6450-01-P

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 431

[Docket Number EERE-2016-BT-TP-0002]

RIN 1904-AD66

Energy Conservation Program: Test Procedure for Dedicated-Purpose Pool Pumps

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

ACTION: Notice of proposed rulemaking and announcement of public meeting.

SUMMARY: The U.S. Department of Energy (DOE) proposes to establish new definitions, a new test procedure for dedicated-purpose pool pumps, new sampling and rating requirements, and new enforcement provisions for such equipment. Specifically, DOE proposes a test procedure for measuring the weighted energy factor (WEF) for certain varieties of dedicated-purpose pool pumps. The proposed test method incorporates by reference certain sections of the industry test standard Hydraulic Institute (HI) 40.6–2014, "Methods for Rotodynamic Pump Efficiency Testing." The proposed definitions, test procedures, certification requirements, enforcement testing procedures, and labeling provisions are based on the recommendations of the dedicated-purpose pool pump (DPPP) Working Group, which was established under the Appliance Standards Rulemaking Federal Advisory Committee (ASRAC).

DATES: DOE will hold a public meeting on Monday, September 26, 2016 from 10:00 a.m. to 2:00 p.m., in Washington, DC. The meeting will also be broadcast as a webinar. See section V, "Public Participation," for webinar registration information, participant instructions, and information about the capabilities available to webinar participants.

DOE will accept comments, data, and information regarding this notice of proposed rulemaking (NOPR) before and after the public meeting, but no later than [**INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**]. See section V, "Public Participation," for details.

ADDRESSES: The public meeting will be held at the U.S. Department of Energy, Forrestal Building, Room 4A-104, 1000 Independence Avenue, SW., Washington, DC 20585. To attend, please notify the Appliance and Equipment Standards staff at (202) 586-6636 or Appliance_Standards_Public_Meetings@ee.doe.gov.

Any comments submitted must identify the Test Procedure NOPR for dedicated-purpose pool pumps, and provide docket number EERE-2016-BT-TP-0002 and/or regulatory information number (RIN) number 1904-AD66. Comments may be submitted using any of the following methods:

1) Federal eRulemaking Portal: www.regulations.gov. Follow the instructions for submitting comments.

2) E-mail: DPPP2016TP0002@ee.doe.gov. Include the docket number and/or RIN in the subject line of the message.
3) Mail: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.
4) Hand Delivery/Courier: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., 6th Floor, Washington, DC, 20024. Telephone: (202) 586-6636. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

For detailed instructions on submitting comments and additional information on the rulemaking process, see section V of this document ("Public Participation").

Docket: The docket, which includes Federal Register notices, public meeting attendee lists and transcripts, comments, and other supporting documents/materials, is available for review at regulations.gov. All documents in the docket are listed in the 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.

A link to the docket webpage can be found at: https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=67. This webpage will contain a link to the docket for this document on the regulations.gov site. The regulations.gov webpage will contain simple instructions on how to access all documents, including public comments, in the docket. See section V for information on how to submit comments through regulations.gov.

FOR FURTHER INFORMATION CONTACT:

Ms. Ashley Armstrong, 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) 586-6590. E-mail: ashley.armstrong@ee.doe.gov.

Johanna Jochum, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-6307. E-mail: Johanna.Jochum@ee.doe.gov.

For further information on how to submit a comment, review other public comments and the docket, or participate in the public meeting, contact the Appliance and Equipment Standards Program staff at (202) 586-6636 or by e-mail: Appliance_Standards_Public_Meetings@ee.doe.gov.

SUPPLEMENTARY INFORMATION: DOE proposes to update the incorporation by reference or newly incorporate by reference the following industry standards into 10 CFR part 431:

(1) Hydraulic Institute (HI) 40.6–2014, ("HI 40.6–2014") "Methods for Rotodynamic Pump Efficiency Testing," except for section 40.6.4.1, "Vertically suspended pumps"; section 40.6.4.2, "Submersible pumps"; section 40.6.5.3, "Test report"; section 40.6.5.5.2, "Speed of rotation during testing"; section 40.6.6.1, "Translation of test results to rated speed of rotation"; Appendix A, section A.7, "Testing at temperatures exceeding 30 °C (86 °F)"; and Appendix B, "Reporting of test results (normative)" copyright 2014.

Copies of HI 40.6–2014 can be obtained from: the Hydraulic Institute at 6 Campus Drive, First Floor North, Parsippany, NJ 07054-4406, (973) 267-9700, or by visiting www.pumps.org.

(2) UL 1081, ("ANSI/UL 1081–2014"), "Standard for Swimming Pool Pumps, Filters, and Chlorinators," 6th Edition, January 29, 2008, including revisions through March 18, 2014.

Copies of American National Standards Institute (ANSI)/UL 1081–2014 can be obtained from: UL, 333 Pfingsten Road, Northbrook, IL 60062, (847) 272-8800, or by visiting http://ul.com.

(3) National Electrical Manufacturers Association (NEMA) MG-1 2014, "Motors and Generators," 2014, section 1.19, "Polyphase Motors"; section 10.34, "Basis of Horsepower Rating"; section 10.62, "Horsepower, Speed, and Voltage Ratings"; 12.30, "Test Methods"; section 12.35, "Locked-Rotor Current of 3-Phase 60-Hz Small and Medium Squirrel-Cage Induction Motors Rated at 230 Volts"; section 12.37, "Torque Characteristics of Polyphase Small Motors"; 12.38, "Locked-Rotor Torque of Single-Speed Polyphase Squirrel-Cage Medium Motors with Continuous Ratings"; section 12.39, "Breakdown Torque of Single-speed Polyphase Squirrel-Cage Medium Motors with Continuous Ratings"; and section 12.40, "Pull-Up Torque of Single-Speed Polyphase Squirrel-Cage Medium Motors with Continuous Ratings."

Copies of NEMA MG-1–2014 can be obtained from: NEMA, 1300 North 17th Street, Suite 900, Rosslyn, VA, 22209, (703) 841-3200, or by visiting www.nema.org.

(4) NSF International (NSF)/ANSI Standard 50–2015, ("NSF/ANSI 50–2015"), "Equipment for Swimming Pools, Spas, hot Tubs and Other Recreational Water Facilities," approved January 26, 2015, section C.3, "self-priming capability," of Annex C, "Test methods for the evaluation of centrifugal pumps."

Copies of NSF/ANSI 50–2015 can be obtained from: NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105, (743) 769-8010, or by visiting www.nsf.org.

Also, this material is available for inspection at U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, Sixth Floor, 950 L'Enfant Plaza, SW., Washington, DC 20024, (202) 586-6636, or go to www1.eere.energy.gov/buildings/appliance_standards/.

See section IV.N for additional information on these standards.

Table of Contents

I. Authority and Background

Pumps are included in the list of "covered equipment" for which the U.S. Department of Energy (DOE) is authorized to establish and amend energy conservation standards (ECSs) and test procedures (TPs). (42 U.S.C. 6311(1)(A)) Dedicated-purpose pool pumps (DPPP), which are the subject of this rulemaking, are a subset of pumps and, thus, DOE is authorized to establish test procedures and energy conservation standards for them. Recently, DOE published in the Federal Register two final rules establishing new energy conservation standards and a test procedure for commercial and industrial pumps. 81 FR 4368 (Jan. 26, 2016) and 81 FR 4086 (January 25, 2016), respectively. However, dedicated-purpose pool pumps were specifically excluded from those final rules because, based on recommendations of the industry and DOE's own analysis, DOE determined that dedicated-purpose pool pumps have a unique application and equipment characteristics that merit a separate analysis. As a result, there currently are no Federal energy conservation standards or a test procedure for dedicated-purpose pool pumps. The following sections discuss DOE's authority to establish a test procedure for dedicated-purpose pool pumps and relevant background information regarding DOE's consideration of establishing Federal regulations for this equipment.

A. Authority

The Energy Policy and Conservation Act of 1975 (EPCA), Public Law 94-163, as amended by Public Law 95-619, Title IV, Sec. 441(a), established the Energy Conservation Program for Certain Industrial Equipment under Title III, Part C (42 U.S.C.

6311-6317, as codified).[1,2] "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)) To address this issue, DOE defined "pump" in a test procedure final rule (January 2016 general pumps TP final rule) 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. 81 FR 4086 (Jan. 25, 2016). Dedicated-purpose pool pumps, which are the subject of this notice of proposed rulemaking (NOPR), meet this definition of a pump and are covered under the pump equipment type. However, DOE has not yet established a test procedure or standards applicable to dedicated-purpose pool pumps (section I.B).

Under EPCA, the energy conservation program consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. The 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 under EPCA (42 U.S.C. 6295(s) and 6316(a)(1)), and (2) making representations about the energy consumption of that equipment. (42 U.S.C. 6314(d)) Similarly, DOE must

[1] For editorial reasons, upon codification in the U.S. Code, Part C was re-designated Part A-1.
[2] All references to EPCA in this document refer to the statute as amended through the Energy Efficiency Improvement Act of 2015, Public Law 114-11 (April 30, 2015).

use these test procedures to determine whether the equipment complies with any relevant standards promulgated under EPCA.

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

In addition, before prescribing any final test procedures, DOE must publish proposed test procedures and offer the public an opportunity to present oral and written comments on them. (42 U.S.C. 6314(b)(1)-(2))

DOE is authorized to prescribe energy conservation standards and corresponding test procedures for covered equipment such as dedicated-purpose pool pumps. Although DOE is currently evaluating whether to establish energy conservation standards for dedicated-purpose pool pumps (Docket No. EERE-2015-BT-STD-0008), DOE must first establish a test procedure that measures the energy use, energy efficiency, or estimated operating costs of a given type of covered equipment before establishing any new energy conservation standards for that equipment. See, generally, 42 U.S.C. 6295(o) and 6316(a).

To fulfill these requirements, in this NOPR, DOE proposes to establish a test procedure for dedicated-purpose pool pumps in advance of the finalization of the ongoing ECS rulemaking for this equipment. (See Docket No. EERE-2015-BT-STD-0008.) The test procedure proposed in this NOPR includes the methods necessary to: (1) measure the performance of the covered equipment, (2) use the measured results to calculate the weighted energy factor (WEF) to represent the energy consumption of the dedicated-purpose pool pump, inclusive of a motor and any controls, and (3) determine the minimum test sample (i.e., number of units) and permitted range of represented values. In this NOPR, DOE also proposes to set the scope of those dedicated-purpose pool pumps to which the proposed test methods would apply.

If adopted, manufacturers would be required to use the DPPP test procedure and metric when making representations regarding the WEF (section III.B.2 for more information) of covered equipment beginning 180 days after the publication date of any DPPP TP final rule establishing such procedures. All representations of energy factor (EF),[3] overall (wire-to-water) efficiency, driver power input, nominal motor horsepower,[4] total horsepower, service factor, pump power output (hydraulic horsepower), and true power factor (PF) must be based on testing in accordance with the new DPPP test

[3] Energy Factor (EF) is a metric that is common in the DPPP industry and which describes the quantity of water provided by a dedicated-purpose pool pump over the input power required to pump that amount of water in units of gallons per watt-hour (gal/Wh). EF is described in more detail in section 0 and the relevant test methods for determining EF are described in section 0 and 0.

[4] In this NOPR, DOE proposes specific test methods and metrics applicable to nominal motor horsepower, total horsepower, service factor, and hydraulic horsepower of dedicated-purpose pool pumps. See section 0 for a discussion of the different horsepower metrics applicable to dedicated-purpose pool pumps and the proposed testing and labeling requirements applicable to these metrics.

procedure beginning 180 days after the publication date of a final rule in the Federal Register. See 42 U.S.C. 6314(d). However, DOE notes that certification of compliance with any energy conservation standards for dedicated-purpose pool pumps would not be required until the compliance date of any final rule establishing energy conservation standards applicable to this equipment. (See Docket No. EERE-2015-BT-STD-0008.)

B. Background

Dedicated-purpose pool pumps are a style of pump for which DOE has not yet established a test procedure or energy conservation standards. Although DOE recently completed final rules establishing energy conservation standards (81 FR 4368 (Jan. 26, 2016); January 2016 general pumps ECS final rule) and a test procedure (81 FR 4086 ((Jan. 25, 2016); January 2016 general pumps TP final rule) for certain categories and configurations of pumps, DOE declined in those rules to establish any requirements applicable to dedicated-purpose pool pumps because of their different equipment characteristics and applications. 81 FR 4086, 4094 (Jan. 25, 2016). Specifically, in the January 2016 general pumps TP and ECS final rules, DOE established relevant definitions, test procedures, and energy conservation standards for end suction close-coupled (ESCC); end suction frame mounted/own bearings (ESFM); in-line (IL); radially split, multi-stage, vertical, in-line diffuser casing (RSV); and submersible turbine (ST) pumps with the following characteristics:

- 25 gallons per minute (gpm) and greater (at best efficiency point (BEP) at full impeller diameter);

- 459 feet of head maximum (at BEP at 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 (HI VS0);
- a clean water pump;[5] and
- not a fire pump,[6] a self-priming pump,[7] a prime-assist pump,[8] a magnet driven pump,[9] a pump designed to be used in a nuclear facility subject to 10 CFR part 50,

[5] In the January 2016 general pumps TP final rule, DOE defined "clean water pump" as 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. 80 FR 4086, 4100 (Jan. 25, 2016).

[6] In the January 2016 general pumps TP final rule, DOE defined "fire pump" as a pump that is compliant with NFPA 20–2016, "Standard for the Installation of Stationary Pumps for Fire Protection," and is either: (1) UL listed under ANSI/UL 448–2013, "Standard for Safety Centrifugal Stationary Pumps for Fire-Protection Service," or (2) FM Global (FM) approved under the January 2015 edition of FM Class Number 1319, "Approval Standard for Centrifugal Fire Pumps (Horizontal, End Suction Type)." 80 FR 4086, 4101 (Jan. 25, 2016).

[7] In the January 2016 general pumps TP final rule, DOE defined "self-priming pump" as a pump that is (1) is designed to lift liquid that originates below the centerline of the pump inlet; (2) contains at least one internal recirculation passage; and (3) requires a manual filling of the pump casing prior to initial start-up, but is able to re-prime after the initial start-up without the use of external vacuum sources, manual filling, or a foot valve. 80 FR 4086, 4147 (Jan. 25, 2016). This NOPR proposes to modify that definition. (See section 0.)

[8] In the January 2016 general pumps TP final rule, DOE defined "prime-assist pump" as a pump that (1) is designed to lift liquid that originates below the centerline of the pump inlet; (2) requires no manual intervention to prime or re-prime from a dry-start condition; and (3) includes a device, such as a vacuum pump or air compressor and venturi eductor, to remove air from the suction line in order to automatically

"Domestic Licensing of Production and Utilization Facilities"; or a pump meeting the design and construction requirements set forth in any relevant Military Specifications.[10]

The pumps for which standards and a test procedure were established in the January 2016 general pumps TP and ECS final rules will be hereafter collectively referred to as "general pumps" in this DPPP TP NOPR.

The January 2016 general pumps TP and ECS final rules were based on the recommendations of the Commercial and Industrial Pump (CIP) Working Group established through the Appliance Standards Rulemaking Federal Advisory Committee (ASRAC) to negotiate standards and a test procedure for general pumps. (Docket No. EERE-2013-BT-NOC-0039)[11] The CIP Working Group 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

---

perform the prime or re-prime function at any point during the pump's operating cycle. 80 FR 4086, 4147 (Jan. 25, 2016).

[9] In the January 2016 general pumps TP final rule, DOE defined "magnet driven pump" as a pump in which the bare pump is isolated from the motor via a containment shell and torque is transmitted from the motor to the bare pump via magnetic force. The motor shaft is not physically coupled to the impeller or impeller shaft. 80 FR 4086, 4147 (Jan. 25, 2016).

[10] 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 for review at http://everyspec.com/MIL-SPECS.

[11] Information on the ASRAC, the CIP Working Group, and meeting dates is available at http://energy.gov/eere/buildings/appliance-standards-and-rulemaking-federal-advisory-committee.

recommendations addressing issues related to the metric and test procedure for general pumps ("CIP Working Group recommendations").[12]

In the CIP Working Group recommendations, the Working Group formally recommended DOE initiate a separate rulemaking for dedicated-purpose pool pumps. (Docket No. EERE-2013-BT-NOC-0039, No. 92, Recommendation #5A at p. 2) Therefore, in the January 2016 general pumps TP final rule, DOE explicitly excluded dedicated-purpose pool pumps from the categories of pumps to which the test procedure and standards applied. 81 FR 4086, 4098–99 (Jan. 25, 2016). DOE also refrained from adopting a definition for dedicated-purpose pool pump and stated that DOE would define the term in the separate rule specifically addressing such equipment. Id.

To begin the separate rulemaking for dedicated-purpose pool pumps referenced in the January 2016 general pumps TP final rule (81 FR 4086, 4098–99 (Jan. 25, 2016)) and recommended by the CIP Working Group (Docket No. EERE-2013-BT-NOC-0039, No. 92, Recommendation #5A at p. 2), on May 8, 2015, DOE issued a Request for Information (RFI), hereafter referred to as the "May 2015 DPPP RFI." The May 2015 DPPP RFI presented information and requested public comment about any definitions, metrics, test procedures, equipment characteristics, and typical applications relevant to DPPP equipment. 80 FR 26475. In response to the May 2015 DPPP RFI, DOE received six written comments. The commenters included the Association of Pool and Spa

[12] The term sheet containing the Working Group recommendations is available in the CIP Working Group's docket. (Docket No. EERE-2013-BT-NOC-0039, No. 92)

Professionals (APSP); Pacific Gas and Electric Company (PG&E), Southern California Gas Company (SCG), Southern California Edison (SCE), and San Diego Gas and Electric Company (SDG&E), collectively referred to herein as the California Investor-Owned Utilities (CA IOUs); the Hydraulic Institute (HI); Ms. Newman; the National Electrical Manufacturers Association (NEMA); and River City Pool and Spa (River City).

In response to the May 2015 DPPP RFI, APSP, HI, and CA IOUs all encouraged DOE to pursue a negotiated rulemaking for dedicated-purpose pool pumps. (Docket. No. EERE-2015-BT-STD-0008, APSP, No. 10 at p. 2; HI, No. 8 at p. 2; CA IOUs, No. 11 at p. 2) Consistent with feedback from these interested parties, DOE began a process through the ASRAC to discuss conducting a negotiated rulemaking to develop standards and a test procedure for dedicated-purpose pool pumps as an alternative to the traditional notice and comment route that DOE had already begun. (Docket No. EERE-2015-BT-STD-0008) On August 25, 2015, DOE published a notice of intent to establish a negotiated rulemaking working group for dedicated-purpose pool pumps (as previously defined, the "DPPP Working Group") to negotiate, if possible, Federal standards for the energy efficiency of dedicated-purpose pool pumps and to announce the first public meeting. 80 FR 51483. The initial ASRAC charter allowed for 3 months of working group meetings to establish the scope, metric, definitions, and test procedure for dedicated-purpose pool pumps and reserved any discussion of standards to a later set of meetings once analysis had been conducted based on the framework established under the original charter. (Docket No. EERE-2013-BT-NOC-0005, No. 56 at p. 27) On October 15, 2015, DOE published a notice of public open meetings of the DPPP Working Group.

80 FR 61996. The members of the Working Group 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 Working Group. Table I.1 lists the 13 members of the DPPP Working Group and their affiliations.

Table I.1 ASRAC DPPP Working Group Members and Affiliations

Member	Affiliation	Abbreviation
John Caskey	National Electrical Manufacturers Association (and ASRAC representative)	NEMA
John Cymbalsky	U.S. Department of Energy	DOE
Kristin Driskell	California Energy Commission	CEC
Scott Durfee	Nidec Motor Corporation	Nidec
Jeff Farlow	Pentair Aquatic Systems	Pentair
Gary Fernstrom	California Investor-Owned Utilities (PG&E, SDG&E, SCG, and SCE)	CA IOUs
Patrizio Fumagalli	Bestway USA, Inc	Bestway
Paul Lin	Regal Beloit Corporation	Regal
Joanna Mauer	Appliance Standards Awareness Project	ASAP
Ray Mirza	Waterway	Waterway
Doug Philhower	Hayward Industries, Inc.	Hayward
Shajee Siddiqui	Zodiac Pool Systems, Inc	Zodiac
Meg Waltner	Natural Resources Defense Council	NRDC

The DPPP Working Group commenced negotiations at an open meeting on September 30 and October 1, 2015, and held three additional meetings to discuss scope, metrics, and the test procedure.[13] The DPPP Working Group concluded its negotiations on December 8, 2015, with a consensus vote to approve a term sheet containing recommendations to DOE on scope, metric, and the basis of the test procedure

[13] Details of the negotiations sessions can be found in the public meeting transcripts that are posted to the docket for the Working Group (www.regulations.gov/#!docketDetail;D=EERE-2015-BT-STD-0008).

("December 2015 DPPP Working Group recommendations").[14] The term sheet containing these recommendations is available in the DPPP Working Group docket. (Docket No. EERE-2015-BT-STD-0008, No. 51) ASRAC subsequently voted unanimously to approve the December 2015 DPPP Working Group recommendations during a January 20, 2016, meeting. (Docket No. EERE-2015-BT-STD-0008, No. 0052)

The December 2015 DPPP Working Group recommendations pertinent to the test procedure and standard metric are reflected in this NOPR. In addition to referring to the December 2015 DPPP Working Group recommendations, DOE also refers to discussions from the DPPP Working Group meetings regarding potential actions that were not formally approved. All references herein to approved recommendations include a citation to the December 2015 DPPP Working Group recommendations and are noted with the recommendation number (e.g., Docket No. EERE-2015-BT-STD-0008, No. #, Recommendation #X at p. Y). References herein to discussions or suggestions of the DPPP Working Group not found in the December 2015 DPPP Working Group recommendations include a citation to meeting transcripts and the commenter, if applicable (e.g., Docket No. EERE-2015-BT-STD-0008, [Organization], No. X at p. Y).

The DPPP Working Group also requested more time to discuss potential energy conservation standards for this equipment. On January 20, 2016, ASRAC met and

[14] The ground rules of the DPPP Working Group define consensus as no more than three negative votes. (Docket No. EERE-2015-BT-0008-0016 at p. 3) Concurrence was assumed absent overt dissent, evidenced by a negative vote. Abstention was not construed as a negative vote.

recommended that the DPPP Working Group continue its work to develop and recommend potential energy conservation standards for this equipment. (Docket No. EERE-2013-BT-NOC-0005, No. 71 at pp. 20–52) Those meetings commenced on March 21, 2016, (81 FR 10152, 10153) and concluded on June 23, 2016, with approval of a second term sheet (June 2016 DPPP Working Group recommendations) containing Working Group recommendations related to scope, definitions, energy conservation standards –performance standards or design requirements for various styles of pumps, applicable test procedure, and labeling for dedicated-purpose pool pumps. (Docket No. EERE-2015-BT-STD-0008, No. 82) The June 2016 DPPP Working Group recommendations also contained a non-binding recommendation regarding industry training for dedicated-purpose pool pump trades. (Docket No. EERE-2015-BT-STD-0008, No. 82, Non-Binding Recommendation #1 at p. 5) The proposed definitions, DPPP test procedure, sampling provisions, enforcement requirements, and labeling requirements contained in this NOPR reflect the suggestions of the DPPP Working Group made during these meetings, as well as the recommendations contained in the both the December 2015 and June 2016 DPPP Working Group recommendations.

DOE notes that many of those who submitted comments pertaining to the 2015 RFI later became members of the DPPP Working Group. As such, the concerns of these commenters were fully discussed as part of the meetings, and the positions of these commenters may have changed as a result of the compromises inherent in a negotiation. The proposals in this NOPR incorporate and respond to several issues and recommendations that were raised in response to the 2015 RFI. However, where an RFI

commenter became a member of the DPPP Working Group, DOE does not separately address comments made by that interested party regarding issues that were later discussed or negotiated in the DPPP Working Group. As a result, no comments are addressed twice. Table I.2 lists the RFI commenters as well as whether they participated in the DPPP Working Group.

Table I.2 List of RFI Commenters

Commenter	DPPP Working Group Member
Association of Pool and Spa Professionals	No
California Investor-Owned Utilities	Yes
Hydraulics Institute	No
Ms. Newman	No
National Electrical Manufacturers Association	Yes
River City Pool and Spa	No

II. Synopsis of the Notice of Proposed Rulemaking

In this TP NOPR, DOE proposes to amend subpart Y to 10 CFR part 431 to include definitions and a test procedure applicable to dedicated-purpose pool pumps. However, DOE proposes to establish a test procedure for only a specific subset of dedicated-purpose pool pumps. Specifically, this proposed test procedure would apply only to self-priming and non-self-priming pool filter pumps, waterfall pumps, and pressure cleaner booster pumps. The proposed test procedure would not apply to integral cartridge-filter pool pumps, integral sand-filter pool pumps, storable electric spa pumps, or rigid electric spa pumps. The proposed test procedure would be applicable to those varieties of pool pumps for which DOE is considering performance-based standards, as well as additional categories of dedicated-purpose pool pumps for which the DPPP

Working Group did not propose standards (see section III.A.6 for more information on the applicability of the proposed test procedure to different DPPP varieties). However, DOE notes that the scope of any energy conservation standards would be established in a separate ECS rulemaking for dedicated-purpose pool pumps. (Docket No. EERE-2015-BT-STD-0008) Manufacturers of dedicated-purpose pool pumps subject to this TP and the related ECS rulemaking would be required to use this DPPP test procedure when certifying compliance with any applicable standard and when making representations about the efficiency or energy use of their equipment. (42 U.S.C. 6314(d))

In this NOPR, DOE proposes a new metric, the weighted energy factor (WEF), to characterize the energy performance of dedicated-purpose pool pumps within the scope of this test procedure. WEF is determined as a weighted average of water flow rate over the input power to the dedicated-purpose pool pump at different load points, depending on the variety of dedicated-purpose pool pump and the number of operating speeds with which it is distributed in commerce. The proposed DPPP test procedure contains the methods for determining WEF for self-priming and non-self-priming pool filter pumps, waterfall pumps, and pressure cleaner booster pumps. In addition, the proposed DPPP test procedure contains a test method to determine the self-priming capability of pool filter pumps to effectively differentiate self-priming and non-self-priming pool filter pumps. Finally, the proposed DPPP test procedure contains optional methods for determining the WEF for replacement DPPP motors.

DOE's proposed test method includes measurements of flow rate and input power, both of which are required to calculate WEF, as well as other quantities to effectively characterize the rated DPPP performance (e.g., head, hydraulic output power, rotating speed). For consistent and uniform measurement of these values, DOE proposes to incorporate by reference the test methods established in HI 40.6–2014, "Methods for Rotodynamic Pump Efficiency Testing," with certain exceptions. DOE reviewed the relevant sections of HI 40.6–2014 and determined that HI 40.6–2014, in conjunction with the additional test methods and calculations proposed in this test procedure, would produce test results that reflect the energy efficiency, energy use, or estimated operating costs of a dedicated-purpose pool pump during a representative average use cycle. (42 U.S.C. 6314(a)(2)) DOE also reviewed the burdens associated with conducting the proposed test procedure, including HI 40.6–2014, and, based on the results of such analysis, found that the proposed test procedure would not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2)) DOE's analysis of the burdens associated with the proposed test procedure is presented in section IV.B.

This NOPR also proposes requirements regarding the sampling plan, certification requirements, and representations for covered dedicated-purpose pool pumps at subpart B of part 429 of title 10 of the Code of Federal Regulations. The sampling plan requirements are similar to those for several other types of commercial equipment and are appropriate for dedicated-purpose pool pumps based on the expected range of measurement uncertainty and manufacturing tolerances for this equipment (see section III.I.1 for more detailed information). As DOE's proposed DPPP test procedure contains

methods for calculating the EF, pump overall efficiency, PF, and other relevant quantities, DOE also proposes provisions regarding allowable representations of energy consumption, energy efficiency, and other relevant metrics manufacturers may make regarding DPPP performance (section III.E).

Starting on the compliance date for any energy conservation standards that DOE may set for dedicated-purpose pool pumps, all dedicated-purpose pool pumps within the scope of those standards would be required certified in accordance with the amended subpart Y of part 431 and the applicable sampling requirements. DOE is also proposing that, beginning on the compliance date of any energy conservation standards that DOE may set for dedicated-purposed pool pumps, certain information be reported to DOE on an annual basis as part of a certification of compliance with those standards (section III.I.2). Similarly, all representations regarding the energy efficiency or energy use of dedicated-purpose pool pumps for which this proposed DPPP test procedure should be made by testing in accordance with the adopted DPPP test procedure 180 days after the publication date of any TP final rule establishing such procedures. (42 U.S.C. 6314(d)(1)) DOE understands that manufacturers of dedicated-purpose pool pumps likely have historical test data (e.g., existing pump curves) that were developed with methods consistent with the DOE test procedure being proposed. As DOE understands that the proposed DPPP test procedure is based on the same testing methodology used to generate most existing pump performance information, DOE notes that it does not expect that manufacturers would need to regenerate all of the historical test data as long as the tested units remain representative of the basic model's current design and the rating

remains valid under the adopted method of test for dedicated-purpose pool pumps. If the testing methods used to generate historical ratings for DPPP basic models were substantially different from those proposed in this NOPR or the manufacturer has changed the design of the basic model, the representations resulting from the historical methods would no longer be valid.

III. Discussion

In this NOPR, DOE proposes to amend subpart Y of part 431 to add a new DPPP test procedure and related definitions, amend 10 CFR 429.60 to add a new sampling plan for this equipment, and add new enforcement provisions for dedicated-purpose pool pumps in 10 CFR 429.110 and 429.134. The proposed amendments are shown in Table III.1.

Table III.1 Summary of Proposals in this NOPR, their Location within the Code of Federal Regulations, and the Applicable Preamble Discussion

Location	Proposal	Summary of Additions	Applicable Preamble Discussion
10 CFR 429.60	Test Procedure Sampling Plan and Certification Requirements	Minimum number of dedicated-purpose pool pumps to be tested to rate a DPPP basic model, determination of representative values, and certification reporting requirements	Section III.I
10 CFR 429.110 & 429.134	Enforcement Provisions	Method for DOE determination of compliance of DPPP basic models	Section III.I
10 CFR 431.462	Definitions	Definitions pertinent to categorizing and testing of dedicated-purpose pool pumps	Section III.A
10 CFR 431.464 & Appendix B	Test Procedure	Instructions for determining the WEF (and other applicable performance characteristics) for applicable varieties of dedicated-purpose pool pumps and replacement DPPP motors	Sections III.B, III.C, III.D, III.E, III.F, and III.G
10 CFR 431.466	Labeling	Requirements for labeling dedicated-purpose pool pumps	III.G

The following sections discuss DOE's proposals regarding A) definitions related to the categorizing and testing of dedicated-purpose pool pumps; B) the metric to describe the energy performance of dedicated-purpose pool pumps; C) the test procedure for different varieties of dedicated-purpose pool pumps; D) the specific test methods for determining pump performance that form the basis for the DOE test procedure; E) additional test methods necessary to determine rated hydraulic horsepower,[15] other DPPP horsepower metrics,[16] and the self-priming capability of dedicated-purpose pool pumps; F) selecting test samples and representations of energy use and energy efficiency; G)

[15] Rated hydraulic horsepower refers to the hydraulic horsepower at maximum speed and full impeller diameter on the reference curve for the rated pump and is the metric DOE proposes to use to describe the "size" of dedicated-purpose pool pumps. (See section 0.)

[16] DOE proposes, based on the June 2016 DPPP Working Group recommendations, standardized methods for determining nominal motor horsepower, total horsepower, and service factor of a dedicated purpose pool pump to support labeling provisions. The proposed test methods are discussed in section 0 and the labeling requirements are discussed in section 0.

labeling requirements for dedicated-purpose pool pumps; H) an optional test method for replacement DPPP motors; and I) certification and enforcement provisions for tested DPPP models.

A. Definitions

As discussed in section I.B, in the January 2016 general pumps TP final rule, DOE adopted a definition at 10 CFR 431.462 for "pump" along with other pump component- and configuration-related definitions. These definitions were necessary to establish the scope of the general pump test procedure and standards and to appropriately apply the test procedure. 81 FR 4086, 4090–4104 (Jan. 25, 2016).

Although dedicated-purpose pool pumps are a style of pump, DOE declined to establish a test procedure or standards applicable to dedicated-purpose pool pumps in the January 2016 general pumps TP and ECS final rules because of their different equipment characteristics and applications. Id. at 4094 (Jan. 25, 2016) and 81 FR 4368 (Jan. 26, 2016), respectively. Therefore, in this NOPR, DOE proposes a definition for dedicated-purpose pool pump, as well as related definitions for different varieties and operating speed configurations of dedicated-purpose pool pumps. DOE also proposes definitions pertinent to categorizing and testing dedicated-purpose pool pumps in accordance with the DOE test procedure. DOE presents these definitions in the subsequent sections. In addition, DOE is proposing definitions and methods for determining for several terms related to describing "DPPP size," including "rated hydraulic horsepower," "dedicated-purpose pool pump nominal motor horsepower," "dedicated-purpose pool pump service

factor," and "dedicated-purpose pool pump motor total horsepower." These terms are discussed in detail in section III.E.1.

1. Existing Pump Definitions

As dedicated-purpose pool pumps fall into the larger pump equipment category, prior to proposing any definitions applicable to dedicated-purpose pool pumps, it is necessary to review existing definitions related to pumps. In the January 2016 general pumps TP final rule, DOE defined a "pump" 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. 81 FR 4086, 4090 (Jan. 25, 2016). In order to fully define the term "pump," DOE also adopted the following definitions for the terms "bare pump," "mechanical equipment," "driver," and "controls:"

- Bare pump means a pump excluding mechanical equipment, driver, and controls.
- Mechanical equipment means any component of a pump that transfers energy from a driver to the bare pump.
- Driver means the machine providing mechanical input to drive a bare pump directly or through the use of mechanical equipment. Examples include, but are not limited to, an electric motor, internal combustion engine, or gas/steam turbine.
- Control means any device that can be used to operate the driver. Examples include, but are not limited to, continuous or non-continuous controls, schedule-based controls, on/off switches, and float switches.

Id. at 4090–91.

DOE notes that because dedicated-purpose pool pumps are a style of pump, these terms also apply to the definition of dedicated-purpose pool pumps and certain DPPP components.

In addition to defining the term "pump," in the January 2016 general pumps TP final rule, DOE also established and defined five varieties of pump to which the test procedure and standards established in the January 2016 general pumps TP and ECS final rules, respectively, apply. These pump varieties are (1) ESCC, (2) ESFM, (3) IL, (4) RSV, and (5) ST pumps.

In order to specifically exclude dedicated-purpose pool pumps from the scope of the general pumps test procedure and standards, DOE explicitly excluded dedicated-purpose pool pumps from the ESCC pump and ESFM pump definitions. 81 FR 4086, 4098–99 (Jan. 25, 2016). Specifically, DOE defined "end suction close-coupled (ESCC) pump" as a close-coupled, dry rotor, end suction pump that has 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 and that is not a dedicated-purpose pool pump. Examples include, but are not limited to, pumps within the specified horsepower range that comply with ANSI/HI nomenclature OH7, as described in ANSI/HI 1.1-1.2–2014. Id. at 4146. DOE also defined "end suction frame mounted/own bearings (ESFM) pump" as a mechanically-coupled, dry rotor, end suction pump that has 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 and that is not a dedicated-purpose pool pump. Examples include, but are not limited to, pumps within the specified horsepower range that comply with ANSI/HI nomenclature OH0 and OH1, as described in ANSI/HI 1.1-1.2–2014. Id. at 4146.

The definitions presented in the previous paragraph ensure that dedicated-purpose pool pumps cannot be classified as ESCC or ESFM, and thus are excluded from the scope of applicability of the general pumps test procedure. DOE notes that dedicated-purpose pool pumps are only constructed as end suction pumps and, thus, exclusion from the IL, RSV, and ST equipment varieties is not necessary as they are not end suction pumps.

As dedicated-purpose pool pumps are end suction pumps, DOE believes the definition for end suction pump established in the January 2016 general pumps TP final rule also applies to dedicated-purpose pool pumps. In the January 2016 general pumps TP final rule, DOE defined "end suction pump" as a single-stage, rotodynamic pump in which the liquid enters the bare pump in a direction parallel to the impeller shaft and on the side opposite the bare pump's driver-end. The liquid is discharged through a volute in a plane perpendicular to the shaft. 81 FR 4086, 4146 (Jan. 25, 2016). DOE notes that, as it is referenced in the definition for end suction pump, the definition for rotodynamic

pump[17] established at 10 CFR 431.462 in the January 2016 general pumps TP final rule also applies to dedicated-purpose pool pumps. Id. at 4147.

In DOE's view, the term "dry rotor pump" applies to dedicated-purpose pool pumps because, to DOE's knowledge, all dedicated-purpose pool pumps are dry rotor, as defined in the January 2016 general pumps final rule. DOE defines "dry rotor pump" as "a pump in which the motor rotor is not immersed in the pumped fluid." 10 CFR 431.462. (Dry rotor pump is used herein in the definition of pressure cleaner booster pump (see section III.A.4.b)).

DOE requests comment on whether all dedicated-purpose pool pumps are dry rotor.

Other definitions established or incorporated by reference in the January 2016 general pumps TP final rule that apply to dedicated-purpose pool pumps are the following: the definition of basic model (discussed further in section III.A.8), the definitions in HI 40.6–2014 relevant to testing pumps (discussed further in section III.D.1), and the definition of self-priming pump (discussed further in section III.A.3.b). While other terms may be applicable to the description of dedicated-purpose pool pumps, they are not, at this time, proposed to be referenced in any of the DPPP definitions or specifications of the DPPP test procedure.

[17] In the January 2016 general pumps TP final rule, DOE defined rotodynamic pump as a pump in which energy is continuously imparted to the pumped fluid by means of a rotating impeller, propeller, or rotor. 81 FR 4086, 4147 (Jan. 25, 2016).

2. Definition of Dedicated-Purpose Pool Pump

The DPPP Working Group recommended that "dedicated-purpose pool pumps" comprise the following pump varieties: self-priming pool filter pumps, non-self-priming pool filter pumps, waterfall pumps, pressure cleaner booster pumps, integral sand-filter pool pumps, integral cartridge-filter pool pumps, storable electric spa pumps, and rigid electric spa pumps. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendations #1 at p. 1) The DPPP Working Group defined the specific characteristics of each specific pump variety that it considers to be a dedicated-purpose pool pump. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendations #4 at pp. 2–4) These definitions are discussed in more detail in sections III.A.3, III.A.4, and III.A.5.

Consistent with the recommendations of the DPPP Working Group, DOE proposes the following definition for dedicated-purpose pool pump:

Dedicated-purpose pool pump comprises self-priming pool filter pumps, non-self-priming pool filter pumps, waterfall pumps, pressure cleaner booster pumps, integral sand-filter pool pumps, integral-cartridge filter pool pumps, storable electric spa pumps, and rigid electric spa pumps.

DOE believes that the proposed definition for dedicated-purpose pool pump captures all varieties of pump that are typically used in pools to circulate water or provide other auxiliary functions and clearly delineates that the term includes only the listed

varieties. DOE notes that the proposed definition is also consistent with comments received in response to the May 2015 DPPP RFI.

DOE requests comment on the proposed definition for "dedicated-purpose pool pump."

3. Pool Filter Pumps

Pool filter pumps are the most common style of dedicated-purpose pool pump. A "pool filter pump" or "pool circulation pump" is typically used to refer to an end suction style pump (see section III.A.1) that circulates water through a pool and filtration system and removes large debris using a basket strainer or other device. The DPPP Working Group recommended to define pool filter pump as an end suction pump that

(a) either:

(1) includes an integrated basket strainer, or

(2) does not include an integrated basket strainer, but requires a basket strainer for operation, as stated in manufacturer literature provided with the pump; and

(b) may be distributed in commerce connected to, or packaged with, a sand filter, removable cartridge filter, or other filtration accessory, so long as the filtration accessory is connected with consumer-removable connections that allow the pump to be plumbed to bypass the filtration accessory. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #4 at pp. 2–3) In this NOPR, DOE proposes adopting the Working Group's recommended definition for pool filter pump.

DOE requests comment on the proposed definition of "pool filter pump."

a. Definition of a Basket Strainer and Filtration Accessories

The proposed definition of pool filter pump includes the use of a basket strainer to differentiate pool filter pumps from other varieties of end suction pumps. The DPPP Working Group discussed the basket strainer feature and determined that all pool filter pumps will either include an integrated basket strainer or require one to be obtained separately and installed in order for the pump function correctly. (Docket No. EERE-2015-BT-STD-0008, CA IOUs and Pentair, No. 58 at pp. 50–53) To clearly and unambiguously establish what would be considered a basket strainer when applying the pool filter pump definition, the DPPP Working Group recommended to define "basket strainer" as "a perforated or otherwise porous receptacle that prevents solid debris from entering a pump, when mounted within a housing on the suction side of a pump. The basket strainer receptacle is capable of passing spherical solids of 1 mm in diameter, and can be removed by hand or using only simple tools. Simple tools include but are not limited to a screwdriver, pliers, and an open-ended wrench." (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #4 at pp. 2–3)

The DPPP Working Group also noted that some pool filter pumps may be distributed in commerce with additional pool filtration equipment, such as a sand filter or removable cartridge filter, but that are otherwise similar to pool filter pumps sold without such additional filtration accessories. The DPPP Working Group concluded that, if the additional pool filtration equipment is connected to the bare pump with consumer-

removable connections that allow the pump to be plumbed to bypass the filtration accessory, then the package, as distributed in commerce, should be considered as a pool filter pump. (Docket No. EERE-2015-BT-STD-0008, No. 58 at pp. 127–132) The DPPP Working Group also recommended that, if the removable cartridge filter or sand filter could not be plumbed out for testing, such a pump would be considered an integral cartridge-filter pool pump or an integral sand-filter pool pump, respectively, as described in section III.A.3.c. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #4 at pp. 2–3)

Therefore, to clearly establish what would be considered a "removable cartridge filter" for the purposes of applying these regulations, and especially to differentiate removable cartridge filters from basket strainers, the DPPP Working Group recommended that the definitions of basket strainer and removable cartridge filter include a specification for the diameter of spherical solid that the basket strainer or filter component is capable of passing. The DPPP Working Group discussed this issue and determined that a diameter of 1 mm would effectively distinguish between removable cartridge filters and basket strainers. (Docket No. EERE-2015-BT-STD-0008, CA IOUs, DOE, Waterway, and Zodiac, No. 53 at pp. 13–19) Therefore, the DPPP Working Group recommended a definition for "removable cartridge filter" as "a filter component with fixed dimensions that captures and removes suspended particles from water flowing through the unit. The removable cartridge filter is not capable of passing spherical solids of 1 mm in diameter, can be removed from the filter housing by hand or using only simple tools, and is not a sand filter. Simple tools include but are not limited to a

screwdriver, pliers, and an open-ended wrench." (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #4 at pp. 2–3)

Similarly, to clearly differentiate the sand filters from other filtration apparatuses, such as basket strainers and removable cartridge filters, the DPPP Working Group recommended defining "sand filter" as "a device designed to filter water through sand or an alternate sand-type media." The proposed definition for sand filter is intended to include all depth filters that allow fluid to pass through while retaining particulates and debris in a porous filtration medium. In the DPPP equipment industry, such a filter is most commonly made with sand, but could also be made with other media such as diatomaceous earth. (Docket No. EERE-2015-BT-STD-0008, No. 58 at pp. 91–96).

DOE notes that these definitions are useful in clearly differentiating different styles of pool filter pumps, including integral cartridge-filter and sand-filter pool pumps, from those that have non-integral filtration accessories. In this NOPR, DOE proposes to adopt definitions for basket strainer, removable cartridge filter, and sand filter, as recommended by the DPPP Working Group.

DOE requests comment on the proposed definitions of "basket strainer," "removable cartridge filter," and "sand filter."

In addition, DOE also proposes a definition for "integral," which is presented and discussed in more detail in section III.A.3.c.

b. Self-Priming and Non-Self-Priming Pool Filter Pumps

All pool filter pumps on the market are either self-priming or non-self-priming. Self-priming pumps are able to lift liquid that originates below the centerline of the pump inlet and, after initial manual priming, are able to subsequently re-prime without the use of external vacuum sources, manual filling, or a foot valve. In contrast, non-self-priming pumps must be manually primed prior to start up each time. Accordingly, self-priming pumps are constructed in a different manner than non-self-priming pumps and have different energy use characteristics. Specifically, self-priming pool filter pumps typically incorporate a diffuser that maintains the prime on the pump between periods of operation. The diffuser affects the energy performance of the pump because it can decrease the maximum achievable energy efficiency.

In addition, whether a pool filter pump is self-priming or not also impacts the typical applications for pool filter pumps. Specifically, in the DPPP equipment industry, self-priming pool filter pumps are often referred to as "inground pool pumps" and non-self-priming pool filter pumps are often referred to as "aboveground pool pumps."[18] This is because in aboveground pools, the pump is typically installed on the ground and below the water level in the pool, so the water will naturally flood the pump and self-priming capability is not necessary. Conversely, in inground pools, the pump is also located on the ground next to the pool, but the pump is above the water line and the pump must be self-priming for convenient and continuous operation of the pump.

[18] DOE notes that in the May 2015 DPPP RFI, DOE referred to self-priming and non-self-priming pool filter pumps as inground and aboveground pool pumps, respectively. 80 FR 26475, 26481 (May 8, 2015)

Accordingly, the DPPP Working Group proposed to analyze self-priming and non-self-priming pool filter pumps separately. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #2A at p. 2) The DPPP Working Group also recommended definitions for "self-priming pool filter pump" and "non-self-priming pool filter pump" as follows:

- Self-priming pool filter pump means a pool filter pump that is a self-priming pump.
- Non-self-priming pool filter pump means a pool filter pump that is not a self-priming pump.

(Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #4 at pp. 2–3)

DOE notes that, in the January 2016 general pumps TP final rule, DOE already defined the term "self-priming pump" as a pump that (1) is designed to lift liquid that originates below the centerline of the pump inlet; (2) contains at least one internal recirculation passage; and (3) requires a manual filling of the pump casing prior to initial start-up, but is able to re-prime after the initial start-up without the use of external vacuum sources, manual filling, or a foot valve. 81 FR 4086, 4147 (Jan. 25, 2016). However, this definition is not applicable to dedicated-purpose pool pumps because pool filter pumps typically do not contain a recirculation passage to accomplish the self-priming function. Instead, self-priming dedicated-purpose pool pumps typically use a

diffuser to maintain prime. Therefore, DOE must develop a new definition that differentiates self-priming versus non-self-priming pool filter pumps.

In considering a definition for self-priming pool filter pump, the DPPP Working Group subsequently discussed any unique characteristics that would effectively differentiate self-priming pool filter pumps from those that were not. Specifically, the DPPP Working Group members noted that NSF International[19]/ANSI 50–2015 (NSF/ANSI 50–2015), "Equipment for Swimming Pools, Spas, Hot Tubs, and Other Recreational Water Facilities," which contains testing methods and criteria for determining whether a dedicated-purpose pool pump is capable of self-priming. (Docket No. EERE-2015-BT-STD-0008, No. XX at pp. 16–40; 109–114; 122–129) Specifically, section 6.8 of NSF/ANSI 50–2015 states that "a pump designated as self-priming shall be capable of repriming itself when operated under a suction lift without the addition of more liquid. Self-priming capability shall be verified in accordance with Annex C, section C.3." Further, section C.3 of Annex C of NSF/ANSI 50–2015 describes the self-priming capability test method. The criteria a pump must meet to satisfy the self-priming capability test are being able to prime under a vertical lift of 5 feet or the manufacturer's specified lift, whichever is greater, within 6 minutes or the manufacturer's recommended time, whichever is greater.

[19] NSF International was previously called the National Sanitation Foundation, but changed their name to NSF International in 1990.

