Proposed Rules

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This section of the FEDERAL REGISTER contains notices to the public of the proposed issuance of rules and regulations. The purpose of these notices is to give interested persons an opportunity to participate in the rule making prior to the adoption of the final rules.

DEPARTMENT OF ENERGY

Office of Energy Efficiency and Renewable Energy

10 CFR Part 430

Energy Conservation Program for Consumer Products: Publication of the Petition for Waiver of the American Water Heater Company's Energy Saver Control From the DOE Water Heater Test Procedure, Denial of the Application for an Interim Waiver, and Request for Comments on Testing Water Heater Performance With Electronic Controls (Case No. WH–010)

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

ACTION: Solicitation of comments.

SUMMARY: This document publishes a Petition for Waiver to the Department of Energy (DOE or Department) water heater test procedure from the American Water Heater Company (American) regarding an adaptive thermostat control. American's Petition for Waiver requests that DOE lower the average tank temperature and base the water draws on equal energy content compared to the existing test procedure. This document also denies an Interim Waiver to American from the existing DOE water heater test procedure. The Department solicits comments, data, and information as to whether to grant the Petition for Waiver as well as comments on testing water heaters with electronic controls.

DATES: DOE will accept comments, data, and information not later than February 25, 2002 on American's Petition for Waiver and comments on testing water heaters with electronic controls.

ADDRESSES: Written comments and statements shall be sent to: Department of Energy, Office of Building Research and Standards, Case No. WH–010, Mail Stop EE–41, Room 1J–018, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585–0121, (202) 586–9127. We welcome electronic comments but they must be followed by a signed letter. Send email comments to terry.logee@ee.doe.gov.

FOR FURTHER INFORMATION CONTACT: Mr. Terry Logee, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Mail Station EE–41, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585–0121, (202) 586–1689, email: Terry.Logee@ee.doe.gov or Ms. Francine Pinto, Esq., U.S. Department of Energy, Office of General Counsel, Mail Station GC–72, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585–0103, (202) 586–7432.

SUPPLEMENTARY INFORMATION: The Energy Conservation Program for Consumer Products (other than automobiles) was established pursuant to the Energy Policy and Conservation Act, as amended, (EPCA) which requires DOE to prescribe standardized test procedures to measure the energy consumption of certain consumer products, including water heaters.

The DOE test procedure, ''Uniform Test Method for Measuring the Energy Consumption of Water Heaters'' prescribes a method for characterizing the energy requirements of all types of water heaters and yields model-specific energy efficiency information that can aid consumers in their purchasing decisions. The test procedure is set forth in Title 10 CFR part 430, Subpart B, Appendix E.

The Department amended the test procedure rules on September 26, 1980, to provide for a waiver process by adding Section 430.27 to Title 10 CFR part 430. 45 FR 64108. The waiver process allows the Assistant Secretary for Energy Efficiency and Renewable Energy (Assistant Secretary) to temporarily waive test procedures for a particular basic model. On November 26, 1986, DOE amended the waiver process to allow the Assistant Secretary to grant an Interim Waiver for immediate relief from test procedure requirements to manufacturers that have petitioned DOE for a waiver of such prescribed test procedures. 51 FR 42823. The amendment is codified at 10 CFR 430.27(a)(2).

Any person may submit a petition to waive the requirements of the applicable test procedure based on a claim that a basic model contains one or more design characteristics that prevent testing according to the prescribed test procedures, or when the prescribed test procedures may evaluate a basic model in a manner so unrepresentative of its true energy consumption as to provide materially inaccurate comparative data. The Department publishes the Petition for Waiver in the **Federal Register** and requests comments from interested parties during a 30-day comment period. The Department analyzes the petition, including all comments, and publishes a notice of each waiver granted or denied in the **Federal Register**. Prior to a decision, the Assistant Secretary will consult with the Federal Trade Commission pursuant to 10 CFR 430.27(l). Waivers generally remain in effect until future test procedure amendments become effective; resolving the problem that is the subject of the waiver.

Any interested person who has submitted a Petition for Waiver may also file an Application for Interim Waiver to the applicable test procedure requirements. The Application may be filed jointly with, or subsequent to, the filing of a Petition for Waiver.

Each Application for Interim Waiver must identify the basic models for which the interim waiver is requested, demonstrate that it meets the criteria in 10 CFR 430.27, and be signed by the applicant or by an authorized representative. In addition, each applicant for an Interim Waiver must notify all known manufacturers of domestically marketed units of the same product type of its filing and provide copies of both the Application for Interim Waiver and the Petition for Waiver to these manufacturers. These manufacturers may send comments to DOE regarding the Petition for an Interim Waiver. An application for an Interim Waiver does not allow the manufacturer to disregard DOE's test procedure requirements until an Interim Waiver has been granted.

