Residential Wood Heaters

New Source Performance Standards (NSPS)
Current Draft Revisions

EPA / WESTAR

Residential Wood Smoke Workshop

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Background

- Current rule requires manufacturers to design new residential wood heaters to meet particulate emission (PM) limits, have representative heaters (per model line) tested by EPA-accredited lab, and attach EPA label after EPA approval
- Current rule requires operation according to owner's manual
- Originally promulgated February 1988
- Proposal was the first regulatory negotiation by EPA (included industry, laboratories, states, consumer advocates)
- Not substantively reviewed until now

Perspective: Wood Smoke $PM_{2.5}$ Emissions Are Significant

- 2008 National Emission Inventory: 2,449,000 tons
- 2008 Residential Wood Combustion:(~13%) 318,323 tons
  - Fireplace: general 51,132
  - Woodstove: fireplace inserts, non-certified 54,286
  - Woodstove: fireplace inserts, certified, non-catalytic 12,017
  - Woodstove: fireplace inserts, certified, catalytic 4,245
  - Woodstove: freestanding, non-certified 71,424
  - Woodstove: freestanding, certified, non-catalytic 15,092
  - Woodstove: freestanding, certified, catalytic 7,911
  - Woodstove: pellet-fired, general 1,798
  - Furnace: indoor, cordwood-fired, non-certified 36,213
  - Hydronic Heater: outdoor 50,427
  - Outdoor Wood Burning Device 7,105

Note: Wood smoke emissions also include other pollutants. Nationally, residential wood combustion accounts for 44 percent of total stationary and mobile polycyclic organic matter (POM) emissions and 62 percent of the 7-polycyclic aromatic hydrocarbons (PAH), which are probable human carcinogens and are of great concern to EPA.

Perspective: Wood Smoke Can Cause Significant Health Effects

- In a number of communities, residential wood smoke increases particle pollution to levels that cause significant health concerns (e.g., asthma attacks, heart attacks, premature death).
- Several areas with wood smoke problems either exceed EPA's health-based standards for fine particles or are on the cusp of exceeding those standards.
- For example, residential wood smoke contributes 25 percent of the wintertime pollution problem in Keene, New Hampshire.
- In Sacramento, California, and Tacoma, Washington, wood smoke makes up over 50 percent of the wintertime particle pollution problem.

Many State, Local, and Tribal Officials Want Updated, Stringent, and Revised NSPS

- Wood smoke programs are very important in numerous areas
- Programs include wood-burning bans and changeouts
- Some State and local emission limits are more stringent than NSPS
- Some States are not allowed to be more stringent than EPA
- Numerous letters and meetings requesting NSPS revisions
  - For example, April 29, 2008 joint letter from NESCAUM and WESTAR requesting:
    - "review and revision of the current residential wood heater/ indoor wood stove NSPS to capture the broader suite of RWD (residential wood heating devices)"
    - "fireplaces, masonry heaters, pellet stoves, and indoor and outdoor wood boilers, furnaces, and heaters… we urge EPA to develop standards…"

Many Requests for NSPS for Hydronic Heaters

- Petition from 6 northeastern states plus Michigan and NESCAUM
- Request from the Hearth, Patio, and Barbecue Association (HPBA) Outdoor Wood-fired Hydronic Heater (OWHH) Caucus
  - Their concerns were “black eye” on industry and proliferation of local bans and state rules with differing requirements
- Huge number of calls and emails from neighbors and others concerned about health effects

Key Dates

- Small Business Regulatory Enforcement Fairness Act (SBREFA) Panel Final Report expected March 2011
  - Convened August 2010
  - 30 Small Entity Representatives (SERs)
- Proposal of NSPS – June 2011
- Final NSPS – July 2012

Overview of Key Draft* Proposals

- Strengthen emission limits to reflect today's Best Demonstrated Technology (BDT)
- Close "loopholes", reduce exemptions
- Include pellet stoves and single-burn rate appliances explicitly
- Include wood "boilers" (hydronic heaters) and furnaces
- Revise test methods as appropriate
- Expand options in certification process by transitioning to International Standards Organization (ISO) bodies plus compliance affirmation

***** All options are draft and are subject to change pending EPA Administrator's review and signature on rulemaking proposal in Federal Register for public comment

