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# Memorandum

TO: MAURA CAROSELLI, KURT LEWANDOWSKI, FELICIA-THOMAS FRIEL, NEW JERSEY DIVISION OF RATE COUNSEL

FROM: KENJI TAKAHASHI, ALICE NAPOLEON, SYNAPSE ENERGY ECONOMICS

DATE: APRIL 5, 2021

RE: REVIEW OF 2020 PSE&G GREEN PROGRAMS COST RECOVERY (DOCKET NO. ER20060467 & GR20060468)

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## 1. Introduction and Summary

New Jersey Division of Rate Counsel (Rate Counsel) commissioned Synapse Energy Economics, Inc. (Synapse) to provide expert technical assistance related to the energy efficiency programs within Public Service Electric and Gas Company (PSE&G)'s 2020 Green Programs Cost Recovery Filing. This memorandum provides our findings and recommendations based on our review of PSE&G's Green Program filing as well as its response to our data requests.

In its Petition to the Board of Public Utilities ("the Board") on June 29, 2020, PSE&G (or "the Company") requested that the Board approve the Company's proposed changes to the Green Program Recovery Charges (GPRC) that will allow the Company to recover revenue requirements for the actual program costs of 11 PSE&G Green Programs from April 1, 2019 to March 31, 2020 and forecasted costs through September 30, 2021. Five of the components relate to energy efficiency (EE): (1) the Carbon Abatement (CA) Program, (2) the Energy Efficiency Economic (EEE) Stimulus Program, (3) the EEE Extension (Extension I) Program, (4) the EEE Extension II (Extension II) Program, and (5) the Energy Efficiency 2017 (EE 2017) Program.

While it is not clearly written in the Petition, the cost recovery for the EE 2017 Program also includes the costs associated with the first extension of the EE 2017 Program, the EE 2017 Extension I Program, which was approved in an Order by the Board dated September 11, 2019. This Order also stated that revenue requirements associated with the incremental expenditures for the EE 2017 Extension I Program would be recovered through the EE 2017 component of the GPRC (Petition, page 41).<sup>1</sup> Further, as part of its cost recovery filing, the Company also proposes to add the costs associated with Clean

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<sup>1</sup> Also see Stipulation of Settlement, BPU Docket Nos. GO18101112 and EO1810113, page 4, enclosed in the Board's February 19, 2020 Order, in the Matter of Petition of PSE&G for Approval of Its Clean Energy Future Energy Efficiency Program on a Regulated Basis.

Energy Act (CEA) studies as a new component to the GPRC. Such studies include a demographic study and a voltage optimization study required by the CEA.

Our review focuses on the results for the EE 2017 Program, as this program had the majority of new program participants and measure installations during the program year review period. While the EEEI Program also had activity during this period, it only had a total of two participants (Petition, Attachment A, Schedule KR-EEEXII-3). The total expenditures for the EE 2017 and EEEI programs were approximately \$42 million and \$5.5 million, respectively (Petition, Attachment A, Schedule KR-EE117-2 and KR-EEEXII-2).

Our findings are summarized below for each key area.

- **CEA costs:** The only CEA-related costs included in this cost recovery filing were the costs associated with the two CEA studies. We found that the process of selecting consultants and the cost allocation among the utilities for the studies were reasonable.
- **Program spending status:** PSE&G had 31 percent higher expenditures (nearly \$10 million more) for April 2019 to March 2020 than originally budgeted for in the EE 2017 Program, largely due to the spending on the Direct Install and Smart Thermostat sub-programs. However, this additional spending was less than the additional budget approved under the EE 2017 Extension I Program.
- **Spending per participant:** Spending per participant was comparable to our estimates based on the original EE 2017 filing for all sub-programs, except for the Direct Install Sub-Program and the Smart Thermostats Sub-Program. For the Direct Install Sub-Program, the Company spent about 40 percent more per participant on average than planned. Spending per participant for the Smart Thermostat Sub-Program was roughly 40 percent less than projected, on average.
- **Savings per participant:** The actual annual savings per participant were substantially lower than estimated in the original EE 2017 filing. Gas savings for the Multifamily, Data Analytics, and Hospital sub-programs were about 70 to 90 percent lower than originally projected, while gas savings for the Direct Install Sub-Program was about 30 percent higher. Electric savings were similar between actuals and projections except for the Data Analytics Sub-Program, which had about 65 percent lower savings.
- **Cost of saved energy for electricity energy efficiency:** The electric energy efficiency (EE) projects under the EE 2017 Program, overall, cost \$0.04 per kWh of lifetime savings. That is approximately 55 percent more than the cost of saved energy (CSE) based on the projected performance at the portfolio level. However, this level of CSE is cost effective based on the 2019 avoided cost estimates, calculated by the Rutgers Center for Green Building (RCGB). Among all sub-programs, the Data Analytics and the Direct Install sub-programs were the most expensive, at \$0.10 per kWh of lifetime savings and \$0.06 per kWh of lifetime savings, respectively (i.e., 179 percent and 185 percent more than originally estimated).



