[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 430

[Docket Number EERE-2011–BT–TP–0042]

RIN: 1904–AC53

Energy Conservation Program: Test Procedures for Residential Water Heaters and Commercial Water Heaters

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

ACTION: Request for Information.

SUMMARY: Through this Request for Information (RFI), the U.S. Department of Energy (DOE) is initiating the rulemaking and data collection process to develop a uniform efficiency descriptor and accompanying test method for residential water heaters and commercial water heaters. This test procedure rulemaking is intended to fulfill DOE's statutory obligation to develop a uniform efficiency descriptor for residential and commercial water heaters pursuant to the amendments to the Energy Policy and Conservation Act (EPCA) brought about by the American Energy Manufacturing Technical Corrections Act (AEMTCA; H.R. 6582), which was signed into law on December 18, 2012 (Pub. L. 112-210). To inform interested parties and to facilitate this process, DOE has identified several issues in this RFI on which DOE is particularly interested in receiving comment from interested parties. In overview, the issues outlined in this

document are mainly associated with: currently available efficiency metrics and test procedures for rating the efficiency of residential and commercial water heaters; the requirements for a uniform metric set forth in the AEMTCA; and available options for DOE to address those statutory requirements. DOE welcomes written comments from the public on any subject within the scope of this rulemaking (including relevant topics not specifically raised in this RFI).

DATES: Written comments and information are requested on or before **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at http://www.regulations.gov. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE-2011-BT-TP-0042 and/or regulatory identification number (RIN) 1904-AC53, by any of the following methods:

- E-mail: HeatingProducts-2011-TP-0042@ee.doe.gov. Include EERE-2011-BT-TP-0042 and/or RIN 1904-AC53 in the subject line of the message. Submit electronic comments in WordPerfect, Microsoft Word, PDF, or ASCII file format, and avoid the use of special characters or any form of encryption.
- Postal Mail: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Mailstop EE–2J, 1000 Independence Avenue, SW., Washington, DC 20585–0121. Telephone: (202) 586–2945. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.

- Hand Delivery/Courier: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, 6th Floor, 950 L'Enfant Plaza, SW., Washington, DC 20024. Telephone: (202) 586–2945. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

Instructions: All submissions received must include the agency name and docket number or RIN for this rulemaking. No telefacsimilies (faxes) will be accepted. For detailed instructions on submitting comments and additional information on the rulemaking process, see section III of this document (Public Participation).

Docket: For access to the docket to read background documents or comments received, go to the Federal eRulemaking Portal at http://www.regulations.gov.

FOR FURTHER INFORMATION CONTACT: Requests for additional information may be sent to Mr. Mohammed Khan, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, Mailstop EE-2J, 1000 Independence Avenue, SW., Washington, DC 20585-0121. Telephone: (202) 586-7892. E-mail: Mohammed.Khan@ee.doe.gov.

Mr. Eric Stas, U.S. Department of Energy, Office of the General Counsel, GC–71, 1000 Independence Avenue, SW., Washington, DC 20585-0121. Telephone: (202) 586-9507. E-mail: Eric.Stas@hq.doe.gov.

For information on how to submit or review public comments, contact Ms. Brenda Edwards, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, EE-2J, 1000 Independence Avenue, SW., Washington, DC 20585-0121. Telephone: (202) 586-2945. E-mail: Brenda.Edwards@ee.doe.gov.

SUPPLEMENTARY INFORMATION:

Table of Contents

I. INTRODUCTION

The American Energy Manufacturing Technical Corrections Act (AEMTCA), Pub. L. 112-210, amended the Energy Policy and Conservation Act of 1975 (EPCA or the Act), Pub. L. 94-163, to require that the U.S. Department of Energy (DOE or the Department) publish a final rule establishing a uniform efficiency descriptor and accompanying test methods for covered

residential water heaters and commercial water heating equipment within one year of the enactment of the AEMTCA.[1] (42 U.S.C. 6295(e)(5)) Historically, DOE has administered its energy conservation standards (and specified the requisite test procedures) for residential water heaters and commercial water heaters separately. Thus, the historical background and statutory authority for these products are divided along those lines in the discussion that follows (i.e., sections I.A.1 and I.A.2). In addition, background information on the AEMTCA is presented in section I.B.

A. Authority and Background

1. Residential Water Heaters

Residential water heaters are products that use oil, gas, or electricity to heat potable water for use outside the heater upon demand. These include storage type units, instantaneous type units, and heat pump type units.[2] (42 U.S.C. 6291(27))

Title III, Part B[3] of EPCA (42 U.S.C. 6291-6309, as codified) sets forth a variety of provisions designed to improve energy efficiency and establishes the Energy Conservation Program for Consumer Products Other Than Automobiles, which includes the residential water heaters that are, in part, the subject of today's notice. (42 U.S.C. 6291(1)-(2) and 6292(a)(4))

[1] The AEMTCA was signed into law on December 18, 2012, so accordingly, DOE must complete the required rulemaking by December 18, 2013.

