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This appendix supplements the findings and results discussed in Section 4. The appendix is divided into five sections, summarized below in order of their appearance. Only the primary reason for discrepancy is provided for each site in this appendix.

- PRIME projects kWh realization rates and primary reason for discrepancy
- O&M projects kWh realization rates and primary reason for discrepancy
- RCx projects kWh realization rates and primary reason for discrepancy
- O&M projects MMBtu realization rates and primary reason for discrepancy
- RCx projects MMBtu realization rates and primary reason for discrepancy

# **PRIME Projects kWh Realization Rates and Primary Reason for Discrepancy**

Site ID	Reported kWh Savings	kWh RR	Primary Reason for Discrepancy
CT15-879459	32,082	267%	The evaluated savings for this project are greater than the claimed values. The tracking analysis assumed as-built production would increase from 35,000,000 to 36,900,000 parts (5.4% increase) based on a percent time savings for the changeover. The customer reported data showed the as-built annual production actually increased from 36,023,905 to 41,704,800 parts (15.8% increase).
CT15-882801	31,982	264%	The evaluated savings for this project are greater than the claimed values. The applicant used an annual facility energy usage value of approximately 600,000 kWh/yr, which was much lower than the nearly 3 million kWh annual usage indicated by the facility's pre-project billing data. This change resulted in higher than expected savings for the project.
CT14-820371	24,978	211%	The evaluated savings for this project are greater than the claimed values. The evaluators inventoried the equipment associated with the affected production line and, through on-site observations and conversations with facility staff, determined a more accurate breakdown of time- and load-dependent energy consumption for each piece of affected equipment. This is the largest contributor to the increase in savings.
CT15-917951	29,476	171%	The evaluated savings for this project are greater than the claimed values. The billing data for the ex ante savings calculation for the CNC project was based on annual billing data that was approximately one-fourth of the actual pre-installation electrical energy usage verified by the evaluators. Correcting this value resulted in higher evaluated savings.
CT15-883436	22,405	146%	The evaluated savings for this project are greater than the claimed values. The ex ante calculations assumed a 15% productivity improvement for the O&R process, but production data for this process area suggests closer to a 39% productivity improvement after the measure was completed. This increased savings.
CT15-900162	40,572	116%	The evaluated savings for this project are greater than the claimed values. The applicant analysis assumed that each of the PRIME events affected 100% of production, but the baseline quantities used in their analysis did not reflect this. Based on the site interview and measure information, the evaluator determined that each event implemented did in fact affect 100% of production. Using a data request of production data from the site contact, evaluators determined higher production quantities than assumed by the applicant, and the higher quantities led to higher evaluated savings.
CT15-892064	33,811	116%	The evaluated savings for this project are greater than the claimed values. The applicant analysis assumed that each of the PRIME events affected 100% of production, but the baseline quantities used in their analysis did not reflect this. Based on the site interview and measure information, the evaluator determined that each event implemented did in fact affect 100% of production. Using a data request of production data from the site contact, evaluators determined higher production quantities than assumed by the applicant, and the higher quantities led to higher evaluated savings.

Site ID	Reported kWh Savings	kWh RR	Primary Reason for Discrepancy
CT15-892062	50,730	116%	The evaluated savings for this project are greater than the claimed values. The applicant analysis assumed that each of the PRIME events affected 100% of production, but the baseline quantities used in their analysis did not reflect this. Based on the site interview and measure information, the evaluator determined that each event implemented did in fact affect 100% of production. Using a data request of production data from the site contact, evaluators determined higher production quantities than assumed by the applicant, and the higher quantities led to higher evaluated savings.
CT15-907788	50,730	116%	The evaluated savings for this project are greater than the claimed values. The applicant analysis assumed that each of the PRIME events affected 100% of production, but the baseline quantities used in their analysis did not reflect this. Based on the site interview and measure information, the evaluators determined that each event implemented did in fact affect 100% of production. Using a data request of production data from the site contact, the evaluators determined higher production quantities than assumed by the applicant, and the higher quantities led to higher evaluated savings.
NfrS	22,511	59%	The evaluated savings for this project are lower than the claimed values. Facility electrical energy usage data provided by the utility was used in the calculation of the evaluated savings results. The facility usage data used by the evaluator is lower than the applicant billed total by 640,400 kWh. Additionally, the evaluators held discussions with the facility staff, which indicated that the production line only accounts for approximately 5% of the total facility electrical usage, as opposed to the 10% estimated by the applicant. These differences contribute to the largest reduction in savings.
CT15-896567	66,610	58%	The evaluated savings for this project are lower than the claimed values. Sales data provided to the evaluators by the site staff showed that the management improvement of consolidating space impacted a group of approximately 10 individuals out of the 112 at the facility, which means that the portion of sales impacted was closer to approximately 10% rather than the 100% that the applicant claimed. This reduced savings for the site.
CT15-889846	39,852	51%	The evaluated savings for this project are lower than the claimed values. The applicant analysis assumed that the project affected 15% of pre-project electric billed usage, but the evaluator determined this value to be 1.5% based on the ratio of affected square footage to total facility square footage. Area is an accurate indicator of affected facility energy consumption in this case, as the facility does not contain manufacturing equipment, and facility loads are dominated by lighting, HVAC, compressed air, and plug loads, which are evenly distributed throughout the facility.
CT15-890883	28,660	47%	The evaluated savings for this project are lower than the claimed values. This measure's primary impact was to improve quality control on the manifold repair process. The result of this was to decrease the number of recycles that repaired manifolds needed to go through. The applicant expected a 15% productivity increase. The evaluators found that the proportion of manifolds requiring recycle decreased from 60% to 27%; however, the annual number of repaired parts also dropped from 48 before the project to 28 after the project. This decreased production resulted in a decrease in the evaluated savings.
CT15-880197	27,074	16%	The evaluated savings for this project are lower than the claimed values. The expected productivity increase (37%) was much higher than observed by the evaluators based on site staff interviews (1.0%). This resulted in lower evaluated savings for the project.

