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DEPARTMENT OF ENERGY

10 CFR Part 431

[EERE-2021-BT-STD-0018]

RIN 1904-AE54

Energy Conservation Program: Energy Conservation Standards for Commercial and Industrial Pumps

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Notification of data availability ("NODA").

SUMMARY: On August 9, 2021, the U.S. Department of Energy ("DOE") published a request for information regarding energy conservation standards for commercial and industrial pumps ("pumps"). In this notice of data availability ("NODA"), DOE is publishing an overview of potential technology/design options and associated estimated national energy savings with preliminary industry net present value estimates for certain pump equipment classes in order to provide stakeholders with additional information and to assist DOE in determining how to proceed with the rulemaking. The analysis presented in this NODA is consistent with the scope that DOE proposed in a test procedure notice of proposed rulemaking for commercial and industrial pumps published on April 11, 2022. DOE requests comments, data, and information regarding its analysis.

DATES: Written comments and information will be accepted on or before, **[INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *www.regulations.gov*, under docket number EERE–2021–BT–STD-0018. Follow the instructions for submitting comments. Alternatively, interested

persons may submit comments, identified by docket number EERE-2021-BT-STE-0018, by any of the following methods:

(1) *Email*: *Pumps2021STD0018@ee.doe.gov*. Include the docket number EERE-2021-BT-STD-0018 in the subject line of the message.

(2) *Postal Mail*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-1445. If possible, please submit all items on a compact disc ("CD"), in which case it is not necessary to include printed copies.

(3) *Hand Delivery/Courier*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., 6th Floor, Washington, DC, 20024. Telephone: (202) 287-1445. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

No telefacsimiles ("faxes") will be accepted. For detailed instructions on submitting comments and additional information on this process, see section IV of this document.

To inform interested parties and to facilitate this rulemaking process, DOE has prepared a technical support document ("TSD") which is available in the docket for this rulemaking.

Docket: The docket for this activity, which includes *Federal Register* notices, comments, public meeting transcripts, and other supporting documents/materials, is available for review at *www.regulations.gov*. All documents in the docket are listed in the *www.regulations.gov* index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

The docket web page can be found at *www.regulations.gov/docket/EERE-2021-BT-STD-0018*. The docket web page contains instructions on how to access all documents, including public comments in the docket. See section IV.A of this document for information on how to submit comments through *www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT:

Mr. Jeremy Dommu, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies, EE-5B, 1000 Independence Avenue, SW., Washington, DC 20585-0121. Telephone: (202) 586-9870. E-mail: *ApplianceStandardsQuestions@ee.doe.gov.*

Mr. Michael Kido, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC 20585-0121. Telephone: (202 586-8145. E-mail: *Michael.Kido@hq.doe.gov.*

For further information on how to submit a comment, review other public comments and the docket, or participate in the public meeting, contact the Appliance and Equipment Standards Program staff at (202) 287-1445 or by e-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

SUPPLEMENTARY INFORMATION:

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I. Introduction

A. Authority

The Energy Policy and Conservation Act, as amended ("EPCA"),[1] authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part C[2] of EPCA, added by Pub. L. 95-619, Title IV, section 441(a), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve energy efficiency. This covered equipment includes pumps, the subject of this document. (42 U.S.C. 6311(1)(A))

EPCA provides that, not later than 6 years after the issuance of any final rule establishing or amending a standard, DOE must publish either a notification of determination that standards for the product do not need to be amended, or a notice of proposed rulemaking ("NOPR") including new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(1)) Not later than three years after issuance of a final determination not to amend standards, DOE must publish either a notice of determination that standards for the product do not need to be amended, or a NOPR including new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(3)(B))

Under EPCA, any new or amended energy conservation standard must be designed to achieve the maximum improvement in energy efficiency that DOE determines is technologically feasible and economically justified. (42 U.S.C. 6316(a); 42

[1] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Pub. L. 116-260 (Dec. 27, 2020), which reflect the last statutory amendments that impact parts A and A-1 of EPCA.

[2] For editorial reasons, upon codification in the U.S. Code, part C was redesignated part A-1.

U.S.C. 6295(o)(2)(A)) Furthermore, the new or amended standard must result in a significant conservation of energy. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(3)(B))

DOE is publishing this NODA to collect data and information to inform its decision consistent with its obligations under EPCA.

B. Deviation from Appendix A

In accordance with section 3(a) of 10 CFR part 430, subpart C, appendix A ("appendix A"), which applies to commercial and industrial pumps under 10 CFR 431.4, DOE notes that it is deviating from the provision in appendix A regarding the length of comment periods for the pre-NOPR stages for an energy conservation standards rulemaking. Section 6(d)(2) of appendix A specifies that the length of the public comment period for pre-NOPR rulemaking documents will not be less than 75 calendar days. For this NODA, DOE has opted instead to provide a 45-day comment period. DOE requested comment in an early assessment request for information published on August 9, 2021 ("August 2021 RFI") on the analysis conducted in support of the previous energy conservation standard rulemaking for pumps. 86 FR 43430, 43431. The August 2021 RFI provided 30 days for submitting written comment, data, and information. In response to comment received from stakeholders, DOE extended the comment period for the August 2021 RFI another 30 days. Given that the analysis will largely remain the same, and in light of the 60-day comment associated with the August 2021 RFI, DOE has determined that a 45-day comment period is sufficient to enable interested parties to review the data and accompanying analysis and develop meaningful comments in response to the NODA.

II. Background

A. Current Standards

In a final rule published on January 26, 2016 ("January 2016 Final Rule"), DOE prescribed the current energy conservation standards for pumps manufactured on and after January 27, 2020. 81 FR 4368. These standards are set forth in DOE's regulations at 10 CFR 431.465 and are reproduced in Table II.1. DOE set standards for equipment classes which were divided based on pump category, nominal speed of rotation (rpm), and load type (constant and variable). Equipment class labels are structured as pump category acronym, rpm, constant-load ("CL") or variable-load ("VL"). CL and VL equipment classes were not analyzed separately in the January 2016 Final Rule and therefore were not assigned different standards.

Table II.1 Federal Energy Conservation Standards for Pumps

Equipment class	Maximum PEI	C-value
ESCC.1800.CL	1	128.47
ESCC.3600.CL	1	130.42
ESCC.1800.VL	1	128.47
ESCC.3600.VL	1	130.42
ESFM.1800.CL	1	128.85
ESFM.3600.CL	1	130.99
ESFM.1800.VL	1	128.85
ESFM.3600.VL	1	130.99
IL.1800.CL	1	129.3
IL.3600.CL	1	133.84
IL.1800.VL	1	129.3
IL.3600.VL	1	133.84

Equipment class	Maximum PEI	C-value
RSV.1800.CL	1	129.63
RSV.3600.CL	1	133.2
RSV.1800.VL	1	129.63
RSV.3600.VL	1	133.2
ST.1800.CL	1	138.78
ST.3600.CL	1	134.85
ST.1800.VL	1	138.78
ST.3600.VL	1	134.85

B. Current Process

In the August 2021 RFI, DOE sought data and information to evaluate whether amended energy conservation standards for pumps would result in a significant savings of energy; be technologically feasible; and be economically justified. 86 FR 43430. Comments received to date as part of the current process have helped DOE identify and resolve issues related to the preliminary analyses. Chapter 1 of the TSD accompanying this NODA summarizes and addresses the comments received.

III. Discussion

The goal of this NODA is to provide an overview of potential design options and associated national energy savings ("NES") and preliminary industry net present value ("INPV") estimates for the various commercial and industrial pump equipment classes, as well as associated qualitative information. Following comments received on this NODA, DOE would determine how to proceed with the rulemaking.

The contents of this NODA are based on the scope proposed in a test procedure notice of proposed rulemaking for pumps published on April 11, 2022 ("April 2022 TP NOPR"). 87 FR 21268, 21273. DOE acknowledges that stakeholder comments in response to the April 2022 TP NOPR include scope-related comments, which DOE will consider in determining the scope of any final test procedure and any subsequent energy conservation standards analyses.

This NODA includes an abbreviated set of analyses as compared to a full preliminary analysis or notice of proposed rulemaking: market and technology assessment; screening analysis; engineering analysis; energy use analysis and shipments analysis to calculate national energy savings; and a preliminary manufacturer impact analysis.

This NODA does not include a life cycle cost analysis ("LCC") or the national net present value portion of the national impact analysis ("NIA"). In the January 2016 Final Rule, all LCC results based on hydraulic redesign were positive since there was no increase in manufacturer production cost ("MPC"), and the energy cost savings significantly outweighed the increase in manufacturer selling price ("MSP") that DOE calculated by assuming manufacturers recouped conversion costs. 81 FR 4368, 4406-4409. At this time, DOE does not have data that would indicate the results would be different from those presented in the January 2016 Final Rule, and as discussed in section III.B.1 of this document, manufacturers were unable to recoup any conversion costs resulting from the current standard. However, if updated data were provided, DOE could evaluate MPC increases for additional hydraulic redesign and these values could be incorporated into a future LCC or NIA analysis, along with MPC increases for other technology options as discussed in section III.C.2.c. of this document.

The analyses in this NODA are primarily based on data from the previous rulemaking, except for updated efficiency distributions, conversion costs, estimated motors and controls performances and costs, and performance data for pumps not currently subject to standards. In addition, due to limited data, the analysis for pumps not currently subject to standards is based largely on proxies from the current scope. Overviews of the analyses can be found in section III.C of this document, with detailed methodology available in the TSD accompanying this NODA.

