ADVANCED

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

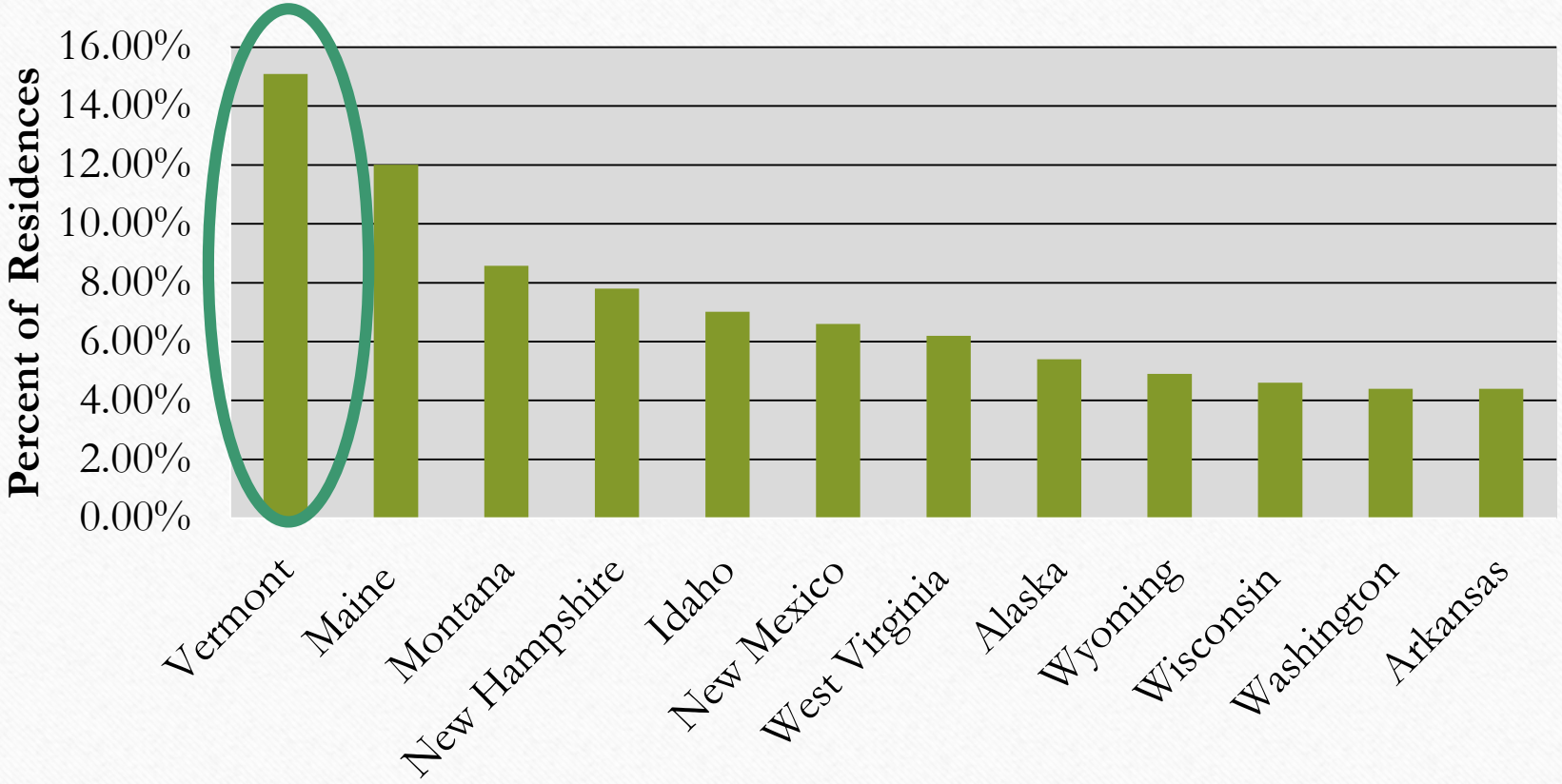
If we reach our goal…

- 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

