

# Are you stoked?

Vermont's Local,  
Renewable Heating  
Solution

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- Vermont Department of Forests, Parks & Recreation

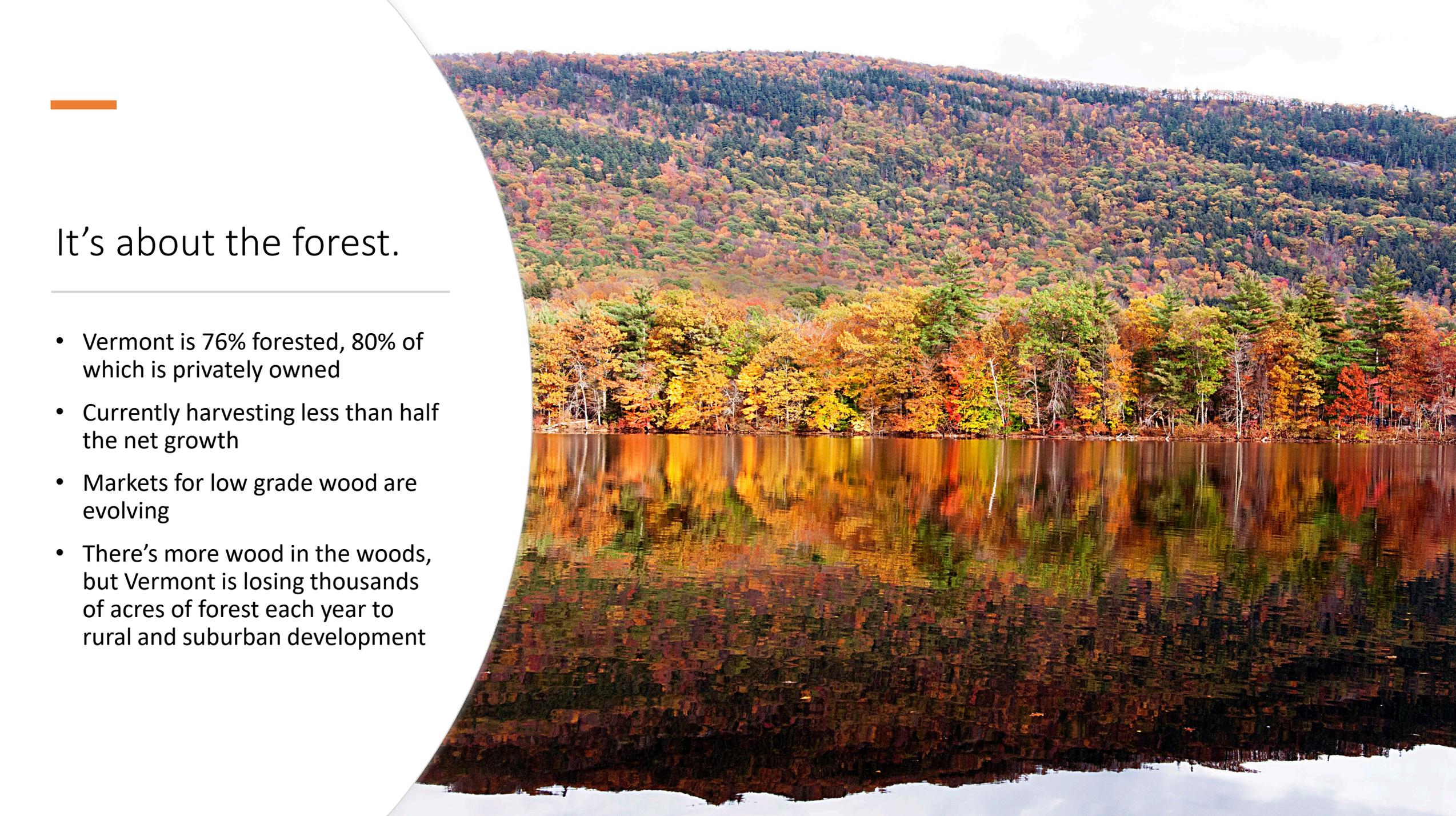


[feelgoodheat.org](http://feelgoodheat.org)

# What is advanced wood heat?

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- Highly efficient wood burning appliances
- New wood stoves all the way to wood chip boilers
- *Automated* wood heat is programmable with a thermostat
- AWH = Advanced Wood Heat



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## It's about the forest.

