Evaluation of PSEG Long Island Energy Efficiency & Renewable Energy Programs

JULY 26, 2017

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Evaluation Overview

- Cumulative evaluated results for program year 2009 through 2016 are 361 MW and 1,811,109 MWh from EE and 98.2 MW and 235,545 MWh from Renewable Energy programs
- Evaluation found that EE and Renewable Energy programs are delivered cost effectively overall
- Evaluated demand and energy savings from all programs in 2016 were 84.3 MW and 369,843 MWh (109% of demand goal and 116% of energy goal)
- Investment in EE and Renewable Energy programs in 2016 yielded a combined $78.4M in total economic benefits to the region, including employment benefits of 433 FTEs

Four Estimates of kW and kWh Savings

	Gross Savings (kW and kWh)	Net Savings (kW and kWh)
Ex Ante	▪ Savings estimates documented in PSEG Long Island tracking systems ▪ Based on planning assumptions; deemed savings values, algorithms, and associated assumptions	▪ As documented in tracking systems. ▪ Based on PSEG Long Island NTG planning assumptions
Verified Ex Ante	▪ Verifies proper application of savings assumptions and algorithms used in PSEG Long Island's program planning tools to rebated measures listed in the 2016 program tracking system	▪ Calculated by applying planning NTG assumptions to verified ex ante gross savings ▪ Used for comparison to 2016 goals
Evaluated	▪ Independent gross savings estimates determined by the Evaluation Team	▪ Applies planning NTG assumptions to evaluated gross savings ▪ Historically used for comparison to savings goals
Ex Post	▪ Same as evaluated	▪ Applies researched NTG factors to evaluated gross savings ▪ Used for cost effectiveness and economic impact assessment

Summary of 2016 Program Savings vs. Goals

Program	Ex Ante Net Savings		Verified Ex Ante Net Savings		Evaluated Net Savings		Ex Post Net Savings	
	MW	% Goal	MW	% Goal	MW	% Goal	MW	% Goal
Energy Efficiency Portfolio								
Commercial Efficiency Programs	**26.2**	**94%**	**25.64**	**92%**	**25.3**	**90%**	**19.6**	**70%**
Residential Programs								
Energy Efficient Products (EEP)	24.7	129%	24.7	129%	25.1	130%	16.4	85%
Cool Homes	3.00	70%	3.11	73%	3.16	74%	3.04	71%
REAP	0.574	103%	0.541	97%	0.586	105%	0.586	105%
HPD	2.77	142%	2.17	111%	1.48	76%	1.48	76%
HPwES	0.528	53%	0.864	87%	0.253	25%	0.253	25%
Subtotal Residential	**31.6**	**117%**	**31.4**	**116%**	**30.5**	**113%**	**21.7**	**80%**
Total Energy Efficiency Portfolio (Commercial Efficiency and Residential)	**57.8**	**105%**	**57.1**	**104%**	**55.9**	**102%**	**41.3**	**75%**
Renewable Energy Portfolio	**28.9**	**131%**	**28.9**	**131%**	**28.4**	**129%**	**28.4**	**129%**
Total Energy Efficiency and Renewable Energy Portfolios	**86.7**	**113%**	**85.9**	**112%**	**84.3**	**109%**	**69.7**	**91%**

