Energy Saving Forecasts in the 2015 Gold Book: A Review of Methodology

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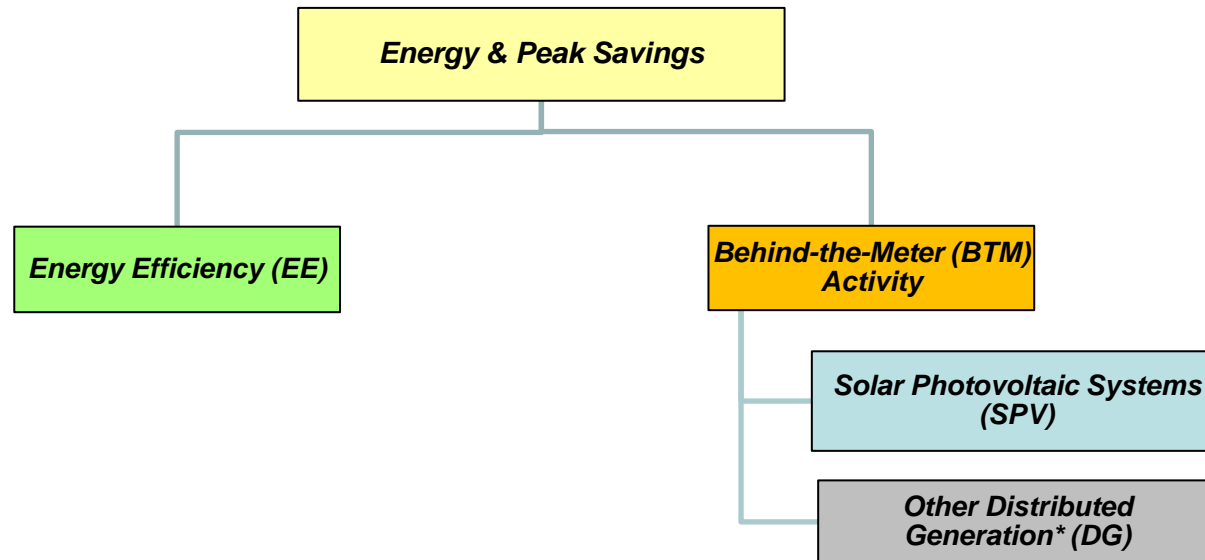*New York Independent System Operator*

ESPWG

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Energy & Peak Saving Impacts

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                    │   Energy & Peak Savings │
                    └───────────┬─────────────┘
          ┌─────────────────────┴──────────────────┐
┌─────────────────────┐              ┌──────────────────────────┐
│ Energy Efficiency   │              │ Behind-the-Meter (BTM)   │
│ (EE)                │              │ Activity                 │
└─────────────────────┘              └───────────┬──────────────┘
                                          ┌──────────────────────────────┐
                                          │ Solar Photovoltaic Systems   │
                                          │ (SPV)                        │
                                          └──────────────────────────────┘
                                          ┌──────────────────────────────┐
                                          │ Other Distributed            │
                                          │ Generation* (DG)             │
                                          └──────────────────────────────┘
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- *The 2015 Gold Book contains a forecast SPV impacts and a combined forecast of EE and DG impacts.*

- *All energy and peak impact forecasts are based on program information and publicly available data from NYSERDA or NYSDPS.*

* *Includes* **Combined Heat & Power (CHP), Anaerobic Digester Gas (ADG), and Fuel Cell systems.**

Clean Energy Fund(CEF) is the major driver of these forecasts

Projected Annual Program Expenditures (millions)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Projected expenditures for existing NYSERDA programs											
Previously approved and/or unexpended expenditures for already launched initiatives (SBC, EEPS & RPS)	**$574**	**$448**	**$168**	**$111**	**$91**	**$79**	**$66**	**$47**	**$34**	**$28**	**$1,646**
Projected program expenditures for recently launched initiatives											
NY-Sun	$121	$149	$149	$150	$139	$99	$61	$33	$-	$-	$901
NYGB	$195	$195	$195	$-	$-	$-	$-	$-	$-	$-	$586
Subtotal	**$316**	**$344**	**$344**	**$150**	**$139**	**$99**	**$61**	**$33**	**$0**	**$0**	**$1,487**
Projected expenditures for new NYSERDA programs											
Market Development	$43	$181	$234	$265	$265	$264	$250	$245	$240	$240	$2,225
Innovation Programs	$-	$14	$41	$68	$68	$68	$68	$68	$68	$68	$530
Subtotal	**$43**	**$195**	**$275**	**$333**	**$333**	**$332**	**$318**	**$313**	**$307**	**$307**	**$2,755**
Total Anticipated Program Expenditures	*$934*	*$987*	*$787*	*$594*	*$563*	*$510*	*$444*	*$393*	*$341*	*$335*	*$5,887*

Source: Clean Energy Fund Proposal, Sep. 23, 2014 (Case 14-M-0094), p. 47.