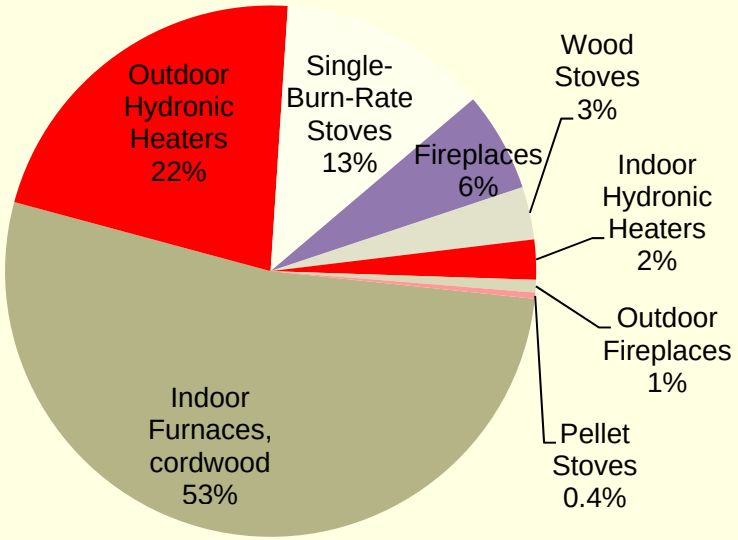
Potential $PM_{2.5}$ Emissions from New Units Sold (tons/year in 5th year, 2017)

Appliance	Baseline (No NSPS changes)	Level I Grouping	Level II Grouping
EPA Certified Wood Stoves	669	669	465
Single-Burn-Rate Stoves	1138	326	?
Pellet Stoves	243	243	219
Fireplaces (90% manufactured, 10% site-built)	843	408	?
Indoor Forced-Air Furnaces	3717	372	?
Hydronic Heaters (90% outdoor, 10% indoor)	1627	162	81
Masonry Heaters	30	30	30
Coal Stoves	140	?	?

Draft Analysis of Health Benefits in 2017

Total Monetized Benefits in 2017 (billions of 2008$)*			
	3% discount rate	7% discount rate	Non-Monetized Benefits
Level I	$2.2 to $5.3	$2.0 to $4.8	36,667 tpy CO, HAPS
Level II	$2.3to $5.6	$2.1 to $5.1	40,607 tpy CO, HAPs

Monetized Benefits Breakdown by Category



Reductions in Health Incidences in 2017*		
	Level I	Level II
Avoided Premature Mortality		
Pope et al.	240	260
Laden et al.	620	660
Avoided Morbidity		
Chronic Bronchitis	180	180
Acute Myocardial Infarction	400	420
Hospital Admissions, Resp	57	60
Hospital Admissions, Cardio	120	130
Emergency Room Visits, Resp	180	190
Acute Bronchitis	410	430
Work Loss Days	35,000	36,000
Asthma Exacerbation	4,500	4,800
Minor Restricted Activity Day	200,000	220,000
Lower Respiratory Symptoms	4,900	5,100
Upper Respiratory Symptoms	3,700	3,900

*All estimates are for the implementation year (2017), and are rounded to two significant figures so numbers may not sum across columns. All fine particles are assumed to have equivalent health effects, but the benefit per ton estimates vary because each ton of precursor reduced has a different propensity to become $PM_{2.5}$. These benefits incorporate the conversion from precursor emissions to ambient fine particles.

Key Messages for Workshop

- EPA intends to remove the exemption for single-burn rate appliances
- EPA intends to require pellet appliance certification tests and operation with industry-certified pellets
  - Emission data show excellent performance potential with premium wood pellets
  - Pellet fuel quality standards are necessary to ensure both good appliance performance and lower emissions
  - EPA has worked with the Pellet Fuels Institute to encourage their development of a fuel certification program (more on next slide)
- EPA intends to explicitly regulate outdoor and indoor hydronic heaters and forced-air / warm-air furnaces
- EPA intends to require energy audits and encourage heat storage to potentially greatly reduce emissions by reducing over-sizing and reducing frequency of operation at typical dirty low burn rates

