Wood Energy Options for the Mahoosuc Region:
A Community Wood Energy Guide
Executive Summary

The increasing cost of fossil fuels, together with concern about greenhouse gas emissions, has increased interest in energy from wood. The U.S. Energy Information Administration, for instance, projects that electricity from wood will be five times its current level by 2030. Pellet manufacturing for local use or export to Europe is already expanding rapidly. Despite the fact that well-managed forests may provide renewable wood fuel, however, the capacity of forests is limited and it makes sense to use this resource in the most efficient way. It is also important to minimize any negative effects from increased wood use and be sure that supply expectations are realistic.

Wood can be used to produce energy in the form of heat, electricity, or liquid fuels. Heating converts the highest portion of the raw wood into useful energy (about 70-80%), because there are fewer processing steps. Combined heat and electricity has a similar conversion rate if all waste heat from generating electricity is used for space heat or hot water. Electricity and liquid fuels convert a much smaller amount of the wood energy into useful form (about 25% for electricity and probably comparable for liquid fuels[1]).

There are many advantages to using locally-sourced wood for energy.

- Local jobs: Compared with other forms of renewable energy, wood continues to support many jobs after initial construction as logging crews, chippers and truckers are needed to deliver a continuing supply of fuel. If conducted as part of a commercial timber sale, the small extra margin from biomass can help keep logging crews and timberland owners solvent.
- Forest management: Energy markets for low-grade wood can improve forest management by reducing the tendency to high-grade (cut only the most valuable wood and leave behind the inferior trees), helping ensure that future timber stands can produce high-quality sawlogs.
- Secure energy: Local wood energy can reduce vulnerability to risky imported oil supplies with their frequent and rapid price changes.
- Emissions: Substituting wood for fossil fuels can reduce greenhouse gas emissions, if the wood is grown sustainably and does not reduce forest carbon stocks. Wood emissions are also lower in sulfur and mercury compared to oil or coal.

Expanded use of wood for energy must also consider possible negative consequences:

- Emissions: Wood combustion releases similar amounts of nitrogen compounds to fossil fuels, more carbon monoxide, and significantly more fine particles which carry human health risks. Wood ash can present disposal challenges if it cannot be spread on agricultural fields or woodlots.
- Water: Like all combustion-based electricity plants, biomass plants use large amounts of water to generate steam and sometimes to cool the steam for re-use, which can deplete or warm local waterways and affect fish and other aquatic organisms.

[1] Heat and electricity can be measured in Btu or kilowatt-hours but the mechanical energy that is usually the end product for liquid fuels is more difficult to measure consistently, so useful energy as a percent of raw wood energy is more difficult to compute for liquid fuels.

- Fire risk: Some wood energy plants have a heightened fire risk due to highly combustible fine sawdust or large quantities of stored wood feedstock that may overheat.
- Transport: Wood is a bulky fuel that requires frequent truck deliveries that can increase traffic congestion and tailpipe emissions.
- Forest resource: Use of forest residues for energy, rather than leaving them in place to return to the soil, could deplete forest soils and damage habitat for creatures that depend on dead wood. Whole-tree harvesting to use tops for biomass can also increase damage to soils and the residual forest stand.
- Supply: In some parts of northern New England, wood is already being harvested at or even above a level that can be sustained long-term. Too many new energy facilities could encourage unsustainable harvesting. Within the "wood basket" surrounding the Mahoosuc region, existing wood energy facilities already use about 1.8 million tons of fuel wood, and proposed plants would need up to 2.8 million tons more. Supply analyses indicate that there is not nearly enough wood to supply all of these proposed facilities.