Site ID	Reported kWh Savings	kWh RR	Primary Reason for Discrepancy
CT15-869098	157,256	13%	The evaluated savings for this project are lower than the claimed values. The evaluators used pre-/post-project information from the site contact to estimate the productivity improvement that was realized due to this project. The site contact indicated that the most appropriate metric to use for this project was an increase in the proportion of correctly packaged product from 20 defects per 3,000 bobbin order to virtually 0 defects per 3,000 bobbin order. This resulted in an 0.7% evaluated productivity gain, which was much lower than the 13.2% that project documents indicated. This reduced savings for this facility significantly.
CT15-878250	26,112	8%	The evaluated savings for this project are lower than the claimed values. The evaluators inventoried the equipment associated with the affected production line and, through on-site observations and conversations with facility staff, determined a more accurate breakdown of time- and load-dependent energy consumption for each piece of affected equipment as well as which which equipment would be affected by the process change. The percentage of equipment consumption that could be effected by the process change went from 35% in tracking estimate to only 1% in the evaluated results. This is the largest contributor to the decrease in evaluated savings.
NbkX	36,861	7%	The evaluated savings for this project are lower than the claimed values. The evaluators considered only the actual baseline power for the operating equipment that was directly impacted by the project, which was substantially lower than the baseline power considered by the vendor.
CT15-886668	28,968	7%	The evaluated savings for this project are lower than the claimed values. The evaluators inventoried the equipment associated with the affected production line and, through on-site observations and conversations with facility staff, determined a more accurate breakdown of time- and load-dependent energy consumption for each piece of affected equipment. This is the largest contributor to the decrease in savings.
CT15-907699	25,239	1%	The evaluated savings for this project are lower than the claimed values. The applicant assumed that the changes to the unloading process would lead to a 15% increase in the amount of product unloaded. The evaluators were able to obtain pre- and post-production values as well as employee man-hour information for the unloading process. While the overall poundage of unloaded product has gone down, not increased by 15% as predicted, the evaluators believe that the unloading process has become more efficient due to the project's lean techniques. Therefore, a pounds-per-man-hour metric was used by the evaluators to most fairly compare pre- and post-project conditions. Although the slight increase in pounds-per-man hour leads to positive evaluated savings, this impact is significantly lower than the ex-ante claim, leading to a comparative decrease in savings.
CT14-820640	36,099	0%	The evaluated savings for this project are lower than the claimed values. The applicant assumed that the total production increase would be 33%. Sales data provided by the customer shows that production actually decreased by 11%. As there was no evidence of improvement in production levels due to the implementation of this project, the evaluators assigned zero savings for this site.

