

DER Market Design Updates

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MIWG

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Background

Date	Working Group	Discussion points and links to materials
03-06-18	Market Issues Working Group (MIWG)	DER Market Design: Aggregations
04-26-18	Market Issues Working Group (MIWG)	DER Market Design: Measurement & Configuration
06-01-18	Market Issues Working Group (MIWG)	DER Market Design: Updates

Purpose of Today's Meeting

- Review market design for:
 - DCEA Registration
 - Updates to Metering Configurations
 - DCEA Performance, Measurement & Verification
 - DCEA Telemetry & Settlements Updates

Purpose of the DER Roadmap Effort

- Develop a Dispatchable DER Participation Model for the NYISO-administered wholesale markets
- Create a model that supports the **NYISO Market Design Vision** - *Attract and retain* the most efficient resources *to meet NY's reliability needs.*

DER Market Participation

- In the MDCP NYISO proposed to allow DER to utilize different participation models
- The participation model used by a DER will be determined by its capabilities and how it chooses to aggregate

Dispatchable DER Participation Models

- **Aggregations may be homogenous or heterogeneous**
 - Heterogeneous aggregations will be subject to the dispatchable DER participation model rules
 - Except for dispatchable Demand Side Resources, homogenous aggregations will be subject to the rules of the particular resource type (i.e., Generator, ESR, Intermittent Power Resource)
 - Dispatchable Demand Side Resources are those resources capable of responding to real-time dispatch signals from the NYISO
 - Dispatchable Demand Side Resources will be subject to the dispatchable DER participation model rules
 - Non-dispatchable Demand Side Resources (i.e., those resources that are not capable of responding to real-time dispatch signals from the NYISO) may continue to participate in the EDRP or SCR Program
- **Aggregations cannot include units requiring commitment**

Participation Models Available to DER

Non-Dispatchable Resources

EDRP & SCR Program Model



Non-Dispatchable Demand Side Resource (DSR) Aggregations (one or more resources)

- Capacity
- Energy for reliability based events

Dispatchable Resources

Dispatchable DER Participation Model



Dispatchable Demand Side Resource (DSR) Aggregations (one or more resources)

- Capacity
- Energy
- Ancillary

Generator/Energy Storage Resource (ESR) Participation Model



Mixed Resource Type Aggregations (two or more resources; DSRs, ESRs, Generation)

Single Resource Type Aggregations (Generator only; ESR only)

Individual Generators or ESRs

- Capacity
- Energy
- Ancillary

<p>DER Coordinating Entity Aggregation (DCEA)</p> <p>An aggregation under the responsibility of a DER Coordinating Entity (DCE) and consists of resources:</p> <ul style="list-style-type: none"> • Qualified to participate in Energy, Ancillary and Capacity market • Capable of responding in real-time to NYISO's direction 	<p>Generator Resource Model</p>	<p>Consisting of Only Generators</p> <ul style="list-style-type: none"> • Aggregation must consist of 2 or more Generator DER
	<p>Energy Storage Resource Model</p>	<p>Consisting of Only Energy Storage Resources (ESR)</p> <ul style="list-style-type: none"> • Aggregation must consist of 2 or more ESR DER
	<p>Dispatchable DER Model</p>	<p>Consisting of Only Demand Side Resources (DSR)</p> <ul style="list-style-type: none"> • Aggregation must consist of 1 or more DSR DER • No DER in the aggregation can inject into the grid, load reduction only
		<p>Mix of Generators, Energy Storage Resources, and Demand Side Resources</p> <ul style="list-style-type: none"> • Aggregation must consist of 2 or more Resource Types (i.e. Generator, ESR, DSR) • Capable of injection and/or load reduction
<p>Individual Resource</p> <ul style="list-style-type: none"> • Qualified to participate in Energy, Ancillary and Capacity market • Capable of Injection • Capable of responding in real-time to NYISO's direction 	<p>Generator Model or Energy Storage Resource Model</p>	<p>Individual Generator or Energy Storage Resource</p> <p>Individual Generator or Energy Storage Resource under the responsibility of a Market Participant</p>
<p>Non-DCEA Aggregation or Individual Demand Side Resource</p> <ul style="list-style-type: none"> • Capable of load reduction • Not capable of responding in real-time to NYISO's direction 	<p>Special Case Resource Model</p>	<p>Special Case Resources (SCR)</p> <p>Individual Demand Side Resources or Small Customer Aggregation under the responsibility of a Responsible Interface Party (RIP) and are resources:</p> <ul style="list-style-type: none"> • Qualified to participate in Capacity market
	<p>Emergency Demand Response Model</p>	<p>Emergency Demand Response Program (EDRP)</p> <p>Individual Demand Side Resources under the responsibility of a Curtailment Service Provider (CSP) and are resources:</p> <ul style="list-style-type: none"> • Qualified to provide Energy during reliability events

