

# US RULES & REGS FOR BOILERS

Fagligt seminar 2019:

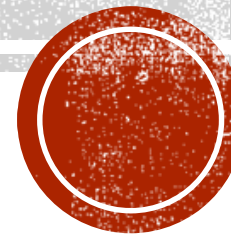
Biomassekedler og brændeovne

Aarhus, Denmark 6/12/19

John Ackerly  
President



**ALLIANCE**  
FOR GREEN HEAT  
low carbon, renewable and local



# OWBS: A PRIMARY SOURCE OF CONFLICT IN THE USA

- “Companies have even bet their future on legal battles with EPA to avoid regulation.”
- “This is a situation in which companies have known for years that their products were bad polluters, they knew for years how to reduce emissions, and they refused to make changes.”
- “Some companies have actively advanced their technology for years/decades and plan to comply with 2020 requirements. Others have sold thousands of filthy appliances, keeping product costs low and highly competitive while knowing regulations were coming.”

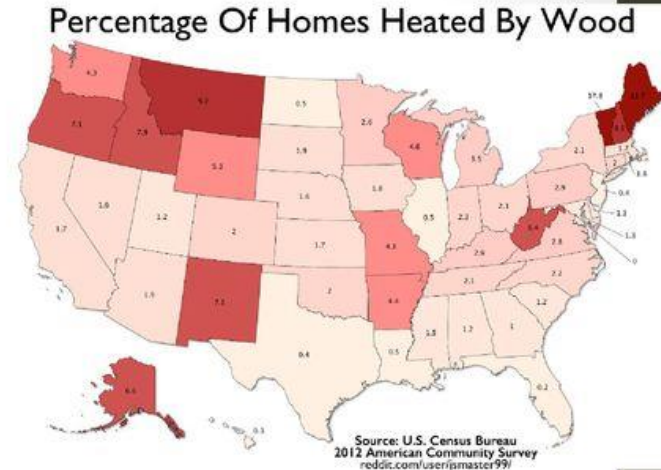
Importer of European boilers



# Mapping wood heat and wood smoke

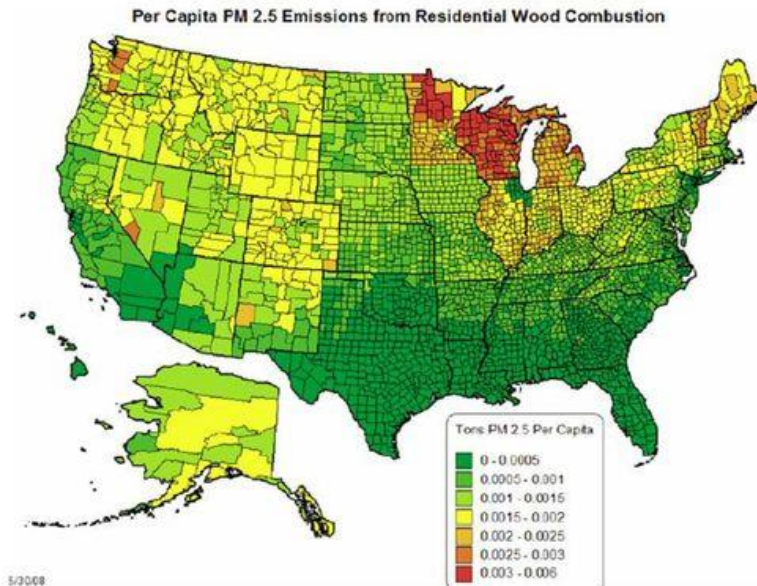
## Census map of primary per capita wood heating.

- ✓ 10 – 13 million households use wood stove
- ✓ 2.5 million use them as primary heaters
- ✓ In hundreds of rural counties, 50% of homes have wood



## PM2.5 map from wood combustion.

- ✓ PM 2.5 from wood smoke correlates in part to type of device.
- ✓ Great Lake states are ground zero for unregulated outdoor wood boilers.



# 2020 EMISSION & EFFICIENCY

## Boilers

**PM emission limit  $\leq 0.10$   
lb/mmBtu** heat output for each  
individual burn rate  
(using crib wood or pellets)  
On May 15, 2020  
*See §60.5474(b)(2);*  
**Or PM emission limit  $\leq 0.15$   
lb/mmBtu** heat output for each  
individual burn rate  
(using cord wood)  
On May 15, 2020  
*See §60.5474(b)(3)*

2015 standard: 0.32MM/BTU

## Furnaces

**PM emission limit  $\leq 0.15$   
lb/mmBtu** heat output (individual  
burn rate, using cord wood or  
pellets)  
On May 15, 2020  
*See §60.5474(b)(6)*

2016/17 standard: 0.93

## Efficiency

The United States has no  
efficiency standards. Heaters  
are only requiring to test and  
report, but do not have to meet  
any minimum.