- **Cost of saved energy for gas energy efficiency:** Overall, the gas EE projects under the EE 2017 Program cost \$3.40 per Dekatherm (Dtherm) of lifetime savings, or about 39 percent less than the planned CSE at the portfolio level. This level of CSE for gas EE is cost effective based on the RCGB’s avoided cost estimates. By sub-program, the Multifamily, Data Analytics, and Hospital sub-programs were substantially more expensive than originally projected, at \$9.40 per Dtherm, \$27 per Dtherm, and \$57 per Dtherm of lifetime savings, respectively. On the other hand, the Direct Install Sub-Program was substantially cheaper at \$1.40 per Dtherm, 95 percent lower than projected, which kept the overall cost of saved energy for natural gas at a reasonable level for the entire EE 2017 Program.
- **Potential excess expenditures:** We estimated what the level of program investment would be if the CSE performance stayed at the same levels as originally projected, but actual savings levels were achieved. Overall, we found that the EE 2017 Program investment would be approximately \$7 million less, or 26 percent lower, than originally projected. We estimated that the Multifamily Sub-Program would have the largest impact, at \$3 million, with the original CSE estimate. This is followed by the Hospital and Data Analytics sub-programs, with about \$1.5 million and \$1.3 million impacts, respectively.
- **Measure specific review:**
  - **Multifamily low-income smart thermostat pilot:** This pilot spent approximately \$470 per customer. This includes the cost of a thermostat (about \$100) and the cost of installation labor (about \$370). This cost appears to be overly expensive. The average cost for an individual residential customer to hire a contractor to install a smart thermostat ranges \$200 to \$450.<sup>2</sup> When an energy efficiency program makes a bulk purchase procurement, we expect the total installed cost of a smart thermostat to be lower than cost estimates for individual customers due to build purchase discounts.
  - **Lighting control measure:** PSE&G used an 18-year measure life for lighting control measures under the Multifamily Sub-Program. This assumption was updated by the Board to 8 years in June 2018. This assumption would make lighting control measures substantially more expensive than initially projected (making several of the past lighting measures 20 to 80 cents per kWh lifetime savings). However, we do not have an issue with the Company’s original estimate, as it used a measure life that was reasonable and consistent with state guidance at the time of the program filing (i.e., an 18-year measure life).

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<sup>2</sup> HomeGuide. “Thermostat Replacement Cost.” Accessed on March 9. Available at <https://homeguide.com/costs/thermostat-installation-cost>; HomeAdvisor. “Thermostat Costs.” Accessed on March 9. Available at <https://www.homeadvisor.com/cost/heating-and-cooling/install-a-thermostat/>

We have recommendations in a few areas, as follows:

- Given the high cost and poor performance of the EE 2017 Program to date, we have two recommendations for the Company, as follows:
  - For future program extensions, the Company should verify and demonstrate that it is using the latest available information on the costs and savings of any programs the Company is requesting to extend.
  - The Company should conduct a benchmarking assessment of the sub-programs under the EE 2017 Program, EE 2017 Extension I Program, and EE 2017 Extension II Program, prior to any further extensions. The purpose of the assessment would be to evaluate the performance and program designs of the sub-programs as compared to similar programs in other jurisdictions. At a minimum, this analysis should review costs of saved energy, benefit cost ratios, level of incentives, and savings. The findings from the benchmarking analysis could also be applied to the Company's ongoing CEA Program, the Clean Energy Future-Energy Efficiency (CEF-EE) Program, because CEF-EE's Residential Behavior, Residential Multifamily, and Direct Install sub-programs are very similar to the Data Analytics, Multifamily, and Direct Install sub-programs under the EE 2017 Program.
- If PSE&G decides to implement the Multifamily Low-income Smart Thermostat Pilot Sub-Program as a regular program with a broader scale, we offer two recommendations to reduce the cost of this program, as follows:
  - If the Company is not already doing so, we recommend that PSE&G use a competitive procurement process to (1) purchase smart thermostats and (2) hire contractors to administer the program and to install thermostats.
  - We recommend that PSE&G take full advantage of the opportunity to access the customer and the customer's premises. PSE&G can better leverage its direct install program delivery mechanism by encouraging or requiring vendors to install other low-cost energy efficiency measures during the same visit to install a smart thermostat. We expect that this approach will significantly increase energy savings for participants and improve the cost-effectiveness of the program.
- For any future program extensions, we strongly recommend that the Company use the latest measure performance data, including annual energy savings and measure life, and update its benefit cost results as a condition of program extension approval. One specific example is the measure life of lighting control measures. We recommend that the Company use the updated measure life of 8 years for lighting control measures and update its benefit cost analysis when seeking an extension of any existing programs.