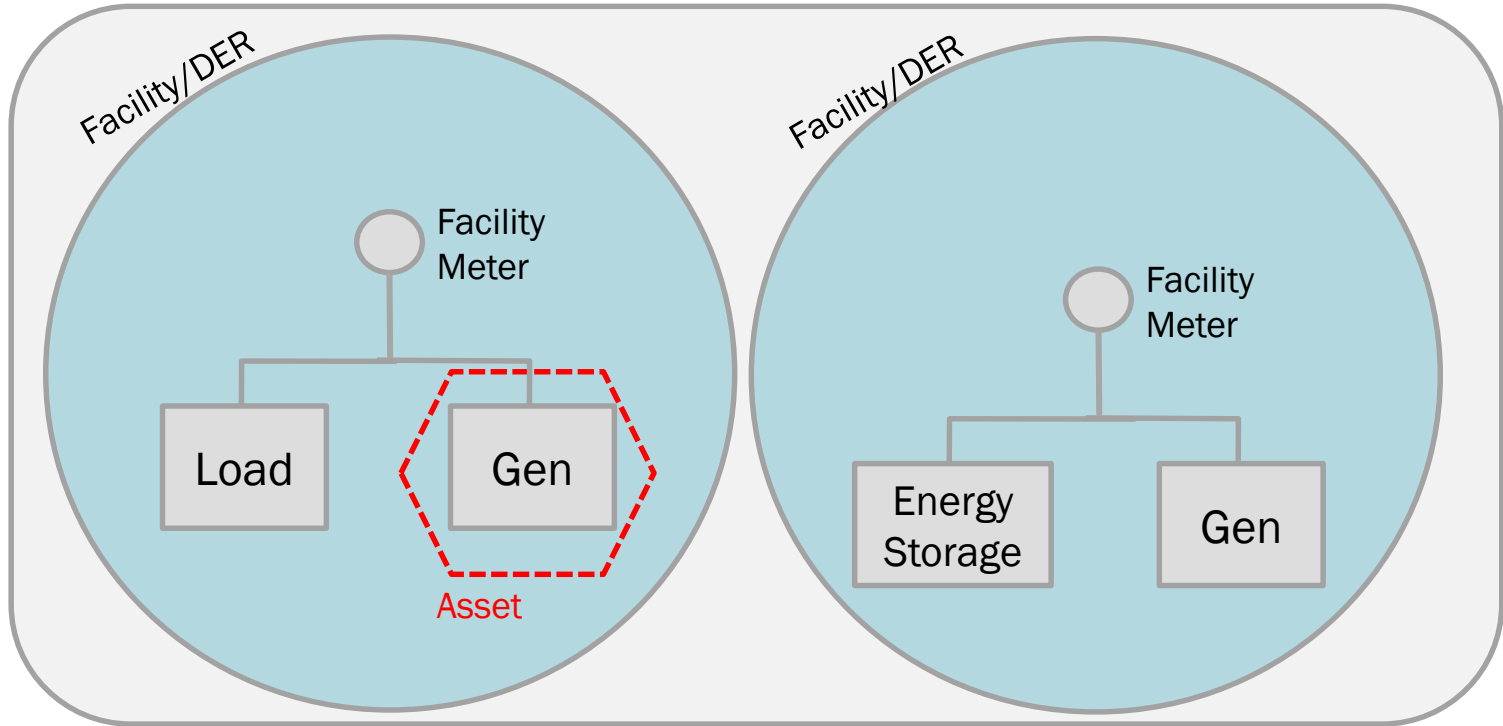
Overview of DER Aggregation Basics

DER Aggregation Basics Recap

- DER will be permitted to aggregate to meet minimum eligibility requirements and performance obligations
- The DER Coordinating Entity (“DCE”) will be the aggregator and NYISO Market Participant
- The DER Coordinating Entity Aggregation (“DCEA”) will be a group of one or more resources participating in the NYISO Market, represented by a PTID
 - Bidding and Performance Obligations will be done and measured on a DCEA basis
 - Settlements and M&V will be done on the DCEA basis, with separate processes being used for the injection and load reduction portion

Terminology Overview

DCEA



DER Aggregation Basics, con't

- **All resources within a DCEA will be required to be behind the same NYISO modeled Transmission Node**
 - The NYISO is working with utilities to identify the set of Transmission Nodes which will accurately reflect intra-zonal congestion
 - Methodology for Transmission Node identification for DCEA modeling will be completed as part of the 2018 Market Design process

Dispatchable DER DCEA Registration

DCEA Registration, con't

- **Maximum net-injection for an individual DER within an aggregation is 20 MW based off the facility's requested physical interconnection capability**
 - For example: a protection scheme may limit a 22 MW name plate resource to 20 MW of injection into the grid
- **There is no limit in size for Demand Side Resources to participate in an aggregation**
- **A DCE may register any number of DCEA at a transmission node**
 - Transmission nodes will be unique to a single TO's subzone
 - A subzone may have multiple transmission nodes

DCEA Registration, con't

- **DCEA will not receive unit commitment from the NYISO and will instead be considered as only a dispatch resource, when participating in the wholesale market**
 - DCEA will not have any commitment parameters such as start up cost considered in the market evaluation
 - Dispatchable DER will likely be serving a primary function other than providing Energy and Ancillary Services to the NYISO-administered wholesale markets, and therefore will already be “committed” when used to serve that primary function. It follows, then, that those resources will not require a day-ahead or real-time commitment by the NYISO.