An Interim Waiver will be granted if it is determined that the applicant will experience economic hardship if the Application for Interim Waiver is denied, if it appears likely that the Petition for Waiver will be granted, and/or the Assistant Secretary determines that it would be desirable for public policy reasons to grant immediate relief pending a determination on the Petition for Waiver. 10 CFR 430.27 (g). An Interim Waiver remains in effect for a

period of 180 days or until DOE issues its determination on the Petition for Waiver, whichever is sooner, and may be extended for an additional 180 days, if necessary.

Summary of Petition

On April 26, 2001, American Water Heater Company filed an Application for Interim Waiver and a Petition for Waiver, Case No. WH–010, concerning the tank temperature of water heaters during testing of water heaters with adaptive electronic controls. There was no confidential material deleted from American's petition. However, American submitted test data at DOE's request which was originally marked confidential. Thereafter, on December 13, 2001, American withdrew its designation of confidentiality for this test data (Letter dated December 13, 2001, from Alex Kovalenko, Manager of Product Development Engineering, American Water Heater Company to Terry Logee, U.S. Department of Energy). The test data is in the docket file. A copy of American's Petition for Waiver and Application for Interim Waiver is appended to this notice.

Whereas the typical electric water heater control has a fixed temperature thermostat setpoint, American's electronic controller can automatically adjust the thermostat setpoint up or down according to actual household water usage patterns. This automatic thermostat adjustment is called an ''Energy Saver Cycle.'' American does not identify any upper or lower thermostat setpoints in its proposal.

American's application seeks the following changes to DOE's test procedure for a controller with an ''Energy Saver Cycle'': (1) Add a qualification test; (2) Decrease the temperature of the thermostat to the lowest stable temperature; (3) Adjust the amount of water withdrawn from the tank during the simulated-use test; and (4) Modify the equations used to compute the energy factor. The current DOE test procedure requires a constant tank temperature of 135 °F and does not permit a variable thermostat setpoint. The test procedure does not have a controller qualification test. DOE's current test procedure also requires a first hour rating test to determine the amount of hot water that can be withdrawn from a tank of water heated to 135 °F.

American's first proposed change for a qualification test for the ''Energy Saver Cycle'' would prove that the controller could automatically adjust the thermostat setpoint. In its proposal, American prescribes a large number of water draws to allow the tank thermostat to reach a minimum setpoint and then to return to 135 °F. The petition calls this control process an ''Energy Saver Cycle'' if the controller reaches an equilibrium temperature lower than 135 °F when the water heater is subjected to the following water usage pattern, herein called draws. Each draw would end when the lower element energizes, and the subsequent draw would commence when the thermostat turns off the power to the lower element. The test would initially start with the tank at 135 °F. The petition states that the sequence will continue until the mean tank temperature reaches 125°F or less. This test shows that the control will lower the set point in response to small water draws. If this sequence is continued, the lowest ''stable'' temperature can be determined. The petition defines the lowest stable temperature as the point at which water draws of 10.7 gallons will not cause the controller to increase the thermostat setpoint.

To test whether the controller will also automatically raise the temperature, water draws large enough to energize the upper element must be made until the controller has returned to the mean tank temperature of 135 °F. These tests demonstrate that the controller adjusts the set point up and down based on actual water usage. Since the ''adjusting'' process could take approximately 100 cycles for the American control logic, the petition seeks to run this test only once for each model of controller; once the controller has been qualified, any water heaters using that controller would qualify to use the ''Energy Saver Cycle'' test procedure.

American's second proposed change would lower the water heater thermostat set point to the lowest stable temperature. This temperature would be obtained through knowledge of the temperature adjustment logic for the ''Energy Saver Cycle''. This lowest stable temperature must be maintained during the six draws of 10.7 gallons or the test is invalid. In this case, the test would need to be repeated at a higher stable temperature.

American's third proposed change is to modify the amount of water drawn in each of the six draws to match the energy contained in each draw of the current procedure. This accounts for the fact that the temperature of the water delivered from the water heater in American's proposal will be lower than that delivered in the current DOE test procedure. Each draw is approximately 10.7 gallons of water and the energy required to raise 10.7 gallons of water from its inlet temperature of 58 °F to 135 °F is 6836 BTU. For the Energy Saver Cycle, the draw would be terminated when 6836 BTU have been removed.

