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Commercial Boilers Standard Evaluation

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Executive Summary

The Northwest Energy Efficiency Alliance (NEEA) contracted with Michaels Energy (the evaluation team) to conduct an independent evaluation to qualitatively assess NEEA and its partner organizations'[1] influence on the establishment of the federal standard for commercial boilers, and to quantitatively assess the savings from the standard due to the combined efforts of those same organizations. The U.S. Department of Energy (DOE) started the commercial boiler test procedure and efficiency standards rulemaking in 2013 by issuing a Notice of Proposed Determination for the efficiency standard, followed in 2014 by a Request for Information for the test procedure. All proceedings for the test procedure concluded in 2016, and the new test procedure was published with an effective date of January 9, 2017. The proceedings for the efficiency standard also concluded in 2016, but the standard was not published in the federal register until early 2020, with a compliance date of January 10, 2023. As of this report, a lawsuit challenging the standard is ongoing.

As part of its Codes and Standards program, NEEA supported this standard's development and adoption. NEEA and its partners participated in public meetings and provided verbal and written comments on the test procedure and standard that influenced DOE's analysis and, ultimately, the final rules for the standard and the test procedure.

To conduct its evaluation, Michaels Energy first reviewed the materials on the DOE's docket for the standard and test procedure. The evaluation team then interviewed stakeholders active in the rulemaking process, including manufacturers, manufacturer associations, energy-efficiency organizations, and utilities.

In our qualitative assessment, the evaluation team found that NEEA engaged in some of the activities in NEEA's Standards Initiative Logic Model (Figure 1), specifically collaborating with its partners to provide written comments and participating in the public meetings. The most significant influence that NEEA and its partners had on the commercial boilers standard was recommending the adoption of trial standard level (TSL[2]) 3. Manufacturers, SoCalGas, Air Conditioning Heating and Refrigeration Institute (AHRI), and gas associations recommended adopting TSL 1. SCE and PG&E recommended adopting TSL 2. TSL 2 was ultimately adopted.

In our quantitative assessment of the share of savings influenced by NEEA and its partners' activities, we assessed the activities conducted by NEEA and its partners, the effectiveness and outcomes of those activities, their ultimate influence on the standard and test procedure, and the role NEEA and its partners played. We assigned a percentage significance to each barrier, a percentage effectiveness to each activity, and a percentage to the role that NEEA and its partners played in each activity. We then multiplied those percentages to calculate the share of savings for each activity. Finally, we summed the share of savings for each activity to estimate

[1] NEEA's partner organizations for this standard were energy-efficiency and advocacy organizations including the Appliance Standards Awareness Project (ASAP), Alliance to Save Energy (ASE), Natural Resources Defense Council (NRDC), Northeast Energy Efficiency Partnerships (NEEP), and ACEEE.
[2] Higher trial standard levels (TSLs) correlate with higher efficiencies.

the total share of savings. We concluded that the activities NEEA and its partners participated in influenced **8.8**% of the total energy savings from the standard.

1 Introduction

This report presents the results of an evaluation of NEEA and its partners organizations'[3] influence on the most recent (2016) federal commercial boilers standard and the share of savings influenced by their efforts. The evaluation team performed 1) a qualitative assessment of NEEA and its partners' actions and their influence on the standard using NEEA's logic model for its Standards Initiative (Figure 1) as a guide, and 2) a quantitative analysis of the proportion of savings that resulted from NEEA and its partners' influence.

Prior to this rulemaking, the U.S. Department of Energy (DOE) had last updated its energy conservation standard for commercial boilers via its July 2009 final rule that had a compliance date of March 2, 2012. The most recent rulemaking was conducted in accordance with the six-year-lookback review provision wherein the DOE is required to publish either a notice stating that there is no need to revise the standard or a notice of proposed updates to the standard. Table 1 summarizes the DOE's activities during this rulemaking process.

Table 1. Timeline of DOE's Commercial Boilers Efficiency Standards Rulemaking Process

Date	Activity
August 2013	The DOE issued a Notice of Proposed Determination (NOPD), to determine if natural draft commercial boilers were covered under the Energy Policy and Conservation Act (EPCA). A comment period was opened for 30 days, ending in September 2013.
September 2013	The DOE issued a Notice of Public Meeting and Framework Document availability. The Framework Document describes the procedural and analytical approaches the DOE planned to use in their evaluation of potential efficiency standards under consideration. A subsequent comment period was opened, and a public meeting was scheduled for October 2013.
October 2013	A public meeting was held to discuss the framework document and allow for input, comments, and discussion from interested parties.
November 2014	The DOE issued a Notice of Public Meeting and Preliminary Analysis document availability.
December 2014	The DOE held a public meeting to discuss the preliminary analysis document and allow for input and comments from interested parties. A subsequent comment period was opened for 30 days, ending in January 2015.
August 2015	The DOE withdrew its August 2013 NOPD in response to comments received after the NOPD and the public meetings. This was done to clarify that natural draft and mechanical draft boilers were covered under EPCA.
March 2016	The DOE issued a Notice of Proposed Rulemaking (NOPR) and Notice of Public Meeting to be held in April 2016.

[3] NEEA's partner organizations for this standard were energy-efficiency and advocacy organizations including the Appliance Standards Awareness Project (ASAP), Alliance to Save Energy (ASE), Natural Resources Defense Council (NRDC), Northeast Energy Efficiency Partnerships (NEEP), and ACEEE.

April 2016	The DOE held a public meeting to discuss the NOPR, followed by a 30-day comment period. The comment period was later extended by another 30 days.
January 2020	In response to a lawsuit filed by NRDC et al. in November 2018, the Ninth Circuit Court of Appeals ruled in October 2019 that the DOE must publish the final rule for commercial boiler standards in the federal register. In January 2020, the final rule was published, with an effective date of March 10, 2020.
March 2020	The American Public Gas Association, AHRI, Spire, and others filed a petition alleging that the DOE overstepped its statutory authority by issuing a rule that is not economically justified and will impose an undue burden on boiler manufacturers and consumers.
January 2022	A D.C. Circuit Court ruling on the March 2020 petition gave the DOE 90 days to provide additional documentation justifying the regulation.
January 2023	The new commercial boiler efficiency standard is scheduled to go into effect, with a compliance date of January 10, 2023.

Table 2. Timeline of DOE's Commercial Boilers Test Procedures Rulemaking Process

Date	Activity
February 2014	The DOE initiated the rulemaking process for possible amendments to the test procedure and issued a Request for Information including written comments, data, and other information relating to the test procedure.
March 2016	The DOE issued a NOPR.
November 2016	The DOE published its final rule on the commercial boilers test procedure, with an effective date of December 2016. The effective date was later pushed back to January 2017 due to amendments that were made after initial publication.
January 2017	The final rule on the commercial boilers test procedure went into effect.
December 2017	As of December 4, 2017, manufacturers are required to make any representations of energy efficiency using the new test procedure.