- Vermont is 76% forested, 80% of which is privately owned
- Currently harvesting less than half the net growth
- Markets for low grade wood are evolving
- There's more wood in the woods, but Vermont is losing thousands of acres of forest each year to rural and suburban development



# Wood Fuel Types

## Cord Wood

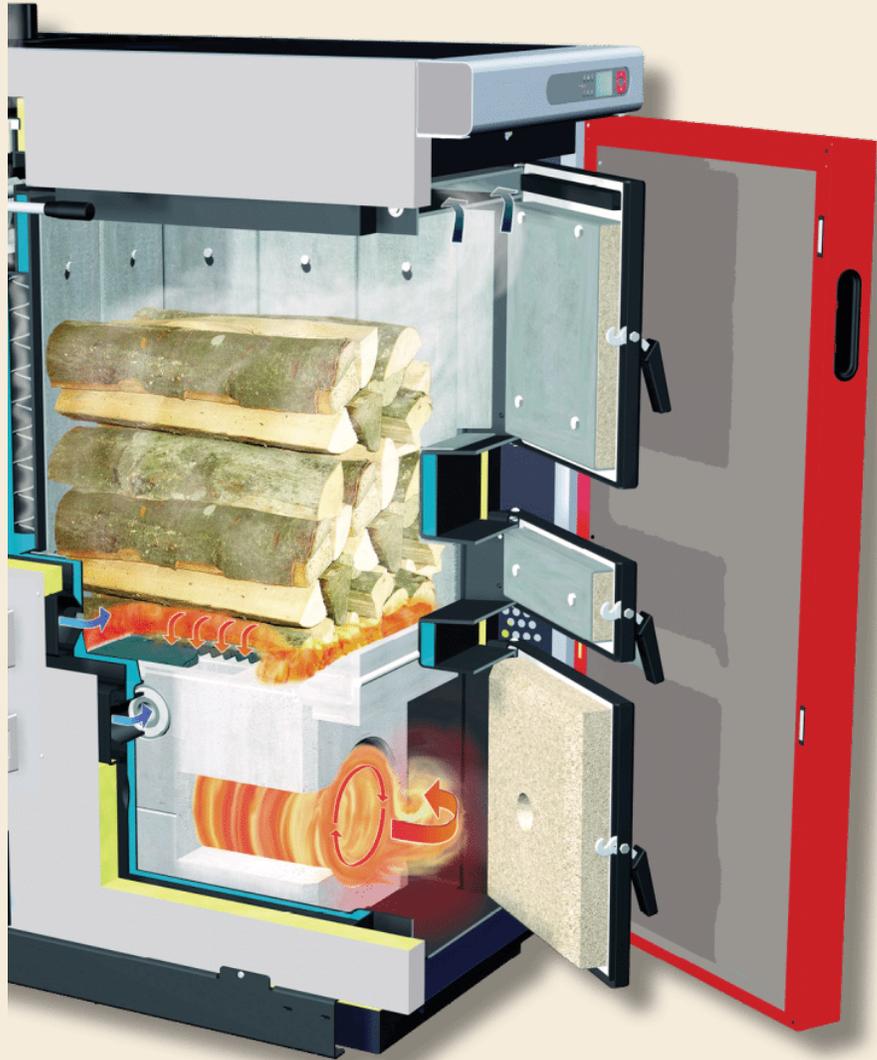
- 4x4x8 Stacked pile of split wood
- Pros: DIY-able, affordable
- Cons: Lots of room for user error
- Over a third of Vermont households use cord wood





Retire these...

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Add these!

