Workshop 2 Agenda

Virtual Workshop on advances in instrumentation used for wood heater testing and field data collection

March 28th & 29th, 2022

As part of the 5th Wood Heater Design Challenge

Day 1

March 28th, 2022 11:00 – 14:00 New York Time (Eastern Daylight Time)

TIME	TOPIC	
11:00 – 11:05	Welcome and goals for the wood heater design challenge and the workshop Mark Shmorhun, *DOE*	
11:05 – 11:10	Organization of the workshop Rebecca Trojanowski, *BNL*	
11:10 – 11:30	"Overview of Performance and Emissions Evaluation" Julian Caubel, *LBNL*	
11:30 – 11:50	"Overview of EPA precision testing" Stef Johnson, *US EPA* Angelina Brashear, *US EPA*	
11:50 – 12:00	BREAK	
12:00 – 13:00	**Breakout Panels** *In-lab measurement focused*	
	Session A	Emissions sampling: Dilution tunnel vs. Flue
	Session B	Thermal performance: Direct and indirect methods
	Session C	Emission measurement instrumentation: PM and Gaseous pollutants
13:00 – 13:15	BREAK	
13:15 – 13:30	Closing remarks (summary of breakout panels) Vi Rapp, LBNL	
13:30 – 14:00	Optional networking	

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

BIOENERGY TECHNOLOGIES OFFICE

Brookhaven National Laboratory

BERKELEY LAB Bringing Science Solutions to the World

ALLIANCE FOR GREEN HEAT low carbon, renewable and local

Day 2

March 29th, 2022 11:00 – 14:00 New York Time (Eastern Daylight Time)

TIME	TALK	
11:00 – 11:10	Highlights from day 1 of workshop John Ackerly, *AGH*	
11:10 – 11:30	"CleanAir2 project – citizen science investigating real-life emission from firewood stoves" Manuel Schwabl, *BEST*	
11:30 – 11:50	"Instrumentation: Issues past and future" Ben Myren, *Myren Consulting, Inc*.	
11:50 – 12:00	BREAK	
12:00 – 13:00	**Breakout Panels** *In-field measurement focused*	
	Session D	Emissions sampling: Instrumentation and dilution
	Session E	Performance evaluation: How do you measure performance in the field?
	Session F	Impact evaluation methods: Public health and the environment
13:00 – 13:15	BREAK	
13:15 – 13:30	Closing remarks (summary of breakout panels) Jake Lindberg, BNL	
13:30 – 14:00	Optional networking	

Breakout Sessions:

DAY 1: In-lab measurement focused

Session A	**Emissions sampling: Dilution tunnel vs. flue**
Description	Many countries have adopted national standards that limit pollution emissions from residential wood heaters, however these standards differ from country to country. This session will focus on the common experimental objectives and major components of such standardized methods as well as how they differ. The session will provide an understanding of the challenges and successes associated with different methods of testing– specifically focused on dilution sampling vs direct stack sampling. One question remains at large; whether or not direct stack sampling can be correlated to dilution tunnel sampling– this session will provide valuable insight into this question. Additionally, this session will also discuss ways to help simplify and modernize methods.
Session B	**Thermal performance: Direct and indirect methods**
Description	Direct methods for determining energy output, burn rate, and thermal efficiency typically involve direct fuel input and direct heat output rate measurement. Indirect methods involve measurement of flue gas and (possibly) jacket losses. In this session measurement options and accuracy issues for the use of both of these measurements will be discussed. Applications can strongly impact the selection of the method, and this includes stoves, hydronic heaters, warm air furnaces, and emerging hybrid systems.
Session C	**Emission measurement instrumentation: PM and gaseous pollutants**
Description	Traditionally, laboratory testing of biomass heaters has focused on measuring the mass of particulate matter (PM) pollution emitted from the chimney using gravimetric filters. While gravimetric PM measurements are certainly an important indicator of air quality impacts and combustion performance, biomass appliances emit other harmful pollutants that merit monitoring, and instrumentation has advanced significantly in recent years. In this session, we will discuss the particulate and gaseous pollutants that are key to characterizing the emissions performance of wood heaters, and new or novel methods for measuring these emissions in the lab. An accurate and expanded understanding of air pollution from wood heaters is critical to informing the development of improved combustion technologies, and effective public policy to protect human health and the environment.

DAY 2: In-field measurement focused

Session D	**Emissions sampling: Instrumentation and dilution**
Description	During this session we will discuss the logistics and challenges with measuring emissions in the field. This includes discussing emission measurement instrumentation and dilution methods. We will also review what emissions are critical and what me might be able to do without.
Session E	**Performance evaluation: How do you measure performance in the field?**
Description	Measuring the performance of wood heaters in the field is no simple task. How can one accurately measure the amount of fuel consumed to determine the thermal efficiency? Should field measurements focus on an imposed duty cycle or how the heater is actually operated by the user? This session will focus on what needs to be included in field measurements such as the user comfort evaluation and understanding what goes into a user's decision to purchase a heater. Could this ultimately help us design a better heater?
Session F	**Impact evaluation methods: Public health and the environment**
Description	Traditionally, wood heater test methods have focused solely on particulate matter, on a mass basis. Recently, gaseous pollutants such as CO have been required to be reported during compliance tests. As residential wood combustion is often the highest source of PM emissions in states and held responsible for numerous health related issues, should we consider other measurements beyond PM mass, such as speciation, number concentrations, and size? This session will provide a forum that focuses on how to measure emissions related to health and environmental impacts.