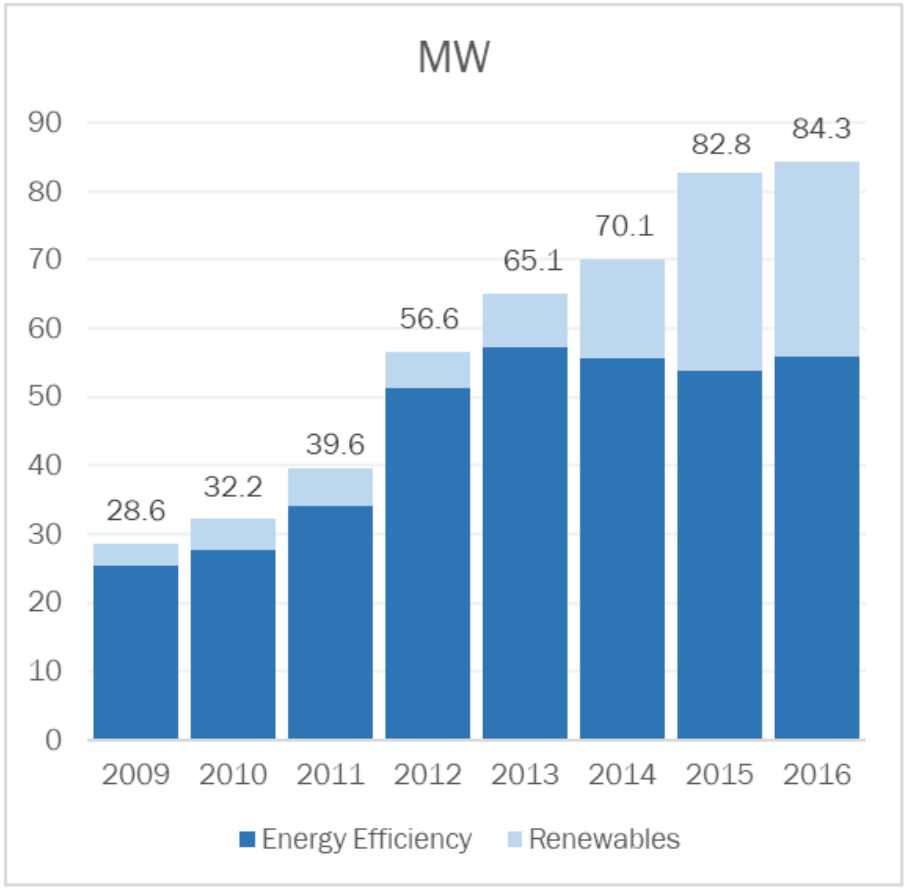
Energy Efficiency & Renewable Energy Program

