

Residential Wood Heating

WESTAR Planning Committee Meeting
December 4, 2024

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National Residential Heating Task Force

Members

- Alaska Department of Environmental Conservation
- California Air Resource Board
- Connecticut Department of Energy and Environmental Protection
- Fairbanks North Star Borough
- Idaho Department of Environmental Protection
- Monterey Bay Air Resources District
- Maine Department of Environmental Protection
- Missoula Public Health
- Minnesota Pollution Control Agency
- Nez Perce Tribe
- New Hampshire Department of Environmental Services
- New Jersey Department of Environmental Conservation
- New York State Department of Environmental Conservation
- Oregon Department of Environmental Quality
- Puget Sound Clean Air Agency
- Rhode Island Department of Environmental Management
- Vermont Department of Environmental Conservation
- Washington Department of Ecology
- NYSERDA – New York State Energy Research and Development Authority
- NESCAUM – Northeastern States for Coordinated Air Use Management
- WESTAR - Western State Air Resources Council
- NACAA – National Association of Clean Air Agencies



Residential Wood Smoke Work Group

- EPA, State, Local, Laboratory, and Industry Representation
- Monthly Calls
- In Person meetings approximately every 2 years
- Data library
- EPA Burnwise Program



Wood Stove Control Measures

3 Main Categories

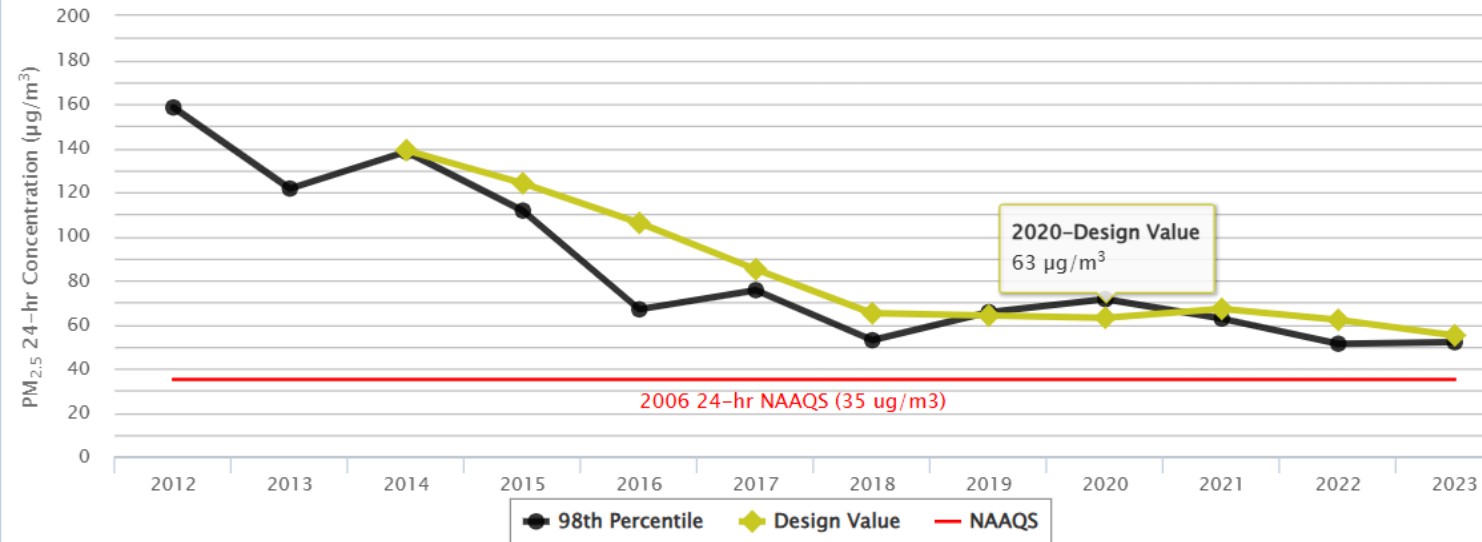
- Curtailment
- Appliance turnover
 - Change Out Programs
 - Removal of Uncertified Appliances
- Operation, Fueling, & Education
 - Dry wood
 - Proper operation



