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Commercial Pre-Rinse Spray Valves Standard Evaluation

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1 Executive Summary

NEEA contracted with TRC to conduct an independent evaluation to qualitatively assess NEEA's influence in the establishment of the Commercial Pre-rinse Spray Valve (CPSV) standard, and to quantitatively assess the savings from the standard due to the combined efforts of NEEA and energy efficiency organizations participating in the process. An efficiency organization is one whose goal is to seek policies that promote energy efficiency in buildings and appliances.

DOE started the spray valves rulemaking in 2012. DOE concluded the test procedure rulemaking in 2013 with a Final Rule that amended the test procedure, requiring compliance by November 2013. DOE initiated a spray valves standards rulemaking in 2014 with the availability of a framework document. DOE concluded the standards rulemaking in 2016 with the publication of the Final Rule that amended efficiency standards for spray valves, requiring compliance by January 2019.

As part of its codes and standards program, NEEA supported this standard's development and adoption. NEEA and other efficiency organizations provided comments on the 2013 test procedure and 2016 standard that affected the analysis and the ultimate DOE Final Rules.

To conduct its evaluation, TRC reviewed the DOE docketed materials for the 2016 standard and 2013 test procedure. TRC also interviewed five stakeholders active in the adoption of the process: one NEEA staff member, three staff members from other efficiency organizations, and one manufacturer. All interviewees were involved in the 2016 CPSV standards rulemaking and/or the 2013 CPSV test procedure rulemaking.

For the qualitative assessment, TRC found that NEEA engaged in most of the activities identified in NEEA's Codes & Standards logic model of its codes and standards program for this evaluation, particularly through comments submitted in the public review process, including submitting written comments and participation in public meetings. For the quantitative assessment of the standard, TRC found that the efficiency organizations' activities, including those engaged in by NEEA, led to 4% of the total energy savings from the standard.

2 INTRODUCTION

This evaluation describes energy efficiency organizations' influence on the development of a federal appliance standard for Commercial Pre-rinse Spray Valve (CPSV) equipment.

The following table summarizes the timeline of this standard's development by the United States Department of Energy (DOE):

Table 1. Timeline Summary of DOE's Development of the CPSV Standard and Test Procedure[1]

Date	Activity
May 30, 2012	DOE published a test procedure NOPR for all five products in which they proposed to adopt the latest version of the relevant ASTM Standard for testing spray valves.
October 23, 2013	DOE published the test procedure final rule to amend the test procedures for CPSV, Showerheads, Faucets, Water Closets, and Urinals. For CPSV, DOE adopted a previous version of the relevant ASTM Standard as the latest version was still in draft form.
September 4, 2014	DOE published a notice announcing the availability of the framework document for CPSV which described the analyses DOE planned to conduct during the rulemaking and sought comments.
July 9, 2015	DOE published a notice of proposed rulemaking (NOPR) for the CPSV energy conservation standards rulemaking.
November 12, 2015	DOE published a Notice of Data Availability in which DOE presented revised analysis
January 27, 2016	DOE published the final rule. Some key issues in the standards rulemaking were: 1) product classes; 2) efficiency metrics; and 3) manufacturer impacts; 4) lifecycle cost; and 5) national impacts.

As part of its codes and standards program, NEEA supported the development and adoption of the CPSV standard, by submitting comments at various stages of the standard development and by participating in public meetings. As is common in federal appliance standard development, other energy efficiency organizations also supported this standard's development process, and NEEA sometimes collaborated with these organizations in the process.

2.1 Study Purpose

The scope of TRC's evaluation was to investigate the barriers to adoption for the CPSV standard, the activities that NEEA conducted, the activities that other energy efficiency organizations

[1] NEEA undertook the evaluation of its efforts in support of this standard several years after it was adopted. The delay was due to the fact that at the time this standard was being developed, NEEA had not yet selected an agreed upon method to evaluate its involvement in standards development process. By the time a methodology had been selected, more than a dozen standards had been adopted. This created a backlog of evaluation work, which NEEA continues to work through.

conducted, and the effectiveness of these activities. Based on the results, TRC provided two assessments:

