

Hybrid Storage Model: CSR Proposal Updates

Kanchan Upadhyay, Amanda Myott
Energy Market Design

ICAPWG/MIWG

October 27, 2020
WebEx

Agenda

- **Background**
- **Proposal Overview**
- **Capacity Rules Proposal Update**
- **CSR Buyer's Side Mitigation Proposal Update**
- **Next Steps**
- **Appendix: Comprehensive 2020 CSR Market Design Proposal**

Previous Presentations on Market Design Proposal and Tariff revisions

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
06-30-20	ICAPWG/MIWG	Hybrid Storage: Proposal for participation options https://www.nyiso.com/documents/20142/13434223/Hybrid%20Storage%206.30.2020%20ICAPWG_MIWG%20draft%20v5_final.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
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

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Previous Presentations on Market Design Proposal and Tariff revisions(cont'd)

Date	Working Group	Discussion Points and Links to Materials
08-10-20	ICAPWG/MIWG	Hybrid Storage: Market Design for Co-located Storage Resources https://www.nyiso.com/documents/20142/14404876/Hybrid%20Storage%20ICAPWG%20MIWG%20081020%20final.pdf/f414f66a-eee0-3a3c-393d-6b075fe5a1ba
08-19-20	ICAPWG/MIWG	Hybrid Storage: Proposed Energy market tariff revisions for Co-located Storage Resources (CSR) https://www.nyiso.com/documents/20142/14617012/02_Hybrid%20Storage%20Energy%20tariff%20ICAPWG%20MIWG%2008.19.20%20draft%20final.pdf/a6b81cb1-fe9a-72cd-2a8f-75befec4afa
08-19-20	ICAPWG/MIWG	Hybrid Storage: Proposed CRIS and Interconnections tariff revisions for Co-located Storage Resources (CSR) https://www.nyiso.com/documents/20142/14617012/03_Hybrid%20Storage%20Interconnection%20tariff%20ICAPWG%20MIWG%2008.19.20_FINAL.pdf/dbae9003-8314-e5c0-d0c3-55a7d6384cec
08-25-20	ICAPWG/MIWG	Hybrid Storage: Proposed Market design updates and energy market tariff revisions for Co-located Storage Resources (CSR) https://www.nyiso.com/documents/20142/14757023/Hybrid%20Storage_Market%20Design%20Updates%20%20Energy%20tariff%20ICAPWG%20MIWG%2008.25.20%20draft%20final.pdf/ffb01347-c4bd-24a1-6549-91cda42d8cb3
08-25-20	ICAPWG/MIWG	Hybrid Storage: Proposed Tariff Revisions for Co-located Storage Resources (CSR) https://www.nyiso.com/documents/20142/14757023/CSR%20ICAP%20Tariff%20Revisions.pdf/01796e6b-d1d8-ba86-9ab8-12c7bdf1d6f6
09-08-20	ICAPWG/MIWG	Hybrid Storage: Proposed Market design updates and energy market tariff revisions for Co-located Storage Resources (CSR) https://www.nyiso.com/documents/20142/15078529/Hybrid%20Storage_Market%20Design%20Updates%20%20Energy%20tariff%20ICAPWG%20MIWG%2009.08.20%20final.pdf/fcbb65d6-71d1-c1ac-52e9-8ecb6efb20f7

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Previous Presentations on Market Design Proposal and Tariff revisions(cont'd)