American's fourth proposed change is to modify several calculations in the current test procedure. The calculations in the current DOE test procedure reference a nominal tank temperature of 135 °F and a nominal outlet temperature of 135 °F. The petition for waiver seeks to modify Section 6.1.6, the calculation of the adjusted daily water heating energy consumption from:

$$Q_{da} = Q_D - \left[\left(\overline{T}_{stby,2} - \overline{T}_{a,stby,2}\right) - \left(135^\circ\ F - 67.5^\circ\ F\right)\right] UA\tau_{stby,2}$$

to:

$$Q_{da} = Q_D - \left[\left(\overline{T}_{stby,2} - \overline{T}_{a,stby,2}\right) - \left(T_{su} - 67.5^\circ\ F\right)\right] UA\tau_{stby,2},$$

where T_{su} is the maximum tank temperature observed after the sixth draw of the simulated-use test.

The petition seeks to change the calculation of $Q_{hw,77}$ in Section 6.1.6 from:

$$Q_{hw,77} = \sum_{i=1}^{6} \frac{M_i C_{p,i}(135^\circ\ F - 58^\circ\ F)}{\eta_r}$$

to:

$$Q_{hw,77} = \sum_{i=1}^{6} \frac{M_i C_{p,i}(T_{su} - 58^\circ\ F)}{\eta_r}$$

The last calculation that the petition for waiver seeks to modify is that of the energy factor in Section 6.1.7. The proposed modification would change the equation from:

$$E_f = \sum_{i=1}^{6} \frac{M_i C_{p,i}(135^\circ\ F - 58^\circ\ F)}{Q_{dm}}$$

to:

$$E_f = \sum_{i=1}^{6} \frac{M_i C_{p,i}(T_{su} - 58^\circ\ F)}{Q_{dm}}$$

Discussion of American's Petition for Waiver

The Department's waiver regulations provide that the applicant for Interim Waiver is required to notify in writing all known manufacturers of domestically marketed units of the same product type that it has filed an Application for Interim Waiver and a Petition for Waiver and provide copies of these documents to the manufacturers. The regulations also provide that the Assistant Secretary will receive and consider timely written comments on the Application for Interim Waiver. 10 CFR 430.27(c)(2).

The Department received comments from Rheem and Applied Energy Technology (AET). Rheem has indicated DOE should recognize new control technologies for water heaters and should pursue changes to credit resulting energy savings. Rheem is concerned, however, that American's proposed method is designed specifically for one type of control system and disqualifies or discounts other well-known alternative control schemes.

Rheem expressed a concern that the proposed procedure assumes the best-case scenario for the test condition. Rheem indicates that potential savings would only be realized if the ''Energy Saver Cycle'' were selected and if a homeowner's water use patterns resulted in a water heater setpoint temperature below 135 °F. Rheem is concerned the proposed procedure would lead to manufacturers claiming water heater efficiencies not representative of those achieved in practice.

Rheem also believes that the first hour rating would need to be adjusted if the tank temperature is lowered. Rheem states that the revised tank temperature, i.e., the lowest stable temperature, should be used for the first-hour rating test.

AET commented that a comprehensive reexamination of the DOE water heater test procedure is needed to allow proper representation of in-field efficiency improvements made possible by a variety of control approaches. While AET indicates that the proposed test method is an improvement over the current test procedure, AET claims that the proposed test method excludes other forms of controls that could be applied to water heaters and therefore would provide a competitive advantage to American.

AET is concerned that because a lowest stable temperature is not specified in the proposed test procedure, the delivered water temperature could consequently be extremely low. AET also commented that the proposed test procedure's absence of a lower and upper setpoint temperature could be abused. A manufacturer could use a large on-off temperature differential on the upper thermostat so that the upper heating element would not energize. This could allow a lowest stable temperature of about 59 °F, resulting in nearly 100 percent efficiency.

AET's final point echoes the concern of Rheem that the proposed test procedure would yield a best-case scenario and would not necessarily reflect the energy use patterns that are typical of consumers. AET claims that the proposed test procedure does not use long draws, like those seen in actual use that would force the controller to reach a stable temperature different from the lowest stable temperature.

In response to these comments, the Department notes that a waiver is issued for specific basic models and that American has identified those models it is seeking to waive in its petition for waiver. Other basic models or other control schemes would have a different waiver and test procedure. The comments by Rheem and AET on the general test procedure are of use because they have identified issues related to the methodology of how to arrive at a test temperature representative of actual consumer use and how to measure the first hour rating. These issues would need to be discussed and resolved before a waiver could be issued regarding testing of water heaters with electronic controls.

Discussion of American's Application for Interim Waiver

Pursuant to the requirements in 10 CFR 430.27(g), an Interim Waiver will be granted if the applicant can show that it will experience economic hardship if the application for Interim Waiver is denied, if the petition for waiver will likely be granted and/or if the Assistant Secretary determines for public policy reasons to grant immediate relief pending a determination on the petition for waiver. DOE will address each of these criteria separately as applied to American's petition for an interim waiver.

