[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 430

[Docket Number EERE-2014-BT-STD-0045]

Energy Conservation Program for Consumer Products: Test Procedures and Energy Conservation Standards for Residential Water Heaters

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

ACTION: Request for information (RFI).

SUMMARY: The U.S. Department of Energy (DOE) is requesting comments, data, and information related to solar-thermal water heating systems where solar components are paired with electric and/or fossil fuel-fired water heaters, which are utilized as secondary heat sources. Although this document contains several specific topics on which DOE is particularly interested in receiving written comment, DOE welcomes suggestions and information from the public on any subject related to solar water heaters.

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

ADDRESSES: Interested parties are encouraged to submit comments electronically. However,

interested persons may submit comments, identified by docket number EERE-2014-BT-STD-0045 by any of the following methods:

- Federal eRulemaking Portal: www.regulations.gov. Follow the instructions for submitting comments.
- E-mail: ResWaterHeater2014STD0045@ee.doe.gov. Include docket number EERE-2014-BT-STD-0045 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-5B, 1000 Independence Avenue, SW., Washington, DC 20585-0121. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.
- 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.

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

FOR FURTHER INFORMATION CONTACT: Requests for additional information may be sent to Ms. Ashley Armstrong, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, EE–5B, 1000 Independence Avenue,

SW., Washington, DC 20585–0121. Telephone: (202) 586-6590. E-mail: Ashley.Armstrong@ee.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, Mailstop EE-5B, 1000 Independence Avenue, SW, Washington, DC 20585-0121. Telephone: (202) 586-2945. E-mail: Brenda.Edwards@ee.doe.gov.

SUPPLEMENTARY INFORMATION:

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I. Authority and Background

Title III, Part B[1] of the Energy Policy and Conservation Act of 1975 ("EPCA" or "the Act"), Pub. L. 94-163 (42 U.S.C. 6291-6309, as codified) sets forth a variety of provisions designed to improve energy efficiency and established the Energy Conservation Program for Consumer Products Other Than Automobiles.[2] These include residential water heaters, the subject of this notice. (42 U.S.C. 6292(a)(4))

[1] For editorial reasons, upon codification in the U.S. Code, Part B was redesignated as Part A.
[2] All references to EPCA in this document refer to the statute as amended through the American Energy Manufacturing Technical Corrections Act (AEMTCA), Pub. L. 112-210 (Dec. 18, 2012).

Under EPCA, energy conservation programs generally consist 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 and equipment must use as both the basis for certifying to DOE that their products and equipment comply with the applicable energy conservation standards adopted pursuant to EPCA, and for making other 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))

> A residential "water heater" is defined by EPCA as a product which utilizes oil, gas, or electricity to heat potable water for use outside the heater upon demand, including –
>
> (A) storage type units which heat and store water at a thermostatically controlled temperature, including gas storage water heaters with an input of 75,000 Btu per hour or less, oil storage water heaters with an input of 105,000 Btu per hour or less, and electric storage water heaters with an input of 12 kilowatts or less;
>
> (B) instantaneous type units which heat water but contain no more than one gallon of water per 4,000 Btu per hour of input, including gas instantaneous water heaters with an input of 200,000 Btu per hour or less, oil instantaneous water heaters with an input of 210,000 Btu per hour or less, and electric instantaneous water heaters with an input of 12 kilowatts or less; and
>
> (C) heat pump type units, with a maximum current rating of 24 amperes at a voltage no greater than 250 volts, which are products designed to transfer thermal energy from one

temperature level to a higher temperature level for the purpose of heating water, including all ancillary equipment such as fans, storage tanks, pumps, or controls necessary for the device to perform its function.

(42 U.S.C. 6291(27))

Water heaters are included in EPCA as covered products. The amendments to EPCA effected by the National Appliance Energy Conservation Act of 1987 (NAECA; Pub. L. 100-12) established standards for the residential water heaters and directed that DOE determine whether these standards should be amended. (42 U.S.C. 6295(e)(1); 42 U.S.C. 6295(e)(4))

On January 17, 2001, DOE published a final rule prescribing the current Federal energy conservation standards for residential water heaters manufactured on or after January 20, 2004, which set minimum energy factors (EFs) that vary based on the storage volume of the water heater, the type of energy it uses (i.e., gas, oil, or electricity), and whether it is a storage, instantaneous, or tabletop model. 66 FR 4474; 10 CFR 430.32(d).

