

DEPARTMENT OF ENERGY

Office of Energy Efficiency and Renewable Energy

10 CFR Part 430

[Docket No. EE-RM-93-501]

Energy Conservation Program for Consumer Products: Test Procedures for Furnaces/Boilers, Vented Home Heating Equipment, and Pool Heaters

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

ACTION: Proposed rule; reopening of comment period.

SUMMARY: On Monday, August 23, 1993, the Department of Energy (DOE or Department) published a proposed rule amending furnace and boiler, vented home heating equipment, and pool heater test procedures (58 FR 44538). Among the various proposed technical changes and revisions, that notice proposed a revision to the existing Energy Factor and proposed a new energy efficiency descriptor, Annual Efficiency. A multiplication factor (F-factor), which represented the ratio of the energy consumed at the power plant to generate the auxiliary electric energy delivered to the fossil-fueled appliance to the useful heat equivalent of that electrical energy delivered at the appliance, was applied to the auxiliary energy in the calculation of the proposed Energy Factor and Annual Efficiency. Today's notice announces a reopening of the comment period to seek comment on an alternative definition of the F-factor based on the ratio of the national average cost of the auxiliary electrical energy to the national average cost of the fossil fuel energy on a common unit energy basis. DOE is soliciting comments, data, and information respecting this alternative energy cost factor.

DATES: Written comments in response to this document must be received by February 21, 1995.

ADDRESSES: Written comments and statements shall be submitted to: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, "Test Procedures for Furnaces/Boilers, Vented Home Heating Equipment, and Pool Heaters," (Docket No. EE-RM-93-501), Mail Stop EE-43, Room 5E-066, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586-7574.

Copies of the transcript of the public hearing and the comments received may be read and/or photocopied at the DOE Freedom of Information Reading Room,

U.S. Department of Energy, Forrestal Building, Room 1E-190, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586-6020, between the hours of 9 a.m. and 4 p.m., Monday through Friday, except Federal holidays.

The Department proposed to incorporate by reference in the Final Rule the following standards:

1. American National Standards Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers Standard 103-1993.
2. American National Standards Institute Standard Z21.56-1990.

Copies of these standards may be viewed at the Department of Energy Freedom of Information Reading Room at the address stated above. Copy of the American National Standards Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers Standards 103, may be obtained from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, 1791 Tullie Circle, Atlanta, Georgia 30329. A copy of the American National Standard Institute Standard Z21.56 may be obtained from American National Standards Institute, 11 West 42nd Street, New York, New York 10036.

FOR FURTHER INFORMATION CONTACT:

Cyrus H. Nasser, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Mail Station, EE-431, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586-9138, FAX (202) 586-4617.

Eugene Margolis, Esq., U.S. Department of Energy, Office of General Counsel, Mail Station, GC-72, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586-9507.

SUPPLEMENTARY INFORMATION:

- I. Introduction
- II. Discussion of Comments
- III. Discussion of Issues for Further Comment

I. Introduction

On August 23, 1993, DOE published in the **Federal Register** a Notice of Proposed Rulemaking and public hearing for furnaces/boilers, vented home heating equipment, and pool heaters (hereafter referred to as the 1993 Proposed Rule) to amend the furnace, vented home heating equipment and pool heater test procedures (58 FR 44538). A public hearing was held in Washington, DC on January 5, 1994. Among the various proposed technical changes and revisions, a revision to the existing Energy Factor and a new energy efficiency descriptor, named Annual Efficiency, were proposed. An intent of

these proposed descriptors was to account for the electrical consumption of a furnace in its efficiency rating. To accomplish this, a multiplication factor (F-factor), which represented the ratio of the energy consumed at the power plant to generate the auxiliary electric energy consumed by the fossil fueled appliance to that auxiliary electrical energy, was applied to the auxiliary energy in the calculation of the proposed Energy Factor and Annual Efficiency.

The current DOE test procedure includes for information the computation of the annual fossil fuel and auxiliary electrical energy consumptions of fossil-fueled furnaces and boilers and an Energy Factor which includes both the fossil fuel and the auxiliary electrical energy consumption of the appliances. The Energy Factor is defined as the ratio of the annual output of energy delivered to the heated space by fossil-fueled appliances to the total annual energy input to the appliances including auxiliary electrical energy.

