Incorporating Customer-Sited Solar PV in Electric Power Forecasts

Arthur Maniaci
Supervisor, Load Forecasting & Energy Efficiency
New York Independent System Operator

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Overview

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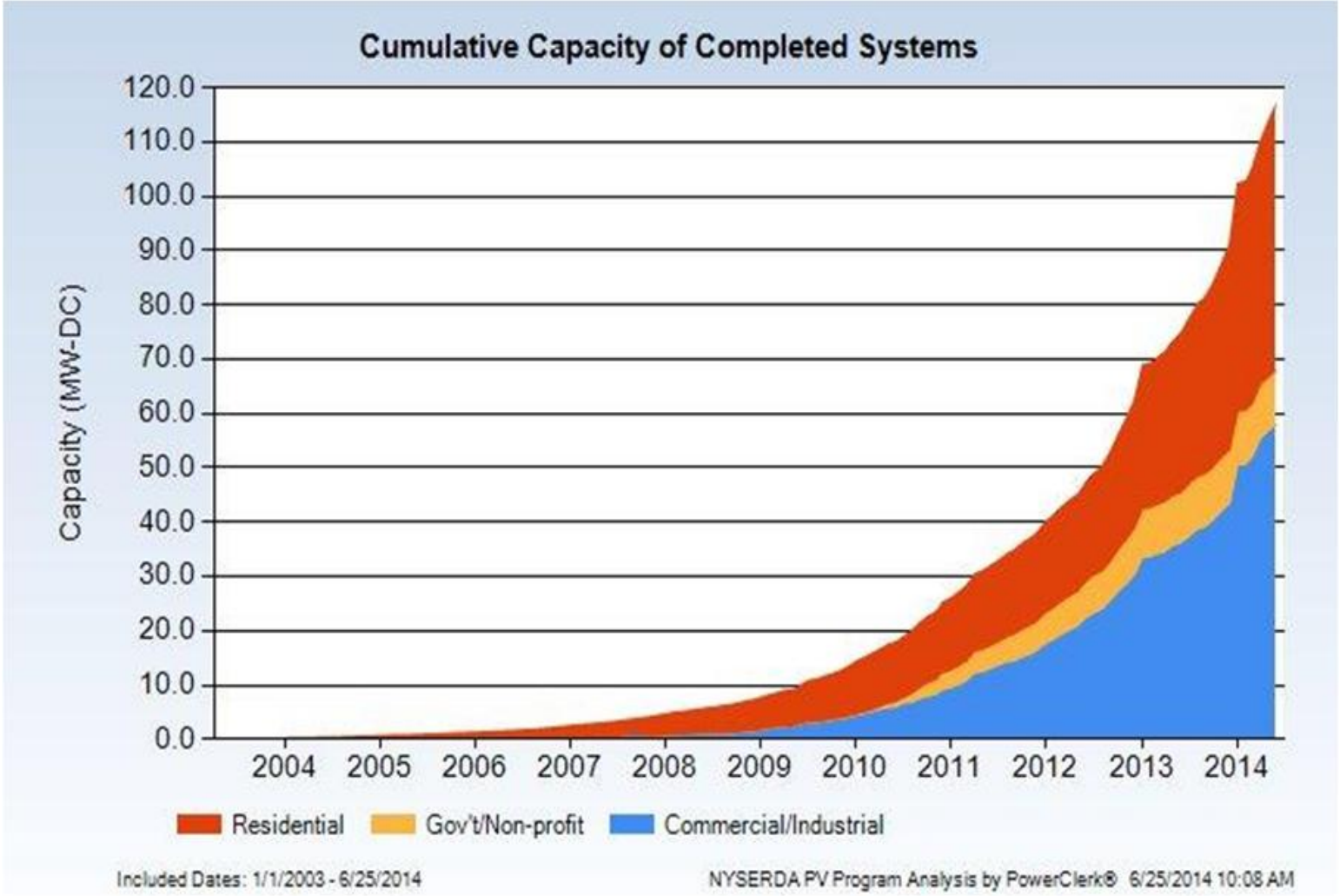
NY Sun Initiative

- Current goal is to install 3,000 MW of customer-sited solar PV by 2023.
- Expected commitment from NY of nearly $1 billion dollars.
- Incentive payments to decrease over time, so as to induce a market transformation
- Current installed capacity is about 245 MW statewide and has seen high growth rates since 2011
- Federal Solar Investment Tax Credit will expire in 2016; impact on NY installations not known.
- Interconnection standards and DC-AC inverter standards are emerging issues.

