Wood Heat for Municipalities

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What is advanced wood heat?

- Highly efficient wood burning appliances with low emissions
- Automated control with regular thermostats
- New residential wood stoves all the way to wood chip boilers for large commercial and institutional buildings.
It’s about the forest

- Vermont is 76% forested
- Currently harvesting less than half the net growth
- Markets for low grade wood have collapsed
- Vermont is losing 1,500 acres a year to suburban and rural development
Support our Local Economy

- 78 cents of every fossil fuel heating dollar leaves Vermont
- Most wood fuel in Vermont is grown within 50 miles of where it is used
- Wood energy generates roughly $60 million in economic activity annually in Vermont
- An estimated 350 jobs in Vermont are directly attributed to wood energy
- About 78 cents of every wood heating dollar stays in Vermont
Goals

• State Clean Energy Plan – 90% Renewable Energy by 2050
• Obtaining 35% of Vermont’s thermal energy needs from wood heat by 2030, through increased adoption of automated wood heating systems
If we reach our goal...

- Displace 40 millions gallons of fossil fuel annually
- Vermonters save $120,000,000.00/year
Where are we now?

- 21% of thermal energy needs comes from wood
- 38% of Vermonters heat in full or in part with wood
Households with Primary Wood Heat by State

Percent of Residences

- Vermont: 16.00%
- Maine: 14.00%
- Montana: 12.00%
- New Hampshire: 10.00%
- Idaho: 8.00%
- New Mexico: 6.00%
- West Virginia: 4.00%
- Alaska: 2.00%
- Wyoming: 0.00%
- Wisconsin: 0.00%
- Washington: 0.00%
- Arkansas: 0.00%

Source: 2010 US Census Data
Vermont Public School Sector

Primary Fuel
- District Heat
- Gas
- Oil
- Propane
- Wood Pellets
- Woodchips

- Oil: 44.5%
- Gas: 20.4%
- Wood Pellets: 8.0%
- Propane: 0.4%
- Woodchips: 0.6%
- District Heat: 0.6%
Wood Fuel Types
Wood Pellets

- Made of compressed sawdust
- Burn very clean
- Less work and less storage than cordwood
- Appropriate for residential and small commercial buildings
- Can be fully automated
- Sold in bag and in bulk
Pellet Stoves

- Looks and functions much like a wood stove
- Much easier to load and run
- Removes user error
- Can be direct vented through a wall
- Requires electricity

Pellet Boilers vs Stoves

Pellet Boilers & Furnaces

- Fully automated whole home heating
- Same experience as heating with oil or propane
Wood pellet heating system

Space heating and domestic hot water supply with pellets

1. Once or twice a year the pellets are delivered by a silo tanker. A loaded storage room of 4.5 m² is enough to keep a single-family house warm for one year.

2. The pellets are carried from the storage room to the boiler by a fully automatic pellet feed.

3. After the burning process all that’s left is ash – with a weight of only 0.5 per cent of the original pellet. The ash can be disposed of with the domestic waste.

4. If the pellet boiler is interconnected with a buffer storage, emissions can be reduced and efficiency increased.

Wood pellets
2-5 cm (0.8-2 in.) in length, diameter 6.6 cm (0.26 in.)

Domestic hot water

Storage room

Pellet boiler

Buffer storage

Space heating
Wood Chips

- Appropriate for large square footage buildings and district heating systems
- Very affordable fuel
- These systems require more maintenance
Considerations

• Handling and storage
• Emissions
Handling and Storage

- Wood is relatively low in energy per unit volume compared to oil
- Large, expensive storage buildings are needed for wood chips
- Wood pellets are more energy dense, but still need storage silos or rooms
- Wood chips systems require buy-in from an invested facilities manager
Emissions

- Wood burning produces emissions of fine particulate matter which is a health concern
- Older wood stoves and boilers are a significant source of particulate emissions
- Air Pollution Control devices are available and effective for larger units
Comparative PM Emissions

