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Efficiency Long Island and Renewable Energy Portfolios

2015 Annual Evaluation Report
(Volume I - Executive Summary)

FINAL

Prepared for:



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June 29, 2016



With Subcontractors:



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1. Introduction to Annual Report

This report presents the program evaluation results of PSEG Long Island's 2015 Efficiency Long Island Portfolio and Renewable Energy Portfolio conducted by the Opinion Dynamics Evaluation Team. The Efficiency Long Island and Renewable Energy portfolios were administered by the Long Island Power Authority from inception through 2013. Effective January 1, 2014, PSEG Long Island began its 12-year contract assuming all day-to-day management and operations of the electric system, including planning, administration, design, and implementation of the Efficiency Long Island Portfolio and the Renewable Energy Portfolio. In March of 2015, PSEG Long Island transitioned the implementation of the Efficiency Long Island Portfolio to its subcontractor, Lockheed Martin. PSEG Long Island continues to implement the Renewable Energy Portfolio. This assessment covers the period from January 1, 2015 to December 31, 2015.

The Evaluation Team produced two volumes that together comprise the entire Annual Evaluation report. This document, the *2015 Annual Evaluation Report (Volume I)*, provides an overview of evaluation findings, including impact and process results for 2015. The *2015 Program Guidance Document (Volume II)* provides detailed program-by-program impact analysis results, process evaluation findings, and a discussion of data collection and analytic methods. The Evaluation Team developed the *Program Guidance Document* with the needs of PSEG Long Island and Lockheed Martin's program planners and managers in mind as the programs in the Efficiency Long Island Portfolio and the Renewable Energy Portfolio continue to be important and cost-effective resources.

1.1 Key Definitions

Below we provide definitions for key terms used throughout the report:

- **Gross Impacts:** The change in energy consumption and/or demand at the generator that results directly from program-related actions taken by participants, regardless of why they participated. These impacts include line losses, coincident factors for demand, and waste-heat factors and installation rate for lighting. Gross impacts are the demand and energy that power plants do not generate due to program-related actions taken by participants.¹
- **Net Impacts:** The change in energy consumption and/or demand at the generator that would not have occurred absent the program. The only difference between the gross and net impacts is the application of the net-to-gross ratio (NTGR).
- **Net-to-Gross Ratio (Free-Ridership and Spillover):** The factor that, when multiplied by the gross impact, provides the net impacts for a program. Free-ridership reduces the ratio to account for those customers who would have installed an energy-efficient measure without the program. The free-ridership component of the NTGR can be viewed as a measure of naturally occurring energy efficiency, which may include efficiency gains associated with market transformation resulting from ongoing program efforts. Spillover increases the NTGR to account for those customers who install energy-efficient measures outside of the program (i.e., without an incentive), but due to the actions of the program.

¹ While this evaluation includes line losses, coincidence factors, and installation rates when estimating gross impacts, PSEG Long Island does not include these factors in its gross impact estimates.

- **Evaluated Net Savings:** The net savings attributed to the program for purposes of comparison to program savings goals. Evaluated net savings are determined by applying program planning assumptions for NTGR to the gross impact estimates determined by the Evaluation Team.
- **kW (Demand or Capacity):** The average level of power used over an hour. Peak demand is the average power used across a 4-hour period when there is high use. For Long Island, peak demand takes place from 2:00 to 6:00 p.m., Monday through Friday (non-holiday), from June to August. System coincident demand is the level of demand at the hour of the day when there is the maximum demand on the system grid. Demand savings values in this report are system coincident demand impacts between 4:00 p.m. and 5:00 p.m. on non-holiday weekdays in from June to August.
- **kWh (Energy Consumption):** The total power consumed over an hour. Energy impacts are based on annual consumption.
- **Program Administrator Cost (PAC) Test:** A test that measures the net costs of an energy efficiency program as a resource option based on the costs incurred by the Program Administrator (including incentive costs) and excluding any net costs incurred by the participant. To allow for direct comparison with PSEG Long Island's assessment of all supply-side options, and consistent with previous evaluation reports, we applied the PAC test as the primary method of determining cost-effectiveness and used assumptions similar to those used by PSEG Long Island's resource planning team.
- **Total Resource Cost (TRC) Test:** A test that measures the net costs of an energy efficiency program as a resource option based on the total costs of the program, including both the participants' and the Program Administrator's costs. Incentive costs are not included in this test as they are assumed to be a societal transfer.
- **Discount Rate:** The interest rate used to calculate the present value of future payments (i.e., the avoided costs from energy and demand savings). PSEG Long Island uses a weighted average cost of capital (WACC) supplied by the Long Island Power Authority (LIPA) that represents the cost of borrowing to build additional capacity to meet the future supply needs of the service territory. Based on these factors, we used a nominal discount rate of 5.50% in the 2015 evaluation.
- **Levelized Cost of Capacity:** The equivalent cost of capacity (kW) to be incurred each year over the life of the equipment that would yield the same present value of total costs, using a nominal discount rate of 5.50% to be consistent with base load generation supply-side resources in the Long Island service territory. The levelized cost of capacity is a measure of the costs of the program to the administrator in a form that can be compared to the cost of supply additions.
- **Levelized Cost of Energy:** The equivalent cost of energy (kWh) over the life of the equipment that would yield the same present value of costs, using a nominal discount rate of 5.50%. The levelized cost of energy is a measure of the costs of the program to the administrator in a form that can be compared to the cost of supply additions.

2. Executive Summary

In 2015, PSEG Long Island continued to cost-effectively increase the savings realized from the Efficiency Long Island and Renewable Energy portfolios. PSEG Long Island spent approximately \$72 million of the annual budget on these portfolios in 2015, and received an additional \$20 million in funding from the New York State Energy Research and Development Authority (NYSERDA) through the NY-Sun Initiative. The total spending of \$92 million is about the same as was spent in 2014. The evaluated demand savings increased to 82.85 MW compared to 70.0 MW in 2014. Evaluated energy savings also increased to 362,102 MWh in 2015 compared to 298,210 MWh in 2014. The 2015 evaluated demand and energy savings from these portfolios exceeded the established goals by 18% and 17%, respectively. Two key factors drove 2015 program performance, described below.

Significant Growth in Solar Installations within the Renewable Portfolio: In 2015, PSEG Long Island's Solar Photovoltaic (PV) program continued to grow rapidly. Evaluated savings were almost double the program's demand and energy savings goals. In August 2014, PSEG Long Island began transitioning from the legacy Solar Entrepreneur and Solar Pioneer programs to the NYSERDA-funded NY-Sun Incentive Program. The rapid growth in 2015 was in large part fueled by \$20 million from the \$60 million in NYSERDA funds allocated to Long Island through the multi-year NY-Sun Initiative. This increase in funding helped system installations more than double from 2014 to 2015 (3,408 to 7,176, respectively) and the Renewable Energy Portfolio exceeded its MW and MWh goals by 181% and 182%, respectively.

Growth in 2015 was also driven by a reduction in the upfront cost barrier to PV installation due to increased leasing of residential PV systems and the continued decline in the cost of solar PV systems.

Increase in Sales of Efficient Lighting Products within the Efficiency Long Island Portfolio: Taken together, residential and commercial lighting measures account for more than two-thirds of all Efficiency Long Island demand savings and 86% of energy savings. As such, the overall performance of the Efficiency Long Island Portfolio depends heavily on PSEG Long Island's ability to continue to promote efficient lighting within a shifting market being driven by rapid changes in technologies, prices, and regulations.