The NSF/ANSI 50–2015 method provides manufacturers with a considerable amount of discretion regarding the categorization of self-priming pumps. However, DOE intends to establish clear and unambiguous criteria to determine self-priming capability to ensure consistent and equitable product ratings across pump models. The DPPP Working Group discussed the importance of aligning the proposed definition of self-priming pool filter pump with that used in NSF/ANSI 50-2015. Specifically, Hayward and Zodiac noted that the vertical lift and true priming time referenced in any potential DOE definition should be equivalent to that specified in NSF/ANSI 50–2015. (Docket No. EERE-2015-BT-STD-0008, Hayward, No. 79 at pp. 160; Zodiac, No. 79 at pp. 161–162,)

In order for DOE's definitions to be clear, consistent, and unambiguous, DOE must specify clear and unambiguous criteria that would be used to determine whether a pool filter pump is self-priming. To that end, the DPPP Working Group proposed definitions for self-priming and non-self-priming pool filter pumps that were consistent with the NSF/ANSI 50-2015 criteria, but also provided clear and unambiguous criteria to allow for consistent categorization of such pumps. Specifically, in the April 2016 meeting, the DPPP Working Group voted to approve the following definitions for self-priming and non-self-priming pool filter pumps:[20]

[20] There was one vote against the approved definitions of self-priming and non-self-priming pool filter pump. Pentair disagreed with the proposed definitions because Pentair manufactures aboveground pool pumps that can prime themselves to some extent. Although Pentair does not claim these pumps as self-priming, they would meet the definition of self-priming proposed by the Working Group. As such, Pentair was concerned that a sizeable portion of their aboveground pumps would be classified as the self-priming variety. (Docket No. EERE-2015-BT-STD-0008, Pentair, No. 79 at p. 191)

Self-priming pool filter pump means a pool filter pump that is certified under NSF/ANSI 50–2015 to be self-priming or is capable of re-priming to a vertical lift of at least 5 feet with a true priming time less than or equal to 10 minutes, when tested in accordance with NSF/ANSI 50–2015.

Non-self-priming pool filter pump means a pool filter pump that is not certified under NSF/ANSI 50-2015 to be self-priming and is not capable of re-priming to a vertical lift of at least 5 feet with a true priming time less than or equal to 10 minutes, when tested in accordance with NSF/ANSI 50–2015.

The definitions are consistent with the NSF/ANSI 50–2015 self-priming designation such that any pumps certified as self-priming under NSF/ANSI 50–2015 would be treated as self-priming pool filter pumps under the DOE regulations, even if such a pump was certified based on manufacturer's specified or recommended vertical lift and/or true priming time. However, as certification with NSF/ANSI 50–2015 is voluntary, the definitions also adopt specific criteria in terms of vertical lift and true priming time that are applicable to any pool filter pumps not certified as self-priming under NSF/ANSI 50–2015. The criterion for vertical lift is specified as 5 feet, consistent with the NSF/ANSI 50–2015 requirement. This ensures that all pool filter pumps that can achieve a vertical lift of 5 feet (within the required true priming time), whether they are certified with NSF/ANSI or not, would be considered a self-priming pool filter pump under DOE's regulations. However, DOE notes that, in order to specify the appropriate level of precision in the definitions, DOE proposes to specify the vertical lift value as 5.0

feet. DOE believes this level of precision is reasonable and achievable given the repeatability of the test and the level of accuracy required by the equipment for measuring distance specified in section III.D.2.f.

The criterion for true priming time recommended by the DPPP Working Group is 10 minutes, as opposed to the 6 minutes specified in NSF/ANSI 50-2015. This is because the 6 minute threshold is a minimum, and manufacturers believed that some pool filter pumps that are currently considered self-priming pool filter pumps in the industry have true priming times greater than 6 minutes. Thus, the DPPP Working Group believed that 10 minutes was more appropriate and comprehensive. Similar to the specification on vertical lift, DOE proposes to more precisely specify the true priming time as 10.0 minutes, which DOE also believes is reasonable and consistent with the level of accuracy required by the time measurement equipment specified in section III.D.2.f.

Therefore, DOE proposes to adopt new definitions for self-priming and non-self-priming pool filter pumps based on the NSF/ANSI 50–2015 test and the criteria recommended by the DPPP Working Group, with minor modifications regarding the level of precision required by the criteria. DOE notes that these definitions rely on the NSF/ANSI 50–2015 test method to determine self-priming capability. Accordingly, DOE proposes to incorporate by reference relevant sections of the NSF/ANSI 50–2015 standard and also proposes several modifications and additions to improve repeatability and consistency of the test results. DOE's proposed test procedure for determining self-

priming capability, including the incorporation by reference of the NSF/ANSI 50–2015 test method, is discussed further in section III.E.2.

As noted previously, DOE established a definition for self-priming pump in the January 2016 general pumps TP final rule that is not applicable to dedicated-purpose pool pumps. 81 FR 4086, 4147 (Jan. 25, 2016). However, self-priming pool filter pumps are a style of pump and are self-priming. Therefore, to ensure the definition of self-priming pump is comprehensive and consistent with the proposed new definitions for self-priming and non-self-priming pool filter pump, DOE proposes to modify the definition of self-priming pump to also include self-priming pool filter pumps, in addition to the other referenced criteria. The proposed amended definition for self-priming pump would read as set out in the regulatory text at the end of this document.

DOE requests comment on the proposed amendments to the definition of self-priming pump.

Finally, as discussed further in section III.A.4.a, a waterfall pump is a specific style of pool filter pump that has flow and head characteristics designed specifically for waterfall and water feature applications. Section III.A.4.a also presents the specific definition for waterfall pump. As waterfall pumps are pool filter pumps and could be either self-priming or non-self-priming, unless explicitly excluded, they would meet the definitions of self-priming or non-self-priming pool filter pump proposed by the Working Group. However, DOE intends for such pumps to be treated specifically as waterfall

pumps. Therefore, in order to exclude waterfall pumps from the self-priming and non-self-priming pool filter pump varieties, DOE proposes to clarify such in the definition of self-priming and non-self-priming pool filter pump. The proposed definitions for self-priming and non-self-priming pool filter pump read as set out in the regulatory text at the end of this document.

DOE requests comment on the proposed definitions for "self-priming pool filter pump" and "non-self-priming pool filter pump."

c. Integral Cartridge-Filter and Integral Sand-Filter Pool Pumps

Most self-priming and non-self-priming filter pumps are installed in permanent inground or aboveground pools. However, a significant market also exists for temporary pools; e.g., inflatable or collapsible pools that can be deflated or collapsed when not in use. Although temporary pools also require dedicated-purpose pool pumps to circulate and filter the water, these pools are typically served by a unique style of dedicated-purpose pool pump that is exclusively distributed in commerce with a temporary pool or as a replacement pump for such a pool. These pumps are integrally and permanently mounted to a filtration accessory such as an integral cartridge-filter or sand-filter. These pumps can only be operated with the integral filtration accessory inline—the filtration accessory cannot be plumbed out for the purposes of testing. As a result, these pumps may require separate testing considerations than dedicated-purpose pool pumps for non-temporary pools. However, as discussed further in section III.A.6, the DPPP Working Group recommended only prescriptive energy conservation standards for such

equipment, not performance-based standards. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #2B at p. 2) The recommended prescriptive standard requires that timers be distributed in commerce with the pumps. (Docket No. EERE-2015-BT-STD-0008, No. 82 Recommendation #2 at p. 2) Therefore, the test procedure proposed in this document is not applicable to integral cartridge-filter and sand-filter pool pumps.

DOE needs to define integral cartridge-filter and integral sand-filter pool pumps clearly to differentiate them from other DPPP varieties. The DPPP Working Group recommended the following definitions for integral cartridge-filter pool pump and integral sand-filter pool pump:

- Integral cartridge-filter pool pump means a pump that requires a removable cartridge filter, installed [in a housing] on the suction side of the pump, for operation; and the pump cannot be plumbed to bypass the cartridge filter for testing.
- integral sand-filter pool pump means a pump distributed in commerce with a sand filter that cannot be bypassed for testing.

(Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #4 at pp. 2–3)

DOE believes that the proposed definitions differentiate integral cartridge-filter and integral sand-filter pool pumps from other varieties of pool filter pumps based on their physical construction. DOE proposes to adopt the definitions for integral cartridge-

filter pool pump and integral sand-filter pool pump recommended by the DPPP Working Group with a minor change to use consistent terminology in both definitions.

DOE requests comment on the proposed definition of "integral cartridge-filter pool pump" and "integral sand-filter pool pump."

4. Other Varieties of Dedicated-Purpose Pool Pumps

In addition to pool filter pumps, in the May 2015 DPPP RFI, DOE identified varieties of dedicated-purpose pool pumps that are used to drive auxiliary pool equipment such as pool cleaners and water features. 80 FR 26475, 26481 (May 8, 2015). These pumps, which include waterfall pumps and pressure cleaner booster pumps, are discussed in greater detail in the following sections.

a. Waterfall Pumps

Certain styles of pumps are similar in design and construction to pool filter pumps but specifically intended to pump water for water features, such as waterfalls, and, therefore, have limited head and speed operating ranges. DOE refers to these pumps as waterfall pumps. Waterfall pumps meet the definition of pool filter pump discussed in section III.A.3.b, but are always equipped with a lower speed motor (approximately 1,800 rpm) in order to serve the specific high flow, low head applications of typical water features. Based on this unique construction and end user utility, the DPPP Working Group found it appropriate to differentiate waterfall pumps from self-priming and non-

self-priming pool filter pumps. In accordance with the intent[21] of the December 2015 DPPP Working Group's recommendation (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #4 at pp. 2–4), DOE proposes to define waterfall pump as "a pool filter pump with maximum head less than or equal to 30 feet, and a maximum speed less than or equal to 1,800 rpm."

The proposed definition uses maximum head and a specific maximum speed to distinguish waterfall pumps from other varieties of pool filter pumps. During negotiations, Hayward noted that waterfall pumps typically operate at half speed [of a typical dedicated-purpose pool pump], because the application of a waterfall feature does not require a significant amount of head. (Docket No. EERE-2015-BT-STD-0008, Hayward, No. 39 at pp. 62–63) In this context, half speed refers to 1,800 rpm nominal speed or a 4-pole motor. (Docket No. EERE-2015-BT-STD-0008, Hayward, No. 39 at p. 74) The DPPP Working Group agreed that all currently available waterfall pumps utilize 4-pole motors, as their low flow requirements do not necessitate the use of a higher speed 2-pole motor. Furthermore, the DPPP Working Group reviewed publically available specification and performance literature for waterfall pumps offered by three major manufacturers. The DPPP Working Group found that these waterfall pumps are single

[21] DOE notes that the verbatim text of the waterfall pump definition proposed by the DPPP Working Group in the December 2015 DPPP Working Group recommendations is "a maximum 1,800 rpm nominal speed, motor-driven pool filter pump with maximum head less than or equal to 30 feet." (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #4 at pp. 2–4) However, in this NOPR, DOE proposes to make a few modifications to the definition recommended by the Working Group to improve the clarity of the definition. Specifically, DOE proposes to rearrange the terms in the definition, and remove the reference to a waterfall pump as referencing a specific driver. DOE believes these changes are consistent with the intent of the DPPP Working Group and do not substantially change the meaning of the definition.

speed and use 4-pole motors and, as shown in Figure III.1, have a maximum head less than or equal to 30 feet.

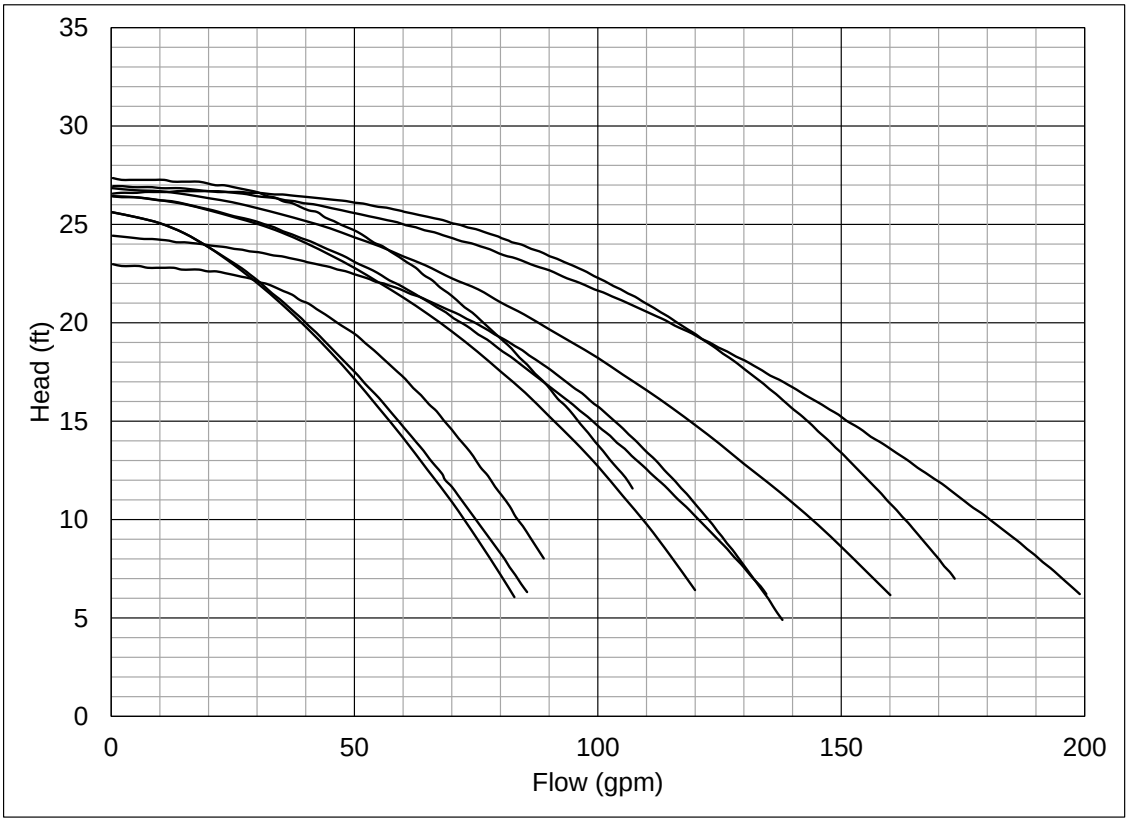

Figure III.1 Performance Curves for Waterfall Pumps Marketed by Different Manufacturers

The DPPP Working Group compared the waterfall pump performance data with the performance data of those defined as self-priming and non-self-priming pool filter pumps, and determined that those filter pumps all produce more than 30 feet of head. Therefore, the DPPP Working Group concluded that a maximum head of 30 feet, combined with a motor with a maximum rotating speed of 1,800, would clearly distinguish waterfall pumps from other varieties of pool filter pumps.

DOE requests comment on the proposed definition of "waterfall pump."

b. Pressure Cleaner Booster Pumps

Pressure cleaner booster pumps provide the water pressure that is used to both propel pressure-side pool cleaners along the bottom of the pool and to remove debris as the cleaner moves. To perform this task, a pressure cleaner booster pump must provide a high amount of head and a low flow.

The DPPP Working Group recommended that pressure cleaner booster pumps be included as a variety of dedicated-purpose pool pump, subject to the test procedure, and specifically considered in the analysis to support potential energy conservation standards. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #1 at p. 1, #2A at p. 2, and #6 at p. 5) However, the DPPP Working Group did not recommend a definition of pressure cleaner booster pump due to the difficulty of effectively differentiating pressure cleaner booster pumps from other DPPP varieties. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #4 at p. 3) Instead, the DPPP Working Group recommended that DOE develop an appropriate definition.

The DPPP Working Group discussed different design and performance aspects of pressure cleaner booster pumps, though none were determined to be sufficiently unique to pressure cleaner booster pumps to effectively differentiate them from other pump varieties. Specifically, the DPPP Working Group acknowledged that pressure cleaner booster pumps have essentially the same construction and similar performance

characteristics (e.g., high head and low flow) as other general purpose end suction pumps. (Docket No. EERE-2015-BT-STD-0008, No. 53 at pp. 84–85)

After considering the design, construction, and performance information for pressure cleaner booster pumps and the discussions of the DPPP Working Group, DOE determined that the most effective differentiator for pressure cleaner booster pumps is the fact that they are designed and marketed for a specific pressure-side cleaning application. Therefore, to effectively differentiate pressure cleaner booster pumps from other pump varieties, DOE proposes to define "pressure cleaner booster pump" as an end suction, dry rotor pump designed and marketed for pressure-side pool cleaner applications, and which may be UL listed under ANSI/UL 1081–2014, "Standard for Swimming Pool Pumps, Filters, and Chlorinators."

The proposed definition for pressure cleaner booster pump does not contain any unique construction or operational features and instead utilizes intended application. To provide clarity and remove ambiguity when applying the proposed definition for pressure cleaner booster pump, DOE also proposes to adopt a definition for "designed and marketed" that DOE will use when determining the applicability of any DPPP test procedure or energy conservation standards to such pumps. Specifically, DOE proposes to define "designed and marketed" as meaning that the equipment is exclusively designed to fulfill the indicated application and, when distributed in commerce, is designated and marketed solely for that application, with the designation on the packaging and all publicly available documents (e.g., product literature, catalogs, and packaging labels).

In the proposed pressure cleaner booster pump definition, DOE also references ANSI/UL 1081–2014, "Standard for Swimming Pool Pumps, Filters, and Chlorinators," as an illustrative aide in identifying pressure cleaner booster pumps, as such pumps would be certified under the ANSI/UL 1081–2014 standard. However, DOE recognizes that other varieties of dedicated-purpose pool pumps may also be certified under ANSI/UL 1081–2014 and thus, the reference is not mandatory in determining whether a given pump would meet the definition of pressure cleaner booster pump.

DOE requests comment on the proposed definition of "pressure cleaner booster pump" and whether DOE should consider making ANSI/UL 1081-2014 a required label instead of illustrative in order to distinguish pressure cleaner booster pumps.

5. Storable and Rigid Electric Spa Pumps

In addition to swimming pools, dedicated-purpose pool pumps are also used in spas to circulate and filter the water and operate water jets. Similar to swimming pools, spas can range in size and construction style. Specifically, spas can be portable or permanent installations and can be constructed out of a variety of materials depending on the installation.

Permanent, inground spas are typically constructed similar to small inground pools and use the same pumps (i.e., self-priming pool filter pumps described in section III.A.3.b) to operate the spa. In some applications, the same self-priming pool filter pump may serve both the pool and the spa. In other applications, the permanent,

inground spa may have a dedicated self-priming pool filter pump that is identical in design and construction to the self-priming pool filter pump installed in permanent, inground pools.

Conversely, for portable spas, a specific-purpose pump is typically distributed in commerce with the portable spa. Typically, the pumps used in portable electric spas are specifically designed and marketed for storable electric spa applications only. Such portable electric spa applications are aboveground and can be further differentiated into two general categories: storable (or temporary) electric spas and rigid (or permanent) electric spas. A storable electric spa refers to an inflatable or otherwise temporary spa that can be collapsed or compacted into a storable unit. In contrast, a rigid electric spa is constructed with rigid, typically more durable materials and cannot be collapsed or compacted for storage. Both of these spa varieties use a pump to circulate water and power the water features of the electric spa. However, the pumps that are typically installed in storable or rigid electric spas have different performance and design characteristics than other varieties of dedicated-purpose pool pumps installed in permanent pools and spas due to their different usage profiles.

In the May 2015 DPPP RFI, DOE identified spa pumps as small ESCC pumps that do not have an integrated basket strainer. 80 FR 26475, 26481 (May 8, 2015). In response to the May 2015 DPPP RFI, APSP commented that there is a difference between spa pumps and portable spa pumps. APSP commented that some spa pumps are similar to other pool pumps that are self-priming and have a strainer basket, while

portable spas are not self-priming and do not have strainer baskets. (Docket No. EERE-2015-BT-STD-0008, APSP, No. 10 at pp. 8–9)

In response, DOE notes that ENERGY STAR also specifically defines and differentiates "residential portable spa pump" as a pump intended for installation in a non-permanently installed residential spa as defined in ANSI/NSPI-6 (ANSI/NSPI-6–1999), "Standard for Portable Spas." According to ENERGY STAR, such pumps are sometimes referred to as hot tub pumps, but do not include jetted bathtub pumps.[22]

The DPPP Working Group discussed potential spa pump definitions, necessary key characteristics that could differentiate the various styles of spa pumps, and the appropriateness of the proposed test procedure or any potential standards for these varieties of pumps. Ultimately, the DPPP Working Group recommended to define "storable electric spa pump" as "a pump that is distributed in commerce with one or more of the following: (1) an integral heater and (2) an integral air pump." The DPPP Working Group also recommended to define "rigid electric spa pumps" as "an end suction pump that does not contain an integrated basket strainer or require a basket strainer for operation as stated in the manufacturer literature provided with the pump," and meets the following three criteria: (1) is assembled with four through bolts that hold the motor rear endplate, rear bearing, rotor, front bearing, front endplate, and the bare pump together as an integral unit; (2) is constructed with buttress threads at the inlet and discharge of the

[22] ENERGY STAR Pool Pumps – Program Requirements Version 1.1. Available at https://www.energystar.gov/products/spec/pool_pumps_specification_version_1_0_pd.

bare pump; and (3) uses a casing or volute and connections constructed of a non-metallic material. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #4 at p. 3) Research conducted for the DPPP Working Group indicates that all pumps currently marketed as rigid electric spa pumps exhibit all three of these features. (Docket No. EERE-2015-BT-STD-0008, No. 53 at pp. 23–24) Additionally, DOE's research did not identify any pumps with all three of these features that are not marketed for use with rigid spas.

Based on the December 2015 DPPP Working Group recommendations, DOE proposes to adopt the definitions recommended by the DPPP Working Group.

In addition, DOE notes that the proposed definition for storable electric spa pump differentiates the storable electric spa pump based on the unique characteristic that the pump is an integral part of an assembly that also contains an integral heater and/or an integral air pump. In support of the proposed definition for storable electric spa pump, the DPPP Working Group also recommended defining the term "integral" as "a part of the device that cannot be removed without compromising the device's function or destroying the physical integrity of the unit." (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #4 at p. 3) The DPPP Working Group determined that the proposed approach effectively differentiated rigid electric spa pumps from other varieties of dedicated-purpose pool pumps. (Docket No. EERE-2015-BT-STD-0008, No. 53 at pp. 20–21) DOE believes that the definition of integral reflects the fact that a storable electric spa pump or rigid electric spa pumps is part of a single, inseparable unit that also

contains a heater and/or an air pump, and which cannot be separated without compromising the physical integrity of the equipment. Therefore, DOE proposes to adopt the definition for integral as proposed by the Working Group. DOE notes that the term integral is also applicable to the definitions for integral cartridge-filter and integral sand-filter pool pumps (see section III.A.3.c).

DOE requests comment on the proposed definitions for "storable electric spa pump," "rigid electric spa pump," and "integral."

6. Applicability of Test Procedure Based on Pump Configuration

In addition to specific definitions, the DPPP Working Group also discussed and provided recommendations pertinent to the scope of applicability of the DPPP test procedure. Ultimately, the DPPP Working Group recommended that the scope of the ECS analysis and applicable test procedure be limited to specific varieties of dedicated-purpose pool pumps. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendations #1, #2A, and #2B at pp. 1–2; Recommendation #6 at p. 5) Specifically, the DPPP Working Group recommended that the scope of analysis for standards consider only the following DPPP varieties and only recommended test methods for these varieties:

- self-priming pool filter pumps,
- non-self-priming pool filter pumps,
- waterfall pumps, and

- pressure cleaner booster pumps.

(Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #2 at p. 2 and 6 at p. 5)

Although the DPPP Working Group recommended defining integral cartridge-filter pool pumps, integral sand-filter pool pumps, storable electric spa pumps, and rigid electric spa pumps as dedicated-purpose pool pumps, it did not recommend that these DPPP varieties be considered in the ongoing ECS analysis or have test methods established in the DPPP test procedure. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendations #1, #2A, and #2B at pp. 1–2; Recommendation #6 at p. 5) For integral cartridge-filter and sand-filter pumps, as discussed previously, the DPPP Working Group recommended to consider only a prescriptive standard, which requires that timers be distributed in commerce with the pumps. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #2B at pp. 1–2) With a prescriptive standard, the performance-related metric (i.e., WEF) and test procedure are not applicable.

Regarding storable electric spa pumps and rigid electric spa pumps, the DPPP Working Group did not recommend including these varieties of dedicated-purpose pool pumps in the scope of analysis for potential standards and did not recommend establishing a test procedure for them. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendations #2A at pp. 1–2 and #6 at p. 5) The DPPP Working Group excluded storable and rigid electric spa pumps from the recommended DPPP test procedure and standards analysis because the DPPP Working Group believed that it would be more

appropriate to test and apply standards to storable and rigid electric spas (i.e., portable electric spas) as an entire appliance, as is currently done under California Title 20 (Cal. Code Regs., tit. 20 section 1604, subd. (g)(2) and section 1605.3, subd. (g)(6)) and the ANSI/APSP Standard 14–2014 (ANSI/APSP 14–2014), "Portable Electric Spa Energy Efficiency." Similarly, in response to the May 2015 DPPP RFI, APSP commented that portable spa pumps do not use a significant amount of energy in a portable electric spa and should not be separately regulated as they are components used in a regulated appliance. (Docket No. EERE-2015-BT-STD-0008, APSP, No. 10 at pp. 8–10)

Although not included in the December 2015 DPPP Working Group recommendations, the DPPP Working Group discussed how the load points specified for self-priming and non-self-priming pool filter pumps were only applicable for pumps with a rated hydraulic horsepower less than 2.5 hp, where rated hydraulic horsepower refers to the hydraulic horsepower measured at the maximum operating speed and full impeller diameter of the rated pump, as discussed in section III.E.1. (Docket No. EERE-2015-BT-STD-0008, No. 57 at pp. 280-291 and No. 50 at p. 56–62) In a meeting following the December 2015 DPPP Working Group recommendations, on April 19, 2016, the DPPP Working Group discussed and ultimately recommended that DOE not develop a test procedure or standards for self-priming and non-self-priming pool filter pumps with a rated hydraulic horsepower greater than or equal to 2.5 hp. (Docket No. EERE-2015-BT-STD-0008, No. 79 at pp. 33–54) The DPPP Working Group discussed how the typical applications and field use of very large pool filter pumps differed significantly from pool filter pumps with hydraulic horsepower less than 2.5 hp. (Docket No. EERE-2015-BT-

STD-0008, CA IOUs , No. 53 at pp. 169–171; CA IOUs, No. 54 at pp. 18–19; Waterway, No. 54 at pp. 21-22; Zodiac, No. 54 at p. 23) Specifically, unlike pool filter pumps with hydraulic horsepower less than 2.5 hp, which are typically installed in residential applications (section III.C.1), very large pool filter pumps are more commonly installed in commercial applications. In commercial pools, the head and flow characteristics of pool systems are significantly different from residential applications. (Docket No. EERE-2015-BT-STD-0008, CA IOUs No. 53 at pp. 197–198) Therefore, the DPPP Working Group determined that any test procedure for very large pool filter pumps would require unique load points.

In addition, the DPPP Working Group noted the lack of performance data for self-priming and non-self-priming pool filter pumps with a rated hydraulic horsepower greater than or equal to 2.5 hp, which precluded the DPPP Working Group from establishing baseline and maximum technologically feasible ("max-tech") efficiency levels. Without baseline and max-tech, the DPPP Working Group was unable establish intermediary levels, and ultimately, was not able to effectively characterize the cost-versus-efficiency relationship for very large pool filter pumps. As a result, the DPPP Working Group recommended that DOE not develop standards for very large pool filter pumps as part of the current negotiated rulemaking and did not to recommend a test procedure for these pumps. (Docket No. EERE-2015-BT-STD-0008, No. 79 at pp. 33–54;) Therefore, consistent with the December 2015 DPPP Working Group recommendations, DOE proposes to not specify a test procedure for very large pool filter pumps with a rated hydraulic horsepower greater than or equal to 2.5 hp as part of this rulemaking. If DOE

decides to pursue a test procedure and standards for very large pool filter pumps, DOE could do so as part of a future rulemaking. Accordingly, all future references to pool filter pumps, self-priming pool filter pumps, and non-self-priming pool filter pumps refer to pumps with a rated hydraulic horsepower less than 2.5 hp.

In accordance with the December 2015 DPPP Working Group recommendations, DOE proposes that the test procedure would only be applicable to those DPPP varieties for which DOE is considering establishing performance-based energy conservation standards: self-priming pool filter pumps, non-self-priming pool filter pumps, waterfall pumps, and pressure cleaner booster pumps. However, DOE notes that applicability of the DPPP test procedure and standards may differ slightly with respect to dedicated-purpose pool pumps that are supplied by single-phase versus three-phase power. Specifically, the Working Group recommended that the scope of standards for self-priming pool filter pumps only apply to self-priming pool filter pumps served by single-phase power, while the recommended test procedure and reporting requirements would still be applicable to all self-priming pool filter pumps—both those served by single-phase power and those served by three-phase power. The DPPP Working Group also clarified that, regardless of whether the pump is supplied by single- or three-phase power, the recommended rated hydraulic horsepower limitation of 2.5 hp would still apply to both single- and three-phase self-priming pool filter pumps. (Docket No. EERE-2015-BT-STD-0008, No. 82 Recommendations #3 at p. 2) Therefore, consistent with the June 2016 DPPP Working Group recommendations, DOE proposes that the proposals contained in this NOPR regarding the test procedure, sampling requirements, labeling,

and related provisions for dedicated-purpose pool pumps apply to all self-priming pool filter pumps and non-self-priming pool filter pumps less than 2.5 rated hydraulic horsepower, as well as waterfall pumps and pressure cleaner booster pumps, regardless of the phase of the supplied power with which they are intended to be used. DOE accordingly will limit the scope of any potential energy conservation standards for such equipment in a related energy conservation standard rulemaking.

Further, consistent with the December 2015 DPPP Working Group recommendations, DOE proposes definitions for rigid-electric and storable-electric spa pumps as a variety of dedicated-purpose pool pump in this test procedure NOPR, but is not prescribing test procedures or reporting requirements for them. In response to HI's comment regarding the applicability of the ESCC definition to spa pumps, DOE notes that any pumps meeting the definition of dedicated-purpose pool pumps are excluded from the ESCC definition (see section III.A.1), including rigid-electric or storable-electric spa pumps, as well as self-priming and non-self-priming pool filter pumps that may be installed in spas. However, DOE notes that self-priming and non-self-priming pool filter pumps that may be installed in spas, but are not storable or rigid electric spa pumps, would still be subject to the test procedure as self-priming or non-self-priming pool filter pumps, respectively, regardless of the application.

In addition, upon further review of the DPPP market and any potentially similar pumps, DOE determined that some end suction, submersible pond pumps may meet the definition of self-priming or non-self-priming pool filter pump, but were not reviewed by

the DPPP Working Group and were not intended by the DPPP Working Group to be in the scope of this rulemaking. In order to exclude these pumps from this regulation, DOE proposes to exclude submersible pumps from the scope of the DPPP test procedure. To accomplish this, DOE proposes to define a "submersible pump" as "a pump that is designed to be operated with the motor and bare pump fully submerged in the pumped liquid."

The specific test methods proposed for each of the applicable DPPP varieties is discussed in more detail in section III.C.

DOE requests comment on the proposed scope of applicability of the DPPP test procedure.

7. Definitions Related to Dedicated-Purpose Pool Pump Speed Configurations and Controls

In addition to definitions of dedicated-purpose pool pump and the specific DPPP varieties, DOE also proposes to establish definitions to further differentiate certain varieties of dedicated-purpose pool pumps based on the speed configuration of the motor and/or the presence of controls on the DPPP model as distributed in commerce. The following subsections discuss definitions for the various DPPP speed configurations and the applicability of control definitions to dedicated-purpose pool pumps.

Currently, dedicated-purpose pool pumps are distributed in commerce with a variety of motor speed configurations (e.g., single-speed, two-speed, multi-speed, or variable-speed). The DPPP Working Group recommended that DOE establish different test points for each speed configuration in the DPPP test procedure, in order to best represent the different energy use patterns exhibited by each configuration (see section III.C). (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendations #6, 7 at p. 5) Therefore, DOE proposes specific definitions to establish the appropriate test method and load points for applicable dedicated-purpose pool pumps.

In the second round of DPPP Working Group meetings, the DPPP Working Group discussed and ultimately recommended definitions for the following speed configurations for dedicated-purpose pool pumps: single-speed, two-speed, multi-speed, and variable-speed. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #5A at p. 3) These definitions would enable each speed configuration to be identified and tested using the most appropriate test method based on (1) the number of operating speeds available on the pump; (2) the minimum operating speed, or turn-down ratio,[23] on the pump; (3) the pump's ability to connect to a pool pump control; and/or (4) the characteristics of that pool pump control. The DPPP Working Group recommended the following definitions:

[23] The turn-down ratio for multi-speed pumps, including two-speed pumps, describes the ability of the pump to decrease speed relative to the maximum operating speed and is calculated as the maximum operating speed over the minimum operating speed of the pump.

- Single-speed dedicated-purpose pool pump means a dedicated-purpose pool pump that is capable of operating at only one speed.

- Two-speed dedicated-purpose pool pump means a dedicated-purpose pool pump that is capable of operating at only two different, pre-determined operating speeds, where the low operating speed is less than or equal to half of the maximum operating speed and greater than zero, and must be distributed in commerce either: (1) with a pool pump control (i.e., variable speed drive and user interface or switch) that sets the speed in response to user preferences or (2) without a pool pump control that has such capability but is unable to operate without the presence of such a pool pump control.

- Multi-speed dedicated-purpose pool pump means a dedicated-purpose pool pump that is capable of operating at more than two discrete pre-determined operating speeds separated by speed increments greater than 100 rpm, where the lowest speed is less than or equal to half of the maximum operating speed and greater than zero, and must be distributed in commerce with an on-board pool pump control (i.e., variable speed drive and user interface or programmable switch) that changes the speed in response to pre-programmed user preferences and allows the user to select the duration of each speed and/or the on/off times.

- Variable-speed dedicated-purpose pool pump means a dedicated-purpose pool pump that is capable of operating at a variety of user-determined speeds, where all the speeds are separated by at most 100 rpm increments over the operating range and the lowest operating speed is less than or equal to one-third of the maximum operating speed and greater than zero. Such a pump must include a variable speed drive (i.e., equipment capable of varying the speed of the motor) and be distributed in commerce either: (1) with a user interface that changes the speed in response to pre-programmed user preferences and allows the user to select the duration of each speed and/or the on/off times or (2) without a user interface but is unable to operate without the presence of a user interface.

(Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #5A at p. 3)

In addition to the number of speeds available on any given pump, the DPPP Working Group's recommended definitions contain minimum operating speeds for two-speed, multi-speed, and variable-speed dedicated-purpose pool pumps. Specifically, the DPPP Working Group recommended a minimum speed less than or equal to half of the maximum operating speed for two-speed and multi-speed dedicated-purpose pool pumps and a minimum operating speed less than or equal to one-third of the maximum operating

speed for variable-speed dedicated-purpose pool pumps.[24] This is generally consistent with ANSI/APSP/ICC-15a–2013,[25] CA Tile 20,[26] and ENERGY STAR,[27] which require that, in order to be considered two-speed, multi-speed, or variable-speed equipment, dedicated-purpose pool pumps must have the capability of operating at two or more speeds with the low speed having a rotation rate that is no more than one-half of the motor's maximum rotation rate.

Further, the DPPP Working Group also recommends that in order to be considered a variable-speed dedicated-purpose pool pump, such a pump must be capable of operating in speed increments of at most 100 rpm, when installed with an applicable pool pump control. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #5A at p. 3) Conversely, if such a pump is only able to operate with speed increments greater than 100 rpm, then that pump would be considered a multi-speed pump (assuming it meets all other previously discussed requirements). The minimum operating speed and spacing requirements in two-speed, multi-speed, and variable-speed dedicated-purpose pool pumps ensure that the test procedure for these speed configurations results in representative energy performance. That is, unless the low operating speed is consistent with or below the specified minimum operating speed, and the speed increment

[24] DOE notes that the requirement for variable-speed dedicated-purpose pool pumps would be applicable to the dedicated-purpose pool pump, when equipped with an applicable pool pump control, as the minimum operating speed will typically be dictated by the control. That is, the pump must inherently be capable of being turned down to such a speed, provided a control that is also capable of being turned down to a speed of less than or equal to one-third of the maximum speed.
[25] Section 4.1.1.2.
[26] Cal. Code Regs., tit. 20 section 1605.3, subd. (g)(5).
[27] ENERGY STAR Pool Pumps – Program Requirements Version 1.1. Available at https://www.energystar.gov/products/spec/pool_pumps_specification_version_1_0_pd.

requirements are met, the DPPP Working Group did not believe that the load points and weights specified for variable-speed dedicated-purpose pool pumps (presented in section III.C.1) would be representative. (Docket No. EERE-2015-BT-STD-0008, No. 95 at pp. 129–146)

Finally, the definitions recommended by the DPPP Working Group contain requirements regarding the presence and operating characteristics of a pool pump control. In the field, two-speed, multi-speed, and variable-speed dedicated-purpose pool pumps require controls to enable operation at all available speeds. In their discussions, the DPPP Working Group acknowledged that most two-speed dedicated-purpose pool pumps are currently distributed in commerce without controls, as such pumps are typically intended to be paired with new or existing two-speed controls. Similarly, the DPPP Working Group acknowledged that variable-speed and some multi-speed dedicated-purpose pool pumps are currently distributed in commerce without a user interface (a type of control), as such pumps are typically intended to be paired with new or existing pool automation systems in the field. (Docket No. EERE-2015-BT-STD-0008, No. 95 at pp. 40–62, 76–79, 82–111; 129–147).

Certain members of the DPPP Working Group voiced concern that if two-speed, multi-speed, and variable-speed dedicated-purpose pool pumps were distributed in commerce without any form of control or user interface, there would be a significant risk that such pumps would not be paired with an applicable pool pump control in the field and would not achieve the performance and potential energy savings represented by the

WEF metric. (Docket No. EERE-2015-BT-STD-0008, No. 91 at pp. 141–183) Therefore, to have reasonable assurance that the test points and resultant WEF metric for the various DPPP speed configurations would be representative of actual performance of the equipment in the field, the DPPP Working Group developed the recommended definitions to ensure that only those dedicated-purpose pool pumps that either: (1) are distributed in commerce with a pool pump control or user interface (as applicable) or, (2) for two-speed and variable-speed dedicated-purpose pool pumps, requires the installation of such controls or user interface (as applicable) in order to operate would be able to be treated as two-speed, multi-speed, and variable-speed dedicated purpose pool pumps.

The DPPP Working Group developed the later requirement (that two-speed and variable-speed dedicated purpose pool pumps cannot operate without being installed with a pool pump control or user interface, as applicable) to accommodate those cases where a dedicated-purpose pool pump was intended to be installed into a residence with an existing pool pump control or user interface (as applicable) that met the stated requirements or may be paired with an applicable pool pump control or user interface in the field. In such cases, the dedicated-purpose pool pump would be allowed to be sold without the presence of a pool pump control or user interface (as applicable) so as not to burden the end-consumer with a duplicative pool pump control or user interface. However, to ensure that two-speed and variable-speed dedicated-purpose pool pumps would in all cases be installed and operated with an applicable pool pump control or user interface that enables the expected energy performance, the definitions require that these pumps be unable to operate without being connected to an applicable pool pump control

or user interface in the field. Specifically, the Working Group recommended that the two-speed DPPP definition require such a pump to be distributed in commerce either: (1) with a pool pump control that has certain capabilities or (2) without a pool pump control that has those capabilities but is unable to operate without the presence of such a pool pump control. Similarly, the Working Group recommended that the variable-speed DPPP definition require such a pump to include a variable speed drive and be distributed in commerce either: (1) with a pool pump user interface with certain capabilities or (2) without a user interface but is unable to operate without the presence of a user interface. Conversely, the DPPP Working Group did not believe that this accommodation was necessary for multi-speed dedicated-purpose pool pumps and, as a result, multi-speed dedicated-purpose pool pumps are required to be distributed in commerce with an on-board control. DOE notes that, based on the proposed definition, multi-speed dedicated-purpose pool pumps would be required to have an on-board control when distributed in commerce, which includes when the pump is imported into the United States.

While the DPPP Working Group's recommended definitions for two-speed, multi-speed, and variable-speed dedicated-purpose pool pumps all reference the presence and operating characteristics of pool pump controls, the applicable types of controls vary among the definitions. In the definition of variable-speed dedicated-purpose pool pump, the definition refers to the terms "variable speed drive" and "user interface," where the terms "variable speed drive" and "user interface" refer to a specific variety of pool pump control. Conversely, in the case of two-speed and multi-speed dedicated-purpose pool

pumps, the recommended definitions allow for an additional variety of pool pump controls, namely switches, which are applicable to such equipment.

In addition, the definitions of multi-speed and variable-speed dedicated-purpose pool pump require the applicable pool pump control to be programmable such that users may select the duration of each speed and/or the on/off times and the pump will automatically operate according to that schedule without manual intervention. Both of these definitions are meant to capture pool pump controls and user interfaces that allow the user to schedule the periods of time the pool pump is operating at any given speed, as well as when the pump turns on and turns off. Pool pump controls and user interfaces that, for example, merely enable the user to set a duration of operation at high speed and then default to low speed operation, but do not allow the user to pre-determine when the pump would turn on and off would not meet the definition of multi-speed or variable-speed dedicated-purpose pool pump. (Docket No. EERE-2015-BT-STD-0008, No. 92 at pp. 222–231)

Conversely, for two-speed dedicated-purpose pool pumps, the DPPP Working Group recommended that the definition include the requirement that the pool pump control be capable of changing the speed in response to user preferences, but did not recommend that such controls must operate on a pre-programmed schedule. As such, the functionality required for two-speed pool pump controls may be accomplished by an automated, pre-programmed, timer-based control and user interface or a simple manual switch that would require the user to physically switch between the low and high

operating speeds. The DPPP Working Group accommodated more simplistic controls for two-speed dedicated-purpose pool pumps based on the fact that most two-speed dedicated-purpose pool pumps available in the market today are not currently sold with any integrated control. (Docket No. EERE-2015-BT-STD-0008, No. 92 at pp. 215–222)

The pool pump control varieties, pool pump control operating characteristics, and requirements regarding the inclusion of pool pump controls applicable to each DPPP speed configuration are summarized in Table III.2.

Table III.2. Summary of Applicable Pool Pump Control Varieties and Related Requirements for Each DPPP Speed Configuration

DPPP Speed Configuration Definition	Applicable Pool Pump Control Varieties	Pool Pump Control Must be Pre-Programmable	Inclusion of Pool Pump Controls as Distributed in Commerce
Two-Speed	• Variable speed drive and user interface or • Switch	No	Included or DPPP model cannot operate without being installed with such controls
Multi-Speed	• Variable speed drive and user interface or • Switch	Yes	Included and on-board
Variable-Speed	• Variable speed drive and user interface	Yes	Included or DPPP model cannot operate without being installed with such controls

However, to ensure that the more accommodating requirements for pool pump controls in the two-speed DPPP definition would not result in an inadvertent loophole and/or bias in the market for DPPP varieties where two-speed dedicated-purpose pool pumps may be the least efficient option, the DPPP Working Group recommended additional provisions for larger two-speed self-priming pool filter pumps. Specifically, in order to use the two-speed DPPP test procedure (described in section III.C.1.b), the DPPP

Working Group recommended that self-priming pool filter pumps that are greater than or equal to 0.711 rated hydraulic horsepower and less than 2.5 rated hydraulic horsepower and that are two-speed must also be distributed in commerce either: (1) with a pool pump control (variable speed drive and user interface or switch) that changes the speed in response to pre-programmed user preferences and allows the user to select the duration of each speed and/or the on/off times or (2) without a pool pump control with such capability but is unable to operate without the presence of such a pool pump control. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #5B at p. 3). This is discussed in more detail in section III.C.1.e.

In this NOPR, DOE proposes to adopt the definitions for single-speed, two-speed, multi-speed, and variable-speed dedicated-purpose pool pump as proposed by the DPPP Working Group, with a few minor modifications. DOE notes that the definition of variable-speed dedicated-purpose pool pump recommended by the DPPP Working Group clarifies the meaning of the term variable speed drive as describing "equipment capable of varying the speed of the motor," while the definitions of two-speed and multi-speed dedicated-purpose pool pump also reference this term but do not contain such a clarification. Therefore, to clarify the meaning of variable speed drive and ensure that such clarification is applicable to all DPPP speed configurations, DOE proposes to establish a definition for variable speed drive, for the purposes of applying the DPPP test procedure, as equipment capable of varying the speed of the motor that removes the clarifying parenthetical ("equipment capable of varying the speed of the motor"). DOE

believes the terms "user interface" and "switch" are unambiguous and well-understood in the industry and, therefore, do not require explicit definitions.

DOE requests comments on these proposed definitions for single-speed, two-speed, multi-speed, and variable-speed dedicated-purpose pool pump.

DOE also requests comment on any additional criteria or specificity that might be required in the definitions to effectively differentiate the various speed configurations for different DPPP varieties.

For dedicated-purpose pool pumps distributed in commerce with applicable pool pump controls, the DPPP Working Group considered additional requirements if the controls also include "freeze protection controls." Freeze protection controls are controls that, at a certain ambient temperature, turn on the dedicated-purpose pool pump to circulate water for a period of time to prevent the pool and water in plumbing from freezing. As the control schemes for freeze protection vary widely between manufacturers, the resultant energy consumption associated with such control can also vary depending on control settings and climate. To ensure freeze protection controls on dedicated-purpose pool pumps only operated when necessary and did not result in unnecessary, wasted energy use, the DPPP Working Group discussed and ultimately recommended establishing prescriptive requirements for dedicated-purpose pool pumps that are distributed in commerce with freeze protection controls. Specifically, the DPPP

Working Group recommended that all dedicated-purpose pool pumps distributed in commerce with freeze protection controls be shipped either:

1) with freeze protection disabled or
2) with the following default, user-adjustable settings:
    a. The default dry-bulb air temperature setting is no greater than 40 °F; and
    b. The default run time setting shall be no greater than 1 hour (before the temperature is rechecked); and
    c. The default motor speed shall not be more than ½ of the maximum available speed.

(Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #6A at p. 4).

In order to identify dedicated-purpose pool pumps with freeze protection controls for which the recommended prescriptive requirements would be applicable, DOE proposes to define "freeze protection controls" as "pool pump controls that, at a certain ambient temperature, turn on the dedicated-purpose pool pump to circulate water for a period of time to prevent the pool and water in plumbing from freezing."

DOE requests comment on the proposed definition for freeze protection controls.

8. Basic Model

In the course of regulating consumer products and commercial and industrial equipment, DOE has developed the concept of a "basic model" to determine the specific product or equipment configuration(s) to which the regulations would apply. For the purposes of applying the proposed DPPP regulations, DOE also proposes to define what constitutes a "basic model" of a dedicated-purpose pool pump. Applying this basic model concept would allow manufacturers to group similar models within a basic model to minimize testing burden, while ensuring that key variables that differentiate DPPP energy performance and/or utility are maintained as separate basic models. In other words, manufacturers would need to test only a representative number of units of a basic model in lieu of testing every model they manufacture. However, manufacturers may only group individual models of dedicated-purpose pool pumps that are reasonably similar; that is, only dedicated-purpose pool pumps from the same equipment class may be grouped together. In addition, the represented performance for all models within a basic model must be based on the tested performance of the least efficient model.

In the January 2015 general pumps TP final rule, DOE adopted a definition for a "basic model" of pump that provided additional specifications regarding the characteristics that differentiate basic models, including variation in number of stages for multistage pumps, variation in impeller trim, and variation in motor horsepower resulting from differences in number of stages or impeller trim. 81 FR 4086, 4092–94 (Jan. 25, 2016).

DOE proposes to amend the definition of "basic model" for pumps established in the January 2016 general pumps TP final rule to also accommodate dedicated-purpose pool pumps. DOE notes that many of the specific accommodations in the basic model definition regarding number of stages for multistage pumps and trimmed impellers are applicable only to those general pumps that were the subject of the January 2016 general pumps TP final rule. 81 FR 4086 (Jan. 25, 2016). DOE understands that dedicated-purpose pool pumps are exclusively single-stage pumps and, therefore, the provision regarding variation in number of stages is not applicable. Furthermore, DOE understands that each DPPP model is offered with only one impeller diameter, unlike general pumps for which a given pump model may be sold with many different impeller diameters that are customized for each application. Therefore, DOE believes that the provision for grouping individual pumps that vary only in impeller diameter, or impeller trim, is also not applicable to dedicated-purpose pool pumps; any variation in impeller trim would constitute a separate basic model for dedicated-purpose pool pumps. Finally, as neither the multistage nor impeller trim specifications for basic model designation apply to dedicated-purpose pool pumps, the provision regarding variation in motor horsepower resulting from variation in either of those characteristics also does not apply to dedicated-purpose pool pumps.

Therefore, DOE proposes to adopt only the general provisions of the current pump basic model definition that are applicable to dedicated-purpose pool pumps, which includes all units of a given product or equipment type (or class thereof) manufactured by one manufacturer, having the same primary energy source, and having essentially

identical electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption, energy efficiency, water consumption, or water efficiency. In addition, DOE proposes to clarify that the specific provisions regarding number of stages, impeller trim, and variation in motor horsepower as a result of those characteristics adopted in the pumps basic model definition are only applicable to the general pumps addressed by the January 2015 general pumps TP and ECS final rule, for which standards are specified in 10 CFR 431.465(b). 81 FR 4086 (Jan. 25, 2016) and 81 FR 4368 (Jan. 26, 2016).