Site ID	Reported kWh Savings	kWh RR	Primary Reason for Discrepancy
CT14-820641	39,667	0%	The evaluated savings for this project are lower than the claimed values. The applicant assumed that the total production increase would be 33%. Sales data provided by the customer shows that production actually decreased by 11%. As there was no evidence of improvement in production levels due to the implementation of this project, the evaluators assigned zero savings for this site.
CT14-847441	43,375	0%	The evaluated savings for this project are lower than the claimed values. The applicant assumed that the total production increase would be 33%. Sales data provided by the customer shows that production actually decreased by 11%. As there was no evidence of improvement in production levels due to the implementation of this project, the evaluators assigned zero savings for this site.
CT15-915917	27,984	0%	The evaluated savings for this project are lower than the claimed values. While the recommended improvements to the process were reportedly implemented by the facility, a sharp decline in the number of gearboxes being repaired between the project implementation in 2015, through 2016 and into the end of 2017, led to no opportunities for process efficiency improvement and subsequent energy savings.
NwGJ	27,855	0%	The evaluated savings for this project are lower than the claimed values. The metal stamping set-up time reduction project was investigated at the facility, but ultimately was not implemented. None of the explored lean techniques were applied; therefore, the project results in zero electric energy savings.
CT15-905239	56,901	0%	The evaluated savings for this project are lower than the claimed values. The applicant assumed that the total production increase would be 5%. Production data provided by the customer shows that production actually decreased by 12%.
CT15-874096	25,668	0%	The evaluated savings for this project are lower than the claimed values. The tracking savings are based on a 20% improvement in production for the affected equipment. Production records for the affected process lines show that production decreased by 22% since project implementation. Furthermore, although production decreased, monthly energy usage increased from the pre- to post-event periods. Hypothetically, this could have been due to manufacturing of more complex parts, but the detailed production logs do not show an increase in run time per part. The facility staff confirmed there was no change in part type or complexity before and after the project.
CT14-860170	24,255	0%	The evaluated savings for this project are lower than the claimed values. The customer-provided sales data showed that production decreased by 0.6%, compared to the applicant's assumption of an increase of 15%. Since the deemed energy analysis depends on increased production as a measure of increased production efficiency, evaluators determined that this project did not achieve any savings. In addition the site showed an increase in energy use per part further indicating no savings.
CT14-807295	24,799	0%	The evaluated savings for this project are lower than the claimed values. The evaluators found through site staff interviews and a review of the limited available data for this project that there was no evidence that the implementation of the project improved the production energy efficiency of the facility.

# **O&M Projects kWh Realization Rates and Primary Reason for Discrepancy**

Site ID	Reported kWh Savings	kWh RR	Primary Reason for Discrepancy
Nsq8	76,967	206%	The evaluated savings for this project are greater than the claimed values. The evaluators found that the equipment at the facility operated approximately 24 hours per day, 5 days per week. This was more than the 9 hours per day used in the applicant analysis.
NncD	134,554	151%	The evaluated savings for this project are greater than the claimed values. The evaluators used trend data from the central air compressor controller to determine the compressed air system operating efficiency in kW/cfm. The evaluated kW/cfm value of 0.63 was substantially greater than 0.16 kW/cfm that was used in the tracking savings calculations. This difference increased the evaluated savings for this project.
CT15-888360	103,428	106%	The evaluated savings for this project are greater than the claimed values. The impacted computers were shut down for more hours than the value predicted by the applicant. This resulted in greater evaluated savings.
CT15-900665	25,581	104%	The evaluated savings for this project are greater than the claimed values. The evaluators adjusted the fixture operating hours from ex ante estimates of 8,544 hours/year to 8,760 hours/year based on site visit findings.
CT14-840123	194,594	92%	The evaluated savings for this project are lower than the claimed values. The primary reason was changes in baseline and proposed wattages. The evaluators modified the 6-lamp baseline fixture wattage from 192W/fixture to 175W/fixture, the 4-lamp baseline fixture wattage from 128W/fixture to 112W/fixture, and the 2-lamp baseline fixture wattage from 64W/fixture to 59W/fixture based on the New York Standard Lighting Wattage Tables. The fixture codes selected were F46ILL, F44ILL, and F42ILL for the 6-lamp, 4-lamp, and 2-lamp fixtures, respectively. The evaluators modified the 6-lamp installed fixture wattage from 102W/fixture to 114W/fixture, the 4-lamp baseline fixture wattage from 68W/fixture to 76W/fixture, and the 2-lamp baseline fixture wattage from 34W/fixture to 38W/fixture based on the DesignLights Consortium (DLC) tested wattages for the installed tubes. The DLC rating is 19W per tube.
CT15-894627	34,232	90%	The evaluated savings for this project are lower than the claimed values. The evaluators have modified the waste heat factor applied to calculate the lighting upgrade's cooling interactivities. The applicant assumed that 67.5% factor. However, based on similar studies in Connecticut and Massachusetts, the evaluators revised this factor to 26%.
CT15-887779	54,922	90%	The evaluated savings for this project are lower than the claimed values. The evaluators have modified the waste heat factor applied to calculate the lighting upgrade's cooling interactivities. The applicant assumed that 67.5% factor. However, based on similar studies in Connecticut and Massachusetts, the evaluators revised this factor to 26%.