A. Scope

In this NODA, DOE conducted analyses for pump categories currently subject to DOE standards, in addition to some pump categories that are not currently subject to standards, but were included in the April 2022 TP NOPR. 87 FR 21268. Pump categories currently subject to standards include end suction frame mounted ("ESFM") pumps, end suction close-coupled ("ESCC") pumps, in-line ("IL") pumps, radially split, multi-stage, vertical, in-line diffuser casing ("RSV") pumps, and submersible turbine ("ST") pumps. Pump categories not currently subject to standards that were included in the April 2022 TP NOPR include between bearing ("BB") pumps, vertical turbine ("VT") pumps, small vertical in-line ("SVIL") pumps, radially split horizontal ("RSH") pumps, pumps with a nominal speed of rotation of 1,200 rpm, and ST pumps with bowl diameters greater than 6 inches. During the pumps negotiations in 2014,[3] DOE collected data on BB, VT, and SVIL pumps. DOE combined these data with data from a recent

[3] A commercial and industrial pumps working group ("CIP working group") was established in 2013 under the Appliance Standards and Rulemaking Advisory Committee ("ASRAC") in accordance with the Federal Advisory Committee Act and the Negotiated Rulemaking Act. (5 U.S.C. App.; 5 U.S.C. 561–570). *See* 78 FR 44036. The purpose of the CIP working group was to discuss and, if possible, reach consensus on proposed standards for pump energy efficiency. On June 19, 2014, the CIP working group reached consensus on proposed energy conservation standards for specific rotodynamic, clean water pumps used in a variety of commercial, industrial, agricultural, and municipal applications. The CIP working group assembled their recommendations into a Term Sheet (*See* Docket EERE-2013-BT-NOC-0039-0092, *www.regulations.gov/document/EERE-2013-BT-NOC-0039-0092*).

round of manufacturer interviews for this NODA analysis. DOE did not have sufficient data to evaluate RSH pumps and ST pumps with bowl diameters greater than 6 inches in this NODA. In addition, as there are so few models of ST.1800 pumps, DOE only evaluated ST.3600 pumps as part of this NODA, consistent with the January 2016 Final Rule.

Table III.1 compares shipments and average horsepower ("HP") for pumps not currently, and currently, subject to standards based on available data. Based on stakeholder feedback through public comments and manufacturer interviews, DOE has tentatively determined that the pumps not currently subject to standards are, on average, rated at a higher HP than the pumps currently subject to DOE standards -- and as a result, total shipments for these pumps within the scope limitations of 200 HP and 459 feet of head tend to be smaller than for the pump categories that DOE currently regulates. As noted, DOE will address stakeholder comments received on the April 2022 TP NOPR related to those pumps that are not currently subject to standards, including the application of the current scope limitations, in subsequent test procedure rulemaking documents.

Table III.1 Shipments and Average HP by Equipment Class for Pumps Not Currently, and Not Currently, Subject to Standards and Pumps Not Currently Subject to Standards

	Equipment Category	2021 Shipments Estimates (Units)	Average HP
Currently subject to standards	ESCC	206,215[a]	9[a]
	ESFM	52,894[a]	20[a]
	IL	60,566[a]	10[a]
	ST	128,893[a]	7[a]
	RSV	60,019[a]	14[b]
Not currently subject to standards	BB	6,379[a]	21[c]
	VT	7,179[a]	7[c]
	SVIL	10,212[c]	0.5[c]
	RSH	N/A	N/A
	1200 rpm (ESCC, ESFM, and IL categories)	7,874[c]	13[c]
	ST and VT > 6inch	N/A	N/A

Total	540,231	10

[a] Year 2012 shipments based on an HI survey (www.regulations.gov/document/EERE-2013-BT-NOC-0039-0068), projected forward to year 2021 based on the shipments methodology (discussed in section III.C.3.b of this document).
[b] DOE's Compliance Certification Database, *see www.regulations.doe.gov/certification-data/CCMS-4-Pumps_-_General_Pumps.html#q=Product_Group_s%3A%22Pumps%20-%20General%20Pumps%22* accessed on March 20, 2022.
[c] Based on both manufacturer data collection conducted for this analysis and for the January 2016 Final Rule while applying equipment class similarity (discussed in section III.C.3.a of this document) and the shipments methodology (discussed in section III.C.3.b of this document).

Issue 1: DOE seeks individual model level data or industry aggregated data to update its shipment and average horsepower estimate for pump categories that are currently subject to standards and those pump categories that are currently not subject to standards.

As discussed previously, DOE intends to use this NODA as a step toward determining how to proceed with a rulemaking for pumps. DOE acknowledges that if pump classes that are not currently within scope of the test procedure were included in the scope of the test procedure final rule, but were not included in the scope of the energy conservation standard, these classes would not have assigned C-values.[4] In this case, the pump energy rating ("PER") for a minimally compliant pump ("PER_{STD}") could not be calculated, making it impossible to determine a pump energy index ("PEI") rating for these classes. To address this issue, DOE could consider issuing a supplemental NOPR for the test procedure to establish C-values for the categories currently subject to standards at a baseline level that would enable calculation of PEI for these categories and facilitate rebate or other efficiency programs for pumps not currently subject to standards.

[4] C-value is the translational component of a three-dimensional polynomial equation that describes the attainable hydraulic efficiency of pumps as a function of flow at best efficiency point ("BEP"), specific speed, and C-value. The C-value is used to define an efficiency level that a pump can readily attain across the entire regulated scope of flow and specific speed for that particular pump.

Issue 2: DOE requests comments on potential benefits or drawbacks of proposing a change to the test procedure to allow calculation of PEI for pumps not subject to energy conservation standards.

B. Technology Options

For this NODA analysis, DOE evaluated hydraulic redesign, advanced motors, and variable-speed drives ("VSDs") as potential technologies for reducing pump energy consumption. These technologies are discussed in the following sections.

1. Hydraulic Redesign

DOE evaluated five efficiency levels ("EL") in the January 2016 Final Rule; each EL was developed according to efficiency percentiles (10th, 25th, 40th, 55th, and 70th percentile) and each percentile for each equipment class was assigned a C-value. 81 FR 4368, 4386. Ultimately, the pumps energy conservation standard was established at C-values corresponding to EL 2 for all equipment classes except for RSV pumps and ST pumps with a specific speed of 1,800 rpm. 81 FR 4368, 4369 and 4386 (see Table IV.2 of the January 2016 Final Rule detailing the adopted efficiency levels). Standards for these pump equipment classes were established at baseline, or EL 0.[5] *Id.*

During interviews, manufacturers stated that additional hydraulic redesign might be possible to reach EL 3 as presented in the January 2016 Final Rule; however, they pointed out that any such redesign would be as or more expensive than the previous redesign and energy savings would likely be minimal. In order to meet the standards set in the January 2016 Final Rule, many manufacturers redesigned their pumps to be as

[5] DOE notes that the baseline for RSV pumps was equivalent to the EU's 40th percentile standard, as all RSV pumps had already been designed to meet that standard.

efficient as possible given pump family and certain technology limitations; most manufacturers did not redesign their pumps to just meet the standard. Therefore, for redesigned pumps that did not reach EL 4 or EL 5 as presented in the January 2016 Final Rule, manufacturers expressed concern that reaching these levels with a hydraulic redesign would be extremely difficult and costly. In particular, manufacturers commented that:

- MPC would begin to increase at EL 4 and EL 5 as presented in the January 2016 Final Rule due to finer part tolerances and manual surface finishing;

- Utility could be compromised. Some manufacturers stated that they had observed a warranty claim increase for redesigned pumps. Additionally, several manufacturers commented that they had to flatten the pump curve in order to achieve higher efficiency levels. A flatter pump curve can limit controllability and cause operational problems in some applications.[6]

- In some cases, manufacturers were or would be unable to maintain flange positions on some models during redesign. This means that a new pump cannot easily replace an older pump without changing piping into and out of the pump, which in turn may result in loss of business for that manufacturer or increase installation costs for end users in replacement situations.

- Manufacturers may choose not to redesign to EL 4 and EL 5, resulting in gaps in a product family, and the possibility that a consumer would then purchase a pump that was less efficient for their application than they would have purchased without such a standard.

[6] Karrasik, Messina, Cooper, and Heald. "Pump Handbook," 4th Edition, pp. 2.55-2.57.

- Manufacturers reported that they did not recoup the conversion costs incurred due to the redesigns required by the current DOE standards due to market pressures. Manufacturers expect the same outcome if DOE were to set more stringent standards.

DOE acknowledges that there are many pumps already on the market that meet EL 4 and EL 5 as presented in the January 2016 Final Rule. There are several reasons why this may be possible, even with manufacturers stating that meeting these ELs are not feasible for all pumps:

- Choices to limit the impacts listed previously (increased MPC and labor/staffing needs, loss of utility for certain applications, potential loss of replacement business due to changed flange positions);

- Choosing to stay within the constraints of a product family in order to take advantage of shared common parts, as opposed to a substantially more expensive redesign of an entire product family or a redesign that would make a model(s) different from the rest of the family;

- Variability in designer skill and experience with computational fluid dynamics;

- Irregularities in the three-dimensional surface that sets the standard level as a function of flow and specific speed. To harmonize with the European Union ("EU"), the surface used to determine DOE energy conservation standards is based on EU data and not data specific to the U.S. market. (*See* January 2016 Final Rule TSD Appendix 3B p. 5, EERE-2011-BT-STD-0031-0056) This means that there may be some points of flow or specific speed where EL 4 or EL 5, as presented in the January 2016 Final Rule, may be easier to achieve than at other points.

Issue 3: DOE requests comment on the percentage of basic models that would be impacted by the following factors if manufacturers were to redesign their pumps to EL 4 and EL 5 (as presented in the January 2016 Final Rule): (1) need to flatten the pump curve beyond potentially acceptable levels for the existing market for a given model or any reported issues with controllability; (2) increased warranty claims; and (3) increased MPCs for pumps redesigned to higher efficiencies. Additionally, DOE requests comment on which EL (as presented in the January 2016 Final Rule) and for which pump classes (or hp ranges) these issues would first appear.

Issue 4: DOE also seeks comment on the availability of designers skilled enough to design a pump that can reach EL 4 and EL 5 and be readily manufactured.

Issue 5: Additionally, DOE requests comment on any other issues that may prevent manufacturers from redesigning pumps to reach higher efficiency levels, including other utility issues.

Issue 6: DOE requests comment on the fraction of installations in which consumers would have to make piping changes as a result of a change in flange position (as opposed to purchasing another model with the desired flange positions), and the cost of such piping changes.