- *It is anticipated that NYSERDA will reveal further line-item details on 6/25/15.*

- *Insight into possible program activity under the Market Development and Innovation categories was based on NYSERDA's "Operating Plan for Technology and Market Development Programs (2012–2016), Case 10-M-0457".*

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Additional Data Sources

While the CEF provides guidance for how policy-driven measures will affect wholesale electricity usage 2016 onwards, the Gold Book forecasts also reflect impacts due to

1. *Existing BTM facilities (SPV & DG) incentivized through NYSERDA programs,*
2. *Projected BTM CHP installations due to active NYSERDA Program Opportunity Notices (PONs), and*
3. *Existing EEPS2 programs with funding approved through 2015.*

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Energy Efficiency Impacts
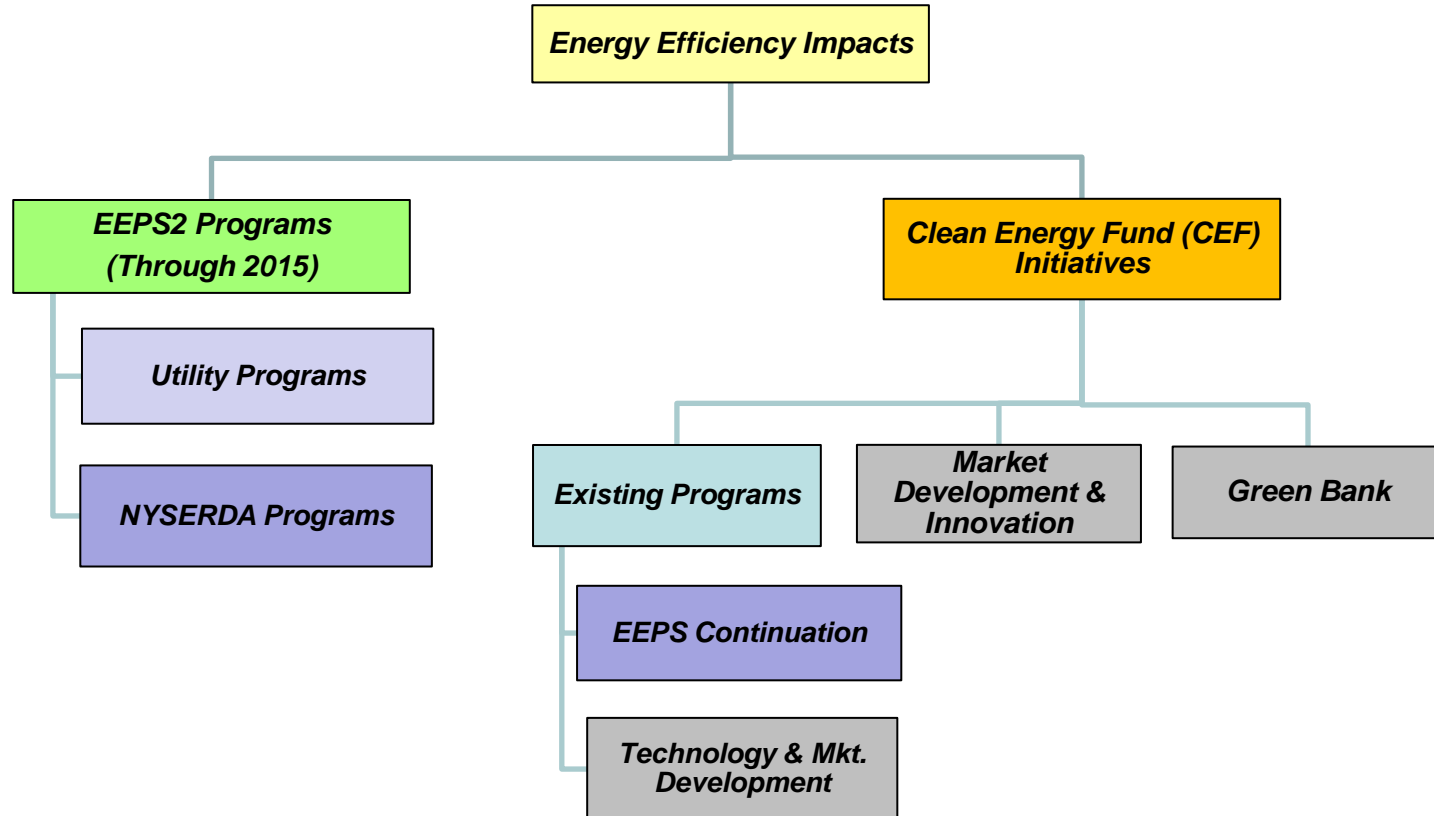
Energy Efficiency Impacts

