New York State Reliability Council
Installed Capacity Subcommittee
DER Modeling Whitepaper- 2024 Phase

Executive Summary

The five-year strategic plan for resource adequacy (RA) modeling improvements includes modeling recommendations for distributed energy resources (DER) in the installed reserve margin (IRM) study.[1] On April 16, 2024, the NYISO implemented the DER participation model to facilitate participation of DER in the NYISO-administered markets. Aggregated resources with different fuel types and dispatchable demand response resources have not been previously modeled in the IRM study.

This whitepaper recommends two modeling principles for DER in the IRM study. Modeling Principle 1 combines single resource type aggregations that have energy duration limitations and DER Aggregations consisting of either only Demand Side Resources or mixed generation resources into one unit by zone, technology type, and duration limitation. Modeling Principle 2 combines single resource type aggregations without energy duration limitations by zone and technology type.

Introduction

On April 16, 2024, the NYISO implemented its new market participation model for DER to participate in the NYISO-administered markets, including the Installed Capacity (ICAP) market. Under this participation model, various resource types (and aggregations thereof) can participate in the NYISO-administered markets and will be required to follow the NYISO's dispatch instructions.

While there are existing approaches to model different types of ICAP Suppliers, certain resource types that may participate as DER have not previously been modeled in the IRM study. For example, aggregated resources with different fuel types and dispatchable demand response resources (i.e., difference resource type than the existing Special Case Resources) have not been previously modeled in the IRM study. The initial modeling principles are a set of guidelines for Aggregations using the DER participation model. Thresholds and other specific details will be addressed in Phase 2 of this whitepaper, once sufficient data is available for Aggregations.

Objective

The focus of the 2024 DER modeling whitepaper is to develop a set of general guidelines and principles for modeling DERs based on comprehensive background research. This whitepaper aims to answer the following questions:

1. What are the operating characteristics of DERs?
2. How are DERs expected to participate in the NYISO ICAP market?
3. Should specific modeling approaches be considered for DERs in the IRM study, based on their characteristics and their expected market behaviors?

DER Characteristics and Definitions

DER Definition: A DER may be one of the following categories of facilities electrically located in the New York Control Area (NYCA): (i) a facility compromising of two or more different technology types

[1] Resource Adequacy Modeling Improvements Strategic Plan (2025-2029), https://www.nysrc.org/wp-content/uploads/2024/08/RA-Modeling-Improvement-2025-Strategic-Plan-09042024-ICS34676.pdf

located behind a single point of interconnection with a maximum injection limit of 20 MW, (ii) a Demand Side Resource, or (iii) a generator with a maximum injection limit of 20 MW.

Facility Definition: An individual facility will be a facility that is either: (i) a single facility at a distinct physical location (e.g., street address and utility account number), or (ii) a single physical location with (a) more than one facility with separate utility account numbers and/or points of interconnection with the distribution system, and that are (b) operated independently from other facilities at that physical location. A facility will have a maximum injection limit of 20 MW and a minimum capability of 10 kW.

Technology Types: Facilities can be compromised of the following technology types: Demand Side Resource (DSR), generators, Energy Storage Resources (ESR), solar generation, wind generation, landfill gas plants (LFG). An individual DER may also be eligible for certain classifications that otherwise apply to standalone resources in the NYISO-administered markets including Energy Limited Resources (ELR) or Limited Energy Storage Resource.

Information about the NYISO DER program

To participate in the NYISO-administered markets, an Aggregation under the responsibility of an aggregator must consist of resources that can qualify to participate in the Energy, Ancillary and ICAP markets, and are capable of responding in real-time to NYISO's dispatch instructions. Aggregations can be categorized into the following types:

> **Generator Resource Model:** Aggregation must consist of two or more Generator DER.
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> **Energy Storage Model:** Aggregation must consist of two or more ESR DER.
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> **Dispatchable DER Model:** Aggregation must consist of: (i) one or more DSR DER and no DER in the aggregation can inject into the grid (i.e., load reduction DSR only), or (ii) two or more resource types (i.e., Generator, ESR, DSR) capable of injection and/or load reduction.

IRM Modeling Principles

Based on the Aggregation's characteristics and its expected market behavior, there are two potential modeling approaches identified for DER in the IRM study: (1) individual resource modeling, and (2) aggregated resource modeling. Individual resource modeling would model facilities that make up a DER Aggregation as individually dispatchable resources using existing resource types. This individual modeling technique is complex due to the number of individual resources that could participate within an Aggregation and their potential sizes. The second approach of aggregated resource modeling (i.e., not individual facilities) leverages existing resource model types, such as using the GE Multi-Area Reliability Simulation software program (MARS) ELR functionality with capacity and daily energy limitations and/or using the enhanced ELR functionality with capacity and daily energy limitations, as well as hourly response rates if inputs are available (similar to the enhanced Special Case Resource (SCR) modeling but outside of the emergency operating procedure (EOP) steps).