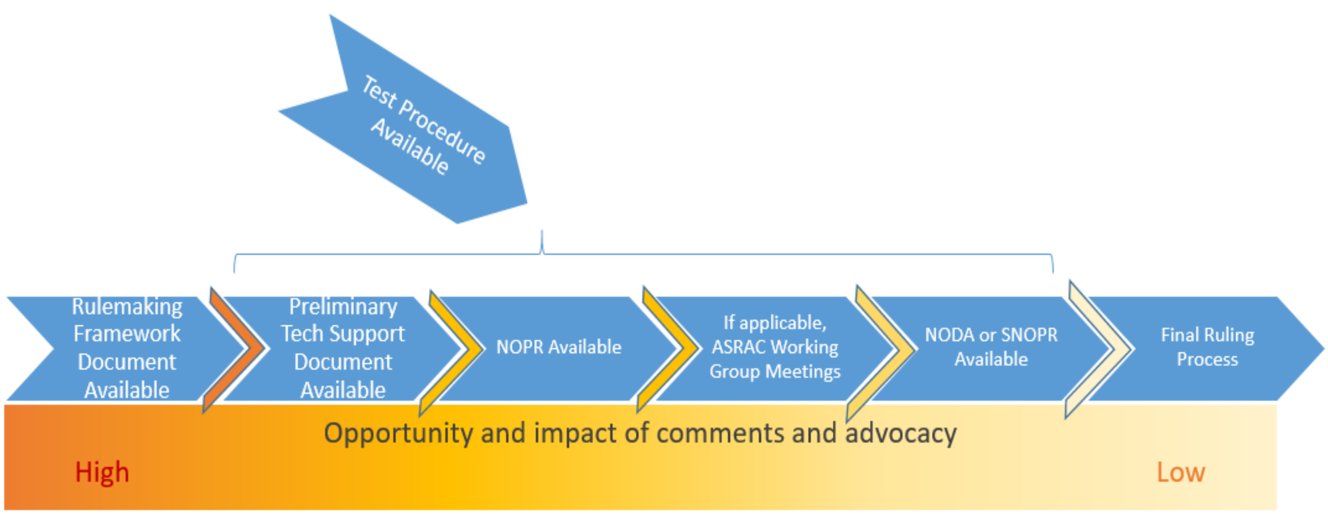
1. A qualitative assessment of NEEA's influence in the establishment of the CPSV standards, which TRC developed based on the NEEA Standards Development Logic Model; and

2. A quantitative assessment of the savings from the standards due to all energy efficiency organizations, including NEEA.

2.2 Description of DOE Adoption Process

As background, TRC provides the following description of the DOE federal standard adoption process. The DOE is the government agency responsible for developing and adopting national appliance energy standards. During the standard development process, the DOE seeks input from stakeholders, including comments regarding the feasibility of the proposed standard and its impact on consumers, manufacturers, and other stakeholders. Stakeholders can provide input during public meetings and comment periods, both of which occur after the public release of rulemaking documents. The DOE must address stakeholder comments and demonstrate that the benefit of a new or revised standard will exceed any burden that it may impose – e.g., that the energy savings (in dollars) from the new standard will exceed costs for implementation. TRC developed Figure 1 to illustrate the general DOE standard development process and opportunities for stakeholder input.

Figure 1. DOE Standard Development Process and Opportunities for Stakeholders' Influence



There are multiple opportunities for stakeholders to influence the final standard and supporting documents that impact energy savings, including providing comments and data on the:

1. Test procedure, which details how a product must be tested for compliance with the standard
2. Inputs and analysis methodologies used to evaluate each efficiency level considered for the standard, including engineering analysis to determine cost effectiveness, market availability and pricing data, and design options that could affect efficiency

3. Efficiency levels proposed for each equipment class

For some standards, a working group formed by the Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) provides recommendations to DOE. This often occurs when a standard requires significant negotiations to identify acceptable terms, such as product classes, definitions, or required efficiency level, and the working group typically includes efficiency organizations. In the case of the CPSV, there was not an ASRAC working group.

3 Methodology

This section provides an overview of the data collection activities and analysis methodology for this evaluation.

3.1 Data Collection Approach

To collect data for this evaluation, TRC:

1. Reviewed literature – primarily from the DOE docket for this appliance standard, and
2. Gathered feedback from stakeholders involved in the rulemaking process for this standard, primarily through phone interviews.

TRC's literature review included:

- DOE docketed comments from stakeholders, including manufacturers, energy efficiency organizations, and other interested parties
- DOE Framework document for the energy conservation standard
- DOE NOPR for the energy conservation standard
- DOE Final Rule for the energy conservation standard
- DOE NOPR for the test procedure
- DOE Final Rule for the test procedure
- DOE Preliminary, NOPR and Final Rule Technical Support Documents (TSDs) for the energy conservation standard
- Public meeting transcripts

TRC conducted phone interviews with staff at various organizations that were active in the adoption of this standard. This included:

- One NEEA staff member
- Staff members from energy efficiency organizations that played a prominent role in supporting this standard's development. TRC interviewed staff from three of the efficiency organizations, one of which is a representative from a utility that TRC categorizes as an efficiency organization, because they consistently provided comments in support of high efficiency levels;
- One manufacturer responded to the interview questions over email

Figure 2 summarizes the interview dispositions. As shown in this figure, TRC did not meet the total number of target interviews, falling short particularly in the manufacturers and trade organizations category. TRC notes that there are relatively fewer organizations involved in this rulemaking compared to other DOE appliance standards rulemaking. TRC attempted to contact manufacturers and trade organizations multiple times and offered a gift card for participation but was unable to recruit more of these types of stakeholders for interviews. As noted below, it is possible that the long time-lag between when the standard development occurred and the evaluation reduced interest in participation in interviews.

Figure 2. Number of Targeted and Completed Interviews by Stakeholder Category

Stakeholder Category	Target Interviews	Candidates Contacted	Completed Interviews
NEEA C&S Staff	1	1	1
Energy Efficiency Organizations and Utility Representative	3 – 5	4	3
Manufacturers and Trade Organizations	3 – 5	4	1
(OPTIONAL - Pending need) Other Stakeholders	1 – 2	1	0
Total	**7 – 11**	**10**	**5**

3.2 Limitations of Data Collection Efforts and Analysis

One overarching limitation was that the DOE began development of the CPSV standard years ago, with stakeholder comments submitted as early as August 2012. To help address recall issues, TRC sent interviewees their organization's docketed comments and a summary of the adoption timeline prior to the interview. TRC acknowledges that this may have introduced some bias into interviewees' responses. Several stakeholders interviewed also reported difficulty recalling aspects of the standard development, given the time lag. As noted above, TRC was not able to complete interviews with as many manufacturer and trade organizations as targeted.

Based on TRC's review of the dockets and from information collected through interviews with participants in the process, we believe that our quantitative and qualitative assessments accurately portray the proceedings and that the conclusions regarding efficiency organizations' influence are reasonable.

3.3 Methodology to Assess NEEA's Influence

To assess NEEA's influence on the development and adoption of this standard, TRC compared the proposed activities from NEEA Logic Model for Standards Rulemaking Process (provided in Appendix: NEEA Logic Model for Standards Rulemaking Process) with activities that NEEA conducted, based on interviews and the literature review. TRC identified barriers to the adoption of this standard, and then identified influential activities that addressed the barriers in which NEEA participated. Finally, TRC identified NEEA's role and contribution for each activity and output.

3.4 Methodology to Estimate Energy Savings from All Efficiency Stakeholders

To estimate savings from all energy efficiency organizations' efforts in support of the standard, TRC first developed a qualitative assessment of the impact of energy efficiency organizations' efforts. Specifically, TRC:

1. Used the docketed literature to identify all barriers to the adoption of the standard, including comments raised by all stakeholders.
2. Used the docketed literature to identify the outcome of each issue where the efficiency organizations provided comments and identified those for which DOE made a change based on the comment – such as a revision in product classes, definitions, analysis, or proposed efficiency level.
3. Used the docketed literature and interviews with stakeholders to understand:
    a. The relative significance of the issues where efficiency organizations provided comments compared to all issues raised for the standards
    b. For each issue affected by the efficiency organizations, the relative impact of the efficiency organizations' comments on the final outcome.

TRC then translated this qualitative assessment into a quantitative framework, to approximate the significance of energy efficiency organizations' activities as a percentage of energy savings resulting from activities during the development and rulemaking process. Section 5.1 provides detail on TRC's methodology for the quantitative analysis.

3.5 Savings Duration

NEEA is currently assuming ten years for its savings claims for appliance standard development support. TRC had conducted a previous analysis for NEEA across multiple appliance standards and did not find any compelling evidence that supports a shorter or longer savings timeframe. Given the various assumptions embedded in DOE's savings analysis as well as in TRC's estimate of share for efficiency organizations, TRC recommends that NEEA assume ten years for its savings claims for CPSV standard development support.

4 NEEA Effectiveness Assessment Results

Figure 3 summarizes the results of TRC's assessment of NEEA's efforts. TRC developed this figure using the NEEA logic model as an assessment framework. Note that NEEA has one logic model for all codes and standards activities. NEEA adapts its activities to suit the specific needs for each particular standard; therefore, not all barriers or activities are relevant for every standard.

Using the assessment criteria from the NEEA logic model, TRC used information from the analysis to identify whether NEEA met each relevant criterion. TRC identified logic model activities and outputs with a "Y" if NEEA undertook the activity or output and "N" if NEEA did not. Figure 3 provides a rationale for whether NEEA accomplished each objective and describes where some activities may not have been relevant or necessary for this standard.

