

April 15<sup>th</sup> 2019

# Wood Heating Success Stories from the Northeastern US

Alaska-Yukon Wood Energy Conference

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Adam Sherman



# About VEIC

- Mission-driven nonprofit
- 30+ years reducing economic & environmental costs of energy
- 300 staff in Vermont, Ohio, & Washington DC
- Design and deliver:
  - Energy efficiency
  - Renewable energy
  - Transportation efficiency
- We “think and do”
  - 30 Consultants
  - 60 Engineers and TA experts
  - 10 Data analytics and EM&V experts
  - 8 Financing strategy experts



- Clients
  - Utilities
  - Government
  - Regulators / Consumer Advocates
  - Environmental Organizations
  - Foundations

# Major Initiatives



# Biomass Energy Resource Center (BERC)

Advancing the use of Local Wood Heat and CHP in North America



## Technical Consulting

- Project feasibility studies
- Fuel supply assessments and procurement
- Third-party expert review
- Develop and review of standards
- Market assessments



## Program Design & Implementation

- Wood heat market expansion potential assessments
- Program design and implementation support
- Training and advisory support services



## Advocacy

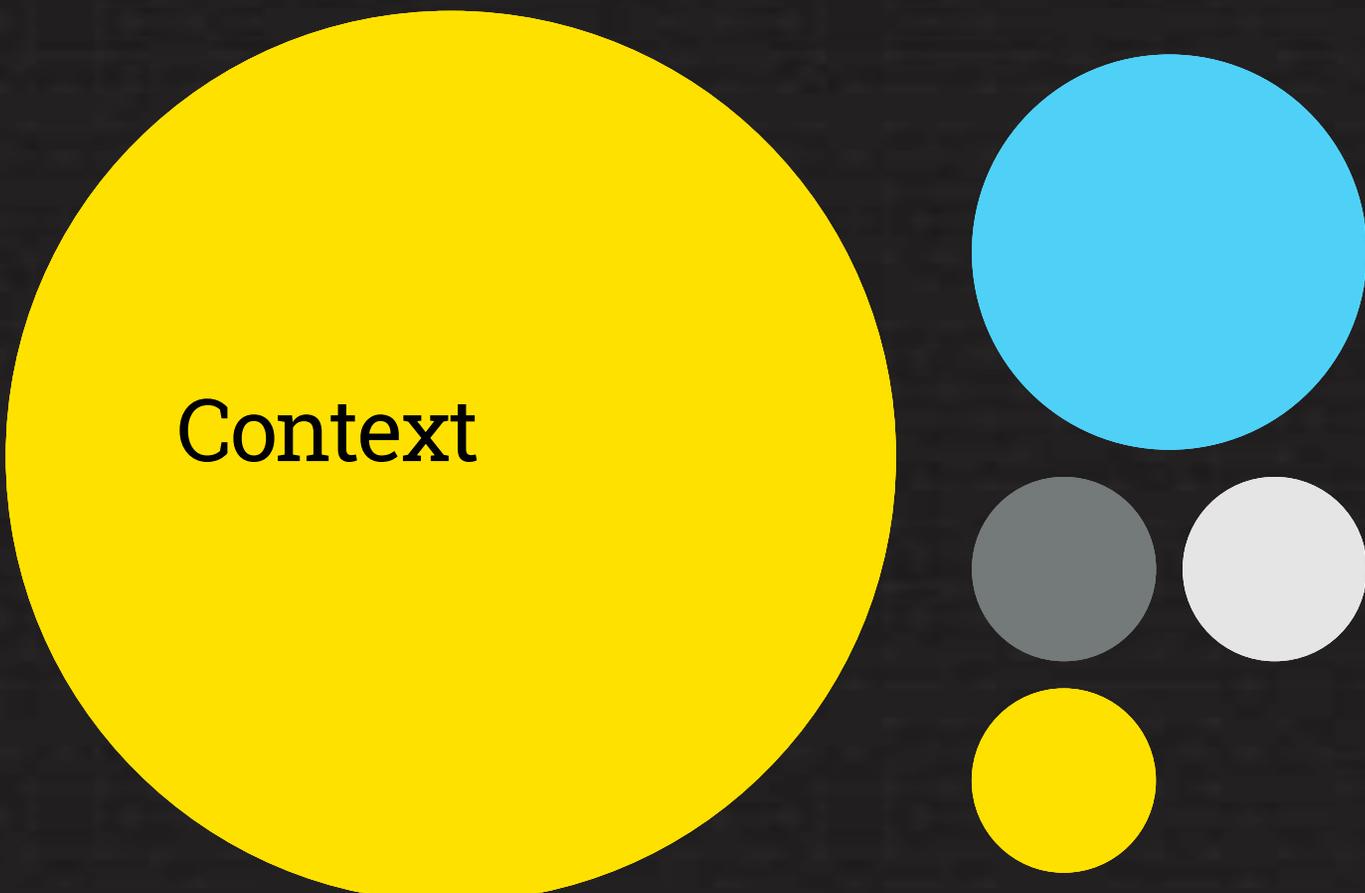
- Showcasing “best practices” and case studies of successful projects
- Tracking market growth and impacts

