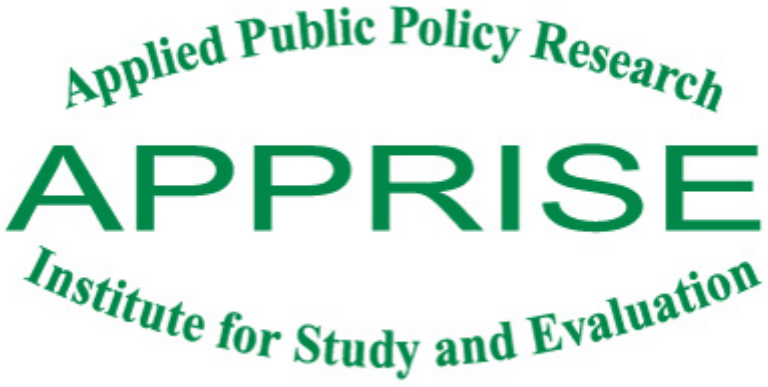

South Jersey Gas
2016 Energy Efficiency Program Evaluation
Final Report

August 2016

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Executive Summary

This report presents the findings from the 2016 South Jersey Gas (SJG) Energy Efficiency Program Evaluation. SJG's Energy Efficiency Programs provide incentives that are complimentary to the New Jersey Clean Energy Programs (NJCEP). The residential and commercial and industrial (C&I) programs provide rebates and loans to assist with the purchase and installation of energy efficient equipment and measures.

Evaluation

The following research activities were undertaken.

- *Background Research:* We reviewed SJG program documents, outreach data, and marketing materials; and interviewed SJG managers and staff.
- *Program Data Analysis*: We analyzed data provided by SJG staff and developed summary statistics on the program implementation.
- *Participant Interviews:* We conducted in-depth telephone interviews with participants in the High-Efficiency Heating and Water Heating (HVAC), Home Performance with Energy Star (HPwES), OPower, Direct Install, and Smart Start program components.
- *Participant Surveys:* We conducted quantitative surveys with participants in the HVAC, HPwES, and OPower programs.
- *Contractor Interviews:* We conducted in-depth telephone interviews with contractors who provide services in the HVAC, HPwES, and Direct Install Programs.
- *Billing Data Analysis:* We analyzed SJG usage data to estimate the impact of the HVAC and HPwES programs on natural gas usage.
- *Non-Energy Benefits*: We analyzed the impact of the SJG residential programs on the environment and the economy.

SJG Energy Efficiency Programs

SJG provides incentives to enhance those provided through the New Jersey Clean Energy Program (NJCEP). We focused on specific incentives provided in 2014 and 2015.

- Residential HVAC Rebate: This program provides a rebate of $500 for customers who install both a WarmAdvantage-qualified heating system and water heating system. This rebate is provided in addition to the $900 from the NJCEP. Customers must participate in an audit provided by SJG to receive the SJG program rebate.

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- Residential HPwES Loan: This program provides a zero percent interest loan of up to $10,000 over a ten-year period for customers who participate in an audit and install energy efficiency measures that are projected to achieve at least 20 percent energy savings. Customers also receive a rebate of up to $5,000 from the NJCEP.

- C&I Direct Install Loan: This program provides zero interest loans of up to $53,571 for customers who participate in the NJCEP Direct Install Program. This is in addition to the 70 percent rebate (up to $125,000) provided by the NJCEP.

- C&I Smart Start Loan: This program provides zero interest loans of up to $100,000 for customers who participate in the NJCEP Smart Start Program. This is in addition to the rebate provided by the NJCEP.

- C&I Pay for Performance Loan: This program provides zero interest loans of up to $100,000 for customers who participate in the NJCEP Pay for Performance Program. This is in addition to the rebate provided by the NJCEP. The Pay for Performance Program requires a plan for usage reduction that is submitted to the state.

- OPower Reports: SJG implemented an OPower Report Program where customers were mailed and emailed Home Energy Reports comparing their usage to similar neighbors' usage in 2016.

The incentives offered by SJG and the NJCEP are summarized in the table below.

Table ES-1
NJCEP and SJG Program Benefits

<table>
<tr><th colspan="5">2014-2015 Programs</th></tr>
<tr><th>SJG Program</th><th colspan="3">NJCEP Rebate</th><th>SJG Incentive</th></tr>
<tr><td rowspan="2">HVAC and Water Heater Rebate</td><td colspan="3" rowspan="2">$900 Rebate</td><td>$500 Rebate</td></tr>
<tr><td>SJG Audit Required</td></tr>
<tr><td rowspan="2">HVAC and Water Heater Loan</td><td colspan="3" rowspan="2">$900 Rebate</td><td>Up to $6,500 Loan
0% interest over 5 years</td></tr>
<tr><td>SJG Audit Required</td></tr>
<tr><td rowspan="3">HPwES Loan</td><td>Tier</td><td>Savings</td><td>Rebate</td><td rowspan="3">Up to $10,000 Loan
0% interest over 10 years</td></tr>
<tr><td rowspan="2">III</td><td>20%-24.99%</td><td>$4,000</td></tr>
<tr><td>>25%</td><td>$5,000</td></tr>
<tr><td>C&I Direct Install Loan</td><td colspan="3">70% of retrofit costs up to $125,000</td><td>Up to $53,571 Loan
0% interest over 3 years</td></tr>
</table>

2014-2015 Programs		
SJG Program	**NJCEP Rebate**	**SJG Incentive**
C&I Smart Start and Pay for Performance Loan	Based on installed measures	Up to $100,000 Loan 0% interest over 5 years

Table ES-2 displays the SJG Energy Efficiency program budgets. Funding was provided in three different allocations, totaling $48.3 million from 2009 through 2015. The bulk of the funding was allocated for the residential HVAC and HPwES programs.

Table ES-2
SJG Budget by Program
2009-2015

Funding Source and Time Period		Residential					Total Residential
		HVAC Rebate	HVAC Loan	HVAC Audit	HPwES	OPower	
EET 1	2009-2010	$5,093,836	-	-	$3,025,800	-	$8,119,636
EET II	2013-2015	$1,815,427	$9,132,500	$503,250	$9,984,263	-	$21,435,440
EET III	2015	$218,402	$279,500	$39,667	$4,911,475	$1,018,285	$6,467,329
Total	2009-2015	$7,127,665	$9,412,000	$542,917	$17,921,538	$1,018,285	$36,022,405

Funding Source and Time Period		Commercial and Industrial					Total C&I
		Direct Install	Combined Heat and Power	Non-Res Energy Efficiency	Smart Start	Pay for Performance	
EET I	2009-2010	$1,025,385	$3,109,900	$4,863,355	-	-	$8,998,639
EET II	2013-2015	$690,224	-	$353,336	$1,761,224	$0.00	$2,804,784
EET III	2015	$246,960	-	$261,594	-	-	$508,554
Total	2009-2015	$1,962,569	$3,109,900	$5,478,285	$1,761,224	$0.00	$12,311,977

Participant Feedback

APPRISE conducted in-depth telephone interviews and quantitative surveys with program participants to develop information on the following issues.

- How the customer learned about the program
- Why the customer decided to participate
- Importance of the program in high-efficiency equipment installation and implementation of other improvements
- Other factors that influenced the decision to upgrade
- Impact of the improvements on bills, comfort, and other factors
- Rebate and financing process satisfaction and challenges
- Whether the customer has plans for additional efficiency work

- Satisfaction with the contractor, the equipment/improvements, and the program
- Recommendations for the program

The tables below summarize information on the interviews and surveys that were conducted.

Table ES-3
In-Depth Interview Summary

	HVAC	HPwES	OPower	Direct Install	Smart Start
Program Participation	4/15 – 12/15	9/15-12/15	3/16-5/16	2015	2015 & 2016
Selected Sample	100	50	100	20	14
Sample Stratification	50 rebate 50 loan	None	50: 2 contacts 50: 4 contacts	None	None
Completed Interviews	51	24	21	10	6
Interview Length	9-35 Minutes	10-25 Minutes	4-8 Minutes	8-17 minutes	
Response Rate	54%	52%	30%	58%	52%
Cooperation Rate	77%	83%	48%	91%	100%

Table ES-4
Quantitative Participant Survey Summary

	HVAC	HPwES	OPower
Program Participation	4/15-12/15	9/15-12/15	3/16-5/16
Selected Sample	300	300	800
Completed Interviews	160	156	126
Response Rate	62%	57%	28%
Cooperation Rate	89%	91%	44%

Key findings from the surveys and interviews are summarized below.

- Program Knowledge: Most respondents reported that they first heard about the residential and commercial programs through their contractor. Other common sources of residential program information were friends or relatives, and other program advertising. Another common source of C&I program information was SJG.

- Program Impact: Respondents were asked whether they would have selected the high-efficiency equipment or implemented the improvements if the SJG loan was not available.
  - HVAC Rebate: 24 percent said they would not have chosen the high-efficiency heating system and 31 percent said they would not have chosen the high-efficiency water heating system if the rebate was not available.

- HVAC Loan: 48 percent said they would not have installed the high-efficiency heating system and 52 percent said they would not have installed the high-efficiency water heating system if the loan was not available.

- HPwES: Only 13 percent said that they would have installed all of the improvements they did if the SJG loan was not available.

- C&I: Seven of the ten Direct Install participants and four of the six Smart Start participants would not have moved forward with the project without the SJG loan.

- Bill Impact: Respondents were asked whether their bills were lower, higher, or unchanged following the installations.
  - HVAC: 22 percent said their bills were much lower and 45 percent said their bills were somewhat lower.
  - HPwES: 22 percent said their bills were much lower and 47 percent said they were somewhat lower.
  - C&I: Thirteen of the sixteen participants said their energy bills were lower.

- Other Impacts: Respondents reported other impacts of the installations.
  - HVAC: 15 percent said their home was warmer or more comfortable, 15 percent said their home was more efficient, and 12 percent said their hot water was hotter.
  - HPwES: 40 percent said their home was warmer or more comfortable.
  - C&I: Ten of the sixteen participants noted comfort improvements

- Satisfaction:
  - HVAC: Satisfaction was high.
    - 88 percent were very satisfied with the heating equipment.
    - 82 were very satisfied with the water heating equipment.
    - 86 percent were very satisfied with the contractor.
    - 89 percent were very satisfied with the SJG HVAC program.

  - HPwES: Satisfaction was also high, especially with the SJG program.
    - 81 percent were very satisfied with Energy Finance Solutions.
    - 78 percent were very satisfied with the energy efficiency improvements.
    - 75 percent were very satisfied with the contractor.
    - 88 percent were very satisfied with the SJG HPwES program.

  - C&I: Almost all reported the highest levels of satisfaction.
    - All ten Direct Install participants found the assessment very helpful.
    - All ten Direct Install participants were very satisfied with the assessment.
    - All ten Direct Install participants were very satisfied with the program process.
    - Four of six Smart Start participants were very satisfied with the program process.
    - Nine of ten Direct Install participants were very satisfied with the SJG Loan program overall.

  - Five of six Smart Start participants were very satisfied with the SJG Loan program overall.

- Recommendations from Participants: The most common recommendation across all programs was to increase advertising. (Note that these are recommendations from participants and do not necessarily correspond to recommendations made by the evaluation.)
  - HVAC: Recommendations were to increase advertising for the program, simplify or streamline the process, increase the rebate or loan amount, and provide better customer service or program communication.
  - HPwES: Recommendations were to increase program advertising, improve the loan application process, improve the loan payment process, and improve customer service or communication.
  - C&I: Recommendations were to simplify program and savings information, include incentives for gas equipment, continue the program, and increase advertising.

- OPower: Key findings from the OPower recipient survey are summarized below.
  - Neighbor Comparison: While 12 percent said the comparison to their neighbors' usage was very helpful, 38 percent said it was somewhat helpful, and 41 percent said it was not at all helpful. Those who did not feel the comparison was "Very Helpful" were most likely to state that this was because their neighbors are different, their neighbors' homes are different sizes, or their neighbors are not home year-round.

  - Usage Reduction Tips and Actions: While 35 percent reported at least one tip to reduce energy usage that was provided in the OPower report, 16 percent said they took at least one of these actions.

  - Website Access: The OPower mailings directed customers to a SJG website with a form to sign up for SJG program information and to another website with energy-saving tips and information on the neighbor comparison. Two percent of the respondents said they visited the website about the OPower report and energy saving tips, and ten percent said they visited the SJG website.

  - Learned About SJG Program: The OPower letter did not provide information on the SJG program directly, but respondents were provided with links to a website that provided such information. Seven percent of the respondents said that they learned about the SJG HVAC program through the OPower letter and five percent said they learned about the SJG HPwES program from the OPower letter.

  - Helpfulness of Reports: 14 percent said the reports were very helpful in thinking about ways to reduce their usage and 58 percent said they were somewhat helpful.

  - Satisfaction with Reports: 16 percent said they were very satisfied with the OPower mailings and 62 percent said they were somewhat satisfied.

- Influence of Reports: Most participants reported that the OPower mailings did not have a large influence on their likelihood of undertaking energy efficiency improvements. However, 55 percent did say that they had a small influence.

Contractor Feedback

APPRISE conducted interviews with 25 contractors who provide services under South Jersey Gas' energy efficiency programs. The following types and numbers of contractors were interviewed.

- HVAC Contractors – 11 contractors
- HPwES Contractors – 12 contractors
- Shore Green Energy
- Direct Install Contractor

Key findings were as follows.

- Contractor Information: The most common source of contractor information about the HVAC and HPwES programs was South Jersey Gas.

- Customer Awareness: About half of the HVAC contractors reported that their customers were frequently aware of the SJG Loan Program and half said they were not.

- HVAC Impact: When asked whether customers would install the high-efficiency option without the loan, eight HVAC contractors said they would not, two contractors said they would not install high-efficiency as frequently, and one said that customers still would still choose the high-efficiency option without the SJG loan.

  When asked whether customers would install the high-efficiency option without the SJG additional rebate, five HVAC contractors said they would not, three said they would choose high-efficiency less frequently, and two said customers would still install high-efficiency equipment without the SJG rebate.

- HPwES Impact: Five HPwES contractors said that customers would not move forward with the HPwES project if the SJG loan had not been available, six said they may, and one said they would move forward.

- Other Factors Influencing Equipment Choice: HVAC contractors reported that pricing, energy savings, and old equipment that needed to be replaced were other factors that influenced customers to purchase the high-efficiency equipment.

  HPwES contractors were most likely to state that home comfort, reduced energy bills, and old or failed equipment were the other factors that influenced customers to make upgrades.

- Business Impact: HVAC contractors were very positive when asked about the impact that the program has had on their business. They stated that it offered an additional avenue to generate revenue, increased the number of customers, increased their revenue, and encouraged conversions to natural gas.

  HPwES contractors also reported that the SJG HPwES Loan Program had a positive impact on their business. They said it enabled them to increase revenue, increase staffing, help them to close deals, convince them to enter the home performance field, and help with educating customers about the program.

- Contractor Satisfaction: Most HVAC and HPwES contractors reported that they were very satisfied with the SJG programs. HVAC contractor complaints related to Energy Financing Solutions and the reliance on SJG to install gas lines. Two HPwES contractors also stated that the loan paperwork prevented them from being completely satisfied with the program.

- Recommendations for Increased Whole House Work: Contractors made recommendations for increasing whole house home performance installations. (Note that these are recommendations from contractors and do not necessarily correspond to recommendations made by the evaluation.)

  HVAC contractors suggested that SJG could further encourage whole house improvements by removing the BPI requirement for home performance work, making it easier for the customer to finance additional work, providing more incentives and rebates, keeping the rebates at a set level for a longer period of time, and reducing contracting time.

  HPwES contractors said that SJG should increase the rebate amount and the loan amount or improve the loan term to encourage whole house work. Contractors also said that SJG should build customer awareness and educate customers about home performance. Other recommendations included reducing the loan paperwork, lowering efficiency requirements, and increasing the number of contractors in the program.

- Program Recommendations: When asked about recommendations for the SJG program, Shore Green Energy recommended that SJG increase the advertising for the program and make more contractors aware of the program.

- Direct Install Contractor: The contractor reported that the SJG loan is very important to most businesses and most would not move forward with the project if the loan and the NJCEP rebate were not available. She stated that the program has impacted the number of projects they do and has increased awareness of energy efficiency opportunities.

Usage Impacts

This section provides results from an analysis of the impacts of the HVAC and HPwES programs on natural gas usage based on pre and post-installation billing data. Key findings from the analysis were as follows.

HVAC Impacts

- Overall: The HVAC participants saved an average of 87 ccf or 10.3 percent of pre-treatment usage.

- Incentive Type: While the rebate participants saved an average of 74 ccf, the loan participants saved an average of 153 ccf.

- Pre-Treatment Usage: Customers with higher pre-treatment usage had higher savings.
  - Those with pre-treatment usage of less than 800 ccf had average savings of 38 ccf.
  - Those with pre-treatment usage of 801 to 1,000 ccf had average savings of 101 ccf.
  - Those with pre-treatment usage over 1,000 ccf had average savings of 170 ccf.

HPwES Impacts

- Overall: The HPwES participants saved an average of 206 ccf, or 23.8 percent of pre-treatment usage.

- Rebate Amount: While those with a rebate of under $5,000 saved an average of 179 ccf, those with a rebate of $5,000 saved an average of 217 ccf.

- Pre-Treatment Usage: Customers with higher pre-treatment usage had higher savings.
  - Those with pre-treatment usage below 800 ccf had mean savings of 141 ccf.
  - Those with pre-treatment usage between 801 and 1,000 ccf had mean savings of 216 ccf.
  - Those with pre-treatment usage of over 1,000 ccf had mean savings of 298 ccf.

- Contractors: Savings differed significantly by contractor.

Non-Energy Benefits

The energy efficiency installations under the HVAC and HPwES programs resulted in lifetime environmental benefits of $2,690,790 and economic benefits of $883,312.

In addition to the environmental and economic benefits quantified, the programs have significant impacts on customer health and safety as a result of requirements for concurrent installation of hot water heaters with high-efficiency heating systems, corrections of gas and carbon monoxide leaks, venting improvements, and identification of other issues including mold, moisture, and asbestos.

Table ES-5
Summary of Environmental and Economic Benefits

Benefit type	HVAC	HPwES	Total Benefit
Environmental	$741,213	$1,949,576	$2,690,790
Economic	$136,453	$696,859	$833,312
Total	$877,666	$2,646,435	$3,524,102

Findings and Recommendations

SJG's Energy Efficiency Program has achieved many successes since its implementation in 2009.

- Customer Participation: SJG has significantly ramped up participation in the HVAC and HPwES programs since SJG increased marketing in 2014.

- Contractor Recruitment: SJG has educated contractors about the potential of home performance for their businesses and increased the number of participating home performance contractors.

- Satisfaction: Participants and contractors expressed high levels of satisfaction with the SJG programs.

- Gas Usage Impacts: The HVAC and HPwES programs achieved significant natural gas savings.

- Non-Energy Benefits: The SJG programs achieved significant environmental, economic, and health and safety benefits.

- Incremental Impact: The SJG programs created additional participation and investment in energy efficiency.

    - Awareness: Customers were most likely to report that they learned about the SJG programs through their contractors, and contractors were most likely to report that they learned about the programs from SJG. SJG's marketing created awareness of the NJCEP programs and the additional SJG incentives and increased energy efficiency activity.

    - HVAC Implementation: The SJG programs influenced customers to install high-efficiency heating and water heating systems. When asked whether they would have chosen the high-efficiency equipment if the SJG rebate or loan was not available, 24 percent said they would not have chosen the high-efficiency heating system if the rebate was not available and 48 percent said they would not have installed the high-efficiency heating system if the loan was not available. Percentages were similar for the water heating system.

- HVAC Additional Measures: HVAC participants installed additional measures as a result of the SJG home energy assessment. While 44 percent said that Shore Green Energy made recommendations for additional work to further improve the energy efficiency of the home, 16 percent said that they made additional improvements.

- HPwES Implementation: The SJG HPwES program influenced customers to undertake additional efficiency improvements. Only 13 percent said that they would have installed all of the improvements they did if the SJG loan was not available. While 36 percent said they would not have installed insulation without the SJG loan, 16 percent said they would not have installed the water heating system, 15 percent said they would not have had the air sealing work done, eight percent said they would not have installed the new heating system, and six percent said they would not have installed the air conditioning system.

Key recommendations relating to program design, marketing and outreach, implementation, Energy Finance Solutions, and data collection are provided below.

Program Design

1. Program Offering: Customers who have installed high-efficiency heating and water heating systems have fewer opportunities for energy savings through the Home Performance Program. South Jersey Gas should consider other incentives to encourage customers who have participated in the HVAC Loan or Rebate Program to move forward with additional whole house energy efficiency improvements, even if they don't receive the highest incentives under the NJCEP HPwES Program.