[2] In a final rule published in the Federal Register on April 16, 2010, DOE determined that heat pump type water heaters with an integrated storage tank are a type of electric storage water heater, but that heat pump type water heaters without an integrated storage tank do not meet the definition of a "water heater" and are, therefore, not covered equipment under EPCA. 75 FR 20112, 20126 and 20135.

[3] This part was originally titled Part B. It was redesignated as Part A in the United States Code for editorial reasons.

This program authorizes DOE to establish technologically feasible, economically justified energy efficiency regulations for certain products and equipment that would be likely to result in substantial national energy savings. (42 U.S.C. 6295(o)(2)-(3)) Under EPCA, this program generally consists of four parts: (1) testing; (2) labeling; (3) establishing 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 both the basis for certifying to DOE that their products comply with the applicable energy conservation standards adopted pursuant to EPCA, and for making representations about the efficiency of those products. (42 U.S.C. 6293(c); 42 U.S.C. 6295(s)) Similarly, DOE must use these test requirements to determine whether the products comply with any relevant standards promulgated under EPCA. (42 U.S.C. 6295(s))

Under 42 U.S.C. 6293 and 6314, EPCA sets forth criteria and procedures that DOE must follow when prescribing or amending test procedures for covered products and equipment. EPCA provides, in relevant part, that any test procedures prescribed or amended under this section must be reasonably designed to produce test results which 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 must not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3) and 6314(a)(2))

In addition, if DOE determines that a test procedure amendment is warranted, it must publish proposed test procedures and offer the public an opportunity to present oral and written comments on them. (42 U.S.C. 6293(b)(2) and 6314(b)) Also, in any rulemaking to amend a

test procedure, DOE must determine the extent to which the proposed test procedure would alter the product's measured energy efficiency. (42 U.S.C. 6293(e)(1)) If DOE determines that the amended test procedure would alter the measured efficiency of a covered product, DOE must amend the applicable energy conservation standard accordingly. (42 U.S.C. 6293(e)(2))

Further, the Energy Independence and Security Act of 2007 (EISA 2007), Pub. L. 110-140, amended EPCA to require that at least once every 7 years, DOE must review test procedures for all covered products and equipment and either amend the test procedures (if the Secretary determines that amended test procedures would more accurately or fully comply with the requirements of 42 U.S.C. 6293(b)(3) or 6314(a)(2)) or publish notice in the Federal Register of any determination not to amend a test procedure. (42 U.S.C. 6293(b)(1)(A) and 6314(a)(1))

The National Appliance Energy Conservation Act of 1987 (NAECA), Pub. L. 100-12, amended EPCA and established energy conservation standards for residential water heaters, as well as requirements for determining whether these standards should be amended. (42 U.S.C. 6295(e)) Specifically, NAECA set minimum standards for residential water heaters in terms of the energy factor (EF) and required that DOE publish a final rule to determine whether the standard should be amended no later than January 1, 1992. (42 U.S.C. 6295(e)(1) and (4)(A)) It also required that DOE publish another final rule by January 1, 2000 to determine whether standards in effect for such products should again be amended. (42 U.S.C. 6295(e)(4)(B))

Pursuant to 42 U.S.C. 6295(e)(4)(A), DOE published a final rule in the Federal Register on January 17, 2001 (hereafter referred to as the "January 2001 final rule"), amending statutorily-prescribed energy conservation standards for residential water heaters. 66 FR 4474. Compliance with the standards in the January 2001 final rule was required by January 20, 2004. Pursuant to 42 U.S.C. 6295(e)(4)(B), DOE published a final rule in the Federal Register on April 16, 2010, amending the energy conservation standards for residential water heaters for a second time. 75 FR 20112. Compliance with the standards in the April 2010 final rule will be required beginning on April 16, 2015. The current and future energy conservation standards for residential water heaters are presented in Table I.1 immediately below.

