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Long Island Power Authority Efficiency Long Island and Renewable Energy Portfolio

2013 Annual Evaluation Report

FINAL

Prepared for:

LIPA Long Island Power Authority

PSEG LONG ISLAND
We make things work for you.

Prepared by:
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ENERGY & RESOURCE SOLUTIONS, INC.

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May 28, 2014

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1. INTRODUCTION TO ANNUAL REPORT

This report presents the program evaluation results of the 2013 Efficiency Long Island Portfolio and Renewable Energy Portfolio for the Long Island Power Authority (LIPA) and PSEG Long Island, 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 administration, design, budget and implementation of the Efficiency Long Island Portfolio and Renewable Energy Portfolio.

The evaluation team produced two volumes that encompass the entire report. The *2013 Annual Evaluation (*Volume I) provides an overview of evaluation findings, including impact and process results for 2013. The *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. This report is developed with the needs of PSEG Long Island's program planners and managers in mind as the efficiency and renewable programs continue to be an important and cost-effective resource.

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 results directly from program-related actions taken by participants, and 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 (NTGR) (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 and coincidence factors when estimating gross impacts, the Long Island Power Authority and PSEG Long Island do not include these in their gross impact estimates.

- **Evaluated Net Savings:** The net savings by the program for purposes of comparison to program savings goals. Evaluated net savings are determined by applying program planning NTGR to the gross impact estimates determined by the evaluation team.

- **kW (Demand or Capacity):** The average level of power used over an hour. System coincident demand is the level of demand at the hour of the day when there is the maximum demand on the system grid. Peak power is the average power used across a four-hour period when there is high demand. For Long Island, peak demand takes place from 2:00 to 6:00 p.m. Monday through Friday (non-holiday) in the summer months from June to August. Demand savings values in this report are peak power demand impacts at hour ending 5PM.

- **kWh (Energy Consumption):** The power consumed over a period of time. Energy impacts are based on annual usage.

- **Program Administrator Cost 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.

- **Total Resource Cost 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 utility's costs. Incentive costs are not included in this test as they are assumed to be a societal transfer.

- **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 5.643% to be consistent with base load generation supply side resources in the Long Island service territory. The levelized cost 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 5.643%. The levelized cost 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 2013, the Long Island Power Authority continued to cost effectively increase the savings realized from the Efficiency Long Island and Renewable Energy Portfolios. The Authority spent approximately $105 million on these portfolios in 2013 compared to $96 million in 2012, while increasing savings to 65.2 MW and 294,000 MWh in 2013 compared to 56.6 MW and 257,000 MWh in 2012. The 2013 evaluated demand and energy savings from these portfolios exceeded the established goals by 8% and 12%, respectively. Key drivers to this success include:

Increase in Sales of Efficient Lighting Products: In 2013, the Energy Efficient Products (EEP) program exceeded its demand and energy savings goals by 52% and 60%, respectively and contributed more demand and energy savings than any other energy efficiency program. The EEP's performance was driven by a significant increase in sales of efficient lighting products. Lighting products account for the vast majority of program sales and savings, and traditionally, compact fluorescent lamps (CFLs) have been the dominant source of lighting product sales and savings through the program.

While CFLs still accounted for the large majority of bulbs sold in 2013, sales of light-emitting diode (LED) light bulbs continued to grow in 2013. With lower wattages, the typical LED bulb replacing a 60 watt incandescent results in a reduction of 48 watts, compared to a reduction of 44 watts for a CFL. Program sales of LED bulbs have increased from less than 1% of all bulbs sold through the program in 2010, to 4% in 2011, 11% in 2012 and 26% in 2013. In total volume, the program sold more than 640,000 LED fixtures and bulbs in 2013, accounting for 45% of all lighting demand savings through the EEP program. Acceptance of LED lighting in the commercial market has also continued to increase with LED fixtures accounting for about 30% of all prescriptive and retrofit lighting savings through the Commercial Efficiency Program in 2012 and about 42% in 2013.

Increased Contributions of Solution Provider: The Solution Provider continued to account for the majority of the Commercial Efficiency Program savings. The program increased its savings over 2012 and met its 2013 savings goals, which were almost 30% higher than in 2012. The program accounts for 28% of the total demand and 27% of the total energy savings realized by the Efficiency Long Island Portfolio of programs and, therefore, the Solution Provider Program savings have a substantial weight on the overall commercial portfolio performance. In 2013, the Long Island Power Authority increased the focus and emphasis of this program based upon its relative success, which contributed to its greater share of savings.

Significant Growth in Solar Installations: Since its inception, the Long Island Power Authority has provided rebates for more than 7,500 solar installations for Solar Pioneer and Solar Entrepreneur participants. In 2013, there were 1,625 photovoltaic installations through the programs, and Solar Entrepreneur began to provide commercial renewable customers with the ability to remote net meter. In addition, residential solar leasing was authorized in December 2012.

The ongoing decline in the costs of manufacturing and installing photovoltaic equipment have helped to enable the Long Island Power Authority to reduce the residential and commercial rebate levels throughout 2013, which further improved the cost effectiveness of this program, leaving solar at its lowest cost to the program since the Authority began investing in renewable programs in 2000.

Continued Improvements in Realization Rates: In 2013 our evaluated energy and demand savings were much closer to ex ante values than in prior years, as shown by the comparatively high 2013 realization rates. As noted in our 2012 annual report, The Long Island Power Authority completed efforts to embed evaluated savings estimates into the Siebel system as they continue to incorporate evaluation findings into program planning assumptions and tracking systems thereby achieving closer

alignment between planned and evaluated savings estimates. The Efficiency Long Island and Renewable Energy Portfolios 2013 plans were developed using updated savings assumptions derived from the 2010 and 2011 evaluation efforts.

The following sections review the Efficiency Long Island and Renewable Energy Portfolios' program impacts for 2013, as well as the key process findings for the Efficiency Long Island and Renewable Energy Portfolio programs.

2.1 SUMMARY OF PORTFOLIO PERFORMANCE

The Long Island Power Authority established 2013 annual demand and energy savings goals of 60.4 MW and 262,934 MWh for the combined Efficiency Long Island and Renewable Energy Portfolios. Combined evaluated net savings achieved 108% of goal for demand and 112% of goal for energy, as shown in Table 1. The overall Efficiency Long Island and Renewable Portfolios achieved higher savings while spending less than the approved budget.

In 2013, the Long Island Power Authority spent just over $105 million implementing the Efficiency Long Island and Renewable Energy programs—91% of the programs' available budgets. Based on our analysis of portfolio impacts and costs, the savings generated by the portfolios are cost-effective. The overall benefit/cost ratio, based on the Program Administrator (PA) test[2], is 2.8 for the combined portfolio savings. (A PA value greater than 1 indicates that portfolio benefits outweigh costs.) In addition, the levelized costs of the combined portfolio savings are $0.049 per kWh, or $203.10 per kW-yr. 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 or $/kWh, they can be readily compared to the cost of alternative supply additions or the cost of generating electricity. The levelized costs of the Efficiency Long Island Portfolio taken by itself, and combined with the Renewable Energy Portfolio are less than the comparable costs of generating the displaced energy.

The avoided cost of displaced energy was updated in the 2012 evaluation based on a more recent, and lower, forecast for long term natural gas prices and avoided costs of capacity. These avoided costs did not change for the 2013 evaluation and remain about 15% below what was used in the 2010 and 2011 evaluation reports.

An important catalyst in the Long Island Power Authority's 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 required to satisfy forecasted energy demand. As such, performance relative to the annual capacity savings goals is the primary performance metric for these programs. The Long Island Power Authority derived its annual savings goals from planning assumptions regarding key inputs to the estimation of expected gross and net savings attributable to program-incented energy efficiency measures. 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 and the

[2] The PA test measures the net costs of an energy efficiency program as a resource option based on the costs incurred by the Program Administrator, including all program costs and any rebate and incentive costs, but excluding costs incurred by the participant. To allow for direct comparison with Long Island Power Authority's assessment of all supply-side options, we applied the PA test as the primary method of determining cost-effectiveness, and used assumptions similar to those used by the Long Island Power Authority's resource planning team.

Renewable Energy Portfolios, as shown in Table 1 and presented throughout this report, for purposes of assessing goal attainment. We calculated evaluated net savings by applying the Long Island Power Authority'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 cost.