2. OPower Neighbor Comparison: OPower respondents did not feel that the neighbor comparison was helpful because they were not convinced that the comparison was a useful one. The reports should provide more information on the selection of neighbors for the comparison and why it is a valid comparison. (Note that while 16 percent said they were very satisfied with the information received, 62 percent said they were somewhat satisfied.)

3. OPower SJG Program Information: The OPower mailing is a great opportunity to market the SJG residential energy efficiency programs. The mailing should include key information on the programs in the text of the report. SJG has discussed this change with OPower and they are planning to include the information in the next round of reports.

Marketing and Outreach

1. Contractor Outreach: Participants were most likely to report that they learned about the program through their contractor and contractors were most likely to report that they learned about the program from SJG. SJG should continue intensive outreach and support to contractors, as they are the most important channel for customer recruitment.

2. Contractor Materials: Some HVAC rebate participants were not aware that they would receive a rebate from SJG in addition to the rebate from the NJCEP. While SJG has

provided information to contractors on the NJCEP and SJG rebates available, we recommend that SJG develop a simplified brochure for contractors to provide to customers that provides information on the SJG rebate, the NJCEP rebate, and the total rebate. This may encourage additional customers to install high-efficiency equipment.

Implementation

1. Shore Green Energy Education: Shore Green Energy should educate customers with good opportunities for whole house performance work about the NJCEP HPwES Program and additional benefits offered by SJG. (Note: Shore Green Energy is wary of referring customers to the HPwES program because customers may be dissatisfied that their HVAC contractor, who was not a home performance contractor, did not let them know about this program option.)

2. CO Detector Education: SJG should encourage contractors to provide carbon monoxide detectors as part of their heating system installation, as this was the most common problem found by Shore Green Energy in 30 percent of their inspections. (SJG reported that they will consider providing CO detectors in their next filing.)

Energy Finance Solutions (EFS)

EFS has reported several improvements in their loan process and their website over the past year. Additional research should be conducted to ensure that these improvements have resulted in higher levels of customer satisfaction. The following issues were identified during the evaluation.

1. Energy Finance Solutions Paperwork: Paperwork required by EFS appears to be a burden for many customers. SJG should work with EFS to determine whether efficiency improvements can be made.

2. Energy Finance Solutions Processing: Participants were sometimes dissatisfied with the loan process because they had to resubmit the same information several times, they were asked for additional documentation during the loan application process that was not originally listed, or they did not receive effective customer service from EFS representatives. Some participants noted that they needed to have their contractor contact EFS to resolve the issues. SJG should discuss potential improvements with EFS.

3. Energy Finance Solutions Website: Participants noted that the EFS website was challenging and froze or did not work properly. SJG should assess whether these problems have declined since the improvements were made.

Data Collection

1. Account Numbers: A significant percentage of the HVAC Loan participant data was missing the customer's SJG account number. As a result, these customers could not be included in the usage impact analysis. SJG should work with the NJCEP or EFS to make sure that these data are available.

2. Health and Safety Information: We recommend that SJG collect data to assess the magnitude of the health and safety impacts.
   - HVAC Participants: SJG could develop a data collection spreadsheet for Shore Green Energy to report information on health and safety issues identified and discussed with customers. These should include gas leaks, high levels of ambient CO or high levels of CO in the flue, venting issues, mold and moisture issues, and asbestos issues.

   - HPwES Participants: SJG should discuss collection, reporting, and sharing of similar health and safety data with the NJCEP.

SJG Program Continuation

SJG's energy efficiency programs have increased investments in energy efficiency and resulted in high natural gas savings and other non-energy benefits. We recommend that these programs are continued if funding continues to be available.

I. Introduction

This report presents the findings from the 2016 South Jersey Gas (SJG) Energy Efficiency Program Evaluation. SJG's Energy Efficiency Programs provide incentives that are complimentary to the New Jersey Clean Energy Programs (NJCEP). The residential and commercial and industrial (C&I) programs provide rebates and loans to assist with the purchase and installation of energy efficient equipment and measures.

A. Evaluation Activities

The following research activities were undertaken.

1. Background Research: We reviewed program documents, outreach data, and marketing materials; and interviewed SJG managers and staff about program design and implementation.

2. Program Data Analysis: We analyzed data provided by SJG staff and developed summary statistics on the program implementation

3. Participant In-Depth Interviews: We conducted in-depth telephone interviews with participants in the High-Efficiency Heating and Water Heating (HVAC), Home Performance with Energy Star (HPwES), OPower, Direct Install, and Smart Start program components.

4. Participant Surveys: We conducted quantitative surveys with customers who participated in the HVAC, HPwES, and OPower programs.

5. Contractor Interviews: We conducted in-depth telephone interviews with contractors who provide services in the HVAC, HPwES, and Direct Install Programs.

6. Billing Data Analysis: We analyzed SJG billing data for program participants and a comparison group to estimate the impact of the HVAC and HPwES programs on natural gas usage.

7. Non-Energy Benefits: We estimated the impact of the energy efficiency services on greenhouse gas emissions and on output and employment in NJ.

B. Organization of the Report

Six sections follow this introduction.

- Section II – SJG Energy Efficiency Programs: This section describes the design and implementation of SJG's energy efficiency programs. Information is based upon program documents, program data analysis, and interviews with SJG program managers and staff.

- Section III – Participant Feedback: This section summarizes the research methodology and feedback provided by SJG participants.

- Section IV – Contractor Feedback: This section summarizes the research methodology and feedback provided by contractors.

- Section V – Energy Impacts: This section describes the methodology for the energy saving analysis and the impacts of the HVAC and HPwES programs on natural gas usage.

- Section VI – Non-Energy Benefits: This section summarizes the impacts of the programs on the environment and the economy.

- Section VII – Summary of Findings and Recommendations: This section provides a summary of the key findings and furnishes recommendations for SJG's energy efficiency programs based on the analyses in this report.

APPRISE prepared this report under contract to SJG. SJG facilitated this research by furnishing data to APPRISE. Any errors or omissions in this report are the responsibility of APPRISE. Further, the statements, findings, conclusions, and recommendations are solely those of analysts from APPRISE and do not necessarily reflect the views of SJG.

II. SJG Energy Efficiency Programs

SJG's Energy Efficiency Programs provide incentives that are complimentary to the New Jersey Clean Energy Programs (NJCEP). The residential and C&I programs provide rebates and loans to assist with the purchase and installation of energy efficient equipment and measures.

A. Background

In October 2008, Governor Corzine developed a plan to improve employment and economic activity in the short term and enhance New Jersey's business climate and economic prospects in the longer term. The plan included a call for electric and gas utilities to invest in utility energy efficiency programs. In response, SJG filed a petition in January 2009 with the Board of Public Utilities (BPU) for five energy efficiency programs. The BPU approved these programs and additional programs, funding, and modifications in several rulings over the following years. This study focuses on the program design and implementation in 2014 and 2015.

B. Program Overview

SJG provides incentives to enhance those provided through the NJCEP. We focused on specific incentives provided in 2014 and 2015.

- Residential HVAC Rebate: This program provides a rebate of $500 for customers who install both a WarmAdvantage-qualified heating system and water heating system. This rebate is provided in addition to the $900 from the NJCEP. Customers must participate in an audit provided by SJG to receive the SJG program rebate.

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- C&I Pay for Performance Loan: This program provides zero interest loans of up to $100,000 for customers who participate in the NJCEP Pay for Performance Program.

This is in addition to the rebate provided by the NJCEP. The Pay for Performance Program requires a plan for usage reduction that is submitted to the state.

- OPower Reports: SJG implemented an OPower Report Program where customers were mailed and emailed Home Energy Reports comparing their usage to similar neighbors' usage in 2016.

The incentives offered by the SJG and the NJCEP are summarized in the table below.

Table II-1
NJCEP and SJG Program Benefits

2014-2015 Programs				
SJG Program	**NJCEP Rebate**			**SJG Incentive**
HVAC and Water Heater Rebate	$900 Rebate			$500 Rebate SJG Audit Required
HVAC and Water Heater Loan	$900 Rebate			Up to $6,500 Loan 0% interest over 5 years SJG Audit Required
HPwES Loan	Tier	Savings	Rebate	Up to $10,000 Loan 0% interest over 10 years
	III	20%-24.99%	$4,000	
		>25%	$5,000	
C&I Direct Install Loan	70% of retrofit costs up to $125,000			Up to $53,571 Loan 0% interest over 3 years
C&I Smart Start and Pay for Performance Loan	Based on installed measures			Up to $100,000 Loan 0% interest over 5 years

C. Goals and Resources

The goals of the SJG program are as follows.

- Increase energy efficiency opportunities for customers.
- Promote and enhance the use of the NJCEP offerings.
- Raise awareness of the whole-house approach to energy efficiency.
- Increase customer awareness of energy-efficient appliances and weatherization measures.
- Increase NJ employment in energy efficiency and conservation.

Table II-2 displays the SJG Energy Efficiency Program budgets. Funding was provided in three different allocations, totaling $48.3 million from 2009 through 2015. The bulk of the funding was allocated for the residential HVAC and HPwES programs.

Table II-2
SJG Budget by Program
2009-2015

Funding Source and Time Period		Residential					Total Residential
		HVAC Rebate	HVAC Loan	HVAC Audit	HPwES	OPower	
EET 1	2009-2010	$5,093,836	-	-	$3,025,800	-	$8,119,636
EET II	2013-2015	$1,815,427	$9,132,500	$503,250	$9,984,263	-	$21,435,440
EET III	2015	$218,402	$279,500	$39,667	$4,911,475	$1,018,285	$6,467,329
Total	2009-2015	$7,127,665	$9,412,000	$542,917	$17,921,538	$1,018,285	$36,022,405

Funding Source and Time Period		Commercial and Industrial					Total C&I
		Direct Install	Combined Heat and Power	Non-Res Energy Efficiency	Smart Start	Pay for Performance	
EET I	2009-2010	$1,025,385	$3,109,900	$4,863,355	-	-	$8,998,639
EET II	2013-2015	$690,224	-	$353,336	$1,761,224	$0.00	$2,804,784
EET III	2015	$246,960	-	$261,594	-	-	$508,554
Total	2009-2015	$1,962,569	$3,109,900	$5,478,285	$1,761,224	$0.00	$12,311,977

D. Expenditure and Participation Statistics

Table II-3 displays the expenditures on the SJG programs from 2009 through 2015 by year and funding source. Expenditures ramped up from 2009 through 2011 and reached a peak in 2015.

Table II-3
SJG Expenditures by Funding Source and Year

Funding Source and Time Period		Year							Total
		2009	2010	2011	2012	2013	2014	2015	
EET I	2009-2014	$1,631,770	$2,952,521	$6,058,396	$5,273,461	$2,687,780	$(1,591)	-	$18,602,337
EET II	2013-2015	-	-	-	-	$881,128	$13,583,951	$7,408,163	$21,873,242
EET III	2015	-	-	-	-	-	-	$13,113,007	$13,113,007
Total	2009-2015	$1,631,770	$2,952,521	$6,058,396	$5,273,461	$3,568,908	$13,582,360	$20,521,170	$53,588,586

Table II-4 displays the expenditures on the SJG programs from 2009 through 2015 by year and type of expenditure. The table shows that the majority of funds were spent in program investments.

Table II-4
SJG Expenditures by Year and Activity

Year	Expenditure Type						Total
	Admin & Program Development	Sales, Call Centers, Marketing and Website	Training	Rebate Processing, Inspections and Quality Control	Evaluation and Related Research	Investment	
2009	$19,050	$109,827	$1,094	-	-	$1,501,800	$1,631,770
2010	$170,869	$371,037	$3,830	$230,846	-	$2,175,940	$2,952,521
2011	$137,943	$388,715	$10,457	$433,061	-	$5,088,221	$6,058,396
2012	$91,254	$108,133	$6,480	$198,523	-	$4,869,070	$5,273,461
2013	$173,112	$175,328	$4,308	$342,445	-	$2,873,715	$3,568,908
2014	$264,331	$124,877	$4,986	$378,601	-	$12,809,565	$13,582,360
2015	$250,490	$304,975	$500	$429,144	$71,180	$19,464,881	$20,521,170
Total	$1,107,049	$1,582,891	$31,655	$2,012,620	$71,180	$48,783,192	$53,588,586

Table II-5 displays the expenditures on the SJG programs by year and program. The table shows that the Home Performance program increased expenditures in 2014 and 2015, showing a movement towards more comprehensive services.

Table II-5
SJG Expenditures by Year and Program

	Residential					Total Residential
	HVAC Rebate	HVAC Loan	HVAC Audit	HPwES	Residential Incentive Re-assigned to SJG	
2009	$51,233	-	-	$1,559,866	-	$1,611,099
2010	$1,037,630	-	-	$1,674,604	-	$2,712,234
2011	$3,428,033	-	-	$2,311,983	-	$5,740,016
2012	$1,075,796	-	-	$1,461,537	-	$2,537,333
2013	$1,224,072	-	-	$1,674,339	-	$2,898,411
2014	$320,285	$2,941,000	$71,100	$9,508,958	$(96,124)	$12,745,219
2015	$308,854	$2,257,301	$300,000	$16,022,736	$(93,060)	$18,795,831
Total	$7,445,903	$5,198,301	$371,100	$34,214,023	$(189,194)	$47,040,143

	Commercial and Industrial				Total C&I
	Direct Install	Combined Heat and Power	Non-Res Energy Efficiency	Other	
2009	$4,449	$6,250	$9,972	-	$20,671
2010	$75,625	$1,411	$163,252	-	$240,288
2011	$41,768	$4,469	$272,143	-	$318,380
2012	$5,926	$2,000,000	$730,201	-	$2,736,127
2013	$9,702	-	$660,796	-	$670,498
2014	$525,063	-	$312,079	-	$837,142
2015	$655,023	-	$460,314	-	$1,115,337
Total	$1,317,556	$2,012,130	$2,608,757	$610,000	$6,548,443

Table II-6 displays participation in the programs. The table shows that nearly 7,500 customers participated in the HVAC Rebate program, over 400 participated in the HVAC Loan program and over 3,000 participated in the Home Performance program. HPwES participation increased significantly in 2014 and 2015.

Table II-6
SJG Participation by Program
2010-2015

Year	Residential			Commercial & Industrial	
	HVAC Rebate	HVAC Loan	Home Performance	Direct Install	Smart Start
2010	1,148	0	585	0	10
2011	3,026	0	321	0	13
2012	1,138	0	390	0	46
2013	936	0	267	0	14
2014	527	95	640	0	--
2015	692	336	1,168	20	9
Total	**7,467**	**431**	**3,371**	**20**	**92**

E. Program Management and Administration

The SJG Energy Efficiency Programs are managed and supported by approximately eight SJG staff members. These staff are also supported by members of other SJG departments including marketing, rates, and financial planning.

SJG has not hired more staff to manage and implement their programs because of a concern that programs could be suspended, requiring SJG to lay off the staff that had been hired.

Instead, SJG's strategy has been to leverage resources. They have assembled trade allies, held meetings, explained the program, and encouraged contractors to get involved.

SJG receives data from the NJCEP administrator (AEG) and the loan administrator, Energy Finance Solutions (EFS). Additionally, SJG has recently entered an agreement with AEG, the administrator of the NJCEP, to provide information to SJG through the State's data system.

SJG works with the residential and the C&I contractors to educate them about the programs and help them to deliver services.

F. SJG Audits and Quality Control

SJG contracted with Shore Green Energy, a Building Performance Institute (BPI) certified company, to perform home energy assessments that are required for customers who install a HVAC system and water heating system. These visits fulfil the BPU requirement for SJG to perform a health and safety check, to ensure that the equipment was installed, and to educate the homeowner on additional steps they can take to increase their energy savings. The visit is an education, quality control, and safety visit. Shore Green Energy performs a complete audit with the exception of the blower door test. All appliances are tested for leakage.

When SJG began the HVAC program, they had seven contractors interested in performing this assessment work. However, most were not able to perform the visit at the agreed-upon compensation, and Shore Green Energy has been completing all of this work for the past several years.

Shore Green Energy documents their work with photos, paper forms, and electronic forms. They contact SJG if there are any questions about the work that was done. When inspecting, they revert to the requirements as specified by the equipment manufacturer.

G. Contractors

Contractors must meet the following requirements to participate in the SJG energy efficiency programs.

- HVAC Rebate: Any licensed contractor in NJ can participate in the SJG Rebate Program. This is the same as what is required for the NJCEP WARMAdvantage Program.

- HVAC Loan: Each contractor is required to meet with SJG and provide documentation of licensing and insurance. SJG reviews the program requirements with the contractor. Contractors are required to advertise two times per year and perform at least six conversions per year.

- HPwES Loan: The Building Performance Institute (BPI) contractors are approved through the NJCEP. They also must be approved by SJG to take advantage of the SJG loan.

- C&I Direct Install: There are three contractors who have been assigned territorial responsibilities for the NJCEP Program within SJG's service territory. Two are the main contractors and one is the refrigeration contractor throughout the state.

H. Energy Finance Solutions

Energy Finance Solutions (EFS) processes the loan applications and approval for South Jersey Gas. Customers apply directly to EFS, submit required documentation, and are notified by EFS whether they are approved, denied, or whether additional information is required.

The residential EFS loans provide the following to customers who own their single-family or duplex homes.

- No collateral requirements
- No fees, points, or closing costs
- No prepayment penalty
- Ability to finance 100% of installation costs

After the work is completed, the contractor sends the signed Certificate of Completion to EFS. EFS then takes the following steps.

- Finalizes the loan. All documents must be in order and all conditions met for final loan approval and processing.
- Pays contractor for the loan amount.
- Sells the loan to SJG. EFS must sell the loan within 60 days of the date that the Certificate of Completion is signed by Homeowner.

EFS has reported the following improvements in their loan process and their website over the past year.

- Electronic Fax Management Tool (4/2015): The tool creates electronic documents from all paper faxes.
- Upload of Customer Documents (5/2015): Customers can upload scanned images to satisfy outstanding conditions of the loan.
- New Loan Origination System (6/2015): Provides customers and contractors with an interactive system from application to close. The customer has the ability to download documentation directly from the consumer portal and upload documentation directly to the loan specialist. Automated emails are sent to both customers and contractors when statuses change and when comments or additional conditions are added.
- Customer Portal (12/2015): The customer portal experience was updated to streamline the application process and improve the post-application experience. EFS added targeted text on the application screens to give the applicant specific information needed during the application process.
- Email Notification (3/2016): EFS expanded the email notification sent to contractors and customers who applied online to provide additional updates as the loans move through the application process.

- Auto Decisions (5/2016): EFS launched a process where applicants who apply online receive an automated response as to whether they receive a loan pre-approval.
- Targeted Messaging (8/2016): EFS made systems enhancements so they can provide targeted messages to customers and contractors when they log into the portal.
- Contractor Tools (8/2016): EFS is launching additional tools to allow contractors to search and provide improved views of the pipeline.

I. Marketing

SJG has historically conducted spring and fall advertising for the energy efficiency programs, but more recently has moved to conducting marketing "bursts" throughout the year. They develop a theme or concept to build each campaign around, and then develop the media plan based on what has been successful in the past as well as on recommendations from the advertising agency they are working with.

The media plan is a mix of digital, print, radio, grass roots, and outdoor advertising. SJG aims to advertise in a way so that everywhere the customer looks, they will see the program – "Surround Sound". They engage customers everywhere they can. Then they shift the advertising budget to what has been successful. It is a test and learn approach.

SJG tracks how customers heard about the program to assess which marketing activities are most successful. The SJG program interest forms have a required field where the customer must report how they heard about the program.

SJG has found their grass roots efforts to be very successful. They send a team of individuals who are well-versed in the energy efficiency programs to local community events such as green fairs or home improvement shows. They also made several program presentations at local rotaries, Lions Clubs, chambers of commerce, and other small business associations.

Marketing activities that have been conducted are summarized in Table II-7. The program marketing was increased significantly in 2014 and 2015.

Table II-7
SJG Energy Efficiency Marketing Activities
2011-2015

Year	Marketing Activities
2011	• Television • Radio • Newspapers • Billboards • Bill Inserts
2012	• Billboards • Bill Inserts
2013	• Television • Radio • Newspapers

Year	Marketing Activities
	• Billboards • Bill Inserts
2014	• Newspapers • Billboards • Bill Inserts • Direct Mail • Website • Trade Shows • Social Media • Email Blasts • Grassroots Sponsorship
2015	• Radio • Newspapers • Website • Social Media • Email Blasts • Grassroots Sponsorship

J. HVAC Rebate Program

The HVAC Rebate Program provides a rebate of $500 for customers who install both a WarmAdvantage-qualified heating system (NJCEP heating replacement rebate) and water heating system in addition to the $900 provided through the NJCEP. Customers must participate in an audit provided by SJG to receive the SJG program rebate.

The program involves the following steps.

