BTEC
Biomass Thermal Energy Council

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Comments from the Biomass Thermal Energy Council to the Biomass Research and Development Technical and Advisory Committee

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I'm Joseph Seymour, Executive Director of the non-profit Biomass Thermal Energy Council (BTEC). BTEC is a nationwide industry association representing the views of 130 biomass feedstock producers, fuel refiners, appliance manufacturers, vendors, non-profits, state energy and environmental offices, and end users. I thank you for the opportunity to update to this Committee on a significant bioenergy initiative.

BTEC is coordinating a comprehensive state and national effort to establish and promulgate an efficiency test procedure for commercial size, solid biomass-fired boilers. Think of this project as "EnergyStar for Commercial-Scale Wood Energy Systems." The efficiency test procedure will be developed over 18-months using accepted standards-writing procedures and will represent the decision making of a balanced and experienced group of representatives from the biomass thermal industry, government and not-for-profit organizations, and other key regional and national stakeholders who are interested in improving efficiency and reducing emissions in biomass utilization. Domestically, it is the first of its kind.

The test procedure will build upon existing European standards, past efforts in the United States to develop standards for biomass-fired heating equipment, and US standards for oil and gas-fired boilers. The test procedure will address commonly-used, solid biomass fuels from both forest and agricultural feedstocks.

Once drafted and tested in an accredited lab environment, the efficiency test procedure will be published as a voluntary BTEC document and made available to state energy offices. Continuing work will then be performed to gain formal acceptance of the test procedure by a respected, national standards organization (e.g., UL or ASHRAE). BTEC will promote the efficiency testing procedure beyond the biomass industry to the HVAC industry, government officials, as well as consumers and businesses.

The final goal of the project will be evaluation and adoption of the new standard by federal government agencies, regulatory bodies, and state governments.

The benefits of such an efficiency protocol are clear. Growth of the biomass thermal industry in the U.S. will reduce dependence on foreign oil and energy sources from outside the United States. This will help to improve energy security for the region as well as reduce the economic drain that results from purchase of fuels from outside high fossil fuel heating states in the Northern Tier. The project will help commercial businesses to become more competitive through significant reductions in their fuel costs. Taxpayers will also save money through reduced fuel costs for government and public education facilities.

A valid test procedure for commercial, biomass-fired boilers will lay the groundwork for the biomass thermal market to expand. A trusted measure of efficiency is needed by all stakeholders in the biomass thermal supply chain, from manufacturers, to specifying engineers, to consumers, and energy regulators.

A lab validated efficiency test protocol will also allow consumers to make informed decisions, and will result in installation of systems with higher efficiencies. This means better use of biomass resources, overall energy efficiency improvements, and reduced emissions. Additionally, transparent and proven efficiency measures allow supporters of commercial incentive programs to allocate limited funds to top performing biomass thermal systems with superior payback performance.

Finally, biomass system efficiency is a key factor in ensuring reduced emissions of criteria pollutants that result from biomass combustion. High efficiency, biomass-fired boilers help to reduce emissions by reducing fuel consumption and also typically by burning fuel more cleanly and completely. Reducing emissions is key to minimizing human health impacts from biomass utilization. Enabling consumers to

choose systems with higher efficiencies will help to ensure that emissions are reduced. This will be especially important for air quality in regions where there are high concentrations of high cost heating fuel utilization (fuel oil and propane), which often drives the switch to locally-sourced and less expensive biomass.

The efficiency test procedure will address the firing rate "turn down" capability of biomass boilers and the related impact on efficiency. Boiler efficiency and emissions performance can vary significantly when biomass boilers are fired at their nominal capacity and at partial load. The current USEPA Method 28 test procedure requires boilers to be tested at 15% of their nominal firing rate. However, this firing rate is below what many manufacturers recommend for proper operation. The flame cooling that occurs at low firing rates can directly interfere with efficient and clean combustion.

High-efficiency, clean combustion requires having high temperatures in the combustion zone. With many conventional wood-fired boiler technologies, if the boiler is turned down to 15%, then the temperature of the burning fuel becomes too low resulting in increased creation of carbon monoxide and fine particulate emissions (especially when burning fuels with higher moisture contents).

Many advanced boilers control systems do not allow the boilers to operate below 30% of their nominal firing rate to avoid inefficient operation. They require the use of thermal storage tanks that can act as a buffer to absorb and release heat and keep combustion within the range of high efficiency.

It is anticipated that new, advanced technologies for biomass combustion will, however, help address the problem of limited turn-down of firing rate through measures such as increased refractory insulation in combustion chambers and recuperative pre-heating of incoming primary and secondary combustion air. The efficiency test procedure will address differences between the turn down capabilities of various biomass boilers and will provide testing options relating to modulation and thermal storage to enable equipment manufacturers to specify how their boilers should be installed and operated for optimal performance.

Furthermore, the efficiency protocol will address the subject of jacket losses and off-cycle draft losses, which are of particular importance in determining boiler efficiency during load conditions. Other variables that will be given consideration will be the use of diurnal heating load profiles and seasonal load variations based on typical weather data to better simulate real-world boiler operation. These considerations will be addressed by utilizing recent work by Bioenergy 2020+ of Austria to develop a variable load profile that incorporate diurnal-type load profiles within an 8 hour test cycle, and annual seasonal efficiency rating procedures as incorporated into the proposed ASHRAE 155 standard for gas and oil-fired commercial boilers.

Goals of the Project

- Provide a platform for bringing the state and national biomass industry together under an accepted standards-writing format to develop an efficiency testing procedure for commercial biomass-fired boilers.
- Develop a protocol that builds upon existing test procedures for residential biomass-fired boilers as well as for commercial gas and oil-fired boilers, and which draws on international testing experience, especially relating to the European standard EN 303-5.
- Perform initial activities to promote the efficiency testing procedure beyond the biomass industry to the HVAC industry, government officials, as well as consumers and businesses.
- Pursue promulgation of the standard by a standards organization.

Proposed Project Methods and Overall Research Design

- Information Gathering
- Scope Development
- Peer Review Process
- Laboratory Testing
- Standards Organization Analysis

- Promulgation of Proposed Standard (Technology Transfer/Information Dissemination)

Project Team Members and Partners

- BTEC Staff (Joseph Seymour, Executive Director, Project Lead)
- BTEC Technical and Regulatory Affairs Committee (Composed of biomass manufacturer members)
- Government Energy Agencies (U.S. Forest Service Forest Products Lab, Dept. of Energy's Brookhaven National Lab, U.S. Environmental Protection Agency, national Canadian and provincial energy agencies)
- Technical Assistants (Bioenergy 2020+, Independent Test Labs)

Following today's discussion, I'd like to explore with the Committee the appropriate contacts and resources within the Department of Energy to participate in the BTEC Thermal Efficiency Protocol Project.

Finally, I would like to invite the participants this Committee's participants to attend the 6th annual Northeast Biomass Heating Expo in Portland, ME, April 9-11. This event will address industry progress, barriers, demonstration projects, and much more. More information on the event may be found at www.nebiomassheat.com

Thank you again for the opportunity to speak today.

Respectfully submitted,

Joseph Seymour
Executive Director, Biomass Thermal Energy Council