NYISO Solar Forecasting

Arthur Maniaci
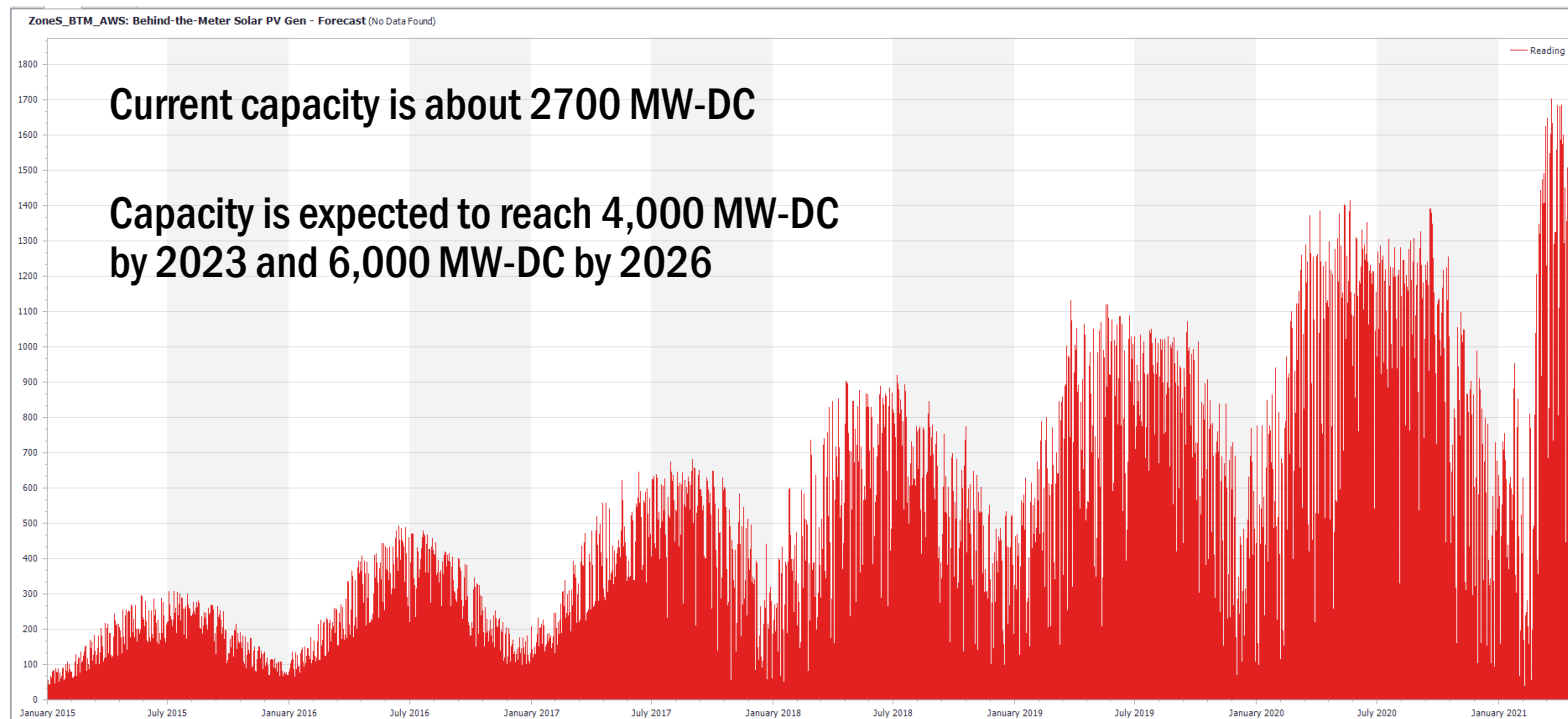
Principal Forecaster, Demand Forecasting & Analysis

