**Public Meeting Notes**

**DOE, Commercial Warm Air Furnace, Notice of Proposed Rulemaking**

**March 2nd, 2015**

**Notes Prepared by:**

David Jagger at Energy Solutions

djagger@energy-solution.com

(510) 482-4420 x 280

Attended: Phone/Webinar

**DOE Product Manager and Key Consultants:**

John Symbolski did the opening remarks

**Participants:**

Harvey Sachs (HS) - ACEEE

Jill Hootman (JH) – Trane

Mike Rain (MR) - Lenox

Adam Darlington (AD) - Navigant

Eric Stauf (ES) - DOE general council

Chris…

Victor Franco (VF) – LBNL

Sam – Navigant consulting

Mike Rivest (MRI) – Navigant consulting

Mike McCay (MM)

Dave Case (DC) – US DOE

Daniel Arnold (DA) – Nortek global HVAC

Mike McCabe (MMC)

Robert Whitwell (RW) – Carrier

John – DOE
Doug Kosar (DK) – GTI Engineering

Frank Stanonik (FS) – AHRI

**Key Issues:**

* Equipment Classes: Should the current standards, which are only classified as ‘gas’ or ‘oil’ fired be expanded into more categories?
	+ The potential expansion categories include the following: weatherized, non-weatherized, condensing, non-condensing, and variations with different input capacities.
		- The point being that each of these categories come with their own difficulties when trying to reach higher efficiency levels. Some categories are able to increase their efficiencies with less complications than others. Some stakeholders want these differences incorporated into the rulemakings but an even greater number of stakeholders believe that making these distinctions would not have a significant impact as the vast majority of CWAF are weatherized gas-fired units.
		- DOE notes that these product categories are set by regulatory definition. This definition notes that utility is not a legal factor and that they are focused on the variations in energy use and capacity.
* Technology Issues with Condensing CWAF: As the efficiencies slowly climb, there is a higher likelihood of acidic condensation forming within the CWAF. This condensation is caused by the exhaust gas cooling past the dew point while, causes rusting and deteriorates the components of the furnace. While the location this condensation occurs is generally consistent the condensation can form in other areas not specifically protected from rusting. The magnitude of condensation can also vary with manufacturing variability (some products may be slightly more efficient, and thus produce more acidic condensate, than others produced) and geographic location.
	+ There are many potential solutions to this issue but they can be costly, such as adding a second heat exchanged made from stainless steel, and not always 100% effective.
	+ There are questions regarding how riding this threshold will effective maintenance requirements and the lifetime of CWAFs.
	+ DOE notes that there are currently CWAFs on the market that reach the 90% thermal efficiency levels without major issues. The technology is viable and should be attainable.
* Electricity Usage: Will the overall electricity usage/emissions increase or decrease with this rulemaking?
	+ By increasing the efficiency to areas where condensing becomes a concern, more powerful equipment will need to be used in order to maintain appropriate working order of the CWAF.
	+ This increase in electricity usage is counteracted with the DOE assumption that the yearly operating hours will decrease based upon the increase in efficiency. I.e. the same input will result in a higher output with these new standards, and thus the desired temperature will be reached in less time.

**Meeting Notes**

**Purpose: Present results of the proposal**

**Market and Technology Assessment**

**What is the current view of the market with respect to the proposed thermal efficiency standards and should the categories for CWAFs be expanded?**

* Adam Darlington (AD) - The market is primarily gas-fired units that are packaged with a commercial air conditioner system installed outdoors on rooftops, ~95% of the market.
	+ Oil fired, much smaller market share, are not generally packaged with air conditioners, and are non-weatherized.
* Mike Rain (MR) - Makeup air units are the models that reach the 90 and 92% efficiency levels as most other units are within the 80-82% thermal efficiency range.
	+ Harvey Sachs (HS) – Are the makeup air units different enough to warrant a separate category?
		- AD – Would be better to check in with some manufacturers.
		- Jill Hootman (JH) – Gas and makeup air units can be tested the same. However, the design for their applications are not the same: fans, cabinet size, and strength (among other items) are considered differently.
		- JH – What does DOE define as different classes. They are designed differently but in whose eyes are they different.
		- AD – Regulatory level sets different classes using the following factors: Different energy uses, capacity related features. Utility isn’t a legal factor.
		- HS – Should condensing units be considered for a 2nd class. Strongly advocating to look into different product classes based on utility.
		- JH – She supports HS, the condensing units definitely have a different use and this should be looked into. Makeup air units aren’t about providing comfort, it’s about getting neutral air conditioning while other units helps create comfort. However, the designing of the heat exchanger is pretty much the same.
		- Daniel Arnold (DA) – Company makes and builds make-up air units. He would advocate keeping them in the same product class. Same testing procedure. Tech is similar to standard CWAF.