- *New York State publishes multi-year budgetary outlay plans for each of the Residential and Commercial/Industrial programs under EEPS.*

- *For each program, Monthly Scorecards report*
  - *Incentive expenditure details (budgetary outlays), and*
  - *Estimated MWh and MW impacts*

NYISO tracks the reports to analyze the impacts as well as the implied costs per MWh and MW saved

EE Impact Forecasts

- *For a given program, annual MWh and MW impact forecasts are based on the following data:*

  - *Planned and projected annual program incentive expenditures, and*

  - *Trend-forecasted Impact Rate (MWh/$) and the Peak to Energy Ratio (MW/MWh).*

$$\text{MWh Impact} = \text{Program Expenditure} \times \text{Impact Rate}$$

$$\text{MW Impact} = \text{MWh Impact} \times \text{Peak to Energy Ratio}$$

EE Impact: Illustration
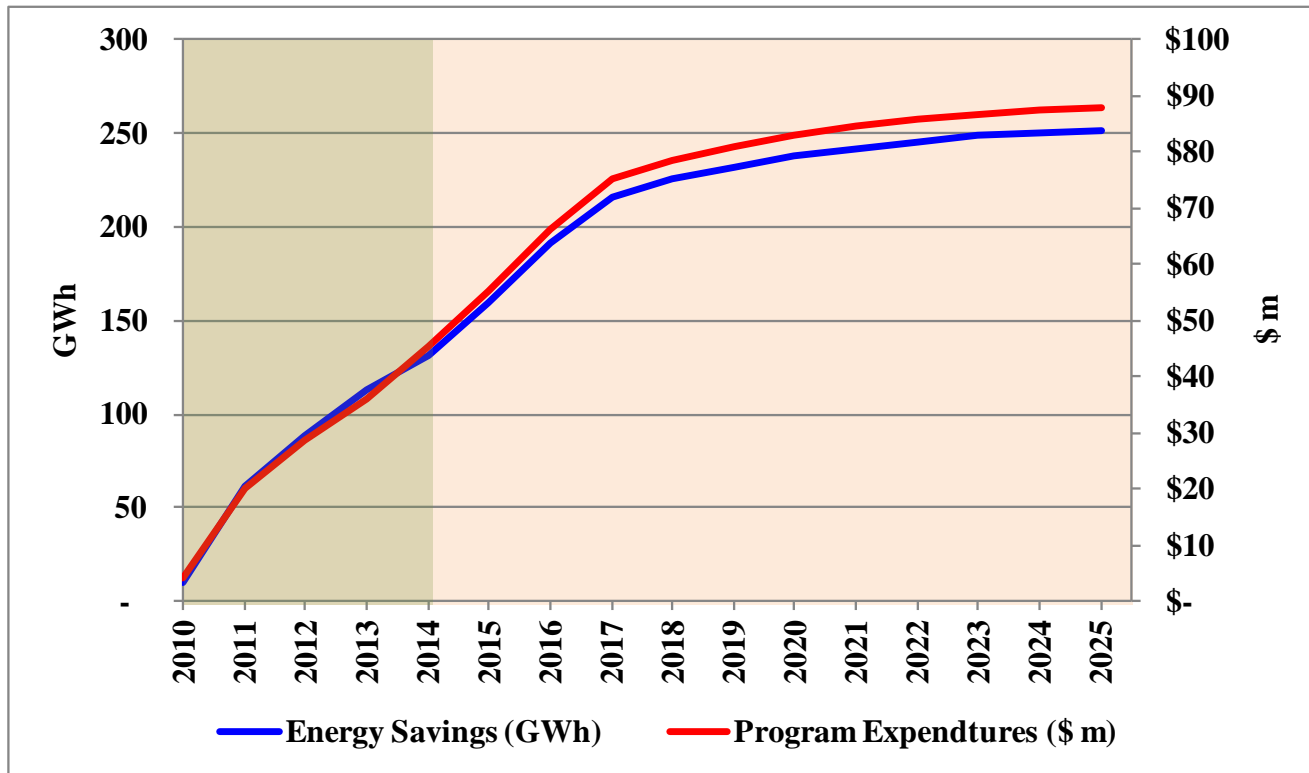
Reported historical and forecasted figures for incentive expenditures and the resulting energy saving impacts of a NY utility commercial program.

