Level (state of charge) telemetry data will be required
 - For the intermittent renewable unit, wind or solar forecast information will be required
 - Forecast information shall include all the meteorological data as well as outage information
- **6-Second telemetered data from the units will be used for real-time operations**
- **Revenue Grade Meter data at the POI will be used**
 - Allocation methodology and example are available on subsequent slides



CSR Metering (cont'd)

- **Proposal for allocation of Energy injections and Energy withdrawals to ESR and intermittent renewable units**
 - Hourly injection (MWh) and withdrawal (MWh) will be determined from the revenue grade meter at the POI
 - Each units' individual telemetered output will be used to determine the injections and withdrawals (MWh) allocated to the ESR and the intermittent renewable unit
- **All energy withdrawals will be allocated to the ESR unit**

CSR Metering Example

■ Example allocation of POI meter data to units

- ESR unit injection

$$\left(\frac{2.5}{5 + 2.5} \right) * 7 = 2.3 \text{ MWh}$$

- PV unit injection

$$\left(\frac{5}{5 + 2.5} \right) * 7 = 4.7 \text{ MWh}$$

- ESR unit withdrawal

$$= -4.5 \text{ MWh}$$

	Hourly Injection (MWh)	Hourly Withdrawal (MWh)
CSR meter (M)	7	- 4.5

	Hourly Integrated Telemetry (MWh)
ESR unit injection	2.5
ESR unit withdrawal	- 4.3
PV unit	5

CSR Energy Market Settlements

CSR Energy Market Settlements

- Settlement will occur at the unit level
- The settlement rules for ESR and intermittent units are proposed to be same as those applicable to standalone ESR and intermittent units, with exceptions noted on subsequent slides

CSR Energy Market Settlements

■ DAMAP Eligibility (current provisions)

- DAMAP is an hourly payment intended to reimburse a Supplier for any lost Day-Ahead Margin that may result from actions taken by the NYISO in real-time that reduce a Resource's Day-Ahead Margin.
- As per the ESR model, ESRs would only be eligible for DAMAP when committed OOM for reliability¹

1. For more discussion on DAMAP eligibility for ESRs, please refer to the presentation on “ESR Participation Model: Energy Market Design”. <https://www.nyiso.com/documents/20142/2686166/ESR%20Market%20Design%20MIWG%2009212018.pdf/ce0dccc8-f903-35b0-fbf9-74e8311a202e>

CSR Energy Market Settlements

- **DAMAP Proposal for the ESR unit within the CSR**
 - If the CSR Injection Limit is equal to or greater than the combined capability of the constituent units, it is proposed that the ESR unit shall be eligible for DAMAP as per the rules in the ESR model
 - If the CSR Injection Limit is less than the combined capability of the constituent units, it is proposed that the ESR unit shall not be eligible for DAMAP
 - Opportunities for a DAMAP payment to ESRs is already limited under the eligibility criteria previously discussed
 - Since DAMAP is a per unit calculation, the NYISO is proposing that the ESR co-located with an intermittent unit that have a shared common injection limit constraint shall not be eligible for DAMAP

Capacity Market Participation rules updates

ICAP Mitigation Measures

- **NYISO is proposing no changes to existing Capacity Market mitigation rules.**
- **Each co-located unit that comprises a CSR in a Mitigated Capacity Zones would be subject to all existing rules:**
 - Pivotal Supplier, Physical Withholding, and Buyer-Side Mitigation
 - Units may request to be considered for Renewable, Self Supply, or Competitive Entry Exemption

Next Steps and Project Timeline

Next Steps

- **Return to future working groups to discuss Tariff revisions and consumer impact analysis with stakeholders**

Timeline for Co-located Storage Resource (CSR) Option

Milestone	Target
Market Design Concept Proposal	Q3 2020
Present Consumer Impact Analysis	Q3 2020
MDC presentation and BIC vote	Q3/Q4 2020
MC vote	Q3/Q4 2020
FERC filing	2021
Deployment	Q4 2021

Timeline for Aggregated Hybrid Storage Resource (HSR) Option

Milestone	Target
Market Design Concept Proposal	2021

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 A – Energy, Interconnection and Capacity rules for CSRs presented at 7/22/2020 ICAPWG/MIWG

