New York ISO
Independent System Operator

2024 Long Term Forecast Assumptions: Load Modifiers

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Demand Forecasting & Analysis – Grid Transition

LFTF/ESPWG

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Topics

- Behind-the-Meter (BTM) Solar
- Energy Efficiency
- Energy Storage
- Non-Solar Distributed Generation

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Behind-the-Meter Solar Forecast

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BTM Solar Forecast Background

- **The forecast focuses largely on distributed generation solar PV projects**
  - Projects that are typically 5 MW (AC) or less in and capacity and are connected to the distribution system
- **The forecast does not consider market or policy drivers oriented towards grid connected projects (i.e., projects >= 20 MW)**
  - Select large solar projects participating as load modifying generation are factored into the BTM-PV forecast
- **Several factors influence the growth of BTM PV installations in the NYCA:**
  - Policy: State and Federal tax credits and incentives
  - Private investment in PV development
  - Costs: Electricity rates and pricing on installation and equipment
  - Number and size of projects in the utility interconnection queues

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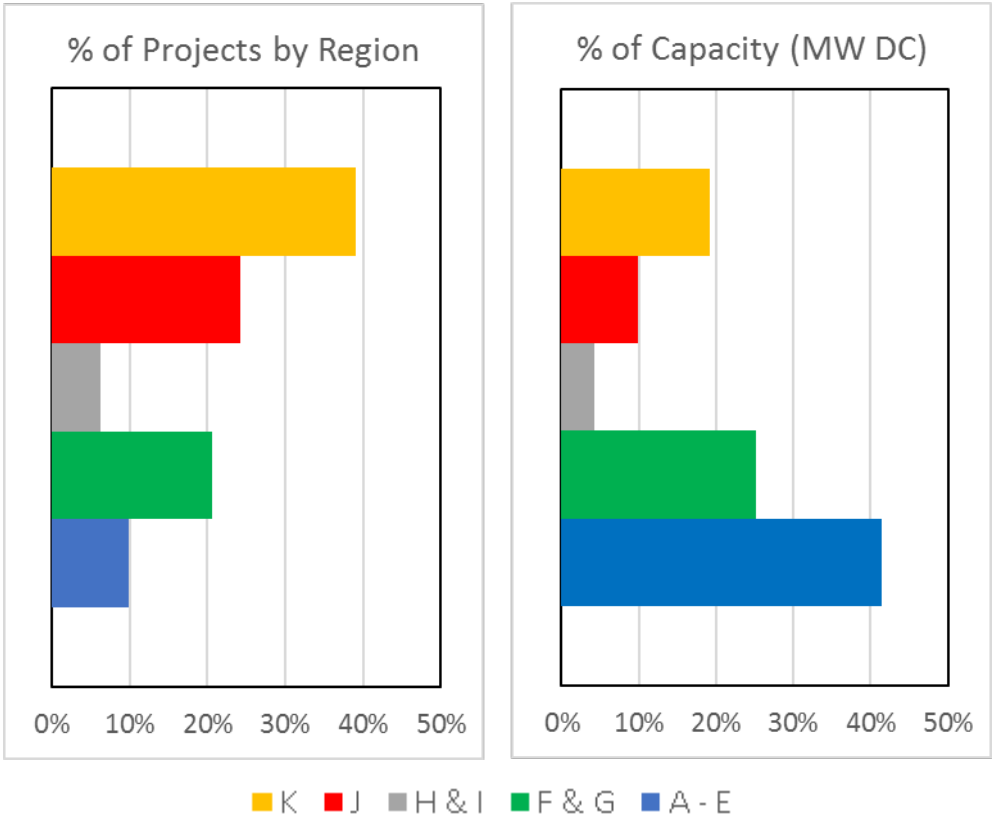
Cumulative BTM Totals



Summary of BTM Solar installations by NYCA region, December 2023

Region	Total Capacity (MW DC)	Total Capacity (MW AC)	Total # of Sites	AC/DC Ratio
A - E	2,144	1,641	21,631	77%
F & G	1,301	1,039	44,994	80%
H & I	223	184	13,461	83%
J	508	423	52,919	83%
K	995	839	85,109	84%
Total	5,172	4,127	218,114	80%

Source: NYS Department of Public Service and NY Utilities – Standard Interconnection Request (SIR) data

AC to DC Ratios were derived using information from the NYSERDA NYSun completed project and California Energy Commission (inverter attributes) data sets

