surveillance plans of decommissioned uranium mills. However, long-term surveillance plans that include groundwater monitoring might not be included in the categorical exclusion.

- Revisions to categorically exclude authorizations to revise emergency plans for administrative changes such as reduction in staffing.
- Revisions to categorically exclude approvals for alternative waste disposal procedures for reactor and material licenses in accordance with § 20.2002, ''Method for obtaining approval of proposed disposal procedures.''
- Revisions to categorically exclude NRC actions during decommissioning that do not authorize changes to physical structures such as changes to administrative, organizational, or procedural requirements; and therefore, do not include activities that have environmental impacts.
- Revisions to include references to the definition of construction in § 51.4, ''Definitions,'' after the phrase ''significant construction impacts'' to clarify this term where it is used in various categorical exclusions.

Additional Questions

Question (1) Are there licensing and regulatory actions that do not or have not resulted in environmental impacts that the NRC should consider as a categorical exclusion?

Question (2) Are there any categorical exclusions that are listed in 10 CFR 51.22(c) that the NRC should consider modifying or clarifying? For example, are there categorical exclusions that licensees, applicants, or members of the public have found confusing?

Question (3) Are there any current categorical exclusions (§ 51.22(c)) that the NRC should consider removing? For example, are there categorical exclusions that are no longer in use, or are there activities listed that have been shown to have an environmental impact?

Question (4) Are there aspects of NRC authorized changes to previously approved programs, such as emergency plans, cybersecurity programs, quality assurance programs, radiation protection programs, or materials control and accounting programs that the NRC should consider categorically excluding?

Question (5) Is there anything else that the NRC should consider regarding its regulations for categorical exclusions?

V. Public Meeting

The NRC will conduct a public meeting to discuss the potential rulemaking and answer questions. The NRC will publish a notice of the location, time, and agenda of the meeting on the NRC's public meeting website at least ten calendar days before the meeting. Interested members from the public should monitor the NRC's public meeting website for information about the public meeting at: *https://www.nrc.gov/public-involve/public-meetings/index.cfm.* In addition, the meeting information will be posted on *https://www.regulations.gov/* under Docket ID NRC–2018–0300.

VI. Plain Writing

The Plain Writing Act of 2010 (Pub. L. 111–274) requires Federal agencies to write documents in a clear, concise, and well-organized manner. The NRC has written this document to be consistent with the Plain Writing Act as well as the Presidential Memorandum, ''Plain Language in Government Writing,'' published June 10, 1998 (63 FR 31885). The NRC requests comment on this document with respect to the clarity and effectiveness of the language used.

VII. Rulemaking Process

The NRC does not intend to provide a detailed response to individual comments submitted on this advance notice of proposed rulemaking; however, the NRC will evaluate all public input in the development of a proposed rule. If the NRC determines a need for supporting guidance, the NRC will issue the draft guidance for public comment. The NRC will provide another opportunity for public comment for any subsequent proposed rule developed before it is finalized.

Dated: April 30, 2021.

For the Nuclear Regulatory Commission.

Margaret M. Doane,

Executive Director for Operations.

[FR Doc. 2021–09675 Filed 5–6–21; 8:45 am]

BILLING CODE 7590–01–P

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 431

[EERE–2016–BT–STD–0004]

RIN 1904–AD61

Energy Conservation Program: Test Procedures and Energy Conservation Standards for Circulator Pumps and Small Vertical In-Line Pumps

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

ACTION: Request for information.

SUMMARY: The U.S. Department of Energy (''DOE'' or ''the Department'') is restarting rulemaking activities to consider potential test procedures and energy conservation standards for circulator pumps and small vertical in-line pumps. Consensus recommendations for test procedures and energy conservation standards were negotiated in 2016 by a stakeholder working group of the Appliance Standards Rulemaking Federal Advisory Committee (''ASRAC''). Through this request for information (''RFI''), DOE seeks data and information regarding development and evaluation of new test procedures that would be reasonably designed to produce test results which reflect energy use during a representative average use cycle for the equipment without being unduly burdensome to conduct. Additionally, this RFI solicits information regarding the development and evaluation of potential new energy conservation standards for circulator pumps and small vertical in-line pumps, and whether such standards would result in significant energy savings and be technologically feasible and economically justified. DOE also welcomes written comments from the public on any subject within the scope of this document (including those topics not specifically raised), as well as the submission of data and other relevant information.

DATES: Written comments and information are requested and will be accepted on or before July 6, 2021.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *http://www.regulations.gov.* Follow the instructions for submitting comments. Alternatively, interested persons may submit comments by email to the following address: *circpumps2016std0004@ee.doe.gov.* Include ''Circulator Pumps RFI'' and docket number EERE–2016–BT–STD–0004 and/or RIN number 1904–AD61 in the subject line of the message. Submit electronic comments in WordPerfect, Microsoft Word, PDF, or ASCII file format, and avoid the use of special characters or any form of encryption.

Although DOE has routinely accepted public comment submissions through a variety of mechanisms, including postal mail and hand delivery/courier, the Department has found it necessary to make temporary modifications to the comment submission process in light of the ongoing Covid-19 pandemic. DOE is currently accepting only electronic submissions at this time. If a commenter finds that this change poses an undue hardship, please contact Appliance Standards Program staff at (202) 586–

1445 to discuss the need for alternative arrangements. Once the Covid-19 pandemic health emergency is resolved, DOE anticipates resuming all of its regular options for public comment submission, including postal mail and hand delivery/courier.

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

Docket: The docket for this activity, which includes **Federal Register** notices, comments, and other supporting documents/materials, is available for review at *http://www.regulations.gov.* All documents in the docket are listed in the *http://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: *https://beta.regulations.gov/docket/EERE-2016-BT-STD-0004.* The docket web page contains instructions on how to access all documents, including public comments, in the docket. See section IV for information on how to submit comments through *http://www.regulations.gov.*

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

Ms. Amelia Whiting, U.S. Department of Energy, Office of the General Counsel, GC–33, 1000 Independence Avenue SW, Washington, DC 20585–0121. Telephone: 202–586–2588. Email: *Amelia.Whiting@hq.doe.gov.*

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

SUPPLEMENTARY INFORMATION:

Table of Contents

I. Introduction

Pumps are included in the list of ''covered equipment'' for which DOE is authorized to establish test procedures and energy conservation standards. (42 U.S.C. 6311(1)(A)) Circulator and small vertical in-line (''SVIL'') pumps, which are the subject of this notification, are categories of pumps. Currently, circulator pumps and SVIL pumps are not subject to DOE test procedures or energy conservation standards. The following sections discuss DOE's authority to establish test procedures and energy conservation standards for circulator pumps and SVIL pumps and relevant background information regarding DOE's consideration of establishing Federal regulations for these equipment types.

A. Authority and Background

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 Public Law 95–619, Title IV, section 441(a) (42 U.S.C. 6311–6317 as codified), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve energy efficiency. This equipment includes pumps, the subject of this document. (42 U.S.C. 6311(1)(A))

The energy conservation program under EPCA consists essentially of four parts: (1) Testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA include definitions (42 U.S.C. 6311), test procedures (42 U.S.C. 6314), labeling provisions (42 U.S.C. 6315), energy conservation standards (42 U.S.C. 6313), and the authority to require information and reports from manufacturers (42 U.S.C. 6316).

Federal energy efficiency requirements for covered equipment established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6316(a) and 42 U.S.C. 6316(b); 42 U.S.C. 6297) DOE may, however, grant waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions of EPCA. (42 U.S.C. 6316(b)(2)(D))

The Federal testing requirements consist of test procedures that manufacturers of covered equipment must use as the basis for: (1) Certifying to DOE that their equipment complies with the applicable energy conservation standards adopted pursuant to EPCA (42 U.S.C. 6316(a); 42 U.S.C. 6295(s)), and (2) making representations about the efficiency of that equipment (42 U.S.C. 6314(d)). Similarly, DOE must use these test procedures to determine whether the equipment complies with relevant standards promulgated under EPCA. (42 U.S.C. 6316(a); 42 U.S.C. 6295(s))

Under 42 U.S.C. 6314, EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered equipment. EPCA requires that any test procedures prescribed or amended under this section must be reasonably designed to produce test results which reflect energy efficiency, energy use or estimated annual operating cost of a given type of covered equipment during a representative average use cycle and requires that test procedures not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2))

Before prescribing any final test procedures, the Secretary must publish proposed test procedures in the **Federal Register**, and afford interested persons an opportunity (of not less than 45 days' duration) to present oral and written data, views, and arguments on the proposed test procedures. (42 U.S.C. 6314(b))

In proposing new standards, DOE must evaluate that proposal against the criteria of 42 U.S.C. 6295(o), as described in section I.C, and follow the

[1] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Public Law 116–260 (Dec. 27, 2020).

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

rulemaking procedures set out in 42 U.S.C. 6295(p). (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)) DOE is publishing this RFI consistent with its obligations in EPCA.

B. Rulemaking History

As stated, ''pumps'' are listed as a type of industrial equipment covered by EPCA, although EPCA does not define the term ''pump.'' (42 U.S.C. 6311(1)(A)) In a final rule published January 25, 2016, DOE established definitions applicable to pumps and test procedures for certain pumps. 81 FR 4086 (''January 2016 TP final rule''). ''Pump'' is defined as equipment designed to move liquids (which may include entrained gases, free solids, and totally dissolved solids) by physical or mechanical action and includes a bare pump and, if included by the manufacturer at the time of sale, mechanical equipment, driver, and controls. 10 CFR 431.462. This definition includes circulator pumps and SVIL pumps, but such pumps are not currently subject to the established Federal test procedure or energy conservation standards.

The established test procedure for pumps is applicable to certain categories of clean water pumps,[3] specifically those that are end suction close-coupled; end suction frame mounted/own bearings; in-line (''IL''); radially split, multi-stage, vertical, in-line diffuser casing; and submersible turbine (''ST'') pumps with the following characteristics:

- Flow rate of 25 gallons per minute (''gpm'') or greater (at best efficiency point (''BEP'') and full impeller diameter);
- 459 feet of head maximum (at BEP and full impeller diameter and the number of stages specified for testing);
- Design temperature range from 14 to 248 °F;
- Designed to operate with either (1) a 2- or 4-pole induction motor, or (2) a non-induction motor with a speed of rotation operating range that includes speeds of rotation between 2,880 and 4,320 revolutions per minute (''rpm'') and/or 1,440 and 2,160 rpm, and in either case, the driver and impeller must rotate at the same speed;
- 6-inch or smaller bowl diameter for ST pumps; and
- For ESCC and ESFM pumps, a specific speed less than or equal to 5,000 when calculated using U.S. customary units.
- Except for: Fire pumps, self-priming pumps, prime-assist pumps, magnet driven pumps, pumps designed to be used in a nuclear facility subject to 10 CFR part 50, ''Domestic Licensing of Production and Utilization Facilities''; and pumps meeting the design and construction requirements set forth in any relevant military specifications.[4]

10 CFR 431.464(a)(1)

The pump categories subject to the current test procedures are referred to as ''general pumps'' in this document. As stated, circulator pumps and SVIL pumps are not general pumps.

DOE also published a final rule establishing energy conservation standards applicable to certain classes of general pumps. 81 FR 4368 (Jan. 26, 2016) (''January 2016 ECS final rule''); *see also,* 10 CFR 431.465.

The January 2016 TP final rule and the January 2016 ECS final rule implemented the recommendations of the Commercial and Industrial Pump Working Group (''CIPWG'') established through the ASRAC to negotiate standards and a test procedure for general pumps. (Docket No. EERE–2013–BT–NOC–0039) The CIPWG concluded its negotiations on June 19, 2014, with a consensus vote to approve a term sheet containing recommendations to DOE on appropriate standard levels for general pumps, as well as recommendations addressing issues related to the metric and test procedure for general pumps (''CIPWG recommendations''). (Docket No. EERE–2013–BT–NOC–0039, No. 92) Subsequently, ASRAC voted unanimously to approve the CIPWG recommendations during a July 7, 2014 webinar. The term sheet containing the CIPWG recommendations is available in the CIPWG's docket. The CIPWG recommendations included initiation of a separate rulemaking for circulator pumps. (Docket No. EERE–2013–BT–NOC–0039, No. 92, Recommendation #5A at p. 2)

On February 3, 2016, DOE published a Notice of Intent to Establish the Circulator Pumps Working Group to Negotiate a Notice of Proposed Rulemaking (''NOPR'') for Energy Conservation Standards for Circulator Pumps to negotiate, if possible, Federal standards and a test procedure for circulator pumps and to announce the first public meeting. 81 FR 5658. The members of the Circulator Pumps Working Group (''CPWG'') were selected to ensure a broad and balanced array of interested parties and expertise, including representatives from efficiency advocacy organizations and manufacturers. Additionally, one member from ASRAC and one DOE representative were part of the CPWG. Table I.1 lists the members of the CPWG and their affiliations.

