



# **Distributed Energy Resources Market Design Concept Proposal**

**A Report by the  
New York Independent System Operator**

December 2017

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## Overview

The New York Independent System Operator, Inc. (NYISO) is in the midst of a multi-year effort that, at its completion, will open New York's wholesale Energy, Ancillary Service, and Capacity Markets to a diverse set of new Distributed Energy Resources (DER). This DER Market Design Concept Proposal (MDCP) is the second step in the market design process, and builds on the ideas outlined in NYISO's February 2017 DER Roadmap<sup>1</sup> and subsequent stakeholder discussions.<sup>2</sup> Beginning in 2018 the NYISO will develop an appropriate set of rules for DER integration.

The concepts proposed in this report are consistent with the key objectives<sup>3</sup> proposed in the DER Roadmap, and reflect the NYISO's focus on the value DER provide the wholesale markets and bulk power system. As explained throughout this report, the NYISO's proposal includes concepts related to:

1. Aggregations and modeling;
2. Measurement & verification and monitoring & control
3. Performance obligations
4. Dual participation in wholesale and retail electricity markets

While each concept will require further development and specification as the associated tariff provisions are drafted, this proposal represents the culmination of more than a year's work with NYISO stakeholders to develop the appropriate market design, and the NYISO is confident that this proposal represents a strong foundation upon which to integrate DER.

In particular, the NYISO has worked closely with the Joint Utilities of New York to develop processes that will facilitate DER participation. The NYISO recognizes that in order to operate a bulk power system that relies on DER, it must have situational awareness of DER output and of DER obligations to the utility programs and/or their own host load.<sup>4</sup>

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<sup>1</sup> New York Indep. Sys. Operator, Inc., Distributed Energy Resources Roadmap for New York's Wholesale Electricity Markets (Feb. 2017) (hereinafter *DER Roadmap*), available at [http://www.nyiso.com/public/webdocs/markets\\_operations/market\\_data/demand\\_response/DER\\_Roadmap/Distributed\\_Energy\\_Resources\\_Roadmap.pdf](http://www.nyiso.com/public/webdocs/markets_operations/market_data/demand_response/DER_Roadmap/Distributed_Energy_Resources_Roadmap.pdf).

<sup>2</sup> Links to the DER Roadmap related stakeholder presentations are located at the end of this report.

<sup>3</sup> The DER Roadmap identified the following key objectives: 1. integrating DER into the Energy, Ancillary Services, and Capacity markets; 2. closely aligning the NYISO's market design with the goals of New York State's Reforming the Energy Vision; 3. enhancing measurement and verification methodologies; 4. aligning compensation with performance; and 5. focusing on wholesale market transactions. *DER Roadmap* at 6.

<sup>4</sup> Throughout this MDCP the NYISO uses the terms "utility" and "Distribution Service Provider" (or DSP) interchangeably.

**Figure 1: Integrating DER in Wholesale Markets**

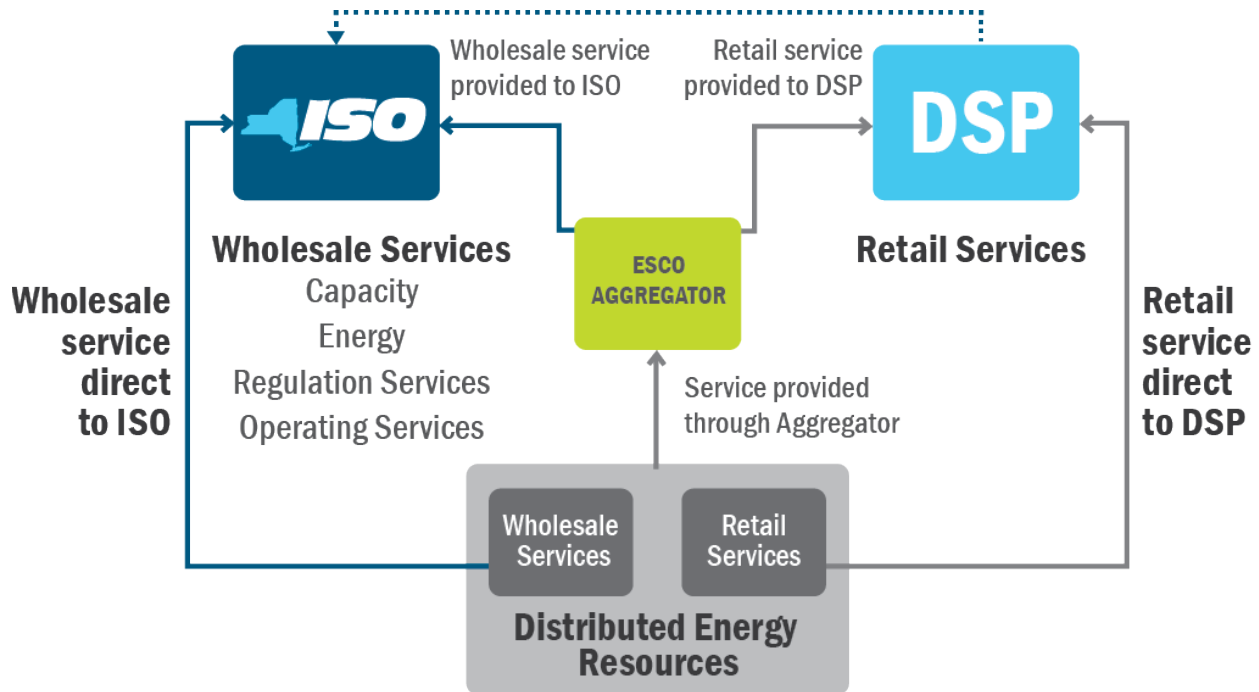


Figure 1 Depicts how the NYISO envisions DER would provide services in the wholesale and retail markets in the future, and the dark blue lines are intended to show the scope of NYISO's DER Roadmap initiative

Figure 2 depicts the NYISO-envisioned participation models for DER, as delineated by their ability to follow dispatch instructions and whether they are economically scheduled, or needed for system reliability.

**Figure 2: Future Wholesale DER Participation**

Future Wholesale DER Participation			
	Capacity	Energy	Ancillary Services
Reliability	<b>Special Case Resource (SCR) Program</b> <ul style="list-style-type: none"> <li>• <i>Manual Activation</i></li> <li>• <i>Receives Capacity Payment</i></li> </ul>	<b>Emergency Demand Response Program (EDRP)</b> <ul style="list-style-type: none"> <li>• <i>Manual Activation</i></li> <li>• <i>Voluntary Load Reduction</i></li> </ul>	
	<b>Load Modifier</b> <ul style="list-style-type: none"> <li>• <i>Self-managed Load Reductions to Reduce Capacity Obligation</i></li> </ul>	<b>Price Capped Load Bid</b> <ul style="list-style-type: none"> <li>• <i>Economic Day Ahead Load Procurement</i></li> </ul>	
Economic	<b>Behind-the-Meter Net Generation</b> <ul style="list-style-type: none"> <li>• <i>Comparable to a Generator</i></li> <li>• <i>Fully integrated in both Capacity and Energy Markets</i> <ul style="list-style-type: none"> <li>• <i>Capacity with Daily Energy Must-Offer Obligation</i></li> </ul> </li> </ul>		
	<b>Dispatchable Distributed Energy Resources</b> <ul style="list-style-type: none"> <li>• <i>Comparable to a Generator</i></li> <li>• <i>Fully integrated in Energy, Ancillary Services and Capacity Markets</i> <ul style="list-style-type: none"> <li>• <i>Capacity with Daily Energy Must-Offer Obligation</i></li> </ul> </li> <li>• <i>Flexible performance &amp; payment options</i></li> </ul>		

