**Public Meeting Notes**

**DOE, Residential Furnace Fan, Standards Rulemaking – Preliminary Technical Support Document (PTSD)**

**July 27, 2012**

**Notes Prepared by:**

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Attended: In-person

**DOE Product Manager and Key Consultants:**

DOE Product Manager – Mohammed Khan, DOE

Moderator – Doug Brookman, Public Solutions, Inc.

Lead Consultants – Sam Jasinki, Navigant; Alex Lekov, LBNL

**Participants:**

Karim Amrane, AHRI

Aniruddh Roy, AHRI

Timothy Ballo, Earth Justice

Alex Boesenberg, NEMA

Rob Boteler, Nidec Motor Corp

Adam Christensen, ASAP

Tom Eckman, Northwest Power and Conservation Council (NPPC)

Victor Franco, LBNL

Michael Ivanovich, Air Movement and Control Association International, Inc

Diane Jakobs, Rheem

Brian James, SCE

Sam Jasinski, Navigant

Paul Lin, Regal Beloit

Chris Lau, Navigant

Alex Lekov, LBNL

Joanna Mauer, ASAP

Sarah Medepalli, ICF

Craig Messmer, Unico

David Ransom, McDermott Will & Emery

Steve Rosenstock, EEI

Gregory Rosenquist, LBNL

Charlie Stephens, Northwest Energy Efficiency Alliance (NEEA)

Greg Wagner, Morrison Products

Ted Williams, American Gas Association

Dave Winningham, Allied Air Enterprises, A Lennox International Inc Company

Detlef Westphalen, Navigant

Bingyi Yu, LBNL

Abigail Daken, EPA

*Various Webinar Participants*

**Key Issues:**

* We recommend that DOE redefine what a typical furnace fan consists of. In the PTSD, DOE states:
  + “DOE considered a typical furnace fan as consisting of a fan motor and its controls, an impeller, and a housing, all of which are components of an HVAC product that includes additional components, including the cabinet.”
  + In order to reduce ambiguity we think a typical furnace fan ought to be described as: “a unit consisting of a fan motor, its controls, an impeller, shroud, and cabinet that houses all of the heat exchange material for the furnace.”
* We believe that “Non-Weatherized Heat Pump Air Handler” ought to be considered as a 10th product class for the rulemaking. In Chapter 2 of the PTSD, DOE states that it intends to include residential CAC/HP products in the scope of this rulemaking, and provides methodology for how DOE avoids double counting the energy savings in cooling mode from higher EE furnace fans used in CAC/HP that is already accounted for in the analysis of those products. As such, we would like DOE to amend Table ES.3.1 to include heat pump air handlers.
* We seek clarification on the efficiency levels for furnace fans used in hydronic air handlers, referenced in table ES.3.5. We believe that EL6 (Switching Mode Power Supply) and EL7 (Toroidal Transformer) must be paired with a premium ECM (EL5). As such, we believe that EL6 should be read as “ECM + Switching Mode Power Supply”, and EL7 should be read as “ECM + Toroidal Transformer”.
  + *This was verified at meeting*
* ES 4.1 Efficiency as a function of capacity: Amanda spoke with Iain Walker on this matter, and this is a summary of his thoughts:
  + It’s true that with larger units you will see more energy consumption, but that’s ok because you’re moving more air
  + DOE is doing the right thing with the FER metric since it measures actually efficiency; inefficient higher capacity units will be reflected in the FER metric
* ES.4.3 Inverter-Driven PSC Fan Motors: The market for inverter-driven PSC fan motors has been overtaken by brushless magnet motors. As such, we believe that inverter-driven PSC fan motors should be prohibited from being tested/sold on the U.S. market.
* ES.4.6 Higher Efficiency Fan Motor Control Costs: Controls do not have to be paired with the fan motors, although they often are integrated. Additionally, you rarely if ever see controls paired with lower energy efficiency motors.
* ES.4.7 Backward-Inclined Impellers: Amanda spoke with Iain Walker about identifying favorable/unfavorable conditions for backward inclined impellers. Below is a summary of Iain’s thoughts on this matter:
  + Their performance depends a lot on other factors, so this isn’t a cut and dry question
  + While they may be more EE over a narrow operating range, these EE gains are not necessary robust since it underperforms outside this range; they probably shouldn’t be thought of as an EE technology
  + Backward inclined propellers are also noisier
  + Forward inclined impellers (which are more universal) are less sensitive to changes in pressure
* ES.4.8 Airflow Path Design: While we realized that optimizing thermal and electrical efficiency is more difficult than optimizing just one or the other, we believe that consideration of the whole unit’s performance is necessary to maximize energy savings. We concur that the size of the cabinet and the geometry of the heat exchanger(s) would be the primary targets for improvements in airflow path design, and as such DOE should develop a methodology to account for energy differences associated with these components.
* ES.4.11 Rebound Effect on Energy Savings from Higher-Efficiency Furnace Fans: We are concerned that the study, conducted in Wisconsin, unfairly biases the rebound effect on the furnace operation since Wisconsin experiences considerably more cooling degree days than the country at large. We believe more data representative of weighted US average cooling degree days be used to better understand the rebound effect’s impact on savings.
* 10. ES.4.14 Full-Fuel-Cycle Energy Savings: As discussed on the CA IOU call, we will not be making comments at the public meeting on this topic. However, it will be useful to collect information on what DOE thinks it ought to be doing with respect to calculating full fuel cycle energy savings<insert key issues and talking points, to be completed before meeting>