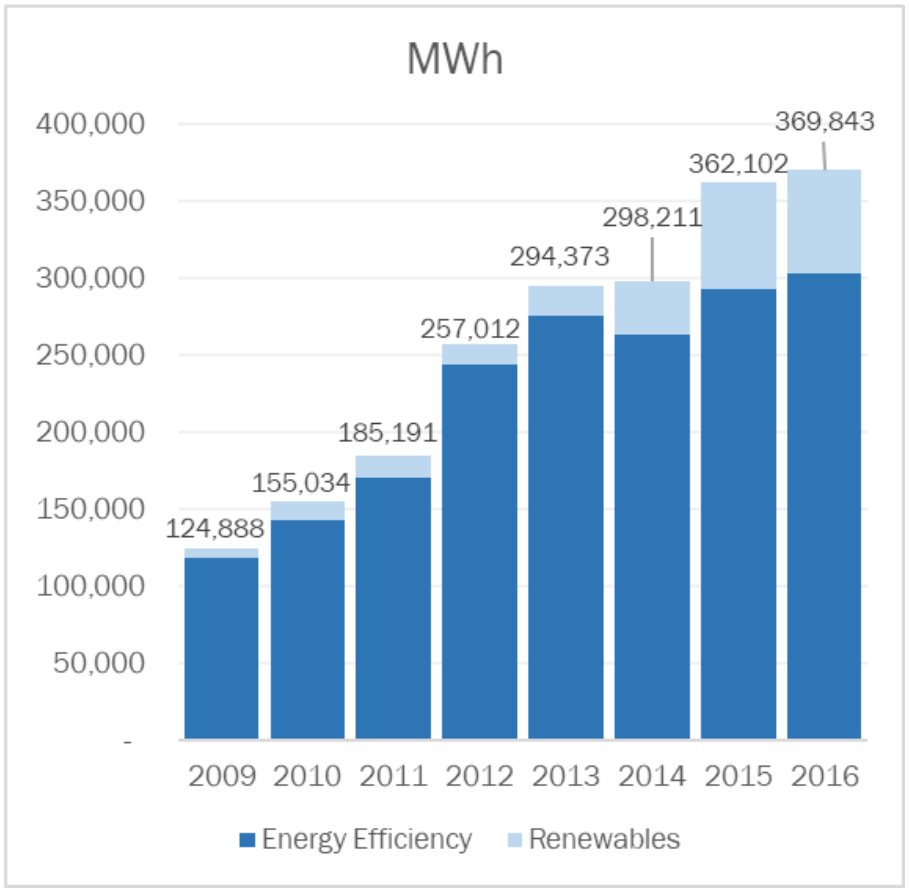
Achievements in 2016

- EE evaluated peak demand savings of 55.9 MW = 102% of 2016 goal
- Renewable program evaluated peak demand savings of 28.4 MW = 129% of 2016 goal
  - Program supplemented with about $10.8 million from NYSERDA's NY-Sun Initiative
  - Program also benefited from more kW of installed PV per dollar of program rebates
- Evaluated results are consistent with those tracked by programs as planning estimates and tracking data are now in close alignment
- Energy Efficient Products program and Commercial Efficiency Programs account for 90% of evaluated net demand savings for the EE Portfolio

Energy Efficiency & Renewable Programs

Progress over Past Eight Years (2009 to 2016)





