[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 429 and 431

[Docket No. 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: Final rule.

SUMMARY: On September 20, 2016, the U.S. Department of Energy (DOE) issued a notice of proposed rulemaking (NOPR) to establish a new metric, as well as new definitions, test procedures, certification requirements, enforcement testing procedures, and labeling provisions for dedicated-purpose pool pumps (DPPPs). That proposed rulemaking serves as the basis for the final rule. Specifically, DOE is adopting a test procedure for measuring the weighted energy factor (WEF) for certain varieties of dedicated-purpose pool pumps. This final rule incorporates by reference certain sections of the industry test standard Hydraulic Institute (HI) 40.6–2014, "Methods for Rotodynamic Pump Efficiency Testing" as the basis of the adopted test procedure. The definitions, test procedures, certification requirements, enforcement testing procedures, and labeling provisions are based on the recommendations of the DPPP Working Group, which was established under the Appliance Standards Rulemaking Federal Advisory Committee (ASRAC).

DATES: The effective date of this rule is [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**]. Compliance with the final rule will be mandatory for representations of WEF and other metrics addressed by the adopted test procedure made on or after [**INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**]. The incorporation by reference of certain publications listed in this rule is approved by the Director of the Federal Register on **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**].

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

A link to the docket web page can be found at https://www.regulations.gov/docket?D=EERE-2016-BT-TP-0002. The docket web page will contain simple instructions on how to access all documents, including public comments, in the docket.

For further information on how to review the docket, contact the Appliance and Equipment Standards Program staff at (202) 586-6636 or by e-mail: ApplianceStandardsQuestions@ee.doe.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.

SUPPLEMENTARY INFORMATION:

This final rule incorporates by reference into 10 CFR parts 429 and 431 the following industry standards:

(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, "Test conditions"; 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) Canadian Standards Association (CSA) C747–2009 (Reaffirmed 2014), "Energy Efficiency Test Methods for Small Motors," CSA reaffirmed 2014, section 1, "Scope"; section 3, "Definitions"; section 5, "General Test Requirements"; and section 6, "Test Method."

Copies of CSA C747–2009 (RA 2014) can be obtained from: 5060 Spectrum Way, Suite 100, Mississauga, Ontario, L4W 5N6, Canada, (800) 463-6727, or by visiting www.csagroup.org.

(3) Institute of Electrical and Electronics Engineers (IEEE) Standard 114–2010, "Test Procedure for Single-Phase Induction Motors," Approved September 30, 2010, section 3.2, "Tests with load"; section 4 "Testing facilities"; section 5.2 "Mechanical measurements"; section 5.3 "Temperature measurements"; and section 6 "Tests."

(4) IEEE Standard 113–1985, "IEEE Guide: Test Procedures for Direct-Current Machines," 1985, section 3.1, "Instrument Selection Factors"; section 3.4 "Power Measurement": section 3.5 "Power Sources"; section 4.1.2 "Ambient Air"; section 4.1.4 "Direction of Rotation"; section 5.4.1 "Reference Conditions"; and section 5.4.3.2 "Dynomometer or Torquemeter Method."

Copies of IEEE 114–2010 and IEEE 113–1985 can be obtained from: IEEE, 45 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, (732) 981-0060, or by visiting www.ieee.org.

(5) NSF International (NSF)/American National Standards Institute (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.

(6) UL 1081, ("ANSI/UL 1081–2016"), "Standard for Swimming Pool Pumps, Filters, and Chlorinators," 7th Edition, ANSI approved October 21, 2016.

Copies of ANSI/UL 1081–2016 can be obtained from: UL, 333 Pfingsten Road, Northbrook, IL 60062, (847) 272-8800, or by visiting http://ul.com.

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

Table of Contents

I. Authority and Background
A. Authority
B. Background
II. Synopsis of the Final Rule
III. Discussion
A. General Comments
B. Definitions
1. Existing Pump Definitions
2. Definition of Dedicated-Purpose Pool Pump
3. Pool Filter Pumps
4. Other Varieties of Dedicated-Purpose Pool Pumps
5. Storable and Rigid Electric Spa Pumps
6. Applicability of Test Procedure Based on Pump Configuration
7. Definitions Related to Dedicated-Purpose Pool Pump Speed Configurations and Controls
8. Basic Model
C. Rating Metric
D. Test Methods for Different DPPP Categories and Configurations

1. Self-Priming and Non-Self-Priming Pool Filter Pumps
2. Waterfall Pumps
3. Pressure Cleaner Booster Pumps
4. Summary
E. Determination of Pump Performance
1. Incorporation by Reference of HI 40.6–2014
2. Exceptions, Modifications and Additions to HI 40.6–2014
F. Representations of Energy Use and Energy Efficiency
1. Use of Alternative Efficiency Metrics
2. Definition of Representation
3. Impact on Voluntary and Other Regulatory Programs
4. Request for Extension
G. Additional Test Methods
1. Determination of DPPP Capacity
2. Determination of Self-Priming Capability
3. Determination of Maximum Head
4. Energy Factor Test Method
H. Labeling Requirements
I. Replacement DPPP Motors
J. Certification and Enforcement Provisions for Dedicated-Purpose Pool Pumps
1. Sampling Plan
2. Certification Requirements
3. Enforcement Provisions
IV. Procedural Issues and Regulatory Review
A. Review Under Executive Order 12866
B. Review Under the Regulatory Flexibility Act
1. Review of DPPP Manufacturers
2. Burden of Conducting the DOE DPPP Test Procedure
C. Review Under the Paperwork Reduction Act of 1995
D. Review Under the National Environmental Policy Act of 1969
E. Review Under Executive Order 13132
F. Review Under Executive Order 12988
G. Review Under the Unfunded Mandates Reform Act of 1995
H. Review Under the Treasury and General Government Appropriations Act, 1999
I. Review Under Executive Order 12630
J. Review Under Treasury and General Government Appropriations Act, 2001
K. Review Under Executive Order 13211
L. Review Under Section 32 of the Federal Energy Administration Act of 1974
M. Congressional Notification
N. Description of Materials Incorporated by Reference
V. Approval of the Office of the Secretary

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 (DPPPs), which are the subject of this rulemaking, are a kind of pump for which DOE is authorized to establish test procedures and energy conservation standards. Recently, DOE published in the Federal Register two final rules establishing 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. 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 test procedures for dedicated-purpose pool pumps. The following sections discuss DOE's authority to establish test procedures for dedicated-purpose pool pumps and relevant background information regarding DOE's consideration of establishing Federal regulations for this equipment.

A. Authority

Title III of the Energy Policy and Conservation Act of 1975, as amended, (42 U.S.C. 6291, et seq.; "EPCA" or, "the Act") sets forth a variety of provisions designed to improve energy efficiency.[1] Part C of Title III, which for editorial reasons was codified as Part A-1 upon

[1] 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 (Apr. 30, 2015).

incorporation into the U.S. Code (42 U.S.C. 6311–6317), establishes the Energy Conservation Program for Certain Industrial Equipment. "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)) DOE defined "pump" in a test procedure final rule (January 2016 general pumps test procedure 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 final rule, meet this definition of a pump and are covered under the pump equipment type.

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 products must use as the basis for (1) certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA, and (2) making representations about the efficiency of those products. Similarly, DOE must use these test procedures to determine whether the products comply with any relevant standards promulgated under EPCA.

Under 42 U.S.C. 6293, EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered products. 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 product during a representative average use cycle or period of use and shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

In addition, if DOE determines that a test procedure amendment is warranted, DOE must publish a proposed test procedure and offer the public an opportunity to present oral and written comments on it. (42 U.S.C. 6293(b)(2)) Finally, in any rulemaking to amend a test procedure, DOE must determine to what extent, if any, the proposed test procedure would alter the measured energy efficiency of any covered product as determined under the existing test procedure. (42 U.S.C. 6293(e)(1))

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 test procedure 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).

To begin the separate rulemaking for dedicated-purpose pool pumps, 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. Following the publication of the May 2015 DPPP RFI, DOE began a process through the Appliance Standards Rulemaking Federal Advisory Committee (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 DPPP Working Group met four times between September and December 2015 [2] and 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 ("December 2015 DPPP Working Group recommendations").[3] 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 DPPP Working Group also requested, and was ultimately granted, more time to discuss possible energy conservation standards for this equipment. (Docket No. EERE-2013-

[2] Details of the negotiations sessions can be found in the public meeting transcripts that are posted to the docket for the DPPP Working Group (https://www.regulations.gov/docket?D=EERE-2015-BT-STD-0008).
[3] 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.

BT-NOC-0005, No. 71 at pp. 20–52) The meetings to discuss energy conservation standards 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). This term sheet contained 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 definitions, DPPP test procedure, sampling provisions, enforcement requirements, and labeling requirements contained in this final rule reflect the recommendations of the DPPP Working Group contained in both the December 2015 and June 2016 DPPP Working Group recommendations.

On September 20, 2016, DOE published a proposed test procedure rulemaking for dedicated-purpose pool pumps (September 2016 DPPP test procedure NOPR), which proposed to implement the recommendations of the DPPP Working Group. 81 FR 64580. On September 26, 2016, DOE held a public meeting to discuss and request comment on the September 2016 DPPP test procedure NOPR (September 2016 DPPP test procedure NOPR public meeting).

The test procedure adopted in this final rule reflects certain recommendations of the DPPP Working Group, as well as input from interested parties received in response to the September 2016 DPPP test procedure NOPR. Provisions of this final rule that are directly pertinent to any of the approved DPPP Working Group recommendations are specified with a citation to the December 2015 or June 2016 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). Additionally, in developing the provisions of this final rule, DOE also has

referenced discussions from the DPPP Working Group meetings regarding potential actions or comments that may not have been formally approved as part of the DPPP Working Group recommendations. These references to discussions or suggestions of the DPPP Working Group not found in the DPPP Working Group recommendations will have 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).

Finally, in this final rule, DOE responds to all comments received from interested parties in response to the proposals presented in the September 2016 DPPP test procedure NOPR, either during the September 2016 DPPP test procedure NOPR public meeting or in subsequent written comments. In response to the September 2016 DPPP test procedure NOPR, DOE received 11 written comments in addition to the verbal comments made by interested parties during the September 2016 DPPP test procedure NOPR public meeting. The commenters included: the 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); a joint comment by the Appliance Standards Awareness Project (ASAP) and the Natural Resources Defense Council (NRDC)[4]; Pentair Aquatic Systems (Pentair); Hayward Industries, Inc. (Hayward); Waterway; Davey Water Products Pty Ltd. (Davey); the California Energy Commission (CEC); the Association of Pool & Spa Professionals (APSP); Nidec Motor Corporation (Nidec); Zodiac Pool Systems, Inc. (Zodiac); and the People's Republic of China (China). DOE identifies comments received in response to the September

[4] ASAP was present at the September 2016 DPPP TP NOPR public meeting. When ASAP commented at the public meeting, comments will be indicated as ASAP. ASAP and NRDC submitted a joint written comment and written comments will be indicated as ASAP and NRDC.

2016 DPPP test procedure NOPR by the commenter, the number of document as listed in the docket maintained at www.regulations.gov (Docket No. EERE-2016-BT-TP-0002), and the page number of that document where the comment appears (for example: Hayward, No. 4 at p. 1). If a comment was made verbally during the September 2016 DPPP test procedure NOPR public meeting, DOE will also specifically identify those as being located in the NOPR public meeting transcript (for example: CA IOUs, public meeting transcript, No. 3 at p. 66).

Regarding comments, during the September 2016 DPPP test procedure public meeting, Hayward inquired if it was appropriate to suggest any modifications to previously negotiated language, if Hayward believed it could be helpful. (Hayward, Public Meeting Transcript, No. 3 at p. 20) DOE requested feedback on a number of items in the September 2016 DPPP test procedure NOPR and welcomed comment from interested parties on any of the proposals contained in the NOPR. DOE notes that DPPP Working Group ground rules stipulate that each party, except individuals that have previously voted negatively on the final term sheet, agrees not to file negative comments or speak negatively on the proposed rule or its preamble to the extent they have the same substance and effect as the term sheet. (Docket No. EERE-2015-BT-STD-0008, No. 16 at p. 5) However, these rules are not legally binding, but instead are good-faith principles to govern Working Group's negotiations. Under the Administrative Procedure Act, DOE must consider all relevant comments submitted concerning the September 2016 DPPP test procedure NOPR, and make modifications to the proposals, as necessary, in this final rule. (5 U.S.C. 553(c)) Specific required modifications are discussed in their relevant sections.

II. Synopsis of the Final Rule

In this final rule, DOE is amending subpart Y to 10 CFR part 431 to include definitions and a test procedure applicable to dedicated-purpose pool pumps. However, DOE is establishing a test procedure for only a specific subset of dedicated-purpose pool pumps. Specifically, this test procedure applies only to self-priming and non-self-priming pool filter pumps, waterfall pumps, and pressure cleaner booster pumps. The test procedure does not apply to integral cartridge-filter pool pumps, integral sand-filter pool pumps, storable electric spa pumps, or rigid electric spa pumps. The test procedure is 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.B.6 for more information on the applicability of the new test procedure to different DPPP varieties).

In this final rule, DOE defines 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. As described further in section III.C, WEF is determined as a weighted average of water volumetric flow rate divided by the input power to the dedicated-purpose pool pump at different load points. The specific load points and weights depend on the variety of the dedicated-purpose pool pump and the number of operating speeds with which it is distributed in commerce. In addition, the DPPP test procedure includes 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 DPPP test procedure provides optional methods for determining the WEF for replacement DPPP motors.

DOE's new test method includes measurements of volumetric 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 is incorporating 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 adopted in this test procedure, will 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 test procedure, including HI 40.6–2014, and, based on the results of such analysis, found that the test procedure is not unduly burdensome to conduct. (42 U.S.C. 6314(a)(2)) DOE's analysis of the burdens associated with the test procedure is presented in section IV.B.

This final rule also establishes requirements regarding the sampling plan, certification requirements, and representations for 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.J.1 for more detailed information). As DOE's DPPP test procedure contains methods for calculating the energy factor (EF),[5] overall (wire-to-water)

[5] EF is a metric that is common in the DPPP industry and which describes the volume of water provided by a dedicated-purpose pool pump divided by the input power required to pump that amount of water in units of gallons per watt-hour (gal/Wh). The relevant test methods for determining EF are described in section III.F.

efficiency, driver power input, DPPP nominal motor horsepower,[6] DPPP motor total horsepower, DPPP service factor, pump power output (hydraulic horsepower), and true power factor (PF), DOE also is adopting provisions regarding allowable representations of energy consumption, energy efficiency, and other relevant metrics manufacturers may make regarding DPPP performance (section III.G.4). DOE is also clarifying the appropriate use of such metrics through the use of two appendices: appendix B1, which contains metrics and test methods applicable to testing dedicated-purpose pool pumps prior to the compliance date of any energy conservation standards for such equipment, and appendix B2, which contains metrics and test methods applicable to testing dedicated-purpose pool pumps on or after the compliance date of any applicable energy conservation standards.

Starting on the compliance date for any energy conservation standards that DOE may establish for dedicated-purpose pool pumps, all dedicated-purpose pool pumps within the scope of those standards would be required to be certified in accordance with the amended subpart Y of part 431 and the applicable sampling requirements in 10 CFR 429.59. DOE is also requiring that, beginning on the compliance date of any DPPP energy conservation standards that DOE may establish, certain certification and compliance information must be reported to DOE on an annual basis (section III.J.2). Similarly, all representations regarding the energy efficiency or energy use of dedicated-purpose pool pumps within the scope of this DPPP test procedure should be made by testing in accordance with the adopted DPPP test procedure (appendix B1) beginning 180 days after the publication date of this test procedure final rule in the Federal Register. (42

[6] In this final rule, DOE is adopting specific test methods and metrics applicable to DPPP nominal motor horsepower, DPPP total horsepower, DPPP service factor, and rated hydraulic horsepower of dedicated-purpose pool pumps. See section III.G.1 for a discussion of the different horsepower metrics applicable to dedicated-purpose pool pumps and the adopted testing requirements applicable to these metrics.

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 new DOE test procedure. DOE also understands that the DPPP test procedure is based on the same testing methodology used to generate most existing pump performance information. Consequently, DOE does not expect that manufacturers will need to regenerate all of the historical test data, as long as the original rating method is consistent with the methods adopted in this final rule, and the original tested units remain representative of the basic model's current design. If the testing methods used to generate historical ratings for DPPP basic models are substantially different from those adopted in this final rule or the manufacturer has changed the design of the basic model, the representations resulting from the historical methods would no longer be valid. This is discussed in more detail in section III.F.

III. Discussion

In this final rule, DOE amends subpart Y of 10 CFR 431 to add a new DPPP test procedure and related definitions, amends 10 CFR 429.59 to add a new sampling plan for dedicated-purpose pool pumps, and amends 10 CFR 429.110 and 429.134 to add new enforcement provisions for this equipment. The amendments are shown in Table III.1.

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

Location	Amendment	Summary of Additions	Applicable Preamble Discussion
10 CFR 429.59	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.J and III.G.4

10 CFR 429.110 & 429.134	Enforcement Provisions	Method for DOE determination of compliance of DPPP basic models	Section III.J
10 CFR 431.462	Definitions	Definitions pertinent to categorizing and testing of dedicated-purpose pool pumps	Section III.B
10 CFR 431.464, Appendix B1, & Appendix B2	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.C, III.D, III.E, III.G.4, III.F, and III.I
10 CFR 431.466	Labeling	Requirements for labeling dedicated-purpose pool pumps	Section III.H

The following sections discuss comments received from interested parties and DOE's final adopted provisions regarding (A) the scope of this rulemaking; (B) definitions related to the categorizing and testing of dedicated-purpose pool pumps; (C) the metric used to describe the energy performance of dedicated-purpose pool pumps; (D) the test procedure for different varieties of dedicated-purpose pool pumps; (E) the incorporation of HI 40.6–2014 as the test method for determining pump performance; (F) representations of energy use and energy efficiency; (G) additional test methods necessary to determine rated hydraulic horsepower,[7] other DPPP horsepower metrics,[8] and the self-priming capability of dedicated-purpose pool pumps; ; (H) labeling requirements for dedicated-purpose pool pumps; (I) an optional test method for replacement DPPP motors; and (J) certification and enforcement provisions for tested DPPP models.

[7] 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 is referencing to describe the capacity of dedicated-purpose pool pumps. (See section III.G.1.)

[8] DOE is adopting, 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 adopted test methods are discussed in section III.F and the labeling requirements are discussed in section III.H.

A. General Comments

CA IOUs submitted a general comment expressing their support of the test procedure proposed in the September 2016 DPPP test procedure NOPR and stating that the proposal reflected issues negotiated in the DPPP Working Group in 2015 and 2016. CA IOUs also encouraged DOE to publish a final rule for both the test procedure and energy conservation standards by the end of 2016 so that the standards can take effect as soon as possible. (CA IOUs, No. 9 at pp. 1–2) DOE appreciates the support of CA IOUs and has finalized this test procedure final rule in 2016. DOE will address the energy conservation standards recommended by the DPPP Working Group in a separate rulemaking.

In response to the September 2016 DPPP test procedure NOPR, Hayward raised concerns on the number of requests for comment and new items outside the DPPP Working Group discussions and the possible need for a supplemental NOPR (SNOPR). (Hayward, Public Meeting Transcript, No. 3 at pp. 5–6) DOE acknowledges that in the September 2016 DPPP test procedure NOPR, DOE proposed a new DPPP test procedure, as well as several items recommended by the DPPP Working Group related to DPPP test procedure, such as definitions and test methods. In addition, the September 2016 DPPP test procedure NOPR contained several items recommended by the DPPP Working Group that are not directly related to the DPPP test procedure, such as labeling and certification requirements. Finally, the September 2016 DPPP test procedure NOPR contained a number of items that were not directly discussed or recommended by the DPPP Working Group, but are necessary to fully implement DOE's regulatory framework, such as a sampling plan for the determination of representative values and enforcement requirements.

While DOE recognizes that the number and breadth of the proposals contained in the September 2016 DPPP test procedure NOPR was significant, DOE maintains that many of the items are necessary to ensure DOE's DPPP regulations, once adopted, are comprehensive and robust. For example, the sampling plan provisions are necessary to describe how to determine uniform and consistent representative values from the test procedure results.

In addition, as discussed at length in the DPPP Working Group negotiations, the energy conservation standard recommended by the DPPP Working Group contains both performance and prescriptive requirements for different varieties of dedicated-purpose pool pumps, which must be implemented in a direct final rule. However, such a direct final rule can only contain the explicit consensus recommendations of the DPPP Working Group, since any additional provisions would not have the opportunity for public comment through the direct final rule process. Therefore, some items typically implemented in standards rulemakings, such as certification reporting requirements and labeling provisions, were included in the September 2016 DPPP test procedure NOPR, because, while they implemented the recommendations of the DPPP Working Group, they contained additional details and minor provisions not explicitly recommended by the DPPP Working Group (see section III.H and III.J.2 for more information on the labeling and certification provisions, respectively).

Therefore, while DOE understands that the breadth of the proposals contained in the September 2016 DPPP test procedure NOPR may be greater than typical test procedure NOPRs, DOE believes that all the proposals are necessary to fully implement the recommendations of the DPPP Working Group and ensure comprehensive and robust DPPP regulations. In addition, DOE notes that interested parties had the opportunity to comment on all DOE's proposals in

response to the September 2016 DPPP test procedure NOPR and DOE has provided answers to all comments, and, where appropriate, has amended its proposal in response to the comments. Therefore, DOE believes that an SNOPR is not necessary.

In written comments, APSP and Pentair noted that DOE based the various efficiency levels considered for energy conservation standards during the DPPP Working Group negotiations on the WEF scores estimated for individual pump models using data from the ENERGY STAR Qualified Products List database. Pentair commented, and APSP agreed, that analysis they conducted using actual test data generated WEF scores that were different from DOE's estimates, sometimes by up to 20 percent. APSP and Pentair recommended that DOE reevaluate the various efficiency levels using actual test data instead of estimates based on ENERGY STAR data points. (APSP, No. 8 at p. 2; Pentair, No. 11 at p. 6) DOE interprets APSP and Pentair's comments to be specific to self-priming pool filter pumps, which are the only variety of pool pump that are listed in the ENERGY STAR Qualified Products List database. [9]

In response to APSP and Pentair, DOE notes that the tested data points for all self-priming pool filter pumps were based on certification data from the ENERGY STAR Qualified Products List database, as well as other entities besides ENERGY STAR. DOE incorporated certification data from the CEC (including current and historical data), APSP, and ENERGY STAR, and included other data provided by DPPP manufacturers in DOE's Self-Priming Pool

[9] ENERGY STAR maintains a database of certified products, including pool pumps. See https://www.energystar.gov/productfinder/product/certified-pool-pumps/results

Filter Pump database.[10] (Docket No. EERE-2015-BT-STD-0008, No. 94 at pp. 24–30) DOE presumes the data in these databases to be accurate and determined in accordance with the appropriate test procedures. As discussed further in section III.G.4, these test procedures are consistent with the test procedure recommended by the DPPP Working Group and adopted by DOE in this final rule. Therefore, the data in the ENERGY STAR, CEC, and APSP databases are deemed to be consistent with data generated in accordance with the adopted DPPP test procedure.

DOE notes that WEF scores used to establish efficiency levels for single-speed and two-speed self-priming pool filter pumps were directly calculated from actual known test data points at appropriate load points, and no mathematical estimations were employed. However, as discussed in the DPPP Working Group, DOE acknowledges that, for variable-speed self-priming pool filter pumps, the WEF scores used to establish efficiency levels considered for energy conservation standards were mathematically estimated from certain known test data points contained in DOE's database. (Docket No. EERE-2015-BT-STD-0008, No. 94 at pp. 26–31)

DOE pursued the mathematical estimation of WEF scores because the variable-speed self-priming pool filter pump performance data contained in above-mentioned databases does not always align with the load points (i.e., speed settings) needed to evaluate each pump against the WEF metric. Specifically, DOE's mathematical estimations were derived from a regression analysis of known variable-speed self-priming pool filter pump data points. Furthermore, as DOE described during the DPPP Working Group meetings, DOE used actual test stand data

[10] Docket No. EERE-2015-BT-STD-0008, No. 102

provided by DPPP manufacturers to validate the estimation methodology. (Docket No. EERE-2015-BT-STD-0008, No. 94 at pp. 28–34) Ultimately, DOE publically presented its regression methodology to the DPPP Working Group for input and no members of the DPPP Working Group offered sustained objections to the methodology or results during the Working Group meetings.[11] (Docket No. EERE-2015-BT-STD-0008, No. 94 at pp. 24–34)

In addition, and as discussed in the DPPP Working Group, DOE acknowledges that the estimated WEF scores for variable-speed pumps are subject to mathematically uncertainty. As a part of the DPPP Working Group meetings, DOE mathematically quantified this uncertainty and provided the DPPP Working Group with a revised variable-speed efficiency level option that would conservatively account for this uncertainty. (Docket No. EERE-2015-BT-STD-0008, No. 100 at pp. 118–121) Ultimately, as a part of their energy conservation standard negotiations, the DPPP Working Group decided not to account for such uncertainty in the variable-speed efficiency level. (Docket No. EERE-2015-BT-STD-0008, No. 92 at pp. 281–283) Consequently, DOE believes that the concept of WEF score uncertainty for variable-speed pumps was well understood by the DPPP Working Group, including the commenters.

In general, DOE developed efficiency level options for the DPPP Working Group based on the best data and analytical methods that were available at the time. In light of the concerns raised by APSP and Pentair, DOE reevaluated its variable-speed WEF estimation methodology, but found no technical inaccuracies. In the absence of new data (noting that APSP and Pentair

[11] The CA IOUs initially objected to the results of the regression methodology, saying that previous CA IOU efforts had gathered data that did not fit the regression trend presented by DOE. (Docket No. EERE-2015-BT-STD-0008, CA IOUs, No. 94 at pp. 30–31) In a subsequent meeting the CA IOUs rescinded their objection and stated that previous CA IOUs analysis shows the same results as DOE's regression methodology. (Docket No. EERE-2015-BT-STD-0008, CA IOUs, No. 95 at pp. 4–5)

did not submit to DOE any test data to substantiate their claims), DOE has no means to adjust its variable-speed WEF estimation methodology at this time. Furthermore, DOE believes that data uncertainty concerns raised by APSP and Pentair were sufficiently considered by the DPPP Working Group, and adjustment to DOE's analysis, based on new test data (if made available), would not materially impact the recommendations of the DPPP Working Group. Therefore, DOE will not reevaluate self-priming pool filter pump efficiency levels using new test data, as recommended by APSP and Pentair. DOE notes that DOE would establish any energy conservation standards as part of a separate rulemaking. (Docket No. EERE-2015-BT-STD-0008)

In written comments, Nidec stated that it believed that there should be a public comment period for the related energy conservation standards and requested information on the timing of the ECS rulemaking as well as the opportunity for public review and comment. (Nidec, No. 10 at p. 4) DOE notes that the related energy conservation standards were negotiated through the DPPP Working Group and approved by ASRAC,[12] and that notice of all meetings were published in the Federal Register.[13] All meetings were open and provided opportunity for public comment. In addition, the public will have 110 days to submit public comments on the forthcoming Direct Final Rule.

[12] Docket No. EERE-2013-BT-NOC-0005, No. 87.
[13] See https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=67 and https://www.regulations.gov/docket?D=EERE-2015-BT-STD-0008.

B. Definitions

In this final rule, DOE is adopting definitions for the term dedicated-purpose pool pump, several sub-varieties of dedicated-purpose pool pumps, and the variations of DPPP operating speed configurations. DOE is also adopting definitions pertinent to categorizing and testing dedicated-purpose pool pumps in accordance with the DOE test procedure. In general, ASAP and NRDC commented that they agreed with DOE's proposed definitions. (ASAP and NRDC, No. 12 at p. 1) DOE appreciates the support of ASAP and NRDC. DOE presents these definitions in the subsequent sections. In addition, DOE is adopting definitions and methods for determining several terms related to describing DPPP capacity, 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.G.1.

1. Existing Pump Definitions

DOE notes that because dedicated-purpose pool pumps are a style of pump, some terms defined at 10 CFR 431.462, as adopted in the January 2016 general pumps test procedure final rule, also apply to dedicated-purpose pool pumps, including bare pump, mechanical equipment, driver, and control. 81 FR 4086, 4090-4091 (Jan. 25, 2016). In addition, as dedicated-purpose pool pumps are end suction pumps, DOE believes the definition for end suction pump established in the January 2016 general pumps test procedure final rule also applies to dedicated-purpose pool pumps. In the January 2016 general pumps test procedure 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 established in the January 2016 general pumps test procedure final rule also applies to dedicated-purpose pool pumps. Id. at 4147.

In the September 2016 DPPP test procedure NOPR, DOE used the term "dry rotor" as a part of the definition of pressure cleaner booster pumps. 81 FR 64580, 64591 (Sept. 20, 2016). DOE also discussed how the term "dry rotor pump" applies to dedicated-purpose pool pumps and asserted that, to DOE's knowledge, all dedicated-purpose pool pumps are dry rotor (as defined in the January 2016 general pumps final rule[14]). 81 FR 64580, 64587 (Sept. 20, 2016) DOE requested comment on the assertion that all dedicated-purpose pool pumps are dry rotor pumps.

In written comments, APSP, Hayward, and Zodiac commented that all of the dedicated-purpose pool pumps covered by this rule are typically dry rotor pumps. (APSP, No. 8 at p.3; Hayward, No. 6 at p. 1; Zodiac, No. 13 at p. 1) However, APSP and Zodiac also requested a clearer definition of dry rotor and wet rotor style pumps. APSP, No. 8 at p. 3; Zodiac, No. 13 at p. 1) APSP, Hayward, and Zodiac also inquired how a wet rotor pump (such as a pump with a water-cooled motor) may be impacted by the dry rotor definition. (APSP, No. 8 at p.3; Hayward, No. 6 at p. 1; Zodiac, No. 13 at p. 1)

In response to APSP and Zodiac's request for clarification regarding the terms dry rotor and wet rotor, DOE defined dry rotor and wet rotor pumps in the January 2016 general pumps

[14] DOE defines "dry rotor pump" as a pump in which the motor rotor is not immersed in the pumped fluid. 10 CFR 431.462

test procedure final rule. 81 FR 4086, 4146 (Jan. 25, 2016). Dry rotor pump means a pump in which the motor rotor is not immersed in the pumped fluid. Conversely, a wet rotor pump is one in which the motor rotor is immersed in the pumped liquid. Id. at 4101 (Jan. 25, 2016) The rotor is the portion of the motor that rotates and provides torque to output shaft (which may be integral to the rotor). For most motors varieties, including all known dedicated-purpose pool pump motors, the rotor is an internal component of the motor, which resides inside the motor stator. If any significant amount of liquid is present in-between the stator and rotor during operation, the rotation of the motor rotor will cause the liquid to surround or cover the rotor (i.e., immerse it). Consequently, such a configuration would be considered a wet rotor pump. Alternatively, if a dedicated-purpose pool pump has no significant amount of liquid between stator and rotor, the rotation of the rotation will not cause the liquid to surround or cover the rotor (i.e., immerse it), and thus such a configuration would not be considered a dry rotor pump. DOE notes that the water-resistance of, or ability to immerse, the exterior casing of a motor has no relation to the definition of wet rotor and dry rotor pump.

DOE believes these definitions are clear and unambiguous and do not require further clarification.

Regarding how a wet rotor pump would be treated under DOE's new dedicated-purpose pool pump regulations, DOE understands that pressure cleaner booster pumps are the only variety of dedicated-purpose pool pump that use the term "dry rotor" within the definition (i.e., a pressure cleaner booster pump is a dry rotor pump). Consequently, the test procedure will only be applicable to dry rotor pressure cleaner booster pumps, as non-dry rotor variants would not meet the definition of a pressure cleaner booster pump. The remaining varieties of dedicated

purpose pool pumps make no specification to whether the pump is, or is not, dry rotor. Consequently, both dry rotor and non-dry rotor pumps will meet certain definitions established in this final rule, and would thus be subject to the test procedure.

DOE received no other comments regarding the use of dry rotor, within the definition of pressure cleaner booster pump. Therefore, the term dry rotor pump will remain a part of the definition of pressure cleaner booster pump.

Additional definitions from the January 2016 general pumps test procedure final rule that apply to dedicated-purpose pool pumps, include the definition of basic model (discussed further in section III.B.8), the definitions incorporated by reference from HI 40.6–2014 (discussed further in section III.E.1), and the definition of self-priming pump (discussed further in section III.B.3.a). While other terms may be applicable to the description of dedicated-purpose pool pumps, they are not referenced in any of the DPPP definitions or specifications of the DPPP test procedure.

2. Definition of Dedicated-Purpose Pool Pump

Consistent with the recommendations of the DPPP Working Group, DOE proposed in the September 2016 DPPP test procedure NOPR to define dedicated-purpose pool pump as follows:

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. 81 FR 64580, 64587 (Sept. 20, 2016).

DOE received no comments in response to the proposed definition of dedicated-purpose pool pump. Therefore, DOE is adopting the definition of dedicated-purpose pool pump as proposed in the September 2016 DPPP test procedure NOPR.

In the September 2016 DPPP test procedure NOPR, DOE also proposed definitions for each DPPP variety based on DPPP Working Group recommendations. These definitions are discussed in more detail in sections III.B.3, III.B.4, and III.B.5.

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 that circulates water through a pool and filtration system and removes large debris using a basket strainer or other device. Consistent with the recommendations of the DPPP Working Group, in the September 2016 DPPP test procedure NOPR, DOE proposed 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); 81 FR 64580, 64587 (Sept. 20, 2016).

In the September 2016 DPPP test procedure NOPR, DOE requested comment on the proposed definition of pool filter pump. No comments, negative or positive, were received regarding the proposed definition of pool filter pump. Therefore, in this final rule, DOE adopts the definition of pool filter pump as proposed in the September 2016 DPPP test procedure NOPR.

a. Definition of a Basket Strainer and Filtration Accessories

The definition of pool filter pump includes the use of a basket strainer to differentiate pool filter pumps from other varieties of end suction pumps. 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)

To establish what would be considered a "removable cartridge filter" and 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 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 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 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)

In the September 2016 DPPP test procedure NOPR, DOE noted 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. As such, DOE proposed adopting the definitions for basket strainer, removable cartridge filter, and sand filter, as recommended by the DPPP Working Group. 81 FR 64580; 64587–88 (Sept. 20, 2016).

In response to the proposed definition of basket strainer, Pentair submitted a written comment stating that there is a possibility of manufacturers using the 1mm size restriction as a loophole to create a strainer basket with very small openings, which would not meet DOE's

definition for pool filter pumps. Pentair acknowledged that doing so would significantly limit the utility of the pump in pool filtration applications. However, Pentair noted that consumers could throw away the original basket strainer and replace it with one that has more reasonable opening size. (Pentair, No. 11 at p. 1)

In response, DOE acknowledges Pentair's concern regarding the potential for manufacturers to circumvent the regulation through adjusting the opening size on the basket strainer. In the DPPP Working Group negotiations, the DPPP Working Group discussed the opening size as the clearest and most unambiguous way to differentiate between basket strainers and removable cartridge filters. During that discussion, Hayward raised the possibility that the filter basket opening size may limit future design flexibility. DOE responded that DOE definitions and analysis are developed around filter basket designs that are currently available on the market. DOE also noted that a filtration apparatus that does not meet the definition established in this rule could be considered in a future rulemakings, if such designs are developed. (Docket No. EERE-2015-BT-STD-0008, CA IOUs, DOE, Waterway, and Zodiac, No. 53 at pp. 13–19) Also, as noted by Pentair, the opening size of the basket filter directly impacts its utility as a filtration device. Therefore, DOE believes that the market will effectively discourage manufacturers from producing pool filter pumps with ineffective basket filters. However, DOE will monitor the market as this test procedure and any associated energy conservation standards take effect and, if DOE observes any such circumvention, DOE may reconsider the definition of basket strainer as necessary.

DOE received no other comments related to the proposed definitions of basket strainer, removable cartridge filter, or sand filter. Therefore, DOE is adopting the definitions of these terms as proposed in the September 2016 DPPP test procedure NOPR.

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 self-priming versus non-self-priming 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." 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)

In the September 2016 DPPP test procedure NOPR, based on feedback from the DPPP Working Group, DOE proposed definitions for self-priming and non-self-priming pool filter pumps, as well as a method to differentiate the two. Specifically, in the September 2016 DPPP test procedure NOPR, DOE proposed the following definitions for self-priming and non-self-priming pool filter pumps:

Self-priming pool filter pump means a pool filter pump that is certified under NSF/ANSI 50–2015[15] 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.

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. 81 FR 64580, 64647–68 (Sept. 20, 2016).

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

[15] NSF International (NSF)/ANSI Standard 50–2015, ("NSF/ANSI 50–2015"), "Equipment for Swimming Pools, Spas, hot Tubs and Other Recreational Water Facilities."

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 5.0 feet, consistent with the NSF/ANSI 50–2015 requirement. This ensures that all pool filter pumps that can achieve a vertical lift of 5.0 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.