DOE requests comment on the proposed definition of "basic model."

In addition, DOE requests comment on any characteristics unique to dedicated-purpose pool pumps that may necessitate modifications to the proposed definition of "basic model."

B. Rating Metric

One of the first and most important issues DOE must consider in designing a test procedure is the selection of the regulatory metric. In selecting an appropriate metric for dedicated-purpose pool pumps, the DPPP Working Group reviewed applicable metrics currently employed by existing regulatory and voluntary programs for dedicated-purpose pool pumps in the United States and internationally. Ultimately, the DPPP Working Group recommended using a new metric, the WEF, as the regulatory metric for dedicated-purpose pool pumps. (Docket No. EERE-2015-BT-STD-0008, No. 51,

Recommendation #5 at p. 4) A review of the existing regulatory programs are discussed in more detail in section III.B.1 and the proposed WEF metric is presented in section III.B.2.

1. Review of Current DPPP Regulatory and Voluntary Programs

In considering a metric for dedicated-purpose pool pumps, the DPPP Working Group conducted research to identify what, if any, DPPP-related regulatory and voluntary programs currently exist. DOE identified one regulatory program, first adopted by the California Energy Commission (CEC) and subsequently implemented in a number of other States,[28] and three domestic voluntary pool pump programs by APSP, the Consortium for Energy Efficiency (CEE), and ENERGY STAR that are relevant to dedicated-purpose pool pumps. DOE also identified international pool pump programs established in Australia and New Zealand, as well as DOE's own January 2016 general pumps TP final rule. 81 FR 4086 (Jan. 25, 2016).

The majority of existing regulatory and voluntary programs in the United States for dedicated-purpose pool pumps focus on energy factor (EF) as the key metric for describing performance. Some programs also establish prescriptive requirements related to the construction of DPPP motors. Specifically, Article 4 of Chapter 4 of Title 20 of the California Code of Regulations, "Appliance Efficiency Regulations," (CA Title 20);[29]

[28] See, e.g. Ariz. Rev. Stat. section 44–1375 (2015); Conn. Agencies Regs. section 16a–48.4 (2015); Fla. Stat. Ann. section 533.909 (2015); and Wash. Rev. Code Ann. section 19.260.040 (2015).
[29] California Energy Commission (CEC). Chapter 4: Energy Conservation, Article 4: Appliance Efficiency Regulations. In California Code of Regulations Title 20. Public Utilities and Energy. §1601

ANSI/APSP/ICC-15a–2013;[30] the CEE Residential Swimming Pool Initiative;[31] and ENERGY STAR[32] all require testing and reporting of EF and other pump performance parameters at a variety of load points, specified in terms of up to three systems curves (curves A, B, and C) and up to four speeds (minimum, maximum, half, and most efficient speed). In addition to EF, three of these programs (i.e., CA Title 20, ANSI/APSP/ICC-15a–2013, and ENERGY STAR) require reporting of nominal motor speed, flow, and input power at the specified load points based on testing in accordance with ANSI/HI 1.6–2000.[33] The three unique system curves (curve A, curve B, and curve C) are described by equations in terms of head and flow, as shown in Table III.3, and were developed to be representative of 2.0-inch, 1.5-inch, and 2.5-inch diameter plumbing, respectively.[34]

1608. March 28, 2014. CEC-140-2014-002. www.energy.ca.gov/2014publications/CEC-140-2014-002/CEC-140-2014-002.pdf . A 2015 update to the CEC Title 20 Appliance Efficiency Regulations was released in July 2015. CEC-400-2015-021. http://www.energy.ca.gov/2015publications/CEC-400-2015-021/CEC-400-2015-021.pdf

[30] Section 4.1.2 of ANSI/APSP/ICC-15a–2013.

[31] Consortium for Energy Efficiency (CEE). CEE High Efficiency Residential Swimming Pool Initiative. December 2012. http://library.cee1.org/sites/default/files/library/9986/cee_res_swimmingpoolinitiative_07dec2012_pdf_10557.pdf.

[32] ENERGY STAR Program Requirements Product Specifications for Pool Pumps, Final Test Method. Rev. Jan-2013. https://www.energystar.gov/sites/default/files/specs/Pool%20Pump%20Final%20Test%20Method%2001-15-2013.pdf.

[33] DOE notes that CA Title 20 actually requires that measurements of pump efficiency be conducted in accordance with ANSI/HI 1.6–2000, but does not explicitly extend this requirement to measured speed, flow, and input power, which are the variables necessary to calculate EF. Cal. Code Regs. section1604, subd. (g).

[34] PG&E developed curves A, B, and C based data from an exercise by ADM Associates, Inc. in 2002, EVALUATION OF YEAR 2001 SUMMER INITIATIVES POOL PUMP PROGRAM and contractor input. However, the actual data for the curves are not contained in the ADM report (the ADM report can be found at www.calmac.org/publications/SI_Pool_Pump.pdf; Last accessed April 4, 2016). Curves A and B are first formally mentioned in a subsequent report by PG&E in Codes and Standards Enhancement

Table III.3. Pump System Curve Formulas

Curve	Formula
A	Head (feet) = 0.0167 X Flow² (gpm)
B	Head (feet) = 0.050 X Flow² (gpm)
C	Head (feet) = 0.0082 X Flow² (gpm)

The majority of programs reference and require reporting on each of curves A, B, and C; however, programs differ in the number of operating speeds that are required to be tested. For example, CA Title 20 requires manufacturers to report all applicable quantities[35] on each curve at maximum speed only for single-speed dedicated-purpose pool pumps and at both maximum and minimum speeds for two-speed, multi-speed, and variable-speed dedicated-purpose pool pumps. Cal. Code Regs. section1604, subd. (g). Conversely, ANSI/APSP/ICC-15a–2013 requires testing at maximum speed for single-speed pumps; all available speeds for multi-speed pumps (including two-speed pumps); and maximum, minimum, half, and most efficient speed for variable-speed dedicated-purpose pool pumps.[36] The load points specified by each program are summarized in Table III.4.

Initiative for FY 2004. However, this report does not discuss the derivation of the curves. (http://consensus.fsu.edu/FBC/Pool-Efficiency/CASE_Pool_Pump.pdf; Last accessed April 29, 2016). In addition, section 4.1.2.1.3 of ANSI/APSP/ICC-15a–2013 describes curves A, B, and C as "approximately" representative of 2.0-inch, 1.5-inch, and 2.5-inch pipe, respectively.

[35] CA Title 20 requires reporting of motor nominal speed (rpm), flow (gpm), power (W and volt amps (VA)), EF (gal/Wh). Cal. Code Regs. section 1606, subd. (a).

[36] Sections 4.1.2.1.4-4.1.2.1.6 of ANSI/APSP/ICC-15a–2013.

Table III.4. Summary of Load Points Required by CA Title 20, ANSI/APSP/ICC-15a–2013, ENERGY STAR, and CEE

Pump Speed(s)	CA Title 20	ANSI/APSP/ICC-15a–2013	ENERGY STAR	CEE
Single-speed	Max Speed on Curves A, B, & C	Max Speed on Curves A, B, & C	Max Speed on Curves A, B, & C	N/A*
Two-speed	Max and Min Speed on Curves A, B, & C	Max and Half Speed on Curves A, B, & C	Max and Half Speed on Curves A, B, & C	Max and Half Speed on Curve A
Multi-speed	Max and Min Speed on Curves A, B, & C	All Available Speed on Curves A, B, & C	All Available Speed on Curves A, B, & C	Max and Half Speed on Curve A
Variable-speed	Max and Min Speed on Curves A, B, & C	Max, Min, Half, and Most Efficient Speed on Curves A, B, & C	Max, Min, and Most Efficient Speed on Curves A, B, & C	Max, Half, and Most Efficient Speed on Curve A

* CEE requires applicable pool pumps to meet an EF requirement at both a high and low speed and, therefore, single-speed pool pumps are not eligible for CEE qualification.

In addition to requiring measurement and reporting of DPPP performance characteristics, CA Title 20,[37] APSP/ANSI/ICC-15a–2013,[38] ENERGY STAR,[39] and CEE[40] contain prescriptive requirements regarding the design and characteristics of the DPPP motor and controls. Specifically, CA Title 20, ANSI/APSP/ICC-15a–2013, and ENERGY STAR all require that DPPP motors must:

1) have the capability of operating at two or more speeds, where the ‘‘low’’ speed has a rotation rate that is no more than one-half of the motor’s maximum rotation rate, if the motor is 1 hp or greater;

[37] Cal. Code Regs. section 1605.3, subd. (g) and section 1604, subd. (g).
[38] Sections 4.1.1, “Motors,” and 4.2, “Pump controllers” of ANSI/APSP/ICC-15a–2013
[39] ENERGY STAR Pool Pumps – Program Requirements Version 1.1. Available at https://www.energystar.gov/products/spec/pool_pumps_specification_version_1_0_pd.
[40] Consortium for Energy Efficiency (CEE). High Efficiency Residential Swimming Pool Initiative: Pool Pump Control Specification. January 1, 2013. http://library.cee1.org/sites/default/files/library/9988/cee_residential_pool_pump_control_specification_29414.pdf.

2) be operated with an applicable multi-speed pump control with a default circulation speed no more than one-half of the motor's maximum rotation rate and whose high speed override capability, if available, does not extend for a period exceeding 24 hours; and
3) have their efficiency reported, as measured in accordance with the test method of the Institute of Electrical and Electronics Engineering (IEEE) 114–2001.

CA Title 20 also requires that DPPP motors not be split-phase or capacitor start-induction run-type motors. Cal. Code Regs. section 1605.3, subd. (g) and section 1604, subd. (g).

In addition to the testing and prescriptive design requirements, ENERGY STAR[41] and CEE[42] also specify performance requirements based on EF at specified speed points on curve A only.[43] The ENERGY STAR and CEE requirements are specified in Table III.5 and Table III.6, respectively. CA Title 20[44] and APSP/ANSI/ICC-15a–2013 do not currently have any minimum energy performance requirements (i.e., these programs do not specify a minimum EF requirement).

[41] ENERGY STAR Pool Pumps – Program Requirements Version 1.1. Available at https://www.energystar.gov/products/spec/pool_pumps_specification_version_1_0_pd.
[42] Consortium for Energy Efficiency (CEE). High Efficiency Residential Swimming Pool Initiative: Pool Pump Specification. January 1, 2013. Available at: http://library.cee1.org/sites/default/files/library/9987/cee_residential_pool_pump_specification_90947.pdf.
[43] DOE notes that, as acknowledged by Pentair during the DPPP Working Group meetings, while curve A is referenced in the CEE High Efficiency Residential Swimming Pool Initiative (see http://library.cee1.org/sites/default/files/library/9986/cee_res_swimmingpoolinitiative_07dec2012_pdf_10557.pdf), an error may have been made in establishing the CEE performance levels and that CEE is aware that some data were generated using curve C, where curve A was intended, resulting in the error. (Docket No. EERE-2015-BT-STD-0008, Pentair, No. 38, p. 135)
[44] Cal. Code Regs. section 1605.3, subd. (g) and section 1604, subd. (g).

Table III.5 ENERGY STAR Pool Pump Energy Factor Criteria at Pool Pump Performance Curve A*

Pump Sub-Variety	Speed Setting	Energy Efficiency Level gal/Wh
Single-Speed Pump	Single-Speed	EF ≥3.80
Multi-Speed, Variable-Speed and Variable-Flow Pump	Most Efficient Speed	EF ≥3.80

* Although the ENERGY STAR test method requires the testing and reporting of EF and other DPPP performance metrics at curves A, B, and C at various speed points, the ENERGY STAR specification is only applied on curve A at a single speed point.

Table III.6 CEE Tier 1 and 2 EF Requirements

Efficiency Level	Lower Speed* EF gal/Wh	Low Speed** EF gal/Wh	High Speed† EF gal/Wh
CEE Tier 1	No Requirement	≥3.8	≥1.6
CEE Tier 2	≥12.0	≥5.5	≥1.7

* Where "lower speed" is the optimal or most efficient speed for the pool pump, likely ranging from 600 to 1,200 RPM.
** Where "low speed" is either the minimum speed for two-speed pumps or half the maximum speed for variable-speed pumps, typically 1,725 RPM.
† Where "high speed" is the maximum operating speed of the pump, usually 3,450 RPM.

Internationally, the Australia state and territory governments and the New Zealand government operate the Energy Rating Labeling Program that relies on Australian Standard (AS) 5102–2009, ''Performance of household electrical appliances—Swimming pool pump—units, Parts 1 and 2'' (AS 5102–2009) as the basis for the efficiency levels and testing requirements for residential pool pumps. The minimum energy performance standard in part 2 of AS 5102–2009 is stated in terms of a minimum EF at a single load point on a new, curve D, shown in Table III.7. The current MEPS is 8 liters/watt-hour (2.09 gal/Wh).

Table III.7 Curve D Definition

Metric Equivalent	Imperial Unit Equivalent *
H (m) = 0.00018 Flow (L/min)**	H (ft) = 0.0084 x Flow (gpm)**

* 1 liter/minute = gallons/minute
** 1 meter (pressure) = feet (pressure)

Finally, DOE notes that in January 2016, DOE published the January 2016 general pumps TP final rule in which DOE established definitions, sampling plans, and a test procedure applicable to pumps. 81 FR 4086 (Jan. 25, 2016). DOE established a new metric, the pump energy index (PEI), to rate the energy performance of pumps subject to that test procedure. 81 FR 4086, 4104–4109 (Jan. 25, 2016). That test procedure contains methods for determining pump energy index for continuous loads (PEI_{CL}) for pumps sold without continuous or non-continuous controls, and the pump energy index for variable loads (PEI_{VL}) for pumps sold with either continuous or non-continuous controls. Both PEI_{CL} and PEI_{VL} describe the weighted average performance of the rated pump at specific load points, normalized with respect to the performance of a minimally compliant pump without controls. Id. Both PEI_{CL} and PEI_{VL} can be generally evaluated as the weighted average input power to the motor or controls, if available, at specific load points over the weighted average input power to a pump and motor that is minimally compliant with DOE's energy conservation standards for general pumps established in a final rule also published in January 2016 serving the same hydraulic load. 81 4086, 4104–4109 (Jan. 25, 2016) (January 2016 general pumps TP final rule) and 81 FR 4368 (Jan. 26, 2016) (January 2016 general pumps ECS final rule).

2. Proposed Metric: Weighted Energy Factor

In developing an appropriate metric for dedicated-purpose pool pumps, the DPPP Working Group reviewed the applicable metrics (i.e., PEI, EF, WEF) and considered the advantage and disadvantages of each. Overall, DOE discussed with the DPPP Working Group the key objectives of any DPPP metric, including that it (1) be objectively

measurable, (2) be representative of the energy use or energy efficiency of dedicated-purpose pool pumps, (3) provide an equitable differentiation of performance among different DPPP models and technologies, (4) be able to compare the energy efficiency of a given DPPP model to a minimum standard level, and (5) provide the necessary and sufficient information for purchasers to make informed decisions regarding DPPP selection. (Docket No. EERE-2015-BT-STD-0008, No. 38 at pp. 207–208)

The DPPP Working Group focused on defining a performance-based metric that is similar to EF metric currently used to describe DPPP performance by many existing programs, as presented in III.B.1, but that also accounts for the potential energy savings of equipment with multiple operating speeds. (Docket No. EERE-2015-BT-STD-0008, No. 38 at pp. 211–213) Specifically, the DPPP Working Group considered developing a metric that is a weighted average of the performance of a dedicated-purpose pool pumps at multiple speed points along a representative system curve. Ultimately, the DPPP Working Group recommended using the weighted energy factor (WEF), which is defined as the ratio of the flow provided by the pump, divided by the input power to the pump, at one or more load points, where these load points are selected depending on the specific DPPP variety and speed configuration, as shown in equation (1). (Docket No. EERE-2015-BT-STD-0008, No. 38 at pp. 209–223)

The DPPP Working Group recommended weighting the measured flow and power individually in the numerator and denominator, respectively, instead of first calculating the EF at each load points and then weighting the calculated EF values at each

load point together. The DPPP Working Group believed that weighting the individual flow and input power points instead of the EF values would be more representative of the relative energy performance of DPPP models. In particular, the DPPP Working Group determined that calculating the weighted average flow over the weighted average input power, as proposed, would result in a relative improvement in energy efficiency between single-speed, two-speed, multi-speed, and variable-speed equipment commensurate with that likely to be experienced in the field. Conversely, weighting the EF values directly would exaggerate the improvement resulting from variable speed technology. (Docket No. EERE-2015-BT-STD-0008, ASAP, No. 48 at pp. 1–2; No. 57 at pp. 25–60)

The equation for WEF is shown in the equation (1):

$$WEF = \frac{\sum_{i=1}^{n}\left(w_i \times \frac{Q_i}{1000} \times 60\right)}{\sum_{i=1}^{n}\left(w_i \times \frac{P_i}{1000}\right)} \quad \textbf{(1)}$$

Where:

WEF = weighted energy factor in kgal/kWh;

w_i = weighting factor at each load point i;

Q_i = flow at each load point i in gal/min; [45]

P_i = input power to the motor (or controls, if present) at each load point i in W;

i = load point(s), defined uniquely for each DPPP variety; and

n = number of load point(s), defined uniquely for each speed configuration.

(Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #5 at p. 4)

The specific load points and weights for each DPPP variety are discussed in section III.C.

As seen in equation (1), this metric would be expressed in terms of kilogallons per kilowatt-hour (kgal/kWh), similar to the EF metric. Regarding the units of the WEF metric, members of the DPPP Working Group suggested that the values of flow and power be determined in gallons and watts, respectively, but the resultant WEF metric be represented in terms of kgal/kWh. DOE notes that this is inconsistent with the EF metric, which represents in terms of gal/Wh, but is numerically identical because both the numerator and denominator are scaled consistently. Pentair stated that, because pools are often discussed in terms of thousands or tens of thousands of gallons, the pool industry often does not understand EF until it is explained as the ability to pump 10,000 gallons for 1 kilowatt-hour of energy. (Docket No. EERE-2015-BT-STD-0008, Pentair No. 59 at p. 132) Therefore, the DPPP Working Group recommended dividing the numerator and denominator by 1,000, to translate the flow, in gallons, and power, in W, to kilogallons

[45] $P_{i,j}$ and $Q_{i,j}$ are determined in accordance with December 2015 DPPP Working Group recommendations. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #8 at p. 6) See section 0 for a discussion of this methodology.

and kW, respectively to facilitate the calculation of WEF in kgal/kWh, which are units that may be more readily understood by both the industry and the market.

DOE agrees with the DPPP Working Group that the recommended WEF metric, as shown in equation (1), provides a representative, objective, and informative characterization of DPPP performance. As such, based on the recommendations of the DPPP Working Group, DOE proposes to adopt the WEF metric as the performance-based metric for representing the energy performance of certain styles of dedicated-purpose pool pumps. DOE notes that any standards considered for any dedicated-purpose pool pumps for which the WEF applies would use this metric as a basis for the standard level. However, as discussed in section III.A.6, DOE notes that the WEF metric only is applicable to the varieties of dedicated-purpose pool pumps for which the DPPP Working Group recommends performance standards.

DOE requests comment on its proposal to adopt WEF as the metric to characterize the energy use of certain dedicated-purpose pool pumps and on the proposed equation for WEF.

C. Test Methods for Different DPPP Categories and Configurations

As discussed in section III.B.2, DOE proposes to characterize the performance of dedicated-purpose pool pumps according to the WEF, which is calculated as the weighted average of the flow over the weighted average of the input power, each measured at different speeds and load points. Due to differences in equipment design and typical use

profiles, the DPPP Working Group recommended that weights and load points be specified uniquely for each DPPP variety and pump speed configuration. Specifically, the DPPP Working Group recommended unique load points for the various speed configurations (e.g., single-speed, two-speed, multi-speed, or variable-speed dedicated-purpose pool pumps) of self-priming and non-self-priming pool filter pumps with a rated hydraulic horsepower less than 2.5 hp (section III.C.1), as well as waterfall pumps (section III.C.1.e) and pressure cleaner booster pumps (section III.C.3), which reference only a single load point. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #6 at p. 5) The load points and weights recommended by the DPPP Working Group in the December 2015 DPPP Working Group recommendations for each DPPP variety are summarized in Table III.8.

Table III.8. Summary of DPPP Working Group Recommended Load Points for DPPP Varieties and Speed Configurations.

DPPP Varieties	Speed Type	# of Points, n	Load Point, i	Test Points	
				Flow Rate Q (GPM)	Head (Described by Reference System Curve), H (ft)
Self-Priming Pool Filter Pumps And **Non-Self-Priming Pool Filter Pumps**	Single	1	High	$Q_{high}(gpm) = Q_{max\_speed@C}$ *	$H = 0.0082 \times Q_{high}^2$
	Two-Speed	2	Low	$Q_{low}(gpm) = 0.5 \times Q_{max\_speed@C} = 39.21 \times P_{hydro,max@C}(HP)^{1/3}$ (at half max speed)	$H = 0.0082 \times Q_{low}^2$
			High	$Q_{high}(gpm) = Q_{max\_speed@C}$ = Flow at max speed on curve C	$H = 0.0082 \times Q_{high}^2$
	Variable and Multi-Speed	2	Low	$Q_{low}(gpm)$= • If pump hydraulic hp at max speed on curve C is >0.75, then Q_{low} = 31.1 gpm • If pump hydraulic hp at max speed on curve C is ≤0.75, then Q_{low} = 24.7 gpm (at lowest available speed to achieve this flow)	$H \geq 0.0082 \times Q_{low}^2$
			High	$Q_{high}(gpm) = 0.8 \times Q_{max\_speed@C}$ (at 80% max speed)	$H = 0.0082 \times Q_{high}^2$
Waterfall Pumps	Single	1	High	Flow corresponding to specified head (on max speed pump curve)	17 ft
Pressure Cleaner Booster Pumps	All	1	High	Flow corresponding to specified head (on max speed pump curve)	90 ft

* $Q_{max\text{-}speed@C}$ = Flow at max speed on curve C (gpm)

Subsequently, in the second round of negotiations, the DPPP Working Group reevaluated the recommended test procedure for pressure cleaner booster pumps. In the June 2016 DPPP Working Group recommendations, the DPPP Working Group recommended a revised load point of 10 gpm at the minimum head the pump can provide at or above 60 ft, where the pressure cleaner booster pump can vary speed to achieve the

minimum head. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #8 at pp. 4–5).

The load points for each DPPP variety are defined as the intersection of the head values described by the reference system curve,[46] which describes the representative hydraulic characteristics of a typical installation for the specific DPPP variety, and the performance curve for any given dedicated-purpose pool pump at a given operating speed. Each intersection point, or load point, is specified in terms of head and flow. As each available operating speed on two-speed, multi-speed, and variable-speed dedicated-purpose pool pumps represents a different performance curve, these pumps require multiple load points to effectively characterize their performance. The load points for self-priming and non-self-priming pool filter pump, waterfall pumps, and pressure cleaner booster pumps are discussed in the subsequent sections.

1. Self-Priming and Non-Self-Priming Pool Filter Pumps

This section identifies the different speed configurations, load points, and weighting factors for both self-priming and non-self-priming pool filter pumps. As noted in section III.A.3, self-priming and non-self-priming pool filter pumps have different construction characteristics and potentially different applications. However, during the Working Group meetings, the DPPP Working Group discussed how the performance of these two different varieties of pumps are comparable in most instances. In addition, the

[46] Note the "reference system curve" is a flat head value for waterfall pumps and pressure cleaner booster pumps.

DPPP Working Group acknowledged that both varieties of pool filter pumps could theoretically be installed in either aboveground or inground pools, depending on the requirements of the particular application. (Docket No. EERE-2015-BT-STD-0008, No. 57 at pp. 329–331) Specifically, the CA IOUs noted that the pump curves from several manufacturers for aboveground pool filter pumps are similar to those for the manufacturers' respective inground pumps. (Docket No. EERE-2015-BT-STD-0008, CA IOUs, No. 57 at p. 329) In addition, the DPPP Working Group discussed how the referenced system curves A, B, and C primarily were developed based on inground pools, and that little data exists regarding the representative system curves for aboveground pools. (Docket No. EERE-2015-BT-STD-0008, Waterway, No. 39 at p. 54; Waterway, No. 53 at pp.146–147; CA IOUs, No, 53 at p. 147)

To provide comparability between WEF ratings for self-priming and non-self-priming pool filter pumps, the DPPP Working Group recommended the same reference system curve for both self-priming and non-self-priming pool filter pumps. Specifically, the DPPP Working Group discussed how curve C, which pertains to 2.5-inch piping, is a reasonable representation of typical existing pool installations, and would only become more common as new pools typically are designed with 2.5-inch piping (curve C), instead of the more restrictive 1.5-inch (curve B) plumbing design that is more common in older pools. (Docket No. EERE-2015-BT-STD-0008, CA IOUs, No. 59 at p. 98; Hayward, No. 59 at pp. 106–107; Waterway, No. 53 at p. 146; DOE, No. 53 at pp. 147–148) Accordingly, consistent with the recommendations of the DPPP Working Group,

DOE proposes that self-priming and non-self-priming pool filter pumps be tested at specific load points specified along curve C (see Table III.3).

DOE requests comment on its proposal to test self-priming and non-self-priming pool filter pumps at load points specified along curve C to determine the WEF for such pumps.

In addition to the specified system curve, the DPPP Working Group recommended specific operating speeds or flow points that would dictate the different load points for the different speed configurations of self-priming and non-self-priming pool filter pumps (see Table III.8). The specific load points for single-speed, two-speed, multi-speed, and variable-speed pool filter pumps are discussed in sections III.C.1.a, III.C.1.b, and III.C.1.c, respectively.

a. Single-speed Pool Filter Pumps

Single-speed pool filter pumps, by definition and design, are only capable of operating at one speed. Therefore, the DPPP Working Group recommended testing single-speed pool filter pumps at the pump's maximum, and only, speed of rotation on curve C. That is, the load point for single-speed pool filter pumps would be specified as the point of intersection between the pump's performance curve at its maximum speed and the system curve C, as shown in Figure III.2. DOE believes the load point recommended by the DPPP Working Group is representative of the performance of single-speed pool filter pumps and provides an equitable comparison among equipment.

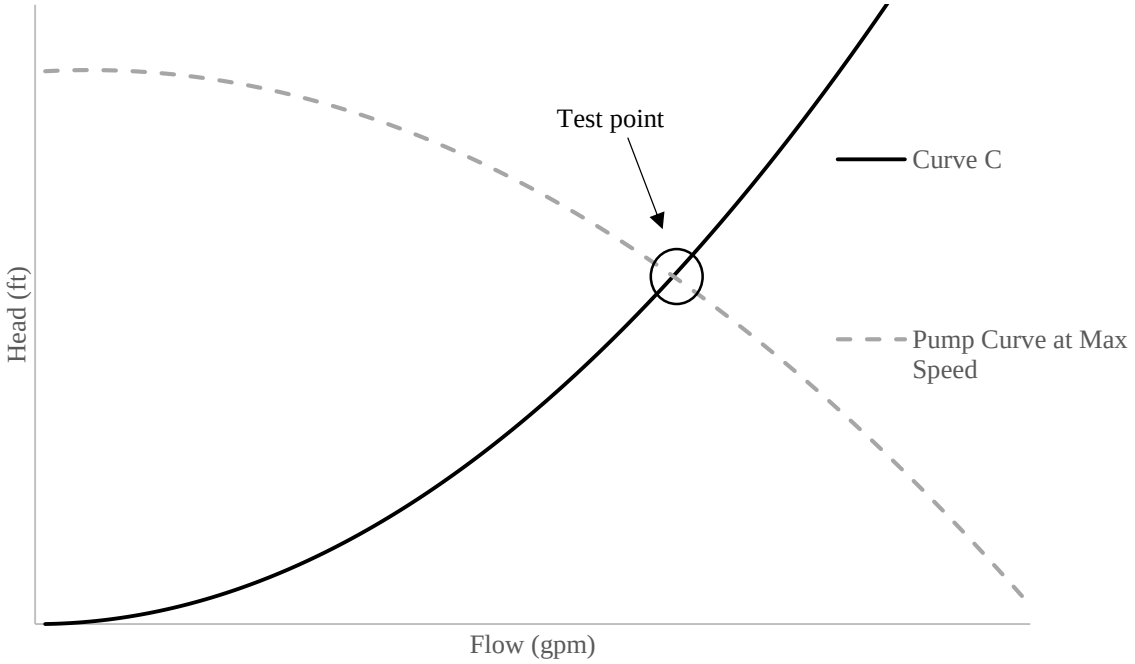

Figure III.2. Specified Load Point on Curve C at Maximum Speed for Single-Speed Self-Priming and Non-Self-Priming Pool Filter Pumps.

DOE requests comment on its proposal to test single-speed pool filter pumps at a single load point corresponding to the maximum speed for that pump on curve C.

b. Two-speed Pool Filter Pumps

Two-speed pumps, by definition and design, are capable of operating at two discrete speeds. As such, the DPPP Working Group recommended evaluating performance at two load points, which would capture the differing performance at the high and low speeds. The Working Group also agreed that these two load point are representative of the typical operation of two-speed pool filter pumps in the field. Specifically, the DPPP Working Group discussed that two-speed pool filter pumps perform two functions: (1) long-term filtration at low speed and low flow to provide an

adequate "turnover rate"[47] and (2) short-term cleaning or mixing at high speed and high flow to operate suction-side pool cleaners and ensure proper mixing of the water.[48, 49,50] As discussed in section III.B.1, many of the existing regulatory and voluntary programs identified in the United States require that the low speed on two-speed pumps is at least 50 percent lower than the maximum, or high, speed of rotation. Consistent with typical two-speed pool filter pump design and the requirements of existing regulatory programs, the DPPP Working Group recommended testing two-speed pool filter pumps (1) at the load point corresponding to the pump's maximum speed of rotation on curve C and (2) at the load point corresponding to half of the maximum-speed flow rate with total dynamic head at or above curve C. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation # 6, at p. 5) Figure III.3 illustrates these test points.

To test applicable two-speed dedicated-purpose pool pumps at the low speed point, the pump operating speed should be reduced to the low-speed setting to achieve the specified flow rate. If the two-speed pump has a low-speed setting that is exactly one-

[47] The turnover rate is described in the pool industry (and defined in ANSI/APSP/ICC-15a–2013) as "the total number of times the entire volume of water in the pool is circulated (or "turned over") in a time period of 24 hours." For residential pools, ANSI/APSP/ICC-15a–2013 recommends a minimum turnover time of 12 hours, which results in a turnover rate of two. For commercial and public pools, requirements for turnover rates and times are typically set by local authorities.

[48] Rainer, L. Proposal Information Template for: Residential Pool Pump Measure Revisions. 2008. Prepared for PG&E. www.energy.ca.gov/appliances/2008rulemaking/documents/2008-05-15_workshop/other/PGE_Updated_Proposal_Information_Template_for_Residential_Pool_Pump_Measure_Revisions.pdf

[49] SCE. Commercial Variable Speed Pool Pump Market Characterization and Metering Study. February 2015. www.etcc-ca.com/sites/default/files/reports/et13sce1170_comm_vfd_pool_pumps_final.pdf

[50] CA IOUs. Pools & Spas Codes and Standards Enhancement (CASE) Initiative for PY 2013: Title 20 Standards. July 29, 2013. http://www.energy.ca.gov/appliances/2013rulemaking/documents/proposals/12-AAER-2F_Residential_Pool_Pumps_and_Replacement_Motors/California_IOUs_Response_to_the_Invitation_to_Submit_Proposals_for_Pool_and_Spas_2013-07-29_TN-71756.pdf

half of the high speed setting, as is typical of pool filter pump design, the low-speed setting will result in a flow rate that is exactly one-half of the flow rate at maximum speed on curve C. In addition, the resultant head point will be exactly on curve C, as shown on the dashed line in Figure III.3.[51] However, this load point is only possible for pumps with the low-speed setting equivalent to one-half of the rotating speed of the maximum speed setting.

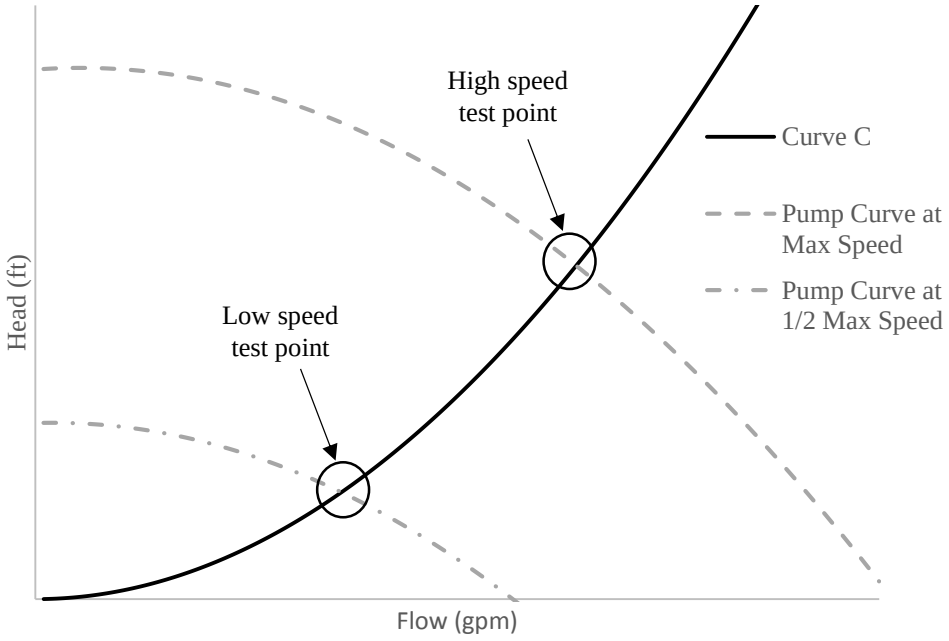

Figure III.3. Specified Load Points on Curve C at Maximum Speed for Two-Speed Self-Priming and Non-Self-Priming Pool Filter Pumps.

[51] The pump affinity laws describe the relationship of pump operating speed, flow rate, head, and hydraulic power. According to the affinity laws, speed is proportional to flow such that a relative change in speed will result in a commensurate change in flow. The affinity laws also establish that pump total head is proportional to speed squared and hydraulic power is proportional to speed cubed.

For any pool filter pumps that may have a low-speed setting lower than one-half of the maximum speed, the low-speed setting would not be able to achieve a flow rate of one-half the flow rate at maximum speed. Therefore, in order to achieve the specified flow point, such a pump would be required to operate at the high-speed setting and be throttled in order to achieve a flow rate of exactly one-half of the flow rate at maximum speed, as shown in Figure III.4 (option 1). This would result in a WEF that is lower (less efficient) than two-speed pumps with a low-speed setting that is exactly one-half of the maximum operating speed. Throttling the high-speed of a two-speed pump, rather than utilizing the low-speed, would not capture the actual efficiency, and thus the actual potential energy savings, of the pump when operated at low speed.

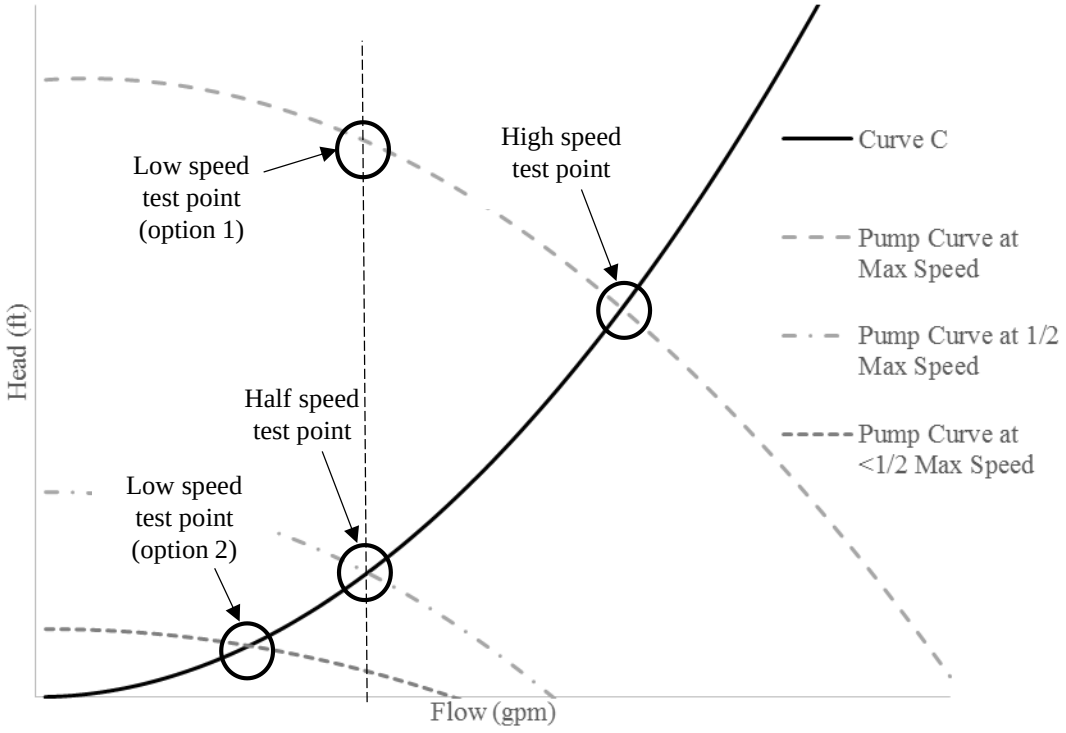

Figure III.4. Specified Load Points on Curve C at Maximum Speed for Two-Speed Self-Priming and Non-Self-Priming Pool Filter Pumps.

DOE notes that an alternative option for testing a two-speed pump would be to specify the low-speed load point as the point where that pump performance curve intersects curve C (option 2). This would result in a WEF that is higher (more efficient) than comparable two-speed pumps with low-speed settings that are higher (e.g., one-half of maximum speed or higher).

Although two-speed pumps typically are equipped with alternating current (AC) induction motors that can operate with either 2- or 4-poles[52] activated, offering nominal synchronous operating speeds of 3,600 or 1,800 rpm, respectively, DOE notes that, due to motor slip, the motor may rotate at slightly less than half of the maximum speed of rotation. Alternatively, two-speed motors may be available with a low speed option that is less than half of the maximum speed, for example Waterway noted the potential for 2-/6-pole DPPP models that would be capable of operating at either 3,600 or 1,200 rpm, respectively. (EERE-2015-BT-STD-0008, Waterway, No. XX at pp. YYY) DOE does not believe that testing such a pump at only the high-speed setting would be representative of the performance of such pumps. Specifically, DOE understands, based on discussions with the DPPP Working Group, that most pumps would be sized and installed in a given pool application based on the low-speed flow rate, to provide adequate filtration at that speed and flow. The pump would be turned up to high speed periodically to provide the cleaning/mixing function. (EERE-2015-BT-STD-0008, CA

[52] Poles are the number of sets of three-way electromagnetic windings contained within a motor. A 2-pole motor has one set of three-way windings, a 4-pole as two sets, and a 6-pole has three sets. The speed of the motor is a function of both the operating frequency and the number of poles in the motor.

IOUs, No. 58 at pp. 152 – 53; CA IOUs, No. 53 at p. 159 – 60; CA IOUs, No. 56 at p. 31; CA IOUs, No. 57 at pp.358 - 59) DOE believes this is the case for all two-speed pumps, regardless of their relative low- and high-speed settings and, therefore, believes that it is most representative to test all two-speed pumps at the low-speed setting on curve C. DOE also notes that, based on the proposed definition of a two-speed pump, a pump that operates at two speeds with a low speed that is greater than one-half of the maximum speed is not considered a two-speed dedicated-purpose pool pump. Dedicated-purpose pool pumps that have a second operating speed that is lower than the maximum speed but higher than one-half of the maximum speed would be tested as single-speed dedicated-purpose pool pumps.

To provide consistent and comparable ratings among two-speed pool filter pumps, DOE proposes to establish the following two test points for two-speed pool filter pumps: (1) a high flow point at the maximum speed at curve C and (2) a low flow point at the low-speed setting on curve C. DOE believes that these test points are representative of typical pool filter pump operation and energy performance. Specifically, DOE believes that the high flow and speed load point effectively characterizes the efficiency of the pump in a cleaning/mixing application, and low speed and low flow load point characterizes the efficiency of the pump in a typical filtration application. DOE also believes that the proposed load points for two-speed pool filter pumps are consistent with the intent of the DPPP Working Group. While DOE acknowledges that the DPPP Working Group specifically recommended a flow rate of one-half of the flow rate at the maximum speed of rotation on curve C, DOE believes the DPPP Working Group was

considering only the most common two-speed pool filter pump design, with low-speed equal to one-half the maximum speed, when specifying the load points. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation # 6, at p. 5) DOE believes, based on the discussions of the DPPP Working Group, that the Working Group intended for two-speed pumps with low-speed settings other than one-half of the maximum speed of rotation to be operated at that low-speed setting and not throttled to achieve a specific flow value, as that is not likely to occur in the field.

However, by specifying that two-speed pool filter pumps would be tested at the low speed that is available on the pump, DOE recognizes that there is an opportunity for manufacturers to improve their WEF score by offering a low speed with a slower speed of rotation. While, in most cases, DOE believes that such differentiation is warranted, the DPPP Working Group acknowledged on several occasions that there is a minimum flow rate that is required for effective pool filtration and that flow rates below that minimum value are not useful and do not result in energy savings in the field. (EERE-2015-BT-STD-0008, Pentair, No. 53 at p. 136; CA IOUs, No. 53 at p. 136-137) Therefore, DOE believes that two-speed pool filter pumps with a low speed of rotation below a minimum threshold that is deemed reasonable for pool applications should not be able to be tested to determine the WEF rating of the pump, as such a rating would not be representative of the pump's performance in the field.

For multi-speed and variable-speed pool filter pumps, DOE proposes to establish discrete flow points, specified as a function of the pump's rated hydraulic horsepower at

maximum speed on curve C, that are intended to represent the minimum flow rate for typical "small" and "large" pool applications (see section III.C.1.c for more discussion). Specifically, in section III.C.1.c DOE proposes a low flow rate of 24.7 gpm for multi-speed and variable-speed pool filter pumps that have a hydraulic output power less than or equal to 0.75 hp (small pool filter pumps) and a low flow rate of 31.1 gpm for multi-speed and variable-speed pool filter pumps that have a hydraulic output power greater than 0.75 (large pool filter pumps). DOE believes these flow rates would also be representative minimum flow rates for two-speed pool filter pumps and would effectively prevent the inclusion of unreasonably low speeds on two-speed pool filter pumps for the sole purpose of inflating WEF ratings.

DOE proposes that the low speed flow rate cannot be below 24.7 gpm for two-speed pool filter pumps that have a hydraulic output power less than or equal to 0.75 hp (small pool filter pumps) and that the low speed flow rate of cannot be below 31.1 gpm for two-speed pool filter pumps that have a hydraulic output power greater than 0.75 hp (large pool filter pumps). If a two-speed pump has a flow rate below the specified value at low speed, the low speed of that pump would not be tested. That is, the pump would only be tested at the high speed setting, similar to a single-speed pump, since the low speed setting results in a flow rate below the specified low flow rate on curve C. DOE is not aware of any such two-speed pumps that currently have a speed below the stated values. However, DOE believes the proposed test procedure is representative of the potential use of any such pumps, as any available low speeds that result in flow rates

below the specified flow rates would not be useful and, therefore, would not be used in the field.

DOE requests comment on the proposed load points for two-speed pool filter pumps, as well as the minimum flow rate thresholds of 24.7 gpm for two-speed pool filter pumps that have a hydraulic output power less than or equal to 0.75 hp (small pool filter pumps) and a low flow rate of 31.1 gpm for two-speed pool filter pumps that have a hydraulic output power greater than 0.75 and less than 2.5 hp (large pool filter pumps).

In particular, DOE requests comment on the load points for two-speed pool filter pumps with a low-speed setting that is higher or lower than one-half of the maximum speed setting.

DOE also requests comment on the availability and any examples of two-speed pool filter pumps with a low-speed setting that are not exactly one-half of the maximum speed setting.

c. Variable-Speed and Multi-Speed Pool Filter Pumps

Although the DPPP Working Group suggested that DOE separately define variable-speed and multi-speed pool filter pumps, they recommended that the same test procedure be applied to both speed configurations. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation # 6, at p. 5) For variable- and multi-speed pool filter pumps, the DPPP Working Group also proposed two load points that are generally

representative of a high-speed mixing/cleaning flow rate and a low-speed filtration flow rate, similar to two-speed pool filter pumps (as discussed in section III.C.1.b). However, the high-speed and low-speed load points for variable- and multi-speed equipment are specified in a slightly different manner than for two-speed equipment. Specifically, as shown in Table III.9, the DPPP Working Group recommended testing multi- and variable-speed pool filter pumps at (1) a high-speed load point that is achieved by running the pump at 80 percent of maximum speed (and flow rate) on curve C and (2) a low-speed load point that is representative of a specific, typical filtration flow rate, as opposed to a specific speed setting or relative reduction from maximum speed. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 at p. 5)

Table III.9. Variable- and Multi-Speed Load Points Recommended by DPPP Working Group

Load Point	Flow Rate gpm	Head ft	Speed rpm
High Speed	$Q_{high}(gpm) = 0.8 \times Q_{max\_speed@C}$	$H \geq 0.0082 \times Q_{high}^2$	Lowest available speed for which the pump can achieve the specified flow rate (a pump may vary speed to achieve this load point)
Low Speed	$Q_{low}(gpm)=$ • If pump hydraulic hp at max speed on curve C is >0.75, then Q_{low} = 31.1 gpm • If pump hydraulic hp at max speed on curve C is ≤0.75, then Q_{low} = 24.7 gpm	$H \geq 0.0082 \times Q_{low}^2$	

The DPPP Working Group recommended these flow rates because the range of operating speeds available in multi- and variable-speed pool filter pumps affects the typical sizing and operation of the pumps in the field. Specifically, the DPPP Working Group recommended a high flow rate of 80 percent of the flow at maximum speed on curve C to reflect the ability of variable-speed and some multi-speed pumps to be "right-

sized" and provide a specific amount of flow that may be less than the flow rate at maximum speed on curve C. (EERE-2015-BT-STD-0008, No. 57 at pp. 388-405) The DPPP Working Group discussed how dedicated-purpose pool pumps are typically over-sized and, therefore, may not require the maximum amount of flow the pump can provide. (EERE-2015-BT-STD-0008, CA IOUs, No. 53 at pp. 142-143; Waterway, No. 54 at p. 51) Such oversizing often occurs as a result of the discrete horsepower sizes available, where a dedicated-purpose pool pump with pump horsepower slightly larger than that required may be installed when the calculated load is between two discrete nominal horsepower sizes. (EERE-2015-BT-STD-0008, Waterway, No. 57 at pp. 396-397) In addition, a larger variable speed pump than needed may also be installed in some installations to ensure the dedicated-purpose pool pump will be able to accommodate the pool volume, even if the pool filter becomes dirty.[53] For example, the Independent Pool & Spa Service Association (IPSSA) recommends, in their basic training manual, to oversize the pump by 25 percent.[54]

The DPPP Working Group also recommended that the high flow point be determined at the lowest speed available on the pump with a head point that is on or above curve C. (Docket No. Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 at p. 5) DOE notes that, for some multi-speed pumps, the high flow point may be determined at the maximum operating speed of the pump and may not be on

[53] As the pool filter accumulates debris, this increases the dynamic head within the pool system plumbing
[54] Independent Pool & Spa Service Association (IPSSA) Inc. 2008. Basic Training Manual. Prepared by Robert Lowry of Lowry Consulting Group, LLC, for the IPSSA.

curve C, as the multi-speed pump does not have a lower operating speed available that can also provide 80 percent of the flow rate at maximum speed on curve C. For example, a three-speed dedicated-purpose pool pump that can operate with 2-, 4-, or 6-poles is capable of operating only at the discrete speeds of 3,600, 1,800, and 1,200 rpm, respectively. For such a pump, the lower operating speeds of 1,800 and 1,200 rpm would not be capable of providing a flow rate of 80 percent of the flow rate at maximum speed on curve C. Therefore, the aforementioned three-speed pump would need to be tested at the maximum operating speed and throttled to a head pressure higher than curve C to achieve a flow rate of 80 percent of the flow rate at maximum flow on curve C, as shown in Figure III.5.

