

DER: NYISO Operations' Perspective

Vijaya Ganugula

Manager, Distributed Resources Operations

NYSRC DER Reliability Workshop

November 7, 2018



DER Classification

- **Wholesale DER**: DER that participate in NYISO wholesale markets
 - Could be connected to the transmission or distribution system
 - NYISO determines the dispatch/deployment
 - NYISO DER Roadmap effort is focused on these resources
- **Non-Wholesale DER**: DER that do not directly participate in NYISO wholesale markets
 - Could be connected to the transmission or distribution system
 - Not dispatched/deployed by NYISO
 - NYISO Operations considers the impact of non-wholesale DER through various mechanisms such as forecasting, regulation requirements, etc

Wholesale DER

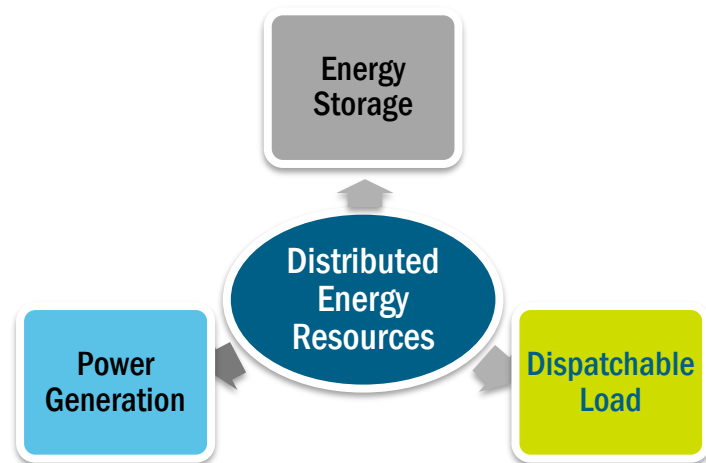
DER that participate in NYISO-administered
wholesale markets

Please Be Advised:

The DER market design is still under development. The information shared in this presentation is subject to change.

What is Wholesale DER?

- DER can consist of:
 - Dispatchable load
 - Power generation
 - Energy storage
 - Combination of the above
- Individual generation or storage assets must have 20 MW or less injection capability
 - No maximum size for load reduction-based DER
- DER can be connected to transmission or distribution system
- NYISO DER Roadmap focuses on **dispatchable DER** capable of following NYISO's real-time dispatch instructions
 - Dispatchable DER will be dispatched through NYISO markets similar to traditional generators to address reliability issues such as transmission constraints



NYISO DER Roadmap Objectives

- Integrate dispatchable DER into Capacity, Energy, and Ancillary Services Markets



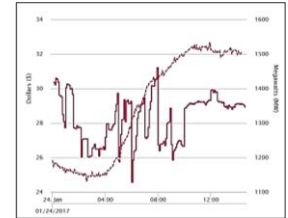
- Align with New York State's REV Goals



- Enhance Measurement and Verification



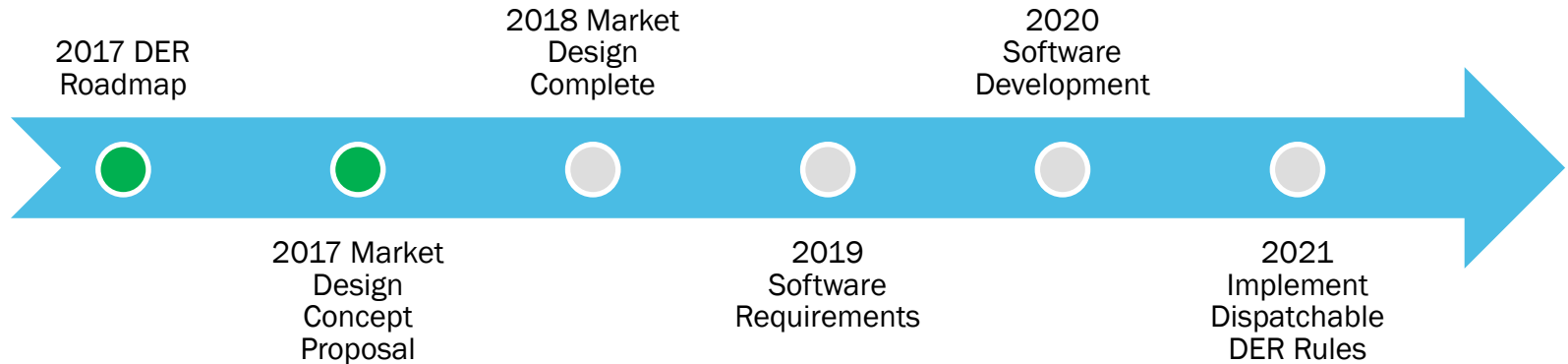
- Align Compensation with System Requirements



