

Appliance Standards Awareness Project
American Council for an Energy-Efficient Economy
National Consumer Law Center
Natural Resources Defense Council
Northwest Energy Efficiency Alliance

September 10, 2012

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

**RE: Docket Number EERE-2010-BT-STD-0011 / RIN 1904-AC22: Preliminary
Technical Support Document for Furnace Fans**

Dear Ms. Edwards:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), American Council for an Energy-Efficient Economy (ACEEE), National Consumer Law Center (NCLC), Natural Resources Defense Council (NRDC), and Northwest Energy Efficiency Alliance (NEEA) on the preliminary technical support document (TSD) for furnace fans. 77 Fed. Reg. 40530 (July 10, 2012). We appreciate the opportunity to provide input to the Department.

This rulemaking to establish energy conservation standards for furnace fans represents a significant energy savings opportunity by improving the efficiency of air distribution through ductwork. In addition to providing energy savings, higher-efficiency furnace fans can also improve comfort by providing sufficient airflow throughout the home. We believe that DOE's approach in this rulemaking, including the incorporation of all modes of furnace fan operation and realistic external static pressure values, will appropriately capture furnace fan energy consumption. However, we are concerned that DOE has excluded a significant fraction of furnace fans from the scope of the preliminary analysis. We encourage DOE to include all furnace fans in this rulemaking to ensure that all types of ducted HVAC equipment provide efficient air distribution.

We encourage DOE to include furnace fans that are part of blower-coil and single-package central air conditioners and heat pumps in the scope of coverage. For the preliminary analysis, DOE excluded from the scope furnace fans that are sold as part of blower-coil and single-package central air conditioners and heat pumps.¹ DOE estimates that these two categories of furnace fans represent about 37% of total furnace fan sales.² DOE states in the preliminary TSD that the energy consumption of these furnace fans is already included in the SEER and

¹ We presume that the majority of these units are split-system heat pumps.

² Preliminary TSD. p. 3-3.

HSPF metrics.³ While SEER and HSPF do capture fan energy use to some extent, the tests are conducted using unrealistically low values for external static pressure (0.1-0.2 in. w.c.).⁴ DOE's compilation of data from a number of field studies found that the weighted-average external static pressure for units paired with an evaporator coil was 0.73 in. w.c., which is several times higher than the values used in the SEER and HSPF test procedures.⁵

Different motor types used in furnace fans respond differently to changes in external static pressure. For example, for PSC motors, both airflow and power decrease as external static pressure increases, while for constant-airflow ECMs, airflow remains relatively constant with increases in external static pressure while power increases. To provide sufficient airflow at a more realistic external static pressure with a PSC motor, a manufacturer would either need to operate the motor at a higher speed tap (if a higher speed tap is available) or move to a motor with higher horsepower. In the field, furnace fans using PSC motors often do not deliver sufficient airflow in homes with typical ducts. DOE notes in the preliminary TSD that HVAC products are typically designed to provide between 350 and 450 cfm/ton of cooling capacity.⁶ A PG&E field study of 1,000 homes found that 44% of air conditioners had low evaporator airflow (<350 cfm/ton),⁷ and a field study of 27 homes conducted by the Florida Solar Energy Center (FSEC) found that the airflow at two-thirds of the homes was less than 350 cfm/ton.⁸ Failure to deliver sufficient airflow not only affects comfort but also affects energy consumption. The FSEC study found that a 25% reduction in airflow from 400 to 300 cfm/ton reduces sensible EER, which controls cooling energy use under thermostat control, by about 10%.⁹

Since the test procedures for SEER and HSPF do not incorporate realistic external static pressures, these metrics neither adequately capture fan energy consumption nor ensure adequate airflow in the field. In addition, SEER and HSPF do not account for fan operation in constant circulation mode, which means that these metrics are not capturing furnace fan energy use in all modes of operation, as DOE has proposed to do in the furnace fan test procedure rulemaking.¹⁰ Therefore, we encourage DOE to include furnace fans that are part of blower-coil and single-package air conditioners and heat pumps in the scope of coverage.

We encourage DOE to include airflow path design as a technology option for improving furnace fan efficiency. Testing conducted by LBNL has found that the clearance between the fan housing and the air handler cabinet walls can significantly affect efficiency.¹¹ At the DOE public meeting on July 27, 2012, several manufacturers stated that DOE should include airflow path design as a technology option.¹² In addition, Rheem stated that there would be no cost

³ *Ibid.* pp. 3-2, 3-3.