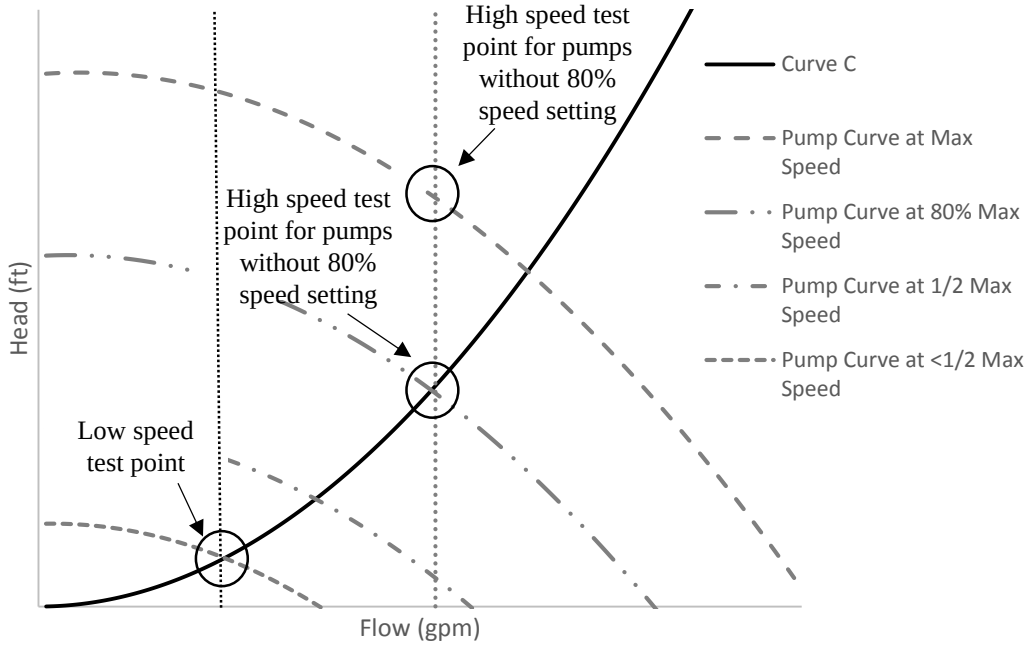

Figure III.5. Specified Load Points on Curve C at Maximum Speed for Multi-Speed and Variable-Speed Self-Priming and Non-Self-Priming Pool Filter Pumps.

DOE believes that such operation is representative of the energy use of multi-speed pumps, as they would not be able to achieve the 80 percent reduction in speed at the high flow point and, therefore, would not be able to be "right-sized" to provide a specific flow rate. Also, specifying the same flow rate for variable-speed and multi-speed pumps results in WEF ratings that are more directly comparable between the speed configurations.

As a result, DOE proposes to accept the DPPP Working Group recommendation that the high flow load point be determined at 80 percent of flow rate of the maximum speed of the pump on or above curve C. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 at p. 5) That is, all multi-speed and variable-speed pumps will be first evaluated at maximum speed on curve C to determine the flow rate at that point. Then, the pump speed will be reduced and/or the pump total head will be increased to achieve a flow rate equivalent to 80 percent of the flow rate measured at the maximum operating speed on curve C for that pump. The flow and input power to the pump at this 80 percent load point would be used to represent the performance of the pump at high speed and flow in calculating the WEF.

DOE requests comment on the proposal to specify the high speed and flow point for multi-speed and variable-speed pool filter pumps based on a flow rate of 80 percent of the flow rate at maximum speed on curve C and head at or above curve C.

Specifically, DOE requests comment on the treatment of multi-speed pumps and the necessity to throttle multi-speed pumps on the maximum speed performance curve if appropriate lower discrete operating speeds are not available to achieve 80 percent of the flow rate at maximum speed on curve C while still maintaining head at or above curve C.

To develop the low flow rate for variable- and multi-speed pool filter pumps, the DPPP Working Group considered the unique application and operation of multi-speed and variable-speed dedicated-purpose pool pumps in the field. That is, the DPPP Working Group commented that, as multi-speed and variable-speed pumps are able to operate at speeds and flow rates significantly lower than their maximum operating speed, larger pumps may be installed in a given application than would otherwise be required, but the flexibility in operating speeds provides the ability to operate the pool filter pump at only the required minimum filtration flow rate for the given application. That is, a variable-speed pump with a rated hydraulic horsepower of 1.5 hp (approximately 3 nameplate horsepower[55]) may be installed to replace a two-speed pump with a rated hydraulic horsepower of 1 hp (approximately 1 nameplate horsepower), but would still be capable of providing the same (or lower) pool filtration flow rate than the pump it is replacing. (EERE-2015-BT-STD-0008, CA IOUs, No. 57 at p. 280) Therefore, instead of specifying the low flow point in terms of the maximum or available operating speeds of the pump, the DPPP Working Group recommended specifying the low flow points as

[55] Nameplate horsepower refers to the nameplate, or rated, horsepower of the motor, see section 0 for more details.

specific, discrete flow rates that are representative of the typical flow rates observed in the field.

To develop a methodology to assign specific flow rates to specific sizes of multi-speed and variable-speed pool filter pumps, DOE and the DPPP Working Group reviewed the available data regarding the range of typical pool filter pump filtration flow rates and most common rated hydraulic horsepower sizes for pool filter pumps. Specifically, the DOE identified a bimodal distribution of rated hydraulic horsepower sizes for DPPP models in the population of self-priming pool filter pumps, with a higher frequency of DPPP models having rated hydraulic horsepowers of 0.5 and 0.75. (EERE-2015-BT-STD-0008, CA IOUs, No. 57 at pp. 308 – 315) To effectively differentiate multi- and variable-speed pool filter pumps appropriate for smaller pools from those appropriate for larger pools,[56] the DPPP Working Group recommended a threshold of 0.75 rated hydraulic horsepower. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 at p. 5) That is, "small" multi-speed and variable-speed pool filter pumps with a rated hydraulic horsepower less than or equal to 0.75 would be associated with one specific flow rate typical of smaller pools and "large" multi-speed and variable-speed pool filter pumps with a rated hydraulic horsepower larger than 0.75 would be associated with one specific flow rate typical of larger pools.

[56] DOE reiterates that the DPPP Working Group also recommended separate load points for pool filter pumps above 2.5 hydraulic horsepower (see section 0) and refers to such pumps throughout this document as "very large pool filter pumps."

To develop the specific flow rates for representative small and large pools, DOE developed flow rates that were representative of flow rates for the most common rated hydraulic horsepower sizes of dedicated-purpose pool pumps (i.e., 0.5 and 0.75 rated hydraulic horsepower). To do this, DOE referenced the relationship between hydraulic horsepower and flow rate inherent in the method for calculating hydraulic horsepower shown in equation (2):

$$P_{Hydraulic} = \frac{H \times Q \times SG}{3956} \quad \textbf{(2)}$$

Where

H = head in feet,

Q = flow in gallons per minute, and

SG = specific gravity of water, which can be assumed to be 1.00 based upon the definition of clean water used in HI 40.6.

Assuming that curve C is a representative system curve for pools, head can also be specified for these pumps according the equation describing curve C (i.e., $H = 0.0082 \times Q^2$). Then, by rearranging equation (2) to specify flow in terms of head and hydraulic power, and by substituting the equation for curve C for head, a relationship can be developed that describes the filtration flow rate on curve C for a given pump in terms of the hydraulic horsepower provided at low speed, as shown in equation (3).

$$Q_{low} = \left(\frac{3956}{0.0082} \times P_{Hydraulic,low}\right)^{1/3} \quad \textbf{(3)}$$

Where:

Q_{low} = the low filtration flow rate (gpm) and

$P_{Hydraulic,low}$ = hydraulic horsepower of the pump at the low flow rate on curve C (hp).

DOE notes that this method is consistent with the typical sizing methods for pool filter pumps described in the industry (i.e., IPSSA), where the necessary pump size required to accomplish the filtration function in pools is typically determined based on the necessary flow and head required on the pool system curve.[57] However, as pump size is typically described with respect to the maximum operating speed of the pump, rather than the low speed, the difference in speed between the low flow point and the maximum speed of the pump must be accounted for in order to accurately estimate the typical flow rates provided by the common pump hydraulic horsepower sizes found in DOE's DPPP database. DOE assumed a 50 percent speed reduction, which is representative of the difference between the high- and low-speeds for two-speed pumps and the least efficient assumption for multi-speed and variable-speed pumps. Accordingly, equation (3) can be updated to determine a representative relationship between the low flow rate and the

[57] Independent Pool & Spa Service Association (IPSSA) Inc. 2008. Basic Training Manual. Prepared by Robert Lowry of Lowry Consulting Group, LLC, for the IPSSA.

rated hydraulic horsepower on curve C at maximum speed of any given pump, as shown in equation (4):

$$\mathbf{Q_{low}} = \left(\frac{\mathbf{3956}}{\mathbf{0.0082}} \times \mathbf{0.5} \times \mathbf{P_{Hydraulic,max}}\right)^{\mathbf{1/3}} = \mathbf{39.21} \times \left(\mathbf{P_{Hydraulic,max}}\right)^{\mathbf{1/3}} \quad \textbf{(4)}$$

Where:

Q_{low} = the low filtration flow rate (gpm) and

$P_{Hydraulic}$ = hydraulic horsepower of the pump at maximum speed on curve C (i.e., rated hydraulic horsepower, see section III.E.1) (hp).

Finally, similar to the logic applied when specifying the high flow point for multi-speed and variable-speed pool filter pumps, the DPPP Working Group considered that two-speed pool filter pumps, which the multi-speed and variable-speed pool filter pumps would replace, are typically oversized. That is, the required size to achieve a given flow rate would be calculated according to equation (4), but if the required horsepower landed between two horsepower bins, the pump would be up-sized to the next highest discrete nominal motor horsepower bin. In this case, DOE and the DPPP Working Group assumed a fixed amount of oversizing based on the difference in horsepower between the nominal motor horsepower bins, or 0.25 hydraulic horsepower. (Docket No. EERE-2015-BT-STD-0008, No. 56 at pp. 209 – 210) In doing so, DOE presumes that, even at low speed, the two-speed pump may be providing slightly more flow than is required to

achieve the desired turnover rate in a given pool and, therefore, installing a variable-speed pump will allow for the exact amount of flow to be delivered and minimize excess flow and associated energy consumption. Using this method, DOE derived a representative flow rate for small pool filter pumps (with rated hydraulic horsepower at 0.5 hp) of 24.7 gpm and a representative flow rate for the large pool filter pumps (with rated hydraulic horsepower of 0.75 hp) of 31.1 gpm.

To relate these representative flow rates to the range of available multi-speed and variable-speed rated hydraulic horsepower sizes, the DPPP Working Group determined that it would be most representative to assign flow rates based on the comparable common DPPP size that any given multi-speed or variable-speed pool filter pump would be intended to replace. (Docket No. EERE-2015-BT-STD-0008, No. 57 at pp. 276 - 283). That is, small multi-speed and variable-speed pool filter pumps with rated hydraulic horsepower less than or equal to 0.75 are assumed to compete with and serve the same applications as a 0.5 rated hydraulic horsepower pump, which is associated with a "representative" curve C low, filtration flow rate of 24.7 gpm. Similarly, large multi-speed and variable-speed pool filter pumps are assumed to compete with pumps that are, at a minimum, 1 rated hydraulic horsepower and that typically operate at a low filtration flow rate of 31.1 gpm.

To verify the representativeness of the specified low flow points for multi-speed and variable-speed pool filter pumps, the DPPP Working Group reviewed typical pool sizes and turnover rates to determine a range of typical flow rates. The DPPP Working

Group discussed that the majority of pools are between 15,000 and 25,000 gallons, and most pools of this size are operated with a turnover time of 12 hours. (Docket No. EERE-2015-BT-STD-0008, No. 59 at pp. 87–88) Specifically, ANSI/NSPI-5 2003, Residential Inground Swimming Pools, recommends a turnover time of 12 hours. This would result in a turnover rate of one to two turns per day, depending on if the pump is operating 24 hours per day or not. DOE notes that a turnover time greater than 12 hours is typically not feasible because the flow rate would be below the minimum required flow rate for proper operation of the pool filters, heater, and other ancillary equipment. That is, CA IOUs and Pentair noted that flow rates below 25 gpm are not representative of typical pool operation because they are below the minimum operating speed of some pool components. (Docket No. EERE-2015-BT-STD-0008, CA IOUs, No. 53 at pp. 136 – 137; Pentair, No. 53 at p. 136)

Assuming a 12-hour turnover time and the typical range of pool sizes noted above, typical filtration flow rates range from 21 to 35 gpm, as shown in Table III.10. This is consistent with CA IOUs observation that typical pool filtration flow rates should be around 25 to 30 gpm. (EERE-2015-BT-STD-0008, CA IOUs, No. 57 at p. 280) Therefore, the DPPP Working Group determined that the low flow points for multi-speed and variable-speed pool filter pumps of 24.7 and 31.1 gpm were reasonable and representative of most residential pool applications.

Table III.10. Typical Flow Rates By Pool Volume for a 12-hour turnover time*

Pool Volume gallons	15,000	20,000	25,000
Flow Rate gpm	21	28	35

* Data in the table were presented during the December 2015 Working Group meeting (EERE-2015-BT-STD-0008, No. 50 at p. 12) for average pool sizes based on sales data.

Based on this analysis, DOE agrees with the DPPP Working Group that flow rates of 24.7 gpm and 31.1 gpm are representative of flow rates that are typical for small and large pool filter pumps that are multi-speed and variable-speed, respectively. DOE also notes that such an approach would ensure that variable-speed pool filter pumps would always perform better than a two-speed pump in the same application, which DOE believes is reflective of the relative energy consumption of two- versus variable-speed pool filter pumps in the field. Therefore, consistent with the recommendations of the DPPP Working Group, DOE proposes to test multi-speed and variable-speed pool filter pumps that have a hydraulic output power less than or equal to 0.75 hp (small pool filter pumps) at a low flow rate of 24.7 gpm and multi-speed and variable-speed pool filter pumps that have a hydraulic output power greater than 0.75 and less than 2.5 hp (large pool filter pumps) at a low flow rate of 31.1 gpm, as summarized in Table III.9. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 at p. 5)

DOE recognizes that this proposal, similar to the proposal for the high flow point for multi-speed and variable-speed pumps, does not explicitly specify the head or speed at which the pump operates at the low flow points. Instead, DOE proposes that the low and high flow rates would be achieved at the lowest available speed while operating on or

above curve C to accommodate multi-speed pumps that may not be capable of operating at the exact speed that allows the pump to achieve the required flow rate exactly on curve C. For such a pump, DOE proposes that the pump be tested at the lowest available speed that can meet the specified flow with a head point that is at or above curve C for the low-flow (Q_{low}) test point, similar to the high-flow (Q_{high}) test point.

DOE requests comment on the proposed low flow points for small and large multi-speed and variable-speed pool filter pumps.

DOE also requests comment on the treatment of multi-speed pumps and proposal to test multi-speed pumps at the lowest available speed that can meet the specified flow with a head point that is at or above curve C for low-flow (Q_{low}) test point, similar to the high-flow (Q_{high}) test point.

d. Weighting Factor for Various Load Points

As WEF is calculated as the weighted average flow rate over the weighted average input power to the dedicated-purpose pool pump at various load points, as described in equation (1), DOE also must assign weights to the load points discussed above for each self-priming or non-self-priming pool filter pump. During the Working Group meetings, the DPPP Working Group discussed and ultimately recommended weights for the various speed configurations of pool filter pumps, as summarized in Table III.11. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #7 at p. 5)

Table III.11. Summary of Load Point Weights (w_i) for Self-Priming and Non-Self-Priming Pool Filter Pumps Recommended by the DPPP Working Group

DPPP Varieties	Speed Type	Load Point(s) i	
		Low Flow	High Flow
Self-Priming Pool Filter Pumps and Non-Self-Priming Pool Filter Pumps	Single	-	1.0
	Two/Multi/Variable*	0.80	0.20

* DOE notes that the DPPP Working Group recommendations explicitly recommended weights separately for "Multi-Speed" and "Variable-Speed" pool filter pump, but not for "Two-speed" pool filter pumps. DOE believes that this is an oversight in the documentation of the DPPP Working Group recommendation, as the DPPP Working Group intended all two-speed, multi-speed, and variable-speed pool filter pumps to have the same weights of 0.2 at the high flow point and 0.8 at the low flow point. (Docket No. EERE-2015-BT-STD-0008, No. 57 at pp. 426-429)

Specifically, for single-speed self-priming and non-self-priming pool filter pumps, because such pumps are tested at only one speed, the weight assigned to the single high flow point is 1.0. For two-speed, multi-speed, and variable-speed pool filter pumps, DOE analyzed all available data regarding representative operating profiles for pool filter pumps to determine representative weights for these pumps and presented such analysis to the DPPP Working Group.[58] Based on DOE's analysis and the collective industry experience of the DPPP Working Group members, the DPPP Working Group recommended weights of 0.20 at the high flow point and 0.80 at the low flow point. Although the DPPP Working Group acknowledged that the relative operation of any given pool filter pump would be variable based on the specific application, the DPPP Working Group believed that these weights would be most representative of the typical application and operation of dedicated-purpose pool pumps in the field. (Docket No. EERE-2015-BT-STD-0008, No. 57 at pp. 355–367)

[58] DOE's analysis of representative weights for different varieties and speed configurations of dedicated-purpose pool pumps is available in the docket for this rulemaking. (Docket No. EERE-2016-BT-TP-0002)

In consideration of the DPPP Working Group recommendation, as well as DOE's own analysis, DOE proposes to use the weighting factors proposed by the DPPP Working Group and summarized in Table III.11 for self-priming and non-self-priming pool filter pumps.

DOE requests comment on the proposal to use a weight of 1.0 for single-speed pool filter pumps and weights of 0.20 for the high flow point and 0.80 for the low flow point for two-speed, multi-speed, and variable-speed pool filter pumps.

e. Applicability of Two-Speed, Multi-Speed, and Variable-Speed Pool Filter Pump Test Methods

As discussed in section III.A.7, DOE proposes specific definitions for two-speed, multi-speed, and variable-speed dedicated-purpose pool pumps that would dictate which of the pool filter pump test methods applies to a given pool filter pump, as described in sections III.C.1.a through III.C.1.c. The definitions for two-speed, multi-speed, and variable-speed dedicated-purpose pool pump establish specific criteria that any given dedicated-purpose pool pump must meet in order to be considered a two-speed, multi-speed, or variable-speed dedicated-purpose pool pump and be eligible to apply the test points for two-speed, multi-speed, and variable-speed pool filter pumps, respectively. If a dedicated-purpose pool pump does not meet the definition of two-speed, multi-speed, or variable-speed dedicated purpose pool pump discussed in section III.A.7, DOE proposes that such a pump would be tested using the single-speed pool filter pump test points, regardless of the number of operating speeds the pump may have.

However, the DPPP Working Group recommended additional provisions for two-speed self-priming pool filter pumps that are greater than or equal to 0.711 rated hydraulic horsepower and less than 2.5 rated hydraulic horsepower. That is, in order to use the two-speed pool filter pump test procedure, the DPPP Working Group recommended that self-priming pool filter pumps that are greater than or equal to 0.711 rated hydraulic horsepower and less than 2.5 rated hydraulic horsepower and are two-speed must also be distributed in commerce either: (1) with a pool pump control (variable speed drive and user interface or switch) that changes the speed in response to pre-programmed user preferences and allows the user to select the duration of each speed and/or the on/off times or (2) without a pool pump control with such capability but is unable to operate without the presence of such a pool pump control. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #5B at p. 3). Effectively, this would require that only two-speed self-priming pool filter pumps (in the referenced size range) distributed in commerce with an automated, pre-programmable control or not distributed in commerce with such a control but unable to operate without one can apply the two-speed test points described in the self-priming pool filter pump test procedure. In such a case, two-speed self-priming pool filter pumps (in the referenced size range) that are distributed in commerce with only a manual switch would still meet the proposed definition of a two-speed dedicated-purpose pool pump, but would not be eligible to be tested with the two-speed pool filter pump test points. Instead, such a pump would be tested as a single-speed pool filter pump.

Consistent with the DPPP Working Group recommendations, DOE proposes to adopt the limitation on applicability of the two-speed test procedure to only those two-speed self-priming pool filter pumps that are greater than or equal to 0.711 rated hydraulic horsepower and less than 2.5 rated hydraulic horsepower and are distributed in commerce either: (1) with a pool pump control (variable speed drive and user interface or switch) that changes the speed in response to pre-programmed user preferences and allows the user to select the duration of each speed and/or the on/off times or (2) without a pool pump control that has capability but is unable to operate without the presence of such a pool pump control.

DOE requests comment on the applicability of the two-speed, multi-speed, and variable-speed pool filter pump test methods to only those pool filter pumps that meet the proposed definitions of two-speed, multi-speed, and variable-speed dedicated-purpose pool pump.

DOE requests comment on additionally limiting the applicability of the two-speed test procedure to only those two-speed self-priming pool filter pumps that are greater than or equal to 0.711 rated hydraulic horsepower and less than 2.5 rated hydraulic horsepower and are distributed in commerce either: (1) with a pool pump control (variable speed drive and user interface or switch) that changes the speed in response to pre-programmed user preferences and allows the user to select the duration of each speed and/or the on/off times or (2) without a pool pump control that has capability but is unable to operate without the presence of such a pool pump control.

DOE requests comment on any additional criteria or requirements that may be necessary to ensure that the test procedure for two-speed, multi-speed, and variable-speed dedicated-purpose pool pumps is representative of their likely energy performance in the field.

2. Waterfall Pumps

Another variety of dedicated-purpose pool pump covered by this proposed DPPP test procedure is waterfall pumps. Under the proposed definition in section III.A.4.a, waterfall pumps are pool filter pumps that have a maximum head less than or equal to 30 feet and a maximum speed less than or equal to 1,800 rpm. DOE also understands waterfall pumps operate typically at a single speed. (Docket No. EERE-2015-BT-STD-0008, Regal-Beloit America Inc, No. 53, at p. 118) Such pumps are specialty-purpose pool filter pumps that typically operate waterfalls or other water features in a pool. Because of these specific applications, the DPPP Working Group recommended unique test points for waterfall pumps that are representative of the typical applications of these pumps.

Specifically, the DPPP Working Group recommended testing waterfall pumps at a fixed head of 17 feet and at the maximum operating speed of the pump. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 at p. 5) The Working Group recommended this test point because, in its view, it represents typical waterfall operating characteristics, which are generally a high flow, low static head application (The range of head values currently available for waterfall pumps is between 10 feet and 25 feet—an

average of 17.5 feet of head). The working group agreed that all current waterfall pump models can achieve this test point, and this test point would not restrict future product designs. (Docket No. EERE-2015-BT-STD-0008, No. 56 at p. 230–237) Consistent with the single recommended load point, the DPPP Working Group also recommended fully weighting that load point (i.e., assigning it a weight of 1.0). (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #7 at p. 5)

In this NOPR, DOE proposes to adopt the recommendations of the DPPP Working Group to test waterfall pumps at a single load point at maximum speed and a head of 17 feet and fully weight that single load point. However, DOE proposes to specify the load point more precisely, as 17.0 feet, to indicate the requisite amount of precision with which the test point must be achieved. DOE believes that this is a reasonable and achievable level of precision given the repeatability of the test and the allowable tolerances specified in sectionIII.D.2.d.

DOE requests comment on the proposed load point for waterfall pumps of 17.0 feet of head at the maximum speed of the pump and the proposed weight of 1.0 for the single load point.

3. Pressure Cleaner Booster Pumps

In addition to self-priming and non-self priming pool filter pumps and waterfall pumps, the DPPP Working Group also recommended specifying a test procedure for pressure cleaner booster pumps (PCBPs). Pressure cleaner booster pumps, as defined in

section III.A.4.b, are dedicated-purpose pool pumps that are specifically designed to propel pressure-side pool cleaners along the bottom of the pool in pressure-side cleaner applications. These pressure-side cleaner applications require a high amount of head and a low flow. In the December 2015 DPPP Working Group recommendations, the Working Group had recommended a single, fixed load point of 90 feet of head at maximum speed based on the fact that any given pressure-side pool cleaner application is typically a single, fixed load point. (Docket No. EERE-2015-BT-STD-0008, Zodiac, No. 56 at p. 244) The DPPP Working Group developed the test point of 90 feet of head at maximum speed because it sufficiently represents typical pressure cleaner booster pump operation, while being achievable by all currently available models of pressure cleaner booster pumps.

However, at that time, the DPPP Working Group acknowledged that field conditions are extremely variable, and the operating conditions depend on the application of the pump. (Docket No. EERE-2015-BT-STD-0008, Pentair, No. 56 at pp. 244 & Hayward Industries, No. 56 at pp. 244–246) For example, Zodiac noted that the required pressure to operate a given pressure-side cleaner may vary from pool to pool based on differences in pool size and length, dimensions, and friction losses associated with the system piping. (Docket No. EERE-2015-BT-STD-0008, Zodiac, No. 56 at p. 244)

As a result, in the second round of negotiations, the DPPP Working Group reevaluated the recommended test procedure for pressure cleaner booster pumps and its ability to representatively evaluate and differentiate the potentially variable energy

performance of different PCBP technologies. Specifically, pressure-side cleaners typically require a relatively fixed flow rate to ensure proper cleaning, and the Working Group discussed how pressure cleaner booster pumps are currently designed conservatively to be able to provide the requisite flow rate in even the worst-case, highest head-loss plumbing systems and pools. With conventional single-speed pressure cleaner booster pumps, orifice rings are typically installed to throttle the flow to the requisite flow rate at a higher head than may be necessary for the application. (Docket No. EERE-2015-BT-STD-0008, No. XX at p. YYY) However, the Working Group acknowledged that some plumbing systems may be able to effectively operate a pressure-side cleaner with significantly less head than typical, single-speed pressure cleaner booster pumps currently provide. For example, the CA IOUs presented data supporting the potential for variable-speed pressure cleaner booster pumps to reduce speed and provide the requisite flow rate and cleaner operating speed at lower head values. (Docket No. EERE-2015-BT-STD-0008, CA IOUs, No. 69) Therefore, to better capture the potential for variable performance of pressure cleaner booster pumps, including variable-speed pressure cleaner booster pumps, in the June 2016 DPPP Working Group recommendations, the Working Group revised the recommended test point for pressure cleaner booster pumps to be a flow rate of 10 gpm at the minimum speed that results in a head value at or above 60 feet.[59] (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #8 at pp. 4–5) In such a case, single-speed pressure cleaner booster pumps would still be

[59] The actual verbiage in the June 2016 DPPP Working Group recommendations describes this load point in tabular format. The paragraph form presented here is identical in intent to the table presented in the June 2016 DPPP Working Group recommendations.

evaluated at a head value and flow rate similar to the previously specified 90 feet. However, any variable-speed, multi-speed, or even two-speed pressure cleaner booster pumps may operate at a lower speed and lower head value, while still providing the requisite 10 gpm.

In either case, as only a single load point is required to adequately characterize the efficiency of pressure cleaner booster pumps, the DPPP Working Group recommended a weighting factor of 1.0 for measured performance at that single load point when calculating WEF. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 and #7 at p. 5)

DOE agrees with the June 2016 DPPP Working Group recommendations, and proposes to test pressure cleaner booster pumps at a single load point of 10 gpm at the minimum speed that results in a head value at or above 60 feet and to weight the measured performance of the pump at that load point with a weighting factor of 1.0. However, similar to waterfall pumps discussed in section III.C.1.e, DOE proposes to specify the load point more precisely, as a flow rate of 10.0 gpm and a head value at or above 60.0 feet, to indicate the requisite amount of precision with which the test point must be achieved. DOE believes that this level of precision is reasonable and achievable given the repeatability of the test and the allowable tolerances specified in section III.D.2.gIII.D.2.f.

DOE requests comment on the proposed load point for pressure cleaner booster pumps of 10.0 gpm at the minimum speed that results in a head value at or above 60.0 feet and the proposed weight of 1.0 for the single load point.

DOE requests comment and information regarding if this test point is achievable for all pressure cleaner booster pumps and, if not, how such pumps should be tested.

4. Summary

In summary, DOE proposes unique load points for the different varieties and speed configurations of dedicated-purpose pool pumps, as recommended by the DPPP Working Group. DOE's proposed load points ($\underline{i}$) and weights ($\underline{w_i}$) used in determining WEF for each pump variety are presented in Table III.12.

Table III.12. Proposed Load Points (i) and Weights (w_i) for Each DPPP Variety and Speed Configuration

DPPP Varieties	Speed Type	Test Points				Weight w_i
		# of Points n	Load Point i	Flow Rate Q	Head H	
Self-Priming Pool Filter Pumps And Non-Self-Priming Pool Filter Pumps (with hydraulic hp ≤2.5 hp)	Single	1	High	Q_{high}(gpm) = $Q_{max\_speed@C}$ = flow at maximum speed on curve C	H = 0.0082 × Q_{high}^2	1.0
	Two-Speed	2	Low	Q_{low}(gpm) = Flow rate associated with specified head and speed that is not below: • 31.1 gpm if pump hydraulic hp at max speed on curve C is >0.75 or • 24.7 gpm if pump hydraulic hp at max speed on curve C is ≤0.75 (a pump may vary speed to achieve this load point)	H ≥ 0.0082 × Q_{low}^2	0.8
			High	Q_{high}(gpm) = $Q_{max\_speed@C}$ = flow at max speed on curve C	H = 0.0082 × Q_{high}^2	0.2
	Multi- and Variable-Speed	2	Low	Q_{low}(gpm)= • If pump hydraulic hp at max speed on curve C is >0.75, then Q_{low} = 31.1 gpm • If pump hydraulic hp at max speed on curve C is ≤0.75, then Q_{low} = 24.7 gpm (a pump may vary speed to achieve this load point)	H ≥ 0.0082 × Q_{low}^2	0.8
			High	Q_{high}(gpm) = 0.8 × $Q_{max\_speed@C}$ = 80% of flow at maximum speed on curve C (a pump may vary speed to achieve this load point)	H = 0.0082 × Q_{high}^2	0.2
Waterfall Pumps	Single	1	High	Flow corresponding to specified head (on max speed pump curve)	17.0 ft	1.0
Pressure Cleaner Booster Pumps	All	1	High	10.0 gpm (a pump may vary speed to achieve this load point)	≥60.0 ft	1.0

D. Determination of Pump Performance

As part of DOE's test procedure for dedicated-purpose pool pumps, DOE is specifying how to measure the performance of the dedicated-purpose pool pump at the applicable load points (section III.C) consistently and unambiguously. Specifically, to determine WEF for applicable dedicated-purpose pool pumps, the proposed test procedure specifies methods to measure the driver input power to the motor or to the DPPP controls, if any, and the flow rate at each specified load point, as well as the hydraulic output power at maximum speed on system curve C (i.e., the rated hydraulic horsepower, see section III.E.1). (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #5 at p. 4)

DOE notes that several industry standards currently exist that specify test methods applicable to dedicated-purpose pool pumps. DOE reviewed these industry test methods and provides a summary of this review in section III.D.1. Section III.D.1 also discusses the industry standard DOE proposes to incorporate by reference for measuring the performance of dedicated-purpose pool pumps. However, DOE believes that several exceptions, modifications, and additions to this base test procedure are necessary to ensure accuracy and repeatability of test measurements (sections III.D.2.a through III.D.2.f). Finally, DOE proposes specific procedures for calculating the WEF from the collected test data and rounding the values to ensure that the test results are determined in a consistent manner (section III.D.2.g).

1. Incorporation by Reference of HI 40.6–2014

When determining the appropriate test method for measuring the relevant performance parameters for dedicated-purpose pool pumps (namely, driver input power, flow rate, speed of rotation, and hydraulic output power), DOE reviewed the DPPP test procedures that are established or referenced by the existing regulatory and voluntary programs that are discussed in section III.B.1. The rating metrics and testing requirements for each of these programs are summarized in Table III.13.

Table III.13. Summary of Rating Metrics and Industry Test Procedures Referenced by Various Voluntary and Regulatory DPPP Programs

Rating Program	Metric	Test Procedure	Other Relevant Standards
CEC 2014 Appliance Efficiency Regulations	Prescriptive design requirements	IEEE Standard 114–2001 for determination of motor efficiency ANSI/HI 1.6–2000 with additional rating requirements and calculations (equivalent to ANSI/APSP/ICC-15a–2013) for pump performance	N/A
ENERGY STAR Program Requirements for Pool Pumps - Version 1.0	EF	ANSI/HI 1.6–2000 with additional rating requirements and calculations (equivalent to ANSI/APSP/ICC-15a–2013)	ANSI/APSP-4–2007 ANSI/NSPI-5–2003 ANSI/NSPI-6–1999
CEE High-Efficiency Swimming Pool Initiative	EF and prescriptive design requirements for DPPP controls	ANSI/APSP/ICC-15a–2013	N/A
Australia and New Zealand Energy Rating Program	EF	Part 1 of AS 5102–2009	N/A

As shown in Table III.13, the CEC 2014 Appliance Efficiency Regulations[60] establish prescriptive design requirements for residential pool pumps, primarily focusing on the motor and controls with which the dedicated-purpose pool pump is sold. Cal. Code Regs., tit. 20 section 1605.3, subd. (g)(5). The CEC requires that reported motor efficiency is verifiable by IEEE Standard 114–2001, "IEEE Standard Test Procedure for Single-Phase Induction Motors."[61] The CEC also requires reporting of DPPP performance, as determined in accordance with the HI Standard 1.6 (ANSI/HI 1.6–2000), "American National Standard for Centrifugal Pump Tests" when certifying a dedicated-purpose pool pump under the Title 20 regulations. Cal. Code Regs., tit. 20 section 1606, subd. (a)(3). The test requirements for ENERGY STAR and CEE reference the ANSI/APSP/ICC-15a–2013, which is harmonized with the CEC testing methodology and also references HI 1.6–2000 for measurement of relevant pump performance parameters. Id. The test requirements for the Australia and New Zealand energy rating programs, defined in part 1 of AS 5102–2009, "Performance of household electrical appliances—Swimming pool pump—units: Energy consumption and energy performance," are similar to the CEC testing requirements, but includes a different test setup, different measurement requirements, and different load points. Id.

In the January 2016 general pumps TP NOPR, DOE incorporated by reference HI 40.6–2014 as the basis for the DOE test procedure for general pumps, with several

[60] California Energy Commission. 2014 Appliance Efficiency Regulations. 2014. www.energy.ca.gov/2014publications/CEC-400-2014-009/CEC-400-2014-009-CMF.pdf
[61] Available for purchase at: http://standards.ieee.org/findstds/standard/114-2001.html

exceptions, modifications, and additions.[62] 81 FR 4086, 4109–4117 (Jan. 25, 2016). As noted in the DPPP Working Group negotiations, HI 40.6–2014 was developed as a more rigorous, standardized test method, based on the acceptance test procedure provided in ANSI/HI 14.6–2011, "Methods for Rotodynamic Pump Efficiency Testing," which superseded HI 1.6–2000.[63]

In the May 2015 DPPP RFI, DOE discussed the various test methods and requested comment on any DPPP test procedure that DOE should consider in developing a potential test procedure for dedicated-purpose pool pumps. 80 FR 26475, 26483 (May 8, 2015). In response, HI stated that HI 40.6–2014 was developed and vetted by manufacturers, energy advocates, and others. HI also stated that HI 40.6–2014 is applicable to dedicated-purpose pool pumps. (Docket No. EERE-2015-BT-STD-0008, No. 8 at p. 4) HI did not believe that there are any other relevant test procedures that should be considered. In contrast, APSP responded that DOE should rely and reference ANSI/APSPICC-15-2013a. APSP elaborated on many aspects of ANSI/APSPICC-15-2013a, including that ANSI/APSPICC-15-2013a references ANSI/HI 1.6–2000, for testing pool pumps. (Docket No. EERE-2015-BT-STD-0008, No. 10 at p. 2) The only other comments DOE received on this topic from the May 2015 DPPP RFI were from entities that later joined the DPPP Working Group (see Table I.2). As previously stated in the NOPR, the May 2015 DPPP RFI comments from DPPP Working Group members

[62] The specific exceptions and modifications adopted in the January 2016 general pump TP final rule and their applicability to the DPPP test procedure proposed herein are discussed in section 0).
[63] For more information see: http://estore.pumps.org/Standards/Rotodynamic/EfficiencyTestsPDF.aspx

are not addressed in this document because their concerns were discussed during the DPPP Working Group meetings and are reflected in the December 2015 DPPP Working Group recommendations.

In response to the comments from both APSP and HI, during the DPPP Working Group meetings, DOE reviewed ANSI/HI 1.6–2000, ANSI/HI 14.6–2011, and HI 40.6–2014. As mentioned by HI in the comment to the May 2015 DPPP RFI, HI 40.6–2014 was developed and vetted by manufacturers, energy advocates, and others—specifically building on ANSI/HI 14.6–2011. Based on this review, as discussed in the DPPP Working Group meetings, DOE determined that HI 40.6–2014 was similar to HI 1.6–2000 and HI 14.6–2011, but improves on the previous test methods by incorporating more clear, unambiguous, specific, and repeatable language that would improve the accuracy and consistency of the test results. (Docket No. EERE-2015-BT-STD-0008, No. 58 at pp. 370–430) Specifically, HI 40.6–2014 defines and explains how to calculate driver power input,[64] volume per unit time, [65] pump total head,[66] pump power output,[67]

[64] The term "driver power input" in HI 40.6–2014 is defined as "the power absorbed by the pump driver" and is synonymous with the term "driver input power" and "input power to the motor and/or controls," as used in this document.
[65] The term "volume per unit time" in HI-40.6 is defined as "the volume rate of flow in any given section" and is used synonymously with "flow" and "flow rate" in this document.
[66] The term "pump total head" is defined in HI 40.6–2014 as the difference between the outlet total head and the inlet total head and is used synonymously with the terms "total dynamic head" and "head" in this document.
[67] The term "pump power output" in HI-40.6 is defined as "the mechanical power transferred to the liquid as it passes through the pump, also known as pump hydraulic power." It is used synonymously with "hydraulic horsepower" in this document. However, where hydraulic horsepower is used to reference the size of a dedicated-purpose pool pump, it refers to the rated hydraulic horsepower, as defined in section 0.

overall efficiency,[68] and other relevant quantities at the specified load points necessary to determine the proposed metric, WEF, and contains appropriate specifications regarding the test setup, methodology, standard rating conditions, equipment specifications, uncertainty calculations, and tolerances.

Based on this analysis, the DPPP Working Group recommended that the DPPP test procedure be based on wire-to-water testing in accordance with HI 40.6–2014. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #8 at p. 6) Consistent with the DPPP Working Group recommendations, DOE believes HI 40.6–2014 contains the relevant test methods needed to accurately characterize the performance of dedicated-purpose pool pumps, with a few exceptions, modifications, and additions noted in section III.D.2. Accordingly, DOE proposes to incorporate by reference certain sections of HI 40.6–2014 as part of DOE's test procedure for measuring the energy consumption of dedicated-purpose pool pumps, with the exceptions, modifications, and additions listed in III.D.2. DOE notes that HI 40.6-2014, with certain exceptions, is already incorporated by reference into subpart Y of 10 CFR part 431 and approved for §431.464, and appendix A to subpart Y of part 431. 10 CFR 431.463. In this rule, DOE proposes to incorporate by reference HI 40.6-2014, with certain different exceptions, into the proposed appendix B to subpart Y that would contain the DPPP test procedure.

[68] The term "overall efficiency" is defined in HI 40.6–2014 as a ratio of pump power output to driver power input and describes the combined efficiency of a pump and driver.

DOE requests comment on the proposal to incorporate by reference HI 40.6–2014 into the proposed appendix B to subpart Y, with the exceptions, modifications, and additions listed in section III.D.2.

2. Exceptions, Modifications and Additions to HI 40.6–2014

In general, DOE finds the test methods contained within HI 40.6–2014 are sufficiently specific and reasonably designed to produce test results necessary to determine the WEF of applicable dedicated-purpose pool pumps. However, only certain sections of HI 40.6–2014 are applicable to the proposed DPPP test procedure. In addition, DOE requires a few exceptions, modifications, and additions to ensure test results are as repeatable and reproducible as possible. DOE's proposed modifications and clarifications to HI 40.6–2014 are addressed in the subsequent sections III.D.2.a through III.D.2.g.

a. Applicability and Clarification of Certain Sections of HI 40.6–2014

Although DOE proposes to incorporate by reference HI 40.6–2014 as the basis for the DPPP test procedure, DOE notes that some sections of the standard are not applicable to the DPPP test procedure, while other sections require clarification regarding their applicability when conducting the DPPP test procedure. Table III.14 provides an overview of the sections of HI 40.62014 that DOE proposes to exclude from the DOE test procedure for dedicated-purpose pool pumps, as well as those that DOE proposes would only be optional and would not be required for determination of WEF.

Table III.14. Sections of HI 40.6–2014 DOE Proposes to Exclude from Incorporation by Reference

Section Number	Title	Proposed Applicability
40.6.4.1	Vertically suspended pumps	Excluded
40.6.4.2	Submersible pumps	Excluded
40.6.5.3	Test report	Excluded
40.6.5.5.1	Test procedure	Certain Portions Optional for Representations
40.6.5.5.2	Speed of rotation during test	Excluded
40.6.6.1	Translation of test results to rated speed of rotation	Excluded
40.6.6.2	Pump efficiency	Optional for Representations
40.6.6.3	Performance curve	Optional for Representations
A.7	Testing at temperatures exceeding 30 °C (86 °F)	Excluded
Appendix B	Reporting of test results	Excluded

DOE proposes not incorporating by reference section 40.6.4.1, "Vertically suspended pumps," and section 40.6.4.2, "Submersible pumps," of HI 40.6–2014 in this DPPP TP NOPR because, as discussed in section III.A.1, dedicated-purpose pool pumps are end suction pumps and are not vertical turbine or submersible pumps. As such, the test provisions applicable to vertical turbine and submersible pumps described in section 40.6.4.1 and section 40.6.4.2 do not apply to the DPPP TP NOPR.

Additionally, section 40.6.5.5.2, "Speed of rotation during test," of HI 40.6–2014 requires that the speed of rotation to establish flow rate, pump total head, and power input be within the range of 80 percent and 120 percent of the rated speed. However, in this DPPP TP NOPR, rated or nominal speeds are not relevant, as DOE proposes testing at the maximum operating speed; low operating speed for two-speed pumps; and, for multi-speed and variable-speed pumps, any available speed that can meet the prescribed head and flow points (see section III.C.4). Similarly, section 40.6.6.1, "Translation of test

results to rated speed of rotation," describes the method by which tested data can be translated to the rated speed of rotation for subsequent calculations and reporting purposes. As DOE proposes that all testing be conducted at the maximum speed of rotation, or at specific speeds that are determined by other characteristics (i.e., the available discrete operating speeds of the pump and/or the specified flow rate and reference curve), translation of tested results based on speed is not necessary. As a result, DOE proposes to not incorporate section 40.6.5.5.2 and 40.6.6.1, and proposes different requirements regarding the operating speed at different test points, as summarized in Table III.12.

HI 40.6–2014 also contains relevant requirements in section 40.6.5.5, "Test conditions," for the characteristics of the testing fluid to be used when testing pumps. Specifically, section 40.6.5.5 requires that the "tests shall be made with clear water at a maximum temperature of 10–30 °C (50–86 °F)" and clarifies that "clear water means water to be used for pump testing, with a maximum kinematic viscosity of 1.5 x 10^{-6} m^2/s (1.6 x 10-5 ft^2/s) and a maximum density of 1000 kgm3 (62.4 lb/ft^3)." DOE agrees with these requirements, as they will increase the repeatability and consistency of the test results, since significant variations in water density or viscosity can affect the tested pump performance. DOE proposes to include such requirements to test with clear water by incorporating by reference HI 40.6–2014, including section 4.6.5.5. However, in section A.7 of appendix A, "Testing at temperatures exceeding 30 °C (86 °F)," HI 40.6–2014 addresses testing at temperatures above 30 °C (86 °F). DOE does not intend to allow testing with liquids other than those meeting the definition of clear water presented

previously, including water at elevated temperatures. Therefore, DOE proposes to exclude section A.7 from the incorporation by reference of HI 40.6–2014. DOE notes that, in the January 2016 general pumps TP final rule, DOE also did not incorporate section A.7 of appendix A of HI 40.6–2014. 81 FR 4086, 4110 (Jan. 25, 2016).

Finally, DOE notes that section 40.6.5.3, "Test report," provides requirements regarding the generation of a test report and appendix B, "Reporting of test results," provides guidance on test report formatting, both of which are not required for testing and rating dedicated-purpose pool pumps in accordance with DOE's procedure. In the January 2016 general pumps TP final rule, DOE also did not incorporate these sections for similar reasons. 81 FR 4086, 4110 (Jan. 25, 2016).

For the reasons stated previously, DOE proposes to not incorporate by reference section 40.6.4.1, 40.6.4.2, 40.6.5.3, 40.6.5.5.2, 40.6.6.1, section A.7 of appendix A, and appendix B of HI 40.6–2014 as part of the DOE test procedure for dedicated-purpose pool pumps.

DOE requests comment on its proposal to not incorporate by reference sections 40.6.4.1, 40.6.4.2, 40.6.5.3, 40.6.5.5.2, 40.6.6.1, A.7, and Appendix B of HI 40.6–2014 as part of the DOE test procedure for dedicated-purpose pool pumps.

In addition to the excluded sections of HI 40.6–2014 referenced previously, DOE also notes that certain sections of HI 40.6–2014 are not necessary to determine WEF for

applicable dedicated-purpose pool pumps, but DOE opts to include them in the proposed DPPP test procedure for the purposes of any other optional representations DPPP manufacturers may wish to make regarding DPPP performance. Specifically, only the following measurements are required to calculate WEF for any given dedicated-purpose pool pump:

- pump power output (hydraulic horsepower) at maximum speed of rotation on the reference curve (i.e., rated hydraulic horsepower);
- driver power input (input power to the motor, or controls if available) at all load points i, specified uniquely for each DPPP variety and speed configuration (see section III.C);
- volume rate of flow (flow rate) at all load points i, specified uniquely for each DPPP variety and speed configuration (see section III.C);
- speed of rotation at each load point i, specified uniquely for each DPPP variety and speed configuration (see section III.C).

HI 40.6–2014 also contains methods that describe how to determine the BEP of the pump, pump efficiency, and overall efficiency. In addition, HI 40.6–2014 section 40.6.6.3, "Performance curve," describes how to specify head versus flow rate, power versus flow rate, and efficiency versus flow rate performance curves. Although determination of these pump performance metrics and curves is not required to calculate WEF, DOE acknowledges that DPPP manufacturers may wish to make representations regarding the performance of their dedicated-purpose pool pumps based on these metrics,

in addition to the proposed WEF metric. Therefore, DOE proposes to incorporate by reference certain portions of HI 40.6–2014 (i.e., sections 40.6.5.5.1, "Test procedure"; section 40.6.6.2, "Pump efficiency"; and section 40.6.6.3, "Performance curve) even though they are not directly applicable to the manner in which DOE proposes to test dedicated-purpose pool pumps to determine WEF. In the proposed regulatory text of the DPPP test procedure, DOE would refer specifically only to those sections that are applicable for the determination of WEF and note that determination of pump efficiency, overall efficiency, BEP, and pump performance curves is not required. With regard to section 40.6.5.5.1 of HI 40.6–2014, DOE notes that the specifications regarding warm-up time and collecting data at steady-state conditions are applicable to the determination of WEF. However, section 40.6.5.5.1, of HI 40.6–2014 also requires measurement of pump performance at test points corresponding to 40, 60, 75, 90, 100, 110, and 120 percent of the flow rate at the expected BEP of the pump. DOE proposes different load points for the varieties and speed configurations of dedicated-purpose pool pumps to which the test procedure is applicable, which are presented in detail in section III.C. Therefore, in the DPPP test procedure, DOE proposes to clarify that measurements at the load points described in section 40.6.5.5.1 are not required and that, instead, relevant parameters must be determined at the specific load points proposed in section III.C for each DPPP variety and speed configuration. However, manufacturers could elect to also record data at the test points described in section 40.6.5.5.1 in order to determine BEP or make representations regarding pump performance over the operating range of the equipment.

To allow manufacturers to make voluntary representations of other metrics, in addition to WEF, DOE proposes to clarify that section 40.6.5.5.1, section 40.6.6.2, and section 40.6.6.3, of HI 40.6–2014 are not required for determination of WEF, but may be optionally conducted to determine and make representations about other DPPP performance parameters.

