

Community-Scale Biomass Energy: *The Vermont Experience*

**Woody Biomass Thermal Heating Project
Development Workshop**

**Castlegar, British Columbia
October 5th, 2010**

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Biomass Energy Resource Center***

Biomass Energy Resource Center (BERC)

BERC is a national not-for-profit organization working to promote responsible use of biomass for energy.

BERC's mission is to achieve a healthier environment, strengthen local economies, and increase energy security across the United States by developing sustainable biomass systems at the community level.

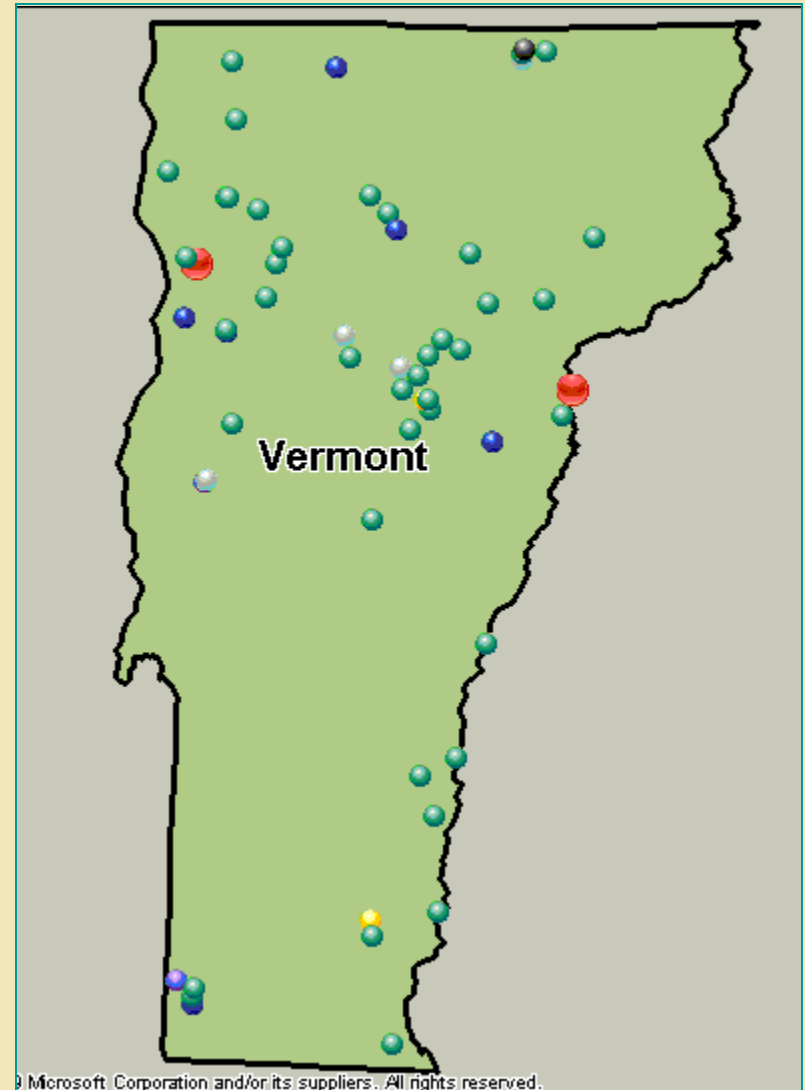


A Little Perspective

	British Columbia	Vermont
Land Area	944,745 km ²	24,923 km ²
Population	4.5 million	650,000
Population of Largest City	2.2 million	35,000
Number of Cows	67,360	154,000
Percent Forest Cover	65%	78%
Percent Private Forestland Ownership	6%	86%