- PROPANE BOILERS: 0.0083 lbs of PM per MMBtu
- NEW OIL BOILERS: 0.013 lbs of PM per MMBtu
- MODERN PELLET BOILERS: 0.032 lbs of PM per MMBtu
- MODERN PELLET STOVE: 0.49 lbs of PM per MMBtu
- MODERN CERTIFIED WOOD STOVE: 1.4 lbs of PM per MMBtu
- OLD NON-CERTIFIED WOOD STOVE OR OWB: 4.6 lbs of PM per MMBtu

Source: EPA Burnwise program
Emissions by Source

2015 Wood Fuel Usage
- Residential: 53%
- Electrical Generation: 37%
- Industrial: 5%
- Institutional: 5%

2015 Estimated PM Emissions from Wood Combustion
- Residential: 94%
- Electrical Generation: 4%
- Industrial: 1%
- Institutional: 1%
Will We Save Money?

• Wood fuel prices are lower and less volatile than fossil fuel
• Higher up front costs, lifetime savings
• ROI ranges from 3 to 20 years
  • Price of oil
  • Available incentives
Municipal Examples
Mansfield Union High School

Woodchip vs. Fuel Oil cost
Mount Mansfield Union High School
2005 - 2015

Net savings over 10 years

$987,455
Fayston Town Offices

• Went on line in Fall of 2009

• Overall Project Avg. Annual Savings w/ Energy Efficiency = $3,590

• AWH System is estimated to be 78% of that = $2,800

• Uses 8+/- Tons of pellets annually

• Pellet system offsetting an average of 1,600 to 2,000 gallons of #2 heating oil annually

• Pellet System cost w/o boiler room addition was aprox $34,000

• Eight year savings to date (from pellet system to date is aprox. $22,400. w/insulating & Air Sealing is aprox. = $28,700
Marshfield, Old Schoolhouse Common Building

~6,600 sq. ft.

• Project installed in Fall of 2011
• Displacing 2,500 gallons of heating oil/yr.
  • Another 2,200 gal/yr. due to weatherization
• 6 ton indoor pellet bin
• Removed one oil boiler and an oil tank. Kept one old oil boiler as back-up
• Total cost ~$35,000. Internal loan.
• Uses ~20 tons of pellets/yr.
Next Steps

Consult a technical expert
- Consider a feasibility study
- Talk to an experienced installer

How to pay for it
- Incentives
- Financing
Technical Experts

• Stoves: Go to your local stove shop
• Pellet Boilers: Talk to an installer
  • List at www.EfficiencyVermont.com
• Large Scale: Talk to a consultant about a feasibility study
  • Biomass Energy Resource Center
  • Forward Thinking
  • Wilson Engineering
  • US Forest Service
  • And more!
Current Incentives – Automated Systems
Complete list available at: http://fpr.vermont.gov/incentives

Buildings < 5,000 sq. ft.
• $3,000 – Clean Energy Development Fund
• $3,000 - Efficiency Vermont
• $1,000 – Washington Electric Coop Members

Buildings > 5,000 sq. ft.
• Efficiency VT - Custom incentive at $1.25/sq. ft. up to $50,000
Current Incentives - Stoves

• Efficiency Vermont - $650 rebate on a new wood or pellet stove - Starting November 1, 2018

• CEDF Wood Stove Changeout Program
  • $1,000 rebate on a pellet stove
  • $800 rebate on an EPA certified wood stove
  • $100 for a new catalyst

• Vermont Electric Coop Members - $150 bill credit with pellet stove purchase
Grants & Other Programs

- USDA Rural Development
  - Community Facilities Direct Loan & Grant Program: Grants and loans for biomass energy projects
  - Cities, villages, and towns with populations less than 20,000
- Windham Wood Heat Initiative
  - Up to $100,000 towards technical and installation costs for an automated wood heat system
- Vermont Community Loan Fund – Farm & Forest Fund
Wait, you never said what these cost!

- Pellet boilers & furnaces - $18-$20k installed (*residential*)
- Pellet Stove - $3-$4k installed
- Wood Stove - $2-$3k installed (assuming you have a chimney)
- Wood Chip Boilers – Lots
Takeaway

• You can feel good about using local wood heat!
  • Keep energy dollars local
  • Support jobs for your neighbors
  • Keep forests as forests
  • (and save some money)
Questions?

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