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# Wood Pellets

- Made of 100% compressed sawdust
- Burn very clean
- Appropriate for residential and small commercial buildings
- Can be fully automated
- Sold in bags and in loose bulk



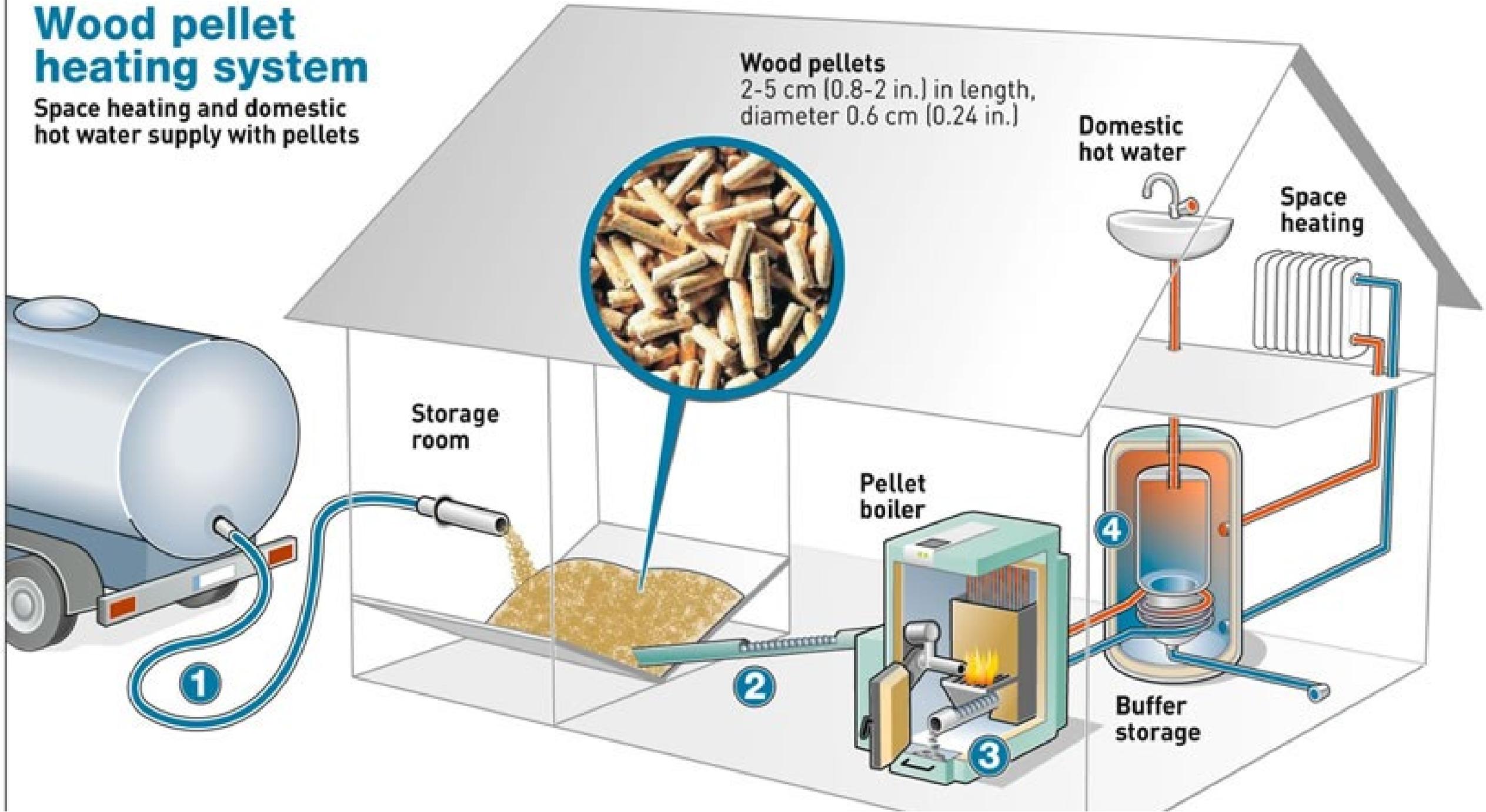


Wood Pellets