The Vermont Experience

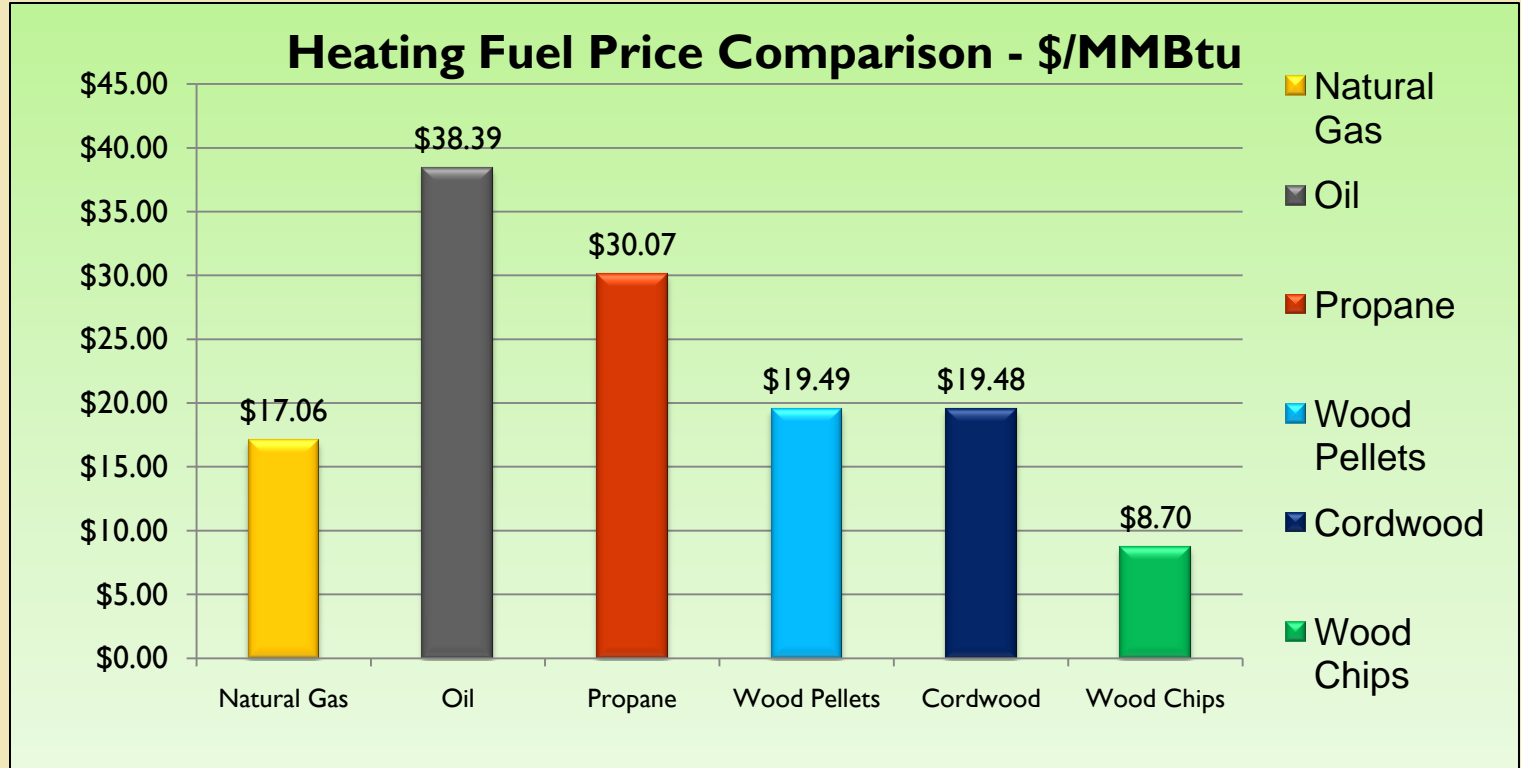
- 2 power plants
- 41 Public Schools
- 1 Hospital
- 5 State Office Complexes
- 3 Housing Complexes
- 3 College Campuses
- Dozens of Businesses