## 2. CEA related Costs

As part of its cost recovery filing, the Company proposes to add the costs associated with CEA studies as a new component to the GPRC. Such studies include a demographic study and a voltage optimization study required by the CEA. The Company projects total revenue requirements of \$370,270 for electric and \$95,630 for gas for these two studies for the period from October 1, 2020 through September 30, 2021 (Petition, Attachment B, page 23).

Per the Board's order dated May 28, 2019, the New Jersey electric and gas utilities developed a joint RFP and procured a consultant to perform the voltage optimization study. The utilities hired Navigant Consulting, Inc. PSE&G submitted its portion of the study to the Board on January 15, 2020 (Petition, page 43 and 44). In response to our data request, PSE&G stated that the cost of the study was allocated among the utilities based on their sales share (Company's response to RCR-EE-21). The Company also stated that it received 4 bids to the RFP and selected one consultant based on various criteria including expertise on voltage optimization studies, description of methodologies, key staff members and experience, and price of the bids (Company's response to RCR-EE-21). Based on our limited review, it appears that the bidding process was fair and reasonable.

Per the Board's order dated October 7, 2019, the New Jersey electric and gas utilities develop a joint RFP for a demographic study and procured a consultant to perform this study. The study was submitted to the Board on May 1, 2020 (Petition, pages 44 and 45). The cost of the Demographic study was allocated across utilities based on their reported jurisdictional revenues, with PSE&G responsible for approximately 56 percent of the total cost of the study (Company's response to RCR-EE-20). We find that the study cost allocation is reasonable.

## 3. Status of Program Spending

PSE&G had 31 percent higher expenditures (nearly \$10 million more) for April 2019 to March 2020 than originally budgeted, largely due to the overspending on the Direct Install and Smart Thermostat sub-programs. However, in response to our data request RCR-EE-25-b and c, the Company revealed that the budget estimate for the EE 2017 Program provided in this cost recovery filing only includes the budget for the initial program approved in August 2017. This explains the large difference between actual spending and the original spending forecast.

**Table 1** below provides a summary of the actual program spending and the original budget by program. PSE&G spent 470 percent more on the Smart Thermostat Sub-Program (\$3.1 million) and 56 percent more on the Direct Install Sub-program (\$3.3 million) than it originally budgeted. However, as shown in **Table 2**, the additional budget authorized under the EE 2017 Extension I Program is sufficient to cover actual spending in excess of the original budget.



**Table 1. EE 2017 Program – Actual Spending vs. Budget**

	<b>Actual Spending</b>	<b>Budget</b>	<b>Difference (\$)</b>	<b>Difference (%)</b>
<b>Residential</b>				
Multi-Family	\$11,077,085	\$9,171,495	\$1,905,590	21%
Smart Thermostat	\$3,777,283	\$661,451	\$3,115,832	471%
Data Analytics	\$1,702,502	\$1,450,506	\$251,996	17%
<b>Commercial &amp; Industrial program</b>				
Hospitals	\$10,628,948	\$9,332,518	\$1,296,430	14%
Direct Install	\$9,286,584	\$5,966,311	\$3,320,273	56%
<b>Total</b>	<b>\$36,472,402</b>	<b>\$26,582,281</b>	<b>\$9,890,121</b>	<b>37%</b>

Source: Schedule KR-EE17-2; RCR-EE\_0006\_2020-03-31 - Attach A - Reif - Sch KR-EE17-2-8 revised.xlsx

**Table 2. Excess Spending Over the EE 2017 Original Filing and Additional Budget**

	<b>Excess over the Original Budget</b>	<b>EE 2017 Extension I Budget</b>
Multi-Family	\$1,905,590	\$10,000,000
Smart Thermostat	\$3,115,832	\$3,250,000
Data Analytics	\$251,996	\$1,250,000
Hospitals	\$1,296,430	\$12,500,000
Direct Install	\$3,320,273	\$0
<b>Total</b>	<b>\$9,890,121</b>	<b>\$14,500,000</b>

Source: Petition, page 42.

## 4. Spending and Savings per Participant

As mentioned above, the Company’s estimated EE 2017 Program budget does not include any of the additional funding approved under the EE 2017 Extension I. This is also true for program participants and savings. Thus, to properly assess the actual performance of the EE 2017 Program, we reviewed the program performance on a per-unit basis - more specifically, based on spending per participant and savings per participant. This allowed us to compare the performance between the actual results and the original projection.

