

# *Are you* stoked?

Vermont's Local,  
Renewable Heating  
Solution

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[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





## It's about the forest.

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- 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



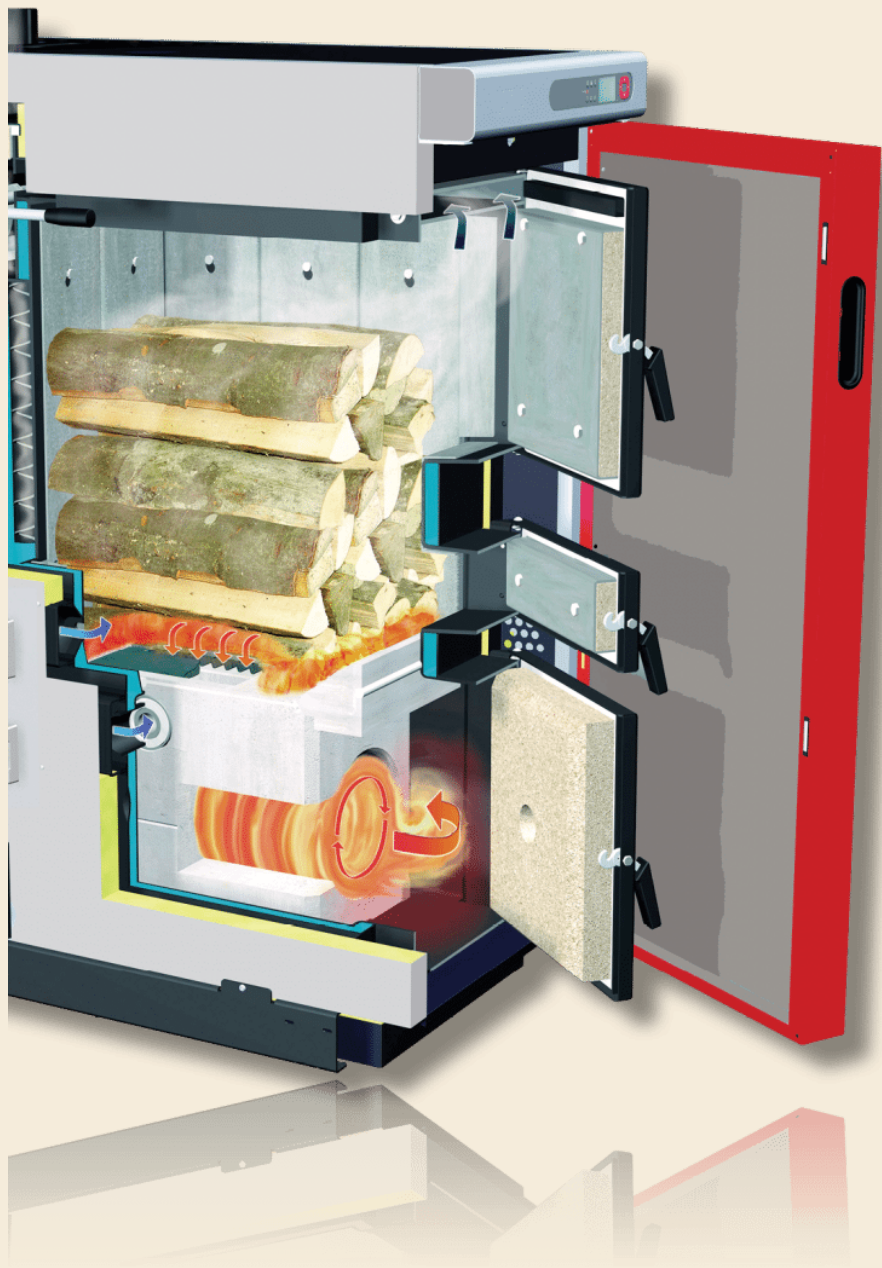




Retire these...