- The contractor educates the homeowner about the $900 rebate from the state and the $500 rebate from SJG.
- The contractor sometimes contacts Shore Green Energy to let them know about the project.
- The contractor submits the WarmAdvantage paperwork or fills out the WarmAdvantage paperwork and gives it to the customer to submit.
- SJG is notified by WarmAdvantage about the participants who have met the criteria for the combination $900 NJCEP rebate.
- SJG contacts the customer and informs them that Shore Green Energy will visit their home to perform the assessment.
- Shore Green Energy submits the information electronically to the NJCEP administrator. The NJCEP administrator pays Shore Green Energy and pays the customer the additional $500 rebate.
- SJG receives weekly reports on the number of participants and the running participation tally since 2010.

Table II-8 displays the unit types installed in the SJG HVAC Rebate Program. The table shows that most units (over the full time period) were furnaces, followed by combination installs. After the implementation of the requirement for water heating replacement as well as heating system replacement in 2013, all units were either combination installation of the two systems or installation of one combined unit.

Table II-8
SJG HVAC Rebate Program
Unit Type

Year	2010	2011	2012	2013	2014	2015	Total
Participants	1,148	3,026	1,138	936	527	692	7,467
Boiler	3%	9%	14%	4%	0%	1%	7%
Combination Unit	0%	0%	0%	0%	0%	14%	1%
Combo Install	0%	<1%	0%	12%	97%	85%	16%
Furnace	55%	88%	85%	20%	0%	0%	59%
Missing	42%	3%	1%	64%	3%	1%	16%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Note: Unit type was not provided in the HVAC Loan file.

Table II-9 displays the projected annual energy savings for the SJG HVAC Rebate participants. Mean annual projected savings were 146 therms. The mean projected savings were somewhat lower than average in 2013 and 2014 and were somewhat higher in 2015.

Table II-9
SJG HVAC Rebate Program
Projected Annual Energy Savings (Therms)

Year	2010	2011	2012	2013	2014	2015	Total
Participants	1,148	3,026	1,138	936	527	692	7,467
Mean Annual Gas Savings (Therms)	144	145	145	129	123	179	146
<100	4%	10%	11%	11%	46%	2%	11%
100-149	29%	41%	42%	12%	15%	12%	31%
150-199	23%	40%	38%	10%	26%	63%	34%
200+	2%	6%	8%	4%	10%	22%	7%
Missing	42%	3%	1%	64%	3%	1%	16%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table II-10 displays the projected lifetime energy savings for the SJG HVAC Rebate participants. Mean lifetime projected savings were 2,854 therms.

Table II-10
SJG HVAC Rebate Program
Lifetime Energy Savings (Therms)

Year	2010	2011	2012	2013	2014	2015	Total
Participants	1,148	3,026	1,138	936	527	692	7,467
Mean Lifetime Gas Savings (Therms)	2,890	2,903	2,903	2,470	2,150	3,245	2,854
<2,000	4%	10%	11%	13%	53%	3%	12%
2,000- 2,999	29%	41%	42%	10%	24%	42%	34%
3,000 – 3,999	23%	40%	38%	10%	13%	39%	31%
4,000+	2%	6%	8%	4%	7%	15%	6%
Missing	42%	3%	1%	64%	3%	1%	16%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

K. HVAC Loan Program

The HVAC Loan Program provides a zero percent interest five-year loan up to a maximum of $6,500 in addition to the $900 rebate provided through the NJCEP. Customers must participate in an audit provided by SJG to receive the SJG loan.

The program involves the following steps.

- The contractor provides a proposal to the customer. He educates the customer on loan options. Sometimes the contractor uses his own credit process.
- If the customer uses the SJG loan through Energy Finance Solutions (EFS), the customer will go on the EFS website to complete the financing application.
- If the customer is approved for financing, the contractor can perform the work.
- The contractor calls Shore Green Energy and informs them of the day that the work will be completed.
- Shore Green Energy schedules their home assessment visit on the same day or close to it.
- The contractor submits documents to EFS to show that the project has been completed.
- Shore Green Energy performs their visit and submits a certificate signed by the customer to EFS.
- The loan is then released.

Table II-11 displays the projected annual energy savings for the SJG HVAC Loan participants. Mean annual projected savings were 102 therms.

Table II-11
SJG HVAC Loan Program
Annual Energy Savings (Therms)

Year	2014	2015	TOTAL
Participants	95	336	431
Mean Annual Gas Savings (Therms)	95	104	102
<100	62%	61%	61%
100-149	19%	25%	24%
150-199	3%	7%	7%
200+	1%	2%	2%
Missing	15%	5%	7%
Total	**100%**	**100%**	**100%**

Table II-12 displays the projected lifetime energy savings for the SJG HVAC Loan participants. Mean lifetime projected savings were 1,870 therms.

Table II-12
SJG HVAC Loan Program
Lifetime Energy Savings (Therms)

Year	2014	2015	Total
Participants	95	336	431
Mean Lifetime Gas Savings (Therms)	1,750	1,900	1,870
<2,000	71%	65%	67%
2,000- 2,999	11%	21%	19%
3,000 – 3,999	3%	7%	6%
4,000+	1%	2%	2%
Missing	15%	5%	7%
Total	**100%**	**100%**	**100%**

L. HPwES Program

The HPwES Loan Program provides a zero percent interest loan of up to $10,000 over a ten-year period for customers who participate in an audit and install energy efficiency measures that are projected to achieve at least 20 percent energy savings. Customers also receive a rebate of up to $5,000 from the NJCEP.

The HPwES Program is managed through the NJCEP. The NJCEP has their own portal. When customers apply for a loan, the customer applies directly to EFS and it is handled at the state level. SJG pays for the loan and the NJCEP rebate is paid by the NJ Clean Energy Program.

Table II-13 displays the total project cost for the HPwES projects. The mean project cost over the full time period was just over $16,000. Most projects were between $15,000 and $20,000.

Table II-13
SJG HPwES Loan Program
Total Project Cost

Year	2010	2011	2012	2013	2014	2015	Total
Participants	585	321	390	267	640	1,168	3,371
Mean Project Cost	$16,973	$16,691	$16,446	$16,311	$16,082	$15,871	$16,282
<$10,000	4%	1%	2%	3%	2%	2%	2%
$10,000 - $14,999	24%	36%	24%	27%	20%	37%	29%
$15,000- $19,999	56%	50%	62%	57%	68%	50%	57%
≥$20,000	16%	13%	12%	12%	10%	11%	12%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table II-14 displays the amount of the SJG HPwES Loan. The mean loan amount was just over $9,000. All loans in the "≥$10,000" category from 2010 through 2014 were $10,000, and a handful were over $10,000 in 2015 when a larger loan amount up to $15,000 became available at a 4.99 percent interest rate.

Table II-14
SJG HPwES Loan Amount

Year	2010	2011	2012	2013	2014	2015	Total
Participants	585	321	390	267	640	1,168	3,371
Mean SJG Loan	$7,203	$9,546	$9,683	$9,353	$9,661	$9,607	$9,183
< $6,500	26%	4%	2%	8%	3%	3%	7%
$6,500 - $9,999	57%	21%	16%	21%	15%	18%	25%
≥$10,000	18%	76%	81%	72%	82%	78%	68%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table II-15 displays the percent of the project cost covered by the SJG Loan. On average, 58 percent of the cost was covered by the loan. Most loans covered between 50 and 69 percent of the project cost.

Table II-15
SJG HPwES Percent of Project Cost Covered by Loan

Year	2010	2011	2012	2013	2014	2015	Total
Participants	585	321	390	267	640	1,168	3,371
Mean % Covered by SJG Loan	43%	59%	60%	59%	61%	62%	58%
<30%	15%	1%	1%	2%	0%	<1%	3%
30-49%	15%	13%	12%	12%	11%	11%	12%
50-69%	69%	71%	80%	85%	85%	71%	76%
≥70%	1%	15%	7%	2%	4%	18%	10%
Missing	0%	<1%	0%	0%	0%	0%	<1%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table II-16 displays an analysis of NJCEP rebates by fiscal year, the Total Energy Score (TES), and the number of SJG HPwES projects that fell into each category. In each year, most of the projects were in the higher tier and received the higher NJCEP rebate amount. For example, in FY 2015, 483 projects were in the $4,000 maximum rebate category and 1,027 were in the $5,000 maximum rebate category.

Table II-16
NJCEP HPwES Rebate Guidelines

Fiscal Year	Tier	Guideline		Obs	Total Energy Score		Rebate Amount	
		Total Energy Score	Rebate Amount		Min	Max	Min	Max
2009	3	≥25%	≤$10,000	1	-	-	$3,738	$3,738
2009	3B	≥25%	≤$10,000	612	-	-	$25	$10,000
2010	3	≥25%	≤$3,000	65	-	-	$3,000	$3,000
2011	2	20-24.99%	≤$3,000	59	20.04%	24.60%	$3,000	$3,000
2011	3	≥25%	≤$4,000	260	25.00%	53.22%	$3,760	$4,000
2012	2	20-24.99%	≤$4,000	103	14.77%	24.48%	$2,750	$4,000
2012	3	≥25%	≤$5,000	466	25.00%	46.94%	$2,186	$5,000
2014	2	20-24.99%	≤$4,000	68	20.05%	24.82%	$4,000	$4,000
2014	3	≥25%	≤$5,000	173	25.05%	44.82%	$3,115	$5,000
2015	2	20-24.99%	≤$4,000	483	20.00%	24.98%	$3,225	$4,000
2015	3	≥25%	≤$5,000	1,027	25.00%	47.02%	$3,737	$5,000
2016	2	20-24.99%	≤$3,000	45	20.06%	24.73%	$3,000	$3,000
2016	3	≥25%	≤$4,000	152	25.01%	45.13%	$4,000	$4,000

Table II-17 displays the NJCEP HPwES rebate distribution. The mean rebate over the entire time period was over $5,214. However, rebates averaged under $5,000 in every year from 2011 through 2015 after the program incentives were adjusted in 2010.

Table II-17
NJCEP HPwES Rebate

Year	2010	2011	2012	2013	2014	2015	Total
Participants	585	321	390	267	640	1,168	3,371
Mean Rebate	$8,084	$4,269	$4,644	$4,742	$4,780	$4,572	$5,214
<$3,000	<1%	<1%	0%	1%	0%	0%	<1%
$3,000 - $4,999	7%	87%	34%	24%	22%	41%	34%
$5,000 - $6,999	17%	3%	66%	75%	78%	59%	52%
$7,000 - $9,999	61%	8%	<1%	0%	0%	0%	11%
$10,000 +	15%	2%	<1%	0%	0%	0%	3%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table II-18 displays the percent of the project cost covered by both the SJG Loan and the NJCEP Rebate. The table shows that the average coverage rate was 91 percent. Most customers had a coverage rate of greater than 70 percent.

Table II-18
SJG HPwES Percent of Project Cost Covered by Loan and NJCEP Rebate

Year	2010	2011	2012	2013	2014	2015	Total
Participants	585	321	390	267	640	1,168	3,371
Mean % Covered by Loan & Rebate	91%	86%	90%	89%	92%	92%	91%
<30%	0%	0%	0%	<1%	0%	<1%	<1%
30-49%	1%	2%	1%	1%	0%	1%	1%
50-69%	16%	11%	8%	7%	8%	8%	10%
≥70%	83%	87%	91%	91%	92%	91%	89%
Missing	0%	<1%	0%	0%	0%	0%	<1%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table II-19 displays the percent of all SJG HPwES projects performed by contractors who did at least five percent of the jobs (at least 169 jobs) over all of the years examined. The table shows that most of the jobs, 54 percent, were performed by Hutchinson, Allied, and Laury. There were only two other contractors who did more than five percent of the jobs over the full period examined.

Table II-19
SJG HPwES Contractors

Year	2010	2011	2012	2013	2014	2015	Total
Participants	585	321	390	267	640	1,168	3,371
Hutchinson Plumbing, Heating & Cooling	36%	39%	30%	24%	17%	11%	22%
Allied Construction LLC	0%	0%	15%	4%	30%	31%	18%
Laury Heating Cooling, LLc	11%	9%	5%	17%	11%	22%	14%
Bovio Heating Plumbing Cooling Insulation	9%	13%	11%	7%	5%	4%	7%
Rubino Service Co.	9%	12%	7%	10%	6%	3%	7%

Table II-20 displays measures that were installed in at least five percent of the jobs. The most common measures were a furnace, air sealing, a hot water heater, insulation, and air conditioning.

Table II-20
SJG HPwES Measure Penetration

Year	2010	2011	2012	2013	2014	2015	Total
Number of Jobs	585	321	390	267	640	1,168	3,371
Gas Furnace	89%	90%	92%	81%	91%	91%	90%
Air Sealing	17%	89%	99%	99%	100%	100%	84%
Gas Domestic Hot Water Heater	76%	85%	87%	78%	85%	83%	82%
Miscellaneous Measure	44%	84%	91%	87%	90%	89%	81%
Attic/Floor Insulation	58%	75%	76%	70%	85%	83%	76%
Central A/C Unit	62%	69%	77%	68%	70%	71%	69%
Custom Safety Measure	17%	28%	27%	37%	64%	58%	44%
Sub Total HVAC	45%	36%	20%	16%	20%	18%	25%
Custom HVAC	26%	24%	21%	27%	24%	10%	19%
Heat Pump	26%	20%	16%	12%	19%	17%	19%
Attic/Wall Insulation	14%	21%	19%	27%	20%	16%	18%
Air Sealing Subtotal	95%	13%	1%	0%	0%	0%	18%
Remove A/C	23%	19%	15%	12%	18%	16%	18%
Sub Total Comfort & Safety	5%	30%	36%	19%	2%	1%	10%
Gas Boiler	8%	7%	6%	13%	6%	7%	7%
Basement/Wall Insulation	6%	5%	6%	9%	7%	4%	6%
Ceiling Insulation	2%	2%	1%	1%	6%	11%	6%
Custom Insulation	7%	3%	5%	4%	3%	6%	5%

Table II-21 displays the distribution of the Total Energy Score (TES). The table shows that the mean TES was 27 percent. While 22 percent of the jobs had a TES of less than 25 percent, 55 percent of the jobs had a TES between 25 and 35 percent.

Table II-21
SJG HPwES Total Energy Score

Year	2010	2011	2012	2013	2014	2015	Total
Participants	585	321	390	267	640	1,168	3,371
Mean Total Energy Score	-	27%	28%	27%	27%	26%	27%
<25%	0%	13%	14%	24%	22%	36%	22%
25%-<35%	0%	53%	76%	71%	74%	61%	55%
35%-<45%	0%	5%	8%	5%	4%	3%	4%
>45%	0%	<1%	0%	<1%	0%	<1%	<1%
Missing	100%	28%	1%	0%	0%	0%	20%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table II-22 displays the mean annual projected gas and electric savings for the HPwES Program. The mean gas savings was 165 therms and the mean electric savings was 924 kWh. Much of the variability in savings over time may have to do with the projection software, as Table II-20 showed less variability in measure installation after 2011.

Table II-22
SJG Home Performance with Energy Star Loan Program
Mean Annual Projected Savings

Mean Annual Savings by Project (kWh and Therms)							
Year	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Total**
Participants	585	321	390	267	640	1,168	3,371
Gas (Therms)	268	234	159	74	149	127	165
Electric (kWh)	317	1,159	1,480	1,224	1,013	859	924

Note: One customer in 2010 was missing savings data.

Table II-23 displays the mean lifetime projected gas and electric savings for the HPwES Program. The mean gas savings was 3,777 therms and the mean electric savings was 14,307 kWh.

Table II-23
SJG Home Performance with Energy Star Loan Program
Lifetime Energy Savings

Mean Lifetime Savings by Project (kWh and Therms)							
Year	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Total**
Participants	585	321	390	267	640	1,168	3,371
With Savings Data	584	321	390	267	640	1,168	3,370
Gas (Therms)	5,751	5,068	3,622	1,971	3,505	3,049	3,777
Electric (kWh)	5,366	18,742	22,305	18,198	15,498	13,345	14,307

M. C&I Programs

The NJ Clean Energy Program offers a Commercial and Industrial Direct Install Program for small to mid-sized commercial, industrial, and local government buildings with a peak electric demand that did not exceed 200 kW in any of the preceding 12 months. The turnkey program provides access to approved participating contractors who conduct an assessment and install measures including lighting, HVAC, and refrigeration. The NJCEP provides reimbursement for 70 percent of the participant's costs up to a maximum of $125,000.

The SJG Direct Install program has increased the benefits offered through this program by providing three-year, zero interest loans for up to the remaining 30 percent of the project cost or a maximum of $53,571.

Within SJG's service territory, there are two primary approved contractors, in addition to the statewide Direct Install refrigeration contractor.

There were 20 participants in the Direct Install Program in 2015. Of the 20 participants, 15 had installations done by South Jersey Energy Service Plus, four had installations done by Hutchinson, and one had installations done by National Resource Management.

Table II-24
SJG Direct Install Program Contractor

Contractor	Participants
South Jersey Energy Service Plus	15
Hutchinson Plumbing Heating and Cooling	4
National Resource Management	1
Total	**20**

Table II-25 displays the projected gas savings, electric savings, and electric demand savings from the Direct Install program. Mean gas savings per project were 1,844 therms and mean electric savings were 54,262 kWh.

Table II-25
SJG Direct Install Program Savings

Gas Savings (Therms)	Participants
0	2
< 1,000	5
1,000 – 1,999	5
2,000 – 2,999	3
3,000 +	3
Missing	2
Total	**20**
Mean Savings (Therms)	1,844

Electric Savings (kWh)	Participants
< 25,000	4
25,000 – 49,999	7
50,000 – 74,999	5
75,000 – 99,999	2
100,000 +	2
Total	**20**
Mean Savings (kWh)	54,262

Electric Demand Savings (kW)	Participants
<5.00	3
5.00-9.99	7
10.00-14.99	5
15.00–19.99	2
20.00–24.99	2
25.00+	1
Total	**20**
Mean Savings (kW)	13.62

The Commercial and Industrial Smart Start Loan Program provides zero interest loans of up to $100,000 for customers who participate in the NJCEP Smart Start Program. This is in addition to the rebate provided by the NJCEP. Smart Start projects can use any contractor.

Table II-26 shows that there were 70 Smart Start projects between 2010 and 2013. The mean project cost was approximately $321,000.

Table II-26
SJG Smart Start Commercial Rebate Program
Total Project Cost

Total Project Cost					
Year	**2010**	**2011**	**2012**	**2013**	**Total**
<$10,000	4	3	13	1	21
$10,000 - $49,999	2	5	6	0	13
$50,000 -$99,999	1	1	3	0	5
$100,000 - $199,999	0	0	7	0	7
$200,000 - $299,999	1	1	3	0	5
$300,000 - $399,999	0	0	1	0	1
$400,000+	0	1	3	1	5
Missing	1	2	5	5	13
Total	**9**	**13**	**41**	**7**	**70**
Mean	$45,072	$135,291	$437,494	$350,000	$321,027

Table II-27 displays the SJG Smart Start incentive amount. The mean incentive amount was almost $9,000. While more than half of the projects had an incentive under $2,500, six projects had an incentive of $20,000 or more.

Table II-27
SJG Smart Start Commercial Rebate Program
SJG Incentive Amount

SJG Incentive Amount					
Year	**2010**	**2011**	**2012**	**2013**	**Total**
≤$0	1	1	1	1	4
$1 -$2,499	7	9	22	1	39
$2,500 - $4,999	1	0	3	2	6
$5,000 - $9,999	0	0	7	1	8
$10,000 - $14,999	0	1	3	1	5
$15,000 - $19,999	0	1	1	0	2
$20,000+	0	1	4	1	6
Total	**9**	**13**	**41**	**7**	**70**
Mean	$785	$10,484	$9,616	$12,571	$8,937

Table II-28 displays the NJCEP Smart Start incentive amount. The mean incentive was over $15,000. Many projects had incentives of less than $1,000 and most had incentives under $5,000. However, two projects had incentives over $100,000.

Table II-28
SJG Smart Start Commercial Rebate Program
NJCEP Incentive Amount

NCEP Incentive Amount					
Mean	$1,913	$13,762	$19,327	$12,870	$15,409
<$1,000	7	6	20	1	34
$1,000 - $4,999	1	4	6	3	14
$5,000 - $9,999	0	0	7	1	8
$10,000 - $99,999	1	2	7	2	12
$100,000+	0	1	1	0	2
Total	**9**	**13**	**41**	**7**	**70**
Mean	$1,913	$13,762	$19,327	$12,870	$15,409

Table II-29 displays the Smart Start equipment installed. The table shows that 46 of the 70 projects had heating equipment installed and 15 had water heating equipment installed. Other measures were much less common.

Table II-29
SJG Smart Start Commercial Rebate Program
Type of Equipment

Equipment					
Year	**2010**	**2011**	**2012**	**2013**	**Total**
Heating Equipment	8	8	24	6	46
Water Heating Equipment	1	3	11	0	15
Gas Cooling	0	0	3	0	3
Custom Gas	0	2	0	0	2
HVAC Equipment	0	0	2	0	2
Custom Measure	0	0	1	0	1
Hot Oil Heater	0	0	0	1	1
Total	**9**	**13**	**41**	**7**	**70**

Table II-30 displays the projected annual gas savings. The mean annual gas savings were 28,061 therms.