# Wood pellet heating system

Space heating and domestic hot water supply with pellets



# Automated Heating with Bulk Pellets



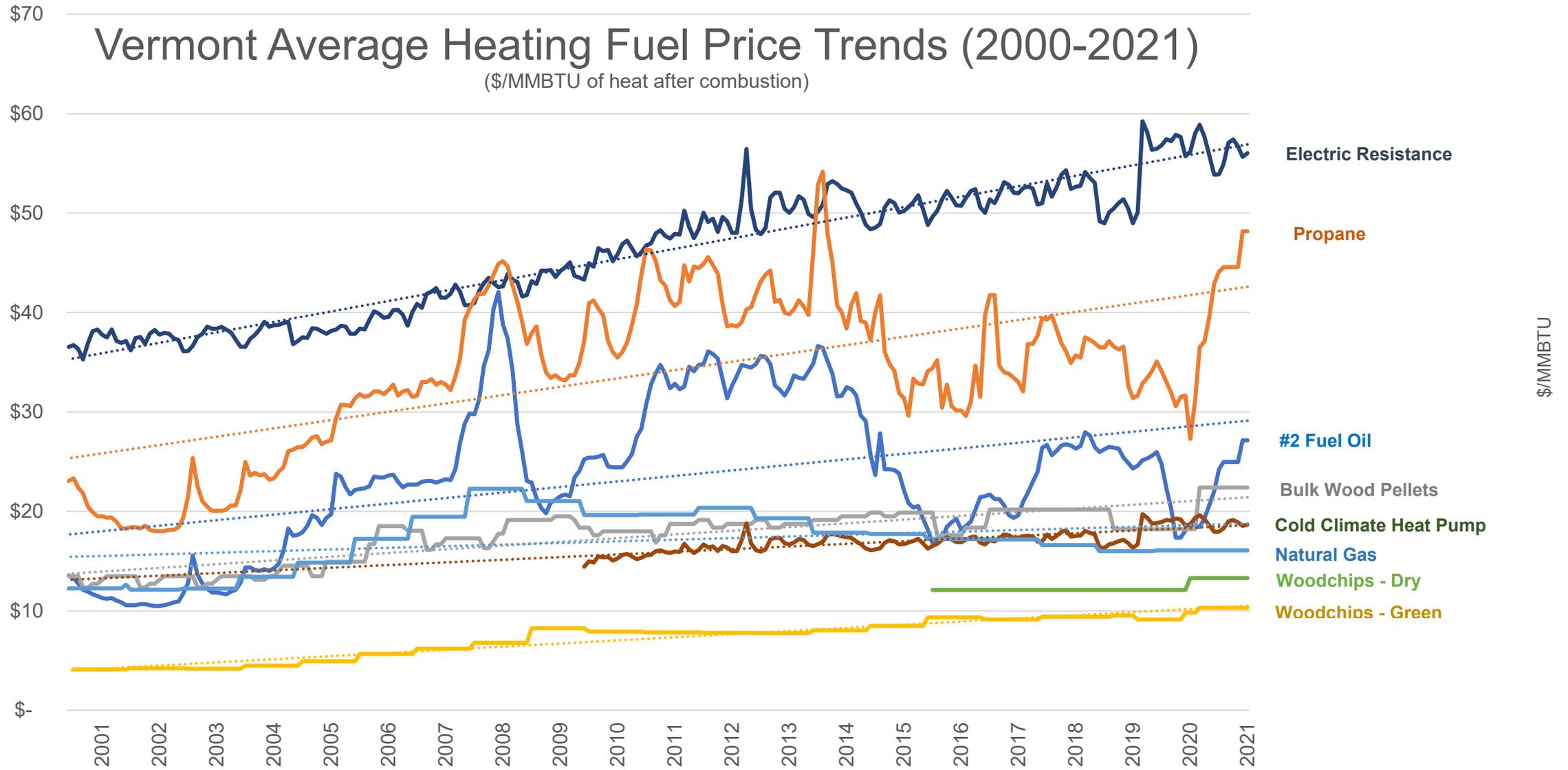
# Wood Chips

- Very affordable fuel, though with a high upfront equipment cost
- Appropriate for large commercial buildings and district heating systems