Pellet Fuel Certification Program Needs

- EPA has worked with the Pellet Fuels Institute to encourage pellet manufacturers and appliance manufacturers to agree on a certification program with grades of necessary characteristics
- Limits on bark, dirt, sand, construction and demolition materials*, chemicals, etc.
- Tailored QA/QC plans, training, transparency
- Testing frequency tailored to results
- Not just 3rd party analyses but also 3rd party inspections, approval of QA/QC plans, sampling, auditing, corrective actions, certification of conformity, reporting of results
- Mutual Goal: pellets that consumers, manufacturers, and Congress can consistently depend upon as they consider decisions to buy and/or support biomass and as EPA regulates heater emissions

*PFI is still working on requirements to ensure absence of construction and demolition materials. EPA suggests testing for lead as an indicator.

Compliance & Enforcement Aspects

- Expand options for certification process --- transition to ISO-accredited labs and ISO-accredited certifying bodies, develop electronic system for submittals and preliminary QA checks
- Improve compliance assurance --- inspections of labs and manufacturers, random audits, monitor websites and trade shows and fairs, alert foreign companies
- Make consumer-friendly --- Burn Wise website, spreadsheets of certifications ranked by emissions, tested efficiency, output
- Require emission tests on each certified type of fuel that manufacturer specifies/warrants for use

Test Methods

- EPA Method 28 was promulgated with the NSPS in 1988
- EPA & HPBA are participating on numerous American Society for Testing and Materials (ASTM) work groups which will result in some improvements that we will propose
- Continuing concern of variability but ASTM improvements will help. Manufacturers and labs have over 15 years of experience at the WA levels of 4.5 g/hr and 2.5 g/hr (over 85% of stoves already meet)
- HPBA participated in revision of Canadian method B415.1-10. We have reviewed it and will propose using it for forced-air furnaces
- Hydronic heater (HH) voluntary program uses EPA conditional method that EPA will need to modify and propose in the Federal Register
- EPA, New York State Energy Research and Development Authority, and others are participating in ASTM efforts on HH test methods, including Canadian and European techniques. We expect this to result in improvements that we will propose
- We will use ASTM and CSA B415.1-10 efficiency test methods

Wood Stove Draft Options (for stoves affected by 1988 NSPS)

- 1988 NSPS:
  - 7.5 g/hr for non-catalytic
  - 4.1 g/hr for catalytic
- Draft NSPS 2013 Limit for PM: Match 1995 Washington State Limits
  - 4.5 g/hr for non-catalytic
  - 2.5 g/hr for catalytic
  - On sales-weighted basis, over 85% of EPA-certified stoves meet today
- We considered but do not intend to propose a tighter NSPS 2015 Level that does not subcategorize catalytic stoves
  - 2.5 g/hr for either (~1/4 of "WA stoves" meet today)
  - Cost-effectiveness was of concern
- Will include CO and visible emission limits and require efficiency test
- Will ask for input on how to consider "Florida Bungalow Syndrome" and how to ensure proper operation at low burn rates

Pellet Stove Draft Options

- 1988 NSPS:
  - 7.5 g/hr for non-catalytic
  - 4.1 g/hr for catalytic
  - However, most pellet stoves are exempt via the 35:1 air-to-fuel ratio exemption
- Draft NSPS 2013 Limit for PM: Match New Wood Stove NSPS
  - over 2/3 of all pellet stoves meet today
- We considered but do not intend to propose a tighter 2015 level
  - 1/3 of pellet stoves meet 1.0 g/hr, but cost-effectiveness is questionable
- Certification tests will be on certified premium pellets. We will require testing of all other pellets that are warranted but not have an emission limit for the other pellets
- We will add CO and visible emission limits and require efficiency tests

Single-Burn-Rate Stove Draft Options

- Exempt from 1988 NSPS
- Estimate >40,000 units sold per year
- Draft NSPS 2014 Limits Equivalent to WA Wood Stove Limits Adjusted for Easier Burn Rate
  - 3.0 g/hr?
- We will request data to potentially support tighter limits
- "Camp stoves" must be labeled for temporary use only
- Test method same as wood stoves, except burn rates
- We will add CO and visible emission limits and require efficiency tests

