Co-Located Storage Resources (CSR) Participation Model

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Disclaimer:

The information provided in this presentation is intended to highlight the salient features of Co-located Storage Resources (CSR) Participation in NYISO's markets.

It is assumed that the learner has some fundamental understanding of how NYISO's wholesale markets function.

Please refer to the Online Learning and Course Materials section on the Market Training webpage on the NYISO website for learning opportunities.

https://www.nyiso.com/training

Presentation Outline

- Introduction to Participation Model
- Interconnection Rules for CSRs
- Energy Market and Ancillary Services Participation
- Energy and Ancillary Services Financial Settlements
- Installed Capacity Market Participation
- Additional Documentation and Resources

Co-located Storage Resources – Introduction to Participation Model

Co-located Storage Resources Participation Model

- Introduction to Participation Model
  - Descriptions
    - Co-located Storage Resources (CSR)
    - Co-located Storage injection/withdrawal Scheduling Limits
  - Overview of Participation Model
    - Market areas (Energy, Ancillary Services and ICAP Market)

Defined Terms

- Co-located Storage Resources (CSR): An Energy Storage Resource and one other type of Generator that is not a Withdrawal-Eligible Generator that:
  - Are both located behind a single Point of injection/withdrawal (POI)
  - Participate in the ISO Administered Markets as two distinct Generators; and
  - Share a set of CSR Scheduling Limits
    - The CSR injection Scheduling Limit: Used to determine the combined Regulation Capacity, Operating Reserve and Energy injection schedules for, and the maximum permitted net injection by a pair of CSR Generators
    - The CSR withdrawal Scheduling Limit is used to determine the combined Regulation Capacity and Energy withdrawal schedules for, and the maximum permitted net withdrawal by a pair of CSR Generators

CSR Description

- The non-ESR Generator can be:
  - a Wind, Solar or Landfill gas Intermittent Power Resource (IPR);
  - a Limited Control Run-of-River (LC-RoR) Hydro Generator; or
  - a Dispatchable Generator which may require commitment and time to start-up
- The non-ESR generator cannot be:
  - a Limited Energy Storage Resource (LESR);
  - a Generator comprised of a group of generating units at a single location,
    - Grouped generating units are separately committed and dispatched by the ISO, and
    - their Injections are measured at a single location
  - Generators participating via a model that can accommodate several participants,
    - Including but not limited to Hybrid Storage Resources and Aggregations; and
  - A Generator that serves a host load (BTM: NG resources)

CSR Description

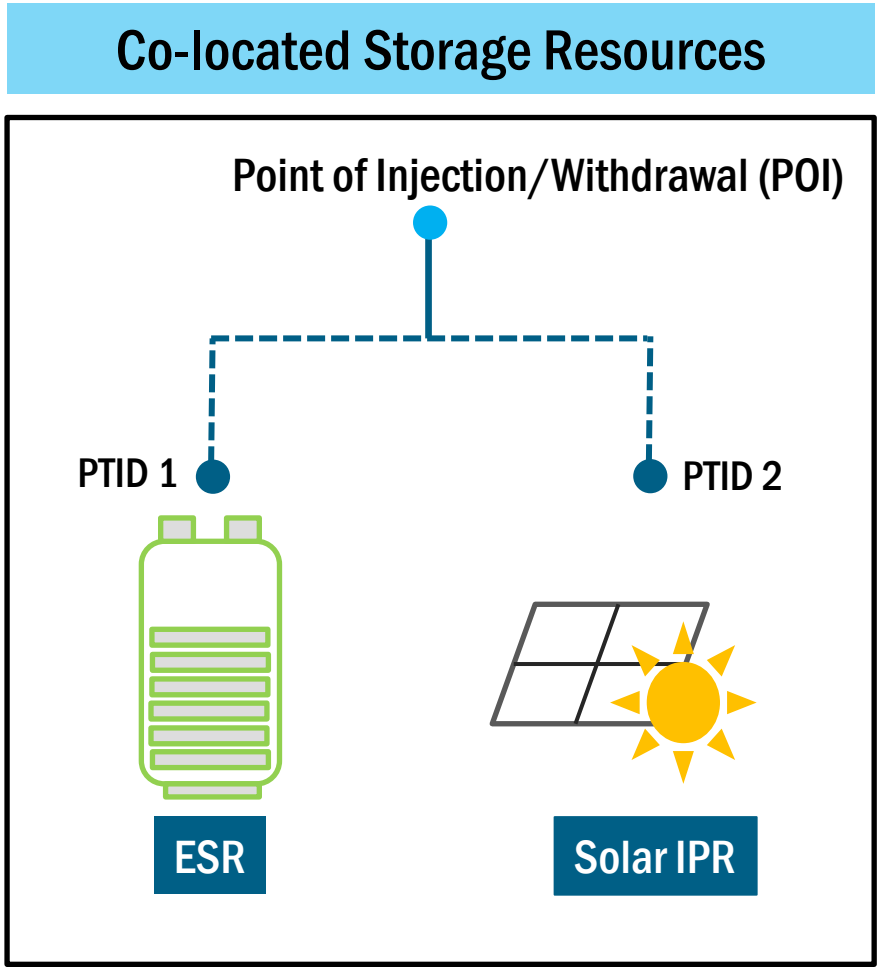
- The ESR and the second non-ESR Generator that participate as a CSR will operate and participate in the NYISO markets as two distinct Generators
- Each Generator will be assigned its own point identifier ("PTID") for scheduling and settlement purposes
- The ESR and non-ESR Generator submit bids, are scheduled and settle as two independent Generators, but their combined injections and withdrawals MWs must adhere to the CSR Scheduling Limits
- The same Locational Based Marginal Price ("LBMP") will apply to both participating Generators because they inject or withdraw Energy at the same electrical location

CSR Description

- The ESR and the non-ESR Generator are likely to share a common set of equipment like an inverter, transformer, etc.
- The ESR can receive charging Energy from the co-located non-ESR Generator, provided the ESR's withdrawal is scheduled by the NYISO
- The two Generators that participate in a CSR will be required to have the same billing organization and the same bidding agent

Co-Located Storage Resources – Illustration

- In the example illustration, the Solar Resource will participate under the Solar Intermittent Power Resource (IPR) model, and the ESR will participate under Energy Storage Resource (ESR) model



Example for Illustrative purposes only

Impacted Markets and Services

Energy Market

- CSR Generators can each participate in the Day-Ahead and Real-Time Energy Markets

