Vermont's Forests
and Our Energy Future

Vermont can be a leader in the innovation, production and sustainable use of biomass energy from local wood if considerations of forest sustainability, maximized efficiency and public health shape the vision and development of biomass energy across the state.

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Vermont's Forests and Our Energy Future

Vermont's magnificent forests produce clean water, fresh air, and abundant wildlife habitat. From the forested expanses of the Green Mountains and Northeast Kingdom to the local woods next door, forests support the state's tourism, recreation and forest-products economy. They also provide heat and power to many Vermont homes, schools and businesses. **In sum, forests are one of Vermont's finest natural assets.**

As fuel oil prices climb and more Vermonters seek affordable, local renewable energy solutions, forests will be looked at to play an increased role in Vermont's energy portfolio. To ensure that Vermont balances needed energy generation with long-term forest health and other public benefits, our limited forest resources must be used in an efficient and sustainable manner.

NRG Systems

The Best Opportunities for Energy from Forest Biomass

Forest biomass can play a role in Vermont's energy future, but a commitment to efficient and sustainable development is essential.

At both a residential and commercial scale, making heat out of biomass is the most efficient use of our limited wood supply. Home heating is an important part of the mix and roughly **30 percent of Vermont's annual wood harvest already goes toward residential firewood**.

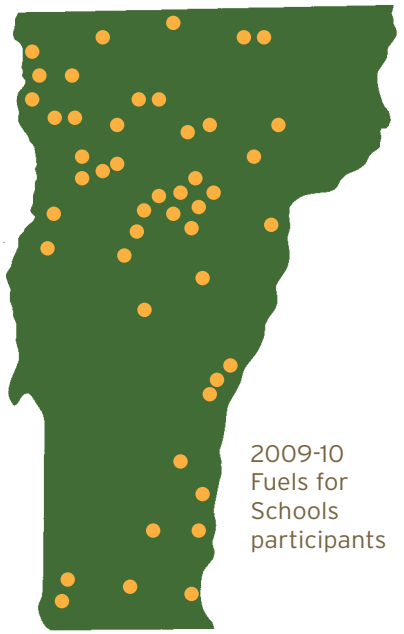
At a more commercial scale, Vermont needs to support sustainable and efficient "thermal-led" biomass energy projects. Wood used for heat and thermal-led combined heat and power (CHP) projects can burn wood at 75 percent or higher levels of efficiency. In contrast, biomass energy projects that only generate electricity (with no heating application), typically operate at only 20-25 percent efficiency – meaning a very large percentage of the energy potential of the wood is lost. We recognize that existing biomass plants in Vermont contribute to the overall power mix. However, as we look ahead it is important to prioritize the most efficient projects possible because wood supply is limited.

We must recognize that there is a limited amount of wood available on a surplus basis for use as a biomass fuel in Vermont.

Vermont's Forest Resources are Limited

Only a limited amount of additional woody biomass, beyond current levels, can be harvested without affecting forest health.

The Vermont Department of Forests, Parks & Recreation recently commissioned an analysis of the state's wood fuel supply, undertaken by the Biomass Energy Resource Center. That study found a range in the potential availability of new "low grade" wood fuel resources across Vermont, from between roughly 250,000 additional green tons in a "conservative" harvesting scenario to 900,000 additional green tons in a "moderate" harvesting scenario to potentially 2 million green tons in an "intensive" harvesting scenario. Within this range, wood fuel is unevenly distributed across Vermont's fourteen counties with at least one county having potentially zero and others having very little net additional capacity for woody biomass harvesting. There are other wood supply studies too that include additional factors that would limit the amount of wood that is available for new biomass development. **This research underscores the variability in estimating wood fuel and the fact that Vermont has a limited annual supply. This means we have to use our forest resources carefully.**



2009-10 Fuels for Schools participants

While it sounds like a there is a lot of wood available In Vermont, it is important to note that the low end estimate would not even support one large electric generating facility. Alternatively, if 900,000 tons are truly available, this amount of wood could power just a couple of large electricity generating plants, or alternatively this amount of wood could be deployed in a more decentralized way to heat **all** of the state's schools, heat more homes, and develop dozens of decentralized district energy projects, such as those being proposed for Montpelier and Brattleboro.