⁴ Code of Federal Regulations, Chapter 10, Part 430, Subpart B, Appendix M.

⁵ Preliminary TSD. p. 7-5.

⁶ *Ibid.* p. 3-29.

⁷ Kinert, R., Proctor, J., Pernick, R. and Engle, D., 1992. "Pacific Gas and Electric Company Model Energy Communities Program," Proceedings of the 1992 Summer Study on Energy Efficiency in Buildings, American Council for an Energy Efficient Economy, Vol. 5, p. 135, Washington D.C.

⁸ Parker, D.S., J.R. Sherwin, R.A. Raustad, and D.B. Shirey. 1997. Impact of Evaporator Coil Air Flow in Residential Air Conditioning Systems. FSEC-PF-321-97.

⁹ *Ibid.*

¹⁰ 77 Fed. Reg. 28674.

¹¹ Walker, I.S. 2005. State-of-the-art in Residential and Small Commercial Air Handler Performance. LBNL 57330.

¹² Public Meeting Transcript. pp. 73-74.

associated with improving airflow path design, and Allied Air noted that improving airflow path design can be a cost-effective option for improving efficiency.¹³

We encourage DOE to consider X13-level motors applied with multi-stage furnaces as a technology option. For the preliminary analysis, DOE evaluated a candidate standard level (CSL) based on a constant-airflow ECM applied with a multi-stage furnace. However, DOE did not evaluate a CSL based on a constant-torque ECM (X13) applied with a multi-stage furnace. At the DOE public meeting on July 27, 2012, Rheem stated that they use PSC and X13 motors in addition to ECM motors in multi-stage furnaces.¹⁴ Another manufacturer's catalog lists two models of two-stage furnaces with X13 motors.¹⁵ We encourage DOE to evaluate whether an X13-level motor applied with a multi-stage furnace would yield additional electricity savings compared to an X13-level motor applied with a single-stage furnace. The proposed rule for test procedures for furnace fans stated that DOE expects that multi-stage furnaces spend most of their heating operating time in the low-heating mode.¹⁶ Therefore, we would expect that when an X13-level motor is applied with a multi-stage furnace, in heating mode the motor would mostly operate at a lower speed (corresponding to the lower burner output) for a greater number of hours compared to an X13-level motor applied with a single-stage furnace. Since motor power decreases with the cube of the speed, the net effect of operating at a lower speed for a greater number of hours could yield electricity savings.

We encourage DOE to consider an effective date three years after publication of the final rule. In the preliminary TSD, DOE states that pursuant to 42 U.S.C. 6295(m), the compliance date for any new standard for furnace fans is five years after the final rule is published.¹⁷ However, while EPCA specifies an effective date five years after publication of the final rule for other residential HVAC products including furnaces, central air conditioners and heat pumps, EPCA does not specify an effective date for furnace fans. The CSLs that DOE evaluated for the preliminary analysis are based on technologies that are already widely employed in current HVAC products—namely X13 and ECM motors. In the preliminary TSD, DOE cited a comment from Rheem that the share of ECM motors had increased from 10% to 30% within the last five years.¹⁸ DOE estimates that in the absence of standards for furnace fans, by 2018 33% of non-weatherized condensing furnaces shipped will have constant-airflow ECMs and an additional 20% will have X13-level motors.¹⁹ We encourage DOE to appropriately balance necessary manufacturer lead time with the additional energy savings associated with an earlier effective date and to consider an effective date three years after publication of the final rule.

Thank you for considering these comments.

Sincerely,

¹³ *Ibid.* pp. 73-74.

¹⁴ *Ibid.* p. 81.

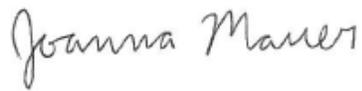
¹⁵ http://www.catalog.bryant.com/corp/details/0,2938,CLI1_DIV42_ETI7231_SIT70,00.html

¹⁶ 77 Fed. Reg. 28680.

¹⁷ Preliminary TSD, p. 8-28.

¹⁸ *Ibid.*

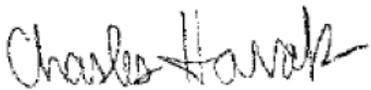
¹⁹ *Ibid.* p. 8-34.



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