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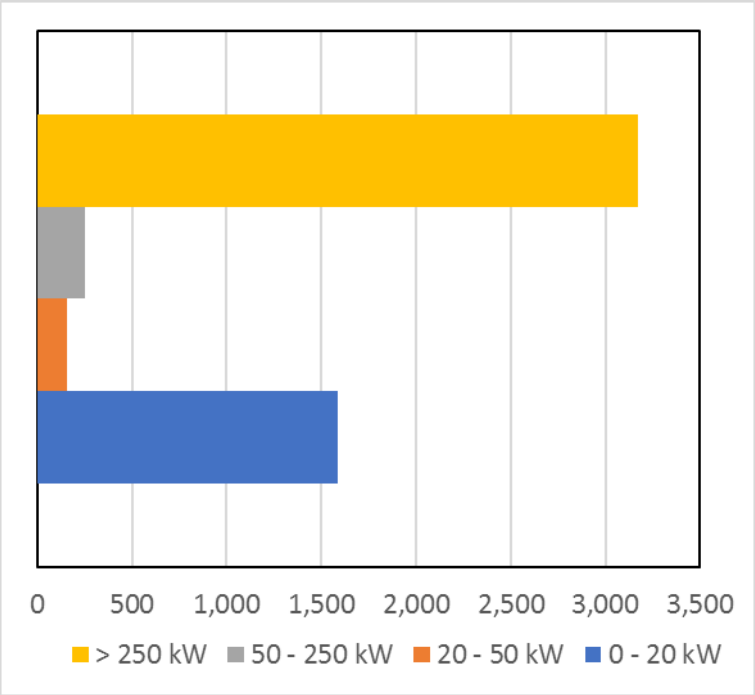
BTM Solar Installed Capacity - 2023

Installations by size category (MW DC)



Size Category (MW DC)	# of Projects	Total Capacity (MW DC)	Total Capacity (MW AC)	AC/DC Ratio
0 - 20 kW	208,672	1,587	1,366	86%
20 - 50 kW	5,671	159	136	86%
50 - 250 kW	2,400	253	210	83%
> 250 kW	1,371	3,174	2,410	76%
NYCA	218,114	5,172	4,122	80%

Source: NYS Department of Public Service and NY Utilities – Standard Interconnection Request (SIR) data

AC to DC Ratios were derived using information from the NYSERDA NYSun (completed projects) and California Energy Commission (module and inverter information) data sets

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Recent Trends in BTM Solar Growth

- Regional growth across the New York Control Area (NYCA) totaled 882 MWs in 2023
- Forecasted growth was 944 MWs, which is 62 MW higher than realized (1.2% of total year end installed capacity)

Region	2023 Forecasted Growth (MW DC)	2023 Actual Growth (MW DC)	Difference (MW)	% Difference vs 2023 Total Capacity
A - E	572	449	123	5.7%
F & G	258	191	67	5.1%
H & I	27	33	-6	-2.7%
J	42	85	-43	-8.4%
K	45	123	-78	-7.9%
Total	944	882	62	1.2%

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BTM Solar – Installed Capacity Forecast

- The forecast is guided by NYISO independent analysis and input from Transmission Owners
  - NY Utilities: SIR data set and projected deployment patterns/timelines
- Historical growth rates across the NYCA are also used to inform the forecast along with state policy objectives and recent attainment of the policy objectives
  - NYSERDA NY Sun Program Incentives: Trends in current and pipeline projects
- Recent trends in BTM Solar growth can largely be attributed to policy programs developed by both New York state and Federal programs

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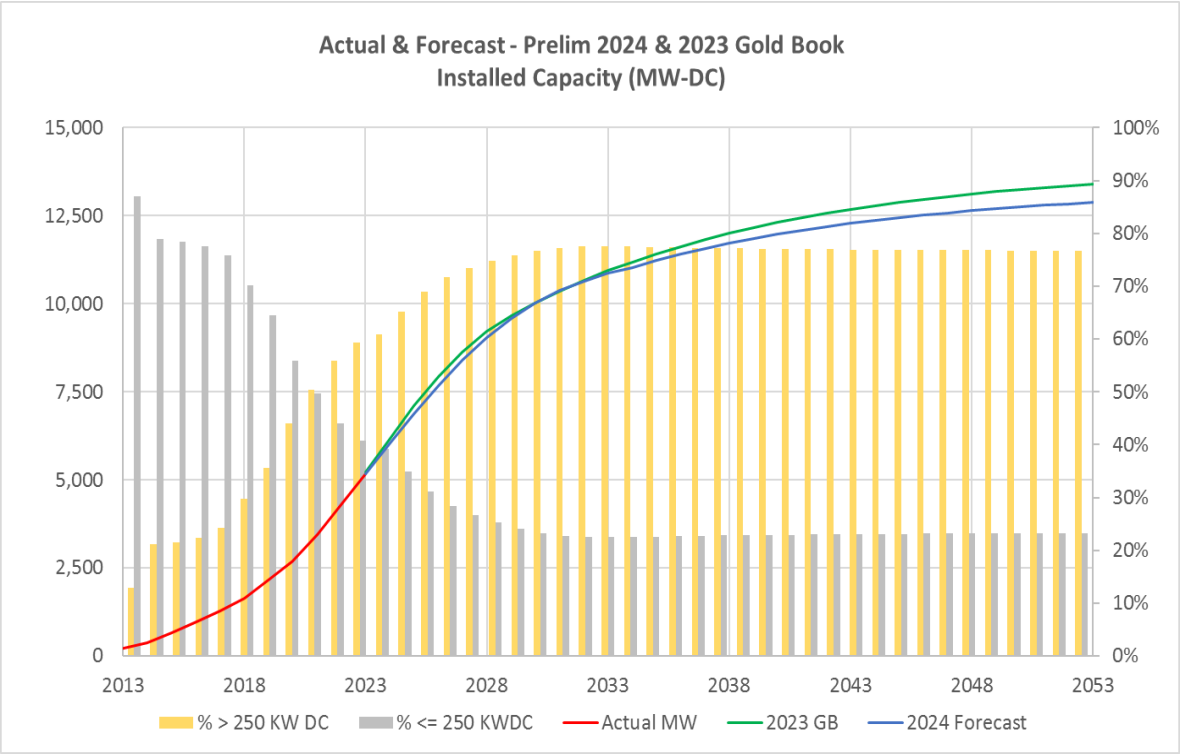
Preliminary Installed Capacity Forecast