As part of NEEA's Codes and Standards program, NEEA and its partners supported the development and adoption of the standard and test procedure advocating for the most stringent, technologically feasible, and economically justified standard to maximize energy savings. They did this by submitting written comments at various stages of the standard and test procedure development and participating in and providing oral comments at public meetings.

1.1 Purpose of the Study

The purpose of this study was to assess, both qualitatively and quantitatively, NEEA and its partners' influence on the federal commercial boiler standard. The evaluation team investigated the challenges and barriers to the adoption of the federal commercial boiler standard and the activities conducted by NEEA and its partners to push forward the most stringent, technologically feasible, and economically viable standard. Based on our investigation, the evaluation team provides two assessments:

1) A qualitative assessment of NEEA and its partners' influence on the standard using NEEA's Standards Logic Model (Figure 1) as a guide, and

2) A quantitative determination of the energy savings influenced by NEEA and its partners.

1.2 Description of DOE Adoption Process

The U.S. Department of Energy (DOE) is the government agency that develops national appliance energy standards. In general, the DOE standard adoption process includes the following steps:

- The DOE sends out a Request for Information for the upcoming rulemaking.
    - Stakeholders, including manufacturers, energy-efficiency organizations, utilities, end-users, industry organizations, and foreign government agencies, may make written comments and provide data.
- The DOE creates a Framework Document and makes it available.
    - Stakeholders may make written comments and provide data.
- The DOE may form an Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) working group, which meets regularly throughout the rulemaking process.
- The DOE writes a Preliminary Technical Support Document (TSD) and makes that available.
    - Stakeholders may make written comments and provide data.
    - DOE holds a public meeting.
- The DOE writes a Notice of Proposed Rulemaking (NOPR) and makes it available.
    - Stakeholders may make written comments and provide data.
    - DOE holds a public meeting.
- If applicable, the DOE makes a Notice of Data Availability (NODA) and Supplementary Notice of Proposed Rulemaking (SNOPR) available.
    - Stakeholders may make written comments and provide data.
    - DOE holds a public meeting.
- The DOE issues the final rule.

The test procedure is a separate rulemaking which follows a similar process.

During these processes, which take years to complete, stakeholders may give input via verbal or written comments to influence the adoption of the final standard. Stakeholders, which include manufacturers, energy-efficiency organizations, utilities, end-users, industry organizations, government agencies (domestic and foreign), and other organizations, may also provide data, engineering analyses, market analyses, cost information, anecdotal experiences or case studies, and design requirements to help influence the final standard and test procedure.

2 Methodology

The sections below describe our methodology for evaluating NEEA and its partners' influence on the federal commercial boiler standard. We begin by describing our data collection approach and its limitations and then describe the specific methodologies we used for the qualitative and quantitative assessments.

2.1 Data Collection Approach

The evaluation team started data collection with a document review. The team reviewed all documentation on the DOE docket for the equipment standard and the test procedure. This included the NOPR, final rule, written comments, unified agenda, transcripts of meetings and supporting materials.

The team then built a list of potential interviewees based on stakeholders' participation in the rulemaking. The team created this list with the intention of gathering a variety of perspectives including those of manufacturers, industry associations, utilities, and energy-efficiency organizations involved in the rulemaking.

We prioritized interviews with organizations that we believed would be able to provide insight into the rulemaking, the issues and challenges that arose during the process, who the main stakeholders were, and NEEA and its partners' influence. We conducted these interviews first and asked interviewees to recommend others we should consider interviewing.

The evaluation team created an interview guide to facilitate conversations with interviewees. The guide included questions about various barriers to the establishment of the standard that we found in our document review and asked whether the interviewee recalled any other barriers. After adding in additional barriers mentioned by the interviewee, we asked the interviewee to rank each barrier on a scale of 0 – 5, with 0 meaning not applicable and 5 meaning the barrier was extremely challenging to overcome. Then, we asked interviewees to comment on each specific activity NEEA and its partners participated in. We also asked interviewees whether they knew of any other actions taken by NEEA and its partners that impacted the rulemaking. We asked interviewees what the outcomes of NEEA and its partners' activities were, what influence the activities and outcomes had on the final standard, and what role NEEA and its partners played in each activity they participated in.

The evaluation team completed interviews by February 9, 2022. Interviewees included one representative from NEEA, one manufacturer, one manufacturer industry organization, one utility representative, and three energy-efficiency advocates. We conducted a total of seven interviews.

2.2 Limitations

Most of the rulemaking process occurred between 2014 and 2016. The final rule was not published in the final register (which makes the rule official) until 2020 due to delays caused by the new Presidential administration. This resulted in two challenges. First, many potential interviewees had

either moved to a different company or retired, making it difficult to contact them for an interview. We contacted individuals who participated in the rulemaking.

Of the twelve organizations that we reached out to, we were able to schedule a total of seven interviews, and five either declined or were unresponsive. Of note, we were unable to connect with the organizations currently involved in litigation with the DOE over the new standard. Our results may therefore be somewhat biased by who we were able to interview and the lack of perspectives from some of the standard's strongest opponents.

Additionally, the interviewees we were able to recruit had difficulty remembering the details of the rulemaking, what activities the different organizations partook in, and what the effects of those activities were. During the interviews we provided examples and prompts when interviewees needed help remembering the details of the rulemaking. This may have introduced bias into interviewees responses.

To help mitigate these issues in the future it would be beneficial to consider whether it is possible to conduct the evaluation sooner after the rulemaking is completed. It is likely that response rates and the quality and accuracy of interviewees' responses would be higher if the evaluation took place sooner.

2.3 Methodology to Assess NEEA and Partners' Influence

To determine NEEA and its partners' influence on the rulemaking process, the evaluation team used NEEA's Standards Initiative Logic Model, shown in Figure 1, as a reference. Starting at the Activities level and moving down to the Outcomes, we numbered each box in the logic model (Figure 1). These numbers correspond with the findings presented in Table 3, Section 3.1.