Energy Efficiency Programs

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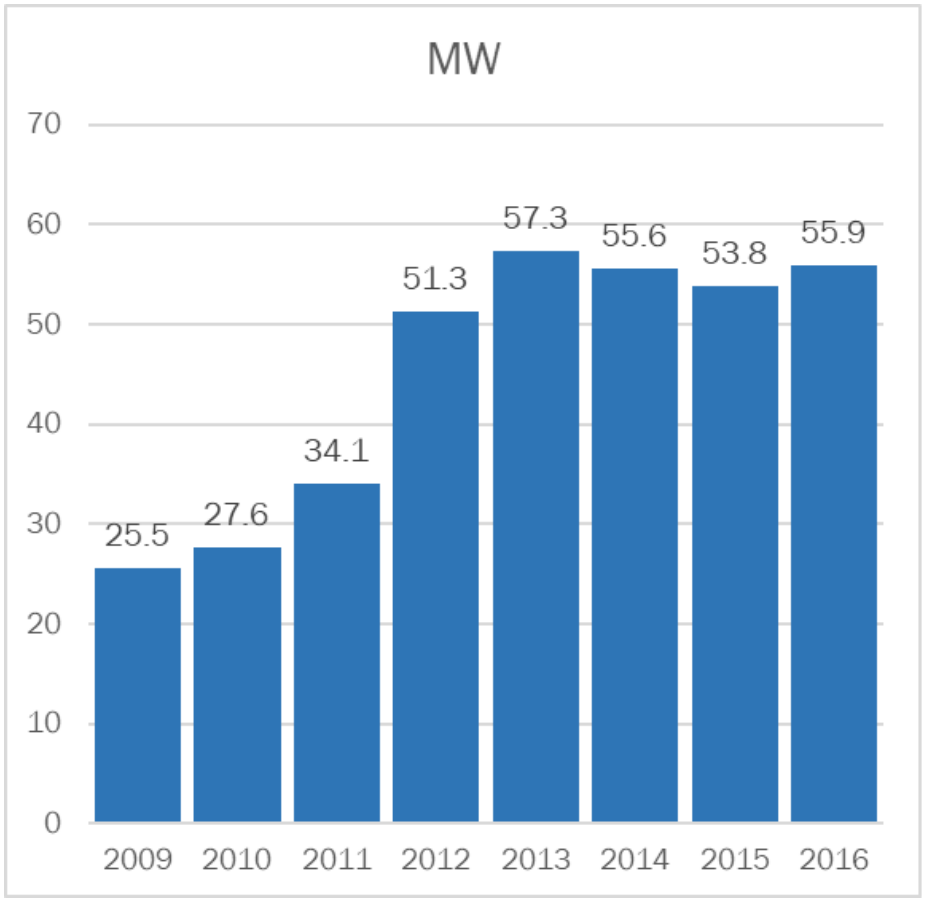
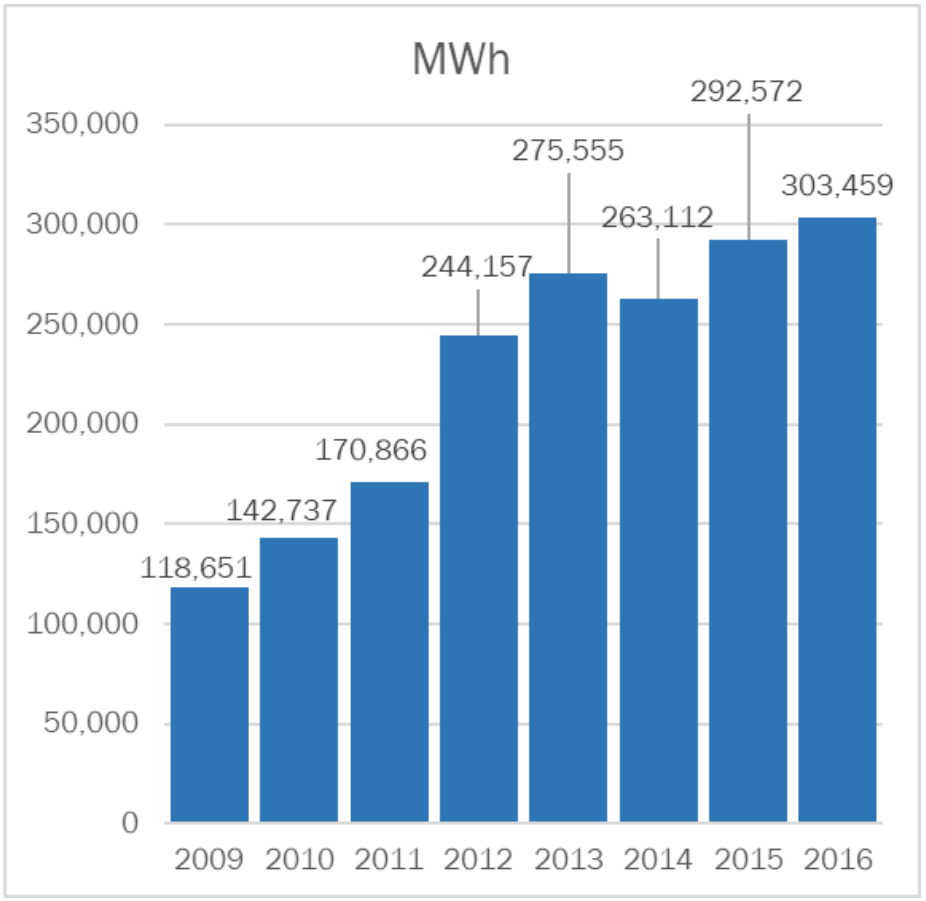




Energy Efficiency Portfolio Achievements in 2016

- In 2016 commercial and residential programs overall are cost effective from PSEG Long Island perspective compared to supply alternatives (B/C > 1)

