

## INFORMATION SHEET Outdoor Wood Boilers in Linn County

### Introduction

As Linn County continues to consider an ordinance for outdoor wood boilers, a variety of questions have been raised by the public. Linn County Public Health has prepared the following information sheet to provide data and analysis regarding air pollution as it relates to the discussion around the merits of the ordinance. The following topics are presented:

- Summary of Current Regulatory Framework
- EPA's Voluntary Program for Outdoor Wood Boilers
- Stack Height Requirements
- Setback Distances to Property Line
- Comparison of Outdoor Wood Boilers to Indoor Wood Stoves
- Wood is Renewable Fuel and Carbon Neutral
- Wood Waste Would Be Burned in an Open Pile Anyway

### Summary of Current Regulatory Framework

Since 1976, local and state codes have required any sized boiler meet a performance standard for particulate matter of 0.6 lb/MMBtu.<sup>i,ii</sup> EPA has reviewed and approved these rules as part of the State Implementation Plan to meet national air quality standards and, as such, is a federally enforceable regulation. All changes to federally enforceable regulations must be approved by EPA.

Historically, little was known or suspected about emissions from outdoor wood boilers. As we are now learning from recent work by EPA and other states, it is apparent that outdoor wood boiler manufacturers have been selling units in Iowa that do not meet the longstanding code of 0.6 lb/MMBtu. Unfortunately, current code places responsibility for complying with the regulation on the owner and not the manufacturer. As currently written, regulations do not grandfather existing sources (even those installed prior to 1976) nor do they allow for any other considerations such as setbacks and stack heights. It is our goal to work together with the public to find additional language that would grandfather existing outdoor wood boiler that will be acceptable to EPA or Iowa DNR.

Any changes allowing outdoor wood boilers to emit more than 0.6 lb/mmbtu could be denied by EPA (or Iowa DNR) as relaxation of existing federally approved air quality rules, which is not allowed under the Clean Air Act. Therefore, such changes must be supported by Linn County with scientific analysis demonstrating that air quality will not be degraded as a result. If we cannot demonstrate this to the satisfaction of EPA, then Linn County may be found deficient in upholding the existing federally enforceable regulations and reject all changes in their entirety.

### EPA's Voluntary Program for Outdoor Wood Boilers

While indoor wood stoves have been subject to EPA New Source Performance Standards for nearly 20 years, outdoor wood boilers do not have similar federal requirements. In 2006, a consortium of northeast states known as the Northeast States

for Coordinate Air Use Management (NESCAUM)<sup>iii</sup> issued an analysis of air pollution from outdoor wood boilers and in early 2007 developed model rules for regulating outdoor wood boilers, which individual member states have implemented.

EPA provided technical and financial support for NESCAUM in this analysis and development of their model rule. Because of the work EPA and states did jointly, EPA chose not to overstep the state and local regulation and instead chose to develop a voluntary program that manufacturers can participate in. This program works much like other successful voluntary programs like the well-known Energy Star program. EPA has stated that it has, created the voluntary program instead of regulating these heaters because, "EPA wants to reduce emissions from these heaters as quickly as possible. EPA's voluntary program has helped bring cleaner heaters to market several years faster than a traditional federal regulation process."<sup>iv</sup>

Many states, including the NESCAUM model rule, reference the Phase 1 and Phase 2 EPA voluntary program standards in their rules for outdoor wood boilers. Such an approach is more economical and faster than independent local or state certifications, which could result in a patchwork of emission standards for manufacturers.

As to the availability of EPA Phase 1 & Phase 2 models, EPA states that, "Twenty manufacturers have agreed to use their best efforts to make cleaner models. These manufacturers represent more than 80 percent of the current sales in the United States. To date, 15 models have qualified at the Phase 1 orange hangtag level; six of these already meet emission levels at the Phase 2 white hangtag level, meaning they are 90 percent cleaner than unqualified units."<sup>v</sup> Complete lists of outdoor wood boilers that have qualified for the EPA voluntary program are available on the EPA website at: <http://www.epa.gov/air/hydronicheaters/models.htm>.

