



∴ AIR QUALITY and Woody Biomass Heating

As gas and fuel oil prices soar, the need to reduce U.S. dependence on foreign oil is clear. New York is overly dependent on fuel oil. According to the U.S. Energy Information Administration (EIA), 33% of New York homes heat with fuel oil, over three times the national average. Many New York businesses and institutions also rely on fuel oil. Worse, the EIA indicates New York has minimal oil production or reserves, making the state almost totally dependent on imports. New York can reduce oil dependency, lower energy costs and keep energy dollars local by replacing oil with wood heat. The technology to do this is established, efficient and cost effective. In neighboring Vermont, 43 schools, representing one third of that state's schoolchildren, heat with wood. These schools reduced their heating costs an average of 46% (\$40,000 each) in the 2009-2010 heating season.

Although wood heat offers savings for strained school budgets, like all energy sources, wood has drawbacks. One criticism of wood heating is its impact on air quality. Even high efficiency wood systems emit more particulate matter compared with fuel oil. However, wood heating can meet all national and New York emissions requirements. Moreover, emissions from modern wood heating systems are much lower than many people think.

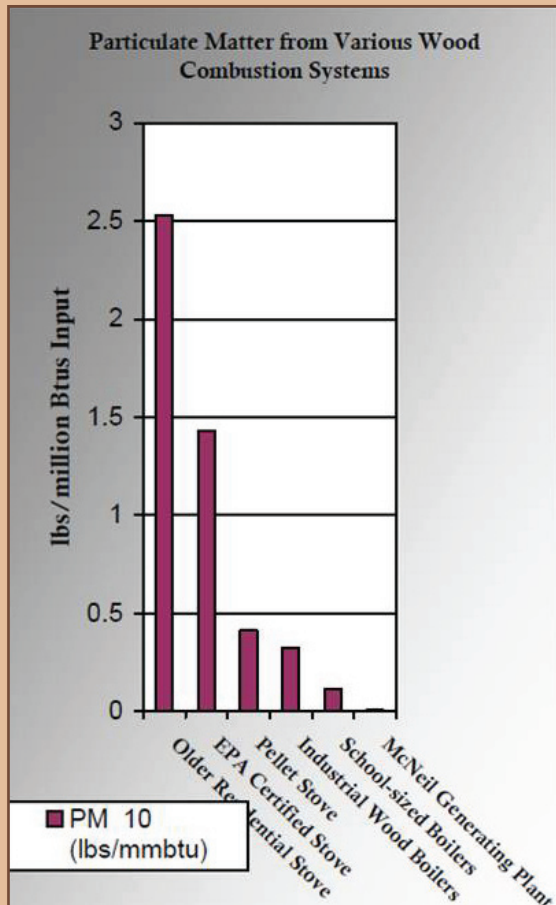


Figure 1. A comparison of PM emissions from various wood combustion systems. Industrial and school sized systems emit far fewer particulates per MMBTU compared with even EPA certified residential systems.

The purpose of this handout is to clarify air quality concerns related to wood heating and discuss how those concerns may be addressed.

Emissions from Wood Burning

When many people think of wood heat, they think of wood stoves or outdoor wood boilers. They picture thick, black smoke. However, modern institutional boilers have far lower emissions than traditional wood heat. School-sized systems emit about 7% of the particulates per million BTU (MMBTU) as U.S. Environmental Protection Agency (EPA) certified wood stoves (Figure 1). These systems may have no visible emissions at all, or, on very cold days, emit white water vapor (Figure 2). A school's wood heating system may have the same emissions as just four or five home wood stoves.

Generally, modern wood and fuel oil systems have comparable emissions except for particulate matter (PM). While fuel oil is very low in PM, less than 0.02 pounds per MMBTU, even efficiently burned wood can have PM emissions of 0.2 - 0.3 pounds per MMBTU. Considering the EPA has linked PM, especially PM2.5 (particulates under 2.5 micrometers) to health problems like asthma and chronic bronchitis, it makes sense to be concerned about PM emissions, particularly for schools.

Wood Heat and Air Quality Regulations

School-sized wood heating systems can meet all current air quality regulations affecting boilers in New York. The New York Department of Environmental Conservation (DEC)'s policy document CP-33 indicates that a boiler emits "insignificant" quantities of PM2.5 if annual PM10 (particulate matter under 10 micrometers) emissions are less than 15 tons per year. School sized systems, which average 6 MMBTU/hour in Vermont, may be expected to emit between 1.5 and 3 tons of PM10 per

year, far below DEC's threshold. Even so, all wood boilers over 1 MMBTU/hour must obtain a permit. School sized boilers typically require a "Minor Facility Registration." In addition, per Regulation 227-1.2, emission rates of all particulates from wood boilers cannot exceed 0.6 pounds per MMBTU. Even without control equipment, modern school sized boilers typically meet this requirement.

At the federal level, for biomass systems under 10 MMBTU/hour, the EPA requires owners to implement a tune-up program. These tune-ups help reduce emissions and improve boiler efficiency and longevity.

Controlling Wood PM Emissions

Even though institutional wood boilers typically meet air quality standards without additional controls, smart management and pollution control devices can reduce emissions further.

The kind of wood and the way it is burned influence emissions. Bark and wet wood add PM, so using debarked wood chips or wood pellets and keeping fuel out of the weather reduce emissions. Wood also needs to burn at over 1,000°F for complete combustion. Wood stoves and outdoor wood boilers burn at lower temperatures, and the resulting incomplete combustion causes higher emissions. School-sized boilers use a two-stage burning process called gasification that results in temperatures of 2,000°F, ensuring complete combustion.

Particulates can be controlled further with pollution control devices. The Biomass Energy Resource Center recommends that systems over 5 MMBTU/hour include either an electrostatic precipitator (ESP) or a multicyclone (Figure 3) combined with a fabric filter. Adding these devices can reduce even PM_{2.5} as much as 99%.



Figure 2. Even on a cold January afternoon, the wood pellet boiler at Elm Hill Elementary in Springfield, Vermont has no visible emissions (top). Across town, the Springfield High School's larger wood chip boiler system emits water vapor (bottom).



Figure 3. A multicyclone filters particulates at Springfield High School's wood chip system.

The Bottom Line

Woody biomass heating emits more PM than fuel oil. However, modern school-sized systems have far lower emissions than EPA certified woodstoves or outdoor wood boilers. School-sized wood heating systems comply with New York and federal air pollution laws, and these systems can go beyond the standards through proper management and pollution control devices. Critically, no energy source is without drawbacks. Fuel oil is expensive, imported, and vulnerable to world politics. Natural gas is obtained through the controversial hydraulic fracturing method. Even solar has drawbacks: it is inefficient, may require structural changes to install panels, and is so expensive it may never pay back its upfront costs. Instead of seeking a perfect energy source, decisionmakers must weigh the costs of each energy and determine what works best for their facility. Is wood perfect? No. But it is an important component of a renewable energy future that doesn't depend on foreign oil.