Table 1. Net Impacts: Efficiency Long Island & Renewable Energy Portfolios Evaluated Impacts Versus Goals

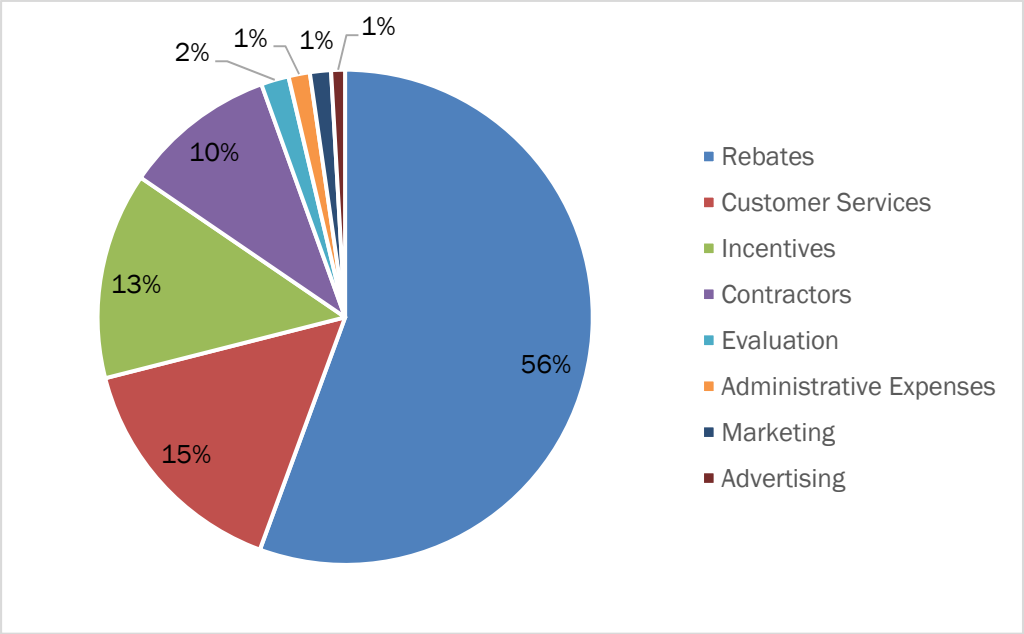
Program	Budget	Actual Cost	Coincident Demand Savings (MW)		Energy Savings (MWh)		Benefit/ Cost Ratio (PA)	PA Levelized Costs	
			Goal	Evaluated	Goal	Evaluated		$/kW-yr	$/kWh
Subtotal Commercial Efficiency Program	**$45,832,301**	**$47,841,002**	**31.00**	**28.67**	**133,590**	**116,260**	**3.0**	**200.93**	**0.049**
EEP	$15,620,228	$15,727,157	14.12	21.49	93,969	150,522	5.2	132.87	0.019
Cool Homes	$8,105,843	$8,417,104	5.01	5.00	4,814	4,361	2.2	200.90	0.255
REAP	$5,959,454	$3,305,568	0.76	0.30	4,480	2,234	0.4	1,735.05	0.235
HPwES	$3,215,125	$1,665,726	0.78	0.46	597	348	1.0	456.75	0.217
HPD	$2,913,632	$2,509,241	0.77	1.10	3,420	1,051	1.1	356.51	0.412
Existing Homes Subtotal	*$20,194,053*	*$15,897,639*	*7.32*	*6.87*	*13,311*	*7,994*	*1.5*	*288.69*	*0.236*
ES New Homes	$3,089,809	$997,863	0.56	0.31	1,082	779	1.5	323.86	0.129
Subtotal Residential	**$38,904,090**	**$32,622,659**	**22.00**	**28.67**	**108,362**	**159,295**	**3.3**	**184.81**	**0.036**
Subtotal Efficiency Long Island	**$84,736,392**	**$80,463,660**	**53.00**	**57.34**	**241,952**	**275,555**	**3.1**	**194.07**	**0.043**
Solar PV	$29,668,931	$24,244,155	7.23	7.84	20,400	18,715	2.1	233.90	0.098
Solar Hot Water	$525,414	$327,190	0.13	0.004	306	28	0.1	7,513.91	0.983
Backyard Wind	$909,093	$238,685	0.02	0.002	276	75	0.3	7,270.38	0.242
Subtotal Renewable Energy	**$31,103,437**	**$24,810,030**	**7.39**	**7.84**	**20,982**	**18,818**	**2.1**	**239.18**	**0.100**
Total	**$115,839,829**	**$105,273,690**	**60.39**	**65.19**	**262,934**	**294,373**	**2.8**	**203.10**	**0.049**

Notes:

1. B/C Ratio from Program Administrator perspective using comparison to baseload marginal supply costs. If B/C is greater than 1.0, program is cost-effective.
2. All levelized cost calculations use a discount rate of 5.643% to be consistent with supply-side alternatives.
3. Results do not include R&D or LIPAedge.
4. Actual costs are the expenditures necessary to obtain the energy and demand savings as reported in Siebel, and do not reflect the Long Island Power Authority accrual accounting.
5. Commercial Efficiency Program goals do not include 770 MWh for BOC. This program was not implemented in 2013 and therefore not evaluated.

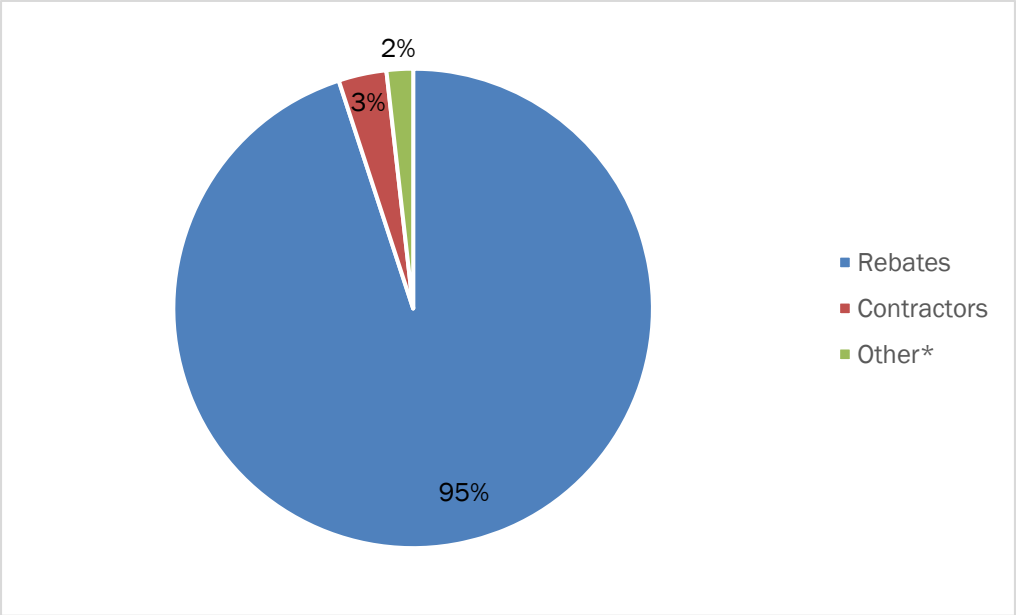
In 2013 the Long Island Power Authority spent slightly more than $105 million on the Efficiency Long Island and Renewable Energy Portfolios, a 10% increase in combined spending as compared to 2012 while increasing demand savings by 11% and 13% in energy savings. Figure 1 presents a summary of the $80.5 million spending related to implementation, management and evaluation of Efficiency Long Island programs in the Efficiency Long Island Portfolio by type of expenditure.[3] Figure 2 provides the detail for the $24.8 million investment in the 2013 Renewable Energy Portfolio.

Figure 1. 2013 Long Island Power Authority Expenditures for the Efficiency Long Island Portfolio



[3] Rebates consist of payments made to participating customers. Incentives consist of payments made to participating contractors (e.g., HVAC installers). Customer Services consist of payments made to program implementers installed in direct installation (e.g., Lime Energy for SBDI).

Figure 2. 2013 Long Island Power Authority Expenditures for the Renewable Energy Portfolio



*Other includes marketing, advertising, evaluation and administrative expenses.

