



**ClearStak, LLC**

**Parts I-III**

**Comments**

**on the**

**ENVIRONMENTAL PROTECTION AGENCY**

**40 CFR Part 60**

**[EPA-HQ-OAR-2009-0734; FRL-9904-05-OAR]**

**RIN 2060-AP93**

**Standards of Performance for New Residential Wood  
Heaters, New Residential**

**Hydronic Heaters and Forced-Air Furnaces, and New  
Residential Masonry Heaters**

**AGENCY: Environmental**

## **About ClearStak LLC**

ClearStak is a private company located in Woodstock, CT. We were founded in 2010 focusing on the reduction of biomass emissions. We have developed several patent pending control technologies to reduce emissions while improving of combustion efficiency and thermal efficiency for heat, power and biochar clients.

We are members the EPA Hydronic Heater Program (HHP), the EPA Combined Heat and Power (CHP) program, the Biomass Thermal Executive Council (BTEC), The Pennsylvania Biomass Association (PBA), The Catalytic Hearth Coalition (CHC), the Connecticut Industry and Business Association (CBIA) and the Connecticut Farm Bureau Association (CFBA).

## **Introduction**

ClearStak has reviewed the proposed rule posted 3 January 2014 and has prepared comments to meet the objectives of the rule to reflect best systems of emissions reduction, eliminate exemptions, strengthen the test methods and streamline the certification process. We have prepared our comments in three parts to reflect what we support, what we would like changed, and what we would like to add to the rule. Before we begin, it is important to understand how we at ClearStak view the future and in what context our comments are being presented.

## **View of the Future**

ClearStak views the future as primarily being driven by environmental stewardship, economics, and technology. Energy demand is slowing down but the cost to produce it is rising. A concern over sustainability and the environment is growing. New products are emerging to meet these needs and provide clean, thermal biomass energy, electricity, water and biochar. ClearStak believes that the proposed rule helps fill the gap to catch residential emissions up to the present but does not look ahead very far to what is happening with hybrid units, feedstock expansion and technology advances.

### **Electricity (mCHP)**

ClearStak has worked with a micro-CHP system in India and in the U.S. and suggests that during the period of this proposed rule residential furnaces and heaters will have hybrid options to generate electricity to power the unit, making it self-sustaining. Surplus electrical power in small heaters will charge cell phones, operate emergency radios, and provide light. Larger heaters and furnaces will power emergency facilities and charge electric vehicles. The proposed rule considers heat output and does not consider integrated electric generation. ClearStak proposes that the EPA strengthen the test method by measuring emissions as a percent of feedstock input (g/kg) to prepare for this change.

### **Solar Thermal**

The quick economic payback of solar thermal systems and the growing use of non-integrated water storage for hydronic heating have the potential to expand quickly to become a more popular hybrid solution as energy costs continue to rise to. The current rule considers heat output as an emissions variable. If a heater is equipped with a solar thermal panel will this be a valid reduction in the emissions output for hydronic heaters? ClearStak proposes that the EPA strengthen the test method by measuring emissions as a percent of feedstock input (g/kg) to prepare for this change.

### **Feedstock Expansion**

The increasing cost of traditional feedstock such as timber and sawdust, combined with rising transportation costs due to diesel fuel prices will expand traditional residential feedstock to include wood chips, wood shavings, invasive plants, livestock bedding, cherry pits, grasses and rice hulls. The proposed rule is limited in feedstock to cord wood and wood pellets. Concerns over organic chemicals such as cyanide and arsenic should be measured and regulated if harmful to the public. ClearStak proposes that the EPA does not go far enough to eliminate exemptions and should add an emissions ceiling that will provide a foundation for testing and approving the expansion of feedstock.

### **Biochar (CHaB)**

The production of biochar is growing rapidly in response to a reduction in the use of pesticides, water conservation, erosion control and organic farming. Heaters are

now in production from several manufacturers that produce biochar and use the thermal output to dry feedstock or heat buildings such as greenhouses. ClearStak proposes that the EPA strengthen the test method by measuring emissions as a percentage of feedstock input (g/kg), including biochar feedstock as an output.

### **Thermal Energy as Waste Heat**

Future generations of heaters and furnaces in residential thermal heating will change from being a primary output, to using waste heat from the generation of products such as electricity and biochar. Output measured in Btu's or Mega Joules (MJ) will not be as relevant as electrical output in cents/kw or adsorption for measuring the quality of biochar, which will become the primary objectives for efficiency and production. ClearStak proposes that the EPA strengthen the test method by measuring emissions as a percent of feedstock input (g/kg) to prepare for this change.