DOE proposed in the 1993 Proposed Rule the definition of Energy Factor as defined in ANSI/ASHRAE Standard 103-1988, with the provision that non-weatherized warm air furnaces are located indoors and all combustion and ventilation air is admitted through grills and ducts from the outdoors and does not communicate with air in the conditioned space [Isolated Combustion Systems (ICS)]. In addition, for those appliances such as mobile home furnaces and vented home heating equipment that are primarily installed indoors, DOE proposed a new descriptor, Annual Efficiency. The new annual efficiency descriptor was identical in form to the Energy Factor but for non-weatherized furnaces. For boilers and for weatherized warm air furnaces, Annual Efficiency and Energy Factor would be identical.

For fossil-fueled furnaces and boilers, the proposal defined "Energy Factor" as a term that gives credit for the electrical energy recovered as usable heat, such as from a blower motor that is in the circulating air stream. In addition, an F-factor, representing the ratio of the energy consumed at the power plant to generate the auxiliary electric energy delivered to the fossil-fueled appliance to that auxiliary electrical energy, was applied to the auxiliary energy in the calculation of the proposed Energy Factor and Annual Efficiency. A typical value of 3.0 for the F-factor is presented as one used in California.

II. Discussion of Comments

This notice addresses comments received on the proposed Energy Factor and Annual Efficiency descriptors and,

in particular, the multiplication factor F, which was applied to the auxiliary electrical consumption. This factor was defined in the 1993 Proposed Rule as the ratio of the energy consumed at the power plant to generate the auxiliary electric energy delivered to the fossil-fueled appliance to the useful heat equivalent of that electrical energy delivered at the appliance.

Many comments were received on the proposed formulation of energy descriptors to capture electrical consumption of furnaces/boilers, vented home heating equipment, and pool heaters. In general, the comments received were supportive of the goals of the proposed amendments.

Twenty-one commenters offered comments on the energy efficiency descriptor issues emphasizing the F-factor. Midwest Gas of the Midwest Power Systems Inc. of Iowa supported fully the energy factor descriptor and the annual efficiency descriptor (Midwest Gas, No. 1, at 2). Columbia Gas Distribution Companies of Columbus, Ohio, Oklahoma Natural Gas Co., Texas Gas Transmission Corp., City Gas Company of Florida, Southern California Gas Co., Southern Union Gas of Texas, Lone Star Gas Co., and Texas and Brooklyn Union Gas of N.Y., all expressed support for the concept of the energy factor and the annual efficiency descriptors; however, they suggested that the source-based F-factor should be applied to all covered appliances, regardless of their primary energy source. They considered it unfair to apply the F-factor to fossil-fueled furnaces and boilers but not to all-electric appliances (Columbia Gas, No. 3, at 1; Oklahoma Natural Gas, No. 4, at 1; Texas Gas, No. 5, at 3; City Gas, No. 6, at 1; Southern California Gas, No. 24, at 1; Southern Union Gas, No. 26, at 1; Lone Star, No. 11, at 2; and Brooklyn Union, No. 19, at 1).

American Gas Association (AGA) and Hydronics Institute (HI) stated that they have long supported a full-cycle approach to energy decisions but are disappointed in that the proposed energy descriptors apply the F-factor only to the auxiliary electric energy in fossil-fueled furnaces and boilers and not to all-electric equipment. AGA considered the proposed approach illogical and biased and stated that it could result in a consumer purchasing electric furnaces because of their lower purchase price without fully considering operating cost. AGA recommended the inclusion of source energy for electric furnaces (AGA, Testimony, at 54, and No. 13, at 2; and HI, Testimony, at 75, and No. 16, at 2). Minnegasco, and Public Service Electric

and Gas Co. (PSE&G) expressed the same concerns as the American Gas Association on the F-factor (Minnegasco, No. 18, at 3; and PSE&G, Testimony, at 102, and No. 9, at 3). The PSE&G further stated that if DOE adopts a source-to-site based F-factor, the factor should be regionally and seasonally applied because of regional and seasonal differences in electricity generation and demand side management programs. The PSE&G further suggested that the energy descriptor be defined to include air emissions and solid waste produced (PSE&G, Testimony, at 102, and No. 9, at 3).

