OFFICE OF AIR QUALITY PLANNING AND STANDARDS
RESEARCH TRIANGLE PARK, NC 27711

June 25, 2024

MEMORANDUM

SUBJECT: IDC East / West Coast Precision Study – Data Availability

FROM: Steffan Johnson – Group Leader
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TO: Docket # EPA-HQ-OAR-2016-0130

This week the EPA is docketing an extensive data set that has been collected to study the variability of residential wood heater emissions and to aid in vetting the establishment of new operating and fueling protocols for these appliances, the Integrated Duty Cycle methodology, developed by the New York State Energy, Research and Development Authority (NYSERDA) with the aid of their contractor, North East States for Coordinated Air Use Management (NESCAUM). Along with the IDC protocol, these data also serve to characterize particulate measurements using another NYSERDA/NESCAUM developed method using a Tapered Element Oscillating Microbalance (TEOM), a measurement approach for particulate that is capable of real-time emissions measurements.

The EPA would like to recognize and thank NYSERDA and NESCAUM for their participation and considerable assistance in conducting this study. Their measurement protocols, assistance with technical concerns and TEOM operations, and their commitment to seeing this testing project through has not gone without notice and is greatly appreciated.

As you gain access to these data, we ask that you look through the test data with an open, scientific mind, and remember that this is the very first time we have really begun to get our arms around test data variability. This is about improving test methods and testing outcomes, about making compliance testing more repeatable and appropriate to the way appliances are used, and about building a foundation upon which improvements can be made moving forward with this regulatory program. This is about the data and what the data say about testing. This is not about the test laboratories or people at those laboratories who worked for many hard hours to put together this impressive data set. We can criticize such things every day for years and never improve a single thing. And I think that one thing we all recognize today is that we have a great many improvements to make in the next several years. So let us focus on the data, for it paints its own picture and tells some compelling stories. We ask you to help us fill in the mosaic, help us identify key insights, help us identify missing pieces, and

help us bind together what may be too loose, or to open what might be too limiting. We certainly could use the help and, together, we can craft what may well become a watershed moment for residential wood heating in the USA.
The data have been collected at two different test laboratories. Each test laboratory has conducted the testing on the very same six appliances; meaning that 3 pairs of wood heaters have been involved, and the same number of tests have been conducted on each pair of appliances. Each pair consists of two of the same model appliances. Each test lab used a common version of the IDC protocol and TEOM SOP (both docketed prior to the beginning of testing). As this testing has taken a good deal of time, the IDC and TEOM SOP have both been modified since this testing began, but EPA did not allow any of the newer versions to be used in this program as we wanted to limit the number of questions that such edits may raise about the resultant data set. Also, please keep in mind that this is only about wood heaters burning cord wood; other IDC protocols are in development for pellet heaters, hydronic heaters, and forced-air furnaces. We will have more data to review in future months and years.

Each of these testing efforts was conducted independently, to the greatest extent possible. There was cooperation deciding on the fuels to be used, the appliances to be used, and some cross training with respect to use of the TEOM before the testing began.

EPA's contractor developed a Level 1 project Quality Assurance Project Plan (QAPP) which is our most stringent data quality plan, specifically pointed at regulatory test method development, and we insisted that NESCAUM emulate a similar Level 1 QAPP to backstop data quality for their work. All the data that we are presenting here have met these stringent data quality requirements.

The testing included a pair of non-catalytic wood heaters, a pair of catalytically controlled wood heaters, and a pair of hybrid wood heaters. Each test lab conducted 52 test runs, and two different fuels were used at each test laboratory. Maple was the common fuel used by each lab, and in addition to maple, Douglas fir was also burned in the Western lab and Birch was burned in the Eastern lab. The breakdown of testing was as follows:

7 pairs of tests were conducted with both Maple and the alternate fuel (birch or fir) with the hybrid stove model.

3 pairs of tests were conducted with both maple and the alternate fuel (birch or fir) with the non-cat stove model.

3 pairs of tests were conducted with both maple and the alternate fuel (birch or fir) on the catalytically controlled stoves.

Paired appliances were needed to establish a repeatability assessment for each test lab. Think of this in terms of "What variability might there be if we tested the same appliance in the same test lab a number of different times?". Paired test labs were needed to establish a reproducibility assessment for each test lab. Think of this in terms of "What variability might there be if we tested an appliance at one lab and then re-tested that appliance at a different lab with different staff, equipment, procedures, and measurement SOP's?".

This is a robust data set the likes of which EPA has never had for the residential wood heating sector and it will help inform us in many ways. Some of those include:

1. What do these data tell us about the IDC test method and how might we refine that method to reduce variability and improve the consistency of test results?
2. Are TEOM measurements, and the TEOM SOP sufficient for use in this sector?
3. Are there other ways we should look to for reducing variability in wood heater test results?
4. Can repeatability and reproducibility of data provide for a more robust emissions standard?
5. What do repeatability and reproducibility tell us with respect to the concept of audit testing?

There are other questions that these data will aid in answering; only a few are listed above. We will meet to discuss these, and other issues in about four months' time. Between then and now EPA will send out additional details about our analysis of these data as we wrap our arms around them and begin to better understand their full meaning.

We look forward to joining you in those discussions.

HOW TO FIND THE DATA:

Our contractor, SC&A, will be posting instructions in the public docket (https://www.regulations.gov/docket/EPA-HQ-OAR-2016-0130/document) that will explain how you can obtain these test data. The data will be packed into two zip files, and you will need to write the EPA Docket Manager who will send you a link to access those files as they are too large to load into the public docket. Our contractor's note will explain this in greater detail.

Note that these are two different data sets assembled by different labs, so it will likely take you some time to get accustomed to each of the data sets and begin to make your comparisons. With that said, these data sets are complete, and you should be able to find all of the details that you need for your review.

Other files already in the docket that are important as you view these data are:

- TEOM SOP
- TEOM Data Template
- IDC Fuel Load Calculator
- EPA QAPP for this project
- A Memo to the docket discussing testing issues encountered
- Tunnel Stratification Test Procedure

- Tunnel Stratification Test Results