First, DOE does not believe American has provided information in its application for the interim waiver to support its claim of economic hardship. In its application, American merely stated, ''From an economic point of view, American Water Heater Company has invested significantly in the development of this product and to not be able to present one of its best features would cause loss of sales and discourage further development.'' (Letter dated April 26, 2001 from Timothy J. Schellenberger, Senior Vice President—Product Engineering, to the Assistant Secretary, Application for Interim Waiver). American's mere assertion of economic hardship does not establish that it will experience such hardship. American did not provide any factual information to justify its assertion.

Second, at this time, the Assistant Secretary does not have adequate information from American to determine that American's Petition for Waiver from the DOE test procedure will likely be granted. The petition is incomplete for the following reasons:

American's proposed test protocol depends on establishing a lowest stable temperature for their thermostat controller. The procedure outlined in the petition uses a 100 draw-cycle to qualify the controller as having an & ldquo;Energy Saver Cycle''. However, this procedure only establishes that the controller will lower and raise the thermostat setpoint. American did not provide any test data that DOE could use to determine that a lower thermostat setpoint would result from typical household use and what that lower thermostat setpoint might be. For the petition for waiver to be complete, it must contain the test temperature for each basic model for which a waiver is requested. From the confidential test

data that was provided, DOE can only determine that the controller can automatically reduce or raise the thermostat setpoint.

DOE believes that American must provide data from field tests of water heaters using this controller to determine an average lowest stable temperature for the U.S. for each basic model for which a waiver is requested. There are probably a number of variables that should be considered so that the resultant lowest stable temperature is representative of U.S. households including tank volumes, various inlet water temperatures and varying family sizes. The appropriate test time and the allowed variability to demonstrate a ''stable'' temperature would have to be determined. Furthermore, the field tests should contain a sample large enough to be statistically relevant at high confidence. The Department would like to receive comments on the concerns listed above.

DOE recognizes that developing the necessary data to quantify the lowest stable temperature for each basic model could be a time consuming and costly task. Since this petition for waiver from the DOE test procedure for an automatic thermostat controller is the first DOE has received for this type of device, we are very interested in receiving comments that would help develop a general test method for automatic thermostat controllers. For instance, is it practical to develop a computer model that could be used to qualify any automatic controller? Is it possible to use existing databases such as the Energy Information Administration's Residential Energy Consumption Survey for housing and family characteristics combined with average inlet water temperature data from ground water temperatures to develop an algorithm that would yield a reasonable lowest stable temperature? Are there other ways to simplify and generalize the test procedure for an automatic thermostat controller?

Second, American's petition for waiver does not address the first hour rating of the water heater. This test result is used by retailers and installers as an indication of what size water heater to install in a given home. The FTC also uses this value to determine which group of water heaters a given model belongs in for establishing the range of energy factors and yearly costs of operation. In the current DOE test procedure, the first hour rating test starts at a maximum temperature of 135 °oF ±5 °F and continues until the average tank temperature has dropped 25 °F. If the water is reheated within the hour, the draw is initiated again and the water withdrawn is summed. American's proposed modification to the current 24-hour simulated-use test did not provide a first hour rating test which is a necessary component of the water heater test procedure. DOE believes it would be logical for the first hour rating test to be conducted at the same tank temperature as the test for determining the energy factor. However, if that temperature is much lower than the current 135 °F ±5 °F, the final water temperature could be too cool to be considered useful.

Finally, the Department has determined that there are no public policy impacts that warrant granting immediate relief pending a determination on the Petition for Waiver.

Conclusions

Following a careful consideration of all material that was submitted by American and based on the criteria for granting an interim waiver as provided in 10 CFR 430.27(g), and for the reasons stated above, the Department has concluded that American's Application for an Interim Waiver should be denied.

At the same time, the Department solicits comments, data, and information as to whether to grant the Petition for Waiver, as well as comments on testing water heaters with electronic controls. Such comments will assist the Department in determining whether it can develop a practical test procedure for these devices.

Issued in Washington, DC, on January 17, 2002.

David K. Garman,

Assistant Secretary, Energy Efficiency and Renewable Energy.

April 26, 2001

Assistant Secretary for Conservation and Renewable Energy

United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

To Whom It May Concern: Subject: Petition for Waiver

Specific Requirements to be Waived.

American Water Heater Company seeks a waiver in the application of the ''Uniform Test Method for Measuring the Energy Consumption of Water Heaters'' contained in 10 CFR Part 430 Subpart B Appendix E as applied to electric water heater models that have adaptive electronic controls.