NEEA's primary influence came from submitting comments to DOE during the standard development process. Comments and recommendations from NEEA and other energy efficiency organizations to DOE which had some impact on the standard included the following:

1. DOE should consider a metric or a product classification structure that addresses equipment performance in addition to water consumption.
2. Commenter opposes using spray force to create product classes and instead maintain a single product class.
3. Support the addition of a spray force measurement based on ASTM Standard F2324-13.
4. DOE should start a separate rulemaking for separate standards for dining and pot and pan cleaning.
5. DOE should use a broader index of grocery, institutional and restaurants to project national sales of CPSV.
6. DOE should consider factors such as early business closures in considering the effective estimated lifetime of a CPSV.
7. DOE should use 1.24 gallons per minute (gpm) for all CPSV as standard.

There were three activities that NEEA did not conduct for this standard: negotiation with manufacturers, conducting primary research and providing savings, and economic analysis based on Northwest data. In general, TRC found that this standard did not necessitate these activities. There was no direct negotiation because this was not a negotiated rulemaking and did not have an ASRAC working group (described in section 2.2) formed by DOE. There was not a high need for NEEA to provide these data or conduct savings analysis for this standard, since manufacturers or other efficiency organizations, including the California Investor Owned Utilities (CA IOUs), were generally able to provide data.

Figure 3 compares NEEA's activities to the C&S logic model. The white cells show the logic model inputs. The blue cells show TRC's assessment of NEEA's activities for this standard.

Figure 3. Assessment of NEEA's Activities on the CPSV Standard

Barrier (NEEA logic model)	Manufacturer opposition			Lack of data with which to conduct the necessary analyses in a rulemaking		Lack of common interest among certain stakeholders	Insufficient funding/staff for US DOE to run standards processes
Proposed Activity (NEEA logic model)	Negotiation with manufacturers.	Attend public meetings held by DOE.	Analyze and critique organizations, manufacturers and rulemaking documents.	Conduct primary research to create data for standards and test procedures.	Provide savings and economic analyses based on Northwest data.	Collaboration with other organizations under the umbrella of ASAP.	Encourage utilities to provide data and political support for standards.
Undertaken by NEEA? (TRC)	N	Y	Y	N	N	Y	Y
Rationale/ explanation (TRC)	TRC did not find evidence that NEEA negotiated with manufacturers during the standard process.	NEEA attended public meetings at all stages of rulemakings.	NEEA submitted sole comments and joint comments on standard development. NEEA attended and actively participated in all public DOE hearings.	NEEA did not collect or provide primary data.	NEEA did not provide savings data for the Northwest.	NEEA submitted joint comments and held on-going communication and meetings.	NEEA worked jointly with CA IOUs, who provided comments in the support of the standard.
Outputs (NEEA logic model)	Consensus-based proposals to submit to DOE or better general understanding of manufacturer positions and concerns	NEEA adds valuable information at each stage of the rulemaking process.		NEEA adds valuable information at each stage of the rulemaking process.	NEEA information/ analysis referenced in rulemaking proceedings/ documentation	NEEA adds valuable information at each stage of the rulemaking process. NEEA information/ analysis referenced in rulemaking proceedings/ documentation	Utilities are present at hearings/ publicly support new standards.
Accomplished by NEEA? (TRC)	N/A	Y		N/A	N/A	Y	Y
Rationale/ explanation (TRC)	N/A, because NEEA did not complete negotiations with manufacturers.	NEEA provided comments in support of DOE and other efficiency organizations that influence the test procedure and efficiency level adopted.		N/A, because NEEA did not complete any primary research for this standard.	N/A, because NEEA did not provide any research for the docket.	DOE rulemaking documentation references NEEA joint comments. NEEA was active during public stakeholder hearings.	NEEA collaborated with the California Investor Owned Utilities (IOUs), which submitted comments that generally aligned with NEEA's.