Site ID	Reported kWh Savings	kWh RR	Primary Reason for Discrepancy
CT14-781484	55,714	75%	The evaluated savings for this project are lower than the claimed values. The applicant assumed all computers use 105W during the idle mode without controls, which is the rated wattage of a typical desktop computer with a monitor. The evaluators found that the project impacted desktop and laptop computers with metered average idle wattages of 49W and 21W, respectively. This difference contributed to a decrease in the evaluated savings.
CT14-768443	167,844	58%	The evaluated savings for this project are lower than the claimed values. The applicant's baseline assumed the compressed air system's operating pressure was 100 psi. The evaluators confirmed with the site contact that the baseline operating pressure was 95 psi. The difference in baseline assumptions resulted in smaller baseline energy consumptions and smaller evaluated savings than calculated by the applicant.
CT14-843268	32,217	55%	The evaluated savings for this project are lower than the claimed values. The evaluators adjusted the baseline fixture operating hours from ex ante estimates of 5,824 hours/year to 2,588 hours/year based on metered data. The installed system operating hours were incorrectly listed as 8,760 hours/year in the applicant analysis. The evaluators adjusted the installed system operating hours to the same hours as the baseline fixtures.
CT14-824574	519,912	40%	The evaluated savings for this project are lower than the claimed values. The tracking savings for measure 2: Power Payoff Removal was based on the assumption that all 16 baseline units were power payoffs and that 50% of them would be converted to flyoffs. In reality, 50% of production was shifted from power payoffs to flyoffs, but reductions in the usage of these were winders since the project was implementation occurred. Currently, only 4 power payoffs are needed to handle 50% of production, rather than the 8 power payoffs assumed by the applicant. As a result, savings was calculated for removing only 4 of the power payoffs present in the base case to account for reductions in production on this line.
CT14-809563	28,113	33%	The evaluated savings for this project are lower than the claimed values. The evaluator inspected 9 of the 15 repaired leaks per this project, and found that 5 of those repaired locations were leaking during the site visit. This reduced the evaluated electric energy savings for the project compared to the reported values.

# **RCx Projects kWh Realization Rates and Primary Reason for Discrepancy**

Site ID	Reported kWh Savings	kWh RR	Primary Reason for Discrepancy
CT13-766854	680,572	143%	The evaluated savings for this project are greater than the claimed values. For HV-2, baseline fan CRAC fan power was greater than assumed by the applicant. This increased the baseline fan energy and resulted in greater electric savings. The updated baseline for AHUs and CRACs resulted in a positive net impact on electric savings.
NqXd	84,739	141%	The evaluated savings for this project are greater than the claimed values. The applicant used a proprietary analysis software to calculate variable frequency drive (VFD) savings on the refrigeration condensers (not in the RCx project scope) and head pressure optimization savings (in the RCx project scope) together, since both projects impacted the same equipment. The estimated VFD savings were calculated separately, outside of the proprietary analysis software, and then subtracted from the total savings to quantify the RCx savings. The applicant's methodology did not produce savings results consistent with the refrigeration load due to the use of different analysis tools. The evaluators used the same analysis software, but calculated the RCx savings directly, resulting in higher refrigeration loads and greater savings than anticipated.
CT13-766855	1,037,209	141%	Overall, the evaluated savings for this project are greater than the claimed values. For HV-2 average proposed AHUs outside airflow is lower than applicant's values. This reduced the proposed cooling load for dehumidification process and resulted in greater electric savings. Average proposed AHUs fan speed is higher than applicant's values. This increased the proposed AHUs fan energy and resulted in lower electric savings. For HV-3, average proposed CRACs fan speed value is lower than the applicant's value. This reduced the CRACs fan energy consumption in the post-installation period and resulted in greater electric savings. The updates shown above resulted in a positive net impact on electric savings.
Nqew	85,718	126%	The evaluated savings for this project are greater than the claimed values. The applicant used a proprietary analysis software to calculate variable frequency drive (VFD) savings on the refrigeration condensers (not in the RCx project scope) and head pressure optimization savings (in the RCx project scope) together, since both projects impacted the same equipment. The estimated VFD savings were calculated separately, outside of the proprietary analysis software, and then subtracted from the total savings to quantify the RCx savings. The applicant's methodology did not produce savings results consistent with the refrigeration load due to the use of different analysis tools. The evaluators used the same analysis software, but calculated the RCx savings directly, resulting in higher refrigeration loads and greater savings than anticipated.