Resource Registration

Registration rules for CSR

- **The entity(s) operating the CSR, will be responsible to register all parameters pertaining to CSR and its units.**
- **CSR Registration Parameters:**
 - Following new registration parameters are proposed to be added for CSR:
 - CSR Injection Limit (MW)
 - CSR Generation Capability (MW)
 - CSR Storage Capability (MW)
 - No. and type of units
- **Registration rules and parameter requirements for each unit within the CSR depends upon the participation model used by them**
 - The NYISO is not proposing any new registration parameters for units within the CSR at this time

Energy Market Bidding

Energy Market Bidding for CSRs

- **Market Participant(s) operating the CSR will submit separate bids for each unit participating in the NYISO wholesale market**
- **Bidding rules and parameter requirements depends upon the participation model used by the units within the CSR**
 - For the ESR unit, bidding rules and parameter requirements under ESR model will be applicable
 - For IPR unit, bidding rules and parameter requirement for specific IPR resource will be applicable
- **CSR Injection limit shall not be a biddable parameter**
- **All desired charging/injecting operations for ESR may be reflected through the bids**

Energy Market Bidding for CSRs

- **Similar to other generators, CSR will be able to bid in both Day Ahead and Real Time markets.**
- **Minimum offer size for Energy and Ancillary Services:**
 - 1 MW for generation units;
 - 100 kW for ESR unit
- **The Bidding process will be same as currently applicable to different resource types**
 - In Real time, bids are locked 75 minutes prior to the operating hour.

Operating and Energy Level modes for CSRs

- Unit operation modes available to each resource type within CSRs are consistent with existing rules

	Unit type	Unit Operation mode	Energy Level mode
Co-located Storage Resource	IPR	Wind: ISO-Committed Flexible; Solar: Self-Committed Fixed ¹	NA
	ESR	ISO-Committed Flexible/Fixed ² ; Self-Committed Flexible/Fixed	Self-managed/ISO – managed

- Unit operation mode for Solar will change once Solar on Dispatch is implemented
- ISO committed Fixed is allowed only if qualified by the NYISO (taken from ESR rules)

Energy Market Scheduling

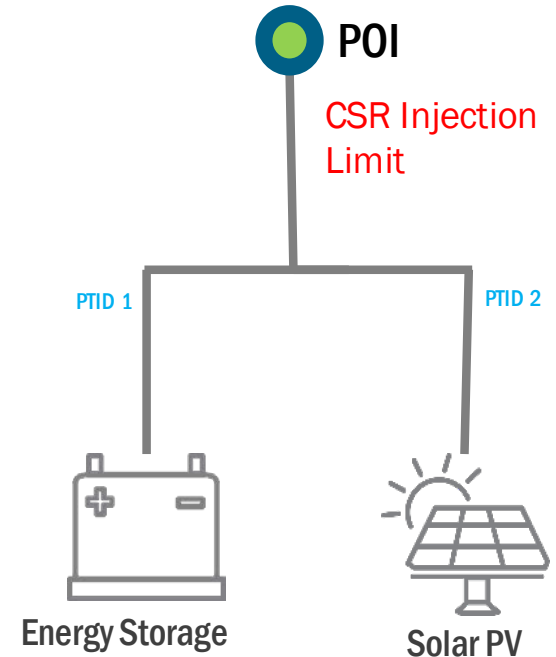
Energy Market Scheduling for CSR

- Basepoints will be sent to individual units
- NYISO will determine energy and reserve schedule for units within the CSR
 - The NYISO is evaluating the feasibility of imposing a CSR scheduling constraint to determine energy and ancillary services schedules for different units within the CSR

Assuming n components within the HSR

$$\sum_{comp=1}^n (Energy_{comp} + Reserves_{comp}^* + Regulation_{comp}^*) \leq CSR \text{ Injection Limit}$$

- Other scheduling constraints applicable to each generation unit shall continue to apply
- The NYISO is evaluating if headroom on the POI will need to be reserved to allow for variation in the IPR and still maintaining the ability to deliver reserves and regulation



*Please note that IPRs are not eligible to provide reserves and regulation

Energy Market Scheduling for CSR

- Confirming the feasibility of implementing the CSR scheduling constraint, and identifying the associated implications is in progress
- CSR Injection Limit could constrain economic output from one or more units associated with the CSR, similar to other constraints currently modeled (e.g. UOL_N , ramp limit)

Energy Market Mitigation

Energy Market Mitigation for CSR

- **The NYISO has not identified the need for any additional energy market mitigation rules specifically for CSRs at this time**
 - Units within the CSRs shall be subjected to the existing mitigation rules

