In the Upcoming Rulemaking on Amendments to the Minimum Efficiency Standards for Non-Weatherized Residential Gas Furnaces, DOE Should Employ Separate Product Classes for Condensing and Noncondensing Furnaces

October 22, 2014

The Department of Energy should, in pursuing the rulemaking on amended residential furnace standards required by the court's order in American Public Gas Association v. DOE (D.C. Circuit Case No. 11-1485), establish separate product classes for condensing and non-condensing non-weatherized residential gas furnaces.

This paper describes the relevant legal authority that governs DOE's decision on this product class issue, the technical characteristics of condensing and non-condensing furnaces indicating that separate product classes are appropriate, and the applicable DOE precedents that should guide DOE in its consideration of separate product classes in this case.

I. Legal Basis for Rulemaking

Under the April 24, 2014 order of the United States Court of Appeals for the District of Columbia Circuit approving a settlement among the parties including DOE, the previously promulgated amendments to the "energy conservation standards for non-weatherized gas furnaces, including but not limited to the Department of Energy's determination that such furnaces constitute a single class of products for purposes of 42 U.S.C. 6295(q)(1)(B)," were vacated and remanded to DOE for notice and comment rulemaking. Thus, DOE agreed, and the court ordered, that DOE reconsider the question of whether condensing and noncondensing non-weatherized gas furnaces should be treated as separate product classes in future rulemaking covering these products.

In setting standards, EPCA requires DOE to structure product classes to ensure the continued availability of a product's unique performance characteristics in light of the utility those characteristics provide to consumers. Specifically, DOE may not prescribe a standard if the standard "is likely to result in the unavailability in the United States in any covered product type (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same" as those already available.[1] Moreover, EPCA's "special rule for certain types or classes of products" requires the Secretary to establish separate standards for any group of covered products if the products "have a capacity or other performance-related feature which other products within such type (or class) do not have and such feature justifies a higher or lower standard from that which applies (or will apply) to other products within such type (or class)."[2] In determining "whether a performance-related feature

[1] 42 U.S.C. § 6295(o)(4).
[2] 42 U.S.C. § 6295(q)(1)(B).

justifies the establishment of a higher or lower standard, the Secretary shall consider such factors as the utility to the consumer of such a feature . . . ."[3]

In light of the unique performance-related characteristics and utility that non-condensing non-weatherized residential gas furnaces provide to consumers, these provisions of EPCA require DOE to establish separate product classes for condensing and non-condensing non-weatherized residential gas furnaces.

II. The Unique Performance-Related Characteristics and Consumer Utility of Non-Condensing Furnaces

Condensing and non-condensing non-weatherized gas furnaces are significantly different in terms of the venting mechanisms they use, how they produce and dispose of condensate and the building environments in which they can be installed.[4] These differences create important differences in consumer utility, and must be appropriately considered in DOE's standards development process.

A. Distinct Venting Characteristics

Non-condensing (also known as Category I) and condensing (also known as Category IV) gas furnaces use separate and technically distinct types of venting systems. Non-condensing furnaces employ net negative vent pressures and require masonry chimneys or metal vents that are installed vertically. Condensing furnaces employ positive net pressures, and use plastic, pressurized, gas-tight venting that is typically installed horizontally. Condensing furnaces require blowers to exhaust combustion products, while non-condensing furnaces rely on an induced draft. Condensing furnaces require condensate drains to operate properly; non-condensing furnaces do not.

Neither type of furnace can be installed with venting designed for the other type of furnace, according to design certification standards for safety covering gas furnaces, gas installation codes, and safe installation practices. For example, installation of a Category IV condensing gas furnace that is certified for positive vent static pressure and vent temperatures

[3] 42 U.S.C. § 6295(q)(1).