**Screening Analysis**

**Reviewing the technology that passed screening criteria and were examined for use in increasing the thermal efficiency of CWAF.**

* HS – Wanted to see a more comprehensive efficiency metric come through with this round of rulemaking.
	+ JH – Most heaters are used in the morning and then they aren’t on again. Internal load takes over after that.
	+ HS – Good point to JH, but still should be on the bucket list for review and hopeful incorporation on the next round of rulemaking.
* Mike McCabe (MMC) – Can the non-make up air units reach the 90-92% area with the technologies chosen?
	+ DOE - yes
	+ JH – She would agree that that they could probably be made but difficult to deal with the caustic condensate. The main issue with the installation of these devices and dealing with the caustic condensate. This issue gets even more difficult for very large CWAF as the size continues to grow and the demand on the equipment is higher.
	+ MMC – The CWAF must be physically larger to incorporate the 2nd heat exchanger and cabinet space. It can get hard to delivery and transport these devices because of the added size that comes with these efficiency increases.
	+ JH – A lot of the businesses (~60%) is in replacement of CWAF. So they are not easily replaced when the size has to change. The rooftop units are usually mounted on a platform and when a bigger unit is introduced the retrofit may involve the adaption or newly installed platforms to fit the bigger CWAF.
* Robert Whitwell (RW) – The 2nd heat exchanger would require an increase in fan size/power which would run year round, not just with the heater. This is something that needs to be considered for energy usage as well.

**Engineering analysis, cost, and requirements to achieve new thermal efficiency standards**

* AD – DOE estimates that a 10% increase in the heat exchanger size would result in a 1% increase in thermal efficiency.
	+ RW - The cost increase for efficiency levels is based on experiments done on a 225,000 Btu/hr unit. How did they, or did they, scale up these tests to the increase in costs associated with a higher input unit, say a 2 million Btu/hr CWAF.
	+ AD – No higher ranges were used but if stakeholders can give their inputs DOE will considered another capacity size to evaluate.
		- Jon from DOE – What is the capacity sizes of the market that should be used for another representative unit? 1 Million…2 Million….. DOE request stakeholder comments on this topic.
		- Doug Kosar (DK) – In his experience once the CWAF input size starts to get above 400,000 Btu/hr a 2nd furnace may be necessary and this can have a big influence on cost when increasing the efficiency. This may be an input size that needs evaluation.
* JH – We can assume that 82% thermal efficiency is a condensing unit. In which case heavy grade aluminum or stainless steel heat exchangers will need to be designed and built.
	+ MR – Agrees with JH but believes everyone will manufacture out of stainless and not aluminum. CWAFs in the 80-82% range start to have some areas that condense and this can vary depending on your location within the United States.
		- AD – What portion of the country or general region is hit with this condensing on these lower efficiency levels? DOE requests comment on this topic.
	+ RW – There is going to be some increase in fan size and fan usage with an increase in heat exchanger size as well, the analysis needs to be sure to account for this increase.