- Focus on Wholesale Market Transactions



Timeline



Distributed Energy Resources Roadmap for New York's Wholesale Electricity Markets:

http://www.nyiso.com/public/webdocs/markets_operations/market_data/demand_response/DER_Roadmap/DER_Roadmap/Distributed_Energy_Resources_Roadmap.pdf

NYISO Distributed Resources Market Design Concept Proposal:

http://www.nyiso.com/public/webdocs/markets_operations/market_data/demand_response/DER_Roadmap/DER_Roadmap/Distributed-Energy-Resources-2017-Market-Design-Concept-Proposal.pdf



Wholesale DER & Operations

Key Operations' focus areas: DER Aggregations, Transmission Nodes, Situational Awareness through Real-Time Telemetry

DER Aggregations

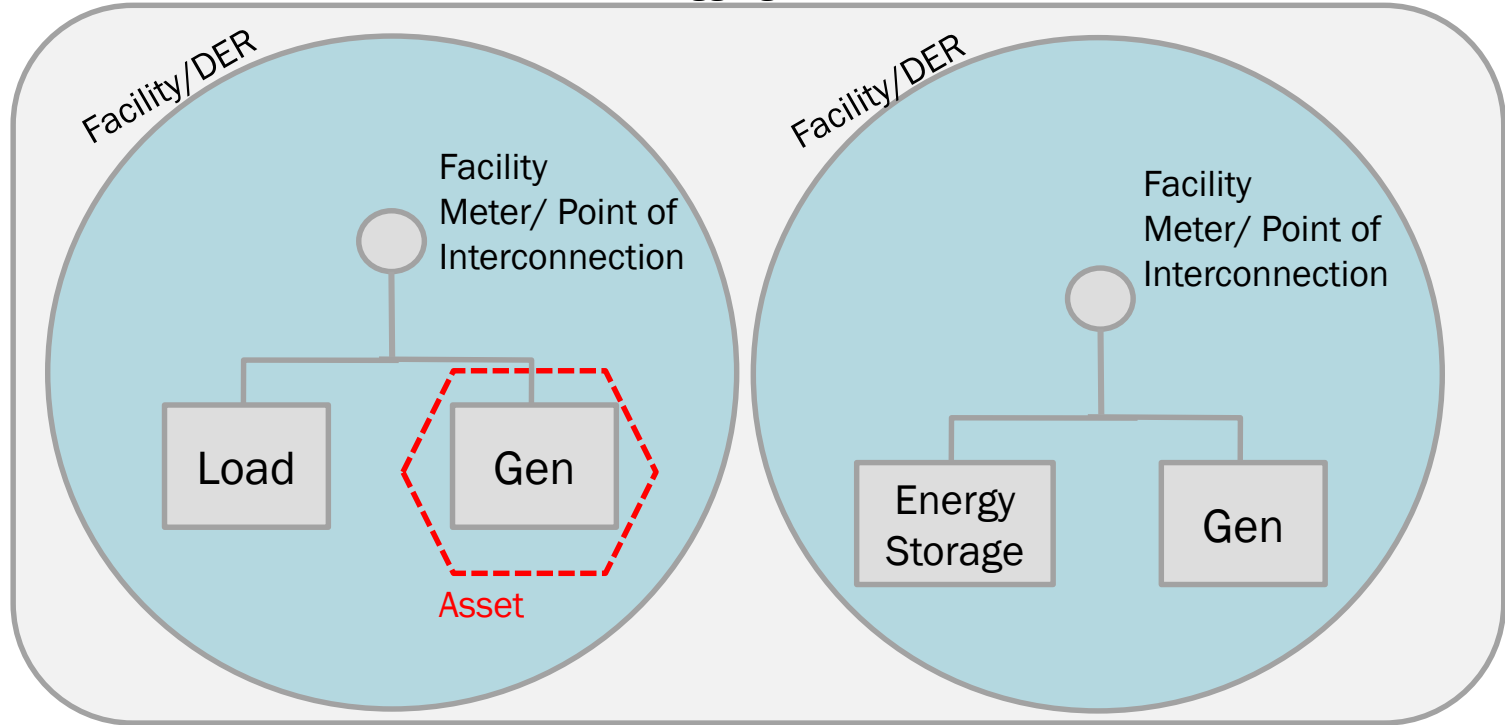
- **DER aggregations allow small DER to be aggregated to participate in NYISO wholesale markets**
- **DER aggregation must be able to offer at least 100kW**
 - No maximum offer size for the DER aggregation
- **Each injection-based DER within the DER aggregation must be 20 MW or less**
 - No minimum size for the DER
 - No maximum size for load reduction-based DER
- **All DER in a DER aggregation must be behind a single transmission node**
 - Additional details on transmission nodes are on the next two slides