Interconnection Proposal

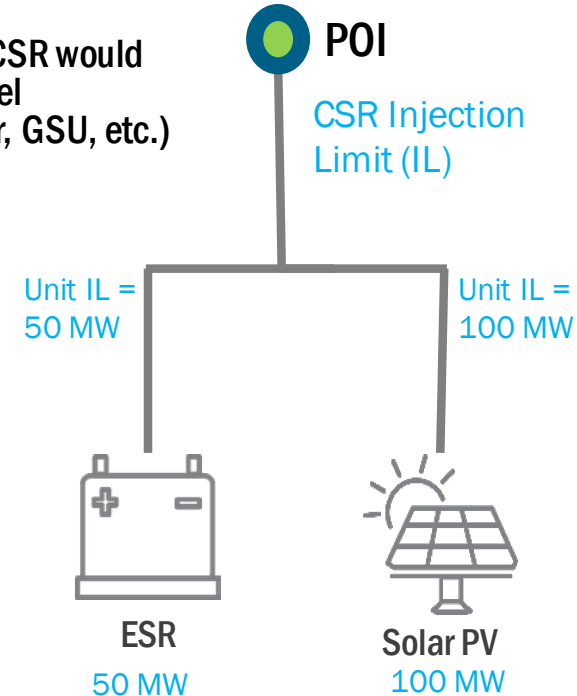
Interconnection Rules for CSRs

- **For facilities proposing to interconnect as a CSR, all units within the CSR may be included in a single Interconnection Request (IR)**
 - The NYISO is working on transition rules to enable projects that currently have separate positions in the Interconnection Queue to combine and proceed under a single Interconnection Request as a CSR
- **Each CSR will be studied in the interconnection process as a single facility with separate ERIIS and CRIS values for each unit**
 - The CSR will indicate to the NYISO how much ERIIS and CRIS it is requesting for each unit within the CSR
 - Requested CRIS may not exceed ERIIS
 - ERIIS and CRIS values may not exceed the injection capability of each unit
 - The sum of CRIS among all units may not exceed the CSR injection limit
 - While the sum of ERIIS among all units may exceed the CSR injection limit, energy injection at the POI may not exceed the CSR injection limit, as described in the examples on subsequent slides
 - The CSR shall register each unit consistent with the allocation of ERIIS and CRIS values awarded during the interconnection study process
- **As currently permitted for facilities proceeding through the NYISO interconnection process, units within the CSR may request ERIIS below the nameplate for the unit in order to avoid upgrading injection capability, provided proper control technologies are in place, per the Tariff**
- **All units within the CSR will have a single Interconnection Agreement (IA)**

Interconnection Examples

- The scenarios below illustrate the amount of ERS and CRIS that units within a CSR would be eligible to receive based on whether injection capability is limited by unit-level equipment (such as PV inverter) and/or facility-level equipment (shared inverter, GSU, etc.)
 - In the examples on this slide, unit-level injection capability is sized to unit nameplate

	Example 1: CSR IL=150 MW	Example 2: CSR IL=100 MW	Example 3: CSR IL = 70 MW
Eligible ERS (MW)	PV <= 100 ESR <= 50	PV <= 100 ESR <= 50	PV <= 100* ESR <= 50
Eligible CRIS (MW)	PV + ESR <=150 PV <= 100 ESR <= 50	PV + ESR <=100 PV <= 100 ESR <= 50	PV + ESR <=70 PV <= 70 ESR <= 50

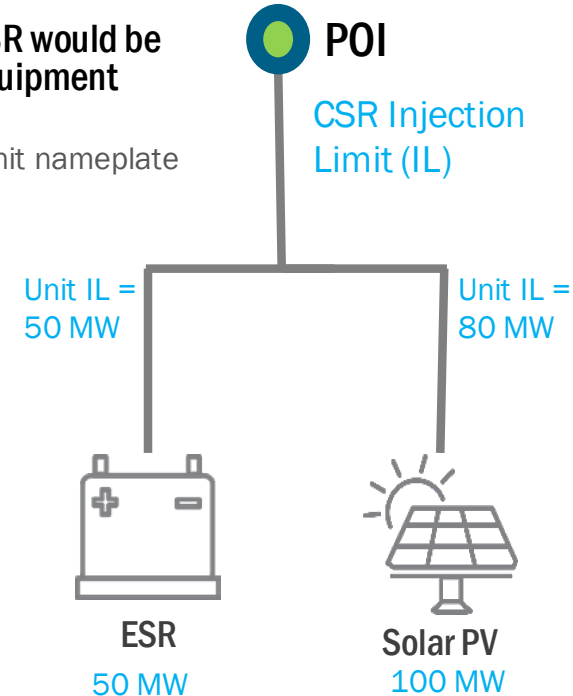


*ERS may only exceed the IL in the case where both CSR units are in the same Interconnection Request

