

# Major B(a)P Source Categories and Reduction Activities

December 2006

# Major B(a)P Source Categories

- **Residential Wood Combustion**
- Coke Ovens
- Mobile Sources
- Residential Open Burning
- Primary Aluminum Production
- Forest Fires and Managed Burning
- Open Burning of Scrap Tires

# Residential Wood Combustion

U.S. Environmental Protection Agency



## Clean Burning Woodstoves and Fireplaces

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- For Air Quality Program Officials
- How-To Guide for Implementing a Woodstove Changeout Campaign

A woodstove or fireplace adds warmth and ambiance to your home. This site offers information to help you choose an [EPA certified stove](#) (PDF, 67 pp, 1142 KB) or another cleaner burning hearth appliance (e.g., gas or pellet stove) and use it efficiently and safely. Air quality program officials will find information to help them support and develop programs for addressing residential wood smoke.

[Basic Information](#) - What you need to know to select a cleaner burning hearth product for your home, including retailers and installers in your area.

[Wood Burning Efficiency and Safety](#) - Tips on proper stove installation, good wood burning practices, and how you can ensure safer heating of your home. Also, see our [Clean Burn Fact Sheet](#) (PDF, 1 pp, 391 KB)

[Healthier Home, Cleaner Environment](#) - Learn the impacts of wood smoke on your health and the environment, as well as the quality of the air where you live.

[Technical Information](#) - Learn why newer woodstoves burn cleaner and safer and review test data on stove emissions.

[Partners & Useful Links](#) - Links to non-EPA partners assisting us with our woodstove changeout campaigns, and other information related to woodstoves and air quality.

[Cleaner Burning Fireplaces](#) - If you have a fireplace, learn more about the clean burning, safer, more efficient fireplace options available.

[For Air Quality Program Officials](#) - Information to help tribal, state and local air quality officials address wood burning emissions in their air quality planning.

[How-To Guide for Implementing a Woodstove Changeout Campaign](#) - A step-by-step guide and reference for air quality program officials to use in putting together a woodstove changeout campaign.

### Woodstove Changeout Programs

[EXIT Disclaimer](#)

- [Yolo-Salano, CA](#)
- [Sacramento County, CA](#)
- [Dayton, OH](#)

You will need Adobe Acrobat Reader, available as a free download, to view some of the files on this page. See [EPA's PDF page](#) to learn more about PDF, and for a link to the free Acrobat Reader.



[Basic Information](#): A more efficient, safer, cleaner model that saves money and time



[Wood burning efficiency and safety](#): Efficient burning and effective heating with less smoke



[Healthier home and cleaner environment](#) with an EPA certified woodstove



[Cleaner burning fireplaces](#) with EPA certified inserts

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Last updated on Wednesday, November 1st, 2006  
URL: <http://www.epa.gov/woodstoves/>

# Residential Wood Combustion Activities

- Wood Stove Change-Out in Dayton, Ohio
  - \$75,000 from Cargill with attempts to raise additional funds
  - from mid-July for 6 Weeks
- Burn-It-Smart Workshops
  - Two held in Michigan in February
  - Four tribal workshops held in Wisconsin, Minnesota, and Michigan in September 2006
- EPA funded Artificial Wax Firelog Study

### GREATER DAYTON WOODSTOVE CHANGEOUT PROGRAM

Beginning July 15th, the Regional Air Pollution Control Agency will be offering "Clean Air Coupons" to help families replace their old, inefficient stoves with a new gas, pellet, corn, or EPA certified woodburning stove.

**The program will run from July 15 to September 17th.**

RAPCA is working with U.S. EPA, the Hearth, Patio and Barbecue Association, Cargill and the Chimney Safety Institute of America to help make a successful program.



**Stop Wasting. Start Saving.**

### PROGRAM DETAILS

In order to qualify for a Clean Air Coupon, participants must meet and agree to the following terms:

- Participants must live in RAPCA's jurisdiction - Clark, Darke, Greene, Miami, Montgomery or Preble County,
- Participants must be using a pre-1992 woodburning stove or fireplace insert to heat their home,
- Participants must agree to have the new stove professional installed, and
- Participants must agree to have their old stove removed and destroyed.

**Clean Air Coupons will be available on a first come, first serve basis. Amounts include:**

- **\$300** for households that replace an old stove/insert with a new pellet, corn or EPA-certified wood stove/insert, and
- **\$400** for households that replace an old stove/insert with a new gas stove/insert.

