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Commercial and Industrial Pumps Standard Evaluation

Prepared For NEEA:
Steve Phoutrides,
Sr. MRE Scientist

Prepared by:
Rupam Singla, Technical Project Manager
Marian Goebes, Technical Director
Yamini Arab, Associate Project Manager

TRC Companies, Inc.
21 Griffin Road
North Windsor, CT 06095

Northwest Energy Efficiency Alliance
PHONE
503-688-5400
EMAIL
info@neea.org

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1 EXECUTIVE SUMMARY

Northwest Energy Efficiency Alliance (NEEA) contracted with TRC to conduct an independent evaluation to qualitatively assess NEEA's influence in the establishment of the Commercial and Industrial Pumps 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.

U.S. Department of Energy (DOE) started the pumps test procedure and standards rulemaking in 2011 by issuing a request for information (RFI). DOE formed an Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) Working Group in 2013 which concluded in 2014 with a term sheet of recommendations. DOE concluded both the test procedure and the standard rulemakings in 2016 with separate Final Rules that created a test procedure and efficiency standards for pumps. The standards Final Rule established energy efficiency requirements for certain pumps, resulting in 0.29 quadrillion Btu (quads) of energy savings in the 30-year period following the standards compliance date. The test procedure Final Rule established a new test procedure for pumps in addition to defining terms related to types of pumps.

As part of its codes and standards program, NEEA supported this standard's development and adoption. NEEA and other efficiency organizations participated in the Working Group and provided comments on the 2016 test procedure and 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 test procedure. TRC also interviewed seven stakeholders active in the adoption of the process: one NEEA staff member, two staff members from other efficiency organizations, one consultant, and three manufacturers. All interviewees were involved in the 2016 pumps standards rulemaking and/or the 2016 pumps 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 participation in the Working Group, comments submitted in the public review process, including submitting written comments and participation in public meetings. For the quantitative assessment of the standard, TRC concluded that the efficiency organizations activities, including those engaged in by NEEA, led to 24% of the total energy savings from the standard. The efficiency organizations' primary contributions were direct negotiation with manufacturers and participation in the Working Group regarding the standard efficiency levels, pump definition, certification and labeling, and circulators and pool pumps inclusion.

2 INTRODUCTION

This evaluation describes energy efficiency organizations' influence on the development of a federal appliance standard for Commercial and Industrial Pumps equipment.

Prior to this rulemaking, DOE did not have a standard for pumps. 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 Pumps Standard and Test Procedure

Date	Activity
June 2011	DOE issued a request for information (RFI) related to pumps, which encompassed both energy conservation standards and test procedure. Following this issue, the Hydraulic Institute and the efficiency organizations discussed potential efficiency standards, which they reported back to DOE.
February 2013	DOE published a Framework in which DOE described the analyses they planned to conduct during the rulemaking, including test procedure issues, and sought comments.
July 2013	DOE issued an intent to form a commercial and industrial pumps Working Group, which was subsequently formed with 16 members, including one DOE representative, five efficiency organizations (including NEEA), six manufacturers and industry representatives, and four other stakeholders.
June 2014	The Working Group concluded with a term sheet, which reflected issues which the members of the working group reached agreement. The term sheet consisted of recommendations related to definitions of covered products, in-scope and out-of-scope pumps, scope refinements, energy conservation standard levels, test procedure and metric, labeling requirements, and certification reporting requirements. DOE considered the approved term sheet in developing proposed standards and the test procedure.
April 2015	DOE published a notice of proposed rulemaking (NOPR) with proposed energy conservation standards for pumps as well as a test procedure NOPR.
January 2016	DOE published both the standards final rule and the test procedure final rule, which largely adopted what was initially laid out in each NOPR, and which largely followed the recommendations made by the Working Group.

As part of its codes and standards program, NEEA supported the development and adoption of the Pumps standard, by participating in the Working Group and 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 pumps standard, the activities that NEEA conducted, the activities that other energy efficiency organizations conducted, and the effectiveness of these activities. Based on the results, TRC provided two assessments:

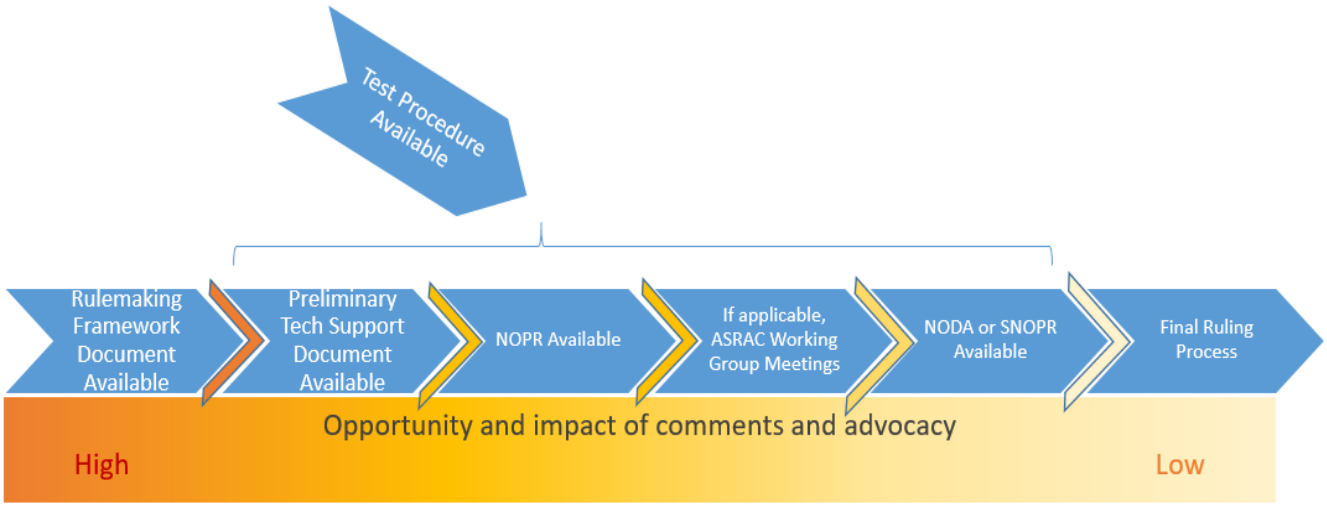
1. A qualitative assessment of NEEA's influence in the establishment of the pumps standard, which TRC developed based on the NEEA Standards Development Logic Model; and

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

2.3 Description of ASRAC Working Group Role in DOE Adoption Process

For some standards – including the Pumps rulemaking, a Working Group formed by the Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) provides recommendations to DOE. The following provides more detail of an ASRAC Working Group's role in the DOE federal standard adoption process. During the standard development process, the DOE may determine that an ASRAC Working Group is needed. As described by the DOE[1]:

> *The Appliance and Equipment Standards Program established the Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) in an effort to further improve the Department of Energy's (DOE) process of establishing energy efficiency standards for certain appliances and commercial equipment. ASRAC will allow DOE to use negotiated rulemaking as a means to engage all interested parties, gather data, and attempt to reach consensus on establishing energy efficiency standards.*

The DOE may form an ASRAC Working Group for several reasons, including the development of minimum efficiency standards for appliances and equipment, or development of product test procedures, both of which applied for pumps. DOE may also form an ASRAC Working Group for rulemakings where reaching consensus on energy efficiency standards may otherwise be challenging. Various stakeholders may participate in the ASRAC Working Group, including manufacturers, energy efficiency organizations, and utilities.