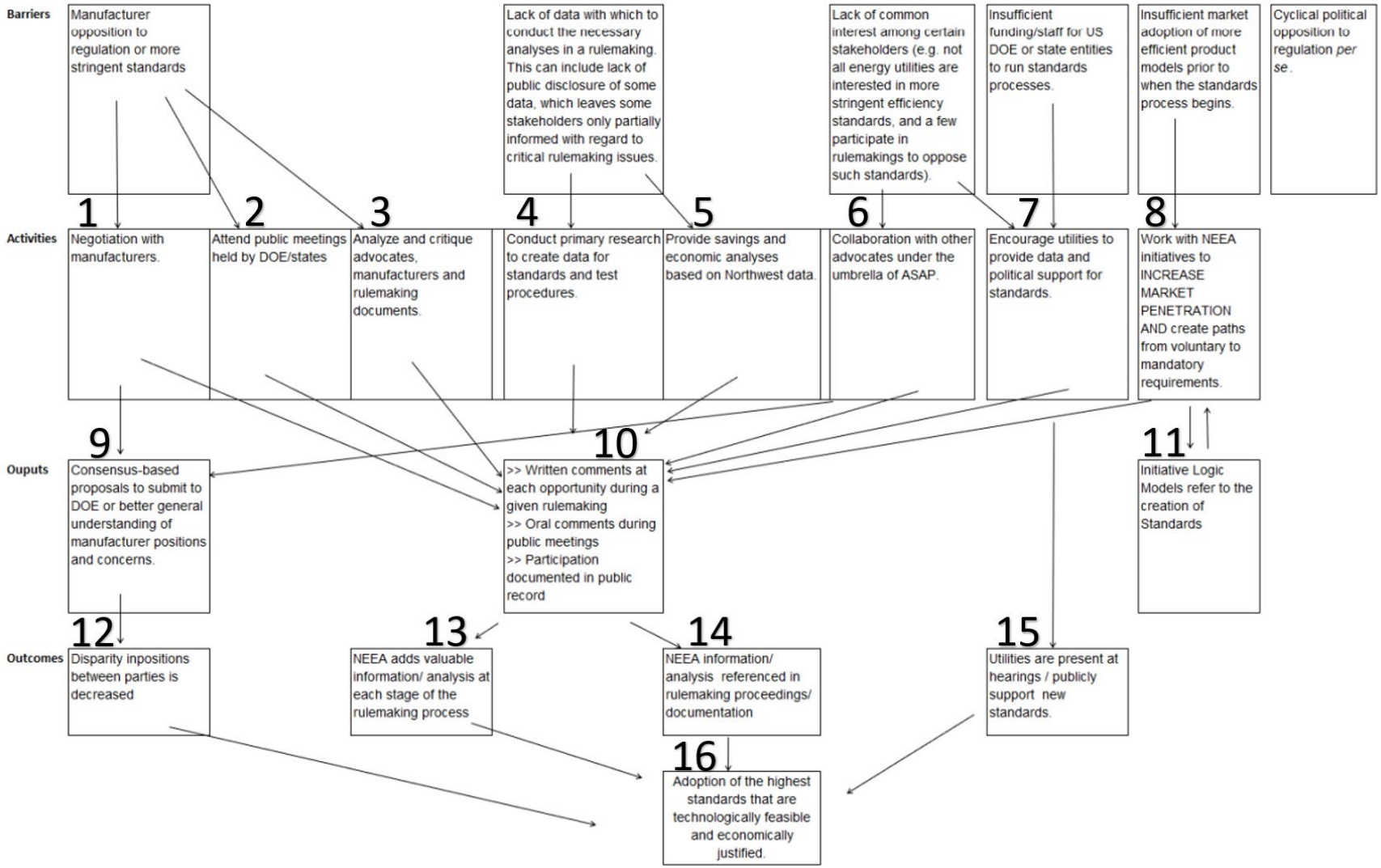

Figure 1. NEEA's Standards Initiative Logic Model

We determined whether NEEA and its partners participated in the activities and generated the outputs and outcomes shown in the logic model through our document review and interviews. Table 3 in Section 3.1 section provides a narrative of the influence that we found NEEA and its partners had in each step in the logic model. The evaluation team rated NEEA and its partners' participation in an activity/creation of an output or outcome as a "Yes" if they had clearly been involved, provided comments, data, or analysis, or participated; a "No" if they clearly did not undertake the activity or generate the output or outcome; and a "Some" if they undertook some of the activity, undertook a related activity, or caused some of the desired output or outcome.

2.4 Methodology to Estimate Share of Energy Savings from NEEA and Partners' Efforts

To estimate the share of savings influenced by NEEA and its partners' activities, we followed a framework developed by NEEA and its stakeholders and used in past evaluations. We summarize the steps included in this framework below. We note that we completed some of the steps below in our data collection efforts.

2.4.1 NEEA Standards Evaluation Framework

1. **Identify all barriers** to the development and the adoption of the standard through the document review and the stakeholder interviews. Many of the barriers will align with NEEA's logic model for standards rulemaking, in Figure 1 above, but some may not.
2. **Estimate barrier significance** by assigning a percent significance to each barrier, including the barriers not addressed by energy-efficiency organizations, which can be lumped together for simplicity. The sum of the percentages for all the barriers is 100%. The evaluator uses their professional judgment to determine the percentage for each barrier.
3. **Identify all activities** undertaken by the energy-efficiency organizations, their outcomes, and which barriers they were designed to address.
4. **Estimate each activity's significance** by assigning a percent to each activity. In past evaluations, the following assignments were used: high effectiveness = 60%, medium effectiveness = 40%, and low effectiveness = 20%. The evaluator uses their professional judgment to determine the percentages for each "bucket" (i.e., high, medium, and low). The evaluator consistently uses the assigned percentages for each bucket with exceptions made for activities that may have had a much larger or much smaller impact on overcoming the intended barrier. The evaluator provides a compelling rationale for deviating from the standard percentages.
5. **Estimate the effectiveness of each activity relative to all the other activities** by multiplying the significance of each barrier (2) by the significance of each of its associated activities (4). This calculation results in an estimate of the effectiveness of each activity relative to all efficiency organization activities to overcome all barriers.
6. **Quantify the role energy-efficiency organizations played** in each activity relative to all participants by applying a specified percentage to primary, major, or minor roles played. In past evaluations, the percentages were specified as follows: primary (led effort to support the DOE) = 50%, major (did not lead but contributed significantly) = 30%, and

minor (did not contribute significantly) = 15%. The evaluator uses their professional judgment to determine the percentages for each "bucket" (i.e., primary, major, and minor). The evaluator consistently uses the assigned percentages for each bucket with exceptions made when energy-efficiency organizations played a much greater or a much smaller role. The evaluator provides a compelling rationale for deviating from the standard percentages.

7. **Calculate the share of savings from efficiency organizations' activities** by first multiplying the results of the effectiveness of each activity (5) by the relative role of energy-efficiency organizations (6). This calculation estimates the savings, as a percentage of total savings from the standard, from each activity. Summing these percentages results in the total savings (as a percentage) that were influenced by NEEA and its partners' activities.

Table 4 in the Results section shows our calculations using this framework.

3 Results

3.1 NEEA and Partners' Influence Assessment Results

Table 3 presents NEEA and its partners' influence on the federal commercial boilers standard and test procedure through the lens of NEEA's Standards Initiative Logic Model.

The most significant influence that NEEA and its partners had on the commercial boilers standard was recommending the adoption of trial standard level (TSL[4]) 3. Manufacturers, SoCalGas, AHRI, and the gas associations recommended adopting TSL 1. SCE and PG&E recommended adopting TSL 2. TSL 2 was ultimately adopted.