Table II-30
SJG Smart Start Commercial Rebate Program
Annual Gas Savings (Therms)

Annual Gas Savings (Therms)					
Year	**2010**	**2011**	**2012**	**2013**	**Total**
<1,000	7	8	20	0	35
1,000 – 2,499	0	1	3	0	4
2,500 – 4,999	2	2	5	0	9
5,000 – 9,999	0	0	2	0	2
10,000 – 99,999	0	1	3	1	5
100,000+	0	1	3	0	4
Missing	0	0	5	6	11
Total	**9**	**13**	**41**	**7**	**70**
Mean	962	20,221	36,016	87,520	28,061

Table II-31 displays the projected lifetime gas savings. The mean lifetime gas savings were 538,396 therms.

Table II-31
SJG Smart Start Commercial Rebate Program
Lifetime Gas Savings (Therms)

Lifetime Gas Savings (Therms)					
Year	**2010**	**2011**	**2012**	**2013**	**Total**
<10,000	6	6	16	0	28
10,000 – 24,999	1	2	4	0	7
25,000 – 49,999	0	1	3	0	4
50,000 – 99,999	2	2	5	0	9
100,000 – 999,999	0	1	5	0	6
1,000,000+	0	1	3	1	5
Missing	0	0	5	6	11
Total	**9**	**13**	**41**	**7**	**70**
Mean	19,163	365,857	701,706	1,575,353	538,396

The Commercial and Industrial Pay for Performance Loan Program is similar to the Smart Start loan program, as it provides zero interest loans of up to $100,000 for customers who participate in the NJCEP Pay for Performance Program. This is in addition to the rebate provided by the NJCEP. However, the Pay for Performance Program aims to increase customer engagement in reducing usage by requiring a plan for usage reduction that is submitted to the state. The Pay for Performance contractors are referred to as "Partners", and can provide services anywhere in the state.

There are three milestones where incentives are provided in the Pay for Performance Program.

1. Energy reduction plan submission.
2. Project completion. SJG releases the loan after this second benchmark.
3. After one year, demonstration that the measures achieved claimed energy savings.

Table II-32 shows that there were 11 Pay for Performance projects between 2010 and 2013. The mean project cost was $824,000.

Table II-32
SJG Pay for Performance Commercial Rebate Program
Total Project Cost

Total Project Cost					
Year	**2010**	**2011**	**2012**	**2013**	**TOTAL**
$150,000-$499,999	1	-	2	1	4
$500,000-$999,999	0	-	1	1	2
$1,000,000+	0	-	0	2	2
Missing	0	-	0	3	3
Total	**1**	**0**	**3**	**7**	**11**
Mean Project Cost	$430,910	-	$484,497	$1,177,368	$824,234

Table II-33 displays the SJG incentive for the Pay for Performance projects. The table shows that the mean incentive amount was almost $75,000. Most projects had incentives over $50,000.

Table II-33
SJG Pay for Performance Commercial Rebate Program
SJG Incentive Amount

SJG Incentive Amount					
Year	**2010**	**2011**	**2012**	**2013**	**TOTAL**
<$10,000	0	-	0	0	0
$10,000-$49,999	0	-	1	1	2
$50,000-$100,000	0	-	1	4	5
$100,000	1	-	1	2	4
Total	1	0	3	7	11
Mean	$100,000	-	$74,664	$70,871	$74,554

Table II-34 displays the NJCEP incentive amount for the Pay for Performance Projects. The mean NJCEP incentive was $237,586.

Table II-34
SJG Pay for Performance Commercial Rebate Program
NJCEP Incentive Amount

NCEP Incentive Amount					
Year	**2010**	**2011**	**2012**	**2013**	**Total**
<$10,000	0	-	0	0	0
$10,000-$99,999	0	-	2	2	4
$100,000-$199,999	1	-	0	1	2
$200,000-$499,999	0	-	1	1	2
$500,000+	0	-	0	1	1
Missing	0	-	0	2	2
Total	1	0	3	7	11
Mean	$154,999	-	$111,583	$329,705	$237,586

Table II-35 displays the types of equipment installed in the Pay for Performance Program. The most common measure was heating equipment.

Table II-35
SJG Pay for Performance Commercial Rebate Program
Type of Equipment

Year	**2010**	**2011**	**2012**	**2013**	**Total**
Heating Equipment	1	-	0	3	4
Boiler, Chiller, Controls	0	-	0	2	2
Heating and Water Heating Equipment	0	-	2	0	2
Condensing Boiler	0	-	0	1	1
Custom Gas	0	-	1	0	1
Missing	0	-	0	1	1
Total	1	0	3	7	11

Table II-36 displays the projected annual gas savings. The mean annual projected gas savings was 50,000 therms.

Table II-36
SJG Pay for Performance Commercial Rebate Program
Annual Gas Savings (Therms)

Annual Gas Savings (Therms)					
Year	**2010**	**2011**	**2012**	**2013**	**Total**
<1,000	0	-	1	0	1
1,000 – 2,499	0	-	0	0	0
2,500 – 4,999	0	-	0	0	0
5,000 – 9,999	0	-	0	0	0
10,000 – 99,999	0	-	2	2	4
100,000+	0	-	0	2	2
Missing	1	-	0	3	4
Total	1	0	3	7	11
Mean	-	-	1,040	86,818	50,056

Table II-37 displays the projected lifetime gas savings. The mean lifetime projected gas savings was over one million therms.

Table II-37
SJG Pay for Performance Commercial Rebate Program
Lifetime Gas Savings (Therms)

Lifetime Gas Savings (Therms)					
Year	**2010**	**2011**	**2012**	**2013**	**TOTAL**
<10,000	0	-	1	0	1
10,000 – 24,999	0	-	0	0	0
25,000 – 49,999	0	-	0	0	0
50,000 – 99,999	0	-	0	0	0
100,000 – 999,999	0	-	2	2	4
1,000,000+	0	-	0	2	2
Missing	1	-	0	3	4
Participants	1	0	3	7	11
Mean	-	-	64,482	1,736,350	1,019,835

SJG will provide a loan even if there are only electric measures, as long as the customer has an active gas account. As long as it is approved by the NJCEP, SJG will supply the financing. This is provided because Atlantic City Electric does not have an energy efficiency program with financing.

N. OPower Reports Program

SJG contracted with OPower to provide reports to customers with information on their energy usage compared to their similar neighbors, and with energy reduction tips. The two-year program aims to influence customer behavior and leverage customer participation in other energy efficiency and conservation programs.

The OPower Program sent residential customers printed and emailed Home Energy Reports beginning in March 2016. Residential customers with an active SJG account were selected after removing usage outliers and undeliverable addresses. Of the 249,000 eligible customers, OPower selected the top 210,000 annual gas users for randomization and selected 178,500 as recipients and 31,500 as controls.

Home Energy Reports were sent on the following schedule.

- The initial Home Energy Reports and welcome inserts were mailed in March 2016.
- A second Home Energy Report was mailed in April 2016.
- A third Home Energy Report was emailed in April 2016.
- A fourth Home Energy Report was emailed in May 2016.

Table II-38 shows that 174,358 customers received the information. While 173,887 customers received at least one letter, 76,692 customers received at least one email.

Table II-38
Number of OPower Recipients

	March 2016	April 2016	May 2016	Total
Received Letter	141,583	171,234	0	173,887
Received Email	0	76,441	54,277	76,692
Received Either	141,583	172,074	54,277	174,358

Table II-39 displays the total number of mailings, number of print letters, and number of emailed letters sent to each customer. The table shows that 52 percent received two letters and no emails, 39 percent received two letters and two emails, and a small percentage received other combinations of contacts.

Table II-39
2016 OPower Mailings

Total Mailings	Number of Print Letters	Number of Emails	Customers	
			#	%
1	1	0	7,180	4%
	0	1	147	<1%
2	2	0	90,486	52%
	1	1	761	<1%
	0	2	324	<1%
3	2	1	4,147	2%
	1	2	4,049	2%
4	2	2	67,180	39%
5	2	3	84	<1%
Total			**174,358**	**100%**

The second year of mailed and emailed OPower reports is planned to begin in October 2016 with five monthly mailed letters and six monthly emailed reports through March 2017.

The Home Energy Reports included the following information.

- Comparison to average and efficient neighbors' usage over the past month.
  - Bar chart showing therms consumed compared to average and efficient neighbors.
  - Explanation that the chart is based on 100 similar homes within approximately one or two miles of the customer.
  - Rating of "Great", "Good", or "Using More than Average Neighbors".
  - Percent less or more used than neighbors.
  - Note that the efficient neighbors are the 20 percent with the least gas usage.

- The last report of the year noted that the customer should look for more reports beginning in fall 2016.

- Comparison to average and efficient neighbors' usage over the past six-month period.
  - Cost compared to efficient neighbors.

- "Tips from efficient neighbors"
  - Wash clothes with cold water (Save up to $15 per year).
  - Seal air leaks (Save up to $150 per year).
  - Install efficient showerheads (Save up to $65 per year).
  - Improve insulation (Save up to $150 per year).
  - Reduce water heater temperature (Save up to $30 per year).
  - Check your air filters every month (Save up to $75 per year).
  - Raise your thermostat a few degrees in the summer.

  - Replace your old refrigerator (save up to 40% by replacing a model manufactured before 2001 with an efficient ENERGY STAR unit).
  - Clean air around vents (save up to $115 per year).

- Comparison to last year's usage.
  - Bar chart by month (no note about whether it is weather-normalized).

- Explanation of various terms and information
  - Definition of a therm (nontechnical).
  - Note that usage is compared to neighbors with similar size homes, building types, and heating systems.
  - Link to https://sjg.opower.com which provides more tips and information on neighbor comparison.
  - Explanation that saving energy helps SJG get closer to state energy efficiency goals.
  - Phone number to opt out from receiving OPower reports.
  - Email and phone number for more information.
  - Link to SJGsimple.com which provides information on SJG energy efficiency programs.

The first report was mailed with a welcome letter with the following information.

- Note on personal information states that the information is compiled anonymously and not shared with neighbors.
- Neighbor comparison explanation states that the customer's usage is compared to approximately 100 nearby occupied homes with similar characteristics such as square footage and fuel types.
- Home information explanation that states that the comparisons and tips in the report are based on publicly available information about home size, type, and other characteristics.
- Note that the customer can go online and update information about their home to make it more accurate.
- Information that the customer can go on-line, find out what their neighbors are doing to save, create a personal savings plan, and sign up to receive email reports.

While the linked websites contain information about SJG energy efficiency program offerings, the mailings themselves do not include any information about the available rebates and loans, even when air sealing or insulation work is recommended.

O. Program Challenges and Successes

SJG has faced the following challenges in implementing the energy efficiency programs.

- Data and Reporting
  - Data and reporting has been a challenge because SJG does not have a large staff to handle the requirements. However, SJG has satisfied all reporting requirements and data requests.

- Contractor Payment
  - Contractors do not get paid in a timely manner from the NJCEP and this has caused some contractors to cease participation in the programs.

- Regulatory Uncertainty
  - Regulatory uncertainty creates financial risk for SJG, and for their trade allies. For example, several contractors were negatively impacted when the renewable rebates were eliminated, and programs such as the Home Performance Program and the Direct Install Program were curtailed. The HPwES program has been significantly modified several times.
  - The NJCEP have been unstable. They have been paused and re-started several times. This makes communication with customers difficult because SJG can't tell them how long the programs will continue.
  - A two-year program is not sufficient to achieve momentum in the programs. Customers who make decisions at the end of the program cycle do so in a hurry and may not be making the best decision.
  - Because SJG programs are tied to the NJ Clean Energy programs, SJG programs are greatly impacted by changes made by the BPU. With the reduced HPwES incentives, increased interest rates, and reduced loan terms, participation has declined.

SJG reported the following accomplishments of the energy efficiency programs.

- Contractor Development: SJG has worked with contractors to help them develop the expertise needed to implement home performance. When SJG first implemented the HPwES program, there were two or three Building Performance Institute (BPI) certified contractors. SJG now estimates that there are more than 30 home performance contractors in Southern New Jersey who understand building science. They believe that this is how to create a green economy.

- Data and Reporting: SJG executed a contract with AEG to improve reporting into the IMS system.

- Energy Saving: There are many businesses and homes that took advantage of the energy efficiency programs and have achieved energy savings that otherwise would not have been realized.

- Comfort Improvements: The homes have been sealed and are more comfortable for the customers.

- Economic Development: Businesses can install equipment, improve their cash flow, and invest the money back into their businesses.

- Building Science: SJG programs brought attention to the importance of building science. The public is recognizing the value of energy efficiency with good building science.

- Health and Safety: SJG took a strong stand on the heating equipment rebates and insisted that customers install a hot water heater at the time that they install a high-efficiency furnace to prevent the problem of orphaned hot water heaters. This has increased the health and safety of participants.

P. Program Modifications

The following modifications have or will be made to the program.

- Energy Finance Solutions: EFS has revamped their website to improve customer services and satisfaction.

- OPower Reports: OPower will revise the Home Energy Reports to include information on the SJG programs in the next mailing.

SJG has recommended the following additional modifications.

- Marketing: SJG could work in partnership with the NJCEP to provide more program marketing.

- Utility Management: The utilities could manage the energy efficiency programs under the guidance and Board Orders set forth by BPU. Utilities can produce and implement energy efficiency and renewable programs, as they have with the NJ Comfort Partners low-income energy efficiency program. This could provide a more stable program environment.

III. Participant Feedback

APPRISE conducted research with participants in SJG's residential and C&I energy efficiency programs. This section describes the research conducted and the findings from this research.

The research conducted was as follows.

- In-depth telephone interviews with participants in the following SJG energy efficiency programs.
  - HVAC Rebate
  - HVAC Loan
  - HPwES Loan
  - OPower Reports
  - C&I Direct Install
  - C&I Smart Start

- Quantitative surveys with participants in the following programs.
  - HVAC Rebate
  - HVAC Loan
  - HPwES Loan
  - OPower Reports

The goal of the participant interviews and surveys was to develop information on the following topics.

- How the customer learned about the program.
- Why the customer decided to participate.
- Importance of the program in high-efficiency equipment installation and implementation of other home-efficiency improvements.
- Other factors that influenced the decision to upgrade.
- Impact of the improvements on bills, comfort, and other factors.
- Rebate and financing process satisfaction and challenges.
- Whether the customer has plans for additional efficiency work.
- Satisfaction with the contractor, the equipment/improvements, and the programs.
- Recommendations for the programs.

A. Methodology

This section provides information on the methodology and response rates for the in-depth interviews and quantitative surveys. Advance letters were sent by mail to all participants and a toll-free number was provided for respondents to call in to complete the interview. Outbound calls were made during the day, evening, and weekends, to provide all members of the selected sample with an opportunity to respond to the interview or survey. Additionally, a phone number was provided for customers to call in and respond or schedule a call at their convenience.

Table III-1 summarizes information on the sample frame, call attempts, field periods, and completed interviews. Except for OPower, all in-depth interviews achieved a response rate of at least 50 percent and a cooperation rate of at least 75 percent.

Table III-1
In-Depth Interview Methodology

	HVAC	HPwES	OPower	Direct Install	Smart Start
Program Participation	4/15 – 12/15	9/15-12/15	3/16-5/16	2015	2015 & 2016
Selected Sample	100	50	100	20	14
Sample Stratification	50 rebate 50 loan	None	50: 2 contacts 50: 4 contacts	None	None
Call Attempts	1-12	1-8	1-12	1-6	1-5
Field Period	4/27/16-6/1/16	5/17/16 – 6/16/16	5/27/16 – 6/27/16	7/29/16-8/10/16	
Completed Interviews	51	24	21	10	6
Interview Length	9-35 Minutes	10-25 Minutes	4-8 Minutes	8-17 minutes	
Response Rate	54%	52%	30%	58%	52%
Cooperation Rate	77%	83%	48%	91%	100%

Table III-2 displays the methodology for the quantitative surveys. All surveys were fielded in June and July 2016. Customers were selected based on HVAC and HPwES participation dates in the second half of 2015 to maximize the probability that customers would remember program and service delivery details, but still allow enough time for the impacts to be felt over the winter months.

Table III-2
SJG Quantitative Participant Surveys
Survey Methodology

	HVAC	HPwES	OPower
Program Participation	4/15-12/15	9/15-12/15	3/16-5/16
Selected Sample	300	300	800
Field Period	6/9/15-6/26/15	6/16/16-7/6/16	6/20/16-7/25/16
Completed Interviews	160	156	126
Response Rate	62%	57%	28%
Cooperation Rate	89%	91%	44%

Table III-3 displays the sample disposition and response rates for the quantitative surveys. While the HVAC survey achieved a response rate of 62 percent, the HPwES survey achieved a response rate of 57 percent. The OPower survey achieved a much lower response rate of 28 percent, as the customers were not invested in this program. Many of the OPower Report recipients received up to 12 phone calls, but did not respond to the survey.

Table III-3
SJG Quantitative Participant Surveys
Final Sample Disposition

	HVAC						HPwES		OPower	
	Rebate		Loan		Total					
Sample	150		150		300		300		800	
Final Disposition	#	%	#	%	#	%	#	%	#	%
Complete	**83**	**55%**	**77**	**51%**	**160**	**53%**	**156**	**52%**	**126**	**16%**
Maximum Attempts Reached	--	--	--	--	--	--	--	--	184	23%
No Answer	34	23%	44	29%	78	26%	95	32%	84	11%
Non-Working /Other Phone Problem	11	7%	18	12%	29	10%	15	5%	156	20%
Refusal / Incomplete Callback	17	11%	8	5%	25	8%	30	10%	163	20%
Ineligible or Unable to Participate	5	3%	3	2%	8	3%	4	1%	87	11%
Total	**150**	**100%**	**150**	**100%**	**300**	**100%**	**300**	**100%**	**800**	**100%**
Cooperation Rate	**87%**		**93%**		**89%**		**91%**		**44%**	
Response Rate	**64%**		**61%**		**62%**		**57%**		**28%**	

B. HVAC Findings

This section summarizes findings from quantitative surveys with HVAC participants.

- Program Knowledge: Most respondents reported that they first heard about the program through their contractor. Other common sources of information were friends or relatives, and other program advertising.

  Overall, 63 percent reported that they learned about the SJG program before they decided to install the high-efficiency heating system and hot water heating system. The loan customers were more likely than the rebate customers to say that they learned about the program before they decided to install the high-efficiency water heating system.

- High-Efficiency Systems: While 56 percent of the respondents said that they were offered the option of a standard heating system, 52 percent said they were offered the option of a standard water heating system. About 36 percent said that the contractor provided an estimate of the savings from the high-efficiency systems.

  While 83 percent said that the loan was very important in the decision to install the high-efficiency heating system and the high-efficiency water heating system, 59 percent said the rebate was very important in the decision to install the high-efficiency heating system and water heating system. While only three percent said that the loan was not at all important in the decision to install the high-efficiency equipment, 16 to 17 percent said the rebate was not at all important in the decision.

When asked whether they would have chosen the high-efficiency equipment if the SJG rebate or loan was not available, 69 percent said they would have chosen the high-efficiency heating system if the rebate was not available and 43 percent said they would have installed the high-efficiency heating system if the loan was not available. Percentages were similar for the water heating system.

Customers also stated that the HVAC incentives encouraged them to implement the switch to natural gas heating.

Those who were using natural gas for both heating and water heating prior to participating were asked whether they had noticed a decrease in the gas bills after installing the new equipment. While 22 percent said their bills were much lower, 45 percent said their bills were somewhat lower.

When asked whether they noticed other changes in their home after participating in the program, 15 percent said their home was warmer or more comfortable, 15 percent said their home was more efficient, and 12 percent said their hot water was hotter. Other benefits that were mentioned were more even heating, reduced noise, and that the hot water gets hot faster.

- Rebate and Financing Process: Rebate participants were most likely to state that they chose the rebate because they did not need the loan. While 59 percent said they did not need the loan, five to seven percent stated that they did not want more debt, that they also received a loan, that they preferred the rebate, or that they were not aware of the loan option. However, 14 percent stated that they did not know why they chose the rebate, suggesting that they also had not been aware of a loan option.

  Most participants reported that the rebate and loan processes were easy. Only six percent of the rebate participants reported that the rebate process was somewhat difficult and 22 percent of the loan participants reported that the loan process was somewhat or very difficult. The in-depth interview respondents described difficulties with the loan process and dissatisfaction with the amount of paperwork that was required.

- Assessment and Additional Work: While 44 percent said that Shore Green Energy made recommendations for additional work to further improve the energy efficiency of the home, 16 percent said that they made additional improvements. The in-depth interview respondents reported that the recommendations received included adding more insulation, sealing the attic hatch, replacing windows or doors, and performing air sealing or caulking.

