



2111 Wilson Boulevard Suite 500 Arlington VA 22201-3001 USA  
Phone 703 524 8800 | Fax 703 562 1942  
www.ahrinet.org

April 27, 2015

Ms. Brenda Edwards  
U.S. Department of Energy  
Building Technologies Program, Mailstop EE-2J  
1000 Independence Avenue SW  
Washington, DC 20585 –0121

Re: Department of Energy's (DOE) Request for Information (RFI) for Energy Conservation Standards for Energy Conservation Standards for Direct Heating Equipment and Pool Heaters [*Docket Number EERE–2015–BT–STD–0003*]

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Dear Ms. Edwards:

These comments are submitted by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) in response to the U.S. Department of Energy's (DOE) request for information (RFI) regarding energy conservation standards for direct heating equipment (DHE) and pool heaters appearing in the *Federal Register* on March 26, 2015.

AHRI is the trade association representing manufacturers of heating, cooling, water heating, and commercial refrigeration equipment. More than 300 members strong, AHRI is an internationally recognized advocate for the industry, and develops standards for and certifies the performance of many of the products manufactured by our members. In North America, the annual output of the HVACR industry is worth more than \$20 billion. In the United States alone, our members employ approximately 130,000 people, and support some 800,000 dealers, contractors, and technicians.

### **Issues on Which DOE Seeks Comments**

AHRI appreciates the opportunity to comment on issues in which the DOE has expressed interest:

- **Issue 1** - DOE seeks data, information, and comment on the electrical consumption of all product classes of DHE in standby and off-mode.

At this time there is no data available regarding typical standby and off mode fossil fuel and electricity consumption for direct heating equipment.

- **Issue 2** - DOE requests data and information regarding typical energy use (fossil fuel and electricity) in standby and off-modes for all pool heater types (i.e. gas-fired, electric resistance, and electric heat pump). DOE also requests data and information regarding the impacts on efficiency ratings of including the standby mode and off mode energy consumption in the integrated thermal efficiency (pool heaters).

AHRI does not have any information at this time regarding pool heaters which would help the DOE develop a method to convert from the existing thermal efficiency ratings (which does not include standby and off mode energy consumption) to ratings under the new integrated thermal efficiency metric (which includes standby and off mode energy consumption). As the revised test procedures go into effect on July 6, 2015, there is not enough data available yet to present as industry aggregate.

DOE should note that we expect the efficiencies to go down, since additional energy consumption will now be included in the new integrated thermal efficiency metric. It is not clear if manufacturers will be required to change model numbers when implementing the new metric. We urge DOE to make it clear that manufacturers do not need to use new model numbers for the same equipment when converting ratings from those under the current metrics to those under the new metrics.

- **Issue 3** - DOE requests feedback on the current product classes for direct heating equipment and seeks information regarding other product classes it should consider for inclusion in its analysis.

AHRI has no comments on this issue at this time.

- **Issue 4** - DOE seeks comment on whether product classes should be established for pool heaters and seeks information regarding product classes it should consider for inclusion in its analysis.

AHRI suggests that separate product classes should be established for pool heaters in DOE's analysis. Each fuel type (gas-fired, electric, and heat pump) should be analyzed separately. Currently there is no maximum capacity associated with these products in the definition. We would like to suggest that the scope be limited to less than 400,000 Btu/h for gas and oil pool heaters and less than or equal to 140,000 Btu/h for heat pump pool heaters to make a clear distinction between residential and commercial products.

- **Issue 5** - DOE seeks data, information, and comment on electric resistance pool heaters, specifically on their capacities and applications. DOE also requests data, information, and comment on whether heat pump technology is a viable design for those applications in which electric resistance pool heaters are typically found.

Heat pump technology is not a viable design for all applications in which electric resistance pool heaters are typically found. The electric resistance-type units are typically installed as a component into a larger, more complex piece of equipment such as a spa or hot tub. Heat pumps could not typically be installed in the same housing. Further, electric resistance pool heaters are typically installed in indoor applications where heat pump technology is not a cost effective substitution. Electrical resistance pool and spa heaters for residential applications are typically between 1.5kW and 57kW.

- **Issue 6** – DOE seeks comment on its tentative conclusion that energy conservation standards for oil-fired pool heaters would result in *de minimis* energy savings.

AHRI agrees with DOE's tentative conclusion that energy conservation standards for oil-fired pool heaters would result in *de minimis* energy savings. To our knowledge there is only one model of this equipment class on the market today.