The criterion for true priming time recommended by the DPPP Working Group and proposed in the September 2016 DPPP test procedure NOPR is 10.0 minutes, as opposed to the 6 minutes specified in NSF/ANSI 50–2015. 81 FR 64580, 64589 and 64647 (Sept. 20, 2016). 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 10.0 minutes was more appropriate and comprehensive. 81 FR 64580, 64589 (Sept. 20, 2016). DOE proposed a vertical lift and true priming time of 5.0 feet and 10.0 minutes in order to clearly specify the appropriate and required level of precision in the definitions and test method. Id.

DOE notes that these definitions rely on the NSF/ANSI 50–2015 test method to determine self-priming capability. DOE's 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.G.2.

The definitions proposed for self-priming and non-self-priming pool filter pumps in the September 2016 DPPP test procedure NOPR also explicitly exclude waterfall pumps. As

discussed in section III.B.4.a, waterfall pumps are pool filter pumps and could meet a definition of either self-priming or non-self-priming, unless explicitly excluded from those definitions. Because DOE intended for these pumps to be treated specifically as waterfall pumps, the proposed definitions for self-priming and non-self-priming pool filter pumps both specifically excluded waterfall pumps.

DOE notes that, in the January 2016 general pumps test procedure 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, in the September 2016 DPPP test procedure NOPR, DOE discussed how 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. Therefore, DOE proposed to revise the definition of self-priming pump to ensure the definition of self-priming is comprehensive and consistent with the new definitions for self-priming and non-self-priming pool filter pump. Specifically, DOE proposed in the September 2016 DPPP test procedure NOPR to modify the existing definition of self-priming pump to also include self-priming pool filter pumps, in addition to the other referenced criteria. 81 FR 64580, 64648 (Sept. 20, 2016).

In response to DOE's proposal, CEC commented in support of DOE's proposal to differentiate self-priming from non-self-priming pool pumps using the NSF/ANSI 50–2015. (CEC, No. 7 at p.2)

During the September 2016 public meeting, Hayward requested clarification of the reference to NSF/ANSI 50–2015 asking if changes are made to that standard, would manufacturers be bound to those changes. (Hayward, Public Meeting Transcript, No. 3 at p. 20) As stated during the September 2016 public meeting, DOE incorporates by reference a specific edition of a specific standard. If that standard is updated, DOE would need to update the reference within their test procedure. Until such an update is made, manufacturers are held to the standard adopted in the DOE test procedure.

Hayward also submitted a written comment in response to DOE's proposed definition of self-priming and non-self-priming pool filter pumps. Hayward recommended that DOE remove the requirement to test whether a non-self-priming pump is capable of self-priming. Hayward stated that requiring pumps not marketed or sold as self-priming pumps to be tested for self-priming capability would be unnecessarily burdensome. Hayward recommended that the definition of non-self-priming pumps be revised to designate pumps that are "not marketed or sold as self-priming," rather than pumps that are not capable of self-priming. (Hayward, No. 6 at p.1)

In response to Hayward's inquiry, DOE clarifies that manufacturers may certify their pump models to DOE as non-self-priming without testing, so long as manufacturers are certain that the non-self-priming pump model has vertical lift (of lack thereof) and true priming time characteristics consistent with DOE's definition of non-self-priming pool filter pump. That is, the non-self-priming pump would meet the definition of non-self-priming, if it were to be tested in accordance with DOE's test method for verifying self-priming capability (see section III.G.2). Consequently, manufacturers are not required to actually test each non-self-priming pump model

to prove that such a pump is non-self-priming. However, in enforcement testing, DOE will use the definition of non-self-priming pool filter pump and the additional test method described in section III.G.2 to ensure that manufacturers are properly categorizing their pool filter pumps as either self-priming or non-self-priming in accordance with the adopted definitions. Consequently, DOE believes that the definition of non-self-priming pool filter pumps does not introduce any additional testing burden, as DOE believes that manufacturers already know whether their pumps currently marketed as "non-self-priming" would meet the definition established in this final rule. With no additional burden, DOE believes that amending the definition of non-self-priming pool filter pumps is not warranted. In addition, DOE notes that establishing a clear, quantitative threshold to differentiate self-priming and non-self-priming pool filter pumps is important to confirm that the pumps are appropriately differentiated based on the utility (i.e., self-priming capability) they are able to provide.

Hayward also requested clarification regarding the definition of self-priming pool filter pumps. APSP and Hayward asked if 10 minutes is the maximum time allowed to reach prime and meet the self-priming requirement. (APSP, No. 8 at p. 3; Hayward, No. 6 at p.1)

The proposed definition for a self-priming pool filter pump allows manufacturers to meet the definition of self-priming pool filter pump in one of two ways. Manufacturers may show that a pool filter pump is self-priming by certifying the pool filter pump as self-priming in accordance with NSF/ANSI 50–2015. Alternatively, manufacturers may show that a pool filter pump is a self-priming pool filter pump by demonstrating that a pump is capable of re-priming to a vertical lift of at least 5.0 feet with a true priming time of less than or equal to 10.0 minutes, without certifying the pump to NSF/ANSI 50–2015. 81 FR 64580, 64589. The NSF/ANSI 50–2015

standard does not specify a maximum true priming time. Section C.3.5 of NSF/ANSI 50–2015 states that, "if a pump is to be designated as self-priming, the true priming time for each run shall not exceed 6 min or the manufacturer's recommended time, whichever is greater." To certify a pump's self-priming capability under NSF/ANSI 50–2015, a manufacturer could recommend a true priming time greater than 10.0 minutes. Under the proposed definition of self-priming pool filter pump, if a pool filter pump has true priming time greater than 10.0 minutes but is certified as self-priming under NSF/ANSI 50–2015, that pump would qualify as a self-priming pool filter pump. However, if the pump is not certified under NSF/ANSI 50–2015, the pump must be capable of re-priming to a vertical lift of 5.0 feet with a true priming time of less than or equal to 10.0 minutes in order to be classified as a self-priming pump.

In written comments, Pentair pointed out that NSF requires pumps to prime to 10 feet in order to be classified as "self-priming" without listing a qualifying height, but allows a product to be certified as self-priming in the 5 to 10 foot range if accompanied by a qualifying height and time to prime. Pentair added that DOE's proposal does not require the listing of the qualifying height and suggested that the definition of self-priming pump should reflect the non-qualified definition of 10 feet. (Pentair, No. 11 at p. 1)

Pentair also disagreed with DOE's attempt to separate dedicated-purpose pool pumps intended for aboveground and inground applications by using non-self-priming and self-priming characteristics, respectively. Specifically, Pentair argued that there are many self-priming aboveground pumps currently in the market that would become non-viable under DOE's proposed definitions. Pentair further notes that while modifications could be made to these existing aboveground pumps to prevent them from priming, such changes would negatively

impact pump efficiency and reduce energy savings for this category of non-self-priming pumps. (Pentair, No. 11 at p. 2)

In response to Pentair's comments regarding DOE's specified vertical lift of 5.0 feet, DOE recommended the vertical lift of 5.0 feet based on the discussions and recommendation of the DPPP Working Group. (Docket No. EERE-2015-BT-STD-0008, Hayward, No. 79 at pp. 160; Zodiac, No. 79 at pp. 161–162) DOE notes that, as mentioned previously, this ensures that all pool filter pumps that can achieve a vertical lift of 5.0 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. DOE reviewed NSF/ANSI 50–2015 and notes that, contrary to Pentair's comment, section 6.9.1 of NSF/ANSI 50–2015 requires that the maximum vertical lift be specified if the pump is designated as self-priming, as determined in accordance with section C.3 of NSF/ANSI 50–2015. NSF/ANSI 50–2015 does not appear to provide the discretion indicated by Pentair if the vertical lift is 10 feet. In this final rule, DOE is adopting a definition specifying a vertical lift of 5.0 feet, as proposed in the September 2016 DPPP test procedure NOPR, to maintain consistency with NSF/ANSI 50–2015.

In response to Pentair's comments regarding the differentiation of self-priming and non-self-priming pool filter pumps, DOE proposed to differentiate these two styles of pool filter pumps based on the recommendations of the DPPP Working Group. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #2A at p. 2) DOE acknowledges that one factor associated with the differentiation of self-priming and non-self-priming pool filter pumps is their ability to service inground pools. That is, the capability of a pump to self-prime is a fundamental utility associated with the ability of a pump to service an inground pool, as the pump is typically

installed on the ground next to the pool, above the water line of the pool. Therefore, the pump must be self-priming in order to reliably circulate water on a continual basis. Conversely, pumps serving aboveground pools are typically installed below the water line and, therefore, gravity can serve to maintain the prime in the pump. Although pumps serving aboveground pools could be self-priming or non-self-priming, self-priming pumps do not provide the same utility to aboveground pools because they require modifications that reduce the energy efficiency benefits that self-priming pumps provide. Non-self-priming pumps do not require those modifications, which benefits the consumer and provides a distinct utility to the end user. This utility is a feature that allows DOE to separate the two styles of pumps into distinct equipment classes. In addition, self-priming pumps are more efficient than non-self-priming pumps, and merging the product classes could result in the unavailability of the feature that non-self-priming pumps provide. For these reasons, consistent with the recommendations of the DPPP Working Group, in this final rule DOE adopts definitions of non-self-priming and self-priming pool filter pumps based on their capability to self-prime.

DOE received no other comments related to the proposed definitions for self-priming and non-self-priming pool filter pumps or the revision to the definition of self-priming pump established in the January 2016 general pumps test procedure final rule. However, in reviewing the definitions, DOE notes that the vertical lift and true priming time should refer to the DOE test method to verifying self-priming capability, which DOE is adopting in this final rule (see section III.G.2) as opposed to the test method in NSF/ANSI 50-2015. As discussed in section III.G.2, DOE's test method for verifying self-priming capability incorporates by reference the test method in section C.3 of NSF/ANSI 50-2015, but also adds several clarifications and additions to improve the repeatability and consistency of the test. DOE believes this is consistent with the

DPPP Working Group's intent, whereby a self-priming pool filter pump would either be certified with NSF/ANSI 50-2015 or have the specified vertical lift and true priming time. DOE's self-priming capability test method is designed to verify the criteria established by the DPPP Working Group. Therefore, in this final rule, DOE is adopting definitions for self-priming and non-self-priming pool filter pumps based on certification with NSF/ANSI 50–2015 and the criteria recommended by the DPPP Working Group, as tested pursuant to the DOE test procedure, with minor modifications regarding the level of precision required by the criteria. DOE is also adopting the changes proposed to the definition of self-priming pump to align with the new definitions for self-priming and non-self-priming pool filter pumps.

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. Some of these pumps are integrally and permanently mounted to a filtration accessory such as an integral cartridge-filter or sand-filter. These particular pumps can only be operated with the integral filtration accessory inline—the filtration accessory cannot be plumbed out for the purposes of testing. The DPPP Working Group recommended establishing prescriptive requirements for these pumps, 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 would not be necessary and, therefore, not applicable.

To clearly differentiate integral cartridge-filter and integral sand-filter pool pumps from other varieties of dedicated-purpose pool pumps, the DPPP Working Group recommended definitions for integral cartridge-filter pool pump and integral sand-filter pool pump. The recommended definitions create differentiation based on the physical construction of the pump. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #4 at pp. 2–3) In the September 2016 DPPP test procedure NOPR, DOE proposed to adopt the definitions for integral cartridge-filter pool pump and integral sand-filter pool pump recommended by the DPPP Working Group, with a few minor changes to use consistent terminology in both definitions. Specifically, DOE proposed 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 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. 81 FR 64580, 64590 (Sept. 20, 2016).

APSP stated that the proposed definitions for integral cartridge-filter pool pump and integral sand-filter pool pump are acceptable and consistent with DPPP Working Group meetings. (APSP, No. 8 at p. 3) DOE appreciates APSP's comment. DOE received no other

comments related to the proposed definitions for integral cartridge-filter pool pump and integral sand-filter pool pump. Therefore, DOE is adopting the definitions as proposed in the September 2016 DPPP test procedure NOPR.

4. Other Varieties of Dedicated-Purpose Pool Pumps

In addition to pool filter pumps, DOE identified varieties of dedicated-purpose pool pumps that are used to drive auxiliary pool equipment such as pool cleaners and water features. These pumps, which include waterfall pumps and pressure cleaner booster pumps, are discussed in greater detail in the following sections.

a. Waterfall Pumps

Within the pool pump industry, a certain variety of pump exists, which is specifically intended to pump water for water features, such as waterfalls. These pumps are similar in construction to pool filter pumps, except that they only 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.B.3.a, but are always equipped with a lower speed motor (approximately 1,800 rpm) in order to provide the specific high flow, low head characteristics required for typical water feature applications. Based on this unique construction and end user utility, the DPPP Working Group recommended to differentiate waterfall pumps from self-priming and non-self-priming pool filter pumps. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #4 at pp. 2–4) In accordance with the intent of the December 2015 DPPP Working Group's recommendation, DOE proposed in the September 2016 DPPP test procedure NOPR 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." 81 FR 64580, 64590 (Sept. 20,

2016). This definition uses maximum head and a specific maximum speed to distinguish waterfall pumps from other varieties of pool filter pumps.

During the September 2016 DPPP test procedure NOPR public meeting, Pentair pointed out that there was a minor typo on page 81 FR 64590 regarding the description of waterfall pumps. Pentair noted that the text read "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" where it should actually refer to their low head requirements, not low flow requirements. (Pentair, Public Meeting Transcript, No. 3 at p. 74) APSP and Pentair reiterated this point in their written comments, pointing out that it is the low head requirements that make use of a higher speed 2-pole motor unnecessary. (APSP, No. 8 at p. 2; Pentair, No. 11 at p. 5) DOE agrees with APSP and Pentair that the statement should refer to the low head requirements of waterfall pumps and that the preamble text in the NOPR was in error.

DOE received no other comments related to the proposed definition of waterfall pump. Therefore, DOE is adopting the definition of waterfall pump as proposed in the September 2016 DPPP test procedure NOPR, with the clarification that the maximum head value is the value certified to DOE.

b. Pressure Cleaner Booster Pumps

Pressure cleaner booster pumps provide water pressure that is used to propel pressure-side pool cleaners along the bottom of the pool and remove debris as the cleaner moves. To

perform this task, a pressure cleaner booster pump must provide high head (i.e., pressure) at 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.

After considering the design, construction, and performance of pressure cleaner booster pumps, 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 proposed in the September 2016 DPPP test procedure NOPR 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." 81 FR 64580, 65491–92 (Sept. 20, 2016).

In response to definition of pressure cleaner booster pump proposed in the September 2016 DPPP test procedure NOPR, the CA IOUs suggested that DOE should include the UL

listing as a requirement rather than an illustrative characteristic. CA IOUs justified this suggestion, by reasoning that in order to be used on pools, most local inspection authorities would want to see the UL label. (CA IOUs, Public Meeting Transcript, No. 3 at pp. 18–19) Conversely, in written comments, Hayward, APSP, and Zodiac asserted that the phrase "be UL listed" should not be included in the definition of pressure cleaner booster pump as it would require a manufacturer to work solely with UL and that DOE should not seek to require manufacturers to list pressure cleaner booster pumps in accordance with a 3rd party, voluntary standard. (Hayward, No. 6, at p. 2; APSP, No. 8 at p. 3; Zodiac, No. 13 at pp. 1–2) Hayward, APSP, and Zodiac further questioned the benefit of adding a statement referencing the UL standard since, while UL 1081 is the de facto standard and is applicable to all DPPP, it is not a requirement in the United States to certify products to the standard and it does not necessarily distinguish a pressure cleaner booster pump from a non-pressure cleaner booster pump. (Id.)

As noted during the September 2016 DPPP test procedure NOPR public meeting, DOE does not wish to narrow or restrict the definition of pressure cleaner booster pump to only those pumps UL listed under ANSI/UL 1081, because DOE is not fully confident that all pressure cleaner booster pumps require such a listing in order to be installed in all pools in the United States. This understanding is consistent with Hayward, APSP, and Zodiac's written comments suggesting removing the reference to ANSI/UL 1081 certification. Therefore, because it is possible that some jurisdictions may not require such a listing, DOE does not wish to limit the definition of pressure cleaner booster pump to pumps with a UL listing if the pump is in fact designed and marketed for pressure-side pool cleaner applications. However, DOE agrees with CA IOUs that the majority of jurisdictions require UL listing for installation of dedicated-purpose pool pumps, including pressure cleaner booster pumps, in pools. This is why DOE

believes that such listing is a useful characteristic to use for distinguishing pressure cleaner booster pumps from other end suction pumps not intended for pools. While helpful, this reference does not require pressure cleaner booster pumps to be certified with UL or any other 3rd party entity. The controlling criteria for determining whether a pump meets DOE's definition of pressure cleaner booster pump is whether that pump is designed and marketed for pressure-side cleaner applications. As such, DOE believes that referencing ANSI/UL 1081 certification continues to be a useful, illustrative indicator for identifying pressure cleaner booster pumps, although it is not mandatory and pressure cleaner booster pumps may still meet the definition regardless of whether they are certified under ANSI/UL 1081 or not. That is, DOE believes the intended application of the pump, as indicated by the pump's own marketing literature, is the best indication of whether or not that pump is a pressure cleaner booster pump, regardless of whether the pump is UL listed under ANSI/UL 1081.

APSP, Hayward, and Zodiac also pointed out in their written comments that the current edition of ANSI/UL 1081 is the 2016 version of the standard, not the 2014 version proposed to be incorporated by reference in the September 2016 DPPP test procedure NOPR. (APSP, No. 8 at p.3; Hayward, No. 6 at pp. 1–2; Zodiac, No. 13 at pp. 1–2) DOE has reviewed ANSI/UL 1081-2016 and finds it to be similar in content and intent to the 2014 edition of the standard. Therefore, in order to reference the most recent and relevant version, DOE is incorporating by reference ANSI/UL 1081–2016 in this final rule.

No other comments were received related to the proposed definition of pressure cleaner booster pump. Therefore, for the reasons discussed in this section and the September 2016 DPPP test procedure NOPR, DOE is adopting the definition of pressure cleaner booster pump as

proposed in the September 2016 DPPP test procedure NOPR, except the adopted definition references ANSI/UL 1081–2016 instead of ANSI/UL 1081–2014.

To provide clarity and remove ambiguity when applying the definition for pressure cleaner booster pump, DOE also proposed a definition for "designed and marketed" that DOE would use when determining the applicability of any DPPP test procedure or energy conservation standards to such pumps. Specifically, DOE proposed to define "designed and marketed" as meaning 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). 81 FR 64580, 64647 (Sept. 20, 2016).

In response to this proposal, CA IOUs expressed concern that the inclusion of "designed and marketed" in the definition of pressure cleaner booster pump could create a loophole where products could be used as pressure cleaner booster pumps even if not specifically marketed for that purpose and, in turn, avoid regulation. (CA IOUs, Public Meeting Transcript, No. 3 at pp. 23–24) ASAP also commented that the proposed definition for designed and marketed seemed to be narrow, pointing to a scenario where a pump is designed as a booster pump for pool applications but is also marketed by the manufacturer for another application. ASAP requested clarification if in this scenario the pump in question would be required to meet the standard. (ASAP, Public Meeting Transcript, No. 3 at pp. 22–23) In written comments, ASAP and NRDC also encouraged DOE to attempt to ensure that the definition for "designed and marketed" does not contain any loopholes. Specifically, ASAP and NRDC supported the definition of designed and marketed presented in the regulatory text portion of the September 2016 DPPP test

procedure NOPR over the one presented in the preamble.[16] Additionally, ASAP and NRDC encouraged DOE to consider whether removing the word "specifically" may further reduce the possibility for potential loopholes and suggested removing the word "all" from "all publicly available documents" to ensure pumps are considered pressure cleaner booster pumps in cases where the designation is on some publicly available documents, but not others. (ASAP and NRDC, No. 12 at pp. 1–2) Similarly, CA IOUs recommended that DOE remove the word "specifically," in order to address pumps designed for both pressure cleaner and domestic water booster pump applications, and change "all" to "any" publicly available documents. (CA IOUs, No. 9 at pp. 2–3)

In response to CA IOUs' concern about pumps used as pressure cleaner booster pumps but not marketed as such, DOE acknowledges that some individuals may attempt to use inappropriate pumps to run pressure-side cleaner applications. However, it is DOE's understanding that pressure-side pool cleaners are designed to be paired with pumps with specific characteristics (e.g., high head and low flow) and that manufacturers all design and market specific pumps intended for this application. DOE also notes that pumps without these specific characteristics would not provide adequate utility in the pressure-side pool application and manufacturers would recommend against the use of such pumps with their pressure-side cleaners. Therefore, while DOE acknowledges the concern of CA IOUs, DOE cannot control the actions of installers who may select inappropriate pumps for pressure-side cleaner applications, and DOE believes that all pumps appropriate for pressure-side pool cleaner applications are

[16] The definition of designed and marketed contained in the preamble (81 FR 64580, 6464592; Sept. 20, 2016) did not exactly match the definition of designed and marketed proposed in the regulatory text (Id. at 64647). Specifically, the preamble definition contained the words "exclusively" and "solely."

currently specifically designed and marketed as such. DOE will continue to monitor the market to ensure that this continues to be the case and that all pumps appropriate for pressure-side pool cleaner applications continue to be characterized as pressure cleaner booster pumps in the future.

In response to the concerns of ASAP, NRDC, and CA IOUs regarding the applicability of the designed and marketed definition to pumps that may be marketed for a variety of applications, in addition to pressure-side pool cleaner applications, DOE agrees with the commenters. Specifically, all pumps designed and marketed for pressure-cleaner booster applications should be treated as pressure cleaner booster pumps, regardless of any other applications for which they may be designed and marketed. DOE acknowledges that the definition of designed and marketed that was presented in the preamble of the September 2016 DPPP test procedure NOPR (81 FR 64580, 64592) was slightly different than that contained in the proposed regulatory text (Id. at 64647) and may have created confusion regarding the applicability of the designed and marketed definition. Specifically, in the preamble, DOE discussed defining the term 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). Id. DOE notes that the definition presented in the preamble was incorrect and the definition presented in the regulatory text on page 64647 of the NOPR was the intended definition. DOE believes that the definition contained in the regulatory text, which does not refer to the exclusivity of the design or that the equipment would be solely marketed for a specific purpose, is broader and inclusive of pumps that would be designed and marketed for pressure-side cleaner applications in addition to other applications. However, DOE agrees with ASAP, NRDC, and CA IOUs, that removal of

the term "specifically" would help clarify this aspect of the definition. In addition, DOE agrees that changing from "all publicly available documents" to "any publicly available documents" best fulfills the intent of the definition, as any marketing of a pump as a pressure cleaner booster pump would show that the pump is intended to be treated as a pressure cleaner booster pump.

Therefore, DOE is defining the term "designed and marketed" in this final rule as meaning "that the equipment is 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 any publicly available documents (e.g., product literature, catalogs, and packaging labels)."

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.B.3.a) to operate the spa. Conversely, for portable spas, a specific-purpose pump is typically distributed in commerce with the portable spa that is specifically designed and marketed for portable electric spa applications only. Such portable electric spa applications can be further differentiated into two general categories: storable electric spas and rigid 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.

In the September 2016 DPPP test procedure NOPR, consistent with the recommendations of the DPPP Working Group (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #4 at p. 3), DOE proposed definitions for "storable electric spa pump" and "rigid electric spa pump" to effectively differentiate them from other varieties of pumps. Specifically, DOE proposed 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." DOE also proposed to define "rigid electric spa pump" 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 bare pump; and (3) uses a casing or volute and connections constructed of a non-metallic material." 81 FR 64580, 64592–93 (Sept. 20, 2016).

DOE received no comments negative or positive related to the proposed definitions for storable electric spa pump and rigid electric spa pump. Therefore, DOE is adopting the definitions for these terms as proposed in the September 2016 DPPP test procedure NOPR.

In addition, DOE notes that the definitions for storable electric spa pump, as well as the definitions for integral cartridge-filter pool pump and integral sand-filter pool pump (see section III.B.3.c), all utilize the term "integral" as part of the definition. In support of these definitions,

the DPPP Working Group recommended a definition for integral. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #4 at p. 7) In the September 2016 DPPP test procedure NOPR, DOE proposed the definition recommended by the DPPP Working Group and proposed 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." 81 FR 64580, 64592–93 (Sept. 20, 2016).

DOE received no comments related to the proposed definition of the term "integral." Therefore, DOE is adopting the definition for integral as proposed in the September 2016 DPPP test procedure NOPR.

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 test procedure be limited to only the following specific varieties of dedicated-purpose pool pumps:

- 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, Recommendations #1, #2A, and #2B at pp. 1–2; Recommendation #6 at p. 5)

In addition, although not included in the December 2015 DPPP Working Group recommendations, the DPPP Working Group discussed and ultimately recommended not considering a test procedure or standards for self-priming and non-self-priming pool filter pumps with a rated hydraulic horsepower[17] greater than 2.5 hp. (Docket No. EERE-2015-BT-STD-0008, No. 79 at pp. 33–54)

The DPPP Working Group also recommended that the test procedure and reporting requirements be applicable to all self-priming pool filter pumps—both those served by single-phase power and those served by three-phase power. [18] (Docket No. EERE-2015-BT-STD-0008, No. 82 Recommendations #3 at p. 2) Consistent with the DPPP Working Group recommendations, DOE proposed in the September 2016 DPPP test procedure NOPR that 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. 81 FR 64580, 64593 (Sept. 20, 2016).

Consistent with the December 2015 DPPP Working Group recommendations, in the September 2016 DPPP test procedure NOPR, DOE also proposed definitions for rigid-electric and storable-electric spa pumps as a variety of dedicated-purpose pool pump in this test

[17] See section III.G.1 for a discussion of determination of rated hydraulic horsepower.
[18] 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.

procedure final rule, but DOE did not propose test procedures or reporting requirements for them.

In the September 2016 DPPP test procedure NOPR, DOE also specifically proposed to exclude submersible pumps from the scope of the DPPP test procedure and proposed defining a "submersible pump" as "a pump that is designed to be operated with the motor and bare pump fully submerged in the pumped liquid." 81 FR 64580, 64594 (Sept. 20, 2016).

In written comments, CEC expressed support of DOE's proposal to set the scope of the test procedure rulemaking to include self-priming and non-self-priming pool filter pumps, waterfall pool pumps, and pressure cleaner booster pumps. (CEC, No. 7 at p. 2) DOE appreciates CEC's support.

In response to DOE's proposal regarding the applicability of the proposed test procedure to dedicated-purpose pool pumps served by both single- and three-phase power, Hayward and APSP requested clarification as to the scope of the rule and specifically if it included three-phase dedicated-purpose pool pumps. (Hayward, No. 6 at p. 4; APSP, No. 8 at p. 5) Nidec supported the DPPP Working Group's recommendation that any potential energy conservation standards would only apply to dedicated-purpose pool pumps served by single-phase power. However, Nidec recommended that the test procedure and reporting requirements only apply to dedicated-purpose pool pumps served by single-phase power. Nidec stated that three-phase motors used with dedicated-purpose pool pumps are very energy efficient and are already regulated. Nidec suggested that three-phase dedicated-purpose pool pumps and related motors should not need further testing nor reporting requirements. (Nidec, No. 10 at p. 3)

In response to Hayward and APSP's request for clarification, DOE clarifies that, as noted previously and discussed in the September 2016 DPPP test procedure NOPR, DOE's proposed test procedure would apply to 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, served by both single-phase power or three-phase power. In response to Nidec's comments regarding the applicability of the proposed DOE test procedure to three-phase equipment, DOE believes that the applicability of the DPPP test procedure proposed in the September 2016 DPPP test procedure NOPR is consistent with the intent of the DPPP Working Group exhibited in the June 2016 DPPP Working Group recommendations, where the Working Group recommended that the test procedure and reporting requirements would be applicable to all self-priming pool filter pumps served by single- and three-phase power. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #3 at p. 2) Although the June 2016 DPPP Working Group recommendations reference only self-priming pool filter pumps, there is no reason why DOE's proposed DPPP test procedure would not be applicable to other varieties of dedicated-purpose pool pumps served by single- or three-phase power. In addition, the DPPP Working Group did not recommend restricting the scope of standards for any of the other DPPP varieties based on the phase of power with which it is intended to be used. However, DOE agrees with Nidec that three-phase motors may already be regulated under existing DOE test procedures and energy conservation standards for electric motors and small electric motors. As discussed further in section III.G.1.b, in this final rule, DOE is limiting the test methods for motor horsepower metrics (i.e., DPPP nominal motor horsepower, DPPP service factor, and DPPP motor total horsepower) to single-phase motors because testing and rating of three-phase motors is already regulated by DOE.

DOE agrees that, as stated by Nidec, the applicability of the DPPP test procedure and standards recommended by the DPPP Working Group differ slightly with respect to dedicated-purpose pool pumps that are supplied by single-phase versus three-phase power. Specifically, the DPPP 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. (Docket No. EERE-2015-BT-STD-0008, No. 82 Recommendations #3 at p. 2)

In response to the scope of test procedure and metric applicability proposed by DOE in the September 2016 DPPP test procedure NOPR, Pentair and APSP commented that some form of differentiation or exclusion should be established for dedicated-purpose pool pumps with nominal motor horsepower greater than 3 hp. Pentair suggested that the metric, as proposed in the NOPR, potentially limits a manufacturer's ability to develop an optimal solution for these lower head hydraulic systems, because these pumps are typically applied to pools with larger plumbing and do not typically operate on curve C. Pentair claimed that as a result, these larger pumps will be eliminated from the market. (Pentair, No. 11, at p. 2; APSP, No 8 at pp. 3–4)

As discussed previously in this section, the DPPP Working Group, of which Pentair was a member, recommended that the scope of the test procedure be limited to self- and non-self-priming pool filter pumps, waterfall pumps, and pressure cleaner booster pumps. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendations #1, #2A, and #2B at pp. 1–2; Recommendation #6 at p. 5) In the December 2015 DPPP Working Group recommendations, the DPPP Working Group discussed and ultimately recommended not considering a test

procedure or standards for self-priming and non-self-priming pool filter pumps with a rated hydraulic horsepower greater than 2.5 hp. (Docket No. EERE-2015-BT-STD-0008, No. 79 at pp. 33–54) However, the DPPP Working Group did not recommend any other test procedure differentiation or exclusions based on nominal motor horsepower, nor did the DPPP Working Group ask DOE to pursue such action. Therefore, the test procedure and standards recommended by the DPPP Working Group were intended to be applicable to self-priming and non-self-priming pool filter pumps with rated hydraulic horsepower less than or equal to 2.5 hp, which include some pool filter pumps with a nominal motor horsepower greater than 3 hp,[19] which are typically installed into applications with larger plumbing, for which the test procedure would not be representative. (Docket No. EERE-2015-BT-STD-0008, No. 94 at pp. 38–53; Docket No. EERE-2015-BT-STD-0008, No. 95 at pp. 176–194; Docket No. EERE-2015-BT-STD-0008, No. 79 at pp. 39–40, 47-48) In response to Pentair and APSP, DOE notes that Pentair and APSP did not introduce any new data indicating that the cutoff should actually be a nominal motor horsepower of 3 hp; rather they simply indicated this was due to larger plumbing systems not on curve C, which the Working Group already considered in making its cutoff selection. Finally, the introduction of an exclusion for pumps with greater than 3 nominal motor horsepower opens a significant circumvention loophole risk. For example, manufacturers of pumps with 3 nominal motor horsepower could decide to slightly increase the capacity of the motor (with no change to the bare pump), in order to avoid being subject the test procedure and any applicable energy conservation standards. Such a change on nominal horsepower would have little impact on the utility or production cost of such a pump. Alternatively, any change to a pump's hydraulic horsepower rating will directly impact end-user utility (i.e., flow and head).

[19] Nominal motor horsepower is approximately equivalent to the rated hydraulic horsepower divided by the pump efficiency and the motor efficiency of the dedicated-purpose pool pump.

Consequently, DOE reaffirms its conclusion that hydraulic horsepower, rather than motor horsepower, should be used to define the upper scope limit, as hydraulic horsepower is more directly tied to end-user utility (i.e., flow and head) than motor horsepower. For these reasons, DOE is not adopting an alternative scope limitation in this final rule.

DOE did not receive any other comments regarding the definition of submersible pump, or the general scope of applicability of the September 2016 DPPP test procedure NOPR. Consequently, in this final rule, DOE is adopting test methods for 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, including pumps served by both single- and three-phase power, with the exclusion of submersible pumps. The specific test methods for each of the applicable DPPP varieties are discussed in more detail in section III.D.

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 proposed in the September 2016 DPPP test procedure NOPR 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. These definitions are discussed in section III.B.7.a. For dedicated-purpose pool pumps distributed in commerce with applicable pool pump controls, DOE also proposed a definition for "freeze protection controls." This is discussed in section III.B.7.b.

a. DPPP Speed Configurations

In the June 2016 DPPP Working Group recommendations, the DPPP Working Group recommended definitions for the following DPPP speed configurations: single-speed, two-speed, multi-speed, and variable-speed. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #5A at p. 3) In the September 2016 DPPP test procedure NOPR, DOE proposed adopting the DPPP Working Group's recommended definitions with a few minor modifications for clarity and consistency. 81 FR 64580, 64594–97 (Sept. 20, 2016). Specifically, DOE proposed the following definitions for single-speed, two-speed, multi-speed, and variable-speed dedicated-purpose pool 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 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.
- 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 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.

81 FR 64580, 64647–48 (Sept. 20, 2016).

DOE's proposed definitions enable each speed configuration to be identified based on (1) the number of operating speeds available to the pump; (2) the minimum operating speed, or turn-down ratio,[20] of 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 pool pump control varieties, pool pump control operating characteristics, and requirements regarding the inclusion of pool pump controls

[20] 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.

applicable to each DPPP speed configuration, as proposed in the September 2016 DPPP test procedure NOPR, are summarized in Table III.2.

Table III.2 Summary of Applicable Pool Pump Control Varieties and Related Proposed 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
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

CEC, in written comments, supported DOE's proposal to establish definitions for single-speed, two-speed, multi-speed, and variable speed pool filter pumps. (CEC, No. 7 at p. 2) DOE appreciates the support of CEC.

In response to DOE's proposed definitions for two-speed dedicated-purpose pool pump, Hayward suggested a modification to the definitional requirement that two-speed dedicated-purpose pool pumps not be able to operate at high speed without the requisite control, instead of not able to operate at all. That is, instead of being unable to operate entirely, two-speed dedicated-purpose pool pumps could be allowed to function at a default low-speed if they are operated without an appropriate pool pump control. (Hayward, Public Meeting Transcript, No. 3 at pp. 21, 26–27) In response to Hayward's suggestion, CA IOUs stated their support for DOE's originally proposed provision that does not allow a two-speed dedicated-purpose pool pump be

considered a two-speed pump unless it is unable to operate without an appropriate pool pump control. (CA IOUs, Public Meeting Transcript, No. 3 at p. 26–27)

In response to Hayward's suggestion regarding the definition of two-speed dedicated-purpose pool pump, DOE agrees with CA IOUs that the proposed modification is not consistent with the recommendations of the DPPP Working Group. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #5A at p. 3) The specific wording of the DPPP speed configuration definitions were discussed at length and in significant detail during the DPPP Working Group negotiations and, if fact, were part of the final negotiation of standard levels. (Docket No. EERE-2015-BT-STD-0008, No. 91 at pp. 141–183; Docket No. EERE-2015-BT-STD-0008, No. 92 at pp. 215–222) Specifically, certain members of the DPPP Working Group voiced concern that if two-speed dedicated-purpose pool pumps were distributed in commerce without any form of control and were capable of being operated without such a control, 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) DOE believes that if a two-speed dedicated-purpose pool pump is capable of operating, even at low speed, without an applicable pool pump control, this significantly increases the risk that two-speed pool filter pumps would be installed and operated without an appropriate control. As the two-speed dedicated-purpose pool pump test points presume a low flow and high flow test point, the two-speed dedicated-purpose pool pump test procedure is only appropriate and representative of two-speed dedicated-purpose pool pumps with controls that enable operation at both speeds. Therefore, to ensure that the test points and resultant WEF metric for two-speed dedicated-purpose pool pumps is representative of actual performance of the equipment in the field, DOE is

adopting the definition for two-speed dedicated-purpose pool pump proposed in the September 2016 DPPP test procedure NOPR. Furthermore, DOE notes that the two-speed dedicated-purpose pool pump definition does not restrict DPPP manufacturers from producing a pump that has two operating speeds and can only be operated at low speed without an appropriate control, as described by Hayward. However, in such a case the pump would not meet the definition of two-speed dedicated-purpose pool pump and, therefore, would be tested and subject to standards based on the single-speed dedicated-purpose pool pump test points. See section D.1 for more discussion regarding the specific test points for the different DPPP speed configurations.

In response to DOE's definition of a two-speed dedicated-purpose pool pump, Hayward and APSP also requested clarification regarding the meaning of the phrase "unable to operate." (Hayward, No. 6 at pp. 2; APSP, No. 8 at p. 3) DOE clarifies that the phrase "unable to operate" means that the pump is non-operational and could not be used to circulate water in a pool. That is, the pump is unable to provide any flow or head, and consumes no energy.

