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Massachusetts 2013 Prescriptive Gas Impact Evaluation

Steam Trap Evaluation Phase 1: DRAFT

Massachusetts Gas Program Administrators and Massachusetts Energy Efficiency Advisory Council

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1 EXECUTIVE SUMMARY & OVERVIEW

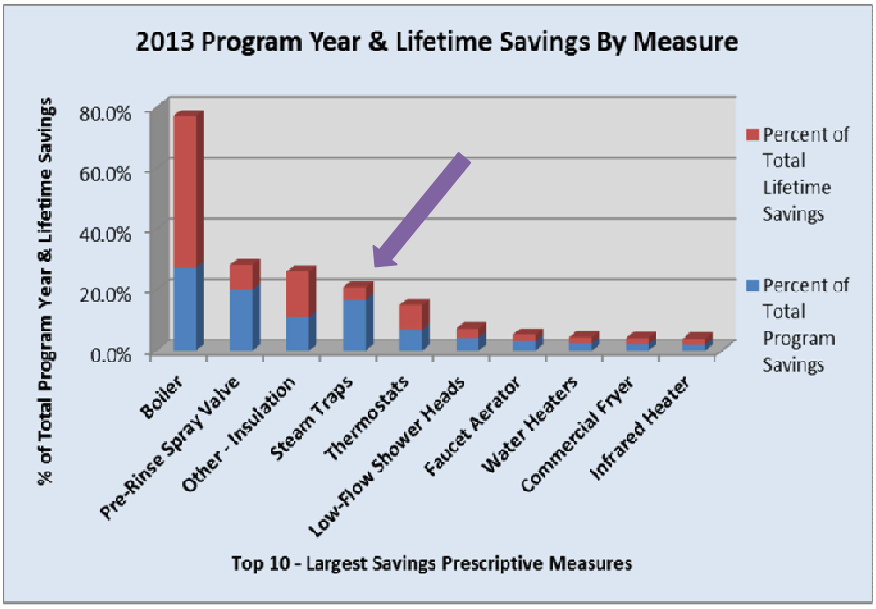
The Massachusetts Program Administrators (PAs) and the Energy Efficiency Advisory Council (EEAC) engaged DNV GL to conduct an impact evaluation of the steam trap measure for the Massachusetts Prescriptive Gas Program. This document presents the objectives, approach, and findings of Phase 1 of our prescriptive steam trap impact evaluation, and presents recommendations for Phase 2 based on those findings.

1.1 Background

As part of its annual scoping effort, the Massachusetts Commercial and Industrial Evaluation Contract (CIEC) Gas Evaluation Team conducts a comprehensive review of the combined statewide gas efficiency program data, identifies the program year and lifetime savings for each prescriptive measure, and assesses any changes from the previous program years. In the most recent scoping effort, undertaken during the summer/fall of 2014, the Gas Evaluation Team determined that it would be worthwhile to conduct an impact evaluation focused on steam traps in order to benefit the gas program.

Savings associated with the steam trap measure, which exists in both the custom and prescriptive gas programs in Massachusetts, has been steadily increasing for three years, and the overall gas savings potential for customers is significant. Figure 1-1 shows that steam trap measures provided a significant portion of total gas program savings in 2013. The lifetime savings contribution of the measure relies on the lifetime assumption which is a key focus for this Phase 1 study.

Figure 1-1: 2013 Program Year and Lifetime Savings by Measure



1.2 Objective and Approach

In light of the overlap between the prescriptive and custom steam trap programs, we conducted a broad-spectrum Phase 1 investigation. The primary focus of the research was to identify the best available deemed savings calculation methods and measure lifetime assumptions; however, we also used the opportunity to solicit general feedback on program delivery and other factors.

Since steam trap lifetime references are not well established in the literature, we supplemented our literature review with information solicited directly from steam trap vendors/manufacturers, and investigated the existence of Massachusetts gas customer facility records that could: 1) provide historical documentation of steam trap replacement, and 2) directly support steam trap measure lifetime conclusions.

DNV GL conducted five major tasks to meet the objectives of this Phase 1 evaluation:

- **Task 1**: Conduct in-depth industry and literature research on the steam trap measure with a focus on the measure lifetime assumption being used
- **Task 2**: Conduct and provide a summary of meetings with vendors/manufacturers most active with repair/replacement of steam traps in Massachusetts
- **Task 3**: Collect actual Massachusetts gas customer facility data that supports steam trap lifetime conclusions
- **Task 4**: Provide a technical discussion of steam trap savings calculations currently in use in the industry and other efficiency programs
- **Task 5**: Provide recommendations for the best approach to adjusting the current steam trap prescriptive program deemed savings value

If approved by the PAs and EEAC, Phase 2 of this evaluation will develop an updated and revised prescriptive steam trap deemed savings value for Massachusetts gas programs, informed by the findings in this Phase 1 report.

