Date: November 3, 2009

Subject: Staff Draft Preliminary Conclusions from Subpart AAA NSPS Review

To: Chebryll Edwards, Leader, EPA Regulatory Development and Policy Analysis Group

From: Gil Wood, Environmental Engineer

I. Introduction

The purpose of this memorandum is to provide my draft preliminary conclusions leading to my recommendation that EPA initiate efforts to revise the New Source Performance Standards (NSPS) for new residential wood heaters to tighten the emission limits to reflect current technology and to expand the scope to include more of the types of appliances that are being marketed today. These standards are codified at 40 CFR part 60, subpart AAA. A snapshot of information about the status of the industry, technology, and emissions is summarized in the separate but related NSPS draft review document prepared by EPA's contractor, EC/R. The purpose of the draft review document is to provide a snapshot summary of available information on residential wood heating, including developments in technology and alternative heating methods. This memorandum and the draft review document also include snapshot summaries of information about implementation of the existing program and suggestions EPA has heard regarding potential improvements. This memorandum and the draft review document are not Agency findings. This memorandum does not include recommendations of specific emission limits because there are several important studies of emission performance that EPA had expected to receive by now but has not yet received. Nevertheless, the preliminary information clearly supports tighter emission limits.

II. What are the issues driving the review?

The NSPS were proposed in 1987 and promulgated in 1988. Section 111(b)(1)(B) of the CAA requires EPA to periodically (every 8 years) review the NSPS unless it determines "that review is not appropriate in light of readily available information on the efficacy of such standard." If needed, EPA must revise the standards of performance to reflect improvements in methods for reducing emissions. The current body of information indicates that review and revision of the current residential wood heater NSPS are needed to capture the improvements in performance of such units and to potentially expand applicability to include additional wood-burning devices that are in the U.S. market and/or available abroad.

EPA has received several requests to conduct a review of the residential wood heater NSPS, including a joint letter from the Western States Air Resources Council (WESTAR) and the Northeast States for Coordinated Air Use Management (NESCAUM) that urged EPA to update and develop regulations relating to a variety of wood combustion devices. The authors cited concerns that many communities are measuring ambient conditions above or very close to the current $PM_{2.5}$ National

Ambient Air Quality Standard of 35µg/m^3. They stated that in many instances, emissions of wood smoke are a significant contributor to those high $PM_{2.5}$ ambient concentrations. Other states, environmental groups, and the Hearth, Patio and Barbecue Association (HPBA) have also recommended changes to the NSPS.

Specific requests for the NSPS review include, but are not limited to, the following topics:

- Tighten PM emission limits based on current performance data
- Address other pollutants of concern (such as CO, PAHs, GHG, mercury)
- Review the format of standard, including the possibility of adding requirements to document the efficiency of the unit
- Close applicability "loopholes" such as air-to-fuel ratios and size and weight cutoffs in the definition of wood heater
- Add other wood heaters such as pellet stoves and outdoor wood boilers to the NSPS
- Add fireplaces and other non-"heaters" (e.g., cook stoves) to the NSPS
- Add other fuel types (e.g., other solid biomass, coal)
- Revise test methods
- Streamline certification process to use electronic data submitted by ISO-certified labs
- Improve enforceability and quality assurance/quality control
- Make the rule more consumer-friendly by making more information readily available on-line.

III. Does available information indicate the need for revisions?

Below are several key questions to consider as EPA evaluates the need for revisions of the wood heater NSPS. In general, the purpose of the questions below are to help ascertain whether, if EPA were to determine "the best technological system of continuous emission reduction which (taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impact and energy requirements) the Administrator determines have been adequately demonstrated" [commonly called "best demonstrated technology" (BDT)], the determination would differ substantially from the original determination that formed the basis for the NSPS promulgated in 1988. I believe the following questions are relevant to such a determination, and my draft answers are listed below. Based on this information, I conclude that revisions to the NSPS are appropriate and necessary.

1. **Has there been improvement in wood heater technology and practices to reduce emissions?**
   - The NSPS has been extremely successful in encouraging the development of improved particulate matter (PM) control technology in residential wood heaters. Over 800 certified wood heater model lines are included in EPA's compliance database, most of which are certified at PM emission levels well below the current NSPS.