### Stack Height Requirements

The configuration of an outdoor wood boiler stack, including the height, significantly affects the dispersion of exhaust into the environment. Stacks that do not project above the eave of nearby buildings, including the outdoor wood boiler, lead to ground level effects that create higher concentrations of pollutants at the ground and in people's breathing zone. In other words, a taller stack results in better dispersion and lower ground level concentrations of particulate pollution. In recognition of this physical phenomenon, nearly all state and local ordinances, including Michigan and Wisconsin, on outdoor wood boilers require that stack heights be at least two feet above the eave of any building within 100-200 feet. Adjustment of the stack height is by far the most economical design aspect to minimizing exposure of pollutants from exhaust (and explains why there are so many tall stacks in Linn County).

The proposed ordinance only requires that a stack be constructed at least 10 feet off the ground. The height of a stack may affect the exhaust in two ways. The first would be to create back pressure due to frictional losses in the stack. The second is that the temperature of the exhaust will cool prior to release. Most stacks researched by Public Health are six inches in diameter, and at 10 feet above ground, less than 6 feet long from the top of the boiler. For even the smallest of outdoor wood boilers, the exhaust is discharged at a rate of five feet per second at a temperature greater than 300 degrees. So, in one second, it is highly improbable that the exhaust would cool to temperatures

that would create condensation in the stack or backpressure great enough to affect combustion.

The draft ordinance lists different stack heights to provide flexibility to the owner of an outdoor wood boiler who might want to take advantage of a higher stack should their unit be constructed that way. Larger commercial boilers (>350,000 Btu/hr) might likely have stacks greater than 10 feet. Some manufacturers sell extension kits for their units as well. The proposed ordinance is not requiring stacks greater than 10 feet, it is merely providing flexibility to those outdoor wood boilers that are.

### Setback Distances to Property Line

Federal, state, and local regulation define public air from the perspective relative to the polluter. Air pollution on the owner's property is not subject to the National Ambient Air Quality Standards; only once it leaves the property does it become subject to those standards. Therefore, EPA regulations require that Public Health assess compliance at the property line for all sources of pollution.

It is understandable to want to only consider impacts at the most likely point of human exposure such as the neighbor's home. The challenge with this approach is dealing with the uncertainty of the future use and development of neighboring properties not under direct control of the owner/operator of the outdoor wood boiler. What should be done if the use of the property changes or is redeveloped? As such, EPA policy has stipulated that compliance be demonstrated at the owner's property line.

Public Health concurs with many of the public's comments on this matter and in lieu of following EPA policy, we are working to identify alternative language that could be included in the ordinance to accommodate neighboring property owners who consent to the continued operation of an outdoor wood boiler even though that boiler may not meet the Public Health recommended setback distances. Similar language exists in the Iowa and Linn County open burning regulations. For open burning that involves clearing and grubbing, prairie management, or building demolition, a person may conduct such an open burn if the owner receives signatures from all residents within one-quarter mile of the burn location. For outdoor wood boilers, a radius associated with the recommended setback distances in the draft ordinance could be relied upon. Current open burning ordinances also limit or ban burning in areas zoned urban service residential (USR) or otherwise incorporated. Public Health is working to identify if a similar approach could be used for outdoor wood boilers as well.

### Comparison of Outdoor Wood Boilers to Indoor Wood Stoves

In 1988, EPA promulgated [40 CFR 60 Subpart AAA, Standards of Performance for New Residential Wood Heaters](#).<sup>vi</sup> EPA's mandatory smoke emission limit, for stoves manufactured after 1992, for non-catalytic stoves is 7.5 grams of smoke per hour (g/h) and 4.1 g/h for catalytic stoves. All wood stoves and fireplace inserts, and some factory-built fireplaces sold in United States must meet this limit. Some newer stoves have certified emissions in the 1 to 4 g/h range. By comparison, Phase 2 qualified outdoor boilers (EPA's toughest performance standard) may emit no more than 19 g/h. Table 1 is an EPA comparison of emission rates for several types of boilers, stoves, and furnaces.