It is also noteworthy that NEEA and its partners "set the stage" for future rulemakings on two significant issues. NEEA and its partners argued that the DOE should include part-load conditions in the test procedure. While the DOE did not follow NEEA and its partners' recommendation, it notes that it "may in the future adopt a test procedure that includes part-load measurements" in the final rule. NEEA and its partners also provided data and comments in support of lowering the return water temperatures used in DOE's analysis supporting the standard. The DOE agreed with the comments made by NEEA and its partners in theory but pointed to a lack of data that would support making the change. The DOE's response suggests that they may be open to changing the return water temperature in future rulemakings if the data is available to justify the change.

[4] Higher trial standard levels (TSLs) correlate with higher efficiencies.

Table 3. Qualitative Analysis of NEEA and its Partners' Influence by NEEA Standard Logic Model Element

Box #	Element	Description	Did NEEA and its partners have influence?	Findings
1	Activity	Negotiation with manufacturers	Some	While there were no formal negotiations or partnerships for submitting comments or data to the DOE, some efficiency advocates, most notably a representative of ACEEE, had conversations with manufacturers and their representatives to discuss their perspectives and bridge the gap between the two groups. We note that prior negotiations may have taken place between efficiency advocates and manufacturers during meetings on ASHRAE Standard 155P, a testing procedure for boilers that includes part-load conditions that has not been finalized yet. This previous collaboration is noteworthy because some manufacturers agreed with NEEA and its partners that the DOE should adopt ASHRAE Standard 155P as the test procedure in the subsequent rulemaking.
2	Activity	Attend public meetings held by DOE	Yes	ACEEE attended the public meeting on the Framework Document. ACEEE and ASAP attended the public meeting on the Preliminary Analysis. ASAP, NEEA and NRDC attended the public meeting on the NOPR. NEEA attended the public meeting on the comments the DOE received on the test procedure NOPR.
3	Activity	Analyze and critique advocates, manufacturers, and rulemaking documents	Yes	NEEA and its partners made verbal comments during the public meetings. They submitted written comments to the DOE that addressed many issues that NEEA and its partners had with details of the rulemaking documents.
4	Activity	Conduct primary research to create data for standards and test procedures	No	No information collected during the document review or stakeholder interviews indicated that NEEA or its partners completed any primary data collection for this standard.
5	Activity	Provide savings and economic analyses based on Northwest* data	Some	NEEA and its partners provided data from and references to multiple studies that illustrate how the DOE's analysis did not reflect typical boiler system setups or the magnitude of savings

				achievable from installing condensing boilers instead of non-condensing units.
6	Activity	Collaboration with other advocates under the umbrella of ASAP	Yes	ASAP led the effort to provide comments. NEEA provided substantial technical support, partnering with other efficiency advocates to formulate comments to submit to the DOE during each phase of the rulemaking process.
7	Activity	Encourage utilities to provide data and political support for standards	No	The California IOUs were involved in this standard, but for their codes and standards programs and without outside encouragement. No other utilities participated in this standard rulemaking.
8	Activity	Work with NEEA initiatives to increase market penetration and create paths from voluntary to mandatory requirements	N/A	There was no NEEA initiative for commercial boilers at the time of this rulemaking.
9	Output	Consensus-based proposals to submit to DOE or better general understanding of manufacturer positions and concerns	Some	Manufacturers and their representatives submitted their own comments, as did NEEA and its partners. There were no consensus-based proposals wherein NEEA and its partners agreed with manufacturers. However, some topics were discussed during the public meetings where NEEA and its partners agreed with manufacturers, such as the adoption of ASHRAE 155P as the basis for the testing standard. Additionally, NEEA and its partners did provide the DOE with written comments that showed consensus amongst energy-efficiency advocates.
10	Output	Written comments and each opportunity during a rulemaking Oral comments during public meetings Participation documented in public record	Yes	While NEEA only participated in some public meetings and was a signatory for some of the written comments submitted, NEEA and its partners collectively appear to have participated in all public meetings held throughout the rulemaking process and submitted comments during each comment period. Comments included pointing out overly conservative assumptions leading to lower savings, arguing for part-load conditions in the test procedure, encouraging the DOE to collect additional pricing data, recommending the DOE consolidate some boiler equipment classes, and recommending DOE adopt TSL 3.

				NEEA and its partners also made oral comments during the public meetings. Specifically, ASAP spoke to the need to use more representative return water temperatures for condensing boilers in the analyses. These activities are documented in the public record.
11	Output	Initiative logic models refer to the creation of standards	N/A	There is no NEEA initiative specifically for commercial boilers, but they are included in the gas equipment initiative.
12	Outcome	Disparity in positions between parties is decreased	Some	Disparities in positions between NEEA and its partners were resolved in the ASAP-convened meetings. They submitted joint comments throughout the rulemaking process showing agreement amongst NEEA and its partners. There were significant disparities in positions between NEEA and its partners and manufacturers, but advocates' participation in previous meetings on ASHRAE Standard 155P allowed some to agree that the DOE should adopt the standard in the subsequent rulemaking.
13	Outcome	NEEA** adds valuable information/analysis at each stage of the rulemaking process	Some	NEEA and its partners provided information or comments at each phase. The DOE did not make the changes to the test procedure recommended by NEEA and its partners regarding part-load testing or lower supply water temperatures. However, the DOE indicates in the final rule that it may consider these recommendations in the subsequent rulemaking. In response to comments made by NEEA and its partners about inlet water temperatures, the DOE tightened requirements for inlet water temperatures but did not adjust the requirements to the extent proposed by NEEA and its partners. NEEA and its partners also made recommendations about expanding the coverage of AEDMs, and the DOE did make some adjustments to the AEDM coverage in the final rule.
14	Outcome	NEEA** information/analysis referenced in rulemaking proceedings/documentation	Yes	The DOE references information provided by NEEA and its partners in the final rules for this standard and test procedure. Specifically, the DOE reference them for providing information on typical return water temperatures, questioning the DOE's assumed performance degradation of non-condensing boilers, providing recommendations on inlet and outlet temperatures to be used in the test procedure, suggesting that the DOE adopt

				ASHRAE Standard 155P in the future as the test procedure, supporting DOE's proposal to consolidate equipment classes, and urging the DOE to adopt TSL 3 to maximize energy savings.
15	Outcome	Utilities are present at hearings/publicly support new standards	No	The California IOUs were involved in this standard, but for their codes and standards programs.
16	Outcome	Adoption of the highest standards that are technologically feasible and economically justified	Some	NEEA and its partners recommended adopting TSL 3, but TSL 2 was ultimately adopted. Manufacturers, SoCalGas, AHRI, and the gas associations recommended adopting TSL 1. SCE and PG&E recommended adopting TSL 2. DOE updated its analysis and determined that TSL 3 was not economically justified.

*For this evaluation we considered the provision of any regional data or studies as NEEA and its partners having influence in this activity. We have done this because NEEA acts in conjunction with its partners and its partners are not all from the Northwest. We recommend reconsidering the wording of this activity in the next revision of the logic model.

** For this evaluation we consider NEEA to be NEEA and its partners. We recommend reconsidering the wording of this activity in the next revision of the logic model.