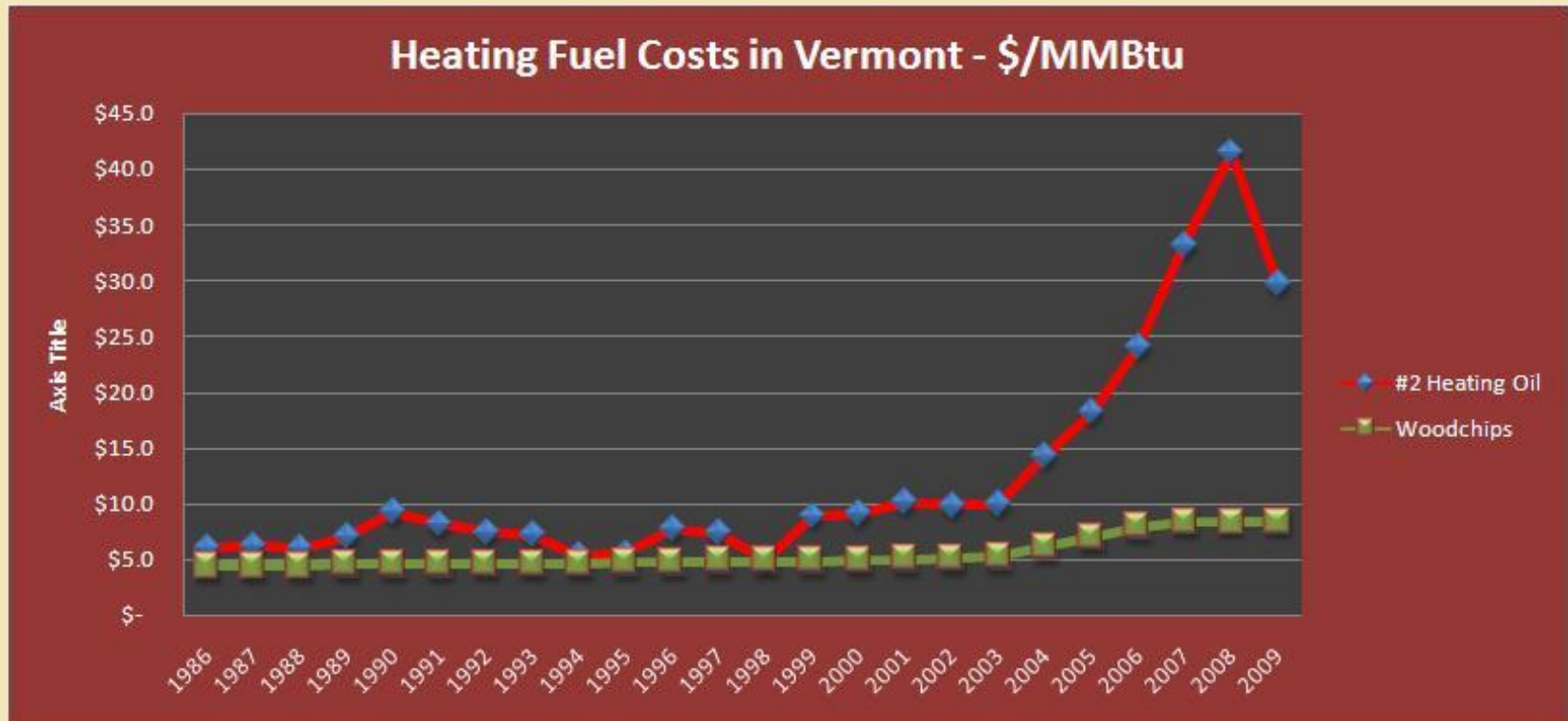
Why did Woodchip Heating Take Off in Vermont?