5 Influence of Efficiency Organizations

5.1 Description of Calculation of Energy Savings

TRC estimated the energy efficiency organizations' influence using an analysis framework described below. Sections 5.3 and 5.4 provide descriptions of TRC's rationale for our rankings and estimates of percentages. This section includes an example calculation, to demonstrate how we arrived at our estimates in the following sections 5.3 and 5.4. In this example we estimate the impact of removing one barrier (lack of adequate definitions of equipment classes). We do this by first estimating how important the removal of this barrier is compared to all others present in this particular standards process. We then estimate how important and how effective energy efficiency work was in removing the barrier. Below we lay out the steps more explicitly, including the estimated input we used (shown in *italics*).

a. **Identified and estimated the relative significance of the barriers** to adoption of the standard. TRC identified two barriers that were significant for standard development – Manufacturer Opposition and Lack of Data Availability and Accuracy. Within each barrier, TRC identified two sub-barriers. This analysis does not include other barriers which came up throughout the rulemaking on which the efficiency organizations did not have an impact. Based on the importance of each barrier and sub-barrier, TRC assigned a weighting factor to each so that the sum of all of the barriers would total 100%:
   i. Manufacturer Opposition:
      i. Metric: 20%
      ii. Efficiency levels: 20%
   ii. Lack of Data Availability and Accuracy:
      i. Product lifetime: 10%
      ii. Product shipments: 10%
   iii. All other barriers over which efficiency organizations did not have influence: 40%

b. **Identified and estimated the significance of each efficiency organization activity to overcome each barrier.** As one example of activity, the energy efficiency organizations commented that the DOE should consider product shipments to a broad mix of commercial building types. TRC found that this activity had a high significance in reducing the barrier, "Lack of Data Availability and Accuracy". TRC estimated the significance as 40% for addressing this barrier, based on the following scale:

   Low = 10%, Medium = 20%, and *High = 40%*

c. **Estimated the effectiveness of each efficiency organization activity relative to all efficiency organization activities to overcome all barriers**. Following our example activity, TRC rated the sub-barrier, "product shipments" as 10% of significance across all barriers. Consequently, TRC estimated that the significance of this energy efficiency organizations activity relative to all activities was 10% x 40% = 4%.

d. **Estimated the role of efficiency organizations in each activity relative to all participants to support DOE (i.e. all, primary, major, minor).** TRC estimated efficiency organizations' role to support DOE and address each barrier and applied a weighting to the significance of their activities. Because DOE (including its consultants) did the majority of the work to develop the draft test procedure, NOPR, and draft engineering analysis, TRC assumed that the maximum role played by the energy efficiency organizations for comments affecting these documents and analysis was 50% or less, as described below:

Primary Support (50%)*:* Led efforts to provide comments to DOE.

Major Support (30%): Did not lead efforts but contributed significantly.

Minor Support (15%): Did not contribute significantly.

Using the example activity of comments on shipments, efficiency organizations provided the Major Support to the DOE. For this example activity, the final estimated significance for this energy efficiency activity is 4% (calculated in step c) x 30% = 1.2%.

e. **Estimated the total impact of efficiency organizations' activities.** For each activity, TRC estimated the significance of each activity to overcome all barriers (step c) and multiplied this by the relative role of the organizations (step d). TRC then summed the significance of all activities.

5.2 Efficiency Organizations' Contribution to Energy Savings

TRC estimates the efficiency organizations' influence on the standard development process is 4%. Figure 4 presents the detailed results. TRC provides a supporting rationale for each input in the sections below the figure. Note that this figure only lists barriers for which TRC found that the efficiency organizations impacted the final standard.

Figure 4. Impact Analysis of Efficiency Organizations' Contributions

Barrier, based on NEEA logic model	Barrier 1: Manufacturer Opposition		Barrier 2: Lack of Data		Total
Sub-barrier specific to standard	DOE requested input on what the efficiency metric for the standard should be. At least one manufacturer opposed a metric which required a spray force test in the test procedure.	In response to the standard efficiency levels proposed in the NOPR, at least one manufacturer cautioned against picking the highest efficiency level (max-tech) solely based on flow rate.	DOE had proposed using product lifetimes which did not account for business-related events.	DOE had proposed shipments that did not account for spray valves used in facilities other than restaurants, such as grocery and institutional facilities.	
Significance for energy savings	Medium	Medium	Low	Low	
a. Significance of barrier (%)	20%	20%	10%	10%	60%
	Activities to Address Barrier 1		Activities to Address Barrier 2		
Activities Conducted by all EE Organizations	Efficiency organizations commented in support of a metric that incorporates both flow rate and spray force.	Efficiency organizations supported the efficiency levels proposed in the NOPR.	Efficiency organizations commented that DOE should assume a 10% attrition rate to account for events such as businesses closing, the unit being replaced, or rinsing stations being removed.	Efficiency organizations commented that DOE should consider product shipments to facilities other than restaurants, such as grocery and institutional facilities.	
Results - i.e., DOE response	DOE adopted the same metric that was used in previous standards: gpm, with different gpm requirements by spray force.	In the Final Rule, DOE adopted efficiency levels with flow rates higher than in the NOPR, but still an improvement over (lower flow rate than) the previous standard.	DOE revised lifetime assumption to assume a 10% attrition rate within the first year of operation	DOE revised shipments assumptions to account for shipments to a broader mix of facilities	
Effectiveness of activity for addressing barrier	Medium	Low	High	High	
b. Significance of activity for each barrier (%)	20%	10%	40%	40%	
c. Significance across <u>all</u> barriers: axb (%)	4%	2%	4.0%	4%	
EE organizations' role	Minor	Major	Major	Major	
d. EEs' Relative Role in activity (%)	15%	30%	30%	30%	
e. Significance of EE activity relative to total savings, cxd (%)	0.6%	0.6%	1.2%	1.2%	3.6%