Ancillary Services

- CSR Generators can each qualify to provide Voltage Support Service
- ESRs and eligible non-ESR Generators can each provide Regulation Service and/or Operating Reserves

Installed Capacity Market

- CSR Generators can each qualify to provide UCAP and participate in the Installed Capacity Market

CSR- Participation Rules

- Key differences between standalone Generators and an ESR and a non-ESR generator that participate as a CSR:
  - Interconnection Process
    - Number of interconnection requests required
    - Manner in which the projects are evaluated in the interconnection studies
    - Calculation and allocation of ERIS and CRIS values
  - Metering Requirements
  - Additional Registration requirements and Bidding parameters
  - Scheduling rules for Energy and Ancillary services
  - Settlement rules
  - Unforced Capacity (UCAP) calculations

CSR- Participation Rules

- To gain a broader understanding of how stand-alone ESRs and other non-ESR generators participate in the NYISO's Energy, Ancillary Services and Installed Capacity Markets, it is strongly recommended to visit the following presentations offered by Market Training:
  - Energy Storage Resources (ESR) Participation Model e-learning module
  - Wind and Solar Intermittent Power Resource (IPR) Participation Model e-learning module
  - New York Market Orientation Course (NYMOC) presentations
  - Please also review slides 74 and 75 at the end of this presentation, which provide references to additional resources

Interconnection Rules for CSRs

Interconnection Rules for CSRs

- For facilities proposing to interconnect as CSR, both the participating ESR and the non-ESR Generator must be included in a single Interconnection Request (IR)
- All Generators participating in the CSR will have a single Interconnection Agreement if they submit a single IR complete the interconnection study process and accept cost allocations and post security for required upgrades
- The CSR will be studied in the interconnection process as a single facility evaluated at a single ERIS value and a single CRIS value
  - ERIS: permissible injection
  - CRIS: MW level subject to review under the NYISO Deliverability Interconnection Standard and one of the eligibility requirements for participation in the ICAP market
- The Interconnection Customer must specify the allocation of ERIS and CRIS to the ESR and the non-ESR Generator in the IR
  - ERIS and CRIS are allocated to each Generator (such that each generator will have its own ERIS and CRIS value)

Interconnection rules for CSRs

New York ISO

- Rules for Maximum Permissible Requested ERIS and CRIS:
  - Total ERIS for the CSR may be less than the sum of the ERIS for the individual Generators
  - ERIS of the individual Generators is subject to the following limitations:
    - ERIS for ESR cannot exceed the lesser of the Point of Injection limit or its nameplate; and
    - ERIS for the non-ESR Generator cannot exceed the CSR Injection Capability plus the full withdrawal capability of the ESR or the Generator's nameplate
  - While the sum of ERIS among both Generators may exceed the CSR injection limit, energy injection at the POI cannot exceed the CSR injection limit
  - The sum of CRIS among both Generators may not exceed the minimum of the following:
    - The expected maximum injection capability in MW for the entire CSR;
    - The nameplate capacity of the entire CSR or
    - The sum of the Facility's requested and existing ERIS
  - Generators participating as a CSR may request ERIS below the nameplate for the Generator in order to avoid upgrading injection capability, provided proper control technologies are in place

Interconnection Rules for CSRs

- Example:

Example for Illustrative purposes only

ESR Nameplate Capacity: 10 MW

Solar IPR Nameplate Capacity: 90 MW

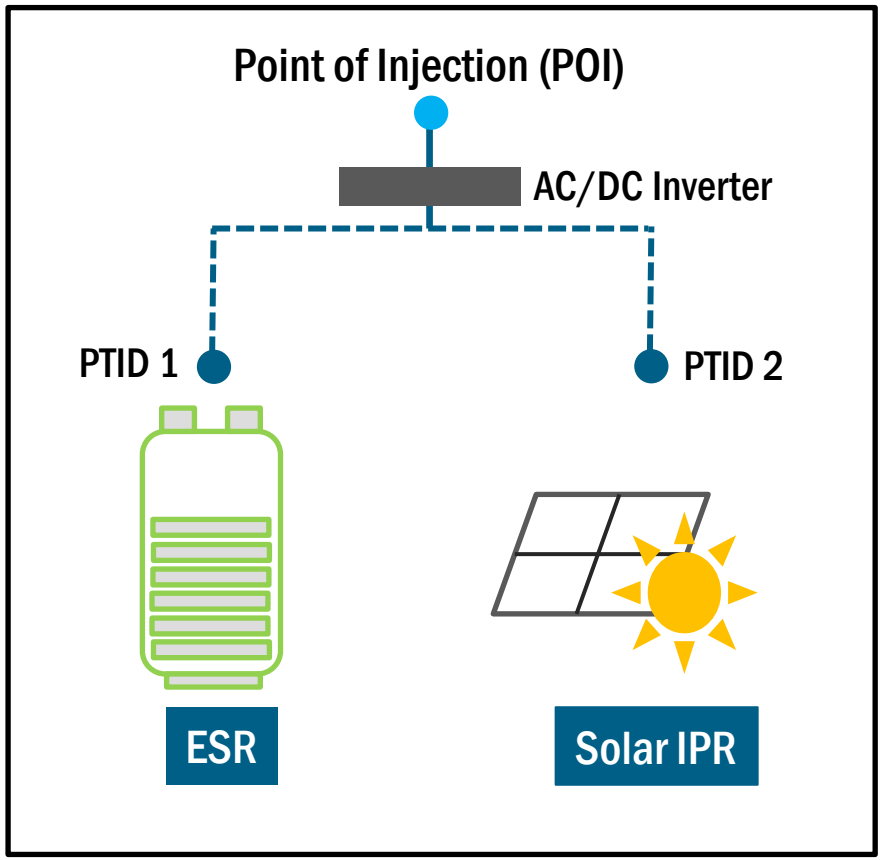
Injection Limit at POI: 80 MW

CRIS Selection by Generators in the CSR:

CRIS for ESR : 10 MW
CRIS for Solar IPR: 70 MW

ERIS values for Generators in the CSR:

ERIS for ESR : 10 MW
ERIS for Solar IPR: 90 MW
[80 MW + 10 MW (for charging the ESR)]



Energy and Ancillary Services Market Participation

Participation Requirements

- Qualifying for wholesale market participation:
  - Minimum offer size requirement:
    - ESR Component of CSR: 100 kW
      - ESRs must be able to Inject at a rate of at least 0.1 MW for a period of at least one hour
    - Non-ESR Generator Component of the CSR: 1 MW
  - Both the ESR and the non-ESR Generator must account for energy consumed as Station Power, and will be subject to existing Station Power registration requirements
  - Wind, solar and landfill gas IPRs and Limited Control-Run of River hydro generators that participate as CSR must be able to respond to economic curtailment signals from the NYISO

Participation Requirements, cont.