2015: testing and reporting





# LABELLING & EXEMPTIONS

Applicability	Required Label Statement	Required Label Information & Additional Statement
Hydronic heaters that certify to meet 2015 limit	“U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2015 particulate emission standards. Not approved for sale after May 15, 2020.”	<p>Month and year of manufacture of the individual unit;</p> <p>Model name or number;</p> <p>Certification test emission value, test method and standard met with test fuel identified (<i>e.g.</i>, 2015 crib wood, 2015 cord wood, or 2015 pellet, or other fuel, and likewise for 2020);</p> <p>Serial number; and</p> <p>Additional required statement: “This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against federal regulations to operate this appliance in a manner inconsistent with operating instructions in the owner's manual.”</p>
Forced-air furnaces (small) that certify to meet 2016 limit	“U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with the 2016 particulate emission standards. Not approved for sale after May 15, 2020”	
Forced-air furnaces (large) that certify to meet 2017 limit	“U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with the 2017 particulate emission standards. Not approved for sale after May 15, 2020”	
Hydronic heaters that certify to meet 2020 limit using crib wood or pellets	“U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with the 2020 particulate emission standards.”	
Hydronic heaters and forced-air furnaces that certify to meet 2020 limit using cord wood	“U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with the 2020 particulate emission standards using cord wood.”	
Exempted export central heater	“U.S. ENVIRONMENTAL PROTECTION AGENCY Export appliance. May not be sold or operated in the United States.”	
Exempted R&D central heater	“U.S. ENVIRONMENTAL PROTECTION AGENCY Not certified. Research Appliance. Not approved for sale or for operation other than for research.”	
Exempted non-wood burning central heater	“U.S. ENVIRONMENTAL PROTECTION AGENCY This appliance is not certified for wood burning. Use of any wood fuel is a violation of federal regulations.”	



# EPA ESTIMATED COMPLIANCE COSTS

Table 1. Annualized Compliance Cost and Average Annual Product Sales, 2015-2020, by Product Type

Product Type	Annualized Compliance Cost (\$ million)	Average Annual Product Sales, 2015-2020 (\$ million)	Compliance Cost/ Product Sales
Pellet stoves	\$1.5	\$132.2	1.1%
Wood stoves	\$3.0	\$123.1	2.4%
Single burn rate stoves	\$0.9	\$11.6	7.8%
Forced-air furnaces	\$15.4	\$91.8	16.8%
Hydronic heating systems	\$24.9	\$145.7	17.1%

**Source:** CRS analysis of EPA's Final Rule RIA, Table 5-5.



# 2020 TEST PROTOCOLS FOR BOILERS

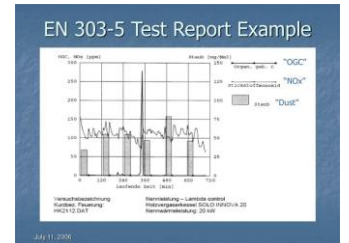
- **EPA Method 28WHH**. Indoor and outdoor hydronic heaters, both pressurized and non-pressurized, using an annual average lb/MMBtu output metric. Outdoor wood boilers (OWB) designed for crib tests. Crib wood
- **EPA Method 28WHH-PTS**. Indoor and outdoor hydronic heaters equipped with external partial thermal storage. Uses cordwood Cord wood
- **ASTM E2618-13**. Indoor and outdoor hydronic heaters, both pressurized and non-pressurized, including no, partial and full thermal storage heaters, using an annual average lb/MMBtu output metric. Have to use cordwood as of 2020. Crib or cord

▪



# OTHER TEST PROTOCOLS – AND EXEMPTIONS

- **EN 303-5** The European standard is allowed to certify to the 2015 hydronic heater standard; it is **not** allowed to certify to the 2020 standard. Hydronic heaters up to 500 kW size, manually or automatically stoked,
- **CSA B415.1-10**. This Canadian Standard for furnaces must use the burn rate categories in Method 28WHH to certify to the 2020 forced-air furnace standard, with results reported per burn rate category.
- **Exemptions:** NSPS: “Appliances that do not burn wood or wood pellets or wood chips (such as coal-only central heaters that meet the definition in § 60.5473 or corn-only central heaters) are exempt from the applicable emission limits of § 60.5474 and the requirements of § 60.5475 provided that all advertising and warranties clearly denote that wood burning is prohibited in these appliances.