[4] The distinguishing technical characteristics of a *condensing gas furnace* include: (1) exhaust gas temperatures generally ranging from 120 to 130°F; (2) the use of a fan for venting, because the exhaust gas is not hot enough to travel up a vertical chimney without propulsion; (3) PVC vent piping because PVC resists corrosion from moisture in the acidic exhaust gas, unlike metal piping, and exhaust gas temperatures remain well below the melting point of PVC pipe; and (4) a dedicated condensate drain for moisture produced during gas combustion. The distinguishing technical characteristics of a *non-condensing gas furnace* include: (1) exhaust gas temperatures of 275°F or above; (2) atmospheric venting – i.e., venting without propulsion via fan – because the temperature of the exhaust gas causes the gas to rise and exit a vertical chimney; (3) no condensate drain, because the moisture produced during gas combustion remains in a gaseous state (above 212°F, the boiling point of water) and vents with the exhaust gas through the chimney. *See generally* "Fundamentals of Venting and Ventilation," American Standard Inc., Pub. No. 34-4010-02 (1993), *available at* http://hvac.amickracing.com/Venting/Fundamentals%20of%20Venting%2034-4010-02.pdf.

that produce condensate from combustion cannot be vented into an "atmospheric" or buoyancy-driven venting system designed for a non-condensing appliance under the National Fuel Gas Code.[5] Doing so would also violate the furnace manufacturer's installation instructions and terms of sale, and applicable building codes. Such installations would pose a threat to the safety of building occupants by increasing the risks of venting system failures due to corrosion and of carbon monoxide poisoning due to incomplete venting of combustion products.

Non-condensing furnaces can also be vented through common vents with atmospherically vented gas water heaters, unlike condensing furnaces which require dedicated venting. Common venting non-condensing gas furnaces and atmospherically vented water heaters together is standard practice and requires proper sizing of the venting system to serve both appliances. In the case of a furnace replacement, a change from a non-condensing to a condensing furnace will require a new venting system for the furnace and may require significant modifications to the venting system of the existing water heater to maintain safe and proper venting of its flue gasses. The venting system requirements underpinning such modifications are well established in national installation codes, and if a consumer neglects to implement the needed venting system changes for cost or other reasons, he or she may be creating a safety hazard.

As discussed in section III.A below, DOE has previously made product class distinctions based on type of venting.

B. Building Constraints on Installation

Because a venting system is part of a building's infrastructure, it represents an installation constraint associated with the building environment for furnaces that need to be replaced in existing structures. Replacing a non-condensing furnace with a condensing furnace will require a new venting system. In many installation situations, switching to a condensing furnace may require abandonment of the existing venting system, structural changes to accommodate a new venting system path, and relocation of the furnace to meet the code and installation requirements of the new condensing furnace system. Because of these installation hurdles, replacing a non-condensing furnace with another non-condensing furnace has significant utility to consumers who, in replacing a furnace, do not anticipate needing to significantly alter their home venting system to maintain their safety.

In some cases, such as in certain multi-family dwellings, these installation hurdles may be significant enough to preclude installation of a condensing furnace. For consumers in such a situation, a non-condensing furnace may be the only feasible furnace alternative that relies upon natural gas. For these consumers, failure to create a separate product class for non-condensing non-weatherized gas furnaces would compel fuel-switching.[6]

[5] National Fuel Gas Code, ANSI Z223.1/NFPA 54.

[6] The record in the vacated Direct Final Rule proceeding contained voluminous record evidence on the extent of the fuel switching that would occur due to the up-front costs associated with replacing a non-condensing furnace

In many other circumstances, the building-related hurdles to installing a condensing furnace could be overcome as a technical matter but only with very significant installation costs. In these situations, building constraints make use of a condensing furnace an economically impractical option.

As discussed in section III.B below, DOE has previously made product class distinctions for products designed to meet building-related constraints.

C. Distinct Product Utility and Performance-Related Characteristics for Condensing and Non-Condensing Furnaces Require Separate Product Classes

Given that non-condensing furnaces provide unique utility and performance-related characteristics in terms of venting, condensate management and installation, DOE should establish separate product classes for condensing and non-condensing furnaces in its rulemaking action pursuant to the court's order. Failure to create a regulatory framework that permits the continued availability of non-condensing furnaces to consumers in building circumstances that require the particular utility of these furnaces would contravene the purposes of EPCA.

