

June 22, 2009

# Rekindling Wood Energy in America

If not properly crafted, new renewable electricity policies will waste biomass energy.

by Dan Richter, Duke University, et al.

Clean-energy opportunities are many and will be realized if energy policy can both promote the efficiency of our energy system and sustainable development of a full complement of renewables: solar, wind, geothermal, hydro, and biomass.

As America begins to back away from fossil fuels, consumers are more and more ready to transition to affordable and sustainable sources of renewable energies. The recently proposed Renewable Electricity Standard (RES) is gaining considerable support in Congress and among the general public. As written however, it inadvertently is poised to waste large amounts of renewable thermal energy and needs more careful crafting.

One of the largest sources of renewable energy available today is one of the oldest, that is direct combustion of wood. Recent European developments in advanced wood combustion (AWC, defined as automated, high-efficiency wood-fired energy systems with strict air pollution control) have wood supplying thermal and electrical energy cleanly and reliably to thousands of communities in Europe and increasingly in North America. AWC minimizes air pollutants including fossil greenhouse gases.

AWC is so clean and safe that AWC systems are commonly deployed in the midst of picture-perfect European towns and villages. Because AWC systems can be developed in community-sized increments of 0.1 to 20 MWth, they can be managed to meet community needs and not overwhelm the productivity of local woodsheds.

Among the renewables, wood has many values and uses that are important to its use as an energy source. Wood is widely used for solid-wood and paper products, and is critical to forest biodiversity, water and soil quality, recreation, and carbon sequestration. For all these reasons, common sense indicates wood must be used as

efficiently as possible. We call this Franklin's Energy Principle, after Ben Franklin who in the 1740s improved the efficiency of the wood stove to both benefit household comfort and save wood.

In the United States, wood energy is abundant in nearly all regions and AWC is a potential energy alternative in many communities. In cities, towns, and remote forestlands alike, AWC is beginning to be deployed for heating and cooling of public buildings, industrial and residential complexes, and schools and universities, typically with large fuel-savings and short pay-back periods on investments. Wood in the United States is several-fold less expensive per unit of energy compared with natural gas or heating oil (\$2 to 5 per GJ vs \$7 to 10 per GJ for recent USA prices of natural gas and heating oil). If properly deployed, AWC systems can not only affordably supply clean and renewable energy, AWC can add value to the forest itself, promote community development, and support local employment and rural and municipal economies. AWC can complement other renewable energy resources as well.

In contrast to community-scale AWC, a different model of wood energy is now being developed by electricity companies, directly in response to regulations such as the proposed national RES. A stand-alone wood-electricity model is a wood-fired facility with electricity as the sole product and waste heat vented to cooling towers. Narrowly defined economies of scale justify this corporate interest in stand-alone wood-electric systems, and scores of large wood-fired electric power plants, each 50 to >100 MW, are being planned in response to RES. These plants will consume large amounts of wood from regional woodsheds and require long-term wood-supply contracts.

While there are many differences between the community-based AWC and stand-alone wood-electricity model, most telling are their differences in energy efficiency. The thousands of AWC systems deployed across Europe demonstrate that up to 90% of the solar energy stored in wood is captured for heat and power, whereas stand-alone wood-electricity plants will average only 20 to 40% efficiency. Simply put, by utilizing nearly all of wood's heat of combustion, AWC will greatly increase wood's contribution to America's energy budget.

It is now time for AWC and renewable thermal energy sources to take center stage in North American energy deliberations. Not only can

wood safely and affordably supply energy, but wood can teach us much about energy in general, energy-use efficiency, and sustainability itself. No one renewable will solve our energy crisis, not solar, not wind, not wood. But recent multi-agency estimates indicate that AWC can sustainably supply at least 5% of the nation's currently inefficient energy consumption without impacting forests that are protected for environmental, social, or economic reasons. This is more energy than that stored in our Strategic Petroleum Reserve, more than what all American hydro-power plants produce in a year, and slightly more than half of the electric energy produced annually by the entire nuclear industry.

Wood is abundant but is far too valuable to inefficiently burn. Resource policy questions should turn on how to encourage wood-energy efficiency, community development and sustainability, and how to avoid extracting wood from the forest like coal from a mine.

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