**Meeting Notes**

**Opening**

**Opening remarks by interested parties**

* Rheem: Costs reported are low, FERs we obtained in lab are higher
* AHRI: Timing for this rulemaking is off, test standard should be done first before standards rule making is considered
* ASAP: DOE excluded central blower HP units. In general, we agree with PTSD, but would like to expand scope of coverage to include HP units, which make up 37% of the market for furnace fans
* EEI: Consider the impact on the whole system. There should not be such a disconnect between the furnace, furnace fan, and central ACHP rulemakings
* Allied Air: Burden by adding on more regulations could impact affordability for consumers at exponential costs. Data needed for this standard should not require a whole new test setup. Motor prices in PTSD are too low.
* Morrison: Small manufacturer gets larger burden. Motor costs are low. This brings into question the entire economic analysis.

**Market and Technology Assessment**

**DOE presented an overview of scope of coverage and product classes they are identifying for this rulemaking.**

* ASAP: While fan energy is calculated in CACHP rulemaking, ESP values are too low. High ESP in this rulemaking is important to account for energy consumption at higher ESP.
* NEEA: Blower Furnace units are sold separately and therefore should be regulated. This would help consumers make purchasing decisions if they knew the efficiency of the AHU. Clarify what DOE is actually trying to regulate: furnace fans or AHUs
* Mortek: Are larger multi-family units excluded? These could potential be used for commercial applications. (DOE said they need data to consider)
* Ingersoll-Rand: We should look at system level performance. We shouldn’t be looking at component performance.
* Ingersoll-Rand: DOE is grouping manufactured homes into key product classes but FER is lower due to lower ESP. This doesn’t make sense.
* Mortek: Too broad of product classes could exclude units that are design for applications intended for smaller markets

**Technology Options**

**DOE presented an overview of the technology options identified that will be the basis for establishing the engineering and economic analysis for the standard**

* SCE on behalf of CA IOUs: Backward impellers are only more efficient over a narrow range, less-efficient over a broad range.
* NEEA: List is woefully short if regulating an air handler.
* Morrison: Cils have grown in size and furnaces have shrunken and become less efficient. This is an example of how DOE needs to account for efficiency of the whole system.
  + Echoed by Rheem and Allied Air
* Ingersoll-Rand: Echoed backward impeller comments
* ASAP: GE study on fan housing design should help provide data
* Unico: Airflow path design should be considered
  + Echoed by multiple manufacturers, NEEA, EPA, ASAP

**Engineering Analysis**

**DOE presented information on results obtained from preliminary lab tests to determine FER. Analysis included potential FER reduction from implementing technology options. Percent reductions were ranked and placed into efficiency levels.**

* Rheem: We tested 3 units for NWG-NC furnaces and FERs for baseline were up in 400s compared to DOE’s 380 FER
* Unico: Should divide by max CFM
  + DOE: max CFM is to limit sensitivity and not penalize ECM motors for ramping up airflow
* Data in slide 36 developed based on literature and DOE testing
* SCE: Are EL6 and EL7 add-ons to EL5?
  + DOE: Yes
* Rheem: Lower IFER compared to FER may lead consumers to think they are savings money when they aren’t necessarily.
* Manufacturers: we see higher costs than what’s presented. Include all costs, including data.
  + DOE: Cost only includes fan components. More detailed costs will be developed in NOPR
* Low volume, high mix manufacturers will have a drastically different price due to lack of economies of scale
* Rheem: ISO standard showed residential FF that small diameter of wheels shows some disadvantages
* Ingersoll: Above 1200 CFM performance falls off for backward inclined fans

**Energy Use Characterization**

**To develop energy consumption savings estimates for selected product efficiency levels.**

* PSC with controls uses more Watts than baseline at higher static
* Manufacturers: Operating at high static where lines on p.74 converge is unsafe and operating in conditions where the unit wasn’t designed to operate. This is a comparison tool and we should use low ESP
* Ingersoll: Circulation mode will skew all numbers
  + Echoed by Rheem

**LCC and Payback Period Analysis**

**Manufacturers expressed concern about costs used to develop LCC analysis.**

* No installation cost because the furnace fan is installed in factory
  + This clearly means DOE is only regulating the fan and not cabinet
* Mortek: X13 will have higher failure rate and therefore longer PBP than projected

**Key Dates & Milestones**

* Comment period closes 9/10/2012
* Standard must be adopted by 12/31/2013
* Framework was held 6/18/2010

**Action Items (if any)**

* Submit data, if available, on ranges of EE operation for backwards impeller fans

**Appendix**

* Presentation Slides



* Transcript