In 2015, the evaluated demand savings attributable to the Energy Efficient Products (EEP) program exceeded the goal by 46% and equaled the evaluated demand savings associated with the Commercial Efficiency Programs (CEP). Efficient residential lighting products, as a measure category, accounted for the vast majority of program savings from the EEP program. Recent increases in the sale of program LED lighting products have driven EEP program performance. CFLs had traditionally been the dominant source of lighting product sales and savings within the EEP program. However, in 2015, the program sold more LEDs than CFLs; similarly, evaluated savings from LED products exceeded those realized from CFLs. Program sales of LED bulbs increased from less than 1% sold through the program in 2010 to 56% in 2015. In total volume, the program sold more than 1.8 million LED bulbs and fixtures in 2015, accounting for 69% of all evaluated demand savings from EEP program lighting measures.

Our evaluation found a similar trend in the share of savings associated with the installation of LED fixtures incentivized through the CEP, as acceptance of LED lighting in the commercial market continued to increase. LEDs grew from 34% of the Prescriptive, Existing Retrofit, and Small Business Direct Install (SBDI) evaluated demand savings in 2013 to 72% in 2015.²

² Due to lack of measure detail for Custom projects, we excluded this program component from the analysis.

2.1 Summary of Portfolio Performance

The 2015 annual demand and energy savings goals were 70.0 MW and 310,232 MWh for the combined Efficiency Long Island and Renewable Energy portfolios, as shown in Table 1. Combined evaluated net savings are 118% of the goal for demand and 117% of the goal for energy. PSEG Long Island exceeded the demand and energy goals at a total cost of approximately \$92.5 million, including the \$20.1 million that was provided directly by NYSERDA for solar incentives.

Table 1. Net Impacts: Efficiency Long Island and Renewable Energy Portfolios Evaluated Impacts versus Goals

Program	PSEG Long Island Annual ELI and Renewable Energy Budget	ELI and Renewable Energy Actual Cost	Coincident Demand Savings (MW)		Energy Savings (MWh)	
			Goal	Evaluated	Goal	Evaluated
Efficiency Long Island Portfolio						
Commercial Efficiency Programs	\$45,791,555	\$35,741,436	30.00	23.02	116,071	107,654
Residential Efficiency Programs						
EEP	\$15,243,244	\$18,125,110	16.71	24.39	144,973	177,356
Cool Homes	\$8,039,589	\$7,387,842	4.29	4.57	4,002	4,084
Residential Energy Affordability Partnership (REAP)	\$3,410,849	\$2,699,969	0.85	0.42	2,494	1,052
Home Performance Direct (HPD)	\$4,436,884	\$4,510,563	1.73	1.00	4,146	2,086
Home Performance with ENERGY STAR® (HPwES)	\$2,286,080	\$2,057,316	0.39	0.43	354	340
Subtotal Residential Programs	\$33,416,646	\$34,780,800	23.98	30.81	155,969	184,918
Total Efficiency Long Island Portfolio (Commercial and Residential Programs)	\$79,208,200	\$70,522,236	53.98	53.83	272,040	292,572
Renewable Energy Portfolio (including NYSERDA Funds in Actual Cost)	\$3,524,002	\$21,964,838	16.00	29.03	38,192	69,530
Total Efficiency Long Island and Renewable Energy Portfolios	\$82,732,202	\$92,487,074	69.98	82.85	310,232	362,102

Notes:

1. Results do not include LIPAEEdge.
2. Actual costs are the expenditures necessary to obtain the energy and demand savings as reported in the Siebel system, and do not reflect PSEG Long Island accrual accounting.
3. Solar PV benefits and costs (which are included in the Renewable Energy Portfolio) include \$20.1 million in rebates from the NYSERDA's NY-Sun Initiative.

In 2015, PSEG Long Island spent just under \$72.4 million of its annual operating budget of \$82.7 million and \$20.1 million in solar incentives from NYSERDA implementing the Efficiency Long Island and Renewable Energy programs for a total of just under \$92.5 million. Based on our analysis of portfolio impacts and costs, the savings generated by the portfolios are cost-effective. As shown in Table 2:

- Based on the Program Administrator Cost test (PAC), the overall benefit/cost ratio is 4.7 for the combined portfolio savings (a PAC value greater than 1 indicates that portfolio benefits outweigh costs), and the levelized costs of the combined portfolio savings are \$119.36/kW-yr and \$0.03/kWh.³
- Based on the Total Resource Cost test (TRC), the overall benefit/cost ratio is 1.1 for the combined portfolio savings and the levelized costs are \$516.13/kW-yr and \$0.15/kWh.

Table 2. Efficiency Long Island and Renewable Energy Portfolios Benefit/Cost Ratio and Levelized Costs

Program	Benefit/Cost Ratio		PAC Levelized Costs		TRC Levelized Costs	
	PAC	TRC	\$/kW-yr	\$/kWh	\$/kW-yr	\$/kWh
Efficiency Long Island Portfolio						
Commercial Efficiency Programs	3.0	2.2	200.46	0.05	267.24	0.06
Residential Efficiency Programs						
EEP	5.8	4.0	114.74	0.02	162.53	0.03
Cool Homes	2.0	0.7	205.64	0.24	605.69	0.70
REAP	0.5	0.5	1,013.36	0.41	1,013.36	0.41
HPD	0.6	0.6	714.91	0.34	714.91	0.34
HPwES	0.9	0.5	475.58	0.60	913.33	1.16
Subtotal Residential Programs	3.6	2.1	167.87	0.03	282.81	0.06
Total Efficiency Long Island Portfolio (Commercial and Residential Programs)	3.3	2.2	182.94	0.04	275.61	0.06
Renewable Energy Portfolio	9.0	0.7	56.41	0.02	754.26	0.32
Total Efficiency Long Island and Renewable Energy Portfolios	4.7	1.1	119.36	0.03	516.13	0.15

Notes:

1. Benefit/cost ratio from Program Administrator perspective using comparison to base load marginal supply costs. If ratio is greater than 1.0, program is cost-effective.
2. All levelized cost calculations use a discount rate of 5.50% to be consistent with supply-side alternatives.
3. Solar PV benefits and costs (which are included in the Renewable Energy Portfolio) include \$20.1 million in rebates from NYSERDA's NY-Sun Initiative.

An important catalyst in the decision to invest in the Efficiency Long Island and Renewable Energy portfolios was the desire to offset the need to develop approximately 520 MW of new generating capacity on Long Island that was required to satisfy forecasted energy demand. As such, performance relative to the annual

³ A levelized cost analysis is a way to quickly compare the cost of energy efficiency programs with energy or demand savings from other sources. Because levelized costs are expressed as \$/kW-yr and/or \$/kWh, they can be readily compared to the cost of alternative supply additions or the cost of generating electricity.