Table I.1 Energy Conservation Standards for Residential Water Heaters (10 CFR 430.32(d))

Product Class	**Energy Factor (EF) as of January 20, 2004**	**Energy Factor (EF) as of April 16, 2015**
Gas-fired Storage	EF = 0.67 - (0.0019 x Rated Storage Volume in gallons).	For tanks with a Rated Storage Volume at or below 55 gallons: EF = 0.675 – (0.0015 x Rated Storage Volume in gallons). For tanks with a Rated Storage Volume above 55 gallons: EF = 0.8012 - (0.00078 x Rated Storage Volume in gallons).
Electric Storage	EF = 0.97 - (0.00132 x Rated Storage Volume in gallons).	For tanks with a Rated Storage Volume at or below 55 gallons: EF = 0.960 – (0.0003 x Rated Storage Volume in gallons). For tanks for a Rated Storage Volume above 55 gallons: EF = 2.057 – (0.00113 x Rated Storage Volume in gallons).
Oil-fired Storage	EF = 0.59 – (0.0019 x Rated Storage Volume in gallons).	EF = 0.68 – (0.0019 x Rated Storage Volume in gallons).
Gas-fired Instantaneous	EF = 0.62 – (0.0019 x Rated Storage Volume in gallons).	EF = 0.82 – (0.0019 x Rated Storage Volume in gallons).
Electric Instantaneous	EF = 0.93 – (0.00132 × Rated Storage Volume in gallons).	

Tabletop	EF = 0.93 – (0.00132 × Rated Storage Volume in gallons).

Note: The Rated Storage Volume equals the water storage capacity of a water heater, in gallons, as specified by the manufacturer.

DOE's test procedures for residential water heaters are found at 10 CFR 430.23(e) and 10 CFR part 430, subpart B, appendix E, Uniform Test Method for Measuring the Energy Consumption of Water Heaters. The test procedures include provisions for determining the energy efficiency (EF), as well as the annual energy consumption of these products.

The following provides a brief history of DOE's more recent test procedure rulemakings related to residential water heaters. The current DOE test procedures for residential water heaters were established by a final rule published in the Federal Register on May 11, 1998 (63 FR 25996), and subsequently updated through final rules published in July 1998 and January 2001. (63 FR 38737 (July 20, 1998); 66 FR 4474 (Jan. 17, 2001)) The July 1998 final rule was a technical correction that added figures to the test procedure, and the January 2001 amendments added a definition to the test procedure, although the bulk of that final rule was dedicated to amended energy conservation standards for residential water heaters. On December 17, 2012, DOE published a final rule in the Federal Register, as required under 42 U.S.C. 6295(gg)(2), that concluded that no modifications were needed to the residential water heater test procedure to account for standby mode and off mode energy consumption, as the existing test procedure already accounted for those modes of energy consumption. 77 FR 74559. DOE initiated a rulemaking to consider updates to the water heater test procedure by publishing an RFI in the Federal Register on October 12, 2011 (hereafter referred to as the October 2011 RFI). 76 FR 63211.

2. Commercial Water Heaters

DOE's regulations include the following types of commercial water heating equipment: (1) gas-fired, electric, and oil-fired commercial storage water heaters; (2) gas-fired and oil-fired instantaneous water heaters; (3) hot water supply boilers; and (4) unfired hot water storage tanks. 10 CFR 431.2. Commercial storage type water heaters heat and store water within the appliance at a thermostatically-controlled temperature for delivery on demand; commercial storage type water heaters do not include units with an input rating of 4,000 Btu per hour or more per gallon of stored water. 10 CFR 431.102. Commercial instantaneous type waters heater include water heaters that have an input rating of at least 4,000 Btu per hour per gallon of stored water, including products meeting this description that are designed to heat water to temperatures of 180° F or higher. Id. An unfired hot water storage tank is a tank used to store water that is heated externally. Id. DOE's regulations further clarify that all such units are industrial equipment. Id.

DOE's regulations for commercial water heating equipment at 10 CFR 431.102 also include hot water supply boilers, which are a type of packaged boiler that is industrial equipment and that:

(1) Has an input rating from 300,000 Btu/h to 12,500,000 Btu/h and of at least 4,000 Btu/h per gallon of stored water,

(2) Is suitable for heating potable water, and

(3) Meets either or both of the following conditions:

(i) It has the temperature and pressure controls necessary for heating potable water for purposes other than space heating, or

(ii) The manufacturer's product literature, product markings, product marketing, or product installation and operation instructions indicate that the boiler's intended uses include heating potable water for purposes other than space heating.

Title III, Part C[4] of EPCA (42 U.S.C. 6311-6317, as codified), added by Pub. L. 95-619, Title IV, §441(a), established the Energy Conservation Program for Certain Industrial Equipment, a program which addresses the energy efficiency of certain types of commercial and industrial equipment, including the commercial water-heating equipment that is, in part, the subject of this rulemaking. Relevant provisions of the Act specifically include definitions (42 U.S.C. 6311), energy conservation standards (42 U.S.C. 6313), test procedures (42 U.S.C. 6314), labelling provisions (42 U.S.C. 6315), and the authority to require information and reports from manufacturers (42 U.S.C. 6316).

