

# Residential Wood Heater NSPS: Improving Wood Technologies in the Residential Heating Market

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# Biomass Heating: an important issue in NYS

- Residential heating markets account for about one quarter of New York's wood harvests
- Biomass central heating units have the highest PM emissions
- ~560,000 wood heating units in NYS
- In NYS, PM emissions from residential wood combustion are greater than those from electric generation or transportation, yet wood is used in <2% of NY homes
- New York is currently home to five advanced technology wood boiler manufacturers

# NYSERDA's Biomass Heating R&D program

- 8 years of research, development and demonstration of biomass heating
- \$8 million of NYSERDA funds, plus \$7 million for new projects
  - product development, evaluation, and demonstration
  - test method development for residential and commercial biomass boilers
  - fuel characterization and regional consensus building for fuel standardization
  - air quality and health effects research
- New generation of biothermal technology has dramatically improved the efficiency performance and emissions profile of wood heating equipment but without a high standard, these companies will suffer.
- Wood Heat Roadmap
  - understanding of the importance of proper sizing, the use of thermal storage, and proper test methods to assess actual performance in the field.
- Many states outside of NY rely on information from NYSERDA

# Renewable Heat New York

- Governor's initiative
- Multi-pronged market development strategy to stimulate growth in the high-efficiency, low-emitting biomass heat industry
- \$20 million, long-term commitment
- Fuel production and distribution, sustainable forest management, equipment manufacturing, sales and installation, workforce training and development

# Air Quality

# Air Quality

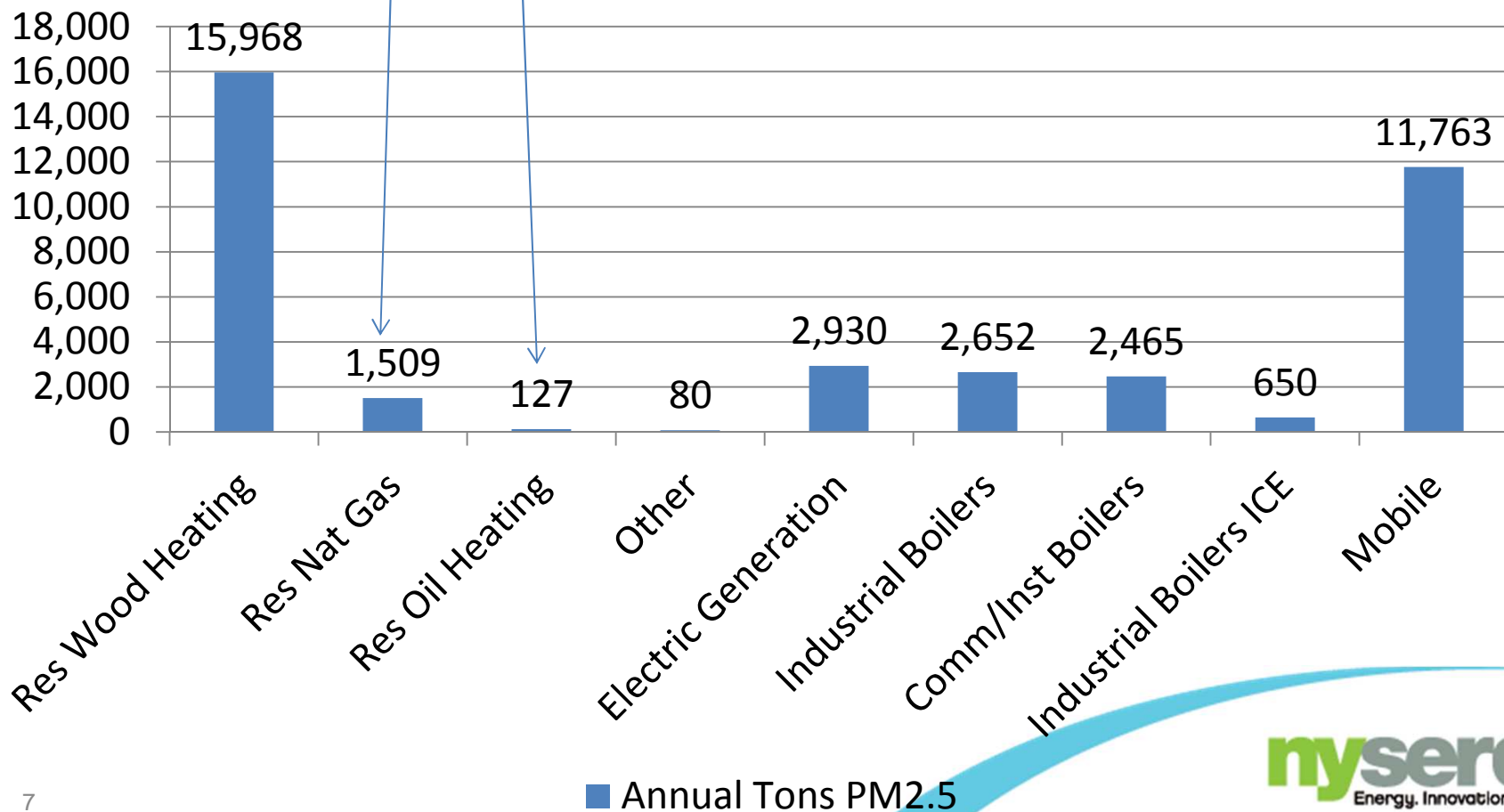
- Wood smoke dominates PM in rural NYS
- Wood smoke contributes 30% of the wintertime PM in Rochester, NY
- Sub-daily concentrations of wood smoke PM are measured at health-relevant levels, even in rural areas
- NYS has a goal to reduce exposure to wood smoke pollution
- New York is looking to support high-efficiency and low-emission wood boiler heating systems, with increasing standards over time.
- New York is also providing incentives to retire outdoor wood boilers, indoor wood boilers, whole house wood furnaces, and wood stoves.
- We have learned much about the technical capabilities and requirements to help us attain our energy and environmental goals.