Department of Energy, SETO Workshop on Solar Forecasting (ISO/RTO Panel Discussion)
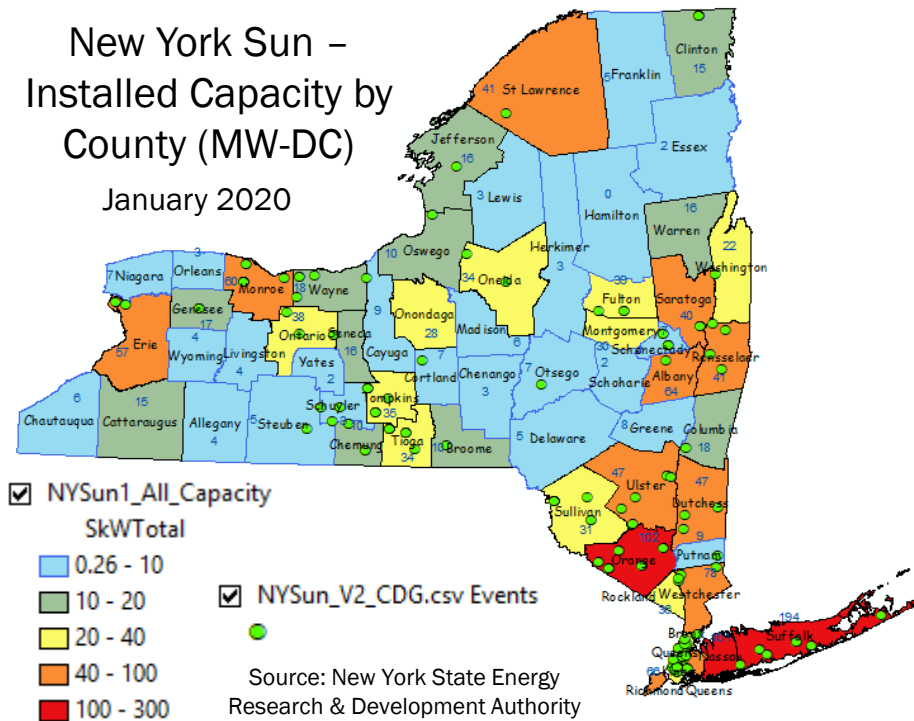
May 5, 2021

BTM Solar Generation is on the Rise...

Growth of BTM Solar Generation From 2015 to Present (NYCA)

ZoneS_BTM_AWS: Behind-the-Meter Solar PV Gen - Forecast (No Data Found)

Current capacity is about 2700 MW-DC

Capacity is expected to reach 4,000 MW-DC
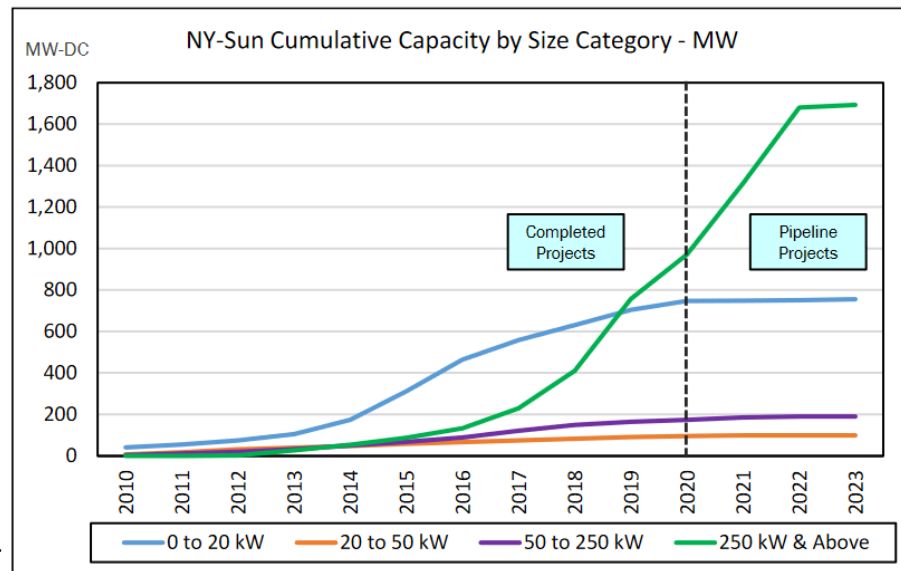by 2023 and 6,000 MW-DC by 2026