The Energy Policy and Conservation Act of 1992 (EPACT 1992), Pub. L. 102-486, amended EPCA and established energy conservation standards for commercial storage water heaters, instantaneous water heaters, and unfired water storage tanks. (42 U.S.C. 6313(a)(5)) Specifically, EPACT 1992 set standards for various types of commercial water heating equipment in terms of minimum thermal efficiency (E_t) and maximum standby loss (SL), based on the type of fuel used, the type of unit (e.g., storage type or instantaneous type), and the input capacity. The standard levels generally corresponded to the levels in the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings, as in effect on October 24, 1992 (i.e., ASHRAE Standard 90.1-1989). In acknowledgement of technological changes that yield

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

energy efficiency benefits, Congress further directed DOE through EPCA to consider amending the existing Federal energy conservation standard for commercial water heating equipment, each time ASHRAE Standard 90.1 is amended with respect to such equipment. (42 U.S.C. 6313(a)(6)(A)) EPCA also requires that if a test procedure referenced in ASHRAE Standard 90.1 is updated, DOE must update its test procedure to be consistent with the amended test procedure, unless DOE determines that the amended test procedure is not reasonably designed to produce test results which reflect the energy efficiency, energy use, or estimated operating costs of the ASHRAE equipment during a representative average use cycle. In addition, DOE must determine that the amended test procedure is not unduly burdensome to conduct. (42 U.S.C. 6314(a)(2) and (4))

Pursuant to the requirements of EPCA, DOE last amended the energy conservation standards for commercial water heating equipment in a final rule published in the Federal Register on January 12, 2001. 66 FR 3336. The amended energy conservation standards largely corresponded to the levels contained in ASHRAE Standard 90.1-1999. In a direct final rule published in the Federal Register on October 21, 2004, DOE prescribed test procedures to rate the energy efficiency of commercial water heaters and hot water supply boilers, specifying definitions for these products as well as unfired hot water storage tanks. 69 FR 61974. The rule also recodified existing energy conservation standards to locate them in closer proximity in the CFR to the test procedures that DOE promulgated. The current standards for commercial water heating equipment are set forth at 10 CFR 431.110 and shown in Table I.2 below.

Table I.2 Energy Conservation Standards for Commercial Water Heating Equipment (10 CFR 431.110)

Product	Size	Energy conservation standard* (products manufactured on and after October 29, 2003)**	
		Minimum thermal efficiency	Maximum standby loss***
Electric storage water heaters	All	N/A	$0.30 + 27/V_m$(%/hr)
Gas-fired storage water heaters	≤155,000 Btu/hr	80%	$Q/800 + 110(V_r)^{1/2}$(Btu/hr)
	>155,000 Btu/hr	80%	$Q/800 + 110(V_r)^{1/2}$(Btu/hr)
Oil-fired storage water heaters	≤155,000 Btu/hr	78%	$Q/800 + 110(V_r)^{1/2}$(Btu/hr)
	>155,000 Btu/hr	78%	$Q/800 + 110(V_r)^{1/2}$(Btu/hr)
Gas-fired instantaneous water heaters and hot water supply boilers	<10 gal	80%	N/A
	≥10 gal	80%	$Q/800 + 110(V_r)^{1/2}$(Btu/hr)
Oil-fired instantaneous water heaters and hot water supply boilers	<10 gal	80%	N/A
	≥10 gal	78%	$Q/800 + 110(V_r)^{1/2}$(Btu/hr)
Product		**Size**	**Minimum thermal insulation**
Unfired hot water storage tank		All	R-12.5

* V_m is the measured storage volume and V_r is the rated volume, both in gallons. Q is the nameplate input rate in Btu/h.

** For hot water supply boilers with a capacity of less than 10 gallons: (1) the standards are mandatory for products manufactured on and after October 21, 2005, and (2) products manufactured prior to that date, and on or after October 23, 2003, must meet either the standards listed in this table or the applicable standards in subpart E of this part for a "commercial packaged boiler."

*** Water heaters and hot water supply boilers having more than 140 gallons of storage capacity need not meet the standby loss requirement if: (1) the tank surface area is thermally insulated to R-12.5 or more, (2) a standing pilot light is not used and (3) for gas or oil-fired storage water heaters, they have a fire damper or fan-assisted combustion.

DOE's test procedures for commercial water heaters (other than commercial heat pump water heaters) are found at 10 CFR 431.106 and as noted previously, were established in an October 21, 2004 direct final rule. 69 FR 61974. The test procedures for commercial water heating equipment are currently largely based on American National Standards Institute (ANSI)

Z21.10.3-1998, Gas Water Heaters – Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous. The test procedures include provisions for determining thermal efficiency and standby loss. DOE published a final rule in the Federal Register on May 16, 2012 that amended the test procedures for commercial water heating equipment to reference the most current industry standard (i.e., ANSI Z21.10.3-2011). 77 FR 28928. Compliance with the amended test procedures is required beginning on May 13, 2013.