- **Issue 7** - DOE seeks information related to these or other efficiency-improving technologies for DHE or pool heaters. Specifically, DOE is interested in comments regarding their costs, applicability to the current market, and how these technologies improve efficiency of DHE and pool heaters.

For gas-fired pool heaters, improved controls are expected to have minimal or negative impact on efficiency due to the large size of pools. Modulating heat is not an effective way to heat up pools. Most gas-fired pool heaters on the market today are equipped with electronic ignition systems and the pilot light only comes on when heat called. Due to the relatively short burner operating hours, condensing heat exchanger technology is not economically feasible option for gas-fired pool heaters. The cost implications from implementing this option would be significant and would lead to concern with fuel switching.

Heat pump pool heaters are already using the highest efficiency compressors available. The compressors are generally larger than those used for space conditioning and are designed specifically for heat pump pool heaters. AHRI urges the DOE to consider that the pool heater market is very, very small compared to the general HVAC market and a significant portion of the manufacturers are considered small businesses. We have serious doubts that implementing higher efficiency compressors is a viable design option for heat pump pool heaters.

Materials and design used for heat exchangers are limited by chemicals used in pools and spas. Any suggestions for improved heat exchanger design need to consider and account for the environment in which pool heaters operate.

For direct heating equipment, the first technology option many manufacturers would consider implementing is improved insulation. Condensing heat exchanger technology is very expensive for the manufacturers to implement and is also much more expensive for consumers to install as they have to account for condensate disposal. Power and direct venting and electronic ignition systems would also be expensive to implement in DHE. Improvements to burners, dampers, flue, controls and heat exchanger need to be implemented simultaneously as they are all inter-related. Burners for DHE are custom designed to work in concert with a specific heat exchanger design and to fit within a specific cabinet.

- **Issue 8** - DOE requests comment on approaches that it should consider when determining a baseline for product classes of DHE and pool heaters, including information regarding the merits and/or deficiencies of such approaches.

AHRI suggests that DOE sets the baseline for heat pump pool heaters using the least efficient product in the AHRI Directory<sup>1</sup> when converting from the “High Air Temperature – Mid-Humidity” COP rating point in AHRI Standard 1160.

For DHE, it would be reasonable to use the April 2013 Federal minimum efficiency levels as the baseline.

- **Issue 9** - DOE requests information on max-tech efficiency levels achievable in the current market and associated technologies for both DHE and pool heaters.

AHRI has no comment on this issue regarding pool heaters.

In the case of DHE, the current federal minimum is close to, if not at, the max-tech level for equipment in most of the product classes on the market. AHRI urges DOE to consider that DHE is a replacement product and that market is already shrinking. We estimate less than 5 percent of industry sales are for new construction projects.

- **Issue 10** - DOE requests feedback on the planned approach for the engineering analysis and on the appropriate representative capacities and characteristics for each DHE product class and for pool heaters of all types.

In the case of gas-fired pool heaters, AHRI suggest that DOE look at the fan-assisted and atmospheric products separately. As suggested in the response to Issue 7, condensing and non-condensing technology should be analyzed separately. And, as discussed in AHRI’s response to Issue 4, we recommend implementing maximum capacities for pool heaters.

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<sup>1</sup> <https://www.ahridirectory.org/ahridirectory/pages/hpph/defaultSearch.aspx>

There is concern that DOE's tear-down approach may not show the simultaneous changes made to burners, dampers, flue, control and heat exchangers made for DHE. AHRI urges DOE to include the specific and custom design of DHE products in its analysis.

- **Issue 11** - DOE seeks input from stakeholders on whether the distribution channels described above are appropriate for direct heating equipment and pool heaters and are sufficient to describe the distribution markets.

AHRI is concerned that distributors have been left out of the pool heater distribution channel. The distributor would be included between manufacturer and wholesaler for both new and replacement markets. DOE should note that distributor is distinctly different from the wholesaler, typically a pool store. A small portion of the pool heater market for new construction is through national accounts.

The DHE distribution channels in the RFI are appropriate. As mentioned previously, very few of these products are sold for new construction. An example of new construction for DHE would be an addition to an existing house where it would not be feasible to extend the house's heating system to the new space. As such, AHRI would like DOE to consider this in the DHE energy use analysis.

- **Issue 12** - DOE seeks input on the percentage of products being distributed through the different distribution channels, and whether the share of products through each channel varies based on product class, capacity, or other feature.

AHRI has no comment on this issue.

