

# THERMAL BIOMASS: BURNING FOR ACCEPTANCE

Advocates of modern wood combustion argue that the process could realistically provide one-third of the nation's heating needs, which would eliminate huge outlays for imported oil, plus cutting net contributions of carbon emissions.  
by Patrick Dawson



In the wild spring skies over the valley, strong winds pull the plume of woodsmoke horizontal. It is not a tall smokestack, not like those sky-smudging icons of American industry a century ago. Instead, it represents a cleaner, greener era struggling to emerge against daunting odds. The new brick building is quiet, clean, and unobtrusive. Inside, the steam boiler is heated by a high-temperature combustor thoroughly incinerating wood wastes from the local lumber mill.

That wood-fired boiler heating the grade school

in Deer Lodge, Montana, is the 10th and latest project in the state's Fuels for Schools program. The initiative was launched by the Northern and Intermountain Regions of the U.S. Forest Service and local interests after the devastating 2000 and 2003 wildfires in western Montana incinerated dozens of structures and nearly 2 million acres of forested land. The idea was to put apparent waste - forest deadfall, thinned timber, beetle-killed trees, and logging wastes that otherwise might accumulate as fuel for future conflagrations - to constructive use.

Fuels for Schools - a program pioneered in Vermont in 1986 - seemed a timely solution for budget-squeezed small school districts in western states hammered by ever-higher rates for fixed expenses of heating oil, natural gas, and electricity.

It is one small part of a so-far quiet national movement to gain independence from the shackles of fossil fuels; its elements include localizing fuel supplies, thereby enhancing local economies, saving money, and reducing net carbon-dioxide emissions.

"The natural gas market has been so volatile," said Deer Lodge Elementary School District Superintendent Tom Cotton. "So our biomass system has been a tremendous thing. We've had virtually no problems with our Messersmith boilers. Right away, our heating-gas bill dropped from \$6,600 a month to \$1,100. We also have a one-year grant from the conservation district to pay for woodchips." The system is expected to pay for itself many times over, and to reduce the school's carbon footprint. Eighty miles east, Townsend schools earned \$12,420 by selling

CO2 emission offsets of 130 metric tons per year for replacing fossil-fuels over 15 years from The Climate Trust. Throughout New England, far-removed from natural-gas supplies and deeply dependent on fuel oil for winter heating, the action is far more intense.

Over the years, 35 school buildings in Vermont have been fitted with biomass-fueled heating systems, along with some state office buildings and private businesses. Vermont's Middlebury College is completing a much larger central thermal biomass system that will provide heating and cooling, saving \$2 million a year on fuel-oil bills, and generating one-fifth of campus electrical-power needs.

An ancient fuel-oil heating system at the Crotched Mountain Rehabilitation Center in New Hampshire was replaced with wood-chip burning boilers in time for the winter of 2007-08, providing all the heat and hot water to the school buildings and a children's hospital, saving \$250,000 over oil.

Out West, a long-simmering movement driven by the Rural Voices for Conservation Coalition's (RVCC) Biomass Working Group is gaining momentum as it organizes in rural communities and lobbies for thermal-biomass tax credits and inclusion in national and state renewable energy portfolios on equal footing with other renewables. The group seeks revised rules for better access to harvesting biomass from federal forest and grazing lands, with the goal of reducing wildfire fuel buildups, adding value to those resources, and creating long-term jobs in rural communities.

As RVCC noted in their 2008 issue paper, "Generating thermal energy is the most efficient conversion possible from woody biomass, exceeding the efficiencies of both electric generation and liquid bio-based fuels."

So far, Arizona is the only state with thermal biomass rated as a renewable energy source by state utility regulators. Other states recognize wind and solar, but not biomass, which often complicates wood-power efforts to enter state renewables portfolios and gain financial support.

Despite feeble political support, thermal biomass

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Top left, a wood-fired boiler heats a grade school in Deer Lodge, Montana.

Left, Tim Maker of Biomass Energy Resource Center shows off the woodchip pile used to produce heat for the U-32 High School in Vermont. Above, woodchips are produced from wood waste so that byproducts can be put to use.