Table I.1 presents the current Federal energy conservation standards for residential water heaters. The water heater standards, set forth in 10 CFR 430.32(d), consist of minimum EF that vary based on the rated storage volume of the water heater, the type of energy it uses (i.e., gas, oil, or electricity), and whether it is a storage, instantaneous, or tabletop model.

Table I.1 Current Federal Energy Conservation Standards for Residential Water Heaters

Product Class	**Energy Factor as of January 20, 2004**
Gas-Fired Storage Water Heater	EF = 0.67 - (0.0019 x Rated Storage Volume in gallons)
Oil-Fired Storage Water Heater	EF = 0.59 - (0.0019 x Rated Storage Volume in gallons)
Electric Storage Water Heater	EF = 0.97 - (0.00132 x Rated Storage Volume in gallons)
Tabletop Water Heater	EF = 0.93 - (0.00132 x Rated Storage Volume in gallons)
Gas-Fired Instantaneous Water Heater	EF = 0.62 - (0.0019 x Rated Storage Volume in gallons)
Instantaneous Electric Water Heater	EF = 0.93 - (0.00132 x Rated Storage Volume in gallons)

On April 16, 2010, DOE published a final rule in the Federal Register amending the energy conservation standards for residential water heaters for a second time. 75 FR 20111. The updated standards maintained the existing product class structure, dividing water heaters based on the type of energy used (i.e., gas, oil, or electricity) and whether it is a storage, instantaneous, or tabletop model, but also differentiated standard levels for electric and gas-fired storage water heaters based on whether the rated storage volume is greater than 55 gallons, or less than or equal to 55 gallons. Compliance with the energy conservation standards contained in the April 2010 final rule will be required starting on April 16, 2015. Table I.2 presents the amended Federal energy conservation standards for residential water heaters, which are also set forth in 10 CFR 430.32(d).

Table I.2 Amended Federal Energy Conservation Standards for Residential Water Heaters Established by April 2010 Final Rule

Product Class	Energy Factor as of April 16, 2015
Gas-Fired Storage Water Heater	For tanks with a Rated Storage Volume at or below 55 gallons: EF = 0.675−(0.0015 × Rated Storage Volume in gallons). For tanks with a Rated Storage Volume above 55 gallons: EF = 0.8012−(0.00078 × Rated Storage Volume in gallons).
Oil-Fired Storage Water Heater	EF = 0.68−(0.0019 × Rated Storage Volume in gallons).
Electric Storage Water Heater	For tanks with a Rated Storage Volume at or below 55 gallons: EF = 0.960−(0.0003 × Rated Storage Volume in gallons). For tanks with a Rated Storage Volume above 55 gallons: EF = 2.057−(0.00113 × Rated Storage Volume in gallons).
Tabletop Water Heater	EF = 0.93−(0.00132 × Rated Storage Volume in gallons).
Gas-Fired Instantaneous Water Heater	EF = 0.82−(0.0019 × Rated Storage Volume in gallons).
Instantaneous Electric Water Heater	EF = 0.93−(0.00132 × Rated Storage Volume in gallons).

II. Discussion

This section briefly discusses the solar water heating systems that are the subject of this RFI and raises the key issues on which DOE seeks comment. As noted in section I, a residential "water heater" means "a product which utilizes oil, gas, or electricity to heat potable water." DOE has previously determined that water heaters that use solar energy as the sole energy source (e.g., solar thermal collectors without the use of a secondary heat source) are not covered as residential water heaters. 75 FR 20111, 20126. However, many solar water heating systems utilize electricity or gas as a secondary heat source, and these types of solar water heating systems (with a secondary electric or fossil fuel heat source) are the subject of this notice.

A. Solar Water Heating Technology

Solar water heating systems consist of a solar collector to capture heat from the sun and storage tanks that maintain the potable water that has been heated by the solar collector. These systems typically require some type of secondary heat source when the sun is not available to provide adequate hot water for the residence. That heat source could be provided within the

storage tank, in a second tank that is plumbed downstream of the solar storage tank, or by means of an instantaneous water heater installed downstream of the solar storage tank.