# Vermont Average Heating Fuel Price Trends (2000-2021)

(\$/MMBTU of heat after combustion)



A photograph of two men in a lumber mill. The man on the left is older, with grey hair, wearing a tan jacket over a red plaid vest and blue jeans. He is smiling and looking towards the other man. The man on the right is younger, wearing a black hoodie and an orange hard hat, seen from the back. In the background, there is a yellow excavator, stacks of logs, and industrial buildings under an overcast sky.

## Support Our Local Economy

- 78 cents of every fossil fuel heating dollar *leaves* Vermont
- 80 cents of every dollar spent on local wood fuels *stays* in Vermont

# Takeaways

- Keep energy dollars local
- Displace fossil fuels
- **Keep forests as forests**





## Goals

- 90% Renewable Energy by 2050
- Obtain 35% of Vermont's thermal energy needs from wood heat by 2030

# Why 35%?

- Based on the 2010 Vermont Wood Fuel Supply Study
- A conservative estimate of net available fuel-grade wood growth (NAFG) that could be used for fuel without compromising forest health
- 2019 update calculated that there's 5% more NAFG now than reported in 2010

# What does 35% look like?

Install an *additional*:

- 38,905 Pellet stoves
- 10,519 Residential pellet boilers
- 2,574 Commercial pellet boilers
- 221 Commercial woodchip systems



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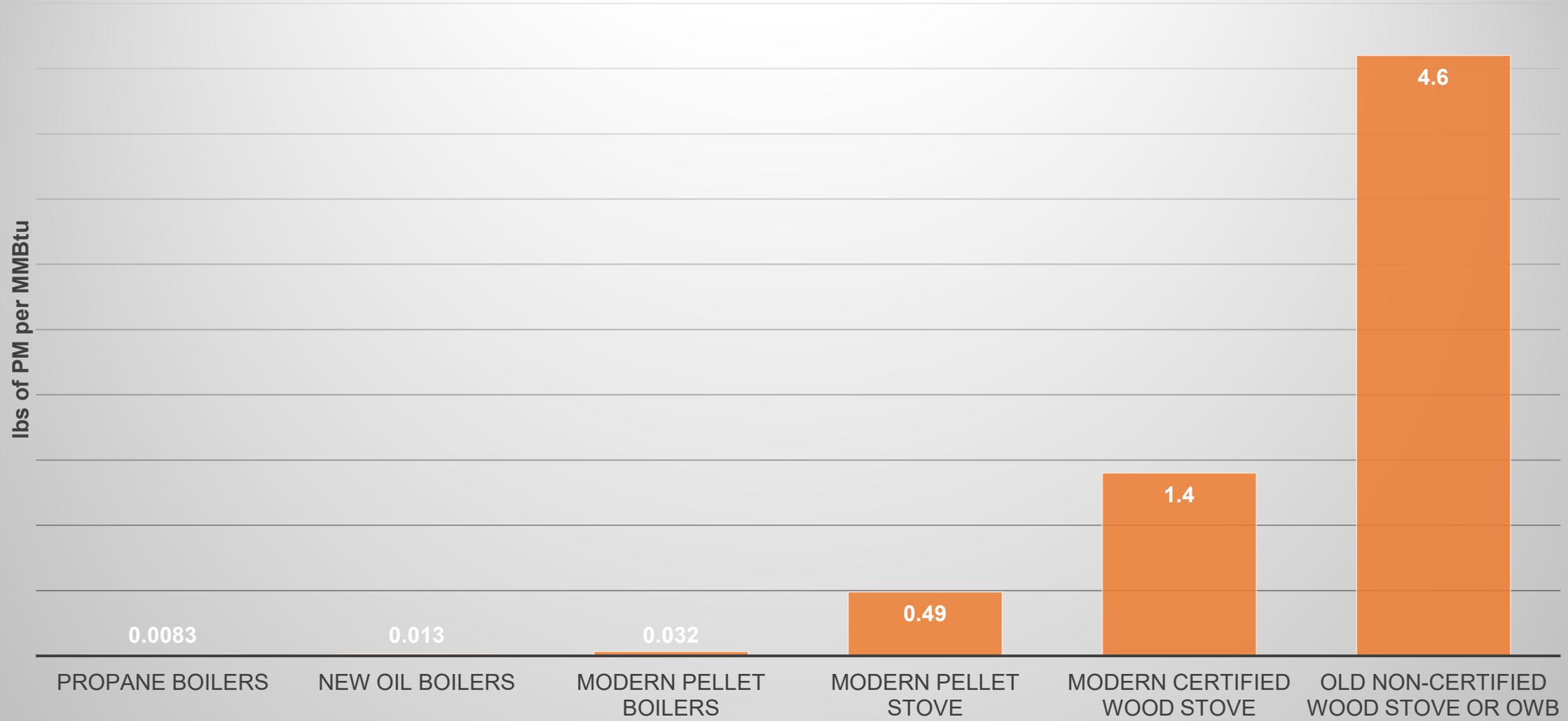
# Where are we now?