Site ID	Reported kWh Savings	kWh RR	Primary Reason for Discrepancy
CT13-766845	646,431	99%	<p>The evaluated savings for this project are lower than the claimed values.</p> <p>For HV-5 average as-built speed of AHU-4 fan is greater than applicant's values, which resulted in higher fan energy consumption and lower electric energy savings.</p> <p>For Measure OCC-3 during the summer, as-built outside air dampers of the impacted AHUs allow more outside air than predicted by the applicant. The dampers' operations resulted in greater cooling energy consumption and smaller electric energy savings.</p>
NqH3	201,976	73%	<p>The evaluated savings for this project are lower than the claimed values. The applicant used a proprietary analysis software to calculate variable frequency drive (VFD) savings on the refrigeration condensers (not in the RCx project scope) and head pressure optimization savings (in the RCx project scope) together, since both projects impacted the same equipment. The estimated VFD savings were calculated separately, outside of the proprietary analysis software, and then subtracted from the total savings to quantify the RCx savings. The applicant's methodology did not produce savings results consistent with the refrigeration load due to the use of different analysis tools. The evaluators used the same analysis software, but calculated the RCx savings directly, resulting in lower refrigeration loads and lower savings than anticipated.</p>
CT13-766848	267,855	57%	<p>The evaluated savings for this project are lower than the claimed values.</p> <p>For measure HV-5 average as-built speed of AHU-4 fan is greater than applicant's values, which resulted in higher fan energy consumption and lower electric energy savings.</p> <p>For measure OCC-3,during the summer, as-built outside air dampers of the impacted AHUs allow more outside air than predicted by the applicant. The dampers' operations resulted in greater cooling energy consumption and lower electric energy savings.</p>
NrQj	209,621	51%	<p>The evaluated savings for this project are lower than the claimed values. The applicant used a proprietary analysis software to calculate variable frequency drive (VFD) savings on the refrigeration condensers (not in the RCx project scope) and head pressure optimization savings (in the RCx project scope) together, since both projects impacted the same equipment. The estimated VFD savings were calculated separately, outside of the proprietary analysis software, and then subtracted from the total savings to quantify the RCx savings. The applicant's methodology did not produce savings results consistent with the refrigeration load due to the use of different analysis tools. The evaluators used the same analysis software, but calculated the RCx savings directly, resulting in lower refrigeration loads and lower savings than anticipated.</p>

Site ID	Reported kWh Savings	kWh RR	Primary Reason for Discrepancy
CT13-766853	104,316	48%	The evaluated savings for this project are lower than the claimed values. The reported savings reflected the assumption that 12 AHUs would realize fan speed reduction savings, whereas the evaluators found that only 10 AHUs realized fan savings, as 2 AHUs had operating schedule constraints. The reported savings reflected equipment operation outside of business hours, whereas the evaluators found that any fan cycling outside of business hours were not impacted by this project.
CT13-755470	116,763	47%	The evaluated savings for this project are lower than the claimed values. Based on the review of EMS screenshots for measure HV-4 taken at various times during the evaluation period, the evaluators concluded that the measure was not implemented and assigned zero savings for this measure.
CT13-767526	194,748	22%	The evaluated savings for this project are lower than the claimed values. In the evaluated savings calculation file, the supply fan speeds and operating hours for HV-1 and HV-4 were updated using metered data. This update resulted in a net decrease in both the electric energy and natural gas savings.

# **O&M Projects MMBtu Realization Rates and Primary Reason for Discrepancy**

Site ID	Reported MMBtu Savings	MMBtu RR	Primary Reason for Discrepancy
CT15-901928	631	458%	The evaluated savings for this project are greater than the claimed values. Two of the traps at the facility were mislabeled as being at a lower orifice size and operating pressure than the evaluators found at the site. Increasing those values resulted in higher savings for this facility.
Nrbn	2,390	173%	The evaluated savings for this project are greater than the claimed values. The tracking savings were calculated using savings algorithms provided in the 2015 Connecticut Program Savings Document (PSD). The steam flow rate from failed steam traps was estimated using Napier's formula, and annual natural gas savings were calculated taking into consideration the pressure, application, failure mode, boiler efficiency, and orifice size of the trap. The evaluators used a different calculation methodology, which still included similar consideration for the pressure, application, failure mode, boiler efficiency, and orifice size of the trap, in which the savings were estimated using Grashof's formula along with algorithm parameters determined by data gathered from the vendor's 2017 steam trap survey and a condensate return factor empirically determined through a recent comprehensive steam trap study in Massachusetts. In the case of this building, steam condensate is not returned to the off-site CHP system that provides the steam to the building (i.e., an open, not closed-loop, system), which substantially increases the savings for the site.
CT15-881537	4,518	85%	The evaluated savings for this project are lower than the claimed values. The tracking savings were calculated using savings algorithms provided in the 2015 Connecticut Program Savings Document (PSD). The steam flow rate from failed steam traps was estimated using Napier's formula, and annual natural gas savings were calculated taking into consideration the pressure, application, failure mode, boiler efficiency, and orifice size of the trap. The evaluators used a different calculation methodology, which still included similar consideration for the pressure, application, failure mode, boiler efficiency, and orifice size of the trap, in which the savings were estimated using Grashof's formula along with algorithm parameters determined by data gathered from the vendor's 2017 steam trap survey and a condensate return factor empirically determined through a recent comprehensive steam trap study in Massachusetts. The evaluator's calculation method led to a decrease in evaluated savings.