Figure 2 shows the future state of Economic and Reliability based Wholesale DER

**Figure 3: DER Roadmap and Supporting Efforts Timeline**

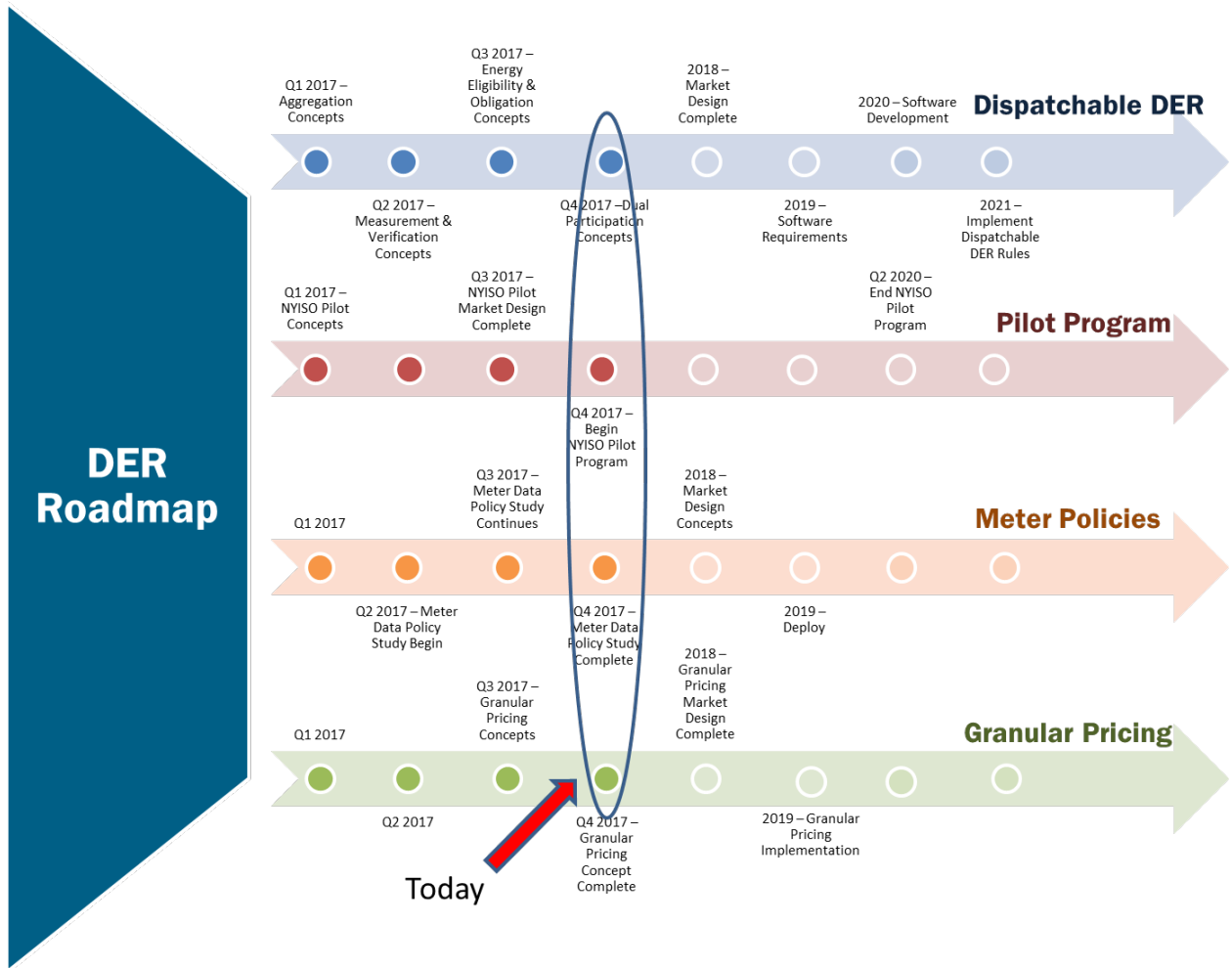


Figure 3 shows the timeline for projects within the DER Roadmap

## Distributed Energy Resources

There does not appear to be a single, industry accepted DER definition, with organizations instead meeting their specific needs. Some entities define DER by their location on the retail electric distribution system or behind an end-use customer meter.<sup>5</sup> Others define DER with subjective terms such as “small,” “typically” or “usually.”<sup>6</sup> Still a third category attempts to define DER by particular technology types (*e.g.*, energy storage, demand response, energy efficiency, or renewable resources).<sup>7</sup>

The NYISO initially defined DER as Suppliers<sup>8</sup> that were not capable of participating in its wholesale markets under the existing rules. It soon became apparent that the latter restriction would prohibit certain DER, such as Energy Limited Resources<sup>9</sup> (ELRs) and Limited Energy Storage Resources<sup>10</sup> (LESRs), from offering their full capabilities to the wholesale markets.

The DER Roadmap took a closer look at the facilities the NYISO sought to bring into the wholesale markets, and identified five resource types<sup>11</sup> whose participation was either outright prohibited, or was not appropriately valued by the existing participation model:

1. Load-only resources<sup>12</sup>
2. Load with generation<sup>13</sup>
3. Load with storage
4. Load with generation and storage
5. Community distributed generation

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<sup>5</sup> See, *e.g.*, *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Notice of Proposed Rulemaking, 157 FERC ¶ 61,121 (Nov. 17, 2016) (defining DER as “Any source or sink of power that is located on the distribution system, any subpart thereof, or behind a customer meter.”); California Indep. Sys. Operator, *Distributed Energy Resource Provider Participation Guide with Checklist* at 4 n.1 (Aug. 26, 2016), <http://www.caiso.com/Documents/DistributedEnergyResourceProviderParticipationGuideandChecklist.pdf> (defined as “any distribution-connected resource, regardless of size or whether it is connected behind or in front of the end-use customer meter. Distribution-connected means connected to distribution facilities controlled by a distribution utility, regardless of voltage level, served by the ISO grid.”).

<sup>6</sup> See, *Distributed Energy Resources*, Elec. Power Research Inst., <http://www2.epri.com/Our-Work/Pages/Distributed-Electricity-Resources.aspx> (last visited Nov. 29, 2017) (“Distributed energy resources (DER) are smaller power sources that can be aggregated to provide power necessary to meet regular demand.”); Tanuj Deora, *et al.*, *Distributed Energy Resources 101: Required Reading for a Modern Grid*, Advanced Energy Economy (Feb. 13, 2017 9:45 AM), <https://blog.aee.net/distributed-energy-resources-101-required-reading-for-a-modern-grid> (“DERs are physical and virtual assets that are deployed across the distribution grid, typically close to load, and usually behind the meter, which can be used individually or in aggregate to provide value to the grid, individual customers, or both.”).

<sup>7</sup> *Reforming the Energy Vision*, New York State Department of Public Service Staff Report and Proposal, Case 14-M-0101 (April 24, 2014), [http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/26be8a93967e604785257cc40066b91a/%24FILE/ATTKOJ3L.pdf/Reforming%20The%20Energy%20Vision%20\(REV\)%20REPORT%204.25.%202014.pdf](http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/26be8a93967e604785257cc40066b91a/%24FILE/ATTKOJ3L.pdf/Reforming%20The%20Energy%20Vision%20(REV)%20REPORT%204.25.%202014.pdf) (“Distributed Energy Resources (DER) is used in this context to include Energy Efficiency (EE), Demand Response (DR), and Distributed Generation (DG).”).

<sup>8</sup> A Supplier is a resource that supplies Capacity, Energy and/or Ancillary Services under the NYISO’s OATT or Services tariff. Market Administration and Control Area Services Tariff § 2.19.

<sup>9</sup> Energy Limited Resources are “Capacity resources, not including BTM:NG Resources, that, due to environmental restrictions on operations, cyclical requirements, such as the need to recharge or refill, or other non-economic reasons, are unable to operate continuously on a daily basis, but are able to operate for at least four consecutive hours each day.” NYISO Market Administration and Control Area Services Tariff § 2.5.

<sup>10</sup> Limited Energy Resources are “[a] Generator authorized to offer Regulation Service only and characterized by limited Energy storage, that is, the inability to sustain continuous operation at maximum Energy withdrawal or maximum Energy injection for a minimum period of one hour.” NYISO Market Administration and Control Area Services Tariff § 2.12.

<sup>11</sup> *DER Roadmap* at 15

<sup>12</sup> The NYISO currently has two economic demand response programs (the Day-Ahead Demand Response Program and Demand Side Ancillary Services Program), and two reliability demand response programs (the Emergency Demand Response Program and Special Case Resource Program) in which Load-only resources can participate. However a single load-only resource may participate in one reliability program and one economic program, potentially limiting the resource’s full value to the grid.

<sup>13</sup> Similar to Load-only Resources, Load with Generation (*i.e.*, Local Generators) have limited participation opportunities in the NYISO’s demand response programs. See, Market Administration and Control Area Services Tariff § 2.12.



In addition to these facilities, the NYISO has also identified additional in front of the meter (*i.e.*, not co-located with a Load) resources that may be underutilized with the existing rule set. Subsequently NYISO identified three basic DER characteristics:

1. **Resource Type:** Aligning with the NYISO's primary goal to open the wholesale markets to all resources that provide value to the wholesale markets, NYISO will be technology neutral. DER can be Demand Side Resources or resources that inject energy onto the distribution or transmission system; can be fueled by renewable sources such as wind or solar or be "traditional" generation such as combined heat and power generators; and can be capable of withdrawing energy from the grid for injection at a later time like batteries.
2. **Resource Location:** The location of a DER is a function of two elements – whether it is in front of or behind an end-use customer's meter, and whether the resource is connected to the "distribution" or transmission system. In many definitions of DER we have reviewed, DER are limited to resources located behind the end-use customer's meter, on the distribution system, or both.<sup>14</sup> The NYISO does not believe limiting DER to behind-the-meter installations or to resources connected to distribution utility facilities is appropriate. For instance, developers in New York State are considering building microgrids connected to the transmission system. While these installations may be used primarily to assist with distribution system reliability and resiliency, the NYISO believes they can and will provide valuable services to the wholesale market. Therefore the NYISO's proposal will not require DER to be located on the distribution system or behind an end-use customer's meter. Such constraints run counter to the NYISO's goal at opening up the wholesale market to resources that provide value.
3. **Resource Size:** The NYISO proposes to limit the maximum individual resource size to 20 MW of injection capability. This limit will permit certain resources, such as community solar, that are likely to be 1 MW or larger to participate, and yet aligns with the maximum resource size permitted by the existing Small Generator Interconnection Procedures.<sup>15</sup> It also permits participation of dispatchable Demand Side Resources of any size.