- Satisfaction and Recommendations: Respondents were very satisfied with the equipment. Eighty-eight percent reported that they were very satisfied with the heating equipment and 11 percent reported that they were somewhat satisfied with the heating equipment. Additionally, 82 percent reported that they were very satisfied with the water heating equipment and 16 percent said that they were somewhat satisfied.

While 86 percent reported that they were very satisfied with the contractor and 12 percent reported that they were somewhat satisfied, 89 percent reported that they were very satisfied with the program and seven percent reported that they were somewhat satisfied with the program. Over three quarters of the participants reported that they had recommended the SJG HVAC program to others.

The most common participant recommendations (note that these recommendations were from participants and are not necessarily recommendations made by the evaluation) were to increase advertising for the program, simplify or streamline the process, increase the rebate or loan amount, and provide better customer service or program communication.

C. HPwES Findings

This section summarizes findings from quantitative surveys with HPwES participants.

- Program Knowledge: Customers were most likely to have first heard about the HPwES Loan program through their contractor, followed by other program advertising, and a friend or relative.

  Respondents were most likely to report that they decided to install the energy efficiency improvements because they had old equipment that needed replacement or to reduce their energy bills.

- Energy Efficiency Improvements: 81 percent of the respondents stated that the contractor provided an estimate of their potential savings on their natural gas bill from the energy efficiency improvements.

  While 83 percent said they installed all measures recommended on the audit report, nine percent said they installed most measures, and two percent said they installed some measures.

  Only 13 percent said that they would have installed all of the improvements they did if the SJG loan was not available. While 36 percent said they would not have installed insulation without the SJG loan, 16 percent said they would not have installed the water heating system, 15 percent said they would not have had the air sealing work done, eight percent said they would not have installed the new heating system, and six percent said they would not have installed the air conditioning system.

  When asked how important the SJG loan was in their decision to install the energy efficiency improvements, 85 percent said it was very important and 13 percent said it was somewhat important.

  Respondents who used natural gas for both heating and water heating were asked if they noticed that their natural gas bills were lower after undertaking the energy efficiency work. While 22 percent said the bills were much lower, 47 percent said they were somewhat lower, and no respondents said they were somewhat or much higher.

When asked about other changes they noticed in their home after the energy efficiency work, 40 percent said their home was warmer or more comfortable.

- Financing Process: When asked about the ease or difficulty of the EFS loan process, 62 percent said it was very easy, 29 percent said it was somewhat easy, nine percent said it was somewhat difficult, and one percent said it was very difficult.

- Satisfaction and Recommendations: Most respondents were very or somewhat satisfied with all aspects of the program. While 81 percent were very satisfied with Energy Finance Solutions, 78 percent were very satisfied with the energy efficiency improvements, 75 percent were very satisfied with the contractor and 88 percent were very satisfied with the SJG HPwES program. Additionally, 81 percent of the respondents reported that they had recommended the program to others.

  When asked what recommendations they had for the program, 44 percent did not have any recommendations. While ten percent recommended increased program advertising, ten percent recommended an improved loan application process, nine percent recommended an improved loan payment process, and nine percent recommended improved customer service or communication (note that these recommendations were from participants and are not necessarily recommendations made by the evaluation).

D. OPower Findings

This section summarizes findings from in-depth interviews and quantitative surveys with OPower participants.

- Program Knowledge: Customers received two print letters or two print letters and two emailed letters. Of those who were sent two print letters, 44 percent were aware that they received that number of contacts. Of those who were sent two letters and two emails, only seven percent were aware that they received four contacts in total.

  While 12 percent said the comparison to their neighbors' usage was very helpful, 38 percent said it was somewhat helpful, and 41 percent said it was not at all helpful. Those who did not feel the comparison was "Very Helpful" were most likely to state that this was because their neighbors are different, their neighbors' homes are different sizes, or their neighbors are not home year-round. Skepticism about the validity of the comparison was a source of dissatisfaction with the reports.

  While 35 percent reported at least one tip to reduce energy usage that was provided in the report, 16 percent said they took at least one of these actions. The in-depth respondents were likely to say that they did not read the part of the report with the tips, did not remember the tips, or that no tips were provided.

  The most common tips that customers reported were improving insulation, sealing air leaks, and raising the thermostat in the summer. Two percent said they improved their

insulation, two percent said they sealed air leaks, and six percent said they raised the thermostat in the summer.

- Other Information Sources: The OPower mailings directed customers to a SJG website with a form to sign up for program information and to another website with energy-saving tips and information on the neighbor comparison. Two percent of the respondents said they visited the website about the OPower report and ten percent said they visited the SJG website.

  The OPower letter did not provide information on the SJG programs directly, but respondents were provided with links to a website that provided such information. Seven percent of the respondents said that they learned about the SJG HVAC program through the OPower letter and five percent said they learned about the SJG HPwES program from the OPower letter.

- Satisfaction: Fourteen percent said the reports were very helpful in thinking about ways to reduce their usage and 58 percent said they were somewhat helpful. While 16 percent said they were very satisfied with the information received, 62 percent said they were somewhat satisfied, 11 percent said they were somewhat dissatisfied, and three percent said they were very dissatisfied.

  Most participants reported that the OPower mailings did not have a large influence on their likelihood of undertaking energy efficiency improvements. However, 55 percent did say that they had a small influence.

E. C&I Program Findings

This section summarizes the findings from in-depth telephone interviews conducted with participants in South Jersey Gas's Direct Install Loan Program and the Smart Start Loan Program.

- Program Information and Motivation: The most common source of information about the programs was the contractor or South Jersey Gas. Five of the 16 participants were not planning on making efficiency improvements before hearing about the program. Others had been considering improvements from three months to ten years.

  Direct Install participants were most likely to state that their main reason for participating was energy savings or the need for new equipment. Smart Start participants were most likely to state that their main reason for participating was the availability of the rebates and zero percent interest financing or an interest in converting to natural gas.

- Assessment: Direct Install participants reported that the assessment provided a list of suggested measures, information on proposed energy savings, and an outline of project costs. Nine out of ten Direct Install participants reported that the contractor reviewed the assessment results and explained the South Jersey Gas Loan program and its requirements.

All ten Direct Install participants reported that the contractor explained the measures and project costs and did a good job of explaining the assessment. All found the assessment very helpful and were very satisfied with it.

- Measure Selection and Installation: Nine Direct Install participants installed all of the recommended measures and one participant installed most of the measures. Direct Install participants were most likely to install HVAC equipment, LED lighting, hot water heaters and faucet aerators. Direct Install participants chose these measures based on their expected energy savings.

  All six of the Smart Start participants installed heating equipment, one also installed air conditioners, and two installed hot water heaters. Three Smart Start participants chose to replace their equipment because it was old and needed to be replaced, while the other three participants were interested in converting from oil to gas heating.

  Most participants would consider additional measures in the future and were most likely to consider additional LED lighting, solar panels and HVAC equipment.

  All participants were very or somewhat satisfied with the installation.

- Program Impact: All participants felt the South Jersey Gas loan was very or somewhat important in their decision to make the improvements. Seven of the ten Direct Install participants and four of the six Smart Start participants would not have moved forward with the project without the SJG loan.

  All ten Direct Install participants felt the NJ Clean Energy rebate was very or somewhat important. While five Smart Start participants felt the rebate was very or somewhat important, one participant felt it was not at all important in deciding to move forward with the project. Nine of the ten Direct Install participants would not have moved forward without the rebate, while only one Smart Start participant would not have moved forward.

  Most participants did not face any barriers in installing the upgrades or participating in the South Jersey Gas Loan Program and the NJCEP. Three of the 16 participants faced barriers in moving forward with the upgrades, which included monetary barriers, finding a pre-approved contractor, and the time it took to process the paperwork. Four of the 16 participants faced barriers participating in the South Jersey Gas Loan program, which included a delay in being billed for the loan, a delay in loan approval, receiving the wrong loan amount, and not receiving all the necessary paperwork at the beginning of the project.

  The most common changes participants noticed following the installation were lower energy bills, more efficient HVAC equipment, and reduced need for repairs and maintenance. Ten of the sixteen participants noted comfort improvements and one Direct

Install participant noted that his business had become less comfortable. Thirteen of the sixteen participants said their energy bills were lower and one said they were higher.

- Application and Payment Process: While 14 participants found the application process very or somewhat easy, two Smart Start participants found it somewhat or very difficult. These participants found it time-consuming and had a difficult time communicating with the loan processing company and determining the paperwork that was needed. Seven of the 16 participants had to send in additional information.

  Participants suggested improving the program process by advertising the program, eliminating the need to communicate between South Jersey Gas and the loan company, expediting loan processing, and providing more information on requirements. All participants were very or somewhat satisfied with the program process.

- Summary and Recommendations: All participants were very or somewhat satisfied with the South Jersey Gas Loan program. Recommendations to improve the program (note that these recommendations were from participants and are not necessarily recommendations made by the evaluation) included simplifying program and savings information, including incentives for gas equipment, continuing the program, and increasing advertising. (Note that SJG has increased advertising to the non-residential customers and has assigned a staff member to personally work with C&I customers to overcome some of the challenges of obtaining credit and gaining approvals from EFS or NJCEP.)

IV. Contractor Feedback

APPRISE conducted interviews with 25 contractors who provide services under South Jersey Gas' energy efficiency programs. The following types and numbers of contractors were interviewed.

- HVAC Contractors – 11 contractors
- HPwES Contractors – 12 contractors
- Shore Green Energy
- Direct Install Contractor

The goal of the contractor interviews was to develop information on the following research issues.

- Source of program information
- Adoption of efficiency measures
- Adequacy and impact of program incentives
- Other factors that influence installations
- Program impact on whole house upgrades
- Barriers to program participation
- Program satisfaction

A. Residential HVAC and Home Performance Contractors

Residential contractors provided important information about the HVAC and HPwES programs.

- Contractor Information: The most common source of contractor information about the HVAC and HPwES programs was South Jersey Gas. Contractors noted that they received an email, a mailing, a call, or met with a company representative. Others learned about the SJG programs from the NJ Clean Energy Program, another contractor, or a contractor association.

- Customer Awareness: About half of the HVAC contractors reported that their customers were frequently aware of the SJG loan program and half said they were not. While three HVAC contractors said customers were frequently aware of the HVAC SJG rebate, three said they are infrequently aware, and five said that they are never aware of the SJG rebate. While six HPwES contractors said that their customers were frequently aware of the SJG loan program, five said they were infrequently aware and one said they were never aware.

- Customer Information: When asked how customers learned about the SJG loan and rebate program, HVAC contractors were most likely to say that customers learned about the program from the contractor, followed by various forms of South Jersey Gas marketing. HPwES contractors reported that customers usually learned about the SJG HPwES loan program from the contractor. Some customers called the contractor about replacing equipment and some contractors reached out to customers to market the

program. Other HPwES customers contacted SJG and learned about the program or received SJG marketing information.

- NJCEP HVAC Requirements: While five contractors said the NJCEP program requirements were fine or reasonable, the other six contractors felt that at least some of the requirements were too stringent or required equipment that was too expensive. All of the HVAC contractors reported that the requirements for the water heating equipment were fine.

- Equipment Availability: All of the HVAC and HPwES contractors reported that qualifying equipment was readily available from their usual suppliers.

- Barriers to Participation: When asked whether any requirements were barriers to participation, seven HVAC contractors noted that there were no barriers, and the others mentioned the paperwork, the NJCEP portal, financial approval for the loans, and the venting requirements for the 95 percent efficiency units. The HPwES contractors noted that credit requirements and loan denials, the required energy reduction, program software, loan paperwork, contractor cash flow and payment risk, and insulation requirements were barriers to participation.

- Barriers to High-Efficiency Equipment: Six HVAC contractors stated that there were barriers to the equipment and five stated that there were none. The barriers that were noted were cost of the system, permit costs, credit limitations, and venting.

  Five of the HPwES contractors said that there were barriers in implementing HPwES upgrades and seven said there were not. Two contractors mentioned health and safety issues, two mentioned loan denials, one said that some customers did not want to replace the hot water heater, and one stated there was sometimes not enough space to add insulation.

- HVAC Equipment Comparison: Ten of the eleven HVAC contractors affirmed that they provide comparisons between the high-efficiency and standard equipment. They stated that they explained the pros and cons of the high-efficiency equipment, the projected energy savings, the payback, the differences in efficiency and rebates, and provided information including manufacturers' literature and websites.

  When asked specifically whether they provided information to customers about the gas usage and annual cost of the high-efficiency equipment compared to the other options, nine HVAC contractors said that they did and two said they did not.

- Measures Selected: While six HPwES contractors reported that customers installed all recommended measures, five reported that customers installed most measures, and one reported that customers installed some measures. They reported that customers were least likely to install complete insulation in all areas of the home, particularly crawl space insulation, attic insulation, wall insulation, and rim joist insulation. They also

stated that customers were less likely to install duct sealing and insulation; the highest rated furnaces, upgraded filters, air conditioning, mechanical ventilation, and smart thermostats; water heating measures; and dehumidifiers and electronic air filters. Contractors were most likely to state that customers did not install these measures because of cost, payback, and that they were not what the customer initially intended to do.

- SJG HVAC Loan Importance: When asked how much of an impact they felt the SJG loan had on customers' decision to install the high-efficiency option, ten HVAC contractors stated that the loan was very important and one said that it was somewhat important.

  When asked whether customers would install the high-efficiency option without the loan, eight HVAC contractors said they would not, two contractors said they would not install high-efficiency as frequently, and one said that customers still would still choose the high-efficiency option without the SJG loan.

- SJG HVAC Rebate Importance: HVAC contractors were less likely to state that the SJG rebate was important. While four contractors said it was very important, five said it was somewhat important, and two said it was not at all important.

  When asked whether customers would install the high-efficiency option without the SJG additional rebate, five said they would not, three said they would choose high-efficiency less frequently, and two HVAC contractors said customers would still install high-efficiency equipment without the SJG rebate.

- SJG HPwES Loan Importance: All 12 of the HPwES contractors interviewed reported that the SJG loan was very important in the customers' decisions to pursue the HPwES whole-house energy efficiency upgrades.

  Five HPwES contractors said that customers would not move forward with the HPwES project if the SJG loan had not been available, six said they may, and one said they would move forward without the loan.

- Other Factors Influencing Equipment Choice: HVAC contractors reported that pricing, energy savings, and old equipment that needed to be replaced were other factors that influenced customers to purchase the high-efficiency equipment.

  HPwES contractors were most likely to state that home comfort, reduced energy bills, and old or failed equipment were the other factors that influenced customers to make upgrades.

- Whole House Upgrades: When asked whether customers inquired about additional work on their home to conserve energy, such as insulation and air sealing, two HVAC

contractors said customers do somewhat often, five said they do not often ask, and four said that they never ask.

When asked whether they thought the program influences customers to perform whole house improvements, four HVAC contractors said they thought it did and seven said they did not. All 12 HPwES contractors interviewed said that they did feel the program influenced customers to perform whole house improvements.

HVAC contractors suggested that SJG could further encourage whole house improvements by removing the BPI requirement for home performance work, making it easier for the customer to finance additional work, providing more incentives and rebates, keeping the rebates at a set level for a longer period of time, and reducing contracting time.

Four HPwES contractors said that SJG should increase the rebate amount or the loan amount or improve the loan term to encourage whole house work, and three contractors said that SJG should build customer awareness and educate customers about home performance. Other recommendations included reducing the loan paperwork, lowering efficiency requirements, and increasing the number of contractors in the program.

Note that these recommendations were from contractors and are not necessarily recommendations made by the evaluation.

- Business Impact: HVAC contractors were very positive when asked about the impact that the program has had on their business. They stated that it offered an additional avenue to generate revenue, increased the number of customers, increased their revenue, and encouraged conversions to natural gas.

  HPwES contractors also reported that the SJG HPwES Loan Program had a positive impact on their business. They said it enabled them to increase revenue, increase staffing, helped them to close deals, convinced them to enter the home performance field, and helped with educating customers about the program. Only one HPwES contractor said it had no impact on his business.

- Contractor Satisfaction: Most HVAC and HPwES contractors reported that they were very satisfied with the SJG programs. HVAC contractor complaints related to Energy Financing Solutions and the reliance on SJG to install gas lines. Two HPwES contractors also stated that the loan paperwork prevented them from being completely satisfied with the program.

- Contractor Contact: When asked about the best way for SJG to contact contractors, most stated that email was the best method or one of the best methods, four said that meetings were best, three said mail was best, and two said they liked webinars.

B. Shore Green Energy

Shore Green Energy provided information about their role in conducting inspections and assessments following installation of high-efficiency heating and water heating systems.

Shore Green Energy reported that they rarely find problems with the installations. The most common installation problems are that customers who don't have CO detectors in the home or do not have them on every floor of their home.

Shore Green Energy reported that customers were very satisfied with the HVAC installations. Shore recommended additional work to almost every customer unless they already had a sealed attic. He usually recommended insulation and air sealing.

When asked about recommendations for the SJG program, Shore recommended that SJG increase advertising for the program and make more contractors aware of the program.

C. Direct Install Contractor

Two contractors provide direct install services in SJG's service territory and one was interviewed as part of this evaluation. The Direct Install program involves an initial assessment and discussion with the customer of the program, the energy savings, the financing available, and the equipment covered under the program. The contractor reported that participants usually install all measures listed on the work scope. The most common measures are heating equipment, air conditioning, water heating equipment, and lighting.

The contractor reported that the SJG loan is very important to most businesses and most would not move forward with the project if the loan and the NJCEP rebate were not available. She stated that the program has impacted the number of projects they do and has increased awareness of the program.

V. Energy Usage Impacts

The evaluation included an analysis of the impacts of the SJG HVAC and HPwES programs on participants' natural gas usage. This section provides a summary of the methodology and findings from the Usage Impact Analysis.

A. Methodology

The analysis group for the evaluation was comprised of customers who received a SJG HVAC rebate or loan or an HPwES loan in 2014 or early enough in 2015 to have enough post-usage data for the analysis.

The first step in the analysis was to identify and remove customers who performed a fuel switch to natural gas as part of their heating system replacement or home performance work. Program data that included information on fuel switching did not include account numbers to merge with other customer participation and usage data. Therefore we identified customers as fuel switchers if they had fewer than six months of data or fewer than 300 ccf of usage in the pre-treatment period. Based on these characteristics, these customers would not have been included in the analysis. However, we remove the fuel switch customers from the group considered to be eligible for inclusion in the analysis, to correctly compute the attrition rate.

Customers were also removed from the analysis group if they did not have close to a full year of usage data in the year before and the year after treatment. Table V-1 displays the data attrition for the analysis. Approximately 39 percent of the eligible 2014 HVAC participants and 44 percent of eligible 2015 HVAC participants were included in the analysis. While 68 of eligible 2014 HPwES participants were included, 53 percent of eligible 2015 HPwES participants were included. A slightly lower percentage of participants were included in the PRISM analysis because this model did not run for a small percentage of the participants.

Table V-1
Natural Gas Usage Data
Participant and Later Comparison Group Attrition

	HVAC Analysis						HPwES Analysis					
	2014 Treatment		2015 Treatment		2015 Comparison		2014 Treatment		2015 Treatment		2015 Comparison	
	#	%	#	%	#	%	#	%	#	%	#	%
Participant	542	-	846	-	846	-	635	-	1,167	-	1,167	-
Early enough in 2015	-	-	657	-	-	-	-	-	780	-	-	-
Remove <5 months Pre	338	-	368	-	509	-	570	-	672	-	997	-
Remove <300 ccf Pre	289	-	306	-	419	-	498	-	583	-	856	-
Eligible Population	**289**	**100%**	**306**	**100%**	**419**	**100%**	**498**	**100%**	**583**	**100%**	**856**	**100%**

	HVAC Analysis						HPwES Analysis					
	2014 Treatment		2015 Treatment		2015 Comparison		2014 Treatment		2015 Treatment		2015 Comparison	
	#	%	#	%	#	%	#	%	#	%	#	%
Received usage data	166	57%	207	68%	291	69%	408	82%	474	81%	703	82%
Sufficient usage data	150	52%	177	58%	264	63%	401	81%	412	71%	659	77%
Pre & Post > 300 ccf	146	51%	167	55%	202	48%	354	71%	350	60%	552	64%
Usage change <65%	128	44%	156	51%	198	47%	352	71%	332	57%	544	64%
Remove Usage Outliers	128	44%	156	51%	197	47%	352	71%	332	57%	544	64%
Matched Non-Participants	114	39%	135	44%	-	-	337	68%	309	53%	-	-
Degree Day Group	**114**	**39%**	**135**	**44%**	**197**	**47%**	**337**	**68%**	**309**	**53%**	**544**	**64%**
PRISM Group	**111**	**38%**	**130**	**42%**	**189**	**45%**	**328**	**66%**	**300**	**51%**	**528**	**62%**

We used two different comparison groups for the natural gas usage impact analysis to control for other exogenous factors that could impact gas usage between the year prior to and following the treatments. The two comparison groups were as follows.