**Table 3** below presents participant and cost data as well as our estimates of spending per participant between the actual results from April 2019 through March 2020 and the original plan. We found that actual spending per participant is comparable to the estimate based on the original EE 2017 filing for all sub-programs except the Direct Install Sub-Program and the Smart Thermostats Sub-Program. For the Direct Install Sub-Program the Company spent about 40 percent more per participant, on average, than

planned. Spending per participant for the Smart Thermostat Sub-Program is roughly 40 percent less than projected, on average.

**Table 3. Spending per Participant – Actual vs. Original Projection**

	Actual Performance (April 2019 - March 2020)			EE 2017 Original Projection			\$ per participant difference (%)
	Participants	Cost (\$ million)	\$ per participant	Participants	Cost* (\$ million)	\$ per participant	
<b>Residential program</b>							
Multifamily	8	11	1,384,636	17	20	1,176,471	18%
Smart Thermostats	18,898	4	200	35,399	12	325	-38%
Data Analytics	63,389	2	27	75,000	3	33	-19%
<b>Commercial &amp; Industrial program</b>							
Direct Install	187	9	49,661	429	15	34,965	42%
Hospitals & Healthcare	4	11	2,657,237	9	25	2,777,778	-4%

*\* The budget for the Smart Thermostats Sub-Program is based on “RCR-EE\_0023\_2017-03-03 - Attach 1 - McCormick - Sch MCM-EE17-5 - Budgets and Repayments.xlsx”. This budget estimate is different from the budget estimate for the same sub-program (\$6.5 million) shown on page 42 of the Petition. Source: Schedule KR-EE17-3; Schedule KR-EE17-2; RCR-EE\_0006\_2020-03-31 - Attach A - Reif - Sch KR-EE17-2-8 revised.xlsx; RCR-EE-0005\_Participant comparison.pdf*

**Table 4** presents a comparison of annual savings per participant based on actual performance and the original projection.<sup>3</sup> The actual savings per participant for the compliance period turned out to be substantially lower than projected in the original 2017 filing for a few programs. Gas savings for the Multifamily, Data Analytics, and Hospital sub-programs were about 70 to 90 percent lower than originally projected, while gas savings for the Direct Install Sub-Program were about 30 percent higher. Differences between actual and projected electric savings tended to be smaller than for gas, but actual electric savings for the Data Analytics Sub-Program were about 65 percent lower than projections based on the original filing. **Table 5** presents a similar comparison based on lifetime energy savings instead of annual energy savings. The differences in lifetime savings among sub-programs are similar to the differences we found in **Table 4** for annual savings.

<sup>3</sup> Data to allow comparison of total program savings relative to projected program savings are not available. Savings projections are not available for the EE 2017 Extension and the original savings forecast is not available for the time frame considered in this proceeding (April 2019 to March 2020).

**Table 4. Annual Savings per Participant – Actual vs. Original Projection**

	Actual Performance (April 2019 - March 2020)		EE 2017 Original Projection		Savings per Participant Difference	
	MWh per participant	Dth per participant	MWh per participant	Dth per participant	MWh per participant (%)	Dth per participant (%)
<b>Residential program</b>						
Multifamily	400	2,574	368	9,677	9%	-73%
Smart Thermostats	0.37	10.9	0.44	10.5	-16%	3%
Data Analytics	0.05	0.1	0.14	1.5	-64%	-93%
<b>Commercial &amp; Industrial program</b>						
Direct Install	54	62	44	15	23%	322%
Hospitals & Healthcare	2,134	1,642	1,515	7,202	41%	-77%

Source: RCR-EE\_0026\_Energy savings comparison revised 2.5.21.xlsx; SCHEDULE KR-EE17-3; RCR-EE-0005\_Participant comparison.pdf

**Table 5. Lifetime Savings per Participant – Actual vs. Original Projection**

	Actual Performance		EE 2017 Original		Savings per Participant	
	MWh per participant	Dth per participant	MWh per participant	Dth per participant	MWh per participant (%)	Dth per participant (%)
<b>Residential program</b>						
Multifamily	6,697	53,929	5,522	193,531	21%	-72%
Smart Thermostats	3.7	109	4.4	105	-16%	3%
Data Analytics	0.2	0.3	0.6	6.2	-70%	-94%
<b>Commercial &amp; Industrial program</b>						
Direct Install	816	1,180	664	265	23%	346%
Hospitals & Healthcare	36,157	9,464	28,788	158,444	26%	-94%

Source: RCR-EE\_0026\_Energy savings comparison revised 2.5.21.xlsx; SCHEDULE KR-EE17-3; RCR-EE-0005\_Participant comparison.pdf

## 5. Cost of Saved Energy

In order to assess the reasonableness of the program cost, we also investigated the cost of saved electricity and natural gas based on the actual performance and the original projection of the performance for the EE 2017 Program. **Table 6** and **Table 7** below present costs and lifetime savings estimates based on the actual performance and the original projection. Because some of the sub-programs offer project cost financing services for program participants, we also provide the expected amount of repayments estimated by the Company for each sub-program. These include the Multifamily, Direct Install, and Hospital sub-programs. As shown in the table, the Multifamily Sub-Program buys down payback years by five years or less, down to a project payback of not less than two years. It also provides an interest free loan for the remainder of the project cost, for which the Company does not provide financial incentives (Petition, Attachment A, page 50). The Direct Install Sub-Program provides



100 percent of the project cost and requires customers to payback 20 percent of the cost (Petition, Attachment A, page 53). For estimating costs of saved energy, we used the total net costs, which subtract the amount of the expected repayments from total costs. These costs are shown as “Elec EE Cost with Repayment” and “Gas EE Cost with Repayment” in the tables below.