Solar PV Impacts
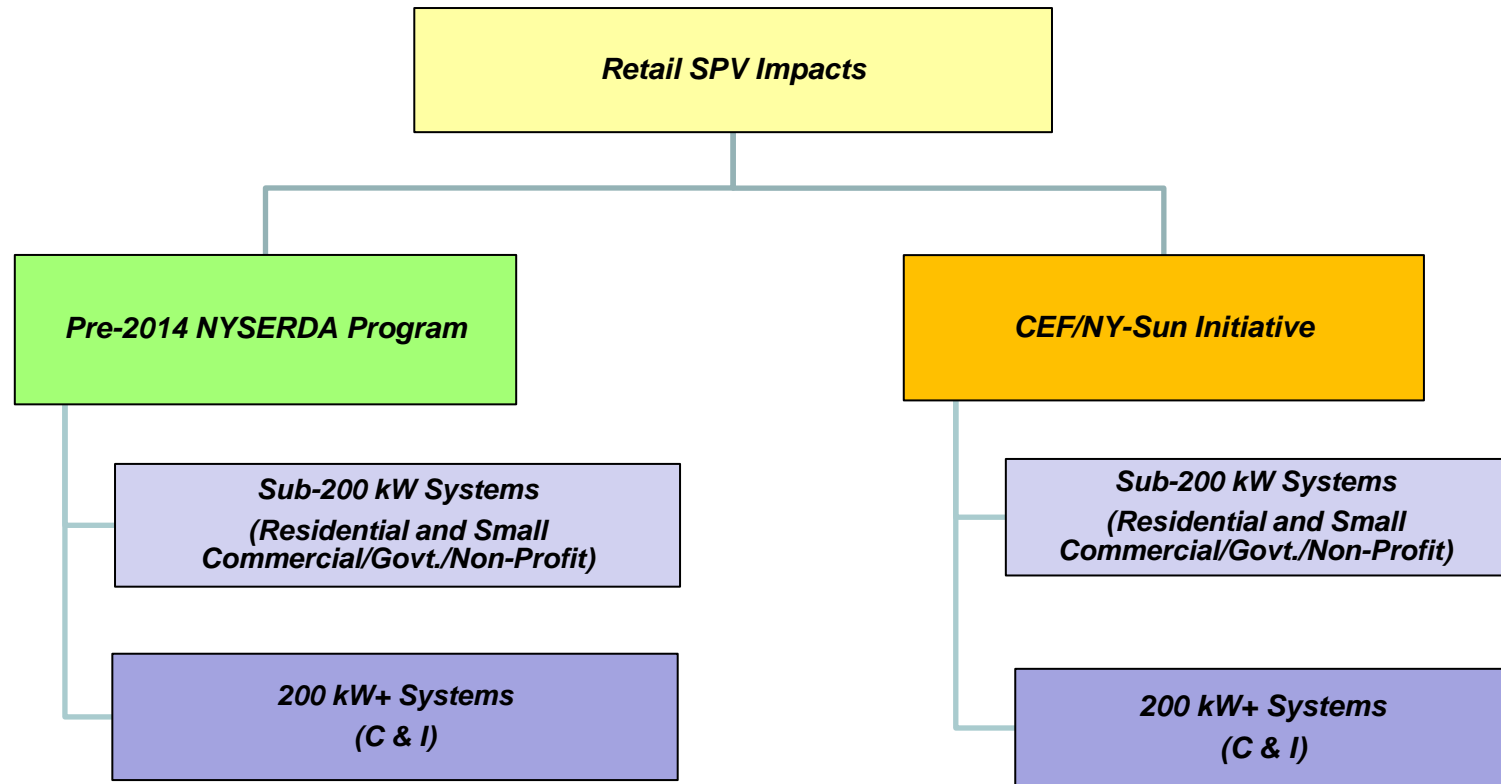
Solar PV Programs in NY

- *Incentives for BTM SPV systems have been provided through NYSERDA since 2003. In 2014, the NY-Sun initiative was launched with a budget of nearly $1 billion for incentives through 2023.*

- *Incentive Structure*

	Long Island	Con Ed Territory	Rest of State
Residential & Small Commercial (Sub-200 kW)	✓	✓	✓
C & I (200 kW +)		✓	✓

- *To date, New York has around 325 MW installed in the sub-200 kW category and just under 65 MW in the 200 kW+ bucket.*