### **Improved Sensor and Data Acquisition Technology**

Sensor technology continues to improve with most sensors available with wireless communication. Traditional continuous emissions monitoring systems use sensor technology to manage combustion efficiency and thermal efficiency. Many new water flow meters provide integrated digital temperature output. Some component manufacturers have integrated this technology into their controls and variable pump technology. Sensors to monitor gases such as oxygen and carbon monoxide continue to become more advanced and lower cost. ClearStak proposes that the EPA supports the use of updated digital and analog technology to strengthen the test methods and monitoring of data.

### **Variable Controls**

Technology is a driver in the ability of a heating appliance to produce products such as electricity. Variability in the management of fuel, oxygen and water flow are essential to maintain quality and consistent power output. New control systems are managing combustion and thermal parameters several times each second while the test method allows large interval recording of variables. ClearStak proposes that the EPA supports the use of updated digital and analog technology to strengthen the test methods and monitoring of data.

## Wireless Operation

Many heaters and furnaces have a wireless data option. This option can be used to transmit data from the appliance directly to a website where operational data and diagnostics can be analyzed. When heater or furnace test data is reviewed by the EPA there are only a few units that have been operated and none that have been sold. As data is collected over the life of the heater, changes to the controls to improve efficiency and safety can be made to the biomass controller to reduce emissions. While the rule outlines how to handle structural changes to the heater it does not address the ability of the manufacturer to update the controls to improve performance, diagnostics and safety. ClearStak proposes that the EPA allow and encourage manufactures to continue to improve performance and provide a streamlined process where these changes can be made electronically and added to the certification process without having to retest the appliance.

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## Comments Part I

ClearStak submitted Part I comments to the EPA which can be found at the following link:

<http://www.regulations.gov>

Then search for document **EPA-HQ-OAR-2009-0734-0541**

The following rule comments are for the EPA-HQ-OAR-2009-0734; FRL-9904-05-OAR Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces, and New Residential Masonry Heaters. The version reviewed was published 1/3/2014 and was replaced by an official version on February 3, 2014. Our comments will reference the page numbers from both the January 3 document and the February 3 document in the following format, (p.8/p.6331), where the first page number references the January 3 document, and the second page number references the February 3 document.

Comments will be organized by section, and alternative and substitute language will be suggested for consideration.

## Supplementary Information

### I. General Information

ClearStak supports the addition of the two new subparts. (40 CFR part 60, subparts QQQQ and RRRR). (p. 8/p. 6331)

ClearStak would suggest that objectives for the proposed changes should also include; simplification of the test method and support for technology. (p. 8/p. 6331)

ClearStak would suggest that the proposal does include requirements for wood-burning appliances already in use. (p. 8/p. 6331)

ClearStak would suggest that NSPS be extended to include light commercial and agriculture up to 1 million Btu's. Is a home-based business exempt from this rule? (p. 11/p. 6332)

### Section A

ClearStak would support the EPA developing additional NSPS to regulate heating devices that burn fuels other than, or in addition to, stick wood or

wood pellets, e.g., wood chips, coal, corn or grass pellets (such as switch grass or miscanthus pellets). (p.20/p.6335)

### **Section C**

ClearStak has worked with several pollution control technologies including catalysts. Several new designs of heaters and furnaces incorporate catalysts into their design and use the heat provided by the catalyst to increase combustion and thermal efficiency. We have seen stainless steel catalysts that have controlled emissions for hundreds of cords of wood. We have catalysts that have been on our shelf for over eight years and have not noticed any deterioration. We have only seen catalysts deteriorate through thermal aging or burning of prohibited fuels (masking). This deterioration is not possible in a well-engineered system and when users follow EPA fuel guidelines. ClearStak would suggest that time is not a factor in catalyst deterioration and that this language be deleted. (p.24/p.6335)

### **Section D**

ClearStak would request that in addition to CSA B415, heater/furnace thermal output should not exceed stoichiometric calculations for fuel and air input. (p.29/p.6335)

### **Section E**

#### **Why is residential wood smoke a concern?**

For all the reasons given on the impact of health and air quality concerns in this section, ClearStak suggest this rule also address the increasing particle pollution from existing appliances. Efforts by some groups are banning the newer, cleaner technology and grandfathering the old, high particulate units. This seems to be backwards. (p. 29-35/p. 6337-6338)