3.2 Share of Energy Savings from NEEA and Partners' Efforts

The following sections present the evaluation team's calculation methodology and resulting share of savings due to NEEA and its partners' activities during the most recent federal commercial boilers rulemaking process. It describes the evaluation team's rationale and findings that support our quantitative assessment of the significance of the challenges this standard faced, the effectiveness of the activities NEEA and its partners participated in, and NEEA and its partners' role in each activity. **The evaluation team estimates that the total share of savings influenced by NEEA and its partners' activities is 8.8%.** We provide more detail on how we quantified the significance of each barrier, the effectiveness of each activity and NEEA and its partners' role in Table 4 below.

Table 4. Estimated Share of Savings

	a			b	c			d	e	
Barrier	Relative significance for energy savings	Significance of barrier (%)	Significance of activity as it relates to the barrier (%)	Activity done by NEEA and its partners	Effectiveness of activity in addressing barrier	Effectiveness of activity in addressing barrier (%)	Effectiveness of activity relative to ALL barriers: a x b (%)	NEEA and its partners' role	NEEA and its partners' relative role in activity (%)	Savings share due to activity
Manufacturer Opposition	High	30%	7%	Argued that return temperuature and that due to the impacts of high return water temperature operation and cycling, the operational efficiency of a non-condensing boiler was below that of its rated efficiency	Low	20%	1%	Primary	50%	0.70%
			5%	Recommended the test procedure include part-load conditions, using inlet water tempreatures that are more representative of typical operation for non-condesing boilers and using and tightening the range of inlet and outlet temperatures allow to be used in the test Recommended AEDMs be allowed for large boilers	Medium	40%	2%	Major	30%	0.60%
			4%	Urged DOE to collect additional price data to support price-efficiency analysis	High	60%	2%	Minor	15%	0.40%
			6%	Recommended a single class for natural and mechanical draft boilers	High	60%	4%	Major	30%	1.10%
			8%	Encouraged DOE to adopt TSL3, stresseing the savings from doing so Enouraged DOE to include a TSL in the NOPR representing the maximum efficiency level	Medium	40%	3%	Primary	50%	1.60%
Lack of Data	High	25%	12.50%	Provided data from and referenced a study that alluded to the need to include part-load conditions in the test procedure	Not Effective	0%	0%	Major	30%	0.00%
			12.50%	Provided data from a study on typical return water temperatures for both condensing and non-condensing boilers	Not Effective	0%	0%	Primary	50%	0.00%
Lack of common interest among stakeholders	Medium	15%	15%	Collaborated with partners under ASAP to write comments	High	60%	9%	Primary	50%	4.50%
Insufficient funding/staff for DOE	N/A	0%	0%							
Insufficient market adoption of more efficient options	Low	10%	10%							
Cyclical political opposition	Medium	20%	20%							
									Total Savings %	**8.80%**

3.2.1 Rationale for Weighting Significance of Barriers

Based on the information gathered in the interviews and interviewees' rankings of the barriers from NEEA's logic model, the evaluation team assigned a percentage to represent the significance of all the barriers. The team estimated barrier significance by assigning a percent significance to each barrier, including the barriers not addressed by NEEA and its partners. The sum of the percentages for all barriers is 100%. Below we explain our rationale for the significance of each barrier.

3.2.1.1 Barrier 1: Manufacturer Opposition

Significance: High (30%)

Rationale and Findings:

- Manufacturer opposition was consistently rated as the biggest issue by energy-efficiency organizations, utilities, manufacturers, and industry associations interviewed by the evaluation team.
- Manufacturers were concerned that condensing units could not effectively replace non-condensing units in existing buildings without major and sometimes impossible modifications to venting systems and heat exchangers, leading to unsafe or difficult installations.
    - Manufacturers had a related concern that installation costs were underestimated.
- Manufacturers expressed concern that savings will not be realized due to the typical operation and design of existing boiler systems being replaced.
    - Manufacturers were concerned that condensing boilers would not be the best choice for existing buildings with high hydronic heating water temperature designs.
    - Manufacturers were concerned that condensing boilers may be operated with water temperatures that do not allow for condensing, resulting in minimal savings.
- Manufacturers had concerns about the updated test procedure and its impact on both the standard (how efficient the boilers would have to be) and its impact on manufacturers (re-testing time and cost burden).
- General opposition from manufacturers included:
    - Concerns about lack of sufficient time to review materials, especially the test procedure.
    - Concerns about flawed analyses and the use of old or incorrect data.
    - Concerns that the DOE was pushing too far on the efficiency side without consideration for technological and economic feasibility.
    - Concern that the DOE's classifications of equipment were not aligned with industry classifications.
    - Disagreement on the definitions of equipment classifications.
- AHRI filed suit against the DOE along with the American Public Gas Association and Spire, Inc. over the published efficiency standard, stating that the DOE did not fulfill its obligation to provide sufficient justification for the standards that were published. This litigation is currently ongoing, and the DOE was given 90 days from January 18, 2022, to produce supplemental justification for the published standard.

3.2.1.2 Barrier 2: Lack of Data

Significance: High (25%)

Rationale and Findings:

- There was a lack of data on field distribution of return water temperatures, which affects the savings from condensing boilers. This was a big concern that was mentioned by almost every interviewee.
- Some efficiency advocates and industry association representatives expressed concern that extrapolating data from small-medium sized commercial boilers to large boilers would not accurately estimate energy use, equipment sales, and prices.
- Industry association representatives and the DOE itself mentioned that because condensing boilers are still a relatively new technology in the United States, there is not a lot of long-term data available for equipment lifetime duration and cost analysis.
- There was widespread and ongoing disagreement and a lack of data on how to appropriately calculate the social cost of carbon.
- Efficiency advocates and industry association representatives expressed concerns that a lack of market data would lead to inaccurately estimated savings, especially as it relates to the feasibility of condensing boilers to replace non-condensing boilers in existing buildings.

3.2.1.3 Barrier 3: Lack of Common Interest Among Stakeholders

Significance: Medium (15%)

Rationale and Findings:

- We define stakeholders as NEEA and its partners who advocated for the highest possible standard. Beyond the normal differences in opinion and subsequent discussions that occur during the technical advisory group (TAG) meetings, no substantial disagreements between NEEA and its partners were noted either in our document review or in our interviews.
- However, there was disagreement between the California IOUs. While we do not consider them to be one of NEEA's partners, their lack of common interest still warrants mention as they supported the adoption of lower TSLs than NEEA and its partners. Gas utilities were not aligned with electric and gas utilities in their stance on the standard. Gas utilities had concerns that a very high standard might lead to fuel-switching. Specifically, SoCalGas recommended adopting TSL 1 while SCE and PG&E recommended adopting TSL 2. NEEA and its partners recommended adopting TSL 3.