- All actual and forecast values represent the end of year BTM Solar installed capacities
- Forecast includes strong capacity growth through 2030
  - >75% of 10GW 2030 NYS goal exists between complete and current pipeline projects
- Growth of the BTM resource after 2030 is reduced
  - Capacity growth is discounted due to a higher degree of uncertainty surrounding possible expansion of existing programs
- Significant grid connected solar is planned throughout 2030 (>15 GW of installed capacity in the latest NYISO interconnection queue)

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BTM Solar – Preliminary Energy Forecast

- Energy projections in the PV forecast factor in the incremental growth during a given year based on historical monthly deployment data (slide 11)
- BTM Solar energy forecast is developed at the zonal level using regional and zonal monthly capacity factor data
- Annual and monthly capacity factor estimates were developed from 5 years (2019-2023) of BTM PV solar generation estimates

Zone(s)	Annual Capacity Factor
A-E	**12.2%**
F&G	**12.7%**
H&I	**13.1%**
J	**12.9%**
K	**13.3%**

Source: NYISO inverter data samples

Capacity factor values are calculated based on MW AC generation values compared to MW DC installed nameplate amount

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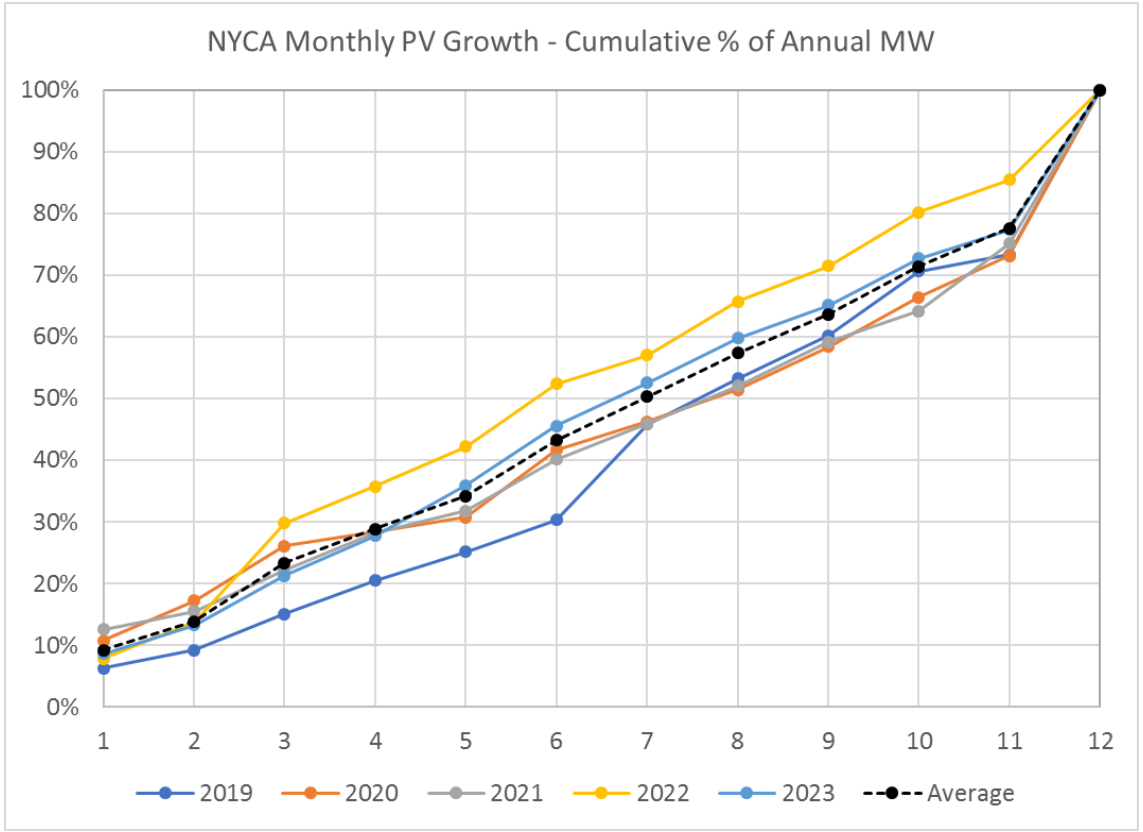
BTM Solar – Preliminary Energy Forecast