# PM2.5 Emissions by Key Source Types

Wood: heats 1.2% NY homes primary heat & ~453,000 stoves

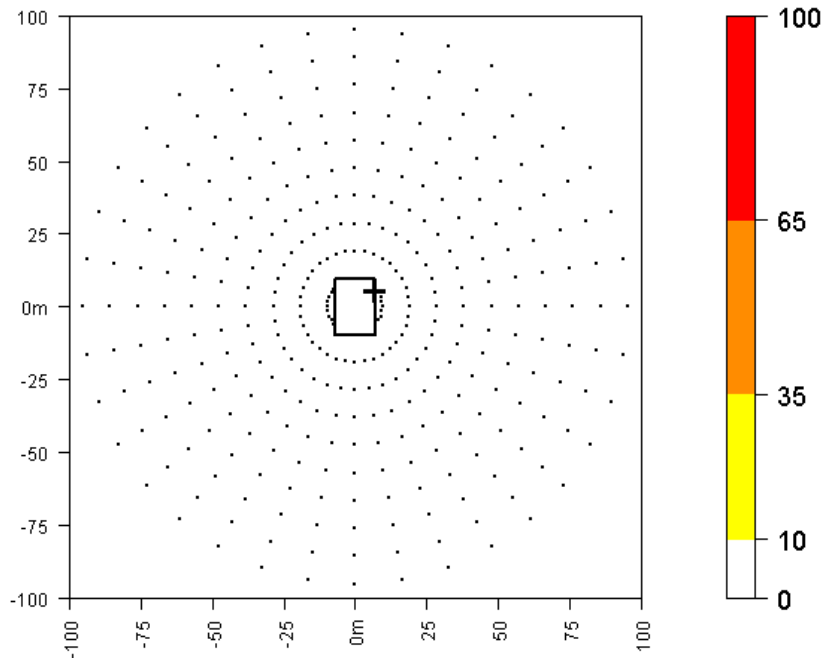
Natural gas: heats 51.7% NY homes (>3.6million)

Home heating oil: heats 33.1% of NY homes (>2.3 million)