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- 23% of *thermal* energy needs comes from wood
- 43% of Vermonters heat in full or in part with wood

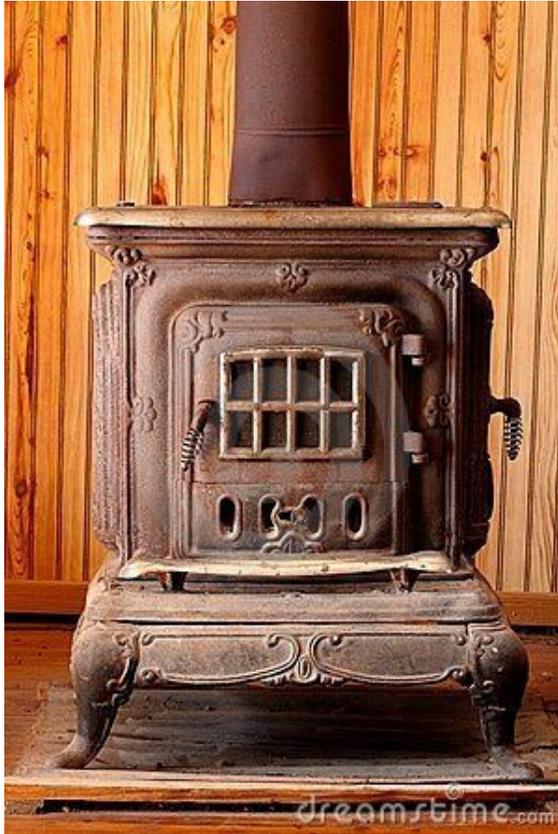