- Today's wood heaters are much more advanced than those of 1988. Many achieve much lower emission levels due to sophisticated secondary combustion design, improved catalytic combustors, improved integration of catalytic combustors into the design of the stoves (rather than just an "add-on"), and improved automatic air-to-fuel adjustments and self-igniters for pellet stoves. The benefits of direct PM reduction are often much larger than the direct costs of the reductions.
- On a sales-weighted basis, over 90 percent of EPA-certified model lines are reported to meet the Washington State wood stove emission limits which are more stringent than the current NSPS.
- We are still collecting data on wood heater performance (including PM emissions reduction as well as other pollutants and overall efficiency), but I anticipate that we will identify a very large number of model lines that significantly outperform the NSPS.

➢ **Wood heater technology and practices have improved significantly since promulgation of the residential wood heater NSPS. Current wood heaters are capable of meeting standards more stringent than those in the NSPS promulgated in 1988.**

2. Have states and other countries developed more stringent regulations than the current NSPS?

- The State of Washington has wood heater particulate emissions standards that are more stringent than the standards in the current NSPS. The Washington State standards do not exempt new fireplaces or new hydronic heaters.
- Several air quality management districts regulate new fireplaces to the emission levels of the 1988 NSPS.
- Wood heaters are regulated by several European countries, Australia, and New Zealand. Canada is considering standards. While these are difficult to compare on their face value, because of different formats and test methods, it is clear that there is worldwide interest in limiting wood smoke emissions from residential heating. The Austrian Biomass Research Center is preparing an analysis which compares the various European standards, and shows the emissions for the top 25 performing European model lines in each appliance category. Advance draft information indicates that a large number of European model lines appear to emit much lower emissions than the NSPS promulgated in 1988.
- Several states and local agencies have developed curtailment programs and building code restrictions (including bans) to limit wood smoke pollution.

➢ **Post-NSPS regulations in the U.S. and foreign countries have pushed the level of emissions reduction that is achievable to limits that are more stringent than the NSPS and to additional types of devices.**

3. **Have voluntary programs been developed in the U.S. or foreign countries that encourage the development of cleaner wood-burning devices?**
    - In response to state concerns about air quality impacts from hydronic heaters, EPA has developed a voluntary program to encourage development of cleaner hydronic heaters and has supported NESCAUM's development of a model rule for states to consider in their development of regulations relating to hydronic heaters. Several states have enacted or are studying similar rules, and some local jurisdictions have instituted outright bans. [Hydronic heaters are not regulated by the current NSPS.]
    - EPA has also developed a voluntary fireplace program to encourage development of cleaner-burning fireplaces. The industry came to EPA to request a voluntary program because of their concerns about the proliferation of bans in numerous air quality management districts. [Fireplaces are not regulated by the current NSPS.]
    - Foreign countries have developed numerous voluntary labeling programs to encourage cleaner wood-burning devices.

➢ **Voluntary programs in the U.S. and foreign countries have resulted in wood-burning devices cleaner than the NSPS and have included additional types of devices.**

4. **Has the residential wood heater market changed to include other types of heaters and should they be included in the NSPS?**
    - Wood pellet stoves have become an increasing force in the market place. Many of these are higher-efficiency devices with lower emissions. Because of the current air-to-fuel ratio applicability requirements in the NSPS (designed principally to exclude fireplaces), many wood pellet stove manufacturers have avoided the certification process ("too long"). However, uncertified model lines have been banned in some areas, and thus manufacturers have more interest in certifying these model lines. Consumers frequently ask EPA for data.
    - Hydronic heaters have become increasingly popular with some consumers, but these devices are often regarded as serious nuisances and they can have significant local air quality impacts. One old, dirty unit can emit enough direct $PM_{2.5}$ to result in frequent exceedances of the $PM_{2.5}$ NAAQS. EPA's voluntary program has led to advances in this technology and now the HPBA Outdoor Hydronic Heater Caucus has requested that EPA develop an NSPS for these models. Consumers have frequently asked EPA for information and regulations.
    - Forced-air, wood-fired furnaces are also popular in some areas. Some manufacturers have asked for furnaces to be included in the hydronic heater voluntary program so they can "show that their emissions are less." Consumers have frequently asked EPA for data.
    - Masonry heaters are popular in Europe, and the market may be growing in the United States. Many of these devices have relatively low emissions and relatively high efficiency. However, they are considerably more expensive to purchase than other wood

heater options, which may limit the extent of market penetration. The Masonry Heaters Association has requested that EPA develop a voluntary program or an NSPS for these models so that they can compete for market share in locales that prohibit non-EPA-certified appliances.