TABLE I.1—ASRAC CPWG MEMBERS AND AFFILIATIONS

Member	Affiliation	Abbreviation
Charles White	Plumbing-Heating-Cooling Contractors Association	PHCC.
Gabor Lechner	Armstrong Pumps, Inc	Armstrong.
Gary Fernstrom	California Investor-Owned Utilities	CA IOUs.
Joanna Mauer	Appliance Standards Awareness Project	ASAP.
Joe Hagerman	U.S. Department of Energy	DOE.
Laura Petrillo-Groh	Air-Conditioning, Heating, and Refrigeration Institute	AHRI.
Lauren Urbanek	Natural Resources Defense Council	NRDC.
Mark Chaffee	TACO, Inc	Taco.
Mark Handzel	Xylem Inc	Xylem.
Peter Gaydon	Hydraulic Institute	HI.
Richard Gussert	Grundfos Americas Corporation	Grundfos.
David Bortolon	Wilo Inc	Wilo.

[3] A ''clean water pump'' is a pump that is designed for use in pumping water with a maximum non-absorbent free solid content of 0.016 pounds per cubic foot, and with a maximum dissolved solid content of 3.1 pounds per cubic foot, provided that the total gas content of the water does not exceed the saturation volume, and disregarding any additives necessary to prevent the water from freezing at a minimum of 14 °F. 10 CFR 431.462.

[4] *I.e.,* MIL–P–17639F, ''Pumps, Centrifugal, Miscellaneous Service, Naval Shipboard Use'' (as amended); MIL–P–17881D, ''Pumps, Centrifugal, Boiler Feed, (Multi-Stage)'' (as amended); MIL–P–17840C, ''Pumps, Centrifugal, Close-Coupled, Navy Standard (For Surface Ship Application)'' (as amended); MIL–P–18682D, ''Pump, Centrifugal, Main Condenser Circulating, Naval Shipboard'' (as amended); and MIL–P–18472G, ''Pumps, Centrifugal, Condensate, Feed Booster, Waste Heat Boiler, And Distilling Plant'' (as amended). Military specifications and standards are available at *http://everyspec.com/MIL-SPECS.*

TABLE I.1—ASRAC CPWG MEMBERS AND AFFILIATIONS—Continued

Member	Affiliation	Abbreviation
Russell Pate	Rheem Manufacturing Company	Rheem.
Don Lanser	Nidec Motor Corporation	Nidec.
Tom Eckman	Northwest Power and Conservation Council (ASRAC member)	NPCC.

The CPWG commenced negotiations at an open meeting on March 29, 2016, and held six additional meetings to discuss scope, metrics, and the test procedure. The CPWG concluded its negotiations for test procedure items on September 7, 2016, with a consensus vote to approve a term sheet containing recommendations to DOE on scope, metric, and the basis of the test procedure (''September 2016 CPWG Recommendations''). The term sheet containing these recommendations is available in the CPWG docket. (Docket No. EERE–2016–BT–STD–0004, No. 58)

The CPWG continued to meet to address potential energy conservation standards for circulator pumps. Those meetings began on November 3–4, 2016 and concluded on December 1, 2016, with approval of a second term sheet (''December 2016 CPWG Recommendations'') containing CPWG recommendations related to energy conservation standards, applicable test procedure, labeling and certification requirements for circulator pumps. (Docket No. EERE–2016–BT–STD–0004, No. 98) ASRAC subsequently voted unanimously to approve the September and December 2016 CPWG Recommendations (collectively, the ''2016 Term Sheets'') during a December meeting. (Docket No. EERE–2013–BT–NOC–0005, No. 91 at p. 2) [5]

In a letter dated June 9, 2017, HI expressed its support for the process that DOE initiated regarding circulator pumps and encouraged the publishing of a NOPR and a final rule by the end of 2017. (Docket No. EERE–2016–BT–STD–0004, HI, No.103 at p. 1) In response to an early assessment review RFI published September 28, 2020 regarding the existing test procedures for certain pumps (85 FR 60734, ''September 2020 Early Assessment RFI), HI commented that it continues to support the recommendations from the CPWG. (Docket No. EERE–2020–BT–TP–0032, HI, No. 6 at p. 1) In addition, NEEA commented that the CPWG recommended adopting test procedures for circulator pumps, which DOE should do in the pumps or a separate rulemaking. (Docket No. EERE–2020–BT–TP–0032, NEEA, No. 8 at p. 8)

C. Rulemaking Process

DOE must follow specific statutory criteria for prescribing new or amended standards for covered equipment. EPCA requires that any new or amended energy conservation standard prescribed by the Secretary of Energy (''Secretary'') be designed to achieve the maximum improvement in energy or water efficiency that is technologically feasible and economically justified. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(A)) The Secretary may not prescribe an amended or new standard that will not result in significant conservation of energy, or is not technologically feasible or economically justified. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(3)(B))

To determine whether a standard is economically justified, EPCA requires that DOE determine whether the benefits of the standard exceed its burdens by considering, to the greatest extent practicable, the following seven factors:

(1) The economic impact of the standard on the manufacturers and consumers of the affected products;
(2) The savings in operating costs throughout the estimated average life of the product compared to any increases in the initial cost, or maintenance expenses;
(3) The total projected amount of energy and water (if applicable) savings likely to result directly from the standard;
(4) Any lessening of the utility or the performance of the products likely to result from the standard;
(5) The impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the standard;
(6) The need for national energy and water conservation; and
(7) Other factors the Secretary considers relevant.

(42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII))

DOE fulfills these and other applicable requirements by conducting a series of analyses throughout the rulemaking process. Table I.2 shows the individual analyses that are performed to satisfy each of the requirements within EPCA.

TABLE I.2—EPCA REQUIREMENTS AND CORRESPONDING DOE ANALYSIS

EPCA requirement	Corresponding DOE analysis
Significant Energy Savings	• Shipments Analysis. • National Impact Analysis. • Energy and Water Use Determination.
Technological Feasibility	• Market and Technology Assessment. • Screening Analysis. • Engineering Analysis.
Economic Justification:	
1. Economic Impact on Manufacturers and Consumers	• Manufacturer Impact Analysis. • Life-Cycle Cost and Payback Period Analysis. • Life-Cycle Cost Subgroup Analysis. • Shipments Analysis.
2. Lifetime Operating Cost Savings Compared to Increased Cost for the Product	• Markups for Product Price Determination. • Energy and Water Use Determination. • Life-Cycle Cost and Payback Period Analysis.

[5] All references in this document to the approved recommendations included in 2016 Term Sheets are noted with the recommendation number and a citation to the appropriate document in the CPWG docket (*e.g.,* Docket No. EERE–2016–BT–STD–0004, No. #, Recommendation #X at p. Y). References to discussions or suggestions of the CPWG not found in the 2016 Term Sheets include a citation to meeting transcripts and the commenter, if applicable (*e.g.,* Docket No. EERE–2016–BT–STD–0004, [Organization], No. X at p. Y).

TABLE I.2—EPCA REQUIREMENTS AND CORRESPONDING DOE ANALYSIS—Continued

EPCA requirement	Corresponding DOE analysis
3. Total Projected Energy Savings	• Shipments Analysis. • National Impact Analysis.
4. Impact on Utility or Performance	• Screening Analysis. • Engineering Analysis.
5. Impact of Any Lessening of Competition	• Manufacturer Impact Analysis.
6. Need for National Energy and Water Conservation	• Shipments Analysis. • National Impact Analysis.
7. Other Factors the Secretary Considers Relevant	• Employment Impact Analysis. • Utility Impact Analysis. • Emissions Analysis. • Monetization of Emission Reductions Benefits. • Regulatory Impact Analysis.

As detailed throughout this RFI, DOE is publishing this document seeking input and data from interested parties to aid in the development of the technical analyses on which DOE will ultimately rely to determine whether (and if so, how) to establish the standards for circulator pumps and SVIL pumps.

II. Request for Information and Comments Pertaining to Potential Test Procedure

In the following sections, DOE has identified a variety of issues on which it seeks input to assist in its evaluation of potential test procedures for circulator pumps and SVIL pumps, to ensure that any such test procedures would comply with the requirements in EPCA that they be reasonably designed to produce test results which reflect energy use during a representative average use cycle, without being unduly burdensome to conduct. (42 U.S.C. 6314(a)(2))

A. Scope and Definitions

In the January 2016 TP final rule, DOE adopted a definition for pump, as well as definitions for pump categories and other pump component- and configuration-related definitions. 10 CFR 431.462. Although circulator pumps are a style of pump, DOE did not define circulator pump. 81 FR 4086, 4094 (Jan. 25, 2016). In addition, although DOE established a definition for inline pumps, the definition requires the pump to have a shaft input power greater than 1 hp and therefore excludes the SVIL pumps considered in this RFI because SVIL pumps have a shaft input power less than 1 hp.[6]

The September 2016 CPWG recommendations addressed the scope of a circulator pumps rulemaking. Specifically, the CPWG recommended that the scope of the circulator pumps test procedure and energy conservation standards cover clean water pumps (as defined at 10 CFR 431.462) distributed in commerce with or without a volute[7] and that are one of the following categories: Wet rotor circulator pumps, dry rotor close-coupled circulator pumps, and dry rotor mechanically-coupled circulator pumps. The CPWG also recommended that the scope exclude submersible pumps and header pumps. (Docket No. EERE–2016–BT–STD–0004, No. 58, Recommendations #1A, 2A and 2B at p. 1–2) The CPWG also recommended the following definitions relevant to scope:

Wet rotor circulator pump means a single stage, rotodynamic, close-coupled, wet rotor pump. Examples include, but are not limited to, pumps generally referred to in industry as CP1.

Dry rotor, two-piece circulator pump means a single stage, rotodynamic, single-axis flow, close-coupled, dry rotor pump that: (1) Has a hydraulic power less than or equal to five horsepower at best efficiency point at full impeller diameter, (2) is distributed in commerce with a horizontal motor, and (3) discharges the pumped liquid through a volute in a plane perpendicular to the shaft. Examples include, but are not limited to, pumps generally referred to in industry as CP2.

Dry rotor, three-piece circulator pump means a single stage, rotodynamic, single-axis flow, mechanically-coupled, dry rotor pump that: (1) Has a hydraulic power less than or equal to five horsepower at best efficiency point at full impeller diameter, (2) is distributed in commerce with a horizontal motor, and (3) discharges the pumped liquid through a volute in a plane perpendicular to the shaft. Examples include, but are not limited to, pumps generally referred to in industry as CP3.

Horizontal motor means a motor that requires the motor shaft to be in a horizontal position to function as designed under typical operating conditions, as specified in manufacturer literature.

Submersible pump means a pump that is designed to be operated with the motor and bare pump fully submerged in the pumped liquid.

Header pump means a pump that consists of a circulator-less-volute intended to be installed in an original equipment manufacturer (''OEM'') piece of equipment that serves as the volute.

(Docket No. EERE–2016–BT–STD–0004, No. 58, Recommendations #2B, 3A, and 3B at p. 2–3)

DOE notes that the orientation of the motor is used to differentiate IL pumps from other pumps. As noted, the definition of IL pump excludes pumps that are distributed in commerce with a horizontal motor. 10 CFR 431.462. DOE currently defines a ''horizontal motor'' as a motor that requires the motor shaft to be in a horizontal position to function as designed, as specified in the manufacturer literature. *Id.*

The definition of horizontal motor recommended by the CPWG includes ''under typical operating conditions'' to qualify ''function as designed.'' The CPWG stated that this qualifier was added to address the potential that a motor would not be covered as a horizontal motor if a manufacturer were to advertise its circulator as being able to be installed in a non-horizontal orientation under certain conditions, such as high operating pressure (*i.e.,* conditions other than typical conditions). (Docket No. EERE–2016–BT–STD–0004, No. 64 at pp. 75–83) The CPWG stated that the requirement to consider motor installation in the context of typical operating conditions, as specified in the manufacturer literature, would address this potential. (Docket No. EERE–2016–BT–STD–0004, No. 66 at pp. 55–57)

The definition for submersible pump is consistent with that already applicable to pumps in 10 CFR 431.462. The recommended definition for header pump is discussed in section II.A of this document.

[6] As noted, an inline pump must have a shaft input power greater than or equal to 1 hp and less than or equal to 200 hp at BEP and full impeller diameter, in which liquid is discharged through a volute in a plane perpendicular to the shaft. See 10 CFR 431.462.

[7] Volutes are also sometimes referred to as a ''housing'' or ''casing.''

DOE requests comment on the CPWG's recommended definitions for wet rotor circulator pump; dry rotor, two-piece circulator pump; dry rotor, three-piece circulator pump; and horizontal motor. Specifically, DOE requests comment regarding whether changes in the market since the CPWG's recommendation would affect the recommended definitions and scope.