Hayward and APSP also requested a better definition of the term "pool pump control." Hayward and APSP both commented that the two-speed dedicated-purpose pool pump definition includes a parenthetical "(i.e., variable speed drive and user interface or switch)" that implies the only two options for a pool pump control are a switch or a variable speed drive and user interface. (Hayward, No. 6 at pp. 2; APSP, No. 8 at p. 3)

DOE recognizes that the use of the abbreviation "i.e."[21] was used in error, and may have caused confusion. DOE's intent was to use the abbreviation "e.g.,"[22] which would signify that a variable speed drive and a user interface or switch were just two examples of possible technologies. That said, the phrase "pool pump control" is not explicitly defined in this final rule and a pool pump control is not limited to the two options used as examples. DOE interprets the phrase "pool pump control" as a general term that encompasses any technology that is capable of changing the speed in response to user preferences. To clarify DOE's original intent, DOE has modified the definition of two-speed dedicated-purpose pool pump to replace "i.e." with "e.g."

Similarly, Davey commented that the proposed definition for variable-speed dedicated purpose pool pumps may hinder innovation of pump products that do not require additional controllers. For example, Davey suggested that a dedicated-purpose pool pump, with no pool pump control, but which enables the user to set a duration of operation at high speed and then default to low speed operation might improve efficiency. Davey also noted that, under the proposed definition of variable-speed dedicated-purpose pool pump, a user could program the pump to run at the highest speed all the time. (Davey, No. 5 at pp. 2–3)

DOE notes that Davey's comment describes a configuration where a pump is capable of operating at a high speed and a low speed and is capable of programming the duration of each speed in response to user preferences. Such a configuration would meet the proposed definition of a two-speed dedicated-purpose pool pump. As described above, DOE proposed that a two-speed dedicated-purpose pool pump be defined as a dedicated-purpose pool pump that is capable

[21] Latin for "id est." Meaning "that is." http://www.merriam-webster.com/dictionary/i.e.
[22] Latin for "exempli gratia." Meaning "for example." http://www.merriam-webster.com/dictionary/e.g.

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. 81 FR 64580, 64594 (Sept. 20, 2016). As noted previously, DOE, in this final rule, is altering the definition to refer to the variable speed drive and user interface or switch as illustrative examples with the term "e.g." and any pool pump control capable of operating in the manner described in the definition would meet DOE's definition of two-speed dedicated-purpose pool pump, regardless of the control's technology.

The DPPP Working Group discussed the definition of variable-speed dedicated-purpose pool filter pumps, and took care to craft a definition that is sufficiently broad so as to not restrict innovation. Working Group members agreed that the definition should not specify whether the pool pump controller is attached to or detached from the motor, and the definition should not specify whether the control is sold with the pump or sold separately from the pump. (Docket No. EERE-2015-BT-STD-008, No. 91 at pp. 164–166) Based on recommendations from the DPPP Working Group, DOE proposed that a variable-speed drive be defined as equipment capable of varying the speed of the motor. 81 FR 64580, 64596 (Sept. 20, 2016) This definition is very broad, and it only limits the available technologies to the extent that is required to describe the utility inherent in a variable-speed dedicated purpose pool pump. Similarly, the September 2016 DPPP test procedure NOPR implicitly defines a user interface as a device 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. 81 FR 64580, 64595 (Sept. 20, 2016) This definition is also

broad, and is only limited to the extent necessary to capture the required functionality of variable-speed dedicated-purpose pool pumps. Based on these points, DOE believes that the definition of a variable-speed dedicated-purpose pool filter pump is sufficiently broad to allow a range of technologies and innovative approaches, while ensuring that any such technologies would still provide the utility of a variable-speed dedicated-purpose pool pump consistent with the intent of the DPPP Working Group.

DOE understands that equipment covered by standards change as manufacturers add new features to their products and update their designs. DOE will monitor the DPPP market for changes in equipment and technology. In the future, DOE may amend the definitions of any of DPPP varieties or speed configurations, or include new varieties of dedicated-purpose pool pumps, if necessary. In the meantime, manufacturers may apply for a test procedure waiver if they develop a pump that meets the intent of the variable-speed DPPP definition but does not meet all of the definition's criteria. In general, any interested party may submit a petition for a test procedure waiver for a basic model of a covered product if the basic model's design prevents it from being tested according to the test procedures or cause the prescribed test procedures to evaluate the basic model in a manner so unrepresentative of its true energy consumption characteristics as to provide materially inaccurate comparative data. Additional details on the petition for waiver process are available at 10 CFR 431.401 and at http://energy.gov/eere/buildings/test-procedure-waivers.

In addition, in reviewing the proposed definitions, DOE also noticed that the proposed definition for two-speed dedicated-purpose pool pump was grammatically incorrect. In this final rule, DOE is correcting the grammatical error, which does not affect the intent or substance of

the definition. Specifically, the proposed definition contained the final clause "but without which the pump is unable to operate without the presence of such a pool pump control," which this final rule adopts as modified to read "but is unable to operate without the presence of such a pool pump control" in this final rule.

Similarly, in reviewing the variable-speed DPPP definition, DOE noticed that the last phrase refers generically to a "user interface" when it is intended to refer to a user interface with specific characteristics and capabilities, as referenced in the previous clause in the definition. Therefore, in this final rule, DOE is modifying the definition to clarify that the definition is, in all places, referring to 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. This ensures that the two clauses in the definition are mutually exclusive. DOE is also updated the terminology in the second clause to be grammatically correct, consistent with the definition of two-speed dedicated-purpose pool pump. That is, DOE adopts a definition with the final clause in the definition to read "without 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, but is unable to operate without the presence of a user interface."

In addition to proposing definitions of the various DPPP speed configurations, in the September 2016 DPPP test procedure NOPR, DOE proposed to define variable-speed drive to mean equipment capable of varying the speed of the motor. 81 FR 64580, 64594–64597 (Sept. 20, 2016). This definition was intended to clarify and support the proposed definitions for two-speed, multi-speed, and variable-speed dedicated-purpose pool pump.

DOE received no comments regarding the proposed definition of variable-speed drive. Therefore, DOE is adopting the definition for variable speed drive as proposed in the September 2016 DPPP test procedure NOPR.

b. Freeze Protection Controls

DPPP Working Group recommended additional prescriptive requirements for dedicated-purpose pool pumps distributed in commerce with "freeze protection controls." (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #6A at p. 4). 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. These prescriptive freeze control requirements are discussed in section III.G.4.

To identify dedicated-purpose pool pumps with freeze protection controls, DOE proposed in the September 2016 DPPP test procedure NOPR 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. 81 FR 64580, 64597 (Sept. 20, 2016).

DOE received no comments related to the proposed definition of freeze protection controls. Therefore, DOE is adopting the definition of freeze protection controls as proposed in the September 2016 DPPP test procedure NOPR. DOE did receive comments related to the proposed test method for verifying the presence and operation of freeze protection controls, which are discussed in section III.J.3.

8. Basic Model

For purposes of certification, compliance, and enforcement, DOE generally applies its energy conservation standards to "basic models" of consumer products and commercial and industrial equipment. For the purposes of applying the DPPP regulations, DOE proposed in the September 2016 DPPP test procedure NOPR to define what constitutes a "basic model" of a dedicated-purpose pool pump. 81 FR 64580, 64597 (Sept. 20, 2016). Applying this basic model concept allows 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 the September 2016 DPPP test procedure NOPR, DOE proposed adopting only the 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. 81 FR 64580, 64597 (Sept. 20, 2016). Procedurally, to apply the basic model concept to dedicated-purpose pool pumps, DOE proposed to amend the definition of "basic model" for pumps that currently exists at 10 CFR 431.462, as established in the January 2016 general pumps test procedure final rule to also accommodate dedicated-purpose pool pumps. 81 FR 4086 (Jan. 25, 2016). The current pumps basic model definition contains several specific accommodations regarding number of stages for multistage pumps and trimmed impellers and is applicable only to those general pumps that were the subject of the January 2016 general pumps test procedure final rule. Consequently, DOE proposed amending the definition to clarify that the multistage pump and

trimmed impeller provisions were only applicable to pumps subject to the test procedure established in the January 2016 general pumps test procedure final rule. 81 FR 64580, 64597 (Sept. 20, 2016).

In response to DOE's proposed definition of basic model for dedicated-purpose pool pumps, DOE received several comments regarding how different individual models could be grouped under the basic model provisions. Waterway commented that sometimes a single individual model has identical functional characteristics to several other individual models, and asked whether such individual models may be grouped within the basic model. (Waterway, Public Meeting Transcript, No. 3 at p. 95)

In response to Waterway's comment, as discussed in the September 2016 DPPP test procedure NOPR public meeting, models that have identical electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption, energy efficiency, water consumption, or water efficiency, fall within the same basic model for the purposes of DOE certification, even if they have different unique model numbers in the manufacturer's catalogue. In such a case, a manufacturer would just list all the unique individual model numbers to which a given basic model certification applied in the certification report submitted to DOE. (See section III.J.2 for more information on certification reporting requirements.)

Pentair expressed concern regarding using a basic model in certifying products to DOE, stating that, in the ENERGY STAR database, when models are grouped under a single certification, utilities often do not recognize models that do not appear in the main column listing the basic models. Pentair stated that this makes it necessary to list each unit separately in the

ENERGY STAR database, even if the performance is similar. (Pentair, Public Meeting Transcript, No. 3 at pp. 32–33)

In response to Pentair's comment, DOE notes that it is at the manufacturer's discretion to group individual models into a single basic model to reduce testing and certification burden or to test and certify each individual model as a unique basic model. Regardless of whether a manufacturer chooses to group individual models into a basic model for purposes of certification, the manufacturer would still be required to specify in its certification the individual model numbers that fall within the basic model certified, and any representations regarding an individual model made in a certification report must be consistent with representation as to that individual model made to ENERGY STAR.

Hayward inquired if the same wet end is used within a family, but the horsepower of the motor and impeller size changes, such individual models could be grouped within the same basic model. (Hayward, Public Meeting Transcript, No. 3 at pp. 31–32) Hayward and APSP also requested clarity on the verbiage of the definition as well as examples from other products. Hayward and APSP asked whether the same product but with a different name or label for specific customers would be the same "basic model." Finally, Hayward and APSP requested elaboration on whether a single or multi-stage pump within the same performance category and WEF criteria are considered within the same basic model. (Hayward, No. 6 at p. 2; APSP, No.8 at p. 4)

In response to Hayward and APSP's inquiry, DOE notes that, consistent with DOE's practice with other products and equipment, DPPP manufacturers may elect to group individual

pump models that are similar, but not identical, into the same basic model to reduce testing burden, provided all representations regarding the energy use of pumps within that basic model are identical and based on the most consumptive unit. See 76 FR 12422, 12423 (March 7, 2011).[23] However, all individual models represented by the same basic model must be in the same equipment class.[24] DOE notes that because standards recommended by the DPPP Working Group in the June 2016 DPPP Working Group recommendations differentiate and assign different standards to dedicated-purpose pool pumps based on their rated hydraulic horsepower, this limits the ability of manufacturers to group individual DPPP models that vary in capacity. (Docket No. EERE-2015-BT-STD-0008, Recommendation #1, No. 82 at p. 1) DOE agrees with Hayward and APSP that a product with different names or labels that is otherwise the same could be grouped within a basic model. Examples from other products and equipment include appliances with varying finishes grouped into one basic model; refrigerators with varying door opening sides grouped into one basic model, or air conditioners of varying voltages grouped into one basic model. DOE notes that the example related to all stage versions of a multi-stage pump being required to be in the same basic model is a specific requirement for general pumps that DOE does not apply to dedicated-purpose pool pumps.

[23] 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 (CCE) 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).

[24] DOE believes this is what Hayward is referring to in their comment when they refer to "performance category and WEF criteria."

No additional comments were received pertaining to DOE's proposal to adopt the general provisions of the general pumps basic model definition. Therefore, DOE is adopting the changes to the definition of basic model in 10 CFR 431.462, as proposed in the September 2016 DPPP test procedure NOPR.

C. Rating Metric

Overall, the key objectives of any DPPP metric are 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.

As described in the September 2016 DPPP test procedure NOPR, the DPPP Working Group focused on defining a performance-based metric that is similar to the energy factor (EF) metric currently used to describe DPPP performance by many existing programs,[25] but that also accounts for the potential energy savings of equipment with multiple operating speeds. 81 FR 64580, 64597–64601 (Sept. 20, 2016). Ultimately, the DPPP Working Group recommended using the WEF, which is defined as the ratio of the volumetric flow provided by the pump, divided by the input power to the pump, at one or more load points, where these load points are

[25] As described in the September 2016 DPPP TP NOPR, EF is used by California Title 20, APSP, and ENERGY STAR to describe DPPP performance. 81 FR 64580, 64598–64600 (Sept. 20, 2016).

selected depending on the specific DPPP variety and speed configuration, as shown in equation (1). The specific load points and weights for each DPPP variety are discussed in section III.D.

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

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 gpm;

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)

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. Consequently, in the September 2016 DPPP test procedure NOPR, DOE proposed 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 performance-based standards considered for any dedicated-purpose pool pumps for which the WEF applies would use this metric .

In the September 2016 DPPP test procedure NOPR, DOE requested feedback on the proposed metric. CEC stated in written comments that CEC supported DOE's proposal to establish a weighted energy factor metric. (CEC, No. 7 at p. 2)

APSP and Hayward commented that they believe that equation (1) in the September 2016 DPPP test procedure NOPR (81 FR 64580, 64600), [26] which is used to determine WEF, does not correctly result in the weighting of energy factors at the specified load points. (APSP, No. 8 at p.4; Hayward, No. 6 at pp. 2–3) Instead, APSP and Hayward proposed using the following equation (2), with all variables as defined previously:

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

(2)

DOE responds that equation (1), as published in the September 2016 DPPP test procedure NOPR, correctly describes the efficiency of DPPP equipment and aligns with the recommendation of the DPPP Working Group. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #5 at p. 4) DOE notes that the DPPP Working Group evaluated both methods of calculating WEF, both the proposed equation (1) and equation (2), as recommended by APSP and Hayward. (Docket No. EERE-2015-BT-STD-0008 No. 49 at pp. 6–9; Docket No. EERE-2015-BT-STD-0008 No. 56 at pp. 24-60) The DPPP Working Group ultimately chose to use equation (1) because it is more representative of the energy savings to the customer. (Docket

[26] Equation (1) in the September 2016 DPPP TP NOPR is identical to equation (1) in this document

No. EERE-2015-STD-0008 No. 50 at p. 3) Equation (2) is a weighting of the EF values, which results in an exaggeration of the benefits of multi-speed and variable-speed technologies, while equation (1) is a ratio of the amount of water pumped over the amount of energy consumed over a given period of time in real-world applications. (Docket No. EERE-2015-BT-STD-0008 No. 56 at pp. 29, 38, 60) That is, mathematically, weighting the EF values directly, as shown in equation (2), results in a weighted average of the flow values in the numerator, but equal weighting of the denominator values, meaning the flow at high speed is given more weight than the associated power value at high speed. To illustrate this, the calculation of WEF, with both equations, for a two-speed, multi-speed, or variable-speed dedicated-purpose pool pump with both a low speed and high speed test point is shown in equation (3).

$$\mathrm{WEF}_{\mathrm{Eq1}} = \frac{\sum_{i=1}^{n}\left(w_i \times \frac{Q_i}{1000} \times 60\right)}{\sum_{i=1}^{n}\left(w_i \times \frac{P_i}{1000}\right)} = \frac{\left(w_{low} \times \frac{Q_{low}}{1000} \times 60 + w_{high} \times \frac{Q_{high}}{1000} \times 60\right)}{\left(w_{low} \times \frac{P_i}{1000} + w_{high} \times \frac{P_i}{1000}\right)}$$

$$\mathrm{WEF}_{\mathrm{Eq2}} = \sum_{i=1}^{n} w_i \left(\frac{\frac{Q_i}{1000} \times 60}{\frac{P_i}{1000}}\right) = \left(\frac{w_{low} \times \frac{Q_{low}}{1000} \times 60}{P_{low}}\right) + \left(\frac{w_{high} \times \frac{Q_{high}}{1000} \times 60}{P_{high}}\right)$$

(3)

Conversely, equation (1) correctly accounts for the amount of power it takes to provide a given amount of flow. That is, equation (1) reflects the more realistic case where a pump provides a low flow rate for an associated amount of power during a portion of the day and a high flow rate for an associate amount of power during another portion of the day. If one were to calculate the "total daily WEF," one would sum the flow rates throughout the day and the power

consumption throughout the day and take a ratio of the two; both power and flow values would be weighted according to their proportional use during the day. Therefore, equation (1) is more representative of the energy efficiency of dedicated-purpose pool pumps over a typical cycle of use.

During the September 2016 DPPP test procedure NOPR public meeting, CA IOUs inquired about including standby power as part of the metric for dedicated-purpose pool pumps. (CA IOUs, Public Meeting Transcript, No. 3 at pp. 91–92) In response to CA IOUs inquiry, DOE explained that standby power was discussed during the DPPP Working Group meetings and, ultimately, the DPPP Working Group decided not to include standby power in the WEF metric due to the negligible impact any standby power measurements would have on the final WEF value. (Docket No. EERE-2015-BT-STD-0008, No. 95 at pp. 229–30) Consistent with the DPPP Working Group recommendations, DOE did not propose to include standby power measurements nor reporting in the September 2016 DPPP test procedure NOPR. While DOE appreciates that some dedicated-purpose pool pumps with controls will consume standby power in their idle state and the desire to minimize this energy consumption, DOE does not believe the additional burden associated with dedicated testing and reporting requirements would be justified. Specifically, testing of standby power for dedicated-purpose pool pumps would require an additional test method and may require different or more specialized power measurement equipment to accurately capture the low power during standby operation. Furthermore, as the DPPP Working Group did not recommend specific requirements for standby energy consumption, such testing would only be informative and would not be necessary to determine compliance of dedicated-purpose pool pumps. DOE does not believe the additional burden associated with establishing test requirements to measure standby energy use of dedicated-

purpose pool pumps is justified at this time. Therefore, in this final rule, DOE is not adopting testing or reporting requirements for standby power of dedicated-purpose pool pumps.

In addition to WEF, in the September 2016 DPPP test procedure NOPR, DOE also proposed an optional test method for EF at multiple speeds and/or system curves and to allow manufacturers and industry to continue to describe the energy performance of dedicated-purpose pool pumps using the EF metric. 81 FR 64580, 64627-64628 (Sept. 20, 2016). DOE typically only includes one primary energy metric, the DOE metric that is used for the energy conservation standards, in the test procedure to ensure standardization of efficiency representations throughout the industry and eliminates potential confusion in the market place if multiple non-equivalent metrics are used to describe the same piece of equipment. However, in this specific case, DOE departed from typical practice due to the interest expressed in the use of the EF metric during the DPPP Working Group negotiations. DOE notes that, as discussed in more detail in section III.F, representations of EF will only be allowed until the compliance date of any standard established for dedicated-purpose pool pumps and, if made, must be accompanied by a representation of the DOE metric, WEF.

D. Test Methods for Different DPPP Categories and Configurations

As discussed in section III.C, DOE will characterize the performance of dedicated-purpose pool pumps according to the WEF. Due to differences in equipment design and typical use profiles, the DPPP Working Group recommended that unique weights and load points be specified for each DPPP variety and pump speed configuration. Based on the recommendations of the DPPP Working Group, in the September 2016 DPPP test procedure NOPR, DOE proposed 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.D.1). DOE also proposed unique load points for waterfall pumps (section III.D.2) and pressure cleaner booster pumps (section III.D.3), each of which reference only a single load point. 81 FR 64580, 64601–64602 (Sept. 20, 2016). The load points for self-priming and non-self-priming pool filter pumps, waterfall pumps, and pressure cleaner booster pumps are discussed in the subsequent sections.

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

As noted in section III.B.3.a, 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 is comparable in most instances. (Docket No. EERE-2015-BT-STD-0008, No. 57 at pp. 329–331) Therefore, to provide comparable ratings between self-priming and non-self-priming pool filter pumps, the DPPP Working Group recommended the same reference curve, curve C, for self-priming and non-self-priming filter pumps. (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #6 at p. 5) Consistent with the DPPP Working Group recommendations, in the September 2016 test procedure NOPR, DOE proposed that both self-priming and non-self-priming pool filter pumps be tested at specific load points along curve C. 81 FR 64580, 64602–64603 (Sept. 20, 2016).

During the September 2016 DPPP test procedure NOPR public meeting, CA IOUs did not object to the recommendation, but noted that the typical pipe size associated with these curves is a generalization and the overall plumbing system can affect the curves as much as the pump size in response to DOE's assertion that curve C was representative of 2.5-inch plumbing.

(CA IOUs, Public Meeting Transcript, No. 3 at p. 37) In response to CA IOUs observation, DOE agrees with CA IOUs that many factors may impact system head. DOE was simply referring to the fact that curve C was initially developed to be representative of 2.5-inch plumbing,[27] as is acknowledged in section 4.1.2.1.3 of ANSI/APSP/ICC-15a–2013.

Beyond the proposed system curve, DOE also proposed specific load points for each variety of self-priming and non-self-priming pool filter pump. The specific load points for single-speed, two-speed, multi-speed, and variable-speed pool filter pumps are discussed in sections III.D.1.a, III.D.1.b, and III.D.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. In the September 2016 DPPP test procedure NOPR, consistent with the DPPP Working Group recommendations (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #6 at p. 5), DOE proposed testing single-speed pool filter pumps at the pump's maximum speed of rotation on curve C. 81 FR 64580, 64603 (Sept. 20, 2016). 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 (which is its only speed) and the system curve C, as shown in Figure III.1. Id.

[27] 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 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).

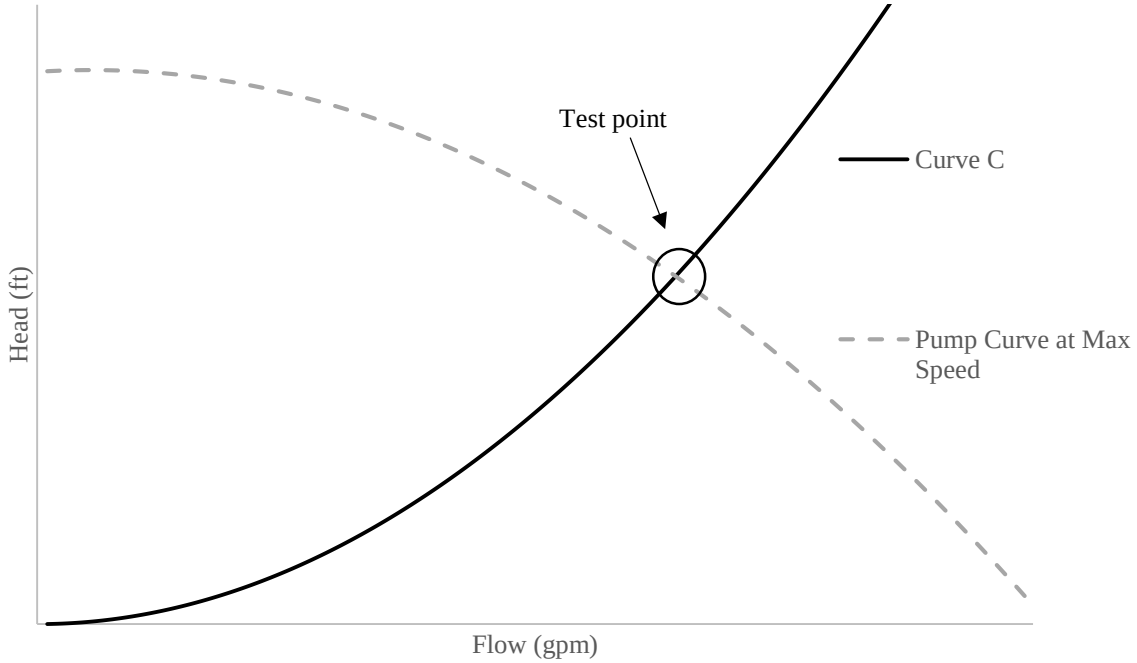

Figure III.1 Specified Load Point on Curve C at Maximum Speed for Single-Speed Self-Priming and Non-Self-Priming Pool Filter Pumps.

CEC, in written comments, supported DOE's proposal to establish a load point for single-speed filter pumps. (CEC, No. 7 at p. 2) DOE received no other comments related to the proposal to test single-speed pool filter pumps at a single load point based on the maximum speed on curve C. Therefore, DOE is adopting in this final rule the proposed single load point for single-speed pool filter pumps.

b. Two-speed Pool Filter Pumps

Two-speed pumps, by definition and design, are capable of operating at two discrete speeds. In two-speed pool filter pumps, the low speed setting is designed to handle filtration and provide an adequate turnover-rate, while the high speed setting operation is designed to be used intermittently for short duration periods to operate suction-side pool cleaners and ensure proper mixing of the water. 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) However, in the September 2016 DPPP test procedure NOPR, DOE proposed load points that were slightly modified from those recommended by the DPPP Working Group. Specifically, DOE proposed the following two load points for two-speed pool filter pumps: (1) a high flow point at the maximum speed on curve C and (2) a low flow point at the low-speed setting on curve C. 81 FR 64580, 64604–64606 (Sept. 20, 2016). As explained in the September 2016 DPPP test procedure NOPR, the load points recommended by the DPPP Working Group are only possible for pumps with the low-speed setting equivalent to one-half of the rotating speed of the maximum speed setting. DOE proposed the modification because DOE believed the DPPP Working Group recommendation, as written, would not provide equitable or representative ratings for any two-speed pool filter pumps with a low speed that was less than one-half the maximum speed setting. Id.

DOE also proposed certain criteria for the low flow point to prevent manufacturers from producing pumps with unrepresentatively high (i.e., advantageous) WEF scores by designing pumps with an extremely low speed setting. Id. Specifically, DOE proposed minimum flow rates for two-speed pumps of 24.7 gpm for two-speed pool filter pumps that have a rated hydraulic horsepower less than or equal to 0.75 hp (small pool filter pumps) and 31.1 gpm for two-speed pool filter pumps that have a rated hydraulic horsepower greater than 0.75 (large pool filter pumps). DOE's proposed minimum flow rates are consistent with the DPPP Working Group's recommended low flow rates for multi-speed and variable-speed pool filter pumps.

(Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 at p. 5); 81 FR 64580, 64604–06 (Sept. 20, 2016). The DPPP Working Group developed these low flow rates based on the minimum effective flow rates for typical pool sizes. DOE believes these flow rates are also representative of minimum flow rates for two-speed pool filter pumps and they will effectively prevent the inclusion of unreasonably low speeds on two-speed pool filter pumps for the sole purpose of inflating WEF ratings. 81 FR 64580, 64604–06 (Sept. 20, 2016).

DOE believes that the proposed load points for two-speed pool filter pumps are representative of typical pool filter pump operation and energy performance, and the load points characterize the efficiency of the pump speeds and flow points in typical applications (i.e., cleaning/mixing and filtration). In addition, DOE believes that the proposal is consistent with the intent of the DPPP Working Group.

During the September 2016 DPPP test procedure NOPR public meeting, CA IOUs confirmed that two-speed pool filter pumps with low speed below one-half of maximum speed are a reasonable scenario and supported DOE's proposed load points to address this scenario. (CA IOUs, Public Meeting Transcript, No. 3 at pp. 39–41) ASAP, NRDC, and CEC, in written comments, supported DOE's proposal to establish load points for two-speed pool filter pumps and did not articulate any different suggestions to the proposed test procedure. (ASAP and NRDC, No. 12 at p. 2; CEC, No. 7 at p. 2) ASAP and NRDC also commented that proposed load points would provide consistent and comparable ratings among two-speed filter pumps. (ASAP and NRDC, No. 12 at p. 2)

DOE appreciates the support of CA IOUs, ASAP, NRDC, and CEC. DOE received no other comments related to the proposed test procedure for two-speed pool filter pumps. Therefore, DOE is adopting in this final rule the proposed load points at low and high speed 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).

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

In accordance with the DPPP Working Group recommendations, in the September 2016 DPPP test procedure NOPR, DOE proposed different definitions for variable-speed and multi-speed pool filter pumps (see section III.B.7.a), but proposed the same test procedure be applied to both speed configurations. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation # 6, at p. 5); 81 FR 64580, 64606–64610 (Sept. 20, 2016). For variable- and multi-speed pool filter pumps, DOE 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.D.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. 81 FR 64580, 64606–64610 (Sept. 20, 2016).

As DOE discussed in the September 2016 DPPP test procedure NOPR, the DPPP Working Group recommended (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 at p. 5), and DOE subsequently proposed, testing multi- and variable-speed pool filter pumps at two load points. These points are (1) a high-flow load point that is achieved

by running the pump at 80 percent of flow rate at maximum speed on or above curve C and (2) a low-flow 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 (also on or above curve C), as summarized in Table III.3. 81 FR 64580, 64606–64610 (Sept. 20, 2016).

Table III.3 Variable- and Multi-Speed Load Points Recommended by DPPP Working Group and Proposed by DOE in September 2016 DPPP Test Procedure NOPR

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	$H \geq 0.0082 \times Q_{low}^2$	

* $Q_{max\_speed@C}$ = flow at maximum speed on curve C

The high speed load point corresponding to a flow rate of 80 percent of the flow at maximum speed on curve C was recommended by the DPPP Working Group to reflect that multi- and variable-speed pool filter pumps can be optimized to account for the oversizing the typically occurs in the field and provide a specific desired amount of flow that may be less than the flow rate at maximum speed. Id. In the September 2016 DPPP test procedure NOPR, DOE discussed that, for multi-speed pumps without a speed setting at 80 percent of the maximum speed setting, the high flow point would be determined at the maximum operating speed of the pump and may not be on curve C. 81 FR 64580, 64607 (Sept. 20, 2016). Such a pump would need to be tested at a speed setting higher than 80 percent of maximum 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.2.

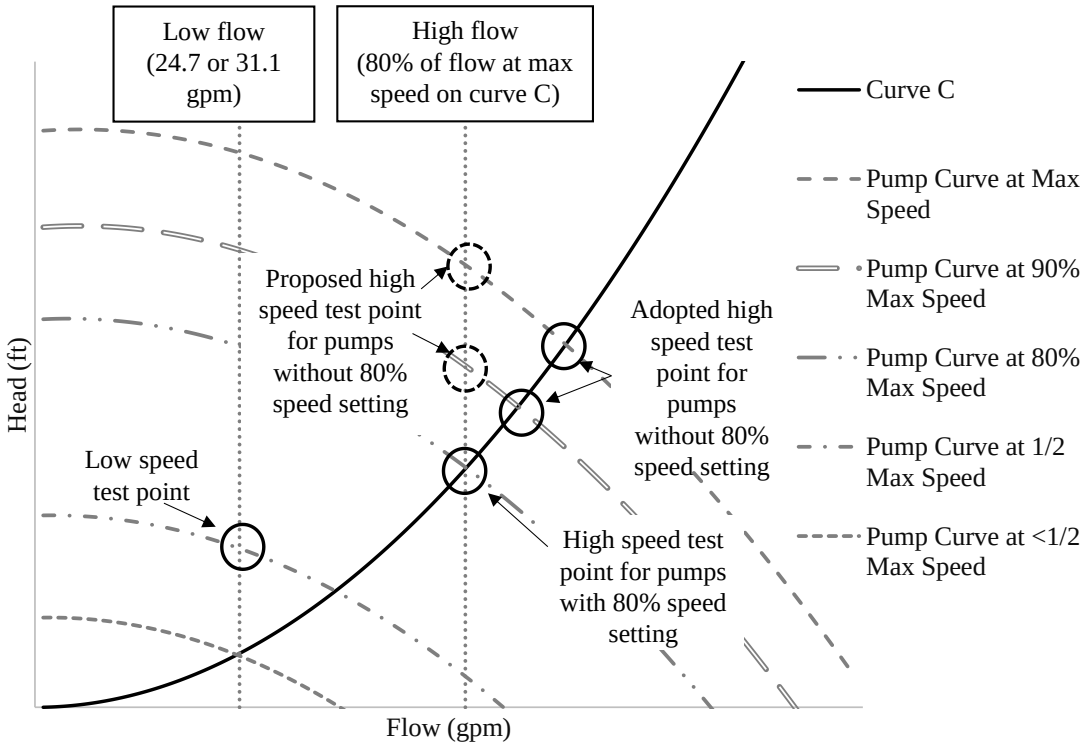

Figure III.2 Specified Load Points on Curve C at Maximum Speed for Multi-Speed and Variable-Speed Self-Priming and Non-Self-Priming Pool Filter Pumps.

To specify the low flow points for multi-speed and variable-speed pool filter pumps, the DPPP Working Group developed specific, discrete flow rates that are representative of the typical flow rates observed in the field. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 at p. 5) That is, as discussed in the September 2016 DPPP test procedure NOPR, the DPPP Working Group recommended that "small pool filter pumps" with rated hydraulic horsepower values of less than or equal 0.75 would be assigned a flow rate of 24.7 gpm, which is representative of the flow rate necessary for filtration in smaller pools. The DPPP Working Group also recommended that "large pool filter pumps" with rated hydraulic horsepower values greater than 0.75 and less than or equal to 2.5 would be assigned a flow rate of 31.1 gpm, which is representative of the flow rate necessary for filtration in large pools. The selected low flow rates for small and large multi-speed and variable-speed pool filter pumps are

intended to be representative of the applications such pumps would typically serve. The methodology for developing the specific flow rates for small and large multi-speed and variable-speed pool filter pumps is discussed at length in the September 2016 DPPP test procedure NOPR. 81 FR 64580, 64606–64610 (Sept. 20, 2016).

DOE's proposal for the high flow and low flow points for multi-speed and variable-speed pumps does not explicitly specify the speed at which the pump operates at the high or low flow points. Instead, DOE determined 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 established 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. Id.

In the September 2016 DPPP test procedure NOPR, DOE requested 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. 81 FR 64580, 64608 (Sept. 20, 2016).

In response, CEC supported DOE's proposal to establish load points for multi-speed and variable-speed pool filter pumps. However, CEC did not advocate for any different values compared to DOE's proposal. (CEC, No. 7 at p. 2). Pentair requested clarification during the September 2016 DPPP test procedure NOPR public meeting and in written comments regarding

whether the high flow load point for multi-speed and variable-speed pool filter pumps was specified with respect to 80 percent flow or 80 percent speed. (Pentair, Public Meeting Transcript, No. 3 at p. 48; Pentair, No. 11 at p. 4) APSP reiterated Pentair's comments that flow and speed were used interchangeably in the September 2016 DPPP test procedure NOPR and recommended that the test procedure be standardized on a percentage of flow requirements (APSP, No. 8 at p. 2). Consistent with APSP's recommendation, in this final rule, DOE clarifies that the high flow load point for multi-speed and variable-speed pool filter pumps is specified with respect to at 80 percent of the flow rate at maximum speed on curve C.

APSP and Pentair also commented that throttling multi-speed pumps to obtain 80 percent flow moves the pump off of curve C, which is otherwise the standardized performance curve proposed by DOE in the test procedure NOPR. Pentair commented that throttling and testing off of curve C makes direct product performance comparisons impossible, and has the potential to overstate the performance of less efficient and less capable pumps. (APSP, No. 8 at pp. 4–5; Pentair, No. 11, at p. 2) Pentair similarly expressed concern over the low flow load points. Pentair agreed that 24.7 gpm and 31.1 gpm are reasonable minimum flow rates for typical swimming pool applications. However, Pentair stated that fixing the low-speed load point at one of these two values would create an unfair bias against higher capacity pumps that are designed for high-flow, low-head systems. (Pentair, No. 11 at p. 2) At the test procedure NOPR public meeting, Pentair suggested that multi-speed pumps that cannot be tested at 80 percent of the flow rate at maximum speed on curve C be tested at their maximum speed on curve C. (Pentair, Public Meeting Transcript, No. 3 at pp. 42–43) Pentair did not provide a specific recommendation for the low flow load points.

In response to Pentair and APSP's dissatisfaction with DOE's proposal to allow throttling multi-speed pumps, DOE agrees with Pentair and APSP's concerns that throttling and testing off of curve C may result in WEF values that are not directly representative of the typical energy performance of the pump in the field, as users are unlikely to throttle pumps to compensate for oversizing. In assessing Pentair and APSP's concerns, DOE recognized that the multi-speed pump load points specified in the December 2015 DPPP Working Group recommendations did not explicitly mention or require throttling. Specifically, for flow, the term sheet stated "same method as variable speed, but testing at closest available speed that can meet the specified flow (while at or above Q_{low} or Q_{high}, respectively)." For head, the term sheet stated: "$H \geq 0.0082 \times Q_{high}^2$." (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 at p. 5) Allowing flow to be "at or above" Q_{high} and "at or above" $0.0082 \times Q_{high}^2$ means that a multi-speed pump that does not have an 80 percent speed setting could test exactly on curve C with a flow rate at or above 80 percent of the flow rate at maximum speed on curve C, as suggested by Pentair, and still meet the load point requirements laid out by the DPPP Working Group in the December 2015 term sheet. Id.