2. Advanced Motors

Advanced motors were not considered as a technology option in support of the January 2016 Final Rule. However, based on feedback from stakeholders, DOE is including advanced motors as a technology option in this NODA analysis. In this NODA, advanced motors refer to any motor paired with a pump that has a greater

efficiency than the default motor referenced in the pumps test procedure. If DOE were to set an energy conservation standard that is stringent enough to require more efficient motors, some pumps may need to be paired with a motor in order to be sold in the U.S.[7] DOE has identified several potential issues with this technology option, which are listed below:

- *Replacement pumps*. If all pumps must be paired with motor for distribution into commerce, it is not clear how the replacement market for bare pumps would work.

- *Potential market disruption*. The majority of sales for most manufacturers are from bare pumps; distributors may then pair the pump with a motor (and possibly controls). Requiring that pumps be sold with a motor (by the pump's original equipment manufacturer) would likely have a negative impact on pump distributors and result in substantial disruption to the pumps market.

- *Potential consequences*. Larger stock in the field of older, more inefficient pumps. Requiring pumps to be paired with a motor for distribution in commerce is expected to increase the cost of the pump. Some end users may opt to repair rather than replace older, inefficient pumps. Additionally, if a motor fails before the pump fails, end users may choose a less efficient motor as a replacement.

- *Overlapping regulation*. The vast majority of motors paired with pumps subject to this rulemaking are already covered equipment (as electric motors) within the

[7] DOE acknowledges that pump manufacturers may be able to hydraulically redesign a bare pump to reach the same PEI level as a minimally compliant bare pump sold with a more efficient motor. In this case, the issues discussed in section III.B.1 might apply. DOE would consider an appropriate ordering of any design options for the engineering analysis after conducting a screening analysis, which it has not done for this NODA. (See discussion in section III.C.1. of this document).

DOE appliance standards program. (subpart B to 10 CFR part 431)[8] DOE is currently undertaking an energy conservation rulemaking to consider amended standards for electric motors (*see* Docket No. EERE-2020-BT-STD-0007). This prevents DOE from determining how much energy savings would result from a pumps design option related to motor efficiency without potentially double-counting energy savings also accounted for in the electric motors rulemaking.

These issues (excluding overlapping regulation) are discussed in more detail in section III.B.3 of this document in the context of VSDs, but apply similarly to motors.

Issue 7: DOE requests comment on how a standard that requires an advanced motor to be paired with a bare pump would impact: (1) the bare pump replacement market; (2) the distributor market and business model; (3) the repair of pumps rather than their replacement and (4) the replacement of failed motors with less efficient motors. DOE also requests feedback on any potential consistency concerns with a standard that requires an advanced motor to be paired with a bare pump and current or future energy conservation standards for electric motors.

3. Variable-Speed Drives

Variable-speed drives were considered as a technology option in the January 2016 Final Rule. (*See* Chapter 3 of the January 2016 Final Rule TSD, EERE-2011-BT-STD-0031-0056, pp. 3-29 to 3-35) VSDs were screened out of the January 2016 Final Rule

[8] Some motors paired with pumps subject to this and other pump rulemakings (*e.g.*, dedicated purpose pool pumps, circulator pumps) are covered by the DOE appliance standards program as small electric motors (subpart X to 10 CFR part 431). Small electric motors that are components of another piece of covered equipment do not have to comply with standards prescribed for this equipment. (*See* 10 CFR 431.466(a). *See also* 42 U.S.C. 6317(b)(3)). As such, the problem of overlapping regulation may not apply to covered products and equipment that are only paired with small electric motors (as defined in 10 CFR 431.462).

analysis because DOE determined the technology may not significantly improve efficiency for all pumps within each equipment class. (*See* Chapter 4 of the January 2016 Final Rule TSD, EERE-2011-BT-STD-0031-0056, pp. 4-5) In fact, DOE determined that energy use would increase for many applications. *Id.*

As discussed in chapter 1 of the TSD accompanying this NODA, DOE received comments from stakeholders recommending that VSDs be considered as a technology option in the current pumps analysis. (CA IOUs, No. 10 at p. 12; ASAP and NRDC, No. 7 at p. 2; NEEA, No. 11 at p. 6) These stakeholders referenced a recent study by NEEA that reported significant savings for both constant-load and variable-load pump applications.[9] If DOE were to set an energy conservation standard that is stringent enough to require VSDs, all pumps would have to be paired with a motor and VSD in order to be sold in the U.S.

During interviews, manufacturers shared multiple concerns about requiring pumps to be sold with a VSD. However, many manufacturers also acknowledged that it would be ideal for DOE to incentivize applications to use controls with their pumps and suggested that a rebate program would be the best way to do this since it would limit all of the potential unintended consequences discussed . On April 27, 2022, DOE published a Notice of Availability and Solicitation of Public Comment on the Draft Implementation Guidance Pertaining to the Extended Product System Rebate Program and Energy Efficient Transformer Rebate Program. 87 FR 25006. This draft implementation guidance includes a rebate program for pumps designed to incentivize adding controls to existing facilities (by specifying a maximum qualifying variable-load PEI ("PEI_{VL}")), with maximum rebate payments to a given entity of up to $25,000 per calendar year. For

[9] Northwest Energy Efficiency Alliance, "Extended Motor Products Savings Validation Research on Clear Water Pumps and Circulators," August 29, 2029. *See www.neea.org/img/documents/XMP-Savings-Validation-Research-on-Clean-Water-Pumps-and-Circulators.pdf.*

more information, refer to the guidance webpage: *www.energy.gov/eere/buildings/draft-implementation-guidance-pertaining-extended-product-system-rebate-program-and*.

a. Potential Disruption to Pumps Market

The primary concern shared by most manufacturers was how disruptive a requirement to sell pumps with controls would be for the overall pumps market. Manufacturers stated that end users typically have specific controller requirements, meaning they have one controller brand for their facility, primarily to simplify maintenance and operation. Because pump manufacturers typically stock one to two controller brands, distributors often buy the pump or pump and motor from the pump manufacturer but buy the controls from the controls manufacturer. Additionally, if pumps were required to be sold with motors and VSDs, pump manufacturers would have to greatly increase their floor space, inventory, and unique model numbers in order to satisfy end users who would currently work through a distributor. In this case, there could be significantly large impacts to distributors, who would provide less added value.

Manufacturers also commented that there are supply chain constraints. Specifically, pump manufacturers were skeptical about the ability of VSD manufacturers to be able to meet the increased demand that an energy conservation standard requiring VSDs would cause. Manufacturers also stated that the VSD technology for higher horsepower motors is not as mature as that for lower horsepower motors, and that, in some cases, they already had trouble obtaining VSDs of acceptable quality for higher horsepower motors.

Issue 8: DOE seeks comment on the frequency with which pump consumers specify only a single controller brand, as well as on the number of controller brands typically stocked by a pump manufacturer.

Issue 9: DOE seeks comment on how a VSD requirement for pumps would impact distributors.

Issue 10: DOE requests comment on whether there would be sufficient quantity and quality of VSDs available if there were a VSD requirement for pumps.

b. Potential Issues with the Replacement Market

The EU is evaluating its current standard for pumps and issued a call of evidence on January 21, 2022, that included a recommendation for evaluating an extended product approach for pumps.[10] In its comments, EuroPump[11] supported the extended product approach as a means to capture savings that were not captured by the current EU regulation. However, while efficiency organizations provided general support for the extended product approach, they also stated that VSDs should only be required as needed to minimize material waste, while commenting that around 50 percent of pump systems benefit from a VSD.[12] During interviews, manufacturers also voiced concerns about how a replacement parts market would work if pumps were required to be sold with motors and controls. If a bare pump is sold as a replacement part, that practice would eliminate the waste associated with replacing an entire pump system. However, selling a bare pump as a replacement part without controls opens a loophole where end users could purchase the bare pump and operate it without controls. This is also an issue for advanced motors, although to a lesser degree since only the motor and bare pump would have to be replaced, not the controller.

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[10] The document discusses the possibility of covering the "extended product" referring to the pump, motor, and VSD as one unit. *See www.ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12831-Ecodesign-requirements-for-water-pumps-review-_en.*

[11] Europump is the European Association of Pump Manufacturer Associations. *See* Comments at *www.ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12831-Ecodesign-requirements-for-water-pumps-review-/F2822271_en*.

[12] *See* comments from ECOS, coolproducts, and the European Environmental Bureau, available at *www.ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12831-Ecodesign-requirements-for-water-pumps-review-/F2878588_en*.

Issue 11: DOE seeks comment on possible methods to retain a replacement market for bare pumps while preventing a loophole where bare pumps could be purchased for current and new installations.

c. Potential Energy Use Impacts

Through interviews conducted with manufacturers, DOE has also identified several ways that VSDs may impact pump energy use (if pumps must be sold with advanced motors or VSDs) that are not accounted for in this NODA's energy use analysis but would need to be to justify new or amended standards that DOE may decide to adopt.

First, if a motor sold with a pump fails, the customer could replace the failed motor with a less efficient motor since current DOE standards for electric motors do not require advanced technology and/or controls. This issue is the reason why stakeholders requested that DOE conduct a rulemaking using its direct final rule authority to establish standards for dedicated-purpose pool pump ("DPPP") motors. In their view, because the adopted DPPP standards require DPPPs (at least in certain cases) to be sold with a VSD. establishing DPPP motor standards would ensure that the expected savings from the DPPP standards would occur. 83 FR 45851, 45853 (September 11, 2018). In the case of DPPPs, there are motors specific to DPPPs, such that adopting a motor standard specific to DPPPs would be feasible. In the case of pumps, the motors used with this equipment are used in multiple applications, so DOE cannot adopt motor standards, as it did for DPPPs, that are specific to pumps. This issue also applies to the advanced motors design option discussed previously.

Second, requiring all pumps to be sold with controls could cause an increase in repairs of inefficient pumps because replacement pumps would have the added cost of a VSD. This would delay the purchase of a new pump with motor and controls. This issue

also applies to the advanced motors design option discussed previously, although to a lesser extent since a motor is less expensive than a motor-plus-VSD combination.