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<sup>14</sup> In contrast, the NYPSC's Order in Phase One on the matter of Value of Distributed Resources states that "no compensation will be offered at this time for energy generated and consumed behind a single utility meter. To the extent that any customers believe that this results in potential under-compensation for their projects, they can arrange for their DER to be separately metered..." See, Order on Net Energy Metering Transition, Phase One of Value of Distributed Resources, and Related Matters, New York Public Service Commission Order, Case 15-E-0751 (March 9, 2017), available at <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={5B69628E-2928-44A9-B83E-65CEA7326428}>

<sup>15</sup> The NYISO has received significant stakeholder feedback on the proposal to limit DER to resources with 20MW or less capability. The rules used to determine resource capability are still under consideration by the NYISO.

The NYISO's initial proposed definitions proved to be cumbersome,<sup>16</sup> and after several discussions with the stakeholder community, the NYISO developed a less complicated definition of DER for the purposes of this MDCP:

**DER are resources qualified to participate in NYISO's Energy, Ancillary Services, and/or Capacity markets that are (i) capable of changing its load, or (ii) capable of injecting 20 MW or less onto the transmission and/or distribution system, at the NYISO's direction.**

This revised definition captures the diverse resource types that may be DER, permits DER to be located both in front of and behind an end-use customer meter and on either the transmission or distribution system, while still limiting DER to small resources.

### **Dispatchable Distributed Energy Resources**

The NYISO's definition of DER is purposely broad and can be separated into three distinct categories of participation models: dispatchable DER (either as part of a heterogeneous or homogeneous DCEA), non-dispatchable DER, and in front the meter participation models (as seen in Figure 4 below).

The dispatchable DER participation model described in this MDCP is for those DER that are able to respond to real-time basepoints at least on a 5-minute interval. DER participating in the dispatchable DER participation model, therefore, may be qualified to offer capacity, day-ahead energy and ancillary services, and real-time energy and ancillary services. The non-dispatchable DER participation model, in contrast, is for those DER that cannot respond to real-time basepoints. DER participating through non-dispatchable DER participation model may be qualified to provide capacity and energy. Finally, a third category of DER participation model is for resources that can be dispatched in real-time and are eligible to supply capacity, energy, and ancillary services, but who qualify to be Generators or Intermittent Power Resources under the NYISO's existing market rules, or as Energy Storage Resources under the NYISO's forthcoming Energy Storage Resource participation model.

Once the new market rules for dispatchable DER participation model are implemented, the only non-dispatchable DER permitted to participate in the NYISO-administered wholesale markets will be those that meet the requirements to be Special Case Resources or Emergency Demand Response Resources.<sup>17</sup> Because

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<sup>16</sup> See, NYISO Presentation *DER Eligibility and Performance Obligations* at 6 (Sept. 29, 2017), available at [http://www.nyiso.com/public/webdocs/markets\\_operations/committees/bic\\_miwg/meeting\\_materials/2017-09-29/3%20Distributed%20Energy%20Resource%20Eligibility%20and%20Performance.pdf](http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_miwg/meeting_materials/2017-09-29/3%20Distributed%20Energy%20Resource%20Eligibility%20and%20Performance.pdf) (defining DER as "a Supplier whose nameplate capability is 20 MW or less that participates in a [DER Aggregation] of (i) one or more Demand Side resource, or (ii) a combination of two or more of the following resource types: Demand Side Resources, energy storage resources, Generators, and Intermittent Power Resources.").

<sup>17</sup> The NYISO's Day-Ahead Demand Response Program and Demand-Side Ancillary Service Program will be retired and replaced with the dispatchable DER market rules, and resources currently participating in DADRP or DSASP will be transitioned to participating as dispatchable DER.

the NYISO seeks to integrate flexible resources able to react to rapidly changing system conditions, this MDCP is focused on real-time dispatchable resources. While the NYISO has no plans at this time to retire the existing EDRP and SCR programs, it will reevaluate the value these programs provide the grid and wholesale markets in the future.

The third category of DER include Generators, Intermittent Power Resources, and Energy Storage Resources, or aggregations thereof, that are in front of an end-use customer’s meter and each resource is able to inject 20 MW or less on to the grid. This third category of DER recognizes that some DER will meet the qualifications for existing (or proposed) resource types (*e.g.*, Generator or Energy Storage Resource). Resources meeting these qualifications will be obligated to follow the rules applicable to that particular resource type’s participation model. While resources in this category can be called DER, the NYISO’s tariffs already permit their full participation in New York’s wholesale electricity markets through existing participation models. Because they do not require the alternative rules described herein, they will be required to participate as the existing resource type’s participation model. This proposal attempts to prevent “program switching,” the ability for an individual or group of resources to move from one participation model, such as dispatchable DER participation model, to another, such as an ESR participation model. Because of the manner in which the NYISO will evaluate resources in its planning and market processes, program switching may lead to negative market impacts.

**Figure 4: DER Wholesale Participation Models**

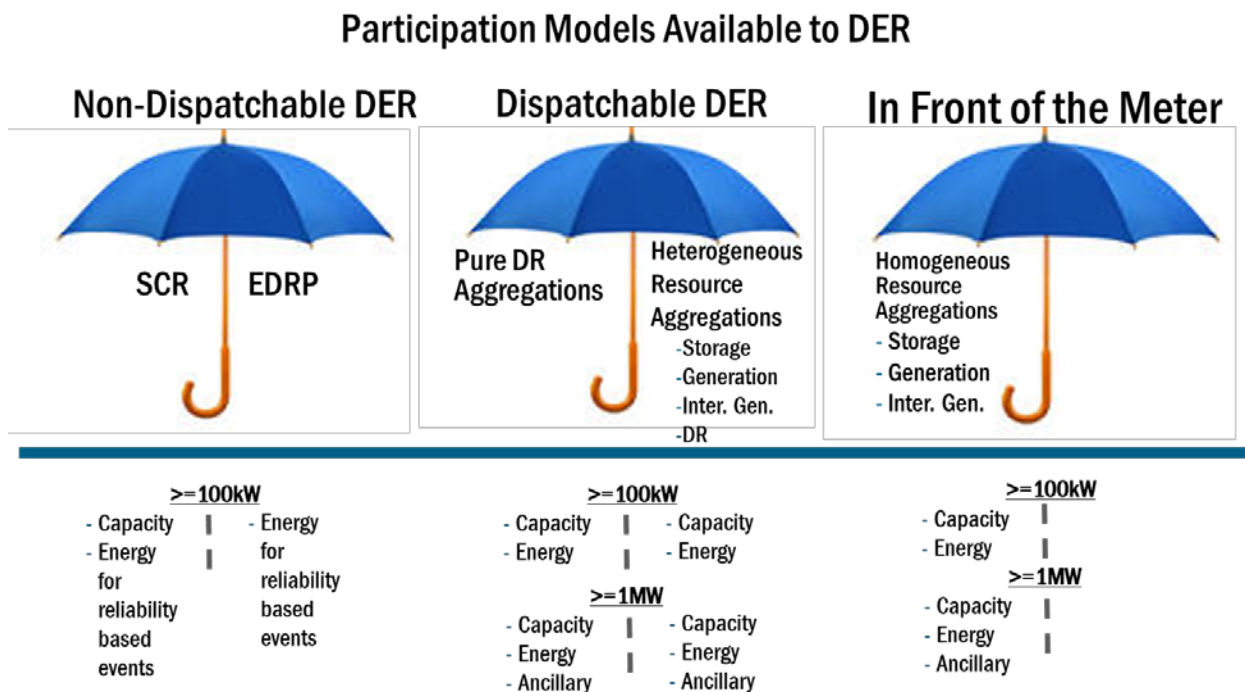


Figure 4 depicts the different market programs in which the NYISO envisions DER participating in the NYISO wholesale market

## Aggregations and Modeling

One of the main barriers to DER participation under the currently effective NYISO tariffs is their capability. Although the NYISO defines DER as resources that can inject up to 20 MW, the NYISO expects most of the resources participating as dispatchable DER to be less than 1 MW in capability which would not meet the NYISO's current minimum bid threshold. Individual resource capability, however, is not necessarily a marker of value, and the NYISO recognizes that allowing DER less than 1 MW to participate in the wholesale market is beneficial to both resources and the wholesale markets. The NYISO, therefore, proposes to reduce the minimum dispatchable DER bid size from 1 MW to 100 kW, and to permit dispatchable DER with a capability less than 100 kW to meet the new minimum bid threshold by aggregating with other dispatchable DER.