ClearStak would suggest that the EPA adopt the action examples mentioned such as the State of Washington, Washoe County (NV), and the Township of Mammoth Lakes (CA) which require removal of units when a home is sold. (p. 33/p.6338)

## **III. Summary of Proposed Residential Wood Heater Appliance Amendments**

### **Section A. Room Heater**

ClearStak suggests that as the emission limits increase, room heater fireboxes will become smaller to meet the requirement. (p.36/p.6338)

ClearStak suggests that if multiple room heaters are installed in a building the emissions impact can be greater than a central heater. Does a benefit analysis exist for these tradeoffs? (p.37/p.6338)

ClearStak would suggest that the states be allowed to manage the length of the transition since each area has different variables, such as availability of stock, of wood, etc. Actions may be considered a zoning action based on population density (p.38/p.6339)

ClearStak would suggest that in parts (b) the phrase “at retail” be deleted. (p. 38-39/p.6339)

ClearStak supports the Alternative Approach. (p.40/p.6339)

ClearStak would request that the EPA consider requiring catalyst replacement based on composition and use. Catalysts are not all equal as they can be made from different substrate materials such as ceramic or stainless steel, and with different amounts of noble metals. It is very easy to determine if the catalyst is working using a temperature probe above the catalyst. Several heaters and furnaces will not work if the catalyst fails. (p.41/p.6340)

ClearStak would suggest using a stoichiometric calculator that could be added to the EPA’s Burnwise web site to help measure theoretical efficiency. Heaters should not be rated over what is theoretically possible. We would also ask that the suggested Btu rating disclose how many times the unit would need to be refueled to deliver the suggested output in 24 hours. A consumer-sizing tool would also be helpful to determine the impact of wood species and density on firebox size and frequency of loading as the rule moves to cord wood. We have found that consumer education needs to be part of the rule since improper sizing is a large contributor to higher emissions. (p.41, 46/p.6340, 6341)

ClearStak has seen that wood geometry can have a big impact in emission performance. Larger pieces of cord wood will need less oxygen than smaller pieces. Moving from cribs to cord wood will also increase the amount of ash content. Does sufficient data exist to make the move to cord wood under the current method or should alternative methods be considered? Older

cordwood methods use kindling where some newer heaters have propane ignition. (p. 41-42/p.6340)

ClearStak supports the requirement for CO monitors as a critical safety component for consumers. ClearStak recommends the requirement of a CO monitor for enclosed/indoor units. (p. 42/p.6340)

ClearStak supports a voluntary labeling program for the cleanest of clean. (p.46/p.6341)

ClearStak has spoken with many manufacturers that must design heaters and furnaces to pass the emissions test, but often cannot pass and meet consumer needs. This leads to exaggerated claims, improper sizing, more frequent loading, and poor performance. The EPA should consider the effect of the emission limits and the impact on consumer operational performance. A 24 hour emissions limit may be a better measure of performance and encourage less frequent loading and longer runs. The current test method rewards hot and fast burning and punishes long runs. The short runs have higher Btu's and therefore better lb/MMBtu numbers. The longer runs have lower peak Btu's even though both may have the same fuel input. ClearStak suggests that emissions/fuel input is more meaningful than emissions/Btu output. Btu output and efficiency numbers have not been very reliable but input numbers are easier to substantiate. (p.46/p.6341)

ClearStak suggests that Phase 2 heaters and Phase 2 furnaces are engineered to operate with a stack height 15' from the ground as in the Method 28 test specification. Some states have been concerned about emissions from unqualified heaters and furnaces and have regulated to increase stack heights as a result. ClearStak would suggest that Step 2 units not be subject to increases in stack height because it causes the creation of increased (faster rate) drafts, decreased efficiency and higher emissions performance. In some U.S. climates where temperatures are often below freezing for long periods of time, the heaters will have problems with condensation and moisture freezing in the exhaust or traveling back into the heater causing corrosion. (p.47/p.6341)

ClearStak suggests that the stick wood moisture definition and requirement for testing is not representative of wood aged one year in a covered shed found in many parts of the U.S. ASTM method E2817-11 calls for stick wood

with a moisture level between 18% and 28%. It is sometimes challenging to find fuel that meets the requirement and we would request that the moisture levels be increased to be more representative of actual fuel. Moisture levels also have an effect on visible emissions since the release of water vapor and the release of hydrogen can often appear to look like smoke. ClearStak would suggest that as condensing technology improves this will not be a long-term concern. (p.47/p.6341)