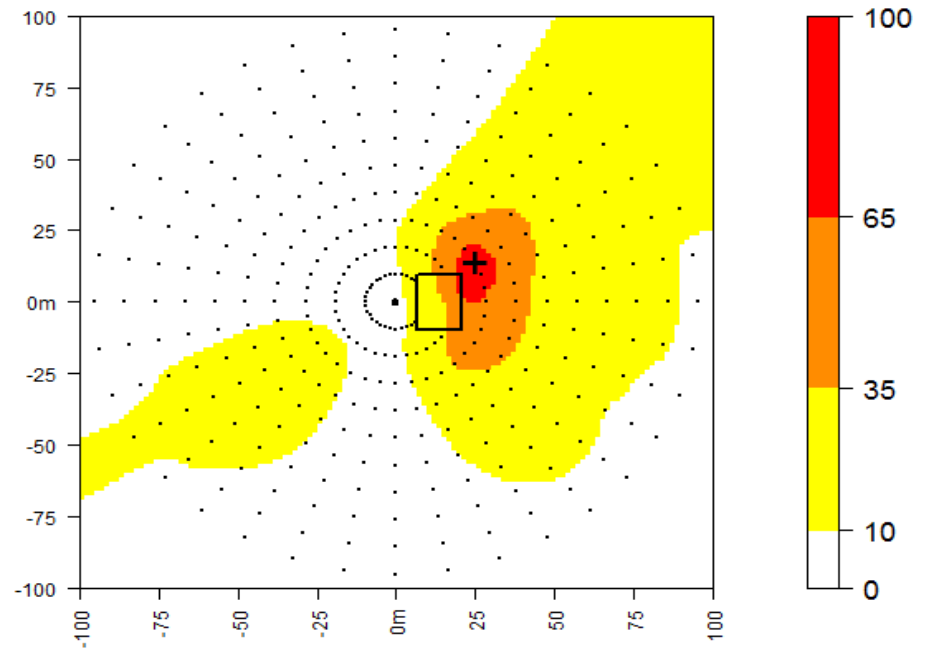
# Modeling 24-hr Impacts

Results of Modeling a Phase 2 OWB based on emissions from M28HH with background



Max Concentration: 12

Results of Modeling a Phase 2 OWB based on emission profile from EPA ORD testing w/out background



Max Concentration: 92



# The Future: Step 1 vs Step 2

Emission Scenario	Concentration ( $\mu\text{g}/\text{m}^3$ )	
	<b>24 hr</b>	<b>annual</b>
<i>EPA NAAQS</i>	35	12
<b>Neighborhood Scenario - Valley</b>		
Scenario 1: Growth with Step 1 technology	58.8	11.6
Scenario 2: Growth with Step 2 technology	27.4	8.7
<b>Neighborhood Scenario - Mountain</b>		
Scenario 1: Growth with Step 1 technology	66.4	10.7
Scenario 2: Growth with Step 2 technology	24.6	7.1
<b>Neighborhood Scenario – Urban/suburban</b>		
Scenario 1: Growth with Step 1 technology	62.9	12.9
Scenario 2: Growth with Step 2 technology	30.5	10.1

# Technologies & Test Methods

# Important advances in wood boiler technology

**Outdoor Wood Hydronic Heater**



**Two-stage, downdraft gasification heater (low-mass boiler) with thermal storage**



- Completely different design principals from the outdoor wood hydronic heater.
- Low mass technologies – advanced technologies - cannot be evaluated using EPA Method 28 WHH
- Lack of a test method became a significant market barrier
- Barriers from traditional avenues for test method creation so NYSERDA requested assistance from Brookhaven National Lab

## Brookhaven National Lab (BNL) Partial Thermal Storage (PTS) Test Method

### More rigorous evaluation yet simpler and more cost effective to conduct

- Test fuel: cord wood NOT dimensional lumber
- Measurements of cold start (Cat I) and hot start (Cat IV)
- Efficiency is measured by thermal output, more rigorous than stack loss measurement used in several proposed test methods
- PM and CO measurements provide emissions at different phases of the burn [start-up, steady-state, and end phases (critical for future design improvements)]

### **Anticipated reduction in testing costs from \$25K to \$10K**

- Commercial labs have refused to test using the BNL –PTS method even though EPA and states accepted its use as a test method in regulatory and voluntary programs



Development supported financially by NYSERDA and EPA.