[1] From the U.S. DOE: https://www.energy.gov/eere/buildings/appliance-standards-and-rulemaking-federal-advisory-committee

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 dockets for pumps, 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 Request for Information for the energy conservation and test procedure
- DOE Framework document for the energy conservation standard
- DOE NOPR for the energy conservation standard and test procedure
- DOE Final Rule for the energy conservation standard and test procedure
- DOE NOPR and Final Rule Technical Support Documents (TSDs) for the energy conservation standard
- DOE public meeting transcripts
- Docketed meeting presentation documents, meeting summaries, and transcripts from the ASRAC Working Group meetings.
- The term sheet recommended by the ASRAC Working Group.

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 developing the Working Group's recommended terms. TRC interviewed staff from two of the efficiency organizations, one of which is a representative from a utility. (TRC categorizes the utility as an efficiency organization as it consistently provided comments in support of high efficiency levels).

- Three manufacturers that played a prominent role in supporting the ASRAC Working Group's terms.
- One consultant involved in the rulemaking. This consultant provided objective, technical support, and was considered separate from the manufacturers and efficiency organizations.

Figure 2 summarizes the interview dispositions.

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	3	2
Manufacturers and Trade Organizations	3 – 5	6	3
(OPTIONAL - Pending need) Other Stakeholders	1 – 2	1	1
Total	**7 – 11**	**11**	**7**

3.2 Limitations of Data Collection Efforts and Analysis

One overarching limitation was that the DOE began development of the Pumps standard years ago, with stakeholder comments submitted as early as 2011. To help address recall issues, TRC sent interviewees a summary of the adoption timeline prior to the interview. TRC acknowledges that this may have introduced some bias into interviewees' responses.

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 Pumps 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 participation in the Working Group meetings. There were two activities that NEEA did not conduct for this standard: 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 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 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 Pumps 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 procedure.	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.
Accomplished by NEEA? (TRC)	Y	Y	Y	N	N	Y	Y
Rationale/ explanation (TRC)	NEEA participated in ASRAC Working Group in which they directly negotiated with manufacturers.	NEEA attended public meetings at all stages of rulemakings including all ASRAC Working Group Meetings.	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 participated in the ASRAC Working Group energy efficiency caucus. There was a uniform position from all efficiency organizations.	NEEA worked jointly with CA IOUs, who provided data 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)	Y	Y		N	N	Y	Y
Rationale/ explanation (TRC)	Participated in ASRAC Working Group efficiency caucus.	NEEA provided comments in support of DOE and other efficiency organizations.		NEEA did not complete any primary research for this standard.	NEEA did not provide any research for the docket.	DOE rulemaking documentation references NEEA joint comments. NEEA active during public stakeholder hearings.	NEEA worked jointly with CA IOUs on the ASRAC Working Group.

5 INFLUENCE OF EFFICIENCY ORGANIZATIONS

DOE developed an ASRAC Working Group and tasked them with negotiating to reach consensus on proposed federal test procedures and standards for pumps.

Figure 4 shows the ASRAC Working Group members, from the docket.

Figure 4. ASRAC Working Group Members

Stakeholder Category	Organization	Member
DOE	U.S. Department of Energy	Lucas Adin
Energy Efficiency Organization	Northwest Power and Conservation Council	Tom Eckman
	California Investor Owned Utilities (CA IOUs)	Gary Fernstrom*
	Appliance Standards Awareness Project	Joanna Mauer
	Northwest Energy Efficiency Alliance	Louis Starr
	Natural Resources Defense Council	Meg Waltner
Manufacturers and trade organizations	TACO, Inc.	Robert Barbour
	Flowserve Corporation, Industrial Pumps	Charles Powers
	Regal Beloit	Howard Richardson
	Xylem Corporation	Mark Handzel
	Patterson Pump Company	Albert Huber
	Grundfos USA	Greg Towsley
Other Stakeholders	Edison Electric Institute	Steve Rosenstock
	American Water	Doug Potts
	ITT Industrial Process	Charles Cappelino
	Pump Design, Development and Diagnostics	Greg Case

*Gary Fernstrom was a consultant for the CA IOUs, which includes Pacific Gas & Electric Company, San Diego Gas & Electric Company, Southern California Edison, and Southern California Gas Company. TRC classified these as efficiency organizations, because they worked with and generally supported proposals put for by the efficiency organizations.

The Working Group included six manufacturers, five efficiency organizations, four other stakeholders, and one DOE staff member.

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 5.3.3 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 5.3.3. In this example we estimate the impact of removing one barrier (definition of pump). 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 organizations' 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 one main barrier that was significant for standard development – Manufacturer Opposition. Within the barrier, TRC identified four 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. Standard efficiency levels: 40%
      ii. Definition of pump: 20%
      iii. Certification and labeling: 10%
      iv. Circulator and pool pumps inclusion: 20%
   ii. All other barriers over which efficiency organizations did not have influence: 10%

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 that most pumps are sold with the motor and controls, and therefore the efficiency standard should apply to the system by including them in the pump definition. TRC found that this activity had a high significance in reducing the barrier, "Manufacturer opposition". TRC estimated the significance as 60% for addressing this barrier, based on the following scale:

   Low = 20%, Medium = 40%, and *High = 60%*

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, "pump definition" as 20% of significance across all barriers. Consequently, TRC estimated that the significance of this energy efficiency organizations activity relative to all activities was 20% x 60% = 12%.

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 Primary Support to the DOE. For this example, activity, the final estimated significance for this energy efficiency activity is 12% (calculated in step c) x 50% = 6%.

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 24%. Figure 5 presents the summarized results. Figure 10 in the Appendix presents the detailed impact analysis. 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, which is why the significance of the barriers listed total 90% and not 100%.