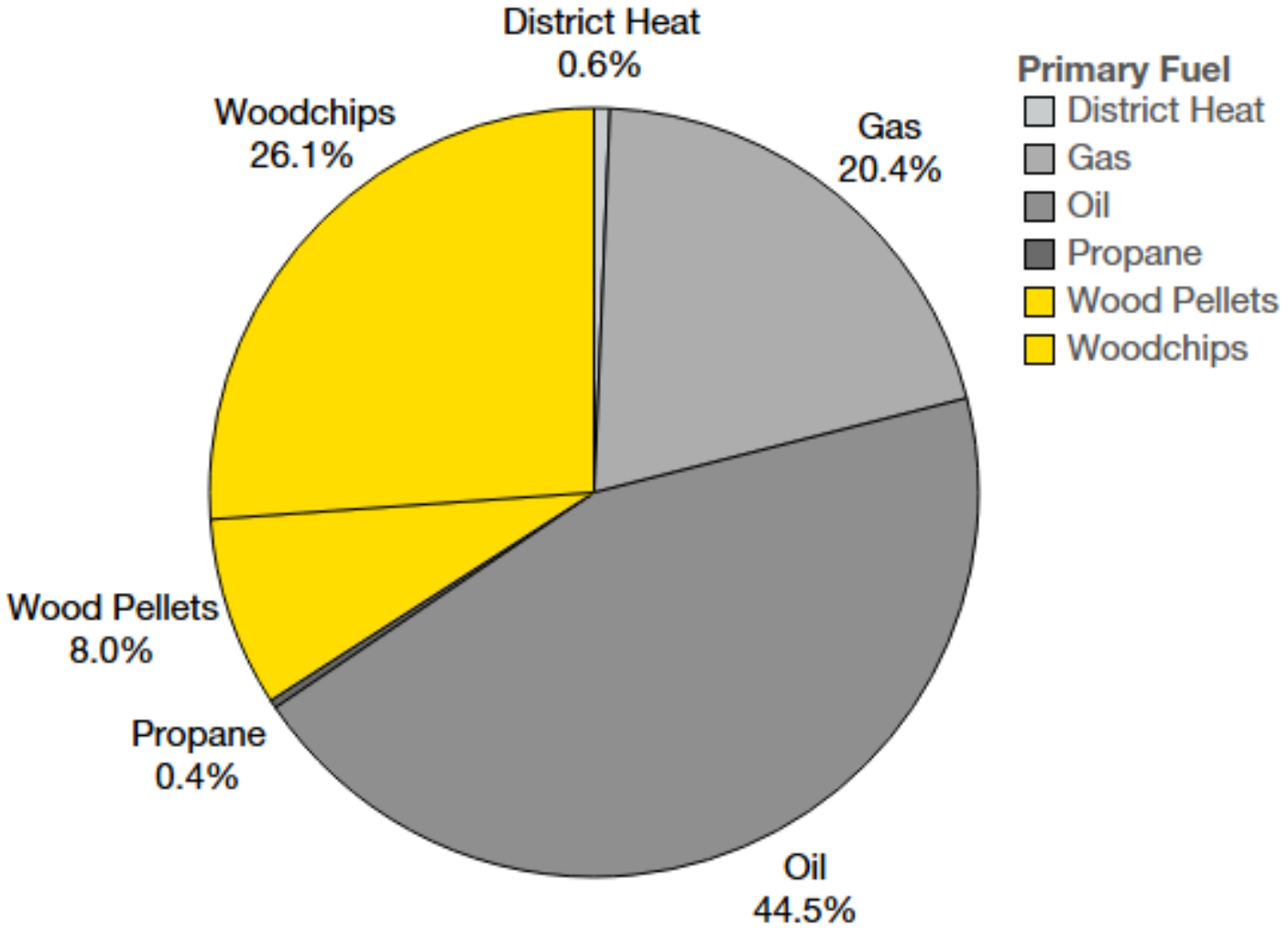


Source: 2010 US Census Data

Vermont Energy Investment Corporation

BERC Biomass Energy Resource Center

Vermont Public School Sector