B. The American Energy Manufacturing Technical Corrections Act (AEMTCA)

The AEMTCA amended EPCA to require that DOE publish a final rule establishing a uniform efficiency descriptor and accompanying test methods for covered water heaters (both residential and commercial) not later than one year after the enactment of the AEMTCA. (42 U.S.C. 6295(e)(5)(B)) The final rule must replace the current EF, E_t, and SL metrics with a uniform efficiency descriptor. (42 U.S.C. 6295(e)(5)(C)) Further, the AEMTCA requires that beginning one year after the date of publication of DOE's final rule establishing the uniform descriptor, the efficiency standards for covered water heaters must be denominated according to the uniform efficiency descriptor established in the final rule (42 U.S.C. 6295(e)(5)(D)), and that DOE must develop a mathematical conversion factor for converting the measurement of efficiency for covered water heaters from the test procedures and metrics currently in effect (i.e., EF for residential water heaters and E_t and SL for commercial water heaters) to the new uniform energy descriptor. (42 U.S.C. 6295(e)(5)(E)(ii)) Such conversion factor would apply to affected water heaters that are tested prior to the establishment of the final rule. The AEMTCA requires that the conversion factor not affect the minimum efficiency requirements for covered water heaters. (42 U.S.C. 6295(e)(5)(E)(iii)) Covered water heaters shall be considered to comply

with the final rule on and after the effective date of the final rule and with any revised labeling requirements established by the Federal Trade Commission to carry out the final rule if the covered water heater was manufactured prior to the effective date of the final rule and complied with the efficiency standards and labeling requirements in effect prior to the final rule. (42 U.S.C. 6295(e)(5)(K))

The AEMTCA requires that the uniform efficiency descriptor and accompanying test method apply, to the maximum extent practicable, to all water heating technologies currently in use and to future water heating technologies. (42 U.S.C. 6295(e)(5)(H)) However, the AEMTCA allows DOE to provide an exclusion from the uniform efficiency descriptor for any specific category of otherwise covered water heaters that do not have a residential use, that can be clearly described, and that are effectively rated using the current thermal efficiency and standby loss descriptors. (42 U.S.C. 6295(e)(5)(F))

The AEMTCA also outlines DOE's options in terms of establishing a new uniform efficiency descriptor for water heaters. Specifically, the options provided to DOE for a uniform descriptor include: (1) a revised version of the energy factor descriptor currently in use; (2) the thermal efficiency and standby loss descriptors currently in use; (3) a revised version of the thermal efficiency and standby loss descriptors; (4) a hybrid of descriptors; or (5) a new approach. (42 U.S.C. 6295(e)(5)(G)) Each of these options is discussed in further detail in section II.B.

Lastly, the AEMTCA also requires that DOE invite interested stakeholders to participate in the rulemaking process used to establish the final rule (42 U.S.C. 6295(e)(5)(I)), and that DOE contract with the National Institute of Standards and Technology (NIST), as necessary, to conduct testing and simulation of alternative descriptors identified for consideration (42 U.S.C. 6295(e)(5)(J))

In response to the statutory provisions of the AEMTCA, DOE envisions developing an energy efficiency metric (or metrics) that covers all residential and commercial water heaters. Such metric (or metrics) would be determined through a test method that is as uniform as possible while still producing a rating that is representative of performance under conditions that approximate actual usage. Additionally, DOE will strive to develop a uniform test method that would minimize incremental test burdens on manufacturers to the extent possible.

II. DISCUSSION

A. Implications of the AEMTCA

DOE tentatively interprets the relevant provisions of the AEMTCA to mean that a single efficiency metric and test method should apply to all water heaters currently covered under residential and commercial test methods unless circumstances justify use of the exclusion provided under 42 U.S.C. 6295(e)(5)(F). This interpretation means that water heaters from the smallest capacity and size rating used in residential applications all the way up to the largest capacity covered under DOE's commercial water heater program should be subject to the same rating metric and testing procedures. These test methods and the resulting uniform rating metric should cover all fuel types and technologies, including storage water heaters, instantaneous water heaters, integral heat pump water heaters, non-integral heat pump water heaters, unfired hot

water storage tanks, and hot water supply boilers. In addition, DOE believes it may be appropriate for the uniform descriptor and test methods to also address hot water supply boilers, which are included with other types of commercial water heating equipment in DOE's regulations at 10 CFR 431.110, although they are not explicitly called out among the covered products in 42 U.S.C. 6295(e)(5)(A). DOE is interested in receiving comment on whether the uniform efficiency descriptor should apply to all types of residential and commercial water heaters covered by EPCA, hot water supply boilers, and unfired hot water storage tanks. Lastly, DOE acknowledges that the AEMTCA provides for the possibility of an exclusion for certain water heaters from the uniform efficiency metric and accompanying test method (42 U.S.C. 6295(e)(5)(F) and further discusses this exclusion below in section II.D.