Figure 5. Impact Analysis of Efficiency Organizations' Contributions

Barrier, based on NEEA logic model	Manufacturer opposition				Total
Sub-barrier specific to standard	Manufacturer opposition to higher standard. Some pump manufacturers wanted no regulation at all. Manufacturers pushed for 15 pump energy rating (PER)[2]. DOE adopted 25 PER in the Final Rule.	Prior to this rulemaking, DOE had not formally defined pumps. In the Framework Document, DOE initially proposed definitions of pumps which did not explicitly include the driver and controls. In the Final Rule, DOE defined a pump to explicitly include driver and controls.	In the Framework Document, DOE noted that they could only require labeling if (1) labeling is technologically and economically feasible; (2) significant energy savings will likely result from such labeling; and (3) labeling is likely to assist consumers in making purchasing decisions, and solicited input from stakeholders. Industry pushed back against labeling, noting that the requirement would lead to significant burden on manufacturers. In the Final Rule, DOE adopted specific labeling requirements.	DOE had not clearly defined what commercial and industrial pumps were included in this rulemaking and what it planned to regulate separately. Industry was resistant to including various categories of pumps, including circulators and pool pumps, which comprise a significant portion of the total pumps market. The ASRAC term sheet included a term that DOE would initiate separate rulemakings for Circulators and Pool Pumps and provided specific timeline targets.	
Significance for energy savings	**High**	**Medium**	**Low**	**Medium**	
a. Significance of barrier (%)	**40%**	**20%**	**10%**	**20%**	**90%**
Effectiveness of EE org activity for addressing barrier	**High**	**High**	**High**	**Medium**	
b. Significance for each barrier (%)	**60%**	**60%**	**60%**	**40%**	
c. Significance across all barriers: a * b (%)	**24%**	**12%**	**6.0%**	**8%**	
EE organizations' role	**Primary**	**Primary**	**Major**	**Primary**	
d. EEs' Relative Role in activity (%)	**50%**	**50%**	**30%**	**50%**	
e. Significance of EE activity relative to	**12.0%**	**6.0%**	**1.8%**	**4.0%**	**24%**

[2] The efficiency metric considered varied throughout the rulemakings. At the time of this negotiation, the Working Group discussed efficiency ratings in terms of PER, where PER 25 reduced energy consumption compared to PER 15. In the Final Rule, DOE adopted standards in terms of Pump Energy Index (PEI).

total savings, c * d (%)					

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 one of the barriers in the NEEA logic model for standards rulemaking as applicable to this standard – "manufacturer opposition", to which TRC identified four sub-barriers: standard efficiency levels, definition of pump, certification and labeling, and circulators and pool pumps inclusion.

5.3.1 Sub-barrier 1: Standard Efficiency Levels

Significance: High

Rationale and Findings: Prior to this rulemaking, Pumps were not covered by a DOE appliance standard, and multiple major pump manufacturers were resistant to any sort of new pump efficiency regulation. However, after closed door meetings, in their joint letter to DOE in March 2012, the Hydraulic Institute and the efficiency organizations stated that they agreed to "pursue recommended standard levels for rotodynamic pumps for pumping clean water based on the draft EU regulations for water pumps".

In the Working Group Meeting 5, the group began serious discussions around the efficiency level (Federal Register Docket No. EERE-2013-BT-NOC-0039, No. 102). Manufacturers noted there is additional burden to designing pumps with higher efficiency. One manufacturer questioned DOE's balancing of the benefits to consumers versus the burden on manufacturers, noting "the cost to what you are going to gain is, for the manufacturer, is terrible", with another manufacturer bringing up concerns about opening themselves up to international competition. In response, an efficiency organization commented that "In every one of these standards improvement processes, we hear your point of view that there is some industry impact….The way I rationalize it is, unfortunately, American industry is subject to international competition. And incrementally these rules bring some energy savings benefit, and I don't think proportionately damage jobs as much as the reality of international competition anyway."

In following discussions, the manufacturers collectively reiterated their concerns and proposed pump energy rating (PER) 15[3] as an efficiency level, noting that though it would overburden their engineering departments, it would be an improvement over the EU's initial starting point. Efficiency organizations collectively, on the other hand, proposed a higher performance goal of 0.25 quads of energy savings, without specifying a particular PER. Efficiency organizations noted that they wanted to adopt a standard that was comparable to the European Union standard, which was essentially PER 40.

[3] The efficiency metric considered varied throughout the rulemakings. At the time of this negotiation, the Working Group discussed efficiency ratings in terms of PER. In the Final Rule, DOE adopted standards in terms of Pump Energy Index (PEI).

In the final discussions on efficiency level prior to voting on the term sheet, manufacturers and efficiency organizations met for closed caucuses and came to general agreement on PER 25, or Trial Standard Level (TSL)[4] 2. This national impact of this TSL, as presented in the NOPR, is shown in Figure 6, where cumulative full-fuel cycle national energy savings over the 30-year analysis period are shown for each TSL (table columns), separated by equipment class (table rows).

National Impact Analysis: National Energy Savings

Cumulative Full-Fuel-Cycle National Energy Savings

Equipment Class	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
	quads				
ESCC 1800	0.017	0.05	0.08	0.12	0.17
ESCC 3600	0.017	0.08	0.12	0.18	0.28
ESFM 1800	0.003	0.06	0.12	0.25	0.37
ESFM 3600	0.002	0.02	0.03	0.05	0.07
IL 1800	0.016	0.05	0.08	0.12	0.17
IL 3600	0.003	0.01	0.02	0.02	0.03
VTS 3600	0.002	0.02	0.11	0.17	0.24
TOTAL	0.059	0.28	0.56	0.91	1.32

Note: Components may not sum to total due to rounding.

Figure 6. National Impact Analysis Results (Source: NOPR Public Meeting Slides (Federal Register Docket No. EERE-2011-BT-STD-0031, No. 0043)[5]

In the Final Rule DOE adopted 25 PER. This standard eliminates the lowest 25% of the pumps market in terms of efficiency and has a projected energy savings of 0.29 quads. Note that the slide in Figure 6 is from the NOPR public meeting which showed 0.28 quads.

TRC ranked this barrier as High because industry pushed for a lower efficiency standard from the beginning and continued to push that throughout the rulemaking.

[4] The Trial Standard Level (TSL) combines specific efficiency levels for each equipment class.

[5] VTS, ESCC, ESFM, and IL are all equipment class designations, where VTS: submersible turbine; ESCC: end suction-closed coupled; ESFM: end suction frame mounted/own bearing; IL: inline.