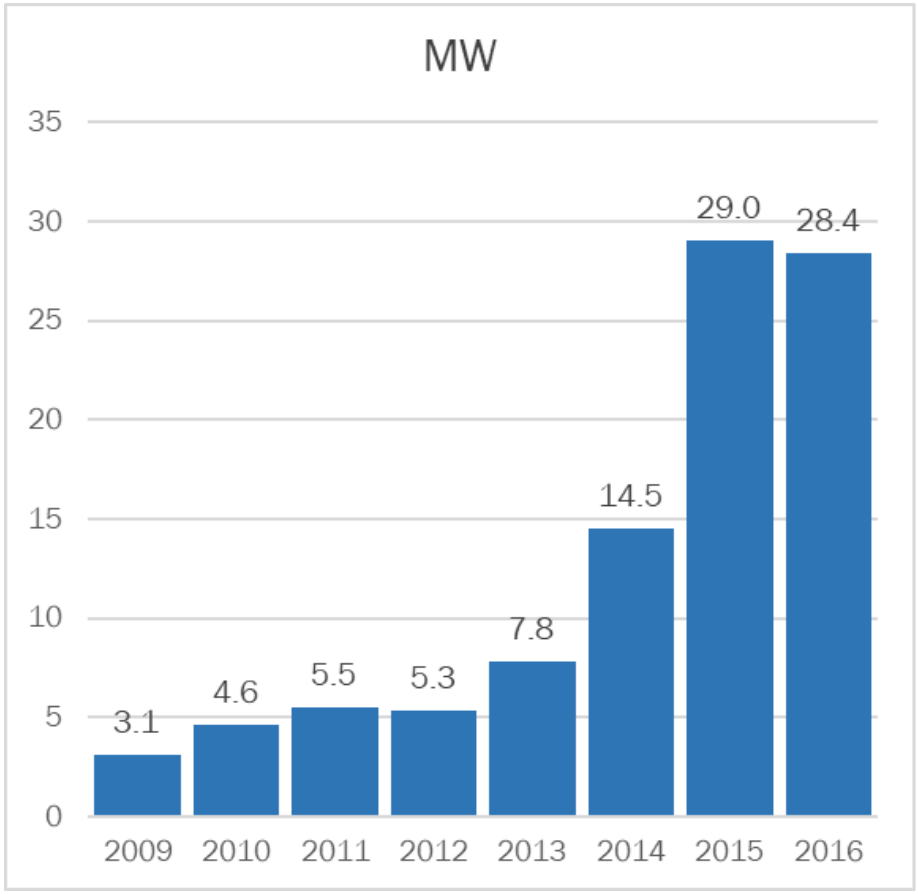
- 2016 levelized cost for EE programs compare favorably to PSEG Long Island's marginal cost of generation at the portfolio and segment (residential and commercial) level