The NYISO's aggregation proposal builds off the aggregation rules used in the existing NYISO demand response programs, but will differ in certain key respects. The remainder of this section will describe the NYISO's concept proposal with respect to the geographic footprint for DER aggregations, the role of the DER Coordination Entity (*i.e.*, the aggregator), the composition of DER aggregations, and finally the market services DER aggregations can provide. Importantly, each aggregation will be represented at a transmission node by a single PTID, and the DER Coordination Entity (DCE) will be the Market Participant (MP) with whom the NYISO interacts. Moving forward, DER aggregations will be referred to as the DCE Aggregation (DCEA).

### Aggregation Footprint

Unlike Demand Side Resources participating in NYISO's current demand response programs, which are permitted to aggregate on a New York Control Area Load Zone basis, the NYISO proposes to aggregate DER at the transmission node level.<sup>18</sup> Keeping DCEA electrical footprints to behind a single transmission node will appropriately recognize characteristics such as intra-zonal congestion and localized price formation, and encourage location-specific resource siting. As further discussed in the NYISO's Market Design Concept Proposal on Granular Pricing and Market Price Delivery<sup>19</sup> it is the NYISO's intention to work with the respective utilities to identify the minimum set of transmission load nodes that balance DER aggregation participation and electrical system differences.<sup>20</sup>

The utility and the DCE will be expected to identify the appropriate transmission node within the

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<sup>18</sup> DER Roadmap at 17-19.

<sup>19</sup> NYISO Presentation *Granular Pricing & Market Price Delivery – Market Design Concept Proposal* (Sept. 29, 2017), available at [http://www.nyiso.com/public/webdocs/markets\\_operations/committees/bic\\_miwg/meeting\\_materials/2017-09-29/6%20Granular%20Pricing%20Market%20Pricing%20Delivery%20-%20MDCP.pdf](http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_miwg/meeting_materials/2017-09-29/6%20Granular%20Pricing%20Market%20Pricing%20Delivery%20-%20MDCP.pdf).

<sup>20</sup> The NYISO and utilities will periodically review DER nodal assignments to ensure they accurately reflect underlying electric system conditions.

utility's service territory for each DER.<sup>21</sup> Once a DCEA is created it will be modeled in the NYISO systems as a single PTID, regardless of resource mix/size.

### **DCE & DCEA Registration**

The DCE will be the registered Market Participant responsible for meeting all applicable NYISO obligations of the DCEA it registers, and of the individual DER in the DCEA.<sup>22</sup> These obligations include NYISO and any applicable utility registration requirements, ensuring the DCEA and individual DER meet all wholesale market participation requirements, completing all required interconnection requirements, and assuming responsibility for all DCEA operation at the direction of the NYISO. The DCE will also be responsible for communications with the NYISO and the Utility, including:

1. Notifying the NYISO of all DCEA de-rates and outages (planned and forced) due to resource-specific and distribution system issues.
2. Updating Day-Ahead and Real-Time offers to reflect changes.

Beginning in 2018, the NYISO will establish registration processes that, when implemented, will:

1. Collect the utility account number for each individual DER in the DCEA to ensure that the DER is not enrolled in multiple DCEAs.
2. Collect DCEA modeling and performance attributes.
3. Ensure that all DER in the DCEA map to a single NYISO-modeled transmission node.
4. Assess the DCEA impact on the transmission system.

Each DCE will be required to satisfy all applicable DCEA registration requirements prior to a DCEA's participation in NYISO-administered wholesale markets.

Further details regarding these processes will be developed during the updates to the NYISO resource registration materials.

### **DCEA Composition**

As explained above, a DCEA is an aggregation of dispatchable DER with a minimum 100 kW capability in aggregate that are electrically connected to the same transmission node. A DCEA comprises two or more mixed resource types (*e.g.*, Demand Side Resources, energy storage resources, Generators) which are individually under 20MW. A DCEA can also comprise one or more Demand Side Resources of any

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<sup>21</sup> It is possible, depending on the applicable distribution system conditions, that individual DER may be required to be re-mapped to a different transmission node. Stakeholders have expressed concern regarding the financial impacts that may result from frequent re-mapping. The NYISO continues to consider stakeholder feedback and will provide further detail in 2018.

<sup>22</sup> While the NYISO expects many DCEs to be third-party aggregators of individual DER, the NYISO does not intend to prohibit individual DER from acting as its own DCE.

capability.<sup>23</sup>

Aggregations that include multiple technologies will generally participate under the dispatchable DER participation model. The NYISO recognizes, however, that aggregating large renewable generators with storage may not fit the aggregation concepts being contemplated in the current DER and ESR efforts (*i.e.*, at least one resource in the aggregation exceeds 20 MW capability, and the aggregation is heterogeneous). The NYISO intends to develop market rules for combinations of large scale renewables and ESRs as part of the third phase of the NYISO's ESR effort called *Renewable and Storage Aggregation*.

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<sup>23</sup> Demand Side Resources cannot inject energy onto the transmission or distribution systems.

## DCEA Market Participation Opportunities

The NYISO's market design will, for the first time, permit DER to offer Energy, Capacity, and Ancillary Services in the wholesale markets through one participation model. The NYISO is still determining the precise market rules for DER participation in those markets, but provided below are the concepts that will guide those rules.

### Energy Market Participation

All DCEAs meeting the minimum registration and operating requirements will be eligible to offer Energy. DCEA energy market participation and settlement will largely mirror the existing rules for Generators on an aggregation basis (that is, by PTID).

While all DCEAs 1 MW or larger will have their offers considered on a stand-alone basis, the NYISO proposes to "Super Aggregate," or combine the offers from DCEAs that have less than 1 MW of capability and are behind the same transmission node. The lone exception to this general rule is that DCEAs 1 MW or larger that choose not to submit Ancillary Service offers will be included in the Super Aggregation.

Super Aggregations are necessary to maintain the efficiency of the co-optimized scheduling and dispatch of Energy and Ancillary Service providers with significant penetration of DER. The NYISO's Security Constrained Economic Dispatch (SCED) runs a complex mathematical optimization for Energy and Ancillary Services nominally every five minutes for the next one hour to meet load at the lowest total production cost, while respecting transmission constraints. As the number of PTIDs increases, the increased processing time may unreasonably delay the solution.<sup>24</sup> In order to maximize DER participation opportunities while minimizing impact to SCED, the NYISO will combine the offers of all DCEAs less than 1 MW (and offers of DCEA 1 MW or greater that do not provide Ancillary Services) and behind a single transmission node into a Super Aggregation (SA). Once DCEAs are super aggregated, they will be considered by SCED as a single resource, and will be eligible to set price in NYISO's Energy market. If the Super Aggregation is awarded a schedule, the NYISO will disaggregate the schedule and distribute it in increments to DCEAs based on their offers. The SA concept is only for the purposes of allowing NYISO a means by which to minimize the impact to SCED; this will not be a parameter available to the DCEA to select.

### Ancillary Services (Reserves and Regulation) Market Participation

Only those DCEAs that are 1 MW or greater will be eligible to provide Ancillary Services for the same reasons discussed above regarding the mathematical complexity of co-optimizing energy and ancillary services for a Super Aggregation. The co-optimization uses each resource's individual and separate bid

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<sup>24</sup> The NYISO is currently investigating how many PTIDs SCED can solve for without unreasonable delay, and expects to make a final determination in 2018.

parameters for energy, reserves, and regulation, evaluates the lost opportunity costs for each service, and tries to find the optimal schedule for energy, reserves, and regulation for each resource. Because the parameters for each service of a resource is independently evaluated, these parameters cannot be super aggregated without losing the ability to evaluate the lost opportunity costs for each service that is required for proper co-optimization evaluation.

DCEAs that are qualified and elect to offer Operating Reserves and/or Regulation will be modeled as a single PTID for scheduling and optimization, will be optimized by SCED, and will be eligible to set prices in NYISO's Energy, Operating Reserves and/or Regulation markets.

Stakeholders have expressed concerns over the NYISO's Super Aggregation concept. Specifically, certain stakeholders believe that because DCEAs will be limited to only those DER that connect to a single transmission node it may be difficult to reach the 1MW threshold required to offer ancillary services and may impact the economic feasibility of DCEAs less than 1 MW in capability.