1. Later Program Participants – These are customers who participated in the HVAC or HPwES program in 2015. These customers are a good comparison group because they also self-selected into the program. However, they may be different than the treatment group in some unobservable ways because they participated one year later. We examine their usage in the two years prior to participating to control for changes in usage that are not related to program participation.

2. Matched Comparison Group – We requested a sample of 100,000 SJG residential customer accounts and conducted analysis to select customers whose 12-month usage patterns were most similar to those in the treatment group prior to services. This is a good comparison group because the usage patterns are very similar to those who participated in the year before installation, and are likely to be a good representation of what the participants' usage would have been the following year if they had not participated in the program. However, these customers may be different than the participants in unobservable ways because they did not choose to participate.

The usage match was conducted in the following steps.

- Average daily gas usage was calculated for each billing month, where average daily gas usage is equal to the total gas usage in the billing cycle divided by the number of days in the billing cycle.
- The Sum of Squared Differences (SSD) in average daily gas usage between the participants and the nonparticipants for the 12-month period prior to participation was calculated.

- We selected nonparticipants for the comparison group with the minimum SSD for the 12-month period. One nonparticipant match was selected to serve as a comparison for each participant.

B. HVAC Impacts

This section examines the impact for customers who participated in SJG's HVAC program in 2014 or 2015. Table V-2 displays savings using the matched comparison group. The table shows that the HVAC participants saved an average of 87 ccf or 10.3 percent of pre-treatment usage. The estimate from the PRSIM model was very similar to the degree-day analysis.

Table V-2
HVAC Natural Gas Savings Estimates
2014 and 2015 Participants
Matched Comparison Group

	Treatment					Matched Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
				ccf	%				ccf	%	ccf	%
All Survived Attrition												
Raw	249	935	749	187***	20.0%	249	951	826	125***	13.1%	62***	6.6%
Day-Adjusted		956	786	170***	17.8%		948	869	78***	8.3%	91***	9.6%
Degree-Day		840	771	69***	8.2%		819	837	-18***	-2.2%	87***	10.3%
With PRISM Results												
Degree-Day	241	837	770	67***	8.0%	241	821	840	-18***	-2.2%	86***	10.2%
PRISM		838	780	58***	6.9%		837	856	-20***	-2.3%	78***	9.3%

***Denotes significance at the 99 percent level.

Table V-3 displays the savings for the 2014 participants using a later participant comparison group (the 2015 participants). With this analysis, we can only include the 2014 participants in the treatment group because we did not have later program participants from 2016 to control for the 2015 participants. This analysis shows lower savings, averaging 43 ccf or 5.4 percent of pre-treatment usage.

Table V-3
HVAC Natural Gas Savings Estimates
2014 Participants
Later Participant Comparison Group

	Treatment					Later Participant Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
				ccf	%				ccf	%	ccf	%
All Survived Attrition												
Raw	128	894	835	59***	6.6%	197	971	944	27**	2.8%	33*	3.7%
Day-Adjusted		926	825	101***	10.9%		976	934	42***	4.3%	59***	6.3%
Degree-Day		800	758	42***	5.3%		856	857	-1	-0.1%	43*	5.4%
With PRISM Results												
Degree-Day	111	799	744	54***	6.8%	189	866	841	25**	2.9%	29*	3.7%
PRISM		794	735	59***	7.4%		858	838	20*	2.3%	39**	5.0%

***Denotes significance at the 99 percent level. **Denotes significance at the 95 percent level. *Denotes significance at the 90 percent level.

V-4 shows savings separately for 2014 and 2015 using the matched comparison group. The table shows that the 2014 participants have somewhat higher savings than the 2015 participants, but the differences are not statistically significant.

Table V-4
HVAC Natural Gas Savings Estimates By Year
Matched Comparison Group

Year	Treatment					Matched Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
				ccf	%				ccf	%	ccf	%
2014	114	798	744	54***	6.8%	114	787	826	-39***	-5.0%	93***	11.7%
2015	135	875	794	81***	9.3%	135	847	847	<1	<0.1%	81***	9.2%
Total	249	840	771	69***	8.2%	249	819	837	-18***	-2.2%	87***	10.3%

***Denotes significance at the 99 percent level.

Table V-5 displays savings by whether the customer received a rebate or loan. The table shows that while the rebate participants saved an average of 74 ccf, the loan participants saved an average of 153 ccf. These differences are statistically significant. Information was not available on the characteristics of the new equipment, so it is not clear why the loan customers saved more.

Table V-5
HVAC Natural Gas Savings Estimates
By Rebate or Loan
Matched Comparison Group

Rebate or Loan	Treatment					Matched Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
				ccf	%				ccf	%	ccf	%
2014 Rebate	105	769	725	44***	5.8%	105	759	795	-36***	-4.7%	80***	10.4%
2015 Rebate	103	855	789	66***	7.7%	103	827	828	-1	-0.1%	67***	7.8%
All Rebate	208	812	757	55***	6.8%	208	793	811	-19***	-2.3%	74***	9.1%
All Loan	41	980	843	138***	14.0%	41	955	970	-15	-1.6%	153***	15.6%

***Denotes significance at the 99 percent level.

Table V-6 displays savings by the projected annual savings. While customers whose projected annual savings was less than or equal to 150 therms saved an average of 78 ccf, those whose projected savings was more than 150 therms saved an average of 97 ccf, lower than the projected level likely due to the low pre-treatment usage of 861 ccf.

Table V-6
HVAC Natural Gas Savings Estimates
By Projected Annual Savings
Matched Comparison Group

Projected Annual Savings	Treatment					Matched Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
				ccf	%				ccf	%	ccf	%
<=150 Therms	118	827	775	52***	6.3%	118	807	833	-26***	-3.2%	78***	9.4%
>150 Therms	118	861	773	87***	10.1%	118	841	851	-10	-1.1%	97***	11.3%
All†	249	840	771	69***	8.2%	249	819	837	-18***	-2.2%	87***	10.3%

***Denotes significance at the 99 percent level.
†13 participants are missing projected annual savings. These are included in All.

Table V-7 displays the savings estimates by pre-treatment usage. As expected, customers with higher pre-treatment usage had higher savings. While those with pre-treatment usage of less than 800 ccf had average savings of 38 ccf, those with pre-treatment usage of 801 to 1,000 ccf had average savings of 101 ccf, and those with usage over 1,000 ccf had average savings of 170 ccf.

Table V-7
HVAC Natural Gas Savings Estimates
By Pre-Treatment Usage
Matched Comparison Group

Pre-Period Usage (ccf)	Treatment					Matched Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
				ccf	%				ccf	%	ccf	%
≤800	121	618	593	25**	4.1%	121	619	632	-12*	-2.0%	38***	6.1%
801-1,000	69	890	816	74***	8.3%	69	890	916	-26**	-3.0%	101***	11.3%
>1,000	59	1,235	1,084	151***	12.2%	59	1,148	1,168	-20	-1.7%	170***	13.8%
All	249	840	771	69***	8.2%	249	819	837	-18***	-2.2%	87***	10.3%

***Denotes significance at the 99 percent level. **Denotes significance at the 95 percent level. *Denotes significance at the 90 percent level.

C. HPwES Impacts

This section analyzes the impact of the HPwES program. Table V-8 shows that the participants saved an average of 206 ccf or 23.8 percent of pre-treatment gas usage. These high savings may relate to the SJG requirement that HPwES participants achieve a 20 percent projected savings to receive the SJG loan.

Table V-8
HPwES Natural Gas Savings Estimates
2014 and 2015 Participants
Matched Comparison Group

	Treatment					Matched Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
				ccf	%				ccf	%	ccf	%
All Survived Attrition												
Raw	646	982	664	318***	32.4%	646	984	866	118***	11.9%	201***	20.4%
Day-Adjusted		988	702	286***	28.9%		983	917	66***	6.7%	220***	22.2%
Degree-Day		869	675	194***	22.3%		859	871	-13***	-1.5%	206***	23.8%

	Treatment					Matched Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
With PRISM Results												
Degree-Day	628	868	674	194***	22.4%	628	860	873	-13***	-1.5%	207***	23.8%
PRISM		865	680	184***	21.3%		869	889	-21***	-2.4%	205***	23.7%

***Denotes significance at the 99 percent level.

Table V-9 displays the savings for 2014 HPwES participants using the 2015 comparison group. The table shows that mean savings were 198 ccf, very similar to those estimated using the matched comparison group.

Table V-9
HPwES Natural Gas Savings Estimates
2014 Participants
Later Participant Comparison Group

	Treatment					Later Participant Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
				ccf	%				ccf	%	ccf	%
All Survived Attrition												
Raw	352	989	752	237***	24.0%	544	740	958	-218***	-29.4%	455***	46.0%
Day-Adjusted		997	743	254***	25.4%		747	948	-201***	-26.9%	454***	45.6%
Degree-Day		872	680	192***	22.0%		854	861	-7	-0.8%	198***	22.8%
With PRISM Results												
Degree-Day	328	857	671	186***	21.7%	528	852	861	-9**	-1.1%	195***	22.8%
PRISM		851	666	185***	21.7%		851	859	-8**	-1.0%	193***	22.7%

***Denotes significance at the 99 percent level. **Denotes significance at the 95 percent level.

Table V-10 compares savings for customers who had a total project cost of up to $15,000 and those who had a total project cost of more than $15,000. The table shows that savings were approximately the same for these two groups.

Table V-10
HPwES Natural Gas Savings Estimates
By Total Project Cost
Matched Comparison Group

Total Project Cost	Treatment					Matched Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
				ccf	%				ccf	%	ccf	%
≤$15,000	407	866	669	196***	22.7%	407	858	870	-12**	-1.4%	208***	24.1%
>$15,000	239	875	685	189***	21.7%	239	859	873	-14**	-1.6%	203***	23.2%
All	646	859	675	194***	22.3%	646	859	871	-13***	-1.5%	206***	23.8%

***Denotes significance at the 99 percent level. **Denotes significance at the 95 percent level.

Table V-11 shows that savings for those with a NJCEP rebate of under $5,000 were less than savings for those with a NJCEP rebate equal to $5,000. While those with a rebate of under $5,000 saved an average of 179 ccf, those with a rebate of $5,000 saved an average of 217 ccf or 25.6 percent of pre-treatment usage. These differences are statistically significant. The average savings of over 25 percent for customers who received the $5,000 NJCEP rebate corresponds to the NJCEP requirement of at least 25 percent projected savings to receive this level of rebate.

Table V-11
HPwES Natural Gas Savings Estimates
By NJCEP Rebate
Matched Comparison Group

NJCEP Rebate	Treatment					Matched Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
				ccf	%				ccf	%	ccf	%
<$5,000	181	920	735	185***	20.1%	181	905	899	6	0.7%	179***	19.4%
$5,000	465	849	652	197***	23.2%	465	841	861	-20***	-2.4%	217***	25.6%
All	646	859	675	194***	22.3%	646	859	871	-13***	-1.5%	206***	23.8%

***Denotes significance at the 99 percent level.

Table V-12 displays the HPwES savings by pre-treatment usage. Those with higher pre-treatment usage had higher savings. While those with pre-treatment usage below 800 ccf had mean savings of 141 ccf, those with pre-treatment usage between 801 and 1,000 ccf had mean savings of 216 ccf, and those with pre-treatment usage of over 1,000 ccf had mean savings of 298 ccf.

Table V-12
HPwES Natural Gas Savings Estimates
By Pre-Treatment Usage
Matched Comparison Group

Pre-Period Usage	Treatment					Matched Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
				ccf	%				ccf	%	ccf	%
≤800 ccf	269	662	542	120***	18.1%	269	668	689	-21***	-3.2%	141***	21.3%
801-1,000 ccf	204	892	679	213***	23.8%	204	875	878	-3	-0.4%	216***	24.2%
>1,000 ccf	173	1,164	877	287***	24.6%	173	1,136	1,147	-11	-1.0%	298***	25.6%
All	646	869	675	194***	22.3%	646	859	871	-13***	-1.5%	206***	23.8%

***Denotes significance at the 99 percent level. **Denotes significance at the 95 percent level. *Denotes significance at the 90 percent level.

Table V-13 displays savings by contractor for those contractors who had 20 or more customers included in the analysis, and for all other contractors in the last row. The table shows that Contractors C and F had much lower savings than A, B, D, and E, and lower savings than the other contractors. These differences are statistically significant.

While Contractor C customers had lower pre-treatment usage and lower project costs than the other contractors on average, leading to the expectation of lower savings, Contractor F's customers' pre-treatment usage was approximately the same as the other contractors and their project cost was higher.

Table V-13
HPwES Natural Gas Savings Estimates
By Contractor
Matched Comparison Group

Contractor	Treatment					Matched Comparison Group					Net Savings		Average Project Cost
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings				
				ccf	%				ccf	%	ccf	%	
A	281	890	678	211***	23.7%	281	883	897	-14**	-1.6%	225***	25.3%	$14,756
B	98	834	637	198***	23.7%	98	806	812	-6	-0.7%	204***	24.4%	$17,697
C	50	746	615	131***	17.6%	50	742	745	-3	-0.4%	135***	18.0%	$14,839
D	47	901	696	205***	22.7%	47	882	898	-16	-1.9%	221***	24.5%	$15,743
E	34	872	694	178***	20.4%	34	875	920	-45*	-5.1%	223***	25.5%	$15,698
F	20	871	732	139***	16.0%	20	864	869	-5	-0.5%	144***	16.5%	$17,190
Other Contractors	116	887	702	184***	20.8%	116	879	890	-11	-1.2%	195***	22.0%	$15,595

Contractor	Treatment					Matched Comparison Group					Net Savings		Average Project Cost
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings				
All	646	859	675	194***	22.3%	646	859	871	-13***	-1.5%	206***	23.8%	$15,556

***Denotes significance at the 99 percent level. **Denotes significance at the 95 percent level. *Denotes significance at the 90 percent level.

While all customers received air sealing, about ten percent did not receive insulation. Table V-14 shows that those who had insulation installed had higher savings than those who did not. These differences are statistically significant.

Table V-14
HPwES Natural Gas Savings Estimates
By Whether Insulation was Done
Matched Comparison Group

Insulation Done	Treatment					Matched Comparison Group					Net Savings	
	Obs	Pre	Post	Savings		Obs	Pre	Post	Savings			
				ccf	%				ccf	%	ccf	%
Yes	581	869	671	198***	22.8%	581	858	872	-14***	-1.6%	221***	24.3%
No	65	870	712	159***	18.2%	65	862	868	-5	-0.6%	164***	18.8%
All	646	869	675	194***	22.3%	646	859	871	-13***	-1.5%	206***	23.8%

***Denotes significance at the 99 percent level.

D. Summary of Findings

This section provided an analysis of the impacts of the HVAC and HPwES programs on energy usage. Key findings from the analysis were as follows.

HVAC Impacts

The HVAC participants saved an average of 87 ccf or 10.3 percent of pre-treatment usage. While the rebate participants saved an average of 74 ccf, the loan participants saved an average of 153 ccf.

As expected, customers with higher pre-treatment usage had higher savings. While those with pre-treatment usage of less than 800 ccf had average savings of 38 ccf, those with pre-treatment usage of 801 to 1,000 ccf had average savings of 101 ccf, and those with usage over 1,000 ccf had average savings of 170 ccf.

HPwES Impacts

The HPwES participants saved an average of 206 ccf or 23.8 percent of pre-treatment usage. While those with a rebate of under $5,000 saved an average of 179 ccf, those with a rebate of $5,000 saved an average of 217 ccf.

Those with higher pre-treatment usage had higher savings. While those with pre-treatment usage below 800 ccf had mean savings of 141 ccf, those with pre-treatment usage between 801 and 1,000 ccf had mean savings of 216 ccf, and those with pre-treatment usage of over 1,000 ccf had mean savings of 298 ccf.

Savings differed significantly by contractor.

VI. Non-Energy Benefits

The evaluation included an assessment of the non-energy benefits of the HVAC and HPwES programs. This section provides a summary of the methodology and calculations.

A. Environmental

Environmental benefits result from SJG's energy efficiency programs, as the programs reduce energy usage and the negative environmental impacts that are associated with that usage. This section provides a description of the methodology used to estimate the environmental impacts.

Methodology

Environmental benefits attributable to energy efficiency measures include reductions in air pollution resulting from decreases in household energy usage. The major air pollutants associated with consumption of natural gas are the following.

- Greenhouse gases (represented in CO2-equivalent)
- Sulfur dioxide (SO2)
- Nitrogen oxide (NOx)
- Fine particulate matter less than 2.5 micrometers in diameter (PM 2.5)
- Volatile organic compounds (VOCs)

Environmental benefits were estimated for the HVAC and HPwES programs because these programs had a sufficient number of participants and sufficient pre-treatment and post-treatment energy usage data to calculate the impacts of these programs on energy usage. The estimation of the environmental benefits associated with the HVAC and HPwES programs involved three steps.

1. *Energy Usage Reductions*: Natural gas usage savings for the HVAC and HPwES programs were estimated through a weather-normalized, comparison group adjusted billing analysis of natural gas usage data.

2. *Quantity of Avoided Emissions by Pollutant:* Published data sources were used to estimate the emissions that were avoided as a result of natural gas usage reductions. The analysis estimated the total tons of avoided CO2, SO2, NOx, PM 2.5, and VOC emissions in the state of New Jersey due to the 2014 and 2015 participants.

3. *Value of Avoided Emissions by Pollutant:* The dollar value of avoided SO2, NOx, PM 2.5 and VOC emissions was computed using values estimated by the Office of Management and Budget (OMB)[1] and Air Pollution Emission Experiments and Policy (APEEP) Model[2] as recommended by the National Research Council (NRC) in its 2010 report to Congress.[3] The analysis estimates the total dollar value of the emissions avoided in the state of New Jersey.

[1] OMB (2015). p17.
[2] Muller (2008).
[3] NRC (2010). p241.

The APEEP Model calculates the marginal damage of emissions by first calculating total damages due to all sources at a baseline level, and then re-computing total damages after adding one ton of one pollutant from one source. The modeled physical effects include premature mortality, illness, reduced timber and crop yields, and other impacts. A dollar value is then assigned to each effect, the market value of goods and services, the values attributed to chronic illness from the nonmarket valuation literature, or the value of a statistical life. The model does not test for interactions among the emissions of various pollutants.

The APEEP Model computes exposures by multiplying county-level populations by county-level pollution concentrations. It is necessary to account for population because the amount of damage caused by any pollutant is greater in an area that is more highly populated, as more individuals are affected.

Highly populated areas are also exposed to more emissions because the pollutants that result from burning natural gas are released from all homes and buildings where natural gas is consumed, not from a single location such as a power plant. It is therefore necessary to determine the level of avoided emissions in each county to determine the amount of damage in each county. To do this, the state-wide levels of avoided pollutants were weighted by county population using data from the 2010 US census. The APEEP damage values for each county were multiplied by these weighted values.

The marginal value of avoided greenhouse gas (GHG) emissions were derived from the Interagency Working Group on the Social Cost of Carbon's Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis (July 2015). Two values, each corresponding to the annual value of the social cost of carbon (SCC) applicable to the year in which gas savings and avoided emissions occurred (2014 or 2015), were used in this analysis. Annual values of the SCC are provided in Table A1 of the Interagency Working Group's Technical Support Document; these values were updated from 2007 dollars to 2015 dollars using the consumer price index (CPI-U).[4]

The following calculation of environmental benefits was performed.

- *CO2-eq Savings = Gas Savings * CO2-eq Emission Rate * Marginal Value of Avoided CO2 Emissions*
- *SO2 Savings = Gas Savings * SO2 Emission Rate * Marginal Value of Avoided SO2 Emissions*
- *NOx Savings = Gas Savings * NOx Emission Rate * Marginal Value of Avoided NOx Emissions*
- *PM2.5 Savings = Gas Savings * PM2.5 Emission Rate * Marginal Value of Avoided PM2.5 Emissions*
- *VOC Savings = Gas Savings * VOC Emission Rate * Marginal Value of Avoided VOC Emissions*

- *Total Savings = CO2 Savings + SO2 Savings + NOX Savings + PM2.5 Savings + VOC Savings*

Benefit Calculation

Table VI-1 displays the natural gas savings from the two programs. Natural gas usage savings were found by calculating the weather-normalized, comparison group adjusted reduction in participants' gas usage from the year prior to participation compared to the year following program participation.

[4] The Technical Support Document is available here: https://www.whitehouse.gov/omb/oira/social-cost-of-carbon.

Savings in ccf were converted to MMBtu savings. The HVAC program resulted in a total reduction in natural gas usage of 14,492 MMBtu and the HPwES program resulted in a total reduction in natural gas usage of 38,088 MMBtu per year for the 2014 and 2015 participants.