Consequently, DOE acknowledges that its proposal in the September 2016 DPPP test procedure NOPR to require throttling of multi-speed pumps was based on one possible interpretation of the December 2015 DPPP Working Group recommendations, while Pentair's proposal to test on curve C as the lowest speed that resulted in a flow rate at or above 80 percent of the flow rate at maximum speed on curve C is based on another possible interpretation. That is, as written, the December 2015 DPPP Working Group recommendations allow multiple interpretations of the appropriate load points for multi-speed pool filter pumps. In the September 2016 DPPP test procedure NOPR, DOE proposed the test method that required fixing the flow

point at 80 percent of the flow rate at maximum speed on curve C (i.e., $Q_{high} = 0.8 \times Q_{max\_speed@C}$) because DOE's test procedure must be precise and repeatable and, therefore, must provide additional specificity beyond that specified by the DPPP Working Group. However, DOE acknowledges that Pentair's suggestion of fixing the head value on curve C ($H = 0.0082 \times Q_{high}^2$) and allowing flow rates above 80 percent of the flow rate at maximum speed on curve C is another viable method to provide the requisite additional specificity and precision in the multi-speed test method. DOE also acknowledges that, as mentioned by Pentair and APSP, that throttling off of curve C would be a departure from the standardized system curve and would result in WEF values that are less representative of the typical energy performance of such multi-speed pumps. Instead, multi-speed pumps would more likely be operated on the standardized system curve (i.e., curve C) at the lowest speed available at or above 80 percent of the flow rate at maximum speed on curve C (i.e., the flow rate the DPPP Working Group believed was "required" for high flow mixing in pumps that are oversized). Therefore, in this final rule, DOE is revising the load points for multi-speed pumps to require the head value to be on curve C, as suggested by Pentair, but allow the flow value to be greater than or equal to 80 percent of the flow rate at maximum speed on curve C. As noted previously, this test method is consistent with that recommended by the DPPP Working Group.

With regard to the low flow load points, DOE responds that the DPPP Working Group recommended that the low-speed load point for variable- and multi-speed pumps be measured at either 24.7 gpm or 31.1 gpm, depending on the pump hydraulic horsepower at maximum speed on curve C. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 at p. 5) As discussed at length in the September 2016 DPPP test procedure NOPR, the DPPP Working Group recommended these values to allow for more comparable WEF values among pool filter

pumps intended to serve the same size pools. 81 FR 64580, 64606–64610 (Sept. 20, 2016). While Pentair noted in its comments that this construct may bias higher capacity (high flow, low head) pumps, DOE notes that in general, higher capacity pumps have been excluded from the scope of this rulemaking. In addition, as discussed previously, these low flow points were chosen specifically to represent typical filtration flow rates that would be experienced in the majority of pools, regardless of the size of the pump. That is, the required filtration flow rate is dictated more by the size of the pool than the size of the pump. Converse to Pentair's observation, the ability of larger pumps to reduce their speed to achieve these low flow rates will potentially result in higher (i.e., better) WEF scores than slightly small dedicated-purpose pool pumps serving the same load.

For these reasons, DOE is adopting in this final rule the low speed load points of 24.7 gpm and 31.1 gpm, as proposed, in the September 2016 DPPP TP NOPR. However, for multi-speed pumps, DOE acknowledges that the low speed may not result in a flow rate that is exactly 24.7 or 31.1 gpm while on curve C and throttling may be required to achieve the flow points proposed in the NOPR. As discussed previously, DOE agrees with Pentair and APSP that throttling may not be representative of the performance of multi-speed dedicated-purpose pool pumps in the field. Therefore, based on the same reasoning as the high flow point, DOE is revising the low flow point for multi-speed dedicated-purpose pool pumps to also require testing along curve C, but allow flow rates at or above the specified values. Specifically, the adopted load points are presented in Table III.4.

Table III.4 Multi-Speed and Variable-Speed Load Points Adopted in this Final Rule

Load Point	Flow Rate gpm	Head ft	Speed rpm
High Speed	$Q_{high}(gpm) \geq 0.8 \times Q_{max\_speed@C}$ *	$H = 0.0082 \times Q_{high}^2$ (i.e., on Curve C)	Lowest available speed for which the pump can achieve the specified head value and flow rate threshold (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 $Q_{low} \geq 31.1$ gpm • If pump hydraulic hp at max speed on curve C is ≤0.75, then $Q_{low} \geq 24.7$ gpm	$H = 0.0082 \times Q_{low}^2$ (i.e., on Curve C)	

* $Q_{max\_speed@C}$ = flow at maximum speed on curve C

DOE believes that the load points shown in Table III.4 are consistent with the intent of the DPPP Working Group while addressing the concerns brought by Pentair and APSP for multi-speed pool filter pumps.

With regard to the variable-speed load points, DOE notes that the load points recommended by the DPPP Working Group were specified clearly as exactly equivalent to 24.7 or 31.1 gpm for the low flow load point and 80 percent of the flow rate at maximum speed on curve C for the high flow load point. (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #6 at p. 5) The DPPP Working Group discussed and recommended these load points based on the understanding that a variable-speed dedicated purpose pool pump would be equipped with a continuously variable control that could exactly achieve the load points specified in the test procedure or desired by a user in the field. However, DOE notes that the definition for variable-speed dedicated-purpose pool pump recommended by the DPPP Working Group and adopted by DOE references a maximum increment between available operating speeds of 100 rpm. Based on the adopted definition it is possible that a variable-speed dedicated-purpose pool pump with extremely wide speed increments (e.g., 95 rpm) will not be

able to exactly achieve the flow points specified by the DPPP Working Group. DOE notes that the definition for variable-speed dedicated-purpose pool pump was not finalized by the DPPP Working Group until after the load points for variable-speed dedicated-purpose pool pump had already by been established and approved. Therefore, the DPPP Working Group did not explicitly consider a scenario where a variable-speed dedicated-purpose pool pump would not be able to exactly achieve the specified flow points.

DOE believes that, similar to multi-speed pool filter pumps, it is unlikely that a user would throttle the pump in the field to achieve a specific flow rate. Instead, DOE believes it would be more representative and consistent to also require variable-speed pool filter pumps to be tested on curve C at the lowest speed that results in a flow rate at or above the flow rate specified by the DPPP Working Group, similar to the load points specified for multi-speed pool filter pumps. Therefore, DOE is adopting, in this final rule, the same load points for multi-speed and variable-speed pool filter pumps, as summarized in Table III.4.

In response to the multi-speed load points proposed in the September 2016 DPPP test procedure NOPR, Hayward commented that the proposed criteria for multi-speed pumps would severely penalize less capable multispeed pumps [without a discrete operating speed at 80 percent of flow rate at maximum speed on curve C]. (Hayward, No. 6 at p. 3) In response to Hayward's concerns regarding the penalization of multi-speed pumps, DOE acknowledges that the test procedure (both as proposed in the NOPR and as adopted in this final rule) will indeed "penalize" (i.e., generate less advantageous WEF score for) less capable multi-speed pumps that cannot exactly achieve 80 percent of the flow rate at maximum speed on curve C. This is by-design and in agreement with the recommendations of DPPP Working Group, because such

pumps provide the end-user less utility and are more likely to be run at higher-speeds and consume more energy than pumps that can reach 80 percent of the flow rate at maximum speed on curve C. Furthermore, the disadvantage in WEF score is commensurate with the reduced speed capability of the pump—the closer the pump can get to the 80 percent load point (with speed reduction), the better the pump's WEF score will be. For this reason, DOE is adopting its proposals as to the treatment of multi-speed pumps in this final rule, except as noted in this section.

Pentair raised a concern that an unintended consequence of specifying the high flow load point based on 80 percent flow was that manufacturers may start designing pool filter pumps with an 80 percent speed setting, even if it is not the best optimization for the pump for specific applications. (Pentair, Public Meeting Transcript. No. 3 at p. 46) In response, DOE acknowledges Pentair's concern, but notes that the 80 percent load point was selected by the DPPP Working Group to be representative of the amount of "right-sizing" that would be possible in typical applications. (EERE-2015-BT-STD-0008, No. 57 at pp. 388-405; CA IOUs, No. 53 at pp. 142–143; Waterway, No. 54 at p. 51) As such, DOE believes the 80 percent setting is representative of a speed setting that would reliably result in energy savings in the field for typical applications. However, DOE acknowledges that for some applications the 80 percent speed setting may not be the most appropriate choice. DOE notes that, if specific applications necessitate different speed settings, manufacturers may continue to produce such equipment to serve the market need for equipment with specific speed settings. The DOE test procedure does not affect the flexibility of manufacturers to produce equipment that is demanded by the market; it just describes how to rate such equipment.

Additionally, Hayward and APSP pointed out a discrepancy between Table 1 in the regulatory text of the September 2016 DPPP test procedure NOPR and the language presented in the rest of the NOPR. Specifically, Hayward noted that the required head for the variable-speed and multi-speed high flow load point should be "$H \geq 0.0082 \times Q_{low}^2$," rather than "$H=0.0082 \times Q_{low}^2$," which was printed in Table 1 of the September 2016 DPPP test procedure NOPR. (Hayward, No. 6 at p. 3; APSP, No. 8 at p. 4) DOE agrees with Hayward and APSP. A typographical error occurred in Table 1 in the September 2016 DPPP test procedure NOPR and the equation should have read "$H \geq 0.0082 \times Q_{low}^2$" based on the proposed load points for multi-speed dedicated purpose pool pumps. However, based on the adopted load points, DOE is specifying the load points as depicted in Table III.4, which have the appropriate mathematical operators.

During the September 2016 DPPP test procedure NOPR public meeting, Pentair also requested verification regarding Figure III.5 in the September 2016 DPPP test procedure NOPR and a similar figure in the September 2016 DPPP test procedure NOPR public meeting presentation. (Pentair, Public Meeting Transcript, No, 3, p. 54) DOE acknowledged during the September 2016 DPPP test procedure NOPR public meeting that the public meeting presentation slide was correct and Figure III.5 in the September 2016 DPPP test procedure NOPR was incorrect.[28] Accordingly, in this final rule, DOE includes the corrected and clarified version of the figure, which is labeled Figure III.2 in this final rule.

[28] The public meeting slides can be found in the docket (www.regulations.gov/#!docketDetail;D=EERE-2016-BT-TP-0002) No. 2 at p. 31

APSP and Zodiac also requested clarification regarding how the high-speed flow point is 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. (APSP, No. 8 at p. 4; Zodiac, No. 13 at p. 2) DOE responds that, as discussed in the September 2016 DPPP test procedure NOPR, the DPPP Working Group recommended the high speed load point corresponding to a flow rate of 80 percent of the flow at maximum speed on curve C to reflect that multi- and variable-speed pool filter pumps can be optimized to account for the oversizing the typically occurs in the field and provide a specific desired amount of flow that may be less than the flow rate at maximum speed. 81 FR 64580, 64606–64610 (Sept. 20, 2016).

Finally, APSP and Zodiac commented that they would like to see a tolerance for the 80 percent load point for multi-speed and variable-speed pool filter pumps, as a speed of 80.00 percent exactly would be difficult to achieve. (APSP, No. 8 at p. 5; Zodiac, No. 13 at p. 2). In response, DOE clarifies that the neither the load points proposed in the September 2016 DPPP test procedure NOPR nor the load points adopted in this final rule for multi-speed and variable-speed pool filter pumps require exact speeds to be achieved. Instead, the load points specify specific head or flow values that must be achieved at the lowest available speed for which the pump can achieve the specified flow rate and/or head value; a pump may vary speed to achieve this load point. DOE proposed and is adopting thresholds on the specified head or flow values to account for experimental variability, which are discussed in section III.E.2.d.

d. Load Point Weighting Factors

WEF is calculated as the weighted average flow rate divided by the weighted average input power to the dedicated-purpose pool pump at various load points, as described in equation

(1). For this reason, DOE also must assign weights to the load points discussed above for each self-priming or non-self-priming pool filter pump. In the September 2016 DPPP test procedure NOPR, consistent with the DPPP Working Group recommendations (Docket No. EERE-2015-BT-STD-0008, No. 51 Recommendation #7 at p. 5) as well as DOE's own analysis, DOE proposed a weight of 1.0 for single-speed self-priming and non-self-priming pool filter pumps and weights of 0.20 at the high flow point and 0.80 at the low flow point for two-speed, multi-speed, and variable-speed pool filter pumps, as summarized in Table III.5. 81 FR 64580, 64610 (Sept. 20, 2016).

Table III.5 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 requested comment on these proposed weights. In response to DOE's proposed weights, APSP and Zodiac stated that unbalanced weighting of the economical single-speed pumps negatively affects consumers who only operate pools for a short seasonal duration. (APSP, No. 8 at p. 5; Zodiac, No .13 at p. 2) DOE acknowledges that pool pumps with more than one speed, such as two-speed, multi-speed, and variable-speed dedicated-purpose pool pumps, will have a greater (i.e., more efficient) WEF score than a single-speed pump. However, this is consistent with the intent of the DPPP Working Group and the typical energy consumption of such pumps in the field. That is, single-speed pumps will use more energy than comparable two-speed, multi-speed, or variable-speed pumps. DOE also disagrees with APSP and Zodiac

that a load point of 1.0 for single-speed pool filter pumps is "unbalanced" because, as recommended by the DPPP Working Group, single-speed pool pump operate at only one load point, which must be fully weighted in order to accurately and equitably account for the energy performance of such pumps.

APSP and Hayward agreed with the 0.8 value for low flow for two-speed pool filter pumps. (APSP, No. 8 at p. 5; Hayward, No. 6 at p. 3) CEC, in written comments, affirmed DOE's proposal to establish weighting factors for single-speed, two-speed, multi-speed, and variable-speed pool filter pumps. (CEC, No. 7 at p. 2) As such, DOE is adopting, in this final rule, the weights proposed in the September 2016 DPPP test procedure NOPR.

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

As discussed in section III.B.7, DOE proposed in the September 2016 DPPP test procedure NOPR to establish 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. The specific test methods for each of the DPPP speed configurations are described in sections III.D.1.a through III.D.1.c. The definitions for two-speed, multi-speed, and variable-speed dedicated-purpose pool pumps establish specific criteria that any given dedicated-purpose pool pump must meet in order to be considered such a 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 a two-speed, multi-speed, or variable-speed dedicated-purpose pool pump discussed in section III.B.7, DOE proposed in the September 2016 DPPP test procedure NOPR that such a pump would be

tested using the single-speed pool filter pump test point, regardless of the number of operating speeds the pump may have. 81 FR 64580, 64610 (Sept. 20, 2016).

In the September 2016 DPPP test procedure NOPR, consistent with the recommendations of the DPPP Working Group (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #5B at p. 3), DOE also proposed that 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 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. Id. DOE also proposed that two-speed self-priming pool filter pumps (in the referenced size range) that do not meet the proposed control requirements would be tested as a single-speed pool filter pump. Id.

Hayward commented, at the September 2016 DPPP test procedure NOPR public meeting, that two-speed dedicated-purpose pool pumps should be allowed to operate at low speed without the requisite control, instead of not able to operate at all. (Hayward, Public Meeting Transcript, No. 3 at pp. 21, 26–27) DOE addressed this comment in section III.B.7.a. In that section, DOE noted that DOE believes the two-speed DPPP test points are only applicable to and representative of two-speed dedicated-purpose pool pumps operated with the appropriate controls. If a two-speed dedicated-purpose pool pump is capable of operating, even at low speed, without an applicable pool pump control, this significantly increases the risk that two-speed pool filter pumps would be installed and operated without an appropriate control.

Similarly, with regard to the applicability of the two-speed test points, DOE believes that two-speed dedicated-purpose pool pumps greater than 0.711 rated hydraulic horsepower must be distributed in commerce with either an appropriate control or not able to operate without the presence of such a pool pump control in order to apply the two-speed dedicated-purpose pool pump test points. If the pump can operate without an appropriate control, even at low speed, the two-speed test points would not be representative of the pump's energy performance in the field. DOE did not receive any comments on this proposal. Therefore, DOE is adopting in this final rule the requirements for applying the two-speed dedicated-purpose pool pump test points proposed in the September 2016 DPPP test procedure NOPR, which was agreed to by all DPPP Working Group members as part of the June 2016 DPPP Working Group Recommendations. test procedure

2. Waterfall Pumps

DOE also proposed a unique test point for waterfall pumps in the September 2016 DPPP test procedure NOPR. 81 FR 64580, 64610–64611 (Sept. 20, 2016). Under the definition discussed in section III.B.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. As discussed in the September 2016 DPPP test procedure NOPR, waterfall pumps are specialty-purpose single-speed, pool filter pumps that typically operate waterfalls or other water features in a pool. Id.

Because of these specific applications, the DPPP Working Group recommended a single unique test point at a fixed head of 17 feet and the maximum operating speed for waterfall pumps, which the DPPP Working Group believed was representative of typical applications.

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 #6 at p. 5)

DOE agreed with the DPPP Working Group recommendations; however, DOE slightly modified the recommendation by adding greater specificity to the head value in DOE's proposal. DOE proposed to test waterfall pumps at a single load point at maximum speed and a head of 17.0 feet and to fully weight that single load point. 81 FR 64580, 64610–64611 (Sept. 20, 2016). DOE received no comment on the proposal and, therefore, is adopting the load point and weighting for waterfall pumps proposed in the September 2016 DPPP test procedure NOPR.

3. Pressure Cleaner Booster Pumps

DOE also proposed a unique test point for pressure cleaner booster pumps in the September 2016 DPPP test procedure NOPR. 81 FR 64580, 64611–64612 (Sept. 20, 2016). Pressure cleaner booster pumps, as defined in section III.B.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 DPPP 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, No. 51, Recommendations #6) However, 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 pressure cleaner booster pump technologies. Specifically, to better capture the potential for variable-speed pressure cleaner booster pumps, in the June 2016 DPPP Working Group recommendations, the DPPP 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. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #8 at pp. 4–5)

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)

In the September 2016 DPPP test procedure NOPR, DOE proposed to adopt the load point and weighting recommended in the June 2016 DPPP Working Group recommendations; however, DOE added specificity to the flow and head values in the September 2016 DPPP test procedure NOPR. Specifically, DOE proposed to test pressure cleaner booster pumps at a single load point of 10.0 gpm at the minimum speed that results in a head value at or above 60.0 feet and to weight the measured performance of the pump at that load point with a weighting factor of 1.0. 81 FR 64580, 64611–64612 (Sept. 20, 2016).

In response to DOE's proposed test method for pressure cleaner booster pumps, APSP and Zodiac commented that the proposed test point seemed reasonable. (APSP, No. 8 at p. 5; Zodiac, No. 13 at p. 2). DOE thanks APSP and Zodiac for their supportive comments.

In written comments, Pentair stated that it would be more appropriate to base the load point for pressure cleaner booster pump testing on a system friction curve instead of a defined single point. (Pentair, No. 11 at p. 3) In response, DOE notes that the proposed load point for pressure cleaner booster pumps was developed based on input from the DPPP Working Group and available information regarding the representative operating characteristics for such pumps. Specifically, the DPPP Working Group recommended a load point of 10 gpm at the minimum speed that results in a head value at or above 60 feet, because this scenario accommodates all pressure cleaner booster pumps on the market. At the same time this scenario also accounts for the potential improved energy performance of pressure cleaner booster pumps that could use variable speed technology to precisely match the head requirements of a pressure cleaner system. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #8 at pp. 4–5; Docket No. EERE-2015-BT-STD-0008, No. 101 at pp. 11–20) The DPPP Working Group selected a value of 10 gpm based on the typical flow rate that was required or recommended for suction-side pressure cleaner apparatus to function. (Docket No. EERE-2015-BT-STD-0008, No. 100, CA IOUs, pp. 186–188; 197–198; Docket No. EERE-2015-BT-STD-0008, No. 101, Various, pp. 14–15, 49–50, 87–89). Although DOE understands that a system curve that includes both static and dynamic friction head would theoretically describe the relationship between head and flow for pressure cleaner booster pump applications, DOE believes that such a system curve is not necessary or representative in this case because: (1) pressure cleaner booster pumps operate at only one load point and (2) the specified flow point and head threshold appropriately describe the required operating parameters for pressure cleaner booster pump applications. That is, as noted by the DPPP Working Group, suction-side pressure cleaner apparatus typically recommend a specific flow rate that will enable the equipment to operate correctly. DOE

acknowledges that a certain amount of pressure must be produced by the pressure cleaner booster pump to deliver the recommended flow rate. However, once that flow and head value are achieved, the pump will operate at only that one load point. Therefore, based on DOE's understanding of pressure cleaner booster pump applications, DOE is requiring in this final rule that a specific flow rate must be achieved regardless of the installation's system curve.

DOE did not receive any other comments related to this proposal. Therefore in this final rule, DOE is adopting the proposal that pressure cleaner booster pumps to be tested at a single load point of 10.0 gpm at the minimum speed that results in a head value at or above 60.0 feet and to weight the measured performance of the pump at that load point with a weighting factor of 1.0.

4. Summary

In summary, DOE adopts, in this final rule, unique load points for the different varieties and speed configurations of dedicated-purpose pool pumps. DOE's load points ($\underline{i}$) and weights ($\underline{w_i}$) used in determining WEF for each pump variety are presented in Table III.6.

DOE requested comment on the high-speed and low-speed load points proposed for all DPPP equipment classes. 81 FR 64580, 64642–64643 (Sept. 20, 2016). Hayward requested clarification regarding whether all of the load points used to determine WEF should be measured on system curve C. (Hayward, No. 6 at p. 2) DOE refers Hayward to Table III.6, which summarizes the load points for all dedicated-purpose pool pumps subject to the test procedure adopted in this final rule. As shown in Table III.6, all of the load points for self-priming and non-self-priming pool filter pumps are specified with respect to curve C. However, while many

self-priming and non-self-priming pool filter pumps models will be evaluated directly on curve C, certain models may have their load points measured at head values above curve C, if the load point cannot be measured on curve C based on the operating speeds available on the pump. In addition, waterfall pumps and pressure cleaner booster pumps have load points that are specified with respect to unique flow and/or head values and do not reference curve C.

Table III.6 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	Speed n	
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	$H = 0.0082 \times Q_{high}^2$	Max speed	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)	$H \geq 0.0082 \times Q_{low}^2$	Lowest speed capable of meeting the specified flow and head values, if any	0.8
			High	Q_{high}(gpm) = $Q_{max\_speed@C}$ = flow at max speed on curve C	$H = 0.0082 \times Q_{high}^2$	Max speed	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 $Q_{low} \geq 31.1$ gpm • If pump hydraulic hp at max speed on curve C is ≤0.75, then $Q_{low} \geq 24.7$ gpm (a pump may vary speed to achieve this load point)	$H = 0.0082 \times Q_{low}^2$	Lowest speed capable of meeting the specified flow and head values	0.8

DPPP Varieties	Speed Type	Test Points					Weight w_i
		# of Points n	Load Point i	Flow Rate Q	Head H	Speed n	
			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	Lowest speed capable of meeting the specified flow and head values	0.2
Waterfall Pumps	Single	1	High	Flow corresponding to specified head (on max speed pump curve)	17.0 ft	Max speed	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	Lowest speed capable of meeting the specified flow and head values, if any	1.0

* As discussed in section III.D.1.e, any pumps that do not meet DOE's definitions of two-speed, multi-speed, or variable-speed pool filter pump, as applicable, and, in the case of 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 do not meet the requirements to apply the two-speed pool filter pump test method must be tested as a single-speed pool filter pump.

E. 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 consistently and unambiguously. Specifically, to determine WEF for applicable dedicated-purpose pool pumps, the 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.G.1).

The following section III.E.1 discusses the industry standard DOE is incorporating by reference for measuring the performance of dedicated-purpose pool pumps. The September 2016 DPPP test procedure NOPR proposed several exceptions, modifications, and additions to this base test procedure that DOE deemed necessary to ensure accuracy and repeatability. These are presented in sections III.E.2.a through III.E.2.f. Finally, DOE is adopting 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.E.2.g).

1. Incorporation by Reference of HI 40.6–2014

In the September 2016 DPPP test procedure NOPR, in accordance with the DPPP Working Group recommendations (Docket No. EERE-2015-BT-STD-0008, No. 51, Recommendation #8 at p. 6), DOE proposed 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.E.2. DOE stated that 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. Id. Specifically, HI 40.6–2014 defines and explains how to calculate driver power

input,[29] volume per unit time, [30] pump total head,[31] pump power output,[32] overall efficiency,[33] and other relevant quantities at the specified load points necessary to determine the metric (WEF), and contains appropriate specifications regarding the test setup, methodology, standard rating conditions, equipment specifications, uncertainty calculations, and tolerances.

DOE also noted that HI 40.6–2014, with several exceptions, modifications, and additions was adopted in the January 2016 general pumps test procedure final rule. 81 FR 4086, 4109–4117 (Jan. 25, 2016). Therefore, HI 40.6–2014, with certain exceptions, is already incorporated by reference into appendix A to subpart Y of part 431. 10 CFR 431.463

In response to DOE's proposal to incorporate by reference certain sections of HI 40.6–2014, CEC expressed its support of DOE's proposal. (CEC, No. 7 at p. 2) Conversely, APSP and Hayward suggested that DOE consider raising the upper limit of the test fluid required in HI 40.6–2014 from 86 °F to 107 °F to be consistent with the requirements for other test standards, including NSF-50 and ENERGY STAR. APSP and Hayward added that this would allow for manufacturers to establish and maintain one temperature volume of water for NSF, ENERGY

[29] 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.
[30] 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.
[31] 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.
[32] 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 capacity of a dedicated-purpose pool pump, it refers to the rated hydraulic horsepower, as defined in section III.G.1.
[33] 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.

STAR, and DOE testing, allowing for more efficient use of laboratory resources. (APSP, No. 8 at pp. 5–6; Hayward, No. 6 at p. 4)

In response to APSP and Hayward's suggestion that DOE allow the use of warmer temperature water for use in testing dedicated-purpose pool pumps, DOE evaluated the impact of using 107 °F water as opposed to water between 50 and 86 °F on the determined WEF, rated hydraulic horsepower, or other metrics. Based on DOE's review, testing with water up to 107 °F would have an insignificant impact on the resultant metrics and, therefore, to reduce testing burden and allow DOE testing to be streamlined with testing for other programs, DOE is adopting requirements for the test fluid that allow testing with water up to 107 °F, as requested by APSP and Hayward.

Similarly, in their comments, APSP and Hayward also requested that DOE use a nephelometric turbidity unit (NTU) measurement to determine and describe the appropriate test fluid for testing dedicated-purpose pool pumps, as opposed to the kinematic viscosity and maximum density metrics used in HI 40.6–2014 and proposed by DOE. APSP and Hayward requested clarification regarding whether test labs would be required to measure the kinematic viscosity and density of the test water and whether these parameters would need to be included in test reports and data. APSP and Hayward stated that test lab water is not currently measured to determine kinematic viscosity and density. APSP and Hayward stated that it is not clear what options test labs will have if incoming municipal supply water does not meet the proposed requirements for kinematic viscosity and density. APSP and Hayward believe that the NTU measurement, which is currently referenced in the NSF/ANSI 50–2015 test and was been used in

the DPPP industry for over 20 years, is a more convenient and cost effective criteria to use to specify the characteristics of the test fluid. (APSP, No.8 at pp. 5–6; Hayward, No. 6 at pp. 4–5).

In response to APSP's and Hayward's suggestion regarding the characteristics of the test fluid, DOE notes that it reviewed the test fluid requirements for NSF/ANSI 50–2015, the ENERGY STAR Test Method for Pool Pumps,[34] and HI 40.6–2014. As discussed in the September 2016 DPPP test procedure NOPR, section C.3.3, "Test conditions," of NSF/ANSI 50–2015 specifies test conditions for both swimming pools and hot tubs/spas in terms of temperature and NTU thresholds, as shown in Table III.7. That section further states that all pumps, except those labeled for swimming pool applications only, are to be tested at the hot tub/spa conditions. 81 FR 64580, 64625–64626 (Sept. 20, 2016).

Table III.7 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.

Section 40.6.5.5, "Test conditions," of HI 40.6–2014, which was proposed to be incorporated by reference into the DPPP test procedure in the September 2016 DPPP test procedure NOPR, 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. 81 FR at 64614–64615. The ENERGY STAR Test

[34] EPA. 2013. "ENERGY STAR Program Requirements Product Specification for Pool Pumps – Final Test Method." Available at: https://www.energystar.gov/sites/default/files/specs/Pool%20Pump%20Final%20Test%20Method%2001-15-2013.pdf

Method for Pool Pumps[35] does not appear to contain requirements regarding the temperature of the test fluid.

In response to APSP's and Hayward's concern regarding the availability of "clear water" as defined in HI 40.6–2014, DOE notes that the characteristics of clear water specified in HI 40.6–2014 are meant to be inclusive of any fresh water in the temperature range of interest, as well as sea water, and would certainly be available from any tap. For reference, the kinematic viscosity of fresh water between 50 and 107 °F ranges from 1.4×10^{-5} ft^2/s to 0.69×10^{-5} ft^2/s, respectively, while the kinematic viscosity of sea water is approximately 1.24×10^{-5} ft^2/s at 68 °F.[36] However, DOE acknowledges that DPPP manufacturers may be less familiar with the measurement of kinematic viscosity than NTU. As the characterization of the test fluid is not expected to greatly affect the resultant WEF score, provided testing is done with municipal water within a reasonable temperature range, DOE agrees with Hayward that the NTU metric referenced by NSF/ANSI 50–2015 is also an acceptable criteria to describe water that is reasonably free from impurities for the purposes of testing.

As discussed in the September 2016 DPPP test procedure NOPR, DOE noted 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

[35] EPA. 2013. "ENERGY STAR Program Requirements Product Specification for Pool Pumps – Final Test Method." Available at: https://www.energystar.gov/sites/default/files/specs/Pool%20Pump%20Final%20Test%20Method%2001-15-2013.pdf

[36] Engineering Toolbox. Liquids – Kinematic Viscosity. Last accessed Nov. 15, 2016. Available at: http://www.engineeringtoolbox.com/kinematic-viscosity-d_397.html

thermodynamic properties of the water. Therefore, to better align with NSF/ANSI 50–2015 and the existing capabilities and experience of DPPP test labs, in this final rule, DOE is adopting requirements that testing be carried out with water that is between 50 and 107 °F with less than or equal to 15 NTU, as opposed to the "clear water" defined in section 40.6.5.5 of HI 40.6–2014. DOE will also exclude section 40.6.5.5 of HI 40.6–2014 from the incorporation by reference into the DOE test procedure, as that section will no longer be necessary. As a result, measurements of kinematic viscosity and density of the test fluid will not be required, minimizing burden on manufacturers. However, measurements of fluid temperature and NTU will be required to be made and maintained as part of the test records underlying certification to DOE to ensure that the test fluid is in accordance with the DOE requirements.

With regard to DOE's proposal to incorporate by reference appendix D of HI 40.6–2014, "Suitable Time Periods for Calibration of Test Instruments," APSP and Hayward noted that HI 40.6–2014 does not explicitly provide an option for historical data to be used as a basis to support a longer recalibration interval than recommended by table D.1 of HI 40.6–2014. APSP and Hayward stated that this provision used to be available as an option in HI 14.6–2011. APSP and Hayward added that it currently calibrates all instruments annually, in accordance with ISO 17025,[37] which would not comply with some of the required calibration intervals in HI 40.6–2014, such as 0.33 years for pressure transducers. As such, APSP and Hayward suggested DOE include a provision to allow for historical data to be used to determine longer calibration

[37] ISO/IEC 17025, "General requirements for the competence of testing and calibration laboratories," is an internationally recognized standard that contains specifics on testing, calibration methods, data quality management systems, and other general requirements for test laboratories to carry out testing or calibration. See www.iso.org for more information.

intervals than currently provided for in appendix D of HI 40.6–2014 (APSP, No. 8 at pp. 5–6; Hayward, No. 6 at p. 5).

In response to APSP's and Hayward's suggestion regarding the allowance for extended calibration intervals beyond those specified in appendix D of HI 40.6–2014 based on historical data, DOE agrees that such a provision used to be available in ANSI/HI 14.6–2011, which preceded HI 40.6–2014. DOE understands that it is common practice to extend the calibration interval of some equipment that has demonstrated, based on past calibration data, to maintain calibration over several calibration cycles. DOE also recognizes that this can reduce the burden of maintaining equipment within the specifications required by the DOE test procedure. As such, DOE believes it is reasonable to allow the use of historical test data to justify calibration intervals longer than those specified in table D.1 of HI 40.6–2014 and that such a provision does not compromise the accuracy of the resultant test data. However, DOE believes additional specificity is required to ensure that unreasonably long time periods between calibration intervals are not permitted. Therefore, DOE is adopting requirements in this final rule that historical calibration data may be used to justify time periods up to three times longer than those specified in table D.1 of HI 40.6–2014. In such a case, the supporting historical data must show maintenance of calibration of the given instrument up to the selected extended calibration interval on at least two unique occasions, based on the interval specified in HI 40.6–2014. For example, in the case of the pressure transducers discussed by Hayward, Hayward may justify a calibration interval up to 1 year[38] (three times the calibration interval of 0.33 years specified in

[38] While DOE acknowledges that three times 0.33 is 0.99, 0.99 years can practically be treated as 1 year, as the calibration intervals are not precise to the hundredths of a year (±3 days).

HI 40.6–2014) based on calibration data taken at least every 0.33 years that demonstrates that the calibration has been maintained for 1 year for at least two different years.

China stated, in written comments, its belief that the proposed test method did not provide a test method for total head. (China, No. 14 at p. 3) DOE disagrees and clarifies that, as stated previously, the proposed test procedure proposed to incorporate by reference certain sections of HI 40.6-2014, which contain relevant specifications regarding test setup, methodology, standard rating conditions, equipment specifications, uncertainty calculations, and tolerances to measure pump total head, among other pump performance metrics.

DOE did not receive any comments on any of the other sections of HI 40.6–2014 DOE proposed to incorporate by reference. Therefore, in this final rule, DOE incorporates by reference HI 40.6–2014, with certain exceptions, modifications, and additions, into the new appendices B1 and B2 (see section III.G.4) to subpart Y that will contain the DPPP test procedure. DOE notes that DOE is using the nomenclature "HI 40.6-2014-B" in the regulatory text to refer to the incorporation by reference of HI 40.6-2014 for the dedicated-purpose pool pumps test procedure in appendices B1 and B2 and differentiate it from the existing incorporation by reference of HI 40.6-2014 to appendix A established in the January 2016 general pumps test procedure final rule. 81 FR 4086, 4109–4117 (Jan. 25, 2016).

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 new 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 modifications and clarifications to HI 40.6–2014 are addressed in the subsequent sections III.E.2.a through III.E.2.g.

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

Although DOE is incorporating by reference HI 40.6–2014 as the basis for the DPPP test procedure, DOE noted in the September 2016 DPPP test procedure NOPR that some sections of the standard are not applicable to the DPPP test procedure and other sections require clarification regarding their applicability when conducting the DPPP test procedure. 81 FR 64580, 64615–20 (Sept. 20, 2016). Table III.8 provides an overview of the sections of HI 40.6–2014 that DOE proposed to exclude from the DOE test procedure for dedicated-purpose pool pumps, as well as those that DOE proposed to only be optional and not required for determination of WEF. Id.

Table III.8 Sections of HI 40.6–2014 DOE Proposed to Exclude from Incorporation by Reference or Make Optional as Part of the DPPP Test Procedure

Section Number	Title	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

In the September 2016 DPPP test procedure NOPR, DOE discussed in detail the specific rationale for excluding or making optional certain sections of HI 40.6–2014. 81 FR 64580, 64615 (Sept. 20, 2016).

In response to DOE's proposal to exclude certain sections from the incorporation by reference of HI 40.6–2014, while making other sections optional for representations, Hayward suggested DOE reconsider the exception of section A.7 of HI 40.6–2017, "Testing at temperatures exceeding 30 °C (86 °F)," in light of their other suggestions related to elevated test fluid temperatures discussed in section III.E.1. Pentair commented that section 40.6.5.5.2, which requires the speed of the pump to be within 80 to 120 percent of the rated speed, should remain a stipulation of testing and should not be excluded, especially for single- and two-speed induction motor pumps, as NEMA-MG requires only better than 7.5 percent of the regulated speed. (Pentair, No. 11 at p. 3) China also commented that the proposed test procedure did not define a test method for rotating speed and, similarly, suggested maintaining speed between 80 and 110 percent of rated rotating speed. (China, No. 14 at p. 3)

In response to Hayward's comment regarding the proposed exclusion of section A.7 of HI 40.6–2014, as discussed in section III.E.1, DOE is adopting alternative criteria to describe the test fluid in lieu of the criteria specified in HI 40.6–2014. Therefore, a specific accommodation to test at higher temperatures, as specified in appendix A.7 of HI 40.6–2014, is not required. In addition, DOE notes that the instructions in section A.7 are not currently very descriptive and could introduce ambiguity to the test. As such, DOE excludes of section A.7 of HI 40.6–2014 from incorporation by reference in this final rule.