SPV Incentives & Capacity
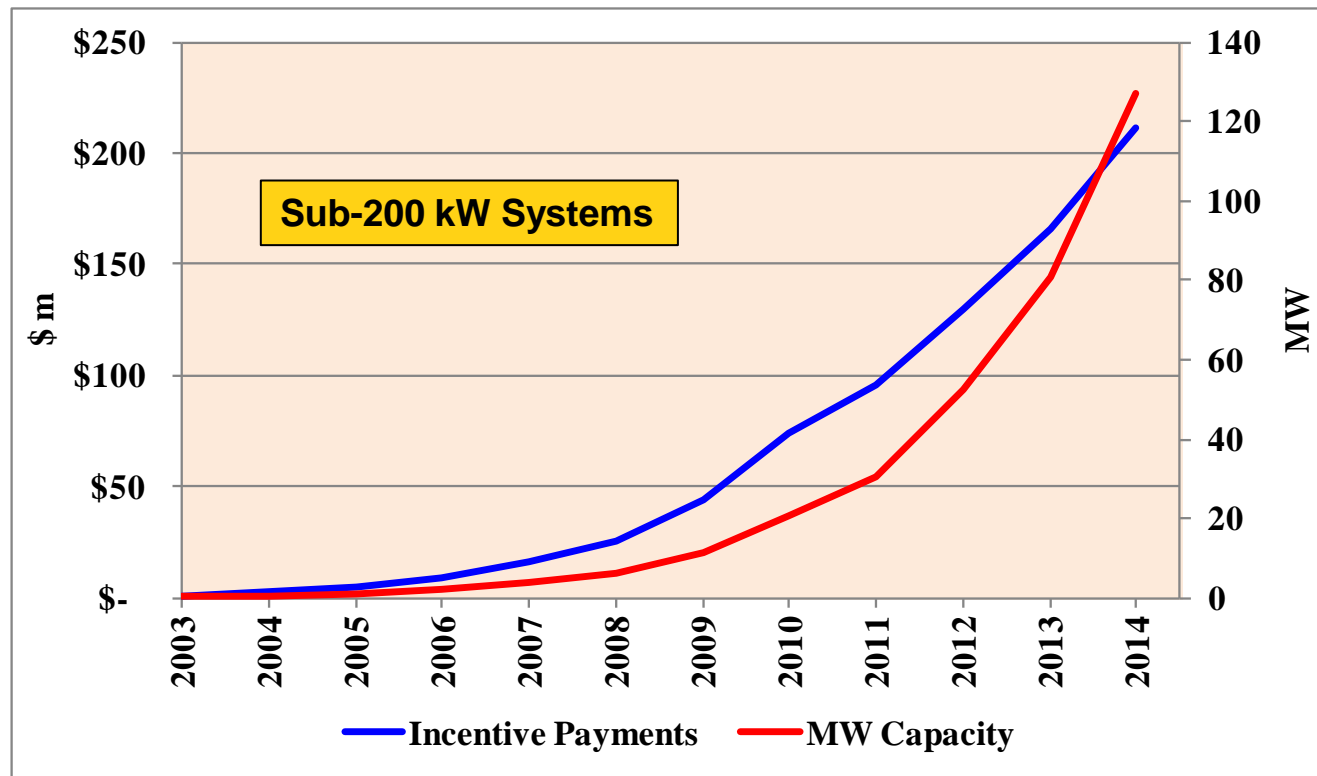
For the 6 weeks since May 1, 2015, DC capacity implied by incentive agreements grew at the rate of roughly 1.5 MW/day.

Forecasting SPV Impacts

- **Detailed system specifications and incentive payments by location are available for installations since 2003.**

- **NYSERDA provides daily updates of county-wise installations.**

- **The Solar PV MWh and MW impact forecasts are developed for NY regions using the following data:**

  - *A forecast of installed capacity based on historical trends, NYSERDA forecasts, and an in-house adoption model;*

  - *Capacity factors based on normative figures and actual performance data;*

  - *Normative Energy output parameters (DC-to-AC conversion ratio, Array-to-Inverter ratio, etc.); and*

  - *Noon (Solar Peak) to HB16 (Energy Peak) factor for each NYCA zone based on normal irradiance profiles.*