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AP PHOTO/HERBERT KROEPPER

thermal biomass in the U.S. is widely fragmented, underestimated, and misunderstood.

Above, wood shreds at a biomass thermal plant in Germany.

proponents remain optimistic and determined. The concept offers such an elegantly simple response to immense economic and environmental problems.

Advocates cite the benefits - especially how readily available products purged from the landscape can replace imported oil. They also tout the carbon neutrality, since most of the CO2 absorbed by trees over their lifetimes will be efficiently combusted, adding heat but no extra CO2 to the biosphere.

Thermal energy (direct heating and cooling from sources including natural gas, oil, and wood) uses nearly one-third of the nation's energy resources. And yet this entire sector has received little policy attention after years of energy and climate debate. Advocates of modern wood combustion claim that the process could realistically provide one-third of the nation's heating needs, which would eliminate huge outlays for imported oil and cut net contributions of carbon emissions.

#### GETTING THE WORD OUT

Compared to the well-organized and politically influential interests of the oil, coal, nuclear, and utility sectors, thermal biomass in the U.S. is widely fragmented, underestimated, and misunderstood.

"As the nation begins to develop an energy policy, we need to focus on more sustainable options," said Andrea Colnes of the Biomass Energy Resources Center, a national advocacy group. "By working only toward renewable electricity standards instead of encouraging a whole renewable energy sector, we're creating distortions. You can't just take new fuels and put them into old applications. There just isn't enough wood to meet our needs in electricity and transportation. We need to focus the right fuels into the right applications; otherwise, it's wasteful. We have not worked up to the thermal piece of the equation."

The U.S. Department of Energy, she noted, has

been focused mostly on large-scale projects and bio-fuels rather than localized applications using thermal biomass. "Opening up perspectives at those agencies is a big part of the strategy. If you look at Europe, there is a major commitment to renewables. The movement is highly developed and highly organized. Here, we are very young. There's a bit of tension here because our public policy moves in a crisis mode. But now is a critical time. If we do it right, we'll have a long-term strategy for an energy infrastructure system. If we do it wrong, we could deplete the resource base. The good news is, we are seeing the beginning of organizing capacity on this issue, and I expect it will take off in the next few months and years."

An idea called advanced wood combustion (AWC) has made impressive technical advances in Europe and Scandinavia, but is just now being tried in the U.S., a land much richer in timber and other biomass resources. The thousands of local AWC heating and power facilities in Europe, according to the March 13 issue of the journal *Science*, "clearly demonstrate that with public backing, AWC can be rapidly implemented, can reduce oil imports and greenhouse gas emissions, and can increase energy security with wood drawn from local woodsheds."

The authors, led by Daniel Richter Jr. of Duke University, pointed out that "the major barriers to AWC implementation are social, not economic or technical . . . To gain public support, decision-makers must increase community appreciation for AWC system reliability, air-pollution control, and sustainable forest management, as well as how wood-energy dollars add jobs and profits to local businesses. Community leadership and public education are critical."

#### WEANING OFF OIL IN FAVOR OF WOOD

"It's time for Congress to develop an energy policy that...rewards performance and promotes innovation," said Sen. Ron Wyden of Oregon upon introduction of a bill last May to allow production tax credits for non-electric renewable energy. The measure is significant because past practices focusing on wood to generate electric power ignored the far more efficient heating applications of the fuel.

"We commend Senator Wyden's leadership in recognizing the importance of addressing every element of our nation's energy portfolio," said Jeffrey Serfass, Executive Director of the Biomass Thermal Energy Council. "It represents a major step forward in our efforts to gain equal consideration for renewable thermal energy with policies already established to encourage renewable electricity and biofuels."

But things were different over in the U.S. House chamber, where the Democratic leadership in late April released its version of an energy bill that, as the Portland Oregonian editorialized on May 2, "explicitly disregards the largest available source of



BIOMASS ENERGY RESOURCE CENTER (2)



Considering the controversial plans to expand the nation's nuclear capacity...how can

biomass in Oregon: federal forests. That makes no sense as a matter of energy policy, economics, or environmental stewardship. Oregon has hundreds of thousands of acres of federal forests that are overgrown, infested with insects and disease, and vulnerable to catastrophic wildfires. It has rural communities struggling with 17% unemployment. It has everything it needs--and every economic motivation--to become a center for biomass energy. But that can't happen if Congress approves an energy bill that sets out incentives and an ambitious goal--and then expressly discounts biomass from the nation's federal forests."