- Lots of expensive electric and oil heating
- Abundance of mill residue chips
- Strong political support for renewable energy and supporting forest products industry
- A handful of tireless champions
- Technical support from experts

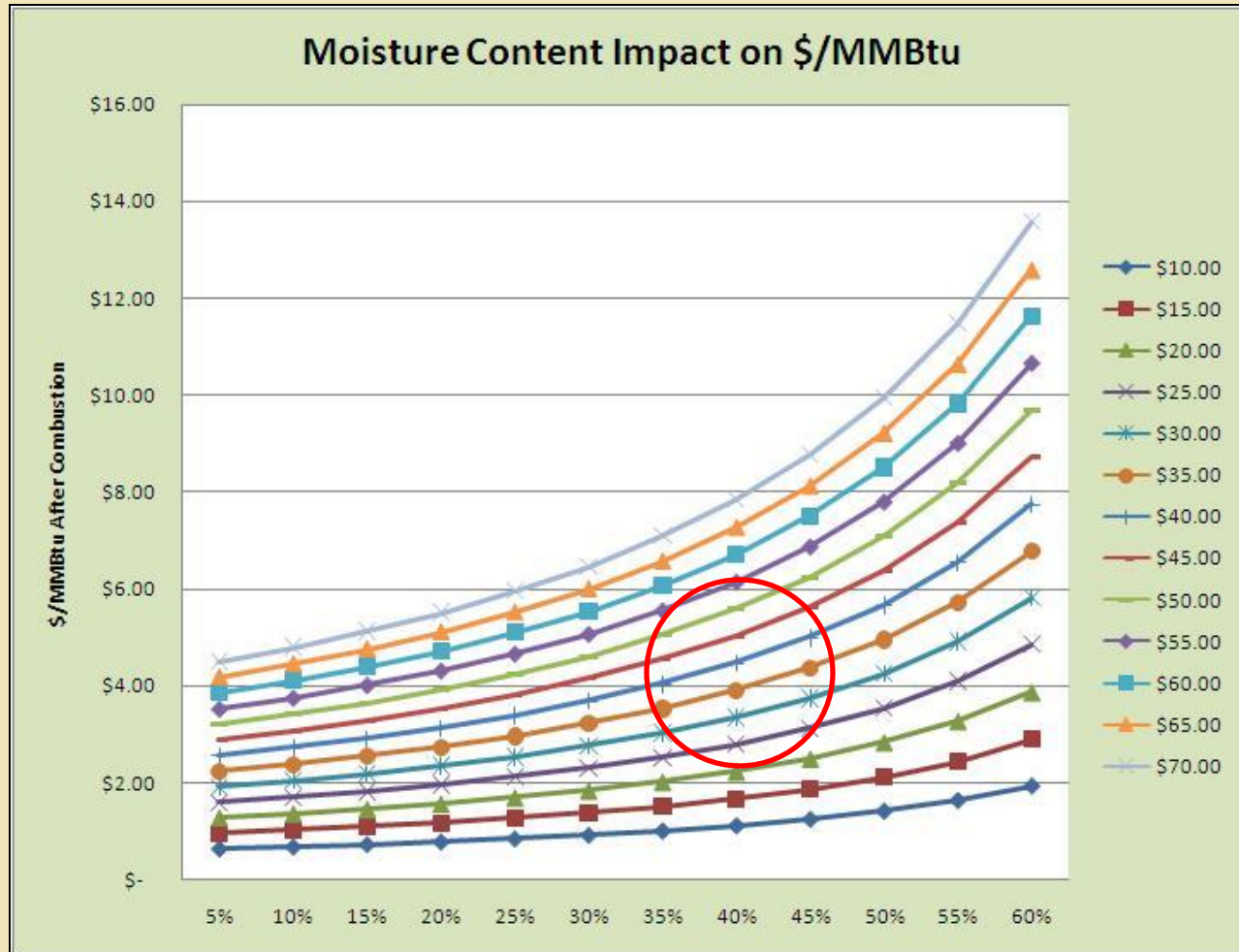
Comparative Cost of Heating Fuels



Price History



Cost of Wood Fuel after Combustion

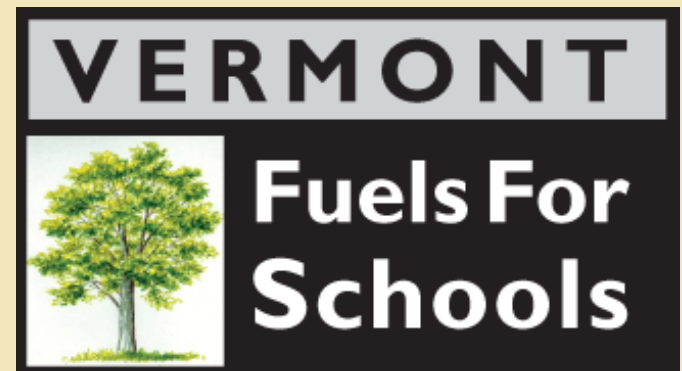


Vermont Fuels for Schools Program

Partners: VT Superintendents Association, VT Department of Forests, Vermont Department of Education, Vermont Department of Public Service, and BERC