Date	Working Group	Discussion Points and Links to Materials
09-22-20	ICAPWG/MIWG	Hybrid Storage: Participation Examples and Energy Market Tariff Revisions for Co-located Storage Resources (CSR) https://www.nyiso.com/documents/20142/15473217/Hybrid%20Storage_CSR%20examples_%20%20Energy%20tariff%20ICAPWG%20MIWG%2009.22.20%20draft%20final.pdf/944fc9aa-edfb-a77a-3d77-b94c82e74b2c
10-02-20	ICAPWG/MIWG	Hybrid Storage: Market Design Updates and Tariff Revisions for Co-located Storage Resources (CSR) https://www.nyiso.com/documents/20142/15773723/4%20Hybrid%20Storage_Energy%20tariff%20ICAPWG%20MIWG%2010.02.20%20final.pdf/856b5bb8-175c-cd27-e972-b72c34e58a19
10-06-20	ICAPWG/MIWG/TPAS	Hybrid Storage Model: Interconnection Tariff Changes https://www.nyiso.com/documents/20142/15824617/2%20Hybrid%20Storage%20Incremental%20Interconnection%20Tariff%20Changes_100620_FINAL.pdf/f5fd38fc-20fb-b669-66ef-6c9a8d0d15ef
10-06-20	ICAPWG/MIWG	Hybrid Storage Model: MST Attachment H Tariff Changes https://www.nyiso.com/documents/20142/15824617/3%20Hybrid%20Storage%20Attachment%20H%20Tariff%20Changes_100620_FINAL.pdf/edea54b2-d8f8-16cb-3aab-31622215a08f
10-16-20	ICAPWG/MIWG	Hybrid Storage Model: MST Energy Market Tariff Changes https://www.nyiso.com/documents/20142/16124862/2%20Hybrid%20Storage_Energy%20tariff%20ICAPWG%20MIWG%20101620.pdf/fcc7cf12-efe1-9c41-a09b-1921da66ebbf

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



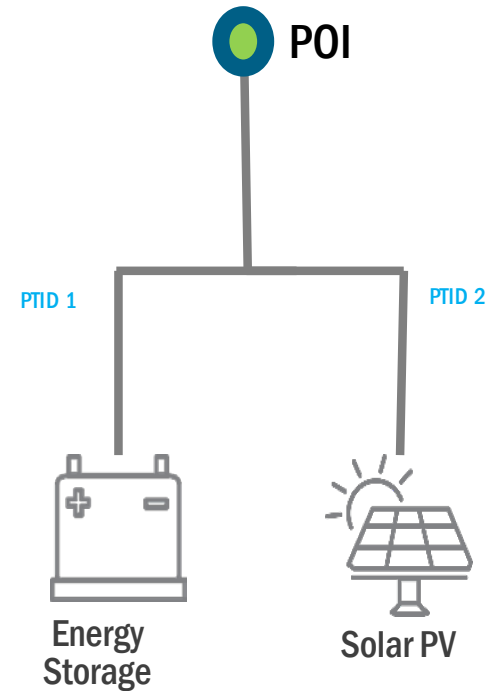
Project Background

- **This project seeks to explore market participation option(s) for co-located front-of-the-meter generators and energy storage resources**
 - Incentives along with improvements in flexibility and availability are motivating developers to couple generation resources with storage resources
- **Modifications to existing market rules will be developed to accommodate CSR by the end of 2020**

CSR Market Design Overview

CSR: Market 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
 - Only the ESR unit will be eligible to provide Reserves and Regulation
- The NYISO plans to utilize a CSR scheduling constraint to determine feasible energy and reserve schedules for units within the CSR
- All units within a CSR will be settled at the same LBMP at the Point of Injection (POI)



Proposed CSR Operating Structure

- All injections/withdrawals by units within a CSR must be effectuated through NYISO bids and schedules¹
- Each unit within a CSR will have a distinct PTID, bid, schedule, and settlement
 - The intermittent unit within a CSR will be scheduled based on economic bids and forecast, consistent with the scheduling rules that apply to all wind and solar IPRs
 - Consistent with existing rules for IPRs, the intermittent unit within a CSR will be eligible to be compensated for its actual output, with the exception discussed below
 - Under certain circumstances, the intermittent unit within a CSR may be subject to a “Wind and Solar Output Limit” in order to enable the deliverability of scheduled Energy and Ancillary Services from the co-located ESR²
 - When the “Wind and Solar Output Limit” is in effect, the intermittent unit within a CSR will not be compensated for output above its economic basepoint and may incur overgeneration charges (with a 3% of UOL tolerance, consistent with the rules that apply to all wind and solar IPRs)