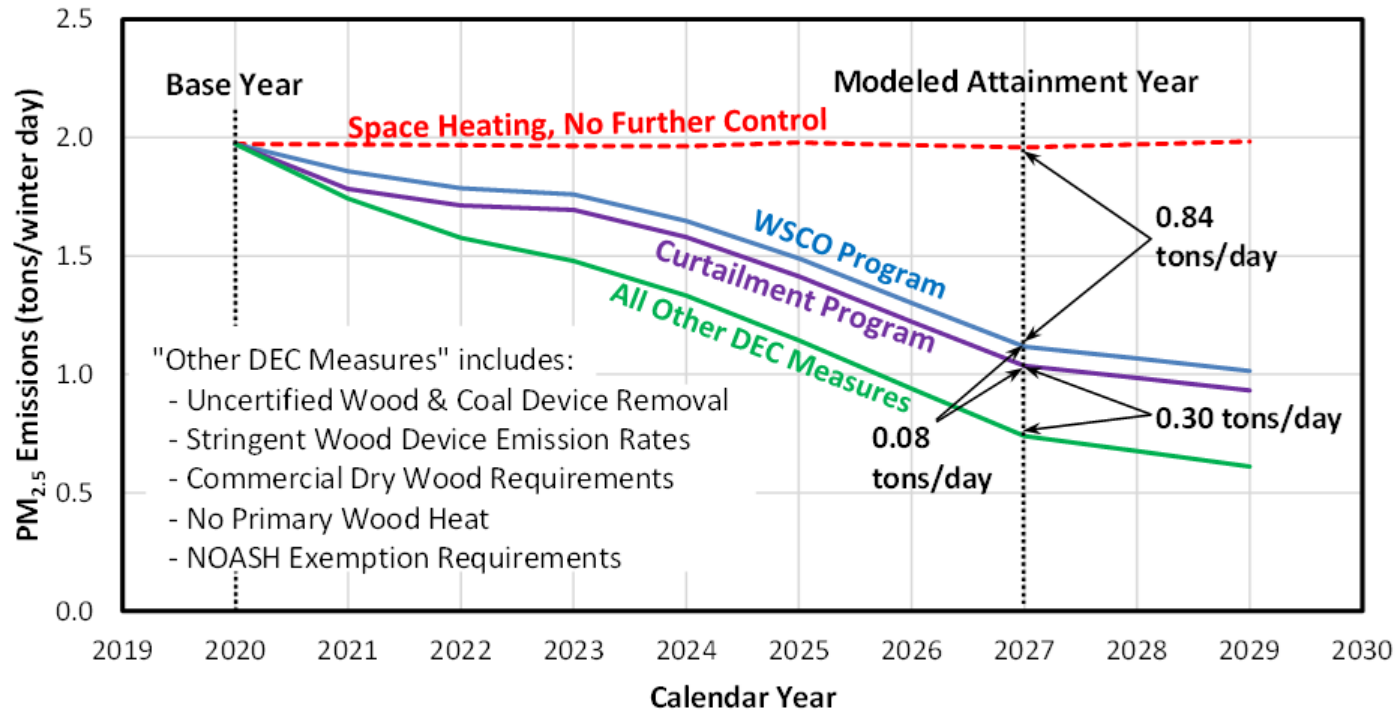
Importance of Appliance Turnover

PM_{2.5} 24-hr Design Values (excluding exceptional events)

North Pole, AK - Hurst Road (Fire Station #3)



Alaska Department of Environmental Conservation | Division of Air Quality | <https://dec.alaska.gov/air/>



Fairbanks Control Strategy



Appliance Turnover



What to backfill with?

- Non-wood: (heat pump, natural gas, etc.)
- **Lower emitting wood stoves – how to identify?**

Programs and Considerations

- Wood Stove Change Out Program
 - Deed restrictions - prohibit future wood stove installations
- Date certain removal of uncertified stoves
 - Applicable during real estate transactions
- Registration requirements for wood stoves



Identifying Lower Emitting Wood Stoves

Long Term

- Need a functional federal program
 - IDC Method Development
 - Revised NSPS
 - Sell through provisions
 - 2030 before new cleaner stoves are in the market?