Month	% of Annual Capacity	Cumulative % of Annual Capacity
1	9%	9%
2	5%	14%
3	9%	23%
4	5%	29%
5	5%	34%
6	9%	43%
7	7%	50%
8	7%	57%
9	6%	64%
10	8%	71%
11	6%	78%
12	22%	100%

Source: NYS Department of Public Service and NY Utilities – Standard Interconnection Request data

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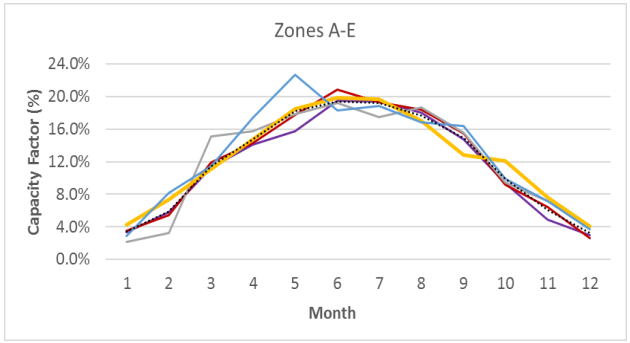
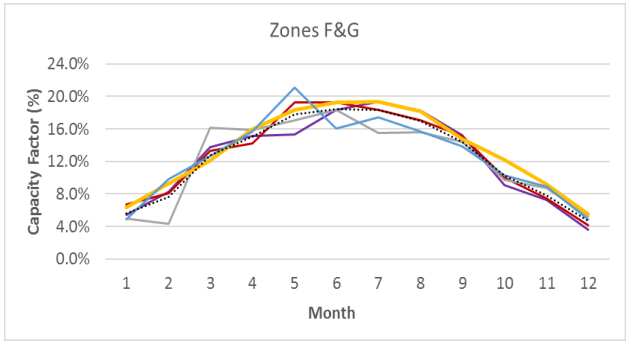
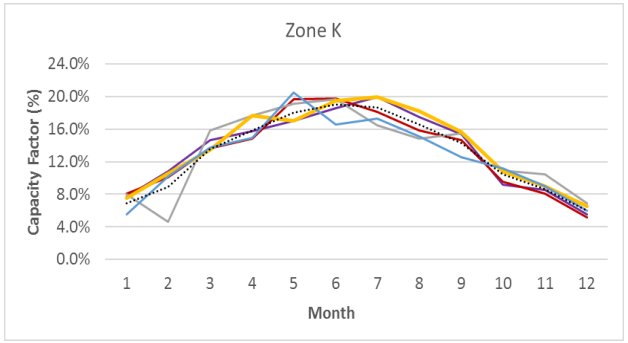
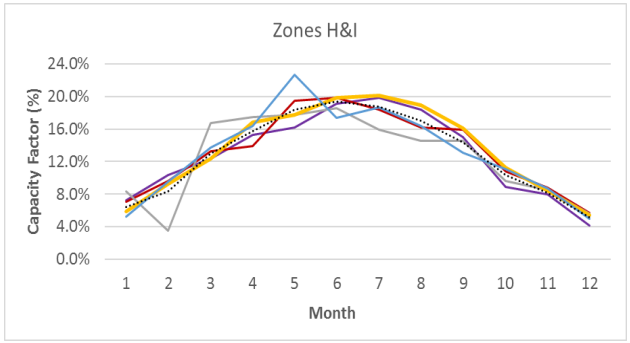
BTM Solar – Preliminary Energy Forecast

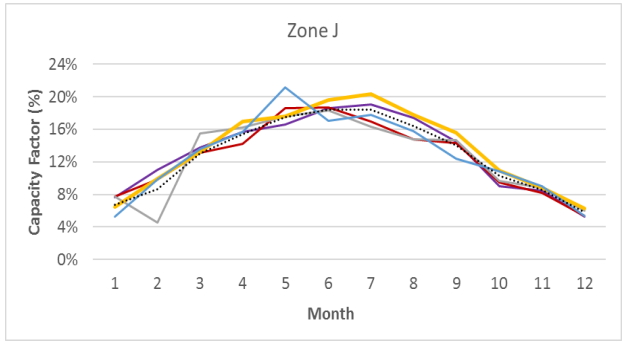
Monthly Capacity Factor Values by Region