Edison Electric Institute supported adoption of the proposed energy descriptors Energy Factor and Annual Efficiency, but without the F-factor (equivalent to setting F=1). Edison Electric Institute believed that site energy rather than source energy should be used in the calculation for Energy Factor and Annual Efficiency because (1) the appliance standard is to benefit the consumer who makes his or her decisions on energy usage based on site energy and has no control over the electrical power plant; (2) there is no technical justification for using source rather than site energy; (3) an unnecessary precedent would be created for other appliance standards that are currently defined using site energy; (4) given that electricity can be generated from renewable energy (wind, solar, hydro), the F-factor could distort the actual amount of energy needed for electricity generation and could have the tendency to favor fossil-fueled equipment over electric equipment; and (5) given that electricity is generated using different fuels and at different rates of conversion from heat to electricity, including nuclear and hydroelectric, a single F-factor would be misleading (Edison, No. 20, at 2).

Lennox Industries supported the inclusion of electrical energy in the proposed energy descriptors but objected that limiting the application of the F-factor on electric energy usage only to fossil-fueled furnaces and boilers would penalize this type of product and confuse the consumer (Lennox, Testimony, at 85).

Inter-City Products stated that (1) applying the F-factor to auxiliary electric energy consumption in gas-fired furnaces, but not to the electric energy consumption in electric furnaces, puts the gas-fired equipment at an unjustified disadvantage in comparison to electric furnaces and heat pumps, which could cause significant load shifting from gas to electric, (2) gas and electrical consumption cannot be separated for

cost comparison in a single energy descriptor that combines two different forms of energy but not cost in the calculation because their operating cost will be different, and (3) there is no basis for the proposed value of 3.37 for the F-factor. Therefore, Inter-City stated that it would not support the proposed energy descriptors until these issues were resolved (Inter-City, No. 7, at 3).

GAMA objected to the proposed energy descriptors' immediate implementation in their present form, for reasons similar to those mentioned by Inter-City, *supra*. GAMA also suggested the possibility of developing two separate energy descriptors for fossil fuel and electric energy consumption. Carrier Corp. and Consolidated Industries both stated their support of GAMA (GAMA, Testimony, at 18, and No. 8, at 5; Carrier, No. 12, at 1; and Consolidated, No. 22, at 1). York International objected to the proposed energy descriptors and would support the descriptors only if the F-factor was not applied. York also considered F-factor's use inconsistent by not applying it to all-electric units (York, No. 10, at 1).

California Energy Commission supported the proposed energy descriptors with the F-factor (California, No. 25, at 3). The National Resources Defense Council (NRDC) strongly supported the proposed energy descriptors and the concept of applying a multiplication factor to auxiliary electrical energy consumed to reflect the cost of energy to the consumers. The NRDC suggested that other than the source-based F-factor, factors based on consumer cost or emission impacts (air pollution impacts or climate pollution impacts) could also be used to develop the F-factor. But NRDC suggested that a factor based on average consumer costs (the ratio of unit energy cost to consumers of electrical energy and fossil fuel) would be a more accurate and useful approach, as it is more reflective of the costs the consumer is incurring. The NRDC suggested that in order to avoid the necessity of changing the cost ratio due to fluctuations or changes in the gas to electric costs every year, a single value for the factor should be chosen and maintained for the next ten years or longer unless the factor changes drastically (NRDC, Testimony, at 68 and No. 15, at 2).

III. Discussion of Issues for Further Comment

The main reason for the Department's 1993 proposal to establish the energy factor and the annual efficiency descriptor was to take into account the consumption of the auxiliary electric

energy in the operation of fossil-fueled furnaces and boilers. The AFUE descriptor for fossil-fueled units, as defined, deals with only the primary energy consumption (gas or oil) of an appliance, and therefore does not give the consumer a complete account of the overall energy and cost performance of the appliance. A survey of the yearly auxiliary electrical energy consumption and gas consumption of gas-fired furnaces, as published in the October 1993 GAMA Efficiency Certification Directory, showed that the auxiliary electrical energy consumption varies from approximately 2.0 to 6.5 percent of the gas consumption. Even though this energy consumption ratio is small, it is significant in cost to the consumer because electricity costs approximately four times more than gas. On the basis of AFUE alone, a consumer would not be able to compare the overall efficiency of two (or more) different models of fossil-fueled furnaces or boilers of comparable output capacity but with blower motors of different efficiencies and, hence, different costs. The proposed Energy Factor or Annual Efficiency will give the consumer the necessary descriptor for a more informed purchasing decision.