**CLICK HERE FOR A LIST OF  
PARTICIPATING RETAILERS  
AND MANUFACTURERS**

#### Woodstove Links

- [Burning Wood Safely - Ohio Fire Marshal Office](#)
- [USEPA Clean Burning Woodstoves & Fireplaces](#)
- [SIP credit guidance](#)
- [List of EPA certified stoves](#)
- [Previous woodstove programs](#)

# Coke Ovens

- Largest Industrial Source of B(a)P Emissions
- Pushing , Quenching and Combustion Stack MACT Requirements went into effect in April, 2006
- LTV Chicago shutdown about 2001
- US Steel Gary Works – Bat. 2 shut down in 2005
- Residual risk requirements in effect July, 2005
  - More stringent requirements for doors, lids, offtakes and charging
  - Affects Indiana Harbor Coke and AK Steel (MACT Track)
- EPA has been working with EC & MOE on an emission reduction and monitoring program at Algoma Steel in Ontario

# US Great Lakes Coke Ovens-IL&IN

Name	ST.	Type	Comments
Mittal St.-Riverdale	IL	BP	
US Steel-Granite City	IL	BP	
LTV Chicago	IL	BP	Shut Down 2001
Mittal-Steel – Burns Harbor	IN	BP	
Mittal Steel – Indiana Harbor (W)	IN	BP	
Mittal Steel – Indiana Harbor (E)	IN	BP	
U.S.Steel-Gary Bat. 3,5,7	IN	BP	Bat.2 Shut Down 2005
Citizens Gas & Coke	IN	BP	
Indiana Harbor Coke	IN	NR	Res. Risk

# US Great Lakes Coke Ovens-OH&MI

Name	St	Type	Comments
WCI Steel-Warren	OH	BP	
Mittal Steel Cleveland	OH	BP	
AK Steel-Middleton	OH	BP	Subject to Res. Risk
Wheeling-Pittsburgh	OH	BP	
Republic -Lorain	OH	BP	
Haverhill North	OH	<b>NR</b>	
Mittal Steel - Warren	OH	BP	
U.S.Steel-Ecorse	MI	BP	
Severstal N.A.-Dearborn	MI	BP	
EES Coke-River Rouge	MI	BP	



# Scrap Tires

- Scrap tire piles eventually lead to tire fires
- In 2004, Great Lakes States with significant remaining piles conducted inventories and GIS mapping
- Michigan and Pennsylvania have over 18 million tires
- Scrap tire piles have also been recognized as potential breeding grounds for mosquitos with West Nile virus.

# Scrap Tire Cleanup Guidebook

- January 2006 Guidebook covers:
  - State scrap tire cleanup programs
  - Stockpile Identification and mapping
  - Identifying markets
  - Evaluating Contractor Qualifications
  - Project Management: site survey, equipment, transportation, environmental factors, fire planning and prevention, site restoration
  - Resources

# Scrap Tire Training and Forums

- Best practices training held April 18, 2006 in Philadelphia for Pennsylvania, Maryland, New Jersey and Delaware
- Additional May 2006 Training in Alabama and South Dakota
- Prior Tire Cleanup Forums:
  - February 2004 in Chicago
  - September 2004 in Lansing MI
- On-line scrap tire cleanup training at <http://www.epa.gov/reg5rcra/wptdiv/solidwaste/tires/guidance/>



Our Strategy to Address  
Outdoor Wood-Fired Hydronic Heaters  
aka “Outdoor Wood Boilers”

## Front View of Typical Unit



# Common Firebox Design







# Air Quality (AQ) Impacts

- Dispersion modeling by Michigan:
  - >1,000ug/m<sup>3</sup> (1-hr max)
  - > 600ug/m<sup>3</sup> (24-hr max)
- AQ monitoring data by NESCAUM:
  - >1,500ug/m<sup>3</sup> with seasoned wood]

Note: Current 24-hour PM<sub>2.5</sub> NAAQS is 65ug/m<sup>3</sup>

December 20, 2005 proposal is 35ug/m<sup>3</sup>



# Petition to Administrator (8/11/05)

- 6 northeastern States plus Michigan & NESCAUM
- Asks for NSPS for OWB or to revise woodstove NSPS to include OWB
- Argues that Federal regulation is needed to avoid patchwork of State and local regulations
- Numerous additional States, local agencies, and citizens have expressed interest in EPA action