Utilizing a microprocessor-based control on an electric water heater allows a level of intelligence to be added to the control logic that is not possible with the conventional electro-mechanical control systems used today. One use of this intelligence is to have the control adjust the stored water temperature based on the actual hot water usage pattern to determine the lowest possible temperature to store water that will meet the needs of the consumer. The result of this new control logic is a reduction in energy consumption. Such a control cycle will be identified as an ''Energy Saver Cycle''.

American Water Heater plans to commercialize a microprocessor-based control system with an Energy Saver Cycle. However, we are unable to characterize and market the true efficiency benefit to the consumer through the ''Uniform Test Method for Measuring the Energy Consumption of Water Heaters'' ratings process. The test procedure does not allow the efficiency benefit of an Energy Saver Cycle to be demonstrated. These types of intelligent electronic controls are more expensive and without the ability to demonstrate the benefits in terms of energy savings, it is difficult to justify the additional cost to the consumer. We are specifically petitioning to allow the use of an alternate test procedure described below to rate and label the efficiency of a water heater when using the ''Energy Saver Cycle''.

Basic Models and all Manufacturers

(See attached list)

Design Characteristics

Background Information

The predominate energy loss of a tank type electric water heater is the standby loss associated with storing the hot water. There are two methods of reducing these losses; one can increase the effectiveness of the insulation system, or reduce the stored water temperature. The ''Energy Saver Cycle'' saves energy by reducing the stored water temperature.

The study report ''Baseline Results and Methodology of the Consumer Sub-group Analysis for Residential Water Efficiency Standards'', submitted to the Department of Energy October 1998, shows that the average set point temperature of residential water heaters varies widely across the United States. The northern states tend to be hotter with average set points as high as 142 °F and the south as low as 123 °F. This corresponds inversely with the average inlet water temperature in the same areas. At the time of use, the hot water is blended with cold water to produce the desired use temperature. This process of blending causes the usage quantity of hot water to change inversely with the stored water temperature. For example: A shower

lasting 10 minutes with a delivered water temperature of 105 °F and a flow rate of 2.5 gallons/minute uses 25 gallons of water. If 135 °F hot water, supplied by a water heater, is blended with cold water at 58 °F, the shower will consume 9.74 gallons of cold water and 15.26 gallons of hot water. In contrast, if the hot water supply temperature were reduced to 115 °F the usage proportions would change to 4.39 gallons of cold water and 20.61 gallons of hot water. The energy consumed and the quantity of water used in the shower is the same in both cases but the proportion of heated water goes up. The important difference is that, in the time between showers, the energy consumed to maintain the stored water temperature goes down by 29.85% when the water is stored at 115 °F versus 135 °F. The person taking the shower didn't know the difference except they had to use more hot water to get the desired temperature. As the stored water temperature is further lowered, eventually the water heater will not be able to supply the needed amount of blended hot water and the water temperature will have to be increased.

The adaptive control logic continually adjusts stored water temperature within specified limits to get to the temperature where the maximum demand event can be met by the quantity and temperature of water stored in the heater. This ''Energy Saver Cycle'' will produce real energy savings in a significant number of households and thus deserves to have a test procedure designed to allow the efficiency benefits to be demonstrated. The current test procedure doesn't allow this because the mean tank test temperature is fixed at 135 °F.

Energy Saver Cycle Qualification test

It is simple for a manufacturer to put an electronic control on a water heater and label a cycle as an ''Energy Saver Cycle'' without having an adaptive control that will adjust stored water temperature based on usage. Some examples of other controls that would not qualify for this modified test procedure could be, a conventional control with a fixed but lower set point which is identified as an ''Energy Saver Cycle'' or an off peak type control that simply adjusts the set point based on the time of the day. This new test is required to prove that the control meets the ''Energy Saver Cycle'' criteria as a qualifier to use the energy saver test modifications. The object of the Page 3 test is to confirm that the control does adapt the stored water temperature based on water usage.

The following simple test would be used to prove that the control adapts water temperature to water usage.

1. The unit is set up per the ''Uniform Test Method for Measuring the Energy Consumption of Water Heaters'', 10 CFR 430.23.

2. The unit is run on normal cycle and the thermostat is adjusted until the mean tank temperature is 135 °F. Then the control is switched to the ''Energy Saver Cycle'' and a series of small draws are made. Each draw should be sufficient to cause the lower element to come on. The lower element will reheat the water until it shuts off at which time another draw will start. This sequence will continue until the mean tank temperature, at the element shutoff point, is 125 °F or less. The mean tank temperature after the first cycle should be 135 °F and the last cycle will be 125 °F or less to show that the control will lower the set point in response to a low water usage situation.