- Qualifying for wholesale market participation (cont.):
  - If the non ESR Generator is a wind or solar IPR, it must provide certain plant configuration data upon registration, and if they are greater than 20 MW, site specific meteorological data
  - The ESR and non-ESR Generator must fulfil resource specific metering requirements, as well as CSR-specific metering requirements
    - If the non-ESR generator is a Fast-Start Resource, LC-RoR, or landfill gas, the Resource is required to provide the breaker status and Generator status as part of its metering requirements

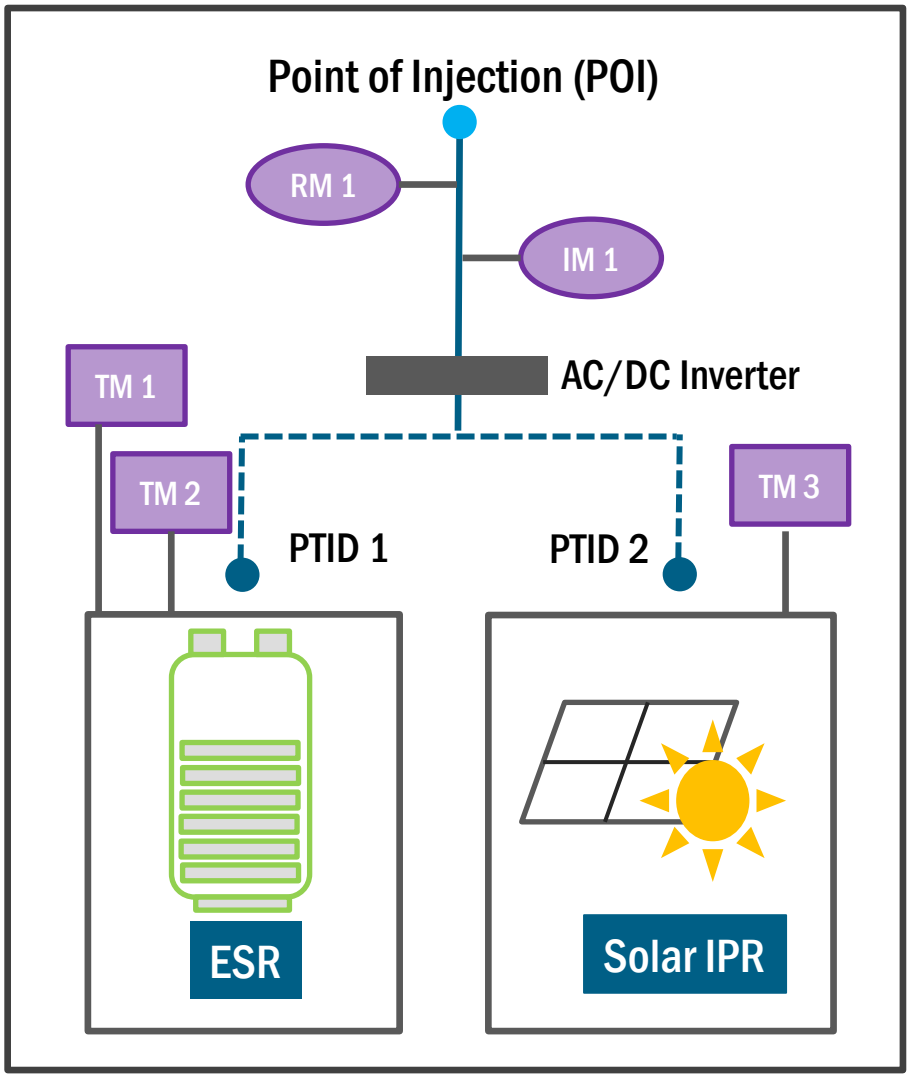
Metering Requirements - CSR

Metering Requirements	Required Unit	Details
Dual Channel Revenue Grade Meter (AC) at POI	CSR	• Meter must be capable of separately recording Energy Injections and Energy withdrawals (MWh) • All energy withdrawals will be allocated to the ESR
6 second Telemetry at POI	CSR	• Telemetry data must reflect the total Energy injections and Energy withdrawals of the CSR
6 second telemetry for output and control signals	ESR and non-ESR Generator separately	• The telemetry should be compensated to the equivalent AC output at the POI
6 second Energy level (State of Charge)telemetry data	ESR	
IPR Day-Ahead and Real-Time forecast information	IPR	• Forecast information should include all the meteorological data (for plants greater than 20 MW) as well as outage information

- 6-Second telemetered data from the units will be used for Real-Time operations, dispatch, and allocation of injections/withdrawals
- Revenue Grade Meter data at the POI will be used for settlement purposes

Metering Configurations - CSR

Meter Designation	Meter Requirements	Data Flows
RM-1	Revenue grade, dual channel meter Reported by a Meter Authority	Hourly data
IM- 1	Instantaneous meter	6 second aggregated output telemetry from CSR
TM-1	SCADA Data	ESR State of Charge (SOC)
TM-2	SCADA data	6 second aggregated output telemetry from ESR
TM-3	SCADA data	6 second aggregated output telemetry from non-ESR Generator



Example for Illustrative purposes only

CSR Registration Parameters

- During the Interconnection process, prior to Registration, an ESR and a qualifying non-ESR Generator will select between participating as two stand-alone Generators or as CSR
- The MP administrator responsible for the CSR must register all parameters pertaining to CSR and the participating Generators
- The MP administrator for the CSR must provide the following registration parameters for the CSR POI:
  - CSR Physical injection Scheduling Limit (MW)
  - CSR Physical withdrawal Scheduling Limit (MW)
- Registration rules and parameter requirements for each Generator in the CSR will depend upon the resource type
  - ESR specific Registration parameters will apply and must be submitted for the participating ESR
  - Non-ESR Generator specific Registration parameters will apply to the participating non-ESR Generator
    - For example: IPR specific Registration parameters if the non-ESR Generator is a wind or solar IPR