Mid Term

- Independent Assessment Project (IAP), test results in 2026 and 2027
- Multi-state/local task force
- IDC Method Development

Near Term

- Existing NSPS, Federally cleared list
- Multi-state/local task force
- Technology based (e.g., catalytic vs non-catalytic)
- Alaska List



Test Method Background

- PM Measurement
 - ASTM 2515
 - Requires use of Dilution Tunnel
 - Common to pellet, cordwood and crib wood protocol
 - Mass emissions for entire test
 - TEOM
 - Requires use of Dilution Tunnel
 - Time resolved mass emissions
- Fueling and Operation
 - ASTM 3053 – Cord wood method
 - M28R & ASTM 2780 – Crib wood method
 - ASTM 2779 – Pellet heaters
 - Integrated Duty Cycle (IDC) – Cord wood method



Stove Test Reviews – Alaska began in 2020

Step 1 Model – Owner’s Manual

Combustible:	Wood
Colors:	Flat Black
Flue Pipe Diameter:	6" (15.3cm)
Flue Pipe Type: (Standard Single Wall or Double Wall):	Black or Blued Steel 2100°F (650°C)
Minimum Chimney Height:	12' (3.7m)
Maximum Log Length:	22" (559mm)
Electrical:	None
Dimensions	
Overall (Depth x Width x Height):	33" x 18.5" x 23" (838mmX470mmX854mm)
Combustion Chamber: Width x Depth:	19" x 9" (482mmX229mm)
Volume: Cubic Feet:	1.2 cubic feet
Door Opening:	7.5 x 10.2 (191mmX259mm)
Pyroceramic Glass Door : (Viewing) Width x Height:	N/A
Weight (lbs):	140 lbs

Step 2 Model – Owner’s Manual

Combustible:	Wood
Colors:	Flat Black
Flue Pipe Diameter:	6" (15.3 cm)
Flue Pipe Type: (Standard Single Wall):	Black or Blued Steel 2100°F (650°C)
Minimum Chimney Height:	12' (3.7 m)
Maximum Log Length:	19" (483 mm)
Electrical:	None
Dimensions	
Overall (Depth x Width x Height):	33" x 18.5" x 23" (838 mm X 470 mm X 854 mm)
Combustion Chamber: Width x Depth:	9" x 19" (229 mm X 482 mm)
Volume: Cubic Feet:	1.2 cubic feet
Door Opening:	7.5" x 10.2" (191 mm X 259 mm)
Weight (lbs):	140 lbs

Step 1 Model – Test Report

Testing Information	Determination			
Test method	EPA M28R			
Test Report Elements	Determination			
Wght Avg PM emissions (g/hr)	4.17	PM Highest 1-hr (g)	5.38	
Wght Avg HHV Efficiency (%)	67.9			
Wght Avg CO (g/hr)	6792	Wght Avg CO (g/mi)	113.2	
Max heat output (Btu/hr)	26471			
Firebox vol. test report	1.25			
Appliance Fueling	Determination			
Fuel species	NR			
Log length (in)	14.5	14.5	14.5	

