

Grid Services from Renewable Generators Study

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March 11, 2021

Agenda

- Project Background
- Grid Services Background
- Next Steps

Project Background

2021 Approved Market Project

- The 2021 Grid Services from Renewable Generators project deliverable is a Q3 Study Complete
- 2021 Project Schedule Milestone Update
- 2021 Approved Market Projects Product and Project Management
 - See Project 22 (Page 23 of 26)

Previous Presentations

Date	Working Group	Discussion Points and Links to Materials
01-21-21	ICAPWG/MIWG	2021 Market Projects Outlook Presentation https://www.nyiso.com/documents/20142/18559701/2021%20Market%20Design%20Project%20Outlook.pdf/0094ad10-3eea-bf35-10ce-fb20592a6d33

Grid in Transition – A Multifaceted Approach

- **Aligning Market Incentives**
 - Carbon Pricing
 - Comprehensive Mitigation Review
- **Prepare for New Technologies**
 - DER Participation Model
 - Energy Storage Participation Model
 - Hybrid Co-Located Model
 - Hybrid Aggregation Model
 - Large Scale Solar on Dispatch
- And more....

Aligning Competitive Markets and New York State Clean Energy Objectives



- **Review Energy & Ancillary Services Design for Incenting Flexibility**
 - More Granular Operating Reserves
 - Regulation Up & Down Services
 - Ramping Services
 - **Grid Services from Renewable Generators**
- **Evolve the Day Ahead and Real-Time Markets to improve managing Forecast Uncertainty**
- **Track certain market metrics to evaluate incentives for flexible resources**
- And more...

Valuing Resource & Grid Flexibility



- **Enhancements to Resource Adequacy Modeling**
- **Improving Installed Capacity Market Incentives**
- **Review Capacity Market Resource Ratings to Reflect Reliability Contribution**
 - Expanding Capacity Eligibility
 - Tailored Availability Metric

Improving Capacity Market Valuation



Project Scope

- **The Grid Services from Renewable Generators project has several key objectives:**
 - Describe the relevant Reliability Rules that the NYISO must comply with, per NERC, NPCC, and NYSRC mandates, and how current market rules support those requirements
 - Describe the nature of grid services and how they are procured and/or provided in New York
 - Discuss the capability of renewable generators to provide various grid services, subject to technological capabilities and Reliability Rules
 - Discuss potential market design and/or product revisions that would improve reliable grid operations and possibly enable participation by renewable generators

Proposed technology types to discuss in this year's study

- Onshore wind
- Offshore wind
- Utility-scale solar PV
- Rooftop solar PV
- Run-of-River Hydro

Grid Services Background

Grid Services Status Quo

- **The following slides provide background on specific grid services the NYISO may include in the study, including definitions and relevant reliability requirements**
 - As part of the 2019 Reliability and Market Considerations for its Grid in Transition Report, the NYISO and its stakeholders completed a “Reliability Gap Assessment,” which discusses potentially prudent grid service product revisions in light of New York’s decarbonization policies¹, such as:
 - Separate regulation “up” and “down” service
 - Ramping requirements in NYISO markets

¹The *Reliability and Market Considerations for a Grid in Transition* report can be found at: <https://www.nyiso.com/documents/20142/2224547/Reliability-and-Market-Considerations-for-a-Grid-in-Transition-20191220%20Final.pdf/61a69b2e-0ca3-f18c-cc39-88a793469d50>

Grid Services Status Quo (continued)

- **NYISO currently procures Operating Reserves, Regulation, Voltage Support Service, and Black Start Service**
 - Operating Reserves and Regulation are procured through competitive markets, while Voltage Support Service and Black Start Service are compensated on a cost-of-service basis
 - Recent industry studies have discussed the potential value of additional services such as fast frequency response, inertial response, and ramping services, as well as the ability of renewable generators to provide these services^{2,3}
 - The NYISO describes fast frequency response, inertial response, and ramping services on subsequent slides

² Demonstration of Essential Reliability Services by a 300-MW Solar Photovoltaic Power Plant. <https://www.nrel.gov/docs/fy17osti/67799.pdf>.

³ Avangrid Renewables Tule Wind Farm: Demonstration of Capability to Provide Essential Grid Services. 11 March 2020. <https://www.caiso.com/Documents/WindPowerPlantTestResults.pdf>.