CSR Participation Model

Example

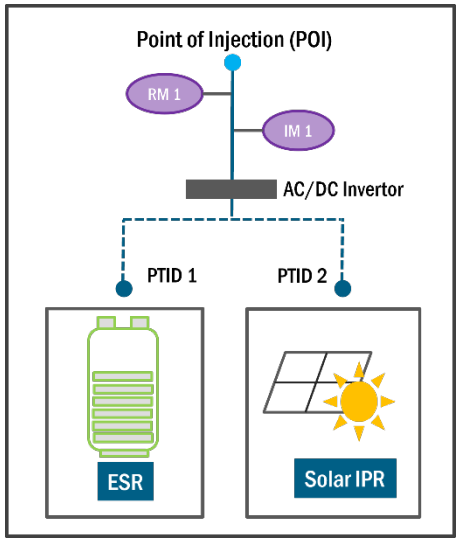
ESR Nameplate Capacity : 50 MW (DC)

Solar IPR Nameplate Capacity : 100 MW (DC)

Injection Limit at POI: 80 MW (AC)
(due to Inverter rating)

Inverter conversion efficiency: 95% or 0.95
(DC to AC)

CSR in a DC coupled configuration



CSR Units' Capabilities and Scheduling Limits		
Solar IPR Capability (max AC)	IPR Nameplate (DC) X Inverter conversion efficiency	100 MW X 0.95 = 95 MW
ESR injection Capability (max AC)	ESR Nameplate (DC) X Inverter conversion efficiency	50 X 0.95 = 47.5 MW
ESR withdrawal capability (max AC)	ESR Nameplate (DC) / Inverter Conversion efficiency	-50/0.95 = -52.6 MW

CSR Physical Injection Limit (AC) = 80 MW
CSR Physical Withdrawal Limit (AC) = -52.6 MW

Example for Illustrative purposes only

Day-Ahead and Real-Time Market Bidding and Scheduling

Energy Market Bidding Rules for CSR

- The ESR and the non-ESR Generator that participate as CSR must submit separate and distinct bids in the Day-Ahead and Real-Time Energy Markets
  - All existing bidding parameters and rules for the two individual resource participation modes will apply for Day-Ahead and Real-Time bidding in the Energy market
  - Unit operation modes (e.g., fixed, flexible, self-schedule) available to each resource type within CSRs are consistent with existing Generator bidding rules
  - However, the self-schedule of one CSR Generator cannot be at a level that precludes the commitment of the other Generator, and Bids to Self-Commit either of the Generators, or both of the Generators together, to inject or to withdraw Energy must not exceed the applicable CSR Scheduling Limit
  - For a broader discussion of bidding parameters and bidding rules that apply to Generators in the Day-Ahead and Real-Time Markets, please refer to the references mentioned on Slide 13

Energy Market Bidding Rules for CSR, cont.

- New CSR specific Bid Parameters that must be submitted within the Day-Ahead and Real-Time Market Bids for the ESR and non-ESR Generator that participate as CSR:
  - CSR injection Scheduling Limit (MW) at the POI
  - CSR withdrawal Scheduling Limit (MW) at the POI
  - CSR Outage Type
- CSR injection/withdrawal Scheduling Limit
  - The CSR Scheduling Limit values in the Bid page must reflect the physical capability to inject or withdraw Energy at the Point of Injection/Point of Withdrawal, for the hours that are being bid
    - Should not exceed the Registration values submitted for CSR Physical Scheduling Limits
  - The submitted CSR Scheduling Limit values must be the same for both the ESR and the non-ESR Generator Bids, or one or both Bids will fail validation
  - Self-commitment/self-scheduling of the participating Generators must not result in violations of the CSR Scheduling Limits

Energy Market Bidding Rules- CSR, cont.

New York ISO

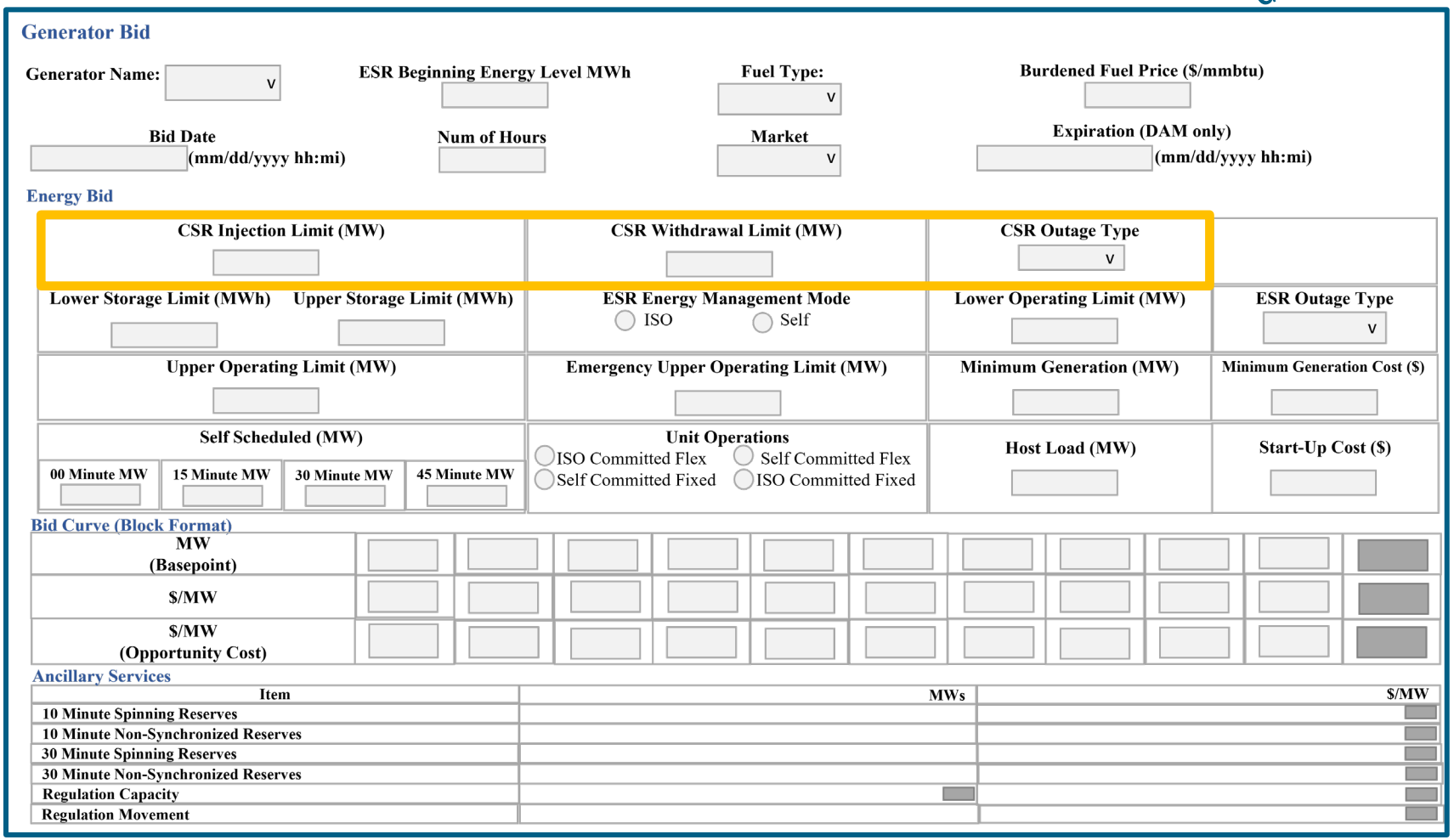
- CSR Outage
  - CSR Outage states pertain to outages/derates at the POI, due to outages or derates of the inverter and/or other equipment that may be common to both generators
    - CSR Outage type
      - Normal, Forced or Planned Outage
        - » Must be the same type for both the ESR and the non-ESR Generator for a given date and hour, or will fail validation
  - Other than CSR POI outages, the ESR and the non-ESR Generator will report outages and derates like stand-alone Generators do