DER Transmission Nodes

- **Transmission Nodes identify the transmission-distribution interface point for the purpose of DER participation in NYISO markets**
- **Transmission Nodes reflect the collection of electrically similar facilities to which individual DER may aggregate with a single PTID**
- **The DER Roadmap outlined the need to:**
 - Consider all Transmission Nodes that allow NYISO to best represent DER's impact on the transmission system
 - Deliver more granular pricing data to incent efficient locational investment
- **Transmission Nodes are for the purpose of wholesale market participation**
 - NYISO proposes to coordinate with the local distribution utility to consider any distribution level constraints in the process of identifying the electrical bounds of each Transmission Node

Terminology Overview

DER Aggregation



DER
Transmission
Node

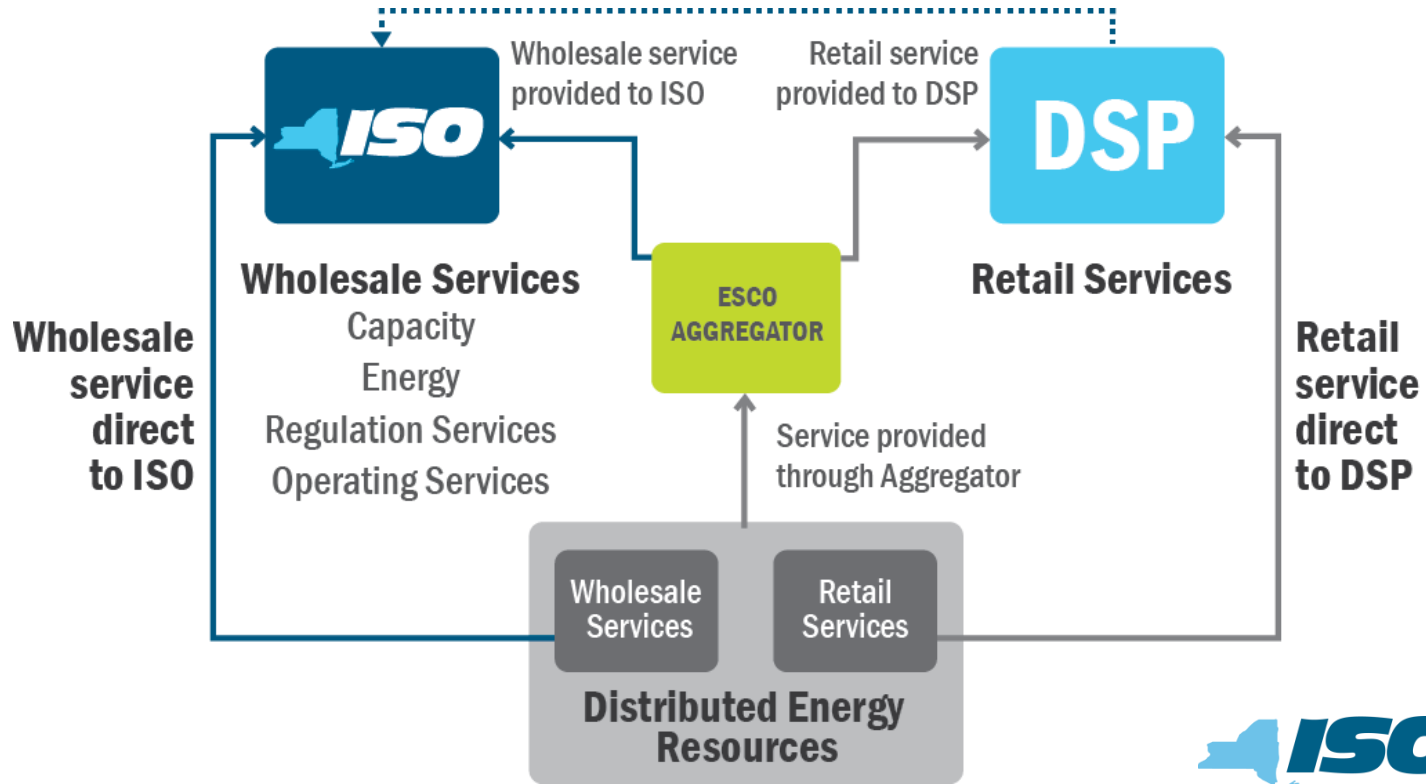
DER Aggregation Real-Time Telemetry

- **DER Aggregations will provide real-time telemetry; communicated with NYISO at 6-second scan rate**