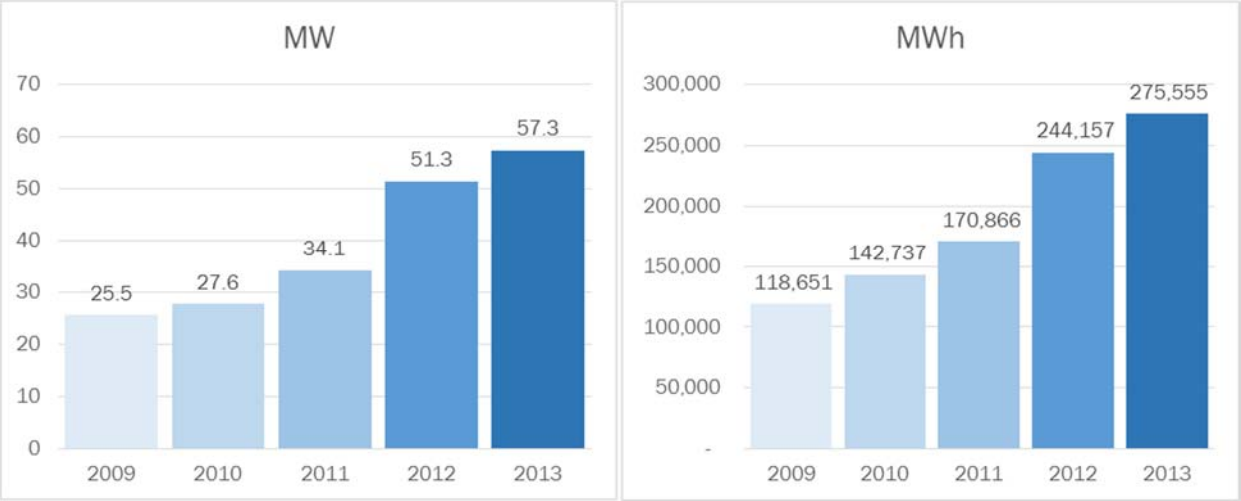
2.2 EFFICIENCY LONG ISLAND PORTFOLIO EVALUATED IMPACTS

In 2013, the Long Island Power Authority spent approximately $80.5 million on the Efficiency Long Island Portfolio. Overall, evaluated net savings from the Efficiency Long Island Portfolio included more than 57 MW of demand and approximately 275,500 MWh of energy. The Efficiency Long Island Portfolio resulted in the annual displacement of roughly 174,500 tons of CO_2, 605 tons of SO_2, and 187 tons of NOx. These environmental savings represent the equivalent of removing approximately 29,000 cars from the road, and a fuel savings of roughly 368,000 barrels of oil[4].

The Efficiency Long Island Portfolio continued to build on its historical success by again performing well in 2013, increasing savings over 2012 and exceeding its demand (MW) and energy (MWh) savings goals by 8% and 14%, respectively. Figure 3 presents the consistent increase in evaluated savings from the energy efficiency programs spanning across the five years since the Efficiency Long Island Portfolio's inception.

[4] Displacement and equivalent savings values based on NYS PSC calculator provided by Long Island Power Authority.

Figure 3. 2013 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 Small Business Direct Install (SBDI) program fell short of its goals, this shortfall was more than offset by the Energy Efficient Products (EEP) program surpassing its goals. As was planned, the total evaluated net savings for 2013 again demonstrate that the EEP program and Commercial Efficiency Programs are key drivers to Efficiency Long Island Portfolio performance. Combined, these programs account for 87% of evaluated net demand savings and 97% of evaluated net energy savings.

In total, the combined evaluated net savings for the Commercial Efficiency Program achieved similar savings as in 2012 and came close to the annual savings goal, realizing 92% of the 2013 demand savings goal and 87% of the energy savings goal. The deficit was driven by the shortfall in savings from the SBDI program, which achieved 71% and 53% of the annual demand and energy goals, respectively. With the Solution Provider and Mid-Market efficiency programs at or near their goals for 2013, the commercial efficiency portfolio overall performed well, increasing evaluated net demand and energy savings by 12% and 13%, respectively, compared to 2012.

The Energy Efficiency Products (EEP) program accounts for the largest share of demand and energy savings among the residential programs and dictates the performance of the residential portfolio. EEP surpassed the annual demand and energy savings goal, realizing evaluated net demand savings equal to 152% of the goal and evaluated net energy savings equal to 160% of goal, more than making up for some small shortfalls in forecasted savings from several other residential programs, including the Residential Energy Assistance Program(REAP) and ENERGY STAR® New Homes Program.

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 2, the benefit/cost ratio, as calculated using the Program Administrator (PA) cost test, is 3.1 (A benefit/cost value greater than 1 indicates that portfolio benefits outweigh costs.) In addition, the levelized costs for Efficiency Long Island Portfolio savings are $194.07 per kW-yr or $0.043 per kWh—less than the comparable marginal costs of supply-side alternatives.

Table 2. Summary of 2013 Efficiency Long Island Program Administrator (PA) Cost Test and Levelized Costs

2013 Portfolio	Benefit/Cost Ratio (PA)	Levelized Cost ($/KW-yr)	Levelized Cost ($/KWh)
Efficiency Long Island	3.1	194.07	0.043

2.3 ECONOMIC IMPACTS OF EFFICIENCY LONG ISLAND PORTFOLIO

Beginning with the 2011 evaluation effort, the Long Island Power Authority has requested that the evaluation team conduct an assessment of the economic impact of its investment in the Efficiency Long Island and Renewable Energy Portfolios on the economy of Long Island. In 2011, the evaluation team 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 the Long Island Power Authority, and draws on the net savings information included in the benefit/cost assessment. The evaluation team updated this model and its inputs for this 2013 evaluation.

In our 2011 evaluation, we estimated one-year and 10-year economic impacts associated with the Long Island Power Authority's 2011 investment, where the 10-year economic impacts accrue from measures installed in 2011 over their remaining measure life. We then extrapolated these impacts to the prior two years of Efficiency Long Island implementation (assuming similar multipliers of economic impact) to arrive at a portfolio-to-date estimate. In our 2012 evaluation, we estimated one-year and 10-year economic impacts associated with the Long Island Power Authority's 2012 investment, using updated model data and inputs. We added these impacts to our 2011 portfolio-to-date estimate (adjusted to 2012 dollars) to arrive at a 2012 portfolio-to-date estimate. In our 2013 evaluation, we again added the one-year and 10-year economic impacts associated with the Long Island Power Authority's 2013 investment to the 2009-2012 estimates to obtain the portfolio-to-date estimate (adjusted to 2013 dollars).

As shown in Table 3, our analysis of economic benefits found that the Long Island Power Authority's $80.5 million investment in the Efficiency Long Island Portfolio in 2013 returned $85.0 million in total economic benefits to the Long Island regional economy in 2013, including an additional 542 full-time equivalent (FTE) employees.[5] Over 10 years, these 2013 investments are expected to return $153.3 million in total economic benefits to the regional economy (in 2013 dollars[6]), with an employment benefit of 1,096 new FTEs over the time period.

[5] 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 one year, but could be done by one person working full-time for a year, two people working part-time for the year, or two people working full-time each for six months.

[6] Using the energy supply discount rate assumption of 5.643%.

Extrapolating these results over the five-year life of the portfolio, the Long Island Power Authority's $261 million investment to date in Efficiency Long Island ($281 million in 2013 dollars) produced approximately $333 million[7] in cumulative economic benefits in first of each program year, with an employment benefit of 2,099 FTE employees. Over the 10 years following each program year investment, these five-year investments are expected to return $711 million[8] to the Long Island regional economy, and result in 3,186 additional FTEs between 2009 and 2022.