1.3 Results, Conclusions, and Recommendations

1.3.1 Recommendations for Immediate Implementation

1. Continue providing two steam trap programs: prescriptive and custom

The research in this Phase 1 study suggests that it is appropriate and useful to continue providing two different energy efficiency programs (prescriptive and custom) to assist customers with repairing and replacing steam traps. This conclusion is based on the following:

- There is a wide variation of steam pressures and sizes/types of steam traps.
- Customers who have steam traps differ dramatically—from small dry cleaners with a dozen traps, to large industrial facilities with hundreds of traps, to municipal/government customers with multi-facility applications that correspond to thousands of traps. The savings values associated with customers' steam trap projects also differ dramatically as does the process a particular customer is able to follow for effecting steam trap repairs at their particular facility.
- The rigorous site-level survey inspection and savings calculation method associated with the custom program is not practical for smaller steam trap applications, and the simple process associated with the prescriptive program (which relies on a single deemed savings value) is not appropriate for larger applications. Therefore we recommend continuing both programs in order to efficiently and effectively measure savings from the full range of steam trap measures. Research of other programs and evaluation work identifies that frequently a single steam trap program is effective for a single market segment but not others.

2. Increase measure lifetime from three to six years

DNV GL reviewed over twenty steam trap lifetime references from available technical reports, energy efficiency evaluations, manufacturer publications, energy efficiency program resource manuals, and other savings documentation. Our research found that all source materials except for the

Massachusetts and Rhode Island Technical Resource Manuals utilized a lifetime assumption of five to six years for steam trap measures and was based largely on Delphi method of manufacturer interviews. Our analysis of data for Massachusetts gas customer facilities that had annual steam trap surveys conducted on an ongoing basis provided support for a lifetime assumption of six years. When Massachusetts customer data was found that contained sufficient details on each individual trap to be used to calculate average steam trap life; the average lifetime was greater than six years.

1.3.2 Proposed Next Steps for Phase 2

1. Convene a steam trap stakeholder group to coordinate adoption of a standardized savings algorithm

Our review of the relevant literature showed that there are several analytic methods to calculate the energy savings achieved from the repair or replacement of failed steam traps. Massachusetts appears to have the only efficiency program that uses two calculation methods that have been effectively "calibrated" to both provide consistent savings values.

The latest version of National Grid's Custom Express Steam Trap Savings Tool uses Grashof's Formula[1] to produce accurate savings values. Eversource has developed a savings tool that is based on the modified Napier's Equation, which yields similar reproducible results. Meetings conducted with steam trap vendors and the PAs' subcontractors suggest that adoption or refinement of a small number of common assumptions would further increase the accuracy and consistency between the two existing tools.

We recommend convening a stakeholder group—composed of PA staff members directly involved with steam traps, program implementation subcontractors, and steam trap repair/replacement vendors—to identify common assumptions/inputs to use in the savings algorithm, with the goal of improving program accuracy and consistency at the state-wide level. Any changes recommended by the stakeholder group would ultimately be approved by the individual PAs.

2. Develop a new prescriptive steam trap deemed savings value

We recommend using the savings algorithm developed in Phase 2 (per the recommendation above) to develop an updated and revised prescriptive steam trap deemed savings value. This algorithm would be applied to a combination of:

- Retrospective recalculation of 2012 – 2014 prescriptive applications, and
- Simultaneously, perform as many pre-post site-level evaluations employing 2015 real-time applications that occur during the next phase of evaluation. This involves a coordinated effort with steam trap vendors while performing steam trap surveys at customer facilities.

3. Leverage the steam trap stakeholder group to identify approaches to increase program participation and savings

In our research for this Phase 1 study, gas customers, vendors, and manufacturers indicated that gas savings through steam trap repair and replacement can be increased through both broader participation and heightened customer awareness. To provide additional value—subsequent to its work on the savings algorithm—the stakeholder group described above could help identify program

[1] Grahof's Formula and Napier's Equation are presented in more detail in Section 6- Task 4: Technical Discussion of Savings Calculations

changes that would increase participation in both the prescriptive and the custom programs. We recommend initiating a first stakeholder meeting in early 2015 to enable quick progress for Phase 2.