Ancillary Services Bidding Rules for CSRs

- The ESR generator and an eligible non-ESR generator that participates as CSR can enter Day-Ahead and Real-Time Operating Reserves and/or Regulation Service Bids
  - Existing rules for bidding Market Based Ancillary Services will apply
- Wind, solar, and landfill gas IPRs are not eligible to provide Operating Reserves and/or Regulation Service

CSR- Energy Market Bid Page

Mock-Up
Generator Bid Screen



Generator Bid

Generator Name: v | ESR Beginning Energy Level MWh | Fuel Type: v | Burdened Fuel Price ($/mmbtu)

Bid Date (mm/dd/yyyy hh:mi) | Num of Hours | Market v | Expiration (DAM only) (mm/dd/yyyy hh:mi)

Energy Bid

CSR Injection Limit (MW)	CSR Withdrawal Limit (MW)	CSR Outage Type v	
Lower Storage Limit (MWh) / Upper Storage Limit (MWh)	ESR Energy Management Mode: ISO / Self	Lower Operating Limit (MW)	ESR Outage Type v
Upper Operating Limit (MW)	Emergency Upper Operating Limit (MW)	Minimum Generation (MW)	Minimum Generation Cost ($)
Self Scheduled (MW): 00 Minute MW / 15 Minute MW / 30 Minute MW / 45 Minute MW	Unit Operations: ISO Committed Flex / Self Committed Flex / Self Committed Fixed / ISO Committed Fixed	Host Load (MW)	Start-Up Cost ($)

Bid Curve (Block Format)

MW (Basepoint)											
$/MW											
$/MW (Opportunity Cost)											

Ancillary Services

Item	MWs	$/MW
10 Minute Spinning Reserves		
10 Minute Non-Synchronized Reserves		
30 Minute Spinning Reserves		
30 Minute Non-Synchronized Reserves		
Regulation Capacity		
Regulation Movement		

Day-Ahead and Real-Time Scheduling for CSRs

- The Day-Ahead and Real-Time scheduling software will schedule the ESR and the non-ESR Generator as separate and distinct generators for Energy, Operating Reserves and Regulation Service, according to the individual participation model scheduling rules for each Generator
  - Basepoints for Energy injection/withdrawal will be sent to the individual Generators
  - Only ESRs will be scheduled for Energy withdrawals
  - ESR withdrawal from the non-ESR generator for charging must be scheduled by the NYISO
    - The ESR will be treated as charging from the non-ESR Generator whenever it is scheduled to charge at the same time as the non-ESR Generator is dispatched to inject Energy

Day-Ahead and Real-Time Scheduling for CSRs

- Parameters such as Minimum Generation and Startup Cost/Time will be considered when relevant
- When the non-ESR Generator that participates as a CSR either:
  - Submits a Minimum Generation Bid, or
  - Is a Fixed Block Unit that is dispatched

  NYISO will treat the Generator as operating at, at least, its Minimum Generation Level (or full output for a Fixed Block Unit) for the purpose of scheduling the Energy Storage Resource whenever the non-ESR Generator is scheduled, including when the non-ESR Generator is in a start-up or shut-down period

Day-Ahead and Real-Time Scheduling for CSRs, cont.

- The NYISO will use CSR scheduling constraints to determine Energy and Ancillary services schedules for the ESRs and non-ESR Generator within the CSR, along with other scheduling constraints specific to each resource type
- Typically,

Total Schedule for both units in CSR { [Energy Injection – (Energy Withdrawal)] + Operating Reserves* + Regulation Capacity * } ≤ CSR Injection Scheduling Limit

Total Schedule for both units in CSR { [(Energy Withdrawal)– Energy Injection] – (Regulation Capacity*) } ≤ (CSR Withdrawal Scheduling Limit)

- The Scheduling software may relax a CSR Scheduling Limit when it is in direct conflict with other limits
  - Conflicting limits could be a response rate, upper storage limit (USL), lower storage limit (LSL), upper operating limit or lower operating limit of a CSR Generator
  - The NYISO will relax the CSR Scheduling Limit by the minimum amount and for the shortest time period necessary to resolve the conflict

* For ESRs and eligible non-ESR generators that can provide Operating Reserves and/or Regulation

Wind and Solar Output Limit

- During Real-Time scheduling, there are instances when a wind, solar or landfill gas IPR, or a LC-RoR generator is selected economically to limit its output, and not exceed its market basepoint (which the resource may otherwise be incentivized to do if eligible for compensable overgeneration)
  - When this occurs, a separate Wind and Solar Output Limit flag is included along with the basepoint instructions that are communicated by NYISO via the TOs to the Resource
- For wind, solar or landfill gas IPRs and LC-RoR generators that participate as a CSR:
  - When the co-located ESR has either a non-zero Ancillary services award or a positive energy schedule; and the pair of CSR Generators' combined Energy and Ancillary Services Schedules is within 10% of the CSR injection Scheduling Limit:
    - The NYISO will instruct the Co-located Generator not to exceed its NYISO-issued basepoint
    - This instruction will be effectuated via the application of a Wind and Solar Output Limit
    - When a Wind and Solar Output Limit applies, the applicable non-ESR generator will not be paid for output in excess of its schedule plus a 3% of its upper operating limit ("UOL") tolerance, and will be eligible to be assessed over-generation charges