**Table 6. 2017 EE Program Actual Cost and Lifetime Savings - April 2019-March 2020**

	Actual Cost (\$ million)	Estimated Cost with Repayment (\$ million)	Elec EE Cost with Repayment (\$ million)	Gas EE Cost with Repayment (\$ million)	Lifetime Electric Savings - Actual (MWh)	Lifetime Gas Savings - Actual (Dth)
<b>Residential program</b>						
Multifamily	11.1	5.7	1.7	4.1	53,579	431,431
Smart Thermostats	3.8	3.8	1.6	2.1	69,282	2,051,444
Data Analytics	1.7	1.7	1.1	0.6	10,800	22,138
<b>Commercial &amp; Industrial program</b>						
Direct Install	9.3	9.1	8.8	0.3	152,542	220,715
Hospitals & Healthcare	10.6	6.8	4.6	2.1	144,626	37,854
<b>Total</b>	<b>36</b>	<b>27</b>	<b>18</b>	<b>9</b>	<b>430,829</b>	<b>2,763,582</b>

Source: WP-KR-EE17-1; “RCR-EE\_0026\_Energy savings comparison revised 2.5.21.xlsx”

**Table 7. 2017 EE Program as Filed Budget and Lifetime Savings - 2017-2020**

	Budget (\$ million)*	Estimated Cost with Repayment (\$ million)	Elec EE Cost with Repayment (\$ million)	Gas EE Cost with Repayment (\$ million)	Lifetime Gas Savings - Actual (MWh)	Lifetime Electric Savings - Actual (MWh)
<b>Residential program</b>						
Multifamily	20.0	11.4	3.3	8.1	93,871	3,290,023
Smart Thermostats	11.5	6.4	2.8	3.6	154,411	3,731,253
Data Analytics	2.5	2.5	1.6	0.9	42,943	466,174
<b>Commercial &amp; Industrial program</b>						
Direct Install	15.0	8.4	5.8	2.7	285,000	113,636
Hospitals & Healthcare	25.0	15.1	9.2	5.9	259,091	1,425,993
<b>Total</b>	<b>74</b>	<b>44</b>	<b>23</b>	<b>21</b>	<b>835,316</b>	<b>9,027,080</b>

\* The budget for the Smart Thermostats is based on “RCR-EE\_0023\_2017-03-03 - Attach 1 - McCormick - Sch MCM-EE17-5 - Budgets and Repayments.xlsx”. This budget estimate is different from the budget estimate for the same sub-program (\$6.5 million) shown on page 42 of the Petition: Source: MCM-EE17-5; “RCR-EE\_0023\_2017-03-03 - Attach 1 - McCormick - Sch MCM-EE17-5 - Budgets and Repayments.xlsx”; “RCR-EE\_0026\_Energy savings comparison revised 2.5.21.xlsx”

Table 8 and Table 9 show the cost of saved energy (CSE) estimates for electric EE and gas EE separately and compare the CSE based on actual and projected performance for each sub-program. The EE 2017 Program cost \$0.04 per kWh lifetime savings as shown in Table 8. This is about 55 percent higher than the CSE based on the projected performance at the portfolio level. However, this level of CSE is cost



effective based on the 2019 avoided cost estimates by the Rutgers Center for Green Building (RCGB).<sup>4</sup> We estimate that the total avoided electricity cost for 2020 would be \$0.06 per kWh. This includes avoided costs of generation, capacity, transmission, and distribution, and excludes avoided costs of carbon emissions.<sup>5</sup> On the other hand, the CSE for the Data Analytics Sub-Program (which sends personalized home energy reports to program participants) turned out to be \$0.10 per kWh, or 170 percent higher than the projection. However, its impact on the portfolio was minimal. The total electric expenditure for this sub-program only accounts for 6 percent of the total electric expenditure at the portfolio level (the cost was \$1.7 million, as shown in Table 6). The electric CSE for the Direct Install Sub-Program was \$0.06 per kWh, which is also substantially larger than the CSE for the projected performance, but much lower than the CSE for the Data Analytics Sub-Program. It is also very close to the avoided cost estimate mentioned above.