Focusing on the development of smaller projects scattered across Vermont would help to spread the benefits of those projects – affordable energy, local jobs, homegrown wood supplies – to more Vermont communities, businesses and residents.

For example, in the 2009/2010 heating season, Vermont's 43 woodchip-heated Fuels for Schools participants used 23,271 green tons of woodchips to offset nearly 1.5 million gallons of oil. That investment saved more than $1.7 million dollars in total – an average of over $40,000 – or 46% of the heating costs per school. These local school systems are using forest resources in an energy efficient way.

To balance the energy, economic and ecological value of our limited forest resources, we must be strategic about the new commercial scale wood energy projects developed and permitted in Vermont. This means developing policies to ensure maximum efficiency, forest sustainability and public health.

The Vermont Natural Resources Council and the National Wildlife Federation support strategic development of woody biomass policy in Vermont that will:

- **Maximize efficiency:** Ensure that we use our limited and valuable forest resources as efficiently as possible to maximize the amount of energy produced. That means the state should provide incentives and support for the most efficient energy technologies, such as thermal-led applications and upgrades to residential woodstoves.
- **Ensure sustainable forestry practices:** Keep Vermont's forests healthy through policies that support the overall ecological integrity of the forest ecosystem. The state should support harvesting and procurement policies that maintain healthy soils, wildlife habitat, water quality, and forest regeneration. The state should also invest in more precise sub-regional estimates of low grade wood fuel availability to ensure that additional harvesting will not jeopardize overall forest health.
- **Utilize local wood energy supplies:** Harvest and use local wood supplies for community and regional needs, at an appropriate scale, to maximize benefits to Vermonters. New large-scale biomass development should not come at the expense of Vermonters who rely on and purchase wood in local residential firewood markets.
- **Promote energy security:** Replace expensive, imported fossil fuels by tapping into local biomass opportunities to provide communities and businesses with stable, consistent, affordable energy supplies for generations. The state should consider developing wood fuel cooperatives similar to those that have been developed for heating oil.
- **Help mitigate climate change:** Pay careful attention to forest practices, efficient combustion technologies, and accurate carbon accounting to foster sustainable biomass energy in Vermont. State government should only support biomass energy projects and policies that clearly demonstrate net greenhouse gas benefits because carbon "neutrality" cannot be assumed for all types of woody biomass energy.

NRG Systems

- **Carefully balance scale, technology and location:** Foster small-scale, distributed energy systems to maximize both energy and transportation efficiencies and local economic benefits. State policies should support biomass projects in strategic locations and at appropriate scales to ensure they are a good fit for the energy needs of communities.

New large-scale biomass development should not come at the expense of Vermonters who rely on and purchase wood in local residential firewood markets.

- **Minimize emissions:** Ensure that energy derived from biomass minimizes emissions and meets or surpasses public health and environmental standards through use of the best available combustion and emissions control technologies.

How Do We Get There?

Strategic thinking, good planning and smart policies on woody biomass energy are needed in Vermont. To get there, policy makers must:

- Implement a comprehensive, strategic energy plan for the State of Vermont that calls for the most efficient and sustainable use of woody biomass in Vermont. This should include an integrated thermal energy policy.
- Adopt procurement standards for sustainable wood supply harvesting that ideally include independent monitoring and verification.
- Ensure model forest harvesting and retention guidelines are implemented on the ground.
- Mandate that any state incentives for new woody biomass energy development continue to meet a minimum standard of 50 percent energy efficiency, such as provided in the SPEED Program.
- Adopt greenhouse gas accounting protocols relevant to wood bioenergy to ensure that projects will result in net greenhouse gas benefits.
- Promote local jobs by focusing new development on community scale, distributed biomass energy systems which carefully balance the use of forest resources with high efficiency combustion technologies and sustainable forest practices.