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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



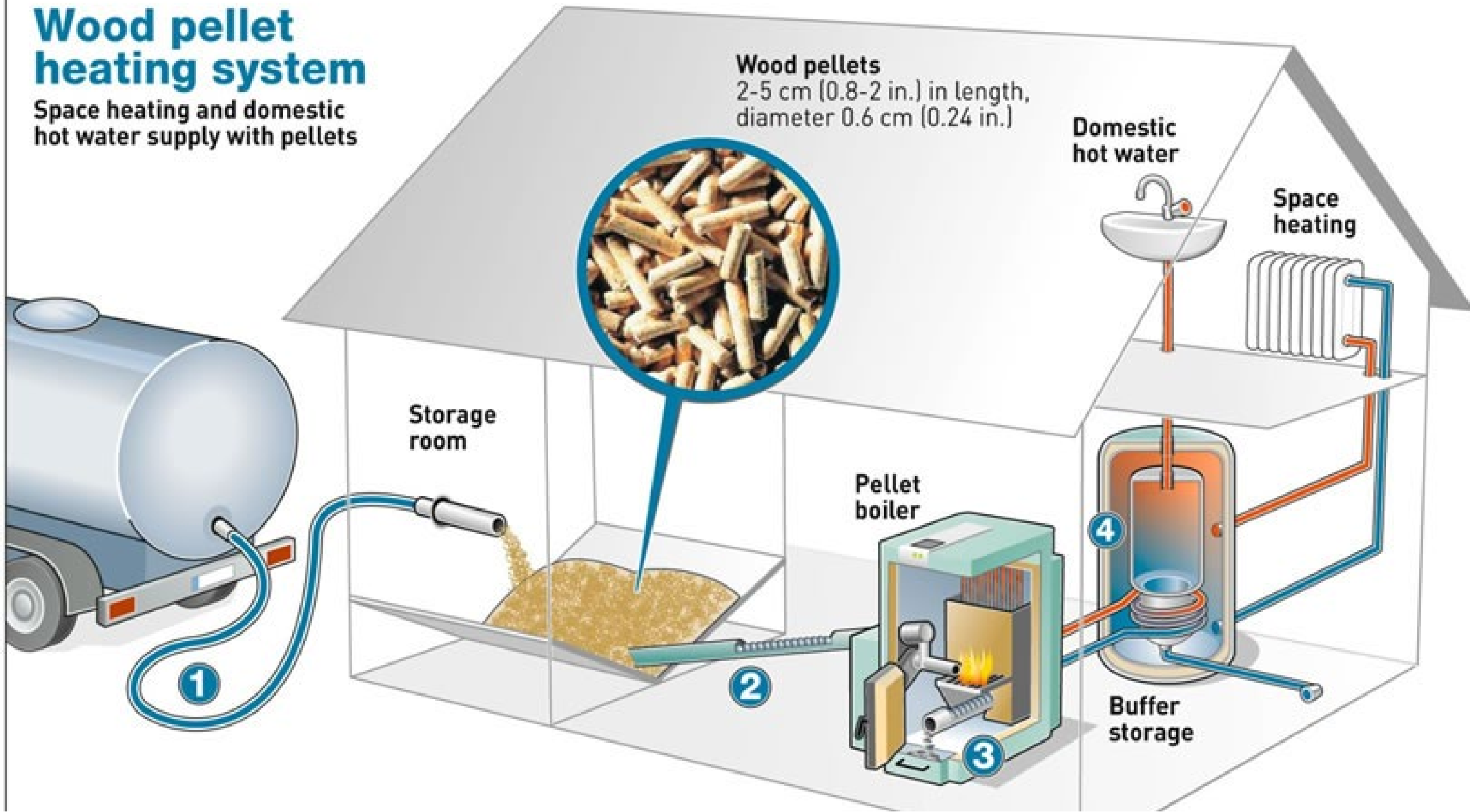




Wood Pellets

# Wood pellet heating system

Space heating and domestic hot water supply with pellets





# Automated Heating with Bulk Pellets





# Wood Chips

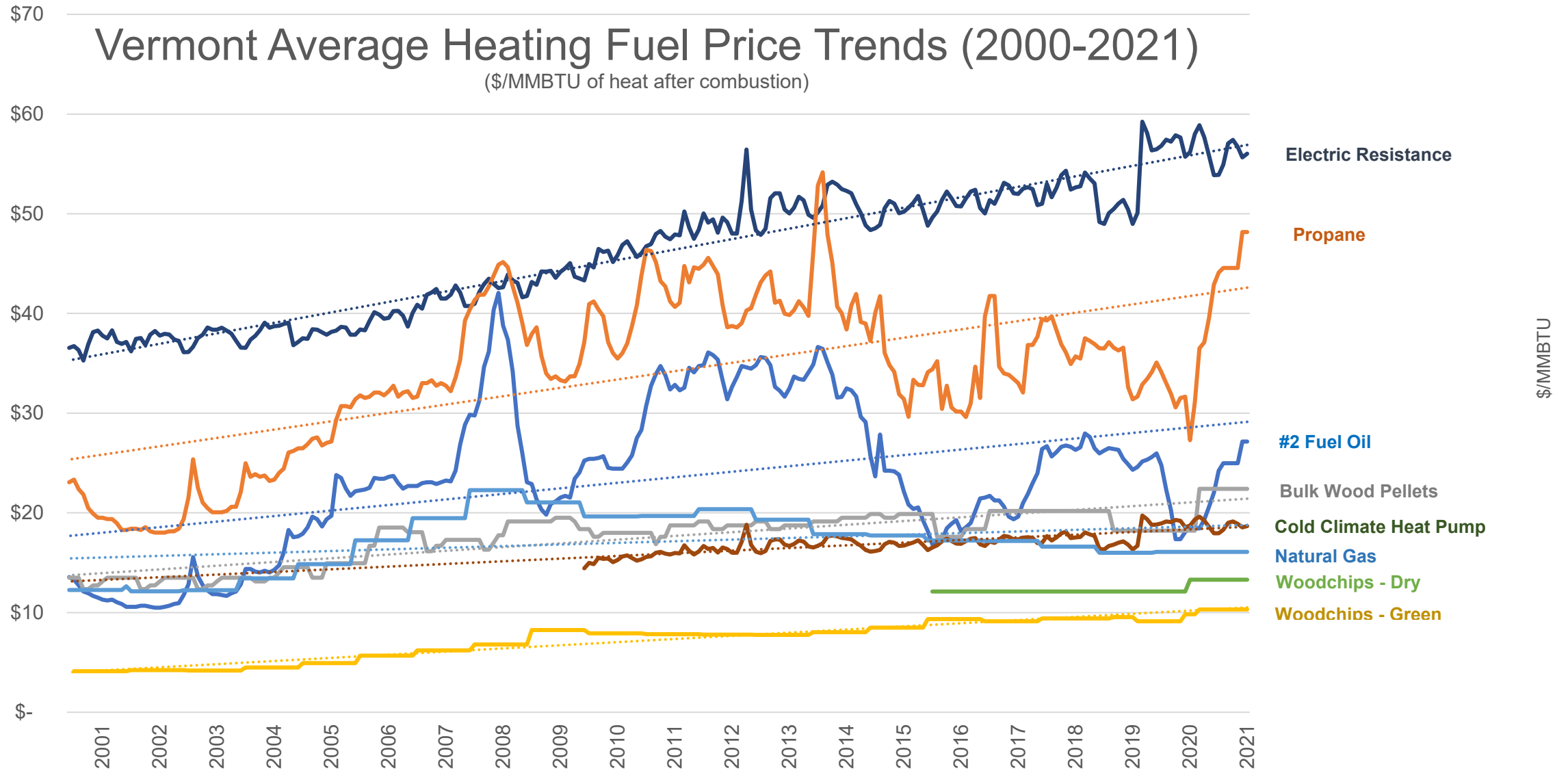
- Very affordable fuel, though with a high upfront equipment cost
- Appropriate for large commercial buildings and district heating systems





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

(\$/MMBTU of heat after combustion)



A photograph of a man with grey hair, wearing a tan jacket over a red plaid vest and blue jeans, smiling and talking to a younger man wearing an orange hard hat and a dark hoodie. They are standing in a logging or construction area with a yellow excavator and piles of logs in the background.