**Table 8. Cost of Saved Energy for Lifetime Electric EE Savings – Actual vs. Projection**

	CSE - actual performance (\$/kWh)	CSE - original estimates (\$/kWh)	% change over original estimates
<b>Residential program</b>			
Multifamily	0.031	0.029	6%
Smart Thermostats	0.024	0.018	32%
Data Analytics	0.102	0.038	171%
<b>Commercial &amp; Industrial program</b>			
Direct Install	0.058	0.020	185%
Hospitals & Healthcare	0.032	0.036	-10%
<b>Total</b>	0.041	0.027	56%

As shown in Table 9 below, the CSE estimate for natural gas savings was \$3.40 per Dtherm lifetime savings at the portfolio level. This estimate was just 39 percent higher than originally projected. However, the CSE for three of the sub-programs turned out to be much higher than the CSE estimates based on the original performance projection. These high-cost sub-programs are the Multifamily (260 percent higher at \$9.40 per Dtherm), Data Analytics (1,330 percent higher at \$27 per Dtherm), and Hospital (1,260 percent higher at \$57 per Dtherm) sub-programs. On the other hand, the Direct Install Sub-Program was only about \$1.4 per Dtherm - about 95 percent lower than the CSE estimate based on the original filing data.

<sup>4</sup> Rutgers Center for Green Building. 2019. *Energy Efficiency Cost-Benefit Analysis Avoided Cost Assumptions – Technical Memo*, May 1, 2019 Update. Available at: <https://www.njcleanenergy.com/files/file/BPU/Avoided%20Cost%20Memo.pdf>

<sup>5</sup> Assuming a 50 percent load factor to convert avoided costs in kW-year for capacity, transmission, and distribution.

**Table 9. Cost of Saved Energy (CSE) for Lifetime Gas EE Savings – Actual vs. Projection**

	CSE - actual performance (\$/Dtherm)	CSE - original estimates (\$/Dtherm)	% change over original estimates
<b>Residential program</b>			
Multifamily	9.4	2.6	260%
Smart Thermostats	1.0	1.0	8%
Data Analytics	26.9	1.9	1333%
<b>Commercial &amp; Industrial program</b>			
Direct Install	1.4	23.4	-94%
Hospitals & Healthcare	56.6	4.2	1263%
<b>Total</b>	<b>3.4</b>	<b>2.4</b>	<b>39%</b>

As mentioned above, the overall CSE results for electricity and gas savings are very reasonable at the portfolio level despite being 40 to 55 percent higher than originally projected. It is also important to note that the Company provides funding to projects under the Multifamily and Hospital sub-programs only if they receive a Program Administrator Cost (PAC) score of 1.0 or higher (Petition, Attachment A, page 51 and 56). The Company provided a PAC score for each project in its response to our data request, RCR-EE-0028, which shows all projects under these sub-programs, as well as the Direct Install Sub-Program, have a PAC benefit cost ratio of 1.0 or higher. It appears that poor CSE results for gas savings were offset by better CSE results for electric savings for most of the sub-programs, while for poor CSE results for electric savings were offset by better CSE results for gas savings for the Direct Install Sub-Program.

However, the CSE results for some sub-programs are still concerning. The Multifamily Sub-Program, the Data Analytics Sub-Program, and the Hospital Sub-Program achieved CSE results for gas that were substantially higher than originally projected. Given the poor performance of these sub-programs, we have two recommendations for the Company, as follows:

- For future program extensions, the Company should verify and demonstrate that it is using the latest available information on the costs and savings of any programs the Company is requesting to extend.
- The Company should conduct a benchmarking assessment of the sub-programs under the EE 2017 Program, the EE 2017 Extension I Program, and the EE 2017 Extension II Program prior to any further extensions. The purpose of the assessment would be to evaluate the performance and program designs of the sub-programs as compared to similar programs in other jurisdictions. At a minimum, this analysis should review costs of saved energy, benefit cost ratios, level of incentives, and savings.

The findings from the benchmarking analysis could also be applied to the Company's ongoing CEA Program, the Clean Energy Future-Energy Efficiency (CEF-EE) Program, because CEF-EE's Residential

Behavior, Residential Multifamily, and Direct Install sub-programs are very similar to the Data Analytics, Multifamily, and Direct Install sub-programs under the EE 2017 Program.

## 6. Calculation of Potential Excess Expenditures

While the overall CSE results for the EE 2017 Program are reasonable, we estimated what the level of program investment would be for the actual program savings if the CSE performance stayed at the same levels as originally projected. More specifically, we applied the CSE that was expected for each sub-program in the original filing to the actual projected lifetime savings based on the actual program performance.

