IMPACT EVALUATION OF 2017 CUSTOM GAS INSTALLATIONS

STUDY SUMMARY   March 2020

This document presents the results of the gross impact evaluation of Custom Gas Program installations for the Massachusetts Program Administrators (PAs). The Evaluation Team conducted the study under the guidance of the Massachusetts Energy Efficiency Advisory Council (EEAC). This study was led by ERS and included expertise from our partner firms DNV GL and DMI.

Study Objective

The primary objective of this impact evaluation was to verify and re-estimate the energy savings for a sample of statistically selected PY2017 custom gas projects through site-specific inspection, monitoring, and analysis.

Results

The Team combined the PY2017 results with the PY2016 impact evaluation results to calculate a rolling RR at the statewide and PA level. PA-specific RRs were calculated for Columbia Gas, Eversource, and National Grid.

APPROACH

Stratified Sampling Design

The Evaluation Team designed the sample for the PY2017 impact evaluation with the intention of pooling the results with the prior cycle's (PY2016) to produce a rolling updated result. In 2020, the Team will pool the PY2016, PY2017, and PY2018 results and apply them to PY2020 savings in the 2021 term year report. The general principle used in this design is that the results from each year would need to achieve ±35% precision at 80% confidence interval (CI) to maintain a three-year pooled result of ±20% precision at 80% CI for gross savings RRs at the individual PA level. Likewise, the annual statewide target must be set at ±17% precision at 80% CI to achieve a rolling three-year result at ±10% precision at 80% CI for gross annual savings RRs.

Data Sources

To support the findings of the study, the Evaluation Team used the following data sources:

- PY2017 tracking data provided by all six PAs that offer the program

- PY2016 tracking data and impact evaluation results

- Project files, which typically include applications, BCR screenings, invoices, technical assistance studies, applicant savings calculations, and post-installation reports

- On-site observations and data collection including inspection and verifications of equipment, nameplate data, staff and vendor interviews, spot measurements of various parameters, and combustion efficiency

- Metered and/or energy management system (EMS) trend data from each of the 31 sites included in the study

Site-Specific M&V Plans

The site evaluation plan established approved field methods and ensured that the ultimate objectives for each site evaluation were met. The M&V plan for each evaluated site provided detailed information on the procedures for accomplishing those objectives. The Team submitted full M&V plans for each evaluated site. These plans were reviewed by each PA.

Project-Specific Analysis

Through the desk reviews for each sampled project, the Team examined the baseline assumptions closely and verified them throughout the course of the project using site data, project documentation, and interviews at the facility. Evaluated (ex post) analysis methods were usually similar to reporting (ex ante) methods. The Team generated evaluated savings estimates for all measures installed at each sampled site, normalizing results to typical production or weather data.

Site-Specific M&V Reports

Each site report contained three sections: project summary and results, evaluated measures, and final results. Each PA reviewed the site reports and provided comments or questions to the engineer who led the site analysis. An EEAC representative also reviewed a sample of site reports. The engineer responded to comments and questions raised until a final agreement was reached.

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KEY FINDINGS AND CONCLUSIONS

PY2017 Performance

The program continues to generate significant natural gas savings. The statewide PY2017 participation consisted of 630 distinct accounts, with adjusted gross savings of over 8 million therms annually. Until PY2016, the impact evaluation cycles were not conducted every year; they were determined by stakeholders based on an assessment of program stability.

Implementation of the Baseline Framework

Since the rollout of the Baseline Framework, both the PAs and evaluators have been working to implement a more rigorous review of baselines and to prepare for the application of dual baseline methods in the 2019 program implementation.

The Team commends the PAs for their selection of baselines for lost opportunity measures. We anticipate that the deployment of the Baseline Repository will help maintain this exemplary practice.

Starting with PY2019, program gross lifetime savings could be modestly reduced by around 1% for dual baseline methods and by around 4% for adjustments to effective useful lives (EULs) for both retrofit and lost opportunity measures to better reflect TRM-recommended EULs.

Future Evaluation

Starting with the evaluation of PY2017, the Team will be rolling results from current and previous cycles to calculate a gross RR. The Team can successfully design efficient multi-year samples that meet the intended precision targets. The Team also notes that the error ratio has been improving over time with the exception of steam trap measures. The improved error ratio allows for smaller sample sizes for future impact evaluations.