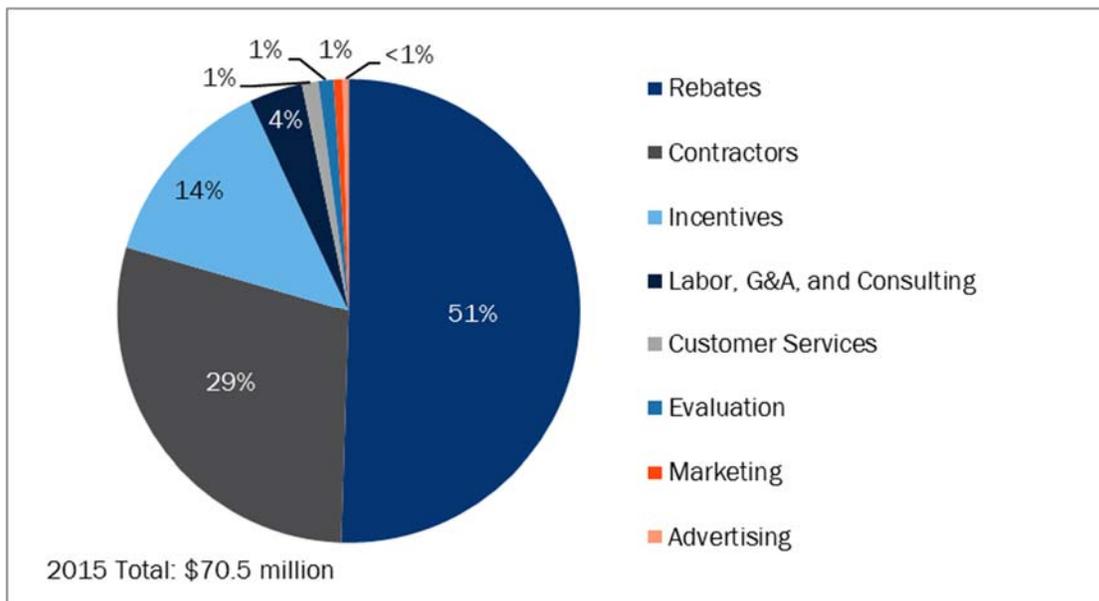
capacity savings goals is the primary performance metric for these programs. To allow for consistency and direct comparison between evaluated program performance and established savings goals, the Evaluation Team developed evaluated net savings estimates for each program within the Efficiency Long Island Portfolio and the Renewable Energy Portfolio, as shown in Table 1 and presented throughout this report, for purposes of assessing goal attainment. We calculated evaluated net savings by applying PSEG Long Island’s planning assumptions for the net-to-gross factor to the gross demand and energy savings estimates determined through our evaluation.

Among other inputs, the benefit/cost assessment requires an estimate of ex post net program savings. The best-practice approach to this assessment dictates that the net savings used to develop the benefit/cost ratio reflect current levels of naturally occurring energy efficiency, free-ridership, and spillover to provide an estimate of the benefits associated with the current year’s investment in the programs. As such, the evaluation team used net-to-gross factors derived from primary data collection with customers to develop the net energy savings estimates included in the benefit/cost ratio calculation and for lifetime levelized costs.

Including the NYSERDA funding, PSEG Long Island spent just under \$92.5 million on the Efficiency Long Island and Renewable Energy portfolios in 2015, about the same as in 2014. However, PSEG Long Island realized a 16% increase in evaluated demand savings and a 20% increase in evaluated energy savings compared to 2014. Figure 1 presents a summary of the \$70.5 million spending related to implementation, management, and evaluation of energy efficiency programs in the Efficiency Long Island Portfolio by type of expenditure.

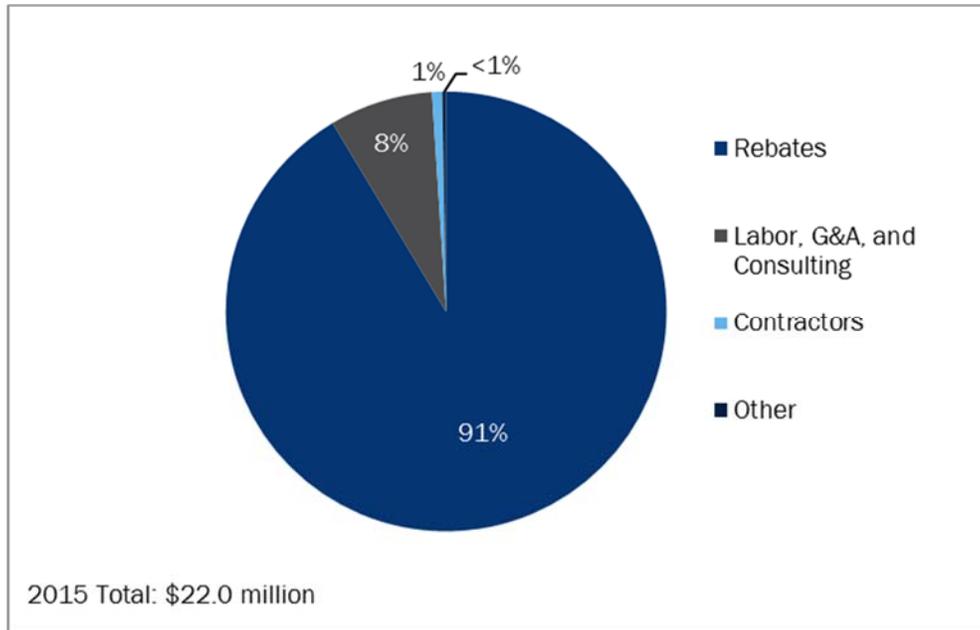
Figure 2 provides the detail for the \$22.0 million investment of PSEG Long Island and NYSERDA funds in the 2015 Renewable Energy Portfolio.

Figure 1. 2015 PSEG Long Island Expenditures for the Efficiency Long Island Portfolio



“Rebates” consists of payments made to participating customers. “Incentives” consists of payments made to participating contractors (e.g., HVAC installers). “Customer Services” consists of payments made to program implementers for direct installation.

Figure 2. 2015 PSEG Long Island and NYSERDA Expenditures for the Renewable Energy Portfolio



Note: "Other" expenditures include evaluation and marketing.

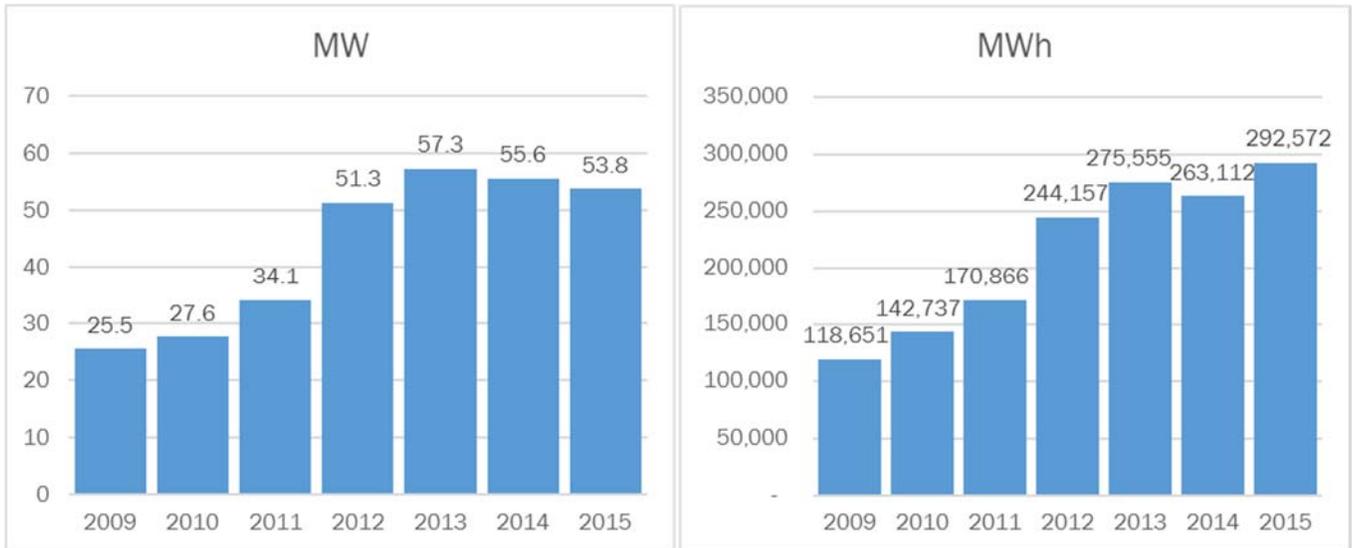
2.2 Efficiency Long Island Portfolio Evaluated Impacts