1. Definitions for Circulator Pumps

In addition to the circulator pump categories discussed in II.A of this document, circulator pumps can also be differentiated based on the configuration in which they are sold. Certain specific instances of this are discussed in sections II.A.1.a and II.A.1.b of this document.

a. Circulators-Less-Volute and Header Pumps

Some circulator pumps are distributed in commerce as a complete assembly with a motor, impeller, and volute, while other circulator pumps are distributed in commerce with a motor and impeller, but without a volute (herein referred to as ''circulators-less-volute''). Some circulators-less-volute are solely intended to be installed in other equipment, such as a boiler, using a cast piece in the other piece of equipment as the volute, while others can be installed as a replacement for a failed circulator pump in an existing system or to be newly installed with a paired volute in the field. (Docket No. EERE–2016–BT–STD–0004, No. 47 at pp. 371–372; Docket No. EERE–2016–BT–STD–0004, No. 70 at p. 98)

In reviewing the definition of a pump, the CPWG stated that circulator pumps distributed in commerce without volutes fall under the definition of pump as defined in the January 2016 TP final rule. (Docket No. EERE–2016–BT–STD–0004, No. 70 at pp. 89–91) Further, the CPWG asserted that, if a circulator-less-volute was not subject to any adopted test procedure and standards, this could present a loophole since a circulator-less-volute and matching volute could easily be purchased and installed instead of a compliant circulator pump with a volute. (Docket No. EERE–2016–BT–STD–0004, No. 74 at pp. 383–403)

However, the CPWG discussed that a circulator-less-volute (header pump) that is solely intended to be installed in other equipment, uses the other equipment as the volute, and does not have a matching volute that is separately distributed in commerce would not pose the same loophole risk and, furthermore, would be very difficult to test. Specifically, the CPWG discussed how circulator manufacturers would not have access to or design authority for the volute design. In addition, the circulator could not be tested as a standalone circulator because the volute would be unable to be removed from the other equipment, and there would be no paired volute distributed in commerce with which the header pump could be tested. Therefore, such equipment would potentially require extensive and burdensome equipment to test appropriately. (Docket No. EERE–2016–BT–STD–0004, No. 74 at pp. 413–416)

The CPWG recommended excluding circulator pumps that are distributed in commerce exclusively to be incorporated into other OEM equipment, such as boilers or pool heaters. (Docket No. EERE–2016–BT–STD–0004, No. 74 at pp. 415–416) The CPWG suggested referring to these circulator-less-volute pumps that are intended solely for installation in another piece of equipment and do not have a paired volute that is distributed in commerce as ''header pumps.'' (Docket No. EERE–2016–BT–STD–0004, No. 74 at pp. 384–386). Specifically, in the September 2016 CPWG recommendations, the CPWG recommended to differentiate header pumps from other circulator-less-volute pumps by defining header pump as a pump that consists of a circulator-less-volute intended to be installed in an OEM piece of equipment that serves as the volute, and to exclude them from the recommended circulator test procedure and standards. (Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendations #2B at p. 2)

DOE requests comment regarding whether the market changes in the intervening years since the CPWG's recommendation of a definition for ''header pump'' warrant modification of that recommended definition.

b. On-Demand Circulator Pumps

On-demand circulator pumps are designed to maintain hot water supply within a temperature range by activating in response to a signal, such as user presence. The CPWG recommended that the following definition for ''on-demand circulator pumps'' be incorporated as necessary:

''On-demand circulator pump'' means a circulator pump that is distributed in commerce with an integral control that:

- Initiates water circulation based on receiving a signal from the action of a user [of a fixture or appliance] or sensing the presence of a user of a fixture and cannot initiate water circulation based on other inputs, such as water temperature or a pre-set schedule.
- Automatically terminates water circulation once hot water has reached the pump or desired fixture.
- Does not allow the pump to operate when the temperature in the pipe exceeds 104 °F or for more than 5 minutes continuously.

(Docket No. EERE–2016–BT–STD–0004, No. 98 Non-Binding Recommendation #1 at pp. 4–5)

In addition, the on-demand circulator pump must not be capable of operating without the control without physically destructive modification of the unit, such as any modification that would violate the product's standards listing.

DOE requests comment regarding the CPWG-recommended definition of ''on-demand circulator pump'' and whether it is appropriate to retain on-demand circulator pumps within the scope of future analysis.

2. Definition of Small Vertical In-Line Pump

During the course of the negotiations, the CPWG also discussed and provided recommendations related to SVIL pumps. As noted, SVIL pumps are similar to IL pumps, but have a shaft input power lower than pumps included in the scope of the general pumps test procedure. Specifically, SVIL pumps are described as IL style pumps with a shaft input power of less than 1 hp at BEP at full impeller diameter and are distinguished from dry-rotor circulator pumps by having a motor that does not have to be configured in a horizontal position. The CPWG found that SVIL pumps could serve similar functions as some dry rotor circulator pumps. (Docket No. EERE–2016–BT–STD–0004, No. 66 at p. 11, 52) Additionally, the CPWG stated that because they serve similar functions to some dry rotor circulator pumps, SVIL pumps pose a substitution risk and recommended that SVIL pumps be addressed as part the circulator pumps rulemaking. (Docket No. EERE–2016–BT–STD–0004, No. 66 at p. 27–30) Specifically, the CPWG recommended that SVIL pumps be evaluated on the PEI_{CL} or PEI_{VL} metric, similar to commercial and industrial pumps (''CIP''),[8] and use the CIP test procedure to measure performance, with any additional modifications necessary as determined by DOE. (Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendations #1B at pp. 1–2) Potential test procedures and metric for SVIL pumps are discussed further in section II.D.

In order to distinguish SVIL pumps from dry rotor circulator pumps, the

[8] Commercial and industrial pumps are referred to as ''general pumps'' throughout this document.

CPWG recommended the following definition for SVIL pumps:

''Small vertical in-line pump'' means a single stage, single-axis flow, dry rotor, rotodynamic pump that:

(1) Has a shaft input power less than 1 horse power at best efficiency point at full impeller diameter,

(2) Is distributed in commerce with a motor that does not have to be in a horizontal position to function as designed, and

(3) Discharges the pumped liquid through a volute in a plane perpendicular to the shaft.

(Docket No. EERE–2016–BT–STD–0004, No. 58, Recommendation #3C at p. 3)

DOE seeks comment and feedback on the scope and definitions recommended by the CPWG, including whether anything has changed in the market since the conclusion of the CPWG that would impact the recommended scope and definitions for SVIL pumps.

DOE seeks feedback and information regarding whether it may be appropriate to include SVIL pumps in the circulator pumps rulemaking, in the commercial and industrial pumps rulemaking, or in a separate rulemaking.

DOE seeks comment regarding any other topics related to scope and definitions for circulator pumps and SVIL pumps.

B. Metric for Circulator Pumps

The CPWG focused on defining a performance-based metric that was similar to the pump energy index (''PEI'') metric established in the January 2016 TP final rule. (Docket No. EERE–2016–BT–STD–0004, No. 64 at pp. 246–247) The CPWG recommended using the PEI_{CIRC} metric, which would be defined as the pump energy rating (''PER'') for the rated circulator pump model (''PER_{CIRC}''), divided by the PER for a circulator that is minimally compliant with energy conservation standards serving the same hydraulic load (''$PER_{CIRC,STD}$''). (Docket No. EERE–2016–BT–STD–0004, No. 58, Recommendation #5 at p. 4)

The equation for PEI_{CIRC} is shown in the equation (1):

$$PEI_{CIRC} = \left[\frac{PER_{CIRC}}{PER_{CIRC,STD}}\right] \quad (1)$$

Where:

PER_{CIRC} = circulator pump energy rating (''hp''); and

$PER_{CIRC,STD}$ = pump energy rating for a minimally compliant circulator pump serving the same hydraulic load.

(Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendation #5 at p. 4)

PER_{CIRC} would be determined as the weighted average input power to the circulator motor or controls, if available, of a given circulator over a number of specified load points. Due to differences in the various control varieties available with circulator pumps, the CPWG recommended that each circulator pump control variety have unique weights and load points that are used in determining PER_{CIRC}. (Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendations #6A and #6B at pp. 4–6) The test points, weights, and test methods necessary for calculating PER_{CIRC} for pressure controls, temperature controls, manual speed controls, external input signal controls, and circulator pumps with no control (*i.e.,* without external input signal, manual, pressure, or temperature control)[9] are described in II.C.1 of this document.

$PER_{CIRC,STD}$ would be determined similarly for all circulator pumps, regardless of control variety. $PER_{CIRC,STD}$ would represent the weighted average input power to a minimally compliant circulator pump serving the same hydraulic load. As such, $PER_{CIRC,STD}$ would essentially define the minimally compliant circulator pump performance, such that the energy conservation standard level would always be defined as 1.00, and lower PEI_{CIRC} values would represent better performance. The CPWG discussed the derivation of $PER_{CIRC,STD}$ at length during the CPWG negotiations and, ultimately, recommended a standard level that is nominally equivalent to a single-speed circulator equipped with an electrically commutated motor. (Docket No. EERE–2016–BT–STD–0004, No. 102 at pp. 53–56; Docket No. EERE–2016–BT–STD–0004, No. 98 Recommendations #1 and 2A–D at pp. 1–4)

The CPWG specified a method for determining $PER_{CIRC,STD}$ equivalent to the test method recommended for circulator pumps with no controls, with additional procedures necessary to determine the minimally compliant overall efficiency at the various test points based on the hydraulic performance of the rated circulator pump. (Docket No. EERE–2016–BT–STD–0004, No. 98 Recommendations #2A–D at pp. 1–4) However, because $PER_{CIRC,STD}$ would represent the energy conservation standard level, DOE would, in a potential future circulator pump ECS rulemaking, discuss in detail the derivation of $PER_{CIRC,STD}$ for the recommended standard level, as well as all of the efficiency levels presented to the CPWG, including assessment of the technical feasibility and economic justification for any adopted levels. (Docket No. EERE–2016–BT–STD–0004)

DOE requests comment on the CPWG recommendation to adopt PEI_{CIRC} as the metric to characterize the energy use of certain circulator pumps and on the recommended equation for PEI_{CIRC}, including whether anything in the technology or market has changed since publication of the 2016 Term Sheets that would lead to this metric no longer being appropriate.

C. Test Procedure for Circulator Pumps

There is no current industry test procedure for circulator pumps. The September 2016 CPWG Term Sheet contained extensive recommendations related to development of a test procedure for circulator pumps. (Docket No. EERE–2016–BT–STD–0004, No. 58, Recommendations #6–12 at p. 4–9)

1. Test Methods for Different Categories and Control Varieties

Many circulator pumps are sold with a variable speed drive and controls (*i.e.,* logic or user interface) with various control strategies that reduce the required power input at a given flow rate to save energy. The ability of a circulator pump to operate at different speeds and the control logic of each control variety will impact the energy use for that circulator pump model in the field. To reflect this variation in energy consumption, the CPWG

[9] As discussed previously in section III.A.5, in this document, circulator pumps with no controls are also inclusive of other potential control varieties that have a control, but are not one of the identified circulator control varieties. DOE refers to these as circulator pumps with no controls throughout this document, as any circulator pump without one of the defined control varieties would be treated as a circulator pump with no controls, regardless of whether it is a single-speed circulator or has a control variety not defined in this test procedure.

recommended that DOE establish different test methods for each control variety in the circulator pump test procedure in order to best represent the different energy use patterns exhibited by each control variety. (Docket No. EERE–2016–BT–STD–0004, No. 58, Recommendation #9 at p. 7)

a. Control Definitions

The CPWG recommended definitions for the following control varieties for circulator pumps: manual speed control, pressure control, temperature control, and external input signal control. The definitions of these pump control varieties recommended by the CPWG are as follows:

• *Manual speed control* means a control (variable speed drive and user interface) that adjusts the speed of a driver based on manual user input.
• *Pressure control* means a control (variable speed drive and integrated logic) that automatically adjusts the speed of the driver in response to pressure.
• *Temperature control* means a control (variable speed drive and integrated logic) that automatically adjusts the speed of the driver continuously over the driver operating speed range in response to temperature.
• *External input signal control* means a variable speed drive that adjusts the speed of the driver in response to an input signal from an external logic and/or user interface.

(Docket No. EERE–2016–BT–STD–0004, No. 58, Recommendation #4 at p. 4)

The CPWG did not recommend a definition for adaptive pressure controls, although it did recommend a separate test procedure for them, because, as discussed by the CPWG, adaptive pressure controls are able to adjust the slope of the control curve to fit the system needs through an ongoing learning process inherent in the software. (Docket No. EERE–2016–BT–STD–0004, No. 72 at pp. 45–46) The test procedure for circulator pumps with adaptive pressure controls is discussed further in section II.C.1.c.

DOE requests comment on the recommended definitions for manual speed control, pressure control, adaptive pressure control, temperature control, and external input signal control. Additionally, DOE requests comment on a possible definition for adaptive pressure control.

DOE requests comment on whether any additional control variety is now currently on the market and if it should be considered in this rulemaking.

b. Reference Curve

All recommended test methods for circulator control varieties, which involve variable speed control of the circulator pump, specify test points with respect to a representative system curve. That is, for circulator pumps with manual speed controls, pressure controls, temperature controls, or external input signal controls, a reference system curve is implemented to be representative of the speed reduction that is possible in a typical system to provide representative results. For circulator pumps with no controls, no reference system is required as measurements are taken at various test points along a pump curve at maximum speed only.

Such a reference system curve describes the relationship between the head and the flow at each test point in a typical system. Additionally, a reference system curve that is representative of a typical system in which circulator pumps are installed may also allow for the differentiation of control varieties to be reflected in the resulting ratings. The CPWG recommended that DOE incorporate the same reference system curve that is used in the January 2016 TP final rule. (Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendations #8 at pp. 6–7) This curve is a quadratic reference system curve, which intersects the BEP and has a static offset of 20 percent of BEP head, as shown in equation (2):

$$H = \left[0.8 * \left(\frac{Q}{Q_{100\%}}\right)^2 + 0.2\right] * \mathrm{H}_{100\%} \quad \textbf{(2)}$$

Where:
H = the pump total head (ft),
Q = the flow rate (gpm),
$Q_{100\%}$ = flow rate at 100 percent of BEP flow (gpm), and
$H_{100\%}$ = pump total head at 100 percent of BEP flow (ft).

(Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendations #8 at pp. 6–7)

DOE requests comment on whether the CPWG-recommended reference system curve shape, including the static offset, is reasonable for circulator pumps.

c. Pressure Control

Pressure controls are a variety of circulator pump controls in which the variable speed drive is automatically adjusted based on the pressure in the system. For example, such controls are common in multi-zone hydronic heating applications in which the flow and speed are adjusted in response to zones opening or closing. The CPWG recommended that for all circulator pumps distributed in commerce with pressure controls, the PER_{CIRC} should be calculated as the weighted average input power at 25, 50, 75, and 100 percent of BEP flow, with unique weights shown in equation (3):

$$PER_{CIRC} = \sum_i \omega_i \left(P_{in,i}\right) \quad \textbf{(3)}$$

Where:
PER_{CIRC} = circulator pump energy rating (hp);
w_i = weight of 0.05, 0.40, 0.40, and 0.15 at test points of 25, 50, 75, and 100 percent of BEP flow, respectively;
$P_{in,i}$ = power input to the driver at each test point i (hp); and

i = test point(s), defined as 25, 50, 75, and 100 percent of the flow at BEP.

(Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendations #6A at pp. 4–5 and #7 at p.6)

The CPWG recommended testing circulator pumps with pressure controls using automatic speed adjustment based on the factory selected control setting, manual speed adjustment, or simulated pressure signal to trace a factory selected control curve setting that will achieve the test point flow rates with a head at or above the reference system curve. The CPWG also recommended that if a circulator pump with pressure controls is tested with automatic speed adjustment, that the pump can be manually adjusted to achieve 100 percent BEP flow and head point at maximum speed. Finally, for circulator pumps with adaptive pressure controls, the CPWG recommended that testing be conducted at the minimum thresholds for head based on manufacturer literature and through manual speed adjustment to achieve the test point flow rates with head values at or above the reference curve. (Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendation #9 at p. 7)

DOE requests comment on the recommended test methods, test points, and weights for circulator pumps with pressure controls, including circulator pumps with adaptive pressure controls. Specifically, DOE requests comment on whether the technology or market for such controls has changed sufficiently since the term sheet to warrant a different approach.

d. Temperature Control

Temperature controls are controls that automatically adjust the speed of the variable speed drive in the pump continuously over the operating speed range to respond to a change in temperature of the operating fluid in the system. Typically, temperature controls are designed to achieve a fixed temperature differential between the supply and return lines and adjust the flow rate through the system by adjusting the speed to achieve the specified temperature differential. Similar to pressure controls, temperature controls are also designed primarily for hydronic heating applications. However, temperature controls may be installed in single- or multi-zone systems and will optimize the circulator pump's operating speed to provide the necessary flow rate based on the heat load in each zone. As there are no minimum head requirements inherent to the circulator pump control, temperature controls may have potential to use less energy than pressure-based controls to serve a given load.

The CPWG recommended that for circulator pumps distributed in commerce with temperature controls, that PER_{CIRC} should be calculated the same way and with the same weights as for pressure controls, as shown in Equation 3. (Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendations #6A at pp. 4–5 and #7 at p. 6) The CPWG also recommended that circulator pumps with temperature controls be tested based on manual speed adjustment or with a simulated temperature signal to activate the temperature-based control to achieve the test point flow rates with a head at or above the reference curve. (Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendation #9 at p. 7)

DOE requests comment on the recommended test methods, test points, and weights for circulator pumps with temperature controls. Specifically, DOE requests comment on whether the technology or market for such controls has changed sufficiently since the term sheet to warrant a different approach.

e. Manual Speed Control

Manual speed controls are controls in which the speed of the pump is adjusted manually, typically to one of several pre-set speeds, by a dial or a control panel to fit the demand of the system within which it is installed. The CPWG discussed how circulator pumps installed with manual speed controls are typically only adjusted one time upon installation, if at all, and will operate at that set speed as if it were a single-speed circulator pump. That is, many manual speed control circulator pumps operate at full speed, while a portion of them may be set to a medium or low speed to suit the needs of the systems. (Docket No. EERE–2016–BT–STD–0004, No. 65 at pp. 131–133) Therefore, the CPWG recommended to test circulator pumps with manual speed controls both: (1) Along the maximum speed circulator pump curve to achieve the test point flow rates for the maximum speed input power values, and (2) based on manual speed adjustment to the lowest speed setting that will achieve a head at or above the reference curve at the test point flow rate for the reduced speed input power values. (Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendation #9 at p. 7)

To accomplish a single rating representative of the ‘‘average’’ energy use of a manual speed circulator, the CPWG recommended that for circulator pumps distributed in commerce with manual speed controls, the PER_{CIRC} should be calculated as the weighted average of $P_{in,max}$ (the weighted average input power at specific load points across the maximum speed curve) and $P_{in,reduced}$ (the weighted average input power at specific load points at reduced speed), but recommended separate load points and speed factors, as shown in equations (4), (5), and (6):

$$PER_{CIRC} = z_{max}(P_{in_{max}}) + z_{reduced}\,(P_{in_{reduced}})$$

Where:

PER_{CIRC} = circulator pump energy rating (hp);
z_{max} = speed factor weight of 0.75;
P_{in_max} = weighted average input power at maximum rotating speed of the circulator (hp), as specified in equation (5);
$z_{reduced}$ = speed factor weight of 0.25; and
$P_{in\_reduced}$ = weighted average input power at reduced rotating speed of the circulator (hp), as specified in equation (6).

$$P_{in_{max}} = \sum_i \omega_{i_{max}}\left(P_{in,i_{max}}\right) \quad (5)$$

Where:

P_{in_max} = weighted average input power at maximum speed of the circulator (hp);
w_{i_max} = 0.25;
P_{in,i_max} = power input to the driver at maximum rotating speed of the circulator at each test point i (hp); and
i = test point(s), defined as 25, 50, 75, and 100 percent of the flow at BEP.

$$P_{in_{reduced}} = \sum_i \omega_{i_{reduced}} \left(P_{in,i_{reduced}} \right) \quad (6)$$

Where:

$P_{in\_reduced}$ = weighted average input power at reduced speeds of the circulator (hp);
$w_{i\_reduced}$ = 0.3333;
$P_{in,i\_reduced}$ = power input to the driver at reduced rotating speed of the circulator at each test point i (hp); and
i = test point(s), defined as 25, 50, and 75 percent of the flow at BEP of max speed and head values at or above the reference curve.

(Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendation #6B and 7 at pp. 5–6)

DOE requests comment on the CPWG-recommended test method and the unique test points, weights, and speed factors for circulator pumps distributed in commerce with manual speed controls. Specifically, DOE requests comment on whether the technology or market for such controls has changed sufficiently since the term sheet to warrant a different approach.

f. External Input Signal Control

The final control variety considered by the CPWG was external input signal controls. External input signal controls are controls in which the device that responds to the stimulus, or the primary control logic, is external to the circulator pump. Unlike pressure and temperature controls, the logic that defines how the circulator pump operating speed is selected in response to some measured variable (*e.g.,* temperature, pressure, or boiler fire rate) is not part of the circulator, as distributed in commerce. Instead, it is part of another control system, such as a building management system or a boiler control system. (Docket No. EERE–2016–BT–STD–0004, No. 72 at pp. 76–84)

For circulator pumps that have only an external input signal control, the CPWG recommended testing along the reference control curve to achieve the test point flow rates with a head at or above the reference system curve with the same weights as temperature and pressure controls. (Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendations #9 at pp. 7–8).

The CPWG recommended that, to ensure the rating would be representative of the performance of such pumps, the external input signal control must be the only control mode on the pump, and the pump must not be able to operate without an external input signal. (Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendations #9 at pp. 7–8)

The CPWG asserted that if external input signal control is one of multiple options available on a circulator pump, or the pump is able to operate without an external input signal, it is less likely that the external input signal control option would be utilized in the field. (Docket No. EERE–2016–BT–STD–0004, No. 72 at pp. 217–218). Therefore, to prevent the possibility of artificially improving the PEI_{CIRC} rating through the addition of an external input signal control mode, the CPWG recommended testing circulator pumps with external input signal controls similar to manual speed controls. (Docket No. EERE–2016–BT–STD–0004, No. 47 at p. 480) The CPWG recommended testing a circulator pump sold with external input signal controls and another control variety with a simulated signal both: (1) Along the maximum speed circulator pump curve to achieve the test point flow rates for the maximum speed input power values, and (2) with speed adjustment using a simulated signal to the lowest speed setting that will achieve a head at or above the reference curve at the test point flow rates for the reduced speed input power values. (Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendation #9 at pp. 7–8)

As such, the CPWG recommended that for circulator pumps distributed in commerce with external input signal controls and at least one other control variety, the PER_{CIRC} should be calculated as the weighted average of $P_{in,max}$ (the weighted average input power at specific load points across the maximum speed curve) and $P_{in,reduced}$ (the weighted average input power at specific load points at reduced speed), similar to circulator pumps with manual speed control, but with a different speed factor, as shown in equations (7), (8), and (9):

$$PER_{CIRC} = z_{max}(P_{in_{max}}) + z_{reduced}\,(P_{in_{reduced}})$$

Where:

PER_{CIRC} = circulator pump energy rating (hp);
z_{max} = speed factor weight of 0.30;
P_{in_max} = weighted average input power at maximum rotating speed of the circulator pump (hp);
$z_{reduced}$ = speed factor weight of 0.70; and
$P_{in\_reduced}$ = weighted average input power at reduced rotating speed of the circulator (hp).

$$P_{in_{max}} = \sum_i \omega_{i_{max}} \left(P_{in,i_{max}} \right) \quad (8)$$

Where:

P_{in_max} = weighted average input power at maximum speed of the circulator (hp);
w_{i_max} = 0.25;
P_{in,i_max} = power input to the driver at maximum rotating speed of the circulator at each test point i (hp); and
i = test point(s), defined as 25, 50, 75, and 100 percent of the flow at BEP.

$$P_{in_{reduced}} = \sum_i \omega_{i_{reduced}} \left(P_{in,i_{reduced}} \right)$$

(9)

Where:

$P_{in\_reduced}$ = weighted average input power at reduced speeds of the circulator (hp);

$w_{i\_reduced}$ = 0.3333;

$P_{in,i\_reduced}$ = power input to the driver at reduced rotating speed of the circulator at each test point i (hp); and

i = test point(s), defined as 25, 50, and 75 percent of the flow at BEP of max speed and head values at or above the reference curve.

(Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendations #6B and #7 at pp. 5–6)

The CPWG recommended the speed factors of 0.30 at maximum speed and 0.70 at reduced speed in order to produce a rating on an equivalent basis as that of a circulator pump with a typical differential pressure control. (Docket No. EERE–2016–BT–STD–0004, No. 58 at p. 6). In addition, these speed factors would represent the likelihood that a circulator pump with an external input signal control is selected to operate with that external input signal control, and whether the signal it receives results in the circulator pump reducing speed.

DOE requests comment on the CPWG-recommended test method for circulator pumps distributed in commerce with only external input signal controls, as well as for those distributed in commerce with external input signal controls in addition to other control varieties. Specifically, DOE requests comment on whether the technology or market for such controls has changed sufficiently since the term sheet to warrant a different approach.

g. No Controls

For circulator pumps with no controls, the CPWG recommended testing the pump along the maximum speed circulator pump curve to achieve the test point flow rates of 25, 50, 75, and 100 percent of BEP flow. (Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendation #9 at p. 7) The CPWG also recommended that for circulator pumps distributed in commerce with no controls, PER_{CIRC} should be calculated with the unique weights and test points as shown in equation (10):

$$PER_{CIRC} = \sum_i \omega_i \left(P_{in,i} \right)$$

(10)

Where:

PER_{CIRC} = circulator pump energy rating (hp);

w_i = 0.25;

$P_{in,i}$ = power input to the driver at each test point i (hp); and

i = test point(s), defined as 25, 50, 75, and 100 percent of the flow at BEP.

(Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendation #6A at pp. 4–5)

The CPWG recommended the 0.25 weights at each test point (*i.e.,* 25, 50, 75, and 100 percent of the flow at BEP) in order to account for the variety of systems and operating points a single-speed circulator may encounter. (Docket No. EERE–2016–BT–STD–0004, No. 70 at pp. 172–173)

DOE requests comment on the CPWG-recommended test methods, test points, and weights for circulator pumps with no controls.