Out-Of-Merit (OOM) Scheduling

- Distinct from setting a CSR Generator Out-of-Merit (OOM), the NYISO can set a CSR Scheduling Limit (which represents the ability to inject or withdraw Energy at the POI) OOM for one of the following reasons:
  - NYISO Reliability,
  - TO Reliability Request, or
  - Generator (MP) Request
- When a CSR Scheduling Limit is set OOM, the CSR Generators will also be treated as OOM
  - Favorable settlement rules may apply to the CSR Generators when a CSR Scheduling Limit is set OOM at the request of the NYISO or a TO
- The OOM MW level will set the injection and/or withdrawal Scheduling Limit of the CSR POI
- Note: A CSR Scheduling Limit OOM may be in effect at the same time as a CSR Generator is set OOM

Ancillary Service Scheduling for CSRs

- ESRs and qualifying non-ESR Generators may be scheduled for Operating Reserves and or Regulation
  - If the non- ESR Generator is a wind, solar or landfill gas IPR, it may only be scheduled for Energy

Energy Market Mitigation Measures

Energy Market Mitigation Measures

- Energy Market Mitigation measures that are applicable to all Generators that participate in NYISO's Energy markets will be applicable to the ESR and the non-ESR generator that participate as CSR
- Additionally, the rules to create ESR Reference levels, and the ESR-specific mitigation rules will apply to an ESR that participates in a CSR
- Physical Withholding Rules for CSRs:
  - CSR Scheduling Limits are expected to represent the physical capabilities of the POI facilities to permit Energy injections and withdrawals
  - Bidding information from the ESR and non-ESR Generator must contain accurate and identical information about the CSR Scheduling Limits
  - Inaccurate submission of CSR Scheduling Limits might lead to physical withholding of one or both CSR Generators and could result in physical withholding penalties

Energy and Ancillary Services Settlements

Energy and Ancillary Service Settlements

- Day-Ahead and Balancing Market (Real-Time) Settlements for Energy will be at the individual Generator level
  - LBMPs will be the same for both CSR Generators because they inject and withdraw from the grid at the same electrical location
  - Settlement for Energy injections and withdrawals for an ESR will be the same as standalone ESR, including Persistent Under generation and persistent Over-Withdrawal charges, and supplemental payments (BPCG and DAMAP)
  - Settlement for Energy injections of the non-ESR Generator will be the same as the applicable standalone generator, including Compensable Overgeneration in the absence of a Wind and Solar Output Limit
  - When a Wind and Solar Output Limit applies, the applicable non-ESR generator will not be paid for output in excess of its schedule plus a 3% of its upper operating limit ("UOL") tolerance, and will be eligible to be assessed over-generation charges

Energy and Ancillary Service Settlements, cont.

- Day-Ahead and Real-Time settlements for Operating Reserves and Regulation service provided by an ESR that participates as a CSR will be the same as for a standalone ESR
- For additional details regarding Energy, Cost Based and Market Based Ancillary Service Settlements for ESRs and non-ESR Generators, please refer to the presentations and other materials referred to on Slide 13 and Market Training's Accounting and Billing Workshop slide material

New/Updated Settlements Specific to CSRs

- If the NYISO issues an Out Of Merit (OOM) at the CSR POI for either for NYISO reliability or for a TO reliability request:
  - Both the ESR and non-ESR generators:
    - May be eligible for RT BPCG
    - Not subject to under/over generation penalty
    - Will balance their Real-Time energy settlement at actual output
  - The ESR generator may be eligible for DAMAP

New/Updated Settlements Specific to CSRs

- An ESR participating as a CSR that received its charging Energy (withdrawals) from the co-located non-ESR generator will not be assessed a:
  - Transmission Service Charge (TSC); or a
  - NYPA Transmission Adjustment Charge (NTAC)

  Even if it is not providing a FERC-recognized "service" to the grid at the time
- An ESR that participates as a CSR, and that notifies the ISO that its charging Energy is invoiced by a retail supplier will receive a rebate from the NYISO for it's Actual Energy Withdrawals from the grid at the CSR POI, so the CSR is not invoiced twice for the same charging energy
  - Charging energy received from the co-located non-ESR Generator are not impacted

Cost-Based Ancillary Services (VSS)

- The ESR and the non-ESR generator that participate as a CSR can each provide Voltage Support Service ("VSS")
- The compensation paid to each VSS supplier in a CSR will be calculated from:
  - The Resource's demonstrated Reactive Power capability;
  - However, the compensation paid to each Resource will be limited to the total Reactive Power capability at the CSR's Point of Injection if the total Reactive Power capability at the Point of Injection is less than the capability of the individual resource

Installed Capacity Market Participation

CSR – Installed Capacity Market Participation

- Installed Capacity Market Qualification and Participation Rules
- ICAP and UCAP Calculations for CSRs
- Installed Capacity Obligations for CSRs
- ICAP Penalties
- Installed Capacity Market Mitigation

Installed Capacity Rules for CSRs - Overview

- The Energy Storage Resource (ESR) and the non-ESR generator that participate as CSR will take part as individual resources in the Installed Capacity market, under the participation rules established for ESRs and the applicable non-ESR generators respectively, with some updated rules
  - Derating factors and UCAP calculations for each unit that participates as CSR will account for the CSR injection Scheduling Limit and will be explained below
  - Bid/Schedule/Notify obligations for all Generators except wind and solar IPRs and ROR hydro that participate as CSR will also account for the CSR injection and withdrawal Scheduling Limits
    - Wind, solar and ROR Hydro are not required to Bid or Schedule in the DAM, they are required to notify the NYISO of outages

ICAP Market Participation - Qualifications and Requirements

ICAP Market Qualifications - CSRs

- Satisfaction of all registration requirements as per tariff rules
- Effective Interconnection Agreement (IA) that allows wholesale market participation
  - The ESR and the non-ESR generator that participate as CSR will have a single IA
  - The ESR and non-ESR generator units will have separate CRIS values elected by the Interconnection Customer
  - The sum of CRIS among all units may not exceed the CSR injection Scheduling Limit
- Minimum injection capability:
  - ESR: 0.1 MW
  - Non-ESR Generator: 1 MW
- Outage Schedules two years forward from the anticipated date of first offer into the capacity market
- Energy Duration Limitation (EDL) Election:
  - ESRs and landfill gas generators with an EDL will be able to elect, on an annual basis, an Energy Duration Limitation that is consistent with their capability
    - An ESR with an EDL may elect a 2-, 4-, 6-, or 8-hour duration
  - Wind or Solar IPRs, and LC-RoR generators are not eligible to participate as Installed Capacity Suppliers with an EDL