5.3.2 Sub-barrier 2: Definition of Pump

Significance: Medium

Rationale and Findings: Prior to this rulemaking, DOE had not formally defined pumps. In the Framework Document, DOE initially proposed the definition of a pump to be "a device that moves clean water by physical or mechanical action". This definition did not explicitly include the driver and controls.

Early on in the rulemaking, in response to the RFI (two years before DOE established the Working Group), efficiency organizations commented that DOE should consider not just efficiency factors for the pump alone, but also consider pump system efficiency where possible. (Federal Register Docket No. EERE-2011-BT-STD-0031, No. 0003). Efficiency organizations agreed with the list of efficiency factors that DOE included in the RFI, including surface roughness, internal clearances, solids handling capability, curve shape, and mechanical shaft seal losses, and other factors. Efficiency organizations commented that there are additional areas for energy efficiency opportunities, including variable speed pump control, which it supported.

The discussions between the Hydraulic Institute and the efficiency organizations in late 2011 and early 2012 resulted in a joint letter to DOE in March 2012 where the organizations agreed to "pursue a scheme to label 'extended product' water pumps (i.e. a package including the pump, motor, drive, and controls), which could facilitate the increased adoption of products that can provide large energy savings." They also stated that they were "considering the potential for energy conservation standards for 'extended product' water pumps, and we are currently exploring the technical and legal issues associated with this approach."

In the Framework document, DOE presented three distinct options for how pumps are defined and sold, as illustrated in Figure 7:

- Option 1: Define pump to exclude motor (Bare Pump option in Figure 7)
- Option 2: Define pump to include motor and controls, if the pump is sold with them (Bare Pump + Driver option in Figure 7)
- Option 3: Define pump to include motor, if the pump is sold with a motor, and consider the variable speed drive (VSD) as a design option of pumps sold with motors (Bare Pump + Driver + Controls in Figure 7)

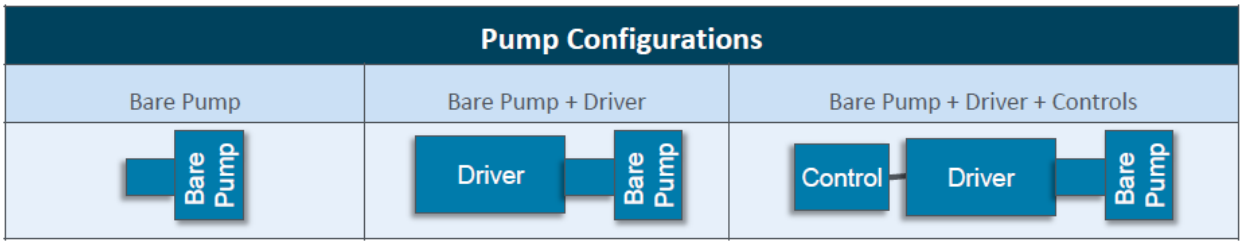


Figure 7. Pump Configuration Schematic. Source: NOPR Public Meeting Slides (Federal Register Docket No. EERE-2011-BT-STD-0031, No. 0043)

Efficiency organizations commented in favor of Option 3, which they argued could increase the use of VSDs and achieve significant energy savings (Federal Register Docket No. EERE-2011-BT-STD-0031, No. 0032). Efficiency organizations brought this up at the very beginning of the Working Group discussions, noting in the first Working Group meeting that whatever a manufacturer shipped together should be the unit required to meet the standard (Federal Register Docket No. EERE-2013-BT-NOC-0039, No. 0017). On the other hand, industry noted the complexity of pump systems and noted that they often do not have control over parts of the pump system. The Working Group continued to discuss this issue in the second and third Working Group meetings before coming to consensus in the third meeting (Federal Register Docket No. EERE-2013-BT-NOC-0039, No. 0033).

Ultimately the Working Group recommended a pump definition that specified: if included by the manufacturer, the mechanical equipment, driver, and controls are considered part of the pump.

In interviews, one efficiency organization noted the importance of this issue in terms of long-term energy savings. A second efficiency organization noted that the pump industry would want to keep applicability of DOE's standard to a minimum. A technical consultant also noted that manufacturers had a pump-centric view and were resistant to such a definition. One manufacturer noted that previously most pumps were rated as bare pumps, not pumps with motors. A second manufacturer reported in an interview that "if you want the most efficient pump, you have to consider the driver, and that was something the efficiency organizations understood".

TRC ranked this barrier as Medium because this required DOE and the industry to change course from their initial assumptions, and because at least some manufacturers resisted the consideration of drivers and controls as part of the pump.

5.3.3 Sub-barrier 3: Certification and Labeling

Significance: Low

Rationale and Findings: In the Framework Document, DOE noted that they could only require labeling if (1) labeling is technologically and economically feasible; (2) significant energy savings will likely result from such labeling; and (3) labeling is likely to assist consumers in making purchasing decisions, and solicited input from stakeholders. Industry pushed back against labeling, noting that the requirement would lead to significant burden on manufacturers.

In their joint letter to DOE in March 2012, the Hydraulic Institute and the efficiency organizations stated that they agreed to "pursue a certification and labeling scheme for pumps."

The Working Group started discussing labeling in Meeting 4.

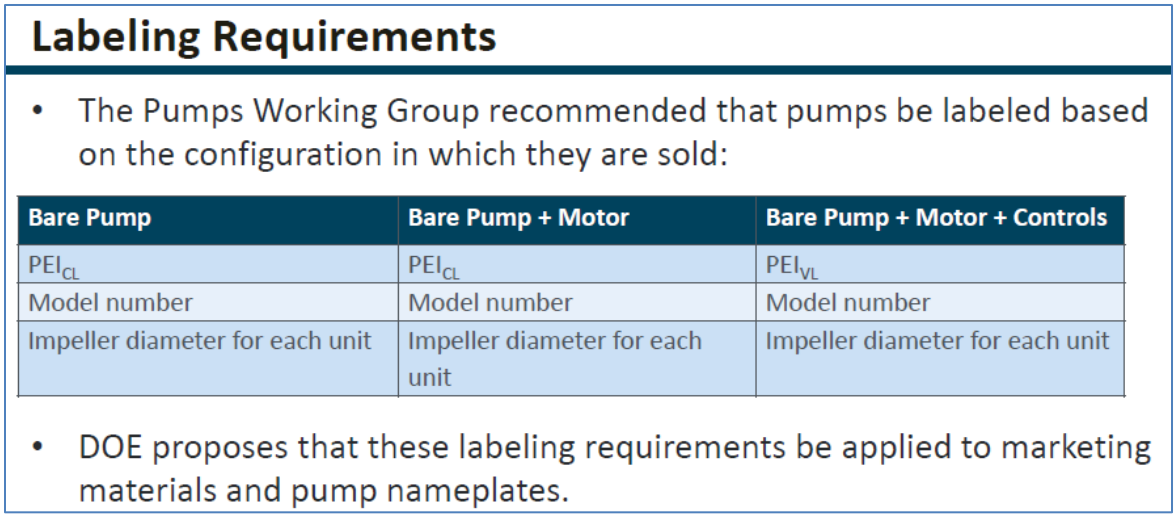


Figure 8. Labeling Requirements. Source: NOPR Public Meeting Slides (Federal Register Docket No. EERE-2011-BT-STD-0031, No. 0043)