ClearStak supports the simplification of the EPA audit testing programs. (p.48/p.6341)

ClearStak supports that changes should be made to improve the reproducibility and repeatability of the test procedures. (p.48/p.6341)

ClearStak suggests that the various categories of burn rates should be based on an 8, a 12 and a 16 hour burn because the goal of building a heater or furnace should be based on providing heat to customers while they sleep and work as well as while they are present. This information is based on experience with customers that ClearStak has had. Customers turn down the stoves when they go to sleep or leave for work because the firebox is usually too small to provide heat until they wake or return home from work. Therefore, when folks wake up or return from work their stove is almost out and they must reload which causes problems with emissions typically at 6 am and 6 pm. To break this cycle of loading frequency the stove needs to be able to burn steady with low emissions until the user returns. Supporting data should be evident from the particulate levels in SIP areas. We should try to fix this problem. Our experience supports that ideally a heater should have an 8 and a 12 hour setting to produce the lowest emissions with the most heat. (p.51/p.6342)

ClearStak does not support the tighter specifications on test fuel moisture content and, according to experience, suggests that the top end should be higher to allow for a more reproducible test. The current specification is hard to meet and this will make it more unrealistic. (p. 53/p.6343)

ClearStak does not support tightening of fuel and water flow to +/- 1 percent. In small fireboxes with low flow we should round to +/- 1 lb and +/- 0.1 gallons. Measurement to a fraction of a pound and flow measurement to a one hundredth of a gallon will be hard to reproduce. (p.53/p.6342)

ClearStak supports the moisture level for stick wood between 18 and 28%. All methods to test fuel moisture are fairly crude. Future testing of individual large pieces of cordwood (8" diameter or greater) will be difficult and will pose very difficult to reproduce. Even wood from the same tree can vary in density and moisture. Will future condensing technology remove the concerns over fuel moisture? How will this impact the test method? ClearStak suggests that the EPA picks a number, such as 22%, to assign for the moisture.

ClearStak would like to know more on the cordwood method in areas such as the proposed selection of the wood, % of fuel with bark, center split allowed, geometry guidelines, changes in ash content (how this affects coals), old growth vs. new growth, etc.

ClearStak would suggest that if wood moisture is a concern that the wood moisture levels accepted would be representative of what is found in the states.

The 1988 NSPS definition of a "wood heater" is an exclusion of heaters that have a minimum burn rate greater than 5 kg/hr or 11.023 lbs/hr. The current NSPS limit for these wood heaters are 7.5 g/hr (non-catalytic) and 4.1 g/hr (catalytic) ClearStak would support that the residential central heaters are defined as having a category IV burn rate over 5kg/hr (11 lb) and less than 20kg/hr (44lb) where particulate emissions are limited to an average of 2.5 g/hr for every 5kg/hr of input so that the standard across all wood heaters would be the same. ClearStak suggests that if the limit is not tied to the g/hr emissions by input/hr burned across heaters, then fireboxes will become smaller over time to meet the cap limits and consumers will be commonly purchasing several smaller heaters, which will circumvent the purpose of the rule in reducing emissions. (1.a, p.99/p.6354)

ClearStak supports the 1.3 g/hr limit as part of Step 3 suggested by this proposal (p.101/p.6355). ClearStak suggests that current technology available to the industry will improve within the next 8 years and will allow manufacturers to achieve this limit within the 8 years, also given that 27 of the current adjustable wood heater models already meet this standard, ClearStak finds that the 1.3 g/hr limit is a plausible limit for 8 years out, and allows manufacturers time to achieve the limit if they have not already done so. ClearStak has found that the cost of the technology will be reduced within the 8 year limit.

ClearStak has found that lower burn rates will be very hard to manage, and will drive the manufacturers to develop units with smaller fireboxes (p.186/p.6375).

This standard will drive manufacturers to build units that are smaller in order to comply with the g/hr limits and lower burn rates. This will drive consumers to install multiple units to heat their residence as opposed to one unit that can meet their need.