Despite recent briefings on biomass thermal energy on Capitol Hill by community forestry interests and the Environment and Energy Study Institute, many of those arguing to open federal lands to biomass energy want to fuel industrial plants producing liquid fuels and electricity.

The reality, of course, is that thermal biomass advocates are severely outgunned by the financial and political clout of competing interests in the petroleum, coal, and gas and electric utility sectors. Glaring examples include proposals to give corporations hundreds of millions in federal subsidies to build or retrofit large, inefficient electric-generation plants for biomass, employing few people and absorbing big capital costs, while small-scale, efficient thermal biomass projects employing many remain ignored and unsubsidized.

As Duke University's Richter posed it in *Science*: "Considering the controversial plans to expand the

nation's nuclear capacity . . . how can we not ask about the future potential of wood energy, especially if the nation were to target its development not only in forests and woodlands but on low-productivity agricultural lands and in cities?"

#### FROM POLLUTION TO PELLETS

Vast palls of woodsmoke hung over timber-mill towns of the valleys and coastlines as the postwar housing boom drove the nation's appetite for lumber and plywood. Sawmill trimmings were fed, day and night, into the ubiquitous teepee burners, those wheezing, polluting, battered-steel incinerators utilized as the most expedient means to dispose of pesky wood wastes. In 1949 wood-fueled energy production in the U.S. constituted over half the renewable energy produced, at 1,549 trillion Btus (British thermal units). The balance of renewables was generated by hydropower. By the 1990s, stimulated by federal action during the administration of President Jimmy Carter, the old renewable mainstays of wood and hydro were joined by biofuels, wind, geothermal, solar/photovoltaic, and municipal solid waste.

Today, with teepee burners long outlawed by air-pollution laws, most large lumber, pulp, and paper mills have integrated their wood wastes into helping fuel their own industrial processes, such as drying kilns, producing steam, and co-generation of electric power. Some wood wastes are compressed into fuel

we not ask about the future potential of wood energy?

Left, workers thin a forest, weeding out smaller trees to give the older trees room to thrive. Above, Low-grade wood, like that shown above, is set aside to create thermal power.

**“We have strong community support because it saves the school district**



BOMASS ENERGY RESOURCE CENTER



STOCKPHOTO

pellets. Still, vast resources of waste wood are scattered about the country, from the urban trash of tree removals and trimmings, park and residential lawn cuttings, and demolished

building detritus to overgrown public and private timber stands.

Though raw woodchips are a cheap feedstock compared to pellets, they are limited by issues involving transportation, storage, contamination, and moisture, and do not yield the Btus and clean-burn quality of pellets, which have four times the energy density.

Recently the markets for wood pellets made in northern Arizona by Forest Energy Corporation have expanded from residential stoves to heating larger buildings such as schools, offices, warehouses, and greenhouses, according to Rob Davis, company president. Davis predicts, “We’ll see that segment growing in the near term.” Besides making pellet fuel, the firm now carries a line of Swedish-made Osby Parca boilers.

Forest Energy Corp., a founding member of the Biomass Thermal Energy Council, has a 10-year stewardship contract under the Healthy Forest Restoration Act to harvest biomass from 150,000 acres on the Apache-Sitgreaves National Forest.

“In the last two years, we’ve seen a lot more interest in pellets than in the past,” Davis said. “Businesses are becoming more interested as they see carbon-emission mandates coming, and realize that reduction of CO2 is the direction to go. But right now there is no incentive for most people to put in a renewable heating system. We would hope that lawmakers look at using this valuable resource efficiently, because biomass can make a great contri-

bution to our energy security and our environment.”

U.S. sales of residential stoves and wood pellets (which have four times the energy density of raw woodchips) have boomed in recent years as oil, gas, and electricity prices jumped. Demand for pellet fuels in the U.S. grew an average of 21% a year after 2003, then 37% between 2006 and 2007.