In response to Pentair and China's comments regarding the measurement of and tolerances related to rotational speed, DOE clarifies that the adopted test procedure references specific load points for different varieties and speed configurations of dedicated-purpose pool pumps, as described in section III.D. These load points were specifically recommended by the DPPP Working Group and include specifications regarding the flow, head, and speed at each load point. For example, single-speed pool filter pumps must be evaluated on curve C at the maximum speed, which is typically the only speed available.[39] Two-speed pool filter pumps must be evaluated at the maximum and low speed, which are, by definition, the only speeds available on the pump. The load points for multi-speed and variable-speed pool filter pumps do not specify speed values, but are described with respect to specific head and flow requirements. In all cases, tolerances around a given speed value are not relevant since there is no "target" speed value that must be attained. Instead, DOE describes tolerances around the tested flow or head values that must be achieved, as those values have specified values or thresholds that must be achieved and drive the specification of the load point. While the speed is integral to attaining a given load point, the tested speed is a dependent variable to satisfy the required head and flow values based on the capabilities of the pump. Therefore, DOE does not believe that allowing measurements at alternative speeds, either those specified in section 40.6.5.5.2 or NEMA MG-1-2016, is necessary or relevant to the DPPP test procedure. In addition, DOE understands the primary purpose of section 40.6.5.5.2 is to accommodate testing of very large pumps that may overload the power supply of the test lab when run at full speed. DOE does not believe this is a concern for dedicated-purpose pool pumps, most of which are less than 2.5 rated hydraulic

[39] As described in more detail in section III.D.1.e, if a dedicated-purpose pool pump does not meet the definition of a two-speed, multi-speed, or variable-speed dedicated-purpose pool pump discussed in section III.B.7, or the necessary criteria to apply the two-speed test method discussed in section III.D.1.e, such a pump must be tested using the single-speed pool filter pump test point, regardless of the number of operating speeds the pump may have.

horsepower. Therefore, this final rule does not incorporate by reference section 40.6.5.5.2, and requires all testing to be conducted at the appropriate load points specified in section III.D for each DPPP variety and speed configuration. Regarding measurement of speed, DOE notes that HI 40.6-2014, which is incorporated by reference in the adopted test procedure, includes specifications for measuring rotating speed.

DOE did not receive any other comments pertaining to the other sections DOE proposed to exclude from DOE's incorporation by reference. Therefore, in this final rule, DOE is not incorporating 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. In addition, as discussed in section III.E.1, as DOE is adopting alternative criteria to describe the test fluid. For that reason, DOE is also excluding section 40.6.5.5 from the incorporation by reference of HI 40.6–2014. To allow manufacturers to make voluntary representations of other metrics, in addition to WEF, DOE incorporates by reference section 40.6.5.5.1, section 40.6.6.2, and section 40.6.6.3, of HI 40.6–2014 and clarifies that these sections are not required for determination of WEF, but may be optionally conducted to determine and make representations about other DPPP performance parameters.

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. As discussed in the September 2016 DPPP test procedure NOPR, DOE proposed that hydraulic horsepower must be calculated with a unit conversion factor of 3956, instead of 3960, which is specified in HI 40.6–2014. 81 FR 64580, 64617 (Sept.

20, 2016). DOE explained that using a value of 3956 is more accurate and precise given the properties of the specified test fluid. Also, as noted, in the September 2016 DPPP test procedure NOPR, the conversion factor of 3956 was adopted also in the January 2016 general pumps test procedure final rule. 81 FR 4086, 4109 (Jan. 25, 2016).

In response to DOE's proposal, during the September 2016 DPPP test procedure NOPR public meeting, Hayward sought clarification from DOE, as it believed that the value referred to the rotating speed of the pump. Hayward questioned whether this was the same value used during the DPPP Working Group meetings. (Hayward, Public Meeting Transcript, No. 3 at pp. 62–63) In response, during the September 2016 DPPP test procedure NOPR public meeting, Pentair clarified that the value was a unit conversion (Pentair, Public Meeting Transcript, No. 3 at pp. 62–63) and DOE clarified that the value of 3956 (as proposed in the September 2016 DPPP test procedure NOPR) was the one used throughout the DPPP Working Group meetings. APSP and Hayward later suggested, in their written comments, that the DPPP test procedure continue to rely on the 3960 value historically used in all hydraulic power calculations. (APSP, No. 8 at p. 6)

While DOE believes that the value of 3956 proposed in the September 2016 DPPP test procedure NOPR is more precise and accurate given the specific gravity of 1.0 assumed in the calculation of hydraulic power, the value of the unit conversion (3956 or 3960) does not meaningfully impact the resultant rated hydraulic horsepower within the number of number of digits to which rated hydraulic horsepower is to be reported. Therefore, in this final rule, DOE adopts a requirement that hydraulic horsepower must be calculated with a unit conversion factor of 3960, consistent with Hayward's request.

c. Data Collection and Determination of Stabilization

The DPPP test procedure must provide instructions regarding how to sample and collect data at each load point. Such instructions must 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.

In the September 2016 DPPP test procedure NOPR, DOE explained that section 40.6.5.5.1 of HI 40.6–2014 provides that all measurements shall be made under steady state conditions. DOE stated that the requirements for determining when the pump is operating under steady state conditions in HI 40.6–2014 were 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. 81 FR 64580, 64617 (Sept. 20, 2016).

In addition to the requirements specified in section 40.6.5.5.1 of HI 40.6–2014, in the September 2016 DPPP test procedure NOPR, DOE proposed requirements that at least two unique measurements must be used to determine stabilization when testing pumps according to the DPPP test procedure. 81 FR 64580, 64617 (Sept. 20, 2016). DOE explained within the September 2016 test procedure NOPR, that HI 40.6–2014 does not specify the measurement interval for determination of steady state operation. Id. DOE's proposal of two measurements is the same as the requirement established in the January 2016 general pumps test procedure final rule. 81 FR 4086, 4011 (Jan. 25, 2016). This requirement accommodates a longer period

between the sampling of individual data points, as compared to the ENERGY STAR program. 81 FR 64580, 64617 (Sept. 20, 2016).

Section 40.6.3.2.2 of HI 40.6–2014, "Permissible fluctuations," specifies 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 of HI 40.6–2014. In the September 2016 DPPP test procedure NOPR, similar to the January 2016 general pumps test procedure final rule (81 FR 4086, 4011 (Jan. 25, 2016)), DOE proposed 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. 81 FR 64580, 64617 (Sept. 20, 2016). DOE also proposed in the September 2016 DPPP test procedure NOPR 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. This requirement is 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. 81 FR 64580, 64617 (Sept. 20, 2016).

In response to DOE's proposed stabilization requirements, particularly those incorporated by reference in section 40.6.5.5.1 of HI 40.6–2014, APSP and Hayward requested clarification of the definition of "vortexing" and an explanation of how to specifically determine if vortices are, or are not present. (APSP, No. 8 at pp.6–7; Hayward, No. 6 at p. 6) In response, DOE acknowledges that DOE did not propose a definition for "vortexing" or "vortices," and such definitions are not contained in HI 40.6–2014. After reviewing the context of section 40.6.5.5.1 of HI 40.6–2014, DOE concludes that the language of "no vortexing" is a redundant, but

informative statement, related to defining steady state conditions. In other words, vortexing is a specific scenario, which would cause test readings to fluctuate beyond 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. Accordingly, DOE will not establish any further definitions or verification procedures related to vortexing or vortices. Under section 40.6.5.5.1 of HI 40.6–2014, as incorporated by reference into the test procedure, steady state is achieved when the mean value of all measured quantities required for the test data point remain constant within the permissible amplitudes of fluctuations defined in Table 40.6.3.2.2 over a minimum time of 10 seconds before data are collected. No explicit measurement or determination of vortexing or vortices is required.

DOE did not receive any additional comments on this proposal and, therefore, is adopting, in this final rule, the proposal that determination of stabilization must be made based on at least two unique measurements and any damping devices are only permitted to integrate up to the data collection interval.

d. Test Tolerances

As discussed in section III.D, DOE proposed in the September 2016 DPPP test procedure NOPR to specify unique load points for each DPPP variety and speed configuration. As DOE noted in the September 2016 DPPP test procedure NOPR, 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. 81 FR 64580, 64617–18 (Sept. 20, 2016).

In the September 2016 DPPP test procedure NOPR, consistent with the tolerances adopted in the ENERGY STAR test procedure, DOE proposed tolerances of ±2.5 percent on flow rate for self-priming and non-self-priming pool filter pumps and pressure cleaner booster pumps. However, due to the fact that the load point for waterfall pumps is specified as a fixed head value, DOE proposed a tolerance of ±2.5 percent of head for waterfall pumps. DOE did not propose a tolerance on the tested speed, as the tested maximum speeds are specific to each dedicated-purpose pool pump being tested. 81 FR 64580, 64617–18 (Sept. 20, 2016).

In response to DOE's proposal, APSP and Hayward commented that maintaining ±2.5 percent of the specified flow rate or head value will be difficult to achieve, particularly with regards to the 10 gpm load point for pressure cleaner booster pumps. APSP and Hayward requested any exemplary data that demonstrates stabilization can be maintained within the specified tolerance at low head or flows and that DOE consider a larger tolerance for low flow or head measurements (APSP, No. 8 at p. 7; Hayward, No. 6 at p. 6).

In response to APSP's and Hayward's request for larger tolerances on low flow and head values, DOE reiterates that DOE based the proposal in the September 2016 DPPP test procedure NOPR on the existing tolerance requirements in the ENERGY STAR Test Method for Pool Pumps.[40] The ENERGY STAR method applies to all load points specified by the test method, including the minimum speed test point for variable-speed dedicated-purpose pool pumps. DOE also notes that the flow rates on Curves A, B, and C at minimum flow rate for many variable-

[40] EPA. 2013. "ENERGY STAR Program Requirements Product Specification for Pool Pumps – Final Test Method." Available at: https://www.energystar.gov/sites/default/files/specs/Pool%20Pump%20Final%20Test%20Method%2001-15-2013.pdf

speed dedicated-purpose pool pumps are at or below 10 gpm, as demonstrated in DOE's Self-Priming Pool Filter Pump Performance Database. (Docket No. EERE-2015-BT-STD-0008, No. 102) Specifically, 43 of the 83 total variable-speed self-priming pool filter pumps in DOE's database report flow rates less than or equal to 10 gpm and at least 19 of those 43 models are from the ENERGY STAR database.[41] Based on the fact that such requirements can be met to certify pumps in accordance with ENERGY STAR, DOE believes that such a requirement can be met when conducting the DOE DPPP test procedure. Although the pumps in the ENERGY STAR database should be conforming to the flow and head tolerances, DOE does not have access to source data to confirm this. Therefore, in light of Hayward's comment, in this final rule, DOE is adopting a broader tolerance requirement for lower flow scenarios. Specificity, the flow tolerance will be ±2.5 percent of the specified flow rate or ±0.5 gpm, whichever is greater. DOE believes that a range of 1.0 gpm can reasonably be maintained with typical lab testing equipment. DOE notes that such an accommodation is not necessary for waterfall pumps, since the tolerance is a fixed 17.0 ± 0.425 feet.

In addition, based on the revised load points for multi-speed and variable-speed pool filter pumps presented in section III.D.1.c, DOE notes that the multi-speed and variable-speed pool filter pump load points are now specified with respect to the head value (i.e., $H = 0.0082 \times Q^2$), while the flow point may vary based on the operating speeds available on the pump. Therefore, in this final rule, DOE is revising the tolerances for the multi-speed and variable-speed pool filter pump test points to be achieved within ±2.5 percent of the specified head value,

[41] ENERGY STAR maintains a database of certified products, including pool pumps. See https://www.energystar.gov/productfinder/product/certified-pool-pumps/results

which is curve C. DOE is adopting all other tolerances as proposed in the September 2016 DPPP test procedure NOPR.

e. Power Supply Characteristics

In the September 2016 DPPP test procedure NOPR and consistent with the January 2016 general pumps test procedure final rule (81 FR 4086, 4112–4115 (Jan. 25, 2016)), DOE proposed tolerances for voltage, frequency, voltage unbalance, and total harmonic distortion that must be maintained at the input terminals to the motor and/or control, as applicable, when conducting the DPPP test procedure. 81 FR 64580, 64618–19 (Sept. 20, 2016). DOE discussed how the measurement of input power to the driver is an important element of the test, because input power is a key component of WEF. In addition, in the September 2016 DPPP test procedure NOPR, DOE discussed how large differences in voltage, frequency, voltage unbalance, or total harmonic distortion can affect the performance of the motor and/or control under test. Id.

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. In the September 2016 DPPP test procedure NOPR, DOE proposed 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. 81 FR 64580, 64619 (Sept. 20, 2016).

APSP and Hayward submitted comments regarding voltage unbalance of the power supply. APSP and Hayward were familiar with a voltage unbalance in a three-phase power supply, but were unclear about how it applied to a single-phase power supply. (APSP, No. 8 at p.7; Hayward, No. 4 at p.1; Hayward, No. 6 at pp. 6–7) In response, voltage unbalance or imbalance is defined as the largest difference between the average RMS voltage and the RMS value of any single voltage phase divided by the average RMS voltage, usually expressed as a percentage.[42] Voltage unbalance is a function of multiple phase power supplies and, by definition, does not exist in single-phase power supplies. As there is no voltage unbalance in a single-phase power supply, the requirement to maintain voltage unbalance within ±3 percent of the rated value of the motor only applies to pumps with motors driven by a three-phase power supply.

APSP and Hayward also requested that DOE confirm that the voltage unbalance specification of "±3 percent of the rated value of the motor" applies to the rated voltage of the motor. (APSP, No.8 at p. 7; Hayward, No. 6 at pp. 6–7) In response, DOE agrees that the proposal in the September DPPP 2016 test procedure NOPR could be clarified. DOE understands that motors typically do not have nominal rated voltage unbalance values, similar to the nominal rated frequency and voltage values listed on many motor nameplates. In this case "±3 percent of the rated value of the motor" refers to "the value at which the motor was rated."

[42] An overview by DOE on voltage unbalance can be found at: http://energy.gov/sites/prod/files/2014/04/f15/eliminate_voltage_unbalanced_motor_systemts7.pdf

That is, the value is referring to the voltage unbalance associated with the rated efficiency of the motor. DOE also notes that, in 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), which are the test methods incorporated by reference as the DOE test procedure for electric motors, a voltage unbalance of ≤0.5 percent is required. Therefore, the requirement of "±3 percent of the value at which the motor was rated" can also be interpreted as ≤3.5 percent for motors rated in accordance with DOE's electric motor test procedure. In this final rule, DOE will specify the voltage unbalance requirement as "±3 percent of value with which the motor was rated."

During the September 2016 DPPP test procedure NOPR public meeting, CA IOUs, DOE, and Hayward discussed total harmonic distortion (THD). Hayward inquired about differences related to tolerances between the September 2016 DPPP test procedure NOPR and ENERGY STAR and specifically sought indication of whether the tolerances in DOE's proposal were more stringent than ENERGY STAR. (Hayward, Public Meeting Transcript, No. 3 at p. 58) DOE responded during the September 2016 DPPP test procedure NOPR public meeting that ENERGY STAR requires THD to be less than 2 percent and DOE's proposal was less than 12 percent. (DOE, Public Meeting Transcript, No. 3 at p. 59) CA IOUs noted that ENERGY STAR's THD requirements were much more stringent than the proposed DOE requirements and raised questions if current test labs can comply with this value. (CA IOUs, Public Meeting Transcript, No. 3 at pp. 59–60) Hayward responded that upon initial review, if a manufacturer is already conducting ENERGY STAR testing in-house, that the DOE proposal does not seem more stringent, nor did Hayward believe that the DOE proposal would require any more elaborate

equipment. (Hayward, Public Meeting Transcript, No. 3 at p. 60) CA IOUs responded that a different THD value might be necessary in that the DOE's proposal of 12 percent seems unreasonably high, but ENERGY STAR's requirement of 2 percent seems unreasonably low. (CA IOUs, Public Meeting Transcript, No. 3 at p. 60)

Regarding Hayward's inquiry as to the relative stringency of DOE's proposed power supply characteristics as compared to the ENERGY STAR[43] test procedure for pool pumps,[44] DOE notes that all of DOE's proposed power supply characteristic requirements are equivalent to or less stringent than the existing ENERGY STAR requirements, as shown in Table III.9.

Table III.9 Comparison of Power Supply Characteristics Requirements Proposed in DOE's September 2016 DPPP test procedure NOPR and in the ENERGY STAR Test Method for Pool Pumps[45]

Power Supply Characteristic	DOE September 2016 DPPP test procedure NOPR Proposal	ENERGY STAR
Voltage	within ±5 percent of the rated value of the motor	within ±1.0 percent of the rated value of the motor
Frequency	within ±5 percent of the rated value of the motor	within ±1.0 percent of the rated value of the motor
Voltage Unbalance	within ±3 percent of the rated value of the motor	N/A
Total Harmonic Distortion	≤12 percent	≤2.0 percent

[43] ENERGY STAR is a joint program of the U.S. Environmental Protection Agency (EPA) and DOE that establishes a voluntary rating, certification, and labeling program for highly energy efficient consumer products and commercial equipment. Information on the program is available at www.energystar.gov/index.cfm?c=home.index.

[44] EPA. 2013. "ENERGY STAR Program Requirements Product Specification 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

[45] EPA. 2013. "ENERGY STAR Program Requirements Product Specification 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

With regard to CA IOUs comment regarding DOE's proposed tolerance on THD perhaps being too large, DOE notes that the THD tolerance of 12 percent was developed based on reasonable limits that motor systems should be designed to handle. Further, a THD tolerance of 12 percent is widely available on the national electrical grid and, therefore, is not unduly burdensome to attain during testing. DOE discussed this justification, at length, in the January 2016 general pumps test procedure final rule. 81 FR 4086, 4112–4118 (Jan. 25, 2016) For example, regarding limitations on harmonic distortion on the power supply, the AMO publication, "Improving Motor and Drive System Performance" (AMO motor sourcebook) states that electrical equipment is often rated to handle 5 percent THD (as defined in IEEE 519–2014[46]), and notes that motors are typically much less sensitive to harmonics than computers or communication systems.[47] In addition, section 5.1 of IEEE 519–2014 recommends line-to-neutral harmonic voltage limits of 5.0 percent individual harmonic distortion and 8.0 percent voltage THD for weekly 95th percentile short time (10 min) values, measured to the 50th harmonic. The IEEE standard also indicates that daily 99th percentile very short time (3 second) values should be less than 1.5 times these values.

Hayward also submitted written comments stating that DOE's proposed voltage, frequency, voltage unbalance, and THD requirements are suitable for testing dedicated-purpose pool pumps and were reasonably achievable in existing laboratory environments. (Hayward, No. 6 at p. 7) Additionally, Hayward submitted written comments that the proposed power supply requirements in the September 2016 DPPP test procedure NOPR are in alignment with (or not as

[46] IEEE. 2014. Standard 519: "IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems." Available at: https://standards.ieee.org/findstds/standard/519-2014.html

[47] DOE EERE. Improving Motor and Drive System Performance—A Sourcebook for Industry. February 2014. Available at www.energy.gov/eere/amo/motor-systems.

stringent as) the power supply requirements for other pool pump industry programs including ENERGY STAR, NSF, and UL. (Hayward, No. 6 at p. 7) Similarly, APSP stated that DOE's proposed power supply requirements were less stringent than the requirements used in DOE motor efficiency testing. (APSP, No. 8 at p. 7) Both APSP and Hayward felt that existing equipment would be more than capable of meeting the proposed requirements. (APSP, No. 8 at p. 7; Hayward, No. 6 at p. 7). Ultimately, for the reasons discussed in this section, DOE adopts requirements in this final rule that when testing dedicated-purpose pool pumps the main power supplied to the motor or controls, if any, must maintain voltage within ±5 percent of the rated value of the motor, frequency within ±1 percent of the rated value of the motor, voltage unbalance of the power supply maintained within ±3 percent of the value with which the motor was rated, and total harmonic distortion maintained at or below 12 percent throughout the test.

f. Measurement Equipment for Testing

Appendix C of HI 40.6–2014, which DOE is incorporating by reference into the DPPP test procedure, specifies the required instrumentation to measure head, speed, flow rate, torque, temperature, and electrical input power to the motor. In the September 2016 DPPP test procedure NOPR, DOE proposes to refer to appendix C of HI 40.6–2014, as incorporated by reference (see section III.E.1), to specify the required instrumentation to measure head, speed, flow rate, and temperature in the DPPP test procedure. 81 FR 64580, 64619–64620 (Sept. 20, 2016). However, DOE noted that for the purposes of measuring input power to the motor or control, as applicable, of DPPP models, 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, DOE proposed requirements that electrical measurements for determining pump power input be taken using equipment capable of measuring current, voltage, and real power up to at least the 40th harmonic

of fundamental supply source frequency[48] and have an accuracy level of ±2.0 percent of the measured value when measured at the fundamental supply source frequency when rating pumps using the testing-based methods or with a calibrated motor. Id. These proposed requirements are consistent with other relevant industry standards[49] for measurement of input power to motor and drive systems and the January 2016 general pumps test procedure final rule. 81 FR 4086, 4118–19 (Jan. 25, 2016) DOE notes that the September 2016 DPPP test procedure NOPR contained inconsistent statements with regard to whether the accuracy requirement was with respect to full scale or the measured value. Specifically, the preamble (81 FR 64619–64620) discussed the accuracy requirement with respect to full scale, while the proposed regulatory text discussed accuracy requirements with respect to the measured value (81 FR 64650). The proposed regulatory text contained the correct proposal, which is that electrical measurement equipment must be accurate to ±2.0 percent of the measured value. DOE notes that this is consistent with the requirements adopted in the January 2016 general pumps test procedure final rule and is less stringent than the requirements contained in the ENERGY STAR Test Method for Pool Pumps,[50] which requires accuracy of 1.5 percent of the measured value for power measurement.

[48] 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.

[49] 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"; 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.

[50] EPA. 2013. "ENERGY STAR Program Requirements Product Specification for Pool Pumps – Final Test Method." Available at: https://www.energystar.gov/sites/default/files/specs/Pool%20Pump%20Final%20Test%20Method%2001-15-2013.pdf

In response to DOE's proposal, Hayward commented that the manufacturer of the power analyzer within Hayward's lab met the level of accuracy proposed in the September 2016 DPPP test procedure NOPR. (Hayward, No. 6 at p. 11) APSP also commented that currently existing motor test data acquisition equipment is adequate to meet the tolerance limits proposed by DOE. (APSP, No. 8 at p. 7)

Therefore, for the reasons discussed in this section, DOE adopts that electrical measurement equipment must be capable of measuring current, voltage, 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 the measured value when measured at the fundamental supply source frequency.

DOE also noted in the September 2016 DPPP test procedure NOPR that HI 40.6–2014 does not contain any requirements for the instruments used for measuring distance. Distance must be measured when determining the self-priming capability of self-priming and non-self-priming pool filter pumps (see section III.G.2). 81 FR 64580, 64620 (Sept. 20, 2016). As such, DOE proposed in the September 2016 DPPP test procedure NOPR to require instruments for measuring distance that are accurate to and have a resolution of at least ±0.1 inch to improve consistency and repeatability of test results. Id. DOE noted that, although this accuracy requirement is generally applicable, when used in combination with other instruments to measure head, both the accuracy requirements of distance-measuring instruments and the specified accuracies for measurement of differential, suction, and discharge head apply. Id.

DOE received no comments related to this proposal. Therefore, in this final rule, DOE requires 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 precision. Therefore, to improve the accuracy and consistency of calculations, DOE proposed in the September 2016 DPPP test procedure NOPR that raw measured data be used to calculate WEF and the resultant value be rounded to the nearest 0.1. 81 FR 646580, 64620 (Sept. 20, 2016). Similarly, DOE proposed that all values of EF, maximum head, vertical lift, and true priming time be reported to the tenths place and all other values be reported to the hundredths place. 81 FR 646580, 64650 (Sept. 20, 2016).

DOE received no comments related to this proposal. However, DOE notes that the June 2016 DPPP Working Group Recommendations specify separate standards for self-priming pool filter pumps with rated hydraulic horsepower greater than or equal to 0.711 hp and less than 0.711 hp. (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #1 at pp. 1-2). As such, DOE notes that rated hydraulic horsepower must be reported to the thousandths place, consistent with the precision desired by the DPPP Working Group in their equipment class specifications. Therefore, in this final rule, DOE adopts that all calculations shall be performed with raw measured data; that WEF, EF, maximum head, vertical lift, and true priming time be

rounded to the nearest tenths place; that rated hydraulic horsepower be reported to the nearest thousandths place; and all other values be rounded to the hundredths place.

F. Representations of Test Metrics

In the September 2016 DPPP test procedure NOPR, DOE stated that manufacturers of equipment that are addressed by the proposed test procedure would have 180 days after the publication of the test procedure final rule to begin using the DOE procedure as the basis for representations. However, DOE clarified that manufacturers would not be required to certify or otherwise 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 will be required to do so using the DOE test procedure. 81 FR 64580, 64627–28 (Sept. 20, 2016).

In the September 2016 DPPP test procedure NOPR, DOE also discussed how other metrics that are outcomes of the DPPP test procedure would also need to be updated to be consistent with the final DPPP test procedure 180 days after publication of the final rule in the Federal Register. Specifically, DOE also proposed establishing standardized and consistent methods for determining several DPPP metrics, including DPPP horsepower metrics, EF, pump efficiency, overall efficiency, driver power input, pump power output, and power factor. 180 days after the publication of this final rule any representations of those metrics would also be required to be based on values consistent with the DOE test procedure. DOE notes that some of these test methods and representations were proposed as optional to allow manufacturers to make such representations if they chose to. Id.

DOE received many comments related to the representation of efficiency metrics, including use of alternative metrics, the definition of a representation, the impact on voluntary programs, and the timing required to transition to the new test procedure. These comments and DOE's responses are discussed in the following sections III.F.1, III.F.2, III.F.3, and III.F.4.

1. Representations of Primary Efficiency Metrics

As discussed in section III.C, DOE is adopting the WEF as the regulatory metric for defining the energy efficiency of dedicated-purpose pool pumps. Typically, DOE only includes in the test procedure the DOE metric (the metric used for the energy conservation standards), and EPCA requires manufacturers to switch over to use of the DOE metric for representations beginning 180 days of publication of the test procedure final rule. This helps ensure standardization of efficiency representations throughout the industry and eliminates potential confusion in the market place if multiple non-equivalent metrics are used to describe the same piece of equipment. DOE believes that requiring use of the single, standardized DOE metric determined through a public notice and comment process is the most appropriate approach. A single, standardized metric that provides a comprehensive picture of the equipment's energy performance will provide a clear and consistent basis for consumers to compare and select dedicated-purpose pool pumps.

As described in detail in the September 2016 DPPP test procedure NOPR, EF is the metric currently used in the industry to describe the energy performance of dedicated-purpose pool pumps. 81 FR 64580, 64598-64600 (Sept. 20, 2016). EF describes the efficiency of the dedicated-purpose pool pump, in terms of gal/Wh, at a single speed point and on a single system curve. However, there are multiple tested speeds and system curves that can be used to

determine EF, resulting in multiple EF values. For example, a single pump can have up to nine different EF values, making selection and comparison of equipment confusing.

Conversely, WEF uses the same measured input data as EF (flow in gallons and input power in W), but weights the efficiency of the pump at multiple speeds into one comprehensive and consistent metric that better represents the average efficiency of the equipment during typical operation. This makes product comparison and selection more straightforward. During the DPPP Working Group discussions, the Working Group members agreed that the weighted average approach was a good approach to achieve a single energy metric that would be representative of the energy efficiency of dedicated-purpose pool pumps, while allowing for an equitable differentiation and comparison of performance among different DPPP models and technologies and providing 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. 212-213; Docket No. EERE-2015-BT-STD-0008, No. 58 at pp. 170-171 and 178) The DPPP Working Group also agreed that, currently, comparing the multiple EF values was confusing and made equipment comparisons difficult. The DPPP Working Group also stated that some of the EF values did not meaningfully represent the efficiency of the equipment . (Docket No. EERE-2015-BT-STD-0008, No. 38 at p. 133; Docket No. EERE-2015-BT-STD-0008, No. 58 at pp. 170-171)

However, the DPPP Working Group also discussed the importance of the EF metric for making product selections for specific applications or making energy saving calculations in support of utility programs. (Docket No. EERE-2015-BT-STD-0008, No. 38 at p. 133 and 213-214; Docket No. EERE-2015-BT-STD-0008, No. 58 at pp. 167-170 and 174-175) Due to

the interest expressed in the use of the EF metric during the DPPP Working Group negotiations, in contrast to typical practice, DOE proposed to allow the representation of two metrics, EF and WEF. Specifically, DOE proposed to include EF as an optional alternative metric in addition to WEF. 81 FR 64580, 64627-64628 (Sept. 20, 2016). DOE notes that the use of this optional additional metric is a unique allowance in this case, a result of a negotiated rulemaking where the industry clearly represented the importance of maintaining the use of the EF metric. DOE provided the DPPP Working Group with an opportunity through the NOPR to formally express their intent to continue using EF as an alternative metric at multiple speeds and/or system curves, in addition to WEF, to describe the energy performance of dedicated-purpose pool pumps.

In the September 2016 DPPP test procedure NOPR public meeting, the CA IOUs expressed support for the ability to test EF at different speeds, in addition to the DOE metric. (CA IOUs, Public Meeting Transcript, No. 3 at pp. 78–79) However, other commenters requested clarification regarding the allowance for the representation of two metrics in DOE's proposal and described how the use of multiple metrics may cause confusion and complicate ratings with other voluntary industry programs. Specifically, during the public meeting and subsequent written comments, APSP, Pentair, and Hayward expressed confusion and concern related to representations of EF, coordination with ENERGY STAR and other entities, and standardization of reported metrics across the industry. (Pentair, Public Meeting Transcript, No. 3 at pp. 8-9, Hayward, No. 6 at p. 1, APSP, No. 8 at p. 2; Pentair, No. 11 at p. 5)

DOE notes that such representations are governed by statute. EPCA requires that, manufacturers of dedicated-purpose pool pumps within the scope of the DPPP test procedure will be required to use the test procedure established 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, "[e]ffective 180 days after a test procedure rule applicable to any covered equipment is prescribed…, [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, beginning 180 days after publication of this final rule, 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 appendix B1. Manufacturers will not be required to certify or make or make other 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. If, however, manufacturers elect to make representations of efficiency prior to such compliance date, they will be required to do so using a measurement of the WEF metric derived from use of the DOE test procedure.

Given the confusion regarding the use of the optional metrics expressed by the majority of interested parties, DOE is adopting, in this final rule, modifications to its proposal to ensure consistency with DOE's test procedure in the long term. Specifically, DOE is providing a test procedure to derive an EF metric, but only for representations made before the compliance date of any energy conservation standards for dedicated-purpose pool pumps. Thus, in this final rule, DOE is adopting two appendices. The first (appendix B1) must be used beginning 180 days after publication of the final rule until the compliance date of energy conservation standards and

includes both WEF and the optional EF method. However, DOE notes that if appendix B1 is used to make representations of the optional metric EF, the manufacturer must also make representations of the required metric WEF, such that, as required by EPCA, the representations "fairly disclose[] the results of testing" under appendix B1. (42 U.S.C. 6314(d)).

The second appendix (B2) includes only the WEF metric. Manufacturers must make representations in accordance with appendix B2 on or after the compliance date of any adopted energy conservation standards, including when certifying compliance with those standards. As appendix B2 does not provide a procedure to arrive at an EF metric, after the compliance date of any energy conservations standards, representations of EF will no longer be allowed.

Through the use of these two appendices, DOE is clarifying that the industry has until the compliance date of adopted energy conservation standards to transition completely to WEF. DOE believes that the transition to use of this one, standardized metric will reduce confusion among manufacturers and in the marketplace. However, prior to the compliance date of any adopted energy conservation standards, DOE is allowing manufactures to continue to make representations using the EF metric, if tested in accordance with the appendix B1, during the transition to representations using only the WEF metric derived from the test procedures in appendix B2. DOE is allowing this optional continued use of EF until the compliance date of any DPPP standards to provide the industry with increased time to transition fully to the new

WEF metric, due to the interest in maintaining the EF metric expressed by the DPPP Working Group. DOE also notes that use of appendix B1 is optional and manufacturers may decline to make representations of EF and WEF, or any other DPPP metrics, until compliance is required with any adopted energy conservation standard, when representations must be based on the results of testing under appendix B2.

2. Definition of Representation

In response to the September 2016 DPPP test procedure NOPR, Hayward requested a definition of the term representation. (Hayward, No. 6 at p. 1) During the NOPR public meeting Hayward also requested that DOE provide an example of what would be a typical representation applied to other regulated products. (Hayward, Public Meeting Transcript, No. 3 at p. 9)

In response, DOE notes that there is no formal definition of representation. However, as noted previously, 42 U.S.C. 6314(d), which establishes the 180-day representation requirements, states that manufacturers, distributors, retailers, and private labelers are prohibited from making "any representation- in writing (including any representation on a label) or in any broadcast advertisement 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, representations include any and all values that are generated by the test procedure, as well as any statement regarding the energy consumption or cost of energy consumed. Representations include, for example, any information included in operation and installation manuals, in marketing materials, on a website, or on the equipment label, as well as verbal statements made in broadcast advertisements.

In response to Hayward's request for an example of what would be a typical representation, potentially for a different product or piece of equipment, DOE provided the example at the September 2016 DPPP test procedure NOPR public meeting of a residential refrigerator where any representation of how much electricity the refrigerator consumes made in a manufacturer's literature or on their website would need to be made based on the appropriate DOE test procedure for that product. DOE stated that any metrics that come out of the DOE test procedure must be based on testing in accordance with that test procedure. (DOE, Public Meeting Transcript, No. 3 at pp. 9–10). For dedicated-purpose pool pumps, the relevant metrics as proposed were WEF, EF, rated hydraulic horsepower, DPPP nominal motor horsepower, DPPP total horsepower, DPPP service factor, true power factor, and maximum head, as well as pump efficiency, overall (wire-to-water) efficiency, driver power input, and pump power output (hydraulic horsepower), graphically or in numerical form, and potentially at a variety of speeds or load points.

3. Impact on Voluntary and Other Regulatory Programs

Hayward asked whether or not current the current reporting of data (e.g., EF, horsepower, service factor, etc.) to EPA, CEC, and APSP are affected by this rulemaking (and whether DOE would work with those entities to update their standards). (Hayward, No. 6 at p. 1) Pentair also requested clarification regarding whether or not the EF value displayed in the ENERGY STAR database would be subject to DOE test procedures and representation requirements 180 days after publication of the final rule. (Pentair, Public Meeting Transcript, No. 3 at pp. 8–9) CA IOUs were supportive of the DOE DPPP test procedure being incorporated by ENERGY STAR as well as if ENERGY STAR or other organizations wanted to test at different speeds, they could

use the DOE test procedure, but specify the speed accordingly. (CA IOUs, Public Meeting Transcript, No. 3 at pp. 78–79)

In response to Hayward and Pentair's comments regarding the reporting of EF, DOE clarifies that, as discussed previously, 180 days after publication of the final rule in the Federal Register, all representations of energy and efficiency metrics, including EF, will need to be updated to be consistent with the final DPPP test procedure. . This is a statutory requirement of EPCA, not a timeframe set by DOE. DOE understands that manufacturers of pumps likely have historical test data which were developed with methods consistent with the DOE test procedure being adopted in this final rule. DOE notes that it does not expect that manufacturers will 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 are substantially different from those adopted in this final rule or the manufacturer has changed the design of the basic model, the representations resulting from the historical methods would no longer be valid.

APSP and Hayward noted that because DOE proposes EF as kgal/kWh, it is not consistent with other programs that require reporting it as gal/Wh, and therefore the same number would be reported with different units. (APSP, No.8 at p. 9; Hayward, No. 6 at p. 8)

In response, DOE notes that, although the DOE test procedure for EF proposed to use kgal/kWh instead of gal/Wh, these values are numerically equivalent. However, for consistency

with previous ratings, in this final rule, DOE is adopting units of gal/Wh for the optional EF test metric.

With regard to coordination with voluntary and other regulatory programs in general, DOE notes that during the Working Group meetings and the NOPR public meeting, it was made clear to stakeholders that not only the industry, but also ENERGY STAR and CEC, would have to transition to the DOE test procedure within 180 days of publication of the test procedure final rule. (Docket No. EERE-2015-BT-STD-0008, No. 54 at pp. 42-43; Public Meeting Transcript, No. 3 at pp. 9-11) On or after this date, representations must be made in accordance with the adopted DOE test procedure. Accordingly, DOE expects that both ENERGY STAR and CEC will transition to DOE's WEF metric and test procedure. DOE will work with ENERGY STAR and CEC to make this transition. However, during this period of transition, manufacturers may still be making representations of EF for other programs and must determine whether their historical test data is valid in accordance with the DOE test procedure or not. After 180 days, all representations, including representations of EF, must be made in accordance with the DOE test procedure. In the case any historical test data is determined not to be valid, that DPPP model must be retested in order to continue making representations of EF.

4. Request for Extension

Hayward requested an extension of the 180 day timeframe for representations to allow manufacturers sufficient time to obtain the necessary resources, equipment, and personnel to respond to DOE's request. (Hayward, No. 6 at p. 1) Pentair and APSP stated that it was impossible to comply with the 180 day requirement for publishing performance and labeling products according to the DOE test procedure, particularly due to the relationship with ENERGY

STAR requirements. They also noted that introducing new terms into the market so early would be disruptive. Therefore, they requested that the 180 day requirement be changed to coincide with the compliance date of energy conservation standards. (APSP, No. 8 at p. 2; Pentair, No. 11 at p. 5)

In response to Pentair and APSP's concerns about labeling and introduction of new metrics, DOE did not propose that products be labeled within the 180 day period (see section III.H). Furthermore, DOE notes that manufacturers may decline to make any representations of WEF, or any other DPPP metrics, until compliance is required with any adopted energy conservation standard, meaning that no equipment is required to be rated in accordance with the DOE test procedure within 180 days. EPCA does require, however, that any representation that a manufacturer may choose to make on a label or otherwise must reflect testing under the applicable DOE test procedure, beginning 180 days after publication of this final rule. (42 U.S.C. 6314(d)) In this case, they must make representations of WEF at a minimum, but may choose to continue making representations of EF, in accordance with the results of testing under appendix B1, until compliance is required with any adopted energy conservation standard.