ClearStak suggests that the EPA consider the difference in measuring efficiency between indoor and outdoor units under the current Method 28 which is used. Radiant heat loss in an indoor unit is measured as used heat applied to the space in which it is heating, while it would be considered lost heat in an outdoor unit. This puts the outdoor units at a disadvantage and causes confusion to consumers. The same unit can have two different efficiency ratings based on whether or not it is an indoor or outdoor unit. A higher efficiency rating allows for a high output in emissions because the current methods are measured as lb/MMBtu output. This encourages units to become indoor units with a higher rated efficiency in order to meet an emissions limit (p.117/ p.6359).

#### **Single Burn Rate Wood Heaters**

ClearStak supports that single burn rate wood heaters have to meet the proposed emission limits as well (p.110/p.6357)

#### **Section B. Central Heaters: Hydronic Heaters and Forced-Air Heaters**

ClearStak would encourage the EPA to add a change out requirement to this Federal rule. (p.56/p.6343)

ClearStak would suggest that the EPA should set the Step 2 limits in 3-5 years as the test methods are proven and more data is gathered. At this time a CO limit could also be established. (p.56/p.6343)

ClearStak supports the three-step approach for hydronic and forced air heaters. (p.56/p.6343)

ClearStak supports the requirement for the collection and reporting of CO emissions. (p. 57/p.6343)

ClearStak has found that a sufficient inclusive method exists for the calculation of efficiency across the various designs of indoor and outdoor central heaters. More research and validation needs to be done to establish a credible metric that both the states and consumers can use for sizing. The expected growth of micro combined

heat and power (mCHP), combined heat and biochar (CHaB) and condensing technology will make the current methods obsolete.

ClearStak would suggest that the states regulate limits on visible emissions. (p. 57/p.6343)

ClearStak would suggest that the states regulate and define their heating season. (p. 57/p.6343)

ClearStak would suggest that all non-step two central heaters should be off between April 1<sup>st</sup> and October 1<sup>st</sup>. (p.57/p.6343)

#### **Table 5**

ClearStak would suggest that the particulate emissions limits should be based on MMBtu of input and capped at 0.32lbs/MMBtu. (p. 58 Table 5 and 6/p. 6344 Table 5 and 6)

#### **Table 6**

ClearStak would suggest the proposed Forced- Air Furnace Particulate Matter Emission Limits should be based on input MMBtu's. We have not seen residential test method data to support emissions based on MMBtu output for all the different types of forced air models. (Table 6. Page 58/Page 6344)

ClearStak would suggest that it will be difficult for the EPA and states to determine units sold to a residence vs. non-residence. (p.59/p.6344)

It is ClearStak's experience that PFI certified pellets can vary in quality, composition and geometry which can affect the fuel/air mixture and pounds per hour of fuel auger feeding and Btu output. PFI also has different grade classification of pellets including Premium, Standard and Utility. Will the manufacturer be required to specify the grade of pellet to be used in their appliance and will the warranty be void if a lower grade is chosen?

ClearStak suggests that torrefied biomass pellets should be permitted as a viable clean fuel.

What is the suggested method for manufacturers that include a mixing or buffer tank, partial heat storage or non-integrated water tank as a bundle with the heater because the storage unit will not handle the full load (or less than 60%) of fuel? What if the unit is sold with an integrated solar thermal? (p.62/p.6345)

## **Section 1**

ClearStak does not suggest testing units with return water temperatures below 150F is best practice; it should not be suggested to consumers as a viable operating range. ClearStak would support that a thermal valve should be used to achieve best practices. ClearStak would suggest that increasing water flow can achieve the same amount of Btu's as widening the delta T. Therefore testing at 120F should not be recommended. (p.64/p.6345)

## **Section 2**

ClearStak has used digital flow meters that also provide water temperature as an integrated solution. If they are properly calibrated they should be allowed to be used to calculate the delta T. ClearStak has also witnessed as much as a 40% change in flow rates between the inlet and outlet based on the spread of the delta T with the cooler water running at a higher rate. (p.64/p.6345)

## **Section 3**

ClearStak can record sensor data, such as temperature, in sub-second intervals. If a test suite was to last over 50 hours these files can start to be very large. What is the maximum data file or time interval that should be submitted with the report? (p.65/p.6345)

## **Section 4**

ClearStak has found that cord wood fuel moisture testing will be difficult in large pieces. Selecting large pieces +/- 1.0 lb may not be reasonable or reproducible and heating them in an oven for 24 hours will add a day to the test and more expense with an uncertain benefit. We would propose that a default moisture level, such as 22%, be added to the method since we have not normally seen oak at <18%. (Section 4, p.66/p.6345)