B. Potential Approaches to Address the Requirements of the AEMTCA

As noted previously, the AEMTCA provides five options by which DOE can meet the relevant requirements related to water heaters. (42 U.S.C. 6295(e)(5)(G)) Each of these options is discussed for comment in the sections that immediately follow.

1. Revised Energy Factor Metric

Energy factor is currently the regulating metric for residential water heaters. Energy factor is a measure of the overall efficiency of the water heater and accounts for efficiency during active, standby, and cyclical operation. DOE's test method for determining energy factor currently includes a 24-hour simulated use test consisting of six hot water draws followed by a standby period. 10 CFR part 430, subpart B, appendix E.

DOE has tentatively decided that the revised energy factor approach would follow the general technique for determining energy factor that is currently in place for residential water heaters. The current approach provides the efficiency of the water heater over a defined period of time (currently 24 hours) subject to a specified usage profile and ambient conditions. Based on comments received in response to the October 2011 RFI (76 FR 63211), DOE believes that a 24-hour simulated-use test is the most viable method for obtaining the energy factor for residential water heaters.

Advantages of such an approach are that it results in a single descriptor that is clear and concise for evaluating the efficiency of a water heater and that it is applicable across all fuel types, sizes, and technologies. All water heaters would be subject to a simulated-use test that is similar to the test currently required for residential water heaters. The simulated-use test provides a means by which the water heater's efficiency is determined under a pattern of representative usage. A properly designed simulated-use test can also be technologically agnostic, meaning that the test applies to water heaters utilizing any water heating technology and that it would properly represent the efficiency of one technology versus another for a particular application.

A disadvantage of the current simulated-use test is that it requires assumptions of in-field usage, and a single use pattern as currently applied in the residential test procedure would not be appropriate for the wide range of water heaters covered under this legislation. The October 2011 RFI requested comments on the appropriateness of the draw pattern. 76 FR 63211, 63214 (Oct. 12, 2011). Among the comments, some mentioned the need to implement multiple draw patterns

appropriate for different size classes. This technique may provide more appropriate demands for a range of water heaters, and allow for an accurate representation of efficiency of a wide range of different water heaters, including those that are currently rated as commercial units. However, one potential disadvantage of using multiple, differing draw patterns would be the increased complexity of a simulated-use test and the added test time.

In addition to comments on the appropriateness of a simulated-use test approach, DOE also seeks comment on draw patterns that could be used in extending such an approach to water heaters intended for the commercial market.

2. Existing Thermal Efficiency and Standby Loss Metrics

Thermal efficiency and standby loss are currently the regulating metrics for commercial water heating equipment, with the exception of unfired storage tanks which are regulated by minimum thermal insulation. Thermal efficiency accounts for the efficiency of a water heater during active operation, while standby loss accounts for efficiency during standby periods. DOE's test methods for determining thermal efficiency and standby loss reference the industry standard, ANSI Z21.10.3, and are specified at 10 CFR 431.106.

DOE has tentatively decided that this option would use the thermal efficiency and standby loss metrics and test methods that are currently in place for the commercial water heating equipment for all covered water heaters, including residential units that are currently rated using energy factor.

The key advantage of this approach is that the tests would be simpler to implement. No changes would be needed to the commercial water heaters test method, because that same test procedure, as it exists today, could be applied to both residential and commercial models. While this may be true from a technical perspective, there may be disadvantages in terms of characterizing representative use, as explained below.

A disadvantage of this approach is that it does not account for energy efficiency performance during cyclical portions of water heater operation. Comments to the October 2011 RFI (76 FR 63211) indicated that field data show lower efficiency in the actual use compared to the rating obtained using the current DOE simulated use test because of cycling of the units between warm and cold states under usage typically seen in residences. The thermal efficiency is a measure of efficiency during the water delivery stage, and the standby loss factor is a measure of efficiency during the standby mode stage. Neither of these metrics would capture the losses associated with cyclical warm-up and cool-down of water heaters. It is also questionable whether thermal efficiency is an appropriate metric for smaller storage water heaters, because they are not designed to provide a large supply of hot water continuously. It should also be noted that the test procedure for residential water heaters utilized the thermal efficiency and standby loss tests up until 1990, when a simulated use test was adopted to make the test uniform across technologies, particularly for heat pump water heaters and gas instantaneous water heaters.