Great support from state air regulators, Biomass Thermal Energy Council, NY Bioenergy Alliance and manufacturers of advanced cordwood boilers

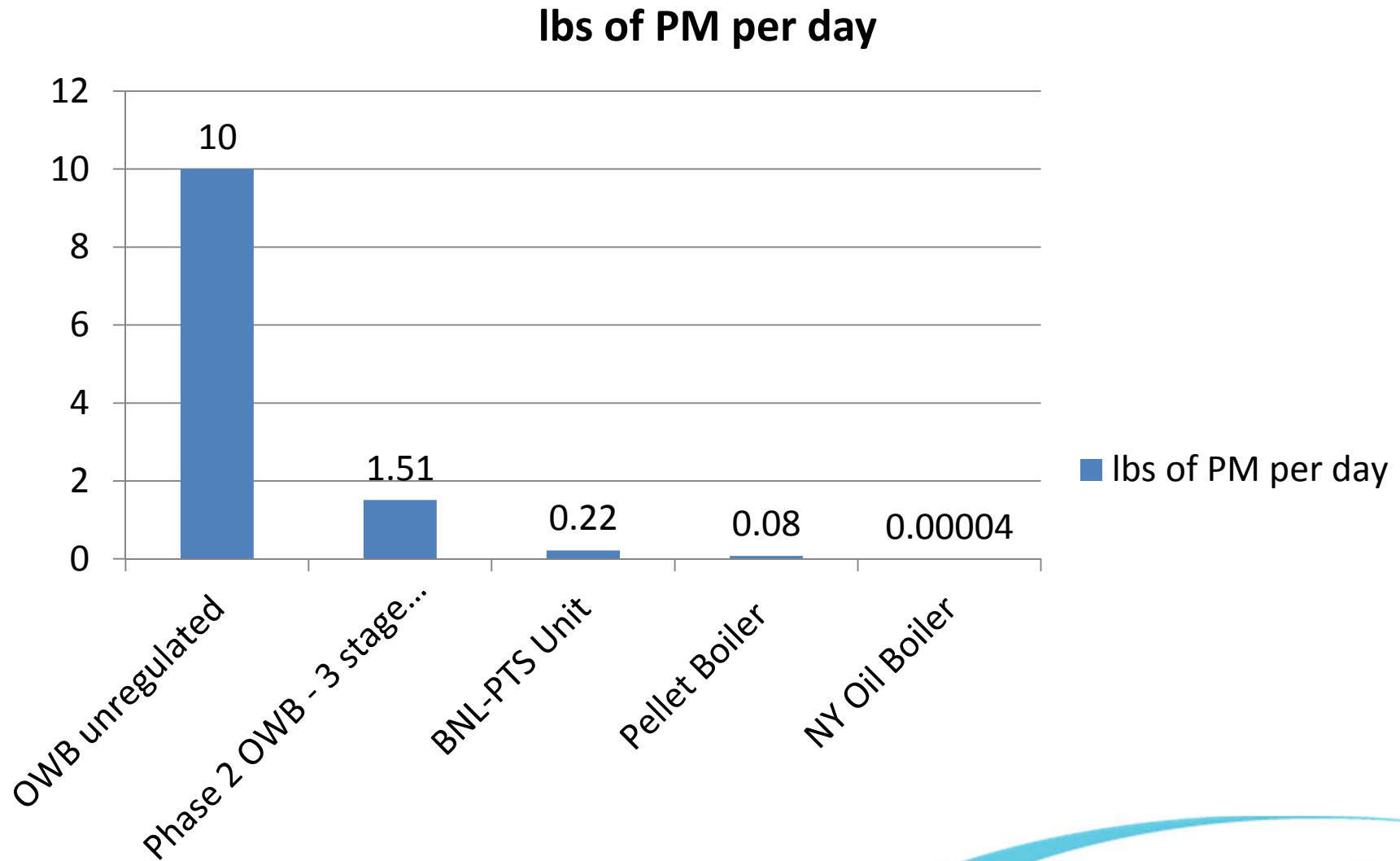
# Comparing Test Results

Device	Test Method	PM Emissions	Efficiency
Froling	EN303-5	0.06 lb/mmBtu g/hr cannot be calculated	86%
Froling	BNL PTS	0.18 lb/mmBtu Max run 7.3 g/hr	Annual average 70%
HSS	BNP PTS	0.28 lb/mmBtu Max run 14 g/hr	Annual average 60%