# 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



A photograph of a building under construction. On the left is a large, cylindrical metal tank with a conical roof and a ladder. The building has beige horizontal siding and a dark grey shingled roof. A worker in a blue shirt and white hard hat is on the roof. A semi-transparent text box is overlaid on the right side of the image.

# 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





# Where are we now?

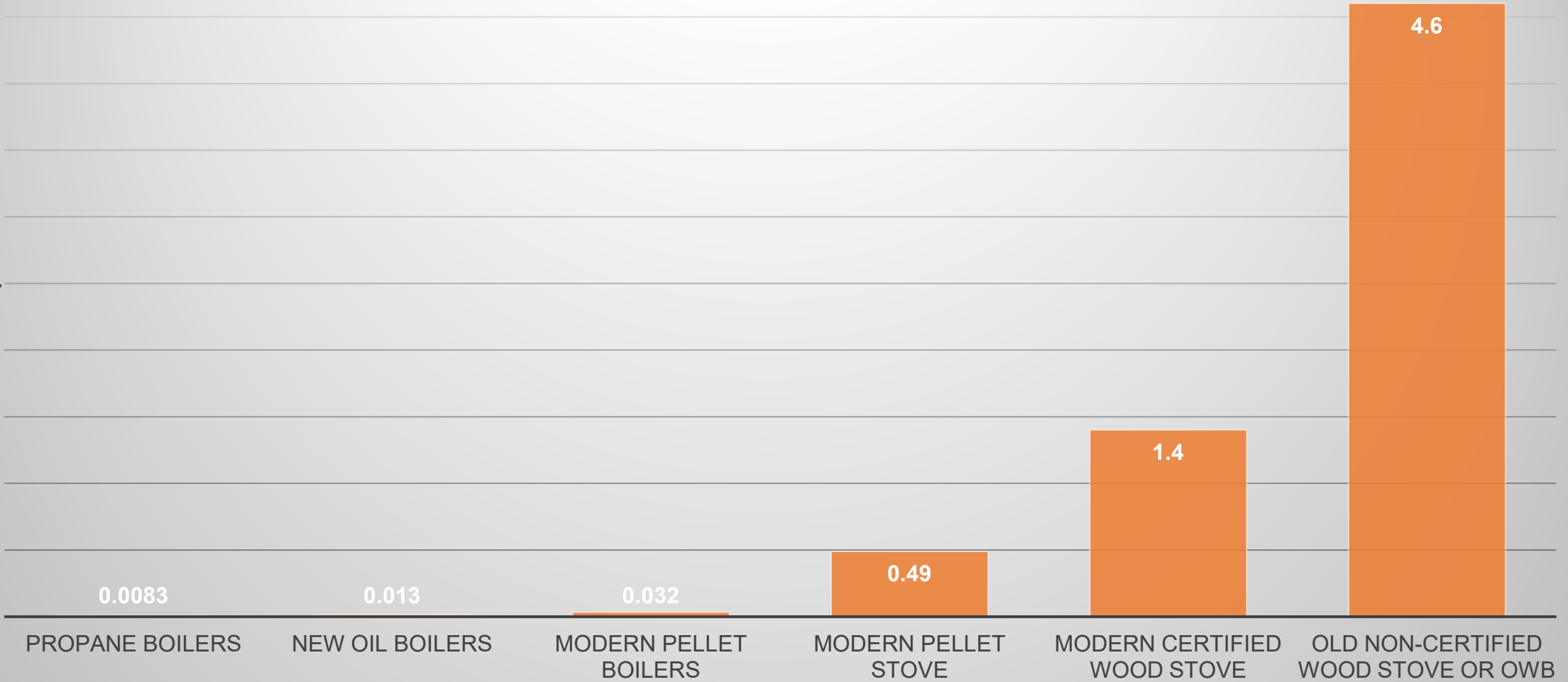
- 23% of *thermal* energy needs comes from wood
- 43% of Vermonters heat in full or in part with wood