Third, pumps designed for integrated controls may have a lower efficiency if installed in properly-sized constant-load applications since there are additional electrical inefficiencies when a controller is added to a motor. If a system operates at a constant load with an appropriately-sized pump, these additional losses become greater than the benefits of a VSD.

Issue 12: DOE seeks comment on the frequency with which customers would replace an inverter-only motor and control with an induction motor upon the end of the lifetime of the motor originally purchased with the pump.

Issue 13: DOE seeks comment on how bare pump repair frequency may change if customers delay purchasing a more expensive pump with motor and controls. For example, in its DPPP motors analysis, DOE assumed that in the standards case, a greater percentage of consumers would repair their pump as compared to the no-new-standards case.

Issue 14: DOE seeks comment on the percentage of pump models that would be redesigned for controls if they were required to be sold with them, and of those, what percentage would have worse efficiency in constant-load applications than the current pump model, and by how much the efficiency or energy use would be impacted.

d. Potential Cost Impacts

During interviews, manufacturers identified potential cost impacts that have not been accounted for in this analysis but would need to be in any analysis to justify new or

amended standards. Specifically, there could be significant installation difficulties or costs for some applications in which electrical upgrades or filters may be required. In addition, there could be a need for re-piping since, in this scenario, pump manufacturers may not offer the same bare pumps. Re-piping is discussed previously in relation to hydraulic redesign. Finally, there could be downtime for facilities while they re-pipe or perform electrical upgrades.

Issue 15: DOE seeks comment on the frequency with which customers who would be required to buy a pump with a VSD would need to add filters or perform electrical upgrades, and the estimated cost of such equipment and installation.

Issue 16: DOE seeks comment on the frequency with which customers might need to re-pipe to accommodate a pump with motor and controls rather than a drop-in replacement pump, and the estimated cost of re-piping.

Issue 17: DOE seeks quantitative data on the overall installation costs of pumps with VSDs compared to bare pumps, as well as any differences in lifetime or repair and maintenance costs for pumps sold with VSDs as compared to bare pumps.

C. Analysis

The following sections provide a brief overview of the results from the analyses DOE conducted for this NODA. Full details of the methodology can be found in chapters 2 through 6 of the TSD accompanying this NODA. Summaries of comments received from the August 2021 RFI responses related to analytical methodologies are included in chapter 1 of the TSD accompanying this NODA.

1. Screening

DOE uses the following five screening criteria to determine which technology options are suitable for further consideration in an energy conservation standards rulemaking:

(1) *Technological feasibility*. Technologies that are not incorporated in commercial products or in working prototypes will not be considered further.

(2) *Practicability to manufacture, install, and service*. If it is determined that mass production and reliable installation and servicing of a technology in commercial products could not be achieved on the scale necessary to serve the relevant market at the time of the projected compliance date of the standard, then that technology will not be considered further.

(3) *Impacts on product utility or product availability*. If it is determined that a technology would have a significant adverse impact on the utility of the product for significant subgroups of consumers or would result in the unavailability of any covered product type with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as products generally available in the United States at the time, it will not be considered further.

(4) *Adverse impacts on health or safety*. If it is determined that a technology would have significant adverse impacts on health or safety, it will not be considered further.

(5) *Unique-pathway proprietary technologies*. If a design option utilizes proprietary technology that represents a unique pathway to achieving a given efficiency level, that technology will not be considered further due to the potential for monopolistic concerns.

10 CFR part 430, subpart C, appendix A, sections 6(b)(3) and 7(b).

If DOE determines that a technology, or a combination of technologies, fails to meet one or more of the listed five criteria, it will be excluded from further consideration in the engineering analysis.

DOE did not conduct a screening analysis for this NODA and instead is presenting analyses for the three technologies discussed in section III.B of this document (*i.e.,* hydraulic redesign, advanced motors, and VSDs) in order to receive stakeholder feedback. In a future analysis to support this rulemaking, based on many of the issues listed in section III.B of this document, DOE may screen out some or all of the listed technologies based on one or more of the screening criteria.

Issue 18: DOE requests comment on if or how the five screening criteria may limit application of hydraulic redesign, advanced motors, or VSDs as design options in the current rulemaking analysis.2. Engineering

The purpose of the engineering analysis is to determine the incremental manufacturing cost associated with producing products at higher efficiency levels. The primary considerations in the engineering analysis are the selection of efficiency levels to analyze (*i.e.*, the "efficiency analysis") and the determination of product cost at each efficiency level (*i.e.*, the "cost analysis").

DOE conducts the efficiency analysis using either an efficiency-level approach, a design-option approach, or a combination of both. Under the efficiency-level approach, the efficiency levels to be considered in the analysis are determined based on the market distribution of existing products (in other words, observing the range of efficiency and efficiency level "clusters" that already exist on the market). This approach typically starts with compiling a comprehensive list of products available on the market, such as from DOE's product certification database. Next, the list of models is ranked by efficiency

level from lowest to highest, and DOE typically creates a scatter plot to visualize the distribution of efficiency levels. From these rankings and visual plots, efficiency levels can be identified by examining clusters of models around common efficiency levels. The maximum efficiency level currently available on the market can also be identified.

Under the design option approach, the efficiency levels to be considered in the analysis are determined through detailed engineering calculations and/or computer simulations of the efficiency improvements from implementing specific design options that have been identified in the technology assessment. In an iterative fashion, design options can also be identified during product teardowns as described. The design option approach is typically used when a comprehensive database of certified models is unavailable (for example, if a product is not yet regulated) -- making the efficiency-level approach unusable.

In certain rulemakings, the efficiency-level approach (based on actual products on the market) will be extended using the design option approach to interpolate between levels to define “gap fill” levels (to bridge large gaps between other identified efficiency levels) and/or to extrapolate to the “max tech” level (the level that DOE determines is the maximum achievable efficiency level), particularly in cases where the “max tech” level exceeds the maximum efficiency level currently available on the market.

The cost analysis portion of the engineering analysis is conducted using one or a combination of cost approaches. The selection of the cost approach depends on a variety of factors such as the availability and reliability of information on product features and pricing, the physical characteristics of the regulated product, and the practicability of purchasing the product on the market. DOE generally uses the following cost approaches:

• *Physical teardown*: Under this approach, DOE physically dismantles a commercially available product, component-by-component, to develop a detailed bill of materials ("BOM") for the product.

• *Catalog teardown*: In lieu of physically deconstructing a product, DOE identifies each component using parts diagrams (available from manufacturer websites or appliance repair websites, for example) to develop the BOM for the product.

• *Price surveys*: If neither a physical nor catalog teardown is feasible (for example, for tightly-integrated products that are infeasible to disassemble and for which parts diagrams are unavailable), DOE conducts retail price surveys by scanning retailer websites and other marketing materials. This approach must be coupled with assumptions regarding distributor markups and retailer markups in order to estimate the actual manufacturing cost of the product.

The engineering analysis conducted for this NODA used an efficiency level approach consistent with that used in the January 2016 Final Rule analysis along with a new design option approach. The cost analysis relied on physical and catalog tear downs and confidential information provided by manufacturers.

a. Methodology

DOE conducted two engineering analyses for this NODA. The first analysis is consistent with that performed to support the January 2016 Final Rule in which only hydraulic redesign was considered as a design option. 81 FR 4368, 4384. This approach developed conversion costs that DOE expected industry to incur when redesigning non-

compliant pumps to meet a potential new standard. Discussions with manufacturers indicated that MPC would not increase as efficiency increases.

The second analysis examined the possibility of motors and controls as technologies to improve pump efficiency. This analysis developed MPC versus efficiency (*i.e.*, PEI) curves. DOE assumed the motors and controls approach would not result in conversion costs for manufacturers. DOE separated these analyses into a "branched" approach that assumes that no hydraulic redesign would occur relative to the current baseline if a motors or controls standard were adopted, and no pumps would shift towards only being sold with motors or controls in a hydraulic redesign scenario. This assumption allowed DOE to separate conversion costs from increases in MPC. DOE performed both of these analyses for pumps larger than 1 horsepower and for SVILs. Details of these analyses are discussed in sections III.C.2.b and III.C.2.c of this document.

Assumptions

Since DOE had limited data for pumps that are not currently subject to standards, the Department used similar pump categories that are currently subject to standards as a proxy to estimate costs and performance metrics for pumps that are not currently subject to standards. Table III.2 summarizes the pump categories used as proxies for the pump categories where DOE had insufficient data to conduct an analysis. The specific instances where DOE used these proxies are discussed in more detail in Chapter 2 of this TSD accompanying this NODA.

Table III.2 Pump Category Similarities Used Throughout Analysis

Pump Category with Insufficient Data	Pump Category Used as Proxy
Between Bearing	End-Suction
Small Vertical In-Line	In-Line
Radially Split Horizontal	Radially Split Vertical
Vertical Turbine	Submersible Turbine
End Suction 1200rpm	End-Suction 1800rpm and 3600rpm

In-Line 1200rpm	In-Line 1800rpm and 3600rpm

Additionally, to make use of older performance data, DOE assumed that for pumps that are not currently subject to standards, performance data obtained during the 2014 pumps negotiations would provide an accurate summary of the performance of these pump models on the market today.

Issue 19: If DOE's assumptions are not appropriate, DOE requests updated shipments and performance data for BB, SVIL, RSH, and VT pumps. DOE also requests updated shipments and performance data for pumps sold at a specific speed of 1,200 rpm and for ST pumps with a bowl diameter greater than 6 inches.

Constant-Load and Variable-Load Pumps

In the analysis for the January 2016 Final Rule, DOE conducted one analysis to encompass both CL and VL equipment classes. 81 FR 4368, 4382. Constant-load pumps are sold without controls and variable-load pumps are sold with controls. 10 CFR 431.466. Since only one analysis was performed for both constant- and variable-load pump classes, the standards for these classes are the same. Setting the PEI metric in this way was intended to incentivize manufacturers to sell pumps with controls as an alternative to hydraulic redesign. As discussed in chapter 1 of the TSD accompanying this NODA, some stakeholders requested that DOE establish a separate set of C-values for VL pumps so that standards for VL pumps could be raised to require that any bare pumps sold with controls would also meet the PEI_{CL} for bare pump efficiency before adding controls. During manufacturer interviews, some manufacturers observed that some companies were selling pumps with controls that do not meet the bare pump

standard; however, DOE notes the current standard is silent as to how a pump distributed into commerce can meet the energy conservation standard.