Due to the complexity of modeling at the individual resource level, the NYSRC Installed Capacity Subcommittee (ICS) adopted the approach of modeling DER at the aggregated level. Modeling DERs at the aggregation level was deemed sufficient and reasonable for the purposes of the IRM

model. Aggregations of the same resource type can be reasonably modeled as a single unit in the MARS simulation while avoiding much of the additional complexity and administrative burden of adding many small units to the simulation. It was also acknowledged that combinations of mixed aggregation types are too varied to identify a "one size fits all approach" for modeling. As a result, the ELR functionality can capture a reasonable approximation given the expected market participation of such mixed aggregations.

Based on the aggregation modeling approach, the following modeling principles were identified to support the IRM modeling framework for the different types of DER Aggregations:

Modeling Principle 1
Combine single resource type Aggregations that have energy duration limitations and DER Aggregations consisting of DSR only or mixed generation resources into one unit by zone, technology type, and duration limitation.

For DER "DSR Only Aggregations": Model DSR only aggregations as ELRs by zone and duration limitation (e.g., using the "EL3" resource type in GE MARS). Currently, DSRs participating in the SCR program are modeled using the enhanced ELR functionality in the EOP steps. DSRs that remain in the SCR program will continue to use this enhanced ELR functionality. Certain characteristics of what is modeled currently is specific to the SCR program and will not be available or necessary if these resources become DER, such as: hourly response rates, a 7-hour duration limitation, and a limit to one call per day.
Example: all DSR only Aggregations located in Load Zone A and subject to a 4-hour duration limit would be modeled as a single ELR with a duration limit of 4 hours in Load Zone A.

For "Single Resource Type Aggregations" - Energy Storage Resources: Model ESR Aggregations by zone and duration limitation.
Example: all ESR Aggregations subject to a 4-hour duration limit located in Load Zone A would be modeled as a single ESR with a duration limit of 4 hours in Load Zone A.

For DER "Mixed Generation Aggregations": Model as an ELR. There are many possible resource combinations for these mixed aggregation types. Data will be coming in at an aggregation level and will not be broken down into the different facilities. It is likely that most of these mixed aggregations will include a DSR or ESR. Therefore, modeling as an ELR is a reasonable approach.

Modeling Principle 2
Combine single resource type Aggregations without energy duration limitations by zone and technology type.

For "Single Resource Type Aggregations" – Intermittent Power Resources: Combine each aggregation by zone and technology type (i.e., solar generation, wind generation, or LFG).
Example: all wind Aggregations located in Load Zone A, would be modeled as a single wind unit in Load Zone A.

For "Single Resource Type Aggregations" – Thermal Generators: Combine generator Aggregations without energy duration limitations by zone as a single unit/
Example: all generator Aggregations, located in Load Zone A, with no duration limitations, would be modeled as a single generator in Load Zone A.

Implementation Recommendation

For the 2025-2026 IRM Study: It is recommended not to model any potential enrollments of expected DER for the 2025-2026 IRM study.[2] Existing resources transitioning into the DER participation model, or new resources enrolling in the DER participation model would not be modeled explicitly as DER in the 2025-2026 IRM study. Given the timing and steps of the DER enrollment process, it is unclear whether sufficient certainty regarding the enrollment of DER for the upcoming summer will be attained by the time the Final Base Case (FBC) assumptions are finalized for the 2025-2026 IRM study.

For the 2026-2027 IRM Study: For the 2026-2027 IRM study cycle, resources enrolled as DER will be included in the IRM study based on the ICS approved modeling for DER. There are two potential options currently being considered for determining the quantity of DER to model: (a) utilize a process similar to SCRs that assumes the same enrollment as the prior summer (e.g., DER enrolled for summer 2024 would establish the resources to model for the 2026-2027 IRM study), or (b) consider existing DER enrollment at the time of the Preliminary Base Case (PBC) and FBC to inform the quantity of DERs to be included in the model. It will be necessary to monitor existing SCRs and/or Emergency Demand Response Program (EDRP) resources switching to DER to help avoid any potential for double counting such resources in the IRM study model.

Beyond the 2026-2027 IRM Study: As more DER participate in the ICAP market and operational data become available, performance data should be reviewed to inform further modeling of DER in the IRM study.

Conclusion

The NYISO developed the new participation model for DER to participate in the NYISO-administered markets, including the ICAP market. Under this participation model, various resource types (including aggregations thereof) can participate in the NYISO-administered markets and will be required to follow the NYISO's dispatch instructions. With this new participation model and expected enrollment of resources, two modeling principles are established to support the IRM modeling framework for the different types of DER Aggregations. Modeling Principle 1 combines single resource type Aggregations that have energy duration limitations and DER Aggregations consisting of either DSR only or mixed generation resources into one unit by zone, technology type, and duration limitation. Modeling Principle 2 combines single resource type Aggregations without energy duration limitations by zone and technology type. Express modeling of DER was not recommended for the 2025-2026 IRM study. Continued monitoring of DER enrollment is recommended and on-going review of DER modeling should be considered for future IRM studies.

[2] Distributed Energy Resources Modeling, https://www.nysrc.org/wp-content/uploads/2024/04/DER-Modeling-05012024-ICS30914.pdf