Overall, evaluated net savings from the Efficiency Long Island Portfolio included 53.8MW of demand savings and approximately 292,572MWh of energy savings. These energy savings resulted in the annual displacement of more than 176,351 tons of CO₂, 144 tons of SO₂, and 106 tons of NO_x. These environmental savings represent the equivalent of removing more than 33,823 cars from the road and a fuel savings of more than 372,053 barrels of oil.⁴

In 2015, the Efficiency Long Island Portfolio achieved its demand savings goal, and achieved energy savings 8% greater than the goal. Figure 3 presents the evaluated savings from the energy efficiency programs spanning the 7 years since the Efficiency Long Island Portfolio's inception.

⁴ Displacement savings values calculated using 2012 Long Island sub-regional emissions rates of the U.S. Environmental Protection Agency's (EPA) Emissions & Generation Resource Integrated Database (eGRID 2012), released October 8, 2015. Equivalent savings values are based on the U.S. EPA's Greenhouse Gas Equivalencies Calculator (updated April 2014).

Figure 3. 2015 Efficiency Long Island Portfolio Evaluated Net MW and MWh Savings



Similar to previous years, there were variances between evaluated results and the established savings goals across programs. While the residential programs exceeded their demand savings goals by 6.83 MW, the CEP fell short of its demand goal by 6.98 MW. However, in terms of energy savings, the residential programs together came in significantly over the goal, more than offsetting a shortfall in energy savings from the CEP. In total, the evaluated net savings for the CEP were significantly lower than in 2014 and realized 77% of the 2015 demand savings goal and 93% of the energy savings goal.

The EEP program accounts for the largest share of demand and energy savings among the residential programs, and its performance largely drives the overall performance of the residential portfolio. In 2015, the program successfully reached its goals 3 months ahead of schedule and was subsequently assigned additional funds and extended goals for the remainder of the year. The EEP program surpassed its annual savings goals, with evaluated net demand and energy savings equal to 146% and 122% of its goals, respectively.

Based on an analysis of portfolio impacts and costs, the savings generated by the Efficiency Long Island Portfolio are cost-effective. As shown in Table 3, the benefit/cost ratio, as calculated using the PAC test, is 3.3. The benefit cost/ratio using the TRC test is 2.2. In addition, the 2015 PAC test leveled costs for Efficiency Long Island Portfolio savings are \$182.94/kW-yr or \$0.04/kWh—less than the comparable marginal costs of supply-side alternatives.

Table 3. Summary of 2015 Efficiency Long Island PAC Test, TRC Test, and Levelized Costs

Cost-Effectiveness Test	Benefit/Cost Ratio	Levelized Cost (\$/kW-yr)	Levelized Cost (\$/kWh)
PAC	3.3	182.94	0.04
TRC	2.2	275.62	0.06

2.3 Efficiency Long Island Portfolio Economic Impacts

As part of the annual evaluation, the Evaluation Team assessed the economic impacts of the Efficiency Long Island Portfolio investments on the economy of Long Island. For 2011, and every year thereafter, we developed an input-output (I-O) model of the Long Island regional economy using IMPLAN modeling software to estimate these impacts. Central to the I-O model approach is the development of a static model for the effects of program spending based on a matrix of relationships among economic sectors, including industries, households, government, and foreign trade. The model requires inputs on spending, avoided cost, electric rates, and other parameters from PSEG Long Island, and draws on the net savings information included in the benefit/cost assessment. The Evaluation Team updated this model and its inputs for this 2015 evaluation.

As in previous years, we estimated 1-year and 10-year economic impacts associated with the 2015 Efficiency Long Island Portfolio investment, where the 10-year economic impacts accrue from measures installed in 2015 over their remaining measure life. We then add these 1-year and 10-year economic impacts to the 2009–2014 estimates to develop a portfolio-to-date estimate (adjusted to 2015 dollars).⁵

As shown in Table 4, our analysis of economic benefits found that PSEG Long Island’s \$70.5 million investment in the Efficiency Long Island Portfolio in 2015 returned \$77.5 million in total economic benefits to the Long Island regional economy in 2015, including an additional 582 full-time equivalent (FTE) employees.⁶ Over 10 years, these 2015 investments are expected to return \$178.1 million in total economic benefits to the regional economy (in 2015 dollars⁷), with an employment benefit of 1,362 new FTEs over the time period.

Extrapolating these results over the 7-year life of the portfolio, the \$401.4 million invested to date in Efficiency Long Island (\$458.6 million in 2015 dollars) produced approximately \$525.7 million⁸ in cumulative economic benefits in each program year, with an employment benefit of 3,208 FTE employees. Over the 10 years following each program year investment, these 7-year investments are expected to return \$1.14 billion⁹ to the Long Island regional economy, and result in 7,354 additional FTEs between 2009 and 2024.

⁵ We estimated the economic impact of the portfolio for the first 2 years of Efficiency Long Island Portfolio implementation by extrapolating the economic impacts from 2011 (assuming similar multipliers of economic impact) to arrive at a portfolio-to-date estimate.

⁶ Full-time equivalents represent the number of total hours worked divided by the number of compensable hours in a full-time schedule. This unit allows for comparison of workloads across various contexts. An FTE of 1.0 means that the workload is equivalent to a full-time employee for 1 year, but could be done, for example, by one person working full-time for a year, two people both working half-time for the year, or two people both working full-time for 6 months.

⁷ Using the energy supply discount rate assumption of 5.50%.

⁸ In 2015 dollars.

⁹ In 2015 dollars.