Table 3. Economic Impact of 2009-2013 Efficiency Long Island Portfolio Program Investments

Effect	Impact of 2013 Program Investment		Impact of 2009-2013 Program Investment	
	First-Year Impact	*Impact over 10 years**	*First-Year Impact*	*Impact over 10 years**
Total Economic Output[9] (2013 $1M)	$85.0	$153.3	$333.3	$711.4
Full-Time Equivalent Employees	542	1,096	2,099	3,186

*Includes the 10-year impacts for each program year beginning in that year

2.4 PROGRESS TOWARD LONG-TERM EFFICIENCY LONG ISLAND PORTFOLIO GOALS

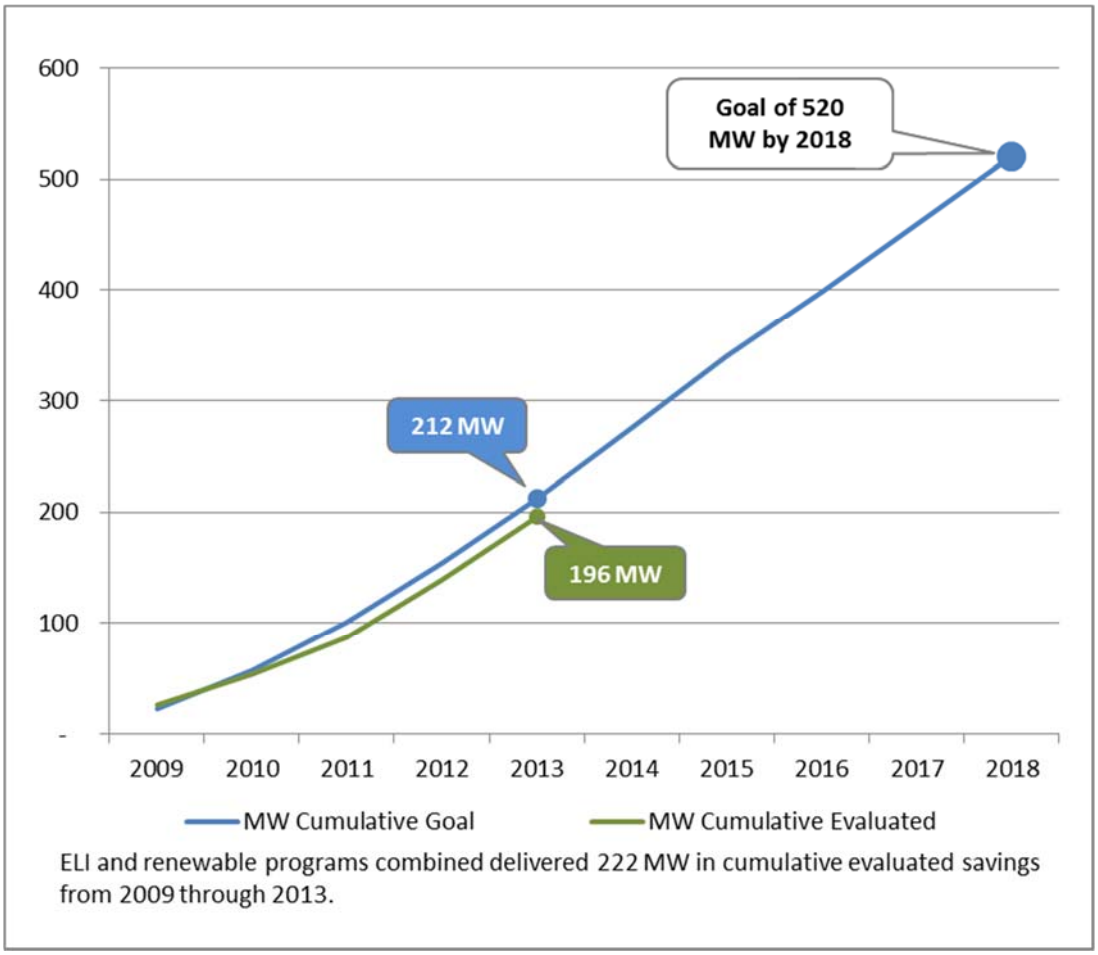
The Long Island Power Authority established aggressive annual and cumulative demand savings goals for the Efficiency Long Island Portfolio. Specifically, the goals call for a cumulative reduction of 520 MW in system coincident peak demand by 2018 as shown in Figure 4.

[7] 2013 dollars.

[8] 2013 dollars.

[9] Total economic output is the value of industry production. In IMPLAN these are annual production estimates in producer prices.

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



The Long Island Power Authority continued to make progress through Efficiency Long Island toward achievement of the long-range goal having achieved 113%, 93%, 86%, 90%, and 92% of the cumulative capacity savings goal in 2009, 2010, 2011, 2012, and 2013, respectively. Based on our analysis of cumulative evaluated net capacity savings attributable to Efficiency Long Island programs since 2009, the portfolio is slightly ahead its pace from the prior two years as it remains slightly below the long-range capacity goals as shown in Figure 4. Evaluated performance of the Efficiency Long Island Portfolio indicates that, at the portfolio level, cumulative evaluated net demand savings through 2013 are at 92% of goal compared to 90% through 2012. It should be noted that the Authority's Electric Resource Plan used an expected value of 79% achievement for the overall Efficiency Long Island Portfolio in its capacity planning models to account for the probability of meeting goals.

When the cumulative demand savings associated with the Renewable Energy programs since 2009 are added to Efficiency Long Island savings, the total cumulative evaluated demand savings increases to 222 MW. Beginning in 2014, PSEG Long Island will revise its savings goal setting process and will use the combined Efficiency Long Island and Renewable Energy Portfolios' savings in determining progress towards savings goals.

Notably, during the same five-year period, each year the evaluated MW savings achieved through the Efficiency Long Island portfolio has increased while also spending approximately 20% less than budgeted over the same period, suggesting that the Long Island Power Authority has been prudent in its expenditures and many of the energy efficiency programs have become more cost effective. Said

another way, the Long Island Power Authority has achieved 92% of its energy demand savings through the Efficiency Long Island Portfolio while spending 80% of its budget. While there were delays in the procurement process for two commercial program implementation contractors in prior years' accounts for a share of the budget savings, such spending shortfalls are not uncommon after substantial expansions in programmatic efforts or changes in program design, which can often lead to contractual and procurement delays. In 2013, with all of its energy efficiency contractors fully engaged, the program realized 108% of its energy demand savings goals and spent approximately 95% of Efficiency Long Island Portfolio budget.

2.5 RENEWABLE ENERGY PORTFOLIO EVALUATED IMPACTS

In 2013, the Long Island Power Authority spent almost $25 million on the Renewable Energy Portfolio, of this total approximately $24.25 million was for the Solar Pioneer and Entrepreneur Program. Overall, the portfolio resulted in 7.8 MW of coincident demand savings and nearly 19,000 MWh of reduced energy consumption. The Renewable Energy Portfolio resulted in an annual displacement of approximately 11,000 tons of CO_2, 19 tons of SO_2, and more than 11 tons of NOx. These environmental savings represent the equivalent of removing more than 1,800 cars from the road, and a fuel savings of more than 23,000 barrels of oil.[10]

The Renewable Energy Portfolio continued to perform well in 2013 achieving 106% of its net energy demand goal and 90% of its energy savings goal, while spending nearly 80% of budget. Demand and energy savings from the Renewable Energy Portfolio increased by almost 50% over 2012. The Solar Pioneer and Entrepreneur program is the clear driver of portfolio performance as both the Backyard Wind and Solar Thermal programs completed a very limited number of projects in 2013.

There continues to be decline in the costs of manufacturing and installing photovoltaic equipment. These factors have helped to enable the Long Island Power Authority to reduce the residential and commercial rebate levels throughout 2013, which further improved the cost effectiveness of this program, leaving solar at its lowest cost to the program since the Authority began investing in renewable programs in 2000.

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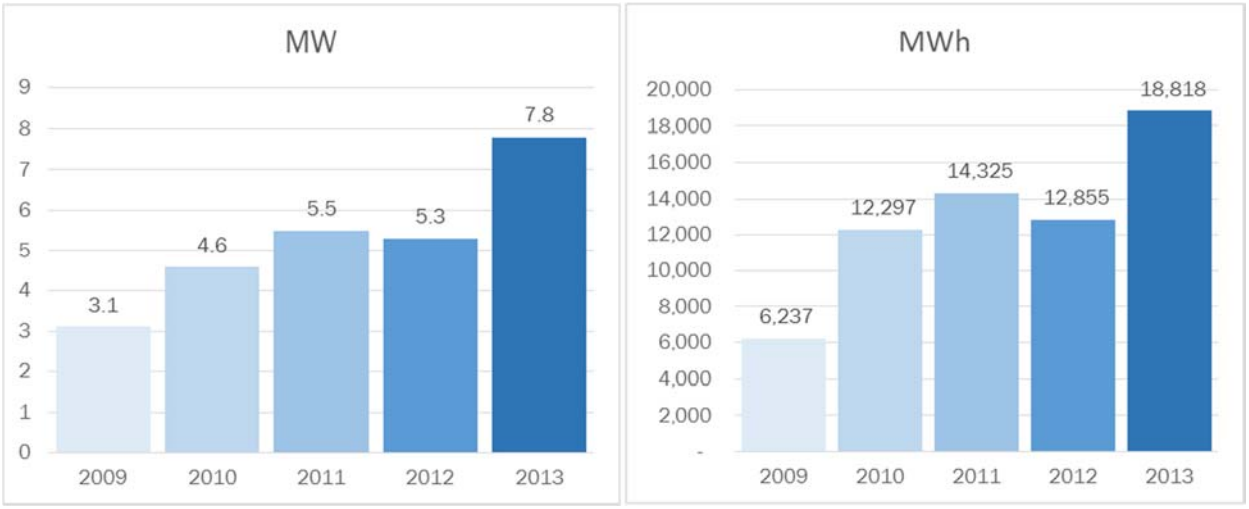
[10] Displacement and equivalent savings values based on NYS PSC calculator provided by the Long Island Power Authority.

