Air-Conditioning, Heating, and Refrigeration Institute

June 3, 2013

Ms. Brenda Edwards
U.S. Department of Energy
Building Technologies Program
Suite 600
950 L'Enfant Plaza, SW
Washington, DC 20024

Re: AHRI Comments on DOE Request for Information on Commercial Warm Air Furnaces [Docket No. EERE–2013–BT–STD–0021]

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) appearing in the Federal Register on May 2, 2013.

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 and water heating 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.

We support DOE's plan to conduct this analysis in stages. Also, we agree that the first step is to evaluate whether more stringent standards are technologically feasible and would lead to significant additional energy savings. Although DOE initiated this rulemaking because the minimum efficiency requirement for commercial gas and oil furnaces in ASHRAE Standard 90.1 has not changed in several years, the lack of change in ASHRAE Standard 90.1 does not mean that this subject has not been considered by the 90.1 Standing Standard Project Committee (SSPC). In this case, SSPC 90.1 did consider the matter of increasing the minimum efficiency requirement for commercial warm air furnaces in 2007 and 2008. The minimum efficiency requirement was not increased because there was compelling information that any appreciable revision of the minimum efficiency requirement was not economically justified and would not save energy. That is still the situation today.

There are several fundamental characteristics of commercial gas furnaces and commercial building heating loads that are critical to understanding why SSPC 90.1's consideration of this matter resulted in no change to the minimum efficiency requirement. These characteristics are:

- The large majority of commercial gas furnaces are in outdoor units packaged with an air conditioner.

2111 Wilson Boulevard | Suite 500 | Arlington | Virginia | 22201-3001 USA
PHONE 703 524 8800 | FAX 703 562 1942 | www.ahrinet.org

- There is a significant installation cost and possible added energy consumption associated with handling condensate generated by a condensing furnace in the outdoor installations that are typical for commercial gas furnace/air conditioner packaged units.
- In order to increase the efficiency of a commercial gas furnace to a condensing level, the heat exchanger surface area must be increased. The added heat exchanger area will increase the pressure drop created by the furnace component of a packaged unit.
- Because of commercial building ventilation requirements and typical system designs, fans within commercial packaged units run continuously during periods of building occupancy. Consequently, any changes to a packaged unit which adds pressure drop in the air distribution section of the unit increases the power consumption by the fan to overcome the added restriction.
- Commercial buildings have higher cooling loads because of the influence of internal plug loads and occupancy density. Related to this, the outdoor temperature at which commercial buildings change to heating from cooling is significantly lower than a residential one or two family dwelling.

When SSPC 90.1 considered this matter, it was provided with an analysis of certain commercial building types that estimated the effect of the increased pressure drop of a condensing gas furnace on the fan energy consumption of a packaged outdoor unit. The analysis showed that for typical values for the added pressure drop, there was no net energy savings in many of the climate zones in the U.S. Furthermore, for a large majority of the remaining climate zones where net energy savings were estimated, the payback period was unacceptably long in relation to the equipment's average life. In general, the unit would have lower gas consumption but higher electric consumption. The payback period in this situation becomes even less attractive when one recognizes that the recent trend in energy prices indicates that average natural gas prices are dropping while average electricity prices are increasing. The value of the gas being saved is less and the value of the added electricity consumption is higher.

As noted in the RFI, DOE can determine that the existing standard does not need to be amended. In the case of commercial warm air furnaces, a thorough analysis will indicate that a decision to not amend the existing energy conservation standard is appropriate.

We have the following specific comments:

Section 1 – Issues Related to Increasing the Energy Conservation Standards for Commercial Warm Air Furnaces

Setting energy conservation standards that are higher than the current federal minimum standards would necessitate the manufacturing of condensing furnaces, which would thereby generate acidic condensate. Issues related to acid condensate are discussed below. The current federal energy standards are already very close to condensing technology efficiency levels. Moreover, the condensing furnace technology would also require new heat exchanger and unit designs that typically do not exist for weatherized equipment.