III. Relevant Precedents for Separate Product Classes

A large body of DOE precedent demonstrates that DOE has frequently considered venting characteristics and installation characteristics related to the building environment as bases for establishing separate product classes under EPCA. Establishment of separate product classes for condensing and non-condensing furnaces would be consistent with all of these precedents.

A. Precedents for Using Venting Characteristics as a Basis for Product Class Distinctions

DOE has previously created distinct product classes based on relevant venting characteristics, as is urged here.[7]

---

with a condensing furnace. *Energy Conservation Program: Energy Conservation Standards for Residential Furnaces and Residential Central Air Conditioners and Heat Pumps,* Direct Final Rule, 76 FR 37524 (June 27, 2011)(rule vacated in relevant part). This fuel switching scenario was confirmed by a recent nationwide survey conducted by GTI (available at http://www.apga.org/i4a/pages/index.cfm?pageid=3881)

[7] In 2011, DOE declined to establish separate non-condensing and condensing classes for non-weatherized gas furnaces on this basis because the "utility derived by consumers from furnaces is in the form of the space heating function that the furnace performs," and because the two types of gas furnaces provide "virtually the same utility with respect to that primary function." *Energy Conservation Standards for Residential Furnaces and Residential Central Air Conditioners and Heat Pumps*, *Notice of Effective Date and Compliance Dates for Direct Final Rule*, 76 FR 67037, 67041 (Oct 31, 2011) (rule vacated in relevant part). That rationale does not square with the precedents listed here, all of which involve product class distinctions based on venting as a non-primary function

1. Residential Electric Clothes Dryers. DOE's standards for electric clothes dryers manufactured on or after January 1, 2015 distinguish between vented and ventless dryers, and include four vented dryer product classes and two ventless dryer product classes.[8] For example, DOE has created product classes for "Vented Electric, Compact (240V) (less than 4.4 ft3 capacity)" and "Ventless Electric, Compact (240V) (less than 4.4 ft3 capacity)"; the only difference between these two product classes is whether the product is vented or ventless. In finalizing these product classes, DOE expressly based its decision to create a product class designation on the utility that the relevant venting mechanism provides to consumers:

> DOE considered four product classes for vented clothes dryers and two product classes for ventless clothes dryers, ventless electric compact (240 V) and combination washer/dryers, recognizing the **unique utility that ventless clothes dryers offer to consumers.**[9]

DOE further explained that the new ventless designation "reflects the actual consumer utility (that is, no external vent required)."[10]

2. Residential Furnace Fans. DOE recently established the following product classes for furnace fans: (i) Non-weatherized, Non-condensing Gas Furnace Fan (NWG-NC); (ii) Non-weatherized, Condensing Gas Furnace Fan (NWG-C); (iii) Mobile Home Non-weatherized, Non-condensing Gas Furnace Fan (MH-NWG-NC); and (iv) Mobile Home Non-weatherized, Condensing Gas Furnace Fan (MH-NWG-C).[11] Thus, DOE created separate non-condensing and condensing classes – precisely the same product class distinction sought here – for non-weatherized gas furnace fans and mobile home non-weatherized gas furnace fans. In so doing, DOE distinguished between non-condensing and condensing furnaces as an appropriate basis for creating separate product classes under EPCA.

3. Commercial Packaged Boilers. DOE's standards for steam commercial packaged boilers include product subcategories for "Gas-fired—all, except natural draft" and "Gas-fired—natural draft."[12] This differentiation based on venting system is directly analogous to the "condensing" and "non-condensing" approach to categorizing furnaces – natural draft venting corresponds with venting of non-condensing furnaces, and positive vent pressure venting corresponds with condensing furnaces. For steam commercial packaged boilers, this distinction was based on the product classes defined in ASHRAE Standard 90.1-2007. [13]

---

[8] 10 C.F.R. § 430.32(h).

[9] *Energy Conservation Program: Energy Conservation Standards for Residential Clothes Dryers and Room Air Conditioners*, *Direct Final Rule*, 76 FR 22453, 22485 (April 21, 2011) (emphasis added).

[10] *Id.* at n.28.

[11] 10 C.F.R. § 430.32(y).

[12] 10 C.F.R. § 431.87(b).