- **Issue 13** - DOE seeks updated data, if available, and recommendations regarding data sources to establish the markups for the parties involved with the distribution of covered equipment.

AHRI has no comment on this issue.

- **Issue 14** - DOE requests comment on the overall method to determine energy use of direct heating equipment and pool heaters and if other factors should be considered in developing the energy use or energy use methodology.

AHRI supports the DOE using 104 hours/year for burner operating hours and 4,446 pool operating hours for evaluating the typical energy use for all pool heater types.

Direct heating equipment is most commonly used as zone heating but can also be used to heat a whole floor or an entire house. We do not expect DHE to use nearly as much as energy as a furnace, even in a whole house heating application, because the equipment is located directly in the space it heats.

There are no duct losses and, consequently, does not run as long as a furnace. It appears that DHE is captured as “room heaters” in the Energy Information Administration’s (EIA) 2009 Residential Energy Consumption Survey (RECS). If that is correct, we ask that DOE model direct heating equipment accordingly.

- **Issue 15** - DOE seeks input on the current distribution of product efficiencies in the market for different product types and classes.

The AHRI Directory<sup>2</sup> is the best resource for ratings of heat pump pool heaters. Electric-resistance pool heater literature typically does not state an efficiency since it is part of a larger system, such as a spa. Manufacturer literature is the only source of product efficiencies in the market for gas-fired pool heaters.

The AHRI Directory<sup>3</sup> is the best resource for ratings for DHE.

- **Issue 16** - DOE requests comment on the overall method that it intends on using to conduct the LCC and PBP analysis for direct heating equipment and pool heaters.

AHRI has no comment on the overall method that DOE intends on using to conduct the LCC and PBP analysis for pool heaters.

DOE’s intended approach to conducting the LCC and PBP analysis for DHE is not correct. As discussed in Issue 14, above, this equipment is typically not used as a whole-house heater but as a secondary heat source, or as an addition to an existing house. DOE’s approach must adequately account for these factors.

- **Issue 17** - DOE seeks input on the approach and data sources it intends to use to develop installation costs, specifically, its intention to use the most recent RS Means Mechanical Cost Data.

DOE needs to account for installing utilities in the case of installing new pools and new construction.

Also, for direct heating equipment, DOE needs to account for higher installation costs when switching to units with electrical power consumption. Most DHE currently does not have electrical power input. There will also be much higher installation costs for condensing units which needs to be included in the analysis.

- **Issue 18** - DOE seeks comment and sources on its approach for developing gas, LPG, and electricity prices.

AHRI has no comment on this issue.

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<sup>2</sup> <https://www.ahridirectory.org/ahridirectory/pages/hpph/defaultSearch.aspx>

<sup>3</sup> <https://www.ahridirectory.org/ahridirectory/pages/dht/defaultSearch.aspx>

- **Issue 19** - DOE seeks input on the approach and data sources it intends to use to develop maintenance costs for DHE and pool heaters, specifically, its intention to use the most recent RS Means Facilities Maintenance & Repair Cost Data, as well as to consider the cost of service and/or maintenance agreements.

For pool heaters, annual maintenance includes the cost of maintaining the pool water quality. Based on conversations with pool owners, this can cost between \$600 and \$1,000 per month of pool operation. In terms of repair, compressor replacement may not be cost justified for the consumers of heat pump pool heaters past warranty. The typical warranty for these products is between seven and ten years.

For DHE, most manufacturers recommend an annual maintenance prior to the heating season. Direct heating equipment service and maintenance agreement are from local distributors, not the manufacturers.

- **Issue 20** - DOE seeks comment as to whether repair costs vary as a function of product efficiency for either DHE or pool heaters. DOE also requests any data or information on developing repair costs for these products.

For heat pump and electric-resistance pool heaters, repair cost is most closely linked to the size of the heat exchanger, not the product efficiency. The product efficiency of gas-fired pool heaters does impact the repair costs. Atmospheric gas-fired pool heaters are the least expensive to repair. Fan-assisted combustion gas-fired pool heaters have mid-range repair costs. Condensing gas-fired pool heaters are the most complex type of this equipment and therefore expensive to repair.

In the case of DHE, there is correlation between product efficiency, complexity and cost to repair. Condensing technology and intermittent pilot systems are more efficient and more complicated than millivolt-type units and also more expensive to repair.

- **Issue 21** - DOE seeks comment on its approach of using a Weibull probability distribution to characterize product lifetimes. DOE also requests DHE and pool heater product lifetime data and information on whether product lifetime varies based on product characteristics, fuel type, product application, or efficiency level considerations.