The typical approach in residential applications is to direct the condensate into the sewer drain. However, condensate disposal is a much bigger issue in commercial applications and

also varies with the manner in which a commercial warm air furnace is installed. Installing condensing furnaces in many existing buildings would entail added costs since those buildings are likely to require the installation of condensate disposal lines. Due to the acidic nature of the condensate, it is not possible to drain it on either the roof or the ground. Certain commercial building codes such as the International Building Code impose restrictions on drainage water collected from a mechanical equipment condensate. In many cases, condensate removal becomes an issue when ground-mounted products are below the level of sewer lines. It is important to note the acidic nature of the condensate. If the condensate is not disposed properly it can be corrosive to the surfaces of a commercial warm air furnace that were not designed to be exposed to condensate. Condensate freezing is yet another issue that weatherized commercial warm air furnaces face as such products usually operate at ambient temperatures below the freezing point. Both equipment corrosion and condensate freezing could cause equipment reliability issues and have implications on safety.

Commercial applications tend to use more cooling than heating due to the heat generated by internal plugged loads and the loads associated with building occupants. Moreover, the benefits of increasing the standards for commercial warm air furnaces will continue to decrease with the gradual decrease in heating loads due to the increase in envelope and insulation stringency in commercial building codes. Many commercial office buildings already manage energy consumption by either turning off a unit or setting back the temperature during the time the building is unoccupied.

DOE must also consider the cumulative regulatory burden of this rulemaking on manufacturers. Most commercial warm air furnaces in today's marketplace are integrated into commercial package unitary equipment. Over the last few years, manufacturers of these products have been required to make major design changes to their equipment due to: a). new energy conservation standards for commercial package air conditioning and heating equipment that went into effect on January 1, 2010; and b). The U.S. Environmental Protection Agency's banning of sale or distribution of air conditioning products containing HCFC-22 from January 1, 2010 onwards. Additionally, some design changes have been incorporated by the industry due to requirements specified in ASHRAE Standard 90.1. For example, the 2010 edition of this standard specifies that effective January 1, 2012, all air conditioning equipment at a cooling capacity greater than or equal to 110,000 Btu/h that serve single zones shall have their supply fans controlled by two-speed motors or variable speed drives. DOE should also understand the unintended consequences of simultaneously revising the energy conservation standards of commercial warm air furnaces and commercial package air conditioning and heating equipment. Raising the energy conservation standards for both types of equipment would not necessarily raise the overall efficiency of the packaged system. The increase in static pressure due to an additional heat exchanger in a condensing warm air furnace will compromise the condenser efficiency and DOE would then need to account for such an adverse impact on the energy conservation standards rulemaking with respect to commercial package air conditioning and heating equipment. Lastly, it is important to note that many commercial warm air furnace manufacturers are also in the business of manufacturing residential furnaces. Although the current energy conservation standard for residential gas furnaces is 78% AFUE, several of these manufacturers have been able to develop residential furnaces with much higher efficiencies that are reliable and cost effective for the consumer. The issues outlined in this letter provide a clear indication of why this trend for residential furnaces cannot be currently extended to commercial warm air furnaces for the same set of manufacturers.

The reasons provided in this section confirm that an increase in energy conservation standards for commercial warm air furnaces is unnecessary at this time.

Section 2 – AHRI Response to Certain Issues on Which DOE Seeks Comment

(1) DOE requests comment on the potential energy savings in creating a separate equipment classes for non-weatherized, indoor commercial warm air furnaces and weatherized, outdoor commercial warm air furnaces. DOE is also interested in learning about existing equipment that fall into this potential equipment class, as well as the market penetration of such equipment.

Answer: Although we believe that separate equipment classes are needed for non-weatherized and weatherized commercial warm air furnaces due to issues related to condensate management, we do not feel that such an action will lead to any significant energy savings because a majority of the commercial warm air furnace market consists of non-condensing weatherized equipment.