3.2.1.4 Barrier 4: Insufficient Staffing and Funding by the DOE

Significance: Not applicable (0%)

Rationale and Findings: There was no evidence that a lack of sufficient DOE staffing or funding was a barrier to creating or adopting this standard.

3.2.1.5 Barrier 5: Insufficient Market Adoption of More Efficient Options

Significance: Low (10%)

Rationale and Findings:

- While condensing boilers are a mature technology, manufacturers were concerned about adoption of condensing boilers in the existing buildings market.

- The replacement of boilers in existing buildings is often constrained by the existing flue systems and hydronic system design, so condensing boilers may not be a cost-effective option, which could hinder market adoption. This sentiment was echoed by interviewees and comments found throughout the document review.

3.2.1.6 Barrier 6: Cyclical Political Opposition

Significance: Medium (20%)

Rationale and Findings:

- While there was no political opposition to the development of the standard or its stringency, after the development of the new commercial boiler efficiency standards, President Obama left office and President Trump took office. The DOE did not publish the standard in the Federal Register after they issued the final rule, which was driven by the new Presidential Administration's efforts to roll back environmental regulations. The change in Presidential Administration resulted in a three-year delay until a court order in 2020 affirmed the DOE's obligation to publish the new standards. The compliance date for the final rule is January 10, 2023.

3.2.2 Weighting the Significance of Activities Relative to Each Barrier

Before analyzing the effectiveness of each activity, we determined the significance of each activity to its corresponding barrier. When there was only one barrier, the significance of the activity to the barrier was equal to the significance of the barrier. When there was more than one activity that addressed the same barrier, we used information collected through our document review and interviews to determine whether any manufacturers supported the action, how much manufacturers may have opposed the action, and how significant the activity was as measured by how often it was discussed and commented on to determine the relative significance of each activity. We used that information and our professional judgment to assign a percentage to the significance of each activity relative to its barrier. The sum of the percentages for each activity equals the percent significance of the barrier.

3.2.3 Rationale for Weighting Effectiveness of Activities and Rating the Role of NEEA and its Partners in Each Activity

Using information gathered from the interviews and the document review, the evaluation team determined what activities NEEA and its partners undertook to overcome the identified barriers. We then assessed the effectiveness of each activity in overcoming the barrier by reviewing the information gathered in our interviews and re-reviewing documents to see if the action resulted in the desired outcome in the final rule. We gave each activity an effectiveness rating of high, medium, low, or not effective. Highly effective activities achieved the desired outcomes. Activities with medium effectiveness achieved some of the desired outcomes, but not all. Activities with low effectiveness achieved very little of the desired outcomes or achieved outcomes with little impact on energy savings. Not effective activities did not achieve any of the desired outcomes during this rulemaking. For example, NEEA and its partners advocated for including part-load conditions in the test procedure for this standard. The DOE elected not to include part-load conditions in this rulemaking but alluded to possibly making a change in the next cycle. Activities with high effectiveness were given an effectiveness rating of 60%. Activities with medium effectiveness were given an effectiveness rating of 40%. Activities with low

effectiveness were given an effectiveness rating of 20%. Not effective activities were given an effectiveness rating of 0%. These ratings are described in Table 5 below.

Table 5. Activity Effectiveness Designation

Activity Effectiveness	Percent Assigned	Description
High	60%	Achieved desired outcome.
Medium	40%	Achieved some of the desired outcome, but not all.
Low	20%	Achieved very little of the desired outcome or achieved outcomes with little impact on energy savings.
Not effective	0%	Did not achieve any of the desired outcome during this rulemaking.

The evaluation team also rated the role of NEEA and its partner organizations in each activity as primary, major, or minor. We used information gathered from the interviews and document review to make these assessments. A primary role means that NEEA and its partners either led the effort themselves or led an effort to support the DOE. A major role means that NEEA and its partners did not lead but contributed significantly to an activity. A minor role means that NEEA and its partners contributed, but not significantly, to an activity. Based on the precedent set in previous standards evaluations, the evaluation team assigned a percentage weight to each role rating representing NEEA and its partners' relative role in an activity compared to other stakeholders. As in past evaluations, the evaluation team assigned 50% to a role rating of primary, 30% to a role rating of major, and 15% to a role rating of minor. Below we explain the rationale behind our ratings. Table 6 shows these role designations and their corresponding percentages.

Table 6. Role of NEEA and its Partners Designations

Role of NEEA and its Partners	Percent Assigned	Description
Primary	50%	NEEA and its partners either led the effort themselves or led an effort to support the DOE.
Major	30%	NEEA and its partners did not lead but contributed significantly to an activity.
Minor	15%	NEEA and its partners contributed, but not significantly to an activity.

Below we explain the rationale behind our ratings.

3.2.3.1 Barrier 1: Manufacturer Opposition

Activity 1-1: Pointing out Overly Conservative Assumptions Leading to Lower Savings

Activity: NEEA and its partners argued that some of the DOE's assumptions were overly conservative, resulting in lower savings for condensing boilers. Specifically, they provided comments on:

- Return water temperature distributions.
- Operational efficiency of non-condensing boilers being below rated efficiency due to high return water temperatures and cycling.

Effectiveness: **Low**. Regarding NEEA and its partners' comments about return water temperature distributions, in its final rule, the DOE commented that the agency:

> *"agrees with the comments from the Joint Advocates in that there is a significant potential for system retrofits and system redesigns in both new and in existing buildings that could provide for better use of low return water temperatures during a larger portion of the heating season; however, these may incur additional and unknown costs that DOE has no ability to represent on an aggregate basis. The experiences and input from other parties indicate that there is strong concern that even many current condensing boiler installations do not live up to their energy savings potential. DOE concludes that its analysis (which presumes a smaller fraction of older existing buildings, a larger fraction of newer existing buildings, and all new construction designs) will be able to support, on average, low return water temperature distribution and accurately reflects the performance of condensing commercial packaged boilers in new construction and existing building stock."*

This response from the DOE indicates that the DOE considered NEEA and its partners' comment, and while they did not change their analysis for this rulemaking, they may be open to changing it in the future, given more data. This was seen as a "win" by the energy-efficiency advocates that we interviewed, wherein "setting the stage for future rulemakings" was one of the strategies mentioned by efficiency advocates. However, the comment from NEEA and its partners about return water temperatures did not result in any energy savings for this rulemaking.

Regarding NEEA and its partners' comments about the operational efficiency of non-condensing boilers being below rated efficiency due to high return water temperatures and cycling, in its final rule, the DOE commented: "that it [the DOE] does consider this in its analysis by using a cycling loss adjustment factor that takes into account the impact of multiple sequenced boilers operation." This response indicates that the DOE considered NEEA and its partners' comment and ensured that their analysis accounted for the issues they raised in some way. NEEA and its partners' comment regarding the operational efficiency of non-condensing boilers had a small influence on the savings from this rulemaking.

Role of NEEA and its Partners: **Primary**. NEEA and its partners were the only parties advocating in the direction of increased energy efficiency on these topics. The only other parties who commented on these issues were manufacturers and manufacturer associations, who argued against increased energy efficiency.