 - DER aggregation basepoint telemetry signal provided by NYISO is the desired response of the aggregation as a whole
 - DER aggregation response telemetry signal provided to NYISO must be the actual response of the aggregation as a whole
- **DER aggregation telemetry signal provided to NYISO must reflect the response from all DER that comprise the aggregation within a 6-second time interval**

NYISO & Utility Coordination

Coordination between NYISO, Utility, DER
Aggregator, and DER

Integrating DER in Wholesale Markets



NYISO, Utility, and DER Aggregator Coordination

- NYISO is currently working with the Joint Utilities to determine how to coordinate DER operations
- DER will require significant coordination between NYISO, utilities, DER aggregators, and DER across many functional areas (operations, planning, registration, etc.)

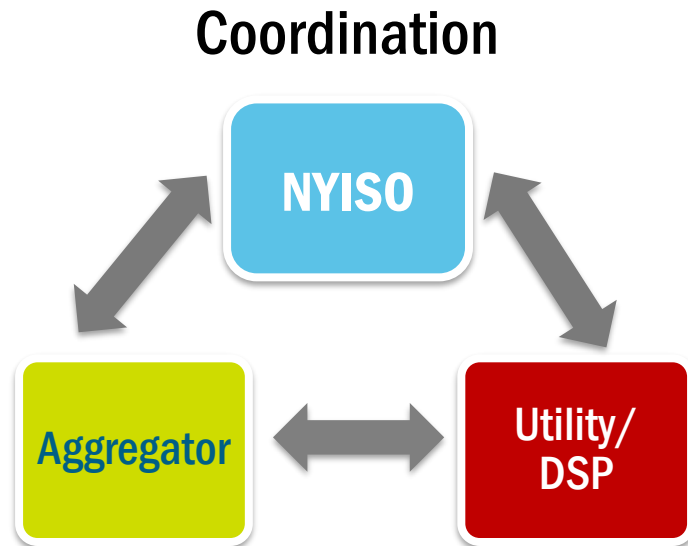
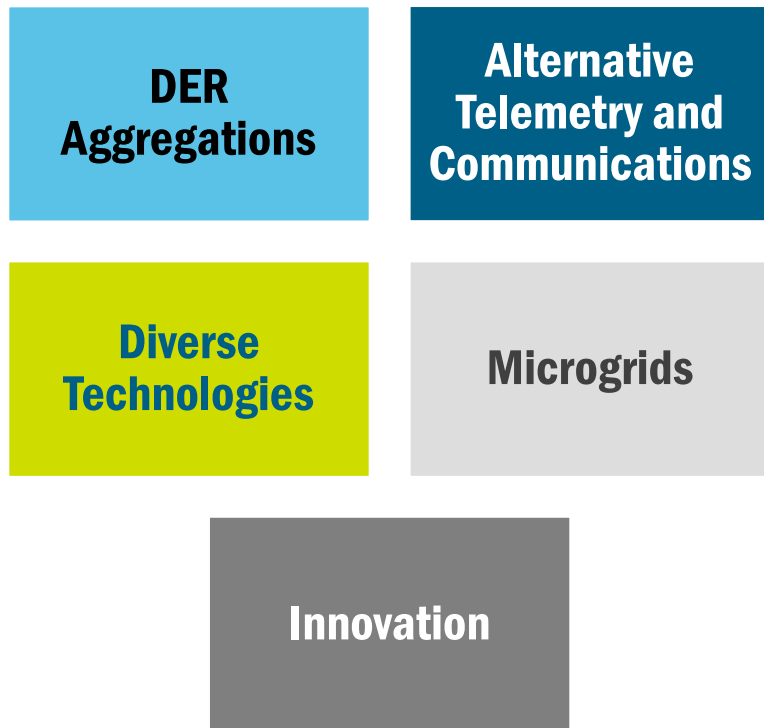
NYISO Pilot Program