(2) DOE requests comment on the need to establish an equipment class for three-phase commercial warm air furnaces with an input capacity less than 225,000 Btu/h and the potential energy savings that could be achieved from creating such an equipment class.

Answer: Although we are not opposed to this approach, we believe that it would not lead to any additional energy savings since three-phase warm air furnaces with an input capacity less than 225,000 Btu/h share the same design as their single phase counterparts, and consequently have similar thermal efficiencies. The single phase warm air furnaces with an input capacity less than 225,000 Btu/h are already regulated by DOE.

(3) DOE also requests comment on whether AFUE or thermal efficiency is an appropriate efficiency metric for three-phase commercial warm air furnaces with an input capacity less than 225,000 Btu/h

Answer: Should DOE decide to group such products as commercial warm air furnaces, we recommend that DOE adopt the thermal efficiency metric, so that there is consistency in the efficiency metric associated with commercial warm air furnaces.

(4) DOE requests information on max-tech efficiency levels achievable in the current market.

Answer: While examining the max-tech efficiency levels that are achievable in the current market, DOE should consider the issues that have been raised in previous sections of this letter.

(6) DOE requests information regarding the technology differences between commercial furnaces at 80 percent thermal efficiency ratings and more-efficient commercial furnaces.

Answer: Refer to the issues that have been raised in section 1 of this letter.

(7) DOE requests feedback on the possible approaches identified for the engineering analysis and on what the appropriate representative capacities and characteristics would be for each equipment class.

Answer: DOE currently defines commercial warm air furnaces as industrial equipment having an input capacity of 225,000 Btu/h or more. We recommend that an upper limit of 2,000,000 Btu/h be placed within this definition. We recently conducted an industry survey and the results suggest that 2,000,000 Btu/h is the maximum input capacity associated with a commercial warm air furnace that is integrated within a commercial package unitary product having a cooling capacity of 760,000 Btu/h.

(8) DOE requests comment on the feasibility of using condensing heat exchanger technology in weatherized commercial warm air furnaces. DOE is also interested in comments on issues related to implementing identified condensing heat exchanger technologies in outdoor warm air furnaces, as well as costs associated with implementing a condensate drain into the building's space.

Answer: Refer to the issues that have been raised in section 1 of this letter.

(12) DOE requests comment or seeks input from stakeholders on the overall method to determine the equipment load profiles.

Answer: Refer to the issues that have been raised in section 1 of this letter.

(13) DOE requests comment or seeks input from stakeholders on the current distribution of equipment efficiencies in the building population.

Answer: Refer to the issues that have been raised in section 1 of this letter.

(18) 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.

Answer: Section 1 of this letter raises the issue of the high costs associated with installing condensing furnaces in existing commercial buildings.

(20) DOE seeks input on the approach and data sources it intends to use to develop maintenance costs, 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.

Answer: DOE should consider all the issues that have been raised in section 1 of this letter while developing maintenance costs.

(24) DOE also requests information on expected trends in efficiency for commercial warm air furnaces over the next five years.

Answer: We expect that the efficiency trend for weatherized commercial warm air furnaces to remain flat for the next five years. The benefits of increasing the standards for commercial warm air furnaces will continue to decrease with the gradual decrease in heating loads due to the increase in envelope and insulation stringency in commercial building codes. This gradual change in building codes could also result in payback periods for non-weatherized commercial warm air furnaces that cannot be justified.

(29) In addition to historical efficiency data, DOE also requests information on expected trends in efficiency of commercial warm air furnaces over the long run.

Answer: Since January 1, 1994, the efficiency trends for commercial warm air furnaces have stayed near a thermal efficiency of 80%. Based on the issues raised in section 1 of this letter, we expect that the efficiency trends for these products will continue to remain flat over the long run.

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

Sincerely,

Aniruddh Roy
Regulatory Engineer
Air-Conditioning, Heating, and Refrigeration Institute
2111 Wilson Boulevard, Suite 500
Arlington, VA 22201-3001, USA
Phone 703-600-0383
Fax 703-562-1942
aroy@ahrinet.org