Table VI-1
Natural Gas Usage Savings for 2014 and 2015 Participants

	HVAC			HPwES		
	2014	**2015**	**Total**	**2014**	**2015**	**Total**
Participants	622	1,028	1,650	640	1,168	1,808
Savings (ccf per Participant)	93	81	87	209	203	206
Total Savings (ccf)	57,846	83,268	143,550	133,760	237,104	372,448
Total Savings (MMBtu)	5,941	8,552	14,492	13,737	24,351	38,088

Table VI-2 displays the emissions rates for each pollutant and the tons of avoided emissions. The natural gas emissions rates are developed at the national level because the composition of natural gas does not vary greatly across the country. The tons of avoided emissions values were calculated by multiplying each program's energy usage savings by the emission rates for each pollutant.

Table VI-2
Emission Rates and Avoided Emissions from Natural Gas Savings

	Natural Gas Emission Rate (Tons CO2-eq/1,000 MMBtu)[1]	**Avoided Emissions (Tons)**					
		HVAC[1]			**HPwES[1]**		
		2014	**2015**	**Total**	**2014**	**2015**	**Total**
CO2-eq[2]	62	368	530	898	851	1,509	2,360
SO2[3]	0.000293	0.0017	0.0025	0.0042	0.0040	0.0071	0.0111
NOx[3]	0.046	0.2724	0.3921	0.6645	0.6299	1.1166	1.7465
PM 2.5[3]	0.000927	0.0055	0.0079	0.0134	0.0127	0.0226	0.0353
VOC[3]	0.00268	0.0159	0.0229	0.0389	0.0369	0.0653	0.1022

[1] Avoided emissions for CO2-eq are in metric tons. Avoided emissions for all other air pollutants are in short tons

Table VI-3 presents the estimates of the marginal values of avoided emissions that were used to monetize the environmental benefits associated with the programs.

Table VI-3
Marginal Value of Avoided Emissions from Natural Gas

	Marginal Value of Avoided Emissions (2015 dollars/Ton)[1]
CO2-eq (2014)[2]	$42.18
CO2-eq (2015)[2]	$43.32
SO2[3]	$110,771
NOx[3]	$22,857
PM 2.5[3]	$465,192
VOC[3]	$43,862

[1] Avoided emissions for CO2-eq are in metric tons. Avoided emissions for all other air pollutants are in short tons.
[2] OMB (2015). Two marginal values, corresponding to the annual value of the social cost of carbon (SCC) applicable to the year in which gas savings and avoided emissions occurred (2014 or 2015), were used in this analysis. Annual values of the SCC are provided in Table A1 of OMB (2015); these values were updated from 2007 dollars to 2015 dollars using the consumer price index (CPI-U) of 1.14, obtained on August 3, 2016, from http://www.bls.gov/data/inflation_calculator.htm.
[3] APEEP values from Muller (2008). Dollar values were converted from 2000 dollars to 2015 dollars using the consumer price index (CPI-U) of 1.38, obtained on August 3, 2016, from http://www.bls.gov/data/inflation_calculator.htm.

The benefits of each avoided pollutant were estimated by multiplying the amount of avoided emissions by the marginal damage values. These values were summed to obtain an estimate of the total environmental benefits resulting from each program.

Because the upgrades installed as a result of the programs reduce natural gas usage over the lifetime of the measures, the emissions savings accumulate over this time period. To estimate the lifetime environmental benefits that result from the programs, the present discounted value (PDV) of these one-year benefits was calculated over the 15-year measure lifetime. The PDV was calculated using the following formula, assuming a three percent discount rate.

$$PDV = (1 - 1.03^{-15})/0.03 * \text{first year savings}$$

Tables VI-4A and VI-4B display the results of these benefit calculations. The total value of all emissions avoided in 2014 was $83,485, and the lifetime value of these avoided emissions is $996,637. The total value of all 2015 emissions avoided was $141,913, and the lifetime value of these avoided emissions is $1,694,153. Tables VI-4C displays the total benefits for 2014 and 2015 participants.

Table VI-4A
Environmental Benefits by Program for 2014 Participants

	HVAC				HPwES				Total	
	Avoided Emissions[1]		Monetized[2]		Avoided Emissions[1]		Monetized[2]			
	Tons	$ per Ton	2014	Lifetime	Tons	$ per Ton	2014	Lifetime	2014	Lifetime
CO2-eq	368	$42.18	$15,525	$185,331	851	$42.18	$35,898	$428,549	$51,423	$613,879
SO2	0.0017	$110,771	$193	$2,299	0.0040	$110,771	$445	$5,317	$638	$7,616
NOx	0.2724	$22,857	$6,227	$74,332	0.6299	$22,857	$14,398	$171,881	$20,624	$246,213
PM 2.5	0.0055	$465,192	$2,561	$30,578	0.0127	$465,192	$5,923	$70,706	$8,484	$101,284
VOC	0.0159	$43,862	$699	$8,346	0.0369	$43,862	$1,617	$19,298	$2,316	$27,644
Total			**$25,204**	**$300,885**			**$58,281**	**$695,751**	**$83,485**	**$996,637**

[1] Avoided emissions for CO2-eq are in metric tons. Avoided emissions for all other air pollutants are in short tons.
[2] Monetary values shown in 2015 dollars for program year 2014 participants.

Table VI-4B
Environmental Benefits by Program for 2015 Participants

	HVAC				HPwES				Total	
	Avoided Emissions[1]		Monetized[2]		Avoided Emissions[1]		Monetized[2]			
	Tons	$ per Ton	2015	Lifetime	Tons	$ per Ton	2015	Lifetime	2015	Lifetime
CO2-eq	530	$43.32	$22,951	$273,989	1,509	$43.32	$65,353	$780,180	$88,304	$1,054,169
SO2	0.0025	$110,771	$277	$3,310	0.0071	$110,771	$789	$9,425	$1,067	$12,734
NOx	0.3921	$22,857	$8,963	$106,999	1.1166	$22,857	$25,522	$304,678	$34,485	$411,677
PM 2.5	0.0079	$465,192	$3,687	$44,016	0.0226	$465,192	$10,499	$125,334	$14,186	$169,350
VOC	0.0229	$43,862	$1,006	$12,014	0.0653	$43,862	$2,866	$34,208	$3,872	$46,222
Total			**$36,885**	**$440,328**			**$105,029**	**$1,253,825**	**$141,913**	**$1,694,153**

[1] Avoided emissions for CO2-eq are in metric tons. Avoided emissions for all other air pollutants are in short tons.
[2] Monetary values shown in 2015 dollars for program year 2015 participants.

Table VI-4C
Environmental Benefits by Program for 2014 and 2015 Participants

	HVAC				HPwES				Total	
	Avoided Emissions[1]		Monetized[2]		Avoided Emissions[1]		Monetized[2]			
	Tons	$ per Ton	Total First Year	Lifetime	Tons	$ per Ton	Total First Year	Lifetime	Total First Year	Lifetime
CO2-eq[3]	898	N/A	$38,476	$459,320	2,360	N/A	$101,251	$1,208,728	$139,727	$1,668,048
SO2	0.0042	$110,771	$470	$5,609	0.0111	$110,771	$1,235	$14,741	$1,705	$20,350
NOx	0.6645	$22,857	$15,189	$181,331	1.7465	$22,857	$39,920	$476,559	$55,109	$657,890
PM 2.5	0.0134	$465,192	$6,248	$74,594	0.0353	$465,192	$16,422	$196,041	$22,670	$270,634
VOC	0.0389	$43,862	$1,705	$20,359	0.1022	$43,862	$4,482	$53,507	$6,188	$73,866
Total			**$62,089**	**$741,213**			**$163,309**	**$1,949,576**	**$225,398**	**$2,690,790**

[1] Avoided emissions for CO2-eq are in metric tons. Avoided emissions for all other air pollutants are in short tons.
[2] Monetary values shown in 2015 dollars for combined program years (2014 and 2015).
[3] The marginal dollar value of avoided CO2-eq emissions is indicated as "N/A" because separate values were used corresponding to the year of program participation. See Table VI-4A and Table VI-4B for the marginal dollar value of avoided CO2-eq emissions used for 2014 and 2015.

Table VI-5 displays a summary of the estimated environmental benefits from the two programs. The total first year environmental benefits of the HVAC and HPwES programs are valued at $225,398 and the lifetime environmental benefits are valued at $2.69 million.

Table VI-5
Summary of Environmental Benefits

Time Period	HVAC	HPwES	Total Benefit
Current Year (2014 and 2015)	$62,089	$163,309	$225,398
Lifetime	$741,213	$1,949,576	$2,690,790

B. Economic

The South Jersey Gas programs result in economic benefits because they shift expenditures from those industries that have lower multipliers in the economy to industries that have higher multipliers. Two key expenditure shifts occur as a result of the program.

1. *Program expenditures replace general retail expenditures*: Funding for both the SJG Energy Efficiency Programs and the NJ Clean Energy Program rebates are derived from additional charges for each unit of energy consumed. We assumed that these expenditures replace retail purchases that otherwise would have been made in the absence of these charges.

2. *Retail expenditures replace natural gas expenditures*: SJG Energy Efficiency Programs result in reductions in natural gas usage and natural gas costs for program participants who undertake the energy efficiency improvements. We assumed that when natural gas costs decline as a result of the program, participants increase spending on retail goods.

The economic benefits result because of the following.

1. Expenditures on energy upgrades create more economic activity than expenditures on retail goods.

2. Expenditures on retail goods create more economic activity than expenditures on natural gas.

These differences result from the labor-intensity of each industry and the percentage of expenditures that are made in New Jersey.

The macroeconomic effects of any economic activity are generally divided into three categories:

- *Direct effects*: The direct effects are jobs and output created from the initial investment in a program. For SJG Energy Efficiency Programs, examples include the salaries of program administrators or the salaries of workers hired to install energy efficiency upgrades.

- *Indirect effects*: The indirect effects are jobs and output in industries that supply goods and services to the program. For SJG Energy Efficiency Programs, an example would be the jobs created by the contractors' expenditures on supplies to perform the energy efficiency upgrades.

- *Induced effects*: The induced effects are jobs and output created when the individuals who are directly and indirectly affected by the program spend their earnings.

These effects can be calculated using economic multipliers. A multiplier shows the change in jobs or output that results from a change in final demand in any given industry. A multiplier is defined as follows.

$$Multiplier = \frac{direct\ effect + indirect\ effect + induced\ effect}{direct\ effect}$$

We estimated the impact of the SJG Programs on output and employment by comparing the multipliers for the industries that are most impacted by SJG's programs to those that would have been affected in the absence of the program.

Methodology

We focused on the 2014 and 2015 HVAC and HPwES programs. To perform this calculation, a simplified model of the savings and expenditures that resulted from the program was developed.

When estimating the economic impact of any expenditure it is necessary to compare the economic output from the activity to the economic output that would have been created from

those expenditures in the absence of the activity. Because there is an opportunity cost to all spending decisions, it is not sufficient to only examine the economic impact of how funds were spent through SJG's Programs. For example, it would be incorrect to conclude that rebates create jobs by employing contractors if, in the absence of the program, customers would have spent that same money on consumer goods and created even more jobs. Assessing how funds would be spent in the absence of the program is therefore a key part of calculating the net economic impact.

The following is a simplified list of all sources of economic impact for the SJG HVAC and HPwES programs.

- *SJG Administrative Spending*: SJG HVAC and HPwES administrative costs are divided into the following categories.
  - Administration and Program Development
  - Sales, Call Center, Marketing, Website
  - Rebate Processing, Inspections, and Quality Control
  - Evaluation and Related Research
  - Residential HVAC Audit

  These expenditures are funded through the ratepayer charges. We assume that in the absence of the HVAC and HPwES programs, ratepayers would spend these funds on consumer goods.

- *SJG HVAC Loans and Rebates, NJCEP HVAC Rebates, SJG HPwES Loans, and NJCEP HPwES Rebates:* These expenditures are made on energy efficiency upgrades, including energy equipment and the labor needed to install that equipment. The source of this funding is also the ratepayer charge, so we assumed that these expenditures would also be spent on consumer goods in the absence of the program.

- *Customer Net Costs:* This is the cost that SJG HVAC and HPwES participants contribute for the energy efficiency upgrades. The expenditures exclude costs covered by SJG loans or rebates or NJCEP rebates. In the absence of the SJG HVAC and HPwES programs, customers would again spend this amount on consumer goods.

- *Participant Natural Gas Savings:* This is the amount that SJG participants save on their natural gas bills as a result of the energy efficiency upgrades installed through the program. We assumed that customers spent these savings on consumer goods. In the absence of the SJG Programs, customers would spend this money on their higher natural gas bills.

For the following reasons, it was assumed that all spending from these sources occurs within New Jersey.

- SJG employees work in New Jersey.
- Contractors' businesses are located in New Jersey.
- Energy equipment purchased as a result of the program is usually bought in New Jersey.

- A significant portion of consumer spending on retail goods occurs within the state.

Each source of economic impact was matched with the appropriate industry multipliers. The multipliers used in the analysis were obtained from the Regional Input-Output Modeling System II (RIMS-II) produced by the Bureau of Economic Analysis (BEA). To calculate the RIMS-II multipliers, the BEA uses a set of national input-output accounts that record the goods and services used by each industry. The input-output accounts used for RIMS-II were last updated in 2007.[5]

The most important assumptions underlying the multipliers are as follows.

- *Backward Linkages:* The calculation assumes backward linkages, meaning that an increase in demand for outputs results in an increase in the demand for inputs (as opposed to a forward linkage model in which an increased supply of inputs results in an increased supply of output).

- *No Time Dimension:* Because it is assumed that there is no time dimension, multipliers hold no predictions about how long it will take for the calculated economic benefits to be realized.

- *Industry Homogeneity:* It is assumed that industries are homogenous, meaning that all business in a single industry use the same inputs to make the same outputs in the same way.

Multipliers are also affected by local supply conditions. The BEA takes this into account by adjusting each regional industry multiplier by the industry's concentration in the region relative to its concentration in the nation. The multipliers used to calculate the impact of SJG Programs are adjusted for Atlantic County, Burlington County, Camden County, Cape May County, Cumberland County, Gloucester County, and Salem County, NJ.

RIMS-II Type II multipliers were used because these include not only direct and indirect effects but also induced effects. As described above, induced effects capture the impact of the increased spending by individuals whose income has risen as a direct or indirect result of the program. Accounting for induced effects is necessary to calculate the full economic impact of the SJG programs.

The output multipliers that were used in the analysis are displayed in Table VI-6A. The output multipliers represent the dollars of output created per one dollar change in final demand. The table also displays the change in the multiplier as the difference between the multiplier with the SJG Programs and in the absence of the SJG Programs.

[5] The multipliers can be purchased at this website: https://www.bea.gov/regional/rims/rimsii/

Table VI-6A
Output Multipliers for SJG Energy Efficiency Economic Impact

Source of Economic Impact	Output Multiplier With Program			Output Multiplier Without Program			Output Multiplier Increase
	Sector		Output Multiplier	Sector		Output Multiplier	
	Code	Description		Code	Description		
HVAC Loan/Rebate							
Administrative Spending							
Administration, Prog Dev.	561100	Office admin services	1.8524	4A0000	Other retail	1.7976	0.0548
Sales, Marketing, Website	561400	Business support services	1.8880	4A0000	Other retail	1.7976	0.0904
Rebate Processing/Inspect	5419A0	Misc. prof, scientific, tech serv	1.7646	4A0000	Other retail	1.7976	-0.0330
Evaluation	5419A0	Misc. prof, scientific, tech serv	1.7646	4A0000	Other retail	1.7976	-0.0330
HVAC Audit	561700	Services to buildings/dwellings	1.7447	4A0000	Other retail	1.7976	-0.0529
SJG & NJCEP Incentives							
SJG HVAC Loan/Rebate	561700	Services to buildings/dwellings	1.7447	4A0000	Other retail	1.7976	-0.0529
NJCEP HVAC Rebate	561700	Services to buildings/dwellings	1.7447	4A0000	Other retail	1.7976	-0.0529
Customer Net Costs							
HVAC Customer Net Costs	561700	Services to buildings/dwellings	1.7447	4A0000	Other retail	1.7976	-0.0529
Customer Total Savings							
HVAC Natural Gas Savings	4A0000	Other retail	1.7976	221200	Natural gas distribution	1.3929	0.4047
HPwES Loan							
Administrative Spending							
Administration, Prog Dev.	561100	Office admin services	1.8524	4A0000	Other retail	1.7976	0.0548
Sales, Marketing, Website	561400	Business support services	1.8880	4A0000	Other retail	1.7976	0.0904
Rebate Processing/Inspect	5419A0	Misc. prof, scientific, tech serv	1.7646	4A0000	Other retail	1.7976	-0.0330
Evaluation	5419A0	Misc. prof, scientific, tech serv	1.7646	4A0000	Other retail	1.7976	-0.0330
SJG & NJCEP Incentives							
SJG HPwES Loan/Rebate	561700	Services to buildings/dwellings	1.7447	4A0000	Other retail	1.7976	-0.0529
NJCEP HPwES Rebate	561700	Services to buildings/dwellings	1.7447	4A0000	Other retail	1.7976	-0.0529
Customer Net Costs							
HPwES Customer Net Costs	561700	Services to buildings/dwellings	1.7447	4A0000	Other retail	1.7976	-0.0529
Customer Total Savings							
HPwES Natural Gas Savings	4A0000	Other retail	1.7976	221200	Natural gas distribution	1.3929	0.4047

The employment multipliers that were used in the analysis are displayed in Table VI-6B. The employment multipliers represent the job-years created per one million dollar change in final demand.

Table VI-6B
Employment Multipliers for SJG Energy Efficiency Economic Impact

Source of Economic Impact	Employment Multiplier With Program			Employment Multiplier Without Program			Employ Multiplier Increase
	Sector		Employ Multiplier	Sector		Employ Multiplier	
	Code	Description		Code	Description		
HVAC Loan/Rebate							
Administrative Spending							
Administration, Prog Dev.	561100	Office admin services	13.7807	4A0000	Other retail	16.5908	-2.8101
Sales, Marketing, Website	561400	Business support services	17.0063	4A0000	Other retail	16.5908	0.4155
Rebate Processing/Inspect	5419A0	Misc. prof, scientific, tech serv	9.9166	4A0000	Other retail	16.5908	-6.6742
Evaluation	5419A0	Misc. prof, scientific, tech serv	9.9166	4A0000	Other retail	16.5908	-6.6742
HVAC Audit	561700	Services to buildings/dwellings	17.6257	4A0000	Other retail	16.5908	1.0349
SJG & NJCEP Incentives							
SJG HVAC Loan/Rebate	561700	Services to buildings/dwellings	17.6257	4A0000	Other retail	16.5908	1.0349
NJCEP HVAC Rebate	561700	Services to buildings/dwellings	17.6257	4A0000	Other retail	16.5908	1.0349
Customer Net Costs							
HVAC Customer Net Costs	561700	Services to buildings/dwellings	17.6257	4A0000	Other retail	16.5908	1.0349
Customer Total Savings							
HVAC Natural Gas Savings	4A0000	Other retail	16.5908	221200	Natural gas distribution	3.7692	12.8216
HPwES							
Administrative Spending							
Administration, Prog Dev.	561100	Office admin services	13.7807	4A0000	Other retail	16.5908	-2.8101
Sales, Marketing, Website	561400	Business support services	17.0063	4A0000	Other retail	16.5908	0.4155
Rebate Processing/Inspect	5419A0	Misc. prof, scientific, tech serv	9.9166	4A0000	Other retail	16.5908	-6.6742
Evaluation	5419A0	Misc. prof, scientific, tech serv	9.9166	4A0000	Other retail	16.5908	-6.6742
SJG & NJCEP Incentives							
SJG HPwES Loan	561700	Services to buildings/dwellings	17.6257	4A0000	Other retail	16.5908	1.0349
NJCEP HPwES Rebate	561700	Services to buildings/dwellings	17.6257	4A0000	Other retail	16.5908	1.0349
Customer Net Costs							
HPwES Customer Net Costs	561700	Services to buildings/dwellings	17.6257	4A0000	Other retail	16.5908	1.0349
Customer Total Savings							
HPwES Natural Gas Savings	4A0000	Other retail	16.5908	221200	Natural gas distribution	3.7692	12.8216

Calculations were performed using the following formulas.

- Output Change = Expenditures * (Output Multiplier with Program – Output Multiplier Without Program)
- Employment Change = (1/$1,000,000) * Expenditures * (Employment Multiplier with Program – Employment Multiplier Without Program)

These two calculations were performed for each source of economic impact. The change in output and the change in employment due to each source was summed to find the total economic impact of the programs.

Benefit Calculation

The calculations of the dollar amount of each source of economic impact are described below.

Data on SJG Administrative Spending was provided directly by SJG. All 2014 and 2015 expenditures from the categories displayed below were used.