Systems can be characterized as being either "active" or "passive."[3] Active systems rely on pumps to circulate fluid from the solar collectors to the storage tank. These types of systems can pump potable water directly through the solar collector and into the storage tank in climates where it rarely freezes ("direct circulation systems") or can circulate a non-freezing, heat-transfer fluid through the collectors and a heat exchanger to transfer the heat from the collector into the potable water ("indirect circulation systems"). Passive solar water heating systems require no pumps, instead relying on pressure from the water main to move water through the system or on natural convection to transfer heat to the potable water. An integral collector storage system is a passive system in which the storage tank also serves as the collector, with the entire storage and collection system being located outdoors in a location where it captures sunlight. Thermosyphon systems are types of passive solar water heating systems that rely on the fact that heated water rises to transfer heated water from a collector to a storage tank that is located above the collector.

As noted, a secondary heating method is required for times when the sun does not provide sufficient heat to raise the water to a temperature required by the end user. DOE is aware of storage tanks that utilize electric resistance elements or gas burners to provide that secondary heat. Those tanks could be part of a single tank system, in which the heat from the solar collectors and the secondary source is applied to the same tank of water, or a dual-tank

[3] U.S. Department of Energy, "Solar Water Heaters," http://energy.gov/energysaver/articles/solar-water-heaters, last accessed October 2, 2014.

system, in which one tank stores water heated by the solar collectors and serves as the supply to a second tank downstream that supplies any necessary additional heat. Additionally, DOE is aware that instantaneous water heaters utilizing gas or electricity can also be used to raise the water temperature from that which is stored in the storage tank to the end use temperature. The components that provide supplemental heat are the primary topic on which DOE seeks information in this RFI.

DOE requests comment on design differences between storage and instantaneous water heaters used in solar systems and those that are used in non-solar applications in typical residences, particularly as they are supplied by the manufacturer as opposed to modified in the field. These water heaters could include storage tanks with heating capability based on any fuel source, instantaneous water heaters designed specifically for solar water heating systems, or other technologies that may not be known to the Department.

DOE also requests comments on the heating capacity of water heaters meant for solar water heating systems compared to those meant for non-solar applications. Related to this question, DOE seeks comments on the amount of hot water that the secondary heat source of a solar water heating system can provide without a solar collector compared with water heaters that are designed for non-solar applications.

Finally, DOE requests information on whether water heaters designed to be a component in a solar water heating system are a direct substitute for traditional water heating technology and whether conventional water heaters can be directly used as a component in a solar water heating

system. Considering that some storage tanks designed for solar water heating systems may contain built-in heat exchangers and multiple inlet and outlet ports to accommodate both potable water and the heat transfer fluid carrying heat from the solar collectors, DOE also seeks comment on whether solar thermal storage tanks can be easily modified in the field to convert them for use in a residence without solar collectors. Likewise, DOE seeks information on whether conventional water heaters can be easily modified for use in solar installations. In summary, DOE seeks comment on the following issues related to solar water heating technologies:

Issue 1. Solar water heating technologies that utilize a secondary heating source that are currently available to the consumer.

Issue 2. Design differences between water heaters that are designed to be part of a solar water heating system compared to those meant for typical residences without a solar water heating system.

Issue 3. Heating rates and the amount of hot water that can be supplied by water heaters meant to serve as a secondary heat source for a solar collector compared to the heating rates and hot water supply capacity water heaters.

B. Solar Water Heating Market

DOE has conducted preliminary research to investigate the solar water heating equipment market. Based on a report by the National Renewable Energy Laboratory (NREL),[4] DOE

[4] Hudon, K., T. Merrigan, J. Burch, and J. Maguire. Low-Cost Solar Water Heating Research and Development Roadmap. National Renewable Energy Laboratory. August 2012. NREL/TP-5500-54793.

distinguished between two distinctive periods of solar water heater installations. From 1985 to 2005, when there were no tax incentives for solar water heaters, the number of installations ranged from approximately 5,000 to10,000 annually. Federal and State tax incentives were instituted in 2006. Between 2006 and 2010, there were between approximately 18,000 and 33,500 solar thermal water heater systems installed annually in the U.S.

Additionally, ENERGY STAR® Unit Shipment Data[5] reports that in 2010, 2011, and 2012, 10,000, 10,000, and 7,000 ENERGY STAR-qualified solar water heaters were shipped, respectively. Almost all ENERGY STAR models are indirect forced circulation systems. However, all available installation and shipment data do not provide information on the types of secondary water heaters used with these systems.