Funding: Allocated by the Vermont Legislature and administered through the Department of Education's school construct aid program

Technical Assistance (initial and on-going): Provided by BERC and other partners to schools



Typical Fuels for Schools Project Development Process

- Initial concept
- Fuels for Schools tech team site visit/energy audit
- Preliminary feasibility study including LCC analysis
- School board decision to pursue concept
- Apply for State School Construction Aid Cost Share
- More detailed feasibility including updated LCCA
- Voter approval for bonding local share of capital cost
- Issue Request For Bids
- Construction/installation
- Commissioning

During the 2008/2009 Heating Season Woodchip Heated Vermont Schools

- Saved more than \$2.2 million dollars on heating costs (an average of (\$59,000 per school)
- Used 22,616 tons of woodchips (offsetting nearly 1.3 million gallons of oil)
- Avoided nearly 14,000 tons of CO₂

SCHOOL WOODCHIP HEATING SYSTEM

Barre Town Elementary and Middle School

BARRE, VERMONT, UNITED STATES

- **Heating Capacity (output):** 1.3 MW (4.5 MMBtu/hr)
- **Annual Woodchip Use:** 650-725 tons
- **Year Installed:** 1996
- **Thermal Output:** Hot water



SCHOOL WOODCHIP HEATING SYSTEM

Mount Abraham Union High School

BRISTOL, VERMONT, UNITED STATES

- **Heating Capacity (output):** 1.8 MW (6 MMBtu/hr)
- **Annual Woodchip Use:** 900 tons
- **Emissions Reduction and Combustion Control Equipment:** Multi-cyclone
- **Year Installed:** 2006
- **Thermal Output:** Hot water



CAMPUS WOODCHIP HEATING SYSTEM

Bennington College

BENNINGTON, VERMONT, UNITED STATES

- **Heating Capacity (output):** 4.0 MW
(14 MMBtu/hr)
- **Year Installed:** 2008
- **Annual Woodchip Use:** 4,000 green tons
- **Thermal Output:** Steam for heating

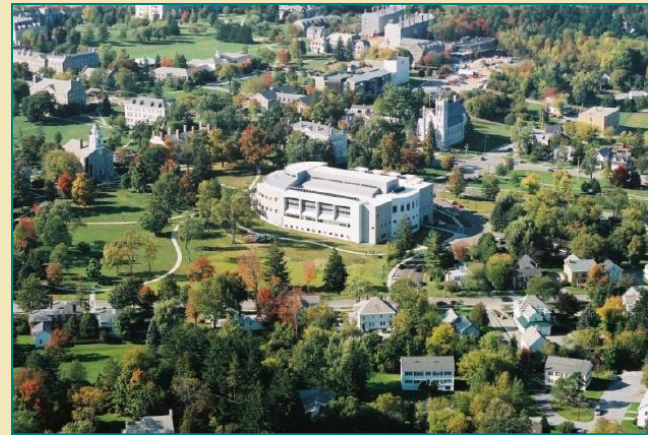


CAMPUS WOODCHIP HEATING SYSTEM

Middlebury College

MIDDLEBURY, VERMONT, UNITED STATES

- **Heating Capacity (output):** 8.8 MW (30 MMBtu/hr)
- **Year Installed:** 2008
- **Annual Woodchip Use:** 20,000 green tons
- **Thermal Output:** Steam for heating and power generation



