Wood Stove Emissions and the Movement to Modernize Wood Heating in the US

John Ackerly, President
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Profitable Firewood Processing Workshop
Wood Education Resource Center
Princeton, WV
## Existing & Proposed EPA Emission Limits

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Stoves (Non-cat)</td>
<td>7.5 g/hr</td>
<td>4.5 g/hr</td>
</tr>
<tr>
<td>Wood Stoves (Catalytic)</td>
<td>4.1 g/hr</td>
<td>2.5 g/hr</td>
</tr>
<tr>
<td>Pellet stoves</td>
<td>exempt</td>
<td>4.5 g/hr</td>
</tr>
<tr>
<td>Single rate stoves</td>
<td>exempt</td>
<td>3.0 g/hr</td>
</tr>
<tr>
<td>Wood boilers</td>
<td>exempt</td>
<td>.32 lb/MMBTU/18 g/hr</td>
</tr>
<tr>
<td>Forced air furnaces</td>
<td>exempt</td>
<td>.93 lb/MMBTU</td>
</tr>
<tr>
<td>Masonry heaters</td>
<td>exempt</td>
<td>.32 lb/MMBTU</td>
</tr>
<tr>
<td>Fireplaces</td>
<td>exempt</td>
<td>exempt</td>
</tr>
</tbody>
</table>
## EPA List of EPA Certified Wood Stoves

<table>
<thead>
<tr>
<th>Manufacturer Name</th>
<th>Model Name</th>
<th>Emissions (G/HR)</th>
<th>Tested Efficiency</th>
<th>Default Efficiency</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blaze King Industries</td>
<td>Chinook / Scirrocco / Ashford 30</td>
<td>0.97</td>
<td>75</td>
<td>63</td>
<td>Non Catalytic</td>
</tr>
<tr>
<td>Blaze King Industries</td>
<td>Blaze King KEJ 1107</td>
<td>1.76</td>
<td>82</td>
<td>72</td>
<td>Catalytic</td>
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<tr>
<td>Blaze King Industries</td>
<td>Princess Inset Model PI 1010A</td>
<td>2</td>
<td>80</td>
<td>72</td>
<td>Catalytic</td>
</tr>
<tr>
<td>Blaze King Industries</td>
<td>Chinook / Scirrocco / Ashford 20</td>
<td>1.3</td>
<td>77</td>
<td>72</td>
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</tr>
<tr>
<td>Blaze King Industries</td>
<td>Princess PEJ 1006</td>
<td>2.4</td>
<td>81</td>
<td>72</td>
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<tr>
<td>Blaze King Industries</td>
<td>Blaze King Princess Insert</td>
<td>2.8</td>
<td>80</td>
<td>72</td>
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</tr>
<tr>
<td>Blaze King Industries</td>
<td>Briarwood II/90</td>
<td>3.5</td>
<td>71.4</td>
<td>63</td>
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<tr>
<td>Blaze King Industries</td>
<td>Blaze King Royal Guardian</td>
<td>5.8</td>
<td>71.1</td>
<td>63</td>
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</tr>
<tr>
<td>Jotul North America</td>
<td>F602 CB</td>
<td>3.4</td>
<td>70.7</td>
<td>63</td>
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</tr>
<tr>
<td>Ravelli / EcoTeck</td>
<td>Laura / Veronica</td>
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<td>91</td>
<td>78</td>
<td>Pellet</td>
</tr>
<tr>
<td>Ravelli / EcoTeck</td>
<td>Sofia / Silvia</td>
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<td>84</td>
<td>78</td>
<td>Pellet</td>
</tr>
<tr>
<td>Ravelli / EcoTeck</td>
<td>Monica / Francesca</td>
<td>1.45</td>
<td>85</td>
<td>78</td>
<td>Pellet</td>
</tr>
<tr>
<td>Ravelli / EcoTeck</td>
<td>Ilaria / Serena</td>
<td>4.4</td>
<td>85</td>
<td>78</td>
<td>Pellet</td>
</tr>
<tr>
<td>Travis Industries, Inc.</td>
<td>LG Flushwood Insert</td>
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<td>72</td>
<td>Catalytic</td>
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<tr>
<td>Travis Industries, Inc.</td>
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<td>80.1</td>
<td>72</td>
<td>Catalytic</td>
</tr>
<tr>
<td>Woodstock Soapstone</td>
<td>Progress Hybrid</td>
<td>1.33</td>
<td>81</td>
<td>72</td>
<td>Catalytic-Hybrid</td>
</tr>
</tbody>
</table>
Typical (& Flawed) US Emission Chart