- **Although cord wood stoves are still the most common form of wood heaters in the U.S., there is evidence that consumers are embracing other residential wood heaters and an NSPS for all wood heaters would be helpful and prudent. [Note: fireplaces are more common than woodstoves but a typical fireplace is not an effective "heater."]**

5. Has the residential wood heater market expanded to include other types of biomass fuel?

- Other solid biomass fuels, such as corn and food product residuals and switchgrass, are under active investigation for their economic viability, emissions potential and heating efficiency. Coal burning units are on the increase too.
- Failure to regulate devices that burn these fuels for home heating could drive consumers to shift to them and possibly contribute to a more serious air pollution problem.

- **A variety of types of solid biomass are burned in residential heating appliances today, and this portion of the market is expected to expand. More work is needed to understand the impact on the environment of the residential burning of non-stick-wood fuels and the potential impacts of regulating devices that burn such fuels. If EPA were to regulate non-wood biomass burning devices, we may need to develop a new category to address them.**

6. Should other types of wood-burning devices, i.e., non-"heaters" be evaluated?

- Note that fireplace inserts (which are really wood stoves) are included in the NSPS.
- Many stakeholders do not consider traditional fireplaces to be "heaters". Instead, fireplaces are considered to be aesthetic devices, similar to chimineas and firepits that are burned primarily for decorative purposes (ambiance).
- Cleaner-burning fireplaces is the goal of the EPA voluntary program, which will provide some information regarding BDT.
- Cookstoves were specifically excluded from the current NSPS. Some units are certified to the extent they also provide heat for the structure.
- Comments have been received that claim that "many" wood stoves are circumventing the NSPS as "cook stoves".
- Some local areas have expressed concern about firepits and chimineas.

- **These devices should be evaluated to establish whether sufficient data exist to determine BDT and to determine whether there are sufficient data to support a new category listing, if necessary.**

7. Should the NSPS test methods be revised?

- Manufacturers, EPA-accredited laboratories, and states have provided many suggestions for changes to simplify the procedures, reduce costs, correct errors, and to make the methods "more representative of the real world".
- Many variables in the existing NSPS test methods influence emissions. Revising the methods must be balanced against the risk of rendering the existing database obsolete because the results are no longer comparable. Changes that make the test easier to pass may also result in a *de facto* decrease in the stringency of the standard.
- At some point, the inherent variability in the test results may be larger than the differences in wood heater performance, which could become an issue if the level of the standard is significantly tightened. Thus, the inter-lab and intra- lab precision needs to be investigated further to ensure the validity of the certifications of model lines.
- There is tension between test methods that are standardized and relatively reproducible and ones that perhaps better reflect real-world operating conditions.
- Different methods/assumptions may be needed for different types of devices.
- EPA needs to develop and/or agree on efficiency test methods.
- EPA is actively participating on several ASTM workgroups that are considering changes to the test methods. ASTM is hoping to reach consensus on several changes this fall.
- EPA is communicating with Environment Canada on their changes to CSA B415.1. They expect to reach consensus this fall.
- EPA has indicated that we are considering changes to Method 28 from a 4-burn-rate test method to a 3-burn-rate test method and reevaluating the burn rate frequency tables.
- EPA will need to propose conditional Method 28 OWHH and/or an ASTM test method for hydronic heaters.
- EPA will need to approve the ASTM test method for fireplaces [or develop another method] if we decide to regulate fireplaces.
- EPA will need to develop and/or agree on a durability test method to ensure that appliances meet BDT for the life of the appliance.

➢ **EPA will carefully consider a variety of revisions and additions to the NSPS test methods, with the recognition that the test methods are integral to the stringency of the standards.**

8. Should pollutants in addition to PM be considered for regulation?

- The current NSPS establishes PM standards, as do rules in many other jurisdictions.
- Wood smoke also contains other criteria pollutants, persistent bioaccumulative air toxics, other air toxics, and greenhouse gases. Organic carbon is emitted from this source category along with elemental carbon. How organic carbon and elemental carbon contribute to global warming is of interest to EPA.