# Comparative PM Emissions



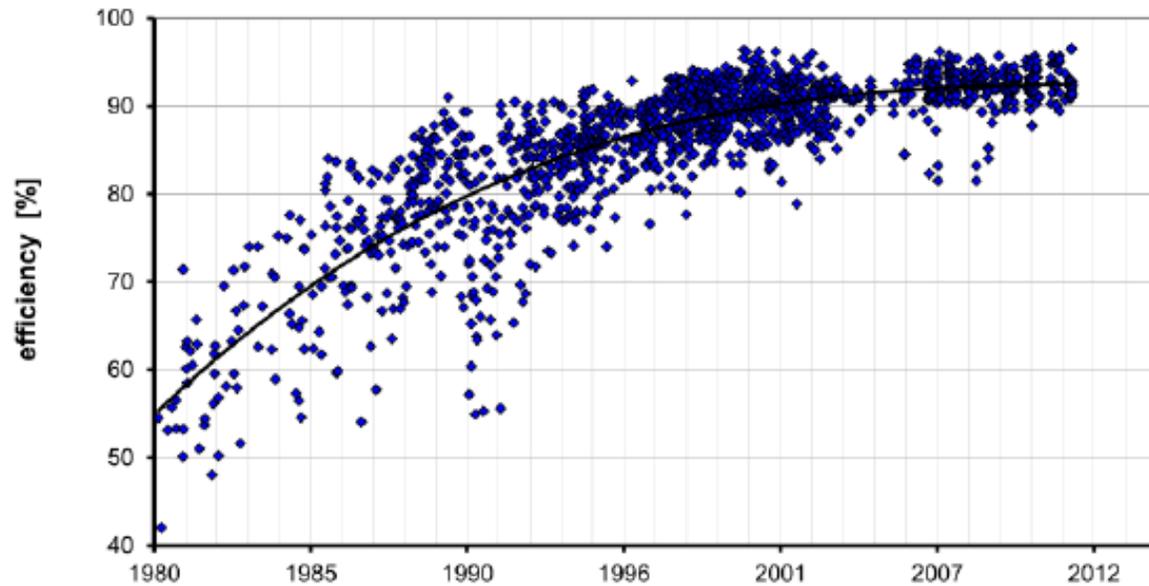
1 Non EPA Certified Wood Stove = 200 Pellet Boilers

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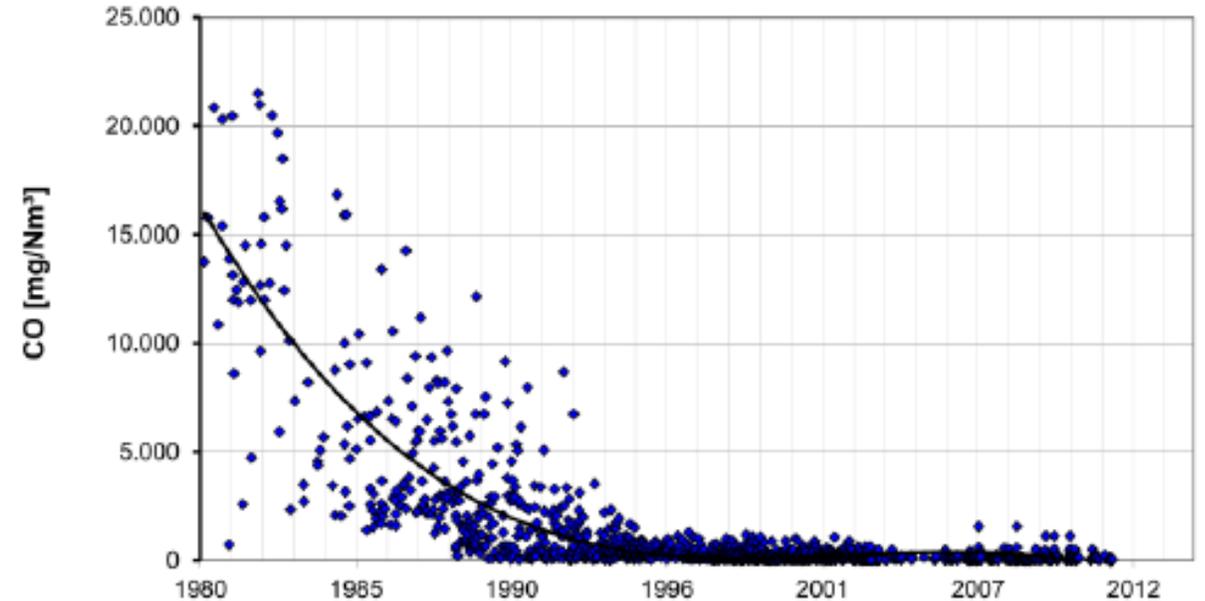