New York ISO

Variations in BTM Solar System Growth

Estimated Total Capacity - 2,730 MW-DC as of April, 27, 2021

New York Sun – Installed Capacity by County (MW-DC)

January 2020

☑ NYSun1_All_Capacity

SkWTotal

☐ (light blue)	0.26 - 10
☐ (green)	10 - 20
☐ (yellow)	20 - 40
☐ (orange)	40 - 100
☐ (red)	100 - 300

☑ NYSun_V2_CDG.csv Events
● (green dot)

Source: New York State Energy Research & Development Authority

Growth rates are varying spatially and by system size/characteristics

NY-Sun Cumulative Capacity by Size Category - MW

Completed Projects

Pipeline Projects

— 0 to 20 kW   — 20 to 50 kW   — 50 to 250 kW   — 250 kW & Above

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Solar Forecasting for Grid & Market Operations

- Forecasts are produced for both grid-connected and behind-the-meter (BTM) solar facilities across the New York Control Area (NYCA)

- Actual data is obtained for both solar irradiance and solar power:
  - Solar irradiance is estimated from satellites and corroborated with the NYS Mesonet observation network
  - Grid-connected solar facilities provide power output directly to the NYISO
  - Behind-the-meter facilities deliver inverter data to a third party who aggregates power output from 11,000 sites and delivers to the NYISO and its solar forecasting provider

- Forecasts for irradiance, grid power and behind-the-meter power are updated once per hour at fifteen minute intervals, 7 days ahead

- Behind-the-meter solar power forecasts are integrated into the load forecast, for real-time dispatch, real-time commitment, and the day-ahead market.

- The project to develop this capability and integrate it into grid operations was implemented in November, 2017

- Solar-on-Dispatch market change expected to implemented in Summer 2021

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NYISO Solar Forecasting System

NYS Mesonet
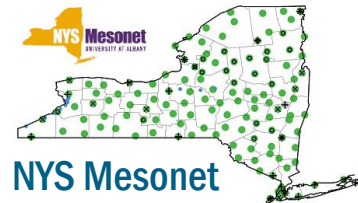
Grid Connected Solar Plants

- Meteorological data (every 30-secs)
- Plant meter readings (every 6-seconds)
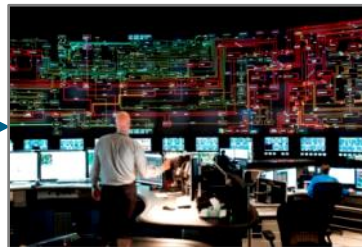
NYISO

Grid Connected Solar Plant Meter readings

- BTM zonal solar forecasts* and Grid Connected Solar Plant forecasts (4x per hour covering 7 days)
- Estimated zonal actual BTM production
- Station level and regional irradiance/weather

Sensible weather & irradiance measurements

BTM Solar Site Samples

Residential

Community Solar

Real-time BTM inverter measurements

Solar Forecasting Vendor

*   BTM zonal solar forecasts are integrated into the NYISO's load forecasting system. Data is currently updated once per hour at 15 minute intervals.

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Solar Forecasting Challenges/Opportunities

- The use of actual inverter data in real-time forecasting and retrospective analyses has proven invaluable (e.g. orientation, shading, module/inverter behavior, impacts of rain and snow, outage rates are captured). Latency of the measurement data can be a challenge on select systems.

- NYISO is upgrading its solar forecasting systems to include 4 size categories to improve real-time forecast accuracy and the conversion of DC to AC power.

- Satellite estimates of irradiance are key for near-term forecasting. Improving numerical weather predication for day-ahead forecasting activities is a key area of improvement (e.g. convective initiation and other mesoscale structures).

- Probabilistic forecasting: additional diagnostics on the uncertainty of the solar irradiance and BTM solar generation forecasts can provide valuable information needed for probability of exceedance forecasts. This information has strong implications for future development of ancillary services in the energy markets.

- Additional information on the attributes and behavior of hybrid systems (e.g. single-axis tracking solar & energy storage) is desired as these systems proliferate in size and number.

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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

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