In the Final Rule, DOE adopted the recommendation from the Working Group (shown in Figure 8) that pumps be labeled based on the configuration in which they are sold (bare pump; or bare pump + motor; or bare pump + motor + controls) and that the pump nameplate include the pump energy index (PEI), model number, and impeller diameter. In the Final Rule, DOE adopted efficiency standards in terms of PEI, where PEI is expressed in terms of constant load (PEI_{CL}) for pumps sold without continuous or noncontinuous controls and PEI is expressed in terms of variable load (PEI_{VL}) for pumps sold with continuous or non-continuous controls.

In interviews, there was some disagreement on the impact on energy savings that would result from the removal of this barrier, with responses from interviewees ranging from low to high, with variation among efficiency organizations and manufacturers.

In an interview, a technical consultant noted that the label has a smaller impact on DOE's work compared to the impact that the label has on the market, where consumers can use the label to make decisions. The technical consultant also noted that utility programs are able to realize savings from the labeling requirement that are not possible through DOE's rule. However, they did note that the label helps DOE enforce the standard. In an interview, one efficiency organization noted that pump selection has the single biggest impact on energy savings, so sizing and application was the single biggest thing that impacted efficiency. A second efficiency organization noted that the labeling requirement introduces burden for manufacturers, so manufacturers would have preferred to not have labeling requirements. In another interview, one manufacturer noted that the labeling and certification decision was not highly impactful in terms of energy savings.

Because other factors appeared to have affected energy savings more significantly than labeling, TRC ranked this barrier as Low.

5.3.4 Sub-barrier 4: Circulators and Pool Pumps Inclusion

Significance: Medium

Rationale and Findings: At the start of the rulemaking, DOE did not clearly define what commercial and industrial pumps were included in this rulemaking and what it planned to regulate separately. Industry was resistant to including various categories of pumps, including circulators and pool pumps, which comprise a significant portion of the total pumps market.

In their joint letter to DOE in March 2012, the Hydraulic Institute and the efficiency organizations stated that they "agreed to pursue recommended standard levels for circulators (pumps used primarily in hydronic heating applications) based on the EU regulations for circulators."

In early Working Group meetings, DOE presented energy use and potential energy saving estimates from circulator pumps as very large. The estimates of annual energy use ranged from Hydraulic Institute's estimate of 0.285 terawatts annual energy use to the efficiency organizations' estimate of 1.0 terawatts annual energy use. There was considerable uncertainty in both of these numbers because of limited data available and because the scope of what a circulator included had not been clearly defined yet. However, there was agreement on the significance of this category of pumps, and much of the discussion in the Working Group meetings focused on how and when these pumps should be regulated. While efficiency organizations were interested in including circulator pumps in this rulemaking to realize some of the energy savings potential, manufacturers pushed for circulators to be considered in a separate rulemaking.

In early Working Group meetings, the group considered pool pumps as within the scope of the rulemaking. There was considerably less discussion among the Working Group regarding pool pump inclusion compared to circulator inclusion. Once the group determined a path forward with the circulators, it seemed natural that pool pumps would follow the same route.

A term in the ASRAC term sheet stated that DOE would initiate separate rulemakings for Circulators and Pool Pumps and provided specific timeline targets. Splitting these off into separate rulemakings ultimately lowered the total savings that results from the main pumps rulemaking, but it did make the main pumps standard more adoptable by helping the stakeholders to come to an agreement on the main pumps rulemaking. Figure 9 is a schematic showing categories of pumps which DOE included and excluded in the scope of this rulemaking. The green oval contains all equipment classes which were ultimately included in this rulemaking, which are a subset of rotodynamic pumps. Rotodynamic pumps which are not included in this rulemaking are shown in the light blue oval. All other pumps are not covered in this rulemaking and are represented by the dark blue oval. While the ovals are purely schematic and are not drawn to scale, it does illustrate that within the category of pumps, there are many categories of rotodynamic pumps, some of which are covered in this rulemaking.

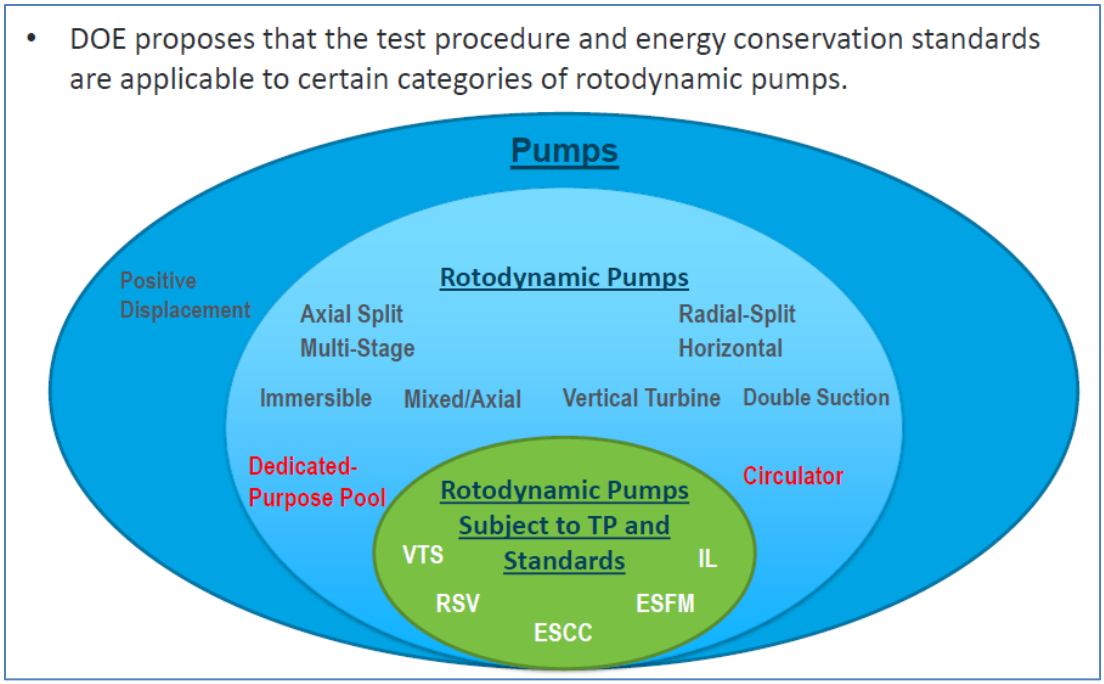


Figure 9. Pump Categories.[6] Source: NOPR Public Meeting Slides (Federal Register Docket No. EERE-2011-BT-STD-0031, No. 0043)