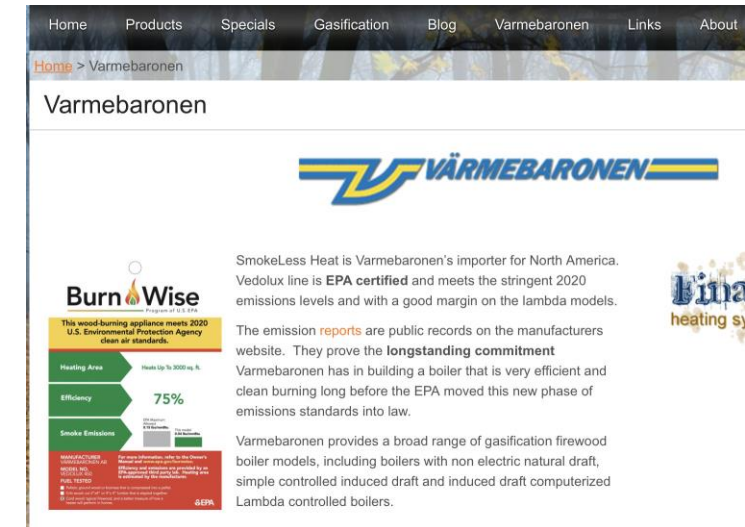
# ONLY 14 MODELS ARE 2020 COMPLIANT

**2020:** As of June 7, only 14 models of central heaters can be sold as of May 15, 2020. We expect this number could double by May 2020.

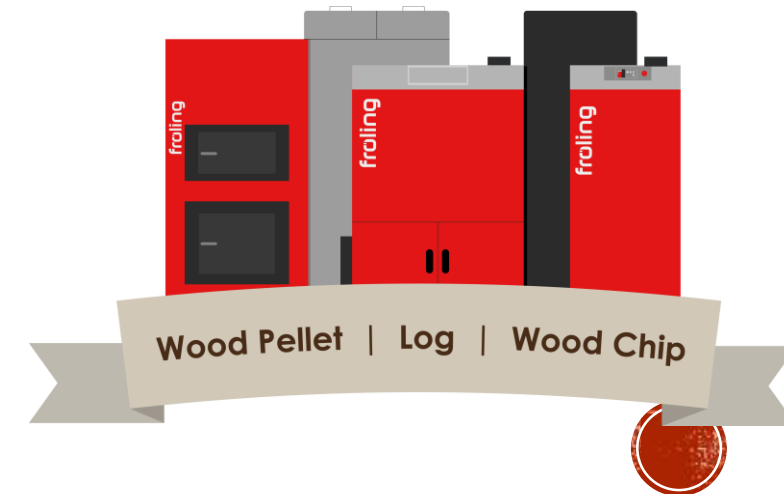
**2019,** there are 134 models on the market.

- Of the 14:
- 5 are Varmebaronen (Sweden)
- 3 are Froling (Austria)
- 1 model from Maine Energy Systems, HY-C, Lamppa, NW & Polar
- Only 3 and pellet models; 11 are cord wood.
- Average efficiency is 72.6% HHV, with range from 52 – 90.
- CO ranges from .02 to 2.4
- 2 are Forced Air Furnaces

**2023:** the next NSPS occurs when “improved technology has been demonstrated.” Blue/democratic states want that in 2023.



The screenshot shows the Varmebaronen website with a navigation menu (Home, Products, Specials, Gasification, Blog, Varmebaronen, Links, About) and a breadcrumb trail (Home > Varmebaronen). The main content area features the Varmebaronen logo and a section titled "Burn Wise" with the text: "This wood burning appliance meets 2020 U.S. Environmental Protection Agency clean air standards." Below this is a bar chart showing performance metrics: Heating Area (Heat Up to 3000 sq. ft.), Efficiency (75%), and Smoke Emissions. To the right, text states: "SmokeLess Heat is Varmebaronen's importer for North America. Vedolux line is EPA certified and meets the stringent 2020 emissions levels and with a good margin on the lambda models. The emission reports are public records on the manufacturers website. They prove the longstanding commitment Varmebaronen has in building a boiler that is very efficient and clean burning long before the EPA moved this new phase of emissions standards into law. Varmebaronen provides a broad range of gasification firewood boiler models, including boilers with non electric natural draft, simple controlled induced draft and induced draft computerized Lambda controlled boilers." A small "Burn Wise" logo is also visible on the right side of the page.