SPV Adoption Model: Illustration
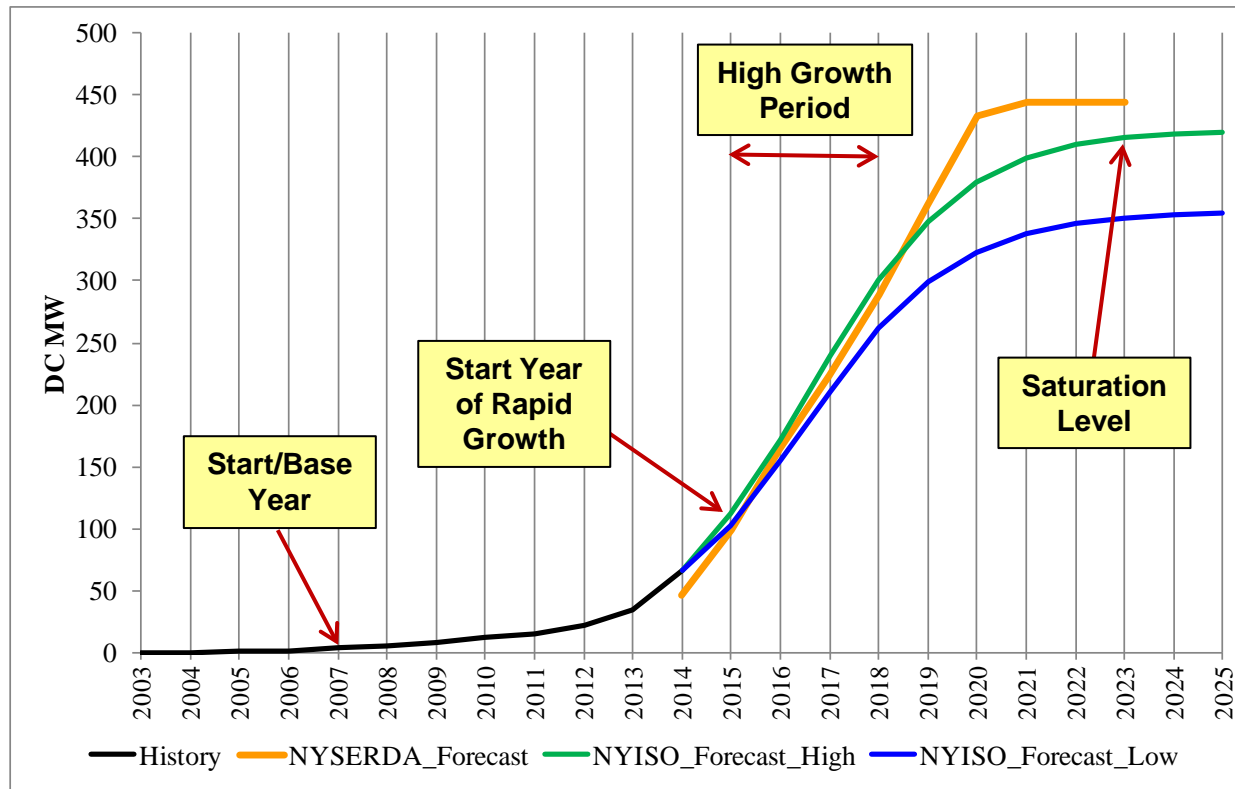
The Adoption model results are based on some key parameters: Start/Base Year, Start Year of Rapid Growth, High Growth Period, and Saturation Level.

SPV Forecast Calculation

Annual impact forecasts are calculated as follows:

$$\text{MWh Impact} = \text{MW DC}^1 \times \text{Capacity Factor} \times 8760$$

$$\text{MW Impact} = \text{MW DC}^2 \times \text{Array to Inverter Ratio} \times \text{DC to AC Conversion Factor at Noon} \times \text{Noon to HB16}^3 \text{ Degradation Factor}$$

1. This forecast is based on year-end capacity levels. For leap years the calculation is based on 8784 hours.

2. This forecast is based on installed capacity expected by mid-year because, typically, the summer peak in New York occurs sometime in the early-July to early-August time frame.

3. Typically, the summer peak occurs during Hour Beginning 1600.

SPV Impact Forecast
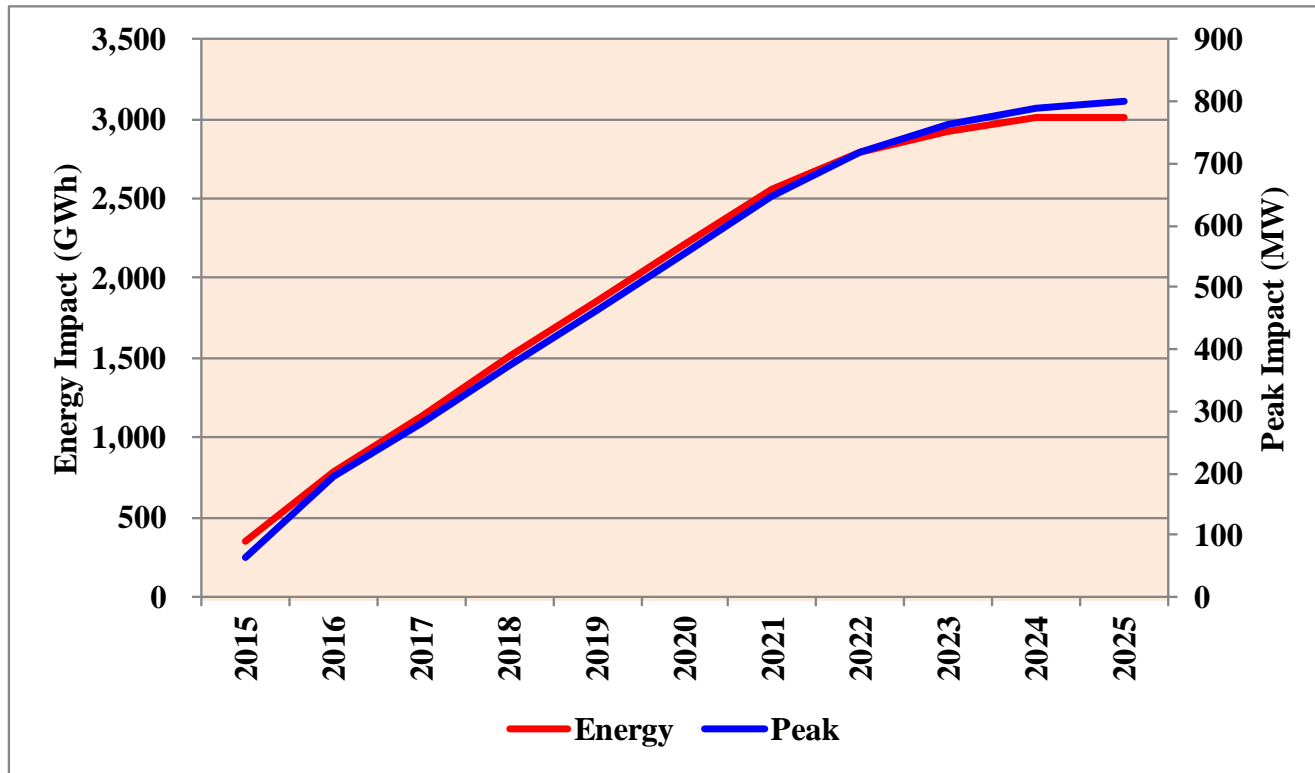
The graph above shows the forecasted impacts of SPV for New York State. This assumes about 2,600 MW of DC capacity by 2025.