# Actions Underway by States

- VT has proposed emission limits for new OWB
- CT, IN, MI, MN, NC, OR “considering” regulations
- WI has developed a model ordinance  
(setbacks, stack height, opacity)
- Many towns in various States have banned new OWB
- WA has stated that their “woodstove” rule also applies to OWB
- NESCAUM has been leading 12-State workgroup that wants test method and model rule this fall
- NY Attorney General assessing “consumer fraud”

# Our 2-Part Stakeholder Strategy

- Part 1 - Incentivized Voluntary Program (IVP)
  
- Part 2 – Model Rule (MR) for States to use as appropriate
  - Parts 1 and 2 are in parallel and complementary.
  - We kicked-off Stakeholder Process on 6/15/06.
  - We expect Stakeholder Process to be complete by 12/15/06 and implementation to begin by 4/07.

# Part 1 -- IVP

## Incentivized Voluntary Program

- We have encouraged manufacturers to make public commitments to voluntarily sell new models with significantly reduced emissions.
- Targets will be established during the IVP development process.
- We have met with top manufacturers and the trade association and they have agreed to have cleaner models for sale by April 2007.
- Manufacturers are developing and shaking-down new designs now.

# Part 2 -- Model Rule (MR)

- In parallel with IVP, we have convened a Stakeholder Process to provide information for a NESCAUM-led effort to develop a MR for States to use as appropriate.

The MR may address:

- New Units - emission limits, zoning, stack height, operation and maintenance, labels, notice to buyers
- Existing Units – operation and maintenance, real estate transfers, funds to solve nuisance units
- Issues – mass/time versus mass/energy or both, lead time, phasing, residential versus small business

# Our Concerns

- Schedule is extremely ambitious
- Stakeholders do not trust each other
- Test method is not finalized nor validated yet
- IVP targets will be based on engineering judgments and predictions rather than data
- Saving graces:
  - Manufacturers are motivated to avoid bans
  - IVP implementation will be based on actual data

# Stakeholder Issue Teams

Cross-section of industry, States, labs, and EPA developed options and pros/cons for full Stakeholder Group discussions on July 19-20:

- 1 - Testing Implementation
  - QA/QC audits, 3<sup>rd</sup> party testing, etc.
- 2 - Benchmarks
  - 2a - Format of the Standards & IVP
  - 2b - Target levels and dates for Phase 1

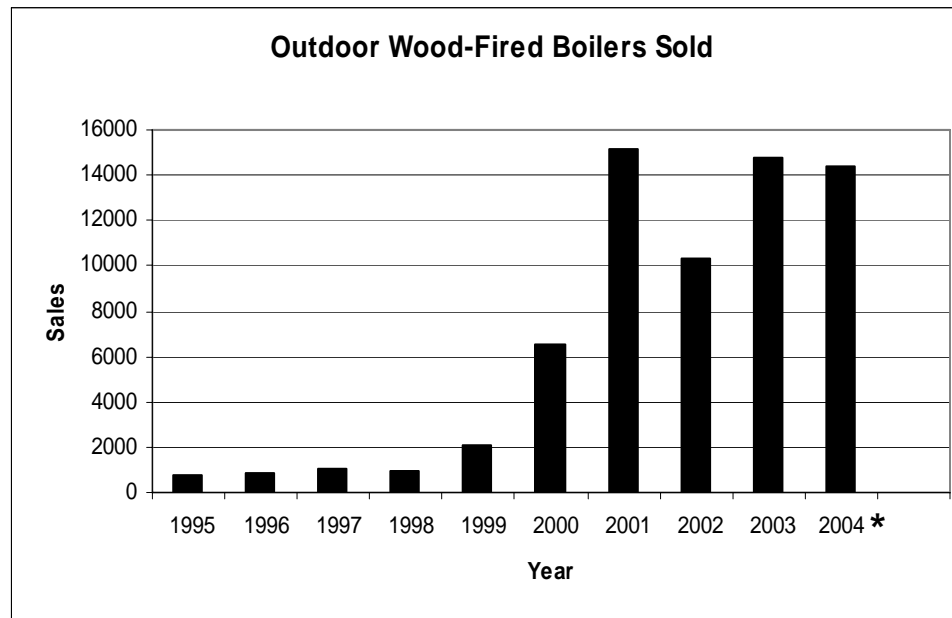
# Stakeholder Issue Teams continued...