# Advancements in Modern Combustion

**efficiency factor**  
(of tested biomass boilers)



**carbon monoxide emissions**  
(of tested biomass boilers)

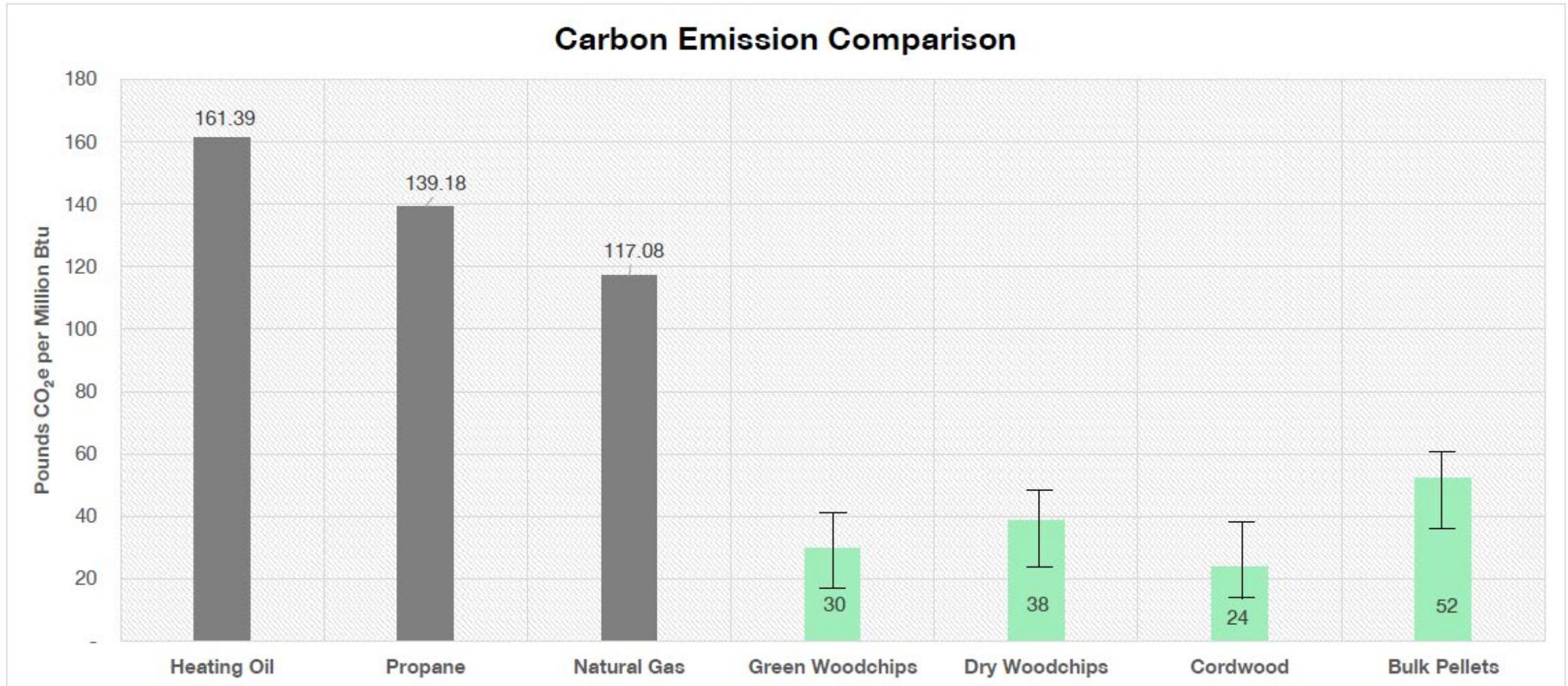


# Intergovernmental Panel on Climate Change (IPCC)

“In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, **while producing an annual sustained yield of timber, fibre, or *energy* from the forest,** will generate the **largest sustained mitigation benefit.**”

*Source:* Energy Policy and Climate Change  
IPCC (4th Assessment Report)

# Estimates of CO<sub>2</sub> Emissions



Source: Based on EIA data and life-cycle emissions analysis for wood fuels conducted by Unnausch and Tabatabaie, 2019

## Will it 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





You can feel  
good about  
heating with  
wood!



Questions