3. Then the draw size will be changed to be large enough that the control will adjust the temperature up. After each reheat the draw will be repeated until the control has adjusted the set point up enough to return the mean tank temperature back to the 135 °F point. At this point, the test would have proven that the control adjusts set point up and down based on actual water usage. If the control can not demonstrate the adaptive ability to adjust stored water temperature based on actual usage, it will not qualify to use the proposed modified procedure.

4. This test is somewhat cumbersome in that a large number of draw reheat cycles would be required to complete the test. In our case, it would require approximately 100 cycles. The test could be automated and allowed to run over night to speed up the qualification process. The test should only have to be run once for a given manufacturer's control. Once the control has been qualified, any units using that control would qualify for the Energy Saver Cycle test sequence.

Test Procedure Changes

Staying with the principal that the delivered hot water energy doesn't change as the stored water temperature changes, the following changes are required to allow the energy savings of an ''Energy Saver Cycle'' to be demonstrated and evaluated.

1. The size of the six water draws will be adjusted such that the BTUs of delivered hot water (BTUs to heat the water from 58F to delivery temperature) is equal to BTUs for the six 10.7 gallon draws heated from 58F to 135F. This calculation = (Gallons × Lbs./gal. × Specific Heat × (delivered temp. − 58F) = (6851 BTU for 10. 7 gal. heated from 58F to 135F). Since the delivered water temperature is not a constant during a draw, this calculation could be accomplished by using ''Simpson's Rule'' method or another suitable numerical method to integrate the delivered water temperature-volume function. The water draw is started and the total is calculated every 5 seconds until the 6851 BTU of delivered hot water energy is reached. The actual volume of each draw will vary inversely as the delivered water temperature varies. The Energy Saver Cycle typically draws about 90 to100 gallons versus the 64.2 gallons of the current test procedure. The hot water energy delivered in both cases is the same.

One approach to running this modified test on a heater with an ''Energy Saver Cycle'' would be to set up the heater as ''normal'' with the thermostat set to give a mean tank temperature of 135 °F. Then run the test draw sequence repeatedly until the temperature adjustment logic of the control lowers the temperature to the lowest stable temperature. At that point, a full 24 hour efficiency test would be conducted to determine the efficiency of the heater using Energy Saver Cycle. This would require over 100 draw and reheat cycles using our control algorithm. This approach is impractical. The practical approach is to run the control in normal mode and adjust the water temperature to the lowest stable temperature that the ''Energy Saver Cycle'' would reach if the above approach were used.

2. *Definition of lowest stable temperature:* This is the lowest water temperature set point such that when the six draw sequence in step 1 is performed, the control will not adjust the set point higher. In our control logic, the set point is increased if the cold water rises far enough in the tank to cause the upper element to come on. Thus for our control logic, the lowest temperature where the draw sequence in step 1 doesn't cause the upper element to come on is our ''lowest stable temperature''. Other control logic could result in another ''lowest stable temperature'' point. To determine this temperature, the tester would need to know the temperature adjustment logic for the Energy Saver Cycle. He would set the test water temperature to the lowest stable temperature based on that logic. He then would observe the draw quantities and temperatures during the efficiency test to see that a temperature adjustment condition was not present. If a temperature adjustment would have been made the test is invalid and the

test would need to be repeated at a higher temperature.

3. In the current procedure, the mean tank temperature is to be adjusted to 135F. There are three places in the calculation of efficiency where the raw data is adjusted back to 135F to correct for variation between actual and ideal test conditions. Since the Energy Saver Cycle test doesn't run at 135F mean tank temperature, this correction needs to be changed to reflect the new test conditions. This means that the hard coded 135 values in the calculations must be changed to a variable so the actual value can reflect the current test conditions. The most appropriate variable is ''Tsu'' which is the maximum mean tank temperature observed after the sixth draw. In the current procedure, Tsu must be 135F ± 5F and is the logical equivalent of the 135F of the current procedure. Thus the calculation of Qda is changed from

$$Qda = Qd - ((Tstby,2 - Ta,stby,2) - (135 - 67.5))\ UA\ tstby,2 \text{ to}$$

$$Qda = Qd - ((Tstby,2 - Ta,stby,2) - (Tsu - 67.5))\ UA\ tstby,2 \text{ and QHW,77 is change from}$$

$$QHW,77 = \sum_{i=1}^{6} \frac{Mi\ Cpi\ (135F - 58F)}{Nr} \text{ to } QHW,77 = \sum_{i=1}^{6} \frac{Mi\ Cpi\ (Tsu - 58F)}{Nr}$$

$$Ef \text{ is changed from } Ef = \sum_{i=1}^{6} \frac{Mi\ Cpi\ (Tsu - 58F)}{Qdm} \text{ to } Ef = \sum_{i=1}^{6} \frac{Mi\ Cpi(Tsu - 58F)}{Qdm}.$$