As discussed above, in the case of pool heaters, AHRI suggest DOE analyze the different products separately. DOE also needs to consider the impact of the pool water quality on the life of the product. If pool water is not rigorously maintained then pool heater life is significantly impacted. DOE also needs to account for consumers who don't properly winterize their pools. Unfortunately, AHRI does not have any suggestions for sources of data on pool maintenance.

AHRI has no comments on this issue regarding DHE.

- **Issue 22** - DOE seeks data, information, and comment on the product lifetimes of electric resistance and electric heat pump pool heaters.

As discussed in Issue 19, the typical product life for heat pump pool heaters is tied to compressor warranty and is estimated to be between seven and ten years.

- **Issue 23** - DOE requests data on current efficiency market shares (of shipments) by product class for DHE and pool heaters, and also input on similar historic data. DOE also requests comment on market segmentation based on capacity, application and fuel type, as well as trends in fuel switching.

AHRI has no comments on this issue at this time.

- **Issue 24** - DOE also requests information on expected future trends in efficiency for DHE product classes and for all pool heater types, including the relative market share of condensing versus non-condensing products in the market in the absence of new efficiency standards.

AHRI has no comments on this issue.

- **Issue 25** - DOE seeks comments and data on any rebound effect that may be associated with more efficient DHE and pool heaters.

In the case of gas-fired pool heaters, the only way for customers to justify the significant first cost associated with condensing products would be to run the products almost constantly.

No rebound effect is expected for DHE.

- **Issue 26** - DOE seeks historical shipments data for DHE and pool heaters, particularly for electric resistance and electric heat pump pool heaters.

AHRI may be able to supply industry aggregate historical shipments data for DHE and pool heaters, but cannot make a definite commitment at this time.

- **Issue 27** - DOE seeks data, information, and comment on expected future trends for shipments of all product classes of DHE and all types of pool heaters, including the relative share of sales to new construction vs. existing households.

AHRI has no comment on this issue.

- **Issue 28** - DOE seeks input on the approach and data sources it intends to use in developing the shipments model and shipments forecasts for this analysis, including main drivers and trends toward consumer switching between fuel types.

AHRI questions the approach and data sources DOE intends to use in developing the shipments model and shipments forecasts for pool heaters. It is not clear how a floor-space approach will yield information on the number of new construction or replacement pools in the United States. The DOE must explain the applicability of its intended approach in developing the shipments model and shipments forecasts for pool heaters.

AHRI has no comments on this issue regarding DHE.

- **Issue 29** - DOE requests comment and any available data on historical, current, and future market share of equipment with step changes in efficiency, such as gas-fired vented home heaters that use condensing technology and electric heat pump pool heaters, as compared to less efficient products, such as non-condensing gas-fired DHE and electric resistance pool heaters, respectively, for each product class.

While gas-fired pool heaters and heat-pump pool heaters can typically be used on the same pool, the home owner must decide which type to use. Heat pump pool heaters typically are more expensive than gas-fired pool heaters, but must be used where gas is not readily available. A gas-fired product can generally heat a pool in one day and so don't need to be kept on when the pool is not in use. Heat pump pool heaters generally take several days to heat the pool.

Condensing technology for gas-fired DHE is very new, and very few manufacturers make these products. AHRI is not able to supply data at this time.

- **Issue 30** - DOE requests comment on the completeness of the manufacturer list presented, including names of any additional manufacturers that may belong on this list.

In the pool heater list of manufacturers, Rheem is a brand of Raypak. Also, we suggest that the DOE add Nirvana Chauffe Piscine/Heat Pumps as a Canadian Manufacturer.

The list of DHE manufacturers is complete.

AHRI would also like to notify the DOE that version of the test procedure, [ANSI/AHRI Standard 1160 \(I-P\) with Addendum 1, 2014 Standard for Performance Rating of Heat Pump Pool Heaters](#) has been published. In this edition, the “High Air Temperature – High-Humidity” test point was added. This test point is the most applicable test condition for Florida, where many heat pump pool heaters are installed.

AHRI appreciates the opportunity to provide these comments. If you have any questions regarding this submission, please do not hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'LPG' with a stylized flourish extending to the right.

Laura Petrillo-Groh, PE  
Engineering Manager, Regulatory Affairs  
Direct: (703) 600-0335  
Email: [LPetrillo-Groh@ahrinet.org](mailto:LPetrillo-Groh@ahrinet.org)