## **Section 5**

ClearStak would suggest that many flow meters can also accurately measure the water temperature (p.67/p.6346)

## **Section 6**

ClearStak has found that equipment such as variable speed pumps, variable speed blowers and variable speed feed augers may affect the accuracy of 10 minute reading calculations and they can be programmatically controlled to ensure a favorable value at the 10 minute reading. What frequency granularity is appropriate to ensure the integrity of the results? (Section 6.b., p.67/p.6346)

## **Section 7**

ClearStak would suggest that manufacturers' operation instructions for cord wood

loading will favor larger pieces of fuel or smaller loads to balance the fuel/air mixture. Load density, bark content and fuel surface area will vary performance widely between furnace design and human operations. The introduction of cord wood will make the testing more realistic but it will also increase the needed skill and experience level of the test operator to ensure the cleanest burn. How will this level of expertise be transferred to the consumer to ensure equal performance? Is the long term objective to make a smarter heater, a skilled tester, or an educated consumer? ClearStak would favor a smarter heater. The role of technology is not clear in the future direction of the rule. (p.68/p.6346)

ClearStak has found that an aquastat for a controller will be able to meet the new rule. Many new biomass controllers enable the user to change the settings through a dedicated or wireless user interface. Some control technologies, such as NEST, will learn and adjust settings through learning algorithms. ClearStak has biomass controllers that will adjust fuel, air, and pump controls automatically for many parameters including delta T, oxygen, and B415 variables. The ClearStak controls do not stay the same for all burn categories. ClearStak suggests that the ability to change settings for burn categories is BSER and that the requirement for settings to be the same in Section 10 should be modified to support best practices to achieve the lowest emissions. (p. 68/p. 6346)

### **Section 8**

ClearStak suggests that a real time field emissions test method that measures cold or warm start up emissions and emission peak is viable through several inexpensive “suitcase” in-stack testing devices. These devices are very popular in Europe and can help regulators to better quantify field output. Devices from different manufacturers do not operate the same and results will be different. ClearStak has begun using these testing devices for R&D on hydronic heaters and forced air furnaces over 300,000 Btus. (p. 69/p. 6346)

### **Section 9.**

ClearStak proposes measuring in g/kg INPUT for central heaters. ClearStak understands that wood-burning central heaters which are combined heat and power units, and units which also make biochar, fall under the definition of central heaters which heat entire residences, as outlined in this document (pg. 113/pg. 6358).

ClearStak suggests that within 5 years, these types of units will be a common type for heating residences. Under the current method, the efficiency of central heaters is determined based on heat loss out of the stack (CSA

B415-1.10). In a combined heat and power unit, the heat loss out of the stack is captured to create electricity. In a unit producing biochar, the combustion process is not complete in order to create biochar (output), causing more heat loss out of the stack. Biochar output can be up to 25% of the feedstock, and there's no current way, as part of Method 28, to compensate electrical energy output or biochar output, as a credit towards the emissions limits. Current CHP systems that have the Btu output that fall into the NSPS guidelines would be at a disadvantage. We would like a consideration to make it equal, specifically for areas like New England where power is frequently lost. In these areas, CHP is a very attractive option.

Solar thermal input is also neglected through the method, and ClearStak recommends that a credit would be given to take into account this solar thermal input.

ClearStak recommends that emissions are looked at as a factor of biomass in because there are so many other inputs that can be added such as solar thermal, and there are so many outputs, such as biochar, that will decrease the measured output. The EPA needs to pick a method that will be fair to all, and at this time it should be based on input, and the thermal output should be kept separate from the emissions.

For example, a manufacturer could add a solar thermal panel to their unit, utilizing their water storage, and claim high output efficiency, yet a manufacturer that added a capability for electrical output would have potentially very low thermal output.

### C. Masonry Heaters

ClearStak has found that the traditional European method for testing masonry heaters is based on grams of emissions/kilograms of fuel **input**. ClearStak supports emission limits for all devices based on **input** in MMBtu's. ClearStak has found that the calculation of MMBtu output across hydronic, forced air and masonry heaters is not beneficial and sometimes misleading to consumers and architects. The **input** measurement would be similar to the automotive Miles per Gallon (MPG) rating and measures combustion efficiency, while the output heat transfer rating is similar to a performance time from zero to sixty, which in heaters, is similar to thermal efficiency. New Source Performance Standards for other industries and fuels are based on **input**. As manufacturers combine other technologies such as solar thermal and power generation into heaters it will be harder to continue to combine these metrics without a large chart of heat loss credits and allowances. ClearStak suggests that in the long term input MMBtu's and output MMBtu's should be separated to assist consumers and architects to more easily size and better estimate operating expense. (p.70/p.6347)

ClearStak supports the 0.32 lb/MMBtu heat output Step 1 limit for masonry heaters (p. 126/p. 6361).