Conclusion

New technologies can foster changes that obsolete current practices. American Water Heater's adaptive control has created an energy saving control method that was not anticipated or covered by the current DOE test procedure. This waiver will allow the efficiency benefits of this improved control method to be demonstrated while the test procedures are modified to keep up with technology. This change in control method will reduce water heater energy consumption, and thus its adoption by the industry should be encouraged. This can best be done by granting this waiver and modifying the test procedure. Confidential test data, which demonstrates the energy efficiency benefit, can be made available upon your request.

Respectfully submitted,

Timothy J. Shellenberger,
Sr. Vice President—Product Engineering.

April 26, 2001

Assistant Secretary for Conservation and Renewable Energy United States Department of Energy,
1000 Independence Avenue, SW.,
Washington, DC 20585

To Whom It May Concern: Subject: Application for Interim Waiver.

American Water Heater Company seeks a waiver in the application of the ''Uniform Test Method for Measuring the Energy Consumption of Water Heaters'' contained in 10 CFR Part 430 Subpart B Appendix E as applied to electric water heater models that have adaptive electronic controls. We are seeking this interim waiver to allow the initial marketing of our new product to claim the benefits of the ''Energy Saving Cycle'' as described in the petition for waiver.

We feel that the interim waiver should be granted because it is likely that the petition for waiver will be granted. The new technology addressed by the petition for waiver yields a legitimate energy savings and improvement in the energy efficiency level of this category of appliance. This improvement serves the interest and goal of the Department of Energy and thus should be supported. Allowing the waiver will encourage other manufacturers to produce similar products creating a general improvement in energy conservation. As new technology is developed, test procedures need to be modified to accommodate the improvement and allow the benefits to be shown to the consumer. These are all good arguments as to why the waiver should be granted and thus the interim waiver be granted.

From an economic point of view, American Water Heater Company has invested significantly in the development of this product and to not be able to present one of its best features would cause loss of sales and discourage further development.

Respectfully submitted,

Timothy Shellenberger,
Sr. Vice President—Product Engineering.

TJS/meh

I, the undersigned, on behalf of American Water Heater Company, hereby certify that a copy of the foregoing Petition for Waiver and Petition for Interim Waiver, has been sent to each of the following known manufacturers of domestically marketed units of the same product type (as listed in Section 322(a) of the Act), as follows:

Rheem Water Heater Division, Rheem Manufacturing Company, 2600 Gunter Park Drive East, Montgomery, AL 36109–1413, Attention: Scott D. Martin

A.0. Smith Water Products Company, Rochelle Park, Suite 200, 600 E. John Carpenter Freeway, Irving, TX 75062–3990, Attention: Ronald Massa

Bradford White Corporation, 200 Lafayette Street, Middleville, MI 49333–9492, Attention: Eric M. Lannes

State Industries, 500 Lindahl Parkway, Ashland City, TN 37015–1234, Attention: John R. Lindahl, Jr.

Lochinvar Corporation, 2005 Elm Hill Pike, Nashville, TN 37210–3807, Attention: Mr. William L. Vallett, Jr.

I further hereby certify that the Assistant Secretary for Conservation and Renewable Energy will receive and consider timely written comments on the Application for Interim Waiver.

This the 26th day of April 2001.
Timothy J. Shellenberger.

DOE WAIVER MODEL COMPARISON

AWHC wholesale models electronic	AWHC retail models electronic	AWHC wholesale models standard	AWHC retail models standard	RHEEM (Richmond, Rudd, GE)	A.O. Smith	Bradford White	State Industries (Reliance, Maytag, Sears)	Lochinvar
EE92-40H***D***	EE2H40HD******	E92-40H***D***	E2H40HD******	81XH40D MDH40-2 82R40-2 EXR40-2	PEST-40	M-I-40T1ODS M-II-40T1ODS	PS-40-20RT 9-40-2KRT HE20-40T SSX-40-2LRT 32746	STA040KK-3