NYISO Pilot Program Overview

- **As part of DER Roadmap efforts, NYISO established a Pilot Project Program**
 - Purpose is to demonstrate DER aggregation/DER capabilities, integration, coordination, and dual participation
- **The Pilot Program will be administered through a test environment, not in NYISO's production (*i.e.*, “not-live”) market and operations system**
- **Pilot Program participants will not be compensated by NYISO for participation in the Pilot Program**
- **The Pilot Projects will provide value to NYISO stakeholders and Pilot Participants by**
 - Demonstrating their capabilities to provide existing dispatchable market products and meet relevant performance requirements
 - Engaging and exercising their DER technologies and solutions in a simulated NYISO dispatch environment
 - Coordinating with NYISO and Utilities to dispatch DER aggregations
- **The deadline to submit proposals was January 31, 2018**

NYISO Pilot Program is looking for:



Pilot Proposal Summary

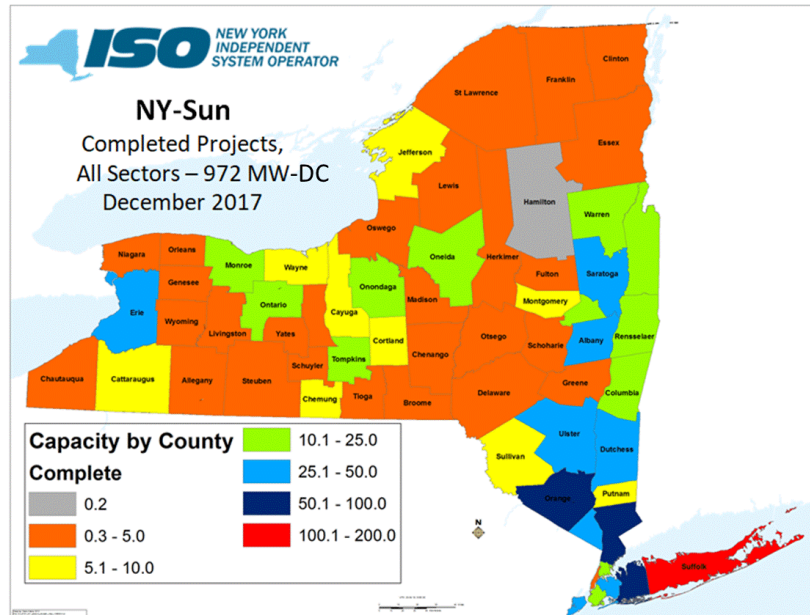
- Total of 10 proposals for consideration
- More than 12 MW proposed in total from the 10 proposals
- 3 proposals have been selected by NYISO for the final review process and include aggregations comprised of the following:
 - Integrated Energy Services Corporation (Axon)
 - High-rise buildings capable of curtailing load
 - Borrego Solar Systems, Inc.
 - In-front-of-the-meter battery energy storage facilities co-located with solar
 - Consolidated Edison
 - In-front-of-the-meter battery energy storage facilities

Non-Wholesale DER & Operations: Real-Time Solar PV Forecasting

DER that do not directly participate in NYISO
wholesale markets

Installed Capacity of Solar PV Systems by County

NYISO monitors inventories of solar PV sites across the state in order to develop the historic time series and short-term forecast of installed solar PV across the state.