¹Detailed examples regarding CSR bidding, scheduling, and settlements can be referenced in the 09/22/20 ICAPWG/MIWG presentation located at:

https://www.nyiso.com/documents/20142/15473217/Hybrid%20Storage_CSR%20examples_%20%20Energy%20tariff%20ICAPWG%20MIWG%2009.22.20%20draft%20final.pdf/944fc9aa-edfb-a77a-3d77-b94c82e74b2c

²Additional description of the “Wind and Solar Output Limit” proposal can be referenced in the 10/02/20 ICAPWG/MIWG presentation located at:

https://www.nyiso.com/documents/20142/15773723/4%20Hybrid%20Storage_Energy%20tariff%20ICAPWG%20MIWG%2010.02.20%20final.pdf/856b5bb8-175c-cd27-e972-b72c34e58a19

Proposed CSR Operating Structure (cont'd)

- **The ESR unit within a CSR will be scheduled to provide Ancillary Services and to inject or withdraw Energy based on its bids**
 - Uninstructed injections/withdrawals by the ESR will have settlement consequences that are consistent with the settlement rules that apply to all ESRs
 - Unscheduled withdrawals by an ESR may result in persistent over-withdrawal charges, see MST Sections 4.5.2.1 and 15.3A.1.2

CSR vs. Standalone Resource Models

- **The NYISO proposal makes the CSR market participation model as similar as possible to the standalone Solar/Wind IPR and ESR rules, with the exceptions below:**
 - The two units in a CSR share a common CSR Scheduling Limit which will be modeled as a scheduling constraint in the optimization
 - The intermittent unit will be subject to a “Wind and Solar Output limit” when the CSR Generators’ combined schedules are close to CSR Injection Scheduling Limit and there is a positive energy, reserve or regulation schedule on the ESR
 - The two units in a CSR share a common revenue grade meter
 - Each units’ individual telemetered output will be used to determine the injections and withdrawals (MWh) allocated to the ESR and the intermittent renewable unit
 - For the ESR unit within the CSR, TSC and NTAC will only be charged on net withdrawals at POI/POW
 - The ESR unit will not pay TSC and NTAC when it receives charging energy from its co-located Intermittent Power Resource behind the shared POI/POW
 - Both units in the CSR can submit one Interconnection request

Capacity Rules Proposal Update

Proposed CSR ICAP and UCAP Calculations

- At the 07/22/20 ICAPWG/MIWG, the NYISO presented proposed methodologies for calculating ICAP and UCAP for each unit within a CSR
 - The NYISO is proposing an incremental change to the CSR Intermittent Production Factor calculation in green below to capture the case where the nameplate value of the Intermittent unit in a CSR is less than the CSR Injection Limit
- **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**
 - $ICAP = \min(CRIS, DMNC)$
 - $Adjusted\ ICAP = ICAP * DAF^2$
 - $UCAP = Adjusted\ ICAP * Production\ Factor\ (PF)$
 - $CSR\ Intermittent\ Production\ Factor = average(\min(CSR\ Intermittent\ Output, CSR\ Injection\ Limit) / \min(Unit\ Nameplate, CSR\ Injection\ Limit))\ across\ performance\ measurement\ window$
- **Numerical examples of these calculations are on the next slide**

*Blue font designates additional calculation components for CSR units. Green font designates the incremental change from what was previously presented. 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))/(min(100, 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 Buyer Side Mitigation (BSM) Proposal Update

Proposed Tariff Revisions Regarding Additional CRIS Requests

- **The NYISO is proposing to add Tariff language to MST Section 23.4.5.7.6 to clarify that, consistent with existing practice, the NYISO may consider all relevant information pertaining to shared costs among units when it performs Additional CRIS evaluations**
 - This revision aims to capture the idea that units within CSRs, as well as other resources, may have shared costs and could possibly have different In-Service and/or Exemption statuses at the time Additional CRIS is being requested

Next Steps

Next Steps

- **Return to the 11/3 ICAPWG/MIWG for additional discussion if necessary**
- **BIC vote**
 - Target date is November 11, 2020
- **MC vote**
 - Target date is November 18, 2020
- **FERC filing**
 - Early February 2021
 - The NYISO intends to request an effective date of 60 days from the FERC filing for the interconnection provisions of the proposal
- **Deployment**
 - Q4 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