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

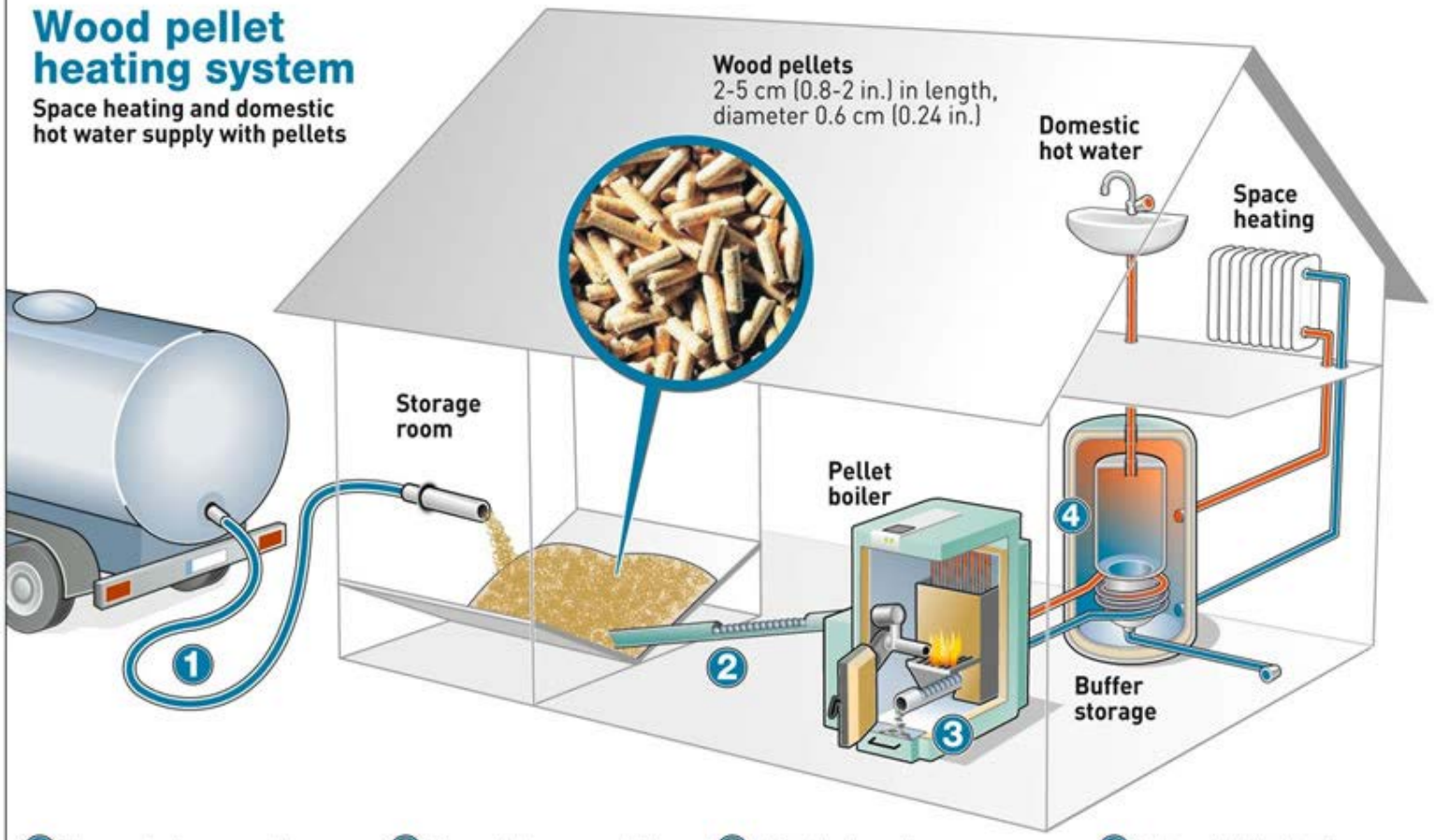
Pellet Boilers vs Stoves

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.