Step 2 Model – Test Report

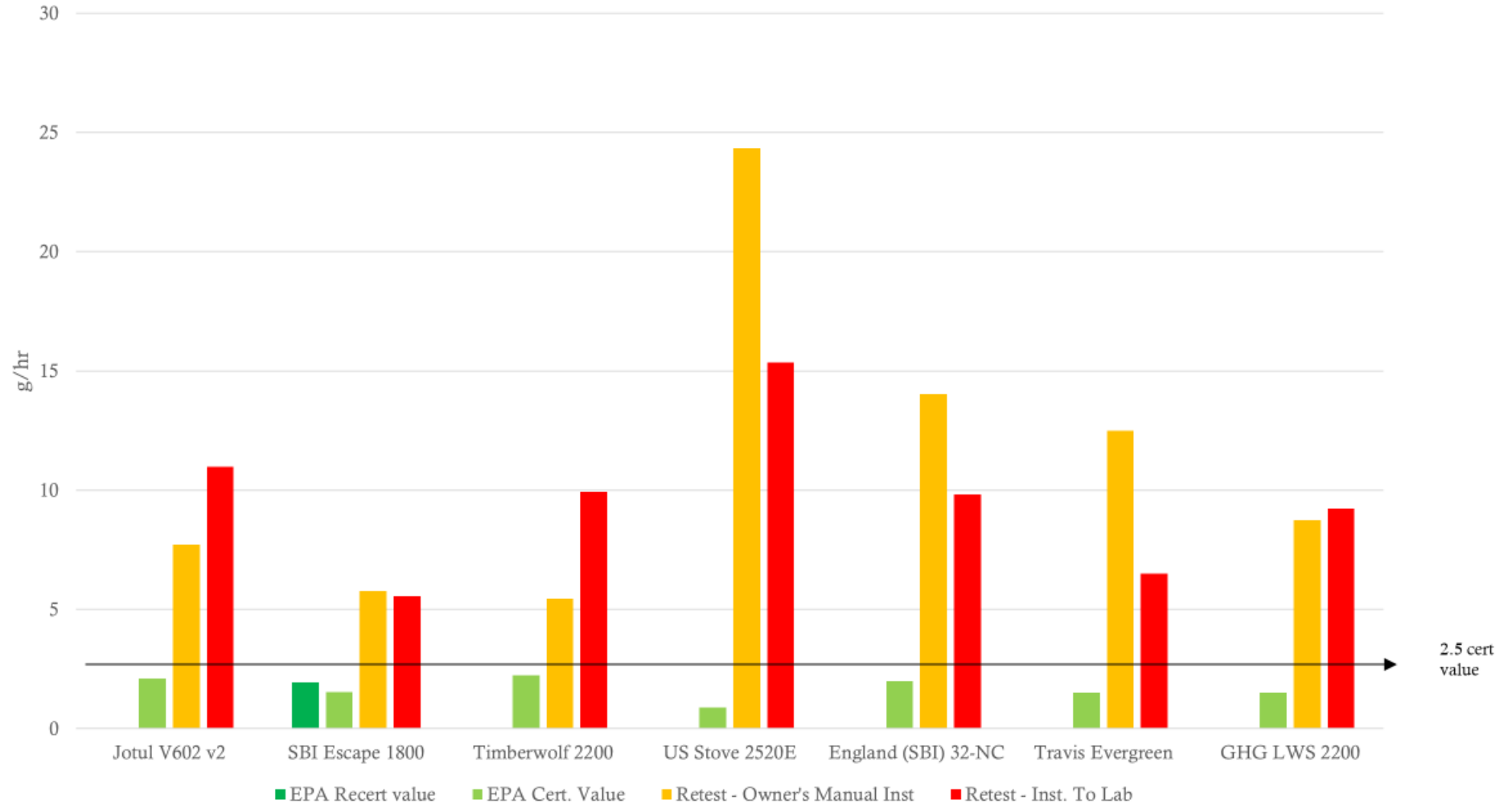
Testing Information	Determination			
Test method	EPA M28R			
Wght Avg PM emissions (g/hr)	1.75	PM Highest 1-hr (g)	2.37	
Wght Avg HHV Efficiency (%)	67.4			
Wght Avg CO (g/hr)	112.2	Wght Avg CO (g/mi)	1.87	
Max heat output (Btu/hr)	29234			
Firebox vol. test report	1.145			
Appliance Fueling	Determination			
Fuel species	Douglas Fir			
Log length (in)	11.5	11.5		



December 20, 2021, OAQPS Revokes ASTM 3053¹

EPA CERTIFICATION EMISSIONS – ASTM 3053-BASED NOT REPEATABLE OR RELIABLE

- All appliances tested exceeded the allowable range for compliance audits. Values would trigger mandatory suspension of sales under NSPS.
- Emissions results 3.6 to 17.4 times higher when comparing certification values to replicate certification test.
- Emissions results 2.4 to 27.7 times higher when comparing certification test values to test values using owner's manual instructions.
- Estimated Certification Expiration Date
 - Jotul 4/2024
 - SBI 3/2027
 - Wolf Steel 7/2024
 - US Stove 7/2024
 - England Stove 5/2025
 - Travis Industries 11/2023
 - GHB Group 8/2025



¹ <https://www.federalregister.gov/documents/2022/01/24/2022-01298/withdrawal-of-broadly-applicable-alternative-test-methods>



OFFICE OF INSPECTOR GENERAL U.S. ENVIRONMENTAL PROTECTION AGENCY

CUSTOMER SERVICE ★ INTEGRITY ★ ACCOUNTABILITY

*Improving air quality
Compliance with the law*

The EPA's Residential Wood Heater Program Does Not Provide Reasonable Assurance that Heaters Are Properly Tested and Certified Before Reaching Consumers