A second reason for having the proposed energy descriptors is to allow for the consideration of design options involving changes in auxiliary electric energy consumption in the Department's analysis supporting the energy efficiency standard rulemaking.

The definition of the F-factor in the 1993 proposed rule was intended to: (1) provide consumers with rating information which reflects annual operating cost, including electrical energy, so they can make informed choices when comparing several models or makes of fossil-fueled appliances; and (2) encourage manufacturers to make the most overall energy efficient appliance, the efficiency of which can be shown to the consumers with a meaningful energy descriptor. After reviewing the objections presented by commenters with regard to the proposed F-factor, the Department invites comment on an alternative formulation of the F-factor based on the ratio of costs. In particular, DOE invites comment on the NRDC suggestion that basing a multiplication factor on energy costs of electricity and fossil fuel to consumers rather than on source energy

ratio would be a more meaningful criterion in reflecting the overall energy efficiency of fossil-fueled appliances. This ratio may also give consumers a clearer grasp of the cost of operating their appliances.

The F-factor value of 3.37 in the 1993 proposed rule was based on historical values of power-plant-to-site energy ratios. More recent calculations, based on future projections in the "Annual Energy Outlook 1994" (Energy Information Administration, DOE, DOE/EIA-0383(94), January, 1994, Table A2), showed that a value of F=3.2 would be appropriate for the years 2000 through 2010. Average national electricity-to-fuel price (as opposed to energy) ratios also were calculated for the same years, using the "Annual Energy Outlook 1994" (Tables A3 and A4). These price ratios were obtained by first calculating a weighted-averaged fuel price (for natural gas, LPG, and oil), then taking the ratio of average national electricity price to the weighted average fuel price. The weighted average price for the three fuels was calculated by weighting each fuel price by its yearly national residential space heating consumption (in quads per year). These calculations showed that the projected electricity-to-fuel price ratio will vary from 3.46 in the year 2000 to 3.30 in the year 2010, and that the trend for this ratio will be toward less variation over time. Therefore, while some variation will exist in the price ratio over time (as cautioned by the NRDC in its testimony), the Department seeks comment on whether a nationwide price ratio of 3.36 will be valid for the next 10 to 20 years (determined by extrapolating for the year 2002 and price ratio remaining unchanged during that period). The actual ratio of electricity-to-fuel price will not be the same across the U.S., but the use of a multiple-valued F-factor, as suggested by the Edison Electric Institute, would cause complications for manufacturers that sell the same appliance in different parts of the country. Using a single value is similar to the adoption of a national average outdoor temperature and a national average heating degree-days in the calculation for the heating seasonal efficiency and AFUE in the current test procedure.

The Department is seeking comment on the equations for the proposed Energy Factor and the Annual Efficiency

for furnaces and boilers that use fossil fuel as the primary source of energy, and a much smaller quantity of electrical energy for the auxiliary equipment (2.0 percent to 6.5 percent of the yearly gas consumption for gas furnaces; less than 1.0 percent for boilers). The F-factor should be applied to all types of source energy and to all types of space-heating equipment. As previously stated, the inclusion of the F-factor in the proposed equations for these energy descriptors is to calculate the total cost of the fossil fuel energy and the auxiliary electrical energy consumed by the appliance. In this way, the consumers would have a more complete energy descriptor than the AFUE to compare the total cost of operating the appliance in their homes. This would also discourage the possible practice of running the air circulation blower longer during burner ignition and shut-off in order to obtain a slightly higher AFUE value, while actually consuming more electrical energy and thus, more overall energy. The Department believes the best information available to consumers to make an informed decision when purchasing a fossil-fueled appliance is an efficiency descriptor that will reflect the total cost of operating the appliance. The proposed energy descriptors do reflect that total cost to the consumer.

Based on the discussion above, DOE is seeking comment today on redefining the F-factor in the August 23, 1993, proposed rule as the ratio of national average price of electricity to the national average price of fossil fuel, on a common unit energy basis. In particular, DOE invites comment on use of value of 3.36 for the F-factor.

The Department solicits comment and information on the application of the proposed consumer energy cost factor to the auxiliary electrical energy consumption as a multiplication factor in the calculation of the proposed Energy Factor and the Annual Efficiency for fossil fuel heating appliances.

Issued in Washington, DC, on January 11, 1995.

Christine A. Ervin,

Assistant Secretary, Energy Efficiency and Renewable Energy.

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