Distributed Generation Impacts
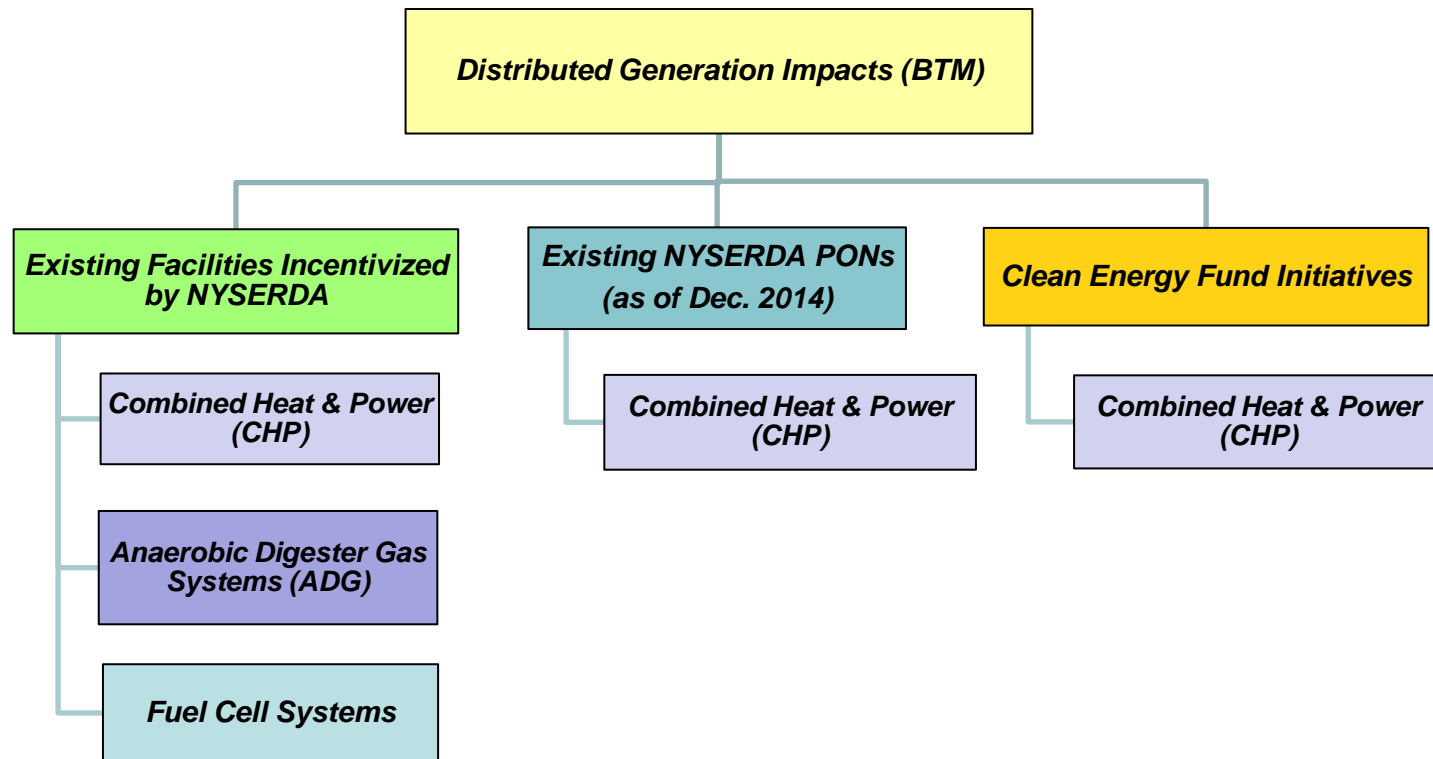
Non-SPV Distributed Generation