Source: NYISO Real-time inverter data sampling

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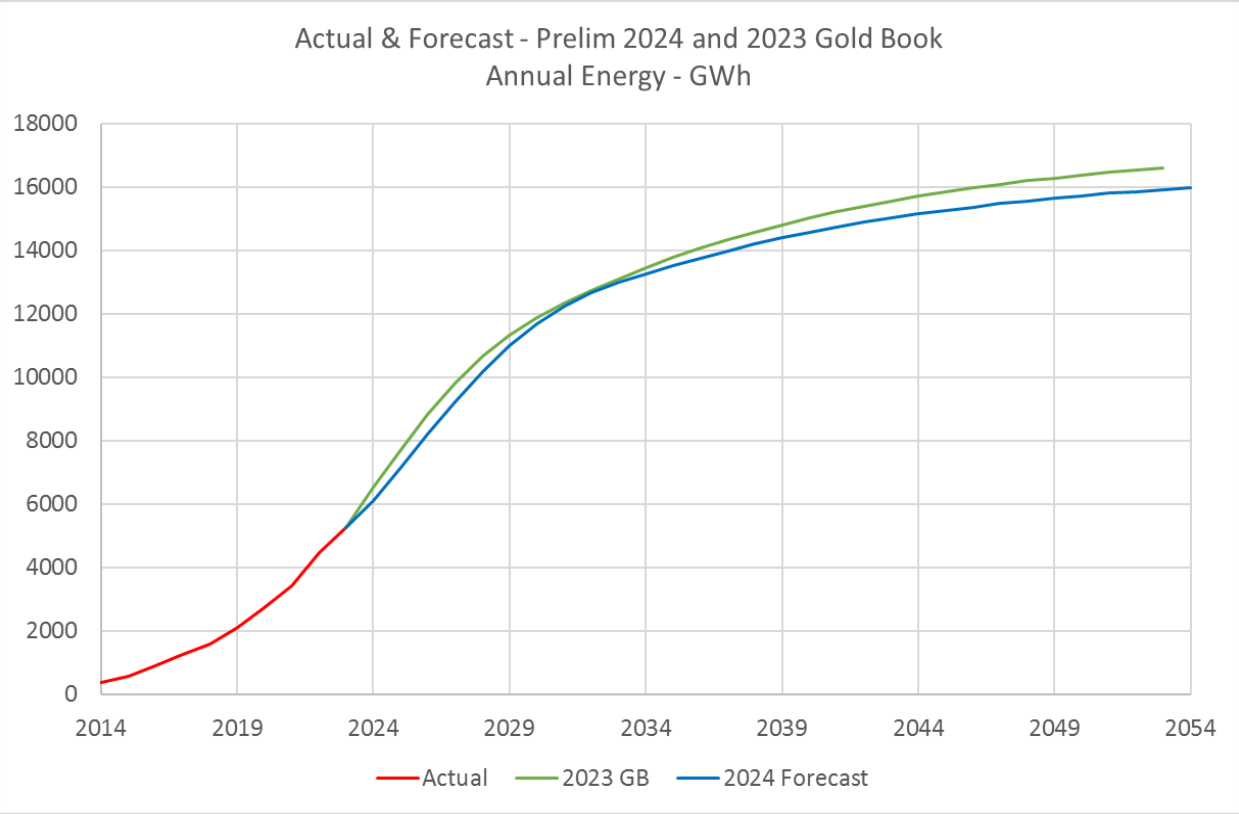
BTM Solar – Preliminary Energy Forecast



Energy values through 2030 have dropped slightly compared to last year's forecast