**Table 1 – Particulate Matter Emissions from Residential Heaters <sup>vii</sup>**

	<b>Mass Emission Rate (grams/hour)</b>	<b>Particulate Emission / Energy Input (lb/MMBtu)</b>	<b>Efficiency (%)</b>	<b>Average Particulate Emission / Heat Output (lb/MMBtu)</b>
EPA Phase 2 Qualified Outdoor Wood Boilers	<19	< 0.32	66 – 95	0.40
EPA Phase 1 Qualified Outdoor Wood Boilers	N/A	< 0.60	>55	1.10
Unqualified Outdoor Wood-fired Boilers	200 - 700	0.50 - 5.0	~ 30-55	4.55
Old Wood Stoves <sup>viii</sup>	25-50 or more	7.5-12.5	~ 54	18.52
NSPS Wood Stoves 40 CFR 60 Subpart AAA	7.5 --Non-Catalytic 4.1 --Catalytic	2.5	~ 68	3.73
Pellet Stoves		1.4	~ 68	2.24
Fireplaces	~ 1	0.3	~ 70-80	0.43
Oil-fired Furnaces		2.8	~ 10	28.00
Natural Gas Furnaces		0.012	~ 90	0.0133

When comparing different heaters, emissions may be normalized as the mass emission rate per unit of heat generated. This is often expressed as pounds per million British thermal unit of lb/MMBtu. Since the amount of energy necessary to heat homes is constant in this comparison, the emission rate per amount of heat generated need only be evaluated. The amount of heat generated is the amount of heat in the fuel multiplied by the heater efficiency. While there is some variability among individual stoves, fireplaces, and boilers, it is apparent that the heat input, efficiency, and emissions it is apparent that NSPS wood stoves are at least well performing as unqualified wood boilers. Therefore, there would be no unintended adverse consequences resulting from installing several wood stoves rather than a single unqualified wood boiler.

Linn County Public Health agrees that an old outdoor wood stove produces more emissions on a “pound per unit of heat produced” than a modern albeit uncertified outdoor wood boiler. Linn County also finds that the current EPA regulation has effectively phased uncertified units out over the last seventeen years. The EPA 2002 National Emission Inventory (most recent inventory available for this analysis) estimates that approximately 140 tons of particulate matter emissions per year are emitted by uncertified indoor wood furnaces.<sup>ix</sup> The Mid Atlantic Region Air Management Association conducted a state by state analysis of indoor wood furnaces in their region and while the amount of wood burned varied from state to state, it is estimated that home owners relying on indoor wood furnace for heat burn about 2 cords of wood a year.<sup>x</sup> Estimating a cord of wood at 5,000 pounds, it would take less than 2000 uncertified indoor wood furnaces to generate 140 tons per year PM emissions. This is

also equivalent to approximately 140 outdoor wood boilers emitting 2 pounds per hour operating 1000 hours per year. Again, this is based on 2002 data and some uncertified indoor wood stoves operating in 2002 have likely been changed out over the last seven years.

Coupling this information with the fact that emission standards for indoor wood stoves were developed seventeen years ago, it is expected that any remaining old stoves installed more than twenty years ago are reaching the end of their product life. Therefore, it is unlikely that a program to replace indoor wood stoves within five years would have much benefit over simply allowing for end-of-life replacement. Additionally, fire places and other wood stoves will have a stack that is above the eave of the building it is housed in, which is much higher than on outdoor wood boilers. As discussed previously, taller stacks provide for better dispersion and less ground effects than relatively shorter stacks characteristic of outdoor wood boilers.

#### Wood is Renewable Fuel and Carbon Neutral

Linn County Public Health agrees that wood is a renewable resource and therefore wood fuel is “carbon neutral.” This is a positive aspect of outdoor wood boilers that Public Health supports. Unfortunately, some outdoor wood boiler manufacturers and vendors have used this fact to mislead buyers of outdoor wood boilers into thinking that their units are clean burning and emit little to no pollution, which is false. The reliance on a voluntary program such as EPA’s helps to stop the spread of misinformation and protects consumers from fraudulent claims. People buying and installing an outdoor wood boiler because they want to be environmentally friendly should be getting what they are buying.