DOE also examined data on the stock of solar water heaters from the American Housing Survey (AHS) and the Energy Information Administration's (EIA) Residential Energy Consumption Survey (RECS) from 1990 to 2011. These data indicate a decreasing trend from around 300,000 solar water heaters installed in primary and secondary housing units in the 1990s to approximately 150,000 or less in the 2000s. RECS 2009 reports that 135,000 solar water heaters served as the household primary water heater. AHS reports that in 2011, 163,000 solar water heaters served as the household primary water heater.

Based on ENERGY STAR model data,[6] DOE determined that the following companies

[5] U.S. Environmental Protection Agency: ENERGY STAR, Unit Shipment Data Archives, 2014. (Last accessed October 2014) (Available at: http://www.energystar.gov/index.cfm?c=partners.unit_shipment_data_archives).
[6] U.S. Environmental Protection Agency, ENERGY STAR Certified Water Heaters, 2014. (Last accessed October

manufacture solar water heaters (collector and storage tank): A.O. Smith Corporation; Agua Del Sol, L.L.C.; EZINC Metal San. Tic. A. S.; NY Thermal Inc.; Pacific West Solar; Integrated Solar, LLC; and Rheem-Ruud Manufacturing. In addition, from manufacturer literature, DOE determined that several more manufacturers produce secondary water heaters (storage and instantaneous) used in solar thermal water heating installations, including Bradford White, Rinnai, and Heliodyne.[7]

Regarding the market for solar water heating systems, DOE seeks comment on the following issues:

Issue 4. DOE seeks comment on the fractions of single tank and dual tank solar water heating systems, and whether the secondary water heaters used include design features that differ from conventional residential water heaters.

Issue 5. DOE seeks comment on the manufacturers of water heaters used in solar thermal installations. DOE also seeks input regarding the market share of each manufacturer, and whether any of them are small businesses.

Issue 6. DOE understands that solar water heaters may be installed with secondary water heaters of varying rated volumes (e.g., 60 gal, 80 gal, 120 gal, etc.), input capacity, and fuel type. DOE seeks input regarding the total annual shipments of the market for solar water heating systems that utilize secondary heat sources, the fractions of water heaters that are used to provide secondary water heating by rated volume, input capacity, and fuel type.

2013). (Available at: http://www.energystar.gov/productfinder/product/certified-water-heaters/results).
[7] Bradford White: http://www.bradfordwhite.com/products/solar.
Rinnai: http://www.rinnai.us/
Heliodyne: http://www.heliodyne.com/.

Issue 7. DOE seeks comment on any other attributes of solar water heating systems that utilize secondary heating tanks, which distinguish them from conventional storage or instantaneous water heaters.

III. Public Participation

DOE will accept comments, data, and information regarding this RFI and other matters relevant to solar water heating equipment no later than the date provided in the **DATES** section at the beginning of this RFI. Interested parties may submit comments using any of the methods described in the **ADDRESSES** section at the beginning of this RFI.

Instructions: All submissions received must reference the Office of Energy Efficiency and Renewable Energy and Docket Number EERE-2014-BT-STD-0045 . No telefacsimilies (faxes) will be accepted.

Docket: The docket is available for review at www.regulations.gov, including Federal Register notices, public meeting attendees' lists and transcripts, comments, and other supporting documents/materials. All documents in the docket are listed in the www.regulations.gov index. However, not all documents listed in the index may be publicly available, such as information that is exempt from public disclosure.

A link to the docket webpage can be found at: http://www.regulations.gov/#!docketDetail;D=EERE-2014-BT-STD-0045. This webpage contains a link to the docket for this notice on the www.regulations.gov website. The www.regulations.gov webpage contains simple instructions on how to access all documents, including public comments, in the docket.

For information on how to submit a comment, review other public comments and the docket, or participate in the public meeting, contact Ms. Brenda Edwards at (202) 586-2945 or by e-mail: Brenda.Edwards@ee.doe.gov.

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 the subject of this notice should contact Ms. Brenda Edwards at (202) 586–2945, or via e-mail at Brenda.Edwards@ee.doe.gov.

Issued in Washington, DC, on October 10, 2014

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