In interviews, one efficiency organization noted that creating separate rulemaking for circulators and pool pumps was a strategy for manufacturers to buy themselves more time. A second efficiency organization noted that savings in subsequent rulemakings for pool pumps and circulators will be very significant, and that those savings would not have been realized if these products were included in the main pumps rulemaking. A technical consultant noted that it would have been difficult to wrangle pool pumps and circulators, so "carving them off into separate rulemakings definitely helped".

One manufacturer noted in interviews that there would have been standards for pool pumps and circulators eventually. A second manufacturer noted that this issue "had an impact on energy savings. [It] had a huge effect on whether it was easier to adopt. At the time, [DOE] had barely developed a definition for circulators. [DOE] defined [circulators] in order to be able to separate it from other pumps." A third manufacturer noted that "The manufacturers position was if [we] included all of those pumps here, then it would dilute the savings."

For these reasons TRC ranked this barrier as Medium.

[6] TP: Test Procedure. VTS, RSV, ESCC, ESFM, and IL are all equipment class designations, where VTS: submersible turbine; RSV: radially split, vertical, in-line diffuser casing; ESCC: end suction-closed coupled; ESFM: end suction frame mounted/own bearing; IL: inline. Note that there are no energy savings associated with the RSV equipment class because the adopted standard for this equipment class is the baseline.

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 Sub-barrier 1: Standard Efficiency Levels

Activity and Significance: Efficiency organizations had a performance goal of saving at least 0.25 quads of energy and advocated for this in the Working Group negotiations, without specifying a particular PER.

The efficiency organizations' main activities to address this sub-barrier were direct negotiation with manufacturers and participation in the Working Group. Efficiency organizations commented that they wanted to adopt a standard that was comparable to the European Union standard, which was essentially PER 40, and would meet their performance goal of 0.25 quads.

In the Final Rule, DOE adopted PER 25. This standard eliminates the 25% lowest performing pumps from the market and has a projected energy savings of 0.28 quads.

In interviews, all manufacturers, efficiency organizations, and technical consultants interviewed stated that efficiency organizations had a high impact on achieving this efficiency level. One manufacturer noted, "Going from the basis that it would have been a perfect world for pump manufacturers if none of this started, anything that the efficiency organizations could get was a success for the U.S. energy users. The [energy efficiency organizations] pushed this and kept it going and made sure it was a win for savings." Another manufacturer noted that the efficiency organizations "passionately argued and compromised eventually".

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

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

Savings from Activity: 12.0% of savings.

5.4.2 Activities to Address Sub-barrier 2: Definition of Pump

Activity and Significance: The efficiency organizations' main activities to address this sub-barrier were direct negotiation with manufacturers and participation in the Working Group. Efficiency organizations commented that most pumps are sold with the motor and controls, and therefore the efficiency standard should apply to the system. Efficiency organizations took a long-range view, recognizing that including these components now could allow for ratcheting up energy savings in the future. Through their direct work with industry on the ASRAC, efficiency organizations convinced manufacturers to see that including the motor and controls as part of the pump would not only be better for consumers but would also provide more market share for pump manufacturers by selling motors and controls in addition to the bare pump.

In the Final Rule, DOE defined a pump as a device that moves liquids (which may include entrained gases, free solids, and totally dissolved solids) by physical or mechanical action and

includes a bare pump and, if included by the manufacturer, the mechanical equipment, driver, and controls.

All interviewees noted that efficiency organizations had a high impact on this issue, with the exception of one manufacturer who noted that the efficiency organizations had a medium impact.

In interviews, one efficiency organization noted that they achieved their ideal, which was to get at the system efficiency. They noted that during the Working Group meetings, they highlighted benefits of such a definition to the manufacturers, noting that it allows them to not just sell the pump but also the motor in drive. In addition, the definition also gives the manufacturer flexibility in meeting efficiency, because the savings could come from the pump or the motor.

In interviews, one manufacturer commented similarly and noted that efficiency organizations helped drive a good definition. Another manufacturer noted collaboration between efficiency organizations and manufacturers on this issue, noting that "When the DOE sees [energy efficiency organizations] and manufacturers teaming, it gives DOE much more incentive to pay attention… Manufacturers and [energy efficiency organizations] teamed together."

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

Role of Efficiency Organizations: TRC identified the efficiency organizations as having the Primary role in this activity.

Savings from Activity: 6.0% of savings.

5.4.3 Activities to Address Sub-barrier 3: Certification and Labeling

Activity and Significance: Efficiency organizations commented strongly in favor of labeling and certification, noting that requiring labels would make it easier for consumers to compare the expected performance of a bare pump to that of a pump with controls. Additionally, labels and certification would help facilitate utility programs by providing a mechanism for verifying the installation of a given pump and by providing publicly available certified data on pump performance. Efficiency organizations noted that while this requirement would not lead to significant energy savings as calculated by the DOE rulemaking, the certification and labeling requirements would significantly support utility programs, which would be able to save significant energy.

Efficiency organizations supported the Working Group labeling recommendation. In the Final Rule, DOE adopted the recommendation from the Working Group. That recommendation was for pumps to be labeled based on the configuration in which they are sold: bare pump; or bare pump + motor; or bare pump + motor + controls; and that the pump nameplate should include the pump energy index (PEI), model number, and impeller diameter.

In interviews, one efficiency organization, one technical consultant, and two manufacturers rated the efficiency organization role as high. One efficiency organization and one manufacturer rated the role as medium.

One efficiency organization noted that efficiency organizations were extremely influential and that they supported this issue throughout the rulemaking. Multiple efficiency organizations commented that they pushed this issue because it benefited utility programs. One manufacturer noted that the efficiency organizations were essential in educating pump manufacturers. A second manufacturer noted that the ability to publish VFD (variable frequency drive) information separately in the labeling was seen as a driver to help the market adopt the controls more often, and that the efficiency organizations were highly influential in reaching this outcome.