# WHAT IS AN IDC TEST METHOD?

- An integrated duty cycle, or IDC is based on a “call for heat” load pattern based on a simulation program for heat demand in a geographic region.
- The Energy department of the state of New York, NYSERDA, used a winter in Syracuse, NY – also known as the “Syracuse load profile” similar to winters in much of US New England states.
- Using an IDC heater operation profile instead of Method 28 WHH’s heat load categories would be more reflective of in-home device use and thereby more protective of people exposed to hydronic heater emissions, including neighbors.



# NESCAUM/BNL/NYSERDA AND ORIGIN OF EPA METHOD 28WHH-PTS

- NESCAUM began working with Brookhaven National Test lab with funding from NYSERDA, leading to an official EPA test method: 28WHH-PTS.
- **Operation.** A single test of the hydronic heater involves operation in 10 different phases. In summary these include:
  - Cold start and ramp up to full output;
  - Reduction of the load to achieve operation at 25%, 50% of full load and burnout;
  - Reload and operation at 15% of full load;  
Operation with the load cycling on and off.
- This test is completed in one day. The test is done three times and results averaged.



**Table 8. Comparison of Key Characteristics of EPA, ASTM and IDC Test Method Approaches**

Element	M28R	ASTM 3053-17	IDC
<b>Operational Parameters</b>			
<b>Number of loading events</b>	1	1	4
<b>Start-up</b>	No	Yes, combined with high fire	Yes, separate phase
<b>High fire</b>	Yes	Yes, combined with start up	Yes
<b>Maintenance – semi-active attended burn</b>	No	No	Yes
<b>Overnight burn</b>	Yes	Yes	Yes
<b>Replicates</b>	None	None	3
<b>Long charcoal tails</b>	Yes	Yes	No
<b>Protocol supported by user data</b>	No	No	Yes
<b>Precision and variability data</b>	No	No	Yes
<b>Fueling Parameters</b>			
<b># of different load sizes by weight</b>	1	2	4
<b># different piece configurations</b>	1	1	4
<b># of allowed fuel species allowed</b>	1	Unlimited based on density	2
<b>Impact of species data</b>	No	No	Yes
<b>PM Measurement</b>			
<b>Real-time PM Measures</b>	No	No	Yes
<b>Changes in filter measurements to Increase method precision</b>	No	No	Yes