Table 10 presents (1) actual electric EE investment costs (excluding administration and IT costs) for March 2019 through April 2020 for the EE 2017 Program and (2) adjusted electric EE investment costs that we estimated using (a) actual electric lifetime savings and (b) original CSE estimates. Because the original electric CSE estimates were lower for all sub-programs except the Hospital Sub-Program, as shown in Table 8, we estimate that the total electric investment would be \$6.4 million lower (i.e., 36 percent lower) applying the planned CSE to actual savings. Among all, the largest contributor to this cost impact is the Direct Install Sub-Program, which would cost \$5.7 million less using the original CSE estimate.

**Table 10. Actual Electric EE Cost vs. Adjusted Electric EE Cost with Original CSE Estimates**

	<b>Actual Electric EE Cost (\$ million)</b>	<b>Adjusted Electric EE Cost (\$ million)</b>	<b>Difference (\$ million)</b>	<b>Difference (%)</b>
<b>Residential program</b>				
Multifamily	1.67	1.58	(0.10)	-6%
Smart Thermostats	1.64	1.24	(0.40)	-24%
Data Analytics	1.11	0.41	(0.70)	-63%
<b>Commercial &amp; Industrial program</b>				
Direct Install	8.80	3.09	(5.72)	-65%
Hospitals & Healthcare	4.63	5.15	0.51	11%
<b>Total</b>	<b>17.85</b>	<b>11.46</b>	<b>(6.40)</b>	<b>-36%</b>

Table 11 presents (1) actual gas EE investment costs (excluding administration and IT costs) for March 2019 through April 2020 for the EE 2017 Program and (2) adjusted gas EE investment costs based on (a) actual lifetime gas savings and (b) original CSE estimates. Interestingly, unlike the impact on the electric EE projects, the Direct Install Sub-Program did very well, saving gas at a much lower cost than originally projected. Thus, using the CSE estimate (based on the sub-program as filed) and applying it to the actual lifetime gas savings would make the total gas cost higher than the actual cost by about \$4.9 million (i.e., 1545 percent higher). On the other hand, the rest of the sub-programs would cost less with the original CSE estimates. Together, the total net cost impact would be \$0.8 million lower (i.e., 8 percent lower) using the gas CSE estimate based on the original plan.

**Table 11. Actual Gas EE Cost vs. Adjusted Gas EE Cost with Original CSE Estimates**

	Actual Gas EE Cost (\$ million)	Adjusted Gas EE Cost (\$ million)	Difference (\$ million)	Difference (%)
<b>Residential program</b>				
Multifamily	4.1	1.13	(2.94)	-72%
Smart Thermostats	2.1	1.98	(0.16)	-7%
Data Analytics	0.6	0.04	(0.55)	-93%
<b>Commercial &amp; Industrial program</b>				
Direct Install	0.3	5.17	4.86	1545%
Hospitals & Healthcare	2.1	0.16	(1.98)	-93%
<b>Total</b>	<b>9.3</b>	<b>8.48</b>	<b>(0.78)</b>	<b>-8%</b>

Table 12 combines both electric and gas investment cost impacts in Table 10 and Table 11. Among all the sub-programs, we found that applying the original CSE estimate to the Multifamily Sub-Program would have the largest impact, at \$3 million. This is followed by the Hospital and Data Analytics sub-programs, with about \$1.5 million and \$1.3 million in cost impacts, respectively. Overall, we found that the EE 2017 Program would be approximately \$7 million less expensive with the originally projected CSE estimates.

**Table 12. Actual Total EE Cost vs. Adjusted Total EE Cost with Original CSE Estimates**

	Actual EE Cost (\$ million)	Adjusted EE Cost (\$ million)	Difference (\$ million)	Difference (%)
<b>Residential program</b>				
Multifamily	5.7	2.7	(3.04)	-53%
Smart Thermostats	3.8	3.2	(0.55)	-15%
Data Analytics	1.7	0.5	(1.25)	-74%
<b>Commercial &amp; Industrial program</b>				
Direct Install	9.1	8.3	(0.86)	-9%
Hospitals & Healthcare	6.8	5.3	(1.47)	-22%
<b>Total</b>	<b>27.1</b>	<b>19.94</b>	<b>(7.17)</b>	<b>-26%</b>

## 7. Measure Specific Review

### Smart Thermostat Lower Income Multifamily Pilot

In response to our data request, RCR-EE-0017, the Company provided detailed cost estimates for its Smart Thermostat Lower Income Multifamily Pilot, which is a subset of the Smart Thermostat Sub-Program. We found that this pilot spent approximately \$470 per customer. This cost includes the average cost of a thermostat (about \$100) and the average cost of installation labor (about \$370). This

cost appears to be unreasonably high. Total installed costs for a residential customer planning to hire a contractor to install a smart thermostat range from \$200 to \$450, based on one online source.<sup>6</sup> Another provided a range of \$200 to \$300+.<sup>7</sup> When an energy efficiency program makes a bulk purchase procurement, we expect that the total installed cost of a smart thermostat would be lower than cost estimates for individual customers due to bulk purchase discounts.