3. Revised Thermal Efficiency and Standby Loss Metrics

DOE has tentatively decided that this approach would be a modified version of the current commercial water heater test procedure that results in the same descriptors, albeit with

potentially modified meanings, as those currently used to rate commercial water heaters. One option would be to use a metric similar to the recovery efficiency and standby heat loss coefficient as computed in the current residential water heater test procedure.

The advantage of such an approach is that simpler laboratory tests that are more repeatable could theoretically be used to rate efficiency. Revisions to the original metrics and test methods, such as changes to account for cycling effects, changes to the water delivery temperature, and ambient conditions, could make them more suitable for residential water heaters compared to the existing metrics.

Disadvantages with this approach are the same as those discussed above in section II.B.2 for the existing thermal efficiency and standby loss metrics. Most notably, it is not clear that these metrics would capture efficiency effects of cycling water heaters on and off. Additionally, DOE is not aware of any proposed approaches other than those discussed related to the residential water heater test method incorporating revised thermal efficiency and standby loss descriptors, nor is it aware of what specifically can be done to revise or improve thermal efficiency and standby loss to accomplish the intent of the AEMTCA.

4. Hybrid Efficiency Metric

DOE has tentatively decided that this approach would involve a combination of the current energy factor, thermal efficiency, and standby loss metrics into a new single uniform descriptor. DOE anticipates that such a metric would utilize some combination of the existing test procedures and aspects of the existing metrics to obtain information for the new hybrid metric.

The advantage of such an approach is that parts or all of existing test methods could be utilized, thereby decreasing the effort for manufacturers and testing agencies in developing test programs even if certain portions of those test methods had not been previously applied to all models of water heaters.

The disadvantage of such an approach could be that it would require more tests on each water heater if each water heater should need to undergo a test to determine multiple individual metrics that ultimately result in a single, hybrid metric, resulting in a higher burden on manufacturers. The testing method to obtain a uniform "hybrid" metric may lead to biases between different water heating technologies if the performance model fails to capture critical aspects of a particular technology's operation. This model may also require adjustment as new technologies emerge. Furthermore, DOE is not aware of any proposed approaches towards developing a hybrid metric, nor what specifically could be done by a hybrid metric to accomplish the intent of the AEMTCA.

5. New Approach

DOE seeks comment on any other approach or descriptor that it should consider that has not previously been discussed.

C. Conversion Factor

The AEMTCA requires that DOE develop a temporary mathematical conversion factor for converting the measurement of efficiency for covered water heaters from the existing test procedures to the new energy descriptor established under the final rule. (42 U.S.C.

6295(e)(5)(E)) The allowance to use the conversion factor will expire 1 year after publication of such conversion factor or December 31, 2015, whichever is later. (42 U.S.C. 6295(e)(5)(E)(v)) The form and magnitude of this mathematical conversion factor would depend on which option is chosen, and on the extent of accompanying test procedure modifications. Thus, particularly for comments related to new or adjusted metrics, DOE seeks comment on ways to convert from the existing metrics for the different types of residential and commercial water heaters to the uniform metric, as discussed above.

D. Exclusions

The AEMTCA indicates that the final rule may exclude a specific category of covered water heaters from the uniform efficiency descriptor, if such category of water heaters: (1) does not have a residential use and can be clearly described in the final rule; and (2) can be effectively rated using the existing thermal efficiency and standby loss descriptors. (42 U.S.C. 6295(e)(5)(F)) Tentatively, DOE does not view the exclusion as applying to all models that are solely offered for non-residential applications, and the Department notes that the statute states that DOE's final rule *may* exclude certain types of water heaters. Moreover, under 42 U.S.C. 6295(e)(5)(H), the AEMTCA states that "[t]he efficiency descriptor and accompanying test method established under the final rule shall apply, to the maximum extent practicable, to all water heater technologies in use… and to future water heater technologies." If DOE were to review the exclusion in a broad manner, it would apply to a large subset of models that currently are characterized as commercial water heaters under DOE's regulatory scheme. In addition, it is unclear how the Department could create an equitable distinction for application of the exclusion based on a manufacturer's claim of intended use of its product. DOE also notes that no other statutory section specifically indicates that the uniform descriptor should only apply to water

heaters intended for residential use, and thus, DOE believes the uniform descriptor should apply to all covered water heaters, unless a clear need exists and the statutory criteria for using the exclusion are met. It is DOE's position that an expansive view of the above-referenced exclusion authority would largely undermine the purposes of AEMTCA in terms of achieving a uniform efficiency metric and test method for all water heaters.