The schools project in Townsend, Montana had technical problems until switching to premium pellets last winter. “We used the fuel-oil boiler only during a 20-below-zero cold spell,” said Townsend School Superintendent Brian Patrick. “Our use of wood pellets might help stimulate a local market and maybe even attract a pellet mill using local forest products. I look at biomass as an insurance policy in these times of unpredictable oil prices. We have strong community support because it saves the school district money. It’s hard not to support common sense.”

#### **SUSTAIN OR PLUNDER?**

In 2005, the Forest Guild released its “Assessment of Biomass Harvesting Guidelines” because, as the nonprofit organization explained, “Previously developed forest practice guidelines did not anticipate the increased removal of biomass and thus offer no specific guidance on removal limits needed to keep forests healthy.”

The Guild is now at work on a set of biomass-harvest guidelines for the New England states, said Mike DeBonis, Southwest Region Director, who noted the uphill struggles: “We’ve come a long way in a year, from when materials from federal lands were excluded. It’s a political process, and complicated, but that’s the way it is. We have to address sustainability and supply. We have renewable biomass standards for liquid fuels and electricity generation, but thermal is not included. We have an energy policy that is split.” DeBonis agrees, howev-

er, that the economic climate of a weak lumber market, coinciding with growing interest in thermal biomass, makes the times “ripe for collaboration.”

DeBonis emphasized that local uses of wood are far preferable to big, industrial-sized electric operations, which may be out of touch with their supply, booming for a while only to bust later. Nor should exploitation reminiscent of the timber clear-cuttings of the past be allowed. “It’s a legitimate concern. I don’t think anyone wants to see the forest denuded for woody biomass, eliminating nutrients and wildlife habitat. It needs to be on an appropriate scale. Biomass in and of itself should not be the purpose of forest management. It should be a tool. We won’t see wholesale conversion of forests into biomass. The laws won’t allow it.”

#### **TIME FOR U.S. TO ACT**

The demand for thermal biomass is growing rapidly in the U.S. It offers a cost-effective, highly efficient, locally-sourced energy alternative to imported fuel oil and large carbon-belching electric plants.

If the housing and lumber markets fail to improve, and more sawmills close, thermal biomass fuel supplies will be reduced in parts of the county until anticipated forest thinning operations become more widespread. The diversion and expansion of biomass fuels to supply the more capital intensive and ravenous industrial plants required to produce the transportation biofuels and electricity for the central power grid – currently favored by Washington policymakers and industrial lobbyists – will almost certainly result in more serious setbacks for the emerging biothermal sector. The large plants will draw fuel from a larger region, increasing pel-

let costs there for even small, efficient users. And the new demand to cut whole trees and harvest forests for industrial combustion – not just the byproducts of thinning operations to improve forest health that community-forestry advocates promote – will increase conflicts over forest harvest policies that many have been hard at work to overcome in the past decade.

If thermal biomass receives its due interest from federal officials and policymakers and is not left to fend for itself in the face of massive subsidies and incentives for industrial biomass, it could be well on its way to taking an important place in our federal energy and forest policy.

Thanks to persuasive precedents set by cleaner-burning and more efficient wood-fired boilers and municipal heating systems developed in Europe, the U.S. now has the opportunity for a major improvement in residential and commercial energy systems that would draw on its abundant raw-fuel supplies while improving forest health, significantly reducing oil imports and carbon emissions, and boosting employment.

After surveying the European success stories, Duke’s Daniel Richter remarks, “These facilities release remarkably low quantities of air pollutants and have system-wide thermal efficiencies approaching 90%. And they recycle money back into the local economy by creating new green-technology jobs, providing new sources of income to local farmers and forest landowners, and even add value to local forests. This is not your grandfather’s smoky stove.”

*Pat Dawson has covered the Rockies as a regional correspondent for TIME for more than 25 years.*



AP PHOTO/BOB GABRAITH

*Plant manager Randy Bates overlooks his facility at Woodland Biomass Power LTD. The plant, which converts wood chips into power, produces electricity for 25,000 homes.*

**The demand for thermal biomass is growing rapidly in the U.S. because it offers a cost-effective, highly efficient, locally sourced energy alternative to imported fuel and large carbon-belching electric plants.**