DOE acknowledges that some DPPP models currently participate in voluntary industry programs, such as ENERGY STAR, that rely on the EF metric. As such, DOE is accommodating the continued use of the EF metric until the compliance date of any DPPP energy conservation standards to allow a smooth transition in the industry, as requested by Pentair and APSP. However, as mentioned previously, both ENERGY STAR and CEC are also required to transition to DOE's new WEF metric and test procedure within 180 days. In addition, after the compliance date of any DPPP energy conservation standards, only

representations of WEF will be allowed, as representation of EF would not be in accordance with the results of testing under appendix B2 of the DPPP test procedure. DOE believes this should address Pentair and APSP's concern regarding market confusion with new metrics.

DOE notes that 42 USC 6314(d)(2) allows manufacturers to petition for an extension of up to another 180 days in the case of undue hardship to the manufacturer. However, because a finding as to undue hardship is particular to a given manufacturer, the petition must be filed by the manufacturer within 60 days of the publication of this final rule, specifying the hardship to the manufacturer that would result from the 180-day requirement, and any extension will be determined by the Secretary on a case-by-case basis. (42 U.S.C. 6314(d)(2))

G. 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 capacity and maximum head 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.D, DOE is establishing different load points and reference curves based on the rated hydraulic horsepower of a given pool filter pump. DOE's standardized and consistent method for determining DPPP capacity is discussed in section III.G.1. As discussed in section III.B.3.a, DOE also is differentiating 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.G.2. In addition, waterfall pumps are categorized with respect to the maximum head the pump can produce. DOE's test method for determining maximum head is discussed in section III.G.3.

1. Determination of DPPP Capacity

As discussed in detail in the September 2016 DPPP test procedure NOPR, industry currently uses several terms to characterize the capacity 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. 81 FR 646580, 64620–64623 (Sept. 20, 2016). The DPPP Working Group discussed these terms and recommended standardizing the terminology by referring to pump capacity 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) In addition, the DPPP Working Group 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 recommended 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) Section III.G.1.a and section III.G.1.b contain DOE's proposals and the adopted provisions related to rated hydraulic horsepower and other DPPP motor horsepower metrics, respectively.

a. Rated Hydraulic Horsepower

In the September 2016 DPPP test procedure NOPR, DOE proposed 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 new DPPP test procedure. 81 FR 646580, 64620–64623 (Sept. 20, 2016). In order to have consistent and comparable values of hydraulic horsepower, the DPPP test procedure must also specify a load point at which

to determine the hydraulic horsepower. DOE proposed 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.D) and at full impeller diameter to result in consistent and comparable ratings among DPPP varieties and speed configurations. Id.

While hydraulic horsepower (termed pump power output[51]) is defined in HI 40.6–2014, in the September 2016 DPPP test procedure NOPR, DOE proposed to use the term "rated hydraulic horsepower" to specifically identify 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. 81 FR 64580, 64622 (Sept. 20, 2016). DOE's goal in proposing this term was to unambiguously specify the pump power characteristic and differentiate it from the general term "hydraulic horsepower" that can be determined at any location on the pump curve. Id. In addition, DOE proposed in the September 2016 DPPP test procedure NOPR that the representative value of 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 new DPPP test procedure. Id. The test method for determining hydraulic horsepower (pump power output) is described in more detail in section III.E.2.b.

[51] 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 capacity of a dedicated-purpose pool pump, it refers to the rated hydraulic horsepower.

DOE did not receive any comments related to the proposed definition of rated hydraulic horsepower, the proposal to base the characterization of DPPP capacity on rated hydraulic horsepower, or the proposed method for determining representative values of rated hydraulic horsepower. Consequently, DOE is adopting the terminology and test methods proposed in the September 2016 DPPP test procedure NOPR without modification.

b. Other DPPP Motor Horsepower Metrics

DPPP Working Group suggested 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). In the September 2016 DPPP test procedure NOPR, DOE reviewed the terms typically used in the DPPP industry to characterize motor horsepower. 81 FR 64580, 64622 (Sept. 20, 2016). To alleviate any ambiguity associated with rated horsepower, total horsepower, and service factor, DOE proposed, in the September 2016 DPPP test procedure NOPR, the terms "DPPP nominal motor horsepower," "DPPP motor total horsepower," and "DPPP service factor." 81 64580, 64622–64623 (Sept. 20, 2016). The proposed definitions for these terms are as follows:

- 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.

81 FR 64580, 64622–64623 (Sept. 20, 2016).

The definitions proposed in the NOPR were 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 defines 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." Id.

In response to DOE's proposed definitions, CA IOUs were generally supportive of this approach and stated that CEC has similar terms to those proposed in the September 2016 DPPP test procedure NOPR, but noted that CEC uses the term "motor capacity" for consistency with the motor industry, which is synonymous with the total horsepower and service factor horsepower. (CA IOUs, Public Meeting Transcript, No. 3 at p. 66).

DOE acknowledges CA IOUs' comment and is aware that different organizations use different terms to describe similar quantities. Although DOE is aware that CEC uses the term motor capacity to refer to what DOE is proposing to define as DPPP motor total horsepower, DOE believes the proposed term is more straightforward and widely understood. DOE also notes that Title 20 of the California Code of Regulations defines both the term "capacity of the motor" and "total horsepower" (of an AC motor) as 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 the nameplate ambient rating and motor insulation class. Cal. Code Regs., tit. 20 section 1602, subd. (g) However, to be consistent with both CEC definitions for the same term, this final rule will adopt the definition with a parenthetical to note that DPPP motor total horsepower is also referred to as service factor horsepower or motor capacity.

Regarding the definition of DPPP nominal motor horsepower, based on response to comment discussed further in this section, DOE is not referencing NEMA MG-1–2014 for the test method to determine DPPP nominal motor horsepower and is instead directly referencing a more simplified method with equivalent burden. As such, DOE's proposed definition is no longer applicable. DOE believes specifying a test method for determining this value is sufficient and is not adopting a definition of DPPP nominal motor horsepower.

In the September 2016 DPPP test procedure NOPR, DOE also proposed test methods to consistently and unambiguously determine the DPPP nominal motor horsepower, DPPP service factor, and DPPP motor total horsepower. To determine the DPPP nominal motor horsepower for single-phase and polyphase small and medium AC motors, DOE proposed to reference the

relevant sections of NEMA MG-1–2014, as summarized in Table III.10. DOE also proposed to incorporate by reference these sections of NEMA MG-1–2014 into the DPPP test procedure. 81 FR 64580, 64622–64623 (Sept. 20, 2016).

Table III.10 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 of NEMA MG-1–2014*

* 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 for DC motors based on the procedures in NEMA MG-1–2014, DOE also proposed to include instructions in the DPPP test procedure that reference the relevant sections of NEMA MG-1–2014. Id.

DOE also proposed to base the determination of DPPP service factor on the standardized service factor values 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 and for DC motors, DOE proposed assigning a service factor of 1.0, consistent with section 12.51.2 of NEMA MG-1–2014. Id.

Finally, DOE proposed 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. Id.

In response to DOE's proposed test methods for the proposed DPPP motor horsepower metrics, Nidec commented that section 10.34 of NEMA MG-1–2014, which DOE proposed to incorporate by reference, applies specifically to general purpose motors, while small electric motors designed for use on dedicated-purpose pool pumps are definite purpose motors that do not follow the design criteria of NEMA MG-1–2014. Instead, Nidec suggested that DOE use equation (4) to determine nominal motor horsepower:

$$P_{nm} = (T \times RPM) \div 5252 \quad \textbf{(4)}$$

Where:

P_{nm} = the nominal total horsepower[52] at full load (in hp),

T = output torque at full load (in lb-ft), and

RPM = the motor speed at full load (in rpm).

[52] Nidec's comment defined this term as the "nominal motor horsepower at full load." However, the rest of the comment describes the value as the motor total horsepower. As Nidec also recommended a service factor of 1.0 (Nidec, No. 10 at pp. 2–3), nominal motor horsepower is equivalent to motor total horsepower and the equation is applicable to both quantities.

Nidec believes that the calculation in equation (4) is a better method for calculation than using the NEMA sections DOE proposed for DPPP motors and stated that equation (4) is the equation Nidec currently uses to rate such motors, which it manufacturers. (Nidec, No. 10 at p. 2). Nidec also inquired as to the test methods DOE proposed to use for DPPP motors. (Nidec, No. 10 at p. 4).

Nidec also commented that the service factor for small electric motors used in the DPPP industry should not follow NEMA section 12.51 of NEMA MG-1–2014 but instead should be established as 1.0 for all DPPP motors. Nidec noted that this is consistent with the labeling requirements set forth in ANSI/APSP/ICC 15a–2013. (Nidec, No. 10 at p. 3). Finally, Nidec commented that three-phase motors utilized on dedicated-purpose pool pumps are energy efficient and already regulated and, therefore, should not need further testing nor reporting requirements. (Nidec, No. 10 at p. 3).

APSP agreed with Nidec that DPPP motors are typically definite-purpose and do not always align with NEMA on mechanical and electrical performance. Similarly, APSP recommended using equation (4) to calculate nominal motor horsepower and assigning a service factor of 1.0, such that nominal motor horsepower was equivalent to motor total horsepower. (APSP, No. 8 at p. 8).

During the September 2016 DPPP test procedure NOPR public meeting, CA IOUs stated that commercial and industrial motors commonly have service factors of 1.15, where the motor is capable of performing at a higher level than what the nameplate shows. In contrast, in DOE's proposal of 1.0, the motor will do at best exactly what the nameplate states. (CA IOUs, Public

Meeting Transcript, No. 3 at p. 68) Pentair also commented that the proposal would restrict a manufacturer's ability to use higher service factor motors for purposes of improved motor life and/or reduction of inventory/SKUs. (Pentair, No. 11 at p. 3). However, Pentair expressed, in its comments, the importance of standardizing and labeling regarding DPPP horsepower metrics and described how the current practice of up-rate and full-rate labeling of similar products causes significant confusion in the market. (Pentair, No. 11 at p. 5). In response to Nidec and APSP's suggestions regarding the appropriate test methods for determining motor horsepower and service factor, DOE believes the method suggested by Nidec and APSP is sound and, as described by the commenters, represents the methods currently used by the motor industry to determine motor total horsepower for DPPP motors. DOE is also aware that equation (4) is a common method for measuring motor horsepower when speed and torque are known. Specifically, equation (4) is described in NEMA MG-1–2014 (the standard DOE proposed to incorporate by reference for this determination), the IEEE Standard 114–2010, "Test Procedure for Single-Phase Induction Motors"; IEEE Standard 113–1985, "IEEE Guide: Test Procedures for Direct-Current Machines"; and Canadian Standards Association (CSA) C747–2009 (Reaffirmed (RA) 2014), "Energy Efficiency Test Methods for Small Motors."[53]

DOE notes that this method provides a direct measurement of the horsepower provided by the motor at full load, which is consistent with the term DPPP motor total horsepower, as opposed to DPPP nominal motor horsepower as suggested by Nidec and APSP. However, DOE acknowledges that, as Nidec and APSP both suggested using a service factor of 1.0 with this

[53] DOE notes that the equation in section 6.4 of CSA C&47–2009 (RA 2014) uses a conversion factor of 5254, instead of the value 5252 suggested by NEMA. However, based on DOE's review, DOE believes a conversion factor of 5252 is more accurate and is more consistent with the value listed in other standards.

method, the DPPP nominal motor horsepower and DPPP motor total horsepower would be equivalent and either could be determined with the suggested method shown in equation (4). Therefore, determining nominal motor horsepower using equation (4) is technically correct, provided it is used with a service factor of 1.0. Both Nidec and APSP specifically suggested determining DPPP nominal motor horsepower using equation (4), setting DPPP service factor to 1.0, and determining DPPP motor total horsepower as the product of the DPPP nominal motor horsepower and DPPP service factor. (Nidec, No. 10 at p. 4; APSP, No. 8 at p. 8). As noted in the NOPR, determining DPPP motor total horsepower as the product of DPPP nominal motor horsepower and DPPP service factor is also consistent with ANSI/APSP/ICC 15a–2013,[54] ENERGY STAR,[55] and CA Title 20[56] definitions for the term. 81 FR 64580, 64620–64622 (Sept. 20, 2016). As such, DOE is adopting the method suggested by Nidec and APSP as the test method for determining DPPP nominal total horsepower for dedicated-purpose pool pumps subject to the adopted procedure.[57] As discussed further in this section regarding incorporations by reference, the burden and fundamental procedure associated with the adopted procedure for measuring motor performance are not different from those proposed in the NOPR, but the adopted method provides a simpler, more direct description.

Regarding service factor, DOE appreciates Nidec and APSP's suggestions regarding service factor and agrees that a service factor of 1.0 for all DPPP motors that are subject to the

[54] ANSI/APSP/ICC-15a–2013, American National Standard for Residential Swimming Pool and Spa Energy Efficiency - section 3, "Definitions." Includes Addenda A. ANSI Approved January 9, 2013. The Association of Pool and Spa Professionals and the International Code Council.
[55] ENERGY STAR Program Requirements for Pool Pumps Eligibility Criteria (Version 1.1), section 1.4, "Product Ratings."
[56] Cal. Code Regs., tit. 20 section 1602, subd. (g)
[57] As discussed subsequently in this section, DOE is adopting test methods for determining the motor horsepower characteristics of dedicated-purpose pool pumps that are only applicable to dedicated-purpose pool pumps distributed in commerce with single-phase AC or DC motors.

adopted motor horsepower provisions would be more consistent and ensure standardized rating across DPPP models. It also enables to use of the more direct determination of DPPP nominal horsepower adopted in this final rule. Although Pentair requested more flexibility specifically with regard to service factor, Pentair also requested standardization in horsepower ratings. As such, in this final rule, in order to better standardize the motor horsepower ratings as recommended by commenters, DOE is adopting a service factor of 1.0 for all dedicated-purpose pool pumps to which the adopted motor horsepower test methods apply.

Regarding Nidec's statement that a service factor of 1.0 was consistent with ANSI/APSP/ICC 15a–2013, DOE reviewed ANSI/APSP/ICC 15a–2013 and finds that ANSI/APSP/ICC 15a–2013 does not appear to provide any restriction with regard to the service factor of DPPP motors. In fact, ANSI/APSP/ICC 15a–2013 defines several terms, including rated horsepower, total horsepower, and service factor, that indicate service factors greater than 1.0 are quiet common. For example, the definition of service factor references a pump with a rated horsepower of 1.5 hp, a service factor of 1.65, and a total horsepower of 2.475 hp.[58]

In response to CA IOUs comments on the proposed DPPP service factor for DPPP motors, DOE notes that, consistent with CA IOUs observation, the service factor prescribed in table 12-4 of section 12.51, "Service Factor of Alternating-Current Motors," is 1.15 for most AC motors with a nominal horsepower greater than 0.5 horsepower and typical synchronous speeds. However, consistent with section 12.51.2 of NEMA MG-1–2014 and the comments of Nidec and APSP, DOE believes that a service factor of 1.0 for AC motors not covered by table 12-4 is more

[58] ANSI/APSP/ICC-15a–2013, section 3, "Definitions."

appropriate than a service factor of 1.15. In addition, as discussed in the September 2016 DPPP test procedure NOPR, NEMA MG-1–2014 does not provide information regarding service factor for DC motors, as nominal synchronous speeds are typically not applicable to DC motors. Therefore, DOE believes a DPPP service factor of 1.0 is appropriate for DC motors, effectively making the nominal horsepower equivalent to the total horsepower of the dedicated-purpose pool pump, which is consistent with the convention for rating such motors in the motor industry.

However, DOE notes that Nidec recommended applying the suggested methodology for single-phase DPPP motors only. Nidec indicated that three-phase motors sold with dedicated-purpose pool pumps are already subject to DOE's energy conservation standards for polyphase electric motors at 10 CFR 431.25 or 10 CFR 431.446, depending on the size of the motor. (Nidec, No. 10 at p. 3). DOE agrees with Nidec that any polyphase induction motors currently subject to DOE's existing regulations for electric motors or small electric motors are already subject to test procedures that describe how to determine relevant motor performance parameters, including nominal motor horsepower and service factor, in a standardized and consistent manner. Therefore, additional specifications in the DPPP test procedure are not required.[59] For these reasons, in this final rule, DOE is limiting the applicability of the test methods for determining DPPP nominal motor horsepower and DPPP service factor to dedicated-purpose pool pumps that are distributed in commerce with single-phase AC or DC

[59] DOE notes that the existing electric motor and small electric motor regulations reference relevant sections of NEMA MG-1–2014 and are consistent with the test methods proposed in the September 2016 DPPP TP NOPR. As such, consistent with CA IOUs observation, dedicated-purpose pool pumps distributed in commerce with polyphase motors will continue to apply table 12-4 in NEMA MG-1–2014.

motors, which are not subject to DOE's existing regulations for electric motors or small electric motors.

DOE notes that the test method for determining DPPP motor total horsepower is still applicable to all dedicated-purpose pool pumps, including those distributed in commerce with polyphase AC motors, as NEMA MG-1–2014 does directly define or prescribe unambiguous methods for determining motor total horsepower. In addition, as discussed further in section III.J.2 and III.H, all dedicated-purpose pool pumps, including dedicated-purpose pool pumps distributed in commerce with polyphase AC motors, are required to report to DOE the DPPP motor total horsepower and include such information on the equipment nameplate.

In adopting Nidec and APSP's recommended test method for determining DPPP nominal motor horsepower, DOE is not referencing NEMA MG-1–2014 as the method for determining DPPP motor total horsepower. However DOE still must adopt specific and standardized test methods for measuring speed and torque of DPPP motors at full load. IEEE Standard 114–2010, "Test Procedure for Single-Phase Induction Motors" (IEEE 114–2010) and IEEE Standard 113-1985, "Test Procedures for Direct-Current Machines" (IEEE 113–1985) describe the general test requirements and methods for determining motor speed and torque at full load for single-phase AC induction motors and DC motors, respectively. DOE notes that these are the test methods referenced in NEMA MG-1–2014, so the burden and fundamental procedure associated with measuring motor performance are not different from those proposed in the NOPR. However, as the method of determining DPPP nominal motor horsepower suggested by Nidec and APSP and incorporated by DOE is more direct, DOE is incorporating by reference the

relevant sections of IEEE 114–2010 and IEEE 113–1985 directly, as opposed to through NEMA MG-1-2014.

In addition, DOE notes that CSA C747–2009 (RA 2014) is another commonly referenced test method for determining motor horsepower that is treated as equivalent to IEEE 114–2010 in DOE's existing small electric motor test procedure. 10 CFR 431.444(b). In DOE's July 2009 small motors test procedure final rule, DOE determined that IEEE 114-2010 and CSA C747-2009 (RA 2014) would produce equivalent ratings. 74 FR 32059, 32065 (July 7, 2009). DOE has reviewed CSA C7474-2009 (RA 2014) as compared to IEEE 113-1985 and believes that the standards will also produce equivalent measurements of full load speed and torque, which are the values relevant for this test procedure. DOE understands that some manufacturers may currently be using CSA C747–2009 (RA 2014) to determine the performance of small motors, including both single-phase AC and DC motors. Therefore, to provide flexibility to manufacturers and consistency with DOE's existing motor regulations, DOE is adopting test provisions that allow for testing in accordance with either the applicable IEEE standard (IEEE 114–2010 for single-phase AC motors or IEEE 113–1985 for DC motors) or CSA C747–2009 (RA 2014). DOE believes that these standards provide the necessary and sufficient methods to determine the torque and rotating speed of the motor at full load for single-phase AC induction motors and DC motors, respectively. Specifically, DOE is adopting the sections specified in the Table III.11 for each standard, which are relevant to measuring speed and torque at full load. In addition, section E.3.2 of both appendix B1 and B2, as adopted in this final rule, states that full-load speed and torque shall be determined based on the maximum continuous duty motor power output rating allowable for the motor's nameplate ambient rating and insulation class.

Table III.11 Sections of IEEE 114-2010 and IEEE 113-1985 that DOE Incorporates by Reference for Determining DPPP Motor Total Horsepower.

Characteristic	IEEE 114-2010	IEEE 113-1985	CSA C747-2009 (RA 2014)
Relevant Scope	Single-phase AC Motors	DC Motors	Single-phase AC and DC Motors
Test Conditions	Section 4	Section 3.5, 4.1.2, and 4.1.4 (and machine temperature rise shall be some value between 50% and 100% of rated temperature rise, as specified in 5.4.3)	Section 5.2, 5.3, 5.5. 6.1
Test Requirements	Section 3.2 and section 6	Section 5.4.3.2 (except that curves of torque versus electric power are not required, as only measurement at full load is required)	Section 6.3, 6.4 (except in section (b) the conversion factor shall be 5252), 6.5 (except only measurements at full load are required), and 6.7.1
Measurement Instruments	Section 5.2 and 5.3	Section 3.1, 3.4	Section 5.1, 5.4.6, 5.4.7, 5.6.4, 5.6.5, 5.6.6, 6.2

In responses to Nidec's inquiry regarding the test methods for determining DPPP motor horsepower characteristics, the test methods referenced in NEMA MG-1–2014 were, by extension, proposed to be incorporated by reference as the specific testing requirements for determining motor performance in the September 2016 DPPP test procedure NOPR.

Regarding the scope of the proposed motor horsepower testing requirements, Pentair commented that a loophole could be introduced in replacement DPPP motors are not also subject to these requirements. (Pentair, No. 11 at p. 3).

In response to Pentair's request, DOE notes that the scope of the required DOE test procedure recommended by the DPPP Working Group and proposed by DOE in the September 2016 DPPP test procedure NOPR is limited to dedicated-purpose pool pumps. DOE acknowledges that, in the September 2016 DPPP test procedure NOPR, DOE proposed an optional test method to determine WEF for replacement DPPP motors. 81 FR 64580, 64629 (Sept. 20, 2016). However, in the September 2016 DPPP test procedure NOPR, DOE also

described how DOE does not intend to regulate replacement DPPP motors as part of this rulemaking because they do not (by themselves) meet the definition of a dedicated-purpose pool pump. Id. Similar to the optional testing provisions for replacement DPPP motors adopted in this final rule, manufacturers of replacement DPPP motors may opt to apply the provisions for determining DPPP nominal motor horsepower, DPPP service factor, and DPPP motor total horsepower, as applicable, and make representations of these quantities if they so choose. However, as discussed further in section III.I, replacement DPPP motors are not dedicated-purpose pool pumps, and requirements for such equipment were not discussed or recommended by the DPPP Working Group. Therefore, DOE is declining to adopt any required testing provisions or reporting requirements for replacement DPPP motors in this rulemaking. DOE may address requirements for replacement DPPP motors in a future rulemaking specifically addressing such equipment.

In summary, based on the comments received in response to the September 2016 DPPP test procedure NOPR, DOE is adopting revised test methods for DPPP nominal motor horsepower and DPPP service factor, which are applicable only to dedicated-purpose pool pumps distributed in commerce with single-phase AC motors and DC motors. DOE is also adopting the test method for DPPP motor total horsepower proposed in the September 2016 DPPP test procedure NOPR without modification, which is applicable to all dedicated-purpose pool pumps. DOE believes such standardized rating methods are consistent with the recommendations of the DPPP Working Group, will be beneficial to consumers in selecting and applying the equipment, and are consistent with existing methods used to rate motors today. DOE notes that these standardized horsepower metrics are intended to support labeling provisions for dedicated-purpose pool pumps, which are discussed further in section III.H.

2. Determination of Self-Priming Capability

As discussed in section III.B.3.a, DOE proposed 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. In the September 2016 DPPP test procedure NOPR, DOE proposed to incorporate by reference relevant sections of the NSF/ANSI 50–2015 standard and also specify several modifications and additions to improve repeatability and consistency of the test results. 81 FR 64580, 64623–27 (Sept. 20, 2016). Specifically, DOE proposed to incorporate by reference section C.3 of Annex C of NSF/ANSI 50–2015, which 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. Id.

To determine the self-priming capability of self-priming and non-self-priming pool filter pumps, DOE proposed in the September 2016 DPPP test procedure NOPR to follow the test method specified in section C.3 of Annex C of NSF/ANSI 50–2015 with several minor modifications to improve test consistency and repeatability, as well as conform with the new definitions for self-priming and non-self-priming pool filter pumps presented in section III.B.3.a. Id. 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 notes that the suction line refers to the riser pipe that extends from the pump suction inlet to the water surface. DOE also proposed in the September 2016 DPPP test procedure NOPR 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.

Id.

Further, DOE noted that NSF/ANSI 50–2015 does not specify where the measurement instruments are to be placed in the test set up. DOE understands that instruments are typically installed at the suction inlet of the pump and therefore, DOE proposed to specify that all measurements of head, flow, and water temperature must be taken at the pump suction inlet. Id. It is also important that all measurements are taken with respect to a common reference plane, which DOE proposed should be the centerline of the pump impeller shaft. DOE also proposed that such adjustments be performed in accordance with section A.3.1.3.1 of HI 40.6–2014. Id.

In addition, DOE proposed that height, or vertical lift (VL), must be determined from the height of the water to the centerline of the pump impeller shaft. Id. In addition to proposing clarifications with regard to the measurement of VL, DOE proposed clarifications on how to

correct the value to a standard temperature of 68 °F, a pressure of 14.7 psia, and a water density of 62.4 lb/ft^3, as shown in equation (5). DOE notes that the definitions proposed in the September 2016 DPPP test procedure NOPR specifies a VL of 5.0 feet:

$$VL = 5.0\text{ft} \times \left(\frac{62.4\,{}^{\text{lb}}/_{\text{ft}^3}}{\rho_{\text{test}}} \right) \times \left(\frac{P_{\text{abs,test}}}{14.7\text{psia}} \right) \quad \textbf{(5)}$$

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.

81 FR 64580, 64624–25 (Sept. 20, 2016).

In addition, DOE also noted in the September 2016 DPPP test procedure NOPR 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. Subsequently, DOE proposed to apply the accuracy requirements contained in HI 40.6–2014 to the measurement devices noted in NSF/ANSI 50–2015, as detailed in Table III.12. 81 FR 64580, 64625 (Sept. 20, 2016).

Table III.12 Measurement Device Accuracy Requirements for Measurements Devices Specified in NSF/ANSI 50-2015

Measurement Device	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 noted in the September 2016 DPPP test procedure NOPR that NSF/ANSI 50–2015 does not specify an instrument for measuring distance and proposed that instruments for measuring distance are accurate to ±0.1 inch, consistent with other requirements for distance-measuring instruments (section III.E.2.f). 81 FR 64580, 64625 (Sept. 20, 2016).

In section C.3.3, "Test conditions," NSF/ANSI 50–2015 specifies test conditions for both swimming pools and hot tubs/spas. NSF/ANSI 50–2015 specifies test conditions in terms of water temperature and turbidity requirements. DOE notes that the remainder of the DPPP test procedure is to be conducted with "clear water," as required by HI 40.6–2014. While NSF/ANSI 50–2015 and HI 40.6–2014 contain different requirements, DOE believes they are intended to do the same thing and result in similar water characteristics. Therefore, to simplify testing requirements and be consistent with the other portions of the DPPP test procedure, in the September 2016 DPPP test procedure NOPR, DOE proposed 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. 81 FR 64580, 64625–64626 (Sept. 20, 2016).

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 measured priming time (MPT). However, NSF/ANSI 50–2015 does not specify how to determine "steady discharge gauge reading or full discharge flow." In the September 2016 DPPP test procedure NOPR, DOE proposed 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. 81 FR 64580, 64626 (Sept. 20, 2016). Based on this criteria for stabilization, DOE also proposed that the elapsed time should be recorded when both steady state pressure and flow readings have been achieved. Id.

Section C.3.4 of NSF/ANSI 50–2015 then specifies that the true priming time (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 (6):

$$\text{TPT} = \text{MPT} \times \left(\frac{\text{pump suction inlet size}}{\text{riser pipe diameter}}\right)^2 \quad \textbf{(6)}$$

As discussed in the September 2016 DPPP test procedure NOPR, DOE noted that, although 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. 81 FR 64580, 64626 (Sept. 20, 2016). As a result, DOE proposed 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. As a result, no adjustment of MPT would be required and TPT would be measured directly. Id.

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. In addition, section C.3.5 of NSF/ANSI 50–2015 requires that both measurements must be less than 6 minutes or the manufacturer's specified TPT, whichever is greater. However, as the criteria for TPT established in DOE's definitions (see section III.B.3.a) instead reference a TPT of 10.0 minutes, DOE proposed to specify that both test runs result in TPT values that are less than or equal to 10.0 minutes. 81 FR 64580, 64626 (Sept. 20, 2016).

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 definitions proposed in the September 2016 DPPP test procedure NOPR reference a specific TPT of 10.0 minutes and VL of 5.0 feet. Therefore, DOE proposed 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 definition. 81 FR 64580, 64626 (Sept. 20, 2016).

In the September 2016 DPPP test procedure NOPR public meeting, DOE presented the general procedure for the self-priming test. (Public Meeting Presentation, No. 2 at p. 44) During the September 2016 public meeting, Hayward sought clarification regarding the second step in the overview of the self-priming test procedure DOE provided in the preamble to the September

2016 DPPP test procedure NOPR. Specifically, Hayward sought confirmation that the terminology "shut off and allow pump to drain" did not mean open the pump to atmosphere. (Hayward, Public Meeting Transcript, No. 3 at pp. 73–74)

In response to Hayward's inquiry, DOE notes that the statement in the September 2016 DPPP test procedure NOPR meant only to shut off the pump and allow all lines to be drained of water, without opening the pump to the atmosphere, as would typically be the case during the NSF/ANSI 50–2015 test. Specifically, in the DPPP test procedure, DOE is incorporating by reference section C.3 of Annex C of NSF/ANSI 50–2015 with the minor modifications discussed above as the test method for determining the self-priming capability of pool filter pumps and all testing must be conducted in accordance with the instructions in those sections.

CEC, in written comments, supported DOE's proposal to use NSF/ANSI 50–2015 to differentiate between self-priming and non-self-priming pool filter pumps. (CEC, No.7 at p. 2) DOE did not receive any other comments suggesting changes to DOE's proposed test method to determine the self-priming capability of pool filter pumps.

Therefore, in this final rule, DOE is adopting the self-priming test method proposed in the September 2016 DPPP test procedure NOPR without modification. This method relies on section C.3 of NSF/ANSI 50–2015 with several minor clarifications and modifications. However, DOE notes that, as discussed in section III.E.1, in this final rule, DOE is adopting alternative requirements for the test fluid instead of testing with "clear water" as specified in HI 40.6–2014. As such, to be consistent with the remainder of the DPPP test procedure, in this final rule DOE is adopting provisions that testing for self-priming capability be performed with the

same test fluid used for all other testing, instead of testing with "clear water" as proposed in the September 2016 DPPP test procedure NOPR. DOE notes that the characteristics of the test fluid adopted in this final rule are now more consistent with those in NSF/ANSI 50–2015 as well.

Table III.13 provides a summary of DOE's modifications and additions to NSF/ANSI 50–2015 to remove ambiguity from the NSF/ANSI 50–2015 test method, improve the repeatability of the test, and harmonize the test requirements with the other DPPP test procedure requirements contained in this final rule.

Table III.13 Summary of Modifications and Additions to NSF/ANSI 50-2015 Self-Priming Capability Test

NSF/ANSI 50-2015 Section	NSF/ANSI 50-2015 Specification	DOE 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 107 °F with ≤15 NTU
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

3. Determination of Maximum Head

As noted in section III.B.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, in the September 2016 DPPP test procedure NOPR, DOE proposed 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. 81 FR 64580, 64627 (Sept. 20, 2016). DOE notes that the minimum flow rate will be assumed to be zero unless otherwise specified in the manufacturer literature. Id.

DOE did not receive any comments in response to the proposed test method for determining maximum head. Therefore, in this final rule, DOE is adopting the proposal to determine the maximum head of dedicated-purpose pool pumps as the head associated with the maximum speed and the minimum flow rate at which the pump is designed to operate continuously or safely, which is assumed to be zero unless otherwise specified in the manufacturer literature.

4. Energy Factor Test Method

As discussed previously, in section III.F, in the September 2016 DPPP test procedure NOPR, DOE's proposed test procedure contained an optional test method for determining EF 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. 81 FR 64580, 64627-64628 (Sept. 20, 2016). Regarding the test method for EF, Pentair and APSP both commented that table III.21 in the September 2016 DPPP test procedure NOPR (81 FR 64580, 64628; Sept. 20, 2016) used inconsistent terminology to specify the flow terms for system curves A, B, C, and D and recommended that the terms be reported consistently as shown in table 4 of the September 2016 DPPP test procedure NOPR (Id. at 64653). (Pentair, No. 11 at p. 6; APSP, No. 8 at p. 2) DOE has made the correction in this final rule and incorporated the correct table into appendix B1.

H. Labeling Requirements

In the June 2016 DPPP Working Group recommendations, the DPPP Working Group recommended that DOE consider whether to require 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) To implement the recommendations of the DPPP Working Group, DOE proposed in the September 2016 DPPP test procedure NOPR to require labeling of all dedicated-purpose pool pumps for which the DPPP Working Group recommended test procedures. 81 FR 64580, 64628–29 (Sept. 20, 2016). That is, DOE proposed that the labeling requirements be applicable to:

- self-priming pool filter pumps less than 2.5 rated hydraulic horsepower,[60]
- non-self-priming pool filter pumps less than 2.5 rated hydraulic horsepower,
- pressure cleaner booster pumps, and
- waterfall pumps.

  Id.

For self-priming pool filter pumps, non-self-priming pool filter pumps, pressure cleaner booster pumps, and waterfall pumps, DOE proposed 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.

  Id.

DOE also proposed specific requirements regarding the formatting of required information on the nameplate and the specific terminology that is required to be displayed. DOE proposed that these labeling requirements would be applicable to all units manufactured,

[60] 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.

including imported, on the compliance date of any potential energy conservation standards that may be set for dedicated-purpose pool pumps. Id.

ASAP and NRDC submitted a joint written comment supporting the labeling requirements proposed in the September 2016 DPPP test procedure NOPR. (ASAP and NRDC, No. 12 at p. 2)

Regarding the proposed formatting of the label, Hayward requested clarification regarding the specific details of the label (e.g., font size, etc.). (Hayward, Public Meeting Transcript. No. 3 at pp. 93–94; Hayward, No. 6 at p. 9) APSP also recommended that all labeling details, including font size and label material, comply with UL1081–2016. (APSP, No. 8 at p. 10) Pentair requested that the pool industry be integrally involved in the labeling efforts, pointing out that details associated with label formatting and sizing can be critical due to other required safety and compliance labeling requirements combined with limited available space. (Pentair, No. 11, at p. 4) Hayward similarly encouraged DOE to allow use of standard industry nomenclature (i.e., "HP" for horsepower and "THP" for total horsepower) due to limited space available on the product for labels. (Hayward, No. 6 at p. 9) Hayward also sought confirmation that the information required may be provided on separate labels/data plates and is not required to be co-located on one label or data plate. (Hayward, No. 6 at p. 9)

Hayward also objected to listing three separate horsepower values saying it will cause confusion and not support the goal of having the correctly sized, most energy efficient pump used in all applications. As an alternative, Hayward support listing only the total horsepower on any DPPP label. (Hayward, No. 6 at p. 9) Similarly, APSP requested that, based on its

recommendations regarding horsepower (see section III.G.1.b), only total horsepower and not nominal motor horsepower or service factor be listed on the label, consistent with requirements in ANSI/APSP/ICC 15a–2013. (APSP, No. 8 at pp. 9–10) Nidec commented similarly. (Nidec, No. 10 at p. 5)

APSP and Pentair commented that while use of hydraulic horsepower for the purposes of sizing is acceptable, use of this value on a label would cause significant confusion in the marketplace and recommended it not be included on the pump label.[61] (APSP, No. 8 at pp. 7–8; Pentair, No. 11 at p. 3) Zodiac similarly commented that so much information on the label my cause confusion during field installation and may compromise proper installation of the pump. (Zodiac, No. 13 at p. 3) However, Zodiac did not provide a suggested alternative.