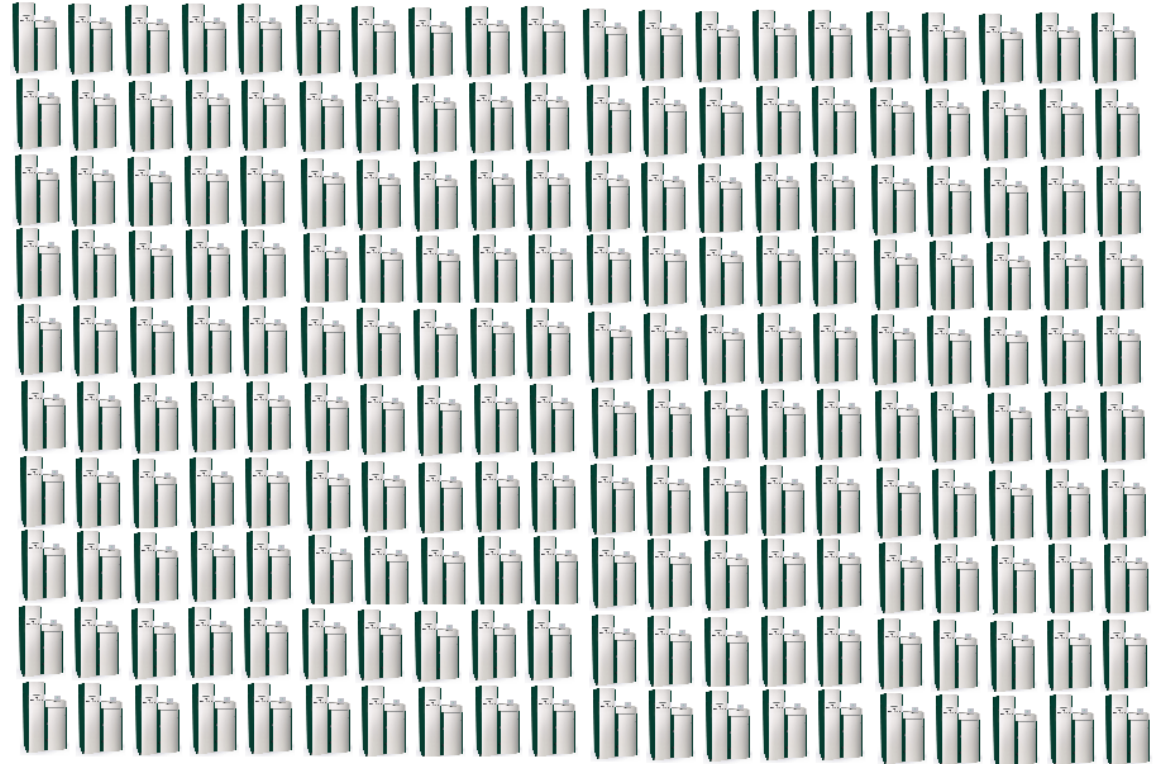
## Comparative PM Emissions

lbs of PM per MMBtu



# 1 Non EPA Certified Wood Stove = 200 Pellet