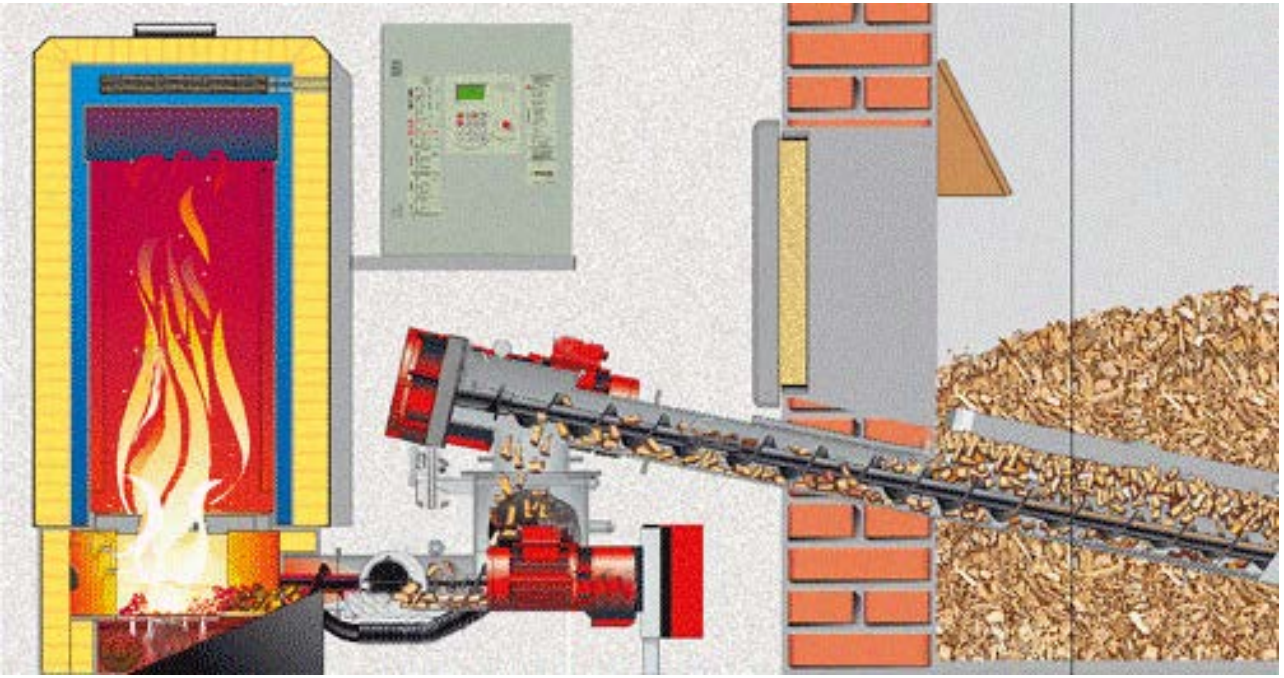
3 After the burning process all that's left is ash – with a weight of only 0.5 per cent of the original pellet. The ash can be disposed of with the domestic waste.