Hayward, APSP, and Zodiac expressed opposition to a requirement that labeling include a specific WEF result, stating that such designation may disadvantage some manufacturers and cause confusion in the marketplace when dissimilar pumps are incorrectly compared. (Hayward, No. 6 at p. 9; APSP, No. 8 at pp. 9–10; Zodiac, No. 13 at p. 3) Zodiac also stated that the WEF result may confuse or contradict ENERGY STAR ratings. (Zodiac, No. 13 at p. 3) Hayward and APSP also commented that the required label should only state "meets DOE WEF requirement." (Hayward, No. 6 at p. 9;APSP, No. 8 at p. 9)

[61] Note that separately APSP presented a recommendation for required nameplate information that did include rated hydraulic horsepower. (APSP, No. 8 at pp. 9–10)

APSP and Hayward recommended that all labeling requirements be removed for three-phase products, as they are out of scope of the final ASRAC working group term sheet. (APSP, No. 8 at p. 10; Hayward, No. 6 at p. 9)

As discussed previously, DOE's proposal in the September 2016 DPPP test procedure NOPR contained details regarding the font size, spacing, and formatting of the required label, as well as when such label would be required to be applied. As proposed in the September 2016 DPPP test procedure NOPR, 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. For this reason, DOE believes that it is not necessary to specify that the labeling requirements comply with UL1081–2016, as requested by APSP, or to have additional industry involvement beyond the comment period on the NOPR, as requested by Pentair, given that the manufacturers already have the option to individually determine the details of the label formatting. In response to Hayward's suggestion regarding use of common industry abbreviations, DOE notes that the use of "hp" for horsepower was already allowed in DOE's proposed labeling requirements. However, in light of Hayward's comments, DOE has modified its proposal to also allow for the abbreviation of total horsepower as THP.

Given the modified requirements for service factor and motor total horsepower discussed in section III.G.1.b, DOE agrees with Hayward, APSP, and Nidec, that DPPP nominal motor horsepower and DPPP service factor do not need to be on the label. In addition, DOE agrees with APSP and Pentair that, while hydraulic horsepower is necessary in certification reporting and for compliance with standards, this information is not used by consumers and does not need to be on the label.

With regard to Hayward, APSP, Zodiac's opposition to including the WEF value on the label, DOE believes that it is especially important to clearly and consistently communicate the performance of dedicated-purpose pool pumps using the DOE metric in order to provide customers with standardized, comparable information to inform purchasing decisions and is retaining the requirement to include the WEF value on the DPPP label. With regard to Zodiac's comment regarding the consistency of WEF and ENERGY STAR EF information, DOE responds that, as discussed in section III.G.4, as of 180 days after the publication of this final rule all representations of WEF, EF, and other representations of dedicated-pool pump performance must be made in accordance with the adopted DOE test procedure and, therefore, any EF values will be consistent with the tested WEF result for that pool pump in that they will be based on the same test data. However, regarding the confusion between EF and WEF values, DOE is clarifying in this final rule that, as of the compliance date of any energy conservation standard for dedicated-purpose pool pumps, all manufacturers and rating programs must transition to the new WEF metric and representations of EF will no longer be allowed. DOE believes this will resolve the confusion Zodiac is concerned with. Representations of EF and WEF are discussed in more detail in section III.G.4.

Therefore, in this final rule DOE is adopting labeling provisions that require dedicated-purpose pool pumps subject to the test procedure to be labeled only with WEF and DPPP motor total horsepower. In response to Hayward's request that the required information not be required to be co-located on one label or data plate, DOE believes, given the reduced labeling requirements adopted in this final rule as compared to the NOPR proposal, that it is entirely reasonable to require that these values appear on the pump's permanent nameplate.

In response to APSP and Hayward's recommendation that labeling requirements not apply to three-phase products, DOE notes that this proposal is not consistent with the recommendations of the DPPP Working Group. The June 2016 DPPP Working Group recommendations only specified that standards should not apply to three-phase self-priming pool filter pumps. (Docket No. EERE-2015-BT-STD-0008, No. 82 Recommendations #3 at p. 2) Therefore, DOE believes that requiring labels for three-phase pumps is consistent with requiring them to be subject to the test procedure and reporting requirements, as recommended by the DPPP Working Group.

I. Replacement DPPP Motors

DOE understands that DPPP motors typically require replacement more frequently than DPPP bare pumps and, thus, replacement DPPP motors are often distributed in commerce to be paired with an existing, appropriate DPPP bare pump in the field. DOE does not intend to regulate replacement DPPP motors, because they do not (by themselves) meet the definition of a dedicated-purpose pool pump. However, DOE believes that end-users and manufacturers may benefit from having a method to determine an applicable WEF for replacement DPPP motors. This method could allow replacement motor manufacturers to label their products and/or utilities or efficiency programs to encourage the sale of replacement DPPP motors, which could maintain or increase the savings of the dedicated-purpose pool pump, as installed in the field.

For those reasons, DOE proposed in the September 2016 DPPP test procedure NOPR an optional method to determine the WEF for replacement DPPP motors. 81 FR 64580, 64629 (Sept. 20, 2016). Specifically, under this method, the replacement motor would be paired with an appropriate DPPP bare pump and the combination would be subject to the DOE test

procedure for that dedicated-purpose pool pump, based on the DPPP variety and speed configuration. Id.

In the September 2016 DPPP test procedure NOPR, DOE recognized that replacement DPPP motors may be offered for sale or advertised to be paired with multiple DPPP bare pumps. Furthermore, each combination of a DPPP motor and a DPPP bare pump may have a different WEF, as each bare pump may affect the WEF rating. Therefore, DOE proposed in the September 2016 DPPP test procedure NOPR that the WEF for each replacement DPPP motor and bare pump pairing be determined separately. However, consistent with DOE's treatment of all equipment, DOE would 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. DOE also proposed that replacement DPPP motor manufacturers would be required to make a statement, along with any advertised WEF value, regarding the specific DPPP bare pump to which the WEF value applies. If no specific DPPP bare pumps were listed in the manufacturer literature or otherwise along with any WEF representation, then the WEF value would be assumed to be applicable to any and all possible DPPP bare pumps. Id.

During the September 2016 DPPP test procedure NOPR public meeting, CA IOUs stated that if the worst performing pump method were to be utilized for replacement motors, the bare pumps considered would have to be specified in order to determine which was the worst performing. (CA IOUs, Public Meeting Transcript, No. 3 at p. 80) As such, CA IOUS proposed that if manufacturers test the replacement motors, the test report or result include the range of

products that were included in the test. (CA IOUs, Public Meeting Transcript, No. 3 at pp. 82–84)

DOE acknowledges CA IOUs' concern in unambiguously identifying the replacement DPPP motor and bare pump combination on which any WEF value was based. However, as DOE is proposing this as an optional procedure, DOE did not propose any standard or reporting requirements for replacement DPPP motors. In addition, the manufacturer of the replacement DPPP motor may be different than the manufacturer of the dedicated-purpose pool pump. For this reason, DOE does not believe that including such information in the list of optional information DPPP manufacturers may submit when certifying products to DOE would be appropriate. As reporting of replacement DPPP motor WEF information would have to be done as a separate certification report and is not based on compliance with any standard, DOE does not believe collecting such information is warranted at this time. The purpose of the procedure is simply to provide a standardized way to determine WEF for replacement DPPP motors.

ASAP, CA IOUs, CEC, and NRDC commented to support the inclusion of this optional test method for DPPP replacement motors. (ASAP and NRDC, No. 12 at p. 2; CA IOUs, No. 9 at p. 2; CEC, No. 7 at p. 2) ASAP and NRDC and CEC stated that the test method could provide data to guide consumers and support utility and efficiency programs that seek to improve the efficiency of dedicated-purpose pool pumps already in use. (ASAP and NRDC, No. 12 at p. 2; CEC, No. 7 at p. 2)

In written comments, Pentair also supported the optional test method for DPPP replacement motors. However, Pentair stated its belief that the DPPP replacement motor testing

should be mandatory, to protect against pool owners pairing low efficiency replacement motors with kit pumps. (Pentair, No. 11 at p. 4) CA IOUs also believe that a national standard is needed for DPPP replacement motors. (CA IOUs, No. 9 at p. 2)

Conversely, in written comments, APSP, Hayward, and Nidec opposed DOE's proposed optional test method for replacement DPPP motors. (APSP, No. 8 at pp. 10–11; Hayward, No. 6 at p. 9; Nidec, No. 10 at p. 6) Hayward noted that such motors were not discussed by the DPPP Working Group. (Hayward, No. 6 at p. 9) Hayward and Nidec also believe that the methodology presented by DOE is not practical and does not ensure compliance. (Hayward, No. 6 at p. 9; Nidec, No. 10 at p. 6) Nidec suggested that replacement DPPP motors be regulated through an expansion in small motor regulations. (Nidec, No. 10 at p. 6)

DOE appreciates the support of ASAP, CA IOUs, CEC, and NRDC. In response to Pentair and CA IOU's request to adopt requirements for replacement DPPP motors, DOE understands that there is a potential for pool owners or installation contractors to purchase and pair a pump wet end with a low-efficiency replacement motor. However, DOE notes that mandatory requirements for DPPP replacement motors are outside the scope of this rulemaking, as this rulemaking pertains only to pumps as defined in 10 CFR 431.462. DOE proposed an optional test method for replacement motors because of this limitation on rulemaking scope. DOE notes that in the future it could consider mandatory requirements for replacement DPPP motors as part of a rulemaking specifically addressing such motors.

DOE understands Hayward's and Nidec's concerns and agrees that this specific proposal was not discussed at length by the DPPP Working Group. However, DOE reiterates that the test

method contained in the September 2016 DPPP test procedure NOPR is an optional test method that manufacturers of DPPP motors may use at their discretion; there is no associated certification or compliance criteria for replacement DPPP motors. That is, replacement DPPP motors would not be required to meet any energy conservation standard set for dedicated-purpose pool pumps. The purpose of the test method is solely to provide standardized information to consumers regarding the efficiency and performance of replacement DPPP motors and provide an opportunity for efficiency programs to incentivize the application of more efficient replacement DPPP motors. In response to Hayward's and Nidec's concern that the test method is impractical, DOE believes that the proposed test method presents a reasonable path to determine the representative WEF score for replacement DPPP motors and notes that Hayward did not provide an alternative suggestion. In response to Nidec's suggestion that replacement DPPP motors be regulated through rules crafted specifically for small motors, DOE notes that, as stated previously, there are no regulatory requirements pertaining to the optional motor test method. Rather, the optional test method proposed for DPPP motors is intended to provide information to consumers and efficiency incentive programs regarding which motors will conserve energy in a DPPP-specific application, and DOE believes this information would not be made available through small motor regulations. As noted previously, this does not preclude DOE from considering mandatory requirements for replacement DPPP motors as part of a rulemaking specifically addressing such motors.

Hayward also recommended clarifying that replacement motors identical to the original motor that was used to test and qualify the DPPP model (only varying in nomenclature for marketing purposes, such as service part number) should be permitted to make representations of WEF when sold for use with the specific bare pump, without the need for additional testing.

(Hayward, No. 6 at p. 9) DOE agrees with Hayward's suggestion. DOE believes that so long as the testing of a given DPPP motor and bare pump pair was performed consistent with DOE's test procedure for replacement DPPP motors, the rating will be accurate. As such, the resultant WEF score can be applied to the tested replacement DPPP motor when offered for sale with the tested DPPP bare pump and would be identical to that applied to the DPPP model comprised of that DPPP motor and bare pump.

J. 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 and when determining compliance with prescribed energy conservation standards. DOE proposed in the September 2016 DPPP test procedure NOPR that DPPP manufacturers use a statistical sampling plan consistent with the sampling plan for pumps that is currently specified at 10 CFR 429.59 to determine representative values of WEF and other energy-related metrics. 81 FR 64580, 64629 (Sept. 20 2016). Manufacturers 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 uses to verify compliance of a basic model. Sections, III.J.1, III.J.2, and III.J.3 discuss DOE's 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. For dedicated-purpose pool pumps, DOE proposed in the September 2016 DPPP test procedure NOPR to adopt statistical sampling plans for WEF, EF, and other energy-related metrics similar to those adopted for pumps. 81 FR 64580, 64630 (Sept. 20, 2016). These sampling plans generally require a sample of sufficient size such that the representative value of WEF, EF, or any other energy consumption metric of a DPPP basic model is less than or equal to the lower of: (A) the lower 95 percent confidence limit divided by 1.05 or (B) the mean of the sample. DOE also proposed similar provisions for quantities, such as pump input power, for which consumers would favor lower values. See 10 CFR 429.59(a)(1)(ii).

In addition to energy-related metrics, DOE also noted that the rated hydraulic horsepower, DPPP nominal motor horsepower, DPPP motor total horsepower, service factor, and true power factor are important characteristics for dedicated-purpose pool pumps that must be reported for each DPPP basic model based on the sampling plan discussed above. Therefore, DOE also proposed that DPPP nominal motor horsepower, DPPP motor total horsepower, service factor, and true power factor for each DPPP basic model be determined based on the mean of the applicable test results, for each metric, from all the tested units that serve as the basis for the rating for that basic model. 81 FR 64580, 64630 (Sept. 20, 2016).

In written comments, Hayward and APSP requested clarification of sampling plan and record keeping requirements for certain motor characteristics. Specifically, APSP and Hayward asked if DOE expects DPPP manufacturers to establish, maintain, and retain underlying test data for nominal motor horsepower, motor total horsepower, and motor service factor for 2 years

from the date on which the model is no longer distributed in commerce or if this information would be the responsibility of the individual motor manufacturers. (APSP, No. 8 at p. 9; Hayward, No. 6 at pp. 7–8) In addition, as noted in section III.G.4, Hayward expressed concern over DOE's requirements being in conflict with other industry programs, especially those regarding determination of EF. (Hayward, No. 6 at p. 1)

In response to Hayward, DOE notes that while motor manufacturers may conduct testing of motors, it is the responsibility of the DPPP manufacturer to retain the underlying test data. As discussed in section III.G.1.b, DOE is adopting test methods for determination of motor horsepower characteristics consistent with those currently used in the industry. However, given the suggestion from interested parties that DOE only require listing DPPP motor total horsepower on the label (see section III.H), DOE is withdrawing the proposal to establish sampling plans for DPPP nominal motor horsepower and DPPP service factor and adopting a sampling plan for DPPP motor total horsepower only.

Regarding potential conflict with industry programs, which DOE believes relates primarily to the sampling plan (as other provisions are quantitatively consistent), in this final rule, DOE limits the sampling plan to only metrics necessary for DOE's test procedure, standard, and labeling requirements (i.e., WEF, rated hydraulic horsepower, and DPPP motor total horsepower). DOE has removed the sampling plan requirements for EF and other motor horsepower metrics. DOE is adopting the other sampling provisions proposed in the September 2016 DPPP test procedure NOPR without modification.

In written comments, APSP asked whether small modifications to the "basic model" require new samples to be tested, and if so, if there is a defined threshold regarding what change would require a new sample to be tested. (APSP, No. 8 at pp. 10-11) DOE believes that APSP is asking about how changes to an individual model's design impact the represented value for a basic model. If any design changes to an individual model that is part of a basic model result in a more consumptive or less efficient represented value, then the individual model must be retested and the represented value must be revised based on the results of the retesting.

2. Certification Requirements

Paragraph (b) of 10 CFR 429.59 contains the certification requirements for certain styles of pumps for which DOE adopted test procedures and standards in the January 2016 general pumps test procedure and ECS final rules. 81 FR 4086 (Jan. 25, 2016); 81 FR 4368 (Jan. 26, 2016). Because dedicated-purpose pool pumps are a style of pump, DOE proposed in the September 2016 DPPP test procedure NOPR to amend 10 CFR 429.59 to include the reporting requirements for dedicated-purpose pool pumps. 81 FR 64580, 64630–64632 (Sep. 20, 2016). Specifically, DOE proposed that 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, because dedicated-purpose pool pumps have a unique test procedure and metric from general pumps, DOE proposed unique certification requirements for dedicated-purpose pool pumps that require manufacturers to supply certain additional information to DOE in certification reports to demonstrate compliance with any energy conservation standards that DOE may set. Id.

Specifically, DOE proposed 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. Id.

In the June 2016 DPPP Working Group recommendations, the DPPP 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

proposed 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. 81 FR 64580, 64630–64632 (Sep. 20, 2016).

In addition, as discussed in section III.B.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 DPPP Working Group, DOE proposed 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). 81 FR 64580, 64630–64632 (Sep. 20, 2016).

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.J.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 timers 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 proposed that the certification report must contain the maximum run-time of the pool pump control with which the integral cartridge-filter or sand-filter pump is distributed in commerce. 81 FR 64580, 64630–64632 (Sep. 20, 2016).

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. To provide additional information to consumers and the market place, DOE proposed in the September 2016 DPPP test procedure NOPR 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 (Pi and Qi), 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.

81 FR 64580, 64631–32 (Sept. 20, 2016).

Although 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 will be optional and at the discretion of the manufacturer.

In response to DOE's proposed reporting requirements, ASAP and NRDC submitted written comments in support of the certification requirements proposed in the September 2016 DPPP test procedure NOPR. (ASAP and NRDC, No. 12 at p. 2) DOE appreciates the support of ASAP and NRDC.

During the September 2016 DPPP test procedure NOPR public meeting, Hayward inquired if they have a pump that meets acceptable NSF priming criteria, how this should be reported along with the WEF value. (Hayward, Public Meeting Transcript, No. 3 at p. 74) Additionally, in written comments, Hayward and APSP commented that the vertical lift and true priming time fields should only be applicable to self-priming pool filter pumps that are not certified with NSF/ANSI 50–2015. (Hayward, No. 6 at p. 10; APSP, No. 8 at p. 11)

As noted in the September 2016 DPPP test procedure NOPR, for self-priming and non-self-priming pool filter pumps, the certification report is required to include 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. However, in light of Hayward and APSP's concern, DOE recognizes that these requirements are only necessary and relevant for self-priming pool filter pumps. In addition, consistent with Hayward and APSP's request, DOE agrees that a statement that the self-priming pool filter pump is certified with NSF/ANSI 50–2015 is sufficient to demonstrate compliance with DOE's definition for self-priming pool filter pump. Therefore, in this final rule, DOE is modifying the certification reporting requirements such that only self-priming pool filter pumps that are not certified with NSF/ANSI 50–2015 need provide the vertical lift and true priming time for the DPPP model.

In written comments, Hayward and APSP requested that DOE explain why maximum head ("dead head") is listed and recommended removing it, as they did not see the need to list it. (Hayward, No. 6 at p. 10; APSP, No. 10 at p. 11) In response, DOE clarifies that maximum head is necessary to differentiate waterfall pumps from self-priming and non-self-priming pool filter pumps. As described in section III.B.4.a, section III.G.3, and the September 2016 DPPP test procedure NOPR, 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 established a specific and repeatable method for determining maximum head of pool filter pumps (discussed in section III.G.3). DOE requires reporting of the maximum head, determined in accordance with the test procedure for self-priming pool filter pumps, non-self-priming pool filter pumps, and waterfall pumps, to ensure that such pumps are appropriately categorized into the correct equipment class.

Hayward and APSP also recommended that, for dedicated-purpose pool pumps with freeze protection controls shipped disabled, the default dry-bulb air temperature setting, default run time setting, and default motor speed setting should not have to be reported. (Hayward, No. 6 at p. 10; APSP, No. 10 at p. 11) In response, DOE notes that Hayward and APSP's suggestion is consistent with the proposal in the September 2016 DPPP test procedure NOPR. 81 FR 64580, 64645 (Sept. 20, 2016). As such, in this final rule, DOE is adopting the proposal in the September 2016 DPPP test procedure NOPR that in the certification report all dedicated-purpose pool pumps must provide a statement regarding if freeze protection is shipped enabled or disabled, but only dedicated-purpose pool pumps distributed in commerce with freeze protection

controls enabled must provide the default dry-bulb air temperature setting (in °F), default run time setting (in minutes), and default motor speed (in rpm).

During the September 2016 DPPP test procedure NOPR public meeting, CA IOUs recommended clarifying that the maximum run time for integrated cartridge-filter and sand-filter pumps referred to the maximum run time without resetting the timer. (CA IOUs, Public Meeting Transcript, No. 3 at p. 90) In response, DOE acknowledges CA IOUs concern that the maximum run time in the field could be extended by resetting the timer. However, DOE believes that the maximum run time of the model is the maximum time interval for which the timer can be set to run and that it is implied that such does not account for resetting of the timer, as it is a physical and unambiguous characteristic of the equipment. Therefore, DOE agrees with CA IOUs regarding the intent of the statement, but does not believe such clarification is necessary.

APSP and Hayward also requested confirmation that the test procedure to determine EF is optional and neither it nor data relating to it will be required to be provided or certified to DOE. (APSP, No. 8 at p. 9; Hayward, No. 6 at p. 8) Similarly, Zodiac also commented that optional items, such as EF, pump efficiency, overall efficiency, driver power input, and/or pump power output, should remain optional and up to the manufacturer to present. (Zodiac, No. 13 at p. 3)

Regarding APSP, Hayward, and Zodiac's comments with respect to EF and other optional tested values (i.e., pump efficiency, overall efficiency, driver power input, and/or pump power output), DOE reiterates that the EF test procedure proposed was optional in that manufacturers may decline to make any representations of EF, but that if made, all

representations of relevant metrics, including EF, would need to be based on the DOE test procedure 180 days after publication of this final rule in the Federal Register. However, EF, pump efficiency, overall efficiency, driver power input, and/or pump power output are not required to be reported to DOE.

In addition, as discussed in section III.F, DOE received several comments from interested parties regarding the testing and representation of energy factor and consistency with other programs. To respond to the concerns of interested parties and clarify the applicability of DPPP metrics, DOE, in this final rule, is adopting two appendices that are applicable before (appendix B1) and on or after (appendix B2) the compliance date of any energy conservation standards set for this equipment. As a result of the confusion regarding representations of energy factor and the lack of comments supporting the optional reporting of energy factor to DOE, DOE is not adopting the proposal to optionally list any tested energy factor values in the certification report submitted to DOE. Specifically, DOE is not including EF 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 in the certification report.

DOE did not receive any other comments or suggestions regarding the certification reporting requirements for dedicated-purpose pool pumps. As such, DOE is adopting, in this final rule, the certification reporting requirements as proposed in the September 2016 DPPP test procedure NOPR, with the exception of the optional listing of energy factor as discussed above. DOE is also clarifying the applicability of the certification requirements that are only applicable to certain styles of pumps for which DOE adopted test procedures and standards in the January 2016 general pumps test procedure and ECS final rules. 81 FR 4086 (Jan. 25, 2016); 81 FR

4368 (Jan. 26, 2016). DOE notes that, as specified in paragraph (a) of 10 CFR 429.12, the certification requirements for covered products and equipment, including those discussed in this final rule, are only applicable to equipment subject to an applicable energy conservation standard set forth in parts 430 or 431. Therefore, the certification requirements established in this final rule will only be required when and if any energy conservation standards for dedicated-purpose pool pumps are established and in effect.

3. Enforcement Provisions

Enforcement provisions govern the process DOE will 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 will 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 proposed in the September 2016 DPPP test procedure NOPR to conduct the applicable DPPP test procedure, to determine the WEF for tested DPPP models. 81 FR 64580, 64632 (Sept. 20, 2016). In addition, DOE proposed 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 will test an initial sample of at least 4 units and determine the mean WEF value and standard error of the sample.

DOE will 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 also proposed to clarify that the provisions at 10 CFR 429.110(e)(5), which are applicable to general pumps subject to the January 2016 general pumps test procedure final rule, are not applicable to dedicated-purpose pool pumps. Id.

In addition, when determining compliance of any units tested for enforcement purposes, DOE proposed in the September 2016 DPPP test procedure NOPR to adopt provisions that specify how DOE would determine the rated hydraulic horsepower at maximum speed on the reference curve for determining the appropriate test method and standard level for any tested equipment (if applicable). Specifically, DOE proposed to 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.D) on one or more units of each model selected for testing. DOE proposed 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 will use the certified value of rated hydraulic horsepower as the basis for determining the standard level for tested equipment. However, if DOE's tested value of rated hydraulic horsepower is not within 5 percent of the certified value of rated hydraulic horsepower, DOE will use the arithmetic mean of all the rated hydraulic horsepower values resulting from DOE's testing when determining the standard level for tested equipment. 81 FR 64580, 64632 (Sept. 20, 2016).

In addition, DOE proposed to establish similar procedures for relevant quantities necessary to differentiate the 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 proposed an enforcement testing procedure for the maximum head value. Similarly, to differentiate self-priming and non-self-priming pool filter pumps, DOE proposed performing the self-priming capability test and determine the vertical lift and true priming time of one or more tested units. DOE proposed tolerances of 5 percent on the certified values in both of these instances as well. Id.

Pentair responded that without audit and enforcement, the economic effect from the potential costs related to testing (see section IV.B) could be low as manufacturers will not feel compelled to re-test dedicated-purpose pool pumps. (Pentair, No. 11 at p. 4) DOE responds that DOE does conduct enforcement testing, as discussed in this section. If a product is suspected of not meeting the minimum energy conservation standard, DOE has enforcement mechanisms to verify the equipment performance in relation to the standard. DOE's burden assessment contained in section IV.B reflects the assumption that manufacturers will conduct testing and certify equipment in accordance with the test procedure adopted in this final rule.

DOE did not receive any other comments related to DOE's proposal related to enforcement testing provisions for WEF, rated hydraulic horsepower, maximum head, or self-priming capability. As such, DOE is adopting the enforcement testing provisions for WEF, rated hydraulic horsepower, and maximum head, as proposed in the September 2016 DPPP test procedure NOPR. However, with regard to the enforcement provisions to verify the self-priming capability of non-self-priming pool filter pumps and self-priming pool filter pumps not certified

with NSF/ANSI 50–2015, DOE notes that, in response to comments from interested parties, DOE is removing the requirement to report the vertical lift and true priming time of non-self-priming pool filter pumps, as discussed in section III.J.2. As DOE's proposed enforcement testing provisions included comparing the tested values to the values of vertical lift and true priming time certified by the manufacturer to determine the validity of the certified values, DOE must adopt different criteria for non-self-priming pool filter pumps, as they will not have certified values to which DOE can compare the test results. Instead, DOE is adopting validity criteria for non-self-priming pool filter pumps based on the values of vertical lift and true priming time referenced in the definition of non-self-priming pool filter pump. That is, DOE will compare the values of vertical lift and true priming time obtained from the tested unit(s) to the values of vertical lift and true priming time referenced in the definition of non-self-priming pool filter pump (i.e., 5.0 feet and 10.0 minutes, respectively). DOE will continue to apply the same tolerance of 5 percent so that any non-self-priming pool filter pump that is not capable of priming to a vertical lift of 5.0 feet with a true priming time of less than or equal to 9.5 minutes (10.0 minutes - 5 percent) will continue to be treated as a non-self-priming pool filter pump, as certified by the manufacturer. DOE notes that vertical lift and true priming time are related variables, such that the 5 percent tolerance need only be applied to true priming time as the independent variable.

In addition, based on DPPP Working Group recommendations (Docket No. EERE-2015-BT-STD-0008, No. 82, Recommendation #6B at p. 4), DOE also proposed in the September 2016 DPPP test procedure NOPR a procedure to verify the presence and operation of any freeze protection controls distributed in commerce with any applicable dedicated-purpose pool pump. The proposed procedure starts 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. 81 FR 64580, 64633 (Sept. 20, 2016).

Under DOE's proposed test 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. 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 is still circulating water after 30.0 minutes of operation at 42 ± 0.5 °F, or if rotating speed for freeze protection is 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. Id.

In written comments, ASAP and NRDC expressed appreciation that DOE developed a verification procedure that can be used to verify whether a DPPP shipped with freeze protection

controls meets the freeze protection certification requirements promulgated in this rule. (ASAP and NRDC, No. 12 at pp. 2–3) DOE appreciates the support of ASAP and NRDC.

During the September 2016 DPPP test procedure NOPR public meeting, Pentair raised a concern that the default run-time setting in the freeze protection requirements recommended by the DPPP Working Group is no greater than an hour, but the test procedure stops after 30.0 minutes. (Pentair, Public Meeting Transcript, No. 3 at p. 101)

In response, DOE agrees with Pentair that the time requirement in the freeze protection enforcement testing procedure should be 60.0 minutes, rather than the 30.0 minutes proposed in the September 2016 DPPP test procedure NOPR, consistent with the recommendations of the DPPP Working Group. Therefore, in this final rule, DOE is updating the procedure to allow 60.0 minutes of operation before the freeze protection ambient temperature and rotating speed, if any, will be recorded again.

In written comments, APSP and Pentair questioned why the dry-bulb temperature was selected as the measurement to determine temperature. APSP and Pentair commented that few if any of the products in the market use dry-bulb temperature sensors to initiate freeze protection controls. (APSP, No. 8 at p. 4; Pentair, No. 11 at p. 2) DOE responds that DOE researched the typical controls and sensing mechanisms of freeze protection controls when developing the test method. Based on DOE's research, the three largest pool pump manufacturers produce freeze protection systems that sense the ambient air temperature and (if freeze protection is enabled) activate the freeze protection mode when the ambient air temperature falls below a certain

threshold.[62] On May 19, 2016, the DPPP Working Group discussed using the dry-bulb air temperature as one of the key metrics for specifying the characteristics of freeze protection controls, and no members of the group opposed the use of dry-bulb temperature. (Docket No. EERE-2015-BT-STD-0008, No. 101 at pp. 105–107) Then, the DPPP Working Group recommended that manufacturers include dry-bulb air temperature in their certification reports. (Docket No. EERE-2015-BT-STD-0008, No. 82 Recommendation #6A at p. 4) DOE believes that the manufacturers' installation and operation manuals, the DPPP Working Group discussions, and the DPPP Working Group recommendations provide ample justification for using dry-bulb air temperature as a certification requirement for dedicated-purpose pool pumps distributed in commerce with freeze protection controls enabled. Further, DOE is not aware of other temperature-based criteria that are relevant to the activation of freeze protection controls at this time and Pentair did not provide an alternative recommendation in their comments. If freeze protection controls are developed that activate based on alternative temperature criteria (other than dry-bulb air temperature), DOE may consider modifying the enforcement test and any prescriptive freeze protection control requirements at that time.

CA IOUs also raised questions related to the temperature measurement apparatus and whether the measurement would be impacted by heat created by the DPPP motor. (CA IOUs, Public Meeting Transcript, No. 3 at pp. 101–102)

[62] Several operation manuals for pool control systems note that freeze protection is triggered by air temperature. See, for example:
Pentair. Intellitouch Quick-Start Manual. 2004. www.pentairpool.com/pdfs/IntelliTouchQuickStartIG.pdf
Hayward. Pro Logic Operation Manual. 2010. www.hayward-pool.com/pdf/manuals/PLTPM-PL-PS-x&PL-PS-x-VOperationsOct08&Later.pdf

In response, DOE notes that, as described in the September 2016 DPPP test procedure NOPR, several methods are allowed to control and record the temperature registered by the freeze protection ambient temperature sensor. This can 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 and measuring the temperature directly at the freeze protection ambient temperature sensor location, or other means to simulate and vary the ambient temperature registered by the freeze protection temperature sensor(s). While DOE acknowledges that, as noted by CA IOUs, the temperature measured by the freeze protection ambient temperature sensor may be slightly higher than the bulk ambient temperature due to localized heating of the sensor from the DPPP motor and controls, DOE believes this is representative of operation in the field and the test procedure is designed to accommodate this. Based on the recommendations of the DPPP Working Group, the freeze protection enforcement test is designed to identify DPPP freeze protection controls that initiate water circulation when the freeze protection ambient temperature sensor registers 40.0 °F or higher, regardless of the bulk ambient temperature (which may be slightly cooler than 40.0 °F). DOE notes that this is accomplished regardless of the method used to measure and control the freeze protection ambient temperature sensor and enables the variety of methods discussed previously. If only the bulk ambient temperature were measured, the pump would need to be placed in an environmental chamber and the temperature of the chamber controlled in order to test the freeze protection controls operation. In summary, DOE believes that the proposed temperature measurement methods provide a representative measure of the ambient temperature measured by the freeze protection controls and minimizes burden associated with the test by

providing a variety of options for measuring and controlling the temperature registered by the freeze protection ambient temperature sensor. DOE also believes the proposal is consistent with the intent of the DPPP Working Group recommendations. Therefore, while DOE acknowledges CA IOUs concern, DOE is adopting the specifications regarding measurement of the temperature registered by the freeze protection ambient temperature sensor as proposed in the September 2016 DPPP test procedure NOPR.

APSP and Hayward, in written comments, recommended clarifying that enforcement testing of freeze protection is not applicable for units shipped with the freeze protection disabled. (APSP, No. 8 at p. 11; Hayward, No. 6 at p. 10) In response, DOE clarifies that the provisions are primarily intended to verify that the default settings for dedicated-purpose pool pumps shipped with freeze protection control enabled are within the thresholds recommended by the DPPP Working Group. However, DOE notes that the freeze protection control enforcement test could also be applied to dedicated-purpose pool pumps shipped with freeze protection control disabled to verify the fact that the controls were, in fact, disabled. In either case, any dedicated-purpose pool pumps tested under the freeze protection control enforcement test provisions should not be altered from their as-shipped settings. DOE is clarifying, in this final rule, that dedicated-purpose pool pumps must be tested in the "as-shipped control settings" when applying the freeze protection control enforcement test. 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.

APSP and Hayward also recommended clarifying that the vertical lift and true priming time for enforcement testing of the self-priming capability test should be 6 minutes or the

manufacturers recommended prime time, as permitted by NSF/ANSI 50–2015. (APSP, No. 8 at p.11; Hayward, No. 6 at p. 10)

In response, DOE acknowledges that, as defined, self-priming pool filter pumps that are certified with NSF/ANSI 50–2015 would have been tested based on the criteria in NSF/ANSI 50–2015 that allow for some amount of manufacturer discretion with regard to the tested vertical lift and true priming time. Specifically, NSF/ANSI 50–2015 allows a vertical lift of 5 feet or the manufacturers specified lift, whichever is greater, and a true priming time not to exceed 6 minutes or the manufacturers recommended time, whichever is greater. However, DOE notes that DOE's self-priming capability enforcement testing provisions are fundamentally designed to evaluate the self-priming capability of a pool filter pump not certified to NSF/ANSI 50–2015 as self-priming to verify the appropriate equipment class is applied to each DPPP model. As such, the criteria adopted in the definitions of self-priming and non-self-priming pool filter pump (see section III.B.3.a) are most applicable.

In addition, DOE notes that, as discussed in the DPPP Working Group, DOE's specified criteria of a vertical lift of 5.0 feet and true priming time of 10.0 minutes were meant to ensure that any pump certified to NSF/ANSI 50–2015 as a self-priming pump would inherently meet DOE's criteria for self-priming pumps. That is, based on NSF/ANSI criteria, any pump that was certified as self-priming would have a vertical lift of at least 5.0 feet, which would also comply with DOE's requirement. Regarding the true priming time, as NSF/ANSI 50–2015 allows for a true priming time of 6 minutes or the manufacturers specified time, whichever is greater, it is possible that a pump could be certified to NSF/ANSI 50–2015 with a priming time greater than 10.0 minutes and still be qualified as a self-priming pump. However, the DPPP Working Group

noted on several occasions that the majority of existing self-priming pool filter pumps have true priming times less than 10.0 minutes. (Docket No. EERE-2015-BT-STD-0008, No. 95 at pp. 20–38, 110–113, and 119–128; Docket No. EERE-2015-BT-STD-0008, No. 79 at pp. 154–192) However, DOE would only apply the self-priming capability enforcement test to pool filter pumps that are not certified as self-priming with NSF/ANSI 50–2015 and, therefore, DOE's requirements of 5.0 feet and 10.0 minutes are the applicable thresholds.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

The Office of Management and Budget (OMB) has determined that test procedure 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 (OMB).

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 et seq.) requires preparation of a regulatory flexibility analysis 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 final rule, which establishes 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 concludes that this final rule will 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 adopted 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, DOE certifies that this test procedure final rule 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 Small Business Administration (SBA) for review under 5 U.S.C. 605(b).

1. Review of DPPP Manufacturers

As presented in the September 2016 DPPP test procedure NOPR, 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 of 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. 81 FR 64580, 64637.

DOE notes that the Regulatory Flexibility Act requires analysis of, in particular, ‘‘small entities’’ that might be affected by the rule. For the DPPP manufacturing industry, the 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 https://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 rule, DOE 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 identified five companies that would be considered small manufacturers by the SBA definition in terms of the number of employees.

DOE requested comment on this estimate in the September 2016 DPPP test procedure NOPR. 81 FR 64580, 64637 (Sept. 20, 2016). Hayward commented that they had no means to confirm the accuracy of this value. (Hayward, No. 10 at pp. 10-11) Further analysis of small

businesses will be part of the Manufacturer Impact Analysis as part of any potential energy conservation standards.

2. Burden of Conducting the DOE DPPP Test Procedure

Although DOE maintains that this 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. Given the ongoing DPPP ECS rulemaking and the potential testing manufacturers may elect to undertake prior to the compliance date of any potential standards, DOE estimated the cost of developing certified ratings for covered DPPP models.

In the September 2016 DPPP test procedure NOPR, DOE estimated the cost to test and certify a DPPP basic model, and the total certification cost for each manufacturer, based on input from manufacturers and independent research. DOE estimated the cost for both (a) testing units in house and (b) testing units at a third-party testing facility. Using the assumption that each manufacturer rates 15 basic models on average, DOE developed testing costs for manufacturers that perform in-house testing ranging from $1,000 to $1,350 per basic model. This included up to $1,000 in capital costs, and up to $350 in labor costs to perform the DPPP tests to comply with DOE's testing requirements. For testing units at third party test labs, DOE estimated the cost to be $11,000 per basic model. 81 FR 64580, 64635–64637 (Sept. 20, 2016).