5.3 Rationale for Weighting Significance of Barriers

To identify barriers, TRC began with the barriers in the NEEA Standards Development Logic Model. Because this is the general logic model that applies to all of NEEA's standards development efforts, TRC revised this list of barriers based on the specific challenges of this standard. TRC identified two of the barriers in the NEEA logic model for standards rulemaking as applicable to this standard – "manufacturer opposition," and "lack of data."

5.3.1 Barrier 1: Manufacturer Opposition, Sub-barrier 1: Standard Efficiency Metric

Significance: Medium

Rationale and Findings: The previous CPSV efficiency standard limited the maximum water flow rate in gallons per minute (gpm). The previous standard did not have multiple product classes, so all CPSV had to meet the same efficiency requirement of no greater than 1.6 gpm. In the Framework and in the NOPR, DOE explored the possibility of adopting a new efficiency metric and requested input on identifying that metric. The standard efficiency metric can have a large impact on how a test procedure is conducted, what products can meet the standard level, and the resulting energy savings.

While one manufacturer commented against a metric which required a spray force test in the test procedure, most organizations commented in support of a metric which accounted for both water flow rate and spray force. In the Final Rule DOE adopted the same metric that was used in previous standards: gallons per minute, or gpm. While the previous standard set the same gpm limit across all spray valves, this Final Rule established different gpm requirements by spray force.

TRC ranked this barrier as Medium because while this is a barrier that has potential to significantly impact the energy savings, the metric that DOE had proposed in the NOPR and adopted in the Final Rule was the same as the previously existing metric and did not face significant opposition.

5.3.2 Barrier 1: Manufacturer Opposition, Sub-barrier 2: Standard Efficiency Levels

Significance: Medium

Rationale and Findings: DOE proposed efficiency levels in the NOPR that lowered the maximum flow rate allowed compared to the previously existing standard. In response to the standard efficiency levels proposed in the NOPR, at least one manufacturer cautioned against picking the highest efficiency level (max-tech) solely based on flow rate.

In the Final Rule DOE adopted efficiency levels which are higher maximum flow rates (lower efficiency) than that proposed in the NOPR but were an improvement over the previously existing standard.

TRC ranked this barrier as Medium because DOE proposed efficiency levels that had significantly lower maximum flow rate requirements than the previously existing standard, but DOE did not face strong opposition.

5.3.3 Barrier 2: Lack of Data, Sub-barrier 1: Product Lifetime

Significance: Low

Rationale and Findings: At the start of the rulemaking, DOE had proposed using product lifetimes which did not account for business-related events.

In the Final Rule DOE assumed product lifetimes which accounted for a 10% attrition rate in the first year due to business-related events such as businesses closing, the unit being replaced, or rinsing stations being removed.

TRC ranked this barrier as Low because this assumption has a smaller impact than various other inputs in calculations. Secondarily, DOE and other organizations that participated in the rulemaking were amenable to using any available data provided regarding the product lifetimes.

5.3.4 Barrier 2: Lack of Data, Sub-barrier 2: Product Shipments

Significance: Low

Rationale and Findings: In the Framework document DOE had proposed shipments that did not account for spray valves used in facilities other than restaurants, such as grocery and institutional facilities.

DOE projects future shipments of CPSV in order to calculate the national energy savings of the new standard. In the Final Rule DOE assumed product shipments to commercial building types beyond just restaurants.

TRC ranked this issue as Low because this assumption has a smaller impact than various other inputs in calculations and because DOE and other organizations that participated in the rulemaking were amenable to using whatever data was provided regarding the product shipments. The national energy savings calculated by DOE are directly correlated with the shipments projections, so declining shipments would result in lower energy savings projections. However, selected standard efficiency levels are typically driven by cost-effectiveness and technical feasibility, so higher national energy savings projections are unlikely to have led to a higher standard efficiency level.

5.4 Rationale for Weighting Significance of Activities

This section describes TRC's rationale for weighting the significance of each activity that the efficiency organizations conducted.