DOE requests comment on the proposal to clarify the applicability of sections 40.6.5.5.1, section 40.6.6.2, and section 40.6.6.3, of HI 40.6–2014.

b. Calculation of Hydraulic Horsepower

In addition to the clarifications regarding the applicability of certain sections of HI 40.6–2014 to the DPPP test procedure, DOE believes that clarification is also required regarding the calculation of hydraulic horsepower. Specifically, in the January 2016 general pump TP final rule, DOE clarified that hydraulic horsepower must be calculated with a unit conversion factor of 3,956, instead of 3,960, which is specified in HI 40.6–2014. 81 FR 4086, 4109 (Jan. 25, 2016). DOE notes that the value of 3,956 more accurately represents the unit conversion from the product of flow (Q) in gpm, head (H) in feet, and specific gravity (which is dimensionless) to horsepower, when assuming a specific gravity of 1.0. In section 40.6.6.2, HI 40.6–2014 specifies a value of 3,960 in regards to calculating pump efficiency, but HI 40.6–2014 does not specify a specific unit conversion factor for the purposes of calculating pump hydraulic output power. Instead, HI 40.6–2014 provides the following equation (5) for determining pump power output:

$$P_u = \rho \times Q \times H \times g$$

(5)

Where:

P_u = the measured hydraulic output power of the tested pump,[69]

ρ = density,

Q = the volume rate of flow,

H = pump total head, and

g = acceleration due to gravity.

As shown in equation (5), the unit conversion factor can be derived from the product of density and acceleration due to gravity. An analysis was performed in support of the January 2016 general pumps TP final rule to convert from the metric units for density and acceleration due to gravity specified in HI 40.6–2014 to the appropriate units. This analysis found the value of 3,956 to be more accurate and have a greater amount of precision than the 3,960 value specified in HI 40.6–2014 for properties and conditions of the clear water used for testing. Therefore, to ensure consistent calculations and results in the DOE test procedure for dedicated-purpose pool pumps, and consistent with the January 2016 general pumps TP final rule, DOE proposes a unit conversion factor of 3,956 instead of the 3,960 value specified in HI 40.6–2014 and proposes to clarify that

[69] For each of the quantities listed, HI 40.6–2014 provides multiple metric and U.S. customary units. Appendix E also provides unit conversions.

the 3,960 calculation in section 40.6.6.2 of HI 40.6–2014 should not be used. Also, DOE notes that the value of 3,956 is the value used by the DPPP Working Group and was shown in presentation material at the working group meetings. (Docket No., EERE-2015-BT-STD-0008, No. 42 at p. 17)

DOE requests comment on its proposal to clarify the calculation of pump hydraulic horsepower to reference a unit conversion of 3,956 instead of 3,960.

c. Data Collection and Determination of Stabilization

In order to ensure the repeatability of test data and results, the DPPP test procedure must provide instructions regarding how to sample and collect data at each load point. Such instructions ensure that the collected data are taken at stabilized conditions that accurately and precisely represent the performance of the dedicated-purpose pool pump at the designated load points, thus improving repeatability of the test.

Section 40.6.5.5.1 of HI 40.6–2014 provides that all measurements shall be made under steady state conditions. The requirements for determining when the pump is operating under steady state conditions in HI 40.6–2014 are described as follows: (1) there is no vortexing, (2) the margins are as specified in ANSI/HI 9.6.1, "Rotodynamic Pumps Guideline for NPSH Margin," and (3) the mean value of all measured quantities required for the test data point remains constant within the permissible amplitudes of fluctuations defined in Table 40.6.3.2.2 of HI 40.6-2014 over a minimum period of 10 seconds before performance data are collected. While HI 40.6–2014 does not specify the

measurement interval for determination of steady state operation, DOE understands that a minimum of two stabilization measurements are required to calculate an average. To provide greater specificity regarding data collection in the context of determination of stabilization, in the January 2016 general pump TP final rule, DOE adopted requirements that at least two unique measurements must be used to determine stabilization. 81 FR 4086, 4011 (Jan. 25, 2016). DOE notes that the ENERGY STAR Program currently requires measurement equipment to record data at a rate "greater than or equal to one reading per second" and requires sampling data to be accumulated for at least one minute and the average (arithmetic mean) value to be recorded.[70] DOE believes the requirements for general pumps adopted in the January 2016 general pumps TP final rule accommodate a longer period between the sampling of individual data points and, therefore, any measurement procedures currently in place for ENERGY STAR testing would also meet the data collection and stabilization requirements adopted in the January 2016 general pumps TP final rule. 81 FR 4086, 4011 (Jan. 25, 2016). As a result, DOE believes the data collection requirements specified in the January 2016 general pumps TP final rule are sufficient to collect accurate and repeatable measurements, but also accommodate more frequent data collection if test labs are able to accommodate such. Therefore, DOE proposes to adopt requirements that at least two unique measurements must be used to determine stabilization when testing pumps according to the DPPP test procedure.

[70] ENERGY STAR Program Requirements Product Specification for Pool Pumps, Final Test Method. Rev. Jan-2013, section 6.2.A.3, p 4. https://www.energystar.gov/sites/default/files/specs/Pool%20Pump%20Final%20Test%20Method%2001-15-2013.pdf.

Section 40.6.3.2.2 of HI 40.6–2014, "Permissible fluctuations," also provides that permissible damping devices may be used to minimize noise and large fluctuations in the data in order to achieve the specifications noted in Table 40.6.3.2.2. To ensure that each stabilization data point is reflective of a separate measurement, in the January 2016 general pumps TP final rule, DOE adopted requirements that damping devices are only permitted to integrate up to the measurement interval. 81 FR 4086, 4011 (Jan. 25, 2016). Similarly, in this DPPP TP NOPR, DOE proposes to specify that damping devices are only permitted to integrate up to the measurement interval to ensure that each stabilization data point is reflective of a separate measurement. DOE also proposes that, for physical dampening devices, the pressure indicator/signal must register 99 percent of a sudden change in pressure over the measurement interval to satisfy the requirement for unique measurements, consistent with annex D of ISO 3966:2008(E), "Measurement of fluid flow in closed conduits – Velocity area method using Pitot static tubes," which is referenced in HI 40.6–2014 for measuring flow with pitot tubes.

DOE requests comment on the proposal to specify that at least two unique data points must be used to determine stabilization and to allow damping devices, as described in section 40.6.3.2.2, but with integration limited to less than or equal to the data collection interval.

d. Test Tolerances

As discussed in section III.D.2.a and III.C, DOE proposes to specify unique load points for each DPPP variety and speed configuration. DOE notes that HI 40.6–2014

does not provide explicit tolerances around each specified load point. That is, HI 40.6–2014 does not specify how close a measured data point must be to the specified load point or if that data point must be corrected in any way for deviations from the specified value. For example, the DPPP test procedure proposes to require testing at a low flow point of 24.7 gpm at or above curve C for multi-speed and variable-speed pool filter pumps. Due to experimental variability and test uncertainty, it is possible that the recorded data point may be slightly above or below 24.7 gpm. To ensure repeatability and consistency of test results, the DOE DPPP test procedure must specify how close each measured data point must be to the specified load point and if any correction should occur.

To develop the proposal regarding tolerances on the measured flow and head parameters for each load point, DOE referred to the requirements of other existing DPPP test procedures and programs, such as ENERGY STAR and NSF/ANSI 50–2015. Specifically, DOE identified that the ENERGY STAR program maintains a tolerance on the flow rate used to test pool pumps of ±2.5 percent but does not require a tolerance of the head measured at each load point for the respective system curve under consideration.[71] Additionally, NSF 50–2015, in section C.1.5 of Annex C of NSF 50–2015 requires that each tested pump at each measured load point must have:

[71] ENERGY STAR Program Requirements Product Specification for Pool Pumps, Final Test Method. Rev. Jan-2013, section 6.2.A.2, p 4. https://www.energystar.gov/sites/default/files/specs/Pool%20Pump%20Final%20Test%20Method%2001-15-2013.pdf.

- a tested total dynamic head that is between -3 percent and +5 percent of the total dynamic head specified by the manufacturer's performance curve and

- a tested flow rate that is ±5 percent of the flow specified by the manufacturers performance curve.[72]

The pump performance curves used by manufacturers to describe the operation of DPPP equipment are often compilations of multiple data sets and are intended to represent the average operation of that specific model of pump. DOE understands that the NSF/ANSI 50–2015 limits are intended to capture both manufacturing variability, as well as experimental variability, and thus represent a worst case tolerance on flow and head that should be attainable by any given unit within a given DPPP model.

Conversely, DOE's tolerances on flow and head at each load point are meant to represent how closely any given pump being tested can achieve a specified load point, which is subject to experimental uncertainty but not manufacturing variability among specific units. Similarly, the ENERGY STAR tolerances apply to a specific tested pump and account for experimental variability only. As a result, DOE believes it is more appropriate to reference tolerances similar to those referenced in ENERGY STAR for the load points specified in the DPPP test procedure, or ±2.5 percent of the specified load point.

[72] NSF/ANSI 50–2015 Equipment for Swimming Pools, Spas, Hot Tubs and Other Recreational Water Facilities, 2015 NSF International, Ann Arbor Michigan.

However, DOE notes that the load points are specified, primarily, in terms of flow and speed for self-priming pool filter pumps, non-self-priming pool filter pumps, and pressure cleaner booster pumps (head is the dependent variable), while waterfall pumps have a load point that is primarily specified in terms of head and speed (flow is the dependent variable). That is, for self-priming pool filter pumps, non-self-priming pool filter pumps, and pressure cleaner booster pumps, the achievable value of pump total head or head point at each flow rate is dependent on the specific operating speed and speed configuration of each dedicated-purpose pool pump. For example, the high flow point for multi-speed and variable-speed pool filter pumps is specified as 80 percent of the flow rate at the maximum speed at or above the reference curve (i.e., curve C for pool filter pump with hydraulic horsepower less than 2.5 hp). Different DPPP models will have different tested head points depending on if the pump can continuously reduce speed to achieve exactly the flow and head points on the reference curve, or if the dedicated-purpose pool pump only has a few discrete speeds and must be tested at 80 percent of the flow rate load point at maximum speed in order to achieve a load point that is both at 80 percent of the flow at maximum speed on the reference curve and at or above the reference curve head points. In such a case, the head value would be above the reference curve.

As a result, DOE proposes to specify, for self-priming and non-self-priming pool filter pumps, that the tested flow rate must be within ±2.5 percent of the specified flow rate, which is the flow rate on the reference curve at the specified speed or 24.7 or 31.1 gpm for multi-speed and variable-speed pool filter pumps. For self-priming and non-self-

priming pool filter pumps, a range of head points would be acceptable, based on the performance of any given DPPP model. Similarly, for pressure cleaner booster pumps, DOE proposes a test point corresponding to a flow rate of 10.0 gpm at a head at or above 60.0 feet. As the flow rate is fixed, but the head value may vary, DOE also proposes that the tested flow rate must be within ±2.5 percent of the specified flow rate for pressure cleaner booster pumps. For waterfall pumps, DOE proposes to specify that the tested head point must be within ±2.5 percent of the specified head value (i.e., 17.0 ± 0.425 feet) at maximum speed, while the flow rate may vary based on the performance of the particular DPPP unit under test. DOE also does not propose a tolerance on the tested speed, as the tested maximum speeds are specific to each dedicated-purpose pool pump being tested.

DOE requests comment on its proposal to require that the tested flow rate at each load point must be within ±2.5 percent of the flow rate at the specified load point self-priming pool filter pumps, non-self-priming pool filter pumps, and pressure cleaner booster pumps.

DOE requests comment on its proposal to require that the tested head point at each load point must be within ±2.5 percent of the head point at the specified load point for waterfall pumps.

e. Power Supply Characteristics

Because input power to the dedicated-purpose pool pump, measured at the motor or control, as applicable, is a component of the proposed metric, the measurement of input power to the driver is an important element of the test. As discussed at length in the January 2016 general pumps TP final rule, the characteristics of the power supplied to the dedicated-purpose pool pump affect the accuracy and repeatability of the measured power draw to the motor or control of the DPPP model being tested. 81 FR 4086, 4112-4115 (Jan. 25, 2016). Consistent with the requirements in the January 2016 general pumps TP final rule, to ensure accurate and repeatable measurements of DPPP input power to the motor or control, DOE proposes to specify nominal values for voltage, frequency, voltage unbalance, and total harmonic distortion; as well as tolerances for each of these quantities that must be maintained at the input terminals to the motor and/or control as applicable.

To determine the appropriate power supply characteristics for testing dedicated-purpose pool pumps, DOE examined applicable test methods for similar equipment (i.e., equipment typically driven by electric motors and sometimes accompanied with variable frequency drives). In the January 2016 general pumps TP final rule, DOE provided a summary of tolerances referenced in other relevant industry standards[73] and performed a

[73] In the January 2016 general pumps TP final rule, DOE determined that the IEEE Standard 112–2004, "IEEE Standard Test Procedure for Polyphase Induction Motors and Generators" (IEEE 112–2004) and the Canadian Standards Association (CSA) C390-10, "Test methods, marking requirements, and energy efficiency levels for three-phase induction motors" (CSA C390-10) are the most relevant test methods for measuring input power to electric motors, as they are the test methods incorporated by reference as the DOE test procedure for electric motors. Other widely referenced industry standard test methods for motors

detailed analysis surrounding the impact of differences in each power supply characteristic (i.e., voltage unbalance, voltage tolerance, frequency tolerance, voltage waveform distortion, and source impendence) on the test measurements and resultant metric. DOE found that large differences in voltage unbalance, voltage tolerance, frequency tolerance, or voltage waveform distortion can impact the performance of the motor or control (especially variable frequency drive) with which the pump may be sold. To ensure that such power supply characteristics were reasonable, DOE also analyzed the typical power characteristics available on the U.S. power grid and the feasibility of achieving the specified requirements with or without power conditioning equipment. Id.

Based on this analysis, DOE adopted the power supply requirements summarized in Table III.15 when testing of the input power to the motor or control,[74] which DOE is also proposing to adopt for the DPPP test procedure. 81 FR 4086, 4152 (Jan. 25, 2016).

include: IEC 60034-1 Edition 12.0 2010-02, "Rotating electrical machines - Part 1: Rating and performance" (IEC 60034-1:2010) and NEMA MG 1–2014, "Motors and Generators" (NEMA MG 1–2014). DOE also identified both AHRI 1210–2011, "2011 Standard for Performance Rating of Variable Frequency Drives," (AHRI 1210–2011) and the 2013 version of CSA Standard C838, "Energy efficiency test methods for three-phase variable frequency drive systems," (CSA C838–13) as applicable methods for measuring the performance of VSD control systems. 81 FR 4086, 4112–15 (Jan. 25, 2016).

[74] Under the pump test procedure adopted in the January 2016 general pumps TP final rule, pumps sold with motors rated using the testing-based method, pumps sold with motors and continuous or non-continuous controls rated using the testing-based method, and any pumps rated using the calculation-based method when the bare pump are evaluated using a calibrated motor to determine pump shaft input power. 81 FR 4086, 4115 (Jan. 25, 2016).

Table III.15 Proposed Power Supply Requirements for Dedicated-Purpose Pool Pumps

Characteristic	Tolerance
Voltage	±5% of the rated value of the motor
Frequency	±1% of the rated value of the motor
Voltage Unbalance	±3% of the rated value of the motor
Total harmonic Distortion	≤12% throughout the test

DOE believes that, because dedicated-purpose pool pumps utilize electrical equipment (i.e., motors and drives) similar to that used by general pumps, such requirements also apply when testing dedicated-purpose pool pumps. DOE notes that, under the proposed DPPP test procedure and in accordance with the DPPP Working Group specifications, all dedicated-purpose pool pumps would require measurement of input power to the pump at the motor or controls, as applicable (see section III.D.1). (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #8 at p. 6) Therefore, in this DPPP test procedure, DOE proposes that when testing dedicated-purpose pool pumps the following conditions would apply to the main power supplied to the motor or controls, if any:

- Voltage maintained within ±5 percent of the rated value of the motor.
- Frequency maintained within ±1 percent of the rated value of the motor.
- Voltage unbalance of the power supply maintained within ±3 percent of the rated value of the motor.
- Total harmonic distortion maintained at or below 12 percent throughout the test.

DOE requests comments on the proposed voltage, frequency, voltage unbalance, and total harmonic distortion requirements that would have to be satisfied when performing the DPPP test procedure for dedicated-purpose pool pumps.

Specifically, DOE requests comments on whether these tolerances can be achieved in existing DPPP test laboratories, or whether specialized power supplies or power conditioning equipment would be required.

f. Measurement Equipment for Testing

In the January 2016 general pumps TP final rule, DOE incorporated appendix C of HI 40.6–2014, which specifies the required instrumentation to measure head, speed, flow rate, torque, temperature, and electrical input power to the motor. However, DOE noted, in that rule, that, for the purposes of measuring input power to the driver for pumps sold with a motor and continuous or non-continuous controls rated using the testing-based method, the equipment specified in section C.4.3.1, "electric power input to the motor," of HI 40.6–2014 may not be sufficient. Instead, consistent with other relevant industry standards[75] for measurement of input power to motor and drive systems, DOE adopted requirements that electrical measurements for determining pump power input be taken using equipment capable of measuring current, voltage, and real power up

[75] Specifically, DOE identified AHRI 1210–2011, "2011 Standard for Performance Rating of Variable Frequency Drives"; the 2013 version of CSA Standard C838, "Energy efficiency test methods for three-phase variable frequency drive systems"; Canadian Standards Association (CSA) C390-10, "Test methods, marking requirements, and energy efficiency levels for three-phase induction motors"; and IEC 61000-4-7, "Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto" as relevant to the measurement of input power to the motor or control.

to at least the 40th harmonic of fundamental supply source frequency[76] and have an accuracy level of ±2.0 percent of full scale when measured at the fundamental supply source frequency when rating pumps using the testing-based methods or with a calibrated motor. 81 FR 4086, 4118–19 (Jan. 25, 2016).

DOE proposes to refer to appendix C of HI 40.6–2014, as incorporated by reference (see section III.D.1), to specify the required instrumentation to measure head, speed, flow rate, and temperature in the DPPP test procedure. In addition, as all dedicated-purpose pool pumps would require measurement of the input power to the motor or control, as applicable, DOE proposes to specify that, for the purposes of measuring input power to the motor or control, as applicable, of DPPP models, electrical measurement equipment must be used that is capable of measuring current, voltage, and real power up to at least the 40th harmonic of fundamental supply source frequency[77] and having an accuracy level of ±2.0 percent of full scale when measured at the fundamental supply source frequency.

DOE requests comment on its proposal to require measurement of the input power to the dedicated-purpose pool pump using electrical measurement equipment capable of measuring current, voltage, and real power up to at least the 40th harmonic of

[76] CSA C838–13 requires measurement up to the 50th harmonic. However, DOE believes that measurement up to the 40th harmonic is sufficient, and the difference between the two types of frequency measurement equipment will not be appreciable.
[77] CSA C838–13 requires measurement up to the 50th harmonic. However, DOE believes that measurement up to the 40th harmonic is sufficient, and the difference between the two types of frequency measurement equipment will not be appreciable.

fundamental supply source frequency and having an accuracy level of ±2.0 percent of full scale when measured at the fundamental supply source frequency.

DOE also notes that HI 40.6-2014 does not contain any requirements or description of the instruments required for measuring distance. However, measurements of distance, for example height above the reference plane, are required when conducting the proposed test procedure, for example when determining the self-priming capability of self-priming and non-self-priming pool filter pumps (see section III.I.3). As such, DOE proposes to require instruments for measuring distance that are accurate to and have a resolution of at least ±0.1 inch. DOE believes this will improve the consistency and repeatability of test results and ensure all results are, in fact, indicative of the measured performance. DOE notes that, while this accuracy requirement is generally applicable, it is a maximum tolerance. To the extent that measurement of height or distance is necessary for determining measured head values, the accuracy of any distance-measuring instruments is included in the overall accuracy requirement for "differential head," "suction head," and/or "discharge head" presented in table 40.6.3.2.3 of HI 40.6-2014, "Maximum permissible measurement device uncertainty." This is consistent with the treatment of all other variables, where when more than one instrument is used to measure a given parameter, the combined accuracy, calculated as the root sum of squares of individual instrument accuracies, must meet the specified accuracy requirements. Therefore, when used in combination with other instruments to measure head, distance-measuring instruments may need to meet higher or lower accuracy requirements to

conform to the specified accuracies for measurement of differential, suction, and discharge head.

DOE requests comment on the proposal to require instruments for measuring distance that are accurate to and have a resolution of at least ±0.1 inch.

g. Calculation and Rounding Modifications and Additions

DOE notes HI 40.6–2014 does not specify how to round values for calculation and reporting purposes. DOE recognizes that the manner in which values are rounded can affect the resulting WEF, and all WEF values should be reported with the same number of significant digits. Therefore, to improve the accuracy and consistency of calculations, DOE proposes that raw measured data be used to calculate WEF and the resultant value be rounded to the nearest 0.1.

DOE requests comment on the proposal to use raw measured data to calculate WEF as well as the proposal to round WEF to the nearest 0.1 kgal/kWh.

E. Additional Test Methods

In addition to the measurements and calculations necessary to determine WEF, DOE also must establish consistent terminology and measurement methods to categorize the "size" of a given dedicated-purpose pool pump, as well as establish whether a given dedicated-purpose pool pump is self-priming. Specifically, as discussed in section III.C, DOE proposes to establish different load points and reference curves based on the rated

hydraulic horsepower of a given pool filter pump. DOE's proposal for a standardized and consistent method to determine DPPP size is discussed in section III.E.1. As discussed in section III.A.3.b, DOE also proposes to differentiate pool filter pumps based on whether they are self-priming. DOE's test method for determining the self-priming capability of dedicated-purpose pool pumps is discussed in section III.E.2.

1. Determination of DPPP Size

Industry currently uses several terms to characterize the size of dedicated-purpose pool pumps, including total horsepower, DPPP motor capacity, nameplate horsepower, rated horsepower, max-rated horsepower, up-rated horsepower, brake horsepower, service factor horsepower, peak power, and hydraulic horsepower. The terms, as they are defined in the industry standard ANSI/APSP/ICC-15a–2013, their definitions, and any synonyms contained in other relevant industry standards are summarized in Table III.16.

Table III.16. Summary of Terms in Typical DPPP Industry Standards Used to Describe Pump "Size"

Defined Term	Definition	Synonyms
Brake horsepower	A term historically used in the pool, spa, and whirlpool bath industries. A term that conflicts with total horsepower and service factor horsepower.[a]	HI 40.6–2014 defines this term as pump power input.[b] Also known as pump shaft horsepower.
Capacity of the motor	The total horsepower or product of the rated horsepower and the service factor of a motor used on a dedicated-purpose pool pump (also known as service factor horsepower) based on the maximum continuous duty motor power output rating allowable for the nameplate ambient rating and motor insulation class. Total horsepower = rated horsepower × service factor.[a]	Total horsepower, DPPP motor capacity, service factor horsepower. HI 40.6–2014 defines this term as driver power input.[b]
Full-rated	A term used to describe DPPP motors with a service factor greater than 1.25 typically. The term is generally used for marketing purposes.[a]	N/A
Max-rated	A term used to describe DPPP motors with a service factor of between 1.0 and 1.25 typically. The term	Up-rated

Defined Term	Definition	Synonyms
	is generally used for marketing purposes.[a]	
Nameplate horsepower	The motor horsepower listed on the pump and the horsepower by which a pump is typically sold.[a] The horsepower displayed on the nameplate mounted on the motor.[c]	Rated horsepower
Peak horsepower	A term historically used in the pool, spa, and whirlpool bath industries. A term that conflicts with total horsepower and service factor horsepower.[a]	N/A
DPPP motor capacity	See Total horsepower.[a] A value equal to the product of motor's nameplate HP and service factor.[c]	Total horsepower, capacity of the motor, service factor horsepower. HI 40.6–2014 defines this term as driver power input.[b]
Rated horsepower	The motor power output designed by the manufacturer for a rated rpm, voltage, and frequency. May be less than total horsepower where service factor is >1.0, or equal to total horsepower where the service factor is = 1.0. [a,d] Also known as nameplate horsepower.[d]	Nameplate horsepower.
Service factor[e]	A multiplier applied to the rated horsepower of a pump motor to indicate the percent above nameplate horsepower at which the motor can operate continuously without exceeding its allowable insulation class temperature limit, provided that other design parameters, such as rated voltage, frequency, and ambient temperature, are within limits.[a, c,d, f]	N/A
Service factor horsepower	The maximum continuous duty motor power output rating allowable for nameplate ambient rating and motor insulation class. Service factor horsepower (also known as total horsepower) = rated horsepower × service factor.[a]	Total horsepower, DPPP motor capacity, capacity of the motor. HI 40.6–2014 defines this term as driver power input.[b]
Special horsepower	A term historically used in the pool, spa, and whirlpool bath industries, which may conflict with rated horsepower and service factor horsepower.[a]	N/A
Total horsepower[d,g]	The product of the rated horsepower and the service factor of a motor used on a dedicated-purpose pool pump (also known as service factor horsepower) based on the maximum continuous duty motor power output rating allowable for nameplate ambient rating and motor insulation class. Total horsepower = rated horsepower × service factor.[a,c,d]	HI 40.6–2014 defines this term as driver power input.[b]
Up-rated	A term typically used to describe DPPP motors with a service factor of between 1.0 and 1.25. The term is generally used for marketing purposes.[a]	Max-rated
Hydraulic horsepower	The mechanical power transferred to the liquid as it passes through the pump. Also known as pump hydraulic power.[b]	HI 40.6–2014 defines this term as pump power output.[b]

[a] ANSI/APSP/ICC-15a–2013, section 3, "Definitions."
[b] HI 40.6–2014, Table 40.6.2.1, "List of quantities, terms, and definitions."
[c] Cal. Code Regs., tit. 20 section 1602, subd. (g)

[d] ENERGY STAR Program Requirements for Pool Pumps-Eligibility Criteria (Version 1.1), section 1.4, "Product Ratings."
[e] Service factor is not an explicit description of pump "size" but is used is defining related terms (e.g., service factor horsepower and total horsepower).
[f] CA Title 20 defines this term as "service factor (of an AC motor) means a multiplier which, when applied to the rated horsepower, indicated a permissible horsepower loading which can be carried under the conditions specified for the horsepower."
[g] Defined as "total horsepower (of an AC motor)" in CA Title 20.

DOE recognizes that the DPPP industry terminology related to pump size is confusing, as there are several commonly referenced and similar terms. The DPPP Working Group discussed these terms, and ultimately recommended standardizing the terminology referring to pump size around the hydraulic horsepower provided by the pump at a specific load point. (Docket No., EERE-2015-BT-STD-0008, No. 56 at pp. 148–173) Using hydraulic horsepower to standardize the description of "pump horsepower" has several benefits as compared to other horsepower terms. First, it is a quantity that is directly measurable. In addition, the variables necessary to determine hydraulic horsepower are already measured in the industry standard DOE proposes to incorporate by reference as the basis for the DPPP test procedure (see section III.D.1). Further, the hydraulic horsepower provides consistent and comparable criteria to compare pumps that provide the same output flow rate and total dynamic head (i.e., serving the same load).

Horsepower ratings describing the input power to the motor are variable, based on the efficiency of the pump and motor for pumps serving the same load. As a result, in this DPPP TP NOPR, DOE proposes to consistently refer to and categorize dedicated-purpose pool pumps based on the hydraulic horsepower they can produce at a particular

load point, as measured in accordance with the proposed DPPP test procedure. Hydraulic horsepower (termed pump power output[78]) is defined in HI 40.6–2014, which DOE proposes to incorporate by reference (see section III.D.1). HI 40.6–2014 also contains a test method for determining pump power output, as described in more detail in sections III.D.2.b.

In order to have consistent and comparable values of hydraulic horsepower, DOE notes that the DPPP test procedure must also specify a specific load point at which to determine the hydraulic horsepower. DOE proposes to categorize dedicated-purpose pool pumps based on the hydraulic horsepower determined at maximum speed on the reference curve for each DPPP variety and speed configuration (section III.C) and at full impeller diameter. DOE notes that this is consistent with the load points for single-speed pool filter pumps, waterfall pumps, and pressure cleaner booster pumps, as well as consistent with the high flow load point for two-speed pool filter pumps. The hydraulic horsepower at the maximum speed on the reference curve is slightly greater than the hydraulic horsepower associated with the high flow load point for multi-speed and variable-speed pool filter pumps, as the high flow point for those pumps is specified as 80 percent of the flow at maximum speed. However, DOE believes that measuring and reporting hydraulic horsepower at the maximum speed and full impeller diameter on the

[78] The term "pump power output" in HI-40.6 is defined as "the mechanical power transferred to the liquid as it passes through the pump, also known as pump hydraulic power." It is used synonymously with "hydraulic horsepower" in this document. However, where hydraulic horsepower is used to reference the size of a dedicated-purpose pool pump, it refers to the rated hydraulic horsepower.

specified reference curve or head value for each DPPP variety would result in the most consistent and comparable ratings among DPPP varieties and speed configurations.

To unambiguously specify the pump power characteristic that DOE proposes to use to describe the size of dedicated-purpose pool pumps, DOE proposes to introduce a new term, the "rated hydraulic horsepower," that is identified as the measured hydraulic horsepower on the reference curve (i.e., curve C for self-priming and non-self-priming pool filter pumps) or the specified load point (i.e., 17.0 ft or 10.0 gpm for waterfall pumps or pressure cleaner booster pumps, respectively) at the maximum speed and full impeller diameter for the rated pump. In addition, DOE proposes that the representative value for rated horsepower for each basic model of dedicated-purpose pool pump be determined as the mean of the rated hydraulic horsepower for each tested unit measured in accordance with the proposed DPPP test procedure.

While the DPPP test procedure and standards recommended by the DPPP Working Group are fundamentally based on the rated hydraulic horsepower, as proposed in this section III.E.1 of this NOPR, the DPPP Working Group also recommended that DOE assist in standardizing the testing and rating of dedicated-purpose pool pumps with regard to other typical horsepower metrics. (Docket No. EERE-2015-BT-STD-0008, No. 92 at pp. 319-322). Specifically, the June 2016 DPPP Working Group recommendations suggest that DOE should investigate a label that would facilitate proper application and include specified horsepower information. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #9 at p. 5).

DPPP motors often are rated with total horsepower (or service factor horsepower). As shown in Table III.16, ENERGY STAR, CA Title 20, and ANSI/APSP/ICC-15a-2013 all describe similar terms to "total horsepower"[79] as the product of the rated horsepower and the service factor of a motor used on a dedicated-purpose pool pump based on the maximum continuous duty motor power output rating allowable for nameplate ambient rating and motor insulation class (i.e., total horsepower = rated horsepower × service factor). The rated horsepower, or nameplate horsepower, is similarly defined as the motor power output designed by the manufacturer for a rated speed of rotation, voltage, and frequency.

However, some of the industry definitions lack the requisite specificity to describe such terms for the purposes of rating and labeling dedicated-purpose pool pumps in an unambiguous, standardized, and consistent manner. For example, the DPPP Working Group discussed how service factors can vary significantly from model to model and are currently assigned arbitrarily at the discretion of the manufacturer. (Docket No. EERE-2015-BT-STD-0008, No. 56 at pp. 121-138).

To alleviate any ambiguity associated with rated horsepower, total horsepower, and service factor, DOE proposes to define the terms "DPPP nominal motor horsepower," "DPPP motor total horsepower," and "DPPP service factor." DOE proposes to define these terms as follows:

[79] ANSI/APSP/ICC-15a-2013 defines this term as service factor horsepower. CA Title 20 defines this as "total horsepower (of an AC motor)."

- Dedicated-purpose pool pump nominal motor horsepower means the nominal motor horsepower as determined in accordance with the applicable procedures in NEMA-MG-1-2014.

- Dedicated-purpose pool pump motor total horsepower (also known as service factor horsepower) means the product of the dedicated-purpose pool pump nominal motor horsepower and the dedicated-purpose pool pump service factor of a motor used on a dedicated-purpose pool pump based on the maximum continuous duty motor power output rating allowable for the nameplate ambient rating and motor insulation class.

- Dedicated-purpose pool pump service factor means a multiplier applied to the rated horsepower of a pump motor to indicate the percent above nameplate horsepower at which the motor can operate continuously without exceeding its allowable insulation class temperature limit.

The proposed definitions are developed based on the existing industry definitions for these terms. However, the term "dedicated-purpose pool pump nominal motor horsepower" is defined slightly differently than the terms "rated horsepower" or "nameplate horsepower," which are synonymous in the industry. Specifically, DOE has proposed to define DPPP nominal motor horsepower based on the nominal horsepower of the motor with which the dedicated-purpose pool pump is distributed in commerce, as determined in accordance with the applicable procedures in NEMA MG-1-2014, "Motors

and Generators." NEMA MG-1-2014 describes consistent and comprehensive methods for determining the nominal horsepower of motors, including motors used in dedicated-purpose pool pumps, based on certain performance characteristics of the motor. For single-phase small and medium AC motors, the design and performance characteristics that serve as the basis for determining the applicable nominal horsepower are described in section 10.34 of part 10 of NEMA MG-1-2014, "Basis of Horsepower Rating." Specifically, the horsepower rating from small and medium AC induction motors up to 10 nominal horsepower is based on the minimum breakdown torque for each model, as determined by testing at a starting temperature of 25 °C. For polyphase small and medium AC motors, the applicable locked-rotor torque, breakdown torque, pull-up torque, slip, and locked-rotor current requirements for determining nominal horsepower are described in section I of part 12 of NEMA MG-1-2014, as summarized in Table III.17. DOE proposes to incorporate by reference these sections of NEMA MG-1-2014 into the DPPP test procedure.

Table III.17. Summary of Relevant NEMA MG-1-2014 Sections Applicable to Small and Medium Single- and Three-Phase AC Motors

Characteristic	Single-Phase AC Motors	Three-Phase AC Motors
Breakdown Torque	Section 10.34 of NEMA MG-1-2014*	Section 12.39 of NEMA MG-1-2014*
Locked-Rotor Torque	N/A	Section 12.37 or 12.38 of NEMA MG-1-2014*
Pull-up Torque	N/A	Section 12.40 of NEMA MG-1-2014*
Locked-rotor current	N/A	Section 12.35.1 of NEMA MG-1-2014*
Slip	N/A	Section 1.19*

* Based on testing in accordance with section 12.30 of NEMA MG-1-2014.

Similarly, for direct current (DC) motors, including electrically commutated motors, section 10.62 of Part 10 of NEMA MG-1-2014, "Horsepower, Speed, and

Voltage Ratings," describes the requirements for determining the nominal horsepower based on the applicable rated load speed and rated voltages for these motors. To clearly specify how DPPP nominal motor horsepower would be determined based on the procedures in NEMA MG-1-2014, DOE also proposes to include instructions in the DPPP test procedure that reference the relevant sections of NEMA MG-1-2014.

NEMA MG-1-2014 also describes standardized service factor values based on the nominal horsepower rating for open AC motors in table 12-4 of section 12.51, "Service Factor of Alternating-Current Motors." For AC motors not covered by table 12-4 of section 12.51 of NEMA MG-1-2014, section 12.51.2 prescribes a service factor of 1.0. DOE proposes to require assignment of these service factors as the DPPP service factor for AC motors. Section II of Part 12 of NEMA MG-1-2014 addressing DC motors does not provide information regarding service factor, as nominal synchronous speeds are typically not applicable to DC motors. As such, DOE proposes to assign DC motors a DPPP service factor of 1.0, effectively making the nominal horsepower equivalent to the total horsepower of the dedicated-purpose pool pump, consistent with the convention for rating such motors in the motor industry.

Finally, to specify how to calculate dedicated-purpose pool pump total horsepower, DOE proposes to specify that total horsepower would be calculated as the product of the DPPP nominal motor horsepower and the DPPP service factor, both determined in accordance with the applicable provisions in the DPPP test procedure.

DOE believes such standardized rating methods are consistent with the recommendations of the Working Group, would be beneficial to consumers in selecting and applying the equipment, and are consistent with existing methods used to rate motors today.

DOE also believes that the methods described to determine DPPP nominal motor horsepower, DPPP motor total horsepower, and DPPP service factor apply to all motors that are distributed in commerce with dedicated-purpose pool pumps that are proposed to be subject to the test procedures recommended by the DPPP Working Group. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #1-2 and #6 at pp. 1-2 and 5) Specifically, the proposed motor rating requirements would be applicable to the following varieties of dedicated-purpose pool pumps:

- Self-priming pool filter pumps less than 2.5 rated hydraulic horsepower
- Non-self-priming pool filter pumps less than 2.5 rated hydraulic horsepower
- Pressure cleaner booster pumps
- Waterfall pumps

DOE notes that these standardized horsepower metrics would be intended to support proposed labeling provisions for dedicated-purpose pool pumps, which are discussed further in section III.G.

DOE requests comment on the proposal to use rated hydraulic horsepower as the primary standardized metric to describe DPPP "size" with regard to specifying the test procedure and energy conservation standards for dedicated-purpose pool pumps.

DOE requests comment on the proposal to determine the representative value of rated hydraulic horsepower as the mean of the measured rated hydraulic horsepower values for each tested unit.

DOE requests comment on the proposed definitions and testing methods for "dedicated-purpose pool pump nominal motor horsepower," "dedicated-purpose pool pump service factor," and "dedicated-purpose pool pump motor total horsepower."

Additionally, DOE seeks comment on whether the proposed test methods are applicable to all motors distributed in commerce with applicable dedicated-purpose pool pumps. If not, DOE requests additional information regarding the characteristics of any motors for which these procedures would not be applicable and any suggestions regarding alternative procedures to determine dedicated-purpose pool pump nominal motor horsepower, dedicated-purpose pool pump service factor, and dedicated-purpose pool pump motor total horsepower.

2. Determination of Self-Priming Capability

As discussed in section III.A.3.b, DOE proposes separate definitions for self-priming and non-self-priming pool filter pumps based on their capability to self-prime as

determined based on testing in accordance with NSF/ANSI 50–2015. As these definitions rely on the NSF/ANSI 50–2015 test method to determine self-priming capability, DOE proposes to incorporate by reference relevant sections of the NSF/ANSI 50–2015 standard and also proposes several modifications and additions to improve repeatability and consistency of the test results. Specifically, section C.3 of Annex C of NSF/ANSI 50–2015 contains the relevant test parameters, test apparatus, and testing instructions for determining the self-priming capability of self-priming and non-self-priming pool filter pumps.

In general, the self-priming capability test described in NSF/ANSI 50–2015 consists of situating a pump above the water level of the pool or water tank and connecting the pump to a riser pipe that is rises a minimum of 5 feet above the water level. The pump suction inlet must also be a minimum of 5 pipe diameters from any 90 degree elbow in the riser pipe connecting the vertical and horizontal segments of the pipe, as shown in Figure III.6.

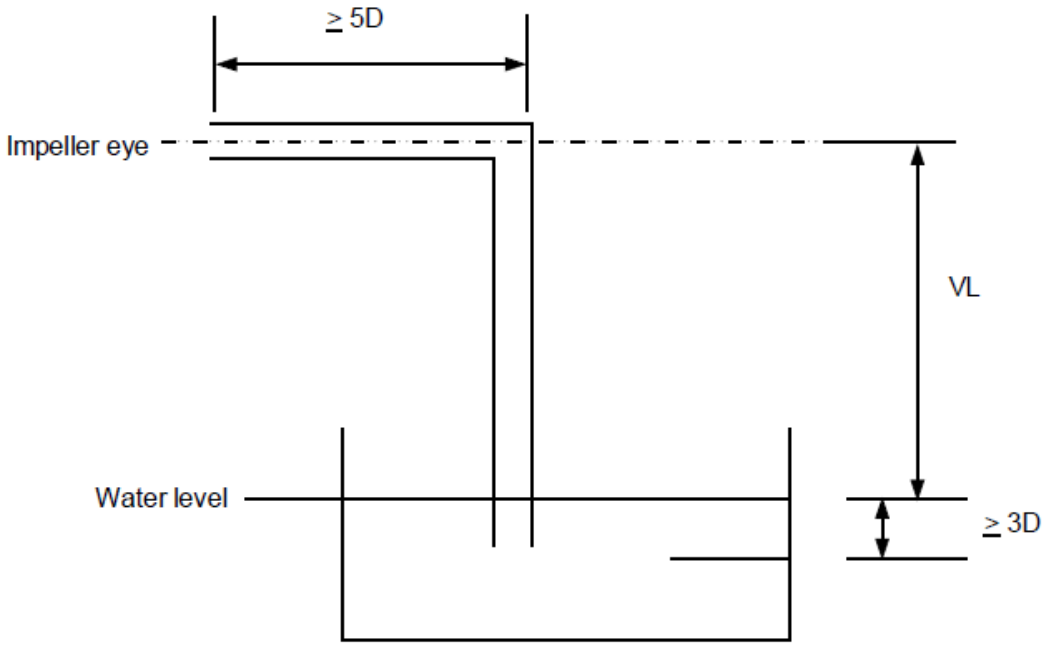

Figure III.6. Test Apparatus for Testing of Self-Priming Capability for Pool Filter Pumps. (In the Figure, D = nominal riser pipe diameter and VL = vertical lift, which much be at least 5.0 feet, adjusted to a nominal conditions. Source: NSF/ANSI 50-2015, figure C.1.)

The pump is then installed according to manufacturer's instructions (including initial priming), turned on, and the timer started. The elapsed time to steady discharge gauge reading or full discharge flow is the "measured priming time (MPT)," which is then adjusted to the "true priming time (TPT)" based on the relative diameters of the pump suction inlet and the riser pipe.[80]

To determine the self-priming capability of self-priming and non-self-priming pool filter pumps, DOE proposes to follow the test method specified in section C.3 of

[80] If the pump suction inlet and the riser pipe are the same diameter, MPT = TPT.

Annex C of NSF/ANSI 50–2015 with several minor modifications to improve test consistency and repeatability, as well as conform with the proposed definitions for self-priming and non-self-priming pool filter pumps presented in section III.A.3.b. First, where section C.3.2, "Apparatus," and section C.3.4, "Self-priming capability test method," state that the "suction line must be essentially as shown in annex C, figure C.1;" DOE proposes to note that the suction line refers to the riser pipe that extends from the pump suction inlet to the water surface. DOE also proposes to clarify that "essentially as shown in Annex C, figure C.1" means:

- the centerline of the pump impeller shaft is situated a vertical distance of 5.0 feet above the water level of a water tank of sufficient volume as to maintain a constant water surface level for the duration of the test;

- the pump draws water from the water tank with a riser pipe that extends below the water level a distance of at least 3 times the riser pipe diameter (i.e., 3 pipe diameters); and

- the suction inlet of the pump is at least 5 pipe diameters from any obstructions, 90° bends, valves, or fittings.

DOE believes this modification will remove ambiguity from the test procedure and the appropriate test setup for evaluating the self-priming capability of pool filter pumps.

Further, DOE notes NSF/ANSI 50-2015 does not specify where the measurement instruments are to be placed in the test set up. Based on feedback from manufacturers, DOE understands that instruments are typically installed at the suction inlet of the pump. DOE proposes to specify that all measurements of head, flow, and water temperature must be taken at the pump suction inlet. It is also important that all measurements are taken with respect to a common reference plane, which DOE proposes should be the centerline of the pump impeller shaft. As measurement instruments may be mounted slightly above the centerline of the pump impeller shaft, all head measurements should be adjusted back to the centerline. NSF/ANSI 50-2015 does not specify methods for performing such adjustment. Therefore, DOE proposes that such adjustments be performed in accordance with section A.3.1.3.1 of HI 40.6-2014.

DOE also notes that, while NSF/ANSI provides some flexibility regarding the height, or VL, of the pump above the water level, DOE's proposed definitions do not provide such discretion and reference only a vertical lift of 5.0 feet, as discussed in section III.A.3.b. Therefore, the VL of the test apparatus must be exactly 5.0 feet when testing the self-priming capability of pool filter pumps that are not already certified with NSF/ANSI 50-2015 and variable VL heights are not allowed. Therefore, to precisely specify how VL would be measured, DOE proposes to clarify that VL must be determined from the height of the water to the centerline of the pump impeller shaft.

In addition, DOE acknowledges that the VL used in the test must be representative of the test conditions to ensure repeatability of the results. Specifically,

the caption of figure C.1 also provides that the VL shall be corrected to a standard temperature of 68 °F, a pressure of 14.7 psia, and a water density of 62.4 lb/ft^3. This ensures that tests performed at locations with, for example, a significantly higher or lower ambient pressure, would result in comparable results. However, NSF/ANSI 50-2015 does not provide instructions regarding how such correction is to be performed. Fundamentally, the vertical height of a column of fluid of consistent diameter will vary proportionally with the temperature of the fluid (which impacts the density) and the ambient pressure. Therefore, DOE proposes that the VL of the test apparatus must be adjusted proportionally for variations in the density of the test fluid and/or variations in the ambient pressure. Specifically, decreases in density would increase the test apparatus VL, while increases in ambient pressure would decrease the test apparatus VL, as specified in equation (6). DOE notes that DOE's proposed definition for VL specifies a VL of 5.0 feet:

$$VL = 5.0\text{ft} \times \left(\frac{62.4\ {}^{\text{lb}}/_{\text{ft}^3}}{\rho_{\text{test}}} \right) \times \left(\frac{P_{\text{abs,test}}}{14.7\text{psia}} \right) \quad \textbf{(6)}$$

Where:

VL = vertical lift of the test apparatus from the waterline to the centerline of the pump impeller shaft, in ft;

ρ_{test} = density of test fluid, in lb/ft^3; and

$P_{atm,test}$ = absolute barometric pressure of test apparatus location at centerline of pump impeller shaft, in psia.

In addition, DOE notes that section C.3.2 of NSF/ANSI 50-2015 describes the instruments that are required to perform the test, but, with the exception of the time indicator, does not specify their required accuracy. DOE proposes to apply the accuracy requirements contained in HI 40.6-2014, which DOE also proposes would apply to all other measurements made under the DPPP test procedure, to the measurement devices noted in NSF/ANSI 50-2015, as detailed in Table III.18.

Table III.18. Proposed Measurement Device Accuracy Requirements for Measurements Devices Specified in NSF/ANSI 50-2015

Measurement Device	Proposed Accuracy Requirement	Source
Elapsed time indicator	±0.1 min	NSF/ANSI 50-2015
Gauge pressure indicating device	±2.5% of reading*	HI 40.6-2014
Temperature indicating device	±0.5 °F	HI 40.6-2014
Barometric pressure indicating device	±2.5% of reading*	HI 40.6-2014
Height	±0.1 inch	N/A

* The ±2.5 percent requirement applies to discharge, suction, and differential head measurements, as indicated in table 40.6.3.2.3, for values taken between 40 and 120 percent of BEP flow.

DOE also notes that NSF/ANSI 50-2015 does not specify an instrument for measuring distance. Therefore, DOE proposes to require instruments for measuring distance that are accurate to ±0.1 inch. DOE believes this will improve the consistency and repeatability of test results and ensure all results are, in fact, indicative of the actual performance. DOE also notes that this is consistent with the proposed requirements for distance-measuring instruments in section III.D.2.f.

In section C.3.3, "Test conditions," NSF/ANSI 50-2015 specifies test conditions for both swimming pools and hot tubs/spas, as shown in Table III.19, and states that all pumps, except those labeled as for swimming pool applications only, are to be tested at the hot tub/spa conditions.

Table III.19. Test Conditions Specified in NSF/ANSI 50-2015

Measurement	Swimming Pool	Hot Tub/Spa
Water Temperature	75 ± 10 °F	102 ± 10 °F
Turbidity	≤15 NTU*	≤15 NTU

* NTU = Nephelometric Turbidity Units; a measure of how much light is scattered by the particles contained in a water sample.

DOE notes that HI 40.6-2014, which is proposed to be incorporated by reference into the DPPP test procedure (see section III.D.1), also contains requirements for water conditions when testing pumps. Specifically, HI 40.6-2014 specifies that all testing must be conducted with "clear water" that is between 50 and 86 °F, where clear water means water with a maximum kinematic viscosity of 1.6×10^{-5} ft^2/s and a maximum density of 62.4 lb/ft^3.

With regard to the temperature requirements, DOE notes that, although all pumps addressed by this rule are dedicated-purpose pool pumps, storable electric and rigid electric spa pumps are excluded from the proposed test procedure, as discussed in section III.A.5. While DOE acknowledges that some dedicated-purpose pool pumps may be installed in the field in either swimming pools or permanent spas, DOE believes that the swimming pool temperatures would be more applicable to the equipment under consideration in this rule. Therefore, DOE proposes that tests of self-priming capability

for those pool filter pumps not already certified with NSF/ANSI 50-2015 be conducted at temperatures representative of swimming pools. DOE clarifies that this proposal would only affect those pumps that are not already certified with NSF/ANSI 50-2015. As DOE's proposal for self-priming pool filter pump includes pool filter pumps that are certified as self-priming under NSF/ANSI 50-2015 (see section III.A.3.b), pool filter pumps may continue to be certified based on testing with hot tub/spa water conditions for the purposes of NSF/ANSI certification. In addition, DOE notes that the temperature range of clear water in HI 40.6-2014 is similar to that established by NSF/ANSI 50-2015 for swimming pools.