The expansion of wood energy will ultimately depend upon how well it pays. Wood heat in the form of firewood, chips or pellets is already less expensive than fuel oil or natural gas, and could remain competitive at higher wood prices. Wood heating equipment for larger buildings is generally more costly and labor-intensive, however, due to extra materials handling and storage. Electricity from wood is currently a bit more expensive than conventional electricity for public utilities (though pulp mills have long found it profitable to generate electricity from their own byproducts). When fossil fuels hit a cyclic high, however, biomass electricity becomes competitive. Liquid fuels from wood feedstocks are still several years from being commercially viable, but breakthroughs in technology could change that picture. Since fuel plants would probably need to be large, the potential may be limited (as it is for biomass electricity) by the distance that wood must travel to the plant.

One important economic viability factor is the relative prices of wood and other fuels. Over the past few decades, fuel wood chips have been relatively inexpensive, with stumpage prices of a dollar or two per green ton, and delivered prices less than $20 per ton. Chips have generally been a byproduct of commercial logging operations or sawmills. If the wood energy industry expands significantly, prices will need to rise enough to divert wood from pulp and other low-grade markets. Those higher prices, though welcomed by loggers and landowners, could limit expansion of the wood energy industry.

Another limitation to expanding biomass electricity is the lack of transmission line capacity between northern New England (where wood and logging infrastructure are most available) and southern New England (where most of the demand comes from). New or upgraded transmission lines are costly, and it is not at all clear who should pay this cost. Long-distance transmission also increases line losses between producer and consumer, further reducing the useful electricity produced from the wood.

Offsetting these limitations to expanded wood is a set of state and federal renewable energy subsidies aimed at reducing our dependence on fossil fuels and lowering greenhouse gas emissions. These policies can tip the balance to make new wood energy facilities more competitive. Such policies include

- RPS: renewable portfolio standards that require utilities to purchase a percentage of power from renewable sources;

- RGGI: the Regional Greenhouse Gas Initiative that encourages conversion from fossil fuels to lower-emissions electricity sources;
- Subsidies: various tax incentives and direct loans and grants to renewable energy developers.

Given both the potential and the risks of expanded wood energy use, several New England states are developing best management practices to protect forests from possible damaged due to more frequent whole-tree harvests. Across the entire Northern Forest Region, several organizations collaborated on a "Northern Forest Biomass Energy Action Plan" the developed a set of principles to guide expanded biomass use. Those principles address many of the benefits and concerns detailed in Wood Energy Options for the Mahoosuc Region:

- Sustainable Forestry: protect the ecological function and integrity of the forest ecosystem;
- Efficiency: make best use of the energy value of wood;
- Local Energy: meet community and regional needs at the appropriate scale;
- Energy Security: provide stable, uninterrupted, affordable, clean energy;
- Climate Change Mitigation: reduce net carbon emissions.

In sum, thermal uses capture more of the potential energy embodied in wood than electricity or fuel uses, and small-scale projects generate more local economic and social benefits with lower transport and transmission losses. Small community projects can also be scaled to match the capacity of the local forests. Although wood can be a renewable resource, it is also a limited one. The region's wildlife, waterways, and recreational opportunities are also important to area residents and the tourism economy.

Building a renewable energy base for the economy of the future will involve difficult decisions and solid planning and the Mahoosuc Region is already taking steps in that direction. The Mahoosuc Initiative partner groups offer this guide as our initial contribution to that process. The Mahoosuc Initiative helps communities build vibrant local economies, conserve and encourage sound management of the region's natural resources, and promote healthy communities connected to the land. Members of the Mahoosuc Initiative are:

Androscoggin River Watershed Council
Appalachian Mountain Club
Appalachian Trail Conservancy
Biomass Energy Resource Center
The Conservation Fund
Forest Guild
Forest Society of Maine
Mahoosuc Land Trust
Northern Forest Alliance
The Wilderness Society
Tri-County Community Action Programs
Trust for Public Land

Learn more about the Mahoosuc Initiative at www.mahoosucinfo.org.

Wood Energy Options for the Mahoosuc Region: A Community Wood Energy Guide is available at http://www.mahoosucinfo.org/mah_bioenergy_final.pdf.