In order to better serve the consumer:

- Eliminate comparison of emissions across different test methods
- Adjust the g/hr cap from 7.5 to 18 g/hr for devices that use test methods including start-up emissions
- Outlaw the use of hang tags and use of emissions and efficiency data in marketing materials for units tested by methods that do not use cord wood or include start-up emissions. Only allow these units to be sold as “certified”
- Allow the use of hangtags and marketing of emissions and efficiency data for units tested with cordwood by methods that include start up emissions

# Performance Comparison Across a Common Duty Cycle



# Commercial Test Lab Capacity

# Review of EPA Accredited Labs Test Reports

- Reviewed 23 test reports
- 90% (21 of 23 reports) found missing or questionable data
- Issues included deviations from test protocol, unreported data, and basic math errors
- Testing was conducted by labs that were EPA-certified and ISO accredited
- Issues continue as states review test reports for their regulatory programs
- Significant questions remain about capabilities, capacities and impartiality



# New York Manufacturers

# Econoburn – Made-in-the-USA

**Mark Odell, Vice President**



- Econoburn of Brocton, NY is a manufacturer of a Made-in-the-USA down-draft wood boiler.
- The EPA Voluntary method has depended solely on M28 WHH and has created a market barrier for our superior technology because M28 WHH cannot evaluate low mass boilers like the Econoburn.
- Some state regulations have used the EPA Voluntary list or depended on M28 WHH to develop regulations. The lack of a test method appropriate for our units effectively blocked Econoburn from key markets.
- Consumers have had the perception that if Econoburn is not listed by EPA it isn't clean and efficient. EPA ORD's own research showed this was not the case and in fact our unit was cleaner than EPA qualified devices

# Econoburn – Made-in-the USA

Market Barriers – EPA accredited test laboratories



- Econoburn is the first Made-in-the USA technology to pass the BNL-PTS.
- The BNL-PTS is the most complete and comprehensive test for our boiler type.
- Econoburn is proud to finally be approved by the NYSDEC and NYSERDA's Renewable Heat NY program.
- We are frustrated that while EPA accepts the BNL-PTS, and recognizes BNL as an accredited test lab, EPA cannot accept our test result because of a conformity issue, which is impossible for a government laboratory to obtain
- Barriers created by the accredited labs have resulted in a significant loss of market share. Without being listed on EPA's voluntary program, we have not been able to enter key markets.
- Our future appears to hang in the balance of four EPA accredited test laboratories that are refusing to test by the EPA accepted BNL-PTS method.



# Econoburn Made-in-the-USA

## Recommendations:



- EPA accredited test labs must not be allowed to dictate what test methods are used.
- Labs appear to be blocking markets by refusing to conduct tests, this raises questions about impartiality of the commercial labs. The rule must ensure that the labs who test are impartial evaluators without perceptions of financial conflict of interest.
- While we can easily meet the weighted annual output emissions rate of 0.32 lb/MMBtu, we respectfully request a limit of 18 g/h for any burn category for units tested by the BNL PTS method.
- Econoburn has gone to great effort to make improvements to our technology – better combustion chamber geometry, the addition of an oxygen sensor and smart controls – all to optimize combustion, increase efficiency and minimize emissions. We make clean burning technology.
- Other companies have not made the investments that we have. Who do you wish to reward?