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BIOMASS IN VERMONT – EFFICIENCY DONE RIGHT

Barre Town Elementary School's Wood Heating System

This late 1990s conversion from an electric to wood chip-based heating system equated to an annual savings of approximately $100,000. In the 2009-2010 heating season, 477 tons of wood supplied from Lathrop Forest Products in Bristol, Vermont valued at $42,786 helped to keep the benefits local and support the Central Vermont economy.

BERC

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NRG Systems' Pellet Heating Project

NRG Systems (above) uses four 140,000 btu Tarm wood pellet boilers as the primary heat sources in its two LEED-gold certified manufacturing facilities in Hinesburg, Vermont. The 46,000-square-foot and 31,000-square-foot facilities respectively used 25 and 10 tons of wood pellets in the 2010-2011 heating season, purchased from New England Coop.

Middlebury College / Brett Simison

Middlebury College's District Heating Project

(Below) Recent, upfront investments at the college to heat and cool the campus will cut Middlebury's fuel oil consumption by nearly half (40 percent). The college installed a woodchip gasifier in 2008, tying in to the campus's existing energy plant. About 20,000 tons of woodchips are supplied annually from within a 75-mile radius, including a willow plantation specifically planted for this project. Middlebury College estimates that $800,000 annually will be added to the local economy through the purchase of woodchips. Based on 2008 fuel prices, the annual cost savings for this 8 MW combined heat and power project will be about $2 million.

GLOSSARY OF BIOMASS TERMS

Biomass: Any organic matter that can be burned for energy. Here used as synonymous with wood in its various forms.

Btu: British thermal unit, a standard unit of energy equal to the heat required to raise the temperature of one pound of water one degree Fahrenheit.

Carbon neutrality: Achieving net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount sequestered or offset.

CHP: The acronym for Combined Heat and Power. CHP is the simultaneous production of heat and electrical power from a single fuel.

District Heating: The use of a single boiler plant to provide hot water or steam for heating a number of buildings in a locality.

Feedstock: Specific plant or substance used as raw material to produce bioenergy.

Gasifier: A combustion device that produces bio-gas from solid biomass.

Megawatt (MW): A common measure of power plant electricity generation capacity which is equal to one million watts.

SPEED Program: Vermont Sustainable Priced Energy Development Program (SPEED) was enacted by the Legislature in 2005 with the intent of of promoting renewable energy development by encouraging long-term contracts for electricity from renewable sources.

Measuring Biomass

- 1 green ton is 2000 lbs. not adjusted for the moisture content of the wood.
- 1 bone dry ton of chips is 2000 dry lbs. (assumes no moisture content).
- 1 cord of wood is the amount of wood that corresponds to a well-stacked woodpile 4 feet wide, 4 feet high and 8 feet long.

RESOURCES

Bioenergy wiki – **http://www.bioenergywiki.net**

Forest Biomass and Bioenergy: Opportunities and Constraints in the Northeastern United States, Cary Institute of Ecosystem Studies – **http://www.ecostudies.org/report_biomass_2011.pdf**

Forest Sustainability in the Development of Wood Bioenergy in the U.S., Pinchot Institute for Conservation and The Heinz Center

Growing a Green Energy Future: A Primer and Vision for Sustainable Biomass Energy, National Wildlife Federation, March 2010 – **http://www.nwf.org/~/media/PDFs/Global%20Warming/Reports/Growing-a-green-energy-future.ashx**

Northern Forest Renewable Energy Report, The Wilderness Society – **http://wilderness.org/files/Northern-Forest-Renewable-Energy-Report.pdf**

Vermont Fuels for Schools Program – **http://www.biomasscenter.org/services/programs/vermont-fuels-for-schools-vffs.html**

Vermont Legislative Study Committee on Biomass Energy Development – **www.leg.state.vt.us/workgroup/biomass**

Vermont Wood Fuel Supply Study: 2010 Update, Biomass Energy Resource Center (BERC) – **http://www.biomasscenter.org/images/stories/VTWFSSUpdate2010.pdf**

Northern Forest Biomass Energy Plan – **http://www.biomasscenter.org/resources/publications.html**

Chuck Rupert