Qualifications for Today's Grid Services

- **Suppliers must pass tests to demonstrate their capability to provide grid services:**
 - **Operating Reserves:**
 - Perform test to demonstrate ability to receive and respond to automatic control signals on a 5 minute periodicity and provide telemetered output data that can be scanned every 6 seconds (Ancillary Services Manual 6.12)
 - NYISO conducts random audit(s) as described in Technical Bulletin 142⁴
 - **Regulation:**
 - This test is “Scheduled within a calendar week, for 24 hours, including at least two four-hour periods, one that spans the morning pick up from hour beginning 5:00 through hour beginning 8:00 and the other that spans the evening load drop off from hour beginning 19:00 through hour beginning 22:00” (Ancillary Services Manual 4.11)
 - **Voltage Support Service (VSS):**
 - Demonstrate maximum leading and lagging MVar capability the supplier can maintain for one hour each (Ancillary Services Manual 3.6)
 - **Black Start Service:**
 - Conduct performance testing annually during test periods (Ancillary Services Manual 7.4)

⁴NYISO Technical Bulletin 142 (Generator Performance Audits) can be found at:
https://www.nyiso.com/documents/20142/2931465/tb_142.pdf/83f38bbe-407a-0bc7-ff5c-fc4279ebff86.

Operating Reserves

■ Definition (MST 2.15):

- “Capacity that is available to supply Energy or reduce demand and that meets the requirements of the ISO... The basic Operating Reserves products that are procured by the ISO are classified as follows:
 - (1) Spinning Reserve: “already synchronized and can respond to instructions to change their output level, or reduce their Energy usage, within ten (10) minutes;”
 - (2) 10-Minute Non-Synchronized Reserve: “can be started, synchronized and can change their output level within ten (10) minutes;”
 - (3) 30-Minute Reserve: “can respond to instructions to change their output level within thirty (30) minutes, including starting and synchronizing to the NYS Power System”

■ Relevant Reliability Rules:

- NPCC: “A Balancing Authority’s synchronized reserve, ten-minute reserve, and thirty-minute reserve, if activated, shall be sustainable for at least one hour from the time of activation.”⁵

⁵NPCC. *Regional Reliability Reference Directory #5*. R6. Page 7. <https://www.npcc.org/content/docs/public/program-areas/standards-and-criteria/regional-criteria/directories/directory-5-reserve-20200426.pdf>.

Regulation

■ Definition (MST 2.18):

- Defined by the Commission as “frequency regulation” instructed as Regulation Capacity in the Day-Ahead Market and as Regulation Capacity and Regulation Movement in the Real-Time Market

■ Relevant Reliability Rules

- NERC: *BAL-001-2*: “Mandatory Subject to Enforcement- Real Power Balancing Control Performance- To control Interconnection frequency within defined limits”

Voltage Support Service

■ Description (Ancillary Services Manual 3.1):

- “In order to maintain transmission voltages on the NYS Transmission System within acceptable limits, facilities under the control of the NYISO are operated to produce (or absorb) Reactive Power. Thus, Reactive Supply and Voltage Control Service (“Voltage Support Service”) must be provided to support all Transactions on the NYS Transmission System”

■ Relevant Reliability Rules:

- NERC: VAR-001-5: “Voltage and Reactive Control- To ensure that voltage levels, reactive flows, and reactive resources are monitored, controlled, and maintained within limits in Real-time to protect equipment and the reliable operation of the Interconnection”

Black Start Service

■ Description (Ancillary Services Manual 7.1):


- “Black start capability represents the key Generators that, following a system-wide blackout, can start without the availability of an outside electric supply and are available to participate in system restoration activities that are under the control of the NYISO or, in some cases, under local Transmission Owner Control”

■ Relevant Reliability Rules:

- NERC: *EOP- 005-3*: “System Restoration from Blackstart Resources- Ensure plans, Facilities, and personnel are prepared to enable system restoration from Blackstart Resources to ensure reliability is maintained during restoration and priority is placed on restoring the Interconnection”

Other possible Grid Services to examine in the study

- **The study may also investigate the ability of renewable generators to provide additional services beyond those that the NYISO procures today, such as:**
 - **Fast Frequency Response**
 - NREL Description: “Fast frequency response (FFR) has emerged as the term that describes the general capability of any resource that can detect and rapidly respond to changes in frequency, supplementing or replacing some amount of conventional inertial response and PFR”
 - **Inertial Response**
 - NREL Description: Sudden imbalances in load or generation can cause undesirable shifts in frequency. “Inertial response injects stored kinetic energy into the system, slowing down the decline in frequency to provide time for other reserve products (including primary frequency response) to detect those changes and respond accordingly”⁶
 - **Ramping**
 - Certain regions have implemented market products for ramping capability in response to concerns regarding uncertainty due to demand and renewable forecasting errors

⁶ Denholm, Paul, Sun, Yinong, and Mai, Trieu. NREL. “An Introduction to Grid Services: Concepts, Technical Requirements, and Provision from Wind.” January 2019. <https://www.nrel.gov/docs/fy19osti/72578.pdf>. Page 11.  New York ISO

Next Steps

Next Steps

- **Return to future working group to discuss the initial study draft and seek stakeholder feedback**
 - Targeted May 2021
- **Return to future working groups to discuss the consumer impact analysis**
 - Targeted June 2021
- **Return to future working group to discuss the final study report**
 - Targeted August 2021

Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policymakers, stakeholders and investors in the power system