Boilers

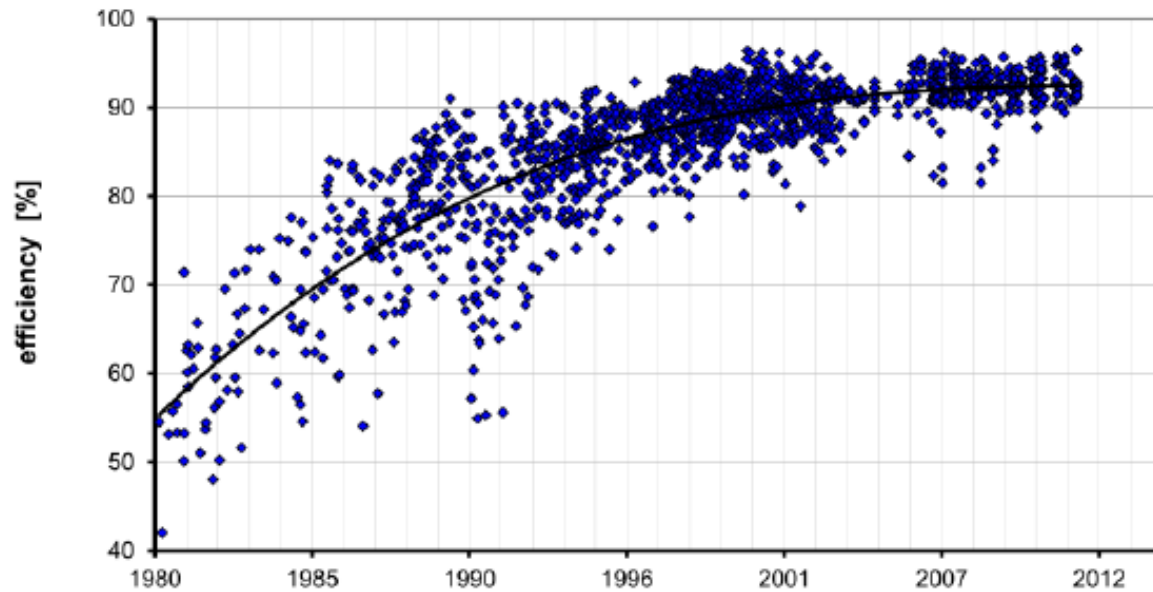
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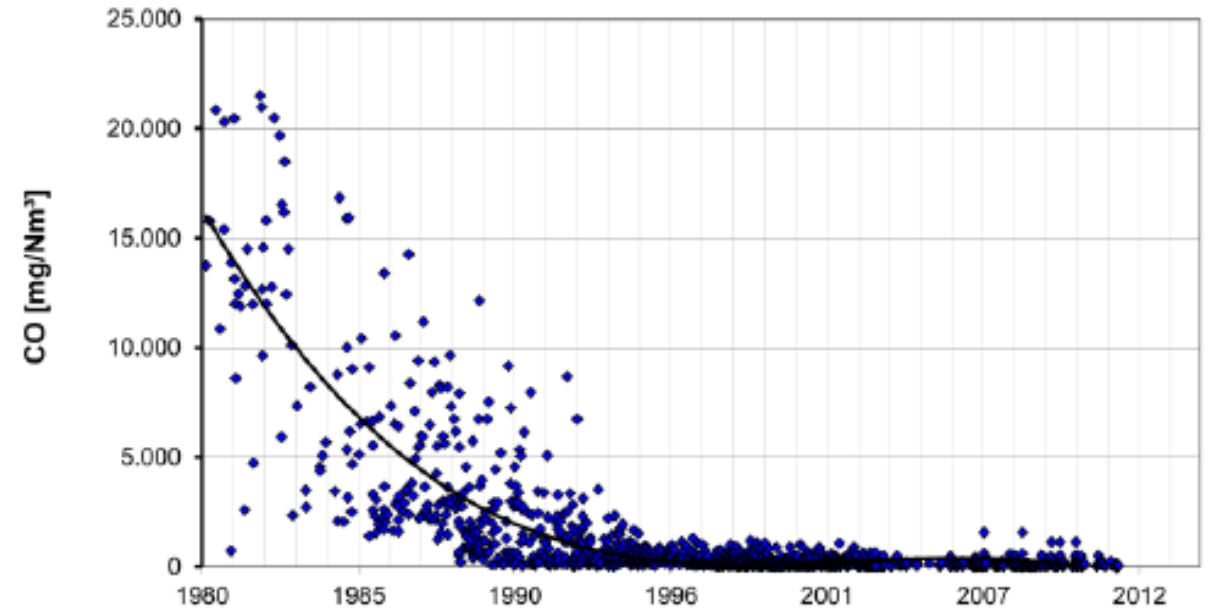