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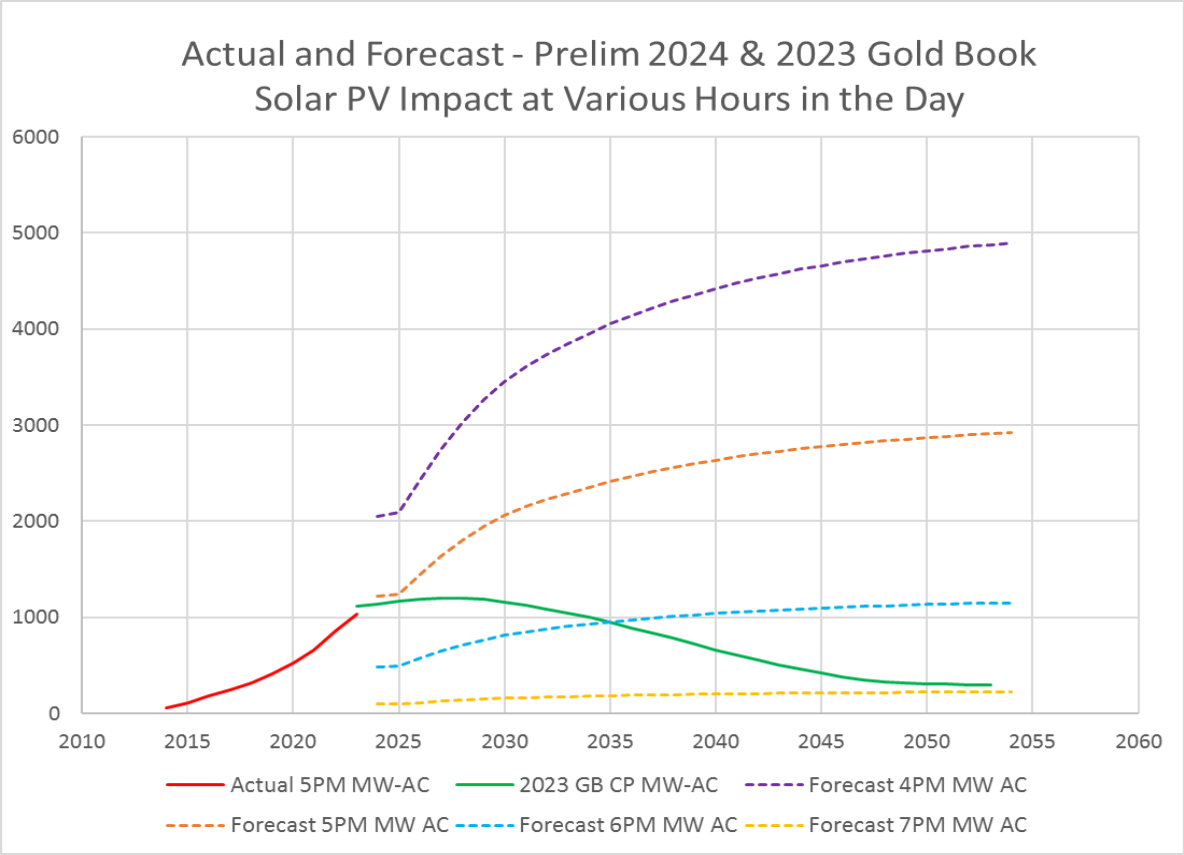
BTM Solar – Summer Peak Impact



The hour of the NYCA system coincident peak is expected to change in future years. The impact of Solar PV on the peak decreases as the hour of the peak moves later in the day.

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Energy Efficiency

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Energy Efficiency and Codes & Standards Impacts

- **Primary data sources for historical energy savings estimates:**
  - Utility ETIP and Clean Energy Dashboard scorecards
  - DPS and NYSERDA energy efficiency and building electrification reporting
  - EIA annual energy efficiency reporting data

- **Primary forecast considerations:**
  - Programmatic energy savings driven by State energy efficiency policy targets
  - Building codes and appliance efficiency standards
  - Future heating and cooling load reductions from building shell improvements

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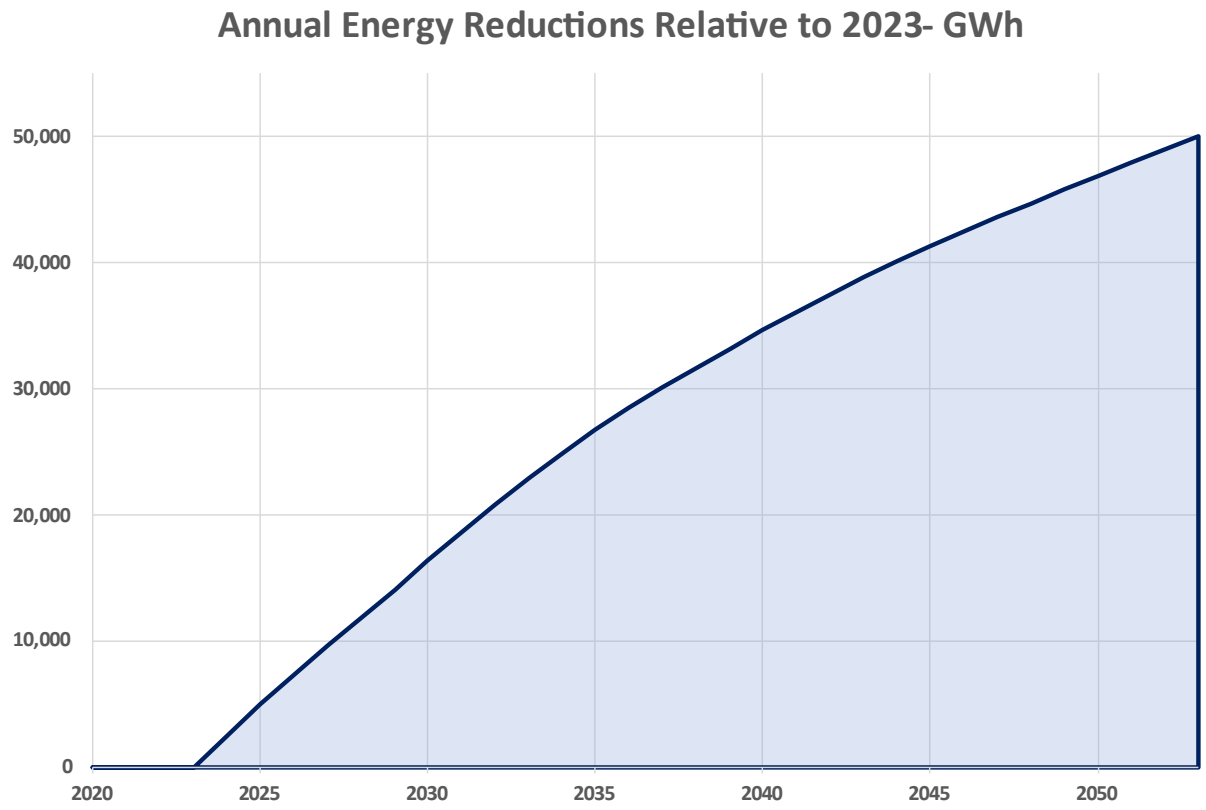
Preliminary Energy Efficiency and Codes & Standards Forecast