5.4.1 Activities to Address Barrier 1: Manufacturer Opposition, Sub-barrier 1: Standard Efficiency Metric

Activity and Significance: Efficiency organizations commented in support of a metric that incorporates both flow rate and spray force.

DOE primarily considered a metric that accounted for both flow rate and spray force and efficiency organizations commented in support of it. One manufacturer commented that a spray force test in the DOE test procedure is unnecessary and counterproductive.

DOE also considered two performance-based alternative metrics: one that takes into account both flow rate and spray force (measured in gpm divided by ounce-force (ozf)) and another that was gallons per plate washed. Efficiency organizations commented against a cleanability metric like gallons per plate washed because they were concerned with efficacy and replicability of cleanability testing.

In the Final Rule DOE adopted the same metric that was used in previous standards: gpm. However, DOE did add separate gpm requirements by spray force.

In interviews, one efficiency organization noted that getting to the outcome of gpm as the metric was very important, as it was the simplest metric considered. The interviewee noted that people make the best decisions when it is intuitive, and that gpm is the metric to which restaurateurs are accustomed.

Because of these factors, TRC ranked the efficiency organizations' effectiveness as Medium.

Role of Efficiency Organizations: TRC identified the efficiency organizations as having a minor role in this activity because their involvement was limited to providing a comment that supported what DOE had already proposed doing.

Savings from Activity: 0.6% of savings.

5.4.2 Activities to Address Barrier 1: Manufacturer Opposition, Sub-barrier 2: Standard Efficiency Levels

Activity and Significance: Efficiency organizations commented in support of a standard that restricted the maximum flow rate compared to the existing standard at the time.

The previous standard set the efficiency requirement of a flow rate of not more than 1.6 gpm for all CSPV. In the NOPR, DOE proposed the standard shown in Figure 5.

Figure 5. Proposed Energy Conservation Standards from CPSV from DOE NOPR

Product class	Maximum water flow rate (gpm)
1. Light duty (≤5 ozf)	0.65
2. Standard duty (>5 ozf and ≤8 ozf)	0.97
3. Heavy duty (>8 ozf)	1.24

Figure 6 shows the trial standard levels (TSLs) DOE had considered for each product class. The efficiency levels considered for the low duty CPSV ranged 0.72 gpm to 0.65 gpm, with 0.65 being the 'max-tech' level. DOE had proposed max-tech for light duty and for heavy duty CPSV, and nearly max-tech for standard duty. While there was no strong opposition against these standard levels, one manufacturer cautioned against picking the highest efficiency level (max-tech) solely based on flow rate.

Figure 6. TSLs from NOPR

TABLE V.1—TRIAL STANDARD LEVELS FOR COMMERCIAL PRERINSE SPRAY VALVES

TSL	Light duty (≤5 ozf)		Standard duty (>5 ozf and ≤8 ozf)		Heavy duty (>8 ozf)	
	EL	Flow rate (gpm)	EL	Flow rate (gpm)	EL	Flow rate (gpm)
1	1	0.72	1	1.10	1	1.44
2	2	0.68	2	0.97	2	1.28
3	3	0.65	2	0.97	3	1.24
4	3	0.65	3	0.94	3	1.24

In the Final Rule DOE adopted the efficiency levels shown in Figure 7, which are higher maximum flow rates (lower efficiency) than that proposed in the NOPR.

Figure 7. Amended Energy Conservation Standards from CPSV from DOE Final Rule

Product class	Maximum flow rate (gpm)
1. Product Class 1 (≤5.0 ozf)	1.00
2. Product Class 2 (>5.0 ozf and ≤8.0 ozf)	1.20
3. Product Class 3 (>8.0 ozf)	1.28

Another barrier that was not analyzed separately, but overlaps with the metric discussion, is that of product classes. While the efficiency organizations were initially in favor of separate product classes based on spray force, ultimately, they adjusted their position to be generally in favor of having a single product class for all spray forces. Efficiency organizations realized that customers did not purchase CPSV based on product class. With separate flow rate limits on each product class, customers would be driven to purchase 'heavy duty' CPSV, essentially eliminating the standard and light duty CPSV from the market. TRC determined that the efficiency organizations did not have a substantive impact on this barrier, and therefore did not include an analysis of it. However, this barrier overlaps with the efficiency level barrier. The efficiency organizations ultimately wanted a single product class with a maximum flow rate allowed of 1.24 gpm, which is only slightly lower than the maximum gpm of the heavy-duty product class.