# Econoburn – Made-in-the-USA



Final comment:

- If you make a weak rule, you will reward those who made no effort to improve their products and continue to sell dirty technology. This will further hurt Econoburn, a small business that has worked hard to produce efficient and clean burning units.
- The longer you delay implementing good test methods and achievable emissions standards, the longer we have an uneven playing field.
- Consumers need to know which units will perform better in the field. The rule should seek to provide special hangtags to units that test with cordwood and start-up emissions so they can easily be identified by the consumer. These units should also receive special recognition on EPA's website.
- Who should really benefit? Those who innovate or those who refuse to do so?

# Hydronic Specialty Supply- Made-in-the-USA

## Dale Furman, Managing Member



- HSS is a new Made-in-USA manufacturer of an advanced cord wood boiler located in Western NY.
- HSS saw the need in the market for better technology and has invested heavily to commercialize this efficient and clean down-draft wood boiler technology.
- HSS has been tested at BNL on the BNL PTS method. We passed and those results are now under review by NYSDEC.
- HSS echoes the comments made by Econoburn. Do not reward dirty technology, reward innovation.
- Do not allow the accredited test labs to dictate what test methods are used and seek to make them impartial evaluators without perceptions of financial conflict of interest.
- Set a realistic category maximum emissions rate of 18 g/h per Category for units tested in start-up conditions. Anything less is too low at this time and will block good technologies from the market.

# Evo World Made-in-the-USA

## Lou Okonski, COO



- Evo World is a Made-in-USA manufacturer resulting from a new partnership of a third-generation family boiler manufacturer based in Troy, NY and an Austrian pellet boiler manufacturer.
- Evo World manufactures high-efficiency pellet boilers that perform best with thermal storage. Evo World has been accepted by the RHHY program only with the use of thermal storage.
- Pellet boilers will not be as clean or efficient if used without thermal storage. If the unit is not installed with storage, it must be tested with EPA M28WHH, anything else will not be representative of actual performance.
- Shortly we will have data that compares performance with and without thermal storage. While we are confident that we can test and be passed on the EPA M28 WHH method, it is not the way we wish for our unit to be installed.

# Evo World Made-in-the USA

- We urge the use of the BNL PTS test method and requirement that those who test by it install their pellet boiler with thermal storage so there is no confusion for the customer.
- All others wishing to install without thermal storage should test by EPA's M-28 WHH.
- Hangtags must provide clear performance information for consumers. If units are tested with real world tests, they should have hangtags
- EvoWorld also echoes the comments by Econoburn
  - Reward innovation, not dirty technology.
  - Do not allow the accredited test labs to dictate what test methods are used
  - ISO and EPA certified labs must become impartial evaluators without real or perceived financial conflict of interest.





# Summary

- New York is committed to supporting high-efficiency and low-emissions wood boiler heating systems.
- We must not reverse any recent improvements in air quality, nor create new health risks associated with wood combustion. A major goal is to reduce exposure to wood smoke pollution and prevent non-attainment of the NAAQS.
- Not all test methods are equal. The use of the ASTM test method, and refusal of the EPA accredited test labs to use the BNL-PTS test method, are barriers to advancing U.S. biomass technologies.
- Approved test methods must include the efficiency and emissions measurements of the full operation of the unit, not just best case. This is the only way to accurately characterize in-field use.
- Accept only the BNL-PTS for down-draft units, it allows the necessary information for further innovation.
- Allow maximum 18 g/h of PM in Category run for units that include start-up emissions.
- CO needs to be measured and reported as part of any approved test method.

## Summary, continued

- We need access to emission reports so data can be scrutinized. The only viable path forward for a vibrant wood heat industry is one which optimizes both energy efficiency and environmental performance.
- Provide a hang tag only for those units tested on cord wood or pellets with comprehensive start-up, steady-state and end-phase emissions testing.
- Remove confusion in the marketplace, do not allow marketing of efficiency or emissions performance determined on any test method other than one using cord wood or pellets and measuring all phases of the burn.
- Remove market barriers created by test labs and void accreditation for labs refusing to test by EPA approved methods such as the BNL-PTS.
- Require boilers testing with thermal storage to include it in the installation.
- Manufacturers must test on all fuel types that they claim the unit can burn.
- To effectively support a vibrant wood fuel heating industry, we must reward innovation rather than dirty, poor performing technologies.