2. Updates to Industry Standards

As part of the September 2016 CPWG recommendations, the CPWG recommended that all test points be tested on a wire-to-water basis, in accordance with HI 40.6–2014, with minor modifications. The CPWG also recommended that if an updated version of HI 40.6 is published prior to publication of the test procedure final rule, DOE should review and incorporate the updated version. (Docket No. EERE–2016–BT–STD–0004, No. 58, Recommendation #10 at p. 8–9)

In 2016, HI published an updated industry standard, HI 40.6–2016, ''Methods for Rotodynamic Pump Efficiency Testing'' (''HI 40.6–2016''). This update aligned the definitions and procedures described in HI Standard 40.6 with the DOE test procedure for pumps published in the January 2016 TP final rule. Appendix A to subpart Y to 10 CFR part 431. In the September 2020 Early Assessment RFI for pumps, DOE requested comment on the potential effect of incorporating HI 40.6–2016 by reference as the DOE test procedure for pumps. 85 FR 60734, 60737. Grundfos, NEEA, and HI commented that HI expects to publish another standard update in 2021 (''HI 40.6–2021'') and urged DOE to incorporate by reference HI 40.6–2021 rather than HI 40.6–2016 (Grundfos, Docket No. EERE–2020–BT–TP–0032, No. 07 at p. 2; NEEA, Docket No. EERE–2020–BT–TP–0032, No. 08 at p. 6; HI, Docket No. EERE–2020–BT–TP–0032, No. 06 at pp. 1, 3). HI specified that HI 40.6–2016 included updates to match DOE's test procedure for pumps, and that HI 40.6–2021 will further include editorial revisions and added circulator pump testing, and also would not impact measured values, burden, or representativeness. (HI, Docket No. EERE–2020–BT–TP–0032, No.06 at p. 3)

At the time of this RFI publication, HI 40.6–2021 was not yet available. DOE expects to review and consider this updated industry standard when available.

DOE seeks comment and feedback on whether HI 40.6–2016 or HI 40.6–2021 is an appropriate test method for conducting wire-to-water testing of circulator pumps, as recommended by the CPWG. In addition, DOE seeks comment on whether the modifications in HI 40.6–2016 and/or HI 40.6–2021 adequately capture the CPWG recommended modifications in Recommendation #10.

Additionally, CPWG recommended several specifications for the circulator pump test procedure that are not included in either HI 40.6–2014 or HI 40.6–2016, including test arrangements for twin-head circulator pumps and circulators-less-volute:

• To test twin head circulator pumps, one of the two impeller assemblies is to be incorporated into an adequate, single impeller volute and casing. An adequate, single impeller volute and casing means a volute and casing for which any physical and functional characteristics that affect energy consumption and energy efficiency are essentially identical to their corresponding characteristics for a single impeller in the twin head circulator volute and casing.
• To test circulators-less-volute, pair the circulator-less-volute with specific volute(s) with which the circulator is advertised to be paired, based on manufacturer's literature, to determine the PEI rating for each circulator-less-volute and volute combination.

(Docket No. EERE–2016–BT–STD–0004, No. 58 Recommendations #11 and #12 at p. 9)

DOE seeks comment on whether the recommendations for twin-head circulator pumps and circulators-less-volute have been adequately addressed in HI 40.6–2021.

D. Metric and Test Procedure for SVIL Pumps

The CPWG recommended evaluating SVIL pumps using the constant load pump energy index (PEI_{CL}) or variable load pump energy index (PEI_{VL}) metric, similar to general pumps, and using the general pump test procedure to measure performance, with any additional modifications necessary as determined by DOE. (Docket No. EERE–2016–BT–STD–0004, No. 98 Recommendations #1B at pp. 1–2) In the January 2016 TP final rule, DOE adopted a metric of PEI_{CL} for pumps distributed in commerce as bare pumps or as bare pumps with a motor (*i.e.,* pumps sold without continuous or non-continuous controls) and a metric of PEI_{VL} for pumps sold with either continuous or non-continuous controls. 81 FR 4086, 4150–4152 (Jan. 25, 2016)

DOE identified the size and characteristics of the motor with which the SVIL pumps are rated as the primary difference between SVIL and IL pumps that affects the application of the DOE general pumps test procedure. Specifically, the general pumps test procedure establishes that testing-based methods are applicable to all pump configurations, while calculation-based methods are applicable only to (1) pumps sold with neither a motor nor controls (*i.e.,* a bare pump), (2) pumps sold with motors that are subject to DOE's energy conservation standards for electric motors, as defined pursuant to 10 CFR 431.25(g), (with or without continuous controls), and (3) pumps sold with submersible motors (with or without continuous controls). This is because the calculation-based test methods presume motor efficiency and motor or motor and drive loss values based on the performance characteristics of motors that are subject to DOE's current energy conservation standards for electric motors at 10 CFR 431.25. Table 1 to appendix A to subpart Y of 10 CFR part 431.

SVIL pumps are often distributed in commerce with motors that are either subject to DOE's electric motor regulations at 10 CFR 431.25 or DOE's small electric motor regulations at 10 CFR 431.466. Therefore, the calculation-based test methods may need to be modified to reference DOE's electric motor regulations at 10 CFR 431.25 or DOE's small electric motor regulations at 10 CFR 431.446, as applicable.

DOE also notes that the general pumps test procedure includes the requirement that all pumps sold with single-phase motors be rated as bare pumps. Table 1 to appendix A to subpart Y of 10 CFR part 431. SVIL pumps sold with single-phase motors could instead be rated to reflect the performance of that single-phase motor, either through the testing or calculation-based methods.

In addition, the general pumps test procedure relies on nominal motor losses to calculate the PER_{STD} and PER_{CL} for the calculation-based method and nominal motor and drive losses to calculate PER_{VL}. Both the motor and combined motor and drive loss curves were developed for the general pumps test procedure based on data from the National Electrical Manufacturers Association (NEMA) and from manufacturers of motors and drives, as well as data from DOE's own testing, for motors and drives from 1 to 250 hp gathered during the general pumps test procedure rulemaking. Since these losses were based on data for motors and drives from 1 to 250 hp, the nominal motor losses derived for the general pumps test procedure may not be appropriate for SVIL pumps. DOE researched typical losses for motors and combined motor and drive assemblies for motors that were less than 1 hp. Based on the information DOE received, the part load loss curves, or the variation in efficiency as a function of load, does not vary significantly between 1 hp motors and drives and motors and drives that are less than 1 hp.

DOE requests comment on the recommendation to test SVIL pumps with the test methods in the general pumps test procedure and additional provisions to account for the differences in size and characteristics of SVIL pump motors. In particular, DOE requests comment on the potential extension of the nominal full load motor efficiency values to reference DOE's small electric motor regulations, including certain single-phase motors, and the need for an exception for SVIL pumps so that those sold with single-phase motors do not have to be rated as bare pumps.

DOE also requests comment on the prevalence of SVIL pumps sold with single-phase versus three-phase motors, and the prevalence of SVIL pumps sold with motors not covered by DOE's small electric motors and electric motors energy conservation standards for either single- or three-phase motors.

DOE also requests comment on whether the equations used to establish the part load motor and drive losses in the general pumps test procedure are appropriate for SVIL pumps under one horsepower. If inappropriate, DOE requests data supporting the generation of alternative loss curves.

III. Request for Information and Comments Pertaining to Energy Conservation Standards

DOE is publishing this RFI to collect data and information to inform its decision, consistent with its obligations under EPCA, as to whether the Department should proceed with an energy conservation standards rulemaking. In the following sections, DOE has identified a variety of issues on which it seeks input to aid in the development of the technical and economic analyses regarding whether standards for circulator pumps and SVIL pumps may be warranted.

DOE seeks comment on whether establishing a standard for circulator pumps and SVIL pumps would be cost-effective, economically justified, technologically feasible, or would result in a significant savings of energy.

For circulator pumps, the CPWG reached agreement on the methodology, data sources, and assumptions required to conduct the analyses and reach consensus on a recommended standard level. Therefore, DOE is requesting comment only on specific inputs to the analyses that may need to be updated due to technological or market changes since the CPWG proceedings. However, because the CPWG did not analyze SVIL pumps, DOE is requesting comment on several of the associated inputs to the analyses.

A. Market and Technology Assessment

The market and technology assessment that DOE routinely conducts when analyzing the impacts of a potential new or amended energy conservation standard provides information about the circulator pumps and SVIL pumps industry that will be used in DOE's analysis throughout the rulemaking process. DOE uses qualitative and quantitative information to characterize the structure of the industry and market. DOE identifies manufacturers, estimates market shares and trends, addresses regulatory and non-regulatory initiatives intended to improve energy efficiency or reduce energy consumption, and explores the potential for efficiency improvements in the design and manufacturing of circulator pumps. DOE also reviews product literature, industry publications, and company websites. Additionally, DOE considers conducting interviews with manufacturers to improve its assessment of the market and available technologies for circulator pumps.

1. Equipment Classes

When evaluating and establishing energy conservation standards, DOE may divide covered equipment into equipment classes by the type of energy used, or by capacity or other performance-related features that justify a different standard. (42 U.S.C. 6316(a); 42 U.S.C. 6295(q)) In making a determination whether capacity or another performance-related feature justifies a different standard, DOE must consider such factors as the utility of the feature to the consumer and other factors DOE deems appropriate. (*Id.*)

For circulator pumps, there are no current energy conservation standards and, thus, no equipment classes. However, the 2016 Term Sheets contained a recommendation related to establishing equipment classes for circulator pumps. Specifically, ''Recommendation #1'' of the December 2016 CPWG Recommendations suggests grouping all circulator pumps into a single equipment class, though with numerical energy conservation standard values that vary as a function of hydraulic output power. (Docket No. EERE–2016–BT–STD–0004, No. 98 Recommendation at p.1)

DOE requests comment regarding the CPWG recommendation to include all circulator pumps within a single equipment class, especially regarding interim market changes since the recommendation that may warrant changes to that recommendation. DOE additionally seeks comment regarding whether the same recommendations should apply to SVIL pumps.

2. Technology Assessment

In analyzing the feasibility of potential new energy conservation standards, DOE uses information about existing and past technology options and prototype designs to help identify technologies that manufacturers could use to meet and/or exceed a given set of energy conservation standards under consideration. In consultation with interested parties, DOE intends to develop a list of technologies to consider in its analysis. An initial list of those options appears in Table III.1 of this document. Each technology option is then described separately in the sections.

TABLE III.1—POTENTIAL TECHNOLOGY OPTIONS FOR CIRCULATOR PUMPS

Improved Hydraulic Design
Improved Motor Efficiency
Ability to Reduce Speed

a. Improved Hydraulic Design

The performance characteristics of a pump, such as flow, head, and efficiency, are influenced by the pump's hydraulic design. For purposes of DOE's analysis, ''hydraulic design'' is a broad term used to describe the system design of the wetted components of a pump. Although hydraulic design focuses on the specific hydraulic characteristics of the impeller and the volute/casing, it also includes design choices related to bearings, seals, and other ancillary components.

Impeller and volute/casing geometries, clearances, and associated components can be redesigned to a higher efficiency (at the same flow and head) using a combination of historical best practices and modern computer-aided design (CAD) and analysis methods. The wide availability of modern CAD packages and techniques now enables pump designers to more quickly reach designs with improved vane shapes, flow paths, and cutwater designs, all of which work to improve the efficiency of the pump. In confidential interviews, manufacturers indicated that the potential for additional efficiency improvements from improved hydraulic design were fairly small.

b. Improved Motor Efficiency

Different varieties (or constructions) of a motor have different achievable efficiencies. Two general motor constructions are present in the circulator pump market: Induction motors, and electronically commutated motors (ECMs). Induction motors can have one of two configurations: Single-phase and three-phase. Single-phase induction motors may be further categorized to include split phase, capacitor-start induction-run (CSIR), capacitor-start capacitor-run (CSCR), and permanent split capacitor (PSC) motors.

The majority of circulator pumps currently available on the market use induction motors. The efficiency of an induction motor can be increased by redesigning the motor to reduce slip losses between the rotor and stator components, as well as reducing mechanical losses at seals and bearings. ECMs are generally more efficient than induction motors because their construction minimizes slip losses between the rotor and stator components. Unlike induction motors, ECMs require an electronic drive to function. This electronic drive consumes electricity, and variations in drive losses and mechanical designs lead to a range of ECM efficiencies.

The performance standard for circulator pumps is based upon wire-to-water efficiency, which is defined as the hydraulic output power of a circulator divided by its line input power. Wire-to-water efficiency is commonly expressed as a percentage. The achievable wire-to-water efficiency of circulator pumps is influenced by both hydraulic efficiency and motor efficiency. DOE assessed the range of attainable wire-to-water efficiencies for circulator pumps with induction motors, and circulator pumps with ECMs, over a range of hydraulic power outputs. Because circulator pump efficiency is measured on a wire-to-water basis, it is difficult to fully separate differences due to motor efficiency from those due to hydraulic efficiency. In redesigning a pump model to attain greater efficiency levels, manufacturers would likely consider both hydraulic efficiency and motor efficiency. However, manufacturers indicated in interviews that the energy savings potential of improving hydraulic efficiency is small compared to that of improving motor efficiency. Higher motor capacities are generally required for higher hydraulic power outputs, and as motor capacity increases, the attainable efficiency of the motor at full load also increases. Higher horsepower motors also operate close to their peak efficiency for a wider range of loading conditions.[10]

Circulator pumps manufacturers manufacture motors in-house or purchase complete or partial motors from motor manufacturers and/or distributors. As a result, manufacturers may select an entirely different motor,

[10] U.S. DOE Building Technologies Office. *Energy Savings Potential and Opportunities for High-Efficiency Electric Motors in Residential and Commercial Equipment.* December 2013. Prepared for the DOE by Navigant Consulting. p. 4. Available at *http://energy.gov/sites/prod/files/2014/02/f8/Motor%20Energy%20Savings%20Potential%20Report%202013-12-4.pdf.*

or redesign an existing motor in order to improve a pump's motor efficiency.

c. Ability To Operate at Reduced Speeds

Circulator pumps with the variable speed capability can reduce their energy consumption by reducing pump speed to match load requirements. As discussed in Section II.B, the PER_{CIRC} metric is a weighted average of input powers at each test point relative to BEP flow. The circulator pumps test procedure agreed to by the CPWG allows: PER_{CIRC} values for multi- and variable-speed circulator pumps to be calculated as the weighted average of input powers at full speed BEP flow, and reduced speed at flow points less than BEP and PER_{CIRC} for single-speed pumps to be calculated based only on input power at full speed. Due to pump affinity laws, variable-speed circulator pumps will achieve reduced power consumption at flow points less than BEP by reducing their rotational speed to more closely match required system head. As such, the PER_{CIRC} metric grants benefits on circulator pumps capable of variable speed operation.