Cook Stove Draft Options

- Exempt from 1988 NSPS
- Draft NSPS 2013: Tighter definition and labels
  - Design requirements for “North American traditional cook stove”
    - Estimates of <1000 units per year
    - Not the big “loophole” that some theorized
- We will request data for tighter emission limit such as European Prototype BAT of 3.0 g/hr or U.S. current catalyst research

Manufactured Fireplace Draft Options

- Most exempt from 1988 NSPS via exemptions for >35:1 air-to-fuel ratio
  - Typical emissions: 12 g/kg where not regulated
- 1995 Washington State limit
  - 7.3 g/kg of wood burned
- EPA 2010 Phase 2 Voluntary Level:
  - 5.1 g/kg
  - 8 models already qualified
- Draft future revised EPA Phase 2 Voluntary Level?
  - 2.7 g/kg? (draft based on air quality modeling significance level)
- Typical California AQMD 2010 regulations:
  - Ban new construction; view potential NSPS as a weakening of restrictions
- Draft NSPS: Not include in NSPS at this time because of concerns about economy and cost-effectiveness
  - Would require new source category listing since most are not “heaters”
- Burn Wise Option: Encourage Closed Doors
  - Can meet 1 g/kg if consumers would keep the doors closed

Site-built Fireplace Draft Options

- Most exempt from 1988 NSPS via exemptions for >35:1 air-to-fuel ratio or "open masonry fireplace constructed on-site"
  - Typical emissions: 12 g/kg where not regulated
- 1995 Washington State rule does not regulate site-built units
- We do not expect any site-built Voluntary Program Partners
- Typical California AQMD 2010 regulations:
  - Ban on new construction
- ➢ Draft NSPS: Not include in NSPS at this time and encourage certification of masons by Mason Contractors Association of America (MCAA)
  - Cost-effectiveness is questionable
  - Only 10% of fireplaces are site-built
  - Perhaps >100,000 small business masons build site-built fireplaces
  - MCAA has agreed to develop a course to be added to current certification program

Masonry Heater Draft Options

- Exempt from 1988 NSPS via weight exemption (800 kg)
- Colorado limit: 6 g/kg (similar to ~7.5 g/hr)
- Industry request for EPA to initiate voluntary program
- Largest manufacturer and several others requested NSPS
  - Less than 1000 units constructed per year in U.S., but many more are constructed in Europe because of relatively low emissions and relatively high efficiency and marketing as “green”, efficient renewable biomass heaters

➢ Draft NSPS 2014 level

  ➢ 2.0 g/hr daily average, 0.32 lb /mmBTU heat output

Hydronic Heater (HH) Draft Options

- Exempt from 1988 NSPS
- Typical emissions: >4 lb /mmBTU heat output
- EPA 2010 Phase 2 Voluntary Program Qualifying Level
  - 0.32 lb / mmBTU heat output
  - 23 EPA-qualified models already
- Typical State 2010 regulatory level
  - 0.32 lb / mmBTU heat output
- Many local jurisdictions ban HH or have setbacks and stack heights
- Draft NSPS limits for PM
  - 0.32 lb / mmBTU heat output for outdoor HH in 2013 and indoor in 2014
  - 0.15 lb / mmBTU heat output for both outdoor and indoor HH in 2016
    - 7 EPA-qualified models already
    - ~100 models qualified by EN 303-05 are estimated to meet this level
- Draft NSPS limits for CO
  - 1000 mg / m^3 at 12% O_2 in 2013/2014
  - 650 mg / m^3 at 12% O_2 in 2016
- Draft NSPS limit for Visible Emissions
  - 6 minutes per hour in field

Forced-Air / Warm-Air Furnace Draft Options

- Exempt from 1988 NSPS
- Canadian B415.1-10 level
  - 0.93 lb / mmBTU heat output
- Draft NSPS limit for PM
  - 0.93 lb / mmBTU heat output in 2014
  - Ask for comments on whether limit should be same as for hydronic heaters to avoid competitive imbalance
- Draft NSPS limit for CO
  - 1000 mg / m^3 at 12% O_2
- Draft NSPS limit for Visible Emissions
  - 6 minutes per hour in field

Coal Stove Draft Options

- Exempt from 1988 NSPS
- No emission data to determine BDT
- Will request data