Seasonal Coincident Peak Reductions* - MW

Year	Summer Peak	Winter Peak
2025	900	700
2030	3,100	2,500
2035	5,200	4,300
2040	6,800	6,100
2045	7,900	7,900
2050	8,800	9,600
2054	9,300	10,800

* Relative to 2023

These are preliminary estimates and subject to revision prior to the Gold Book forecast

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Energy Storage

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Energy Storage Forecast

- The Gold Book storage capacity forecast includes only behind-the-meter (BTM) storage
- The BTM storage forecast considers storage resources included in the SIR database and information from Transmission Owners
- A portion of installed BTM storage is expected to reduce system peak demand by injecting energy into the grid during the summer and winter peak hours
- Both wholesale and BTM storage resources have relatively small net annual electricity consumption due to less than 100% round trip efficiency of the charging/discharging cycle
- There is an underlying wholesale storage capacity projection used to estimate net electricity consumption, which considers storage resources listed on the NYISO Interconnection Queue
- The large majority of projected storage capacity in the long run is expected to be wholesale, based on the relative sizes of the NYISO wholesale and SIR BTM project pipelines
- The total (wholesale + BTM) underlying storage capacity projection is consistent with New York State energy storage targets

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Preliminary Energy Storage Forecast

NYCA Preliminary Energy Storage Forecast

	Behind-the-Meter Only		*BTM + Wholesale*
Year	Capacity (MW)	Peak Reductions (MW)	Net Energy Consumption (GWh)
2025	400	300	200
2030	900	600	900
2035	1,400	1,000	1,300
2040	2,000	1,400	1,800
2045	2,500	1,800	2,200
2050	2,800	2,000	2,600
2054	3,000	2,100	3,000

These are preliminary estimates and subject to revision prior to the Gold Book forecast

Pipeline Storage in the Queue:

NYISO IQ: ~ 38,000 MW

SIR: ~ 3,000 MW

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Non-Solar DG

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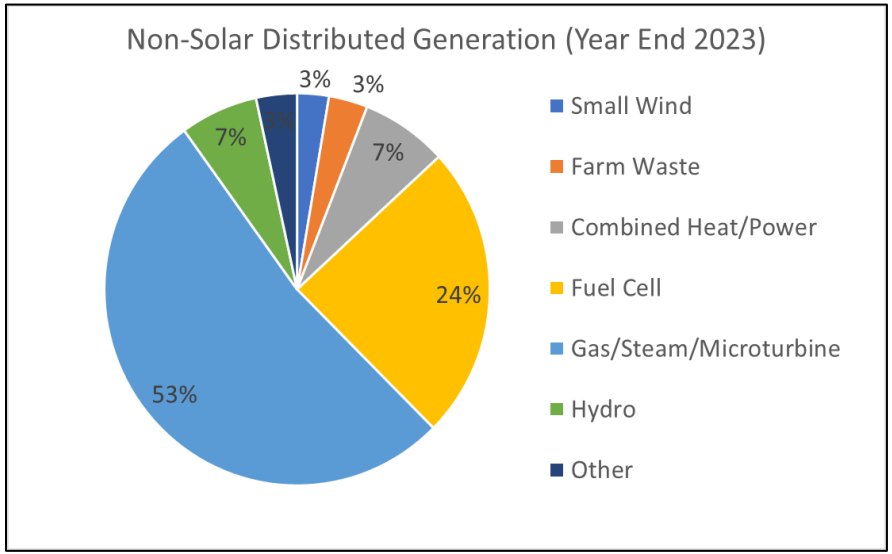
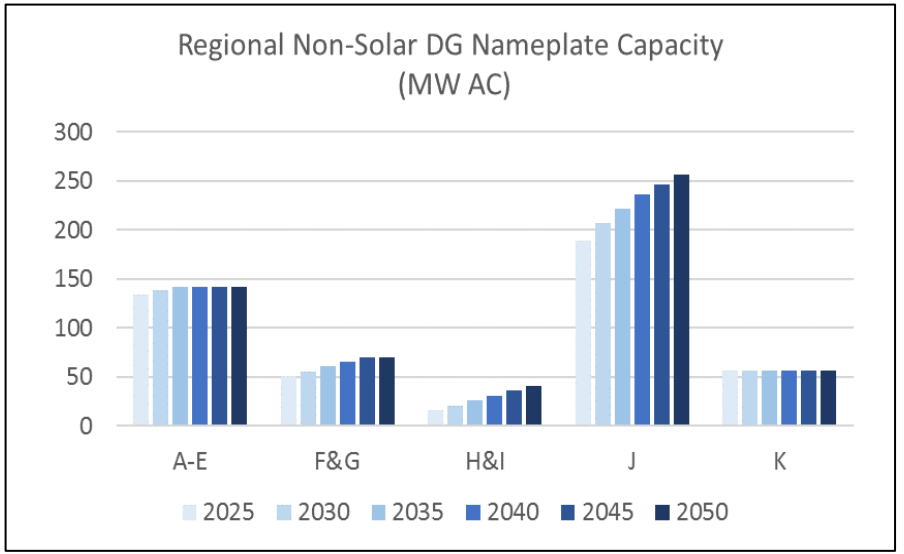
Non-Solar DG Forecast

The forecast considers non-solar generation resources included in the SIR database and information from Transmission Owners





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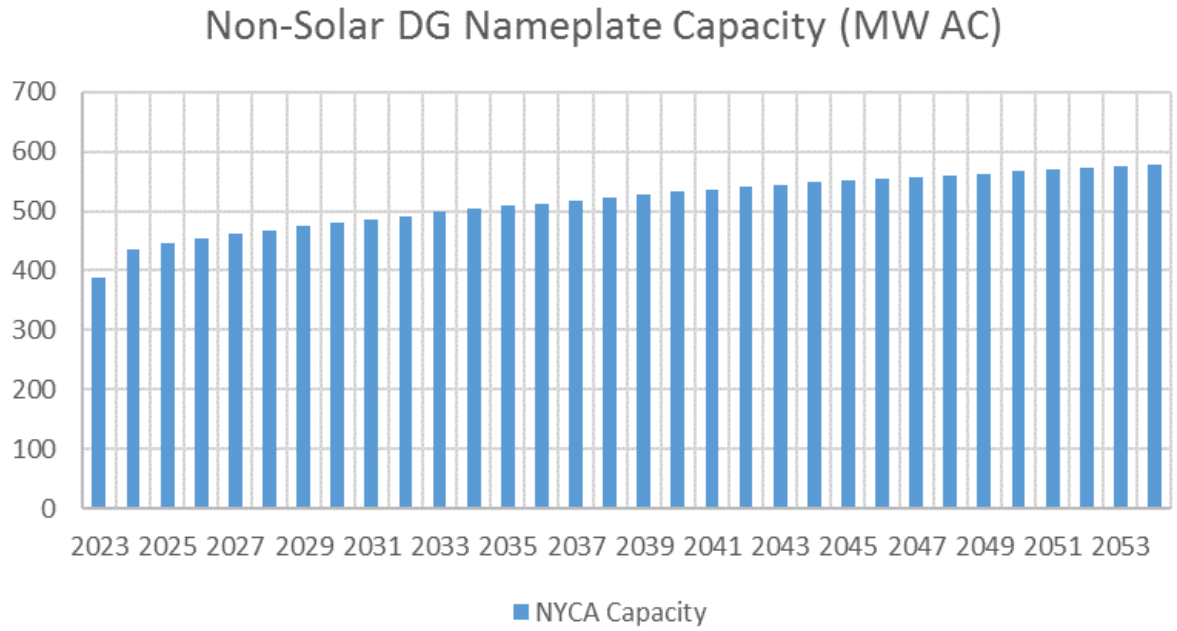
Non-Solar DG Forecast



NYCA Non-Solar DG Impacts

Year	Energy (GWh)	Peak Reductions (MW AC)
2025	2,068	361
2030	2,222	388
2035	2,352	410
2040	2,461	429
2045	2,550	445
2050	2,615	456

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Questions?

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Our Mission & Vision

Mission

Ensure power system reliability and competitive markets for New York in a clean energy future

Vision

Working together with stakeholders to build the cleanest, most reliable electric system in the nation

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