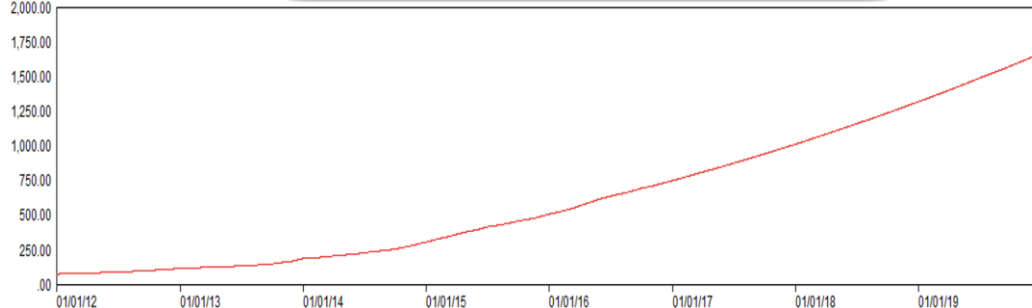


NY Sun data from NYSERDA



ZoneS_ICAP: Installed Capacity - Forecast
1/1/2012 - 12/31/2019

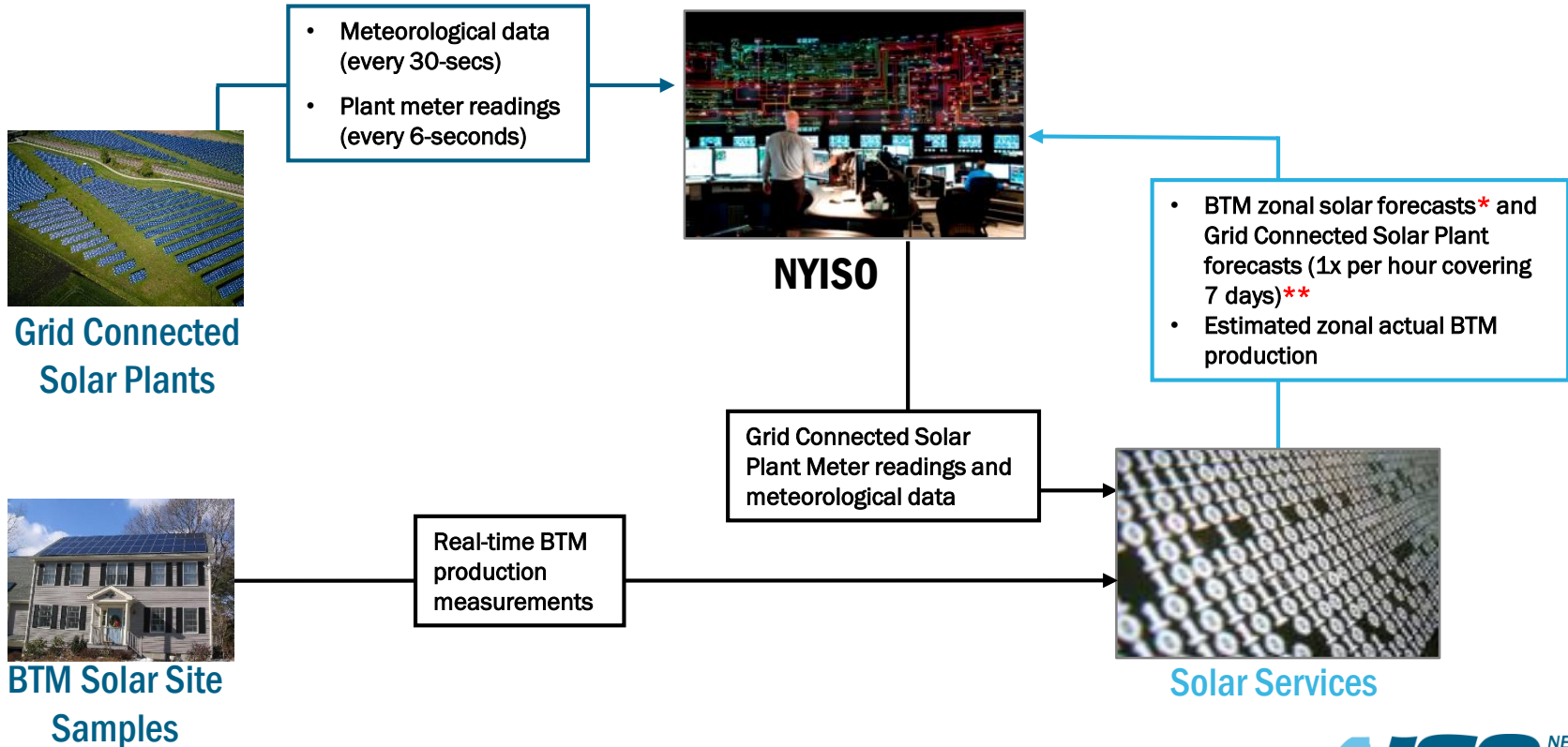
Daily Time Series of NYCA Installed Capacity, 2012 to 2019



