Community-Scale Heating with Wood in New Hampshire
The New Hampshire Wood Energy Council is a not-for-profit partnership that provides professional guidance to support growth in commercial and institutional heating with wood. NHWEC brings together individuals, organizations, businesses, industry associations, and government agencies interested in the sustainable use of our renewable forests to help bring energy independence and economic prosperity to the Granite State.

This project is coordinated by North Country Resource Conservation & Development and funded through a grant from the USDA Forest Service. North Country RC&D, coordinator of the NH Wood Energy Council, complies with federal nondiscrimination policy and is an equal opportunity provider.
Outline

I. How NH Heats

II. Benefits

III. Supply of Wood for Energy: the Forest Resource

IV. Technology Options for Wood Heat

V. NH Examples of Community Scale Wood Heating

VI. How to Get Started/ How Can NHWEC Help You
How NH Heats

• New Hampshire is the second most dependent state on petroleum energy
• Over 80% of heating is supplied by imported fossil heating fuels
• NH is second most dependent state in the country on heating oil (Maine is #1)
• 50% of state population has no access to pipeline natural gas
• NH exports about $1 Billion annually to import fossil heating fuels

80 cents of every heating dollar spent leaves the region!!!
Comparing Heating Costs of Different Fuel Types

$ /MMBtu

- Propane
- Heating Oil
- Natural Gas
- Firewood
- Wood Pellets
- Wood Chips

Source: NH Office of Energy & Planning
Wood Fuel Diversity

Wood or Grass Briquettes

Wood Pellets, Wood Chips

Cord wood
Benefits of Heating with Wood

• **Save $$$** on heating cost
• **Keep fuel dollar in local economy**
  - we export **$1 BILLION** annually for fossil heating fuels
• **Reduce dependence on imported oil/propane**
• **Reduce greenhouse gas emissions, wood is low carbon fuel in comparison to fossil fuels**
• **Support strong markets for low-grade wood – keeps forests undeveloped**
• **Create jobs** in New Hampshire
• **Reduce certain air pollutants (e.g. SO2, Hg)**
• **RENEWABLE, SUSTAINABLE**
The Carbon Cycle: Biomass vs. Fossil Fuels
Supply of Wood for Energy: the Forest Resource

NH is 84% Forested

![Figure 6: Growth vs. Harvest - New Hampshire forests](chart)

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2012</th>
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<tbody>
<tr>
<td>Net Growth</td>
<td>177,443,022</td>
<td>200,412,483</td>
</tr>
<tr>
<td>Removals</td>
<td>174,695,058</td>
<td>134,813,612</td>
</tr>
</tbody>
</table>

Source: USDA Forest Service, Forest Inventory and Analysis

Sarah Smith, UNH Cooperative Extension
2014
Products from the Forest

- **Hardwood Pulp**: 20%
- **Whole Tree Chips**: 30%
- **Softwood Pulp**: 10%
- **High Grade Wood**: 35%
- **Fuel Wood**: 5%

Source: NH Division of Forests and Lands

*Sarah Smith, UNH Cooperative Extension 2013*
NH Forest Ownership

Private 68%
Federal 14%
State & Municipal 10%
Private Investment Groups 8%

Source: USDA Forest Service
Sarah Smith, UNH Cooperative Extension 2013
Wood Fuel Supply

• **Roundwood** - firewood

• **Pellets** – densified from sawdust, chips, grindings or shavings

• **Chips** - whole tree chips (mostly for electric generation, co-firing)
  - bole chips
  - pulp quality chip from sawmill or chipping plant
  - chips from other sources of clean wood – pallets
Community-Scale

Community-scaled projects draw from the following supplies and create new local markets for:

- Sawmill residues
- Bole chips from culled and poor quality trees
- Land clearing activities; chipping contractors
- Pellet manufacturers
Technology Options - Characteristics of Advanced Wood Heating Systems

- Controlled combustion engineering
- Fully automated fuel storage and conveying
- Fully automated ash handling
- Computer controls and monitoring
- Emission controls to meet stringent standards
- Hot water or steam at range of pressures
- Can be combined with thermal storage and other renewable technologies (e.g. solar hot water)
Delivery and Transport

**Wood Chip**
Generally by live-floor trailers that dump into large fuel storage bin, usually under cover

**Wood Pellet Fuel**
Bulk delivery to outside storage (silage style)
## Chips Vs. Pellets

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Chips</th>
<th>Pellets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Cost ($/MMBtu)</td>
<td>Lower</td>
<td>Higher (about 2X chips)</td>
</tr>
<tr>
<td>Capital Cost/MMBtu</td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td>Fuel supply</td>
<td>Diversity of suppliers</td>
<td>Fewer suppliers</td>
</tr>
<tr>
<td>Applicability</td>
<td>Generally &gt;3MMBTU</td>
<td>Generally &lt;3MMBTU</td>
</tr>
<tr>
<td>Fuel Standards to Ensure Consistency of Fuel</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Energy Density (MMBtu/ton)</td>
<td>Lower</td>
<td>Higher (about 2X chips)</td>
</tr>
<tr>
<td>Maintenance Cost</td>
<td>Generally higher than pellet system</td>
<td>Generally lower than chip system</td>
</tr>
<tr>
<td>Output efficiency</td>
<td>Generally &lt;75%</td>
<td>80-90+%</td>
</tr>
<tr>
<td>Particulate Emissions</td>
<td>Higher than pellets w/out emission controls</td>
<td>Lower than chips</td>
</tr>
</tbody>
</table>
Wood Chip Heating Systems in NH (partial list)