Two more teams are kicking off this week to develop options and pros/cons for full Stakeholder Group discussions on September 12-13:

- 3 - Consumer issues
  - IVP infrastructure, market incentives, labels, comparisons with other products, “burning smart”
- 4 - Existing Units
  - Health, AQ modeling, location, best burning practices, solutions for nuisance units



# Sales Data



\* 2004 sales are projected

**Known cumulative sales are 72,423 units**

Basis: Region I Information Collection Request and Industry Contacts  
[NESCAUM states that real value is >125,000 units and growing faster]

# Test data caveats

- Draft ASTM consensus test method has just been developed — currently going through ASTM review and balloting process – final expected in April 2007
- Test data vary widely due to different methods, test conditions, and models

# PM2.5 Emissions and Efficiency Comparisons

	Per Time (grams/hr)	Per Wood Burned (pounds/Ton) [pounds/MM BTU]	Efficiency (%)
Outdoor Wood-fired Boilers (OWB)	30-390	6-60 [0.5-5]	~30-55
Old Wood Stoves	25-50 or more	~90-150 [7.5-12.5]	~54
NSPS Wood Stoves 40CFR60 Subpart AAA	7.5 Non-Catalytic 4.1 Catalytic	~30 [2.5] ~16 [1.4]	~67
Washington State Wood Stoves	4.5 Non-Catalytic 2.5 Catalytic	~18 [1.5] ~10 [0.8]	~70-80
Pellet Stoves	~1	4.2 [0.3]	~70-80
Fireplaces		34.6 [2.8]	~10
Oil-fired Furnaces		NA [0.012]	~90
Natural Gas Furnaces		NA [0.0075]	~90
Small ICIB		NA [0.025]	>98

# Estimated National Emissions

<b>Sources</b>	<b>TPY of PM 2.5 (direct)</b>
Residential Open Burning	165,000
Highway Diesel	124,000
Non-road Diesel	174,000
Woodstoves and Fireplaces	420,000
OWB	1,450-37,000 NESCAUM: perhaps 250,000

Source: NEI for All Categories Except OWB

# Control Technology Assessment

- Commercially available units utilize poor combustion technology
- No “best demonstrated technology” – but most manufacturers have prototypes
- General belief of potential for 50-90% emission reduction with redesign and possibly catalyst
- Key is separate air-to-water heat exchanger

# Obstacles to Developing a Federal Rule for OWB Now

- ❖ Insufficient data for Federal rule now
- Quantification of Baseline Emissions
  - No consensus test method yet -- ASTM effort recently sped up; expect near consensus by 12/06 and final by 4/2007\*
  - Estimate of number of OWB is uncertain (on low-side and growing)
- Quantification of the Reductions Believed Achievable
  - No commercially available “best demonstrated technology” (BDT)\*\*
  - Cannot quantify benefits and costs absent BDT

\*We offered \$60K to help last year, but industry and States stepped up instead.  
Our \$500K grant to CT for wood smoke monitoring & OWB characterization may also help this year and next.

\*\*SBIR RFA and discussions with catalyst manufacturers should help some but big advance is the IVP and MR efforts.

# NESCAUM “Assessment of Outdoor Wood-fired Boilers”

## Findings:

- OWBs generally do not use catalytic or non-catalytic emission control devices that other residential wood-fired combustion devices, such as indoor woodstoves, commonly employ
- Use has become more prevalent and continued increase is likely
- Emit significantly more PM than other residential woodburning devices and short term spikes can be extremely high
- Could contribute almost 900,000 tons of PM by 2010
- Local populations are likely subject to elevated PM levels
- Current regulations do not provide surrounding areas with adequate protection...
- There is lack of information relating to air toxics

## Unique issues:

- Year-round operation -- summer hot water, swimming pools, spas
- Cyclic operation -- contributes to incomplete combustion
- Short stack heights -- poor dispersion, more likely fumigation
- Oversized firebox --allows inappropriate materials. “Enforcement programs have discovered OWBs burning tires, large bags of refuse, and railroad ties.”

Published 3/06, revised 5/06

# NESCAUM Recommendation

in “Assessment of Outdoor Wood-fired Boilers”

“Given the significant health effects OWB emissions may pose and the lack of action on the Federal level, NESCAUM believes that States should take action immediately to control OWB emissions by establishing technology-forcing standards that will lead manufacturers to develop cleaner-burning OWBs.”