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

www.unendlich-viel-energie.de

Wood Chips

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



Considerations

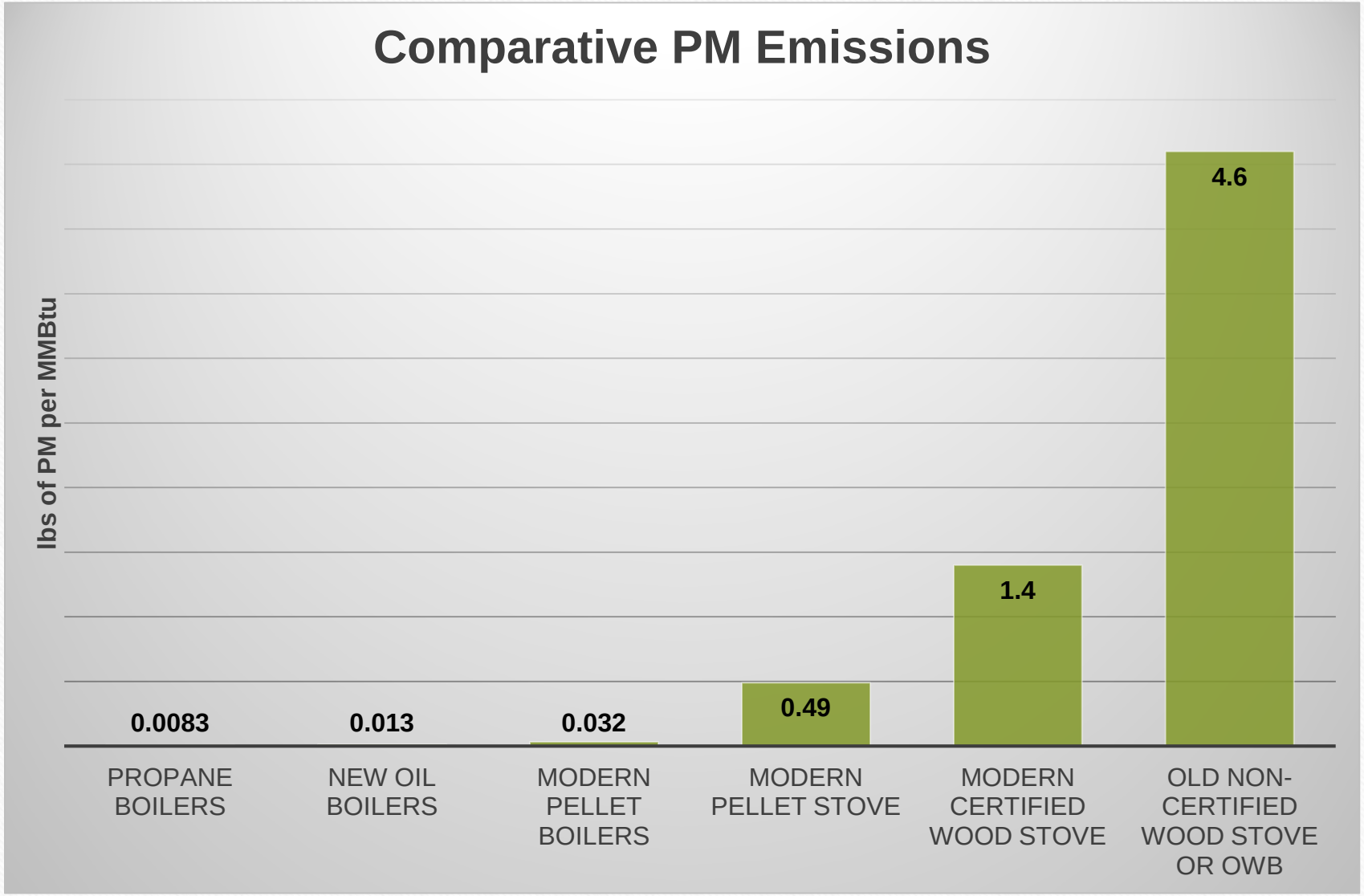
- Handling and storage
- Emissions

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

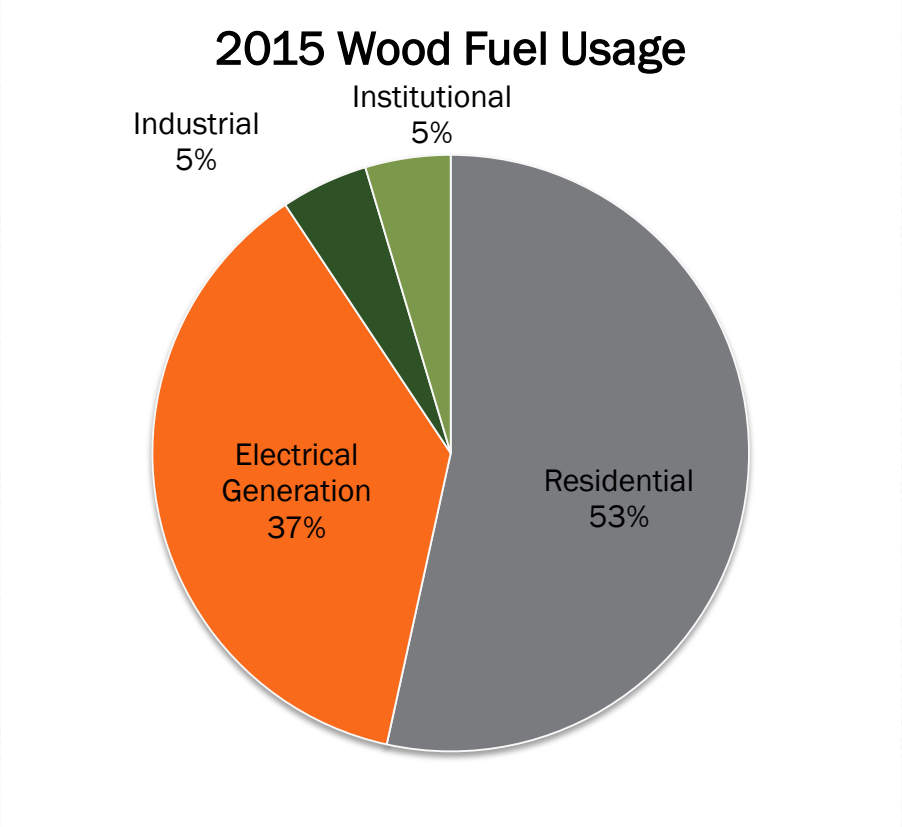