Interconnection Examples

- The scenarios below illustrate the amount of ERIS and CRIS that units within a CSR would be eligible to receive based on whether injection capability is limited by unit-level equipment (such as PV inverter) and/or facility-level equipment (shared inverter, GSU, etc.)
 - In the examples on this slide, PV injection capability is undersized compared to unit nameplate

	Example 1: CSR IL=130MW	Example 2: CSR IL=80 MW	Example 3: CSR IL = 70 MW
Eligible ERIS (MW)	PV <= 80 ESR <= 50	PV <= 80 ESR <= 50	PV <= 80* ESR <= 50
Eligible CRIS (MW)	PV + ESR <= 130 PV <= 80 ESR <= 50	PV + ESR <= 80 PV <= 80 ESR <= 50	PV + ESR <= 70 PV <= 70 ESR <= 50



* ERIS may only exceed the IL in the case where both CSR units are in the same Interconnection Request

Capacity Rules Proposal

DMNC Test for CSR

- **Each unit within the CSR will have its own DMNC value**
 - Existing DMNC rules for each resource type will be applicable to units within a CSR
 - ESR units must perform DMNC tests during the Peak Load Window if they have an Energy Duration Limitation (EDL) or provide operating data
 - DMNC is nameplate for Intermittent Power Resources

CSR ICAP and UCAP Calculations

- **ICAP and UCAP calculation methods for each unit within a CSR will be similar to existing methods based on resource type, with small adjustments to account for the shared Point of Interconnection (POI)**
 - A POI itself can have a derate (e.g., if the inverter is limited) that does not require the ESR unit to reduce its UOL to match the POI injection capability. Therefore, the NYISO proposes to calculate CSR ESR UCAP using the existing method for calculating UDR
 - While the existing ESR UCAP calculation only measures availability of the ESR itself, the proposed CSR ESR UCAP calculation will multiply the POI availability by the ESR availability
 - Intermittent UCAP will also be limited by the POI injection capability, by taking the minimum of POI injection capability and intermittent output when calculating the Production Factor for CSR intermittent units
 - Additional detail on these calculations is on subsequent slides
- 1. It is to be noted that the DAF is 100% for non-duration limited resources
- 2. Intermittent Power Resources have a DAF of 100% as they are not eligible to be a Duration Limited Resources

CSR ICAP and UCAP Calculations

■ CSR ESR

- $ICAP = \min(CRIS, DMNC)$
- $Adjusted\ ICAP = ICAP * Duration\ Adjustment\ Factor\ (DAF)^1$
- $UCAP = Adjusted\ ICAP * (1 - Derating\ Factor)$
 - $Derating\ Factor = 1 - Availability\ Factor\ (AF)$
 - $CSR\ ESR\ Availability\ Factor = ESR\ Unit\ Availability\ Factor * CSR\ Injection\ Limit\ Availability\ Factor$

■ CSR Intermittent

- $ICAP = \min(CRIS, DMNC)$
- $Adjusted\ ICAP = ICAP * DAF^2$
- $UCAP = Adjusted\ ICAP * Production\ Factor\ (PF)$
 - $CSR\ Intermittent\ Production\ Factor = average(\min(CSR\ Intermittent\ Output, CSR\ Injection\ Limit) / CSR\ Injection\ Limit)$ across performance measurement window

■ Numerical examples of these calculations are on subsequent slides

*Blue font designates additional calculation components for CSR units. Existing resource type calculations are in gray.

1. It is to be noted that the DAF is 100% for non-duration limited resources
2. Intermittent Power Resources have a DAF of 100% as they are not eligible to elect an Energy Duration Limitation

CSR ICAP and UCAP Example

Assumptions: Max Facility Injection Limit = 80MW

Intermittent: Nameplate = 100 MW, CRIS = 30 MW, DMNC = 100, DAF = 1

ESR: Nameplate = 50 MW, CRIS = 50 MW, DMNC = 50MW, DAF = 1

Hour	CSR Intermittent Output (MW) (A)	CSR ESR UOL (MW)* (B)	CSR Injection Limit (MW) (C)
1	90	50	80
2	70	50	40
3	60	30	80
4	50	50	80