Residential Solar PV Installed Capacity
200 kW Tier



Current Installed Capacity of Customer-Sited Solar PV MW(DC) (as of August 2014)

(a)	(b)	(c)	(d)	(e)=(d/c)	(f)=(d_i /Σd_i)	(g)	(h)=(d/g)
Zone	Metro Area	Number of Solar PV Systems	Total MW, DC	Avg kW, DC	Pct of Solar PV MW in Zone	2013 Peak MW	Pct of SPV MW as Share of 2013
A	Buffalo	839	15.4	18.4	6.7%	2,549	0.6%
B	Rochester	539	4.8	8.8	2.1%	2,030	0.2%
C	Syracuse	701	16.4	23.5	7.1%	2,921	0.6%
D	Plattsburg	88	0.9	10.4	0.4%	819	0.1%
E	Utica	1,259	7.7	6.2	3.4%	1,540	0.5%
F	Albany	2,173	43.2	19.9	18.7%	2,392	1.8%
G	Poughkeepsie	2,634	30.2	11.5	13.1%	2,358	1.3%
H	Westchester	322	4.3	13.4	1.9%	721	0.6%
I	Westchester	549	7.3	13.3	3.2%	1,517	0.5%
J	New York City	1,345	31.2	23.2	13.5%	11,456	0.3%
K	Long Island	8,687	68.9	7.9	29.9%	5,653	1.2%
	Total	19,136	230.3	12.0	100.0%	33,956	0.7%

(1) Data includes NYSERDA customer-sited programs for small SPV (<= 200 kW) , large SPV (>200 kW) and LIPA's customer-sited programs.
(2) Solar PV capacity is reported in DC power. Inverter losses to convert DC to AC are not included.

Cumulative Capacity of Distributed Energy Resources (DER) MW (as of August 2014)

Zone	Anaerobic Digesters	Combined Heat & Power	Total MW
A	2.9	5.9	8.8
B	0.7	2.2	2.9
C	2.2	30.8	33.0
D	0.1	0.0	0.1
E	0.9	9.8	10.7
F	0.3	7.5	7.8
G	0.0	0.3	0.3
H	0.0	0.4	0.4
I	0.0	0.7	0.7
J	0.0	63.5	63.5
K	0.0	3.3	3.3
Total	7.1	124.4	131.5