**Energy Use Analysis**

**Energy use characterization**

* Victor Franco (VF) – To attempt to project energy use going forward the CBECS 2003/RECS 2009 (commercial building energy consumption survey and residential energy consumption survey respectively) were used. It is worth noting that the current average MMBtu/yr noted in this documents is lower than that projected for 2018. The reason being that DOE is attempting to project building efficiencies, regional differences, and global warming into the future. These are very lose projections as they are made with a 15 year difference from data to projected year.
	+ JH – Recommends doing analysis on another baseline case on something besides 225,000 Btu/hr. They will recommend a new size.
	+ VF – Will assign a different building size, based upon recommendations, and perform an analysis, not just scale up the current review.
	+ MR – Does the energy use analysis the use of a variable frequency drive? E.g. for the fans to decrease energy use while still maintaining operation?
		- DOE – Not specifically, but it will be addressed after this comment.
* DK – Commenting on the level of auxiliary component electricity usage noted on the DOE presentation: they saw additional kWh/yr in auxiliary components in the field. DOE should look at these standards again.
* RW – With reference to the noted energy savings by adopting these new standards: where does the electrical savings come from?
	+ VF – Offset between savings with reduced operating hours (assuming a fixed input capacity so the same input gives you more output with the higher efficiency level) and the increased cooling and heating factors (secondary heat exchanger and increased fan usage/power).

**Life Cycle Costs and Payback Period Analysis**

**Methodology analysis – maintenance and repair costs were at issue.**

* MMC – Did DOE consider different cost models for replacement or new installation
	+ VF – Yes we did and found no significant difference.
* Frank Stanonik (FS) – What about maintenance costs for the increase in efficiency levels? Due to, at a minimum, occasional condensation the maintenance costs would be expected to increase.
	+ DOE requests specific comments on this topic. I.e. if this is regionally or what exact location might have bigger impacts on maintenance due to condensation.

**Methodology results**

* DOE would like more comments regarding any compliance date issues and how it may line up coinciding rulemaking, such as with air-conditioning units and fans/blowers.
* The CWAF units tested by DOE varied in their reported efficiency levels versus how they performed in the lab. This happened in both directions, where some lab tests had higher and some lower resulting thermal efficiencies then reported. If some of the 82% efficiency levels reach 84% levels there will be more condensate issues. As has been previously mentioned this can happen more often in certain areas of the US. Companies aren’t necessarily tracking where these outliers in manufacturing (which deviate from the predicted thermal efficiency) are being shipping. If these higher efficiency outliers are installed in locations that are conducive to high condensate then there will be big maintenance issues.

**National Impact Analysis**

**A review of the national energy savings and net present value calculations.**

* MMC – EIA uses rebound effect for their commercial heating and cooling estimations but rebound effect is not used in this analysis. Should EIA drop it or should it be added into this analysis?
	+ John at DOE (former EIA modeler) – He worked on the residential side, not commercial, but believes there is some rebound effect, and not necessarily a negative rebound. He wouldn’t say for certain to what extend but he made it sound like it wasn’t significant.
* FS – Comparing energy savings he commented about the fact that moving from 80 to 81% efficiency produces x savings, but moving from 81 to 82% produces <2x savings. What is the reason for this?
	+ VF – When considering the market you have to consider all of the existing units that are already at 81% which would not have any savings when moving from 80 to 81%. While moving to 82% there would be savings from more equipment.

**Manufacturer Impact Analysis**

**What is the potential impact on manufacturers, manufacturer subgroups, and employment?**

* JH – It is hard to capture just the costs of the furnace as other components of the full device will have to change – e.g. changing heat exchanger and size of cabinets fan – which is followed by qualification testing which can take 6-8 weeks and then cycle testing for heat exchanger testing which can take up to 2 years. The estimated impact cost on manufacturers is low in her mind.
* Mike Revest (MRI) – Regulatory burden based upon manufacturers based upon other regulations going on at the same time (such as air conditioning units). Hard to quantify dollar values as the regulations continue to contain more of the market share. As with CWAF when air conditioners are currently in the rulemaking process as well. There are only so many engineering hours, testing facilities available to test these products and thus the time frame, at a minimum, gets pushed out. Not to mention the economic impact.
	+ HS – We need to work better to synchronize the regulations reviewing period to be able to better redesign and redevelop products that are covered under multiple categories.

**Key Dates & Milestones**

* Comment period closes April 6th, 2015 at 11:59pm EDT

**Appendix**

* <Add presentation slides and transcript, when available. Please do not include links to documents, as URLs can change.>