**COMMUNITY BUILDING WOOD PELLET
HEATING SYSTEM**

All Souls Interfaith Gathering

SHELBURNE, VERMONT, UNITED STATES

- **Heating Capacity (output):** 145 kW (0.5 MMBtu/hr)
- **Annual Wood Pellet Use:** 30-40 tons
- **Year Installed:** 2007
- **Thermal Output:** Hot water for heating



HOSPITAL CHP SYSTEM

North Country Hospital

NEWPORT, VERMONT, UNITED STATES

- **Heating Capacity (output):** 4.3 MW (15 MMBtu/hr)
- **Annual Woodchip Use:** 3,000 green tons
- **Year Installed:** 2006
- **Thermal Output:** Steam for heating, cooling, and electricity production



Traditional Sources and Grades of Woodchips

Sawmills



Paper Grade Chips

Timber Harvest



Whole-tree Chips

Wood Waste Recycling



Hog fuel/ Mulch

“Commodity” Wood Chip Fuel



Bole Chips

Success Factors

- Target larger facilities with oil or propane fired hydronic heating systems
- Find local “champions” to push projects forward
- Involve community early on in planning process
- Pay particular attention to fuel supply and strive to understand the entire length of the supply chain
- Build project clusters in areas new to woodchip heating
- First projects in new regions are critical – if done properly they demonstrate success if done improperly they demonstrate failure

Parting Comments

- Replace oil, propane, and natural gas with local renewable fuel
- Create local jobs
- Lower carbon footprint
- Keep dollars in local economy
- Create local, stable markets for low-grade and small diameter wood products