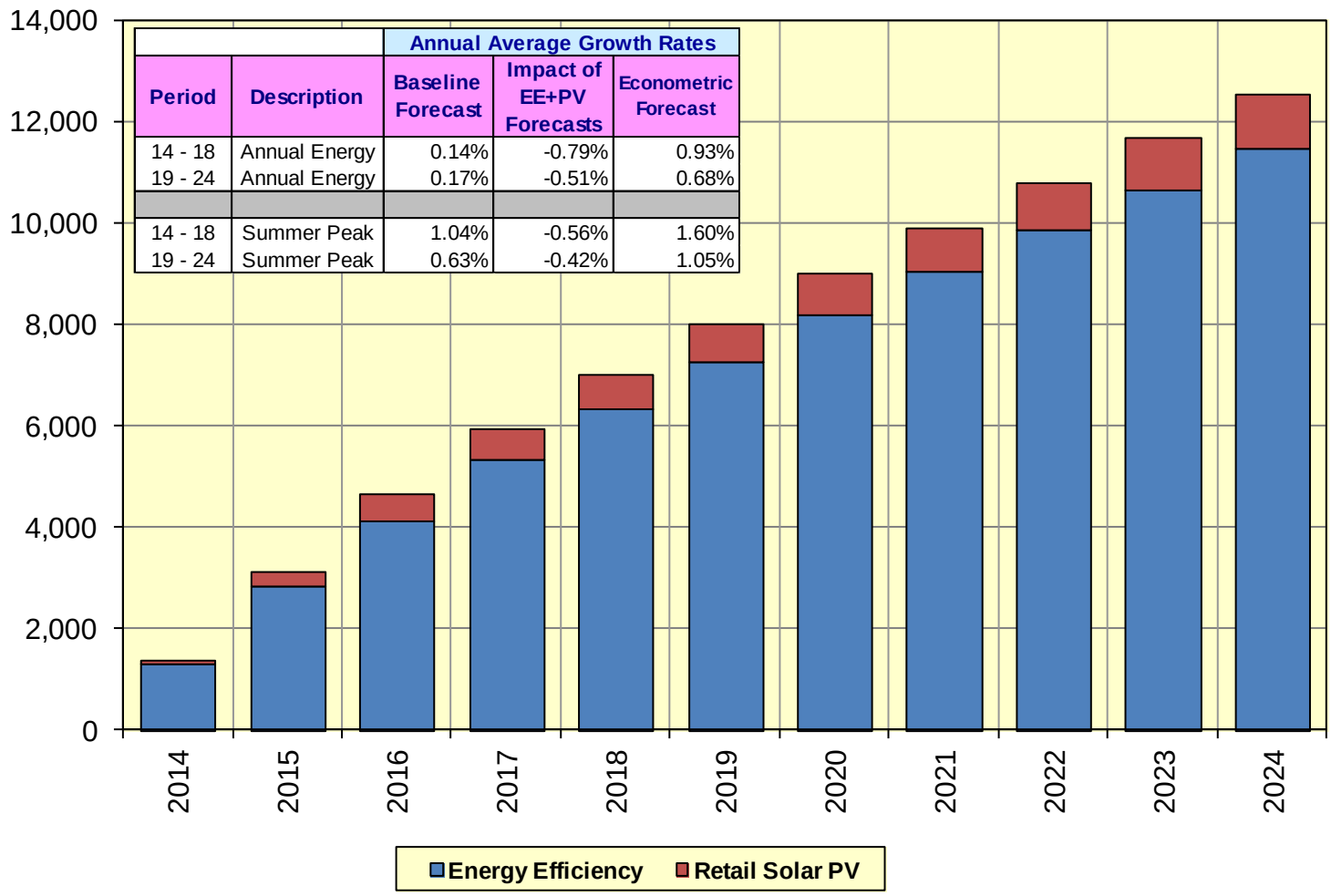
Data from NYSERDA

Long Term Forecast

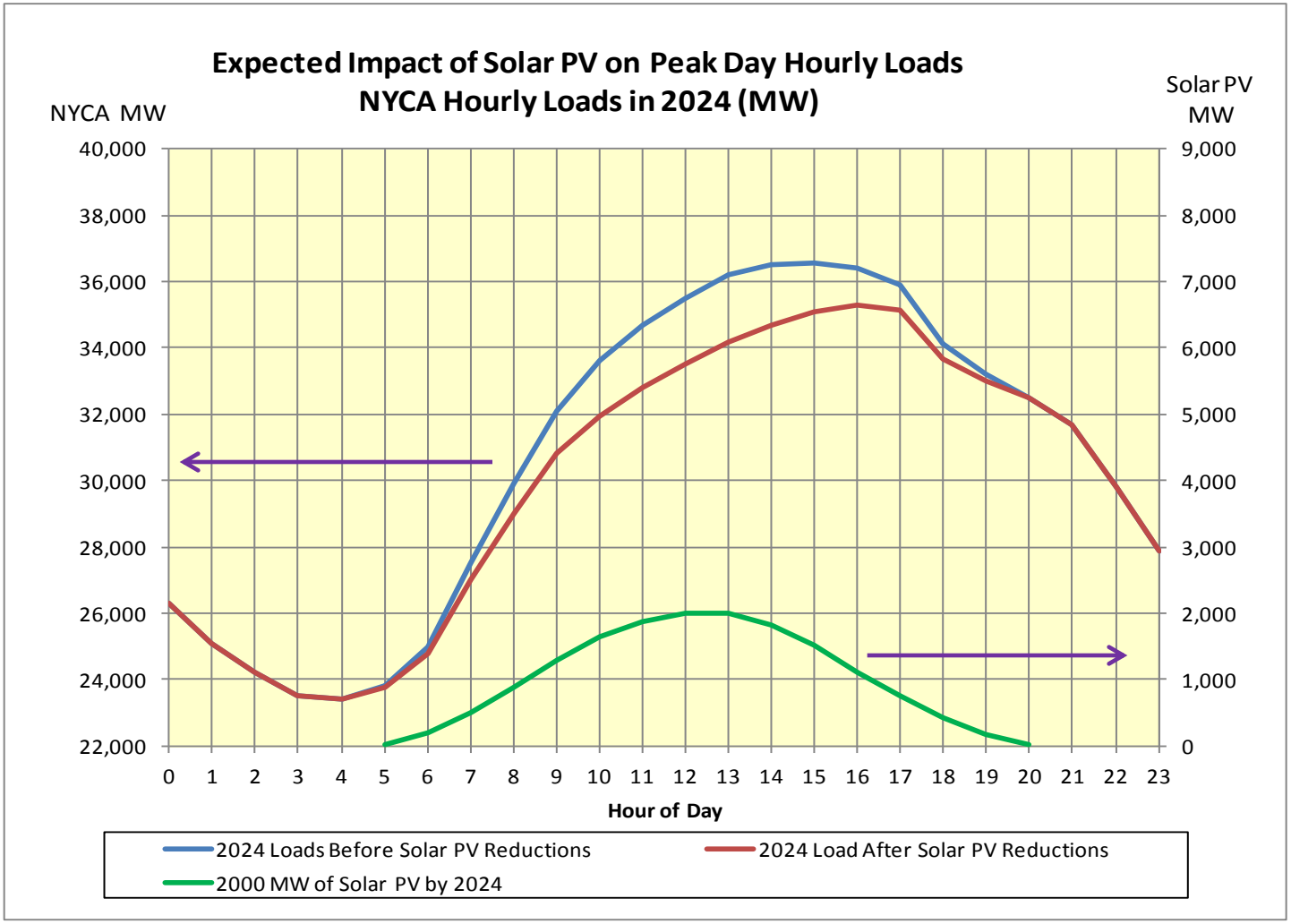
- **Current NYISO forecast recognizes substantial increase in Solar PV capacity over the next 10 years.**
  - ***Must account for inverter losses, sub-optimal orientations, shading, decrease in irradiance by 4 pm.***
- **2014 Gold Book included 2,000 MW DC of new installed solar PV capacity by 2024**
  - ***Net energy impact of solar PV is small, compared to current projections of energy efficiency (1,070 GWh as compared to 11,450 GWh).***
  - ***Current estimate of impact by 2024 is 360 MW reduction of peak demand.***
- **Future projections will be updated based upon observed rate of increase in capacity in overall installed capacity factors.**