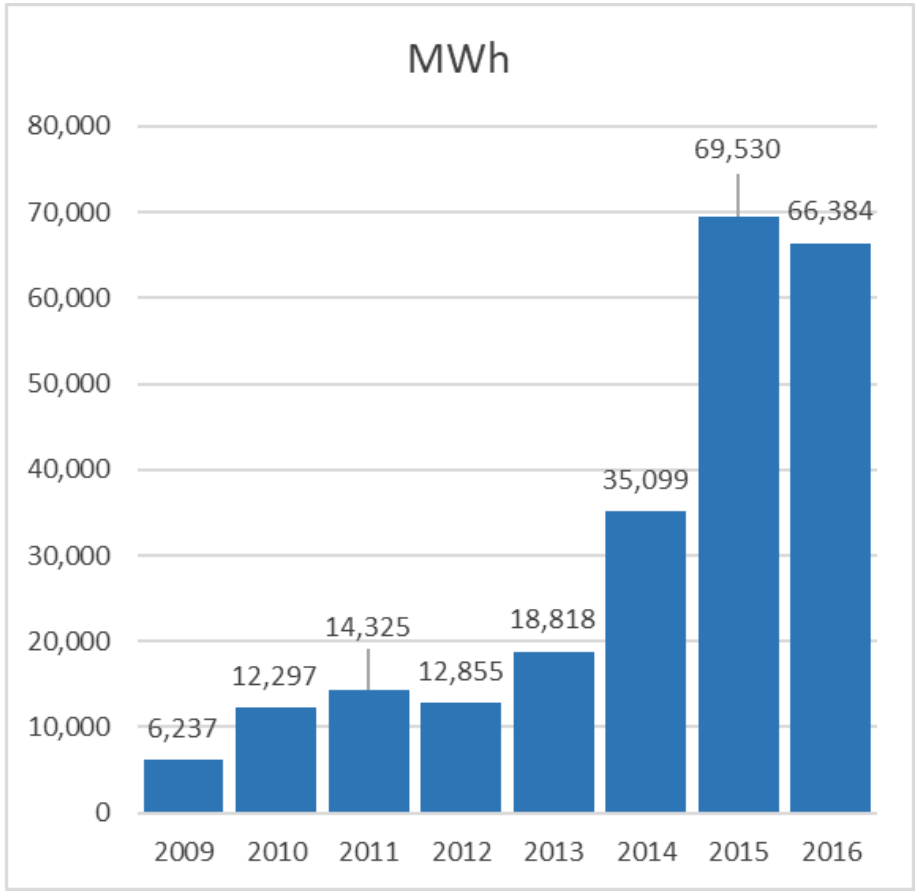
Program	Utility Cost Test (B/C) *	Levelized Cost ($/kW-yr) Capacity *	Levelized Cost ($/kWh) Energy *
Commercial	3.7	$167.80	$0.04
Efficient Products (EEP)	4.4	$153.42	$0.03
Existing Residential	0.74	$564.74	$0.45
Residential with EEP	2.5	$242.86	$0.05
EE Portfolio	3.1	$197.48	$0.05

*Evaluated results – using 4.17% nominal discount rate

Renewable Program

Achievements in 2016





Renewable Program
Achievements in 2016

Program	Utility Cost Test (B/C) *	Levelized Cost ($/kW-yr) Capacity *	Levelized Cost ($/kWh) Energy *
Solar PV	15.5	$33.52	$0.01

Includes $10.8 million in rebates from NYSERDA's NY-Sun Initiative.

- 2016 B/C ratio is a notable improvement over 2015, which was 9.0
- Improvements in cost effectiveness are reflected in the overall decrease in per kW cost of installed solar systems and associated decreases in rebates per kW

*Evaluated results – using 4.17% nominal discount rate
** Solar PV costs do not account for any lost revenue from net metering

Conclusions

- Programs are well managed and results have maintained consistent in recent years with the EE portfolio achieving a cumulative evaluated 361 MW through 2016
- PSEG Long Island has leveraged evaluation results to improve program design and operations
- Programs are cost effective with an overall B/C ratio of 3.1 for the EE portfolio and 15.5 for Renewables programs (5.1 overall)
- Programs yield positive impacts on the Long Island economy and environment

Questions & Discussion

Variance 2017 Plan vs 2016 Actuals

- 2017 Goal = 243,285 MWH
- 2016 Actual = 313,459 MWH
- 2016 Energy Efficiency budget underrun of $6.5 million