Contact Information

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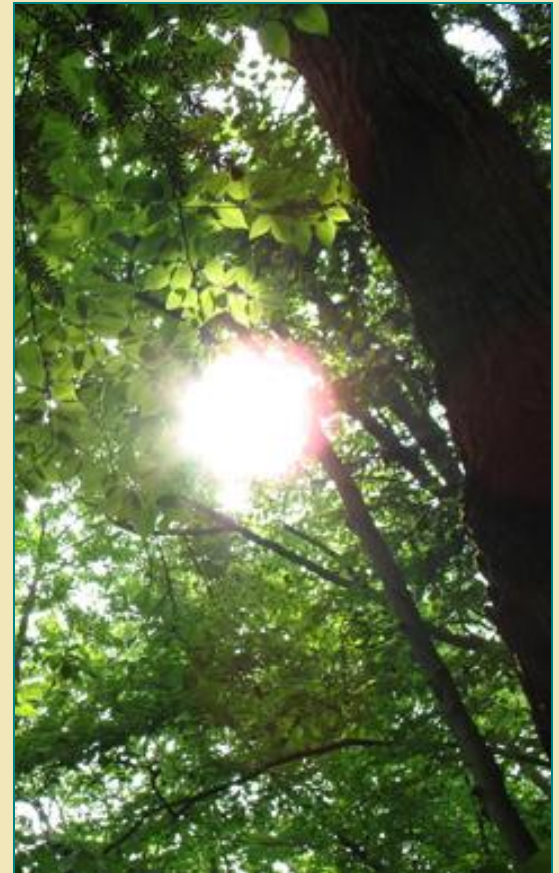
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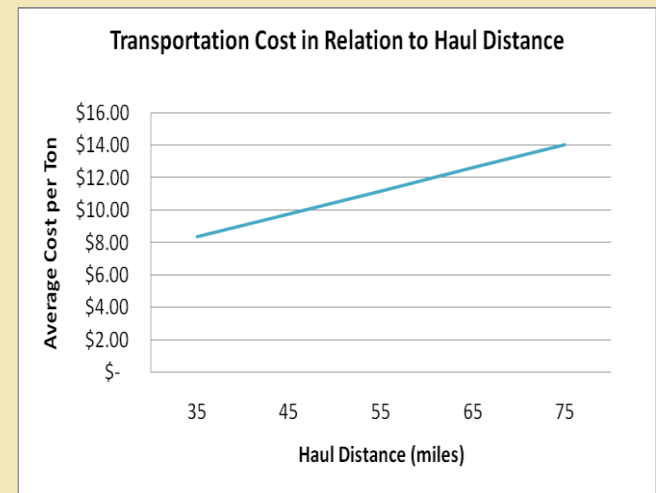
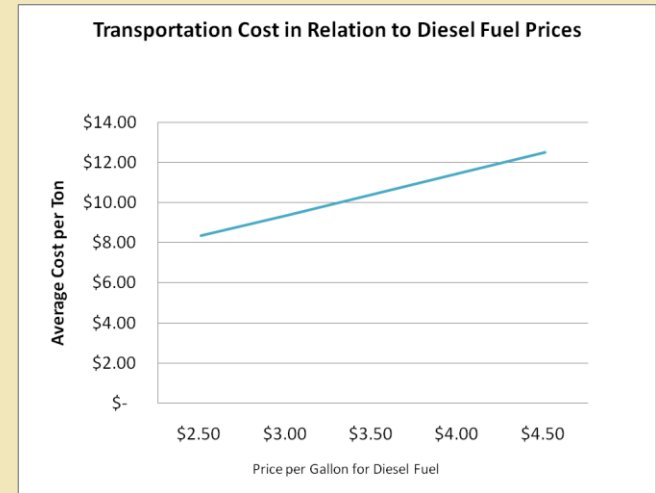
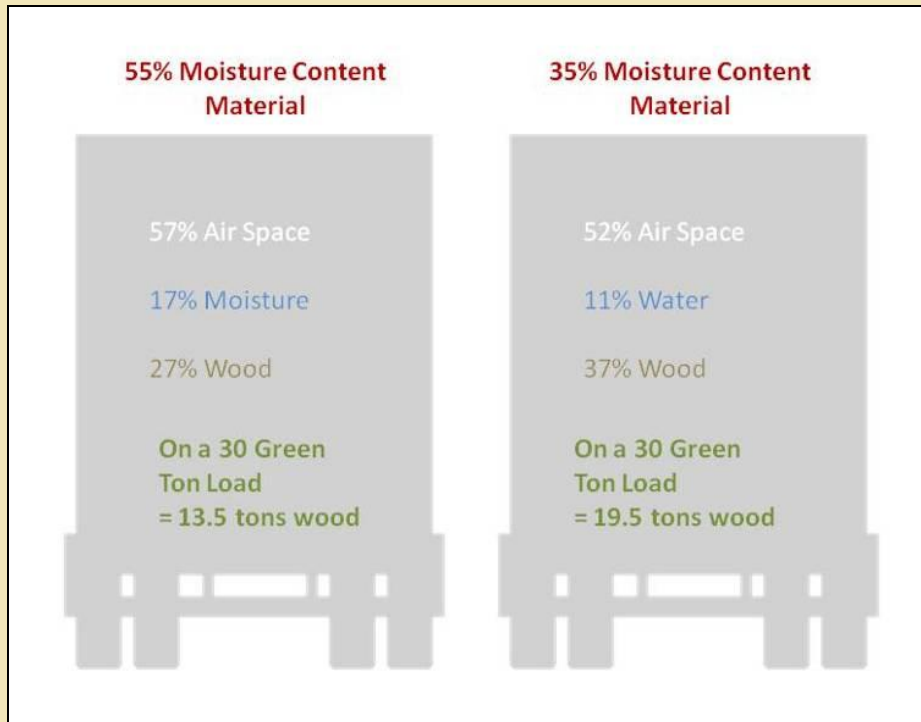
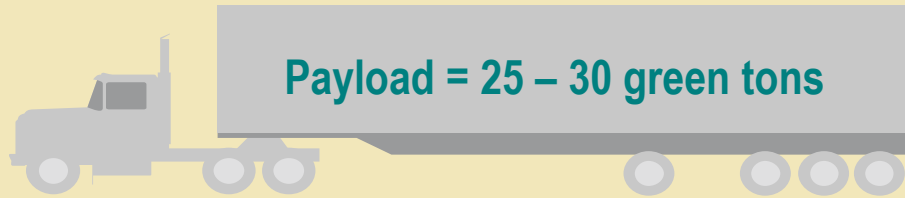


What is Next for Wood Energy in Vermont?