Non-Wholesale Solar PV Forecasting

- NYISO subscribes to service which monitors, in real-time, solar PV inverter data for about 8,000 sites, aggregates the data into small regions, and makes it available to NYISO's solar forecasting service. The monitored sites are closely representative of the entire population of non-wholesale solar PV sites in New York, numbering around 80,000
- NYISO's solar forecasting service develops solar forecast (irradiance and MW) and provides to NYISO
 - Forecasts developed at 15-minute intervals, updated hourly. Forecasts cover the next 7 days ahead.
- NYISO has the capability to integrate non-wholesale solar PV forecasts into the 5-minute load forecasts

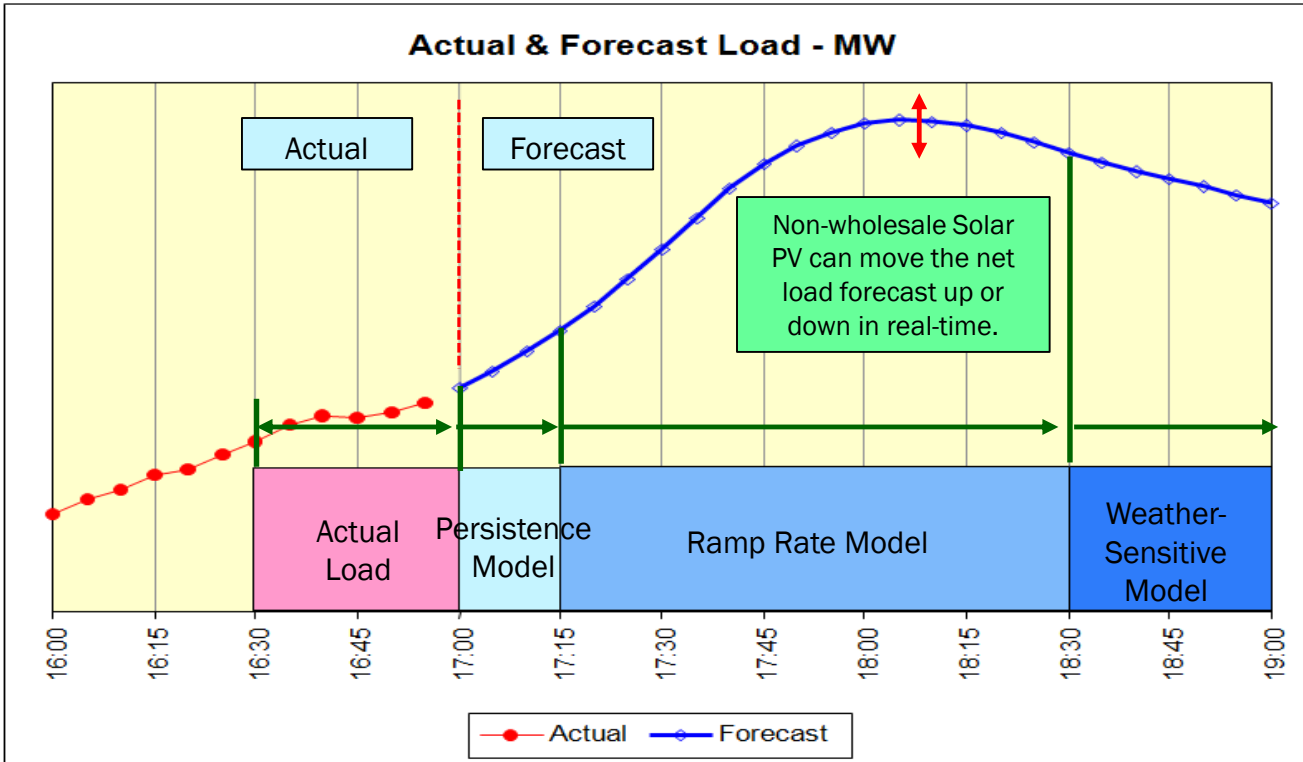
Solar Forecasting Details



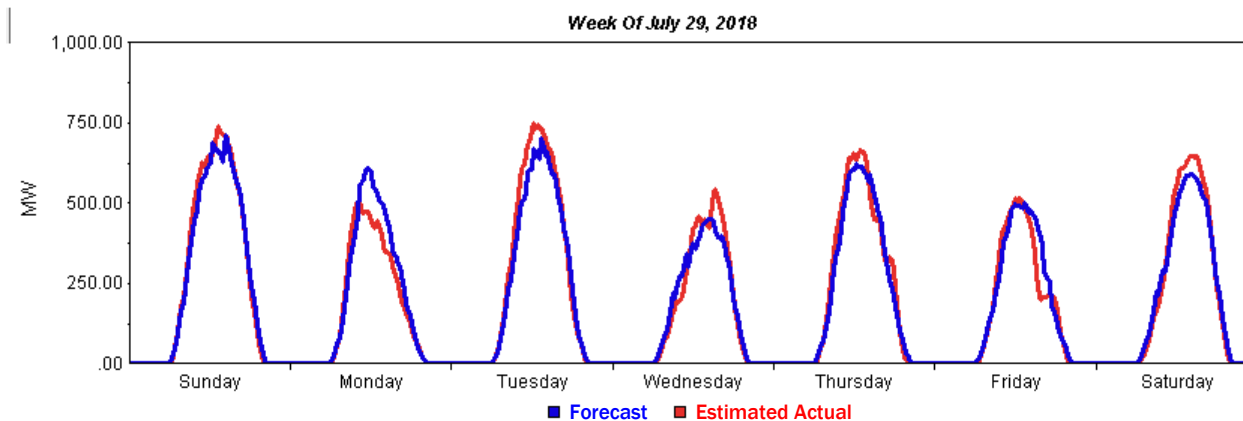
* BTM zonal solar forecasts are integrated into the NYISO's load forecasting system

** Grid-scale solar plant forecasts are only integrated into NYISO's EMS at this time, not its Market Systems

Real-Time Forecast Schematic



NYCA-Wide Non-Wholesale Solar PV, Forecast & Estimated Actual – Week of July 29, 2018



	DATE	12:45	13:00	13:15	13:30	13:45	14:00	14:15	14:30	14:45	15:00
▶	Sun, 7/29/2018	671.36	658.58	663.77	656.46	645.34	630.10	711.02	691.42	670.01	646.44