Regarding the specification of water properties or clarity, DOE notes that the viscosity and density requirements adopted in HI 40.6-2014 are intended to accomplish the same purpose as the turbidity limits in NSF/ANSI 50-2015, to ensure the test is conducted with water that does not have contaminants or additives in such concentrations that they would affect the thermodynamic properties of the water. In addition, DOE notes that viscosity is a characteristic of water that would affect the thermodynamic properties of water, but may not affect the turbidity.

Therefore, DOE finds the viscosity and density requirements in HI 40.6-2014 to potentially be more descriptive regarding the necessary criteria for ensuring all pump tests are conducted with clear water. Therefore, DOE proposes to require testing of the self-priming capability of pool filter pumps with clear water that is between 50 and 86 °F, as opposed to the existing water temperature and turbidity requirements contained in

section C.3.3 of the NSF/ANSI 50-2015 test method. As the temperature range of clear water in HI 40.6-2014 is similar to that established by NSF/ANSI 50-2015 and the viscosity and density requirements are intended to accomplish the same goal, DOE does not believe that the proposed HI 40.6-2014 requirements would result in different measurements or results. In addition, DOE notes that, in NSF/ANSI 50-2015, the reported VL is to be corrected to a standard temperature of 68 °F, a pressure of 14.7 psia, and a water density of 62.4 lb/ft^3, which further obviates the need for elevated temperature testing.

Section C.3.4, "Self-priming capability test method," of NSF/ANSI 50-2015 specifies that "the elapsed time to steady discharge gauge reading or full discharge flow" is to be recorded as the MPT. However, NSF/ANSI 50-2015 does not specify how to determine "steady discharge gauge reading or full discharge flow." DOE proposes to determine steady discharge gauge and full discharge flow as when the changes in head and flow, respectively, are within the tolerance values specified in table 40.6.3.2.2, "Permissible amplitude of fluctuation as a percentage of mean value of quantity being measured at any test point," of HI 40.6-2014. DOE also proposes that tested pumps must meet both pressure and flow stabilization requirements prior to recording MPT. That is, the measurement must be taken under stable conditions. However, DOE recognizes that it will take some non-trivial amount of time to determine stabilized flow prior to recording the elapsed time, which would then no longer be indicative of the time at which the pump reached that flow and head point. Therefore, DOE also proposes to clarify that the elapsed time should be recorded when steady state pressure and flow readings have

been achieved, where steady state is achieved when the measured data remain constant within the permissible amplitudes of fluctuation defined in table 40.6.3.2.2 of HI 40.6-2014. Then the MPT would be determined by examining the data and evaluating when that load point was first achieved. Note, DOE also proposes that both pressure and flow measurements be required to achieve steady state, as DOE believes both would be necessary to ensure the pump is operating at stable conditions.

Section C.3.4 of NSF/ANSI 50-2015 then specifies that the TPT is calculated by scaling the MPT based on the relative diameter of the riser pipe and the pump suction inlet according to the following equation (7):

$$\text{TPT} = \text{MPT} \times \left(\frac{\text{pump suction inlet size}}{\text{riser pipe diameter}}\right)^2 \quad \textbf{(7)}$$

DOE notes that, while theoretically correct, testing with different riser pipe diameters could affect the accuracy and repeatability of the results, especially if pipes that are substantially larger or smaller than the pump suction inlet are used. Therefore, DOE proposes that testing of self-priming capability of pool filter pumps that are not already certified with NSF/ANSI 50-2015 be performed with riser pipe that is of the same pipe diameter as the pump suction inlet. Therefore, no adjustment of MPT would be required and TPT would be measured directly.

Section C.3.4 of NSF/ANSI 50-2015 also specifies that the complete test method must be repeated, such that two TPT values are generated. However, NSF/ANSI 50-2015 does not specify how these duplicative measurements should be treated, but does require in section C.3.5 that both measurements must be less than 6 minutes or the manufacturer's specified TPT, whichever is greater. However, DOE notes that the criteria for TPT established in DOE's proposed definitions instead reference a TPT of 10.0 minutes. Consistent with this intent, DOE believes that it would be most appropriate to specify that both test runs result in TPT values that are less than or equal to 10.0 minutes.

Similarly, section C.3.5 of NSF/ANSI 50-2015 describes the TPT criteria that pumps must meet in order to certify as self-priming under NSF/ANSI 50-2015 and the caption of figure C.1 specifies the VL criteria applicable to the NSF/ANSI 50-2015 test. As noted previously, DOE's proposed definitions reference a specific TPT of 10.0 minutes and VL of 5.0 feet. Therefore, DOE proposes to exclude section C.3.5 and the relevant portions of the VL definition in the caption of C.1 to be consistent with DOE's proposed definition.

Table III.20 provides a summary of DOE's proposed modifications and additions to NSF/ANSI 50-2015 to remove ambiguity from the SNF/ANSI 50-2015 test method, improve the repeatability of the test, and harmonize the test requirements with the other proposed DPPP test procedure requirements contained in this NOPR.

Table III.20. Summary of Proposed Modifications and Additions to NSF/ANSI 50-2015 Self-Priming Capability Test

NSF/ANSI 50-2015 Section	NSF/ANSI 50-2015 Specification	DOE Proposed Modification/Addition
Section C.3.2, "Apparatus," and Section C.3.4, "Self-priming capability test method"	"Essentially as shown in Annex C, figure C.1"	More clearly specify the test setup requirements, where VL = 5.0 feet, adjusted to nominal conditions of 14.7 psia and a water density of 62.4 lb/ft^3
Section C.3.2, "Apparatus"	Measurement Instruments (no accuracy requirements)	Accuracy requirements contained in HI 40.6-2014, table 40.6.3.2.3, as applicable
Section C.3.3, "Test conditions"	Water temperature and turbidity requirements; all measurements at hot tub/spa temperatures unless for swimming pool applications only	Test with clear water between 50 and 86 °F, as specified in HI 40.6-2014
Section C.3.4, "Self-priming capability test method"	Measure MPT at steady discharge gauge or full discharge flow	Measure elapsed time at steady state pressure and temperature conditions; MPT is when those conditions were first achieved
Section C.3.4, "Self-priming capability test method"	Adjust MPT to TPT based on relative diameter of suction inlet and pipe diameter	Use pipe of the same diameter as the suction inlet (MPT=TPT)
Section C.3.5, "Acceptance criteria," and caption of figure C.1	TPT of 6 minutes or the manufacturer's specified recommended time, whichever is greater and VL of 5.0 feet or the manufacturer's specified lift, whichever is greater.	Excluded; TPT = 10 minutes and VL = 5.0 feet adjusted to nominal conditions of 14.7 psia and a water density of 62.4 lb/ft^3

DOE requests comment on the proposal to incorporate by reference the test method contained in section C.3 of NSF/ANSI 50-2015, with the minor modifications and additions summarized in Table III.20, to measure the self-priming capability of pool filter pumps.

3. Determination of Maximum Head

As noted in section III.A.4.a, waterfall pumps are, by definition, pool filter pumps with maximum head less than or equal to 30 feet, and a maximum speed less than or

equal to 1,800 rpm. Therefore, in order to unambiguously distinguish waterfall pumps from other varieties of pool filter pumps, DOE must establish a specific and repeatable method for determining maximum head of pool filter pumps. Based on the demonstrated relationship between flow and head, DOE understands the maximum head to be associated with the minimum flow of the pump. However, DOE also understands that pumps cannot always be operated safely or reliable at zero or very low flow conditions. Therefore, DOE proposes that, for the purposes of differentiating waterfall pumps from other varieties of pool filter pumps, the maximum head of pool filter pumps be determined based on the measured head value associated with the maximum speed and the minimum flow rate at which the pump is designed to operate continuously or safely. DOE notes that the minimum flow rate will be assumed to be zero unless otherwise specified in the manufacturer literature.

DOE requests comment on the proposed method for determining the maximum head of pool filter pumps when differentiating waterfall pumps from other pool filter pump varieties.

F. Representations of Energy Use and Energy Efficiency

Manufacturers of dedicated-purpose pool pumps within the scope of the DPPP test procedure would be required to use the test procedure proposed in this rulemaking when making representations about the energy efficiency or energy use of their equipment. Specifically, 42 U.S.C. 6314(d) provides that "[n]o manufacturer…may make any representation…respecting the energy consumption of such equipment or cost

of energy consumed by such equipment, unless such equipment has been tested in accordance with such test procedure and such representation fairly discloses the results of such testing."

Therefore, manufacturers of equipment that are addressed by this test procedure would have 180 days after the promulgation of any TP final rule to begin using the DOE procedure as the basis for representations. However, manufacturers would not be required to certify or make representations regarding the performance of applicable dedicated-purpose pool pumps using the WEF metric until the compliance date of any potential energy conservation standards that DOE may set for dedicated-purpose pool pumps. However, if manufacturers elect to make representations of WEF prior to such compliance date, they would be required to do so using the DOE test procedure.

As discussed in section III.E.1, DOE also proposes standardized and consistent methods for determining several DPPP horsepower metrics, including rated hydraulic horsepower, DPPP nominal motor horsepower, DPPP total horsepower, and DPPP service factor. Section III.E.1 also discusses how manufacturers currently use a variety of terms to refer to these DPPP motor characteristics. Similar to WEF, 180 days after the publication of any final rule establishing such test methods, the DPPP nominal motor horsepower, DPPP total horsepower, and DPPP service factor would be required to be based on values consistent with the DOE test procedure. DOE notes that this includes any common synonyms for such quantities. For example, all references to capacity of the motor, nameplate horsepower, DPPP motor capacity, rated horsepower, service factor

horsepower, total horsepower, or similar metrics would need to be updated to refer to the DPPP nominal motor horsepower or DPPP total horsepower, as applicable, and generated based on the DPPP test methods for these metrics beginning 180 days after the publication of any DPPP test procedure final rule.

With respect to representations, generally, DOE understands that manufacturers often make representations (graphically or in numerical form) of energy use metrics, including EF, pump efficiency, overall (wire-to-water) efficiency, driver power input, and/or pump power output (hydraulic horsepower) and may make these representations at a variety of different load points or operating speeds. DOE proposes to allow manufacturers to continue making these representations. However, in order to ensure consistent and standardized representations across the DPPP industry and to ensure such representations are not in conflict with the reported WEF for any given DPPP model, DOE proposes to establish optional testing procedures for these parameters that are part of the DOE test procedure. DOE also proposes that, to the extent manufacturers wish to make representations regarding the performance of dedicated-purpose pool pumps using these additional metrics, they would be required to do so based on testing in accordance with the DOE test procedure.

DOE notes that pump efficiency, overall (wire-to-water) efficiency, driver power input, and/or pump power output (hydraulic horsepower) are already parameters that are described in HI 40.6–2014, which DOE proposes to incorporate by reference in the DOE

test procedure (section III.D.1). DOE believes that further specification is not necessary regarding the determination of these parameters.

Regarding EF, which is currently the metric most commonly used to describe DPPP performance, DOE proposes to adopt in the DOE test procedure, optional provisions that describe how to calculate EF at any given load point. Specifically, DOE also proposes to establish the four most common reference curves (curves A, B, C, and D), as shown in Table III.21.

Table III.21. Systems Curves for Optional EF Test Procedure

System Curve	Definition
Curve A	$H = 0.0167 \times Q^2$
Curve B	$H = 0.050 \times Q^2$
Curve C	$H = 0.0082 \times \text{Flow (gpm)}^2$
Curve D	$H = 0.0044 \times \text{Flow (gpm)}^2$

In addition, DOE proposes to specify that EF may be determined at any available speed. DOE recognizes that the existing industry programs and test methods for dedicated-purpose pool pumps restrict the load points at which EF may be determined for each DPPP configuration, based on the style of motor and/or control with which the pump is distributed in commerce, as shown in Table III.22. However, DOE does not believe such restriction is necessary for a voluntary metric, like EF.

Table III.22. Proposed Speeds for Optional EF Test Procedure

Pump Speed(s)	Tested Speeds
Single-speed	Max Speed on Curves A, B, C, and/or D
Two-speed	Max and Min Speed on Curves A, B, C, and/or D
Multi-speed	All Available Speed on Curves A, B, C, and/or D
Variable speed	Max, Min, and Most Efficient Speed on Curves A, B, C, and/or D

At each specified load point, DOE proposes that EF would be calculated in according to equation (8), which DOE notes is consistent with existing industry procedures (see section III.B.1):

$$EF = \frac{\left(\frac{Q}{1{,}000} \times 60\right)}{\left(\frac{P}{1{,}000}\right)} \quad \textbf{(8)}$$

Where:

EF = energy factor, determined at any given load point, in kgal/kWh;

Q = flow rate at any given load point, in gal/min; and

P = input power to the motor (or controls, if present) at any given load point, in watts.

DOE proposes to incorporate units consistent with those proposed for the WEF, as recommended by the DPPP Working Group (see section III.B.1). That is, flow is determined in gal/min, input power to the motor or controls is determined in W, and EF is determined in kgal/kWh.

DOE also proposes that these load points would be found using the same test methods proposed in the DPPP test procedure. Specifically, the measurement of pump input power and flow rate, as well as any other relevant parameters, would be made in accordance with certain sections of HI 40.6–2014, with the specific exceptions, modifications, and additions noted in section III.D.2. However, instead of the load points specified for each of the DPPP varieties and speed configurations specified in sections III.C to calculate WEF, pump manufacturers could determine and make representations regarding EF on the optional system curves specified in Table III.21 at any desired speed.

If adopted, this means that 180 days after the publication date of any DPPP TP final rule, manufacturers would only be able to make representations of EF in accordance with the proposed DPPP test procedure. DOE believes providing a standardized method for determining EF at the specified load points would benefit manufacturers and consumers by ensuring consistent, reliable, and representative representations of energy performance, based on the optional EF metric. However, DOE does not wish to unnecessarily limit the extent to which manufacturers may make optional representations regarding EF at representative load points that would provide important information to the customer. DOE believes the proposed specific load points are comprehensive and represent all EF values that manufacturers either currently use to make representations, or may use to make in the future. Therefore, DOE believes this proposal would strike a balance between not limiting a manufacturer's ability to make EF representations at desired load points, but would provide the benefit of additional consistency and

comparability of EF values by providing a specific test procedure and discrete load points at which EF could be determined.

DOE requests comment on its proposal to adopt optional provisions for the measurement of several other DPPP metrics, including EF, pump efficiency, overall (wire-to-water) efficiency, driver power input, and/or pump power output (hydraulic horsepower), in addition to the required representations.

DOE also requests comment on its belief that HI 40.6–2014 contains all the necessary methods to determine pump efficiency, overall (wire-to-water) efficiency, driver power input, and/or pump power output (hydraulic horsepower) and further specification is not necessary.

Finally, DOE requests comment on the proposed optional test procedure to determine EF on the specific reference curves A, B, C, and D at any available operating speed.

G. Labeling Requirements

In the June 2016 DPPP Working Group recommendations, the DPPP Working Group recommended that DOE investigate a label that would facilitate proper application and include specified horsepower information. (Docket No.EERE-2015-BT-STD-0008, No. 82, Recommendation #9 at p. 5). As discussed in section III.E.1, the DPPP industry currently uses a variety of metrics to describe the "size" of a dedicated-purpose pool

pump, including nominal motor horsepower, total horsepower, service factor horsepower, and hydraulic horsepower, among others. To standardize the terminology and testing procedures for determining DPPP size and motor horsepower information, as discussed in section III.E.1, DOE proposed definitions and specific test methods for determining rated hydraulic horsepower, DPPP nominal motor horsepower, DPPP motor total horsepower, and service factor. DOE also proposes specific sampling plans and calculation procedures for determining the representative values of these and other relevant DPPP metrics, as discussed in section III.I.1.

To implement the recommendations of the DPPP Working Group, DOE proposes to require labeling of all dedicated-purpose pool pumps for which the DPPP Working Group recommended test procedures. That is, DOE proposes that the labeling requirements be applicable to:

- Self-priming pool filter pumps less than 2.5 rated hydraulic horsepower[81]
- Non-self-priming pool filter pumps less than 2.5 rated hydraulic horsepower
- Pressure cleaner booster pumps
- Waterfall pumps

[81] DOE notes that the DPPP Working Group only recommended standards for single-phase self-priming pool filter pumps less than 2.5 rated hydraulic horsepower. However, the DPPP Working Group recommended that the test procedure and reporting requirements would still be applicable to single- and three-phase self-priming pool filter pumps. Therefore, DOE believes it is appropriate to apply the proposed labeling requirements to three-phase pumps.

For self-priming pool filter pumps, non-self-priming pool filter pumps, pressure cleaner booster pumps, and waterfall pumps, DOE proposes that each DPPP unit clearly display on the permanent nameplate the following information:

- WEF, in kgal/kWh,
- Rated hydraulic horsepower,
- DPPP nominal motor horsepower,
- DPPP motor total horsepower, and
- service factor.

DOE also proposes specific requirements regarding the formatting of required information on the nameplate and the specific terminology that is required to be displayed. However, DOE proposes that these labeling requirements would be applicable to all units manufactured, including imported, on the compliance date of any potential energy conservation standards that may be set for dedicated-purpose pool pumps.

DOE requests comment on the proposed labeling requirements for dedicated-purpose pool pumps.

DOE requests comment on any other information that should be included on the permanent nameplate or in manufacturer literature to aid customers of dedicated-purpose pool pumps in proper selection and application of DPPP units.

H. Replacement DPPP Motors

DOE understands that DPPP motors wear out much more frequently than DPPP bare pumps and, thus, replacement DPPP motors are often sold to replace the original motor with which the pump was sold. Although DOE does not intend to regulate replacement DPPP motors because they do not (by themselves) meet the definition of a dedicated-purpose pool pump, DOE understands that it may be beneficial to have a method to determine an applicable WEF for replacement DPPP motors. This could be advantageous for replacement motor manufacturers to label their products and for utilities or efficiency programs to encourage the sale of replacement DPPP motors that would maintain or increase the savings of the dedicated-purpose pool pump, as installed in the field.

Therefore, DOE proposes to establish an optional method to determine the WEF for replacement DPPP motors. Specifically, under this method, the replacement motor would be paired with an appropriate DPPP bare pump and the combination would be subject to the proposed DOE test procedure for that dedicated-purpose pool pump, based on the DPPP variety and speed configuration.

DOE recognizes that replacement DPPP motors may be offered for sale or advertised to be paired with multiple DPPP bare pumps, and each combination may have a different WEF. Since each of these bare pumps may impact the WEF rating, each replacement DPPP motor and DPPP bare pump pairing would represent a unique pairing. Therefore, DOE proposes that the WEF for each replacement DPPP motor-DPPP bare

pump pairing be determined separately. However, consistent with DOE's treatment of all equipment, DOE proposes to allow manufacturers to group similar replacement motor-bare pump pairings within a given replacement DPPP motor rating to minimize testing burden, while still ensuring that the rating is representative of minimum efficiency or maximum energy consumption of the group. Specifically, for other equipment, DOE provides that manufacturers may elect to group similar individual models within the same equipment class into the same basic model to reduce testing burden, provided all representations regarding the energy use of individual models within that basic model are identical and based on the most consumptive unit. See 76 FR 12422, 12423 (Mar. 7, 2011).[82] Similarly, manufacturers of replacement DPPP motors could opt to make representations of the WEF of each individual replacement DPPP motor and DPPP bare pump combination, or may elect to make WEF representations regarding a replacement DPPP motor combined with several individual DPPP bare pumps of the same equipment class, and rate the group with the same representative WEF value, which would be representative of the least efficient model. DOE also proposes that replacement DPPP motor manufacturers would need to make a statement, along with any advertised WEF value, regarding the specific DPPP bare pump to which it applies. If no specific DPPP bare pumps are listed in the manufacturer literature or otherwise along with any WEF

[82] These provisions allow manufacturers to group individual models with essentially identical, but not exactly the same, energy performance characteristics into a basic model to reduce testing burden. Under DOE's certification requirements, all the individual models within a basic model identified in a certification report as being the same basic model must have the same certified efficiency rating and use the same test data underlying the certified rating. The Compliance Certification and Enforcement final rule also establishes that the efficiency rating of a basic model must be based on the least efficient or most energy consuming individual model (i.e., put another way, all individual models within a basic model must be at least as energy efficient as the certified rating). 76 FR at 12428–29 (March 7, 2011).

representation, then the WEF value would be assumed to be applicable to any and all possible DPPP bare pumps. That is, it is representative of the least efficient DPPP bare pump available for each equipment class.

DOE requests comment on the proposed optional test procedure for replacement DPPP motors. Specifically, DOE seeks comment as to any additional details that should be addressed in testing a replacement DPPP motor with any given DPPP bare pump to determine applicable WEF values.

I. Certification and Enforcement Provisions for Dedicated-Purpose Pool Pumps

DOE must provide uniform methods for manufacturers to determine representative values of energy- and non-energy-related metrics, for each basic model. See 42 U.S.C. 6314(a)(2). These values are used when making public representations (as discussed in section III.E) and when determining compliance with prescribed energy conservation standards. DOE proposes that DPPP manufacturers must use a statistical sampling plan consistent with the sampling plan for pumps that is currently specified at 10 CFR 429.59. Manufactures would use these sampling plans to determine the representative values of WEF and other metrics necessary to demonstrate compliance with any energy conservation standards DOE may set for dedicated-purpose pool pumps. In addition, DOE commonly specifies enforcement procedures that DOE will follow to verify compliance of a basic model. The following sections III.I.1 III.I.2, and III.I.3 discuss DOE's proposed sampling plan, certification requirements, and enforcement provisions for dedicated-purpose pool pumps, respectively.

1. Sampling Plan

DOE provides, in subpart B to 10 CFR part 429, sampling plans for all covered equipment. As mentioned previously, the purpose of a statistical sampling plan is to provide a method to ensure that the test sample size (i.e., number of units tested) was sufficiently large that a represented value of energy- and non-energy-related metrics is, in fact, representative of the population of units in the basic model. In the January 2016 general pumps TP final rule, DOE adopted sampling provisions applicable to pumps that were similar to those used for other commercial and industrial equipment. 81 FR 4086, 4135–36 (Jan. 25, 2016).

For dedicated-purpose pool pumps, DOE proposes to adopt statistical sampling plans similar to that adopted for pumps. That is, DOE proposes to amend 10 CFR 429.59 to require that, for each basic model of pump (including dedicated-purpose pool pumps), a sample of sufficient size must be randomly selected and tested to ensure that any representative value of WEF, EF, or other measure of energy consumption of a basic model for which customers would favor higher values is less than or equal to the lower of the following two values:

(1) The mean of the sample, where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

and $\bar{x}$ is the sample mean; n is the number of samples; and x_i is the maximum of the i^{th} sample;

(2) The lower 95 percent confidence limit (LCL) of the true mean divided by 0.95, where:

$$LCL = \bar{x} - t_{0.95}\left(\frac{s}{\sqrt{n}}\right)$$

and $\bar{x}$ is the sample mean; s is the sample standard deviation; n is the number of samples; and $t_{0.95}$ is the t statistic for a 95 percent one-tailed confidence interval with n–1 degrees of freedom (from appendix A of subpart B of 10 CFR part 429).

DOE also proposes similar provisions for quantities, such as pump input power, for which consumers would favor lower values. See 10 CFR 429.59(a)(1)(ii).

Under this proposal, for purposes of certification testing, the determination that a basic model complies with the applicable energy conservation standard would be based on testing conducted using the proposed DOE test procedure and sampling plan. The general sampling requirement currently applicable to all covered products and equipment provides that a sample of sufficient size must be randomly selected and tested to ensure compliance and that, unless otherwise specified, a minimum of two units must be tested to certify a basic model as compliant. 10 CFR 429.11(b)

DOE proposes to apply this same minimum sample size requirement to dedicated-purpose pool pumps. Thus, DOE proposes that a sample of sufficient size be selected to ensure compliance and that at least two units must be tested to determine the representative values of applicable metrics for each basic model. Manufacturers may need to test a sample of more than two units depending on the variability of their sample, as provided by the statistical sampling plan.

DOE notes that the proposed sampling provisions would be applicable to all energy-related metrics for which a DPPP manufacturer elected to make representations, including overall efficiency. DOE believes that, similar to other pumps, an upper confidence limit (UCL) and LCL of 0.95, which are divided by a de-rating factor of 1.05 and 0.95, respectively, would also be appropriate for dedicated-purpose pool pumps. Specifically, DOE believes dedicated-purpose pool pumps would realize similar performance variability to general pumps.

In addition to WEF, DOE also notes that the rated hydraulic horsepower, as defined in section III.E.1, is an important characteristic for determining the appropriate load points for testing and characterizing the capacity of a given DPPP model. Therefore, DOE also proposes a method to determine the "representative value" of rated hydraulic horsepower for each DPPP basic model. That is, DOE proposes that the representative value of rated hydraulic horsepower be determined as the average of all the tested units that serve as the basis for the rated efficiency for that basic model. Similarly, the DPPP nominal motor horsepower, DPPP motor total horsepower, and service factor are

important characteristics that may aid customers in properly selecting and applying dedicated-purpose pool pumps. Consistent with the DPPP Working Group recommendations, as discussed in section III.E.1 and III.G, DOE proposes standardized methods for determining these DPPP motor characteristics and that such information be included on the permanent label affixed to each DPPP unit. To ensure such values are determined in a consistent manner, DOE also proposes that DPPP nominal motor horsepower, DPPP motor total horsepower, and service factor be determined based on the average of the test results, for each metric, from all the tested units that serve as the basis for the rating for that basic model. That is, DOE proposes specific test methods for determining DPPP nominal motor horsepower based on the tested torque, current, and slip characteristics of the DPPP motor. DOE proposes that the DPPP nominal motor horsepower be determined based on the average breakdown torque, locked-rotor torque, pull-up torque, locked-rotor current, and slip (as applicable) for each tested unit of DPPP motor. The representative values of DPPP service factor and DPPP motor total horsepower are then calculated based on that representative value of DPPP nominal motor horsepower. DOE recognizes that, in many cases, such testing may be performed by the motor manufacturer and, as such, DOE notes that the tested DPPP motor units and the DPPP units do not have to be the same units, provided they are representative of the same population.

Finally, consistent with provisions for other commercial and industrial equipment, DOE notes the applicability of certain requirements regarding retention of certain information related to the testing and certification of dedicated-purpose pool pumps,

which are detailed under 10 CFR 429.71. Generally, manufacturers must establish, maintain, and retain certification and test information, including underlying test data for all certification testing for 2 years from the date on which the dedicated-purpose pool pump is no longer distributed in commerce.

DOE requests comment on the proposed statistical sampling procedures and certification requirements for dedicated-purpose pool pumps.

2. Certification Requirements

Paragraph (b) of 10 CFR 429.59 contains the certification requirements for certain styles of pump for which DOE adopted test procedures and standards in the January 2016 general pumps TP and ECS final rules. 81 FR 4086 (Jan. 25, 2016); 81 FR 4368 (Jan. 26, 2016). Since dedicated-purpose pool pumps are a style of pump, DOE proposes to amend 10 CFR 429.59 to include the reporting requirements for dedicated-purpose pool pumps. The general certification report requirements contained in 10 CFR 429.12 would apply to dedicated-purpose pool pumps as they do to other styles of pumps, including general pumps. However, as dedicated-purpose pool pumps have a unique test procedure and metric from general pumps, DOE proposes to establish unique certification requirements for dedicated-purpose pool pumps that would require manufacturers to supply certain additional information to DOE in certification reports to demonstrate compliance with any energy conservation standards that DOE may set.

Specifically, for a dedicated-purpose pool pump subject to the test procedure proposed in this NOPR (i.e., self-priming and non-self-priming pool filter pumps, waterfall pumps, and pressure cleaner booster pumps, see section III.A.6), DOE proposes that the following items be included in certification reports and made public on DOE's website:

- WEF in kilogallons per kilowatt-hour (kgal/kWh);
- Rated hydraulic horsepower in horsepower (hp);
- Maximum speed of rotation in revolutions per minute (rpm);
- Dedicated-purpose pool pump nominal motor horsepower in horsepower (hp);
- Dedicated-purpose pool pump motor total horsepower in horsepower (hp);
- Dedicated-purpose pool pump service factor (dimensionless);
- The speed configuration for which the pump is being rated (i.e., single-speed, two-speed, multi-speed, or variable-speed);
- For self-priming pool filter pumps, non-self-priming pool filter pumps, and waterfall pumps, the maximum head in feet; and
- For self-priming and non-self-priming pool filter pumps: the vertical lift and true priming time for the DPPP model and a statement regarding whether the pump is certified with NSF/ANSI 50-2015.

Such data are necessary for DOE to verify compliance of the given DPPP model, to determine the appropriate test procedure method to follow when verifying ratings, and

to verify the accuracy of information provided on the label of any applicable DPPP models.

In the June 2016 DPPP Working Group recommendations, the Working Group also recommended that DOE require reporting of true power factor at all applicable test procedure load points in the public information provided in the certification report for all dedicated-purpose pool pumps to which the test procedure is applicable (i.e., self-priming and non-self-priming pool filter pumps, waterfall pumps, and pressure cleaner booster pumps). (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation # 7 at p. 4) As such, DOE is proposing that, for all dedicated-purpose pool pumps to which the test procedure is applicable, true power factor be reported at all applicable test procedure load points in the certification report and be made public on DOE's website.

In addition, as discussed above in section III.A.7, the DPPP Working Group recommended specific prescriptive requirements for dedicated-purpose pool pumps distributed in commerce with freeze protection controls to ensure freeze protection controls on dedicated-purpose pool pumps only operate when necessary and do not result in unnecessary, wasted energy use. Specifically, the DPPP Working Group recommended that all dedicated-purpose pool pumps distributed in commerce with freeze protection controls be shipped either:

1) with freeze protection disabled or
2) with the following default, user-adjustable settings:

a. The default dry-bulb air temperature setting is no greater than 40 °F; and
b. The default run time setting shall be no greater than 1 hour (before the temperature is rechecked); and
c. The default motor speed shall not be more than ½ of the maximum available speed.

(Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #6A at p. 4).

Relatedly, the DPPP Working Group recommended that, in order to certify compliance with such a requirement, DPPP manufacturers be required to make a statement certifying compliance to the applicable design requirement and make available publicly as part of their literature the details by which they have met the applicable design standard. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #6B at p. 4). The DPPP Working Group specifically recommended that, as part of certification reporting, manufacturers must include the default dry-bulb air temperature setting (in °F), default run time setting (in minutes), and default motor speed (in rpm). (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #6A at p. 4). Therefore, consistent with recommendations of the Working Group, DOE proposes that, for dedicated-purpose pool pumps distributed in commerce with freeze protection controls enabled, the certification report also include the default dry-bulb air temperature setting (in °F), default run time setting (in minutes), and default motor speed (in rpm).

The DPPP Working Group also recommended that DOE include a verification procedure in case there was ever an issue regarding whether a product distributed in commerce actually had such features. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #6A at p. 4). The verification test is discussed in more detail in section III.I.3.

Finally, for integral cartridge-filter and sand-filter pool pumps, the DPPP Working Group recommended DOE consider only a prescriptive standard, which requires such pumps be distributed in commerce with pool pump timers. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #2B at pp. 1–2) Relatedly, the DPPP Working Group also recommended a definition for pool pump timer that describes the specific features and operational characteristics that applicable pool pump times must contain in order to comply with the prescriptive standard. The recommended definition defines pool pump timer as a pool pump control that automatically turns off a dedicated-purpose pool pump after a run-time of no longer than 10 hours. As such, for these DPPP varieties, DOE proposes the certification report contain the maximum run-time of the pool pump control with which the integral cartridge-filter or sand-filter pump is distributed in commerce.

In addition to the required elements, DOE recognizes that other DPPP characteristics may provide useful information to inform consumers or support programs related to dedicated-purpose pool pumps. As discussed during the DPPP Working Group negotiations, the input power and flow rate at each applicable load point and the EF at

multiple load points would be useful for utilities in calculating energy savings associated with dedicated-purpose pool pumps in specific applications. (Docket No. EERE-2015-BT-STD-0008, No. 54 at pp. 5-7) As discussed in section III.F, DOE is proposing to establish in the DPPP test procedure specific methods to calculate EF at any desired speed on any of the specified optional system curves (i.e., Curve A, B, C, or D). Therefore, to provide additional information to consumers and the market place, DOE proposes that the following information may optionally be included in certification reports and, if included, would be made public:

- Calculated driver power input and flow rate at each load point i (P_i and Q_i), in horsepower (hp) and gallons per minute (gpm), respectively; and/or
- Energy factor at any desired speed on any of the specified optional system curves (i.e., Curve A, B, C, or D), along with the tested speed and the system curve associated with each energy factor value.

While useful to consumers and the public, DOE recognizes that manufacturers may incur additional burden conducting the testing for and reporting of these additional metrics. DOE reiterates that the reporting of these additional metrics would be optional and at the discretion of the manufacturer.

DOE notes that, as specified in paragraph (a) of 10 CFR 429.12, the certification requirements for covered products and equipment, including those proposed for dedicated-purpose pool pumps in this NOPR, are only applicable to equipment subject to

an applicable energy conservation standard set forth in part 430 or 431. Therefore, the certification requirements proposed in this NOPR would only be required when and if any energy conservation standards for dedicated-purpose pool pumps are established and in effect.

DOE requests comment on the proposed mandatory and optional reporting requirements for certification of dedicated-purpose pool pumps.

3. Enforcement Provisions

Enforcement provisions govern the process DOE would follow when performing its own assessment of basic model compliance with standards, as described under subpart C of 10 CFR part 429. Specifically, subpart C describes the notification requirements, legal processes, penalties, specific prohibited acts, and testing protocols related to testing covered equipment to determine or verify compliance with standards. 10 CFR 429.102-429.134. DOE notes that the same general enforcement provisions contained in subpart C of 10 CFR part 429 would be applicable to dedicated-purpose pool pumps.

Related to enforcement testing of dedicated-purpose pool pumps, as specified in 10 CFR 429.110(e), DOE would conduct the applicable DPPP test procedure, once adopted, to determine the WEF for tested DPPP models. In addition, DOE believes that, as dedicated-purpose pool pumps have relatively large shipments and are generally a high-volume piece of equipment, DOE should apply the enforcement testing sample size and calculations applicable to consumer products and certain high-volume commercial

equipment specified in appendix A to subpart C of 10 CFR part 429. Therefore, DOE proposes to use, when determining performance for a specific basic model, the enforcement testing sample size, calculations, and procedures laid out in appendix A to subpart C of 10 CFR part 429 for consumer products and certain high-volume commercial equipment. These procedures, in general, provide that DOE would test an initial sample of at least 4 units and determine the mean WEF value and standard error of the sample. DOE would then compare these values to the WEF standard level, once adopted, to determine the compliance of the basic model or if additional testing (up to a total of 21 units) is required to make a compliance determination with sufficient confidence. DOE notes that DOE adopted enforcement testing sample size and calculations for general pumps in the January 2016 general pumps TP final rule. Specifically, in the January 2016 general pumps TP final rule, DOE adopted provisions at 10 CFR 429.110(e)(5)[83] stating that DOE would assess compliance of any pump basic models undergoing enforcement testing based on the arithmetic mean of up to four units. 81 FR 4086, 4145 (Jan. 25, 2016). To clarify that the enforcement provisions adopted in the January 2016 general pumps TP final rule are only applicable to those pumps subject to the test procedure adopted in the January 2016 general TP final rule, DOE also proposes to clarify the applicability of the provisions at 10 CFR 429.110(e)(5).

[83] DOE notes that the 2016 general pumps TP final rule were originally adopted into 10 CFR 429.110(e)(1)(iv), but a recent rulemaking reorganized the enforcement provisions for various equipment, including pumps, to place the pump enforcement provisions in 10 CFR 429.110(e)(5). 81 FR 31827, 31841 (May 20, 2016).

In addition, when determining compliance of any units tested for enforcement purposes, DOE proposes to adopt provisions that specify how DOE would determine the rated hydraulic horsepower at maximum speed on the reference curve, which describes the capacity of the DPPP model (see section III.E.1) for determining the appropriate standard level for any tested equipment (if applicable). Specifically, DOE proposes that DOE would perform the same test procedure for determining the rated hydraulic horsepower at maximum speed on the reference curve specified by the test procedure for each DPPP variety (see section III.C) on one or more units of each model selected for testing. DOE proposes that, if the rated hydraulic horsepower determined through DOE's testing (either the measured rated hydraulic horsepower for a single unit sample or the average of the measured rated hydraulic horsepower values for a multiple unit sample) is within 5 percent of the certified value of rated hydraulic horsepower, then DOE would use the certified value of rated hydraulic horsepower as the basis for determining the standard level for tested equipment. This would give manufacturers certainty regarding the appropriate standard level their equipment would be subject to in enforcement testing. However, if DOE's tested value of rated hydraulic horsepower is not within 5 percent of the certified value of rated hydraulic horsepower, DOE would use the arithmetic mean of all the rated hydraulic horsepower values resulting from DOE's testing when determining the standard level for tested equipment. DOE believes such an approach would result in more reproducible and equitable rating of equipment and compliance determinations among DOE, manufacturers, and test labs.

DOE developed the 5 percent tolerance on hydraulic power based on statistical analysis of the maximum allowed testing uncertainty due to fluctuations in measurements, measurement uncertainty, and the typical manufacturing variability. The maximum experimental uncertainty is discussed in HI 40.6–2014, which DOE proposes to incorporate by reference in the DOE test procedure (section III.D.1). DOE estimated the manufacturing variability based on the maximum tolerances on head and flow that are allowed in the NSF/ANSI 50–2015 standard. Specifically, NSF/ANSI 50–2015 requires that the tested flow be within ±5 percent of the pump performance curve and the tested head be within -3 to +5 percent of the pump performance curve, whichever is greater (see section III.D.2.d). However, DOE recognizes that these are all worst-case uncertainties and that testing a unit with the maximum possible variability in every parameter would be extremely unlikely. Therefore, DOE assumed that the maximum uncertainty would represent a worst case. For the purposes of analysis, DOE assumed the maximum uncertainty was three standard deviations away from the mean (encompassing 99.7 percent of the population). In this enforcement testing procedure, DOE proposes to use a tolerance of one standard deviation. DOE notes that this is also consistent with the tolerances on flow and head allowed for in NSF/ANSI 50–2015.

In addition, DOE proposes similar procedures for relevant quantities necessary to differentiate the different varieties of pool filter pumps: self-priming pool filter pumps, non-self-priming pool filter pumps, and waterfall pumps. Specifically, to differentiate waterfall pumps, DOE proposes to establish an enforcement testing procedure for the maximum head value. Similar to rated hydraulic horsepower, DOE would perform the

proposed test procedure for determining maximum head (discussed in section III.E.3) on one or more units and compare the testing results to the value of maximum head certified by the manufacturer. If the value certified by the manufacturer is within 5 percent of the test values, DOE would use the manufacturer's certified value and resultant equipment class. Otherwise, DOE would use the enforcement testing results to determine the applicable equipment class and standard level. Similarly, to differentiate self-priming and non-self-priming pool filter pumps, DOE would perform the self-priming capability test and determine the vertical lift and true priming time of one or more tested units. DOE would also use the manufacturer's certified values and equipment class designation, provided the vertical lift and true priming time determined in DOE's testing is within 5 percent of the manufacturer's certified values.

DOE requests comment on the proposed enforcement provisions for dedicated-purpose pool pumps. Specifically, DOE seeks comment upon the applicability of a 5 percent tolerance on rated hydraulic horsepower, maximum head, vertical lift, and true priming time for each tested DPPP model or if a higher or lower percentage variation would be justified.

In addition, as discussed in section III.I.2, as part of its extended charter, the DPPP Working Group recommended requirements that require all dedicated-purpose pool pumps distributed in commerce with freeze protection controls be shipped either:

1) with freeze protection disabled; or

2) with the following default, user-adjustable settings:

a. The default dry-bulb air temperature setting is no greater than 40 °F; and

b. The default run time setting shall be no greater than 1 hour (before the temperature is rechecked); and

c. The default motor speed shall not be more than ½ of the maximum available speed.

(Docket No. EERE-2015-BT-STD-0008, No. 74 at pp. 16).

Relatedly, the DPPP Working Group recommended that DOE include a verification procedure in case there was ever an issue regarding whether a product distributed in commerce actually had such features. Id.

Therefore, based on the DPPP Working Group recommendations, DOE proposes a procedure to verify the presence and operation of any freeze protection controls distributed in commerce with any applicable dedicated-purpose pool pump. The verification procedure would consist of testing the dedicated-purpose pool pump with the default, as-shipped control settings in a test apparatus identical to that described in section III.D for determining the WEF of applicable pool pumps, except that the ambient temperature registered by the freeze protection ambient temperature sensor would also be able to be controlled. This could be accomplished, depending on the specific location and configuration of the temperature sensor by exposing the freeze protection

thermocouple to a specific temperature by, for example, submerging the thermocouple in a water bath of known temperature, adjusting the ambient air temperature of the test chamber, or other means to simulate and vary the ambient temperature registered by the freeze protection temperature sensor(s).

The general procedure would begin by installing the DPPP unit in a test stand in accordance with HI 40.6-2014 with the pump powered on but not circulating water (i.e., the controls are active and the flow or speed are set to zero). The temperature measured by the freeze protection temperature control would then be gradually decreased by 1 ± 0.5 °F every 5.0 minutes, starting at 42 ± 0.5 °F until the pump freeze protection controls initiate water circulation or 38 ± 0.5 °F, whichever occurs first. The freeze protection ambient temperature reading and DPPP rotating speed, if any, would be recorded after each reduction in temperature and subsequent stabilization (see stabilization requirements in III.D, which DOE proposes would also be applicable to this verification procedure).

If the DPPP freeze protection controls do not initiate water circulation at a temperature of 38 ± 0.5 °F, as measured by the freeze protection ambient temperature sensor, the test would conclude and the dedicated-purpose pool pump would be deemed compliant with the stated design requirement for freeze protection controls. If the freeze protection controls initiate water circulation, the temperature would be increased to 42 ± 0.5 °F and the dedicated-purpose pool pump would be allowed to run for at least 30.0 minutes. After 30.0 minutes, the freeze protection ambient temperature and rotating speed, if any, would be recorded again. If the dedicated-purpose pool pump initiated

water circulation at a temperature greater than 40 °F; if the dedicated-purpose pool pump was still circulating water after 30.0 minutes of operation at 42 ± 0.5 °F; or if rotating speed for freeze protection was greater than one-half of the maximum rotating speed of the DPPP model, as certified by the manufacturer, that DPPP model would be deemed to not comply with the stated design requirement for freeze protection controls.

DOE requests comment on the proposed verification procedure for DPPP freeze protection controls.

DOE notes that the actual design requirements would be established in any ECS rulemaking for dedicated-purpose pool pumps and that this verification procedure would only be necessary if and when any such requirements are established.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

The Office of Management and Budget (OMB) has determined that TP rulemakings do not constitute "significant regulatory actions" under section 3(f) of Executive Order 12866, Regulatory Planning and Review, 58 FR 51735 (Oct. 4, 1993). Accordingly, this action was not subject to review under the Executive Order by the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 et seq.) requires preparation of an initial regulatory flexibility analysis (IFRA) for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, "Proper Consideration of Small Entities in Agency Rulemaking," 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's website: http://energy.gov/gc/office-general-counsel.

DOE reviewed this proposed rule, which would establish a new test procedure for dedicated-purpose pool pumps, under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. DOE tentatively concludes that the proposed rule, if adopted, would not result in a significant impact on a substantial number of small entities, as it would not, in and of itself, require the use of the proposed test procedure. That is, any burden associated with testing dedicated-purpose pool pumps in accordance with the requirements of this test procedure would not be required until the promulgation of any energy conservation standards final rule for dedicated-purpose pool pumps, as discussed in section II. On this basis, this NOPR has no incremental burden associated with it and a regulatory flexibility analysis is not required.

While DOE maintains that this proposed test procedure has no incremental burden associated with it when viewed as a stand-alone rulemaking, DOE recognizes that DPPP energy conservation standards are currently being considered in a negotiated rulemaking that is ongoing (Docket No. EERE-2015-BT-STD-0008) and may be proposed or promulgated in the near future. In addition, DOE realizes that manufacturers often provide information about the energy performance of the dedicated-purpose pool pumps they manufacture since this information is an important marketing tool to help distinguish their dedicated-purpose pool pumps from competitor offerings. While manufacturers may elect to make such representations regarding WEF or other DPPP energy performance characteristics, DOE reiterates that making such representations regarding the energy efficiency or energy use of covered DPPP models is voluntary and thus the proposed test procedure does not have any incremental burden associated with it. That is, if necessary, a manufacturer could elect to not make representations about the energy use of covered DPPP models. However, given the ongoing DPPP energy conservation standards rulemaking (Docket No. EERE-2015-BT-STD-0008) and the potential testing manufacturers may elect to undertake prior to the compliance date of any potential standards, DOE is estimating in this NOPR the full cost of developing certified ratings for covered DPPP models for the purposes of making representations regarding the energy use of covered equipment or certifying compliance to DOE under any future energy conservation standards. Therefore, while such is not required yet, DOE is presenting the costs associated with testing equipment consistent with the requirements of the proposed test procedure, as would be required to certify compliance with any future

energy conservation standard. DOE presents the results of such analysis in the following sections.

However, DOE is not determining the significance of that burden with respect to manufacturers' financial situation or status as a small entity. As the use of the testing requirements contained in this NOPR is contingent upon the energy conservation standards rulemaking, DOE believes it would be more appropriate to analyze the effect of the combined burden associated with both the test procedure and energy conservation standards rulemakings in the manufacturer impact analysis performed as part of any energy conservation standards rulemaking. Therefore, the estimates provided in this test procedure regulatory flexibility analysis serve only to provide information about the possible burden manufacturers may incur while testing pumps using this DOE test procedure; they do not represent actual burden incurred by the industry as there is no incremental burden associated with the proposed test procedure until and unless any associated DPPP energy conservation standards final rule is published.

1. Burden of Conducting the Proposed DOE DPPP Test Procedure

As dedicated-purpose pool pumps would be newly regulated equipment, DOE currently has no test procedures or standards for this equipment. In this TP NOPR, DOE proposes to amend subpart Y to 10 CFR part 431 to include definitions and a test procedure applicable to a specific subset of dedicated-purpose pool pumps, including self-priming and non-self-priming pool filter pumps, waterfall pumps, and pressure cleaner booster pumps. The proposed test procedure would not apply to integral

cartridge-filter pool pumps, integral sand-filter pool pumps, storable electric spa pumps, or rigid electric spa pumps (see section III.A.6 for more discussion).

In the proposed test procedure, DOE proposes a new metric, called the weighted energy factor (WEF), to characterize the energy performance of dedicated-purpose pool pumps within the scope of this test procedure. The WEF is determined as a weighted average of water flow rate over the input power to the dedicated-purpose pool pump at different load points, depending on the variety of dedicated-purpose pool pump and the number of operating speeds with which it is distributed in commerce. The proposed test procedure contains the methods for determining: (1) the WEF and rated hydraulic horsepower for self-priming and non-self-priming pool filter pumps, waterfall pumps, and pressure cleaner booster pumps; (2) the self-priming capability of pool filter pumps to effectively differentiate self-priming and non-self-priming pool filter pumps; (3) the WEF for replacement DPPP motors; and (4) optional test methods to determine additional energy performance metrics applicable to dedicated-purpose pool pumps. To determine the applicable measured values for determining DPPP performance, DOE proposes to incorporate by reference the test methods established in HI 40.6–2014, "Methods for Rotodynamic Pump Efficiency Testing," with certain exceptions.

This NOPR also proposes requirements regarding the sampling plan and representations for covered dedicated-purpose pool pumps at subpart B of part 429 of title 10 of the Code of Federal Regulations. The sampling plan requirements are similar to those for several other types of commercial equipment and, among other things,

require a sample size of at least two units per DPPP basic model be tested when determining representative values WEF, as well as other DPPP performance metrics.

To estimate the burden associated with the testing and sampling plan requirements proposed in this TP NOPR, DOE understands that in order to conduct the proposed test procedure, each manufacturer would have to either (a) have the units tested in house or (b) have the units tested at a third party testing facility. If the manufacturer elects to test dedicated-purpose pool pumps in house, each manufacturer may have to undertake, at most, the following burden inducing activities: (1) construct and maintain a test facility that is capable of testing dedicated-purpose pool pumps in compliance with the test procedure, including acquisition and calibration of any necessary measurement equipment, and (2) conduct the DOE test procedure on two units of each covered DPPP model.