## **ClearStak Comments Part II**

ClearStak presented part II of their comments verbally and via PowerPoint at the public EPA hearing on February 26, 2014 in Boston, MA. ClearStak submitted Part I comments to the EPA which can be found at the following link:

<http://www.regulations.gov>

Then search for document: **EPA-HQ-OAR-2009-0734-0576**

## **ClearStak Comments Part III**

### **Section D. Adoption of BSER**

ClearStak does not support the retesting of units that do not meet the proposed Step 1 4.5 g/hr upon promulgation of the rule (p.108/p. 6356). ClearStak suggests acknowledging the 5 year certification given to the units upon Phase 2 certification, after which manufacturers will have to re-test. Given the new proposed emission limits and timeline of the step 2 and step 3 emission limits, ClearStak suggests that it is too large a financial burden to require the manufacturers to retest after already investing and achieving the Phase 2 certification, while also already preparing to meet a Step 2 standard within 3 or 5 years.

ClearStak proposes that every certification be good for 5 years, regardless of when the next limit goes into effect in order to allow manufacturers time to develop another unit and to accumulate savings for the next round of testing.

ClearStak supports the use of devices such as catalysts, cyclones, electrostatic precipitators, and bag houses to reduce organic and inorganic particulate emissions, and CO, and suggests that innovative manufacturers that integrate these devices should not be discouraged by having to meet higher standards than manufacturers that choose not to use a pollution control device. The long-term goal of the rule should be to encourage innovation, which we anticipate will be needed to pass future limits. (pg. 104/pg. 6355)

## Section E. Tax Credits

ClearStak supports the idea of offering state tax credits to consumers for low-emitting pellet heaters/stoves (p. 107/pg. 6356). This encourages manufacturers to achieve the lowest emissions they possibly can and encourages competition in the market.

## Section F. Test Method

### Section 1

ClearStak supports the move to cord wood for testing (pg. 107/pg. 6356). It is representative of real world use of units. ClearStak believes that the 3 step emission limits as suggested and outlined in this proposal are achievable with cord wood, and believes that requiring manufacturers to test both with crib and cord wood places a large financial burden on the manufacturers solely at the benefit of the EPA, regarding data, which needs to be accounted for. ClearStak suggests allowing a certification of 8 years to manufacturers to sell units that undergo testing with cordwood and crib wood as an incentive to them for having to pay for both forms of testing. This would give manufactures an additional amount of time to recoup the additional testing cost.

ClearStak proposes establishing a surface area per square foot or burn space adding testing with split versus un-split wood (pg. 147/pg. 6366).

ClearStak proposes that the use of variable speed pumps be taken into consideration regarding current test method issues (pg. 148/pg. 6367).

ClearStak proposes the use of suitcase type in-stack testing technology to allow manufacturers to reduce the burden and time for manufacturers to complete the testing process, as they will allow manufacturers to evaluate emissions on units during the R&D process, and before testing (pg. 162/pg. 6370)

ClearStak has found that there are products that would meet a daily 24 hour average over the heating period versus averaging only over the combustion period, as opposed to averaging only over the combustion period (pg. 129/pg. 6361). ClearStak proposes that the test method for central heaters and masonry heaters should be based on 24 hour burns. ClearStak supports determining g/Btu/day as that is a number that would be valuable to consumers.

## Section 2

ClearStak objects to the 5 hours pre-burn test of the catalyst, and the operation of a medium heat output rate category II or III test for 50 hours for catalytic appliances. This test is based on a lack of data in 1988 regarding catalyst longevity, mostly in regards to ceramic catalyst. In 2014, catalysts have come a long way, and this requirement is only a financial burned limiting the adoption of BSER. ClearStak proposes removing this requirement or adding electrostatic precipitators, bag houses, and cyclones to this requirement as well (pg. 315/pg. 6396).

## Section 3

ClearStak agrees with the requirement of a temperature sensor that can monitor combustor gas stream temperatures within or immediately downstream of the catalytic combustor surface as written on page 188/page 6376.