CSR Intermittent Calculations

ICAP = min (CRIS,DMNC) = 30 MW

Adjusted ICAP = ICAP * DAF = 30 MW * 1 = 30 MW

UCAP = Adjusted ICAP * Production Factor

= 30 MW * (sum(min(A,C))/(80*4 hours))

= 30 MW * ((80+40+60+50)/320 MWh)

= 22 MW

CSR ESR Calculations

ICAP = min (CRIS,DMNC) = 50 MW

Adjusted ICAP = ICAP * DAF = 50 MW * 1 = 50 MW

UCAP = Adjusted ICAP * Availability Factor (AF)

= 50 MW * CSR ESR AF * CSR Injection Limit AF

= 50 MW * (Sum(B)/(50 MW*4 hours)) * (Sum(C)/(80 MW* 4 hours))

= 50 MW * 0.9 * 0.875

= 39 MW

*Note that other elements are included in the existing availability calculation for ESRs, all of which will be applicable for ESRs within CSRs. UOL is used as a proxy for ESR availability for the purposes of this simplified example.

CSR Bid/Schedule/Notify (B/S/N) Obligations

- **Each unit within a CSR will be subject to B/S/N obligations consistent with existing rules based on resource type**
 - An ESR within a CSR that has an Energy Duration Limitation (EDL) must Bid/Schedule/Notify in the Day-Ahead Market (DAM) for injection of the ICAP Equivalent of UCAP sold (ICE), for the consecutive number of hours that correspond to its duration requirement, and during the Peak Load Window (PLW)
 - An ESR within a CSR that has an EDL must also bid the full withdrawal range, i.e. $\max(\text{negative Installed Capacity Equivalent}, \text{Lower Operating Limit})$, for all hours outside of the Peak Load Window
 - If the ESR does not have an EDL, it must B/S/N ICE injection into the DAM for all hours, consistent with traditional generator requirements
 - Intermittent units within a CSR will not be required to B/S/N in the DAM

Appendix B – Stakeholder Feedback Summary

Stakeholder Feedback Summary

- **Below is a summary of stakeholder questions from previous working groups and NYISO's response to them. Some of these have been addressed in earlier and 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
 - The latest proposed definitions for Co-located Storage Resources (CSR) and Hybrid Storage Resources (HSR) do not include the term "front-of-the-meter"
 - Request for exploration of possible thermal + storage model
 - Addressed in 06.30.2020 and 07.22.2020 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 06.30.2020 ICAPWG/MIWG presentation

Stakeholder Feedback Summary

- Request for examples on CRIS and ERIS allocation
 - Addressed in 07.22.2020 ICAPWG/MIWG presentation
- Request for examples on UCAP calculations
 - Addressed in 07.22.2020 ICAPWG/MIWG presentation
- Request for a detailed timeline of the proposed options
 - Addressed in 08.10.2020 ICAPWG/MIWG presentation
- Concerns on the sufficiency of Co-located HSR Option (Option 1) to meet the business needs for hybrid storage projects.
 - Based on the feedback received from developers, as well as evaluation of other options, the NYISO has determined that Option 1 with scheduling constraint could satisfy majority of the hybrid use cases as well as be made available on a shorter time frame. Therefore, NYISO has proposed to pursue this option for MDC in 2020. The NYISO also proposed to pursue the Aggregated HSR option for Market Design Concept Proposal in 2021.

Stakeholder Feedback Summary

- Request to make hybrid participation options technology agnostic
 - Addressed in 07.22.2020 ICAPWG/MIWG presentation
- Request to provide data on hybrid projects in the queue
 - The determination of possible co-located storage projects from the interconnection queue is based on the similarity among projects with respect to their location, POI, project name and developer.

	ESR (MW)	Solar (MW)	Wind (MW)	Zone
Solar + ESR	100	200		C
Solar + ESR	4	20		E
Solar + ESR	83	177		C
Wind + ESR	5		100.8	E
Total	192	397	100.8	

Stakeholder Feedback Summary

- Request to develop IPR like model for Hybrid Storage resources comprising of Intermittent resources with a small energy storage.
 - Reasons for our concerns with an IPR like model for HSRs is explained in detail in 07.22.2020 ICAPWG/MIWG presentation
- Concerns expressed that Aggregated HSR option (Option 2) may not be suitable for Hybrid Storage resources comprising of Intermittent resources with a small energy storage
 - A new option - Forecasted HSR, targeted towards such use cases, was introduced in 06.30.2020 ICAPWG/MIWG presentation