Specifically, the pump affinity laws describe the relationship of pump operating speed, flow rate, head, and hydraulic power as shown in Equations (11), (12), and (13).

$$\frac{Q_1}{Q_2} = \frac{N_1}{N_2} \quad (11)$$

$$\frac{H_1}{H_2} = \left(\frac{N_1}{N_2}\right)^2 \quad (12)$$

$$\frac{P_1}{P_2} = \left(\frac{N_1}{N_2}\right)^3 \quad (13)$$

Where:

Q_1 and Q_2 = volumetric flow rate at two operating points

H_1 and H_2 = pump total head at two operating points

N_1 and N_2 = pump rotational speed at two operating points

P_1 and P_2 = pump hydraulic power at two operating points

This means that a pump operating at half speed will provide one half of the pump's full-speed flow and one eighth of the pump's full-speed power.[11] However, pump affinity laws do not account for changes in hydraulic and motor efficiency that may occur as a pump's rotational speed is reduced. Typically, hydraulic efficiency and motor efficiency will be reduced at lower operating speeds. Consequently, at reduced speeds, power consumption is not reduced as drastically as hydraulic output power. Even so, the efficiency losses at low-speed operation are typically outweighed by the exponential reduction in hydraulic output power at low-speed operation; this results in a lower input power at low speed operation at flow points lower than BEP.

Circulator speed controls may be discrete or continuous, as well as manual or automatic. Circulator pumps with discrete speed controls vary the pump's rotational speed in a step-wise manner. Discrete controls are found mostly on circulator pumps with induction motors, and have several speed settings that are can be used to allow contractors greater installation flexibility with a single circulator model. For these circulator pumps, the pump's speed is set manually with a dial or buttons by the installer or user and operate at a constant speed once the installation is complete.

Circulator pumps equipped with automatic speed controls can adjust the circulator's rotational speed based on a signal from differential pressure or temperature sensors, or an external input signal from a boiler. The variable frequency drives required for ECMs makes them fairly amenable to the addition of variable speed control logic. Currently, the vast majority of circulator pumps with automatic continuously variable speed controls also have ECM motors. However, some circulator models with induction motors also come equipped with automatic continuous variable speed controls. Automatic controls can reduce energy consumption either by allowing circulator speed to dynamically respond to changes in system conditions or simply by reducing speed to a single value optimal for the specific application. Automatic controls can be broadly categorized into two groups: Pressure-based controls, and temperature-based controls.

Pressure-based controls vary the circulator speed based on changes in the system pressure. These pressure changes are typically induced by a thermostatically controlled zone valve that monitors the space temperature in different zones and calls for heat (*i.e.,* opens the valve) when the space/zone temperature is below the set-point, similar to a thermostat. In this type of control, a pressure sensor internal to the circulator determines the amount of pressure in the system and adjusts the circulator speed to achieve the desired system pressure.

Temperature-based controls monitor the supply and return temperature to the circulator and modulate the circulator speed to maintain a fixed temperature drop across the system. Circulator pumps with temperature-based controls are able to serve the heat

[11] A discussion of reduced-speed pump dynamics is available at *https://www.regulations.gov/document?D=EERE-2015-BT-STD-0008-0099.*

loads of a conditioned space at a lower speed, and therefore lower input power, than those with differential pressure controls. This is because they can account for the differential temperature between the space and supplied hot water, delivering a constant BTU/hr load to the space when less heat is needed even in a given zone or zones.

DOE seeks information on the technologies listed in Table III.1 regarding their applicability to the current market and how these technologies may impact the efficiency of circulator pumps as measured according to the DOE test procedure. Specifically, DOE seeks information on the range of efficiencies or performance characteristics that are currently available for each technology option.

DOE seeks information on the technologies listed in Table III.1 regarding their market adoption, costs, and any concerns with incorporating them into products (*e.g.,* impacts on consumer utility, potential safety concerns, manufacturing/production/implementation issues, etc.).

DOE seeks comment on other technology options that it should consider for inclusion in its analysis and if these technologies may impact product features or consumer utility.

B. Screening Analysis

The purpose of the screening analysis is to evaluate the technologies that improve equipment efficiency to determine which technologies will be eliminated from further consideration and which will be passed to the engineering analysis for further consideration.

DOE determines whether to eliminate certain technology options from further consideration based on the following criteria:

(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 of a technology in commercial products and reliable installation and servicing of the technology could not be achieved on the scale necessary to serve the relevant market at the time of the compliance date of the standard, then that technology will not be considered further.

(3) *Impacts on equipment utility or equipment availability.* If a technology is determined to have significant adverse impact on the utility of the equipment to significant subgroups of consumers, or result in the unavailability of any covered equipment type with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as equipment 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 will 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 431.4; 10 CFR part 430, subpart C, appendix A, 6(c)(3) and 7(b)

Technology options identified in the technology assessment are evaluated against these criteria using DOE analyses and inputs from interested parties (*e.g.,* manufacturers, trade organizations, and energy efficiency advocates). Technologies that pass through the screening analysis are referred to as ''design options'' in the engineering analysis. Technology options that fail to meet one or more of the five criteria are eliminated from consideration.

DOE requests feedback on what impact, if any, the five screening criteria described in this section would have on each of the technology options listed in Table III.1 with respect to circulator pumps. Similarly, DOE seeks information regarding how these same criteria would affect any other technology options not already identified in this document with respect to their potential use in circulator pumps.

C. Engineering Analysis

The purpose of the engineering analysis is to establish the relationship between the efficiency and cost of circulator pumps. There are two elements to consider in the engineering analysis: 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''). In determining the performance of higher-efficiency equipment, DOE considers technologies and design option combinations not eliminated by the screening analysis. For each equipment class, DOE estimates the baseline cost, as well as the incremental cost for the equipment at efficiency levels above the baseline. The output of the engineering analysis is a set of cost-efficiency ''curves'' that are used in downstream analyses (*i.e.,* the life-cycle cost (''LCC'') and payback period (''PBP'') analyses and the NIA).

1. Efficiency Analysis

DOE typically uses one of two approaches to develop energy efficiency levels for the engineering analysis: (1) Relying on observed efficiency levels in the market (*i.e.,* the efficiency-level approach), or (2) determining the incremental efficiency improvements associated with incorporating specific design options to a baseline model (*i.e.,* the design-option approach). Using the efficiency-level approach, the efficiency levels established for the analysis are determined based on the market distribution of existing products (in other words, based on the range of efficiencies and efficiency level ''clusters'' that already exist on the market). Using the design option approach, the efficiency levels established for 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. DOE may also rely on a combination of these two approaches. For example, the efficiency-level approach (based on actual products on the market) may be extended using the design option approach to interpolate to define ''gap fill'' levels (to bridge large gaps between other identified efficiency levels) and/or to extrapolate to the max-tech level (particularly in cases where the max-tech level exceeds the maximum efficiency level currently available on the market).

Although DOE has not developed a formal engineering analysis, DOE supported the CPWG by providing some engineering-like analysis based on the efficiency-level approach. The analysis was presented over a series of working sessions, transcripts and accompanying material for which is available in the rulemaking docket. (Docket No. EERE–2016–BT–STD–0004)

For each established equipment class, DOE selects a baseline model as a reference point against which any changes resulting from new or amended energy conservation standards can be measured. The baseline model in each equipment class represents the characteristics of common or typical products in that class. Typically, a baseline model is one that meets the current minimum energy conservation standards and provides basic consumer utility.

DOE requests feedback on appropriate baseline efficiency levels for DOE to apply to each equipment class in evaluating whether to establish energy conservation standards for these products.

DOE requests feedback on the appropriate baseline efficiency levels for any newly analyzed equipment classes that are not currently in place or for the contemplated combined equipment classes, as discussed in section III.A.1 of this document. For newly analyzed equipment classes, DOE requests energy use data to characterize the baseline efficiency level.

As part of DOE's analysis, the maximum available efficiency level is the highest efficiency unit currently available on the market. DOE also defines a max-tech efficiency level to represent the theoretical maximum possible efficiency if all available design options are incorporated in a model. In applying these design options, DOE would only include those that are compatible with each other that when combined would represent the theoretical maximum possible efficiency. In many cases, the max-tech efficiency level is not commercially available because it is not economically feasible.

DOE seeks input on whether the maximum available efficiency levels are appropriate and technologically feasible for potential consideration as possible energy conservation standards for circulator pumps—and if not, why not.

DOE also requests feedback on which maximum efficiencies are representative of those for the other circulator pumps not included within the scope of the Term Sheets. If the range of possible efficiencies is different for such other equipment, what alternative approaches should DOE consider using for those equipment classes and why?

DOE seeks feedback on what design options would be incorporated at a max-tech efficiency level, and the efficiencies associated with those levels. As part of this request, DOE also seeks information as to whether there are limitations on the use of certain combinations of design options.

2. Cost Analysis

The cost analysis portion of the engineering analysis is conducted using one or a combination of cost approaches. The selection of cost approach depends on a suite of factors, including availability and reliability of public information, characteristics of the regulated product, and the availability and timeliness of purchasing the equipment on the market. The cost approaches are summarized as follows:

- *Physical teardowns:* Under this approach, DOE physically dismantles a commercially available product, component-by-component, to develop a detailed bill of materials for the product.
- *Catalog teardowns:* 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 bill of materials for the product.
- *Price surveys:* If neither a physical nor catalog teardown is feasible (for example, for tightly integrated products such as fluorescent lamps, which are infeasible to disassemble and for which parts diagrams are unavailable) or cost-prohibitive and otherwise impractical (*e.g.,* large commercial boilers), DOE conducts price surveys using publicly available pricing data published on major online retailer websites and/or by soliciting prices from distributors and other commercial channels.

The bill of materials provides the basis for the manufacturer production cost (''MPC'') estimates. DOE then applies a manufacturer markup to convert the MPC to manufacturer selling price (''MSP''). The manufacturer markup accounts for costs such as overhead and profit. The resulting bill of materials provides the basis for the manufacturer production cost (''MPC'') estimates.

As described at the beginning of this section, the main outputs of the engineering analysis are cost-efficiency relationships that describe the estimated increases in manufacturer production cost associated with higher-efficiency products for the analyzed equipment classes.

DOE requests feedback on whether, and if so how, manufacturers would incorporate the technology options listed in Table III.1 to increase energy efficiency in circulator pumps beyond the baseline. This includes information in which manufacturers would incorporate the different technologies to incrementally improve the efficiencies of products. DOE also requests feedback on whether the increased energy efficiency would lead to other design changes that would not occur otherwise. DOE is also interested in information regarding any potential impact of design options on a manufacturer's ability to incorporate additional functions or attributes in response to consumer demand.

DOE also seeks input on the increase in MPC associated with incorporating each particular design option. DOE also requests information on the investments necessary to incorporate specific design options, including, but not limited to, costs related to new or modified tooling (if any), materials, engineering and development efforts to implement each design option, and manufacturing/production impacts.

DOE requests comment on whether certain design options may not be applicable to (or incompatible with) specific equipment classes.

To account for manufacturers' non-production costs and profit margin, DOE applies a non-production cost multiplier (the manufacturer markup) to the MPC. The resulting manufacturer selling price (''MSP'') is the price at which the manufacturer distributes a unit into commerce.

DOE requests feedback on what manufacturer markups are appropriate for non-built-in and built-in products, respectively.

D. Markups Analysis

DOE derives customer prices by applying a multiplier called a ''markup'' to the MSP. In deriving markups, DOE determines the major distribution channels for product sales, the markup associated with each party in each distribution channel, and the existence and magnitude of differences between markups for baseline products (''baseline markups'') and higher-efficiency products (''incremental markups''). The identified distribution channels (*i.e.,* how the products are distributed from the manufacturer to the consumer), and estimated relative sales volumes through each channel are used in generating end-user price inputs for the LCC and PBP analyses and the national impact analysis (''NIA'').