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

Role of Efficiency Organizations: TRC identified the efficiency organizations as having a Major role in this activity.

Savings from Activity: 1.8% of savings.

5.4.4 Activities to Address Sub-barrier 4: Circulators and Pool Pumps Inclusion

Activity and Significance: In the Working Group, efficiency organizations pushed to include Circulators and Pool Pumps in this main Pumps rulemaking. While they did not achieve this, efficiency organizations ultimately recommended that Circulators and Pool Pumps have their own dedicated rulemakings under a specific timeline.

Efficiency organizations recommended including terms in the Working Group term sheet that would provide there be separate rulemakings for circulators and pool pumps and that these rulemakings be scheduled "as quickly as practicable". The efficiency organizations recommended a goal to have both negotiations start by the end of December 2014. Industry and efficiency organizations agreed upon this recommendation. Splitting these off into separate rulemakings allowed the stakeholders to come to an agreement on the main Pumps rulemaking. DOE initiated rulemakings for dedicated pool pumps and circulator pumps in 2015 and 2016, respectively.

In interviews, most efficiency organizations and manufacturers were not able to attribute a particular impact rating to the efficiency organizations. Most noted that efficiency organizations wanted to guarantee that these products would be covered within a certain timeframe and that ultimately it was a collaboration among efficiency organizations and manufacturers.

In interviews, one efficiency organization noted that industry thought these products were too inconsequential to merit consideration in the rulemaking, and that if industry would not move all of the products they wanted, the fallback position was to have another rulemaking. This efficiency organization noted that "circulators and pool pumps wouldn't have been on the table otherwise". A second efficiency organization noted that they gave DOE an ultimatum that they would shut down the rulemaking if the Working Group did not agree to have separate rulemakings in the term sheet. The same efficiency organization noted that manufacturers accepted pool pumps and circulators being separate rules, and that manufacturers "knew this was coming, they just wanted to buy time to get their manufacturing up."

One manufacturer noted that "everyone was fine with splitting off separate rulemakings and it followed EU regulations". That manufacturer did note that without efficiency organization

involvement, there would have been no assurance that rulemakings would have happened so soon after, noting that they "might have been overlooked for a while."

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

Role of Efficiency Organizations: TRC identified the efficiency organizations as having a Primary role in this activity.

Savings from Activity: 4.0% of savings.

6 FUTURE ENERGY SAVINGS AND OTHER FEEDBACK COLLECTED

TRC notes other activities that the efficiency organizations conducted during the pumps standard development that may lead to future energy savings:

- As noted in regards to the sub-barrier pool pumps and circulators inclusion, efficiency organizations commented to ensure that pool pumps and circulators would have separate rulemakings that would occur within a specified timeframe. Efficiency organizations expect that there will be significant energy savings resulting from both of these rulemakings. DOE initiated rulemakings for dedicated pool pumps and circulator pumps in 2015 and 2016, respectively.

- As noted in regards to the certification and labeling barrier, the certification and labeling requirements enable utility programs to save additional pump energy

Two of the three manufacturers interviewed provided generally positive comments regarding the role of the efficiency organizations, in addition to those described in Section 5:

- "Without the [energy efficiency organizations'] participation, the rulemaking would have been much different and wouldn't have saved as much energy."

- "In general, it was very important that the [energy efficiency organizations] were not only present, but those that were there were very active. Had it not been for that, the actual rulemaking activities would have lasted longer or may have even stopped because of the negative attitude of the other pump manufacturers. So it was very important that [energy efficiency organizations] were involved."

The third manufacturer interviewed expressed a mix of positive and negative comments regarding the role of the efficiency organizations, and negative comments regarding appliance regulations in general.

- "There is no way that DOE could have done this effectively without the [energy efficiency organizations]. Hats off to the bright people at [energy efficiency organizations]…DOE relies heavily on the [energy efficiency organizations] to bring up counter questions-arguments to industry. Without the [energy efficiency organizations], there would have been a much more lopsided technical discussion. DOE would be able to specify requirements much closer to what industry proposed."

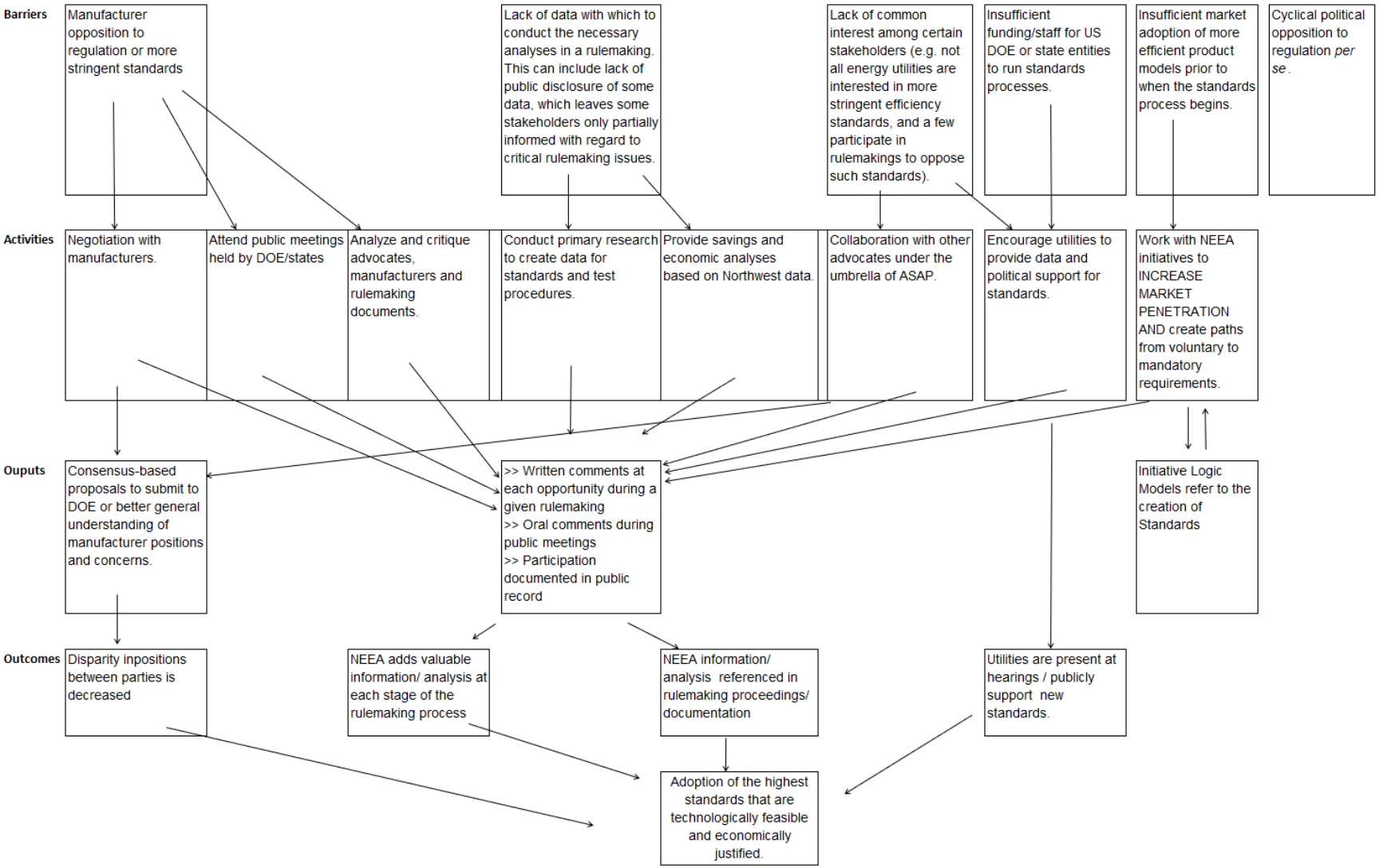
- This manufacturer expressed "consternation over [DOE] creating regulations for the sake of regulations." This manufacturer noted they have enjoyed a 4-year hiatus, and that the regulations are a huge expense. This manufacturer reported the efficiency gain will never come close to what it costs the industry and disagreed with DOE's manufacturer impact analysis. This manufacturer was also "appalled by the business plan of the [energy efficiency organizations]."