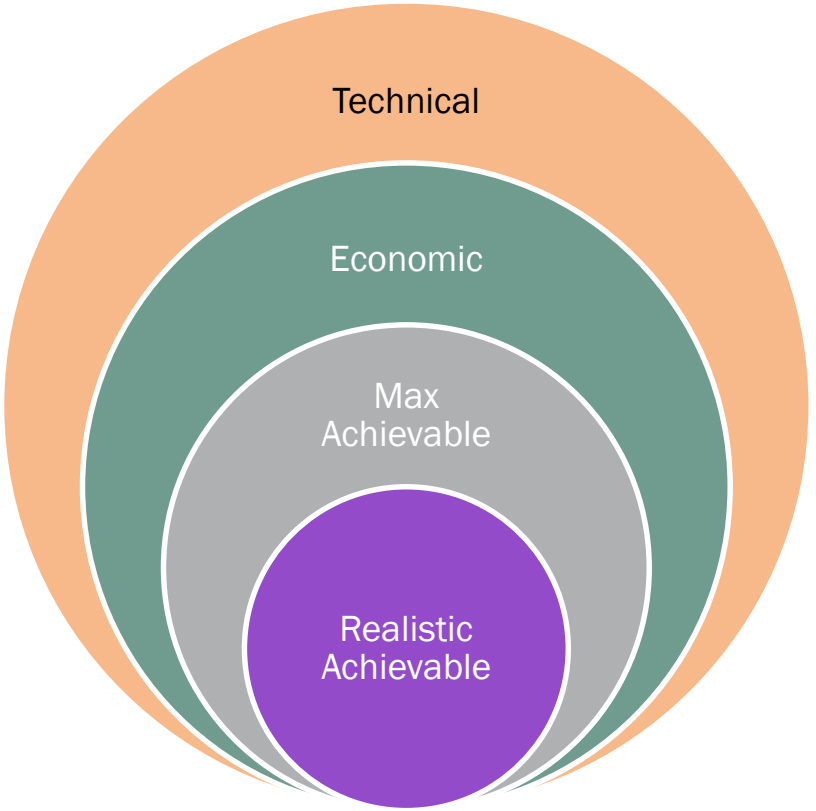
- Reason 1
  - Change in Net to Gross factor for Residential LED's
  - Elimination of cheaper CFL's from portfolio in 2017
    - In 2016, $7.3 million in rebates for 3.47 million bulbs produced 143,000 MWH savings.
    - In 2017, $7.3 million in rebates for 2.56 million bulbs would produce 50,700 MWH savings (roughly 92,000 MWH less).

Variance 2017 Plan vs 2016 Actuals (continued)

- Reason 2
  - NYSERDA grant funding provides for collaboration on annual Energy Efficiency Plans.
  - 2017 collaboration resulted in dedication of rebate funding for other than electrical energy savings (this had not occurred in 2016 or earlier years).
    - $5.1 million budgeted for oil and propane savings rebates through the Home Performance with EnergyStar program.
    - $1 million budgeted for oil savings rebate for pilot commercial/multi-family project(s).

Potential – Four Levels from AEG Potential Study

- **Technical potential** is the theoretical upper limit, where all EE measures are phased in to all customers regardless of cost
- **Economic potential** is also a theoretical construct, where all *cost-effective* measures are phased in to all customers. Cost-effective is defined as a TRC >= 1.0
- **Maximum achievable potential** considers customer-related barriers to adoption
  - e.g., customers don't like light delivered with CFL lamps, don't want to be bothered with energy efficiency, etc.
- **Realistic achievable potential** also includes regulatory and program implementation barriers
  - e.g., program funding limitations, need to ramp up programs, etc.



Summary Potential from 2016 AEG Potential Study

Annual EE Potential, Selected Years

	2016	2017	2018	2025	2035
PSEG LI Load Forecast (GWh)	20,283	20,509	20,724	22,955	26,471
Cumulative Savings (GWh)					
Realistic Achievable Potential	187	382	543	1,058	1,512
Maximum Achievable Potential	273	561	791	1,518	2,153
Economic Potential	406	827	1,155	2,094	2,947
Technical Potential	561	1,127	1,587	3,201	4,449
Energy Savings as a % of Forecast					
Realistic Achievable Potential	0.90%	1.90%	2.60%	4.60%	5.70%
Maximum Achievable Potential	1.30%	2.70%	3.80%	6.60%	8.10%
Economic Potential	2.00%	4.00%	5.60%	9.10%	11.10%
Technical Potential	2.80%	5.50%	7.70%	13.90%	16.80%
Incremental Savings (GWh)					
Realistic Achievable Potential	187	195	161		
Maximum Achievable Potential	273	288	230		
Actual/Plan	**313**	**243**			