Table 4. Economic Impact of 2009–2015 Efficiency Long Island Portfolio Program Investments

Effect	Impact of 2015 Program Investment		Impact of 2009–2015 Program Investment	
	First-Year Impact	Impact over 10 years ^a	First-Year Impact	Impact over 10 years ^a
Total Economic Output ^b (2015 \$1M)	\$77.5	\$178.1	\$525.7	\$1,137.7
FTE Employees	582	1,362	3,208	7,354

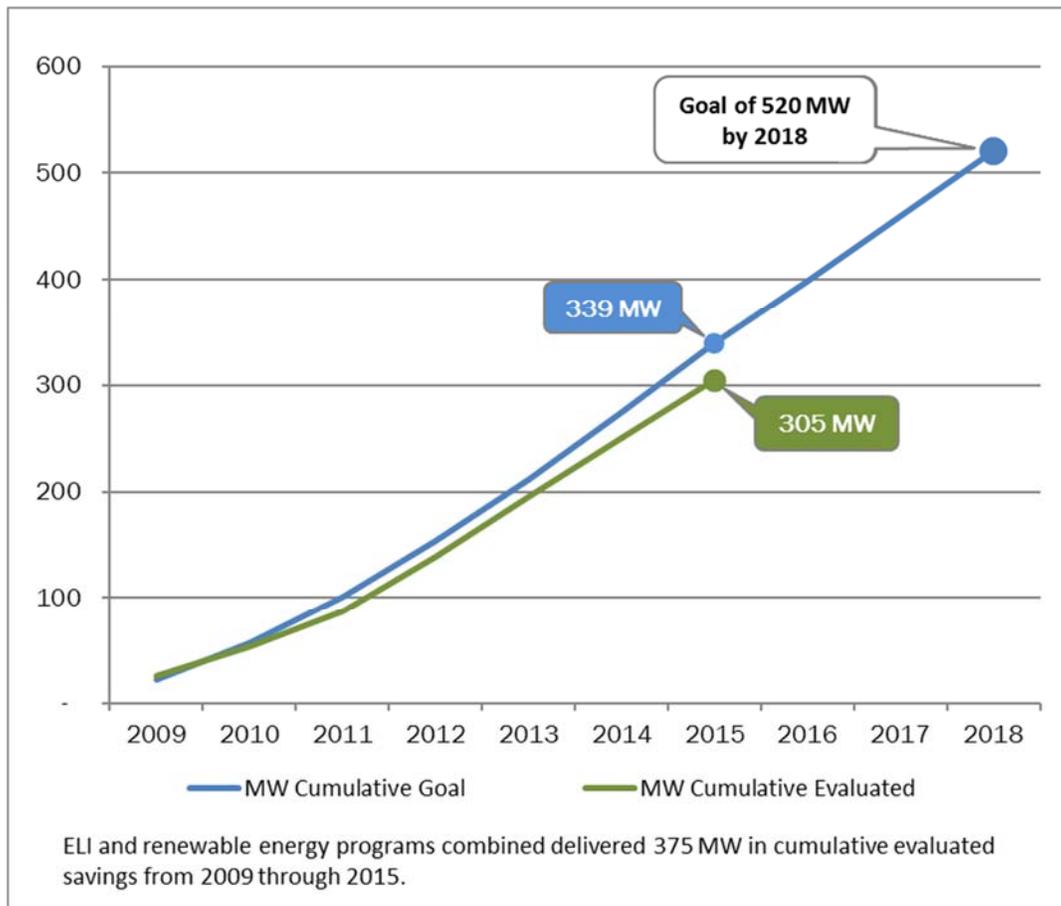
^a Includes the 10-year impacts for each program year beginning in that year.

^b Total economic output is the value of industry production. In IMPLAN, these are annual production estimates in producer prices.

2.4 Progress toward Long-Range Efficiency Long Island Portfolio Goals

In 2009, LIPA established aggressive annual and cumulative demand savings goals for the Efficiency Long Island Portfolio. These goals call for a cumulative reduction of 520 MW in system coincident peak demand by 2018, as shown in Figure 4.

Figure 4. Efficiency Long Island Portfolio Progress toward Demand Goal (MW)



Since establishing these goals, the Efficiency Long Island Portfolio investments continue to result in progress toward the long-range goal. The Efficiency Long Island Portfolio has achieved 90% of the cumulative demand savings goal as of 2015, compared to 91% through 2014.¹⁰ (It should be noted that LIPA's Electric Resource Plan used an expected value set conservatively to 79% of the long-range goal for the Efficiency Long Island Portfolio in its capacity planning models to account for the possibility of falling short of the goal.) In 2015, based on our evaluated savings results, the Efficiency Long Island Portfolio realized 108% of its annual energy demand savings goals and spent approximately 89% of its budget. Moving forward, we can expect a greater emphasis on energy savings in order to help the State meet its goal of 40% greenhouse gas reductions by 2030.

2.5 Renewable Energy Portfolio Evaluated Impacts

PSEG Long Island spent \$1.9 million of its operating budget on the Renewable Energy Portfolio in 2015, with NYSERDA providing \$20.1 million in rebate costs through the NY-Sun Initiative.¹¹ Overall, our evaluation showed that the portfolio generated 29.03 MW of coincident demand and 69,530 MWh of energy. The Renewable Energy Portfolio resulted in an annual displacement of approximately 41,923 tons of CO₂, 34 tons of SO₂, and 25 tons of NO_x. These environmental savings represent the equivalent of removing approximately 8,007 cars from the road and a fuel savings of almost 88,446 barrels of oil.¹²

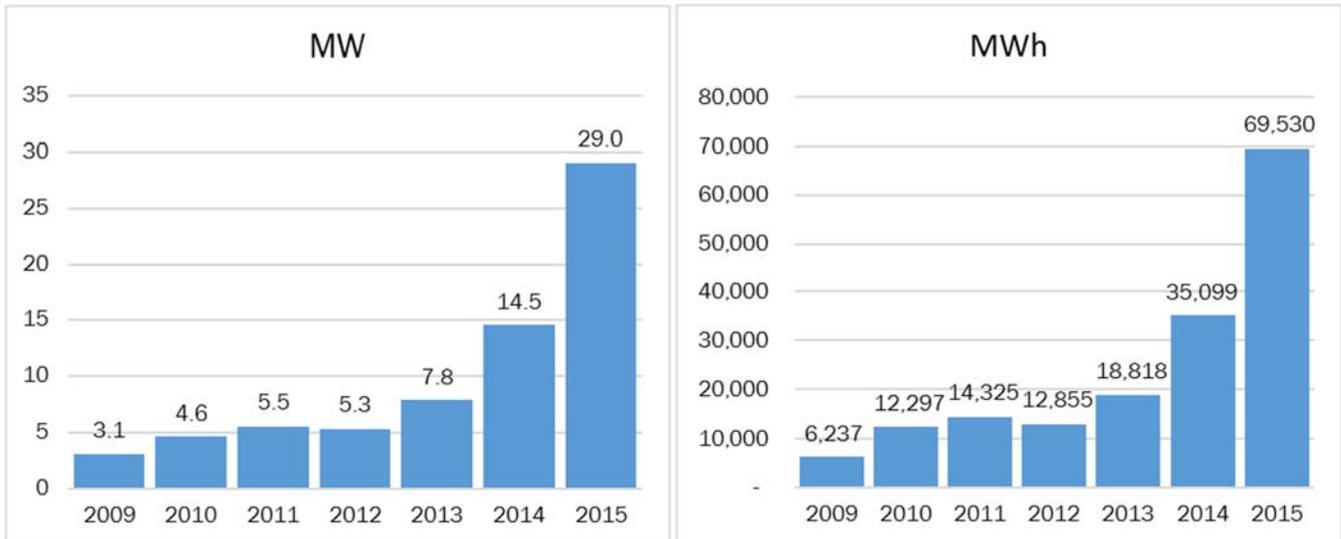
The Renewable Energy Portfolio greatly exceeded its goals in 2015, achieving 181% of its net demand goal and 182% of its energy goal, which was largely due to the renewable budget being supplemented with \$20.1 million from the NYSEDA's NY-Sun Initiative, as well as decreasing system and rebate costs per kW. Demand and energy savings from the Renewable Energy Portfolio each doubled compared to 2014, while overall spending remained about the same.