Figure 5. 2013 Renewable Energy Portfolio Evaluated Net MW & MWh Savings



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 4, the benefit cost is 2.1, which is a notable improvement of the 2012 cost/benefit value of 1.6. (A benefit/cost value greater than 1 indicates that portfolio benefits outweigh costs.) The 2013 levelized costs are $0.100 per kWh and $239.18 per kW-yr, compared to $0.126 kWh and $303.37 kW-yr in 2012. It is important to note that this levelized cost does not include the lost revenue associated with net metering, which is consistent with how energy efficiency programs are evaluated.

There is an ongoing decline in the costs of manufacturing and installing photovoltaic equipment, and the Long Island Power Authority reduced the residential and commercial rebate levels throughout 2013 reflecting these lower costs. The reduction in rebates was a significant contributor to the improved cost effectiveness of this program. Solar is at its lowest cost and rebates at the lowest levels since the Long Island Power Authority began investing in renewable energy programs in 2000.

Table 4. Summary of 2013 Renewable Energy Program Administrator (PA) Cost Test and Levelized Costs

2013 Portfolio	Benefit Cost Ratio (PA)	Levelized Cost ($/KW-yr)	Levelized Cost ($/KWh)
Renewable Energy	2.1	239.18	0.100

2.6 Economic Impacts of Renewable Energy Portfolio

As noted above, the 2013 evaluation included an assessment of the economic impact of investments in the Efficiency Long Island and Renewable Energy Portfolios 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 for 2012 and 2013. We estimated economic impacts associated with the Long Island Power Authority's 2013 investments, and then combined those results with our 2012 estimate and our 2011 assessment of the prior three years of implementation of the Renewable Energy programs to arrive at a portfolio-to-date estimate.

As shown in Table 5, our analysis of economic benefits found that the Long Island Power Authority's almost $25 million investment in the Renewable Energy Portfolio in 2013 returned $36 million in total economic benefits to the Long Island regional economy in 2013, including an additional 229 FTEs. Over the 10-year period, these 2013 investments are expected to return $49 million in total economic benefits to the regional economy (2013 dollars[11]), with an employment benefit of 339 new FTEs.

Extrapolating these results over the five-year life of the portfolio, the Long Island Power Authority's $122 million investment in Renewable Energy programs to date ($135 million in 2013 dollars) produced approximately $123 million[12] in cumulative economic benefits in first of each program year with an employment benefit of 746 FTE employees. Over the 10 years following each program year investment, these five-year investments are expected to return approximately $193 million[13] to the Long Island regional economy and result in 1,255 additional FTEs between 2009 and 2022.

Table 5. Economic Impact of 2009-2013 Renewable Energy Program Investments

Effect	Impact of 2013 Program Investment		Impact of 2009-2013 Program Investment	
	First-Year Impact	*Impact over 10 years**	*First-Year Impact*	*Impact over 10 years**
Total Economic Output[14] (2013 $1M)	$35.9	$49.2	$122.6	$193.6
Full-Time Equivalent Employees	229	339	746	1,255

*Includes the 10-year impacts for each program year beginning in that year

Spending on the Long Island Power Authority's Renewable Energy Portfolio resulted in much greater benefits to the Long Island economy in the 2013 program year than in 2012. This improvement in cost effectiveness is largely driven by the lower rebate levels and falling prices of manufacturing and installing PV modules, that have helped to significantly increase number of systems installed through the Solar Pioneer and Entrepreneur programs. We updated our assumptions of the component costs (e.g., hardware and installation labor) of solar PV systems and, as a result, the estimated labor costs increased in 2013 as a share of the total system cost.[15] Because the economic benefit of labor costs remains mostly on Long Island while the spending on PV modules benefits firms outside Long Island, the increased share of labor costs results in relatively more economic benefit in the Long Island service territory.

[11] Using the energy supply discount rate assumption of 5.643%.

[12] 2013 dollars.

[13] 2013 dollars.

[14] Total economic output is the value of industry production. In IMPLAN these are annual production estimates in producer prices.

[15] National Renewable Energy Laboratory. *Benchmarking of Non-Hardware Balance-of-System (Soft) Costs for U.S. Photovoltaic Systems, Using a Bottom-Up Approach and Installer Survey – Second Edition.*

2.7 KEY THEMES FOR CONTINUED SUCCESS

As noted throughout this document, the Efficiency Long Island and Renewable Energy Portfolios continued to grow and demonstrate strong performance in 2013, providing substantial capacity and energy savings in a cost-effective manner and exceeding the established goals. To continue to realize the long range savings and overall portfolio performance, and build on the historical success of the Efficiency Long Island program, PSEG Long Island should identify and consider emerging issues and challenges to success in its planning, budgeting, implementing, and management decisions. Below we provide an overview of the performance of the Efficiency Long Island and Renewable Energy programs for the 2013 evaluation cycle, and identify challenges found through our research that could be addressed in the future.

Efficiency Long Island Portfolio

Commercial Efficiency Programs

Overview of performance

The Long Island Power Authority's portfolio of Commercial Efficiency Programs (CEP) showed strong overall performance in 2013 achieving 92% of energy demand savings goal and 87% of energy savings goal. Despite falling short of its overall goal, the programs' evaluated net demand and energy savings were comparable to 2012 results. The Solution Provider and Mid-Market programs met or came very close to their demand savings goals in 2013 and the Solution Provider program exceeded its energy savings goal. The Small Business Direct Install (SBDI) program realized slightly more demand savings than in 2012, however, it fell short of its goals due to disruptions in implementer operations due to staffing changes, and a strategic decision to slow down the program spending toward the end of the year to apportion the remaining CEP budget to the best advantage of the portfolio overall given the stronger performing Solution Provider program.

In 2013, the Commercial Efficiency Programs built upon a proven implementation structure and solid foundation of rigorous data capture, transfer, and tracking, as well as a procedure-driven delivery process with thorough QA/QC processes. Siebel continued to be the core data entry and tracking system for CEP. Based on the interviews with the program staff, the program ran smoothly in 2013 with few bottlenecks or issues.

Core programmatic changes that have been instituted in 2013 include streamlined delivery and application systems, redesign of the Technical Assistance program to incentivize customers to implement energy savings initiatives in the study, and capping incentives that customers are able to receive through the Prescriptive, Existing Retrofit, and Custom components of the CEP to 70% of the project cost.

Program staff interviews consistently indicated that program promotion through trade ally outreach continued to be the main vehicle for marketing the Mid-Market and the Solution Provider programs in 2013.

According to PSEG Long Island, few changes are planned to CEP in 2014 and, as there are a considerable number of carryover projects from 2013, the program is well positioned to meet its 2014 goals.

Challenges for Future

The Commercial Efficiency Program continues to deliver its offerings in a streamlined and transparent manner due to the continued awareness and growth in the CEP. The ability of the Commercial Efficiency Program to meet its goals in the future will depend on the performance of the SBDI program. There is a concern that the SBDI program might underperform in the future years. Multiple factors could be at play, including frequent staffing changes at Lime Energy (the SBDI program implementer) that can potentially prevent effective program marketing and execution, lack of opportunities for improvements, measure offerings, and difficulty engaging the target customer base.