Dependable Maximum Net Capability (DMNC) or DMNC Equivalent

- Each CSR Generator will have its own DMNC value
  - Existing DMNC rules for each resource type will be applicable to each Generator in a CSR
  - Please refer to ICAP Manual, Section 4.2
  - Additionally,
    - ESR:
      - An Energy Storage Resource may derate its output to meet the applicable run-time requirement, specified in the tariff
      - ESR units must perform DMNC tests during the Peak Load Window if they have an Energy Duration Limitation (EDL) or provide operating data
    - Intermittent Power Resources (IPRs) and Limited Control Run-of-River Resources (LC-RoR):
      - The DMNC equivalent value of IPRs will be the combined nameplate capacity of all units in each station, net any station service Load required for operation and delivery to the NYCA transmission system

ICAP and UCAP Calculations

ICAP to UCAP Translation

- <u>UCAP calculation methods for the ESR and the non-ESR generator will be similar to existing methods based on Resource type</u>
- Small adjustments to account for any shared Point of Injection (POI) availability when an ESR is co-located with a wind or solar IPR
  - The UCAP calculations for the ESR will account for any derates at the POI (due to inverter limitations), along with calculation of derating factor for the Resource itself
    - 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
  - The UCAP calculations for the wind or solar IPR will also be limited by the POI injection capability, by taking the minimum of POI injection capability and intermittent output when calculating the Resource Specific Derating Factor (RSDF)

UCAP Calculations for CSR - Timeline

- UCAP calculation for a given month for the wind, solar or landfill gas IPR, or LC-ROR generator participating as a CSR:
  - Based on its operating data for two Prior Equivalent Capability Periods during applicable Peak Load Windows
    - UCAP calculation for a month in Summer 2025 will be based on data applicable Peak Load Window in Summer 2024 and Summer 2023
    - UCAP calculation for a month in the Winter 2024-2025 Capability Period will be based on data from the applicable Peak Load Window in Winter 2023-2024 and Winter 2022-2023 Capability Periods
- UCAP calculation for a given month for the ESR participating as a CSR:
  - Based on its Real-Time operating data from 2 Prior Equivalent Capability Periods
    - UCAP calculation for a month in Summer 2025 will be based on data from the Summer 2024 and Summer 2023 Capability Periods
    - UCAP calculation for a month in the Winter 2024-2025 Capability period will be based on data from the Winter 2023-2024 and Winter 2022-2023 Capability Periods

Peak Load Window Annual review Process, ICAP Manual Section 7.3

UCAP Calculations for CSR - Timeline

- UCAP calculation for a given month for other non-ESR generator participating as a CSR:
  - Based on its GADS operating data from 2 Prior Equivalent Capability Periods
    - UCAP calculation for a month in Summer 2025 will be based on data from the Summer 2024 and Summer 2023 Capability Periods
    - UCAP calculation for a month in the Winter 2024-2025 Capability period will be based on data from the Winter 2023-2024 and Winter 2022-2023 Capability Periods
- For months where the resource(s) are not in operation, the ISO will replace such months operating data with class average derating factors, as detailed in the ICAP Manual

Peak Load Window Annual review Process, ICAP Manual Section 7.3

CSR – Adjusted ICAP

- Adjusted ICAP for wind, solar and landfill gas IPRs, and LC-ROR Generators: The amount of ICAP the Resource has available, accounting for the Resource's applicable Capacity Accreditation Factor

Adjusted ICAP = Available ICAP x Capacity Accreditation Factor

Available ICAP = Min (Nameplate Capacity, CRIS Cap*)

- Adjusted ICAP for ESR and other Generator types not listed above: The amount of ICAP a Resource has available, accounting for the Resource's applicable Capacity Accreditation Factor

Adjusted ICAP = Available ICAP x Capacity Accreditation Factor

Available ICAP = Min (DMNC, CRIS Cap*)

*CRIS Caps different for Summer and Winter Capability Period

CSR UCAP Calculations

- For Wind/Solar/Landfill Gas IPRs and LC-ROR generators participating as a CSR:

$$UCAP_{(month)} = (1\text{-}RSDF_{(month)}) \times \text{Adjusted ICAP}$$

- RSDF: Resource Specific Derating Factor
  - For details on how RSDF is calculated please refer to ICAP Manual Attachment J, Section 6.8.1

CSR UCAP Calculations

- For an ESR participating as a CSR:

$$UCAP_{(month)} = \text{(1- Average Injection Limit Unavailability Factor)} \times \text{(1- Average Resource Unavailability Factor)} \times \text{Adjusted ICAP}$$

- For details on how Average Resource Unavailability Factor and Average Injection Limit Unavailability Factor are calculated please refer to ICAP Manual Attachment J, Section 6.8.2

CSR UCAP Calculations

- For other non-ESR generators participating as a CSR:

$$UCAP_{(month)} = (1\text{-Average EFORD}) \times \text{Adjusted ICAP}$$

- For details on how Average EFORD calculated please refer to ICAP Manual Attachment J, Section 6.1

ICAP Market Obligations

ICAP Market Obligations

- Outage Scheduling: Each CSR generator is required to follow the same outage scheduling process as all other Generators
- Reporting GADS Data: ESRs and non-ESR generators participating as CSR must submit their reportable operating data via the NYISO GADS portal every month
  - GADS data will not be the basis of determining Derating Factors for ESRs
  - GADS data will not be the basis of determining UCAP for Wind/Solar/landfill gas IPRs and LC-ROR generators

Selling Capacity as an ICAP Supplier

- The ESR and the non-ESR Generator participating as CSR can sell capacity as an ICAP Supplier up to the amount of UCAP MWs they are qualified to sell, either through:
  - NYISO Auctions
    - Capability Period or Strip Auction
    - Monthly Auction
    - Spot Market Auction

    And/OR
  - Bilateral transactions
- CSR Generator UCAP sales must be in accordance with current rules, which are similar to all other Generators