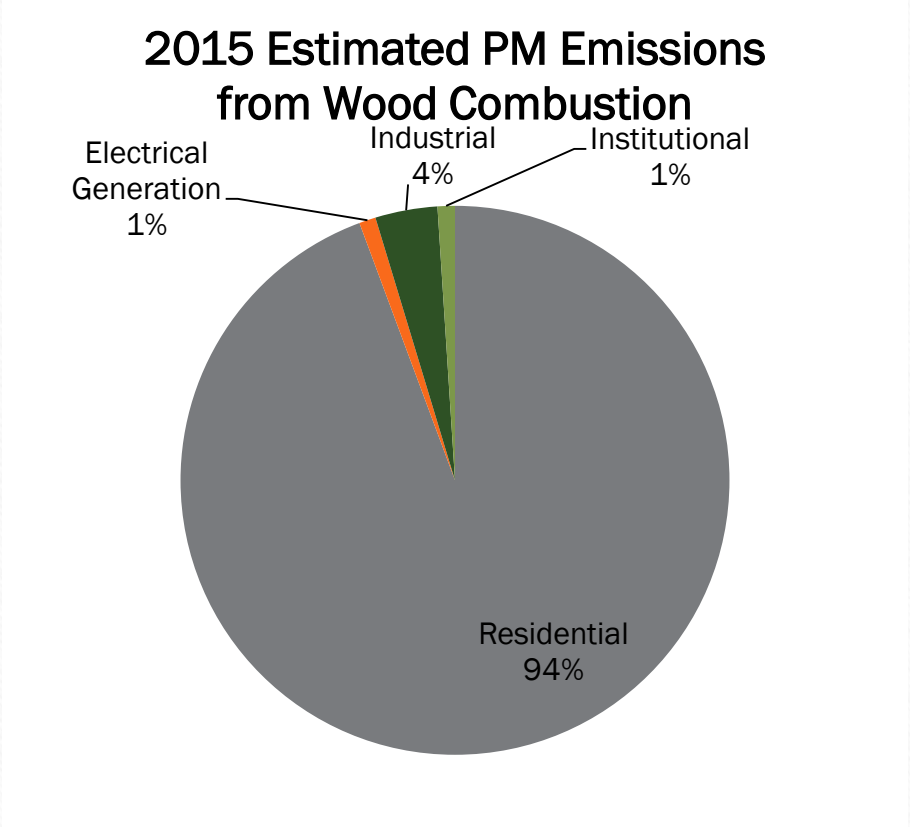
Vermont Energy Investment Corporation

BERC Biomass Energy Resource Center

Source: EPA Burnwise program

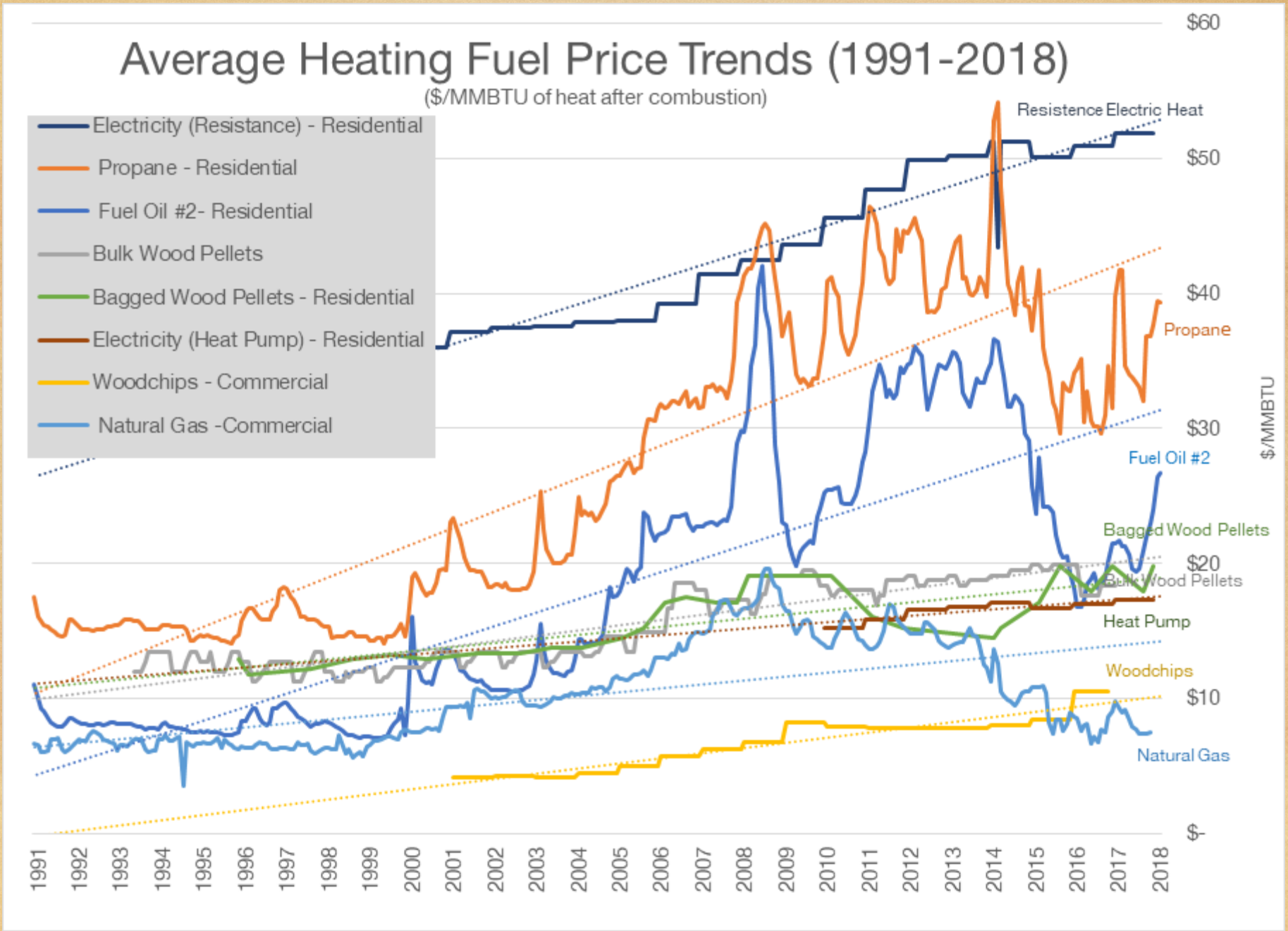
Emissions by Source





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


Average Heating Fuel Price Trends (1991-2018)
($/MMBTU of heat after combustion)