The NYISO has initiated an analysis on SCED performance impacts due to the increased number of PTIDs being co-optimized, and intends to complete this analysis by Q2 2018 once testing systems for the new NYISO EMS/BMS platform are available. The NYISO will also periodically refresh the results of such testing after implementation to ensure that minimum threshold for offering Ancillary Services continues to be appropriate.



Figure 5: Energy Market Participation

# Energy Market Participation Concept

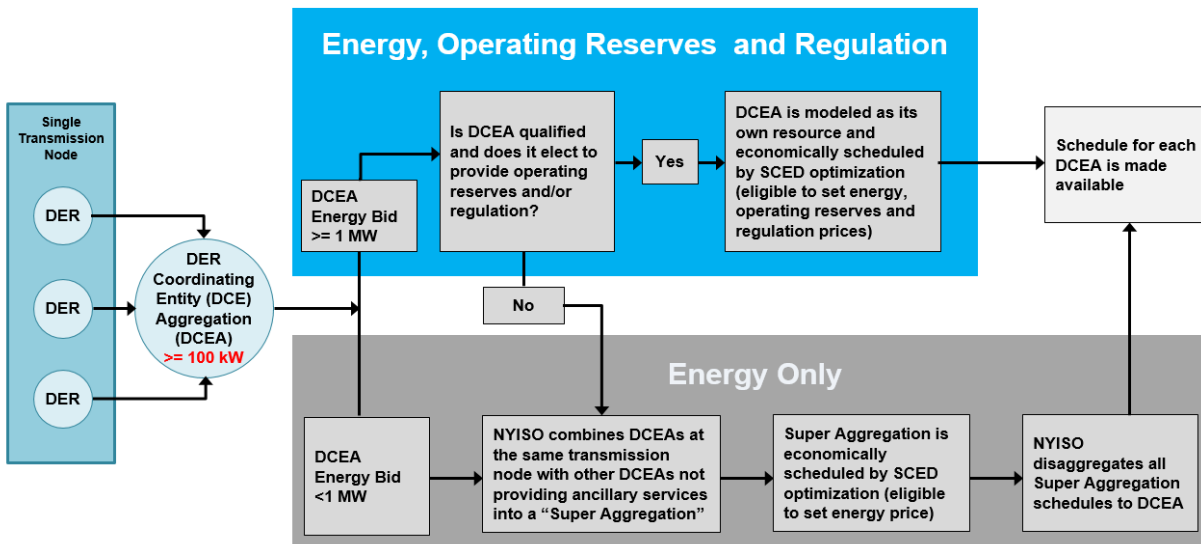


Figure 5 depicts the process flow for the dispatch of DCEAs

## Installed Capacity Market Participation

Qualified DCEAs will be eligible to participate in the NYISO’s Installed Capacity Market once the appropriate market rules are in place. As a first step the NYISO intends to begin in 2018 an assessment of the value of DER capacity. It is expected that this assessment will be based on its impact on the Loss of Load Expectation.

This assessment will also look to define a “capacity window” where DER will be most valuable to the NYISO and the transmission grid. This “capacity window” is expected to have both a time of day and duration component. The impetus for this is to create a capacity model, similar to that used for Intermittent Power Resources, which measures the resource’s capacity value during a NYISO defined “capacity window.” However, due to the operational and economical differences of DER (*e.g.*, likely to be available to respond to dispatch instructions) and Intermittent Power Resources (*e.g.*, likely to generate output when the fuel is available), NYISO is considering evaluating an availability based model similar to traditional generators for DER Capacity instead of an output based model used for Intermittent Power Resources.

This assessment will also develop an appropriate manner to prorate DER capacity for resources that are

unable to meet the requirements for the full duration of the “capacity window.” The NYISO, is also considering applying this new “capacity window” model to SCRs, but it is anticipated that SCRs will continue to be measured on performance instead of availability.

## Measurement & Verification and Monitoring & Control

Measurement & Verification (M&V) and Monitoring & Control (M&C) are two interrelated concepts addressing the real-time situational awareness and operational control (M&C), and after the fact verification of performance for the purposes of financial settlement (M&V). Effective M&V and M&C of wholesale market resources is vital to ensuring that resources are responding and performing as directed in real-time grid operations, and are properly compensated thereafter.

The NYISO has evaluated its existing M&V and M&C requirements for Demand Side Resources and Generators to determine whether there is a need to develop alternative requirements for DER. This evaluation has occurred in parallel with a series of meetings NYISO staff had with members of the Joint Utilities of New York and additional meetings of the Joint Utilities Interconnection Technical Working Group (ITWG). Close coordination on these topics is needed to ensure the alternative requirements will provide accurate M&V and M&C, and align with the New York State's REV.

The NYISO's review of DER M&V and M&C is divided into two parts: an external study on Measurement & Verification requirements completed by a consultant, and an internal NYISO evaluation of Monitoring & Control requirements. The external study (*i.e.* the Meter Data Study), performed by E-Cubed Policy Associates, LLC, investigated DER meter data collection methodologies, baselines for energy, ancillary service and capacity market participation, and statistical sampling methodologies for DER. The internal evaluation performed by NYISO staff focuses on real-time operational data and communication of that data via telemetry.

### Meter Data Study

In August 2017 the NYISO engaged E-Cubed Policy Associates, LLC, to analyze specific metering and meter data issues, and to recommend metering, baseline and sampling requirements appropriate for the NYISO-administered markets. Specifically, E-Cubed Policy Associates, LLC studied the following:

1. Provision of metering and meter data services.
  - a. Review of existing New York State policies and regulations for Meter Service Providers (MSP) and Meter Data Service Providers (MDSP)
  - b. Eligibility for third-party provision of metering or meter data services to a NYISO Market Participants
  - c. Verification of compliance with metering and meter data requirements
2. Baselines for Demand Side Resources and other DER in DER aggregations
  - a. Incorporating behind-the-meter generation or storage in DER aggregations, and the metering configurations that may be required
  - b. Evaluating individual DER wholesale market performance with a baseline when the DER also provides non-wholesale market services
  - c. Considerations for calculating a real-time baselines

- d. Considerations for calculating a single baseline for a DER aggregation
3. Statistical sampling methodologies of small Demand Side Resources participating in an aggregation
  - a. Eligibility of resource types and wholesale market services
  - b. Review of existing statistical sampling methodologies in other wholesale markets
  - c. Considerations for approval of statistical sampling methodologies for small Demand Side Resources

E-Cubed Policy Associates, LLC has completed its study and the report is available on the NYISO website.<sup>25</sup> The NYISO continues to review the report's findings and will incorporate those findings as appropriate in future DER M&V requirements.

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<sup>25</sup> Paul M. Sotkiewicz, NYISO Meter Data Study Final Report (Dec. 13, 2017), *available at* [http://www.nyiso.com/public/webdocs/markets\\_operations/market\\_data/demand\\_response/DER\\_Roadmap/NYISO-Meter-Data-Study-Report.pdf](http://www.nyiso.com/public/webdocs/markets_operations/market_data/demand_response/DER_Roadmap/NYISO-Meter-Data-Study-Report.pdf).

## Real-time Telemetry for Power System Operations

### Communications Options for Real-Time Telemetry

The primary communication path for real-time telemetry of wholesale resource operating data is through the utility or Transmission Owner (TO). A majority of existing wholesale resources that participate in NYISO’s Energy and Ancillary Services market configure their telemetry infrastructure in this manner.<sup>26</sup> Some stakeholders, however, have indicated a desire to develop alternatives to the NYISO’s existing rules for DER participation.

The NYISO proposes two options for DCE’s communication of DCEA telemetry signals. Option 1 is the generally-used communication path whereby telemetry signals are sent through the utility to the NYISO. Option 2 is an alternative communication path where telemetry signals are sent to the utility and the NYISO simultaneously. In either option the utility must receive the same telemetered values as the NYISO for each DCEA for the purposes of interim control operations<sup>27</sup> in the event that dispatch communication with NYISO operations is compromised.

**Figure 6: DCE Communication Paths**

**Option 1** – DCE communicates only with DSP, and DSP provides data to/from NYISO



**Option 2** – DCE communicates with both DSP and NYISO in parallel

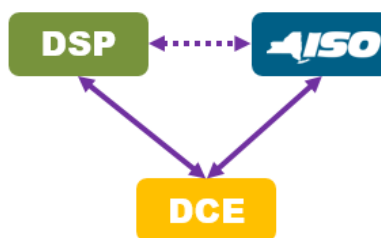


Figure 6 shows possible options for telemetry and communication options for a DER Coordination Entity (DCE)

### Communication Protocols for Real-time Telemetry

As of December 2017, the NYISO has not received specific stakeholder feedback on beneficial alternative

<sup>26</sup> A small subset of resources participating in the NYISO’s DSASP send telemetry data directly to the NYISO. DSASP participation using direct communication is subject to a NYCA-wide limit of 200 MW. NYISO Ancillary Services Manual Section 6.2.3.9 – Limit on Direct Communication for DSASP Resources

<sup>27</sup> NYISO Control Center Requirements Manual Section 2.4.2 – Interim Control Operation

communication protocol(s) to the Inter-Control Center Communication Protocol (ICCP). While the NYISO is open to evaluating alternative telemetry protocols, the NYISO will not begin exploring alternatives until it receives more interest in what alternative communication protocol on which it should focus.