TRC also noted that the manufacturers reported educating the efficiency organizations, and that the efficiency organizations reported educating the manufacturers. Members of both parties noted that they taught, and learned from, the other group.

7 CONCLUSIONS

Based on the data collected and analysis applied, TRC's impact assessment was that efficiency organizations had a high influence on the Commercial and Industrial Pumps standard. The influence of the efficiency organizations came from participation in the Working Group and direct negotiation with industry. TRC estimates that the efficiency organizations contributed 24% of total savings from the standard, based on their role in the standard efficiency levels, pump definition, certification and labeling, and circulators and pool pumps rulemakings.

APPENDIX: NEEA LOGIC MODEL FOR STANDARDS RULEMAKING PROCESS



APPENDIX: IMPACT ANALYSIS OF EFFICIENCY ORGANIZATIONS' CONTRIBUTIONS

Figure 10. Impact Analysis of Efficiency Organizations' Contributions

Barrier, based on NEEA logic model	**Manufacturer opposition**				**Total**
Sub-barrier specific to standard	Manufacturer opposition to higher standard. Some pump manufacturers wanted to see no regulation at all. Manufacturers pushed for 15 pump energy rating (PER).	Prior to this rulemaking, DOE had not formally defined pumps. In the Framework Document, DOE initially proposed definitions of pumps which did not explicitly include the driver and controls.	In the Framework Document, DOE noted that they could only require labeling if (1) labeling is technologically and economically feasible; (2) significant energy savings will likely result from such labeling; and (3) labeling is likely to assist consumers in making purchasing decisions, and solicited input from stakeholders. Industry pushed back against labeling, noting that the requirement would lead to significant burden on manufacturers.	DOE had not clearly defined what commercial and industrial pumps were included in this rulemaking and what it planned to regulate separately. Industry was resistant to including various categories of pumps, including circulators and pool pumps, which comprise a significant portion of the total pumps market.	
Significance for energy savings	**High**	**Medium**	**Low**	**Medium**	
a. Significance of barrier (%)	**40%**	**20%**	**10%**	**20%**	**90%**
	EE orgs had a performance goal of saving at least 0.25 quads of energy and advocated for this in the Working Group negotiations. EE orgs commented that they wanted to adopt a standard that was comparable to the European Union standard, which was essentially 40 PER.	EE orgs commented that most pumps are sold with the motor and controls, and therefore the efficiency standard should apply to the system. EE orgs took a long-range view, recognizing that including these components now could allow for racheting up energy savings in the future. Through their direct work with industry on the ASRAC, EE orgs convinced manufacturers to see that including the motor and controls as part of the pump would not only be better for consumers but would also	EE orgs commented strongly in favor of labeling and certification, noting that requiring labels would make it easier for consumers to compare the expected performance of a bare pump to that of a pump with controls. Additionally, labels and certification would help facilitate utility programs by providing a mechanism for verifying the installation of a given pump and by providing publicly-available certified data on pump performance. EE orgs noted that while this	In the Working Group, EE orgs had pushed to include Circulators and Pool Pumps in this main Pumps rulemaking. While they did not achieve this, EE orgs ultimately recommended that Circulators and Pool Pumps have their own dedicated rulemakings under a specific timeline.	

		provide more market share for pump manufacturers.	requirement would not lead to significant energy savings as-calculated by the DOE rulemaking, the certification and labeling requirements would be a huge support to utility programs, which would be able to save significant energy.		
Results - i.e., DOE response	DOE adopted 25 PER in the Final Rule. This standard eliminates the lower 25% of the pumps market and has a projected energy savings of 0.29 quads.	In the Final Rule, DOE defined a pump as a device that moves liquids (which may include entrained gases, free solids, and totally dissolved solids) by physical or mechanical action and includes a bare pump and, if included by the manufacturer, the mechanical equipment, driver, and controls.	In the Final Rule, DOE adopted the recommendation from the Working Group that pumps be labeled based on the configuration in which they are sold (bare pump; or bare pump + motor; or bare pump + motor + controls) and that the pump nameplate include the pump energy index (PEI), model number, and impeller diameter.	A term in the ASRAC term sheet stated that DOE would initiate separate rulemakings for Circulators and Pool Pumps and provided specific timeline targets. Splitting these off into separate rulemakings allowed the stakeholders to come to an agreement on the main Pumps rulemaking.	
Effectiveness of activity for addressing barrier	**High**	**High**	**High**	**Medium**	
b. Significance for each barrier (%)	**60%**	**60%**	**60%**	**40%**	
c. Significance across all barriers: axb (%)	**24%**	**12%**	**6.0%**	**8%**	
EE organizations' role	**Primary**	**Primary**	**Major**	**Primary**	
d. EEs' Relative Role in activity (%)	**50%**	**50%**	**30%**	**50%**	
e. Significance of EE activity relative to total savings, cxd (%)	**12.0%**	**6.0%**	**1.8%**	**4.0%**	**24%**