Electricity (Resistance) - Residential
Propane - Residential
Fuel Oil #2- Residential
Bulk Wood Pellets
Bagged Wood Pellets - Residential
Electricity (Heat Pump) - Residential
Woodchips - Commercial
Natural Gas -Commercial
Resistence Electric Heat
Propane
Fuel Oil #2
Bagged Wood Pellets
Bulk Wood Pellets
Heat Pump
Woodchips
Natural Gas
$60
$50
$40
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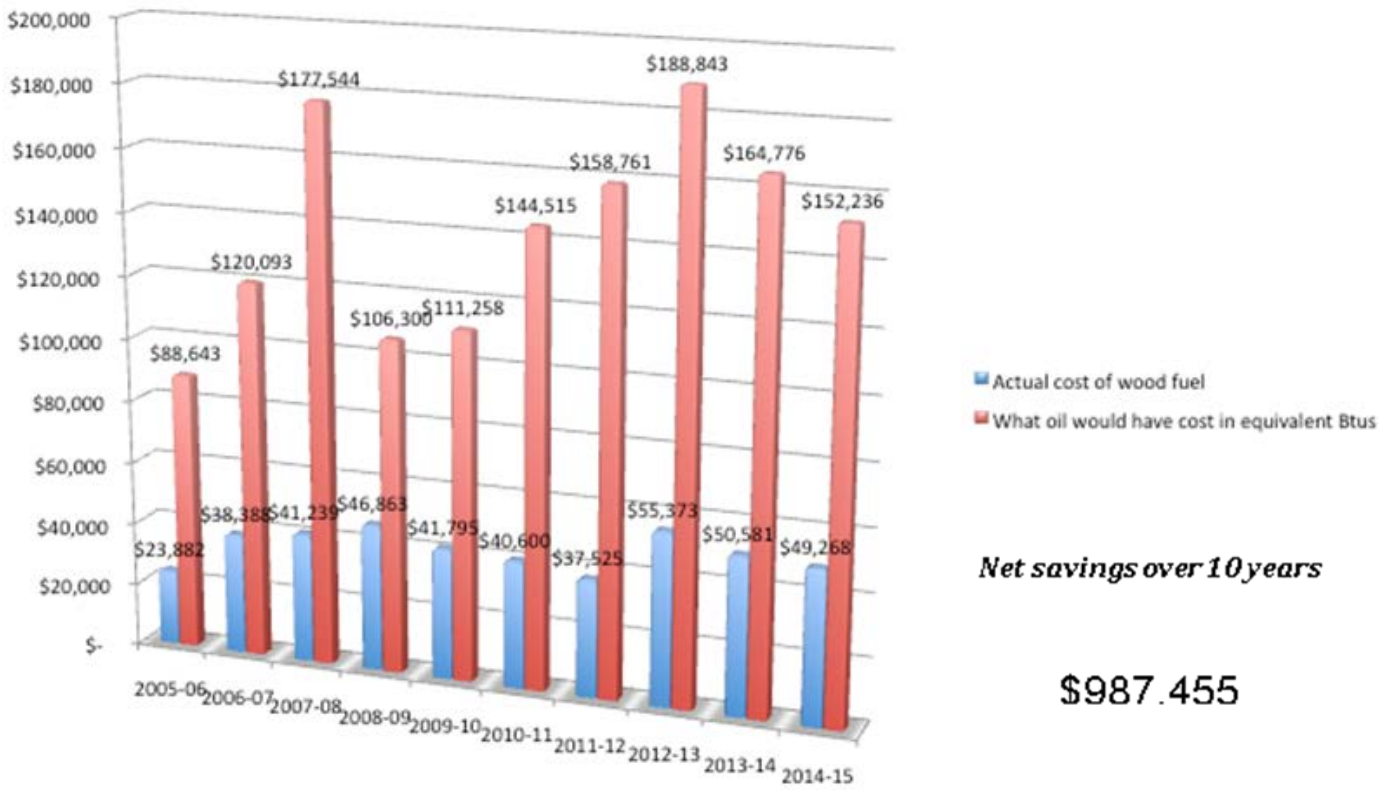
Municipal Examples

Mansfield Union High School



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.

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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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