Savings from Activity: **0.7%**

Activity 1-2: Argued for Changes to the Test Procedure

Activity: NEEA and its partners argued for changes to the test procedure so that it would be representative of field conditions, consistent and repeatable, and so that it would not be too burdensome on manufacturers. Specifically, they argued for:

- Including part-load conditions in the test procedure.
- Ensuring that alternative efficiency determination methods (AEDMs) were an option for certification of large commercial boilers.
- Using inlet water temperatures that are more representative of typical operation for non-condensing boilers and tightening the range of temperatures allowed to be used for condensing and non-condensing boilers to ensure test are consistent and repeatable.

Effectiveness: **Medium**. Regarding NEEA and its partners' push to incorporate part-load conditions in the test procedure, the DOE "concluded that part-load testing was not warranted and therefore did not propose any new test procedure provisions towards that end." This response leaves the window open for this to be revisited in subsequent rulemakings, aligning with NEEA and its partners' strategy of "playing the long game" mentioned by some interviewees.

Regarding NEEA and its partners' push for AEDMs for large commercial boilers, in the final rule on the standard, the DOE states that it "conducted a rulemaking to expand AEDM coverage to commercial HVAC, including commercial boilers and issued a final rule on December 31, 2013."

Regarding NEEA and its partners' push for using more representative water temperatures for condensing boilers and tightening the range of temperatures used in the test, the DOE did tighten the requirements for return (inlet) water temperatures in the test procedure for non-condensing boilers. However, the DOE ultimately decided not to adopt the inlet water temperature proposed by NEEA and its partners for non-condensing boilers, stating, "DOE believes that the concerns regarding impacts on ratings due to the proposed 140°F inlet water temperature are mitigated with the temperature requirements it is adopting in this Final Rule." This response indicates that the DOE considered the comments made by NEEA and its partners, implemented some, and decided that its adopted inlet water temperatures for condensing boilers were representative of typical operation, as noted in the following statement from the final rule on the test procedure.

> *"DOE believes that this Final Rule results in a test procedure that is more representative of efficiencies found in the field by increasing the allowable inlet water temperature and more repeatable because of the narrower allowable range of inlet water temperatures while mitigating concerns regarding the impact on ratings.*"

Role of NEEA and its Partners: **Major.** NEEA and its partners were influential and provided many comments and data to support its positions on the test procedure. However, some manufacturers also advocated for including part-load conditions in the test procedure to align with ASHRAE 155P, a test procedure for boilers that has been under development for many years but not completed. In addition, manufacturers also commented on the AEDM and testing burden as well as the inlet temperatures used in the test.

Savings from Activity: **0.6%**

Activity 1-3: Recommended Collecting Additional Price Data

Activity: NEEA and its partners commented on DOE's preliminary technical support document, offering suggestions for improvements to the analysis. The most notable of their recommendations was urging the DOE to collect additional price data to support its price-efficiency analysis.

Effectiveness: **High.** Based on our interviews and a review of the final rule, the DOE did collect additional price data. Per the final rule, "DOE gathered this information through consultations with manufacturers, distributors, and contractors that provided CPB [commercial packaged boiler] price data."

Role of NEEA and its Partners: **Minor**. While NEEA and its partners submitted written comments about collecting additional price data, their comment is not referenced in the final rule. Other stakeholders, including manufacturers and trade organizations, were referenced in the final rule as having submitted comments and expressed concerns verbally during public meetings about pricing data.

Savings from Activity: **0.4%**

Activity 1-4: Recommended Eliminating Equipment Class Distinctions by Draft Type

Activity: NEEA and its partners provided written comments on the preliminary technical support document recommending a single class for natural and mechanical draft boilers.

Effectiveness: **High**. NEEA and its partners were successful in their efforts to convince the DOE not to have separate classes of equipment, as evidenced in the classes in the final rule and noted by one of our interviewees.

Role of NEEA and its Partners: **Major**. NEEA and its partners were supported in its effort to consolidate class types by one manufacturer, while other manufacturers urged to keep the classes separate based on draft type. Pacific Gas and Electric (PG&E) and Southern California Edison (SCE) also supported the consolidation of equipment classes based on draft type.

Savings from Activity: **1.1%**

Activity 1-5: Pushed for the Highest Possible Standard

Activity: NEEA and its partners pushed for the highest efficiency standard possible. They provided written comments on the preliminary technical support document urging the DOE to include a TSL in the NOPR representing the maximum efficiency level. They also provided written comments on the NOPR for the standard urging the DOE to adopt TSL 3, stressing the savings from doing so.

Effectiveness: **Medium**. While the DOE did include a TSL (TSL 5) in its final analysis that represented "max-tech," the DOE ultimately adopted TSL 2 instead of TSL 3. That said, our interviewees expressed the opinion that when the DOE adopts one level below the level

recommended by NEEA and its partners, they consider it a "win" because, without the involvement of NEEA and its partners, the DOE might accept the lowest tier due to the influence of manufacturers.

Role of NEEA and its Partners: **Primary**. In the final rule, NEEA and its partners were the only party that supported TSL 3. All other parties, including the California IOUs, opposed TSL 3.

Savings from Activity: **1.6%**

3.2.3.2 Barrier 2: Lack of Data

Activity 2-1: Provided Data Demonstrating the Need for Part-Load Testing

Activity: In its efforts to convince the DOE that part-load conditions needed to be included in the test procedure, NEEA and its partners referenced a study from Durkin that shows well-regulated condensing boilers can have substantial gas savings compared to non-condensing units. NEEA and its partners used the study to show that substantially higher savings could be achieved from condensing boilers than might be expected based on their rated efficiencies. The study also pointed out that ASHRAE Standard 155P, which is still in development and includes part-load conditions, will be a better representation of performance in the field.

Effectiveness: **Not effective.** The DOE concluded that part-load testing was not warranted and did not incorporate part-load efficiency testing in the updated test procedure. However, in their comments the DOE left open the possibility of incorporating part-load efficiency testing in the next test procedure rulemaking:

> *"DOE does not intend to develop a test procedure at this time for the purpose of measuring part-load efficiency. DOE believes the ratings produced by its test procedure provide a sufficient basis to give the purchaser enough information when choosing between commercial packaged boilers models. DOE may in the future adopt a test procedure that includes part-load measurements."*

Role of NEEA and its Partners: **Major.** NEEA and its partners were major advocates for including part-load efficiency in the test procedure along with SCE and PG&E. The latter provided data from a lab study it conducted on ASHRAE Standard 155P.

Savings from Activity: **0.0%**

Activity 2-2: Provided Data on Typical Return Water Temperatures

Activity: NEEA and its partners cited data on typical return water temperatures for both condensing and non-condensing boilers from a Minnesota Department of Commerce study, arguing that the DOE's return water temperature distributions for condensing boilers represented overly conservative scenarios and do not reflect typical operating parameters.