During the CPWG meetings, the CPWG identified distribution channels for circulator pumps and estimated their respective shares of shipments by sector (residential and commercial), based on manufacturer feedback (Docket No. EERE–2016–BT–STD–0004, No. 49 at p. 51), as shown in Table III.2:

TABLE III.2—CIRCULATOR PUMPS DISTRIBUTION CHANNELS AND RESPECTIVE MARKET SHARES

Channel: From manufacturer	Residential shipments share (%)	Commercial shipments share (%)
Sales Rep → Contractor → End User	....	37

TABLE III.2—CIRCULATOR PUMPS DISTRIBUTION CHANNELS AND RESPECTIVE MARKET SHARES—Continued

Channel: From manufacturer	Residential shipments share (%)	Commercial shipments share (%)
Sales Rep → Distributor → Contractor → End User	73	36
Distributor → End User		2
Sales Rep → Distributor → End User	2	
OEM → Contractor → End User	12	12
OEM → Distributor → Contractor → End User	13	13
Total	100	100

DOE requests information on whether there have been market changes since the CPWG that would affect the distribution channels and the percentage of circulator pump shipments in each channel and sector, as shown in Table III.2, and if so, how such market changes would affect the circulator pump distribution channels. DOE also requests information on whether the same distribution channels and associated breakdowns across sectors apply for SVIL pumps, and if not, DOE requests relevant data on the SVIL distribution channels and their market shares.

E. Energy Use Analysis

As part of the rulemaking process, DOE conducts an energy use analysis to identify how products are used by consumers, and thereby determine the energy savings potential of energy efficiency improvements. DOE will base the energy consumption of circulator pumps and SVIL pumps on the rated annual energy consumption as determined by the DOE test procedure. Along similar lines, the energy use analysis is meant to represent typical energy consumption in the field.

1. Consumer Samples and Market Breakdowns

To estimate the energy use of products in field operating conditions, DOE typically develops consumer samples that are representative of installation and operating characteristics of how such products are used in the field, as well as distributions of annual energy use by application and market segment. According to manufacturer feedback, there are two main applications for circulator pumps: Hydronic heating and hot water recirculation. DOE estimated the market share of these two applications based on manufacturer-provided circulator pump shipments data for 2015, as well as the market distribution of circulator pumps in the residential and commercial sectors based on the horsepower ratings of the shipments data and industry expert input.

To develop consumer samples, the CPWG relied on the Energy Information Administration's (EIA) 2009 residential energy consumption survey (RECS) and the 2012 commercial buildings energy consumption survey (CBECS), for the residential and commercial sectors, respectively. (Docket No. EERE–2016–BT–STD–0004, No. 46 at p. 158) In a potential energy conservation standards rulemaking for circulator pumps and SVIL pumps, DOE may utilize the most current versions of the RECS and CBECS consumer samples, currently the 2015 RECS and the upcoming 2018 CBECS.

DOE requests data and information on whether the breakdowns of circulator pumps by sector and application have changed since the CPWG proceedings, and if so, how. DOE also requests information on the market applications of SVIL pumps and how those are broken down by sector.

As discussed in section II.A.1.b of this document, the CPWG recommended a definition for ''on-demand circulator pumps''. (Docket No. EERE–2016–BT–STD–0004, No. 98 Non-Binding Recommendation #1 at pp. 4–5) In order to consider analyzing on-demand circulator pumps, DOE requires information to characterize their market size. The CPWG reported that on-demand circulator pumps comprise 5 percent of the hot water recirculation market. (Docket No. EERE–2016–BT–STD–0004, No. 46 at p. 168)

DOE requests feedback on whether there have been market changes since the CPWG meetings that would warrant a different estimate of the fraction of circulator pumps sold with on-demand controls, and if so, what that fraction is.

2. Operating Hours

To develop annual energy use estimates, the CPWG reviewed the operating hours of circulator pumps by sector (residential and commercial) and application (hydronic heating and hot water recirculation). For hydronic heating applications in the residential sector, operating hours per year (''HPY'') were estimated based on two field metering studies: A 2015 Vermont study and a 2012–2013 metering study in Ithaca, NY.[12] Based on these metering studies, the CPWG suggested establishing a relationship between residential sector heating degree days (''HDDs'') and circulator pump HPY to develop operating hour estimates for the hydronic heating application. For the residential sector, this scaling factor was 0.33 HPY/HDD. (Docket No. EERE–2016–BT–STD–0004, No. 100 at pp. 54, 108). For the commercial sector, the CPWG recommended a scaling factor of 0.45 HPY/HDD. (Docket No. EERE–2016–BT–STD–0004, No. 100 at pp. 122–123). These scaling factors were used to develop distributions of circulator pump operating hours across the consumer samples. The weighted average HPY for the hydronic heating application were estimated at approximately 1,970 and 2,200 for the residential and commercial sector, respectively.

For circulator pumps used in hot water recirculation applications, the CPWG agreed to HPY estimates based on their associated control types (Docket No. EERE–2016–BT–STD–0004, No. 60 at p. 74), as shown in Table III.3.

[12] For more information on the Ithaca, NY study, see *https://www.nrel.gov/docs/fy14osti/60200.pdf.*

TABLE III.3—CIRCULATOR PUMP OPERATING HOURS IN HOT WATER RECIRCULATION

Control type	Sector	Fraction of consumers	HPY	Notes
No Control	Residential Commercial	50%	8,760	Constant Operation.
Timer	Residential	25%	7,300	50% operate constantly and 50% operate 16 hours/day.
	Commercial		6,570	50% operate constantly and 50% operate 12 hours/day.
Aquastat	Residential Commercial	20%	1,095	3 hours per day.
On Demand *	Residential	5%	61	10 minutes per day *.
	Commercial		122	20 minutes per day *.

* Assuming that circulator pumps operate for 30 seconds for each demand "push"

DOE requests information on any updated or recent data sources, such as circulator pump field metering studies, to inform and validate the circulator pump operating hours in the residential and commercial sectors and across all applications. DOE also requests comment on whether there have been any technology or market changes since the term sheet to warrant a different approach on the circulator pump operating hours.

DOE requests input on the operating hours for SVIL pumps by sector and application, and specifically, whether a similar approach should be followed for SVIL pumps, as the one used to estimate operating hours for circulator pumps.

F. Life-Cycle Cost and Payback Period Analyses

DOE conducts the LCC and PBP analyses to evaluate the economic effects of potential energy conservation standards for circulator pumps and SVIL pumps on individual customers. For any given efficiency level, DOE measures the PBP and the change in LCC relative to an estimated baseline level. The LCC is the total customer expense over the life of the equipment, consisting of purchase, installation, and operating costs (expenses for energy use, maintenance, and repair). Inputs to the calculation of total installed cost include the cost of the equipment—which includes the MSP, distribution channel markups, and sales taxes—and installation costs. Inputs to the calculation of operating expenses include annual energy consumption, energy prices and price projections, repair and maintenance costs, equipment lifetimes, discount rates, and the year that compliance with new and amended standards is required.

DOE measures savings of potential standards relative to a "no-new-standards" case that reflects conditions without new and/or amended standards, and uses efficiency market shares to characterize the "no-new-standards" case equipment mix. By accounting for consumers who already purchase more efficient equipment, DOE avoids overstating the potential benefits from potential standards. For circulator pumps, the CPWG reviewed the market efficiency distribution for circulator pumps by efficiency level, circulator variety (*e.g.,* CP1, CP2, CP3), horsepower rating, and application. The data used to develop the no-new-standards case were confidential manufacturer shipments data from 2015. Table III.4 shows the no-new-standards efficiency distribution in 2015, as agreed by the CPWG. (Docket No. EERE–2016–BT–STD–0004, No. 99 at pp. 206–208). Note that due to confidentiality concerns, the actual market shares are not shown, and instead market availability is depicted by 'X'.

Table III.4 Circulator Pump Efficiency Distribution in 2015

Application	Efficiency Level	1/40 hp			1/25 hp			1/6 hp			1 hp		
		CP1	CP2	CP3	CP1	CP2	CP3	CP1	CP2	CP3	CP1	CP2	CP3
Heating	EL0	X			X		X	X	X	X	X		X
	EL1	X			X	X		X	X	X	X		X
	EL2									X			X
	EL3				X			X		X	X		
	EL4	X			X			X			X		
Hot Water Recirculation	EL0	X			X		X	X	X	X	X		X
	EL1	X			X	X		X	X	X			X
	EL2	X			X								
	EL3	X			X			X			X		
	EL4*												

*The CPWG agreed that EL4 was not viable for circulator pumps used in hot water recirculation.

DOE requests feedback and data on whether any changes in the circulator pump market since 2015 have affected the market efficiency distribution of circulator pumps, and if so, how. DOE also requests information on the current efficiency distribution of SVIL pumps.

DOE requests data and information on the installation costs of SVIL pumps, and whether those vary by motor type, control type, or any other factor affecting their efficiency. DOE also requests input on SVIL repair and maintenance costs and frequencies, and SVIL lifetimes, including average and maximum service lifetimes.

G. Shipments

DOE develops shipments forecasts of equipment to calculate the national impacts of potential amended energy conservation standards on energy consumption, net present value (''NPV''), and future manufacturer cash flows. DOE shipments projections are typically based on available historical data broken out by equipment class, capacity, and efficiency. Current sales estimates allow for a more accurate model that captures recent trends in the market.

For circulator pumps, DOE utilized manufacturer-provided confidential historical shipments data up to the year 2015 to estimate future circulator pump shipments, which were broken down by circulator pump variety (CP1, CP2, CP3), horsepower rating, and circulator pump housing material.

DOE requests circulator pump annual sales data (*i.e.,* number of shipments) from 2016 to 2020 broken out by circulator pump category, horsepower rating, and circulator pump housing material. If disaggregated fractions of annual sales are not available, DOE requests more aggregated fractions of annual sales. DOE also requests annual historical shipments data for SVILs for the past 10 years, if possible disaggregated by horsepower rating, motor type, housing material, or any other differentiating factor used in the industry.

To project future shipments, DOE typically uses new housing starts projections and floorspace projections from the Annual Energy Outlook (AEO) as market drivers for the residential and commercial sectors, respectively. In addition to the aforementioned drivers, for hydronic heating applications in the residential sector, the CPWG also agreed to utilize Department of Commerce historical data (from 1973 to 2015), which showed a declining saturation for new construction. Based on these inputs and resulting projections, the CPWG agreed that circulator pump shipments would remain constant at approximately 1.8 million units per year throughout the analysis period (2022–2051). (Docket No. EERE–2016–BT–STD–0004, No. 100 at pp. 19–21).

To project future shipments of circulator pumps, DOE plans to utilize the market drivers and saturation trends agreed by the CPWG and to update the data sources with the most current ones, if available.

DOE requests information on any market changes since 2015 that would justify using market drivers and saturation trends that are different than those recommended by the CPWG. DOE also requests input on the market drivers and saturation trends that would help project shipments for SVIL pumps.

H. Manufacturer Impact Analysis

The purpose of the manufacturer impact analysis (''MIA'') is to estimate the financial impact of amended energy conservation standards on manufacturers of circulator pumps, and to evaluate the potential impact of such standards on direct employment and manufacturing capacity. The MIA includes both quantitative and qualitative aspects. The quantitative part of the MIA primarily relies on the Government Regulatory Impact Model (''GRIM''), an industry cash-flow model adapted for each product in this analysis, with the key output of industry net present value (''INPV''). The qualitative part of the MIA addresses the potential impacts of energy conservation standards on manufacturing capacity and industry competition, as well as factors such as product characteristics, impacts on particular subgroups of firms, and important market and product trends.

As part of the MIA, DOE intends to analyze impacts of amended energy conservation standards on subgroups of manufacturers of covered equipment, including small business manufacturers. DOE uses the Small Business Administration's (''SBA'') small business size standards to determine whether manufacturers qualify as small businesses, which are listed by the applicable North American Industry Classification System (''NAICS'') code.[13] Manufacturing of circulator pumps is classified under NAICS 333914, ''Measuring, Dispensing, and Other Pumping Equipment Manufacturing,'' and the SBA sets a threshold of 750 employees or less for a domestic entity to be considered as a small business. This employee threshold includes all employees in a business' parent company and any other subsidiaries.

One aspect of assessing manufacturer burden involves examining the cumulative impact of multiple DOE standards and the product-specific regulatory actions of other Federal agencies that affect the manufacturers of a covered product or equipment. While any one regulation may not impose a significant burden on manufacturers, the combined effects of several existing or impending regulations may have serious consequences for some manufacturers, groups of manufacturers, or an entire industry. Assessing the impact of a single regulation may overlook this cumulative regulatory burden. In addition to energy conservation standards, other regulations can significantly affect manufacturers' financial operations. Multiple regulations affecting the same manufacturer can strain profits and lead companies to abandon product lines or markets with lower expected future returns than competing products. For these reasons, DOE conducts an analysis of cumulative regulatory burden as part of its rulemakings pertaining to appliance efficiency.

To the extent feasible, DOE seeks the names and contact information of any domestic or foreign-based manufacturers that distribute circulator pumps or SVILs in the United States.

DOE identified small businesses as a subgroup of manufacturers that could be disproportionally impacted by amended energy conservation standards. DOE requests the names and contact information of small business manufacturers, as defined by the SBA's size threshold, of circulator pumps or SVILs that manufacture products in the United States. In addition, DOE requests comment on any other manufacturer subgroups that could be disproportionally impacted by amended energy conservation standards. DOE requests feedback on any potential approaches that could be considered to address impacts on manufacturers, including small businesses.

DOE requests information regarding the cumulative regulatory burden impacts on manufacturers of circulator pumps and SVILs associated with (1) other DOE standards applying to different products that these manufacturers may also make and (2) product-specific regulatory actions of other Federal agencies. DOE also requests comment on its methodology for computing cumulative regulatory burden and whether there are any flexibilities it can consider that would reduce this burden while remaining consistent with the requirements of EPCA.