### **Scan Rate and Latency Requirements for Real-time Telemetry in NYISO-Administered Energy and Ancillary Service Markets**

Real-time telemetry provides essential two-way communication of operational data between wholesale market resources and the NYISO. The NYISO relies on real-time telemetry for system visibility to effectively balance supply and demand within the New York Control Area, and to reliably secure and operate the Bulk Electric System. Real-time telemetry is also required to communicate time-sensitive dispatch instructions to resources providing regulation service, operating reserves, and energy.

Time granularity of operational data is critical to identify and respond to abnormal and emergency conditions. The NYISO, preserving the standard imposed by the New York Power Pool, requires real-time telemetry data on a 6-second basis.

The NYISO currently requires 6-second scan rate for telemetered data from all resources participating in NYISO's Energy and Ancillary Services Markets. The first and foremost reason is for the NYISO to maintain situational awareness of the power system, especially during significant unexpected events or changes occurring on the NYCA system. A second reason for 6-second telemetry is to maintain the NYISO's ability to instruct resources to respond to significant unexpected events or changes that occur on the NYCA system to maintain reliability. It should be noted that the NYISO can dispatch any available resource, including energy-only resources, to respond to reliability events. The third reason for the 6-second telemetry requirement is for the NYISO to maintain optimization of its Security-Constrained Economic Dispatch (SCED) and co-optimization of Energy, Operating Reserves, and Regulation Services. The 6-second data (*i.e.*, MW output) from resources providing Energy or Ancillary Services are inputs to NYISO's SCED and impact the Automatic Generation Control (AGC) basepoints including those to Regulation suppliers. Finally, 6-second telemetry is needed to meet mandatory reliability criteria, including criteria unique to New York State. Specifically, New York State Reliability Council Requirement R1.1 for Mitigation of Major Emergencies requires immediate corrective action must be taken to reduce the loading on a transmission facility to below its Short Term Emergency (STE) rating within 5 minutes.<sup>28</sup> These requirements emphasize the need for time-sensitive visibility to any resource under NYISO's dispatch to respond to and mitigate a reliability event. If NYISO observes a resource is not responding to its dispatch sufficiently to mitigate the event, it may need to dispatch other resources in the area to also respond.

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<sup>28</sup> New York State Reliability Council, Reliability Rules & Compliance Manual – For Planning and Operating the New York State Power System, Version 41, September 8, 2017

Dispatchable DER providing Energy and/or Ancillary Services have similar grid operations impacts as that of any other supply resource and therefore should be responsible for the same provisions of dispatch control and visibility to the NYISO. A critical aspect of DER integration is the ability to instruct any available resource on dispatch control to address reliability events (*e.g.*, the NYISO may utilize resources with flexible energy dispatch to provide relief on an overloaded transmission circuit). The NYISO expects to rely on DER to provide local relief to maintain compliance to NYSRC reliability requirements as DER penetration increases. Therefore, DER using the dispatchable DER participation model would be required to meet the same scan rate for telemetry applied on the aggregated telemetered data for each DCEA, and the same latency requirement applied between the NYISO and the DER, as expected from other resources participating in NYISO's Energy and Ancillary Services Markets. Demand Side Resources participating in the dispatchable DER participation model will be seen as generation for the purpose of real-time grid operations and therefore will be required to have the same visibility as generation resources.

DCEs will be required to ensure that the aggregated data (*e.g.*, net MW/MVAR flow, status) for each DCEA is calculated by such a means that it reflects the actual performance of the individual DER being dispatched. The most straightforward approach is for each DER to exchange telemetered values at a 6-second scan rate with the DCE such that actual resource telemetry data across the aggregation can be netted on a 6-second basis to produce a net output from the DCEA. Data that is not transmitted via 6-second telemetry, but by another method that degrades data quality (*e.g.*, slower scan rate, lower accuracy, reduced precision, increased latency) reduces the DCEA's value to the NYISO.

The NYISO has received feedback from DER developers that the cost of these existing telemetry requirements could be significant, and therefore may present a barrier for DER participation. DER developers have argued that the existing telemetry requirements for wholesale market participation are a barrier to entry for smaller resources (*e.g.*, residential customers), and that the 6-second scan rate requirement is the main driver for those cost barriers.

Because of the feedback received from certain stakeholders, the NYISO is considering ways to lower the barrier to entry for smaller resources (*e.g.*, residential customers) that find it cost prohibitive to deploy traditional metering and telemetry solutions. Any alternative permitted by the NYISO, however, must provide the same level of situational awareness and controllability NYISO operators have under the existing requirements, and cannot be used by DCEAs providing Ancillary Services. The NYISO is open to approaches that provide 6-second telemetry from a combination of traditional direct metering (*e.g.*, 5-minute scan rate) augmented with an alternative methodology that calculates resource output on a 6-second basis. The NYISO believes this type of approach will meet the intent for time-granular visibility to support real-time grid operations and reduces costs for smaller resources (*e.g.*, residential customers). Under this alternative, traditional direct metering at a slower scan rate will still be necessary and will be used to verify that the

alternative methodology is accurately representing the DER facility output.

Prior to using an alternative methodology to augment the directly telemetered values of a DER, the DCE must demonstrate the approach accurately reflects the actual performance of both the individual DER and the DCEA while being able to communicate the aggregated, augmented data to NYISO at the required 6-second periodicity. Alternative methodologies may include the use of:

- Empirical data to model the expected DER output and verifying dispatch using a control signal.
- Status signals (reported by exception<sup>29</sup> to the DCE) and/or pre-defined operating modes to indicate when a DER is:
  - Operating in a pre-configured mode using fixed parameters (such as a specific ramp rate (normal vs. fast ramping modes) or lower UOL (*e.g.*, curtailment)).
  - Limited by a physical constraint such as state of charge or inverter power limit.
- Weather data such as temperature, humidity, solar irradiance, and cloud movement.

The NYISO will evaluate alternative methodologies proposed by stakeholders on a case-by-case basis for precision (*i.e.*, consistency), accuracy, data integrity and replicability. NYISO will approve alternative methodologies before use. The NYISO will continue to explore feasibility of using alternate methodologies in 2018.

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<sup>29</sup> Status data is transmitted only when data value changes within a specified tolerance, saving bandwidth on the communication link.



## Performance Obligations

The NYISO's MDCP treats dispatchable DER comparably to traditional generators but recognizes that DER capabilities may differ from traditional generators. Where possible, the NYISO intends to apply the existing generator performance obligations applicable to DCEA. The NYISO recognizes, however, that some obligations will need to be modified to account for DER capabilities. To the extent that DCEA performance provides less value to the wholesale markets, the NYISO intends to adjust compensation accordingly.

### Eligibility and Bid Parameters

Consistent with the NYISO's goal to assimilate DER into the NYISO's existing rules to the greatest extent possible, DCEA eligibility will largely parallel traditional generator eligibility requirements, and DCEA are expected to use similar offer parameters as traditional generators. One significant departure from the existing rules is a reduction of the minimum bid requirement for DCEAs from 1 MW to 100 kW. All resources will still be required to offer in 100 kW increments above the minimum bid requirement.

In addition to the traditional generator offer parameters, DCEs will also be able to use some of the ESR offer parameters which are currently being developed.<sup>30</sup>

### Commitment and Dispatch for Energy and Ancillary Services

As explained throughout, the NYISO intends to integrate DER using existing market concepts to the greatest extent possible. To that end, dispatchable DER are expected to be dispatchable and capable of following real-time instructions from the NYISO, just like Generators, Intermittent Power Resources, and Energy Storage Resources.

In the DER Roadmap, the NYISO recognized that 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.

Throughout the 2017 market design process, however, stakeholders indicated their desire that DCEA be eligible for day-ahead and real-time commitment, primarily to provide DER with an advanced notification and to position themselves to follow real-time dispatch instructions.

While the NYISO appreciates stakeholders' request, it has concerns about the impact of significantly increasing the number of resources needing to be evaluated by the commitment software. Therefore, NYISO has agreed to explore the feasibility of allowing DCEAs 1 MW and greater to be eligible for an advanced

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<sup>30</sup> The NYISO is proposing new bid parameters for Energy Storage Resources in a separate market design proposal. Once those additional bid parameters are implemented, they will be available to energy storage DER.

notification or alternative commitment. This review will assess the increased solution time required to solve for significant increases in the number of resources being evaluated for commitment. At this time, the NYISO will not commit DCEAs in Super Aggregations because it is not technically feasible to appropriately assign commitments to those DCEAs.