With the above understanding in mind, DOE has tentatively concluded that a uniform efficiency descriptor and test method would be possible for all water heaters covered by the statute, but DOE seeks comment on the types of water heaters, if any, that should be excluded, along with a rationale to support such exclusion. (42 U.S.C. 6295(e)(5)(F)) As an example, DOE notes that unfired storage tanks and commercial "add-on" heat pump water heaters (which are typically shipped without tanks and the paired with a storage tank or storage water heater) are not completely contained water heating systems, and are required to be paired with other water heating equipment in the field to operate as intended. As such, these types of equipment have specific characteristics that may not be conducive to a uniform efficiency metric, and certain efficiency metrics may not be applicable to these types of equipment depending on the testing requirements for that metric. DOE requests comment on whether these types of equipment should be excluded from the uniform efficiency descriptor requirement.

If stakeholders were to suggest that DOE exclude certain heaters that do not have a residential use, comments are sought as to how to distinguish those water heaters based on characteristics of the products. DOE would be interested in comments regarding whether the storage volume, energy input capacity, output capacity as determined through testing, or another

means would be appropriate for indicating which water heaters clearly do not have a residential use and are effectively rated under current procedures.

At this point, the Department tentatively expects the exclusions, if any, to be limited in number. DOE seeks comments on the characteristics of any types of water heaters that should be excluded from this uniform efficiency descriptor, as well as the rationale for doing so.

E. Other Concerns

DOE seeks comments on any other issues that may relate to the development of a uniform efficiency descriptor and test methods, and the requirements of the AEMTCA. In particular, DOE has identified several additional issues below for discussion.

1. Representative Test Procedures

As noted above, under 42 U.S.C. 6293 and 6314, EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered products and equipment. EPCA provides, in relevant part, that any test procedures prescribed or amended under this section must be reasonably designed to produce test results which 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 must not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3) and 6314(a)(2)) Usage patterns between water heaters intended for residential applications and those intended for commercial applications, however, are vastly different, as dictated by factors such as water delivery temperature, flow rate, total volume of water delivered per day, and draw pattern. In addition, environmental factors that could affect performance (e.g., such as ambient air temperature, ambient relative humidity, and inlet water

temperature) may also vary. DOE seeks comments on the best approaches to managing these wide ranges of conditions for testing purposes, while still meeting the requirements of EPCA to produce energy efficiency results during a representative period of use and not be unduly burdensome to conduct.

2. Measures of Delivery Capacity

The current DOE residential water heater test procedure requires a test to measure the delivery capacity of the water heater, resulting in either a first-hour rating for storage water heaters or a maximum gallons-per-minute rating for instantaneous water heaters. No equivalent test for delivery capacity is present for commercial water heaters. DOE seeks comments on the need for this metric for water heaters intended for non-residential applications. Additionally, DOE seeks comments regarding the applicability of the metrics and test methods currently present in the residential water heater test procedure (first-hour rating, maximum gallons-per-minute) for commercial water heaters.

3. Implications for Current Energy Conservation Standards

In developing the uniform efficiency descriptor, the AEMTCA requires that DOE develop a mathematical conversion factor (discussed in section II.C) for converting the measurement of efficiency for covered water heaters under the current test procedures to the uniform descriptor. The AEMTCA stipulates that the conversion factor shall not affect the minimum efficiency requirements for covered water heaters.

To address this requirement, DOE plans to develop a conversion factor as discussed in section II.C and apply it to the current energy conservation standards to equate the standards

under the existing metric and test procedures to the standards using the new uniform efficiency metric and test procedures. DOE requests comment on this approach to maintaining equivalent efficiency standards, and on the appropriate approach to develop the mathematical conversion.

III. PUBLIC PARTICIPATION

DOE invites all interested parties to submit in writing by **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**, comments and information on matters addressed in this notice and on other matters relevant to DOE's consideration of a uniform efficiency descriptor and accompanying test methods for residential and commercial water heaters.

After the close of the comment period, DOE will begin collecting data, conducting the relevant analyses, and reviewing the public comments. These actions will be taken to aid in the development of a test procedure NOPR for residential and commercial water heaters that establishes a uniform efficiency descriptor and accompanying test method.

DOE considers public participation to be a very important part of the process for developing the uniform energy descriptor and developing updates to the test procedure, if necessary, to accommodate the new metric. DOE actively encourages the participation and interaction of the public during the comment period in each stage of the rulemaking process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in the rulemaking process. Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this rulemaking should contact Ms. Brenda Edwards at (202) 586–2945, or via e-mail at Brenda.Edwards@ee.doe.gov.

Issued in Washington, DC, on January 7, 2013.

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

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