Table VI-7
HVAC and HPwES Administrative Expenditures

HVAC Loan/Rebate	2014	2015	Total
Administration and Program Development	$122,992	$85,188	$208,180
Sales, Call Center, Marketing, Website	$0	$14,664	$14,664
Rebate Processing, Inspections, and Quality Control	$197,292	$181,431	$378,723
Evaluation and Related Research	$0	$27,571	$27,571
Residential HVAC Audit	$71,100	$300,000	$371,100
Total HVAC Loan/Rebate Administrative Expenditures	**$391,384**	**$608,854**	**$1,000,238**
HPwES Loan	**2014**	**2015**	**2014-2015 Total**
Administration and Program Development	$99,057	$93,790	$192,847
Sales, Call Center, Marketing, Website	$93,876	$217,911	$311,787
Rebate Processing, Inspections, and Quality Control	$172,436	$246,787	$419,223
Evaluation and Related Research	$0	$43,609	$43,609
Total HPwES Administrative Expenditures	**$365,369**	**$602,097**	**$967,466**

The total SJG and NJCEP HPwES incentives distributed in 2014 and 2015 were calculated using the following data.

- Number of HPwES Participants: The number of HPwES participants was obtained from the HPwES program data.

- SJG Loan Amount: Data on the average SJG loan was obtained from the HPwES program data.

- Mean NJCEP Rebate: Data on the NJCEP rebate was obtained from program data.

The multiplication of number of participants by the average SJG loan resulted in an estimated cost of $17,404,016 for all 2014-2015 HPwES SJG incentives. Note that the SJG loan amount could instead be included as a customer net cost. However, the categorization into

one or the other of these categories does not affect the calculation of economic benefits because in both cases the funds were spent on "Services to Buildings or Dwellings" with the program and to "Other Retail" without the program.

Table VI-8
Calculation of SJG HPwES Incentives

Year	HPwES Participants	SJG Loan	Total SJG Incentives
2014	640	$9,661	$6,183,040
2015	1,168	$9,607	$11,220,976
Total	**1,808**		**$17,404,016**

The multiplication of number of participants by the mean NJCEP rebate resulted in an estimated cost of $8,399,296 for all 2014-2015 HPwES NJCEP incentives.

Table VI-9
Calculation of NJCEP HPwES Incentives

Year	HPwES Participants	Mean NJCEP Rebate	Total NJCEP Incentives
2014	640	$4,780	$3,059,200
2015	1,168	$4,572	$5,340,096
Total	**1,808**	**-**	**$8,399,296**

The total dollar amount of SJG HVAC incentives distributed in 2014 and 2015 was calculated using the following data.

- Number of Rebate and Loan Participants: The number of participants was obtained from the SJG program data.
- SJG Rebate Amount: The SJG Rebate amount was that defined by the program rules.
- SJG Loan Amount: The loan amount was calculated from the loan activity data, using the mean loan amount for all customers marked as HVAC loan recipients in 2014 or 2015.

This calculation resulted in a total SJG incentive of $3,566,020, as displayed in Table III-5.

Table VI-10
Calculation of SJG HVAC Incentives

Year	HVAC Rebate		HVAC Loan		Total SJG Incentives
	Rebate Participants	Rebate	Loan Participants	SJG Loan	
2014	527	$500	95	$7,000	$928,500
2015	692	$500	336	$6,820	$2,637,520
Total	**1,219**	**-**	**431**	**-**	**$3,566,020**

The total dollar amount of NJCEP HVAC rebates distributed in 2014 and 2015 was calculated using the following data.

- Number of Participants: The number of participants was obtained from the SJG program data.
- NJCEP Rebate Amount: The NJCEP rebate amount was that defined by the program rules, and was the same for SJG Rebate and Loan Participants.

This calculation resulted in a total NJCEP incentive of $1,485,000, as displayed in Table VI-11.

Table VI-11
Calculation of NJCEP HVAC Incentives

Year	Rebate Participants	Loan Participants	Total Participants	NJCEP Rebate	Total NJCEP Incentives
2014	527	95	622	$900	$559,800
2015	692	336	1,028	$900	$925,200
Total	**1,219**	**431**	**1,650**	**-**	**$1,485,000**

The net cost to 2014-2015 HPwES participants was calculated using the following data.

- Mean Job Cost: The mean job cost was obtained through program data.
- Mean NJCEP Rebate: The mean NJCEP amount was acquired from program data.
- Mean SJG Loan: The mean SJG loan was obtained from HPwES program data.
- The net cost of each project was calculated as the difference between the mean cost of the 2014-2015 HPwES jobs and the combination of the 2014-2015 NJCEP rebate and SJG loan.

This calculation resulted in total net cost for 2014-2015 HPwES customers of $3,026,496, as displayed in Table VI-12.

Table VI-12
Calculation of HPwES Net Participant Costs

Year	HPwES Participants	Mean Job Cost	Mean NJCEP Rebate	SJG Loan	Total Net Participant Costs
2014	640	$16,082	$4,780	$9,661	$1,050,240
2015	1,168	$15,871	$4,572	$9,607	$1,976,256
Total	**1,808**	-	-	-	**$3,026,496**

The net cost to 2014-2015 HVAC participants was calculated using the following data.

- Number of Rebate and Loan Participants: The number of participants was obtained from the SJG program data.

- Mean Job Cost: The mean job cost was estimated by adding the SJG Loan amount to the $900 NJCEP Rebate. The mean job cost was assumed to be the same for both Rebate and Loan participants.

- NJCEP Rebate Amount: The NJCEP rebate amount was that defined by the program rules, and was the same for Rebate and Loan participants.

- SJG Rebate Amount: The SJG Rebate amount was that defined by the program rules.

- SJG Loan Amount: The loan amount was calculated from the loan activity data, using the mean loan amount for all customers marked as HVAC loan recipients in 2014 or 2015.

- The net cost of each SJG rebate project was calculated as the difference between the mean cost of the 2014-2015 HVAC jobs and the sum of the 2014-2015 NJCEP rebate and SJG rebate. The net cost of each SJG loan project was calculated as the difference between the mean cost of the 2014-2015 HVAC jobs and the sum of the 2014-2015 NJCEP rebate and SJG loan.

This calculation resulted in a total net cost to all 2014 and 2015 HVAC participants of $7,798,940. These data displayed in Table VI-13.

Table VI-13
Calculation of HVAC Net Participant Costs

Year	Rebate Participants	Loan Participants	Mean Job Cost	NJCEP Rebate	SJG Rebate	SJG Loan	Total Net Participant Costs
2014	527	95	$7,900	$900	$500	$7,000	$3,425,500
2015	692	336	$7,720	$900	$500	$6,820	$4,373,440
Total	**1,219**	**431**	-	-	-	-	**$7,798,940**

The total value of participants' natural gas savings was calculated using the following data.

- The mean natural gas savings for 2014 and 2015 HVAC Rebate/Loan and HPwES participants was calculated with natural gas usage data provided by SJG. The methodology for the analysis is described in detail in the energy usage impact analysis memo.

- The dollar value of each participant's savings was calculated by applying a cost of $1.227 for each ccf saved.

- Because savings accumulate each year over the lifetime of the measures, the economic impact of these savings was calculated using the present discounted value (PDV) of savings over time. The PDV was calculated for 15 years of savings using the following formula, assuming a three percent discount rate.

- This value was multiplied by the number of participants to estimate the dollar savings for all 2014-2015 participants.

$$PDV = (1 - 1.03^{-15})/0.03 * \text{first year savings}$$

Table VI-14 displays the calculation for the total savings for 2014 and 2015 participants in the HVAC program, which is estimated to be $2,067,016.

Table VI-14
Calculation of HVAC Participant Gas Savings

Year	Participants	Average Gas Savings			Total Participant Savings
		ccf	$	15 Year PDV	
2014	622	93	$114	$1,362	$847,319
2015	1,028	81	$99	$1,186	$1,219,697
Total	**1,650**				**$2,067,016**

Table VI-15 displays the calculation for the total savings for 2014 and 2015 participants in the HPwES program, which is estimated to be $5,432,359.

Table VI-15
Calculation of HPwES Participant Gas Savings

Year	Participants	Average Gas Savings			Total Participant Savings
		ccf	$	15 Year PDV	
2014	640	209	$256	$3,061	$1,959,296
2015	1,168	203	$249	$2,974	$3,473,063
Total	**1,808**				**$5,432,359**

The inputs described above were used to calculate the impact of the HVAC and HPwES programs. Table VI-16 displays the calculation for the impact of the HVAC and HPwES programs on the output of the state of New Jersey. The estimated increase in output was $833,312.

Table VI-16
SJG Energy Efficiency Economic Impact
2014-2015 HVAC and HPwES Participants

Source of Economic Impact	Base Amount	Output Multiplier			Economic Impact ($)
		With Program	Without Program	Change	
HVAC Loan/Rebate					
Administrative Spending					
Administration, Prog Dev.	$208,180	1.8524	1.7976	0.0548	$11,408
Sales, Marketing, Website	$14,664	1.8880	1.7976	0.0904	$1,326
Rebate Processing/Inspect	$378,723	1.7646	1.7976	-0.0330	-$12,498
Evaluation	$27,571	1.7646	1.7976	-0.0330	-$910
HVAC Audit	$371,100	1.7447	1.7976	-0.0529	-$19,631
SJG & NJCEP Incentives					
SJG HVAC Loan/Rebate	$3,566,020	1.7447	1.7976	-0.0529	-$188,642
NJCEP HVAC Rebate	$1,485,000	1.7447	1.7976	-0.0529	-$78,557
Customer Net Costs					
HVAC Customer Net Costs	$7,798,940	1.7447	1.7976	-0.0529	-$412,564
Customer Total Savings					
HVAC Natural Gas Savings	$2,067,016	1.7976	1.3929	0.4047	$836,521
HPwES Loan					
Administrative Spending					
Administration, Prog Dev.	$192,847	1.8524	1.7976	0.0548	$10,568
Sales, Marketing, Website	$311,787	1.8880	1.7976	0.0904	$28,186
Rebate Processing/Inspect	$419,223	1.7646	1.7976	-0.0330	-$13,834
Evaluation	$43,609	1.7646	1.7976	-0.0330	-$1,439
SJG & NJCEP Incentives					
SJG HPwES Loan	$17,404,016	1.7447	1.7976	-0.0529	-$920,672
NJCEP HPwES Rebate	$8,399,296	1.7447	1.7976	-0.0529	-$444,323
Customer Net Costs					
HPwES Customer Net Costs	$3,026,496	1.7447	1.7976	-0.0529	-$160,102
Customer Total Savings					
HPwES Natural Gas Savings	$5,432,359	1.7976	1.3929	0.4047	$2,198,476
Total Economic Impact					$833,312

Table VI-17 displays the calculation for the impact of the HVAC and HPwES programs on employment in the state of New Jersey. It was estimated that 133 job years were created as a result of the programs. Most of these gains come from the labor needed to install energy efficiency upgrades and the natural gas savings; the administrative expenditures resulted in a net loss of jobs.

Table VI-17
SJG Energy Efficiency Employment Impact
2014-2015 HVAC and HPwES Participants

Source of Employment Impact	Base Amount	Employment Multiplier			Employment Impact
		With Program	Without Program	Change	
HVAC Loan/Rebate					
Administrative Spending					
Administration, Prog Dev.	$208,180	13.7807	16.5908	-2.8101	-1
Sales, Marketing, Website	$14,664	17.0063	16.5908	0.4155	0
Rebate Processing/Inspect	$378,723	9.9166	16.5908	-6.6742	-3
Evaluation	$27,571	9.9166	16.5908	-6.6742	0
HVAC Audit	$371,100	17.6257	16.5908	1.0349	0
SJG & NJCEP Incentives					
SJG HVAC Loan/Rebate	$3,566,020	17.6257	16.5908	1.0349	4
NJCEP HVAC Rebate	$1,485,000	17.6257	16.5908	1.0349	2
Customer Net Costs					
HVAC Customer Net Costs	$7,798,940	17.6257	16.5908	1.0349	8
Customer Total Savings					
HVAC Natural Gas Savings	$2,067,016	16.5908	3.7692	12.8216	27
HPwES Loan					
Administrative Spending					
Administration, Prog Dev.	$192,847	13.7807	16.5908	-2.8101	-1
Sales, Marketing, Website	$311,787	17.0063	16.5908	0.4155	0
Rebate Processing/Inspect	$419,223	9.9166	16.5908	-6.6742	-3
Evaluation	$43,609	9.9166	16.5908	-6.6742	0
SJG & NJCEP Incentives					
SJG HPwES Loan	$17,404,016	17.6257	16.5908	1.0349	18
NJCEP HPwES Rebate	$8,399,296	17.6257	16.5908	1.0349	9
Customer Net Costs					
HPwES Customer Net Costs	$3,026,496	17.6257	16.5908	1.0349	3

Source of Employment Impact	Base Amount	Employment Multiplier			Employment Impact
		With Program	Without Program	Change	
Customer Total Savings					
HPwES Natural Gas Savings	$5,432,359	16.5908	3.7692	12.8216	70
Total Employment Impact					133

Table VI-18 summarizes the economic impact of the SJG HVAC and HPwES programs on the state of New Jersey.

Table VI-18
Summary of SJG HVAC and HPwES Economic Benefits

Type of Impact	Impact
Output ($)	$833,312
Employment (job-years)	133

C. Health and Safety

In addition to the environmental and economic benefits quantified in this section, the programs have impacts on customer health and safety. One direct impact is that the SJG programs require the installation of a high-efficiency water heating system when a high-efficiency heating system is installed through the programs. As a result, many customers installed this equipment and avoided potential backdrafting problems caused by orphaned water heaters.

While data were not available to quantify other health and safety benefits, these programs result in identification and resolution of the following types of problems.

- Gas leaks
- Improper dryer venting
- Improper bath venting
- CO levels above acceptable ranges
- Water heater backdrafting
- Moisture issues
- Structure issues
- Asbestos issues

We recommend that SJG collect data to assess the magnitude of these impacts.

D. Summary

The energy efficiency installations under the HVAC and HPwES programs resulted in lifetime benefits of $2,690,790.

The SJG HVAC and HPwES programs also increased both output and employment in the state of New Jersey. Output increased by $833,312 as a result of the programs, and 133 jobs were created.

Table VI-19
Summary of Benefits

Benefit Type	HVAC	HPwES	Total Benefit
Environmental	$741,213	$1,949,576	$2,690,790
Economic	$136,453	$696,859	$833,312
Total	$877,666	$2,646,435	$3,524,102

In addition to the environmental and economic benefits quantified in this section, the programs have impacts on customer health and safety.

E. Sources

Bureau of Economic Analysis. Regional Input-Output Modeling System II Multipliers. 2010. Accessed 17 July 2015.

Bureau of Labor Statistics. CPI Inflation Calculator. Accessed August 2016. Retrieved from http://www.bls.gov/data/inflation_calculator.htm

Environmental Protection Agency. eGRID2012 Version 1.0 Year 2009 Data. 2012. Accessed August 2016.

Environmental Protection Agency. "Section 1.4: Natural Gas," *Compilation of Air Pollutant Emission Factors*. 1998. p.5-6.

Muller, Nicholas. Air Pollution Emission Experiments and Policy Analysis Model (APEEP) Data. 2008. Accessed August 2016.

National Research Council. *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use.* The National Academies Press, Washington, DC. 2010. p241.

Office of Management and Budget. "Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis." July 2015. p17.

VII. Summary of Findings and Recommendations

SJG's Energy Efficiency Program has achieved many successes since its implementation in 2009.

- Customer Participation: SJG has significantly ramped up participation in the HVAC and HPwES programs since SJG increased marketing in 2014.

- Contractor Recruitment: SJG has educated contractors about the potential of home performance for their businesses and increased the number of participating home performance contractors.

- Satisfaction: Participants and contractors expressed high levels of satisfaction with the SJG programs.

- Gas Usage Impacts: The HVAC and HPwES programs achieved significant natural gas savings.

- Non-Energy Benefits: The SJG programs achieved significant environmental, economic, and health and safety benefits.

- Incremental Impact: The SJG programs created additional participation and investment in energy efficiency.

    - Awareness: Customers were most likely to report that they learned about the SJG programs through their contractors, and contractors were most likely to report that they learned about the programs from SJG. SJG's marketing created awareness of the NJCEP programs and the additional SJG incentives and increased energy efficiency activity.

    - HVAC Implementation: The SJG programs influenced customers to install high-efficiency heating and water heating systems. When asked whether they would have chosen the high-efficiency equipment if the SJG rebate or loan was not available, 24 percent said they would not have chosen the high-efficiency heating system if the rebate was not available and 48 percent said they would not have installed the high-efficiency heating system if the loan was not available. Percentages were similar for the water heating system.

    - HVAC Additional Measures: HVAC participants installed additional measures as a result of the SJG home energy assessment. While 44 percent said that Shore Green Energy made recommendations for additional work to further improve the energy efficiency of the home, 16 percent said that they made additional improvements.

    - HPwES Implementation: The SJG HPwES program influenced customers to undertake additional efficiency improvements. Only 13 percent said that they would have installed all of the improvements they did if the SJG loan was not available. While 36 percent said they would not have installed insulation without the SJG loan,

16 percent said they would not have installed the water heating system, 15 percent said they would not have had the air sealing work done, eight percent said they would not have installed the new heating system, and six percent said they would not have installed the air conditioning system.

Key recommendations relating to program design, marketing and outreach, implementation, Energy Finance Solutions, and data collection are provided below.

A. Program Design

1. Program Offering: Customers who have installed high-efficiency heating and water heating systems have fewer opportunities for energy savings through the Home Performance Program. South Jersey Gas should consider other incentives to encourage customers who have participated in the HVAC Loan or Rebate Program to move forward with additional whole house energy efficiency improvements, even if they don't receive the highest incentives under the NJCEP HPwES Program.

2. OPower Neighbor Comparison: OPower respondents did not feel that the neighbor comparison was helpful because they were not convinced that the comparison was a useful one. The reports should provide more information on the selection of neighbors for the comparison and why it is a valid comparison. (Note that while 16 percent said they were very satisfied with the information received, 62 percent said they were somewhat satisfied.)

3. OPower SJG Program Information: The OPower mailing is a great opportunity to market the SJG residential energy efficiency programs. The mailing should include key information on the programs in the text of the report. SJG has discussed this change with OPower and they are planning to include the information in the next round of reports.

B. Marketing and Outreach

1. Contractor Outreach: Participants were most likely to report that they learned about the program through their contractor and contractors were most likely to report that they learned about the program from SJG. SJG should continue intensive outreach and support to contractors, as they are the most important channel for customer recruitment.

2. Contractor Materials: Some HVAC rebate participants were not aware that they would receive a rebate from SJG in addition to the rebate from the NJCEP. While SJG has provided information to contractors on the NJCEP and SJG rebates available, we recommend that SJG develop a simplified brochure for contractors to provide to customers that provides information on the SJG rebate, the NJCEP rebate, and the total rebate. This may encourage additional customers to install high-efficiency equipment.

C. Implementation

1. Shore Green Energy Education: Shore Green Energy should educate customers with good opportunities for whole house performance work about the NJCEP HPwES Program and additional benefits offered by SJG. (Note: Shore Green Energy is wary of referring customers to the HPwES Program because customers may be dissatisfied that their HVAC contractor, who was not a home performance contractor, did not let them know about this program option.)

2. CO Detector Education: SJG should encourage contractors to provide carbon monoxide detectors as part of their heating system installation, as this was the most common problem found by Shore Green Energy in 30 percent of their inspections. (SJG reported that they will consider providing CO detectors in their next filing.)

D. Energy Finance Solutions (EFS)

EFS has reported several improvements in their loan process and their website over the past year. Additional research should be conducted to ensure that these improvements have resulted in higher levels of customer satisfaction. The following issues were identified during the evaluation.

1. Energy Finance Solutions Paperwork: Paperwork required by EFS appears to be a burden for many customers. SJG should work with EFS to determine whether there are any ways to reduce the paperwork required for the SJG loans.

2. Energy Finance Solutions Processing: Participants were sometimes dissatisfied with the loan process because they had to resubmit the same information several times, they were asked for additional documentation during the loan application process that was not originally listed, or they did not receive effective customer service from EFS representatives. Some participants noted that they needed to have their contractor contact EFS to resolve the issues. SJG should discuss potential improvements with EFS.

3. Energy Finance Solutions Website: Participants noted that the EFS website was challenging and froze or did not work properly. SJG should assess whether these problems have declined since the improvements were made.

E. Data Collection

1. Account Numbers: A significant percentage of the HVAC Loan participant data was missing the customer's SJG account number. As a result, these customers could not be included in the usage impact analysis. SJG should work with the NJCEP or EFS to make sure that these data are available.

2. Health and Safety Information: We recommend that SJG collect data to assess the magnitude of the health and safety impacts.
   - HVAC Participants: SJG could develop a data collection spreadsheet for Shore Green Energy to report information on health and safety issues identified and discussed with

customers. These should include gas leaks, high levels of ambient CO or high levels of CO in the flue, venting issues, mold and moisture issues, and asbestos issues.

- HPwES Participants: SJG should discuss collection, reporting, and sharing of similar health and safety data with the NJCEP.

F. SJG Program Continuation

SJG's energy efficiency programs have increased investments in energy efficiency and resulted in high natural gas savings and other non-energy benefits. We recommend that these programs are continued if funding continues to be available.