Effectiveness: **Not effective.** In its final rule, the DOE commented that it

> *"agrees with the comments from the Joint Advocates in that there is a significant potential for system retrofits and system redesigns in both new and in existing buildings*

that could provide for better use of low return water temperatures during a larger portion of the heating season; however, these may incur additional and unknown costs that DOE has no ability to represent on an aggregate basis. The experiences and input from other parties indicate that there is strong concern that even many current condensing boiler installations do not live up to their energy savings potential. DOE concludes that its analysis (which presumes a smaller fraction of older existing buildings, a larger fraction of newer existing buildings, and all new construction designs) will be able to support, on average, low return water temperature distribution and accurately reflects the performance of condensing commercial packaged boilers in new construction and existing building stock."

This response from the DOE indicates that the DOE considered NEEA and its partners' comment, and while they did not change their analysis for this rulemaking, they may be open to changing it in the future, given more data.

Role of NEEA and its Partners: **Primary.** NEEA and its partners led the charge in arguing for adopting lower water temperatures in the testing standard, particularly for condensing boilers.

Savings from Activity: **0.0%**

3.2.3.3 Barrier 3: Lack of Common Interest Among Stakeholders

Activity 3-1: Collaborating with Other Advocates Under ASAP

Activity: NEEA and its partners attended Technical Advisory Group (TAG) meetings organized by the Appliance Standards Awareness Project (ASAP), which resulted in joint written comments.

Effectiveness: **High**. NEEA and its partners presented a unified perspective on the rulemaking and submitted joint comments demonstrating such. There was no evidence that NEEA and its partners had public disagreements in the materials on the docket.

Role of NEEA and its Partners: **Primary**. The Appliance Standards Awareness Project (ASAP), one of NEEA's partners, led the initiative to organize a TAG to bring together all the efficiency advocates active in the commercial boiler rulemaking. This allowed the advocates to work together to submit joint comments and have consistent messaging in the verbal comments they made throughout the rulemaking process.

Savings from Activity: **4.5%**

The total share of savings from NEEA and its partners' efforts is 8.8%.

4 Savings Duration

Currently, NEEA assumes the savings from its work on a standard have a duration of ten years. This duration of savings assumes that the market would have independently arrived at the same efficiency specified in the standard ten years from the standards' compliance date. In 2019, an analysis was conducted for NEEA which did not find any compelling evidence that supports the use of a different savings duration. In our research we did not find evidence to suggest that a different duration of savings should be used for the commercial boilers standard. We believe that ten years is a reasonable duration for the savings for this standard.

5 Future Energy Savings

The evaluation team found that NEEA and its partners conducted some activities that "set the stage" for increased savings in future rulemakings. Indeed, this was a strategy mentioned by one of our interviewees. The following activities may result in future energy savings:

- NEEA and its partners were instrumental in pushing for the adoption of part-load efficiency in the testing standard, consistent with the methodology in ASHRAE 155P. While part-load testing was not included in the final test procedure, stakeholders, including some manufacturers believe it has a high likelihood of being included in the next test procedure.
- NEEA and its partners provided data and comments in support of lowering the return water temperatures used in DOE's analysis supporting the standard. The DOE agreed with the comments made by NEEA and its partners in theory but pointed to a lack of data that would support making the change. The DOE's response suggests that they may be open to changing the return water temperature in future rulemakings if the data is available to justify the change.

The evaluation team recommends that NEEA evaluate this standard again after the DOE completes its next rulemaking process (i.e., when the final rule for the next standard or test procedure for commercial boilers is issued). Doing so could capture savings influenced by activities that occurred during this rulemaking as well as savings influenced NEEA and its partners' participation in the next rulemakings on commercial boilers standards and test procedures.

6 Conclusion and Recommendations

6.1 Conclusion

Based on the information collected and the evaluation team's analysis, NEEA and its partner organizations' influence on the standard primarily came from their joint written comments to the DOE. In particular, the most significant influence that NEEA and its partners had on the commercial boilers standard was recommending the adoption of TSL 3. Manufacturers, SoCalGas, AHRI, and the gas associations recommended adopting TSL 1. SCE and PG&E recommended adopting TSL 2. TSL 2 was ultimately adopted. Cumulatively, we estimate that NEEA and its partners' activities influenced **8.8%** of the total savings from the federal commercial boiler standard. NEEA and its partners also conducted some activities that "set the stage" for increased savings in future rulemakings.

6.2 Recommendations

The evaluation team has several recommendations for NEEA to consider for all future efficiency standards advocacy work and evaluations unless otherwise noted including:

- Conduct the evaluation as soon as possible after the rulemaking to ensure the evaluation team can conduct interviews with participants in the rulemaking (they will be less likely to have changed jobs, retired, etc.) and to ensure interviewees remember the details of the rulemaking.
- Consider increasing coalition building efforts/negotiations with manufacturers to get them and energy-efficiency advocates in agreement on at least some items and to see if they could share data with either the energy-efficiency advocates or the DOE to help support the DOE's analysis. This could help NEEA and its partners to craft a more compelling proposal for the DOE that manufacturers might agree with. In particular, an efficiency advocate noted that they and their partners did not do as much coalition building with the manufacturers as they should have, and that it will be important to improve upon this for the next standards development cycle.
- Related to the above point, ensure that there is a new representative amongst NEEA and its partners who manufacturers trust and respect, particularly for HVAC equipment. This person's role is to bridge the gap between energy-efficiency advocates and manufacturers, really trying to understand their perspectives and helping the energy-efficiency community to create proposals for the DOE that manufacturers could agree with. In particular, we found that:
    - One manufacturer noted that ACEEE had a very good working relationship with manufacturers and that the individual from ACEEE working on standards at the time bridged the gap between advocacy groups and manufacturers. The same manufacturer stated that they did not feel there was any other collaboration between manufacturers and energy-efficiency advocates. When we interviewed that representative from ACEEE, they stated that trying to understand manufacturers perspectives was something they worked hard to do – visiting their plants, meeting with them, seeking to understand their operations and working to

help create comments and proposals for the DOE to consider that might be palatable to manufacturers. This individual is now retired, and they stated that they hoped that someone was continuing this important work.

- If it is deemed helpful to the standard, encourage utilities besides the California IOUs and utilities opposed to increasing the standard to attend and support the standard. In addition to being another voice supporting more stringent standards, some utilities can offer useful data from previously conducted studies in their service territories or can invest in primary research to support the rulemaking process. This recommendation applies to all NEEA's work on standards. Specifically:
    - One interviewee noted the importance of all efficiency advocates participating in DOE's rulemaking process, regardless of the budget an organization can dedicate to standards development. They noted that different organizations bring different strengths, information and data to the table and having more voices at the table pushing for the same thing can be powerful.
- Consider conducting primary research or independent analyses if budgets allow and there is a need. For this standard, for example, more research on return water temperatures in the field would have been helpful and could have resulted in a different outcome.