Report No. 23-E-0012

February 28, 2023

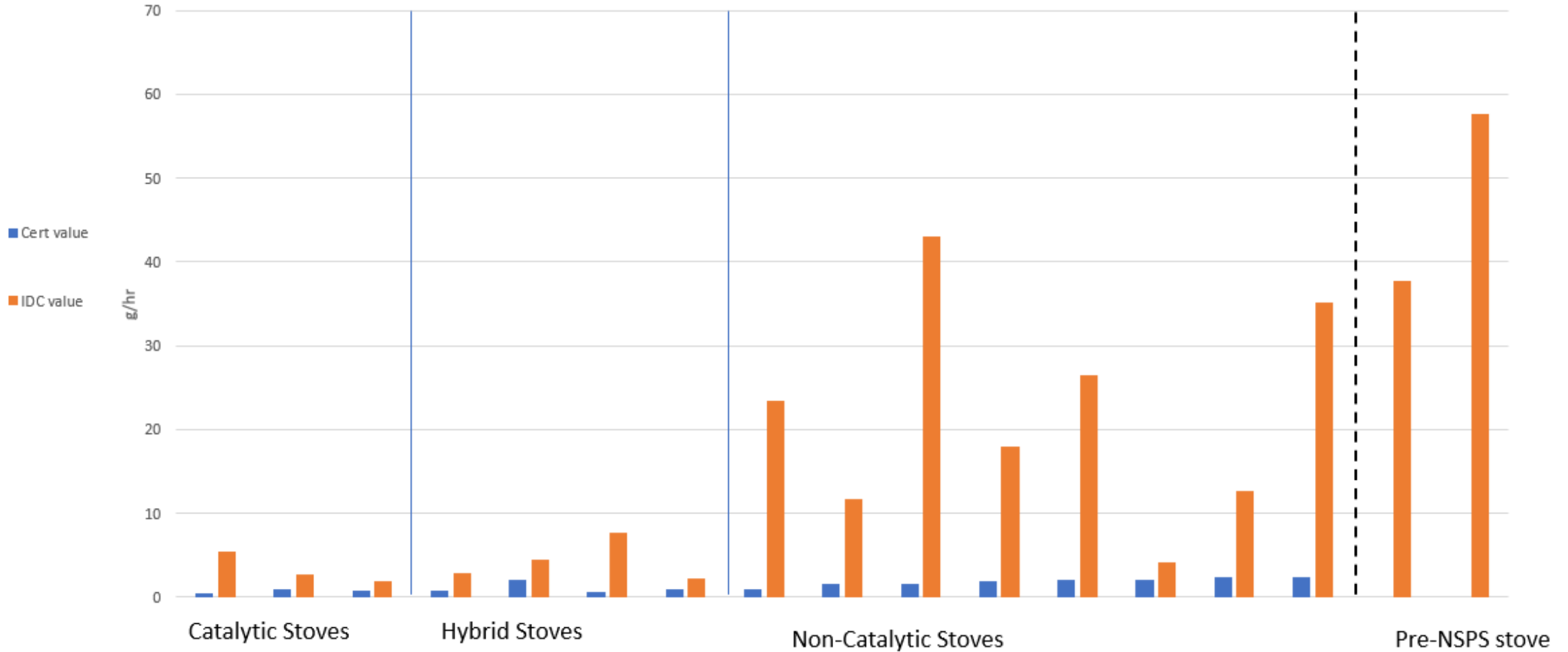
Office of Inspector General Report issued February 28, 2023

<https://www.epaoig.gov/reports/inspection-evaluation/epas-residential-wood-heater-program-does-not-provide-reasonable>

- One of several recommendations
 - Developing policies and procedures that detail how to conduct in-depth reviews of certification test reports.
- EPA committed to
 - Review test reports with additional staffing to assess the identified deficiencies
 - Post a corrective action list developed to clarify EPA expectations with respect to conducting certification testing
 - Rigorously reviewing certification test reports, not only for wood heaters already certified but also for heaters seeking certification



Certification vs. IDC Results



Step 2 Certified Stoves

East Coast West Coast Test Method Study Design

- EPA provided research plan framework and required Level 1 QAPP to conduct testing
 - Two separate projects for testing with no direct coordination or communication
 - NYSERDA funded east coast testing
 - EPA funded west coast testing
 - Only commonality
 - Stoves
 - Protocols
 - EPA added ASTM 2515 filter measurements added after study began
- Study assessed many variables not studied before
 - ASTM 2515 dilution tunnel variability
 - ASTM 2515 filter measurement variability
 - IDC fueling and operational protocol variability
 - Stove production variability



October 2024 Round Table Meeting Conclusions: Need New Test Methods ASAP

- Study highlighted the need for new test method
 - ASTM 2780 needs to be replaced to create a better system to assess appliance performance
 - ASTM 2515 must be replaced to improve PM measurement precision and reduce variability
- State, Local, and Tribal agencies need to new methods in place ASAP
 - Current non-attainment areas not coming into attainment
 - New RWH non-attainment areas and bump ups will happen under new PM National Ambient Air Quality Standards (NAAQS)
- NSPS revisions require new test methods, EPA should work to propose new test methods ASAP.