**X**

**X**

**X**

**X**

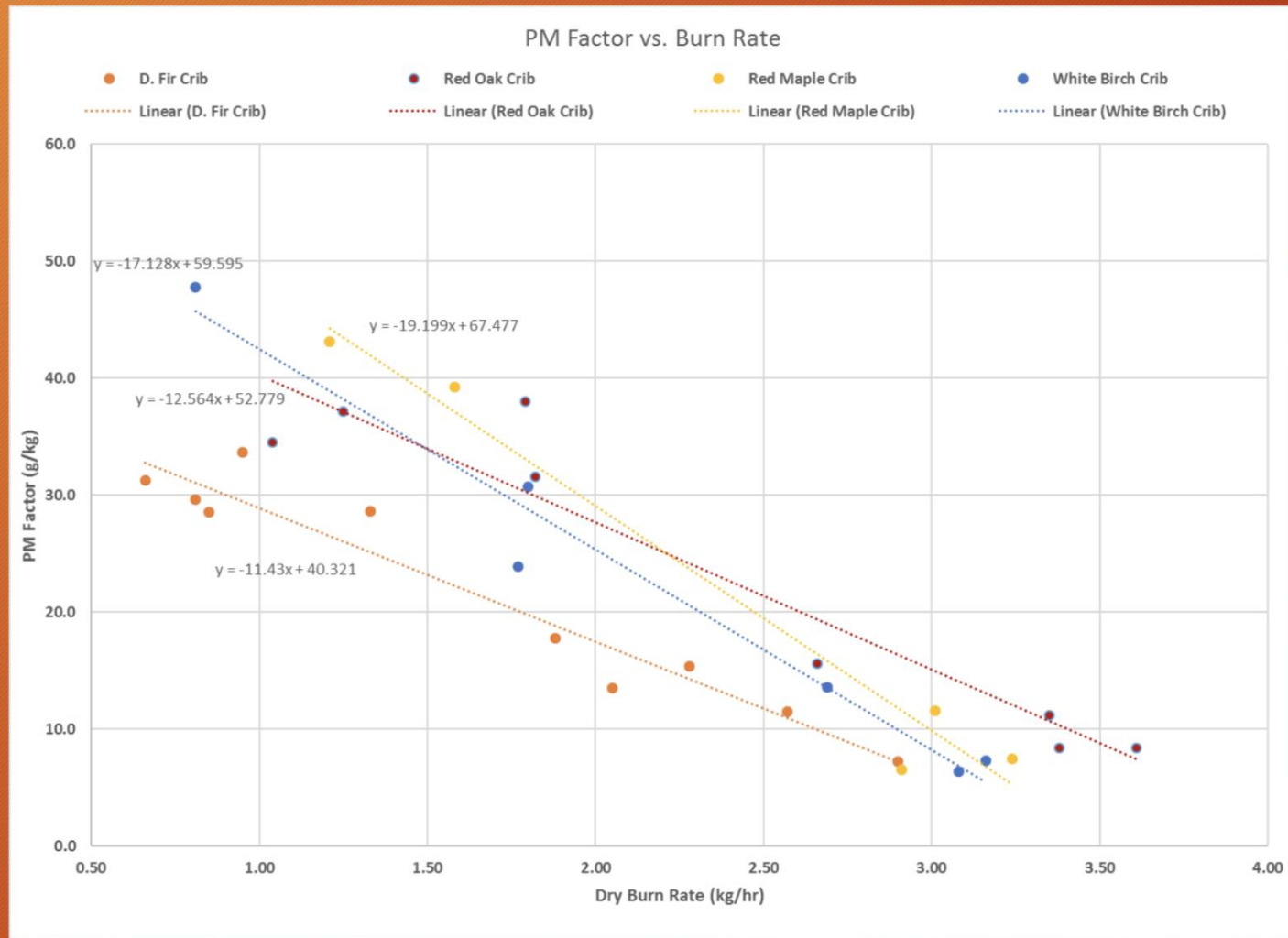


**Excerpted from  
NESCAUM ANPR  
comment to EPA,  
2/12/2019**





# SPECIES AND EMISSIONS



# EPA'S PROCESS FOR APPROVING ALTERNATIVE TEST METHODS

The EPA has a process for reviewing and approving case-by-case alternative test method requests. This can lead to the EPA's approval of broadly applicable alternative test methods.

- 4.1 Case-by-Case Alternative Test Method Approval
- EPA's process for approval of alternatives and modifications to test methods and testing procedures is outlined in Guideline Document GD-022, available on the internet at: <http://www3.epa.gov/ttnemc01/guidlnd/gd22.pdf>.



# RESIDENTIAL VS. COMMERCIAL

- The EPA's NSPS only covers residential heaters
- But the NSPS does not contain any BTU levels
  - Tarm USA supported requiring NSPS compliance for boilers at 500,000 BTU or less
  - NESCAUM supports compliance for units at 1,000,000 or less, used by the following states: CT, MA, NY and RI.
- Commercial boilers regulated by state law and often start between 1 and 2.5 million BTU.
- Loophole with small commercial boilers that are larger than residential but less than commercial sized.
- Vermont required all OWBs to be certified – residential & commercial



# NESCAUM POSITIONS ON CURRENT NSPS

- **Sub-categorization:** NESCAUM, most in industry, states & enviro groups opposed to setting different emission standards for pellet and wood heaters.
- But, US law on air quality based on a determination of BSER – “Best System of Emission Reduction.” Is a variant of a fuel, such as pellets, as form of BSER?
- **Efficiency calculations:** Outdoor boiler efficiencies: NESCAUM is urging the EPA to account for efficiency losses for outdoor units. Currently, they appear on par with indoor units.
- **Audit testing:** NESCAUM supports using a 50% increase during an audit to revoke a certification except for units certified at 50% less than the standard, which should be allowed higher variances.
- **Mandatory use of TEOM:** NESCAUM is urging immediate requirement of labs to concurrently use tapered element oscillating microbalance (TEOM) instruments





# THANK YOU

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FOR GREEN HEAT  
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NEXT GENERATION  
**Woodstove**  
DesignChallenge