In response to the September 2016 DPPP test procedure NOPR, APSP, Hayward, and Pentair commented that DOE's estimated capital cost for in-house testing is too low. APSP,

Hayward, Pentair, and Zodiac stated that a manufacturer starting out should expect to spend between $50,000 and $100,000 for equipment suitable for testing. (APSP, No. 8 at p. 11; Hayward, No. 6 at p. 10; Pentair, No. 11, at p. 4; Zodiac, No. 13 at p. 3) In addition, Hayward, APSP, and Zodiac stated that the estimated time to complete a test of a DPPP basic model is between 12 and 14 hours. (APSP, No. 8 at p. 11; Hayward, No. 6 at p. 10; Zodiac, No. 13 at p. 3)

DOE notes that APSP, Hayward, Pentair, and Zodiac did not provide additional detail regarding the basis for their estimates or why they are higher than DOE's estimates. However, DOE recognizes that the assumptions in the September 2016 DPPP test procedure NOPR only accounted for the capital cost of acquiring the necessary equipment and did not account for the additional labor associated with setting up and commissioning any new testing facility. DOE believes that, including the additional labor estimates, a figure of $50,000 to $100,000 may be appropriate. Therefore, DOE has revised the worst-case burden estimate, which was previously estimated as $43,800, using the information provided by manufacturers. Using the same assumption from the September 2016 DPPP test procedure NOPR that each manufacturer will rate 15 basic models on average and the estimated capital costs provided by Hayward, APSP, Pentair, and Zodiac, the worst-case burden estimate ranges from $3,333 to $6,666 per basic model. In addition, adjusting the testing time to 14 hours and using a labor rate with fringe benefits of $56.42 per hour,[63] the total labor costs are $790 per basic model. In total, using

[63] 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.

estimates from Hayward, APSP, Pentair, and Zodiac, the per basic model testing costs range from $4,123 to $7,456.

However, as discussed in the September 2016 DPPP test procedure NOPR, many DPPP manufacturers already have existing testing capabilities and likely would not incur the full burden on constructing completely new test facilities. Specifically, DOE estimated a more representative burden estimate of $15,000 for manufacturers that may be required to acquire new power measurement equipment and power conditioning equipment to comply with the proposed test procedure requirements. However, DOE noted that the costs could be as low as $0. 81 FR 64580, 64635–64637 (Sept. 20, 2016). DOE notes that these representative burden estimates are consistent with the comments of APSP, Hayward, and Pentair that many of the requirements regarding test equipment and test conditions adopted in the DOE test procedure are consistent with (or less stringent than) those already in use in manufacturer's test labs (see section III.E.2.e and III.E.2.f). (APSP, No. 8 at p. 7; Hayward, No. 6 at pp. 7, 11; Pentair, No. 11 at . 4) In addition, in response to comments from interested parties, DOE is making several modifications in this test procedure final rule to further align testing requirements with existing industry programs and, therefore, reduce testing burden for manufacturers (see section III.E.2, III.G.4, and III.J.1). However, Pentair pointed out that manufacturers may need to upgrade capacity to certify all applicable DPPP models in accordance with the regulation. (Pentair, No. 11 at p. 4) While DOE understands that manufacturers may incur cost to certify DPPP models in accordance with any energy conservation standard that may be set, there is no requirement to certify any or all models associated with this test procedure final rule. As such, DOE is assessing the burden associated with certifying DPPP models in accordance with this test procedure and the impact on manufacturers in the Manufacturer Impact Analysis in the

associated energy conservation standard (Docket No. EERE-2015-BT-STD-0008). Specifically, in the Manufacturer Impact Analysis in the energy conservation standard, DOE is including the highest cost per basic model testing cost estimate to prevent underestimating testing burden to the industry. DOE determined that the per basic model test cost at third-party test labs ($11,000 per model, as estimated in the September 2016 DPPP test procedure NOPR) is greater than the per basic model test cost estimate from Hayward, Pentair, and APSP. Therefore, in the ECS Manufacturer Impact Assessment, DOE assumes that all manufacturers test 15 basic models at third-party test labs at a cost of $11,000 per basic model.

In the September 2016 DPPP test procedure NOPR, DOE also estimated that manufacturers incur testing burden every time a new basic model is introduced. DOE estimated that manufacturers introduce or significantly modify the basic model every 5 years. Pentair APSP, and Zodiac responded that significant changes in basic models are not common and the 5 year estimate is low. APSP commented that 5 years is the minimum time for a manufacturer to make changes to basic models, but it could be as much as 10 years. (Pentair, No. 11 at p. 4; APSP, No. 8 at p 12; Zodiac, No. 13 at p. 3) DOE appreciates the comments from the interested parties and concludes that, based on the updated testing time of 14 hours discussed previously, ongoing testing costs would be approximately $790 per manufacturer to certify new models. However, DOE reiterates that this cost would not be required until the compliance date of any energy conservation standard that may be adopted for such equipment.

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 adopted in this final rule are similar to those established for general pumps in the January 2016 general pumps test procedure 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.J.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 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 final rule, DOE is adopting new definitions; a new test procedure; and new certification, enforcement, and labeling requirements for dedicated-purpose pool pumps. 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 rule considers a test procedure for dedicated-purpose pool pumps that is largely based upon industry test procedures and methodologies resulting from a negotiated rulemaking without affecting the amount, quality, or distribution of energy usage, and, therefore, will 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 examined this final rule and determined that it will 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 final 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, this final 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 regulatory action resulting 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 final 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 final rule will 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 will 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 final 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 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 significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use if the regulation is implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

This regulatory action is not a significant regulatory action under Executive Order 12866. Moreover, it would not 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.

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 NOPR 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 modifications to the test procedure for dedicated-purpose pool pumps adopted in this final rule incorporates testing methods contained in certain sections of the following commercial standards:

1) UL 1081, ("ANSI/UL 1081–2016"), "Standard for Swimming Pool Pumps, Filters, and Chlorinators," 7th Edition, ANSI approved October 21, 2016.

Canadian Standards Association (CSA) C747-2009 (Reaffirmed 2014), "Energy Efficiency Test Methods for Small Motors," CSA reaffirmed 2014, section 1, "Scope"; section 3, "Definitions"; section 5, "General Test Requirements"; and section 6, "Test Method."

Institute of Electrical and Electronics Engineers (IEEE) Standard 114-2010, "Test Procedure for Single-Phase Induction Motors," Approved September 30, 2010, section 3.2, "Tests with load"; section 4 "Testing facilities"; section 5.2 "Mechanical measurements"; section 5.3 "Temperature measurements"; and section 6 "Tests."

Institute of Electrical and Electronics Engineers (IEEE) Standard 113-1985, "IEEE Guide: Test Procedures for Direct-Current Machines," 1985, section 3.1, "Instrument

Selection Factors"; section 3.4 "Power Measurement": section 3.5 "Power Sources"; section 4.1.2 "Ambient Air"; section 4.1.4 "Direction of Rotation"; section 5.4.1 "Reference Conditions"; and section 5.4.3.2 "Dynomometer or Torquemeter Method."

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 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, "Test conditions"; 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 is only modifying the existing incorporation by reference to extend the applicability of certain sections to the new appendices B1 and B2 to subpart Y that will contain the DPPP test procedure.

Although the DPPP test procedure is not exclusively based on these industry testing standards, some components of the test procedure will adopt definitions, test parameters,

measurement techniques, and additional calculations from them without amendment. DOE has evaluated these standards and is unable to conclude whether it fully complies with the requirements of section 32(b) of the FEAA (i.e., whether it was developed in a manner that fully provides for public participation, comment, and review). DOE has consulted with both the Attorney General and the Chairman of the FTC about the impact on competition of using the methods contained in these standards and has received no comments objecting to their use.

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. Description of Materials Incorporated by Reference

In this final rule, DOE incorporates by reference three industry standards related to pump nomenclature, definitions, and test specifications, which DOE has referenced in its proposed definitions and test procedure.

Specifically, the definitions in this final rule, 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 1081–2016"), "Standard for Swimming Pool Pumps, Filters, and Chlorinators," 7th Edition, ANSI approved October 21, 2016.

2) Canadian Standards Association (CSA) C747-2009 (Reaffirmed 2014), "Energy Efficiency Test Methods for Small Motors," CSA reaffirmed 2014, section 1, "Scope"; section 3, "Definitions"; section 5, "General Test Requirements"; and section 6, "Test Method."

3) Institute of Electrical and Electronics Engineers (IEEE) Standard 114-2010, "Test Procedure for Single-Phase Induction Motors," Approved September 30, 2010, section 3.2, "Tests with load"; section 4 "Testing facilities"; section 5.2 "Mechanical measurements"; section 5.3 "Temperature measurements"; and section 6 "Tests."

4) Institute of Electrical and Electronics Engineers (IEEE) Standard 113-1985, "IEEE Guide: Test Procedures for Direct-Current Machines," 1985, section 3.1, "Instrument Selection Factors"; section 3.4 "Power Measurement": section 3.5 "Power Sources"; section 4.1.2 "Ambient Air"; section 4.1.4 "Direction of Rotation"; section 5.4.1 "Reference Conditions"; and section 5.4.3.2 "Dynomometer or Torquemeter Method."

5) 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 incorporates by reference UL 1081–2016 into 10 CFR 431.462 and NSF/ANSI 50–2015 into 10 CFR 429.59, 10 CFR 429.134, 10 CFR 431.462, and appendices B1 and B2 of subpart Y. UL 1081–2016 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. DOE incorporates by reference CSA C747-2009 (RA 2014), IEEE 114-2010, and IEEE 113-1985 into appendices B1 and B2 of part 431 to describe the standardized methods for determining certain DPPP motor horsepower characteristics. IEEE 114-2010 and IEEE 113-1985 contain standardized methods for evaluating and categorizing motors.

In addition, the test procedure adopted in this final rule 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, "Test conditions"; 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 already IBR approved for 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 the new appendices B1 and B2 to subpart Y that would contain the DPPP test procedure, as well as 10 CFR 429.134 to support DOE's enforcement testing. 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, adopted in this final rule (see sections III.C and III.G.4).

Additionally, these standards can be obtained from the organizations directly at the following addresses:

1) 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.

CSA, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, L4W 5N6, Canada, (800) 463-6727, or by visiting www.csagroup.org.

IEEE, 45 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, (732)981-0060, or by visiting http://www.ieee.org.

NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105, (743) 769-8010, or by visiting www.nsf.org.

V. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this final rule.

List of Subjects

10 CFR part 429

Administrative practice and procedure, Confidential business information, Energy conservation, Imports, Incorporation by reference, 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 December 22, 2016.

Kathleen B. Hogan
Deputy Assistant Secretary for Energy Efficiency
Energy Efficiency and Renewable Energy

For the reasons stated in the preamble, DOE amends 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 429.4 is amended by:

a. Redesignating paragraph (d) as (e); and

b. Adding new paragraphs (d) as (f) to read as follows:

§429.4 Materials incorporated by reference.

* * * * *

(d) HI. Hydraulic Institute, 6 Campus Drive, First Floor North, Parsippany, NJ 07054-4406, 973-267-9700. www.Pumps.org.

(4) HI 40.6–2014, ("HI 40.6–2014-B"), "Methods for Rotodynamic Pump Efficiency Testing," copyright 2014, IBR approved for §429.134 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, "Test conditions"; 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)."

* * * * *

(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 §429.59 and §429.134 of this part.

3. Section 429.59 is amended by:

a. Revising paragraph (a)(1)(ii) and (c); 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 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 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 the mean of the dedicated-purpose pool pump motor total horsepower for each tested unit.

(iii) True power factor (PF_i). The representative value of true power factor at each load point i of a basic model of dedicated-purpose pool pump must be the mean of the true power factors at that load point for each tested unit of dedicated-purpose pool pump.

(b) * * *

(2) * * *

(iv) For a dedicated-purpose pool pump subject to the test methods prescribed in §431.464(b) 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 i (dimensionless), as specified in Table 1 of appendix B1 or B2 to subpart Y of part 431, as applicable; 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) which is based on the mean of the units in the tested sample; a statement regarding whether 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); for self-priming pool filter pumps a statement regarding whether the pump is certified with NSF/ANSI 50-2015 (incorporated by reference, see §429.4) as self-priming; and, for self-priming pool filter pumps that are not certified with NSF/ANSI 50-2015 as self-priming: the vertical lift (in feet) and true priming time (in minutes) for the DPPP model.

(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 §431.464(b) 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.

* * * * *

(c) Individual model numbers.

(1) For a pump subject to the test methods prescribed in appendix A to subpart Y of part 431 of this chapter, each individual model number required to be reported pursuant to §429.12(b)(6) must consist of the following:

Equipment configuration (as distributed in commerce)	Basic model number	Individual model number(s)		
		1	2	3
Bare pump	Number unique to the basic model	Bare Pump	N/A	N/A.
Bare pump with driver	Number unique to the basic model	Bare Pump	Driver	N/A.
Bare pump with driver and controls	Number unique to the basic model	Bare Pump	Driver	Controls.

(2) Or must otherwise provide sufficient information to identify the specific driver model and/or controls model(s) with which a bare pump is distributed.

4. 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.

* * * * *

5. 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 (incorporated by reference, see §429.4) as self-priming, 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.

(A) For self-priming pool filter pumps that are not certified with NSF/ANSI 50–2015 as self-priming, at a vertical lift of 5.0 feet, the result of the true priming time measurement(s) will be compared to the value of true priming time certified by the manufacturer. The certified value of true priming time will be considered valid only if the measurement(s) (either the measured true priming time for a single unit sample or the average of true priming time values for a multiple unit sample) is within 5 percent of the certified value of true priming time.

(1) If the representative value of true priming time is found to be valid, the value of true priming time certified by the manufacturer will be used to determine the appropriate equipment class and standard level for that basic model.

(2) If the representative value of true priming time is found to be invalid, the mean of the values of true priming time determined from the tested unit(s) will be used to determine the appropriate equipment class and standard level for that basic model.

(B) For non-self-priming pool filter pumps, at a vertical lift of 5.0 feet, the result of the true priming time measurement(s) (either the measured true priming time for a single unit sample or the average of true priming time values, for a multiple unit sample) will be compared to the value of true priming time referenced in the definition of non-self-priming pool filter pump at §431.462 (10.0 minutes).

(1) If the measurement(s) of true priming time are greater than 95 percent of the value of true priming time referenced in the definition of non-self-priming pool filter pump at §431.462 with a vertical lift of 5.0 feet, the DPPP model will be considered a non-self-priming

pool filter pump for the purposes of determining the appropriate equipment class and standard level for that basic model.

(2) If the conditions specified in paragraph (i)(2)(ii)(B)(1) are not satisfied, then the DPPP model will be considered a self-priming pool filter pump for the purposes of determining the appropriate equipment class and 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 and 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 §429.4), except that the ambient temperature registered by the freeze protection ambient temperature sensor will be able to be measured and 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, by adjusting the actual ambient air temperature of the test chamber and measuring the temperature at the freeze protection ambient temperature sensor location, or by other means that allows the ambient temperature registered by the freeze protection temperature sensor to be reliably simulated, varied, and measured. Do not adjust the default freeze protection control settings or enable the freeze protection control if it is shipped disabled.

(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 ± 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. After 5 minutes, decrease the temperature measured by the freeze protection temperature sensor by 1.0 ± 0.5 °F and allow the temperature to stabilize. After each reduction in ambient temperature and subsequent stabilization, record the DPPP rotating speed, if any, and 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. If no flow is initiated, record zero rpm or no flow. Continue decreasing the temperature measured by the freeze protection temperature sensor by 1.0 ± 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 ± 0.5 °F has been evaluated (i.e., the end of the 5.0 minute interval of 38.0 °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 ± 0.5 °F and maintain that temperature for 60.0 minutes. Do not modify or interfere with the operation of the DPPP freeze protection operating cycle. After60.0 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 60.0 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 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

6. The authority citation for part 431 continues to read as follows:

Authority: 42 U.S.C. 6291–6317; 28 U.S.C. 2461 note.

7. Section 431.462 is amended by:

a. Adding introductory text after the section heading; and

b. 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 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," and "Waterfall pump"; and

c. Revising 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 2014 version of ANSI/HI Standard

1.1-1.2, “Rotodynamic (Centrifugal) Pumps For Nomenclature And Definitions” (ANSI/HI 1.1-1.2–2014; incorporated by reference, see §431.463), or the 2014 version of ANSI/HI Standard 2.1-2.2, “Rotodynamic (Vertical) Pumps For Nomenclature And Definitions” (ANSI/HI 2.1-2.2–2014; incorporated by reference, see §431.463). 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 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 motor's nameplate ambient rating and insulation class. (Dedicated-purpose pool pump motor total horsepower is also referred to in the industry as service factor horsepower or motor capacity.)

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 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 any 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 (incorporated by reference, see §431.463) 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 section F of appendix B1 or B2 of this subpart, 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 1081–2016, “Standard for Swimming Pool Pumps, Filters, and Chlorinators” (incorporated by reference, see §431.463).`

* * * * *

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 (incorporated by reference, see §431.463) 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 section F of appendix B1 or B2 of this subpart, 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 (e.g., 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 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 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, but is 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 a certified maximum head less than or equal to 30.0 feet, and a maximum speed less than or equal to 1,800 rpm.

8. Section 431.463 is amended by:

a. Revising paragraph (a) through (e);

b. Redesignating (b) as (c);

c. Adding a new paragraph (b);

d. Redesignating paragraph (c) as (d);

e. Adding a new paragraph (d)(4);

f. Redesignating paragraph (d) as (f);

g. Redesignating paragraph (e) as (h);

h. Adding a new (h)(2); and

i. Adding new paragraphs (e) 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.

(b) CSA. Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, L4W 5N6, Canada, (800) 463-6727. www.csagroup.org

(1) CSA C747-2009 (Reaffirmed 2014), ("CSA C747-2009 (RA2014)"), "Energy Efficiency Test Methods for Small Motors," CSA reaffirmed 2014, IBR approved for appendix B1 and B2 of this part, as follows:

(i) Section 1, “Scope”;

(ii) Section 3, “Definitions”;

(iii) Section 5, “General Test Requirements”; and

(iv) Section 6, “Test Method.”

(2) [Reserved]

* * * * *

(d) * * *

(4) HI 40.6–2014, (“HI 40.6–2014-B”), “Methods for Rotodynamic Pump Efficiency Testing,” copyright 2014, IBR approved for §429.134 and appendix B1 and B2 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, “Test conditions”; 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) IEEE. Institute of Electrical and Electronics Engineers, Inc., 45 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, (732)981-0060. http://www.ieee.org.

(1) IEEE Standard 113-1985, (“IEEE 113-1985”), “IEEE Guide: Test Procedures for Direct-Current Machines,” 1985, IBR approved for appendix B1 and B2 of this part, as follows:

(i) Section 3.1, “Instrument Selection Factors”;

(ii) Section 3.4 “Power Measurement”;

(iii) Section 3.5 “Power Sources”;

(iv) Section 4.1.2 “Ambient Air”;

(v) Section 4.1.4 “Direction of Rotation”;

(vi) Section 5.4.1 “Reference Conditions”; and

(vii) Section 5.4.3.2 “Dynomometer or Torquemeter Method.”

(2) IEEE Standard 114-2010, (“IEEE 114-2010”), “Test Procedure for Single-Phase Induction Motors,” Approved September 30, 2010, IBR approved for appendix B1 and B2 of this part, as follows:

(i) Section 3.2, “Tests with load”;

(ii) Section 4 “Testing facilities”;

(iii) Section 5.2 “Mechanical measurements”;

(iv) Section 5.3 “Temperature measurements”; and

(v) Section 6 “Tests.”

* * * * *

(g) 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 §429.59, §429.134, §431.462, appendix B1, and appendix B2 of this part.

(2) [Reserved]

(h) * * *

(2) UL 1081, (“ANSI/UL 1081–2016”), “Standard for Swimming Pool Pumps, Filters, and Chlorinators,” 7th Edition, ANSI approved October 21, 2016, IBR approved for §431.462.

9. 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 range 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 (WEF), 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 B1 or appendix B2 of this subpart, as applicable.

10. 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 must be marked clearly with the following information:

(A) The weighted energy factor (WEF); and

(B) 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.

(A) The WEF must be identified in the form "WEF ____."

(B) 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 _____," "motor total horsepower _____," "motor THP _____," or "THP _____."

(2) [Reserved.]

APPENDIX A TO SUBPART Y OF PART 431 [AMENDED]

11. 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)".

12. Add appendices B1 and B2 to subpart Y of part 431 to read as follows:

APPENDIX B1 TO SUBPART Y OF PART 431 – UNIFORM TEST METHOD FOR THE MEASUREMENT OF ENERGY EFFICIENCY OF DEDICATED-PURPOSE POOL PUMPS

Note: On **[INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]** but before the compliance date of any energy conservation standards specified in §431.465(f), 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. Any optional representations of energy factor (EF) must be accompanied by a representation of weighted energy factor (WEF).

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-B, 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, "Test conditions"; 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-B 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-B 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) and rated hydraulic horsepower to the thousandths place (i.e., 0.001). Round all other reported values to the hundredths place unless otherwise specified.

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-B 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-B 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.

B.2 Calibration. Calibration requirements for instrumentation are specified in appendix D of HI 40.6-2014-B (incorporated by reference, see §431.463). Historical calibration data may be used to justify time periods up to three times longer than those specified in table D.1 of HI 40.6-2014-B provided the supporting historical data shows maintenance of calibration of the given instrument up to the selected extended calibration interval on at least two unique occasions, based on the interval specified in HI 40.6-2014-B.

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-B 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" (incorporated by reference, see §431.463).

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 value with which the motor was rated, and

(4) Maintain total harmonic distortion below 12 percent throughout the test.

C.3 Test Conditions. Testing must be carried out with water that is between 50 and 107 °F with less than or equal to 15 nephelometric turbidity units (NTU).

C.4 Tolerances. For waterfall pumps, multi-speed self-priming and non-self-priming pool filter pumps, and variable-speed self-priming and non-self-priming pool filter pumps all measured load points must be within ±2.5 percent of the specified head value and comply with any specified flow values or thresholds. For all other dedicated-purpose pool pumps, all measured load points must be within the greater of ±2.5 percent of the specified flow rate values or ±0.5 gpm and comply with any specified head values or thresholds.

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-B (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-B 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 variety and speed configuration:

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 **And**	Single-speed dedicated-purpose pool pumps and all self-priming and non-self-priming pool filter pumps	1	High	$Q_{high}(gpm) = Q_{max\_speed@C}$**	$H = 0.0082 \times Q_{high}^{2}$	Maximum speed

DPPP Varieties	Speed Configuration(s)	Number of Load Points n	Load Point i	Test Points		
				Flow Rate Q (GPM)	Head H (ft)	Speed rpm
Non-Self-Priming Pool Filter Pumps	not meeting the definition of two-*, multi-, or variable-speed dedicated-purpose pool pump					
	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 rated hydraulic horsepower is >0.75 or • 24.7 gpm if rated hydraulic horsepower is ≤0.75	$H = 0.0082 \times Q_{low}^2$	Lowest speed capable of meeting the specified flow and head values, if any***
			High	Q_{high}(gpm) = $Q_{max\_speed@C}$**	$H = 0.0082 \times Q_{high}^2$	Maximum speed
	Multi-speed and variable-speed dedicated-purpose pool pumps	2	Low	Q_{low}(gpm) = • If rated hydraulic horsepower is >0.75, then $Q_{low} \geq$ 31.1 gpm • If rated hydraulic horsepower is ≤0.75, then $Q_{low} \geq$ 24.7 gpm	$H = 0.0082 \times Q_{low}^2$	Lowest speed capable of meeting the specified flow and head values
			High	Q_{high}(gpm) ≥ $0.8 \times Q_{max\_speed@C}$ **	$H = 0.0082 \times Q_{high}^2$	Lowest speed capable of meeting the specified flow and head values
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 such capability, but without which the pump is unable to operate.

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.
** $Q_{max\_speed@C}$ = Flow at max speed on curve C (gpm)
*** If a two-speed pump has a low speed that results in a flow rate below the specified values, the low speed of that pump shall not be tested.

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, in gpm;

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

i = load point(s), defined uniquely for each DPPP variety and speed configuration as specified in section D.3; and

n = number of load point(s), defined uniquely for each DPPP variety and speed configuration as specified in section D.3.

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 Configuration(s)	Load Point(s) i	
		Low Flow	High Flow
Self-Priming Pool Filter Pumps and Non-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	-	1.0
	Two-speed dedicated-purpose pool pumps*	0.80	0.20
	Multi-speed and variable-speed dedicated-purpose pool pumps	0.80	0.20
Waterfall Pumps	Single-speed dedicated-purpose pool pumps	-	1.0
Pressure Cleaner Booster Pump	Any	-	1.0

* 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 such capability, but without which the pump is unable to operate. 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.

E.3 Determination of Horsepower and True Power Factor Metrics.

E.3.1 Determine the pump power output at any load point i using the following equation:

$$P_{u,i} = \frac{Q_i \times H_i \times SG}{3960}$$

Where:

$P_{u,i}$ = the measured pump power output at load point i of the tested pump, in hp;

Q_i = the measured flow rate at load point i of the tested pump, in gpm;

H_i = pump total head at load point i of the tested pump, in 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 For dedicated-purpose pool pumps with single-phase AC motors or DC motors, determine the dedicated-purpose pool pump nominal motor horsepower as the product of the

measured full load speed and torque, adjusted to the appropriate units, as shown in the following equation:

$$P_{nm} = \frac{(T \times n)}{5252}$$

Where:

P_{nm} = the dedicated-purpose pool pump nominal total horsepower at full load, in hp;

T = output torque at full load, in lb-ft; and

n = the motor speed at full load, in rpm.

Full-load speed and torque shall be determined based on the maximum continuous duty motor power output rating allowable for the motor's nameplate ambient rating and insulation class.

E.3.2.1 For single-phase AC motors, determine the measured speed and torque at full load according to either section E.3.2.1.1 or E.3.2.1.2.

E.3.2.1.1 Use the procedures in section 3.2, "Tests with load"; section 4 "Testing facilities"; section 5.2 "Mechanical measurements"; section 5.3 "Temperature measurements"; and section 6 "Tests" of IEEE 114-2010 (incorporated by reference, see §431.463), or

E.3.2.1.2 Use the applicable procedures in section 5, "General test requirements" and section 6, "Tests" of CSA C747-2009 (RA 2014); except in section 6.4(b) the conversion factor shall be 5252, only measurements at full load are required in section 6.5, and section 6.6 shall be disregarded (incorporated by reference, see §431.463).

E.3.2.2 For DC motors, determine the measured speed and torque at full load according to either section E.3.2.2.1 or E.3.2.2.2.

E.3.2.2.1 Use the procedures in section 3.1, "Instrument Selection Factors"; section 3.4 "Power Measurement": section 3.5 "Power Sources"; section 4.1.2 "Ambient Air"; section 4.1.4

"Direction of Rotation"; section 5.4.1 "Reference Conditions"; and section 5.4.3.2 "Dynomometer or Torquemeter Method" of IEEE 113-1985 (incorporated by reference, see §431.463), or

E.3.2.2.2 Use the applicable procedures in section 5, "General test requirements" and section 6, "Tests" of CSA C747-2009 (RA 2014); except in section 6.4(b) the conversion factor shall be 5252, only measurements at full load are required in section 6.5, and section 6.6 shall be disregarded (incorporated by reference, see §431.463).

E.3.3 For dedicated-purpose pool pumps with single-phase AC motors or 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 according to section E.3.4.1 for dedicated-purpose pool pumps with single-phase AC motors or DC motors and section E.3.4.2 for dedicated-purpose pool pumps with polyphase AC motors.

E.3.4.1 For dedicated-purpose pool pumps with single-phase AC motors or DC motors, 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.3.4.2 For dedicated-purpose pool pumps with polyphase AC induction motors, determine the dedicated-purpose pool pump motor total horsepower as the product of the rated nominal motor horsepower and the rated service factor of the motor.

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, divided by 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, in watts;

V_i = voltage at each load point i, in volts;

I_i = current at each load point i, in amps; and

i = load point(s), defined uniquely for each DPPP variety and speed configuration as specified in section D.3.

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 non-self-priming pool filter pumps and self-priming pool filter pumps that are not already certified as self-priming under NSF/ANSI 50-2015 (incorporated by reference, see §431.463) by testing such pumps pursuant to section C.3 of appendix C of NSF/ANSI 50-2015, 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," of NSF/ANSI 50-2015 (incorporated by reference, see §431.463) state that the "suction

line must be essentially as shown in annex C, figure C.1;" the phrase "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 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:

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

$P_{abs,test}$ = 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 All measurements of head (gauge pressure), flow, and water temperature must be taken at the pump suction inlet and all head measurements must be normalized back to the centerline of the pump impeller shaft in accordance with section A.3.1.3.1 of HI 40.6 2014-B (incorporated by reference, see §431.463).

F.1.3. All tests must be conducted with clear water that meets the requirements adopted in section C.3 of this appendix.

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-B (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 gal/Wh;

X = one of four possible system curves (A, B, C, or D), as defined in section G.1.1 of this appendix;

s = the tested speed, in rpm;

$Q_{X,s}$ = 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.1.1 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 the Table 4:

Table 3. 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.2 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 replacement DPPP motor 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 replacement DPPP motor 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.

APPENDIX B2 TO SUBPART Y OF PART 431 – UNIFORM TEST METHOD FOR THE MEASUREMENT OF ENERGY EFFICIENCY OF DEDICATED-PURPOSE POOL PUMPS

Note: Any representations made on or after the compliance date of any energy conservation standards specified in §431.465(f) 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-B, 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, "Test conditions"; 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-B 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-B 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, maximum head, vertical lift, and true priming time values to the tenths place (i.e., 0.1) and rated hydraulic horsepower to the thousandths place (i.e., 0.001). Round all other reported values to the hundredths place unless otherwise specified.

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-B 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-B 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.

B.2 Calibration. Calibration requirements for instrumentation are specified in appendix D of HI 40.6-2014-B (incorporated by reference, see §431.463). Historical calibration data may be used to justify time periods up to three times longer than those specified in table D.1 of HI 40.6-2014-B provided the supporting historical data shows maintenance of calibration of the given instrument up to the selected extended calibration interval on at least two unique occasions, based on the interval specified in HI 40.6-2014-B.

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-B 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" (incorporated by reference, see §431.463).

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 value with which the motor was rated, and

(4) Maintain total harmonic distortion below 12 percent throughout the test.

C.3 Test Conditions. Testing must be carried out with water that is between 50 and 107 °F with less than or equal to 15 nephelometric turbidity units (NTU).

C.4 Tolerances. For waterfall pumps, multi-speed self-priming and non-self-priming pool filter pumps, and variable-speed self-priming and non-self-priming pool filter pumps all measured load points must be within ±2.5 percent of the specified head value and comply with any specified flow values or thresholds. For all other dedicated-purpose pool pumps, all measured load points must be within the greater of ±2.5 percent of the specified flow rate values or ±0.5 gpm and comply with any specified head values or thresholds.

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-B (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-B 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 variety and speed configuration:

Table1. 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 **And** **Non-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

DPPP Varieties	Speed Configuration(s)	Number of Load Points n	Load Point i	Test Points		
				Flow Rate Q (GPM)	Head H (ft)	Speed rpm
	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 rated hydraulic horsepower is >0.75 or • 24.7 gpm if rated hydraulic horsepower is ≤0.75	$H = 0.0082 \times Q_{low}^2$	Lowest speed capable of meeting the specified flow and head values, if any***
			High	Q_{high}(gpm) = $Q_{max\_speed@C}$**	$H = 0.0082 \times Q_{high}^2$	Maximum speed
	Multi-speed and variable-speed dedicated-purpose pool pumps	2	Low	Q_{low}(gpm) = • If rated hydraulic horsepower is >0.75, then $Q_{low} \geq$ 31.1 gpm • If rated hydraulic horsepower is ≤0.75, then $Q_{low} \geq$ 24.7 gpm	$H = 0.0082 \times Q_{low}^2$	Lowest speed capable of meeting the specified flow and head values
			High	Q_{high}(gpm) ≥ $0.8 \times Q_{max\_speed@C}$ **	$H = 0.0082 \times Q_{high}^2$	Lowest speed capable of meeting the specified flow and head values
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 such capability, but without which the pump is unable to operate. 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.

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

*** If a two-speed pump has a low speed that results in a flow rate below the specified values, the low speed of that pump shall not be tested.

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, in gpm;

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

i = load point(s), defined uniquely for each DPPP variety and speed configuration as specified in section D.3; and

n = number of load point(s), defined uniquely for each DPPP variety and speed configuration as specified in section D.3.

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 Configuration(s)	Load Point(s) i	
		Low Flow	High Flow
Self-Priming Pool Filter Pumps and Non-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	-	1.0
	Two-speed dedicated-purpose pool pumps*	0.80	0.20
	Multi-speed and variable-speed dedicated-purpose pool pumps	0.80	0.20
Waterfall Pumps	Single-speed dedicated-purpose pool pumps	-	1.0
Pressure Cleaner Booster Pump	Any	-	1.0

* 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 such capability, but without which the pump is unable to operate. 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.

E.3 Determination of Horsepower and True Power Factor Metrics.

E.3.1 Determine the pump power output at any load point i using the following equation:

$$P_{u,i} = \frac{Q_i \times H_i \times SG}{3960}$$

Where:

$P_{u,i}$ = the measured pump power output at load point i of the tested pump, in hp;

Q_i = the measured flow rate at load point i of the tested pump, in gpm;

H_i = pump total head at load point i of the tested pump, in 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 For dedicated-purpose pool pumps with single-phase AC motors or DC motors, determine the dedicated-purpose pool pump nominal motor horsepower as the product of the

measured full load speed and torque, adjusted to the appropriate units, as shown in the following equation:

$$P_{nm} = \frac{(T \times n)}{5252}$$

Where:

P_{nm} = the dedicated-purpose pool pump nominal total horsepower at full load, in hp;

T = output torque at full load, in lb-ft; and

n = the motor speed at full load, in rpm.

Full-load speed and torque shall be determined based on the maximum continuous duty motor power output rating allowable for the motor's nameplate ambient rating and insulation class.

E.3.2.1 For single-phase AC motors, determine the measured speed and torque at full load according to either section E.3.2.1.1 or E.3.2.1.2.

E.3.2.1.1 Use the procedures in section 3.2, "Tests with load"; section 4 "Testing facilities"; section 5.2 "Mechanical measurements"; section 5.3 "Temperature measurements"; and section 6 "Tests" of IEEE 114-2010 (incorporated by reference, see §431.463), or

E.3.2.1.2 Use the applicable procedures in section 5, "General test requirements" and section 6, "Tests" of CSA C747-2009 (RA 2014); except in section 6.4(b) the conversion factor shall be 5252, only measurements at full load are required in section 6.5, and section 6.6 shall be disregarded (incorporated by reference, see §431.463).

E.3.2.2 For DC motors, determine the measured speed and torque at full load according to either section E.3.2.2.1 or E.3.2.2.2.

E.3.2.2.1 Use the procedures in section 3.1, “Instrument Selection Factors”; section 3.4 “Power Measurement”: section 3.5 “Power Sources”; section 4.1.2 “Ambient Air”; section 4.1.4 “Direction of Rotation”; section 5.4.1 “Reference Conditions”; and section 5.4.3.2 “Dynomometer or Torquemeter Method” of IEEE 113-1985 (incorporated by reference, see §431.463), or

E.3.2.2.2 Use the applicable procedures in section 5, “General test requirements” and section 6, “Tests” of CSA C747-2009 (RA 2014); except in section 6.4(b) the conversion factor shall be 5252, only measurements at full load are required in section 6.5, and section 6.6 shall be disregarded (incorporated by reference, see §431.463).

E.3.3 For dedicated-purpose pool pumps with single-phase AC motors or 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 according to section E.3.4.1 for dedicated-purpose pool pumps with single-phase AC motors or DC motors and section E.3.4.2 for dedicated-purpose pool pumps with polyphase AC motors.

E.3.4.1 For dedicated-purpose pool pumps with single-phase AC motors or DC motors, 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.3.4.2 For dedicated-purpose pool pumps with polyphase AC induction motors, determine the dedicated-purpose pool pump motor total horsepower as the product of the rated nominal motor horsepower and the rated service factor of the motor.

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, divided by 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, in watts;

V_i = voltage at each load point i, in volts;

I_i = current at each load point i, in amps; and

i = load point(s), defined uniquely for each DPPP variety and speed configuration as specified in section D.3.

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 non-self-priming pool filter pumps and self-priming pool filter pumps that are not already certified as self-priming under NSF/ANSI 50-2015 (incorporated by reference, see §431.463) by testing such pumps pursuant to section C.3 of appendix C of NSF/ANSI 50-2015, 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," of NSF/ANSI 50-2015 (incorporated by reference, see §431.463) state that the "suction line must be essentially as shown in annex C, figure C.1;" the phrase "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 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:

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

$P_{abs,test}$ = 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 All measurements of head (gauge pressure), flow, and water temperature must be taken at the pump suction inlet and all head measurements must be normalized back to the centerline of the pump impeller shaft in accordance with section A.3.1.3.1 of HI 40.6 2014-B (incorporated by reference, see §431.463).

F.1.3. All tests must be conducted with clear water that meets the requirements adopted in section C.3 of this appendix.

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-B (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 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 replacement DPPP motor 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 replacement DPPP motor 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.