DOE is concerned that increasing the standard for VL classes may increase their cost relative to CL classes. This may result in equipment class switching, where consumers who would have purchased a pump with a motor and control may purchase a bare pump or a bare pump with only a motor in order to reduce their first costs. However, DOE also acknowledges that sales of pumps with motors and controls do not seem to have been driven by the option for manufacturers to sell only into the VL class and instead is limited by market demand.

Issue 20: DOE seeks comment on the likelihood of equipment class switching or other unintended consequences if DOE were to set a higher standard for VL equipment classes.

For this NODA, DOE's analysis is consistent with its approach supporting the January 2016 Final Rule. However, DOE did evaluate VSDs as a potential technology for reducing energy consumption in this NODA. This analysis could be applied differently to CL and VL classes in future rulemaking analyses.

SVILs

As discussed in the April 2022 TP NOPR, stakeholders universally supported addressing SVILs as part of the commercial and industrial pump rulemaking. 87 FR 21268, 21275. This support aligns with recommendations from the Circulators Working group.[13] (Docket No. EERE–2016–BT–STD–0004, No. 58, Recommendation #1B at pp.

[13] On February 3, 2016, DOE published its intention to establish a working group under the Appliance Standards and Rulemaking Federal Advisory Committee ("ASRAC") to negotiate a test procedure and energy conservation standards for circulator pumps. 81 FR 5658. Throughout this document this working group shall be referred to as "the Circulator Pumps Working Group."

1-2) However, during interviews, manufacturers provided conflicting suggestions for how DOE should conduct its SVIL analysis. One group of manufacturers suggested evaluating hydraulic redesign only for SVILs, similar to the approach taken in the January 2016 Final Rule for IL pumps. In this case, any new SVIL standards would be consistent with IL pump standards. A subset of manufacturers viewed this approach as appropriate since many SVILs are a 4-pole version of a 2-pole IL pump. Another group of manufacturers suggested that potential SVIL standards should be equivalent to any future standards for circulator pumps. Manufacturers expect that the circulators analysis will be based on motor and controls design options, consistent with recommendations by the Circulators Working Group to set a standard at EL 2 that would essentially require a single-speed electronically commutated motor. (Docket No. EERE–2016–BT–STD–0004, No. 98 Recommendation #1 at p. 1 and No. 97 at p. 2). In this case, SVILs would be a potentially less efficient and less costly substitute for circulators. Additionally, DOE received conflicting feedback on whether circulators and SVILs would compete with, or act as substitutes for, each other. Some manufacturers stated that an SVIL would never be substituted for a circulator, while others said that it was possible.

Issue 21: DOE requests comment on specific applications for which SVILs could be used instead of circulators and how an SVIL would need to be modified for use in these applications.

Issue 22: DOE requests comment on the portion of the SVIL market whose bare pumps are already subject to DOE's IL pump standards. Specifically, what portion of SVIL bare pumps are a different pole version of IL pumps, and what portion of SVIL pumps are a separate product family?

Issue 23: DOE requests comment on the potential benefits and drawbacks of setting standards for SVILs that align with circulator pumps versus setting standards for SVILs that align with IL pumps.

b. Hydraulic Redesign Approach

In this NODA, DOE evaluated hydraulic redesign using the same approach that it used in the January 2016 Final Rule. 81 FR 4368. In the January 2016 Final Rule, DOE assumed that hydraulic redesign would be the only design option used by manufacturers to meet the energy conservation standard.[14] 81 FR 4368, 4416. Conversations with manufacturers indicated that this assumption was appropriate in order for most pump families to meet the current energy conservation standard. The conversion costs presented in the January 2016 Final Rule assumed that every pump not meeting the energy conservation standard would either be redesigned to just meet the prescribed standard or removed from the market. However, during interviews, many manufacturers stated that they redesigned their pumps to be as efficient as possible with the technology and resources available at the time. DOE analyzed its Compliance Certification Database ("CCD") to confirm this assertion. Table III.3 summarizes the estimated distribution, by equipment class, over the ELs 2, 3, 4, and 5, as defined in the January 2016 Final Rule. Table III.4 shows the current distribution efficiency distribution from the CCD, by pump equipment class, over ELs 0, 1, 2 and 3.

Table III.3: Projected Efficiency Distributions by Equipment Class as Presented in the January 2016 Final Rule

Product Class	2016 EL 2	2016 EL 3	2016 EL 4	2016 EL 5	Total
ESCC,1800	52%	11%	13%	24%	100%
ESCC,3600	27%	3%	4%	67%	100%
ESFM,1800	39%	24%	10%	27%	100%

[14] Other technologies hydraulic redesign may encompass are clearances, seals, and other volumetric losses.

ESFM,3600	44%	16%	11%	29%	100%
IL,1800	41%	11%	11%	38%	100%
IL,3600	41%	5%	12%	43%	100%
ST,3600	46%	6%	6%	43%	100%

Table III.4: CCMS Efficiency Distributions by Equipment Class Using Manufacturer Data from the January 2016 Final Rule Power Bin Distributions

Product Class	NODA EL 0	NODA EL 1	NODA EL 2	NODA EL 3	Total
ESCC,1800	42%	6%	7%	45%	100%
ESCC,3600	20%	3%	3%	74%	100%
ESFM,1800	32%	17%	8%	43%	100%
ESFM,3600	29%	8%	10%	53%	100%
IL,1800	33%	8%	8%	52%	100%
IL,3600	36%	1%	10%	52%	100%
ST,3600	47%	5%	4%	44%	100%

The hydraulic redesign approach was conducted in the same manner as the January 2016 Final Rule's analysis. 81 FR 4368, 4387. (*See also* Chapter 5 of the January 2016 Final Rule TSD, EERE-2011-BT-STD-0031-0056, pp. 5-30 to 5-42)

For currently regulated pumps, DOE set the baseline efficiency at the standard. In the January 2016 Final Rule, the pumps energy conservation standard was set at EL 2 for all equipment classes except for RSV pumps and ST pumps with a specific speed of 1,800 rpm. 81 FR 4368, 4369 and 4386. Standards for RSV pumps and ST pumps with a specific speed of 1,000 rpm were set at baseline, or EL 0. *Id.* DOE did not redefine efficiency levels for those pumps whose standard was set at EL 2 for this NODA; instead, DOE shifted ELs 2 through 5 so that EL 2 became EL 0 (or baseline) in this NODA analysis. The new nomenclature is summarized in Table III.5 and is used in the rest of this NODA and in the TSD accompanying this NODA. EL 1, EL 2, and EL 3 have the same C-values as EL 3, EL 4, and EL 5, respectively, as presented in the January 2016 Final Rule.

Table III.5 Efficiency Level Nomenclature Changes for Pumps Currently Subject to Standards

January 2016 Final Rule Efficiency Level	Current NODA Efficiency Level
EL 0	-
EL 1	-
EL 2	EL 0 (Baseline)
EL 3	EL 1
EL 4	EL 2
EL 5	EL 3

For pumps that were not analyzed in the January 2016 Final Rule, DOE defined new efficiency levels based on C-values from pump performance data. DOE had model level performance data available for some BB, VT, and SVIL pumps. DOE did not have data available for pumps with nominal speeds of rotation at 1,200 rpm, RSH pumps, or ST pumps with bowl diameters greater than 6 inches. For this reason, DOE did not develop C-values for these pump categories in this analysis.

DOE developed preliminary C-values for BB and VT pumps using the same procedure used in the January 2016 Final Rule. (*See* Chapter 5 of the January 2016 Final Rule TSD, EERE-2011-BT-STD-0031-0056, pp. 5-15 to 5-16) Each efficiency level corresponded to a percentile of pump performance. The C-value calculated for the efficiency level was the C-value for the minimally compliant pump at the prescribed performance percentile.

DOE set the baseline for pumps not currently subject to standards at the 5th percentile of pump performance, just as was done for pumps in the January 2016 Final Rule. (*See* Chapter 5 of the January 2016 Final Rule TSD, EERE-2011-BT-STD-0031-0056, pp. 5-16 to 5-19) The reasons for using the 5th instead of the 0th percentile are discussed in Chapter 5, section 5.8.6 of the January 2016 Final Rule TSD. (EERE-2011-BT-STD-0031-0056)

Conversion costs are based on those used in the January 2016 Final Rule, manufacturer interviews, data from the DOE CCD, and data collected during the 2014 pump negotiations.[15] 81 FR 4368, 4388. A more detailed description of the development of these costs is included in chapter 2 of the TSD accompanying this NODA. As stated previously, DOE assumed that hydraulic redesign did not increase the MPC of pumps but may consider MPC increases in future analyses. The estimated total conversion costs and estimated per model conversion costs for pumps currently subject to standards are summarized in Table III.6 and Table III.7, respectively. Estimated total conversion costs and estimated per model conversion costs for pumps not currently subject to standards are summarized in Table III.8 and Table III.9, respectively. Based on conversations with manufacturers, the per model costs are higher than those estimated in the January 2016 Final Rule. The conversion costs are used as inputs to the manufacturer impact analysis, presented in section III.C.4 of this document. As previously discussed, DOE accounted for conversion costs in the LCC in the January 2016 Final Rule but DOE has not conducted an LCC for this NODA.

Due to a lack of performance data for the pumps that were not analyzed in the January 2016 Final Rule, DOE was unable to conduct the national energy savings analysis using the C-values developed for this NODA and relied instead on the proxy equipment classes that were analyzed in the January 2016 Final Rule discussed in section III.C.3 of this document. As a result, the national energy savings associated with each EL analyzed may not directly correspond to the manufacturer impacts associated with each EL. DOE would address this inconsistency in any future analyses.

[15] The data collected in the 2014 pump negotiations is described in detail in the 2016 final rule TSD (*see* Chapter 5 for the January 2016 Final Rule TSD, EERE-2011-BT-STD-0031-0056, pp. 5-6 to 5-8).