Combined PA Results and Statewide Summary

Results	Columbia Gas	Eversource	National Grid	Statewide
Two-year pooled RR	84%±11.7%	75%±14.5%	91%±8.6%	85%±6.5%
PY2017 RR	91% ±27%	77% ±16%	94% ±15%	87% ±10%
PY2016 RR	80% ±6%	72% ±25%	88% ±9%	82% ±9%

Statewide Natural Gas Program Evaluation History

Results	2009	2010	2011	2013	2016	2017
Tracked savings (therms)	1,982,441	4,427,361	5,491,076	8,345,907	9,652,649	9,221,180
Statewide evaluated savings (therms)	1,736,323	2,991,776	4,507,074	7,344,398	7,915,172	8,022,426
RR	88%	68%	82%	88%	82%	87%
Relative precision (80% CI)	±10.8%	±9.0%	±9.4%	±10%	±9%	±10%
Sample size	43	48	16	46	53	31
Steam trap and pipe insulation (% of tracked)	Max: <24%	Max: <21%	No data	No data	39%	47%
Major sources of savings discrepancies	Inoperable (-6%), Baselines (-4.5%)	Indeterminate (-15%)	No data	Operational (-7%), Tracking/admin (-2%)	Operational (-11%), Measure removal (-5%)	Operational (-12%)

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RECOMMENDATIONS

1. Use appropriate realization rates

The Team recommends that Columbia Gas, Eversource, and National Grid use their individual pooled RRs. Berkshire Gas, Liberty Gas, and Unitil should use the statewide pooled RR. This recommendation was based on the following factors:

- When pooled with PY2016 results, the study produced statewide prospective results that are reliable (±7% at 80% confidence level).
- When pooled with PY2016 results, the relative precision of the RRs for Columbia Gas (±12%), Eversource (±15%), and National Grid (±9%) meets or exceeds the target.

The Team recommends using these RRs for planning and program reporting, starting with PY2019 and continuing to subsequent years until a new impact evaluation study is conducted and those results are rolled in.

2. Use protocol to determine error ratio

The Team has recommended a protocol for determining error ratios for future custom gas studies, as follows:

1. Average the actual and assumed error ratio from the previous impact evaluation for steam traps and non-steam-trap projects.
2. Round up to the nearest 0.05.
3. Establish a hard floor of 0.25.

The protocol incorporates the historical error ratio, which is embodied in the assumed error ratio, and the actual error ratio of the most recent study. Rounding the value up helps ensure that the target is met or exceeded.

3. Use current sampling methodology

The Team recommends using the current sample design method, as follows:

1. Plan for 20% for a three-year pooled relative precision at 80% confidence interval for Columbia Gas, Eversource, and National Grid results calculated for each program year.
2. Plan for 10% for a three-year pooled relative precision at 80% confidence interval for statewide results calculated for each program year.
3. The stakeholders will decide if for the next cycles, steam traps projects will be treated separately in the sample design.

4. Research methods for measures impacting steam traps and heat load

During the PY2017 evaluation, methodological questions were raised about steam traps and best practices for incorporating boiler efficiency into measures impacting the heating load (like steam traps and insulation).

Steam traps constitute a large share of custom program savings and had a poorer realization rate in this evaluation. This raises the issue of whether steam trap measures should be treated as a separate segment within the custom program or even evaluated separately entirely. In addition, a statewide calculator is used to estimate steam trap savings. In 2016, this tool was vetted and calibrated using participant billing data. Potentially, the steam trap calculator could benefit from another round of calibration incorporating additional sites from recent evaluations. Measures such as insulation and steam traps reduce the heating load served by a boiler. Converting the heat load reduction from these measures to natural gas savings requires a boiler efficiency.

The Team recommends conducting a two-phase approach to resolving these issues. The purpose of the first phase is to use readily available data, best practices research, and interviews of knowledgeable staff to produce a clear problem statement and to conduct a high-level assessment of the potential value of additional research and the scope of that research. Phase two will execute the approved research recommended by the first phase.

5. Use lifetime impacts methods

The PAs have done a commendable job adopting correct ISP baselines. Stakeholders regularly referencing the new Baseline Repository should be helpful in continuing this practice. Application of dual baselines requires new lifetime savings calculation methods and includes closer scrutiny of EULs for both retrofit and lost opportunity measures. The Team recommends the following:

1. PAs adopt the recommendation made in the "Memorandum on Dual Baseline Calculation Practices and Assumptions, November 27, 2019" to maximize the accuracy of lifetime savings.
2. Starting with subsequent impact studies, evaluate lifetime savings impacts and calculate an adjustment factor to be applied to tracking lifetime savings. This factor should be applied to PY2020 tracking savings reported in the 2020 Plan Year Report in the spring of 2021.
3. Expand the in-progress PY2018 Custom Gas workplan to include the scope to provide the technical support and facilitation for implementing the lifetime savings adjustment.

CONSIDERATIONS

1. Continue the Baseline Advisory Group

2. Determine boiler hours of use

3. Verify boiler efficiency

4. Generate pipe and fitting insulation measure calculator

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