In interviews, three efficiency organizations noted that the efficiency organizations were influential in helping to get to a standard that DOE could adopt. The manufacturer noted that the final efficiency level outcome was a result of collaboration between efficiency organizations and manufacturers, and that these efforts had a high impact on the final outcome.

While not responding directly about efficiency levels, one manufacturer noted: "We firmly believe a collaborative process is necessary to develop standards that make sense for all stakeholders. When regulators, industry and environmental groups work together to develop mutually agreed upon standards, everyone benefits. When this doesn't happen, the resulting requirements are often impossible to achieve from a technical standpoint and unfeasible for a manufacturer (or a user) to pursue."

Because of these factors, TRC ranked the efficiency organizations' effectiveness as Low.

Role of Efficiency Organizations: TRC identified the efficiency organizations as being the major proponent to the DOE for this activity.

Savings from Activity: 0.6% of savings.

5.4.3 Activities to Address Barrier 2: Lack of Data, Sub-barrier 1: Product Lifetime

Activity and Significance: In the Framework document, DOE noted that they believed that the useful life of a CPSV is approximately 5 years.

In response to the Framework document, efficiency organizations commented that because of events such as businesses closing, the unit being replaced, or rinsing stations being removed, that there was a 10% attrition rate after 1 year. The efficiency organization provided a reference or a report that estimated CPSV lifetimes might be as low as two years based on valves volumes. The efficiency organizations recommended that DOE factor this into their analysis.

One manufacturer suggested that DOE consider lifetime impacts from factors such as usage, or water temperature and pressure. DOE did not revise their analysis based on this comment. One manufacturer said that because of the variability, lifetime cannot be accurately quantified.

In the NOPR then in the Final Rule, DOE revised their product lifetime distribution assumption to explicitly account for a 10% probability of product failure within the first year after installation, as seen in Figure 8, which is a table from the DOE Final Rule Technical Support Document (TSD).

Figure 8. Probability of CPSV Failure by Year. Source: Final Rule TSD

Years Since Installation	Probability of Failure*
1	10.1%
2	1.5%
3	6.6%
4	16.2%
5	25.1%
6	24.1%
7	12.9%
8	3.3%
9	0.3%
10	0.01%

Because manufacturers were resistant to having a lifetime value at all, efficiency organizations support for the general approach was likely helpful. The way that model energy savings assumes a certain turnover rate. A shorter lifetime helps with higher stock turnover and increases the impact of the standard. The average product gets replaced sooner with a more efficient product.

In interviews, one efficiency organization noted that the efficiency organization influence here was high. One manufacturer noted that it was difficult to determine because there are so many factors that influence lifetime, but that based on their experience, the reduction in lifetime proposed by efficiency organizations makes sense.

Because of these factors, TRC ranked the efficiency organizations' effectiveness as High.

Role of Efficiency Organizations: TRC identified the efficiency organizations as being the major proponent to the DOE for this activity.

Savings from Activity: 1.2% of savings.

5.4.4 Activities to Address Barrier 2: Lack of Data, Sub-barrier 2: Product Shipments

Activity and Significance: In the Framework document, DOE estimated historical shipments of CPSV based on the number of restaurants in California, then extrapolated that to the US restaurant population.

In response to the Framework document, efficiency organizations commented 30 to 45% of all spray valves were used in facilities other than restaurants, such as grocery and institutional facilities. Efficiency organizations recommended that DOE consider shipments to these facilities when determining the shipments of CPSV. Because DOE does a stock-accounting model, the historical shipments drive the shipment projections.

In the NOPR as well as in the Final Rule, DOE revised their shipments assumptions to explicitly account for shipments from a broad mix of commercial building types.

During interviews, three efficiency organizations could not recall their influence with certainty. One efficiency organization noted that the efficiency organizations were highly influential. One manufacturer noted that the efficiency organization comment had a high impact.

Because of these factors, TRC ranked the efficiency organizations' effectiveness as High.

Role of Efficiency Organizations: TRC identified the efficiency organizations as being the major proponent to the DOE for this activity.

Savings from Activity: 1.2% of savings.

6 Conclusions

Based on the methodology and constraints encountered in the data collection, TRC's impact assessment was that efficiency organizations had a low influence on the CPSV standard. The influence of the efficiency organizations came from submitting comments related to the engineering analysis, including support of a metric that incorporates both flow rate and force, support for the efficiency levels proposed in the NOPR, that DOE should account for business-related events when considering product lifetime, and that DOE should include shipments to a broad mix of commercial building types. TRC estimates that the efficiency organizations contributed 4% of total savings from the standard.

APPENDIX: NEEA LOGIC MODEL FOR STANDARDS RULEMAKING PROCESS