- **We believe that PM is still a good surrogate for many of the pollutants in wood smoke. We will consider the co-benefits of reductions in other pollutants as we conduct analyses in support of the NSPS revision.**

9. **Is there a need to revisit compliance certification, laboratory accreditation, and QA/QC in order to make these procedures more cost-efficient and more effective?**
    - Manufacturers, EPA-accredited laboratories, and EPA compliance personnel have stated that improvements should be considered.
    - EPA considers using national consensus organizations when appropriate.
    - The International Standards Organization (ISO) accredits laboratories to conduct tests and accredits bodies to certify conformance with standards and ensure quality assurance and control. Safety standards often rely on ISO-accredited organizations.
    - ISO procedures for QA/QC are typically equal to or better than those conducted by EPA.
    - EPA has not used the random compliance audits allowed under the current NSPS and has infrequently used the selective enforcement audits.
    - Electronic submittal of test data per an EPA format will reduce the time for processing.
    - Laboratories appear to be not taking the round-robin proficiency testing as seriously as the certification testing since there is no reward or punishment.
    - Manufacturing tolerances and processes have improved considerably since 1988 and thus there is less need for frequent physical inspections of units.

- **EPA should consider allowing ISO-accredited laboratories to conduct certification tests**
- **EPA should consider requiring manufacturers to contract with an ISO-accredited certifying body to issue certificates of conformance to the NSPS requirements, including QA/QC and periodic inspections of the manufacturing processes and products.**
- **EPA should consider requiring manufacturers annually and each time they seek certification of model lines to submit an enforceable signed affirmation that they understand that they alone are legally responsible for being in compliance with all requirements at all times and will immediately report to EPA any instances of non-compliance and remedial measures. The affirmation should clearly state that errors on parts of others, including the ISO-accredited bodies, do not absolve the manufacturer of responsibility.**
- **EPA should develop specific procedures for random compliance audits and use them in addition to selective enforcement audits.**
- **EPA should develop a standardized format for electronic submittal of test data.**
- **EPA should consider providing incentives/penalties for laboratories to always perform as seriously during proficiency testing as they do during certification testing.**
- **EPA should consider reducing the frequency of manufacturer's physical measuring of product tolerances.**

10. Is there a need to revisit the format of the standard(s) (e.g., grams per hour, grams per kilogram of wood, pounds per million BTU heat output, etc.)?

- The variety of formats is confusing to consumers. Helping the public understand the appropriate comparisons is very important for the consumers to make the best purchases and to operate the appliances properly [EPA has begun a BurnWise education program.]
- The g/hr format has the advantage of most directly relating to the impact on the air shed.
- The pounds per million BTU heat output format has the potential advantage of allowing comparisons of models across product types, i.e., common denominator of heat output for different heaters. This allows consumers and air quality planners to make strategic environmental and energy choices.
- All formats likely will still need to consider a range of operating conditions and frequency of operation at different burn rates, i.e., weighted averages.
- The current standard has both weighted averages and individual run caps.
- The Phase 2 voluntary program for hydronic heaters uses a weighted average based on heat output plus a cap on any individual run.
- The voluntary program for fireplace uses g/kg because fireplaces typically are used for ambience rather than as "heaters". That is, different formats may still be appropriate for different devices.
- Efficiency can be measured and reported separately or it can be indirectly built into a format of emissions per heat output.

➢ **EPA should seek additional input from states, manufacturers, and consumers to determine what formats best meet the needs of both air quality planners and consumers.**

11. Is there a need to revisit the labels and owners manual requirements to update them and to ensure the information is consumer-friendly and accurate?

- Numerous states, manufacturers, and consumers have stated that improvements should be considered.
- The 1988 hangtag is "plain" compared to many other labels of today.
- Good operation is very important for ensuring lower emissions. Improper operation can negate the expected emission reductions
- EPA has begun a BurnWise campaign to help educate potential consumers and operators.

➢ **EPA should seek input from states, manufacturers, and consumers to determine what best meets the needs of both air quality planners and consumers.**

IV. Staff Draft Conclusion

A variety of revisions to the NSPS appear to be both appropriate and necessary. EPA should seek input from the stakeholders and thoroughly consider their input and other available data to develop

proposed revisions. Economic impact and energy impact analyses will need to be undertaken in adherence to Executive Orders and other requirements. Because most of the manufacturers are small entities, EPA should conduct appropriate analyses of the potential impacts on small businesses, following the guidance in the Small Business Regulatory Enforcement Fairness Act. Also, EPA has volunteered for this rulemaking effort to undergo an Environmental Justice analysis. As noted in the Introduction of this memorandum, this memorandum represents Staff Draft Preliminary Conclusions, not Agency findings. Any rulemaking that is forthcoming may or may not match this memorandum and will be published in the Federal Register for public comment before promulgation.