DOE recognizes that many DPPP manufacturers already have DPPP test facilities of various configurations and conduct DPPP testing as part of an existing manufacturing quality control process, to develop DPPP performance information for new and existing products, and to participate in voluntary energy efficiency programs or to submit information to certain states as part of their energy code. However, DOE recognizes that, because such testing is not currently required or standardized, testing facilities may vary widely from one DPPP manufacturer to another. As such, DOE has estimated the maximum potential testing burden associated with this TP NOPR, which is associated with a situation where a given DPPP manufacturer does not have existing test facilities

and would be required to construct such facilities to test equipment in accordance with any TP final rule. In addition, DOE discusses a more representative burden estimate that DOE believes is more indicative of the incremental burden manufacturers would likely encounter due to the testing requirements proposed in this TP NOPR based on the testing capabilities most manufacturers in the industry currently possess. The basis for both of these estimates is laid out in the subsequent sections in terms of physical equipment and testing costs, labor costs, the combined burden for in house testing, and third-party testing costs.

a. Estimated Equipment Costs for Testing Dedicated-Purpose Pool Pumps

In the maximum burden case where a DPPP manufacturer would be required to construct a test lab from scratch, manufacturers would be required to make significant capital outlays to acquire test equipment. The first necessary item for testing a dedicated-purpose pool pump is a water reservoir to hold the water that the pump circulates during testing. The size of the dedicated-purpose pool pump will directly affect the size of the necessary water reservoir. Manufacturers provided estimates to DOE on the cost of water reservoirs for a variety of sizes. Based on the information provided, DOE estimates the cost of a water reservoir to be $2.50 per gallon. Because the dedicated-purpose pool pumps vary in size, DOE is using a 1,000 gallon water reservoir as a typical size and thus estimates the cost at $2,500 for the water reservoir. Water conditioning equipment may also be necessary, in some cases, in support of the water reservoir and to ensure that water is maintained at the appropriate test temperature (the proposed test procedure

requires testing with clear water between 50 and 86 °F, see section III.D.2.a). DOE estimates the cost of water conditioning equipment to be $2,000.

To complete the DPPP test loop, assorted piping and valves would be necessary to circulate water from the reservoir to the pump and regulate the flow and head of the water. Multiple diameter pipes, valves, and associated fittings may be required to accommodate different size dedicated-purpose pool pumps. The total costs for the values and piping will vary on pipe diameter as well as the actual testing laboratory configuration. DOE estimates a cost of $1,000 for the piping and valves necessary to test the dedicated-purpose pool pumps within the scope of the proposed test procedure.

In addition to water conditioning, the proposed DOE test procedure also requires the power supply characteristics (i.e., voltage, frequency, voltage unbalance, and total harmonic distortion) to be maintained within specific values, as described in section III.D.2.e. Specifically as stated in Table III.15, the proposed power supply requirements must within a few percent of the rated voltage, frequency, and voltage harmonic distortion. Also, the total harmonic distortion must be limited throughout the test. In some situations, manufacturers may be required to acquire power conditioning equipment to ensure the power supplied to the DPPP motor or control is within the required tolerances. DOE estimated researched power supplies as well as manufacturers provided estimates of possible equipment costs which ranged from $100 to $20,000 for the proposed power supply. This range of equipment includes a variety of equipment

specifications; however, DOE estimates the cost for power conditioning equipment as $2,000.

In addition to the physical testing apparatus, the proposed DPPP test procedure also contains requirements regarding the characteristics and accuracy of the measurement equipment necessary to precisely and accurately determine relevant measured quantities. The primary measurement equipment includes flow measuring equipment, pressure measuring equipment, and power measuring equipment.

Also, as discussed in section III.D.2.d, test facilities would need equipment to measure the flow rate in gallons per minute to verify that the pool pump is operating at the applicable load point. Manufacturers indicated that, for flow measurement equipment, they utilized magnetic flow measurement devices. These magnetic flow measurement devices vary in price based on the range of the device to accommodate the anticipated flow rate from different sizes of dedicated-purpose pool pumps. DOE researched flow measurement devices as well as was provided feedback from manufacturers about the typical prices of various sizes. DOE's research indicates that as the size of the flow meter increases, so does cost. Flow measurement devices ranged from $1,500 to $4,500 per DOE's research. DOE estimates a typical flow measurement equipment device to be $3,000 for compliance with the proposed TP NOPR.

Pressure measurement equipment could include a manometer, bourdon tube, digital indicator, or a transducer. DOE's research indicates that manufacturers use

different options. Each of the different measurement devices has different prices. DOE estimated the cost of the different pressure measurement devices and estimates the average cost to be $950.

Finally, electrical measurement equipment is necessary to determine the input power to the dedicated-purpose pool pump, as measured at the input to the motor or controls, if present. There are multiple devices that can measure power and energy values. However, DOE proposes specific requirements regarding the accuracy and quantities measured for such power measuring equipment, as discussed in section III.D.2.f. In this case, only specific power analyzers and watt-amp-volt meters with the necessary accuracy can measure RMS voltage, RMS current, and real power up to at least the 40^{th} harmonic of fundamental supply source frequency and having an accuracy level of ±2.0 percent of full scale when measured at the fundamental supply source frequency. DOE researched equipment as well as inquired with manufacturers about the equipment used and related costs. Based on information provided by manufacturers and DOE's own research, a range from $2,000 to $30,000 was found for the potential electrical measurement equipment. DOE estimates the typical cost for such electrical measurement equipment as $4,000.

Additionally, measurements of speed, time, height, and temperature would also be necessary, to perform the test procedure as proposed. Speed measurement equipment such as a tachometer, eddy current drag, torque meter, or other equipment may be necessary. Based on information supplied by manufacturers, DOE estimates the cost of

measuring speed at $250. To verify that the testing fluid (i.e., clear water) is within the specified temperature range, testing facilities will also need to measure temperature. DOE estimates a cost of $100 for potential temperature measurement devices. Also, as discussed in section III.D.2.f, test facilities would need equipment to measure height to determine the height above the reference plane for any pressure-measuring instruments, as well as measure the vertical lift when determining the self-priming capability of self-priming and non-self-priming pool filter pumps. DOE estimates that the cost of any distance measuring equipment would be minimal (i.e., less than $10), as a standard tape measure would satisfy the proposed accuracy requirements (see section III.D.2.f and III.E.2).

Finally, to ensure that all data are taken simultaneously and properly recorded, a data acquisition system might also be necessary. DOE researched data acquisition systems and determined they ranged between $2,000 and $35,000. DOE estimates the typical cost for a data acquisition system as $19,000.

In total, DOE estimates the cost of acquiring all the necessary equipment and materials to construct a suitable test apparatus and determine applicable quantities to perform the proposed DPPP test procedure as approximately $43,800. However, DOE notes that the majority of DPPP manufacturers may already have existing testing capabilities to verify equipment performance, as well as certify performance under ENERGY STAR, in accordance with applicable state laws, or for other applicable DPPP

programs.[84] Therefore, DOE believes the previously estimates $43,800 value is a worst-case estimate that is not representative of the likely burden manufacturers would actually be likely to incur. Specifically, many manufacturers indicated to DOE that they already possessed equipment necessary to comply with such programs, including test apparatus and suitable equipment to measure temperature, time, speed, pressure, flow, and a data acquisition system to compile such measurements. Manufacturers indicated that they also currently used a variety of power measuring devices, some of which would be compliant with the proposed accuracy and measurement requirements proposed in this NOPR (section III.D.2.f) and some of which would not. Similarly, manufacturers did not indicate use of any power conditioning equipment, which may or may not be required based on the existing power quality conditions of the test facility.[85] DOE finds it that, at most, current DPPP manufacturers would be required to acquire new power measurement equipment and power conditioning equipment to comply with DOE's proposed testing requirements, for a total cost of $15,000. However, DOE notes that, for some manufacturers, the cost could be a low as $0.

DOE requests comment on the capital cost burden associated with the proposed test procedure, including the estimated capabilities of current manufacturers.

[84] See section 0 for a review of applicable DPPP regulatory and voluntary programs.
[85] Many test facilities may inherently meet DOE's proposed requirements for power supply characteristics, as DOE proposed to use values that are likely to be widely available on the national electrical grid. See section 0.

Specifically, DOE requests comment on the estimate that the likely capital cost burden incurred by existing DPPP manufacturers would be between $0 and $15,000.

b. Labor Associated with Testing Dedicated-Purpose Pool Pumps

DOE also estimates the related labor necessary to complete the proposed test procedure. DOE estimates the cost of labor using the median hourly wage of $43.40.[86] Including fringe benefits, which are estimated to be nominally 30 percent of total compensation, the total hourly cost to an employer is estimated to be $56.42.[87] DOE received information from manufacturers about the typical time required to test a dedicated-purpose pool pump for ANSI/NSF-50, ENERGY STAR, and other applicable programs with similar testing requirements proposed in this NOPR.[88] Although a small sample size, the time for testing ranged from a few hours per test to an entire day when completing testing for multiple programs. The longer testing is a function of the stabilization requirements of ENERGY STAR that are greater than DOE has proposed in this document. The expected testing time for this proposed test procedure is between 3 to 5 hours depending on the number of speeds and corresponding number of test points.

[86] United States Department of Labor. Bureau of Labor Statistics Occupational Outlook Handbook. Washington, DC. http://www.bls.gov/oes/current/oes_nat.htm. Last accessed May 26, 2016.
[87] U.S. Department of Labor, Bureau of Labor Statistics. 2015. Employer Costs for Employee Compensation—Management, Professional, and Related Employees. Washington, DC www.bls.gov/news.release/pdf/ecec.pdf.
[88] See section 0 for a discussion of applicable programs and the similarity to DOE's proposed test procedure.

Using the labor rate established in the previous section, the total cost of labor for testing a dedicated-purpose pool pump ranges from $350 and $500 per basic model.[89]

DOE requests comment on the estimated time to complete a test of a single DPPP unit under the proposed test procedure.

c. Estimated Testing Cost per Manufacturer

To assess the total cost of complying with the proposed DPPP test procedure and rating applicable DPPP models, DOE estimates the combined capital and labor costs for DPPP manufacturers. As discussed above in section IV.B.1.a, based on DOE's analysis, the equipment necessary could total a maximum of $43,800, but would more likely range between $0 and $15,000. For the purpose of estimating a "typical" estimated burden associated with testing under the proposed test procedure, per manufacturer, DOE uses the $15,000 figure.

However, DOE notes that this capital cost would be distributed across all the units being tested by a given manufacturer. DOE researched the market and estimates 30 models of dedicated-purpose pool pumps produced by manufacturers. Manufacturers may also be able to group these dedicated-purpose pool pumps into basic models, so the actual quantity of basic models per manufacturer could be less than this range. (See section III.A.8 for a discussion of DOE's basic model definition and how individual

[89] The costs are $225 and $450 respectively per unit, but the minimum number of units is 2 per basic model, therefore, costs are expressed in terms of basic model.

models can be treated under such a definition.) To account for this, DOE analyzed DOE's DPPP database to determine the likely number of basic models a typical DPPP manufacturer would certify, based on the grouping provisions allowed for in the DPPP basic model definition. DOE estimates, based on similarities between some individual models in DOE's DPPP database, that DPPP manufacturers would each typically rate 15 unique basic models. Therefore, DOE distributed the estimated capital cost of $15,000 across the estimated15 basic models to determine the typical capital cost per DPPP model.

To determine the total burden of the proposed DPPP test procedure, DOE also estimates the labor cost per DPPP model. DOE previously estimated the labor cost as a range between $350 and $500 per basic model. However, as discussed in section III.I.1, manufacturers would be required to test at least two units of each basic model to determine the applicable ratings for that model. Thus, at least two tests would be required per basic model, resulting in approximately 30 tests per manufacturer, to rate all of their DPPP models that would be subject to the proposed test procedure. If a given DPPP manufacturer makes 15 basic models and tests 2 units, the resultant testing costs, including both capital expenditures and labor to conduct the test, are between $1,000 and $1,350 per DPPP basic model depending on the total labor time, number of speeds, and number of basic models.

DOE also recognizes that not all manufacturers have in-house testing facilities and may opt for independent third-party testing. This may be the most cost-effective

solution for manufacturers with few basic models, so as to avoid all the capital cost burden associated with acquiring a test facility consistent with DOE's proposed testing requirements. Therefore, to estimate burden for these manufacturers, as well as verify the reasonableness of DOE's in-house testing estimate, DOE researched potential testing costs from independent testing labs. Based on input from third-party labs and manufacturers, DOE estimates the cost of third-party testing to be $4,000 per unit, or $11,000 per model.

2. Review of DPPP Manufacturers

To determine the likely testing burden for applicable DPPP manufacturers, DOE researched the current DPPP industry to identify manufacturers of dedicated-purpose pool pumps and estimate the number of DPPP models that would be subject to the proposed test procedure for those manufacturers.

DOE conducted a focused inquiry into manufacturers of equipment covered by this rulemaking. During its market survey, DOE used available public information to identify potential small manufacturers. DOE's research involved the review individual company websites and marketing research tools (e.g., Dun and Bradstreet reports, Manta, Hoovers) to create a list of companies that manufacture pumps covered by this rulemaking. Using these sources, DOE identified 21 distinct manufacturers of dedicated-purpose pool pumps.

DOE notes that the Regulatory Flexibility Act requires analysis of, in particular, "small entities" that might be affected by the proposed rule. For the DPPP manufacturing industry, the Small Business Administration (SBA) has set a size threshold, which defines those entities classified as ''small businesses'' for the purpose of the statute. DOE used the SBA's size standards to determine whether any small entities would be required to comply with the rule. The size standards are codified at 13 CFR part 121. The standards are listed by North American Industry Classification System (NAICS) code and industry description and are available at www.sba.gov/sites/default/files/files/Size_Standards_Table.pdf. DPPP manufacturers are classified under NAICS 333911, ''Pump and Pumping Equipment Manufacturing.'' The SBA sets a threshold of 750 employees or less for an entity to be considered as a small business for this category.

To determine the number of DPPP manufacturers that are small businesses and might be differentially affected by the proposed rule, DOE then reviewed these data to determine whether the entities met the SBA's definition of a small business manufacturer of dedicated-purpose pool pumps and then screened out companies that do not offer equipment covered by this rulemaking, do not meet the definition of a ''small business,'' are foreign-owned and operated, or are owned by another company. Based on this review, DOE has identified 5 companies that would be considered small manufacturers by the SBA definition in terms of the number of employees.

DOE requests comment regarding the size of DPPP manufacturing entities and the number of manufacturing businesses represented by this market.

3. Summary

The final cost per manufacturer primarily depends on the number of basic models the manufacturer sells. However, based on the previous assumptions and analysis, DOE estimates that DPPP manufacturers would, on average, have 15 DPPP basic models that would require rating under the proposed test procedure and sampling plan requirements, resulting in an initial testing cost of $1,350 per manufacturer per basic model assuming that the manufacturers only had to purchase power supplies and electrical measurement devices that meet the proposed requirements. In addition, DOE notes that these are not annual costs because DOE does not require manufacturers to retest a basic model annually. If a manufacturer modifies a basic model in a way that makes it more efficient or less consumptive or introduces a new basic model, new testing is required to determine the representative performance of the new or modified model. DOE estimates that manufacturers, on average, introduce new or significantly modified DPPP models approximately once every 5 years. Therefore, after the initial testing to newly certify all existing DPPP models, DOE estimates manufacturers would incur ongoing testing costs (primarily labor because the equipment because the manufacturer would have the

equipment) of approximately $350 to $500 (depending on the number of speeds tested) per new basic model introduced or significantly modified.[90]

DOE requests comment on its assertion that manufacturers typically introduce or significantly modify basic models once every 5 years.

As discussed in section IV.B.2, DOE analyzed the industry for DPPP manufacturing to determine all manufacturers of dedicated-purpose pool pumps covered in this TP NOPR. Analysis of the industry determined that 45 percent of all DPPP manufacturers could be classified as small businesses according to SBA classification guidelines. Although 45 percent of the market could be considered a significant portion of the overall industry, DOE estimates that the proposed testing would only incur $1,350 in initial testing costs and $350 on an ongoing basis to certify new or modified models. These estimates are based on the assumption that many DPPP manufacturers, including small manufacturers, are already participating in compulsory or voluntary programs that require similar testing and, therefore, the burden associated with testing and rating dedicated-purpose pool pumps within the scope of the proposed test procedure would be similar to the testing currently conducted by manufacturers subject to this rulemaking.

However, DOE reiterates that the proposed test procedure and sampling requirements would not result in a significant impact on a substantial number of small

[90] DOE assumes that the new equipment for testing is disaggregated across the initial estimated 15 basic models. Therefore, any new tests would be related to the labor required to complete the test.

entities, as it would not, in and of itself, require the use of the proposed test procedure. That is, any burden associated with testing dedicated-purpose pool pumps in accordance with the requirements of this test procedure would not be required until the promulgation of any ECS final rule for dedicated-purpose pool pumps, as discussed in section II. DOE would analyze the effect of the combined burden associated with both the test procedure and ECS rulemakings in the manufacturer impact analysis performed as part of any ECS rulemaking establishing standards for this equipment.

Based on the criteria outlined earlier, DOE certifies that the proposed test procedure would not have a "significant economic impact on a substantial number of small entities," and the preparation of a regulatory flexibility analysis is not warranted. DOE will transmit the certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the SBA for review under 5 U.S.C. 605(b).

DOE requests comment on the testing currently conducted by DPPP manufacturers, including the magnitude of incremental changes necessary to transform current test facilities to conduct the DOE test procedure as proposed in this NOPR.

DOE requests comment on the tentative conclusion that the proposed test procedure will not have a significant economic impact on a substantial number of small entities.

C. Review Under the Paperwork Reduction Act of 1995

All collections of information from the public by a Federal agency must receive prior approval from OMB. DOE has established regulations for the certification and recordkeeping requirements for covered consumer products and industrial equipment. 10 CFR part 429, subpart B. In an application to renew the OMB information collection approval for DOE's certification and recordkeeping requirements filed in January 2015, DOE included an estimated burden for manufacturers of pumps in case DOE ultimately sets energy conservation standards for this equipment, and OMB approved the revised information collection for DOE's certification and recordkeeping requirements. 80 FR 5099 (Jan. 30, 2015). In the January 2016 general pumps ECS final rule, DOE established energy conservation standards and reporting requirements for certain categories of pumps and estimated that public reporting burden for the certification for pumps, similar to other covered consumer products and commercial equipment, would average 30 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. 81 FR 4368, 4428 (Jan. 26, 2016). As dedicated-purpose pool pumps are a specific style of pump and the testing and certification requirements proposed in this NOPR are similar to those established for general pumps in the January 2016 general pumps TP final rule, DOE believes that the estimated reporting burden of 30 hours would also be applicable for dedicated-purpose pool pumps. 81 FR 4086 (Jan. 25, 2016). DOE notes that, although this test procedure rulemaking discusses recordkeeping requirements that are associated with executing and maintaining the test data for this equipment (see section III.I.1), certification

requirements would not need to be performed until the compliance date of any final rule establishing energy conservation standards for pumps.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act (PRA), unless that collection of information displays a currently valid OMB control number.

D. Review Under the National Environmental Policy Act of 1969

In this proposed rule, DOE proposes definitions and a test procedure for dedicated-purpose pool pumps that it expects will be used to develop and implement future energy conservation standards for this equipment. DOE has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321, *et seq.*) and DOE's implementing regulations at 10 CFR part 1021. Specifically, this proposed rule considers a test procedure for a pump that is largely based upon industry test procedures and methodologies resulting from a negotiated rulemaking, so it would not affect the amount, quality or distribution of energy usage, and, therefore, would not result in any environmental impacts. Thus, this rulemaking is covered by Categorical Exclusion A5 under 10 CFR part 1021, subpart D, which applies to any rulemaking that interprets or amends an existing rule without changing the environmental effect of that rule. Accordingly, neither an environmental assessment nor an environmental impact statement is required.

E. Review Under Executive Order 13132

Executive Order 13132, "Federalism," 64 FR 43255 (August 4, 1999) imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have Federalism implications. The Executive Order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive Order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have Federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE has examined this proposed rule and has determined that it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this proposed rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297(d)) No further action is required by Executive Order 13132.

F. Review Under Executive Order 12988

Regarding the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, "Civil Justice Reform," 61 FR 4729

(Feb. 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; (3) provide a clear legal standard for affected conduct rather than a general standard; and (4) promote simplification and burden reduction. Section 3(b) of Executive Order 12988 specifically requires that Executive agencies make every reasonable effort to ensure that the regulation: (1) clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction; (4) specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in sections 3(a) and 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, the proposed rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Pub. L. No. 104-4, sec. 201 (codified at 2 U.S.C. 1531). For a proposed regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the

private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed "significant intergovernmental mandate," and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at http://energy.gov/gc/office-general-counsel. DOE examined this proposed rule according to UMRA and its statement of policy and determined that the rule contains neither an intergovernmental mandate, nor a mandate that may result in the expenditure of $100 million or more in any year, so these requirements do not apply.

H. Review Under the Treasury and General Government Appropriations Act, 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105-277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This rule would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

I. Review Under Executive Order 12630

DOE has determined, under Executive Order 12630, "Governmental Actions and Interference with Constitutionally Protected Property Rights" 53 FR 8859 (March 18, 1988), that this regulation would not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

J. Review Under Treasury and General Government Appropriations Act, 2001

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct. 7, 2002). DOE has reviewed this proposed rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OMB, a Statement of Energy Effects for any proposed significant energy action. A "significant energy action" is defined as any action by an agency that promulgated or is expected to lead to promulgation of a final rule, and that: (1) is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or

use of energy; or (3) is designated by the Administrator of OIRA as a significant energy action. For any proposed significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use should the proposal be implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

DOE has tentatively concluded that today's regulatory action, which would prescribe the test procedure for measuring the energy efficiency of dedicated-purpose pool pumps, is not a significant regulatory action under Executive Order 12866 and is not likely to have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by the Administrator of OIRA. Therefore, it is not a significant energy action, and, accordingly, DOE has not prepared a Statement of Energy Effects on the proposed rule.

L. Review Under Section 32 of the Federal Energy Administration Act of 1974

Under section 301 of the Department of Energy Organization Act (Pub. L. 95–91; 42 U.S.C. 7101), DOE must comply with section 32 of the Federal Energy Administration Act of 1974, as amended by the Federal Energy Administration Authorization Act of 1977. (15 U.S.C. 788; FEAA) Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with

the Attorney General and the Chairman of the Federal Trade Commission (FTC) concerning the impact of the commercial or industry standards on competition.

The proposed rule incorporates testing methods contained in the following commercial standards:

(1) UL 1081, ("ANSI/UL 1081–2014"), "Standard for Swimming Pool Pumps, Filters, and Chlorinators," 6th Edition, January 29, 2008, including revisions through March 18, 2014.

(2) National Electrical Manufacturers Association (NEMA) MG-1-2014, "Motors and Generators," 2014, section 1.19, "Polyphase Motors"; section 10..34, "Basis of Horsepower Rating"; section 10.62, "Horsepower, Speed, and Voltage Ratings"; section 12.30, "Test Methods"; section 12.35, "Locked-Rotor Current of 3-Phase 60-Hz Small and Medium Squirrel-Cage Induction Motors Rated at 230 Volts"; section 12.37, "Torque Characteristics of Polyphase Small Motors"; 12.38, "Locked-Rotor Torque of Single-Speed Polyphase Squirrel-Cage Medium Motors with Continuous Ratings"; section 12.39, "Breakdown Torque of Single-speed Polyphase Squirrel-Cage Medium Motors with Continuous Ratings"; and section 12.40, "Pull-Up Torque of Single-Speed Polyphase Squirrel-Cage Medium Motors with Continuous Ratings."

(3) NSF International Standard (NSF)/American National Standards Institute (ANSI) 50–2015, ("NSF/ANSI 50–2015"), "Equipment for Swimming Pools, Spas, hot

Tubs and Other Recreational Water Facilities," approved January 26, 2015, section C.3, "self-priming capability," of Annex C, "Test methods for the evaluation of centrifugal pumps."

In addition, the proposed rule expands the incorporation by reference of Hydraulic Institute (HI) 40.6–2014, ("HI 40.6–2014") "Methods for Rotodynamic Pump Efficiency Testing," (except for section 40.6.4.1, "Vertically suspended pumps"; section 40.6.4.2, "Submersible pumps"; section 40.6.5.3, "Test report"; section 40.6.5.5.2, "Speed of rotation during testing"; section 40.6.6.1, "Translation of test results to rated speed of rotation"; Appendix A, section A.7, "Testing at temperatures exceeding 30 °C (86 °F)"; and Appendix B, "Reporting of test results (normative)";) copyright 2014. HI 40.6–2014 is already IBR approved for §431.464, and appendix A to subpart Y of part 431. 10 CFR 431.463. As such, DOE proposes only to modify the existing incorporation by reference to extend the applicability of certain sections to the new appendix B to subpart Y that would contain the DPPP test procedure.

Although this proposed test procedure is not exclusively based on these industry testing standards, some components of the DOE test procedure would adopt definitions, test parameters, measurement techniques, and additional calculations from them without amendment. The Department has evaluated these standards and is unable to conclude whether they fully comply with the requirements of section 32(b) of the FEAA, (i.e., that they were developed in a manner that fully provides for public participation, comment, and review). DOE will consult with the Attorney General and the Chairman of the FTC

concerning the impact of these test procedures on competition, prior to prescribing a final rule.

M. Congressional Notification

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of this rule before its effective date. The report will state that it has been determined that the rule is not a "major rule" as defined by 5 U.S.C. 804(2).

N. Materials Incorporated by Reference

In this NOPR, DOE proposes to newly incorporate by reference two industry standards related to pump nomenclature, definitions, and test specifications, which DOE has referenced in its proposed definitions and test procedure.

Specifically, the definitions proposed in this NOPR, as well as relevant testing procedures to determine self-priming capability, incorporate by reference the following sections of the following standards:

1) UL 1081, ("ANSI/UL 1081–2014"), "Standard for Swimming Pool Pumps, Filters, and Chlorinators," 6th Edition, January 29, 2008, including revisions through March 18, 2014.

2) National Electrical Manufacturers Association (NEMA) MG-1-2014, "Motors and Generators," 2014, section 1.19, "Polyphase Motors"; section 10..34,

"Basis of Horsepower Rating"; section 10.62, "Horsepower, Speed, and Voltage Ratings"; section 12.30, "Test Methods"; section 12.35, "Locked-Rotor Current of 3-Phase 60-Hz Small and Medium Squirrel-Cage Induction Motors Rated at 230 Volts"; section 12.37, "Torque Characteristics of Polyphase Small Motors"; 12.38, "Locked-Rotor Torque of Single-Speed Polyphase Squirrel-Cage Medium Motors with Continuous Ratings"; section 12.39, "Breakdown Torque of Single-speed Polyphase Squirrel-Cage Medium Motors with Continuous Ratings"; section 12.40, "Pull-Up Torque of Single-Speed Polyphase Squirrel-Cage Medium Motors with Continuous Ratings."

3) NSF International Standard (NSF)/American National Standards Institute (ANSI) 50-2015, ("NSF/ANSI 50–2015"), "Equipment for Swimming Pools, Spas, Hot Tubs and Other Recreational Water Facilities," approved January 26, 2015, section C.3, "self-priming capability," of Annex C, "Test methods for the evaluation of centrifugal pumps."

DOE proposes to incorporate by reference UL 1081–2014 into 10 CFR 431.462 and NSF/ANSI 50–2015 into 10 CFR 431.462 and appendix B of subpart Y. UL 1081–2014 describes, among other things, the safety-related performance and construction requirements for rating dedicated-purpose pool pumps under the UL 1081 standard. Section C.3 of annex C of the NSF/ANSI 50–2015 standard describes the test methods and criteria for establishing the self-priming capability of dedicated-purpose pool pumps.

In addition, the test procedure proposed in this NOPR incorporates by reference the Hydraulic Institute (HI) 40.6–2014, ("HI 40.6–2014") "Methods for Rotodynamic Pump Efficiency Testing," (except for section 40.6.4.1, "Vertically suspended pumps"; section 40.6.4.2, "Submersible pumps"; section 40.6.5.3, "Test report"; section 40.6.5.5.2, "Speed of rotation during testing"; section 40.6.6.1, "Translation of test results to rated speed of rotation"; Appendix A, section A.7, "Testing at temperatures exceeding 30 °C (86 °F)"; and Appendix B, "Reporting of test results (normative)";) to establish procedures for measuring relevant pump performance parameters. HI 40.6–2014, with certain exceptions, is IBR approved for §431.464, and appendix A to subpart Y of part 431. 10 CFR 431.463. DOE proposes to incorporate by reference HI 40.6-2014, with certain additional exceptions, into a new appendix B to subpart Y that would contain the DPPP test procedure. HI 40.6–2014 is an industry-accepted standard used to specify methods of testing for determining the head, flow rate, pump power input, driver power input, pump power output, and other relevant parameters necessary to determine the WEF of applicable pumps, as well as other voluntary metrics, proposed in this NOPR (see sections III.B.2 and III.F).

Additionally, these standards can be obtained from the organizations directly at the following addresses:

Hydraulic Institute, located at 6 Campus Drive, First Floor North, Parsippany, NJ, 07054, (973)267-9700, or by visiting www.pumps.org.

UL, 333 Pfingsten Road, Northbrook, IL 60062, (847) 272-8800, or by visiting http://ul.com.

NEMA, 1300 North 17th Street, Suite 900, Rosslyn, VA, 22209, (703) 841-3200, or by visiting www.nema.org.

NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105, (743) 769-8010, or by visiting www.nsf.org.

V. Public Participation

A. Attendance at Public Meeting

The time, date and location of the public meeting are listed in the DATES and ADDRESSES sections at the beginning of this document. If you plan to attend the public meeting, please notify the Appliance and Equipment Standards staff at (202) 586-6636 or Appliance_Standards_Public_Meetings@ee.doe.gov.

Please note that foreign nationals visiting DOE Headquarters are subject to advance security screening procedures, which require advance notice prior to attendance at the public meeting. If a foreign national wishes to participate in the public meeting, please inform DOE of this fact as soon as possible by contacting Ms. Regina Washington

at (202) 586-1214 or by e-mail: Regina.Washington@ee.doe.gov so that the necessary procedures can be completed.

DOE requires visitors to have laptops and other devices, such as tablets, checked upon entry into the building. Any person wishing to bring these devices into the Forrestal Building will be required to obtain a property pass. Visitors should avoid bringing these devices, or allow an extra 45 minutes to check in. Please report to the visitor's desk to have devices checked before proceeding through security.

Due to the REAL ID Act implemented by the Department of Homeland Security (DHS), there have been recent changes regarding identification (ID) requirements for individuals wishing to enter Federal buildings from specific states and U.S. territories. Driver's licenses from the following states or territory will not be accepted for building entry, and one of the alternate forms of ID listed below will be required. DHS has determined that regular driver's licenses (and ID cards) from the following jurisdictions are not acceptable for entry into DOE facilities: Alaska, American Samoa, Arizona, Louisiana, Maine, Massachusetts, Minnesota, New York, Oklahoma, and Washington. Acceptable alternate forms of Photo-ID include: U.S. Passport or Passport Card; an Enhanced Driver's License or Enhanced ID-Card issued by the states of Minnesota, New York or Washington (Enhanced licenses issued by these states are clearly marked Enhanced or Enhanced Driver's License); a military ID or other Federal government-issued Photo-ID card.

In addition, you can attend the public meeting via webinar. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's website https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=67. Participants are responsible for ensuring their systems are compatible with the webinar software.

B. Procedure for Submitting Prepared General Statements for Distribution

Any person who has plans to present a prepared general statement may request that copies of his or her statement be made available at the public meeting. Such persons may submit requests, along with an advance electronic copy of their statement in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format, to the appropriate address shown in the ADDRESSES section at the beginning of this document. The request and advance copy of statements must be received at least 1 week before the public meeting and may be emailed, hand-delivered, or sent by mail. DOE prefers to receive requests and advance copies via email. Please include a telephone number to enable DOE staff to make a follow-up contact, if needed.

C. Conduct of Public Meeting

DOE will designate a DOE official to preside at the public meeting and may also use a professional facilitator to aid discussion. The meeting will not be a judicial or evidentiary-type public hearing, but DOE will conduct it in accordance with section 336 of EPCA (42 U.S.C. 6306). A court reporter will be present to record the proceedings

and prepare a transcript. DOE reserves the right to schedule the order of presentations and to establish the procedures governing the conduct of the public meeting. After the public meeting and until the end of the comment period, interested parties may submit further comments on the proceedings and any aspect of the rulemaking.

The public meeting will be conducted in an informal, conference style. DOE will present summaries of comments received before the public meeting, allow time for prepared general statements by participants, and encourage all interested parties to share their views on issues affecting this rulemaking. Each participant will be allowed to make a general statement (within time limits determined by DOE), before the discussion of specific topics. DOE will permit, as time permits, other participants to comment briefly on any general statements.

At the end of all prepared statements on a topic, DOE will permit participants to clarify their statements briefly and comment on statements made by others. Participants should be prepared to answer questions by DOE and by other participants concerning these issues. DOE representatives may also ask questions of participants concerning other matters relevant to this rulemaking. The official conducting the public meeting will accept additional comments or questions from those attending, as time permits. The presiding official will announce any further procedural rules or modification of the above procedures that may be needed for the proper conduct of the public meeting.

A transcript of the public meeting will be included in the docket, which can be viewed as described in the Docket section at the beginning of this document. In addition, any person may buy a copy of the transcript from the transcribing reporter.

D. Submission of Comments

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

Submitting comments via regulations.gov. The regulations.gov webpage will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment 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. 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 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 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 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 regulations.gov provides after you have successfully uploaded your comment.

Submitting comments via email, hand delivery, or mail. Comments and documents submitted via email, hand delivery, or mail also will be posted to 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. If you submit via mail or hand delivery, please provide all items on a CD, if feasible. It is not necessary to submit printed copies. No facsimiles (faxes) will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, 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, postal mail, or hand delivery two well-marked copies: one copy of the document marked confidential including all the information

commented to be confidential, and one copy of the document marked non-confidential with the information commented to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Factors of interest to DOE when evaluating requests to treat submitted information as confidential include: (1) a description of the items; (2) whether and why such items are customarily treated as confidential within the industry; (3) whether the information is generally known by or available from other sources; (4) whether the information has previously been made available to others without obligation concerning its confidentiality; (5) an explanation of the competitive injury to the submitting person which would result from public disclosure; (6) when such information might lose its confidential character due to the passage of time; and (7) why disclosure of the information would be contrary to the public interest.

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).

E. 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 whether all dedicated-purpose pool pumps are dry rotor.
2) DOE requests comment on the proposed definition for "dedicated-purpose pool pump."
3) DOE requests comment on the proposed definition of "pool filter pump."
4) DOE requests comment on the proposed definitions of "basket strainer," "removable cartridge filter," and "sand filter."
5) DOE requests comment on the proposed amendments to the definition of self-priming pump.
6) DOE requests comment on the proposed definitions for "self-priming pool filter pump" and "non-self-priming pool filter pump."
7) DOE requests comment on the proposed definition of "integral cartridge-filter pool pump" and "integral sand-filter pool pump."
8) DOE requests comment on the proposed definition of "waterfall pump."
9) DOE requests comment on the proposed definition of "pressure cleaner booster pump" and whether DOE should consider making ANSI/UL 1081-2014 a required label instead of illustrative in order to distinguish pressure cleaner booster pumps.
10) DOE requests comment on the proposed definitions for "storable electric spa pump," "rigid electric spa pump," and "integral."
11) DOE requests comment on the proposed scope of applicability of the DPPP test procedure.

12) DOE requests comments on these proposed definitions for single-speed, two-speed, multi-speed, and variable-speed dedicated-purpose pool pump.
13) DOE also requests comment on any additional criteria or specificity that might be required in the definitions to effectively differentiate the various speed configurations for different DPPP varieties.
14) DOE requests comment on the proposed definition for freeze protection controls.
15) DOE requests comment on the proposed definition of "basic model."
16) DOE requests comment on any characteristics unique to dedicated-purpose pool pumps that may necessitate modifications to the proposed definition of "basic model."
17) DOE requests comment on its proposal to adopt WEF as the metric to characterize the energy use of certain dedicated-purpose pool pumps and on the proposed equation for WEF.
18) DOE requests comment on its proposal to test self-priming and non-self-priming pool filter pumps at load points specified along curve C to determine the WEF for such pumps.
19) DOE requests comment on its proposal to test single-speed pool filter pumps at a single load point corresponding to the maximum speed for that pump on curve C.
20) DOE requests comment on the proposed load points for two-speed pool filter pumps, as well as the minimum flow rate thresholds of 24.7 gpm for two-speed pool filter pumps that have a hydraulic output power less than or equal

to 0.75 hp (small pool filter pumps) and a low flow rate of 31.1 gpm for two-speed pool filter pumps that have a hydraulic output power greater than 0.75 and less than 2.5 hp (large pool filter pumps).

21) DOE requests comment on the load points for two-speed pool filter pumps with a low-speed setting that is higher or lower than one-half of the maximum speed setting.

22) DOE requests comment on the availability and any examples of two-speed pool filter pumps with a low-speed setting that are not exactly one-half of the maximum speed setting.

23) DOE requests comment on the proposal to specify the high speed and flow point for multi-speed and variable-speed pool filter pumps based on a flow rate of 80 percent of the flow rate at maximum speed on curve C and head at or above curve C.

24) DOE requests comment on the treatment of multi-speed pumps and the necessity to throttle multi-speed pumps on the maximum speed performance curve if appropriate lower discrete operating speeds are not available to achieve 80 percent of the flow rate at maximum speed on curve C while still maintaining head at or above curve C.

25) DOE requests comment on the proposed low flow points for small and large multi-speed and variable-speed pool filter pumps.

26) DOE requests comment on the treatment of multi-speed pumps and proposal to test multi-speed pumps at the lowest available speed that can meet the

specified flow with a head point that is at or above curve C for low-flow (Qlow) test point, similar to the high-flow (Qhigh) test point.

27) DOE requests comment on the proposal to use a weight of 1.0 for single-speed pool filter pumps and weights of 0.20 for the high flow point and 0.80 for the low flow point for two-speed, multi-speed, and variable-speed pool filter pumps.

28) DOE requests comment on the applicability of the two-speed, multi-speed, and variable-speed pool filter pump test methods to only those pool filter pumps that meet the proposed definitions of two-speed, multi-speed, and variable-speed dedicated-purpose pool pump.

29) DOE requests comment on additionally limiting the applicability of the two-speed test procedure to only those two-speed self-priming pool filter pumps that are greater than or equal to 0.711 rated hydraulic horsepower and less than 2.5 rated hydraulic horsepower and are distributed in commerce either: (1) with a pool pump control (variable speed drive and user interface or switch) that changes the speed in response to pre-programmed user preferences and allows the user to select the duration of each speed and/or the on/off times or (2) without a pool pump control that has capability but is unable to operate without the presence of such a pool pump control.

30) DOE requests comment on any additional criteria or requirements that may be necessary to ensure that the test procedure for two-speed, multi-speed, and variable-speed dedicated-purpose pool pumps is representative of their likely energy performance in the field.

31) DOE requests comment on the proposed load point for waterfall pumps of 17.0 feet of head at the maximum speed of the pump and the proposed weight of 1.0 for the single load point.

32) DOE requests comment on the proposed load point for pressure cleaner booster pumps of 10.0 gpm at the minimum speed that results in a head value at or above 60.0 feet and the proposed weight of 1.0 for the single load point.

33) DOE requests comment and information regarding if this test point is achievable for all pressure cleaner booster pumps and, if not, how such pumps should be tested.

34) DOE requests comment on the proposal to incorporate by reference HI 40.6–2014 into the proposed appendix B to subpart Y, with the exceptions, modifications, and additions listed in section III.D.2.

35) DOE requests comment on its proposal to not incorporate by reference sections 40.6.4.1, 40.6.4.2, 40.6.5.3, 40.6.5.5.2, 40.6.6.1, A.7, and Appendix B of HI 40.6–2014 as part of the DOE test procedure for dedicated-purpose pool pumps.

36) DOE requests comment on the proposal to clarify the applicability of sections 40.6.5.5.1, section 40.6.6.2, and section 40.6.6.3, of HI 40.6–2014.

37) DOE requests comment on its proposal to clarify the calculation of pump hydraulic horsepower to reference a unit conversion of 3,956 instead of 3,960.

38) DOE requests comment on the proposal to specify that at least two unique data points must be used to determine stabilization and to allow damping

devices, as described in section 40.6.3.2.2, but with integration limited to less than or equal to the data collection interval.

39) DOE requests comment on its proposal to require that the tested flow rate at each load point must be within ±2.5 percent of the flow rate at the specified load point self-priming pool filter pumps, non-self-priming pool filter pumps, and pressure cleaner booster pumps.

40) DOE requests comment on its proposal to require that the tested head point at each load point must be within ±2.5 percent of the head point at the specified load point for waterfall pumps.

41) DOE requests comments on the proposed voltage, frequency, voltage unbalance, and total harmonic distortion requirements that would have to be satisfied when performing the DPPP test procedure for dedicated-purpose pool pumps.

42) Specifically, DOE requests comments on whether these tolerances can be achieved in existing DPPP test laboratories, or whether specialized power supplies or power conditioning equipment would be required.

43) DOE requests comment on its proposal to require measurement of the input power to the dedicated-purpose pool pump using electrical measurement equipment capable of measuring current, voltage, and real power up to at least the 40th harmonic of fundamental supply source frequency and having an accuracy level of ±2.0 percent of full scale when measured at the fundamental supply source frequency.

44) DOE requests comment on the proposal to require instruments for measuring distance that are accurate to and have a resolution of at least ±0.1 inch.

45) DOE requests comment on the proposal to use raw measured data to calculate WEF as well as the proposal to round WEF to the nearest 0.1 kgal/kWh.

46) DOE requests comment on the proposal to use rated hydraulic horsepower as the primary standardized metric to describe DPPP "size" with regard to specifying the test procedure and energy conservation standards for dedicated-purpose pool pumps.

47) DOE requests comment on the proposal to determine the representative value of rated hydraulic horsepower as the mean of the measured rated hydraulic horsepower values for each tested unit.

48) DOE requests comment on the proposed definitions and testing methods for "dedicated-purpose pool pump nominal motor horsepower," "dedicated-purpose pool pump service factor," and "dedicated-purpose pool pump motor total horsepower."

49) DOE seeks comment on whether the proposed test methods are applicable to all motors distributed in commerce with applicable dedicated-purpose pool pumps. If not, DOE requests additional information regarding the characteristics of any motors for which these procedures would not be applicable and any suggestions regarding alternative procedures to determine dedicated-purpose pool pump nominal motor horsepower, dedicated-purpose pool pump service factor, and dedicated-purpose pool pump motor total horsepower.

50) DOE requests comment on the proposal to incorporate by reference the test method contained in section C.3 of NSF/ANSI 50 2015, with the minor modifications and additions summarized in Table III.20, to measure the self-priming capability of pool filter pumps.

51) DOE requests comment on the proposed method for determining the maximum head of pool filter pumps when differentiating waterfall pumps from other pool filter pump varieties.

52) DOE requests comment on its proposal to adopt optional provisions for the measurement of several other DPPP metrics, including EF, pump efficiency, overall (wire-to-water) efficiency, driver power input, and/or pump power output (hydraulic horsepower), in addition to the required representations.

53) DOE requests comment on its belief that HI 40.6–2014 contains all the necessary methods to determine pump efficiency, overall (wire-to-water) efficiency, driver power input, and/or pump power output (hydraulic horsepower) and further specification is not necessary.

54) DOE requests comment on the proposed optional test procedure to determine EF on the specific reference curves A, B, C, and D at any available operating speed.

55) DOE requests comment on the proposed labeling requirements for dedicated-purpose pool pumps.

56) DOE requests comment on any other information that should be included on the permanent nameplate or in manufacturer literature to aid customers of

dedicated-purpose pool pumps in proper selection and application of DPPP units.

57) DOE requests comment on the proposed optional test procedure for replacement DPPP motors. Specifically, DOE seeks comment as to any additional details that should be addressed in testing a replacement DPPP motor with any given DPPP bare pump to determine applicable WEF values.

58) DOE requests comment on the proposed statistical sampling procedures and certification requirements for dedicated-purpose pool pumps.

59) DOE requests comment on the proposed mandatory and optional reporting requirements for certification of dedicated-purpose pool pumps.

60) DOE requests comment on the proposed enforcement provisions for dedicated-purpose pool pumps. Specifically, DOE seeks comment upon the applicability of a 5 percent tolerance on rated hydraulic horsepower, maximum head, vertical lift, and true priming time for each tested DPPP model or if a higher or lower percentage variation would be justified.

61) DOE requests comment on the proposed verification procedure for DPPP freeze protection controls.

62) DOE requests comment on the capital cost burden associated with the proposed test procedure, including the estimated capabilities of current manufacturers.

63) DOE requests comment on the estimate that the likely capital cost burden incurred by existing DPPP manufacturers would be between $0 and $15,000.

64) DOE requests comment on the estimated time to complete a test of a single DPPP unit under the proposed test procedure.

65) DOE requests comment regarding the size of DPPP manufacturing entities and the number of manufacturing businesses represented by this market.

66) DOE requests comment on its assertion that manufacturers typically introduce or significantly modify basic models once every 5 years.

67) DOE requests comment on the testing currently conducted by DPPP manufacturers, including the magnitude of incremental changes necessary to transform current test facilities to conduct the DOE test procedure as proposed in this NOPR.

68) DOE requests comment on the tentative conclusion that the proposed test procedure will not have a significant economic impact on a substantial number of small entities.

VI. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this proposed rule.

List of Subjects

10 CFR Part 429

Administrative practice and procedure, Confidential business information, Energy conservation, Imports, Intergovernmental relations, Small businesses.

10 CFR Part 431

Administrative practice and procedure, Confidential business information, Energy conservation, Imports, Incorporation by reference, Intergovernmental relations, Small businesses.

Issued in Washington, DC, on August 25, 2016.

_____

Kathleen B. Hogan,
Deputy Assistant Secretary for Energy Efficiency
Energy Efficiency and Renewable Energy.

For the reasons stated in the preamble, DOE proposes to amend parts 429 and 431 of chapter II, subchapter D of title 10, Code of Federal Regulations as set forth below:

PART 429 – CERTIFICATION, COMPLIANCE, AND ENFORCEMENT FOR CONSUMER PRODUCTS AND COMMERCIAL AND INDUSTRIAL EQUIPMENT

1. The authority citation for part 429 continues to read as follows:

Authority: 42 U.S.C. 6291–6317; 28 U.S.C. 2461 note.

2. Section 429.59 is amended by:

a. Revising paragraph (a)(1)(ii); and

b. Adding paragraphs (a)(2), (b)(2)(iv) and (v), and (b)(3)(iv).

The revision and additions read as follows:

§429.59 Pumps.

(a) * * *

(1) * * *

(ii) Any representation of weighted energy factor or other measure of energy efficiency of a basic model must be less than or equal to the lower of:

(A) The mean of the sample, where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

and $\bar{x}$ is the sample mean; n is the number of samples; and x_i is the maximum of the i^{th} sample;

Or,

(B) The lower 95 percent confidence limit (LCL) of the true mean divided by 0.95, where:

$$LCL = \bar{x} - t_{0.95}\left(\frac{s}{\sqrt{n}}\right)$$

and $\bar{x}$ is the sample mean; s is the sample standard deviation; n is the number of samples; and $t_{0.95}$ is the t statistic for a 95 percent one-tailed confidence interval with n-1 degrees of freedom (from appendix A of this subpart).

(2) Other representations--(i) Rated hydraulic horsepower. The representative value of rated hydraulic horsepower of a basic model of dedicated-purpose pool pump must be the mean of the rated hydraulic horsepower for each tested unit.

(ii) Dedicated-purpose pool pump nominal motor horsepower. The representative value of dedicated-purpose pool pump nominal motor horsepower of a basic model of dedicated-purpose pool pump must be determined based on the mean of the breakdown torque, locked-rotor torque, pull-up torque, locked-rotor current, slip, speed and/or voltage (as applicable) for each tested unit. The tested sample of dedicated-purpose pool pump motor units and the tested sample of dedicated-purpose pool pump units do not have to be the same units, provided they are representative of the same population.

(iii) Dedicated-purpose pool pump motor total horsepower. The representative value of dedicated-purpose pool pump motor total horsepower of a basic model of dedicated-purpose pool pump must be determined based on the representative values of

dedicated-purpose pool pump service factor and dedicated-purpose pool pump nominal motor horsepower.

(iv) Dedicated-purpose pool pump service factor. The representative value of dedicated-purpose pool pump service factor of a basic model of dedicated-purpose pool pump must be determined based on the representative value of dedicated-purpose pool pump nominal motor horsepower.

(v) True power factor. The representative value of true power factor of a basic model of dedicated-purpose pool pump must be determined based on the mean of the true power factors for each tested unit of dedicated-purpose pool pump motor.