I. Other Issues

The CPWG analyzed four ELs (ELs 1 through 4) as potential standard levels for circulator pumps.[14] The CPWG recommended standard level #2 as the

[13] Available online at *https://www.sba.gov/document/support--table-size-standards.*

[14] The CPWG did not analyze SVILs, therefore no standard levels were considered.

proposed standard level, with a compliance date of four years following the publication of a circulator pumps final rule. (Docket No. EERE–2016–BT–STD–0004, No. 98 Recommendation #1 at p. 1).

DOE requests comment on whether there have been any market or technology changes since publication of the 2016 Term Sheets that would make the CPWG's EL 2 recommendation no longer valid.

IV. Submission of Comments

DOE invites all interested parties to submit in writing by the date specified under the **DATES** heading, comments and information on matters addressed in this RFI and on other matters relevant to DOE's consideration of test procedures and energy conservation standards for circulator pumps and small vertical in-line pumps. These comments and information will aid in the development of test procedure and energy conservation standards NOPRs for circulator pumps and small vertical in-line pumps if DOE determines that amended test procedures may be appropriate for this equipment.

Submitting comments via http://www.regulations.gov. The *http://www.regulations.gov* web page 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 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. Following this instruction, 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 *http://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 *http://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 *http://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 *http://www.regulations.gov* provides after you have successfully uploaded your comment.

Submitting comments via email. Comments and documents submitted via email also will be posted to *http://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 on 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. Faxes will not 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, written in English and 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. According 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).

DOE considers public participation to be a very important part of the process for developing test procedures and energy conservation standards. DOE actively encourages the participation and interaction of the public during the comment period in each stage of this process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in the process. Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this process should contact Appliance and Equipment Standards Program staff at (202) 287–1445 or via email at *ApplianceStandardsQuestions@ee.doe.gov.*

A. Issues on Which DOE Seeks Comment

Although DOE welcomes comments on any aspect of this proposal, DOE is particularly interested in receiving comments and views of interested parties concerning the following issues:

(1) DOE requests comment on the CPWG's recommended definitions for wet rotor circulator pump; dry rotor, two-piece circulator pump; dry rotor, three-piece circulator pump; and horizontal motor. Specifically, DOE requests comment regarding whether changes in the market since the CPWG's recommendation would affect the recommended definitions and scope.

(2) DOE requests comment regarding whether the market changes in the intervening years since the CPWG's recommendation of a definition for ''header pump'' warrant modification of that recommended definition.

(3) DOE requests comment regarding the CPWG-recommended definition of ''on-demand circulator pump'' and whether it is appropriate to retain on-demand circulator pumps within the scope of future analysis.

(4) DOE seeks comment and feedback on the scope and definitions recommended by the CPWG, including whether anything has changed in the market since the conclusion of the

CPWG that would impact the recommended scope and definitions for SVIL pumps.

(5) DOE seeks feedback and information regarding whether it may be appropriate to include SVIL pumps in the circulator pumps rulemaking, in the commercial and industrial pumps rulemaking, or in a separate rulemaking.

(6) DOE seeks comment regarding any other topics related to scope and definitions for circulator pumps and SVIL pumps.

(7) DOE requests comment on the CPWG recommendation to adopt PEI_{CIRC} as the metric to characterize the energy use of certain circulator pumps and on the recommended equation for PEI_{CIRC}, including whether anything in the technology or market has changed since publication of the 2016 Term Sheets that would lead to this metric no longer being appropriate.

(8) DOE requests comment on the recommended definitions for manual speed control, pressure control, adaptive pressure control, temperature control, and external input signal control. Additionally, DOE requests comment on a possible definition for adaptive pressure control.

(9) DOE requests comment on whether any additional control variety is now currently on the market and if it should be considered in this rulemaking.

(10) DOE requests comment on whether the CPWG-recommended reference system curve shape, including the static offset, is reasonable for circulator pumps.

(11) DOE requests comment on the recommended test methods, test points, and weights for circulator pumps with pressure controls, including circulator pumps with adaptive pressure controls. Specifically, DOE requests comment on whether the technology or market for such controls has changed sufficiently since the term sheet to warrant a different approach.

(12) DOE requests comment on the recommended test methods, test points, and weights for circulator pumps with temperature controls. Specifically, DOE requests comment on whether the technology or market for such controls has changed sufficiently since the term sheet to warrant a different approach.

(13) DOE requests comment on the CPWG-recommended test method and the unique test points, weights, and speed factors for circulator pumps distributed in commerce with manual speed controls. Specifically, DOE requests comment on whether the technology or market for such controls has changed sufficiently since the term sheet to warrant a different approach.

(14) DOE requests comment on the CPWG-recommended test method for circulator pumps distributed in commerce with only external input signal controls, as well as for those distributed in commerce with external input signal controls in addition to other control varieties. Specifically, DOE requests comment on whether the technology or market for such controls has changed sufficiently since the term sheet to warrant a different approach.

(15) DOE requests comment on the CPWG-recommended test methods, test points, and weights for circulator pumps with no controls.

(16) DOE seeks comment and feedback on whether HI 40.6–2016 or HI 40.6–2021 is an appropriate test method for conducting wire-to-water testing of circulator pumps, as recommended by the CPWG. In addition, DOE seeks comment on whether the modifications in HI 40.6–2016 and/or HI 40.6–2021 adequately capture the CPWG recommended modifications in Recommendation #10.

(17) DOE seeks comment on whether the recommendations for twin-head circulator pumps and circulators-less-volute have been adequately addressed in HI 40.6–2021.

(18) DOE requests comment on the recommendation to test SVIL pumps with the test methods in the general pumps test procedure and additional provisions to account for the differences in size and characteristics of SVIL pump motors. In particular, DOE requests comment on the potential extension of the nominal full load motor efficiency values to reference DOE's small electric motor regulations, including certain single-phase motors, and the need for an exception for SVIL pumps so that those sold with single-phase motors do not have to be rated as bare pumps.

(19) DOE also requests comment on the prevalence of SVIL pumps sold with single-phase versus three-phase motors, and the prevalence of SVIL pumps sold with motors not covered by DOE's small electric motors and electric motors energy conservation standards for either single- or three-phase motors.

(20) DOE also requests comment on whether the equations used to establish the part load motor and drive losses in the general pumps test procedure are appropriate for SVIL pumps under one horsepower. If inappropriate, DOE requests data supporting the generation of alternative loss curves.

(21) DOE seeks comment on whether establishing a standard for circulator pumps and SVIL pumps would be cost-effective, economically justified, technologically feasible, or would result in a significant savings of energy.

(22) DOE requests comment regarding the CPWG recommendation to include all circulator pumps within a single equipment class, especially regarding interim market changes since the recommendation that may warrant changes to that recommendation. DOE additionally seeks comment regarding whether the same recommendations should apply to SVIL pumps.

(23) DOE seeks information on the technologies listed in Table III.1 regarding their applicability to the current market and how these technologies may impact the efficiency of circulator pumps as measured according to the DOE test procedure. Specifically, DOE seeks information on the range of efficiencies or performance characteristics that are currently available for each technology option.

(24) DOE seeks information on the technologies listed in Table III.1 regarding their market adoption, costs, and any concerns with incorporating them into products (*e.g.,* impacts on consumer utility, potential safety concerns, manufacturing/production/implementation issues, etc.).

(25) DOE seeks comment on other technology options that it should consider for inclusion in its analysis and if these technologies may impact product features or consumer utility.

(26) DOE requests feedback on what impact, if any, the five screening criteria described in this section would have on each of the technology options listed in Table III.1 with respect to circulator pumps. Similarly, DOE seeks information regarding how these same criteria would affect any other technology options not already identified in this document with respect to their potential use in circulator pumps.

(27) DOE requests feedback on appropriate baseline efficiency levels for DOE to apply to each equipment class in evaluating whether to establish energy conservation standards for these products.

(28) DOE requests feedback on the appropriate baseline efficiency levels for any newly analyzed equipment classes that are not currently in place or for the contemplated combined equipment classes, as discussed in section III.A.1 of this document. For newly analyzed equipment classes, DOE requests energy use data to characterize the baseline efficiency level.

(29) DOE seeks input on whether the maximum available efficiency levels are appropriate and technologically feasible for potential consideration as possible energy conservation standards for circulator pumps—and if not, why not.

(30) DOE also requests feedback on which maximum efficiencies are representative of those for the other circulator pumps not included within the scope of the Term Sheets. If the range of possible efficiencies is different for such other equipment, what alternative approaches should DOE consider using for those equipment classes and why?

(31) DOE seeks feedback on what design options would be incorporated at a max-tech efficiency level, and the efficiencies associated with those levels. As part of this request, DOE also seeks information as to whether there are limitations on the use of certain combinations of design options.

(32) DOE requests feedback on whether, and if so how, manufacturers would incorporate the technology options listed in Table III.1 to increase energy efficiency in circulator pumps beyond the baseline. This includes information in which manufacturers would incorporate the different technologies to incrementally improve the efficiencies of products. DOE also requests feedback on whether the increased energy efficiency would lead to other design changes that would not occur otherwise. DOE is also interested in information regarding any potential impact of design options on a manufacturer's ability to incorporate additional functions or attributes in response to consumer demand.

(33) DOE also seeks input on the increase in MPC associated with incorporating each particular design option. DOE also requests information on the investments necessary to incorporate specific design options, including, but not limited to, costs related to new or modified tooling (if any), materials, engineering and development efforts to implement each design option, and manufacturing/production impacts.

(34) DOE requests comment on whether certain design options may not be applicable to (or incompatible with) specific equipment classes.

(35) DOE requests feedback on what manufacturer markups are appropriate for non-built-in and built-in products, respectively.

(36) DOE requests information on whether there have been market changes since the CPWG that would affect the distribution channels and the percentage of circulator pump shipments in each channel and sector, as shown in Table III.2, and if so, how such market changes would affect the circulator pump distribution channels. DOE also requests information on whether the same distribution channels and associated breakdowns across sectors apply for SVIL pumps, and if not, DOE requests relevant data on the SVIL distribution channels and their market shares.

(37) DOE requests data and information on whether the breakdowns of circulator pumps by sector and application have changed since the CPWG proceedings, and if so, how. DOE also requests information on the market applications of SVIL pumps and how those are broken down by sector.

(38) DOE requests feedback on whether there have been market changes since the CPWG meetings that would warrant a different estimate of the fraction of circulator pumps sold with on-demand controls, and if so, what that fraction is.

(39) DOE requests information on any updated or recent data sources, such as circulator pump field metering studies, to inform and validate the circulator pump operating hours in the residential and commercial sectors and across all applications. DOE also requests comment on whether there have been any technology or market changes since the term sheet to warrant a different approach on the circulator pump operating hours.

(40) DOE requests input on the operating hours for SVIL pumps by sector and application, and specifically, whether a similar approach should be followed for SVIL pumps, as the one used to estimate operating hours for circulator pumps.

(41) DOE requests feedback and data on whether any changes in the circulator pump market since 2015 have affected the market efficiency distribution of circulator pumps, and if so, how. DOE also requests information on the current efficiency distribution of SVIL pumps.

(42) DOE requests data and information on the installation costs of SVIL pumps, and whether those vary by motor type, control type, or any other factor affecting their efficiency. DOE also requests input on SVIL repair and maintenance costs and frequencies, and SVIL lifetimes, including average and maximum service lifetimes.

(43) DOE requests circulator pump annual sales data (*i.e.,* number of shipments) from 2016 to 2020 broken out by circulator category, horsepower rating, and circulator housing material. If disaggregated fractions of annual sales are not available, DOE requests more aggregated fractions of annual sales. DOE also requests annual historical shipments data for SVILs for the past 10 years, if possible disaggregated by horsepower rating, motor type, housing material, or any other differentiating factor used in the industry.

(44) DOE requests information on any market changes since 2015 that would justify using market drivers and saturation trends that are different than those recommended by the CPWG. DOE also requests input on the market drivers and saturation trends that would help project shipments for SVIL pumps.

(45) To the extent feasible, DOE seeks the names and contact information of any domestic or foreign-based manufacturers that distribute circulator pumps or SVILs in the United States.

(46) DOE identified small businesses as a subgroup of manufacturers that could be disproportionally impacted by amended energy conservation standards. DOE requests the names and contact information of small business manufacturers, as defined by the SBA's size threshold, of circulator pumps or SVILs that manufacture products in the United States. In addition, DOE requests comment on any other manufacturer subgroups that could be disproportionally impacted by amended energy conservation standards. DOE requests feedback on any potential approaches that could be considered to address impacts on manufacturers, including small businesses.

(47) DOE requests comment on whether there have been any market or technology changes since publication of the 2016 Term Sheets that would make the CPWG's EL 2 recommendation no longer valid.

Signing Authority

This document of the Department of Energy was signed on April 27, 2021, by Kelly Speakes-Backman, Principal Deputy Assistant Secretary and Acting 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 April 28, 2021.

Treena V. Garrett,

Federal Register Liaison Officer, U.S. Department of Energy.

[FR Doc. 2021–09242 Filed 5–6–21; 8:45 am]

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