Table III.6 Estimated Total Conversion Costs for Currently Regulated Pumps

Class	EL 1	EL 2	EL 3
ESCC	$28,771,000	$97,667,000	$177,414,000
ESFM	$65,068,000	$204,491,000	$390,974,000
IL	$38,456,000	$78,965,000	$148,440,000
ST	$42,046,000	$106,922,000	$169,737,000

Table III.7 Estimated Per Model Conversion Costs for Currently Regulated Pumps

Class	EL 1	EL 2	EL 3
ESCC	$167,000	$235,000	$301,000
ESFM	$167,000	$235,000	$301,000
IL	$201,000	$283,000	$363,000
ST	$203,000	$288,000	$374,000

Table III.8 Estimated Total Industry Conversion Costs for Not Currently Regulated Pumps

Pump Category	EL 1	EL 2	EL 3	EL 4	EL 5
BB	$3,356,000	$14,057,000	$26,832,000	$47,273,000	$85,095,000
VT	$252,000	$988,000	$1,774,000	$3,122,000	$5,625,000
ES.1200	$4,253,000	$12,291,000	$21,547,000	$38,884,000	$60,316,000
IL.1200	$767,000	$2,782,000	$4,126,000	$7,284,000	$11,279,000
SVIL	$1,055,000	$4,419,000	$8,461,000	$14,941,000	$26,917,000

Table III.9: Estimated Per Model Conversion Costs for Not Currently Regulated Pumps

Pump Category	EL 1	EL 2	EL 3	EL 4	EL 5
BB	$156,000	$245,000	$275,000	$388,000	$498,000
VT	$105,000	$165,000	$185,000	$260,000	$335,000
ES.1200[16]	$105,000	$165,000	$185,000	$260,000	$335,000
IL.1200	$107,000	$149,000	$167.000	$260,000	$301,000
SVIL	$101,000	$159,000	$179,000	$253,000	$325,000

Issue 24: DOE requests shipment and performance data for (1) pumps with a nominal speed of rotation at 1,200 rpm; (2) RSH pumps; and (3) ST pumps with bowl diameters greater than 6 inches.

[16] ES.1200 and IL.1200 refer to end suction and in-line pumps with nominal speeds of 1,200 rpm.

Issue 25: DOE requests comment on its conversion cost approach for evaluating hydraulic redesign.

c. Motors and Controls Approach

The January 2016 Final Rule engineering analysis evaluated one representative configuration per equipment class. For this NODA analysis, DOE instead selected 3 representative units per equipment class to assess motor and control technologies and their effect on the efficiency of a pump as measured by the DOE test procedure. These representative units are described by head flow pairings. The three representative units were selected to cover the most common head and flow areas in a given equipment class based on unit shipments, which were determined from unit performance and shipment data DOE collected during the 2014 pumps negotiations. The process of selecting representative units is described in more detail in chapter 2 of the TSD accompanying this NODA.

As discussed in section III.C.2.a of this document, DOE assumed no hydraulic redesign would be conducted if motors and controls were used to meet a potential new energy conservation standard. Therefore, DOE assumed that the baseline for each representative unit is a minimally compliant pump according to the current pump standard and the current DOE electric motor standards summarized in Table 5 of 10 CFR 431.25, effective as of June 1, 2016. For pumps currently subject to standards, PEI is equal to 1. For pumps not currently subject to standards, DOE used the preliminary EL 0 C-value for all PEI calculations, which means that pumps not currently subject to standards were assumed to have a PEI of 1.

DOE defined the efficiency levels for the motors and controls approach based on the technologies applied to the representative unit. DOE analyzed single-speed induction

motors, improved single-speed induction motors, and VSDs for pumps larger than 1 hp. Therefore, each representative unit had three efficiency levels: baseline (EL 0) with a bare pump paired to a minimally compliant single-speed induction motor, EL 1 with the same bare pump paired to a more efficient single-speed induction motor, and EL 2 with the same configuration as EL 1 paired with a VSD. These efficiency levels are consistent with the efficiency levels used for SVIL pumps except DOE included electronically commutated motors ("ECM") as a technology for SVILs. DOE has tentatively determined that ECMs are not produced at hp ratings large enough for commercial industrial pumps. DOE maintained similar efficiency levels across SVILs and larger pumps to ensure consistency in any potential standards. The efficiency levels for all pumps are summarized in Table III.10.

Table III.10 Motor and Controls Approach Efficiency Level Summary

Pump Category	EL 1	EL 2	EL 3	EL 4
Pumps Larger Than 1 HP	Single-speed induction motor	Improved single-speed induction motor	VSD	
SVILs	Single-speed induction motor	Improved single-speed induction motor	ECM	VSD

The motor and controls approach evaluated MPCs with data from the prior standards rulemaking, electric motor teardowns, and VSD teardowns. The analysis evaluated efficiency with pump performance data, motor efficiency data, and default VSD performance from the DOE pumps test procedure.

Results from this analysis are not used in any of the downstream analyses in this NODA but could be considered in future analyses if the technology options pass the

screening criteria. Additional analysis details and results are included in chapter 2 of the TSD accompanying this NODA.

Issue 26: DOE requests comment on its approach for evaluating pump efficiency and costs with the addition of advanced motors and/or VSDs for pumps larger than 1 hp.

Issue 27: DOE requests comment on its approach for evaluating pump efficiency and costs with the addition of advanced motors and/or VSDs for SVILs.

For future analyses, DOE may choose to convert MPCs to MSPs using manufacturer markups. DOE has tentatively determined that the markups used in the 2016 analysis and summarized in Table III.11 remain accurate. DOE has used similar assumptions between classes, as discussed in section III.C.2.a of this document, to estimate markups for pump classes not currently subject to standards.

Table III.11 Industry-Average Markups by Pump Category

Efficiency Level	Equipment Class Group						
	ESCC	**ESFM**	**IL**	**ST**	**BB**	**VT**	**SVIL**
EL 0	1.387	1.380	1.472	1.372	1.330	1.350	1.425
EL 1	1.387	1.387	1.472	1.397	1.368	1.369	1.462
EL 2	1.387	1.387	1.472	1.397	1.380	1.372	1.472
EL 3	1.387	1.387	1.472	1.397	1.387	1.397	1.472
EL 4	N/A				1.387	1.397	1.472
EL 5					1.387	1.397	1.472

Issue 28: DOE requests comment on the accuracy of the manufacturer markups presented in Table III.11.

2. National Energy Savings

DOE estimated national energy savings for hydraulic redesign only. DOE is not assessing national energy savings for the advanced motor technology option given the concurrent electric motor rulemaking noted in section III.B.2 of this document. DOE acknowledges that the potential national energy savings resulting from a VSD technology option could be substantially higher than for any hydraulic redesign efficiency level if such a technology option could be successfully implemented. However, DOE did not estimate national energy savings for this technology option given the significant hurdles discussed in section III.B.3 of this document, as well as current lack of information on how to factor some of these issues into the analysis (specifically, the potential inability of the supply chain to meet required demand as discussed in section III.B.3.a of this document, as well as the potential energy use impacts discussed in section III.B.3.c of this document.).

In order to estimate national energy savings from hydraulic redesign, DOE first conducted an energy use analysis and a shipments analysis, which are described in the following sections.

a. Energy Use Analysis

To conduct the energy use analysis for the current scope of pumps, DOE relied primarily on the methodology, efficiency levels, and energy use inputs from the January 2016 Final Rule (assuming EL 2 from the January 2016 Final Rule is now EL 0, and EL 5 is now EL 3, as discussed previously). Consumer inputs to the energy use analysis are based on operational demands that are independent of the pump's efficiency, while equipment inputs to the analysis are based on the efficiency of the pump. Consumer inputs include the consumer duty point (defined by the flow and head), annual load

profile, and annual operating hours. For this NODA, DOE updated the energy use analysis based on efficiency distributions from the CCD and integration of a load profile from the January 2016 Final Rule VSD consumer subgroup analysis with revised load profile weighting. Further details can be found in chapter 3 of the TSD accompanying this NODA.

For pumps not currently subject to standards, DOE relied on proxy pump classes within the current scope of pumps, with the range and frequency of horsepower bins constrained based on data collected in manufacturer interviews. See Table III.12 of this document. The sample weights (sector, application, and power bin correlations) were also developed based on the proxy classes. For these pumps, DOE evaluated five (5) levels of hydraulic redesign (ELs 0-5), consistent with those analyzed for the proxy pump categories in the January 2016 Final Rule.

Table III.12: Equipment Class Substitutes for Pumps Not Currently Subject to Standards

Equipment Class Not Currently Subject to Standards	Substitute Equipment Class	Additional Constraint
ESCC,1200	ESCC,1800	-
ESFM,1200	ESFM,1800	-
IL,1200	IL,1800	-
BB[a]	ESCC,1800	Above power bin 4 (>10.53 HP)
SVIL	IL,1800 and IL,3600	Lowest power bin only (1-1.79 HP)
VT	VT-S,3600	-

[a] Where the design speed is not specified, the equipment category represents aggregated design speeds at 1200, 1800, and 3600 rpm.

In addition, as discussed in chapter 1 of the TSD accompanying this NODA, NEEA suggested that DOE re-evaluate the load profiles used in its analysis. DOE undertook two sensitivities by conducting the energy use analysis using: (1) DOE's load

profiles with BEP offset from NEEA and (2) NEEA load profiles with no BEP offset. This sensitivity is discussed in appendix 3A of the TSD accompanying this NODA.

Issue 29: DOE seeks model level performance data for all pumps not currently subject to standards as well as RSV pumps.

b. Shipments Analysis

In the shipments analysis for the January 2016 Final Rule, DOE developed shipment projections for pumps and, in turn, calculated equipment stock from 2020 through 2049, using the 2012 shipment estimates from the Hydraulics Institute (Docket EERE-2013-BT-NOC-0039-0068). To project pump shipments, DOE relied primarily on Annual Energy Outlook 2014 forecasts.