(b) * * *

(2) * * *

(iv) For a dedicated-purpose pool pump subject to the test methods prescribed in appendix B to subpart Y of part 431 of this chapter: weighted energy factor (WEF) in kilogallons per kilowatt-hour (kgal/kWh); rated hydraulic horsepower in horsepower (hp); the speed configuration for which the pump is being rated (i.e., single-speed, two-speed, multi-speed, or variable-speed); true power factor at all applicable test procedure load points, as specified in Table 1 of appendix B to subpart Y of part 431; dedicated-purpose pool pump nominal motor horsepower in horsepower (hp); dedicated-purpose pool pump motor total horsepower in horsepower (hp); dedicated-purpose pool pump service factor (dimensionless); for self-priming pool filter pumps, non-self-priming pool filter pumps, and waterfall pumps: the maximum head (in feet), and a statement regarding if freeze protection is shipped enabled or disabled; for dedicated-purpose pool pumps distributed in commerce with freeze protection controls enabled: the default dry-bulb air

temperature setting (in °F), default run time setting (in minutes), and default motor speed (in rpm); and, for self-priming and non-self-priming pool filter pumps: the vertical lift (in feet) and true priming time (in minutes) for the DPPP model and a statement regarding whether the pump is certified with NSF/ANSI 50-2015.

(v) For integral cartridge-filter and sand-filter pool pumps, the maximum run-time (in hours) of the pool pump control with which the integral cartridge-filter or sand-filter pump is distributed in commerce.

(3) * * *

(iv) For a dedicated-purpose pool pump subject to the test methods prescribed in appendix B to subpart Y of part 431 of this chapter: calculated driver power input and flow rate at each load point i (P_i and Q_i), in horsepower (hp) and gallons per minute (gpm), respectively; and/or energy factor ($EF_{X,s}$) at any desired speed s on any of the optional system curves specified in Table 4 of this appendix A, along with the tested speed s in rpm and the system curve letter (i.e., A, B, C, or D) associated with each EF value.

* * * * *

3. Section 429.110 is amended by revising paragraphs (e)(1) and (5) to read as follows:

§429.110 Enforcement testing.

* * * * *

(e) * * *

(1) For products with applicable energy conservation standard(s) in §430.32 of this chapter, and commercial prerinse spray valves, illuminated exit signs, traffic signal

modules and pedestrian modules, commercial clothes washers, dedicated-purpose pool pumps, and metal halide lamp ballasts, DOE will use a sample size of not more than 21 units and follow the sampling plans in appendix A of this subpart (Sampling for Enforcement Testing of Covered Consumer Products and Certain High-Volume Commercial Equipment).

* * * * *

(5) For pumps subject to the standards specified in §431.465(a) of this chapter, DOE will use an initial sample size of not more than four units and will determine compliance based on the arithmetic mean of the sample.

* * * * *

4. Section 429.134 is amended by revising paragraph (i) to read as follows:

§429.134 Product-specific enforcement provisions.

* * * * *

(i) Pumps--(1) General purpose pumps. (i) The volume rate of flow (flow rate) at BEP and nominal speed of rotation of each tested unit of the basic model will be measured pursuant to the test requirements of §431.464 of this chapter, where the value of volume rate of flow (flow rate) at BEP and nominal speed of rotation certified by the manufacturer will be treated as the expected BEP flow rate. The results of the measurement(s) will be compared to the value of volume rate of flow (flow rate) at BEP and nominal speed of rotation certified by the manufacturer. The certified volume rate of flow (flow rate) at BEP and nominal speed of rotation will be considered valid only if the measurement(s) (either the measured volume rate of flow (flow rate) at BEP and nominal

speed of rotation for a single unit sample or the average of the measured flow rates for a multiple unit sample) is within five percent of the certified volume rate of flow (flow rate) at BEP and nominal speed of rotation.

(A) If the representative value of volume rate of flow (flow rate) at BEP and nominal speed of rotation is found to be valid, the measured volume rate of flow (flow rate) at BEP and nominal speed of rotation will be used in subsequent calculations of constant load pump energy rating (PER_{CL}) and constant load pump energy index (PEI_{CL}) or variable load pump energy rating (PER_{VL}) and variable load pump energy index (PEI_{VL}) for that basic model.

(B) If the representative value of volume rate of flow (flow rate) at BEP and nominal speed of rotation is found to be invalid, the mean of all the measured volume rate of flow (flow rate) at BEP and nominal speed of rotation values determined from the tested unit(s) will serve as the new expected BEP flow rate and the unit(s) will be retested until such time as the measured rate of flow (flow rate) at BEP and nominal speed of rotation is within 5 percent of the expected BEP flow rate.

(ii) DOE will test each pump unit according to the test method specified by the manufacturer in the certification report submitted pursuant to §429.59(b).

(2) Dedicated-purpose pool pumps. (i) The rated hydraulic horsepower of each tested unit of the basic model of dedicated-purpose pool pump will be measured pursuant to the test requirements of §431.464(b) of this chapter and the result of the measurement(s) will be compared to the value of rated hydraulic horsepower certified by the manufacturer. The certified rated hydraulic horsepower will be considered valid only if the measurement(s) (either the measured rated hydraulic horsepower for a single unit

sample or the average of the measured rated hydraulic horsepower values for a multiple unit sample) is within 5 percent of the certified rated hydraulic horsepower.

(A) If the representative value of rated hydraulic horsepower is found to be valid, the value of rated hydraulic horsepower certified by the manufacturer will be used to determine the standard level for that basic model.

(B) If the representative value of rated hydraulic horsepower is found to be invalid, the mean of all the measured rated hydraulic horsepower values determined from the tested unit(s) will be used to determine the standard level for that basic model.

(ii) To verify the self-priming capability of non-self-priming pool filter pumps and of self-priming pool filter pumps that are not certified with NSF/ANSI 50–2015, the vertical lift and true priming time of each tested unit of the basic model of self-priming or non-self-priming pool filter pump will be measured pursuant to the test requirements of §431.464(b) of this chapter and the result of the measurement(s) will be compared to the values of vertical lift and true priming time certified by the manufacturer. The certified values of vertical lift and true priming time will be considered valid only if the measurement(s) (either the measured vertical lift and true priming time for a single unit sample or the average of vertical lift and true priming time values, respectively, for a multiple unit sample) is within 5 percent of the certified values of vertical lift and true priming time.

(A) If the representative values of vertical lift and true priming time are found to be valid, the values of vertical lift and true priming time certified by the manufacturer will be used to determine the appropriate equipment class and standard level for that basic model.

(B) If the representative values of vertical lift or true priming time are found to be invalid, the mean of the values of vertical lift and true priming time determined from the tested unit(s) will be used to determine the appropriate equipment class standard level for that basic model.

(iii) To verify the maximum head of self-priming pool filter pump, non-self-priming pool filter pumps, and waterfall pumps, the maximum head of each tested unit of the basic model of self-priming pool filter pump, non-self-priming pool filter pump, or waterfall pump will be measured pursuant to the test requirements of §431.464(b) of this chapter and the result of the measurement(s) will be compared to the value of maximum head certified by the manufacturer. The certified value of maximum head will be considered valid only if the measurement(s) (either the measured maximum head for a single unit sample or the average of the maximum head values for a multiple unit sample) is within 5 percent of the certified values of maximum head.

(A) If the representative value of maximum head is found to be valid, the value of maximum head certified by the manufacturer will be used to determine the appropriate equipment class and standard level for that basic model.

(B) If the representative value of maximum head is found to be invalid, the measured value(s) of maximum head determined from the tested unit(s) will be used to determine the appropriate equipment class standard level for that basic model.

(iv) To verify that a DPPP model complies with the applicable freeze protection control design requirements, the initiation temperature, run-time, and speed of rotation of the default control configuration of each tested unit of the basic model of

dedicated-purpose pool pump will be evaluated according to the procedure specified in paragraph (i)(2)(iv)(A) of this section:

(A) DPPP freeze protection control test method. (1) Set up and configure the dedicated-purpose pool pump under test according to the manufacturer instructions, including any necessary initial priming, in a test apparatus as described in appendix A of HI 40.6-2014 (Incorporated by reference, see §431.463), except that the ambient temperature registered by the freeze protection ambient temperature sensor will be able to be controlled by, for example, exposing the freeze protection temperature sensor to a specific temperature by submerging the sensor in a water bath of known temperature, adjusting the actual ambient air temperature of the test chamber, or other means that allows the ambient temperature registered by the freeze protection temperature sensor to be reliably simulated and varied.

(2) Activate power to the pump with the flow rate set to zero (i.e., the pump is energized but not circulating water). Set the ambient temperature to 42 ± 0.5 °F and allow the temperature to stabilize, where stability is determined in accordance with section 40.6.3.2.2 of HI 40.6-2014 (Incorporated by reference, see §431.463). After 5 minutes, decrease the temperature measured by the freeze protection temperature control 1 ± 0.5 °F and allow the temperature to stabilize. Record the freeze protection ambient temperature reading, where the "freeze protection ambient temperature reading" is representative of the temperature measured by the freeze protection ambient temperature sensor, which may be recorded by a variety of means depending on how the temperature is being simulated and controlled, and DPPP rotating speed, if any, after each reduction in temperature and subsequent stabilization. If no flow is initiated, record zero or no

flow. Continue decreasing the temperature measured by the freeze protection temperature control 1 ± 0.5 °F after 5.0 minutes of stable operation at the previous temperature reading until the pump freeze protection initiates water circulation or until the ambient temperature of 38 ± 0.5 °F has been evaluated (i.e., the end of the 5 minute interval of 38 °F), whichever occurs first.

(3) If and when the DPPP freeze protection controls initiate water circulation, increase the ambient temperature reading registered by the freeze protection temperature sensor to a temperature of 42 ± 0.5 °F and maintain that temperature for at least 30.0 minutes. Do not modify or interfere with the operation of the DPPP freeze protection operating cycle. After at least 30.0 minutes, record the freeze protection ambient temperature and rotating speed, if any, of the dedicated-purpose pool pump under test.

(B) If the dedicated-purpose pool pump initiates water circulation at a temperature greater than 40.0 °F; if the dedicated-purpose pool pump was still circulating water after 30.0 minutes of operation at 42.0 ± 0.5 °F; or if rotating speed measured at any point during the DPPP freeze protection control test in paragraph (i)(2)(iii)(A) of this section was greater than one-half of the maximum rotating speed of the DPPP model certified by the manufacturer, that DPPP model is deemed to not comply with the design requirement for freeze protection controls.

(C) If none of the conditions specified in paragraph (i)(2)(iv)(B) of this section and §431.134 of this chapter are met, including if the DPPP freeze protection control does not initiate water circulation at all during the test, the dedicated-purpose pool pump

under test is deemed compliant with the design requirement for freeze protection controls.

* * * * *

PART 431 -- ENERGY EFFICIENCY PROGRAM FOR CERTAIN COMMERCIAL AND INDUSTRIAL EQUIPMENT

5. The authority citation for part 431 continues to read as follows:

Authority: 42 U.S.C. 6291–6317; 28 U.S.C. 2461 note.

6. Section 431.462 is amended by:

a. Adding, in alphabetical order, definitions for the terms “Basket strainer,” “Dedicated-purpose pool pump,” “Dedicated-purpose pool pump motor total horsepower,” “Dedicated-purpose pool pump nominal motor horsepower,” “Dedicated-purpose pool pump service factor,” “Designed and marketed,” “Freeze protection control,” “Integral,” “Integral cartridge-filter pool pump,” “Integral sand-filter pool pump,” “Multi-speed dedicated-purpose pool pump,” “Non-self-priming pool filter pump,” “Pool filter pump,” “Pressure cleaner booster pump,” “Removable cartridge filter,” “Rigid electric spa pump,” “Sand filter,” “Self-priming pool filter pump,” “Single-speed dedicated-purpose pool pump,” “Storable electric spa pump,” “Submersible pump,” “Two-speed dedicated-purpose pool pump,” “Variable-speed dedicated-purpose pool pump,” “Variable speed drive,” “Waterfall pump;” and

b. Revising the introductory text and the definitions for “Basic model” and “Self-priming pump.”

The additions and revisions read as follows:

§431.462 Definitions.

The following definitions are applicable to this subpart, including appendices A and B. In cases where there is a conflict, the language of the definitions adopted in this section takes precedence over any descriptions or definitions found in the 2008 version of ANSI/HI Standard 1.1-1.2, "Rotodynamic (Centrifugal) Pumps For Nomenclature And Definitions" (ANSI/HI 1.1-1.2–2008), or the 2008 version of ANSI/HI Standard 2.1-2.2, "Rotodynamic (Vertical) Pumps For Nomenclature And Definitions" (ANSI/HI 2.1-2.2–2008). In cases where definitions reference design intent, DOE will consider marketing materials, labels and certifications, and equipment design to determine design intent.

* * * * *

Basic model means all units of a given class of pump manufactured by one manufacturer, having the same primary energy source, and having essentially identical electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption, energy efficiency, water consumption, or water efficiency; and, in addition, for pumps that are subject to the standards specified in §431.465(b), the following provisions also apply:

(1) All variations in numbers of stages of bare RSV and ST pumps must be considered a single basic model;

(2) Pump models for which the bare pump differs in impeller diameter, or impeller trim, may be considered a single basic model; and

(3) Pump models for which the bare pump differs in number of stages or impeller diameter and which are sold with motors (or motors and controls) of varying horsepower may only be considered a single basic model if:

(i) For ESCC, ESFM, IL, and RSV pumps, each motor offered in the basic model has a nominal full load motor efficiency rated at the Federal minimum (see the current table for NEMA Design B motors at §431.25) or the same number of bands above the Federal minimum for each respective motor horsepower (see Table 3 of appendix A to subpart Y of this part); or

(ii) For ST pumps, each motor offered in the basic model has a full load motor efficiency at the default nominal full load submersible motor efficiency shown in Table 2 of appendix A to subpart Y of this part or the same number of bands above the default nominal full load submersible motor efficiency for each respective motor horsepower (see Table 3 of appendix A to subpart Y of this part).

Basket strainer means a perforated or otherwise porous receptacle, mounted within a housing on the suction side of a pump, that prevents solid debris from entering a pump. The basket strainer receptacle is capable of passing spherical solids of 1 mm in diameter, and can be removed by hand or using only simple tools (e.g., screwdriver, pliers, open-ended wrench).

* * * * *

Dedicated-purpose pool pump comprises self-priming pool filter pumps, non-self-priming pool filter pumps, waterfall pumps, pressure cleaner booster pumps, integral

sand-filter pool pumps, integral-cartridge filter pool pumps, storable electric spa pumps, and rigid electric spa pumps.

Dedicated-purpose pool pump motor total horsepower means the product of the rated horsepower and the service factor of a motor used on a dedicated-purpose pool pump (also known as service factor horsepower) based on the maximum continuous duty motor power output rating allowable for nameplate ambient rating and motor insulation class.

Dedicated-purpose pool pump nominal motor horsepower means the nominal motor horsepower as determined in accordance with the applicable procedures in NEMA-MG-1 2014 (incorporated by reference, see §431.463).

Dedicated-purpose pool pump service factor means a multiplier applied to the rated horsepower of a pump motor to indicate the percent above nameplate horsepower at which the motor can operate continuously without exceeding its allowable insulation class temperature limit.

Designed and marketed means that the equipment is specifically designed to fulfill the indicated application and, when distributed in commerce, is designated and marketed for that application, with the designation on the packaging and all publicly available documents (e.g., product literature, catalogs, and packaging labels).

* * * * *

Freeze protection control means a pool pump control that, at a certain ambient temperature, turns on the dedicated-purpose pool pump to circulate water for a period of time to prevent the pool and water in plumbing from freezing.

* * * * *

Integral means a part of the device that cannot be removed without compromising the device's function or destroying the physical integrity of the unit.

Integral cartridge-filter pool pump means a pump that requires a removable cartridge filter, installed on the suction side of the pump, for operation; and the cartridge filter cannot be bypassed.

Integral sand-filter pool pump means a pump distributed in commerce with a sand filter that cannot be bypassed.

* * * * *

Multi-speed dedicated-purpose pool pump means a dedicated-purpose pool pump that is capable of operating at more than two discrete, pre-determined operating speeds separated by speed increments greater than 100 rpm, where the lowest speed is less than or equal to half of the maximum operating speed and greater than zero, and must be distributed in commerce with an on-board pool pump control (i.e., variable speed drive and user interface or programmable switch) that changes the speed in response to pre-programmed user preferences and allows the user to select the duration of each speed and/or the on/off times.

* * * * *

Non-self-priming pool filter pump means a pool filter pump that is not certified under NSF/ANSI 50–2015 to be self-priming and is not capable of re-priming to a vertical lift of at least 5.0 feet with a true priming time less than or equal to 10.0 minutes, when tested in accordance with NSF/ANSI 50–2015, and is not a waterfall pump.

Pool filter pump means an end suction pump that:

(1) Either:

(i) Includes an integrated basket strainer; or

(ii) Does not include an integrated basket strainer, but requires a basket strainer for operation, as stated in manufacturer literature provided with the pump; and

(2) May be distributed in commerce connected to, or packaged with, a sand filter, removable cartridge filter, or other filtration accessory, so long as the filtration accessory are connected with consumer-removable connections that allow the filtration accessory to be bypassed.

Pressure cleaner booster pump means an end suction, dry rotor pump designed and marketed for pressure-side pool cleaner applications, and which may be UL listed under ANSI/UL 1081–2014, "Standard for Swimming Pool Pumps, Filters, and Chlorinators."

* * * * *

Removable cartridge filter means a filter component with fixed dimensions that captures and removes suspended particles from water flowing through the unit. The removable cartridge filter is not capable of passing spherical solids of 1 mm in diameter or greater, and can be removed from the filter housing by hand or using only simple tools (e.g., screwdrivers, pliers, open-ended wrench).

Rigid electric spa pump means an end suction pump that does not contain an integrated basket strainer or require a basket strainer for operation as stated in manufacturer literature provided with the pump and that meets the following three criteria:

(1) Is assembled with four through bolts that hold the motor rear endplate, rear bearing, rotor, front bearing, front endplate, and the bare pump together as an integral unit;

(2) Is constructed with buttress threads at the inlet and discharge of the bare pump; and

(3) Uses a casing or volute and connections constructed of a non-metallic material.

* * * * *

Sand filter means a device designed to filter water through sand or an alternate sand-type media.

Self-priming pool filter pump means a pool filter pump that is certified under NSF/ANSI 50–2015 to be self-priming or is capable of re-priming to a vertical lift of at least 5.0 feet with a true priming time less than or equal to 10.0 minutes, when tested in accordance with NSF/ANSI 50–2015, and is not a waterfall pump.

Self-priming pump means a pump that either is a self-priming pool filter pump or a pump that:

(1) Is designed to lift liquid that originates below the centerline of the pump inlet;

(2) Contains at least one internal recirculation passage; and

(3) Requires a manual filling of the pump casing prior to initial start-up, but is able to re-prime after the initial start-up without the use of external vacuum sources, manual filling, or a foot valve.

* * * * *

Single-speed dedicated-purpose pool pump means a dedicated-purpose pool pump that is capable of operating at only one speed.

Storable electric spa pump means a pump that is distributed in commerce with one or more of the following:

(1) An integral heater; and

(2) An integral air pump.

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

* * * * *

Two-speed dedicated-purpose pool pump means a dedicated purpose pool pump that is capable of operating at only two different pre-determined operating speeds, where the low operating speed is less than or equal to half of the maximum operating speed and greater than zero, and must be distributed in commerce either:

(1) With a pool pump control (i.e., variable speed drive and user interface or switch) that is capable of changing the speed in response to user preferences; or

(2) Without a pool pump control that has the capability to change speed in response to user preferences, but without which the pump is unable to operate without the presence of such a pool pump control.

Variable-speed dedicated-purpose pool pump means a dedicated-purpose pool pump that is capable of operating at a variety of user-determined speeds, where all the speeds are separated by at most 100 rpm increments over the operating range and the lowest operating speed is less than or equal to one-third of the maximum operating speed

and greater than zero. Such a pump must include a variable speed drive and be distributed in commerce either:

(1) With a user interface that changes the speed in response to pre-programmed user preferences and allows the user to select the duration of each speed and/or the on/off times; or

(2) Without a user interface but be unable to operate without the presence of a user interface.

Variable speed drive means equipment capable of varying the speed of the motor.

Waterfall pump means a pool filter pump with maximum head less than or equal to 30 feet, and a maximum speed less than or equal to 1,800 rpm.

7. Section 431.463 is amended by:

a. Revising paragraph (a);

b. Adding paragraph (c)(4);

c. Revising paragraph (e); and,

d. Adding paragraphs (f) and (g).

The revisions and additions read as follows:

§431.463 Materials incorporated by reference.

(a) General. DOE incorporates by reference the following standards into subpart Y of this part. The material listed has been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Any subsequent amendment to a standard by the standard-setting organization will not affect the DOE test procedures unless and until amended by DOE. Material is incorporated as it exists on the date of the approval, and notification of any change in the

material will be published in the Federal Register. All approved material can be obtained from the sources listed below and is available for inspection at the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, Sixth Floor, 950 L'Enfant Plaza, SW., Washington, DC 20024, (202) 586-2945, or go to: http://www1.eere.energy.gov/buildings/appliance_standards. It is also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

* * * * *

(c) * * *

(4) HI 40.6–2014, ("HI 40.6–2014"), "Methods for Rotodynamic Pump Efficiency Testing," copyright 2014, IBR approved for §429.59, §429.134 and appendix B to subpart Y of this part, except sections 40.6.4.1, "Vertically suspended pumps"; 40.6.4.2, "Submersible pumps"; 40.6.5.3, "Test report"; 40.6.5.5.2, "Speed of rotation during test"; 40.6.6.1, "Translation of test results to rated speed of rotation"; Appendix A, section A.7, "Testing at temperatures exceeding 30 °C (86 °F)"; and Appendix B, "Reporting of test results (normative)."

* * * * *

(e) NEMA. National Electrical Manufacturers Association. 1300 North 17th Street, Suite 900, Rosslyn, VA, 22209, (703) 841-3200. www.nema.org.

(1) NEMA MG-1-2014, ("NEMA MG-1-2014"), "Motors and Generators," 2014, IBR approved for §431.462 and appendix B of this part, as follows:

(i) Section 1.19, "Polyphase Motors";

(ii) Section 10.34, “Basis of Horsepower Rating”;

(iii) Section 10.62, “Horsepower, Speed, and Voltage Ratings”;

(iv) Section 12.30, “Test Methods”;

(v) Section 12.35, “Locked-Rotor Current of 3-Phase 60-Hz Small and Medium Squirrel-Cage Induction Motors Rated at 230 Volts”;

(vi) Section 12.37, “Torque Characteristics of Polyphase Small Motors”;

(vii) Section 12.38, “Locked-Rotor Torque of Single-Speed Polyphase Squirrel-Cage Medium Motors with Continuous Ratings”;

(viii) Section 12.39, “Breakdown Torque of Single-speed Polyphase Squirrel-Cage Medium Motors with Continuous Ratings”;

(ix) Section 12.40, “Pull-Up Torque of Single-Speed Polyphase Squirrel-Cage Medium Motors with Continuous Ratings.”

(2) [Reserved]

(f) NSF. NSF International. 789 N. Dixboro Road, Ann Arbor, MI 48105, (743) 769-8010. www.nsf.org.

(1) NSF/ANSI Standard 50–2015, (“NSF/ANSI 50–2015”), “Equipment for Swimming Pools, Spas, Hot Tubs and Other Recreational Water Facilities,” ANSI approved January 26, 2015, Annex C - “Test methods for the evaluation of centrifugal pumps,” Section C.3, “self-priming capability.” IBR approved for §431.462 and appendix B of this part.

(2) [Reserved]

(g) UL. UL, 333 Pfingsten Road, Northbrook, IL 60062, (847) 272-8800. www.ul.com.

(1) UL 448, ("ANSI/UL 448–2013"), "Standard for Safety Centrifugal Stationary Pumps for Fire-Protection Service," 10th Edition, June 8, 2007, including revisions through July 12, 2013, IBR approved for §431.462.

(2) UL 1081, ("ANSI/UL 1081–2014"), "Standard for Swimming Pool Pumps, Filters, and Chlorinators," 6th Edition, January 29, 2008, including revisions through March 18, 2014, IBR approved for §431.462.

8. Section 431.464 is revised to read as follows:

§431.464 Test procedure for the measurement of energy efficiency, energy consumption, and other performance factors of pumps.

(a) General pumps--(1) Scope. This paragraph (a) provides the test procedures for determining the constant and variable load pump energy index for:

(i) The following categories of clean water pumps:

(A) End suction close-coupled (ESCC);

(B) End suction frame mounted/own bearings (ESFM);

(C) In-line (IL);

(D) Radially split, multi-stage, vertical, in-line casing diffuser (RSV); and

(E) Submersible turbine (ST) pumps.

(ii) With the following characteristics:

(A) Flow rate of 25 gpm or greater at BEP and full impeller diameter;

(B) Maximum head of 459 feet at BEP and full impeller diameter and the number of stages required for testing (see section 1.2.2 of appendix A of this subpart);

(C) Design temperature ranges from 14 to 248 °F;

(D) 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;

(E) For ST pumps, a 6-inch or smaller bowl diameter; and

(F) For ESCC and ESFM pumps, a specific speed less than or equal to 5,000 when calculated using U.S. customary units.

(iii) Except for the following pumps:

(A) Fire pumps;

(B) Self-priming pumps;

(C) Prime-assist pumps;

(D) Magnet driven pumps;

(E) Pumps designed to be used in a nuclear facility subject to 10 CFR part 50, "Domestic Licensing of Production and Utilization Facilities"; and

(F) Pumps meeting the design and construction requirements set forth in Military Specifications: 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 for review at http://everyspec.com/MIL-SPECS.

(2) Testing and calculations. Determine the applicable constant load pump energy index (PEI_{CL}) or variable load pump energy index (PEI_{VL}) using the test procedure set forth in appendix A of this subpart.

(b) Dedicated-purpose pool pumps--(1) Scope. This paragraph (b) provides the test procedures for determining the weighted energy factor, rated hydraulic horsepower, dedicated-purpose pool pump nominal motor horsepower, dedicated-purpose pool pump motor total horsepower, dedicated-purpose pool pump service factor, and other pump performance parameters for:

(i) The following varieties of dedicated-purpose pool pumps:

(A) Self-priming pool filter pumps;

(B) Non-self-priming pool filter pumps;

(C) Waterfall pumps; and

(D) Pressure cleaner booster pumps;

(ii) Served by single-phase or polyphase input power;

(iii) Except for:

(A) Submersible pumps; and

(B) Self-priming and non-self-priming pool filter pumps with hydraulic output power greater than or equal to 2.5 horsepower.

(2) Testing and calculations. Determine the weighted energy factor (WEF) using the test procedure set forth in appendix B of this subpart.

9. Section 431.466 is revised to read as follows:

§431.466 Pumps labeling requirements.

(a) General pumps. For the pumps described in paragraph (a) of §431.464, the following requirements apply to units manufactured on the same date that compliance is required with any applicable standards prescribed in §431.465.

(1) Pump nameplate--(i) Required information. The permanent nameplate must be marked clearly with the following information:

(A) For bare pumps and pumps sold with electric motors but not continuous or non-continuous controls, the rated pump energy index—constant load (PEI_{CL}), and for pumps sold with motors and continuous or non-continuous controls, the rated pump energy index—variable load (PEI_{VL});

(B) The bare pump model number; and

(C) If transferred directly to an end-user, the unit's impeller diameter, as distributed in commerce. Otherwise, a space must be provided for the impeller diameter to be filled in.

(ii) Display of required information. All orientation, spacing, type sizes, typefaces, and line widths to display this required information must be the same as or similar to the display of the other performance data on the pump's permanent nameplate. The PEI_{CL} or PEI_{VL}, as appropriate to a given pump model, must be identified in the form "PEI_{CL} ____" or "PEI_{VL} ____." The model number must be in one of the following forms: "Model ____" or "Model number ____" or "Model No. ____." The unit's impeller diameter must be in the form "Imp. Dia. ____(in.)."

(2) Disclosure of efficiency information in marketing materials. (i) The same information that must appear on a pump's permanent nameplate pursuant to paragraph (a)(1)(i) of this section, must also be prominently displayed:

(A) On each page of a catalog that lists the pump; and

(B) In other materials used to market the pump.

(ii) [Reserved]

(b) Dedicated-purpose pool pumps. For the pumps described in paragraph (b) of §431.464, the following requirements apply on the same date that compliance is required with any applicable standards prescribed in §431.465.

(1) Pump nameplate--(i) Required information. The permanent nameplate of a dedicated-purpose pool pump described in paragraph (b) of §431.464 must be marked clearly with the following information:

(A) The weighted energy factor (WEF);

(B) The rated hydraulic horsepower;

(C) The dedicated-purpose pool pump nominal motor horsepower;

(D) The dedicated-purpose pool pump service factor; and

(E) The dedicated-purpose pool pump motor total horsepower.

(ii) Display of required information. All orientation, spacing, type sizes, typefaces, and line widths to display this required information must be the same as or similar to the display of the other performance data on the pump's permanent nameplate. In all instances, horsepower may be abbreviated as "hp."

(A) The WEF, as appropriate to a given pump model, must be identified in the form "WEF ____."

(B) The rated hydraulic horsepower must be identified in the form "rated hydraulic horsepower _____."

(C) The dedicated-purpose pool pump nominal motor horsepower must be identified in one of the following forms: "dedicated-purpose pool pump nominal motor horsepower _____," "DPPP nominal motor horsepower _____," or "nominal motor horsepower _____."

(D) The dedicated-purpose pool pump service factor must be identified in one of the following forms: "DPPP service factor _____," "service factor _____," or "SF _____."

(E) The dedicated-purpose pool pump motor total horsepower must be identified in one of the following forms: "dedicated-purpose pool pump motor total horsepower _____," "DPPP motor total horsepower _____," or "motor total horsepower _____."

(2) [Reserved]

Appendix A to Subpart Y of Part 431 [Amended]

10. In the introductory note to appendix A of subpart Y of part 431, remove the reference "10 CFR 431.464" add in its place "10 CFR 431.464(a)".

11. Add appendix B to subpart Y of part 431 to read as follows:

APPENDIX B TO SUBPART Y OF PART 431 – UNIFORM TEST METHOD FOR THE MEASUREMENT OF ENERGY CONSUMPTION OF DEDICATED-PURPOSE POOL PUMPS

Note: Starting on **[DATE 180 DAYS AFTER DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER]**, any representations made with respect to the energy use or efficiency of dedicated-purpose pool pumps subject to testing pursuant to 10 CFR 431.464(b) must be made in accordance with the results of testing pursuant to this appendix.

I. Test Procedure for Dedicated-Purpose Pool Pumps

A. General.

A.1 Test Method. To determine the weighted energy factor (WEF) for dedicated-purpose pool pumps, perform "wire-to-water" testing in accordance with HI 40.6–2014, except section 40.6.4.1, "Vertically suspended pumps"; section 40.6.4.2, "Submersible pumps"; section 40.6.5.3, "Test report"; section 40.6.5.5.2, "Speed of rotation during testing"; section 40.6.6.1, "Translation of test results to rated speed of rotation"; section 40.6.6.2, "Pump efficiency"; section 40.6.6.3, "Performance curve"; section A.7, "Testing at temperatures exceeding 30 °C (86 °F)"; and appendix B, "Reporting of test results"; (incorporated by reference, see §431.463) with the modifications and additions as noted throughout the provisions below. Do not use the test points specified in section 40.6.5.5.1, "Test procedure" of HI 40.6-2014 and instead use those test points specified in section D.3 of this appendix for the applicable dedicated-purpose pool pump variety and speed configuration. When determining overall efficiency, best efficiency point, or other applicable pump energy performance information, section 40.6.5.5.1, "Test procedure"; section 40.6.6.2, "Pump efficiency"; and section 40.6.6.3, "Performance curve" must be used, as applicable. For the purposes of applying this appendix, the term

"volume per unit time," as defined in section 40.6.2, "Terms and definitions," of HI 40.6–2014 shall be deemed to be synonymous with the term "flow rate" used throughout that standard and this appendix.

A.2. Calculations and Rounding. All terms and quantities refer to values determined in accordance with the procedures set forth in this appendix for the rated pump. Perform all calculations using raw measured values without rounding. Round WEF, EF, maximum head, vertical lift, and true priming time values to the tenths place (i.e., 0.1). Round all other reported values to the hundredths place.

B. Measurement Equipment.

B.1 For the purposes of measuring flow rate, speed of rotation, temperature, and pump power output, the equipment specified in HI 40.6–2014 Appendix C (incorporated by reference, see §431.463) necessary to measure head, speed of rotation, flow rate, and temperature must be used and must comply with the stated accuracy requirements in HI 40.6–2014 Table 40.6.3.2.3, except as specified in section B.1.1 and B.1.2 of this appendix. When more than one instrument is used to measure a given parameter, the combined accuracy, calculated as the root sum of squares of individual instrument accuracies, must meet the specified accuracy requirements.

B.1.1 Electrical measurement equipment for determining the driver power input to the motor or controls must be capable of measuring true root mean squared (RMS) current, true RMS voltage, and real power up to the 40th harmonic of fundamental supply source frequency, and have a combined accuracy of ±2.0 percent of the measured value at the fundamental supply source frequency.

B.1.2 Instruments for measuring distance (e.g., height above the reference plane or water level) must be accurate to and have a resolution of at least ±0.1 inch.

C. Test Conditions and Tolerances.

C.1 Pump Specifications. Conduct testing at full impeller diameter in accordance with the test conditions, stabilization requirements, and specifications of HI 40.6–2014 (incorporated by reference, see §431.463) section 40.6.3, "Pump efficiency testing"; section 40.6.4, "Considerations when determining the efficiency of a pump"; section 40.6.5.4 (including appendix A), "Test arrangements"; and section 40.6.5.5, "Test conditions."

C.2 Power Supply Requirements. The following conditions also apply to the mains power supplied to the DPPP motor or controls, if any:

(1) Maintain the voltage within ±5 percent of the rated value of the motor,

(2) Maintain the frequency within ±1 percent of the rated value of the motor,

(3) Maintain the voltage unbalance of the power supply within ±3 percent of the rated values of the motor, and

(4) Maintain total harmonic distortion below 12 percent throughout the test.

C.3 Tolerances. For self-priming pool filter pumps, non-self-priming pool filter pumps, and pressure cleaner booster pumps, all measured load points must be within ±2.5 percent of the specified flow rate values on the reference curve. For waterfall pumps, all measured load points must be within ±2.5 percent of the specified head value (i.e., 17.0 ±0.425 ft) at maximum speed.

D. Data Collection and Stabilization.

D.1 Damping Devices. Use of damping devices, as described in section 40.6.3.2.2 of HI 40.6−2014 (incorporated by reference, see §431.463), are only permitted to integrate up to the data collection interval used during testing.

D.2 Stabilization. Record data at any tested load point only under stabilized conditions, as defined in HI 40.6–2014 section 40.6.5.5.1 (incorporated by reference, see §431.463), where a minimum of two measurements are used to determine stabilization.

D.3 Test Points. Measure the flow rate in gpm, pump total head in ft, the driver power input in W, and the speed of rotation in rpm at each load point specified in Table 1 for each DPPP varieties and speed configurations:

Table 1. Load Points (i) and Weights (w_i) for Each DPPP Variety and Speed Configuration

DPPP Varieties	Speed Configuration(s)	Number of Load Points n	Load Point i	Test Points		
				Flow Rate Q (GPM)	Head H (ft)	Speed rpm
Self-Priming Pool Filter Pumps	Single-speed dedicated purpose pool pumps and all self-priming and non-self-priming pool filter pumps not meeting the definition of two-*, multi-, or variable-speed dedicated purpose pool pump	1	High	$Q_{high}(gpm) = Q_{max\_speed@C}$**	$H = 0.0082 \times Q_{high}^{2}$	Maximum speed
And **Non-Self-Priming Pool Filter Pumps**	Two-speed dedicated-purpose pool pumps*	2	Low	$Q_{low}(gpm)$ = Flow rate associated with specified head and speed that is not below: • 31.1 gpm if pump hydraulic hp at max speed on curve C is >0.75 or • 24.7 gpm if pump hydraulic hp at max speed on	$H = 0.0082 \times Q_{low}^{2}$	Lowest speed capable of meeting the specified flow and head values, if any

DPPP Varieties	Speed Configuration(s)	Number of Load Points n	Load Point i	Test Points		
				Flow Rate Q (GPM)	Head H (ft)	Speed rpm
				curve C is ≤0.75		
			High	Q_{high}(gpm) = $Q_{max\_speed@C}$	H = 0.0082 × Q_{high}^2	Maximum speed
	Variable-speed and multi-speed dedicated-purpose pool pumps	2	Low	Q_{low}(gpm) = • If pump hydraulic hp at max speed on curve C is >0.75, then Q_{low} = 31.1 gpm • If pump hydraulic hp at max speed on curve C is ≤0.75, then Q_{low} = 24.7 gpm	H ≥0.0082 × Q_{low}^2	Lowest speed capable of meeting the specified flow and head values
			High	Q_{high}(gpm) = 0.8 × $Q_{max\_speed@C}$	H = 0.0082 × Q_{high}^2	80 percent of maximum speed
Waterfall Pumps	Single-speed dedicated-purpose pool pumps	1	High	Q_{low}(gpm) = Flow corresponding to specified head	17.0 ft	Maximum speed
Pressure Cleaner Booster Pumps	Any	1	High	10.0 gpm	≥60.0 ft	Lowest speed capable of meeting the specified flow and head values

* In order to apply the test points for two-speed self-priming and non-self-priming pool filter pumps, self-priming pool filter pumps that are greater than or equal to 0.711 rated hydraulic horsepower that are two-speed dedicated-purpose pool pumps must also be distributed in commerce either: (1) with a pool pump control (variable speed drive and user interface or switch) that changes the speed in response to pre-programmed user preferences and allows the user to select the duration of each speed and/or the on/off times or (2) without a pool pump control that has the capability, but is unable, to operate without the presence of such a pool pump control. Two-speed self-priming pool filter pumps greater than or equal to 0.711 rated hydraulic horsepower that do not meet these requirements must be tested using the load point for single-speed self-priming or non-self-priming pool filter pumps, as appropriate.

** $Q_{max\text{-}speed@C}$ = Flow at max speed on curve C (gpm)

E. Calculations.

E.1 Determination of Weighted Energy Factor. Determine the WEF as a ratio of the measured flow and driver power input to the dedicated-purpose pool pump in accordance with the following equation:

$$WEF = \frac{\sum_{i=1}^{n}\left(w_i \times \frac{Q_i}{1000} \times 60\right)}{\sum_{i=1}^{n}\left(w_i \times \frac{P_i}{1000}\right)}$$

Where:

WEF = Weighted Energy Factor in kgal/kWh;

w_i = weighting factor at each load point i, as specified in section E.2 of this appendix;

Q_i = flow at each load point i measured in accordance with section D.4, in gal/min;

P_i = driver power input to the motor (or controls, if present) at each load point i measured in accordance with section D.4 in watts;

i = load point(s), defined uniquely for each DPPP variety and speed configuration in section D.4; and

n = number of load point(s), defined uniquely for each DPPP variety and speed configuration.

E.2 Weights. When determining WEF, apply the weights specified in Table 2 for the applicable load points, DPPP varieties, and speed configurations:

Table 2. Load Point Weights (w_i)

DPPP Varieties	Speed Type	Load Point(s) i	
		Low Flow	High Flow
Self-Priming Pool Filter Pumps and Non-Self-Priming Pool Filter Pumps	Single	-	1.0
	Two	0.80	0.20
	Multi/Variable	0.80	0.20
Waterfall Pumps	Single	-	1.0
Pressure Cleaner Booster Pump	Single	-	1.0

E.3 Determination of Horsepower and Power Factor Metrics.

E.3.1 Determine the pump power output at any load point i using the following equation:

$$P_u = \frac{Q \times H \times SG}{3956}$$

Where:

P_u = the measured pump power output at load point i of the tested pump (hp),

Q = the measured flow rate at load point i of the tested pump (gpm),

H = pump total head at load point i of the tested pump (ft), and

SG = the specific gravity of water at specified test conditions, which is equivalent to 1.00.

E.3.1.1 Determine the rated hydraulic horsepower as the pump power output measured on the reference curve at maximum rotating speed and full impeller diameter for the rated pump.

E.3.2 Determine the dedicated-purpose pool pump nominal motor horsepower according to section E.3.2.1 for single- and three-phase AC motors or section E.3.2.2 for DC motors:

E.3.2.1 For single- and three-phase AC motors, determine the dedicated-purpose pool pump nominal motor horsepower as the nominal horsepower rating associated with the appropriate values of breakdown torque, locked-rotor torque, pull-up torque, locked-rotor current, and slip, as applicable for the NEMA motor designation with which the dedicated-purpose pool pump is distributed in commerce, as indicated by the following sections of NEMA MG-1-2014 (incorporated by reference, see section §431.463) shown in Table 3.

Table 3. Relevant NEMA MG-1 2014 Sections Applicable to Small and Medium Single- and Three-Phase AC Motors

Motor Characteristic	Single-Phase AC Motors	Three-Phase AC Motors
Breakdown Torque	Section 10.34 of NEMA MG-1-2014	Section 12.39 of NEMA MG-1-2014
Locked-Rotor Torque	N/A	Section 12.37 or 12.38 of NEMA MG-1-2014
Pull-up Torque	N/A	Section 12.40 of NEMA MG-1-2014
Locked-rotor current	N/A	Section 12.35.1 of NEMA MG-1-2014
Slip	N/A	Section 1.19

E.3.2.2 For DC motors, determine the nominal motor horsepower according to the specifications in section 10.62 of NEMA MG-1-2014 (incorporated by reference, see section §431.463).

E.3.3 Determine the dedicated-purpose pool pump service factor according to section E.3.3.1 for single- and three-phase AC motors or section E.3.3.2 for DC motors:

E.3.3.1 For single- and three-phase AC motors, determine the dedicated-purpose pool pump service factor based on the requirements of section 12.51 of NEMA MG-1-2014 (incorporated by reference, see section §431.463).

E.3.3.2 For DC motors, the dedicated-purpose pool pump service factor is equal to 1.0.

E.3.4 Determine the dedicated-purpose pool pump motor total horsepower as the product of the dedicated-purpose pool pump nominal motor horsepower, determined in accordance with section E.3.2 of this appendix, and the dedicated-purpose pool pump service factor, determined in accordance with section E.3.3 of this appendix.

E.3.5 Determine the true power factor at each applicable load point specified in Table 1 of this appendix for each DPPP variety and speed configuration as a ratio of driver power input to the motor (or controls, if present) (P_i), in watts, over the product of

the voltage in volts and the current in amps at each load point i, as shown in the following equation:

$$PF_i = \frac{P_i}{V_i \times I_i}$$

Where:

PF_i = true power factor at each load point i, dimensionless;

P_i = driver power input to the motor (or controls, if present) at each load point i measured in accordance with section D.4 in watts;

V_i = voltage at each load point i measured in accordance with section D.4, in volts;

I_i = current at each load point i measured in accordance with section D.4, in amps; and

i = load point(s), defined uniquely for each DPPP variety and speed configuration in section D.4.

E.4. Determination of Maximum Head. Determine the maximum head for self-priming pool filter pumps, non-self-priming pool filter pumps, and waterfall pumps by measuring the head at maximum speed and the minimum flow rate at which the pump is designed to operate continuously or safely, where the minimum flow rate is assumed to be zero unless stated otherwise in the manufacturer literature.

F. Determination of Self-Priming Capability.

F.1. Test Method. Determine the vertical lift and true priming time of self-priming and non-self-priming pool filter pumps that are not already certified as self-priming under NSF/ANSI 50-2015 by testing such pumps pursuant to section C.3 of appendix C of NSF/ANSI 50-2015, "Equipment for Swimming Pools, Spas, Hot Tubs and Other

Recreational Water Facilities" (incorporated by reference, see §431.463), except for the modifications and exceptions listed in the following section F.1.1 through F.1.5 of this appendix:

F.1.1. Where section C.3.2, "Apparatus," and section C.3.4, "Self-priming capability test method," state that the "suction line must be essentially as shown in annex C, figure C.1;" "essentially as shown in Annex C, figure C.1" means:

- the centerline of the pump impeller shaft is situated a vertical distance equivalent to the specified vertical lift (VL), calculated in accordance with section F.1.1.1. of this section, above the water level of a water tank of sufficient volume as to maintain a constant water surface level for the duration of the test;
- the pump draws water from the water tank with a riser pipe that extends below the water level a distance of at least 3 times the riser pipe diameter (i.e., 3 pipe diameters);
- the suction inlet of the pump is at least 5 pipe diameters from any obstructions, 90° bends, valves, or fittings; and
- the riser pipe that is of the same pipe diameter as the pump suction inlet.

F.1.1.1. The vertical lift (VL) must be normalized to 5.0 feet at an atmospheric pressure of 14.7 psia and a water density of 62.4 lb/ft^3 in accordance with the following equation:

$$VL = 5.0ft \times \left(\frac{62.4\,{}^{lb}/_{ft^3}}{\rho_{test}} \right) \times \left(\frac{P_{abs,test}}{14.7psia} \right)$$

Where:

$\underline{VL}$ = vertical lift of the test apparatus from the waterline to the centerline of the pump impeller shaft, in ft;

$\underline{\rho_{test}}$ = density of test fluid, in lb/ft^3; and

$\underline{P_{atm,test}}$ = absolute barometric pressure of test apparatus location at centerline of pump impeller shaft, in psia.

F.1.2. The equipment accuracy requirements specified in section B, "Measurement Equipment," of this appendix also apply to this section F, as applicable.

F.1.2.1 Adjust all measurements of head (gauge pressure), flow, and water temperature must be taken at the pump suction inlet and all head measurements back to the centerline of the pump impeller shaft in accordance with section A.3.1.3.1 of HI 40.6 2014 (incorporated by reference, see §431.463).

F.1.3. All tests must be conducted with clear water, as defined in HI 40.6-2014 (incorporated by reference, see §431.463) and the test conditions specified in section C.3.3 of NSF/ANSI 50-2015 (incorporated by reference, see §431.463) do not apply.

F.1.4. In section C.3.4, "Self-priming capability test method," of NSF/ANSI 50-2015 (incorporated by reference, see §431.463), "the elapsed time to steady discharge gauge reading or full discharge flow" is determined when the changes in head and flow, respectively, are within the tolerance values specified in table 40.6.3.2.2, "Permissible amplitude of fluctuation as a percentage of mean value of quantity being measured at any test point," of HI 40.6-2014 (incorporated by reference, see §431.463). The measured priming time (MPT) is determined as the point in time when the stabilized load point is first achieved, not when stabilization is determined. In addition, the true priming time (TPT) is equivalent to the MPT.

F.1.5. The maximum true priming time for each test run must not exceed 10.0 minutes. Disregard section C.3.5 of NSF/ANSI 50-2015 (incorporated by reference, see §431.463).

G. Optional Testing and Calculations.

G.1 Energy Factor. When making representations regarding the EF of dedicated-purpose pool pumps, determine EF on one of four system curves (A, B, C, or D) and at any given speed (s) according to the following equation:

$$EF_{X,s} = \frac{\left(\frac{Q_{X,s}}{1{,}000} \times 60\right)}{\left(\frac{P_{X,s}}{1{,}000}\right)}$$

Where:

$EF_{X,s}$ = the energy factor on system curve X at speed s in kgal/kWh;

X = one of four possible system curves (A, B, C, or D), as defined in section G.2 of this appendix;

$Q_{X,s}$ = flow rate measured on system curve X at speed s in gpm; and

$P_{X,s}$ = driver power input to the motor (or controls, if present) on system curve X at speed s in watts.

G.2 System Curves. The energy factor may be determined at any speed (s) and on any of the four system curves A, B, C, and/or D specified in Table 4:

Table 4. Systems Curves for Optional EF Test Procedure

System Curve	System Curve Equation*
A	$H = 0.0167 \times Q^2$
B	$H = 0.0500 \times Q^2$
C	$H = 0.0082 \times Q^2$
D	$H = 0.0044 \times Q^2$

* In the above table, Q refers to the flow rate in gpm and H refers to head in ft.

G.3 Replacement Dedicated-Purpose Pool Pump Motors. To determine the WEF for replacement DPPP motors, test each replacement DPPP motor paired with each dedicated-purpose pool pump bare pump for which the replacement DPPP motor is advertised to be paired, as stated in the manufacturer's literature for that DPPP model, according to the testing and calculations described in sections A, B, C, D, and E of this appendix. Alternatively, each replacement DPPP motor may be tested with the most consumptive dedicated-purpose pool pump bare pump for which it is advertised to be paired, as stated in the manufacturer's literature for that DPPP model. If a replacement DPPP motor is not advertised to be paired with any specific dedicated-purpose pool pump bare pumps, test with the most consumptive dedicated-purpose pool pump bare pump available.

[FR Doc. 2016-21310 Filed: 9/19/2016 8:45 am; Publication Date: 9/20/2016]