Certification

- Generators participating as CSR, that have sold capacity as a supplier in NYISO auctions, or have sold capacity in Bilateral Transactions must follow all current Certification rules and obligations for an ICAP Supplier
- Exact timelines and deadlines for Certification obligations identified in the ICAP Event Calendar

ICAP Settlements

- Capacity payments for Generators participating as CSR will be based on UCAP MWs awarded in an auction and the applicable auction clearing price ($/kW-month)
  - Steps:
    - Convert MWs to kW by multiplying by 1000
    - Then multiply by auction clearing price
    - This monthly capacity payment is then allocated to the weekly invoice accordingly

Determining Installed Capacity Equivalent (ICE) of the UCAP Supplied

- ICE is the Installed Capacity Equivalent of the amount of Unforced Capacity that the ESR or non-ESR generator supplies in a specified month
- For every month that the ESR or the non-ESR generator receives capacity payments:

ICE of UCAP Supplied for ESR

$$= \frac{\text{UCAP Sold for given month}}{\left(\text{1- Applicable Derating Factor}\right) \text{X} \left(\text{1- Injection Limit Unavailability Factor for the CSR for given month}\right) \text{X} \left(\text{Capacity Accreditation Factor}\right)}$$

ICE of UCAP Supplied for non-ESR Generator

$$= \frac{\text{UCAP Sold for given month}}{\text{(1-Applicable Derating Factor) X Capacity Accreditation Factor}}$$

Bid/Schedule/Notify Obligations

- Each CSR generator that is an ICAP Supplier, will be subject to Day Ahead Market bidding obligations consistent with existing rules based on resource type
  - ESRs, landfill gas IPRs and other Generators participating as CSR that are not identified below as exempt:
    - Must do one or more of the following, for injection/withdrawal of the ICAP Equivalent of UCAP sold (ICE), for all hours of the day*
      - Bid [Offer] Energy in the DAM
      - Schedule a Bilateral Transaction

        AND/OR
      - Notify the NYISO of any outage
  - Wind/Solar IPRs and LC-RoR generators participating as a CSR:
    - NOT subject to daily Bid/Schedule/Notify obligations in the Day-Ahead Market

* For ESRs with Energy Duration Limitation, specific rules will apply for Peak Load Windows

Day-Ahead Market Obligations for CSRs

- Additionally, for each hour of the Day-Ahead Market that bids are entered for, both the ESR and non-ESR Generators participating as CSR must:
  - Provide a CSR injection Scheduling Limit; and
  - Notify the ISO of any derate or outage to the interconnection facilities comprising the Point of Interconnection (POI)
- The CSR Scheduling Limit values submitted by the Generators that participate as a CSR are expected to be identical because they address the same set of interconnection facilities
- The availability of the POI will be used to determine the UCAP that can be sold by the CSR Generators going forward

Penalties and Sanctions

- Generators participating as a CSR may be subject to penalties/shortfall charges for:
  - Over sale of capacity/ICAP Shortfall
  - Failure to Bid/Schedule/Notify (Only for ESR and non-ESR generators that have a B/S/N obligations)
  - Failure to include CSR Scheduling Limits in Day-Ahead Market Bids and notifying NYISO of interconnection facility outages

ICAP Market Mitigation

ICAP Supply Side Mitigation

- CSRs in Zone J and the G-J Locality (*i.e.*, in the Mitigated Capacity Zones (MCZs)) are subject to existing Supply Side Mitigation measures
  - Each ESR and non-ESR generator that participates as a CSR will be a distinct Examined Facility
  - CSR Generators in Mitigated Capacity Zones will be subject to the mitigation evaluations that pertain to ICAP offering behavior
  - CSR Generators must identify all "Affiliated Entities" each month based on the criteria in the Market Services Tariff, Attachment H
  - CSR Generators will have a "must offer" obligation if their MW are under the control of a Pivotal Supplier
  - The ICAP Event Calendar specifies the deadlines for identifying Affiliated Entities

CSR- Buyer Side Mitigation

- Buyer Side Mitigation rules apply for resources present in the MCZs
  - Buyer Side Mitigation (BSM) is intended to prevent uneconomic entry from artificially suppressing Installed Capacity prices
  - Each Generator participating as a CSR will each be a separate Examined Facility for purposes of the BSM Measures
- ESRs and applicable non-ESR generators that are considered an Excluded Facility and satisfy the goals specified in the New York State Climate Leadership and Community Protection Act (CLCPA) will not be subject to review by the NYISO under BSM rules or otherwise be subject to an Offer floor
  - Non-ESR generators that are not considered Excluded Facilities will be subject to BSM evaluations according to current rules and may be subject to an Offer floor
  - Please refer to MST Section 23.2 for a full definition of Excluded Facilities

Additional Resources

- Tariff:
  - Market Services Tariff (MST)
    - Market Services Tariff, Section 23 -ISO Market Power Mitigation Measures
    - MST Attachment H, Section 23.4.5 Installed Capacity Market Mitigation Measures
  - Open Access Transmission Tariff (OATT)
    - OATT Attachment HH, Standard Interconnection Procedures
- Manuals
  - Day-Ahead Scheduling Manual
  - Transmission and Dispatch Manual
  - Ancillary Services Manual
  - Reference Levels Manual
  - Accounting and Billing Manual
  - Installed Capacity Manual
  - Attachment J, Unforced Capacity for Installed Capacity Suppliers, ICAP Manual
  - Attachment K, Reportable Operating Data, ICAP Manual
  - Outage Scheduling Manual

Additional Resources

- User's Guides
  - Market Participant User's Guide (MPUG)
  - UG 09: Wind and Solar Plant Operator User's Guide
  - Reference Level Software (RLS) User's Guide
  - ICAP AMS User's Guide
  - TB 154: Wind and Solar Resource Bidding, Scheduling, Dispatch, and Settlement
- Market Training Online Learning Modules:
  - ESR Onboarding Educational Suite
  - ESR Participation Model e-learning
  - Wind/Solar IPR Participation Model e-learning
- Market Training Course Materials:
  - NYMOC - MT 201
  - Intermediate ICAP Course – MT 305
  - Accounting and Billing MT-304

Presentation Summary

- Introduction to Participation Model
- Interconnection Rules for CSRs
- Energy Market and Ancillary Services Participation
- Energy and Ancillary Services Financial Settlements
- Installed Capacity Market Participation
- Additional Documentation and Resources

Questions?

For any future assistance, please contact NYISO Stakeholder Services at stakeholder_services@nyiso.com or by phone at (518) 356-6060