For this NODA, DOE based the shipments analysis on the methodology used for the January 2016 Final Rule. DOE updated the AEO trends on which the shipment growth was based to reflect the most recent AEO -- and for pumps not currently subject to standards, DOE used initial year shipments data from 2012, as discussed in section II.A. of this document. DOE projected shipments for the period 2028-2057. For more details on the shipments methodology, refer to chapter 4 of the TSD accompanying this NODA.

Issue 30: DOE seeks comment on the total shipments of pump categories not currently subject to standards as well as RSV pumps.

c. National Energy Savings

To calculate national energy savings over the lifetime of equipment shipped from 2028-2057, DOE relied on the energy use inputs and shipments analysis discussed

previously and added data reflecting the penetration of VSDs in the no-new-standards case and standards cases starting at 18.5% in 2021, with an additional 0.67% penetration per year. See chapter 5 of the TSD accompanying this NODA for more details on DOE's derivation of these numbers. Although DOE did not analyze RSVs directly in the energy use and shipments analysis in this NODA or the 2016 Final Rule, due to lack of available data, DOE added scaler factors in the national energy savings analysis to account for potential energy savings from these pumps. These factors were based on a consideration of the distribution of power bins and efficiencies obtained from DOE's CCMS data. Refer to chapter 5 of the TSD accompanying this NODA for more detail. Table III.13 shows the full fuel cycle results.

DOE notes that this NES analysis relies on a technology option that DOE has not yet determined would be technologically feasible or would pass the screening analysis as a result of the issues discussed in section III.B of this document. In addition, as discussed in the previous sections, for pumps not currently subject to standards, the analysis relies on efficiency levels and data inputs from the 2016 rulemaking and proxy equipment classes. For RSVs, the analysis relies on scalers based on proxy class assumptions, and only includes two efficiency levels, baseline and max-tech. For both pumps not currently, and currently, subject to standards, the NES analysis does not account for the potential loss of utility, as discussed in section III.B.1 of this document, which could reduce savings. In addition, DOE does not have robust information on a nationally representative sample of load profiles for pumps across the United States. DOE acknowledges that while load profile selection could significantly impact energy savings estimates for variable-speed drives if analyzed, it does not significantly impact results for ELs based on hydraulic redesign. This can be seen in the sensitivity conducted based on NEEA load profiles, which results on average in increased NES of only 1 to 2 percent for TSLs 1 and

2. The full results for the sensitivity are shown in appendix 5A of the TSD accompanying this NODA.

For all of these listed reasons, the savings in Table III.13 should be viewed as an order-of-magnitude estimate for savings across different equipment categories rather than an indication of a specific outcome should a full analysis be conducted. As noted previously, DOE has not conducted an LCC or national net present value analysis for this NODA; such analyses would be assessed, if needed, along with the manufacturer impact analysis (discussed in section III.C.4 of this document) when determining whether new or amended standards would be economically justified at the considered levels, should any considered technology options pass the screening analysis.

Table III.13 Estimates of Cumulative Full-Fuel-Cycle National Energy Savings (Quads) by TSL (30 years of shipments)

Equipment Class		Trial Standard Level*				
		1	2	3	4	5
		Quads**				
Currently Subject to Standards	ESCC,1800	0.03	0.07	0.12	0.12	0.12
	ESCC,3600	0.04	0.11	0.21	0.21	0.21
	ESFM,1800	0.08	0.22	0.34	0.34	0.34
	ESFM,3600	0.01	0.03	0.05	0.05	0.05
	IL,1800	0.04	0.08	0.13	0.13	0.13
	IL,3600	0.01	0.01	0.02	0.02	0.02
	RSV	0.21	0.21	0.21	0.21	0.21
	ST,3600	0.08	0.17	0.23	0.23	0.23
	Sub-Total	0.50	0.89	1.31	1.31	1.31
Not Currently Subject to Standards	BB	0.00	0.01	0.02	0.03	0.04
	ESCC,1200	0.00	0.01	0.01	0.02	0.02
	ESFM,1200	0.00	0.00	0.00	0.01	0.01
	IL,1200	0.00	0.00	0.00	0.00	0.01
	SVIL	0.00	0.00	0.00	0.00	0.00
	VT	0.00	0.00	0.01	0.01	0.01
	Sub-Total	0.01	0.03	0.04	0.07	0.10
	Total	0.51	0.92	1.35	1.38	1.40

* Trial Standard Levels ("TSLs") refer to standards case scenarios. In this analysis, each TSL corresponds to the same EL for each equipment category (*i.e.*, TSL 1 includes EL 1 for each pump category), with a few exceptions. For pumps currently subject to standards, DOE only examined 3 ELs; as such the results for TSL 4 and TSL 5 for those pumps are equivalent to those for TSL3. In addition, for the RSV class, which has models only at EL 0 and EL 3, TSL 1 and TSL 2 correspond to EL 3. Results for each TSL account for the base case efficiency distribution shown in Table III.4. DOE assumes that all pumps below a given EL "roll-up" to that EL, and all pumps at ELs above the given EL remain unchanged.

** The results are rounded to two decimals. All values showing 0.00 are non-zero values, with savings at the thousandths place or less.

Issue 31: DOE requests comment on the applicability of load profiles found in the NEEA data to the full sample of pumps in this analysis.

3. Manufacturer Impact Analysis

DOE has conducted an initial analysis on the potential impacts to manufacturers resulting from the analysis discussed in this NODA. In developing its analysis of the industry, DOE began with the financial parameters used in the January 2016 Final Rule. These financial parameters were, prior to the January 2016 Final Rule and during interviews preceding this rulemaking, vetted by multiple manufacturers and are the most robust equipment-specific estimates that are publicly available. DOE noted that tax rate estimates from before 2018 are not relevant for modeling future cash-flows due to the Tax Cuts and Jobs Act of 2017,[17] which was signed into law in December 2017 and changed the maximum Federal corporate tax rate from 35 percent to 21 percent. Table III.14 reflects these initial financial parameters.

Table III.14 Initial Financial Metrics

Financial Metric	**Initial Estimate**
Tax Rate *(% of Taxable Income)*[18]	21.0
Working Capital *(% of Revenue)*	18.6
SG&A *(% of Revenue)*	21.6
R&D *(% of Revenues)*	1.6
Depreciation *(% of Revenues)*	2.6
Capital Expenditures *(% of Revenues)*	2.4
Net Property, Plant, and Equipment *(% of Revenues)*	15.0

[17] *See www.congress.gov/115/bills/hr1/BILLS-115hr1enr.pdf.*
[18] The tax rate used in the 2016 Final Rule was 32 percent.

During interviews, manufacturers generally commented that their markups were similar to what was presented by the interviewers (see Table III.11), taking into account different product lines and distribution channels. However, manufacturers did state that markups did not change substantially across efficiency levels and that they were largely unable to recoup investments made to comply with the existing energy conservation standards. Accordingly, DOE proceeded with the previously adopted standard level estimated markup across all ELs—which is EL 0 in Table III.11. For pumps not currently subject to standards, DOE assumed that BB pumps and ESFM pumps, ST and VT pumps, and IL and SVIL pumps have respectively similar markups. DOE did not include RSV pumps due to a lack of available data.

Initial financial parameters, estimates of product markups and conversion costs (discussed in III.C.2 of this document), shipment estimates (discussed in III.C.3.b of this document), and the MPC estimates—adjusted for inflation from the January 2016 Final Rule—form the primary inputs for the Government Regulatory Impact Model ("GRIM") that DOE uses to assess impacts of industry and industry subgroup cashflows. As in the January 2016 Final Rule, the MPC estimates remain the same across efficiency levels. In the tables that follow, DOE compares the GRIM results for each evaluated EL against the results for the no-new-standards case, in which energy conservation standards are not established or amended. In this preliminary GRIM, consistent with the NES, DOE only considers efficiency levels that can be accomplished by hydraulic redesign—corresponding to EL 1 to EL 3 for currently in-scope pumps and EL 1 to EL 5 for pumps that are not currently subject to standards. Results examine a single markup scenario where manufacturers are assumed to preserve the same gross margin percentage in the standards cases as in the no-new-standards case. Table III.18 presents the results for the entire scope considered in this NODA, whereas Table III.19 and Table III.20 present results for pumps not currently, and currently, subject to standards, respectively. These

results are similar to the flat markup scenario results presented in the January 2016 Final Rule, which are included in Table III.21.

Further details on the manufacturer impact analysis are included in chapter 6 of the TSD accompanying this NODA.

Table III.18 Preliminary Manufacturer Impact Analysis for Pumps Not Currently, and Currently, Subject to Standards – Preservation of Gross Margin Percentage Markup Scenario

	Units	No-New-Standards Case	Trial Standard Level				
			1	2	3	4	5
INPV	*2020$ MM*	237.5	144.92	(44.1)	(283.1)	(910.8)	(961.9)
Change in INPV	*2020$ MM*	-	(92.6)	(281.6)	(520.6)	(1,148.2)	(1,199.3)
	%	-	(39.0)	(118.6)	(219.2)	(483.5)	(505.1)
Product Conversion Costs	*2020$ MM*	-	126.9	360.3	654.23	687.3	740.2
Capital Conversion Costs	*2020$ MM*	-	57.7	164.0	297.6	315.4	342.8
Total Investment Required	*2020$ MM*	-	184.6	524.2	951.8	1,002.7	1,083.0

*Values in parenthesis indicate negative numbers

Table III.19 Preliminary Manufacturer Impact Analysis for Pumps Currently Subject to Standards – Preservation of Gross Margin Percentage Markup Scenario

	Units	No-New- Standards Case	Trial Standard Level		
			1	2	3
INPV	*2021$ MM*	211.2	123.4	(51.5)	(274.1)
Change in INPV	*2021$ MM*	-	(87.8)	(262.7)	(485.3)
	%	-	(41.6)	(124.1)	(229.8)
Product Conversion Costs	*2021$ MM*	-	120.3	336.9	611.7
Capital Conversion Costs	*2021$ MM*	-	54.1	151.3	274.8
Total Investment Required	*2021$ MM*	-	174.4	488.2	886.5

*Values in parenthesis indicate negative numbers
**EL 3, arrived at in TSL 3, represents max-tech for pumps currently subject to standards