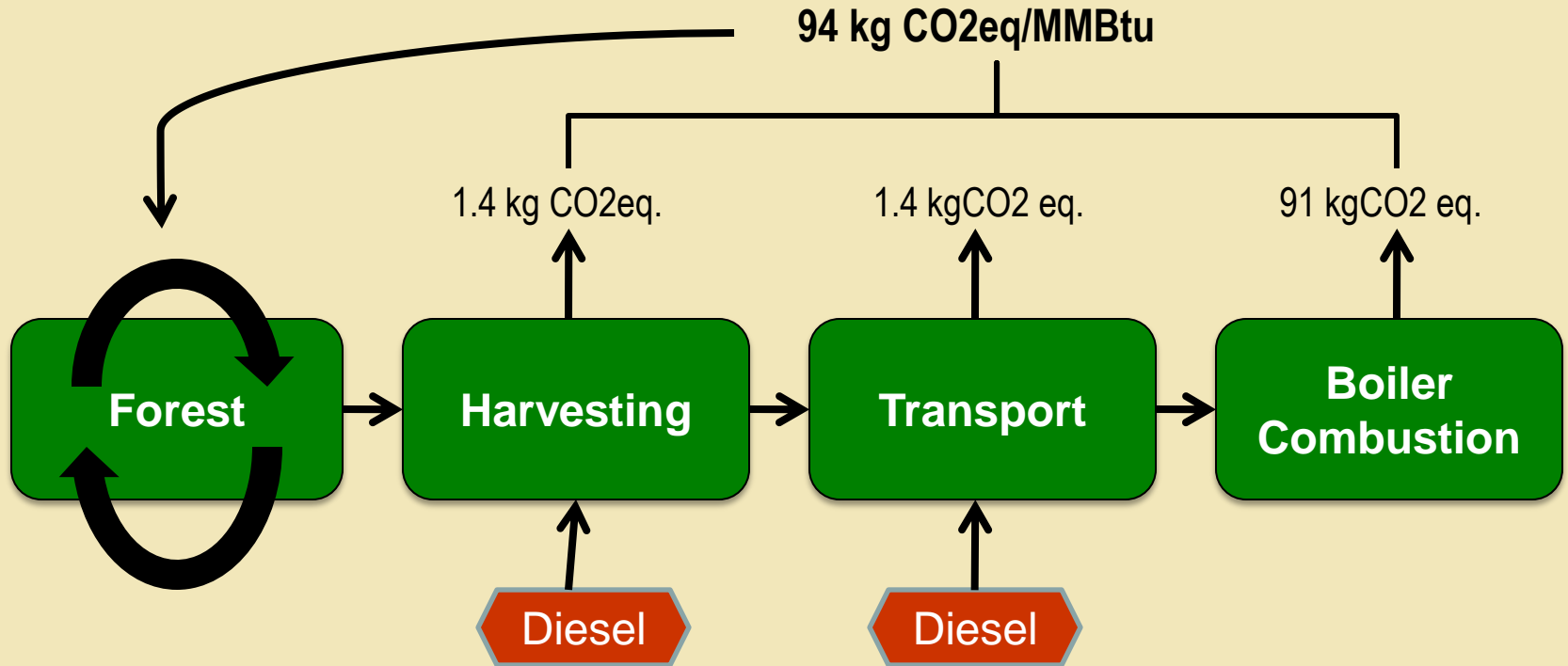
- 6 communities pursuing community district heating projects
- Several more pellet mills proposed
- Expansion of bulk pellet fueled boiler market
- Several more college campuses
- Possibly another large power plant in Southern Vermont

Woodchip Fuel Transportation Factors:

Diesel, Distance, and Moisture



Life-Cycle Carbon Impacts of Wood Energy



As Compared to:

#2 Heating oil
Natural gas

95 kg CO₂eq/MMBtu
72 kg CO₂eq/MMBtu