[13] *Energy Conservation Program for Certain Industrial Equipment: Energy Conservation Standards and Test Procedures for Commercial Heating, Air-Conditioning, and Water-Heating Equipment*, *Final Rule*, 74 FR 36312, 36320 (July 22, 2009).

B. Precedents Using Installation Constraints and Costs as a Basis for Product Class Distinctions

DOE has previously created product classes expressly based on relevant installation characteristics that permit continued installation of a covered product in an existing building condition without undue burden.[14]

1. Packaged Terminal Air Conditioners (PTAC) and Heat Pumps (PTHP). In addition to its "standard-size" class for PTACs and PTHPs, DOE has adopted a "non-standard size" class for PTACs and PTHPs, reasoning that wall sleeve size (the housing into which the product is fitted in the wall) is a performance-related feature.[15] DOE created the non-standard product class because in facilities using non-standard size equipment, "altering the existing wall sleeve opening to accommodate the more efficient, standard size equipment could include extensive structural changes to the building, which could be very costly . . . DOE was concerned that, absent non-standard equipment, commercial customers could be forced to invest in costly building modifications to convert non-standard sleeve openings to standard size dimensions."[16]

2. Central Air Conditioners and Heat Pumps. DOE adopted a space-constrained product class for air conditioners and a space-constrained product class for heat pumps.[17] Originally established in 2004, DOE continued the space-constrained product class in 2011 - in the same rulemaking in which it declined to establish a non-condensing, non-weatherized gas furnace product class - pointing out that DOE believes that "a larger through-the-wall unit would trigger a considerable increase in the installation cost to accommodate the larger unit."[18]

3. Residential Water Heaters. DOE adopted a product class for tabletop water heater in 2001 due to "strict size limitations" for the products.[19]

---

[14] In 2011, DOE declined to establish separate non-condensing and condensing classes for non-weatherized gas furnaces on the ground that avoiding the installation obstacles associated with switching from non-condensing to condensing furnaces was an "economic impact" rather than a "special utility" to consumers. 76 FR at 67042 (rule vacated in relevant part). That rationale is not consistent with the precedents listed here, all of which involve product classes developed to ensure that the installation of new covered products in certain building conditions is not foreclosed. This inconsistency is highlighted by the fact that all of the constraints that form the basis for these product class distinctions listed here can be overcome with changes to a building condition, but only at unreasonable cost.

[15] *Energy Conservation Program for Commercial and Industrial Equipment: Packaged Terminal Air Conditioner and Packaged Terminal Heat Pump Energy Conservation Standards*, *Final Rule*, 73 FR 58772, 58782 (Oct. 7, 2008).

[16] *Id.*

[17] 10 C.F.R. § 430.32(c).

[18] *Energy Conservation Program: Energy Conservation Standards for Residential Furnaces and Residential Central Air Conditioners and Heat Pumps*, *Direct Final Rule*, 76 FR 37407, 37446 (June 27, 2011)(rule vacated in relevant part).

[19] *Energy Conservation Program for Consumer Products: Energy Conservation Standards for Water Heaters*, *Final Rule*, 66 FR 4474, 4478 (Jan. 17, 2001).

4. Compact Products. DOE has created compact product classes for a large number of appliances, including refrigerators/refrigerator-freezers/freezers, dishwashers, clothes washers, and clothes dryers.[20] DOE has adopted such product classes because of the unique utility that compact appliances provide consumers by permitting installation of appliances in existing space-constrained environments.[21]

[20] *See* 10 C.F.R. 430.32(a), (f), (g), and (h).

[21] *See*, *e.g.*, *Energy Conservation Program: Energy Conservation Standards for Residential Clothes Dryers and Room Air Conditioners*, *Direct Final Rule*, 76 FR 22453, 22485 (April 21, 2011) ("DOE also notes that compact-size clothes dryers provide utility to consumers by allowing for installation in space-constrained environments."); *Energy Conservation Program: Energy Conservation Standards for Residential Dishwashers*, *Direct Final Rule*, 77 FR 31917, 31926 (May 30, 2012) ("compact dishwashers provide unique utility").