Site ID	Reported MMBtu Savings	MMBtu RR	Primary Reason for Discrepancy
NkLy	1,313	72%	<p>The evaluated savings for this project are lower than the claimed values. The tracking savings were calculated using savings algorithms provided in the 2015 Connecticut Program Savings Document (PSD). The steam flow rate from failed steam traps was estimated using Napier's formula, and annual natural gas savings were calculated taking into consideration the pressure, application, failure mode, boiler efficiency, and orifice size of the trap. The evaluators used a different calculation methodology, which still included similar consideration for the pressure, application, failure mode, boiler efficiency, and orifice size of the trap, in which the savings were estimated using Grashof's formula along with algorithm parameters determined by data gathered from the vendor's 2017 steam trap survey and a condensate return factor empirically determined through a recent comprehensive steam trap study in Massachusetts. The evaluator's calculation method led to a decrease in evaluated savings.</p>
CT14-826508	2,895	70%	<p>The evaluated savings for this project are lower than the claimed values. The tracking savings were calculated using savings algorithms provided in the 2015 Connecticut Program Savings Document (PSD). The steam flow rate from failed steam traps was estimated using Napier's formula, and annual natural gas savings were calculated taking into consideration the pressure, application, failure mode, boiler efficiency, and orifice size of the trap. The evaluators used a different calculation methodology, which still included similar consideration for the pressure, application, failure mode, boiler efficiency, and orifice size of the trap, in which the savings were estimated using Grashof's formula along with algorithm parameters determined by data gathered from the vendor's 2017 steam trap survey and a condensate return factor empirically determined through a recent comprehensive steam trap study in Massachusetts. The evaluator's calculation method led to a decrease in evaluated savings.</p>
NrzM	1,325	69%	<p>The evaluated savings for this project are lower than the claimed values. The tracking savings were calculated using savings algorithms provided in the 2015 Connecticut Program Savings Document (PSD). The steam flow rate from failed steam traps was estimated using Napier's formula, and annual natural gas savings were calculated taking into consideration the pressure, application, failure mode, boiler efficiency, and orifice size of the trap. The evaluators used a different calculation methodology, which still included similar consideration for the pressure, application, failure mode, boiler efficiency, and orifice size of the trap, in which the savings were estimated using Grashof's formula along with algorithm parameters determined by data gathered from the vendor's 2017 steam trap survey and a condensate return factor empirically determined through a recent comprehensive steam trap study in Massachusetts. The evaluator's calculation method led to a decrease in evaluated savings.</p>



Site ID	Reported MMBtu Savings	MMBtu RR	Primary Reason for Discrepancy
NqK9	812	66%	<p>The evaluated savings for this project are lower than the claimed values. The tracking savings were calculated using savings algorithms provided in the 2015 Connecticut Program Savings Document (PSD). The steam flow rate from failed steam traps was estimated using Napier's formula, and annual natural gas savings were calculated taking into consideration the pressure, application, failure mode, boiler efficiency, and orifice size of the trap. The evaluators used a different calculation methodology, which still included similar consideration for the pressure, application, failure mode, boiler efficiency, and orifice size of the trap, in which the savings were estimated using Grashof's formula along with algorithm parameters determined by data gathered from the vendor's 2017 steam trap survey and a condensate return factor empirically determined through a recent comprehensive steam trap study in Massachusetts. The evaluator's calculation method led to a decrease in evaluated savings.</p>
CT15-885516	3,933	57%	<p>The evaluated savings for this project are lower than the claimed values. The tracking savings were calculated using savings algorithms provided in the 2015 Connecticut Program Savings Document (PSD). The steam flow rate from failed steam traps was estimated using Napier's formula, and annual natural gas savings were calculated taking into consideration the pressure, application, failure mode, boiler efficiency, and orifice size of the trap. The evaluators used a different calculation methodology, which still included similar consideration for the pressure, application, failure mode, boiler efficiency, and orifice size of the trap, in which the savings were estimated using Grashof's formula along with algorithm parameters determined by data gathered from the vendor's 2017 steam trap survey and a condensate return factor empirically determined through a recent comprehensive steam trap study in Massachusetts. The evaluator's calculation method led to a decrease in evaluated savings.</p>
Nks6	583	56%	<p>The evaluated savings for this project are lower than the claimed values. Only 7 of the 11 radiators that were supposed to have TRVs installed had installed TRVs during the evaluation site visit. Of these, only 4 were installed on radiators that were not previously plugged. Evaluators included TRV savings on all radiators that previously did not have them installed.</p>
CT15-911376	126	53%	<p>The evaluated savings for this project are lower than the claimed values. The tracking savings were calculated using savings algorithms provided in the 2015 Connecticut Program Savings Document (PSD). The steam flow rate from failed steam traps was estimated using Napier's formula, and annual natural gas savings were calculated taking into consideration the pressure, application, failure mode, boiler efficiency, and orifice size of the trap. The evaluators used a different calculation methodology, which still included similar consideration for the pressure, application, failure mode, boiler efficiency, and orifice size of the trap, in which the savings were estimated using Grashof's formula along with algorithm parameters determined by data gathered from the vendor's 2017 steam trap survey and a condensate return factor empirically determined through a recent comprehensive steam trap study in Massachusetts. The evaluator's calculation method led to a decrease in evaluated savings.</p>