¹⁰ When the cumulative evaluated demand savings associated with the Renewable Energy programs since 2009 are added to Efficiency Long Island Portfolio savings, the total cumulative evaluated demand savings increases to 375 MW.

¹¹ PSEG Long Island also paid an additional \$22,436 in rebates for legacy Solar Pioneer projects.

¹² Displacement savings values calculated using 2012 Long Island sub-regional emissions rates from the U.S. EPA's Emissions & Generation Resource Integrated Database (eGRID 2012), released October 8, 2015. Equivalent savings values are based on the U.S. EPA's Greenhouse Gas Equivalencies Calculator (updated April 2014).

Figure 5. 2015 Renewable Energy Portfolio Evaluated Net MW and MWh Savings



In August 2014, PSEG Long Island began a transition from the legacy Solar Entrepreneur and Solar Pioneer programs to the NYSERDA-funded NY-Sun Residential and Small Commercial initiatives. After August 12, 2014, PSEG Long Island accepted only NY-Sun applications, and the NY-Sun program absorbed the incentive costs for all ongoing projects. Through the initiative, NYSERDA committed \$60 million in total incentives for Long Island, consisting of 122 MW for residential systems and 58 MW for nonresidential systems under 200 kW. The ultimate goal of the initiative is to promote market transformation in the state by creating a sustainable market not dependent on subsidies. To accomplish this, NYSERDA created blocks of MW targets at specific incentive levels for each region of the state based on the maturity of the region’s solar PV market. When the MW target of each block is met, the block is closed and a new block with a new MW target and lower incentive level is opened until all blocks for the region are filled and the incentive is no longer offered. As of April 2016, funding for the first three blocks of residential funding has been exhausted and only approximately 4% of the fourth and final block of funding remains.

The Evaluation Team also reviewed the cost-effectiveness of the Renewable Energy Portfolio. Based on an analysis of portfolio impacts and costs, the savings generated by the Renewable Energy Portfolio are cost-effective. As shown in Table 5, the PAC benefit/cost ratio is 9.0,¹³ which is a notable improvement over the 2014 value of 4.4. This increase in the PAC benefit/cost ratio for renewables in 2015 is due mainly to the decreasing rebate costs per kW of installed solar PVs. The benefit cost/ratio using the TRC test is 0.7.

The 2015 PAC test levelized costs are \$56.41/kW-yr and \$0.02/kWh compared to \$107.80/kW-yr and \$0.05/kWh in 2014. It is important to note that these levelized costs do not include the lost revenue associated with net metering, which is consistent with the calculation of levelized costs for energy efficiency programs. We provide this value to allow for a direct comparison to the Efficiency Long Island Portfolio.

¹³ Includes \$20.1 million from the NYSERDA’s NY-Sun Initiative.

Table 5. Summary of 2015 Renewable Energy PAC Test, TRC Test, and Levelized Costs

Cost-Effectiveness Test	Benefit/Cost Ratio ^a	Levelized Cost (\$/kW-yr)	Levelized Cost (\$/kWh)
PAC	9.0	56.41	0.02
TRC	0.7	754.26	0.32

^a Includes \$20.1 million from the NYSEERDA's NY-Sun Initiative.

2.6 Renewable Energy Portfolio Economic Impacts

The 2015 evaluation also includes an assessment of the economic impact of investments in the Renewable Energy Portfolio on the economy of Long Island. The Evaluation Team developed an I-O model of the Long Island regional economy for the 2011 evaluation and updated the model inputs in each subsequent year. We estimated economic impacts associated with the PSEG Long Island's 2015 investments, and then combined those results with our assessments of the prior 5 years of implementation of the Renewable Energy programs to arrive at a portfolio-to-date estimate.

As shown in Table 6, our analysis of economic benefits found that the combination of PSEG Long Island's \$1.9 million budget in the Renewable Energy Portfolio in 2015 plus the additional \$20.1 million in funding through NYSEERDA's NY-Sun Initiative returned \$83.2 million in total economic benefits to the Long Island regional economy in 2015, including an additional 457 FTEs. Over the 10-year period, these 2015 investments are expected to return \$159.9 million in total economic benefits to the regional economy (2015 dollars¹⁴), with an employment benefit of 1,083 new FTEs.

Extrapolating these results over the 7-year life of the portfolio, the \$143.8 million investment in Renewable Energy programs to date (\$176.3 million in 2015 dollars) produced approximately \$283.2 million¹⁵ in cumulative economic benefits in each program year, with an employment benefit of 1,614 FTE employees. Over the 10 years following each program year investment, these 7-year investments are expected to return approximately \$476.0 million¹⁶ to the Long Island regional economy and result in 3,042 additional FTEs between 2009 and 2024.

Table 6. Economic Impact of 2009–2015 Renewable Energy Program Investments

Effect	Impact of 2015 Program Investment		Impact of 2009–2015 Program Investment	
	First-Year Impact	Impact over 10 Years ^a	First-Year Impact	Impact over 10 Years ^a
Total Economic Output ^b (2015 \$1M)	\$83.2	\$159.9	\$283.2	\$476.0
FTE Employees	457	1,083	1,614	3,042

^a Includes the 10-year impacts for each program year beginning in that year.

^b Total economic output is the value of industry production. In IMPLAN, these are annual production estimates in producer prices

As we found in 2014, spending on PSEG Long Island's Renewable Energy Portfolio resulted in much greater benefits to the Long Island economy in the 2015 program year than in some prior years. This difference is primarily driven by the substantial increase in the number of solar systems installed through the Solar

¹⁴ Using the energy supply discount rate assumption of 5.50%.

¹⁵ In 2015 dollars.

¹⁶ In 2015 dollars.

Pioneer program that were supported through the additional \$20.1 million in funding received through NYSERDA's NY-Sun Initiative.

2.7 Key Themes for Continued Success

The Efficiency Long Island and Renewable Energy portfolios continued to demonstrate strong performance in 2015, providing substantial capacity and energy savings in a cost-effective manner. Combined, the portfolios exceeded the established goals for demand and energy savings. To continue to make progress toward the long-range savings goals, to maintain overall portfolio performance, and to build on the historical success of the Efficiency Long Island and Renewable Energy programs, PSEG Long Island must continue to identify and consider emerging issues and challenges to success in its planning, budgeting, implementation, and management decisions. Below we provide an overview of the performance of the Efficiency Long Island and Renewable Energy programs for the 2015 evaluation cycle and identify challenges that warrant attention in the future.

COMMERCIAL EFFICIENCY PROGRAMS

OVERVIEW OF PERFORMANCE

PSEG Long Island's CEP portfolio continued to effectively service commercial customers on Long Island through the Prescriptive, Existing Retrofit, and Custom program offerings. PSEG Long Island's 2015 CEP portfolio also included no-cost energy assessments, cost-shared technical assistance studies, building commissioning co-funding, Leadership in Energy and Environmental Design (LEED) certification incentives, and ENERGY STAR Benchmarking certification. In addition, PSEG Long Island offered an SBDI program as part of the CEP in the first quarter of 2015. PSEG Long Island discontinued the SBDI program offering in March 2015 with no immediate plans to resume an SBDI program solution. Based on evaluated savings, the CEP achieved 77% of the peak demand goal and 93% of the energy savings goal in 2015.