NSPS Revisions

- NSPS revisions are required every 8 years.
 - 2015 NSPS were required to be updated by May 2023
 - The states of New York, Alaska, Illinois, Maryland, Massachusetts, Minnesota, New Jersey, Oregon, Vermont, Washington, and the Puget Sound Clean Energy Agency filed suit in September 2023
- Consent Decree filed October 2, 2024:
 - Subpart AAA – Wood Stoves and Pellet Stoves
 - Propose new NSPS by December 2026
 - Finalize new NSPS by December 2027
 - Subpart QQQQ – Hydronic Heaters and Wood Fired Forced Air Furnace
 - Propose new NSPS by December 2027
 - Finalize new NSPS by December 2028
- Task Force prepared 20-page paper detailing deficiencies with current NSPS and proposing solutions



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Mid Term: Independent Assessment Project (IAP)



East Coast West Coast Study

Highlighted need for new test method

Replace ASTM 2780 to better assess appliance performance

Replace ASTM 2515 to improve PM measurement

NESCAUM currently working to validate new PM measurement method, both filter and TEOM



National Residential Heating Task Force

Independent Assessment Advisory Committee

- Provide routine oversight of the IAP
- Develop stove prioritization matrix and recommendations



Near Term: Options

National Residential Heating Task Force

Options for Wood Stove Change-out Programs

Independent testing of residential wood heating technologies found not all certified equipment is the same:

- Certification testing values do not provide a reliable indication of in-use performance.¹
- Non-catalytic cordwood stoves that test at low emission levels for EPA certification testing may not perform well when installed.²
- Non-catalytic cordwood stove emissions are more sensitive to fuel moisture content.³
- Non-catalytic cordwood stoves emit hazardous air pollutants at higher rates than catalytic-equipped cordwood stoves or pellet stove appliances.⁴

Recommendations for Change-Out Programs

Option 1. Most preferred option: move to zero-emission, carbon-neutral appliances

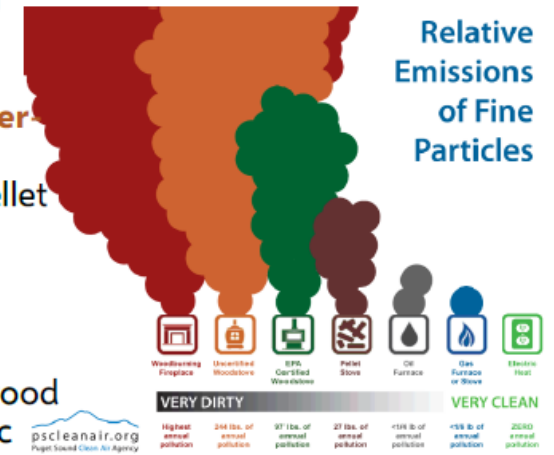
Only allow wood-to-electrification exchanges, such as air or ground source heat pumps, if available.

Option 2. Preferred option: move to lower emitting automated technologies

Only allow heat pumps, natural gas, and pellet appliances.

Option 3. Least preferred option: allow limited cordwood options

Allow changeout from cordwood-to-cordwood stoves but only allow non-catalytic, catalytic or hybrid woodstoves into the program that have been verified (Alaska List, or additional review of EPA Certification testing reports).



1. Trade association (HPBA) comments, Nov, 30, 2018, p19.
2. Assessment of EPA's Residential Wood Heater Program. 2019, p. 9.
3. Development of an IDC Test Method for Cordwood Stoves, Sept 2022, p 214-243.
4. Effects of catalytic converter on PCDD/F chloropheno and PAH emissions in residential wood combustion., 2012. <https://doi.org/10.1016/j.chemosphere.2012.02.027>

Fairbanks Alaska's List

- Emission standards
 - 2.0 g/hr weighted average – based on existing NSPS
 - 1st hour filter pull of 6.0 g/hr or less
- Certification Review
 - Review underlying test data to ensure that certification tests follow all method and NSPS requirements
- EPA certification 5-year renewals based on test report with major deficiencies will not be accepted by ADEC
- Alaska regulations allow IAP testing to inform list
- 17 wood stoves on Alaska List
- 32 pellet stoves on Alaska List

<https://dec.alaska.gov/air/burnwise/standards/>



Takeaways

- Test method development is critical
 - Advocate for IDC and new PM measurement
- Independent Assessment Project
- NSPS
- Resources & ways to get involved
 - National Residential Heating Task Force
 - Residential Wood Smoke Work Group
- Options are available to bridge gap



Questions?

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