- *Existing NYSERDA programs (via PONs) and proposed funding plans (under CEF) incent the installation of these systems.*

- *Data on hourly performance is provided by NYSERDA. Multiple years of this data is analyzed to develop normative zonal Capacity Factors and Peak-to-Capacity ratios.*

- *Currently there are ~175 MW of DG capacity in New York State.*

Forecasting DG Impacts

♦ **Announced and projected incentive budgets for programs encouraging DG installation are the basis for developing zonal capacity forecasts (*This assumes typical per kW NYSERDA incentives provided*).**

MW Capacity	*=*	*Annual Expenditure*	*÷*	*Per-kW Incentive Cost*	

MWh Impact	*=*	*MW Capacity*	*x*	*Capacity Factor*	*x 8760*

MW Impact	*=*	*MW Capacity*	*x*	*Peak to Capacity Ratio*

Combined EE + DG Impacts
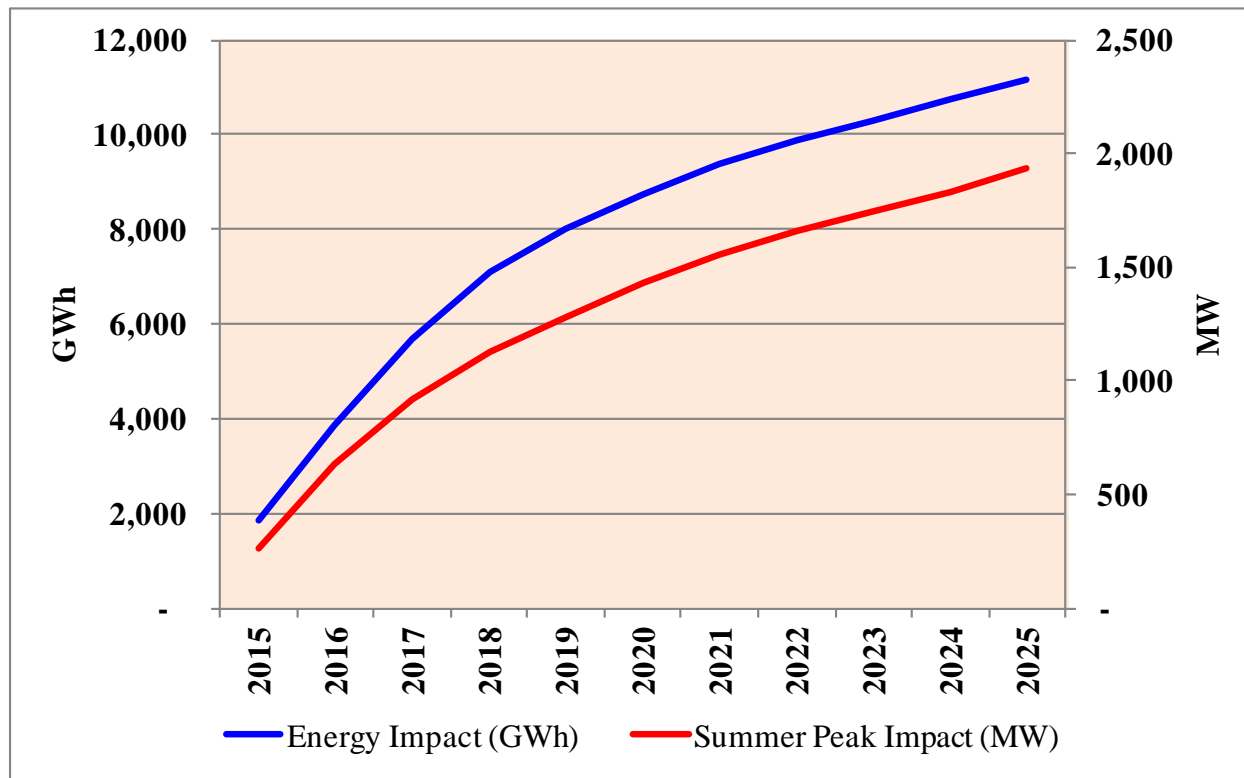
As compared to the Baseline, these savings amount to ~7% and ~5.5% of the 2025 energy and peak forecasts, respectively.

The New York Independent System Operator (NYISO) is a not-for-profit corporation responsible for operating the state's bulk electricity grid, administering New York's competitive wholesale electricity markets, conducting comprehensive long-term planning for the state's electric power system, and advancing the technological infrastructure of the electric system serving the Empire State.

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