PSE&G hired a consultant to evaluate this Smart Thermostat Pilot Program. This evaluation study found participants' overall electricity usage went down by 3.2 percent on average and gas usage went down by 1.6 percent on average. The study also found that most of the participants were very satisfied or somewhat satisfied with the program. The study recommends a full-scale implementation of this program for PSE&G.<sup>8</sup>

If PSE&G decides to implement this pilot as a regular program on a broader scale, we offer two recommendations to reduce the cost of this program as follows:

- If the Company is not currently using a competitive procurement process for the pilot, we recommend that PSE&G do so. Competitive procurement should be used for (1) the purchase of smart thermostats and (2) hiring contractors to administer the program and to install thermostats.
- We recommend that PSE&G take full advantage of the opportunity to access the customer and the customer's premises. PSE&G can better leverage its direct install program delivery mechanism by encouraging or requiring vendors to install other low-cost energy efficiency measures such as LED light bulbs, water heater tank wraps, and low flow shower heads, during the same visit to install a smart thermostat. We expect this approach will significantly increase energy savings for participants and improve the cost-effectiveness of the program.

### **Lighting control projects**

Per the Company's response to RCR-EE-28, we found that the Company used an 18-year measure life for lighting control measures under the Multifamily Sub-Program. The BPU modified this assumption to 8 years in June 2018 according to the Company (RCR-EE-28). We do not have an issue with the Company's original estimate, as it used a measure life that was reasonable and consistent with state guidance at the time of the program filing (i.e., an 18-year measure life). However, for any future program extensions, we recommend that the Company use the updated measure life of 8 years for lighting control measures

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<sup>6</sup> HomeGuide. "Thermostat Replacement Cost." Accessed on March 9. Available at: <https://homeguide.com/costs/thermostat-installation-cost>

<sup>7</sup> HomeAdvisor. "Thermostat Costs." Accessed on March 9. Available at <https://www.homeadvisor.com/cost/heating-and-cooling/install-a-thermostat/>

<sup>8</sup> This report is titled "PSE&G Low-Income Multi-Family Smart Thermostat Pilot Program Evaluation" and was prepared by APPRISE on March 2020. We obtained the report from PSE&G in response to our data request RCR-EE-17. The file name is "RCR-EE\_0017\_PSEG Smart Thermostat Pilot Final Evaluation Report.pdf."



and update its benefit cost analysis. This is important because several lighting controls measures would have been quite expensive on a CSE basis if a measure life of 8 years is used instead of 18 years. We also strongly recommend that the Company use the latest measure performance data, including annual energy savings and measure life, and update its benefit cost results as a condition of program extension approval.

**Table 13** below shows our estimates of the CSE (lifetime) for actual lighting control projects using 18-year and 8-year measure lives. The adjusted \$/kWh values use an 8-year measure life. Several lighting control measures were already expensive, ranging from 10 cents to 38 cents per kWh lifetime savings. When the measure life was adjusted, those lighting control measures would become extremely expensive, ranging from 22 cents per kWh to as high as 84 cents per kWh.

**Table 13. Costs of Saved Energy – Original Estimates vs. Adjusted Estimates**

Program : Name	Project : Name	Measure : Type Name	Original \$/kWh	Adjusted \$/kWh
Multi-Family EE 2017	MF17_102210	Lighting Controls	0.15	0.34
Multi-Family EE 2017	MF17_102211	Lighting Controls	0.02	0.04
Multi-Family EE 2017	MF17_102211	Lighting Controls	0.02	0.03
Multi-Family EE 2017	MF17_102211	Lighting Controls	0.20	0.46
Multi-Family EE 2017	MF17_102211	Lighting Controls	0.02	0.05
Multi-Family EE 2017	MF17_102302	Lighting Controls	0.18	0.40
Multi-Family EE 2017	MF17_102303	Lighting Controls	0.24	0.55
Multi-Family EE 2017	MF17_102303	Lighting Controls	0.27	0.61
Multi-Family EE 2017	MF17_102303	Lighting Controls	0.06	0.13
Multi-Family EE 2017	MF17_102306	Lighting Controls	0.10	0.22
Multi-Family EE 2017	MF17_102709	Lighting Controls	0.38	0.84
Multi-Family EE 2017	MF17_103115	Lighting Controls	0.02	0.05
Multi-Family EE 2017	MF17_103000	Lighting Controls	0.07	0.15
Multi-Family EE 2017	MF17_103114	Lighting Controls	0.16	0.36
Multi-Family EE 2017	MF17_103114	Lighting Controls	0.12	0.27

Source: RCR-EE\_0011\_Measure list 11.23.20.xlsx