The implementation team has noted that the rate of conversion from audits to projects is lower than anticipated. Additionally, the geographically disperse customer base poses challenges to marketing and the efficient use of field resources. One strategy to address this is taking a targeted approach to program design and delivery. It includes exploring participation history and customer base to identify and better understand segments of the commercial and industrial customers on Long Island that may be underserved by the program and tailoring program offerings to meet their needs. To the extent that PSEG Long Island relies on the savings from the SBDI component, it is important that there be enhanced and proactive outreach to customers by the program implementer and to monitor program's progress toward goals and work with the implementer to identify outstanding issues and address them in a timely manner.

Residential Efficiency Programs

Overview of performance

The Efficiency Long Island Portfolio offers a comprehensive suite of residential efficiency programs for customers. Collectively, the programs provided substantial capacity and energy savings that have historically, and again in 2013 were largely driven by the Energy Efficient Products (EEP) program. In 2013, the EEP program far exceeded its goals, which were reflected in the overall residential portfolio performance while savings for the REAP, Home Performance with ENERGY STAR® (HPwES), and ENERGY STAR® Labelled Homes programs were below projected program goals in 2013. While the Cool Homes program's savings goals were significantly reduced between 2012 and 2013, the program was able to increase its actual savings during this period. As a result, after falling short of its projected participation and savings goals for two consecutive years, the Cool Homes program met its demand goal in 2013. This increase in Cool Homes savings was driven by the increase in the share of Cool Homes customers that participate in the early retirement component of the program.

Challenges for Future

With respect to capacity and energy savings, the performance of the EEP program is a significant contributor to the performance of the residential portfolio with Compact Fluorescent Lamps (CFL) savings accounting for a substantial proportion of savings from the EEP program. The CFL market is evolving and 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, which 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. While we anticipate that CFLs will remain an important part of the residential portfolio into the future, they will gradually yield lower savings per unit as the baseline efficiency of residential lighting increases. While reliance on CFLs for residential energy and demand savings is common among utilities implementing energy efficiency programs, the reduction in unit savings presents a challenge. The Long Island Power Authority has worked to adjust the portfolio to accommodate this reduction in CFL savings and significantly increased the share of Solid State Lighting products (LED's) through the program in 2013.

Research in other jurisdictions has shown that the 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. Given the importance of residential lighting as source of savings, monitoring the actual baseline lighting efficiency on Long Island will be critical to understanding energy savings associated with EEP lighting and to inform future revisions in program strategy. The Evaluation Team has recommended primary research to establish and track baseline efficiency values by lumen category in the future.

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. Increasing federal efficiency standards for room air conditioners going into effect in 2014 may decrease the share of units that meet the new standard and increase market share for non-ENERGY STAR® units, As such, PSEG Long Island may wish to monitor market trends moving forward and consider reinstating rebates for these higher energy efficient products as they come into the marketplace. It is important to note that the increased efficiency baseline will likely reduce future per unit savings values associated with room air conditioners.

In 2013, the Evaluation Team conducted extensive CAC market characterization research on Long Island (see Section 4.2 below). This research suggests that there remain significant opportunities for the Cool Homes program to expand market share as the program currently captures 17% of the overall residential spilt system CAC market. In early 2013, interviews with contractors revealed that many find aspects of program participation to be arduous and, therefore, choose not to participate in the program or to reduce the share of program eligible CAC units that they submit for program incentives. The market characterization research also revealed that while the Early Retirement (ER) program offering does increase overall efficiency and lower capacity compared to non-participating units, it does not appear to accelerate the replacement of inefficient CAC equipment. The results of this study, and of other CAC market characterization research, suggest that program strategies designed to increase market share as opposed to those targeting early retirement may yield higher net savings at the program level. This is a hypothesis that Opinion Dynamics suggests exploring further in 2014.

Renewable Energy Programs

Overview of Performance

The Renewable Energy Portfolio continued to perform well in 2013, both in terms of delivering demand and energy savings and, in particular, with respect to its role in the development of a renewable energy industry on Long Island. In 2011, Opinion Dynamics conducted a market assessment and net-to-gross analysis for the Solar Pioneer and Solar Entrepreneur Programs and we found that, over time, the programs have helped to increase consumer awareness, availability, and demand for solar energy and effectively develop a strong PV market infrastructure on Long Island and knowledgeable trade ally base.

Through increased consumer awareness, continuing to move toward market transformation with lower prices, lower rebate levels, strong market infrastructure, growth in residential sales and the incorporation of residential leasing the Long Island Power Authority exceed its demand savings goal (106%) and approach the energy savings goal (90%) in 2013.

Challenges for Future

The Solar Thermal and Backyard Wind programs have been in place for three and four years respectively, and continue to have very low participation. For these programs to achieve its annual goals, PSEG Long Island should consider strategic market research to assess the potential for expanding the awareness of using solar to heat hot water and the acceptance of wind power among the targeted customer base and if barriers to participation can be addressed through program design enhancements.

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 2013, achieving an increase in evaluated net savings as compared to 2012, exceeding its stated goals for the year, and delivering considerable energy and demand savings to electric customers on Long Island. Specifically, the Efficiency Long Island Portfolio accounted for more than 57 MW and 275,000 MWh in total evaluated net savings for 2013. This represents an 11% increase in evaluated net demand savings and 13% in evaluated net energy savings over 2012 results, which were approximately 51 MW and 244,000 MWh. As shown in Table 6, the portfolio reached 108% of its net demand and 114% of its net energy savings goals. The 2013 goal was 53 MW, program tracking reported 58 MW, and after a rigorous evaluation, we find evaluated net savings of 57.34 MW.

Table 6. Net Impacts: Efficiency Long Island Portfolio Evaluated Savings versus Goals

Program	2013 Net Savings Goals		Evaluated Net Savings		Percent of Goal	
	MW	MWh	MW	MWh	MW	MWh
CEP Mid-Market	7.02	29,809	6.90	25,074	98%	84%
Solution Provider	16.26	71,040	16.27	73,719	100%	104%
Direct Install	7.72	32,741	5.49	17,466	71%	53%
Total Commercial	*31.00*	*133,590*	*28.67*	*116,260*	*92%*	*87%*
Energy Efficient Products	14.12	93,969	21.49	150,522	152%	160%
Cool Homes	5.01	4,814	5.00	4,361	100%	91%
Residential Energy Affordability Partnership	0.76	4,480	0.30	2,234	40%	50%
Home Performance with ENERGY STAR®	0.78	597	0.46	348	59%	59%
Home Performance Direct	0.77	3,420	1.10	1,051	144%	32%
Residential New Homes	0.56	1,082	0.31	779	56%	72%
Total Residential	*22.00*	*108,362*	*28.67*	*159,295*	*130%*	*147%*
Efficiency Long Island Total	*53.00*	*241,952*	*57.34*	*275,555*	*108%*	*114%*

Consistent with the design of the Efficiency Long Island Portfolio, for the second consecutive year the Commercial Efficiency programs account for about half of total evaluated net demand savings of the Efficiency Long Island Portfolio. At the portfolio level, commercial efficiency programs achieved 92% of their combined 2013 net demand savings goal and 87% of their net energy savings goals. Driven by the success of the EEP, the residential efficiency programs performed exceptionally well, achieving 130% of their combined demand savings goals and 147% of their combined energy savings goal.

Within the Commercial Efficiency Program offerings portfolio, the Solution Provider program performed very well, meeting its goal for demand savings and slightly exceeding its goal for energy savings (104%), while ultimately accounting for more than half of the annual evaluated demand and energy savings of the commercial portfolio. In contrast, the SBDI program fell short of its projected demand and energy goals in 2013.

The Energy Efficient Products (EEP) program continues to account for the largest portion of energy and demand savings within the residential programs, and performance of this program, along with the Cool Homes program, has a substantial impact on the ability of the portfolio to achieve savings goals. The EEP program exceeded the demand savings goal by 52% and its net energy savings goal by 60%, while the Cool Homes program met its demand goal in 2013. The continued success of the EEP program significantly contributed to the strong overall performance of the residential efficiency programs in 2013.

3.2 RENEWABLE ENERGY PORTFOLIO IMPACTS

Energy and Demand Impacts

The portfolio of Renewable Energy programs exceeded its net demand goal but fell short of its energy goal, achieving 106% and 90% of these goals, respectively. The performance of the portfolio is driven by the performance of the Solar Pioneer and Entrepreneur PV program, as shown in Table 7.