## Section 4

ClearStak proposes that the placement of the flow meter be reconsidered as the GPM will be higher when the water is cooler, and slower when the water is warmer (pg. 313/pg. 6404).

## Section 5

Data from Earth Outdoor Wood Furnaces Klear Sky 400 demonstrates that it is possible to have low emissions, high combustion efficiency and lower thermal efficiency as tested by the method. Emissions are products of combustion efficiency. Thermal efficiency is the ability to transfer the heat into a medium (such as water or air). Therefore, it is possible to have low emissions, but also low thermal efficiency (pg. 133/pg. 6363). Since the method does not account for thermal loss over time, longer burns are penalized and appear to have lower thermal efficiency. The EPA has recently posted some hydronic heater manufacturers thermal efficiency numbers on the burn wise site it would also be suggest that the B415 combustion efficiency numbers are also posted.

## Section 6

ClearStak does not support a conversion of units tested to the European method EN303-5 to units tested to Method 28 and CSAB415.1-10 due to differences in exhaust temperatures at the points of collection, including dilution with air (pg. 63/pg. 6345). These factors can affect the amount of organic and inorganic compounds that condense out of the exhaust onto the filter. Thus, due to the

difference in testing methods, ClearStak feels that a conversion would not be accurate. Thus, it is difficult to derive a direct comparison between the EN303-5 and Method 28 methods.

### **Section G. Pellet Heaters/Stoves**

ClearStak proposes that a 35:1 air to fuel ratio be a maximum for testing with wood pellets (pg. 107/pg. 6356).

#### **Section 1**

ClearStak likes the PFI standard, but raises the question as to how this standard is enforced? ClearStak does not support the EPA's proposed requirement of only burning units with PFI certified fuels that have been produced under a licensing agreement with the PFI (pg. 134/pg. 6363). ClearStak has found that fuel quality varies greatly even between bags of pellets from different manufacturer's labeled premium. ClearStak supports retail audits of pellets for determining quality.

### **Section H. Forced Air Furnaces**

ClearStak supports the proposed Step 1 limit of 0.95 lb/MMBtu, and the 3 step alternative approach (pg. 120/pg. 6361).

## **Suggested Language and Definition Changes**

### **Section A**

#### **Section 1**

ClearStak supports the addition of the language regarding prohibited fuel types such as trash, plastics, and yard waste (pg. 137/pg. 6364).

ClearStak raises the question as to why corn-only pellet stoves are exempt from the applicable emission limits (pg. 178/pg. 6374)?

ClearStak raises the question as to how manufacturers contest the definition of "at retail" (pg. 179/pg. 6374).

ClearStak suggests the following language change:

*Catalytic combustion* means a device, ceramic or stainless steel, coated with noble metals used in a wood heater to lower the temperature required for combustion (pg. 180/ pg. 6374).

ClearStak suggests clarifying "are similar in all material respects" in the definition

of Model line (pg. 181/pg. 6374).

ClearStak challenges the definition of seasoned wood on pg. 182/pg. 6375, and suggests that seasoned wood can range from 15-30%, depending on the geographic location and climate.

## Section 2

ClearStak also recommends clarification as to whether “excess of 1.3 g/hr (0.003 lb/hr) for any burn rate” means any burn rate based on volume or by weight (pg. 186/pg. 6375).

## Section 3

ClearStak proposes establishing a minimum length for wood pellets, as short pellets smoke (pg. 186/pg. 6376).

## Section 4

ClearStak raises the question as to whether pallets fall under the definition of pressure treated wood as listed under prohibited fuel types as pallets are a common fuel sources and central heaters have been developed specifically with the intent of burning pallets (pg. 187/pg. 6376).

## Section 5

ClearStak recommends adding the following language:

“For wood heaters so equipped, the location and horsepower of blower motors and the fan blade size” *and/or angle* (pg. 197/pg. 6378).

## Summary

ClearStak supports the efforts by many to improve standards of performance for residential wood smoke. ClearStak will continue to provide information and white papers on our website, [www.ClearStak.com](http://www.ClearStak.com), and through social media to better communicate work that we are doing in the Americas, Europe and Asia to improve air quality, combustion efficiency and thermal efficiency while producing electrical and thermal energy. ClearStak supports advances in technology to provide a cleaner future and hopes that the EPA will view these comments as positive and constructive in support of this vision.