#### Wood Waste Would Be Burned in an Open Pile Anyway

Linn County ordinance does allow for open burning of landscape waste. However, there are many limitations on this activity that are not currently imposed on outdoor wood boilers. Foremost, all open burning is prohibited within Cedar Rapids, Hiawatha, Marion, and all properties within one-half mile that are zoned urban service residential or otherwise incorporated. The open burning of landscape waste is limited to the property where such waste is generated. Anyone wishing to conduct an open burn for the purposes of clearing and grubbing or prairie management must obtain consent from all property owners within ¼ mile of the burn location. Public Health does acknowledge that some landscape waste currently being burned in an outdoor wood boiler would otherwise be burned in an open pile. However, there is no data available to estimate the amount of the landscape waste burned in outdoor wood boilers and so it is difficult to make a claim as to the exact relationship. Nevertheless, Public Health is evaluating this apparent disparity in the ordinance and will work to identify language that would make the regulation for burning wood waste consistent whether it is landscape waste being burned in an outdoor wood boiler or an open burn pile.

As an additional note, the Iowa Legislature is currently set (e.g. it has passed the funnel and on the House floor) to vote on a law that would prohibit open burning in all municipalities in the state, which we believe is likely to pass.

## Endnotes

<sup>i</sup> 567 Iowa Administrative Code, Chapter 23.3(2)b, <http://www.legis.state.ia.us/aspx/ACODocs/DOCS/3-25-2009.567.23.3.pdf>.

<sup>ii</sup> Linn County Code of Ordinance# 9-7-2008, Chapter 10.8.2.b, Emissions from Fuel Burning Equipment, [http://www.linncleanair.org/Handler.ashx?Item\\_ID=1B531B7A-8C6D-467F-86F4-FAA53254E5A0](http://www.linncleanair.org/Handler.ashx?Item_ID=1B531B7A-8C6D-467F-86F4-FAA53254E5A0).

<sup>iii</sup> NESCAUM is a 501(c)(3) nonprofit association of air quality agencies in the Northeast. The Board of Directors consists of the air directors of the six New England states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont), New Jersey, and New York. More information on NESCAUM's outdoor wood boiler program is available at: <http://www.nescaum.org/topics/outdoor-hydronic-heaters>.

<sup>iv</sup> Frequently Asked Questions, EPA's Phase 2 Voluntary Partnership Program: Hydronic Heaters, <http://www.epa.gov/air/hydronicheaters/pdfs/FAQs10-22-08VT.pdf>, page 3.

<sup>v</sup> Ibid. A complete list of Phase 1 and Phase 2 qualified units is available at <http://www.epa.gov/air/hydronicheaters/models.htm>.

<sup>vi</sup> The full content of the regulation is available at <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=ce974ba4dfff9bfd12551aa208c94526&rgn=div6&view=text&node=40:6.0.1.1.1.65&idno=40>.

<sup>vii</sup> Source: Adopted from EPA, *Outdoor Wood-fired Hydronic Heaters (OWHH) Program Update for HPBA Expo Workshop 2/28/08*, slide 11 and modified to include EPA Phase 1 and Phase 2 Qualified Boilers, data provided where not included by EPA. <http://www.epa.gov/woodstoves/workshop2008/owhh.pdf>.

<sup>viii</sup> EPA Emission Factors for Residential Wood Combustions, Table 1.10.1, <http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s10.pdf>.

<sup>ix</sup> Emissions from indoor wood furnaces are based on a national per capita rate and not any surveys directly obtained for Linn County. Because there is a lack of information on outdoor wood boilers, emission from these sources were not characterized in the 2002 National Emission Inventory. The 2005 National Emission Inventory is currently being posted by EPA and will be reviewed by Linn County and used to update this report at time.

<sup>x</sup> Mid Atlantic Regional Air Management Association (MARAMA), Residential Wood Combustion Survey and Emissions Inventory Projects, <http://www.marama.org/visibility/ResWoodCombustion/index.html>. MARAMA is a voluntary, non-profit association of ten state and local air pollution control agencies: Delaware, the District of Columbia, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, West Virginia and Philadelphia and Allegheny County, Pennsylvania.