	Mon, 7/30/2018	541.32	529.18	509.06	502.79	490.63	472.54	456.23	440.38	421.23	398.38
	Tue, 7/31/2018	650.11	637.09	703.84	687.09	668.04	645.48	638.59	638.29	614.14	584.53
	Wed, 8/1/2018	388.78	399.13	428.78	431.32	435.41	439.85	452.36	451.04	448.50	443.25
	Thu, 8/2/2018	616.02	606.94	611.55	598.10	584.59	569.15	588.91	566.85	548.45	524.54
	Fri, 8/3/2018	490.36	483.61	503.04	494.35	483.84	470.62	477.25	467.27	459.87	445.86
	Sat, 8/4/2018	549.72	562.43	580.00	584.86	587.53	589.95	590.24	584.68	581.93	573.59

Table shows MW-AC forecasts at 15 minute intervals

DER: Additional Operations' Considerations

DER: Additional Operations' Considerations

- **NYISO Operations continues to monitor and evaluate if any additional changes are required to integrate DER:**
 - Regulation requirements
 - Operating reserve requirements
 - Geographical granularity
 - Solar PV forecasting
 - Load forecasting
 - Behind-the-meter (non-wholesale) DER
 - Price responsive load
 - Geographical granularity
 - Transmission security requirements
 - Voltage support requirements
 - Black start requirements
 - Future market design efforts to incent resource flexibility and dispatchability

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



www.nyiso.com