- PM2.5 levels from biomass stoves accurate
- Levels from fossil furnaces grossly underestimate emissions.
- Life-cycle, not just point of combustion emissions, must be accounted for.

Full report available at: www.forgreenheat.org/resources/toolkit.html
Most Wood Heating Equipment is Outdated and Too Polluting

- Pellet Boiler w/Storage
- Masonry Heater
- EPA Wood Boiler
- Traditional Boiler
- Pellet Stove
- EPA Certified Wood Stove
- Old Wood Stove

% in Use vs. Emissions Average (grams per hour)
Fossil Fuel Reduction of a $2,000 Wood/Pellet Stove

=  

Fossil Fuel Reduction of a $20,000 Solar PV

• Both systems can displace equal amounts of carbon from fossil fuel: 3 tons.
• 1 kw system, 1 cord of wood or 1 ton of pellets all displace about 1 ton of carbon from fossil fuels.

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Wood is 3rd most common heat in U.S.
Residential Renewable Energy 101

Renewable Energy Tech used in U.S. Homes (EIA)

- 95% Wood Stoves
- 5% Solar Panels

Renewable Energy Production in the U.S. (EIA)

- 76% Wood, Solar, Wind & Geothermal
- 24% Other renewable sources

Riding Solar's Coattails: Coalitions for Promoting Wood Heat
We need to get away from this...

...and onto this!
Future?

1. Combining biomass thermal storage with solar thermal.

2. Mini residential biomass CHP units.

3. Real time digital display of emissions/efficiency.

3. Making electricity just to recharge a cell phone or light a room.
Wood Stove Design Challenge:

☑ Modeled on the DOE’s Solar Decathlon
☑ $25,000 prize for cleanest, most efficient & innovative wood stove.
☑ Held on the DC National Mall in November 2013.
☑ To engage and challenge perceptions of policymakers and public about their image of wood heat.
☑ Build expectations and demand for really clean, efficient heaters.
1. The Way Forward: State Roles

Incentives: Fight for inclusion in renewable energy programs

- Every state that gives incentives for solar PV, should at least give incentives for pellet stoves.
- Incentives for solar PV typically goes to very wealthy families, who often have large homes. Is this who should get subsidies in an economic downturn?
- Incentives for cleanest wood and pellet stoves can help ordinary middle-income families.
2. The Way Forward

Research & Development

R & D is sorely missing in the residential thermal biomass sector. Industry is too small and too strapped. Technology has not been recognized as a priority. We need-

- State Prioritizing
- Federal Funding – DOE, EPA, USDA
- University engagement
3. The Way Forward: Federal Roles

**Renewable Energy Incentives:** Any future tax credit should require 70% minimum efficiency using HHV values as measured by B415.1.

- **EPA’s New Source Performance Standards for wood burning appliances:** Stricter and mandatory emission and efficiency standards are needed in America for all major wood burning appliances.

**Low Income Heating Assistance, Weatherization Programs & Energy Audits** should better integrate wood stoves and lead to change-outs of old, uncertified and unsafe wood stoves. EPA, DOE, USDA and HHS collaboration could speed this up.

Full report available at: www.forgreenheat.org/resources/toolkit.html
4. The Way Forward – Firewood

• A national or regional firewood association could establish best practices to improve delivery of full cords of dry wood.
• A state could require firewood dealers to document moisture content of firewood on sales receipt.
• A Yelp type website that rates firewood dealers and promotes the honest reliable ones.
European model: deliveries on pallets
Volume and moisture content far more consistent