DOE WAIVER MODEL COMPARISON—Continued

AWHC wholesale models electronic	AWHC retail models electronic	AWHC wholesale models standard	AWHC retail models standard	RHEEM (Richmond, Rudd, GE)	A.O. Smith	Bradford White	State Industries (Reliance, Maytag, Sears)	Lochinvar
EE122-40H***D***	EE2J40HD******	E122-40H***D***	E2J40HD******	81XH40D MEH40-2	PEST-40	M-I-40T10DS M-II-40T10DS	PX-40-20RT 9-40-2KRT HE29-40T SSX-40-2LRT 32746 12-40-2ART	STA040KK-3
EE122-40H***D***	EE3H40HD******	E93-40H***D***	E3H40HD******	MR40245 MP40245	PEHT-40	M-III-40T10DS	32049 LT-40-2LRT	
EE93-40H***D***	EE3J40HD******	E123-40H***D***	EJ40HD******	MR40245 MP40245	PDHT-40	M-III-40T10DS	32049 LT-40-2LRT	
EE92-40R***D***	EE2H40RD******	EE92-40R***D***	E2H40RD******	RMEMKR 40-2	PES-40	M-III-40S10DS	SSX-40-2LRS 9-40-2KRS	
EE122-40R***D***	EE2J40RD******	E122-40R***D***	E2J40RD******	RMEMKR 40-2 PE40M9A	PES-40	M-II-40S10DS	SSX-40-2LRS 9-40-SK4S 12-40-2ARS	
EE93-40R***D***	EE3H40RD******	E93-40R***D***	E3H40RD***H***	RMEMXR 40-2TI SE40M12A	PEC-40		HE21240S LT 40-2LRS	
EE123-40R***D***	EE3J40RD******	E123-40R***D***	E3J40RD******	RMEMXR 40-2TI SE40M12A	PEC-40		HE21240S LT 40-2LRS	
EE92-50H***D***	EE2H50HD******	E92-50H***D***	E2H50HD******	81X52 D ME52-2 RMEKR 50-2 PE50T9A 82XR52-2 EXR52-2	PEST-52	M-II-50T10DS	PX-52-20RT 9-52-2KRT HE29 50T 32756 SSX-52-2LRT	STA052KK-3
EE122-50H***D***	EE2J50HD******	E122-50H***D***	E2J50HD******	RMEXR 50-2TI SE50T12A		M-II-50T10DS	12-52-ART 32059	
EE93-50H***D***	EE3H50HD******	E93-50H***DC***	E3H50HD***C***	MR50245 MP50245	PEH-52	M-III-50T10DS	HE212 50T LT-52-2LRT 32151	
EE123-50H***D***	EE3J50HD******	E123-50H***DC***	E3J50HD***C***	MR50245 MP50245	PEH-52	M-III-50T10DS	HE212 50T LT-52-2LRT 32151	
EE92-50R***D***	EE2H50RD******	E92-50R***D***	E2H50RD******	RMEMKR 50-2 PE50M9A 82 MXR52-2 EMXR52-2	PES-52	M-II-50S10DS	PX-52-2ORS SSX-52-2LRS 9-52-2KRS HE2950S	
EE122-50R***D***	EE2J50RD******	E122-50R***D***	E2J50RD******	RMEMXR 50-2TI SE50M12A	PEC-52		12-52-2ARS HE212 50S	
EE93-50R***D*** EE123-50R***D***	EE3H50RD****** EE3J50RD******	E93-50R***DC*** E123-50R***DC***	E3H50RD***C*** E3J50RD***C***				LT-52-2LRS	
EEZ3-50R***D***	EE3Z50RD******	EZ3-50R***DC***	E3Z50RD***C***	MSR50245				
EE92-65H***D***	EE2H65HD******	E92-65H***D***	E2H65HD******	81X66D ME66-2 RMEKR65-2 82XR66-2 EXR66-2 PE65T9A	PEC-66	M-II-65R10DS	HE29 66T 32766 SSX-66-2LRT	STA066KK-3
E122-65H***D*** EE93-65H***D***	EE2J65HD****** EE3H65HD******	E122-65H***D*** E93-65H***DC***	E2J65HD****** E3H65HD***C***				12-66-2ART	
E123-65H***D***	EE3J65HD******	E123-65H***DC***	E3J65HD***C***	RMEXR 65-2TI	PEH-66	M-III-65R10DS	32069	
EE92-80H***D***	EE2H80HD******	E92-80H***D***	E2H80HD******	RMEKR80-2 82XR80-2 EXR80-2	PES-80		32786 SSX-82-2LRT	STA082KK-3
EE122-80H***D*** EE93-80H***D***	EE2J80HD****** EE3H80HD******	E122-80H***D*** E93-80H***DC***	E2J80HD****** E3H80HD***C***		PEC-80		12-82-2ART	
EE123-80H***D***	EE3J80HD******	E123-80H***DC***	E3J80HD***C***	RMEXR 80-2TI SE80T12A MR85245 MP85245	PEH-80	M-III-80R10DS	HE212 82T 32089 LT 82-2LRT	

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