 - In addition, unit commitment requires knowing the off/on status of the resource. Given that a DCEA is an aggregation of DER, it is not possible to determine DCEA’s on/off status

Updates to Metering Configurations

Update to April 26th MIWG Presentation

- On April 26th, the NYISO proposed that metering for DER be performed only at the point of interconnection to the distribution or transmission system
- After reviewing further permutations of multiple resource types behind the same point of interconnection and Stakeholder feedback, the NYISO has determined that any Energy Storage Resource, co-located with retail load, intending to inject energy at the shared interconnection point above the retail load facility consumption will need the Energy Storage Resource and retail load to be separately metered
 - FERC Order No. 841 requires ISO/RTOs to directly meter ESRs so that all energy entering and exiting the resource is measured by the meter; ISO/RTOs must ensure that the sale of electric energy from the RTO/ISO markets to an ESR that the resource then sells back to those markets be at the wholesale LBMP; ISO/RTOs must prevent ESRs from paying twice (i.e., at both retail and wholesale price) for the same charging energy*
 - These requirements apply regardless of whether ESR is using ESR participation model

Update to April 26th MIWG Presentation, con't

- **The co-located load would be included as part of the retail load. This configuration would require Meter Authorities to adjust the LSE's retail load calculations to only include the co-located retail load and not the charging/discharging energy for the ESR.**
 - The proposal will allow for the differentiation between actual retail load and the ESR charging and discharging and would ensure that the ESR is not paying for the same energy to both the NYISO and the LSE
 - Without separate metering all retail Load would pay the wholesale rate
 - This proposal is consistent with the NYISO's proposal in its ESR participation model
 - See the June 19, 2018 ESR Metering MIWG presentation for more details
- **The metering for all other DER would need be performed at the point of interconnection to the distribution or transmission system**