# Advancements in Modern Combustion

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



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



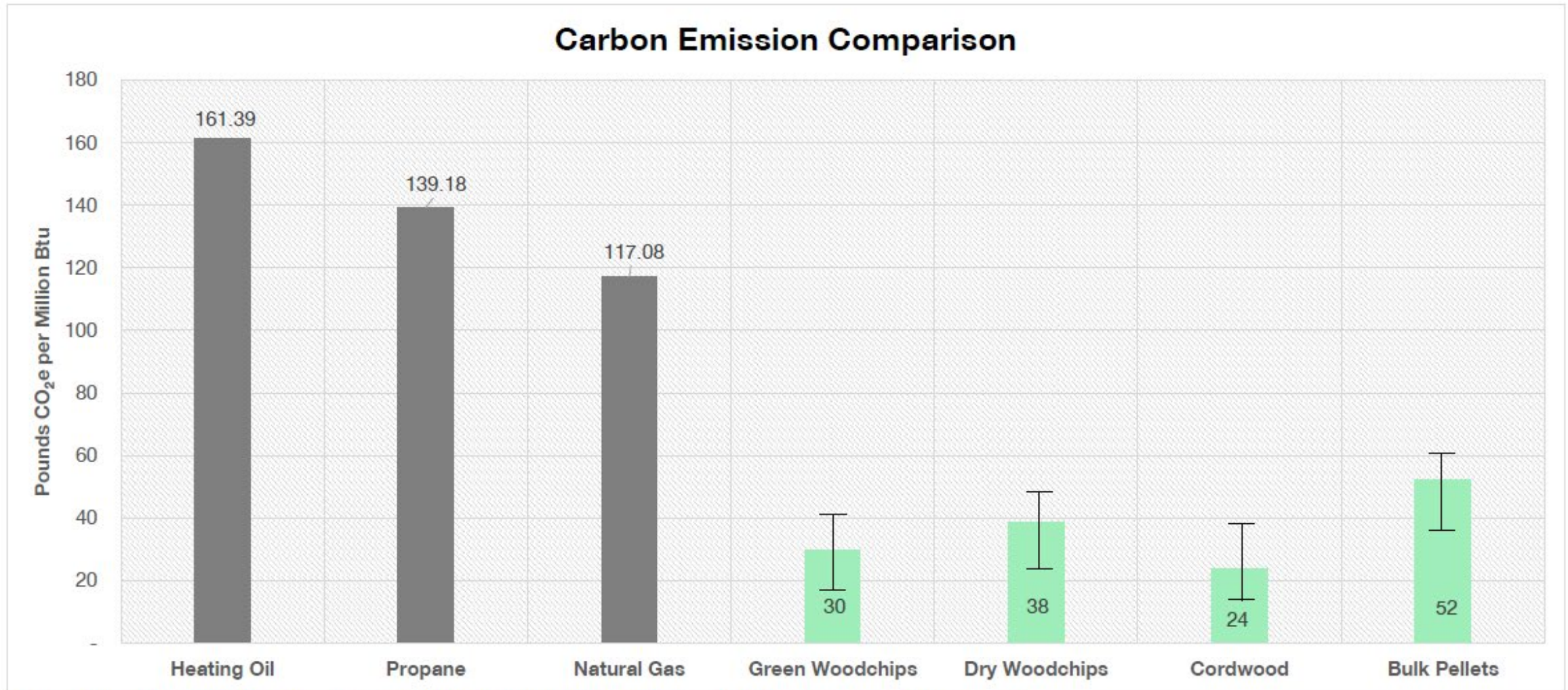
# Intergovernmental Panel on Climate Change (IPCC)

“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