Energy Efficiency & Retail Solar PV - Annual Energy (GWh)

		Annual Average Growth Rates		
Period	Description	Baseline Forecast	Impact of EE+PV Forecasts	Econometric Forecast
14 - 18	Annual Energy	0.14%	-0.79%	0.93%
19 - 24	Annual Energy	0.17%	-0.51%	0.68%
14 - 18	Summer Peak	1.04%	-0.56%	1.60%
19 - 24	Summer Peak	0.63%	-0.42%	1.05%



How Solar PV Forecast Will Impact A Load-Shape In The Year 2024



Short Term Forecast

- **Data requirements for fitting a Solar PV model to historic loads**
  - ***Historic time series of installed capacity***
  - ***Concurrent time series of solar irradiance (watts / sq meter)***
  - ***Either: Site-specific technical specifications of location, collector geometry, inverter, power conversion curves***
  - ***Or: Other geographic estimate of aggregate hourly PV output***
- **Short-term forecast requirements:**
  - ***Solar irradiance & cloud cover, 7 days ahead at hourly intervals***
  - ***Rolling projection of capacity growth one to two years ahead on a daily basis to capture near-term capacity expansion.***

Current Forecasting Activities

- Expanding number of weather stations from 17 to 25
- Currently receiving forecasts of hourly irradiance, 7 days ahead
- Working with other ISOs, weather and forecasting consultants on model building and forecasting methods
- Consulting with NYSERDA to identify potential applications of their site-specific data for NYISO forecasting activities – both Solar PV and Combined Heat & Power

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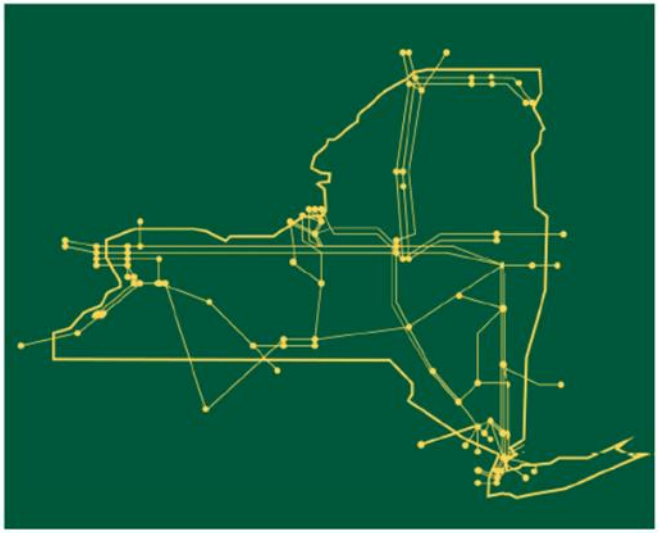

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