DCEA Performance, Measurement & Verification

DER Response

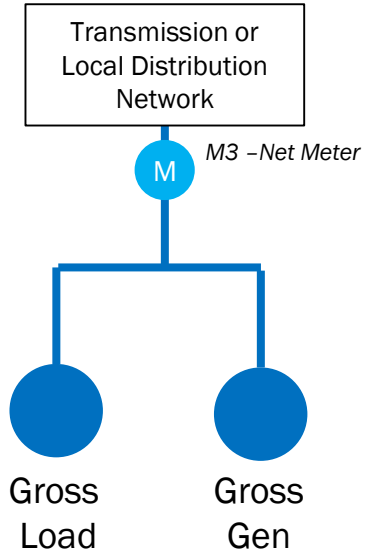
- **DER within a DCEA can provide injection response and load reduction response in the same 5-minute LBMP interval**
 - Load with on-site generation may perform both Load reduction (either through curtailing the Load or shifting the Load to on-site generation) and injection into the grid at the same interval

DER Response, con't

- **Telemetry and revenue/settlement data submittals for a DCEA shall be provided by the DCE, using the following calculation:**
 - For net-injection component of individual DER response:
 - Injection Response = $\max(0, \text{Net Meter Value})$ (1)
 - For net-load reduction component of individual DER response:
 - Load Reduction Response = $\text{Baseline} + \min(0, \text{Net Meter Value})$ (2)
 - Total Response = (1) + (2)
 - Coincident injection and reduction response for the same resource shall be measured separately, telemetered separately and submitted in the separate and applicable meter files for settlements
- **Sign convention used for DER response calculation:**
 - 'Baseline' is always non-negative
 - 'Net Meter Value' is negative when DER is net-withdrawing from the grid, and positive when DER is net-injecting into the grid as measured at the net facility meter

Injection and Load Reduction-No Dispatch

- DER has host load 2 MW based on M3 meter data for a specific 5-minute interval, also has a dispatchable 4 MW generator, and is the only DER in the DCEA
- At the start of that 5-minute interval:
 - The DCEA is not dispatched by the NYISO
 - The facility baseline load is 2 MW
 - The generator outputs 0 MW
- Injection component:
 - At the point of interconnection (i.e. M3) there is 2 MW of Load
 - Injection Response = $\max(0, \text{Net Meter Value})$
 - Injection Response = $\max(0, -2)$
 - Injection Response = 0, Therefore the Injection response of the DER is 0 MW
- Load Reduction component:
 - The baseline of the facility is 2 MW
 - At the point of interconnection the M3 meter reads -2 MW
 - Load Reduction Response = $\text{Baseline} + \min(0, \text{Net Meter Value})$
 - Load Reduction Response = $2 + \min(0, -2)$
 - Load Reduction Response = 0, Therefore, Load Reduction response of the DER is 0 MW