### **DCEA Net-Capabilities and FERC Order No. 745**

FERC Order No. 745 specifies a set of rules related to the compensation of demand response resources participating in wholesale energy markets. Specifically, Order No. 745 required the NYISO to develop a Net Benefits Test to determine the price threshold point where the benefit of deploying demand response resources outweighs the costs, required the NYISO to establish a new baseline - the Economic Customer Baseline Load, and directed that demand response costs be allocated to load where demand response reduces prices. The Commission accepted the last of the NYISO's Order No. 745 compliance filings on January 30, 2017.<sup>31</sup>

When it was issued, Order No. 745 impacted the NYISO's Day-Ahead Demand Response Program as well as the Demand Side Ancillary Services Program. The NYISO intends to retire these programs once the dispatchable DER participation model is implemented. At this time the NYISO expects DCEAs whose wholesale market participation is load reduction (as opposed to injections of energy) to be subject to Order No. 745. Because of Order No. 745, the NYISO intends to model all DER aggregations as either "Net-Injection" or "Net-Curtailment." The NYISO will continue to develop this concept next year during the market rule design phase.

The tariff enhancements submitted to comply with Order No. 745 will come into effect in 2018. Because the NYISO's DER participation model is not expected to become effective until at least 2020, there will be a period of time in which existing rules will apply to the DADRP and DSASP. During the interim period before the dispatchable DER participation model takes effect, the NYISO will undertake an evaluation of the NYISO's tariff revisions submitted in compliance with Order No. 745 to determine its impact on, and applicability to, the DER participation model.

It is not expected that the NYISO will revise its Net-Benefits Test or the associated cost allocation methodology. The NYISO intends to apply the existing test, and offer floor rules, to all net-curtailment aggregations because the DCEA's participation in the wholesale market is a reduction in Load. The Order No. 745 rules will not apply to Net-Injection DCEAs.

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<sup>31</sup> *New York Indep. Sys. Operator, Inc.*, 158 FERC ¶ 61,081 (Jan. 30, 2017).

## Dual Participation

The NYISO considers dual participation to be the simultaneous enrollment of an individual resource, to provide services to the NYISO-administered wholesale markets and to another entity (*e.g.*, utility or host facility). Simultaneous participation has the potential to deliver greater benefits to both the resource and the bulk electric system by allowing the opportunity for a resource to receive multiple revenue streams by delivering multiple services to the grid. FERC's Policy Statement on Utilization of Energy Storage for Multiple Services When Receiving Cost-Based Rate Recovery underlines considerations important to the NYISO's market design that must be addressed. The potential for combined revenue streams may result in a resource receiving uncompetitive financial incentives akin to a "double payment" for providing the same service to the detriment of cost-based rate-payers. The potential a resource may in part be only able to compete to provide a cost based service to the grid if expected market revenues are considered from subsequent program participation, suppressing competitive prices to the detriment of other competitors.<sup>32</sup>

The NYISO is currently evaluating how DER dual participation will be coordinated with New York's Utilities. This evaluation includes discussions with the Joint Utilities of New York on how to effectively coordinate Energy market dispatch of DER for both transmission system and distribution system needs. Additionally, the NYISO is monitoring the evolution of New York State's "Value of Distributed Energy" (VDER) proceedings, which will inform any framework that expands the dual participation rules for DER. The NYISO will present its findings once a framework has been developed. The NYISO intends to evaluate applying this framework to the provision of Ancillary Services and, potentially, Installed Capacity Market obligations. The NYISO will continue working on this framework with both stakeholders and the Joint Utilities of New York in 2018.

### Operational Control and Dispatch

One of the primary objectives for NYISO in evaluating DER dual participation approaches is maintaining NYISO's situational awareness and operational visibility of DER so that NYISO can correctly reflect DER output and availability in NYISO's security analysis and dispatch processes.

The NYISO has identified two main operational concerns for DER participating in the NYISO-administered markets and in a retail program:

1. Overlapping obligations due to reliability concerns.
2. Overlapping obligations due to economic variables. Dispatch signals for transmission and

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<sup>32</sup> See, *Utilization of Energy Storage for Multiple Services When Receiving Cost-Based Rate Recovery*, Policy Statement, 158 FERC ¶ 61,051 (Jan. 19, 2017) ("the following issues, as raised in prior proceedings, should be addressed: (1) the potential for combined cost-based and market-based rate recovery to result in double recovery of costs by the electric storage resource owner or operator to the detriment of cost-based ratepayers; (2) the potential for cost recovery through cost-based rates to inappropriately suppress competitive prices in the wholesale electric markets to the detriment of other competitors who do not receive such cost-based rate recovery.")

distribution reliability will continue to be prioritized over economic dispatch.

It is the NYISO's expectation that the DCE representing individual DER, which are participating in both the NYISO-administered markets and a retail program, will notify the NYISO of all non-wholesale dispatch so that NYISO operators are able to maintain situational awareness. Timely updates of the DCEA's offers may be necessary, and/or derates called in, to properly reflect any diminished flexibility of the resource in the wholesale markets due to competing obligations. Notification may also be necessary for tracking meter data for settlements and accounting. For each DCEA dispatch, the NYISO will need to account for the:

1. Reliability vs economic concerns.
2. The impact on price setting.
3. The party financially responsible for compensating the DCEA.

This Dual Participation concept proposal will require the NYISO to distinguish NYISO-directed dispatch from dispatch instructions from other entities. The specific procedures for dual participation will be addressed during the market rule design process in 2018.

#### **Sub-Aggregate Operational Control and Dispatch**

Because DER are individual actors, the potential exists for DER to have obligations to other entities in addition to the DCEA representing it in the wholesale market. Such competing obligations may arise due to DER within an aggregation being enrolled in separate distribution level programs. It will be the DCEA's obligation to comply with NYISO-issued dispatch directives and the NYISO tariffs. The DCEA will be responsible for resolving any conflicts through its real time energy offers, and if conflicts occur, it will be subject to settlement adjustments, penalties and/or applicable availability calculations.<sup>33</sup>

The NYISO is considering evaluating the possibility of extending dual participation opportunities to other resource types once a framework for DER Dual Participation is established.

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<sup>33</sup> DCEAs will not be required to specify dual participation conflicts at DER registration.

## Additional Initiatives

### Pilot Program

The purpose of the NYISO Pilot Program is to inform market design efforts within the NYISO, build operational DER experience among the NYISO, utilities and market participants, and demonstrate market and grid operational coordination to integrate DER and DER aggregations. The focus of the program is on understanding physical operation attributes of DER and the associated coordination.

The NYISO has opened enrollment for its Pilot Program and published its Pilot Program Guide<sup>34</sup> on October 20, 2017. Interested parties can propose Pilot Projects through an application to the NYISO at ([http://www.nyiso.com/public/webdocs/markets\\_operations/market\\_data/demand\\_response/DER\\_Roadmap/Pilot\\_Program/NYISO-Pilot-Program-Application-Form.docx](http://www.nyiso.com/public/webdocs/markets_operations/market_data/demand_response/DER_Roadmap/Pilot_Program/NYISO-Pilot-Program-Application-Form.docx)) until program enrollment is closed. Pilot Projects should address specific objectives that NYISO and its stakeholders are seeking to demonstrate. Pending proposal submissions, NYISO anticipates having its Pilot Test Environment ready for testing in Q2 of 2018 and will seek to administer Pilot Projects after that time when Pilot Participants are ready for pilot setup and testing. The NYISO Pilot Program may seek additional Pilot Projects in the future until the close of the program (anticipated in April 2020).

### Granular Pricing

In order to encourage participation of DER in the NYISO-administered wholesale markets, the NYISO is working to publish intra-zonal load bus prices which will help to identify additional locations that can provide benefits to the bulk transmission system. The NYISO currently publishes zonal LBMPs that represent a weighted average of load bus prices within each zone, calculated every 5 minutes. The current zonal-average prices do not provide location-specific data to DER. Granular pricing data helps to encourage investment at the most economically-efficient transmission locations.