Existing Retrofit projects and lighting measures continued to be the primary source of energy and demand savings. Existing Retrofit projects accounted for 83% of evaluated demand savings and 72% of evaluated energy savings. Lighting measure installations for Prescriptive and Existing Retrofit projects accounted for 82% of evaluated demand savings and 74% of evaluated energy savings.¹⁷ LED lighting continued to increase in prominence in 2015. More specifically, LEDs grew from 34% of the Prescriptive, Existing Retrofit, and SBDI evaluated demand savings in 2013 to 72% in 2015. Given the heavy reliance on lighting for overall program savings, program staff are continuously exploring other measure offerings to diversify the measure mix. For example, the CEP added thermal storage systems to the 2016 CEP offerings.

POTENTIAL CHALLENGES FOR THE FUTURE

LIGHTING

The CEP's heavy reliance on lighting continues to be a challenge. (This challenge, we note, is not unique to CEP, but rather is endemic to commercial lighting programs across the nation.) This challenge is multifold. Through its success in transforming the commercial lighting market over the history of the program deployment, the CEP will likely face more difficulty identifying savings opportunities in the future. In addition, market forces, such as the phase-out of the T12 lamps and dramatic reductions in LED prices, will likely

¹⁷ Note that these measures include lighting controls and refrigeration lighting.

contribute to further baseline erosion and an increase in naturally occurring adoption of energy-efficient products. These market forces will, in turn, negatively affect both gross savings assumptions and net-to-gross ratios. Understanding the state of the market and market dynamics while strategically adjusting the portfolio's offerings will be critical for the program's continued success. Diversifying the program away from such a heavy reliance on lighting measures will become even more important in future program years. Given the rapid increase in the adoption of LEDs in the commercial sector, the Evaluation Team is recommending that PSEG Long Island conduct research on the current penetration and saturation of LEDs in commercial spaces on Long Island. In addition, to accurately reflect net program savings, it will be necessary to update the planning assumptions and evaluated net-to-gross factors for the CEP program such that they stay abreast of these changes.

TERMINATION OF THE SBDI PROGRAM

With the termination of the SBDI program, PSEG Long Island lost not only a considerable source of savings, but also a program design that engaged small business customers. To better address the needs of small business customers, PSEG Long Island introduced a Fast Track LED program in 2016 that offers rebates on LED lighting products without requiring pre-approval or pre-inspection. Large customers (rate code 285) are not eligible to participate in this program. The program sets a limit on the number of products for which customers can receive rebates in order to limit participation by larger customers.

While the Fast Track LED program is designed to at least partially fill the gap in savings from and offerings for small business customers, it may ultimately lack the appeal and the ease of participation of a broader turnkey offering. Based on the results of the recently completed Small Business Profiling study for the Long Island region, small business customers represent 82% of accounts, yet the historical participation rate among this group is just one third of the participation rate of non-small business customers (5% vs. 15%). With such a wide gap in participation, and in the absence of a broader turnkey program, PSEG Long Island may have a difficult time engaging small business customers who are often constrained by financial barriers and a lack of resources and time to dedicate to energy efficiency improvements or program engagement.

PROGRAM DATA TRACKING SYSTEM TRANSITION

As PSEG Long Island moves from the Siebel data tracking system to Lockheed Martin's LM Capture system in 2016, challenges with data capture, transfer, and processing may arise, resulting in implementation bottlenecks. Deploying a staggered transition to LM Capture, providing thorough training on the new system, carefully documenting the data entry and processing steps, and developing quality assurance protocols will help eliminate possible issues and make the transition to LM Capture seamless to customers.

RESIDENTIAL EFFICIENCY PROGRAMS

OVERVIEW OF PERFORMANCE

Collectively, the residential programs provided substantial demand and energy savings in 2015 that were largely driven by the EEP program. In 2015, based on evaluated savings, the EEP program exceeded its demand and energy goals by 46% and 22%. The Cool Homes program, next largest in terms of savings, exceeded its demand goal by 7% and 2% respectively. Together, the EEP and Cool Homes programs accounted for 94% of the evaluated demand savings from the residential programs in 2015.

While the HPwES program met its goals, the remaining residential programs—REAP and HPD—were below their demand and energy goals.

POTENTIAL CHALLENGES FOR THE FUTURE

LIGHTING

The performance of the EEP program largely drives the overall energy and demand performance of the residential portfolio. Within the EEP program, lighting products account for 75% of savings. The 2015 EEP Lighting program reflected the changing lighting marketplace, with increased sales of (and savings from) LEDs relative to CFLs, the historically leading product. Substantial growth in the importance of LEDs to the program are being driven by a mix of market forces (e.g., growing number of products, declining prices, and increasing quality) and programmatic decisions. PSEG Long Island has been proactive over the years in adjusting the program offerings to accommodate these market forces. Nevertheless, two key factors are likely to create challenges to maintaining the energy and demand savings the program currently and historically has received from residential lighting measures.

First, the baseline efficiency of incandescent bulbs will increase going forward due to code changes introduced as part of the Energy Independence and Security Act (EISA) of 2007. EISA required the phasing out of inefficient 100-watt incandescent light bulbs beginning in 2012, 75-watt incandescent bulbs in 2013, and 60-watt and 40-watt incandescent bulbs in 2014. Research in other jurisdictions has shown that this baseline efficiency of lighting products is not necessarily moving in real time with the effective dates of the EISA standards. Some retailers have lingering pre-EISA stock on their shelves, and some lighting manufacturers may not be complying with the EISA requirements, as there is no enforcement of the provisions of the act. Nevertheless, the dates for compliance with EISA have now passed for all general service bulbs. In addition, the U.S. Department of Energy has proposed new standards to go into effect in 2020 that will further reduce maximum allowable wattages per lumen and will cover many more bulb types. Considering the importance of residential lighting as a source of savings, monitoring the actual baseline lighting efficiency on Long Island will be critical to understand energy savings associated with EEP lighting and to inform future revisions in program strategy.

Second, customer preferences for LEDs may be driving the transition to efficient lighting faster than anticipated. Compared to most other lighting options, LEDs offer superior efficiency, longer life, excellent performance, and a greater range of applications. These benefits, coupled with falling prices, have made LEDs the fastest growing segment of the lighting market. However, despite their growing popularity, LEDs currently fill a relatively small percentage of the sockets nationally, and the 2015 baseline research conducted by AEG indicated that LEDs make up less than 10% of residential bulbs on Long Island. In addition, incandescent halogens still make up a large portion of bulb shipments nationally, and many customers continue to purchase them due to familiarity with the product and lower prices. Given current market trends, LEDs will likely fill most available sockets in the future. However, it is yet unclear as to the pace of their adoption.

Before PSEG Long Island can accurately plan for future lighting program savings and determine what program interventions will be needed and for how long, it will be necessary to understand the amount of remaining lighting energy efficiency opportunity in its residential customers' homes. As such, the Evaluation Team is recommending primary research to establish and track baseline efficiency values by lumen category, to determine the typical usage characteristics of higher- and lower-use sockets on Long Island, and the prevalence and rate of adoption of LED lights in higher- and lower-use settings. In addition, given the recent and ongoing changes to both the lighting market and the products offered by the EEP program, the Evaluation Team is recommending research to update net-to-gross values on residential lighting measures.