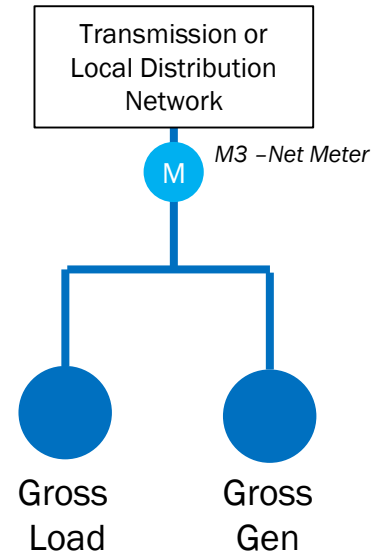


Total Response=
Injection + Load Reduction
Total Response = 0 MW

Injection and Load Reduction Response-Only Load

Reduction

- DER has host load 2 MW based on M3 meter data for a specific 5-minute interval, also has a dispatchable 4 MW generator, and is the only DER in the DCEA
- At the start of that 5-minute interval:
 - The DCEA is dispatched for 2 MW by the NYISO
 - The facility baseline load is 2 MW
 - The generator outputs 2 MW
- Injection component:**
 - At the point of interconnection (i.e. M3) there is 0 MW of Injection
 - Injection Response = $\max(0, \text{Net Meter Value})$
 - Injection Response = $\max(0, 0)$
 - Injection Response = 0, Therefore the Injection response of the DER is 0 MW
- Load Reduction component:**
 - The baseline of the facility is 2 MW
 - At the point of interconnection the M3 meter reads 0 MW
 - Load Reduction Response = Baseline + $\min(0, \text{Net Meter Value})$
 - Load Reduction Response = $2 + \min(0, 0)$
 - Load Reduction Response = 2, Therefore, Load Reduction response of the DER is 2 MW

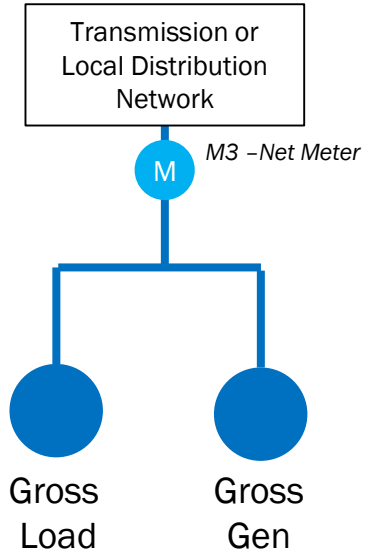


Total Response=
Injection + Load Reduction
Total Response = 2 MW

Injection and Load Reduction Response-Injection

and Load Reduction – Example 1

- DER has host load 2 MW based on M3 meter data for a specific 5-minute interval, also has a dispatchable 4 MW generator, and is the only DER in the DCEA
- At the start of that 5-minute interval:
 - The DCEA is dispatched for 4 MW by the NYISO
 - The facility baseline load is 2 MW
 - The generator outputs 4 MW
- Injection component:**
 - At the point of interconnection (i.e. M3) there is 2 MW of Injection
 - Injection Response = $\max(0, \text{Net Meter Value})$
 - Injection Response = $\max(0, 2)$
 - Injection Response = 2, Therefore the Injection response of the DER is 2 MW
- Load Reduction component:**
 - The baseline of the facility is 2 MW
 - At the point of interconnection the M3 meter reads 2 MW, a net injection
 - Load Reduction Response = Baseline + $\min(0, \text{Net Meter Value})$
 - Load Reduction Response = $2 + \min(0, 2)$
 - Load Reduction Response = 2, Therefore, Load Reduction response of the DER is 2 MW

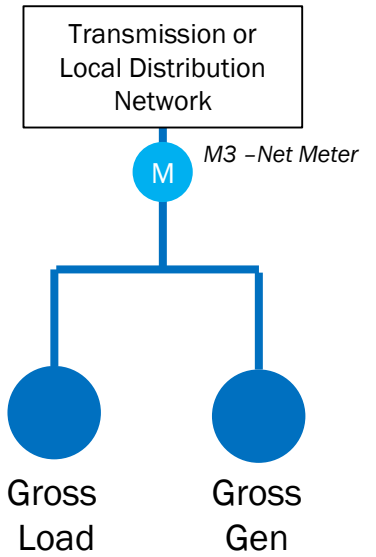


Total Response=
Injection + Load Reduction
Total Response = 4 MW

Injection and Load Reduction Response-Injection

and Load Reduction – Example 2

- DER has host load 2 MW based on M3 meter data for a specific 5-minute interval, also has a dispatchable 4 MW generator, and is the only DER in the DCEA
- At the start of that 5-minute interval:
 - The DCEA is dispatched for 4 MW by the NYISO
 - The facility baseline load is 2 MW
 - The facility load curtails 2 MW, the generator outputs 2 MW
- Injection component:**
 - At the point of interconnection (i.e. M3) there is 2 MW of Injection
 - Injection Response = $\max(0, \text{Net Meter Value})$
 - Injection Response = $\max(0, 2)$
 - Injection Response = 2, Therefore the Injection response of the DER is 2 MW
- Load Reduction component:**
 - The baseline of the facility is 2 MW
 - At the point of interconnection the M3 meter reads 2 MW, a net injection
 - Load Reduction Response = $\text{Baseline} + \min(0, \text{Net Meter Value})$
 - Load Reduction Response = $2 + \min(0, 2)$
 - Load Reduction Response = 2, Therefore, Load Reduction response of the DER is 2 MW