The NYISO has developed, in conjunction with the Joint Utilities of New York, a methodology by which to select transmission nodes for DER aggregation mapping and pricing. These transmission nodes will be selected from the existing load bus nodes that the NYISO currently models. The NYISO will work with the appropriate utility to identify the minimum number of transmission nodes to balance DER aggregation participation with the need to recognize the intra-zonal electrical differences between each transmission node. The respective utility will provide the NYISO with lower voltage facilities that may overload during normal operation, heavy load periods, transmission outages, or generation unavailability to account for the

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<sup>34</sup> NYISO Pilot Program Guide (October 2017), available at [http://www.nyiso.com/public/webdocs/markets\\_operations/market\\_data/demand\\_response/DER\\_Roadmap/Pilot\\_Program/NYISO-Pilot-Program-Guide-Final.pdf](http://www.nyiso.com/public/webdocs/markets_operations/market_data/demand_response/DER_Roadmap/Pilot_Program/NYISO-Pilot-Program-Guide-Final.pdf)

underlying electrical system differences. To the extent that transmission and/or distribution system issues arise due to DER nodal assignments (*e.g.*, congestion, pricing, or system security), the NYISO and the impacted utility will work to alleviate the issues(s) by assigning DER to a different transmission load node or designating additional load nodes. Designated transmission load nodes are therefore subject to change based on future system conditions. Prior to the dispatchable DER participation model's implementation, the NYISO currently estimates publishing a total of 100-200 sub-zonal transmission nodes to be made available for granular pricing and DER aggregation mapping, based on review with the applicable utilities.

At each transmission node that is identified, the NYISO will publish Real-time and Day Ahead LBMPs. The software changes required to deliver this pricing data will be deployed after the system upgrades to NYISO's Energy and Business Management Systems that are scheduled to be completed in 2019.

As part of this effort the NYISO will develop a graphical interface that will provide each transmission node's pricing information at its geographic location within New York State. This graphical interface currently displays the 35 nodes identified in 2016, along with the generator bus pricing nodes already made public today (*see* Figure 7). While the NYISO will only be able to incorporate additional transmission node modeling and pricing after software upgrades have been completed, this graphical interface along with the 35 transmission nodes mentioned above shall be made available publically to provide the market signals for DER investment opportunities. Along with this graphical interface, the NYISO is considering developing a Restful Application Programming Interface (API) that will allow 3rd parties to create applications to automatically retrieve prices.

**Figure 7: Granular Pricing Map**

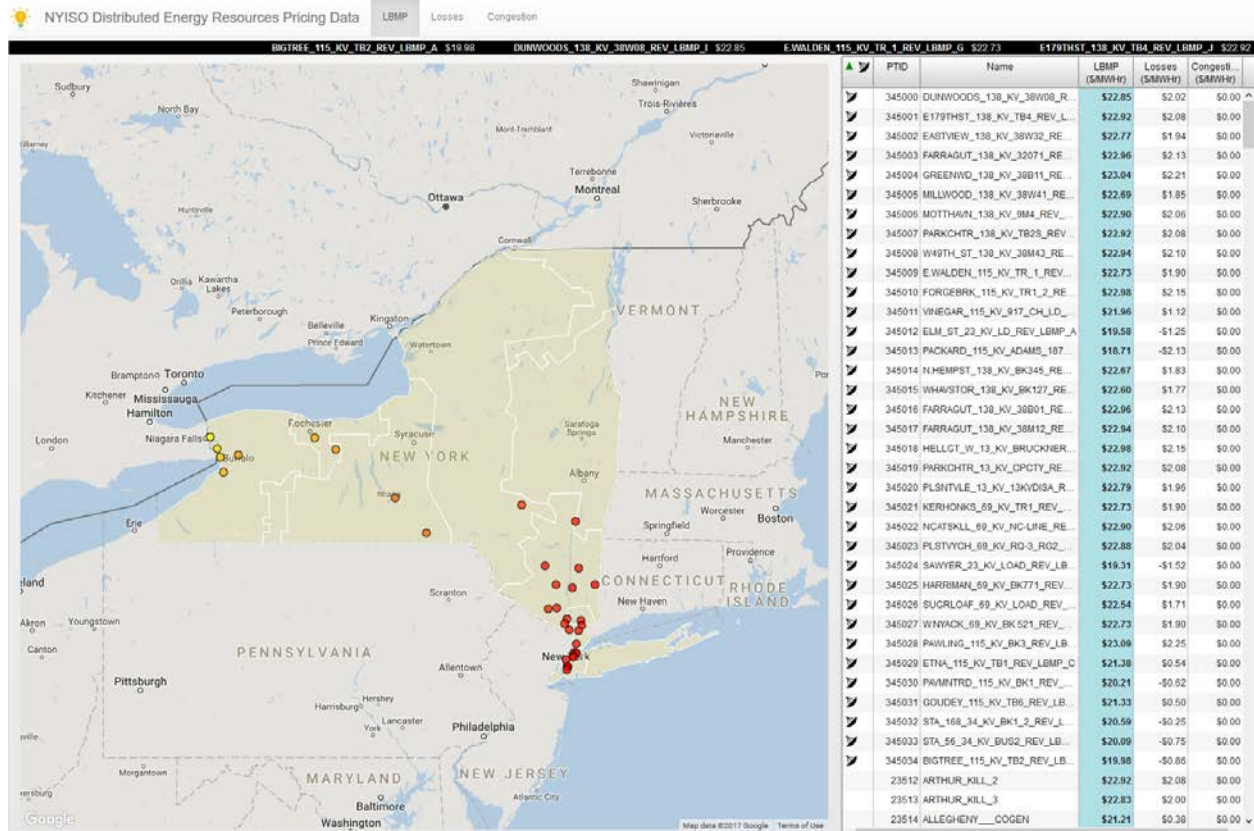


Figure 7 - Demo Version of Granular Pricing Map, may be retrieved at <http://www.nyisopilotnodalprices.com>

## Next Steps

In 2018, NYISO will develop the market rules required to implement this MDCP and the Tariff required to implement those rules. As NYISO develops these market rules and Tariff it will continue reviewing this material with stakeholders through the year.

The NYISO will in tandem begin to develop the market rules and tariff language for the subject matter found in this document as it continues to conduct the Capacity Market study and evaluates the requirements of implementation through the Pilot program. Following the conclusion of the Capacity Market Study and halfway through the initial Pilot program phase, NYISO will begin rule development for the remainder of topics, including but not limited to Capacity Market offer requirements, mitigation, forecasting and interconnection. These topics are being developed at different stages; in tandem, to complete market rule development and tariff language by the end of 2018.

Following the development and market rules for all topics, to be concluded by the end of 2018, the next stage in development will be for software upgrades and any additional technical requirements required to implement this DER participation model by 2021.



## References

### Acronyms

Acronyms	
Acronym	Term
AGC	Automatic Generation Control
API	Application Programming Interface
DADRP	Day-Ahead Demand Response Program
DER	Distributed Energy Resource
DCE	DER Coordinating Entity
DCEA	DCE Aggregation
DSASP	Demand Side Ancillary Services Program
EDRP	Emergency Demand Response Program
ESR	Energy Storage Resource
ELR	Energy Limited Resource
FERC	Federal Energy Regulatory Commission
ICCP	Inter-Control Center Communication Protocol
JU	Joint Utilities of New York State
kW	Kilowatt
LESR	Limited Energy Storage Resource
MDCP	Market Design Concept Proposal
MDSP	Meter Data Service Provider
MIWG	Market Issues Working Group
MSP	Meter Service Provider

MW	Megawatt
NOPR	Notice of Proposed Rulemaking
NYCA	New York Control Area
NYISO	New York Independent System Operator
PTID	Point Identification
SCR	Special Case Resource
SCED	Security Constrained Economic Dispatch
TO	Transmission Owner

## 2017 MIWG Presentations

E-Cubed Policy Associates. “Meter Data Study Initial Findings.” Presented to the NYISO Market Issues Working Group, Rensselaer, New York. October 30, 2017.

[http://www.nyiso.com/public/webdocs/markets\\_operations/committees/bic\\_miwg/meeting\\_materials/2017-10-30/Meter%20Data%20Study%20Initial%20Findings%20-%20E-Cubed%20Policy%20Associates.pdf](http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_miwg/meeting_materials/2017-10-30/Meter%20Data%20Study%20Initial%20Findings%20-%20E-Cubed%20Policy%20Associates.pdf)

New York Independent System Operator. “DER Roadmap: Aggregation and Dual Participation.” Presented to the NYISO Market Issues Working Group, Rensselaer, New York. October 30, 2017.

[http://www.nyiso.com/public/webdocs/markets\\_operations/committees/bic\\_miwg/meeting\\_materials/2017-10-30/Distributed%20Energy%20Resource%20Aggregations%20and%20Dual%20Participation%20MIWG%20103017%20Final.pdf](http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_miwg/meeting_materials/2017-10-30/Distributed%20Energy%20Resource%20Aggregations%20and%20Dual%20Participation%20MIWG%20103017%20Final.pdf)

New York Independent System Operator. “DER Roadmap: Aggregation Participation Model.” Presented to the NYISO Market Issues Working Group, Rensselaer, New York. April 24, 2017.

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