- Androscoggin Hospital, Berlin
- Crotched Mountain Rehab Ctr, Greenfield
- GlenCliff Nursing Home, Benton
- Grafton County Complex, Woodsville
- Hanover High School, Hanover
- Littleton Regional Healthcare, Littleton
- John Stark High School, Weare
- Kearsarge Elementary and Middle School, Sutton
- Merrimack Valley School District, Penacook
- Pembroke Academy, Pembroke
- Proctor Academy, Andover
- Rockingham County Complex, Brentwood
- Sullivan County Complex, Unity
- Weeks Medical Center, Lancaster
- Winnisquam Regional High School, Tilton
- Keene School District, Keene
Merrimack Valley Schools District Heating Plant, Penacook

Wood Chip Heating Plant

5 MMBTU boiler heats 250,000 square feet in four buildings with hot water grid
Crotched Mountain Rehab. Center, Greenfield

12 MMBTU (2 boilers) heat 400,000 square feet on campus
Winnisquam School District, Tilton

5MM BTU boiler heats high school and middle school
Wood Pellet Heating Systems in NH (partial list)

- Carroll County Nursing Home, Ossipee
- Claremont Fire Station, Claremont
- Cornish Elementary School, Cornish
- Dartmouth College Sachem, Lebanon
- DRED Warehouse, Allenstown
- Dublin School, Dublin
- Effingham Town Offices, Effingham
- Franklin Pierce University, Rindge
- Gorham Town Garage, Gorham
- Greenville SAU, Greenville
- Harris Center, Hancock
- Hopkinton Town Garage, Hopkinton
- Jaffrey Wastewater Facility, Jaffrey
- Lyme Town Garage, Lyme
- Marlborough Elem. Sch., Marlborough
- Mascenic High School, New Ipswich
- Mason Elementary School, Mason
- McDowell Colony, Peterborough
- New England College, Henniker
- New Hampshire Audubon, Concord
- New Hampshire SPCA, Stratham
- Nubanusit Co-Housing, Peterborough
- Peterborough Police Department
- Peterborough Public Library
- Peterborough Town Hall Sachem Village
- St. Kieran Arts Center, Berlin
- Tuftonboro Meeting Hall, Tuftonboro
- White Mtn School, Bethlehem
- Wolfeboro Water Treatment, Wolfeboro
200 MBTU wood pellet boiler

Wood Pellet Boiler Conversion
Greenville Elementary School | Greenville, NH
New England College, Henniker NH

1 MMBTU wood pellet boiler, heats Science Building
Carroll County Nursing Home Complex, Ossipee

(2) 1.6 MMBTU wood pellet boilers
White Mountain Nat. Forest Complex, Campton NH

1 MMBTU
Pellet Boiler

Pellet-fueled
100 kw
Cogeneration Unit

Bulk delivery to external silo
Emissions

• State permitting for systems >2MMBTU, may require air dispersion modeling
• Regulated pollutants: SO$_2$, NOx, PM, CO, VOCs
• Particulate matter is primary public health focus
• Best technology = complete combustion = minimal emissions
• Pellets generally lower in emissions than chips
• Back end controls can reduce PM to limits comparable to fossil fuel systems but add cost
Getting Started

- Understand what you are trying to achieve
- Learn as much as you can on your own
  - lots of free information
- Talk to others who have already done it
- Talk to prospective vendors
- Hire a qualified energy advisor to assist you
- Consider audit and efficiency measures BEFORE you size your system
- Carefully size your system
- Develop financial pro forma
- Consider public relations of your project: fuel supply, emissions, trucks, etc.
  - engage your stakeholders!
Incentives

- USDA REAP grant 25% capital cost up to $500,000
- NH Thermal Renewable Energy Certificates
- NH PUC Competitive Grants
- NH Public Utilities Commission Commercial Wood Pellet Boiler Rebate Program – 30% of capital cost up to $50,000
- NH Wood Energy Council
  - Applications accepted on a rolling basis
Another Tool

The Roadmap is a decision-making tool to help communities decide if woody biomass heating/cooling is a good choice for their energy future.
The Roadmap has two main components:

1. Establish community goals
2. Evaluate a biomass project
Community Engagement

- Makes good use of local expertise
- Allows people to gain new information
- Allows leaders to gauge community interest
- Result is better, well-informed decision-making
Community Roadmap

At the end of the process, a community will have a pretty good idea of whether it makes sense to pursue one or more biomass projects.
Levels of Assistance

- **Ambassadors** – introduce your project leaders to basics of commercial/institutional wood heating

- **Coaches** – an expert on modern fully-automated wood heating systems – will be hired at no cost to you and will meet with you, analyze your current heating system(s) and make a preliminary determination on whether you should pursue a switch to a wood heating system

- **Pre-Feasibility Studies** – Technical assistance from qualified experts in evaluating details of your project

- **Feasibility Studies** – Full technical analysis of options and economics for qualified projects (cost-share required)
New Hampshire Wood Energy Council
C/O NCRC&D
PO Box 870
Meredith, NH 03253
(603) 527-2093
ncrd.rick@gmail.com

www.nhwoodenergycouncil.org
Facebook.com/NHWEC
Twitter.com/NHWEC