Site ID	Reported MMBtu Savings	MMBtu RR	Primary Reason for Discrepancy
CT15-932482	1,346	46%	The evaluated savings for this project are lower than the claimed values. The applicant assumed 5,376 hours of operation for all pipe insulation savings calculations. At each location, the evaluators collected 4 weeks of metered data, which provided information on boiler operation. These identified operational profiles were extrapolated across the facility heating seasons as described by the facility contact (approximately October through April). The resulting hours were significantly lower than those described in the applicant analyses.
CT15-928225	861	41%	The evaluated savings for this project are lower than the claimed values. The applicant assumed 5,376 hours of operation for all pipe insulation savings calculations. At each location, the evaluators collected 4 weeks of metered data, which provided information on boiler operation. These identified operational profiles were extrapolated across the facility heating seasons as described by the facility contact (approximately October through April). The resulting hours were significantly lower than those described in the applicant analyses.
CT15-932501	393	41%	The evaluated savings for this project are lower than the claimed values. The applicant assumed 5,376 hours of operation for all pipe insulation savings calculations. At each location, the evaluators collected 4 weeks of metered data, which provided information on boiler operation. These identified operational profiles were extrapolated across the facility heating seasons as described by the facility contact (approximately October through April). The resulting hours were significantly lower than those described in the applicant analyses.
CT15-932492	1,431	37%	The evaluated savings for this project are lower than the claimed values. The applicant assumed 5,376 hours of operation for all pipe insulation savings calculations. At each location, the evaluators collected 4 weeks of metered data, which provided information on boiler operation. These identified operational profiles were extrapolated across the facility heating seasons as described by the facility contact (approximately October through April). The resulting hours were significantly lower than those described in the applicant analyses.
CT15-896287	1,464	37%	The evaluated savings for this project are lower than the claimed values. The tracking savings were calculated using savings algorithms provided in the 2015 Connecticut Program Savings Document (PSD). The steam flow rate from failed steam traps was estimated using Napier's formula, and annual natural gas savings were calculated taking into consideration the pressure, application, failure mode, boiler efficiency, and orifice size of the trap. The evaluators used a different calculation methodology, which still included similar consideration for the pressure, application, failure mode, boiler efficiency, and orifice size of the trap, in which the savings were estimated using Grashof's formula along with algorithm parameters determined by data gathered from the vendor's 2017 steam trap survey and a condensate return factor empirically determined through a recent comprehensive steam trap study in Massachusetts. The evaluator's calculation method led to a decrease in evaluated savings.

Site ID	Reported MMBtu Savings	MMBtu RR	Primary Reason for Discrepancy
CT14-770377	122	36%	The evaluated savings for this project are lower than the claimed values. The applicant savings are based on the assumption that outdoor air for AHU-10 was reduced in fraction from 22% during occupied periods to 11%, a 50% drop, due to the installation of a DCV system. The evaluators found that the post-installation outdoor air fraction was closer to 18%, resulting in a drop of only 18%.
CT14-845902	5,686	33%	The evaluated savings for this project are lower than the claimed values. The tracking savings were calculated using savings algorithms provided in the 2015 Connecticut Program Savings Document (PSD). The steam flow rate from failed steam traps was estimated using Napier's formula, and annual natural gas savings were calculated taking into consideration the pressure, application, failure mode, boiler efficiency, and orifice size of the trap. The evaluators used a different calculation methodology, which still included similar consideration for the pressure, application, failure mode, boiler efficiency, and orifice size of the trap, in which the savings were estimated using Grashof's formula along with algorithm parameters determined by data gathered from the vendor's 2017 steam trap survey and a condensate return factor empirically determined through a recent comprehensive steam trap study in Massachusetts. The evaluator's calculation method led to a decrease in evaluated savings.
CT14-856963	2,286	32%	The evaluated savings for this project are lower than the claimed values. AHUs 5 and 6 have been completely decommissioned at the facility. The steam traps connected to these units do not contribute to measure savings (44% of reported savings per applicant calculations) and have not been included in the evaluated analysis. This is the primary source for the reduction in savings.
CT15-932485	675	31%	The evaluated savings for this project are lower than the claimed values. The applicant assumed 5,376 hours of operation for all pipe insulation savings calculations. At each location, the evaluators collected 4 weeks of metered data, which provided information on boiler operation. These identified operational profiles were extrapolated across the facility heating seasons as described by the facility contact (approximately October through April). The resulting hours were significantly lower than those described in the applicant analyses.