Total Response=
Injection + Load Reduction
Total Response = 4 MW



DCEA Performance

- A DCEA's performance will be measured by the DCE, across all DER in the aggregation
- DCEA allows for balancing by the DCE of individual DER performance within the aggregation
 - Over performing DER can balance the under performing DER within the DCEA

DCEA Performance, con't

- **DER within a DCEA may provide balancing within the DCEA, as an example:**
 - DCEA contains one 5 MW ESR and one 4 MW generator
 - DCEA bids in and is scheduled to charge 1 MW
 - The ESR charges at 5 MW while running its generator at 4 MW
 - **DCEA response = -5 MW of ESR + 4 MW of injection = - 1 MW**
 - **The DCEA would be responsible for wholesale energy market payments of 1 MW**

DCEA Performance, con't

- **DER within a DCEA may provide balancing within the DCEA, load reduction example:**
 - DCEA contains one 5 MW ESR and 4 MWs of load reduction
 - DCEA bids in and is scheduled to charge 1 MW
 - The ESR charges at 5MW while providing 4MW of load reduction
 - DCEA response = -5 MW of ESR + 4 MW of load reduction = - 1 MW
 - LBMPs are above the NBT for the month
 - The NYISO is currently evaluating what would occur when the load reduction is below the NBT

DCEA Telemetry and Settlements Updates



Real-Time Telemetry & Settlement Data

- **Similar to Generators participating in the NYISO markets today, the DCEA will be required to send all telemetry signals for 24 hours of the day, 7 days a week if it is participating in the wholesale markets**
 - This will be required regardless of dispatch schedule, for the independent signals for:
 - DCEA aggregate signal
 - DCEA aggregate Injection/Negative Generation
 - DCEA aggregate Load Reduction
- **The DCEA will need to measure the injection and the load reduction of all DER within the DCEA, during dispatch**
 - This will be done regardless of utilization of assets for meeting dispatch
 - This applies to both real-time telemetry and settlement data submission

Real-Time Telemetry & Settlement Data, con't

- The DCE will substitute values of zero for the load-reduction response of all load reduction DER during intervals of non-dispatch by the NYISO
- The DCE will send any non-zero injection response of all injecting DER during intervals of non-dispatch by the NYISO
 - This will ensure that the sub-zonal load calculations are accurate

Load Reduction Negative Performance

- **If a load reduction asset has a negative response during a dispatch interval, that negative value must be included by the DCE as part of the:**
 - Aggregate DCEA load-reduction response
 - Aggregate total DCEA response
 - This applies to both real-time telemetry and settlement data submission
- **Negative response by a load reduction DER can be balanced by other over-performing DER within the DCEA to satisfy a NYISO dispatch**

Next Steps

- In 2018, the NYISO will develop rules for energy and capacity market offer requirements, mitigation, forecasting and interconnection
 - The NYISO will also more fully develop the market rules and tariff language to implement the 2017 MDCP
- The NYISO will evaluate the implementation of rules through the pilot program
- NYISO plans to conclude development of rules in 2018 for the eventual implementation of DER in 2021

Feedback?

- To ensure all feedback is captured please email additional feedback to: DER_Feedback@nyiso.com

Reminder – All comments received will be posted on the NYISO Distributed Energy Resources [webpage](#)

Appendix A - Acronyms

- DER – Distributed Energy Resource
- DCE – DER Coordinator Entity
- DCEA – DCE Aggregation
- DSP – Distributed System Platform
- DR – Demand Response
- RT - Real-Time
- DA – Day-Ahead
- RTC – RT Commitment
- RTD – RT Dispatch
- DAM – DA Market
- RTM – RT Market

The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits 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 policy makers, stakeholders and investors in the power system



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