The Backyard Wind program reached 12% and 27% of its demand and energy savings goals, respectively. The Solar Thermal program, in its third year of implementation, achieved 3% and 9% of its demand and energy goals, respectively. While there continues to be significant growth in the Solar Pioneer and Entrepreneur Programs, there continues to be lower than planned levels of participation in the solar thermal and wind programs.

Table 7. Net Impacts: Renewable Energy Portfolio Evaluated Savings versus Goals

Program	2013 Net Savings Goals		Evaluated Net Savings		Percent of Goal	
	MW	MWh	MW	MWh	MW	MWh
Solar PV	7.23	20,400	7.84	18,715	108%	92%
Solar Hot Water	0.13	306	0.004	28	3%	9%
Backyard Wind	0.02	276	0.002	75	12%	27%
Total Renewable	**7.39**	**20,982**	**7.84**	**18,818**	**106%**	**90%**

4. PROGRAM-SPECIFIC RESEARCH

While the impact assessment was the primary focus of the 2013 evaluation effort, the evaluation team also completed research on specific programs and select markets that are the target of the Long Island Power Authority programs to enhance program design, delivery, and performance. These efforts focused on three aspects of the Long Island Power Authority's program implementation: 1) EEP program market research participation, 2) Cool Homes program market research, and 3) ENERGY STAR® Labeled Homes program market effects. Below we summarize the research and associated process findings for each of these implementation areas. More detail on the methods, findings, and recommendations are presented in the 2013 Program Guidance document.

4.1 ENERGY EFFICIENT PRODUCTS (EEP) PROGRAM MARKET PARTICIPATION

The Energy Efficient Products (EEP) program offers discounts on several energy efficient products, including lighting, appliances, and pool pumps. Rebates are also provided for recycling old appliances. Our 2013 process assessment included four different data collection and analysis efforts, including:

- In-depth interviews with program staff and program implementation contractors: We conducted interviews with two PSEG Long Island staff members, two Applied Proactive Technologies, Inc. (APT) staff members, one Energy Federation, Inc. (EFI) staff member, one representative from Applied Energy Group (AEG), and one representative from Appliance Recycling Centers of America, Inc. (ARCA). Key questions explored during these interviews included:
  - What were the goals of the program?
  - Did roles or responsibilities change for the program in 2013?
  - What were the major strengths or successes of the program, and what were the major challenges or barriers?
  - Were there changes to rebate levels, product types, program designs or processes?
- Review of program databases and materials: We reviewed the program-tracking database and program promotional materials.
  - In home assessment: We conducted an in-home study of 244 homes to update our understanding of residential customer lighting saturation and penetration, as well as secondary refrigerators and freezers, and pool pumps.
  - Room A/C and dehumidifier store shelf survey: We conducted shelf surveys and retailer interviews to determine the market availability of standard efficiency and ENERGY STAR® rated products in the Long Island service territory, gather retailer feedback regarding the influence of the Authority's rebate program on consumer purchasing behavior and retailer stocking practices, and measure retailer response to upcoming changes in federal standards for room air conditioner efficiency.

In the Program Guidance document, we present our detailed process findings for each of these efforts, and discuss program participation, any changes that occurred during the program year, marketing and

outreach efforts, data tracking, and potential recommendations. Below we provide a summary of our research findings and recommendations resulting from the data collection and analysis described above.

Key Findings of In-depth Interviews and Review of Program Data

The Long Island Power Authority's EEP program exceeded its demand and energy savings goals by more than 50%, driven by a significant increase in sales of efficient lighting products. The program exceeded its unit sales goals for several product categories, including CFLs, LEDs, fixtures, dehumidifiers, room air conditioners, and pool pumps. The program fell short of unit goals for refrigerators advanced power strips, and refrigerator/freezer recycling.

Overall, the program processes work well. The transition from the Long Island Power Authority to PSEG Long Island has presented a unique challenge for program marketing. Changing program logos and updating program marketing materials may affect the program's ability to realize goals for 2014.

Key Findings from 2013 In-Home Assessment

Between June and August of 2013, we conducted an in-home study of 244 homes to update our understanding of residential customer lighting saturation and penetration, as well as secondary refrigerators and freezers, and pool pumps in the Long Island service territory. This study was intended to assess the current state of the residential lighting market and future direction for the program's lighting, appliance rebate, and appliance recycling components. Below we provide a summary of our findings and recommendations resulting from the in home visits. In the Program Guidance document, we present our detailed findings from this research.

- **CFL and LED Awareness:** A sizeable majority of the Long Island Power Authority customers are aware of energy efficient lighting technologies. We found that 89% of residential customers were aware of CFLs. Additionally, 70% of customers reported being aware of LED light bulbs.

- **CFL and LED Saturation and Penetration**: An overwhelming majority of residential customers (94%) had at least one CFL installed, which was a statistically significant increase from the 83% penetration rate we found in 2010. Eighteen percent of customers had at least one LED light bulb installed. The CFL saturation has also increased from 2010 to 2013. In 2013, the average home had CFLs installed in 28% of light sockets compared to only 22% in 2010. LED saturation was 2% in 2013. Despite the increase in saturation, a large number of eligible sockets in the Long Island service territory, around 35 million, still do not have the most efficient type of lighting installed. Comparatively, 16.5 million screw based sockets in the service territory have a CFL or LED installed.

- **Appliance Recycling:** One in five residential customers (20%) has a secondary appliance in their home that could be recycled through the appliance recycling program. Twenty-nine percent of residential customers had a secondary refrigerator, of which, 70% would qualify for PSEG Long Island's program because they were at least seven years old. The average age of these refrigerators was about 15 years. We asked these customers if they would be interested in recycling their secondary appliance, and 21% said they would be either, very, or somewhat likely to get rid of their secondary refrigerator through the Refrigerator/Freezer Recycling Program. Similar numbers were found for stand-alone freezers. Our research showed that, while there are plenty of eligible appliances in the Long Island service territory, interest in the program is limited by the fact that most people want to keep their secondary appliances. It is not

clear if customers are aware of the energy saving benefits of disposing of their older secondary appliance. If this barrier proves insurmountable because customers would rather have a second appliance than save the energy, PSEG Long Island may want to consider promoting replacing these older less efficient appliances with newer more efficient alternatives.

- **Pool Pumps:** There was a significant increase in pool pump program in 2013 as the program provided rebates for more variable speed pumps than it had planned. Nevertheless, the program has had some difficulty reaching overall savings goals in recent years. Results from the in-home audits suggest that there remain significant opportunities to upgrade pool pumps in the Long Island service territory. Out of 244 sites included in our study, 14% (33) had swimming pools that used a pool pump. Of these 33 pool pumps, 73% were constant or one-speed, 12% were two-speed, and 12% were variable-speed-capable (one pump's type could not be identified). The average pool pump was just under seven years old.[16] When we extrapolate these results to the overall population on Long Island, we estimate that just under 100,000 single speed pool pumps exist on Long Island. While the pool pump program appeared to be heading in the right direction in 2013, if in the future the program is not able induce the retrofit of a significant portion of these existing single speed pumps, PSEG Long Island may want to consider an enhanced and more targeted marketing campaign or increased incentive levels to increase the market-share of more energy efficient pumps.

2013 Room AC and Dehumidifier Store Shelf Survey

In addition to the in-home study, we conducted a retailer shelf survey designed to better understand the contemporary room air conditioner and dehumidifier market, in support of the appliance rebate component of the Energy Efficient Products Program. We visited 10 appliance retailers in the Long Island service territory in June of 2013. Opinion Dynamics also contacted both local and national retailers of room air conditioners. At that time, the Long Island Power Authority offered discounts on ENERGY STAR® rated room air conditioners and dehumidifiers, with incentives varying between $40 and $75. Below we provide a summary of our conclusions and recommendations resulting from the shelf survey visits.

- **Dehumidifiers:** We found twenty different models of dehumidifiers available at the ten retailers we visited. All but one of these models was ENERGY STAR® labeled and would qualify for the rebate. Units varied between 25 and 70 pints/day in capacity, and ranged in price between $149.99 and $799.99. Given that nearly all the dehumidifiers we found qualified for the energy efficiency rebate, we recommended discontinuing incentives for dehumidifiers, which PSEG Long Island removed from the program for 2014.