# **RCx Projects MMBtu Realization Rates and Primary Reason for Discrepancy**

Site ID	Reported MMBtu Savings	MMBtu RR	Primary Reason for Discrepancy
CT13-766847	327	282%	<p>The evaluated savings for this project are greater than the claimed values.</p> <p>For measure HV-6 average as-built pump speed of the impacted HW pumps is smaller than the applicant's values, which resulted in smaller as-built pump energy consumption and greater electric energy savings.</p> <p>For measure HV-7, during the summer, the as-built outside air dampers of the impacted AHUs allow less outside air than the values predicted by the applicant. The operation of the dampers resulted in less cooling energy consumption and greater electric energy savings.</p> <p>The impacted AHUs operated for more hours in the economizer mode. The economizer operation reduced the total mechanical cooling energy consumption and resulted in greater electric energy savings.</p>
CT13-766854	320	194%	<p>The evaluated savings for this project are greater than the claimed values. For measure HV-1 the as-built winter average speed value of the supply air fans of the AHUs is smaller than the value used by the applicant in the tracking savings calculations. This decreased the as-built heating load because less air is being delivered to the space. The reduced heating load resulted in a greater gas savings.</p>
CT13-755470	335	174%	<p>The evaluated savings for this project are greater than the claimed values.</p> <p>For <i>measure PL-1</i> the applicant used an online pool energy calculator to calculate energy savings for this measure. The evaluators calculated the evaluated savings using a bin-weather based energy model. This difference resulted in greater natural gas savings than the applicant's savings.</p>
CT13-766855	455	115%	<p>The evaluated savings for this project are greater than the claimed values.</p> <p><i>For measure HV-2</i> during the dehumidification process, the AHUs provide reheat to satisfy the discharge air temperature setpoint. The reheat load was not included in the applicant's analysis. The added reheat load to both baseline and as-built cases resulted in greater gas savings.</p> <ul style="list-style-type: none"> <li>- The boiler efficiency was not included in the applicant's heating calculation. The added boiler efficiency to both baseline and as-built cases resulted in greater gas savings.</li> <li>- In the baseline case, the AHUs were providing a greater outside airflow than the value used by the applicant in the tracking savings calculations. This increased the baseline heating load and resulted in greater gas savings.</li> </ul> <p>The updated baseline resulted in a positive net impact on gas savings.</p>

Site ID	Reported MMBtu Savings	MMBtu RR	Primary Reason for Discrepancy
CT13-766519	848	87%	The evaluated savings for this project are lower than the claimed values. The evaluators used monthly gas billing data provided by the site contact for the period from January 2011 through December 2016 to perform a billing analysis for this project. When normalized to TMY3 data for the nearby Hartford weather station, the evaluators found the actual gas savings for this project were somewhat lower than claimed by the applicant. Possible reasons for the discrepancy include differences in DCV operation, difference in normalization between the applicant and evaluator, and changes in occupancy patterns leading to increased unit operation.
CT13-765091	969	81%	The evaluated savings for this project are lower than the claimed values. Per on-site observations and analysis of trended data, the evaluators adjusted minimum fan speeds in occupied and unoccupied modes, rated fan air flow capacities, and minimum percentage OA, resulting in lower overall savings
CT13-766849	1,018	58%	The evaluated savings for this project are lower than the claimed values. For measure HV-5, average as-built speed of AHU-4 fan is greater than applicant's values, which resulted in higher fan energy consumption and lower electric energy savings. For measure OCC-3, during the summer, as-built outside air dampers of the impacted AHUs allow more outside air than predicted by the applicant. The dampers' operations resulted in greater cooling energy consumption and lower electric energy savings.
CT13-767526	1,021	22%	The evaluated savings for this project are lower than the claimed values. In the evaluated savings calculation file, the supply fan speeds and operating hours for HV-1 and HV-4 were updated using metered data. This update resulted in a net decrease in both the electric energy and natural gas savings.
CT13-766858	586	1%	The evaluated savings for this project are lower than the claimed values. The evaluators determined that the implemented optimization on the HWP's and CAH did not result in heating savings, as neither the heating load, schedule, nor heating equipment efficiencies were impacted.