# “Health Effects of Breathing Wood Smoke”

## What is the concern about wood smoke exposure?

- Numerous scientific studies report potentially serious adverse health effects from breathing wood smoke emitted by residential wood combustion (RWC). The smoke emitted from RWC is the product of incomplete combustion, and is possible even in the most modern wood burning devices when they are operated incorrectly. In addition to that amount released directly inside the home, a large percentage (i.e., 70%) of outdoor wood smoke from chimneys actually reenters the house and permeates neighborhood dwellings (Pierson et al., 1989). Since individuals typically spend 60-70% of their out-of-work time at home, indoor wood smoke potentially represents a major source for human exposure (Szalar , 1972; Chapin , 1974; Sexton et al., 1986).
- The emissions from wood-burning stoves and fireplaces consist of a complex mixture of gases and particles including inhalable PM (particulate matter of diameter less than or equal to 10 micrometers, or PM10), the finer respirable PM (PM2.5) and contaminants that contribute to poor air quality and smog, for example sulfur oxides (SOx), nitrogen oxides (NOx) and carbon monoxide (CO). RWC emissions also contain potentially carcinogenic compounds, including polycyclic aromatic hydrocarbons (PAH), benzene, formaldehyde and dioxins (NEIPTG , 2000; Larson and Koenig , 1994; ERMD , 2000). Many of these substances can adversely impact health.

# “Health Effects of Breathing Wood Smoke”

## What happens when people breathe wood smoke?

- Some of the health effects of exposure to inhaled particles in wood smoke that researchers have found include irritation and inflammation of the upper and lower respiratory tract resulting in rhinitis, cough, wheezing, and worsening of asthma, as well as a link to chronic bronchitis. Many studies have concluded that young children living in homes heated by a wood-burning stove had a greater occurrence of moderate and severe chronic respiratory symptoms than children of the same age and sex who did not live in homes heated with a wood burning stove. The following conclusions were taken from a review article by Judith T. Zelikoff that appeared in the Journal of Toxicology & Environmental Health in 2002.
- More specifically, with regard to adults, studies show that prolonged inhalation of wood smoke contributed to chronic bronchitis (Rajpandey , 1984), chronic interstitial lung disease, pulmonary arterial hypertension (Sandoval et al., 1993), and altered pulmonary immune defense mechanisms (Demarest et al., 1979; Ramage et al., 1988). While adverse effects on adults are notable, children appear to be at greatest risk. Exposure of preschool children living in homes heated with wood burning stoves or in houses with open fireplaces yielded these effects (Zelikoff 8): decreased pulmonary lung function in young asthmatics (Koenig et al., 1993); increased incidence of acute bronchitis and severity/frequency of wheezing and coughing (Butterfield et al., 1989); and increased incidence, duration, and possibly severity of acute respiratory infections (Honicky et al., 1983, 1985; Rajpandey, 1984; Morris et al., 1990; Collings et al., 1990; Honicky and Osborne , 1991; Kammen et al., 1998).

































# Cowboy Hot Tubs



# Snorkel Tubs







# Our Position

- OWB emissions are a State and local concern
  - Air quality complaints from neighbors
  - Improper design and/or operation
- OWB team coordinating emissions reductions through industry voluntary and State regulatory efforts

# Two-Part Stakeholder Strategy

- Parallel and complementary
- Stakeholder Process kick-off on 6/15/06
  - Expected completion by 12/15/06
  - Implementation of Phase 1 by 4/07

# Stakeholder Decisions

- Testing
  - ASTM Method
  - 3<sup>rd</sup> party testing, QA/QC audits, etc.
- Benchmarks – format, levels, dates
  - 0.6 #/MMBTU heat input for Phase 1 IVP --4/2007
  - 0.44 #/MMBTU heat input for Phase 1 MR --4/2008
  - ~0.3 #/MMBTU heat output for Phase 2 MR --4/2010

# Our Concerns/ Next Steps

- Schedule is extremely ambitious
- Test method consensus meeting -- 10/23-24
- Stakeholder meeting -- 11/16/06 in RTP
- Public roll-out -- 12/15/06
- Test method validation -- 1/07
- Phase 1 IVP Implementation -- 4/07
- Saving graces:
  - Manufacturers are motivated to avoid bans
  - States are motivated to use MR