Table III.20 Preliminary Manufacturer Impact Analysis for Pumps Not Currently Subject to Standards – Preservation of Gross Margin Percentage Markup Scenario

	Units	No-New- Standards Case	Trial Standard Level				
			1	2	3	4	5
INPV	*2021$ MM*	26.28	21.35	7.4	(9.0)	(37.4)	(88.5)
Change in INPV	*2021$ MM*	-	(4.9)	(18.9)	(35.3)	(63.7)	(114.8)
	%	-	(18.8)	(71.8)	(134.1)	(242.3)	(436.9)
Product Conversion Costs	*2021$ MM*	-	6.5	23.4	42.5	75.6	128.5
Capital Conversion Costs	*2021$ MM*	-	3.7	12.6	22.8	40.6	68.0
Total Investment Required	*2021$ MM*	-	10.2	36.0	65.3	116.2	196.5

*Values in parenthesis indicate negative numbers

Table III.21 2016 Final Rule Manufacturer Impact Analysis – Flat Markup Scenario (Equivalent to Preservation of Gross Margin Scenario)

	Units	No-New-Standards Case	Trial Standard Level (Old Rulemaking)				
			1	2	3	4	5
INPV	*2014$ MM*	120.0	110.3	80.5	20.9	(86.1)	(229.0)
Change in INPV	*2014$ MM*	-	(9.7)	(39.5)	(99.1)	(206.1)	(349.0)
	%	-	(8.1)	(32.9)	(82.6)	(171.8)	(290.9)
Product Conversion Costs	*2014$ MM*	-	16.6	56.9	123.1	234.0	380.8
Capital Conversion Costs	*2014$ MM*	-	6.2	24.3	54.0	103.9	169.8
Total Investment Required	*2014$ MM*	-	22.8	81.2	177.2	337.9	550.6

*Values in parenthesis indicate negative numbers
**TSL 2 represents the adopted standard level

Issue 32: DOE requests comment on the financial parameters used, the product markups used, whether DOE's assumption that markups do not or will not (in the

case of standards being applied) change across efficiency levels, the conversion costs used, what—if any—additional markup scenarios should be considered, and the estimated industry impacts presented in this analysis.

a. Small Business Impacts

Throughout the rulemaking process, DOE will examine the impacts of potential energy conservation standards on small business manufacturers and how those impacts may be different or disproportionate to the industry as a whole. Further details on the small business industry subgroup analysis are included in chapter 6 of the TSD accompanying this NODA.

Issue 33: DOE requests comment on whether and how small businesses may be disproportionately affected by amended energy conservation standards.

IV. Public Participation

A. Submission of Comments

DOE will accept comments, data, and information regarding this NODA before or after the public meeting, but no later than the date provided in the **DATES** section at the beginning of this document. Interested parties may submit comments, data, and other information using any of the methods described in the **ADDRESSES** section at the beginning of this document.

Submitting comments via *www.regulations.gov*. The *www.regulations.gov* webpage will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names,

organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment itself or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Otherwise, persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to *www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information ("CBI")). Comments submitted through *www.regulations.gov* cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

DOE processes submissions made through *www.regulations.gov* before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that *www.regulations.gov* provides after you have successfully uploaded your comment.

Submitting comments via email, hand delivery/courier, or postal mail. Comments and documents submitted via email, hand delivery/courier, or postal mail also will be posted to *www.regulations.gov*. If you do not want your personal contact information to

be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information in a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments

Include contact information each time you submit comments, data, documents, and other information to DOE. If you submit via postal mail or hand delivery/courier, please provide all items on a CD, if feasible, in which case it is not necessary to submit printed copies. No telefacsimiles ("faxes") will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, that are written in English, and that are free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email two well-marked copies: one copy of the document marked "confidential" including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed

to be confidential deleted. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

B. Issues on Which DOE Seeks Comment

Issue 1: DOE seeks individual model level data or industry aggregated data to update its shipment and average horsepower estimate for pump categories that are currently subject to standards and those pump categories that are currently not subject to standards.

Issue 2: DOE requests comments on potential benefits or drawbacks of proposing a change to the test procedure to allow calculation of PEI for pumps not subject to energy conservation standards.

Issue 3: DOE requests comment on the percentage of basic models that would be impacted by the following factors if manufacturers were to redesign their pumps to EL 4 and EL 5 (as presented in the January 2016 Final Rule): (1) need to flatten the pump curve beyond potentially acceptable levels for the existing market for a given model or any reported issues with controllability; (2) increased warranty claims; and (3) increased MPCs for pumps redesigned to higher efficiencies. Additionally, DOE requests comment on which EL (as presented in the January 2016 Final Rule) and for which pump classes (or hp ranges) these issues would first appear.

Issue 4: DOE also seeks comment on the availability of designers skilled enough to design a pump that can reach EL 4 and EL 5 and be readily manufactured.

Issue 5: Additionally, DOE requests comment on any other issues that may prevent manufacturers from redesigning pumps to reach higher efficiency levels, including other utility issues.

Issue 6: DOE requests comment on the fraction of installations in which consumers would have to make piping changes as a result of a change in flange position (as opposed to purchasing another model with the desired flange positions), and the cost of such piping changes.

Issue 7: DOE requests comment on how a standard that requires an advanced motor to be paired with a bare pump would impact: (1) the bare pump replacement market; (2) the distributor market and business model; (3) the repair of pumps rather than their replacement and (4) the replacement of failed motors with less efficient motors. DOE also requests feedback on any potential consistency concerns with a standard that requires an advanced motor to be paired with a bare pump and current or future energy conservation standards for electric motors.

Issue 8: DOE seeks comment on the frequency with which pump consumers specify only a single controller brand, as well as on the number of controller brands typically stocked by a pump manufacturer.

Issue 9: DOE seeks comment on how a VSD requirement for pumps would impact distributors.

Issue 10: DOE requests comment on whether there would be sufficient quantity and quality of VSDs available if there were a VSD requirement for pumps.

Issue 11: DOE seeks comment on possible methods to retain a replacement market for bare pumps while preventing a loophole where bare pumps could be purchased for current and new installations.

Issue 12: DOE seeks comment on the frequency with which customers would replace an inverter-only motor and control with an induction motor upon the end of the lifetime of the motor originally purchased with the pump.

Issue 13: DOE seeks comment on how bare pump repair frequency may change if customers delay purchasing a more expensive pump with motor and controls. For example, in its DPPP motors analysis, DOE assumed that in the standards case, a greater percentage of consumers would repair their pump as compared to the no-new-standards case.

Issue 14: DOE seeks comment on the percentage of pump models that would be redesigned for controls if they were required to be sold with them, and of those, what percentage would have worse efficiency in constant-load applications than the current pump model, and by how much the efficiency or energy use would be impacted.

Issue 15: DOE seeks comment on the frequency with which customers who would be required to buy a pump with a VSD would need to add filters or perform electrical upgrades, and the estimated cost of such equipment and installation.

Issue 16: DOE seeks comment on the frequency with which customers might need to re-pipe to accommodate a pump with motor and controls rather than a drop-in replacement pump, and the estimated cost of re-piping.

Issue 17: DOE seeks quantitative data on the overall installation costs of pumps with VSDs compared to bare pumps, as well as any differences in lifetime or repair and maintenance costs for pumps sold with VSDs as compared to bare pumps.

Issue 18: DOE requests comment on if or how the five screening criteria may limit application of hydraulic redesign, advanced motors, or VSDs as design options in the current rulemaking analysis.2. Engineering

Issue 19: If DOE's assumptions are not appropriate, DOE requests updated shipments and performance data for BB, SVIL, RSH, and VT pumps. DOE also requests updated shipments and performance data for pumps sold at a specific speed of 1,200 rpm and for ST pumps with a bowl diameter greater than 6 inches.

Issue 20: DOE seeks comment on the likelihood of equipment class switching or other unintended consequences if DOE were to set a higher standard for VL equipment classes.

Issue 21: DOE requests comment on specific applications for which SVILs could be used instead of circulators and how an SVIL would need to be modified for use in these applications.

Issue 22: DOE requests comment on the portion of the SVIL market whose bare pumps are already subject to DOE's IL pump standards. Specifically, what portion of SVIL bare pumps are a different pole version of IL pumps, and what portion of SVIL pumps are a separate product family?

Issue 23: DOE requests comment on the potential benefits and drawbacks of setting standards for SVILs that align with circulator pumps versus setting standards for SVILs that align with IL pumps.

Issue 24: DOE requests shipment and performance data for (1) pumps with a nominal speed of rotation at 1,200 rpm; (2) RSH pumps; and (3) ST pumps with bowl diameters greater than 6 inches.

Issue 25: DOE requests comment on its conversion cost approach for evaluating hydraulic redesign.

Issue 26: DOE requests comment on its approach for evaluating pump efficiency and costs with the addition of advanced motors and/or VSDs for pumps larger than 1 hp.

Issue 27: DOE requests comment on its approach for evaluating pump efficiency and costs with the addition of advanced motors and/or VSDs for SVILs.

Issue 28: DOE requests comment on the accuracy of the manufacturer markups presented in Table III.11.

Issue 29: DOE seeks model level performance data for all pumps not currently subject to standards as well as RSV pumps.

Issue 30: DOE seeks comment on the total shipments of pump categories not currently subject to standards as well as RSV pumps.

Issue 31: DOE requests comment on the applicability of load profiles found in the NEEA data to the full sample of pumps in this analysis.

Issue 32: DOE requests comment on the financial parameters used, the product markups used, whether DOE's assumption that markups do not or will not (in the case of standards being applied) change across efficiency levels, the conversion costs used, what—if any—additional markup scenarios should be considered, and the estimated industry impacts presented in this analysis.

Issue 33: DOE requests comment on whether and how small businesses may be disproportionately affected by amended energy conservation standards.

V. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this notification of data availability.

Signing Authority

This document of the Department of Energy was signed on August 3, 2022, by Kelly J. Speakes-Backman, Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on August 4, 2022.

Treena V. Garrett,

Federal Register Liaison Officer,

U.S. Department of Energy.

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