ROOM AIR CONDITIONERS

Research conducted by the Evaluation Team on Long Island in 2013 revealed that the market for room air conditioners and dehumidifiers has essentially transformed such that the vast majority of units for sale are ENERGY STAR qualified. Based on this research, PSEG Long Island discontinued its rebates for these products for the 2014 program year. Federal efficiency standards for room air conditioners tightened in 2014, and, in late 2015, ENERGY STAR version 4.0 specifications for room air conditioners increased the accepted combined energy efficiency ratio (CEER) base rating across all room air conditioners. Anticipating these new ENERGY STAR version 4.0 criteria, and expecting a decrease in the share of qualifying models, PSEG Long Island began providing rebates for the approved ENERGY STAR version 4.0 room air conditions in 2016. The Evaluation Team recommends conducting in-store research to confirm that sufficient non-qualifying models exist, such that the rebates do have the potential to drive the purchase of higher energy-efficient products.

GEOTHERMAL HEAT PUMPS

Geothermal systems represent a significant opportunity for energy savings, and PSEG Long Island is making efforts to increase the installation of these systems on Long Island. However, geothermal heat pump installations through the Cool Homes program have remained flat in recent years. The Evaluation Team recommends that PSEG Long Island conduct research that will aid in long-term planning of the geothermal heat pump component of the Cool Homes program. Research should be conducted on the free-ridership rate and efficiency baseline for these systems in PSEG Long Island electric service territory, just as research should be undertaken to establish the most effective incentive levels. Given that geothermal installations are significantly more expensive than air-source heat pumps (ASHPs) and traditional central air conditioning (CAC) systems, an ongoing education effort combined with a higher/more-effective incentive level may be key elements to growing the geothermal component of the Cool Homes program.

RENEWABLE ENERGY PORTFOLIO

OVERVIEW OF PERFORMANCE

The Renewable Energy Portfolio greatly exceeded its goals in 2015, driven by continued decreases in system prices, the demand for leased residential solar systems, and the influx of \$20 million from NYSERDA's NY-Sun Initiative. Past research conducted by Opinion Dynamics found that, since their inception, the Solar Pioneer and Solar Entrepreneur programs have promoted the development of a renewable energy industry on Long Island by helping increase consumer awareness and availability of and demand for solar energy. The programs have effectively developed a strong PV market infrastructure on Long Island and a knowledgeable trade ally base. With this market in place, the combination of the influx of leased systems, which accounted for 71% of total installations in 2015, spurred additional demand and resulted in strong growth and program participation in 2015. The program's shift to implementing the NY-Sun Initiative, with its \$60 million allocated to the Long Island electric service territory, also fostered growth in the market, as it allowed PSEG Long Island to continue to accept applications at a high rate throughout the year and not to slow or suspend the program due to annually set budget constraints, as in previous years. Through the NY-Sun Initiative, PSEG Long Island will continue to foster market transformation and create a sustainable market.

POTENTIAL CHALLENGES FOR THE FUTURE

PSEG Long Island has implemented NYSERDA's NY-Sun Initiative since August 2014, providing many benefits to Long Island's electric customers (including the \$60 million in funding provided by NYSERDA). The

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NY-Sun Initiative is funded at a level that is designed to provide long-term confidence to the marketplace and incrementally reduces rebates as more customer choices (e.g., lease, purchase, remote net metering, community aggregation) are available, the market grows, and prices decrease. The Initiative has the goal of realizing a transformed and sustainable solar PV market on Long Island. As designed, the program is now winding down and soon will no longer offer solar PV incentives to residential and commercial customers. As of March 2016, PSEG Long Island has used 97% of the 149 MW of residential solar PV capacity available for program funding and 40% of the 58 MW available for small nonresidential customers. According to the program staff, funding for both residential and nonresidential projects will run out in 2016. PSEG Long Island is developing a proposal for a REV demonstration project for on-bill financing which, if successful, should help to sustain a market for solar PV going forward.

3. Impact Results

This section presents the evaluated net energy and demand impacts for the Efficiency Long Island and Renewable Energy portfolios.

3.1 Efficiency Long Island Portfolio Impacts

ENERGY AND DEMAND IMPACTS

The portfolio of Efficiency Long Island programs performed well in 2015, achieving similar evaluated net savings as those of 2014, and delivering considerable energy and demand savings to electric customers on Long Island. The portfolio’s evaluated net demand savings came in essentially equal to its stated goal and its energy savings exceeded its stated goal for the year. Specifically, the Efficiency Long Island Portfolio accounted for 53.8 MW and 292,572 MWh in total evaluated net savings for 2015. This represents approximately 97% of evaluated net demand and 111% of evaluated net energy savings compared to 2014 results, which were approximately 55.6 MW and 263,000 MWh. As shown in Table 7, the portfolio reached 100% of its net demand and 108% of its net energy savings goals.

Table 7. Net Impacts: Efficiency Long Island Portfolio Evaluated Savings versus Goals

Program	2015 Net Savings Goals		2015 Evaluated Net Savings		Percent of Goal	
	MW	MWh	MW	MWh	MW	MWh
Commercial Efficiency Programs	30.0	116,071	23.0	107,654	77%	93%
Residential Programs						
EEP	16.7	144,973	24.4	177,356	146%	122%
Cool Homes	4.3	4,002	4.6	4,084	107%	102%
REAP	0.9	2,494	0.4	1,052	49%	42%
HPwES	0.4	354	0.4	340	110%	96%
HPD	1.7	4,146	1.0	2,086	57%	50%
Subtotal Residential Programs	24.0	155,969	30.8	184,918	128%	119%
Total Efficiency Long Island Portfolio	54.0	272,040	53.8	292,572	100%	108%

Down from about half of total evaluated net demand savings of the Efficiency Long Island Portfolio in the previous 3 years, the CEP accounted for about 43% of evaluated demand savings in 2015. At the portfolio level, the CEP achieved 77% of the 2015 net demand savings goal and 93% of the net energy savings goal. Driven primarily by the success of the EEP program, the residential programs performed exceptionally well, achieving 128% of their combined demand savings goals and 119% of their combined energy savings goal.

The EEP program continues to account for the largest portion of energy and demand savings within the residential programs, and performance of this program has a substantial impact on the ability of the portfolio to achieve savings goals. The continued success of the EEP program significantly contributed to the strong overall performance of the residential programs in 2015.

3.2 Renewable Energy Portfolio Impacts

ENERGY AND DEMAND IMPACTS

Leveraging the \$20.1 million in funding for rebates through NYSERDA’s NY-Sun Initiative, the Renewable Energy Portfolio exceeded its net demand and energy goal, achieving 181% and 182% of these goals, respectively, as shown in Table 8.

Table 8. Net Impacts: Renewable Energy Portfolio Evaluated Savings versus Goals

Program	2015 Net Savings Goals		Evaluated Net Savings		Percent of Goal	
	MW	MWh	MW	MWh	MW	MWh
Solar PV	16.0	38,192	29.0	69,530	181%	182%
Total Renewable Energy Portfolio	16.0	38,192	29.0	69,530	181%	182%

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