- **Room Air Conditioners:** For room air conditioners, in the stores we visited a great majority (between 79% and 89%) of the units are ENERGY STAR® and, therefore, qualify for the mail-in rebate. While we were unable to determine the relative sales of these models, conversations with sales staff at several of the stores confirmed that the majority of room air conditioner sales were ENERGY STAR® units. Our conversations with retailers indicate that the program was having, at most, a marginal

[16] Based on 28 pool pumps where age could be identified.

impact on the overall proportion of ENERGY STAR® versus non-ENERGY STAR® models being sold in the Long Island service territory. While the retailers we spoke with were universally positive about the program and its effects on their overall sales, we found no evidence that national level retailers' shelving practices were influenced by the presence or absence of a single utility-sponsored rebate program. Further, while local retailers assumed that each year the Long Island Power Authority would provide some sort of rebate on ENERGY STAR® units, retailer planning decisions regarding the makes and models to purchase and stock are made several months in advance of when the Long Island Power Authority finalizes their rebate programs for the coming year. Because of the minimal impact that the program has on current room air conditioner shelving practices, and the fact that nearly 90% of all models shelved on Long Island are ENERGY STAR® qualified, it appears that the room air conditioner market on Long Island has largely been transformed. We, therefore, recommended that PSEG Long Island discontinue the room air conditioner rebate program, which has been removed from the program for 2014. We note, however, there is some uncertainty surrounding what the ENERGY STAR® market share will be in the 2015 cooling season once federal standards for room air conditioners and subsequent ENERGY STAR® efficiency standards are increased. Once new regulations are fully implemented, the proportion of ENERGY STAR® qualifying units sold may be reduced for a period of time. Currently, it is unclear how the new standards will affect the availability of non-ENERGY STAR® options and what impact they may have on unit pricing. Given this uncertainty, PSEG Long Island may wish to consider revisiting the room air conditioner market after the new standards have been in place long enough for the market to have fully responded.

4.2 COOL HOMES PROGRAM MARKET RESEARCH

2013 Market Characterization Study

In 2013, the Evaluation Team conducted a market characterization study to explore reasons for low program participation levels as well as produce a baseline from which net savings could be calculated. We identified and recruited qualifying non-participants for site visits during the non-participant telephone survey. Technicians visited each of the 107 non-participating homes to confirm that the systems qualified, and to obtain the quantity and make and model of non-program split CAC systems. From this field data, we determined SEER, EER, and capacity for these systems. We also leveraged data collected from 231 residential site visits conducted concurrently in support of the Energy Efficient Products lighting and appliance study. These site visits included homes with and without qualifying CAC equipment. We leveraged information from these site visits, as well as the results of the non-participant survey, to determine the penetration of CAC equipment types on Long Island.

Results of these visits include the following findings:

- Cool Homes participants install CAC systems that are more efficient and smaller (more likely to be properly sized) as compared to customers that install CACs outside of the program. The average SEER and cooling capacity of Cool Homes installations are 16.2 SEER and 3.5 tons respectively, compared to the market baseline of 14.3 SEER and 3.9 tons.

- While the Early Retirement (ER) program offering does increase overall efficiency and lower capacity compared to non-participating units, it does not appear to accelerate the replacement of inefficient CAC equipment. There is little difference in age and functionality of systems replaced through ER component of the Cool Homes program

and those recently replaced outside of the program. Approximately 78% of CAC split systems replaced in the last three years outside of the program were operational. Additionally, the average age of units replaced outside of the program is the same as those replaced through the program.

- The research establishing baseline SEER values provides sufficient data to allow for the application of the standard market baseline method (SMB) for estimating net impacts. The SMB method would use the market baseline SEER and cooling capacity value and program tracking data to estimate net savings without the need to apply a separate NTG factor derived from self-reported data.

- The results of the 2013 Market Characterization study, and of other CAC market characterization research, suggest that there remain significant opportunities for the Cool Homes program to expand market share as the program currently captures 17%[17] of the overall residential spilt system CAC market. In early 2013, interviews with contractors revealed that many find aspects of program participation to be burdensome and, therefore, choose not to participate in the program. The results of this study, and of other CAC market characterization research, suggest that program strategies designed to increase market share as opposed to those targeting early retirement may yield higher net savings at the program level. This is a hypothesis that Opinion Dynamics suggests exploring further and testing in 2014.

Additional 2014 Research

Results from the 2013 Market Characterization revealed that while the Early Retirement (ER) program offering does increase overall efficiency and lower capacity compared to non-participating units, it does not appear to accelerate the replacement of inefficient CAC equipment. Opinion Dynamics will conduct additional research in the spring of 2014 to test the hypothesis that the Cool Homes program and its ER offering is accelerating the retirement of all systems replaced on Long Island (participating and non-participating). We will collect information on the age of CAC spit systems being replaced through interviews with HVAC contractors in comparable regions outside of Long Island where early retirement programs are not offered (e.g., New Jersey and Connecticut).

In addition, in 2014 Opinion Dynamics is further analyzing the results of the participant and non-participant telephone surveys conducted in 2013 to determine why and how homeowners choose to participate or not participate in the Cool Homes program. Findings of this research are presented in the Program Guidance document and include:

- Contractor recommendations are the most important factor in determining whether customers select high efficiency equipment and participate in Cool Homes. Sixty-eight percent of participants found out about the Cool Homes program from their contractor. Additionally, 85% of participants and 86% of non-participants report that their contractor was very influential in determining the efficiency level of their CAC system. Cool Homes should continue to partner closely with contractors and increase the participating contractor base in order to increase Cool Homes' market share.

[17] From 2010 through 2012, Cool Homes has provided incentives for about 17% of eligible split system CACs installed on Long Island. *2013 Cool Homes Market Characterization Study*.

- Most homeowners consider high efficiency equipment because they are interested in lowering their utility bills. Ninety-five percent of homeowners (part and non-part) report that saving energy is important to them. When asked why, 74% of these respondents report they strive to be energy efficient because of the impact it has on their bills. PSEG Long Island should continue to highlight the financial benefits of this program in their homeowner-targeted marketing.

4.3 ENERGY STAR® LABELED HOMES MARKET EFFECTS

The ENERGY STAR® Labeled Homes (ESLH) program works with local residential building contractors and the supporting contractor and architect infrastructure to encourage the construction of more energy efficient, ENERGY STAR® certified homes as well as homes that achieve a HERS score below 70 (referred to as "HERS Index homes"). The program draws on an established network of Home Energy Rating System (HERS) providers to work with builders during the design and construction of participating homes. In addition, the program uses marketing and outreach to educate both homeowners and builders about the program and the benefits of participating.

In 2013, the program completed 61 ENERGY STAR® homes and 305 HERS Index homes.

HERS Index Homes

In 2013, the ESLH program included new direct incentives to HERS Indexed homes. This was in response to the 2012 decline in builder participation due to the added requirements of ENERGY STAR® Version 3.0. Citing the program's influence on local building practices, in 2012 the program provided a $100 incentive for builders and HERS raters to submit the REM/rate file on HERS Index homes. The program then claimed the incremental savings above code on those homes.

We conducted additional research in 2013 to validate the program's claim of influencing building practices on Long Island, including the adoption of energy saving building codes by the towns and the program influence on the construction of HERS Index homes beyond the minimum code. Our preliminary research consisted of two primary steps:

- Interviews with stakeholders
- A review of previous studies and the history of code changes to establish a new-homes baseline

Our preliminary findings indicated that the Long Island Power Authority and the ESLH program likely had a significant influence on Long Island towns adopting increased codes as well as on building the infrastructure to support builders' efforts to meet or exceed these codes.

For the 2013 program year, we have determined that the new direct incentives for HERS Indexed homes, as well as the probable influence that the Long Island Power Authority has had on Long Island code and infrastructure, indicate that full savings from HERS Indexed homes should be claimed for the 2013 ESLH program.

Recommendations for future research

To better understand and quantify the Long Island Power Authority's influence on the region's new construction market, we recommended two further research efforts[18]: first, a Delphi Panel of other key stakeholders to quantify the Long Island Power Authority's influence on code changes and infrastructure, and the development of a survival curve to reflect the interaction of different influencers within the market. The Evaluation Team has since learned that PSEG Long Island has significantly reduced its efforts related to ESLH, including the work to strengthen energy saving building codes. As such, further research quantifying the market effects of the program may not be the most appropriate use of evaluation resources at this time.

[18] November 8, 2013 memorandum, entitled "*Establishment of Baseline and Outline of Proposed 2014 Residential New Homes Research*"