BERC is a program of VEIC  
A mission-driven non-for-profit whose mission is to reduce the economic and environmental impacts of energy production and consumption



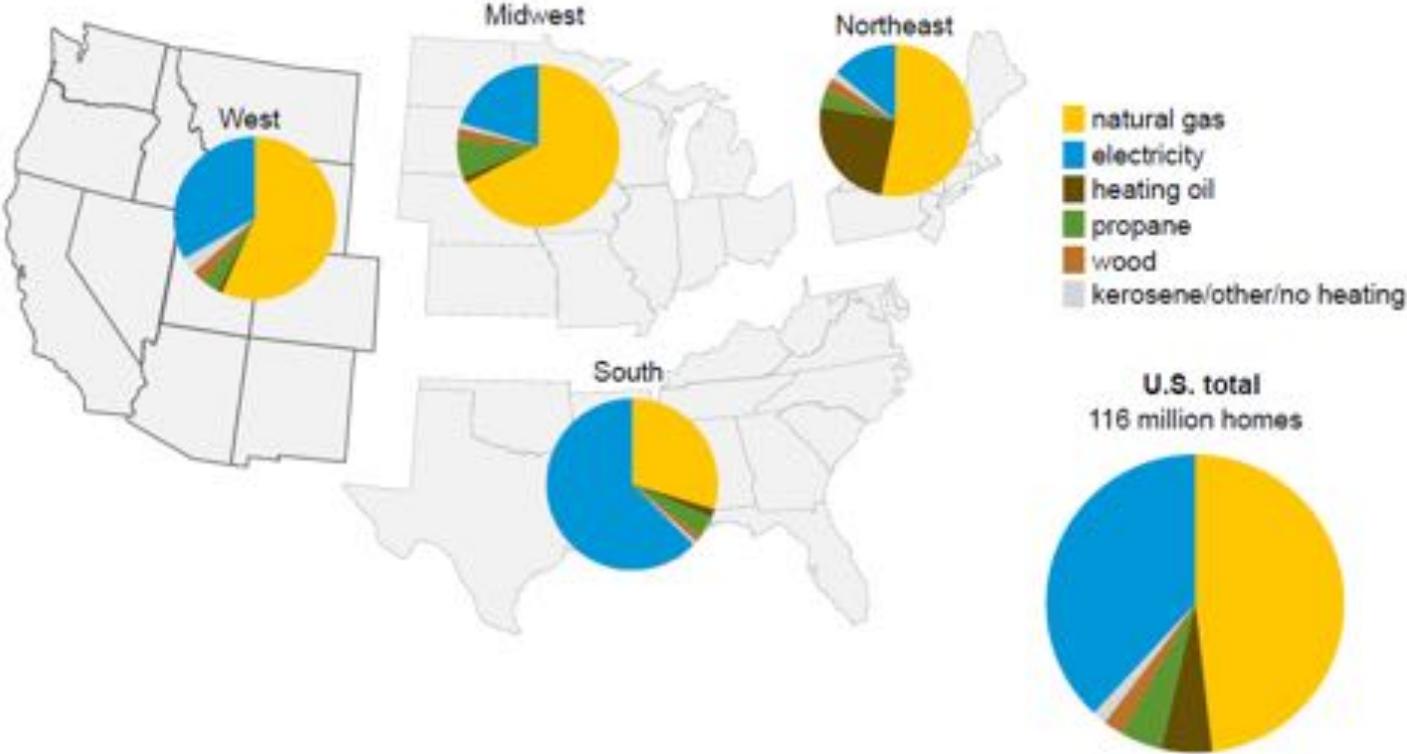
# Presentation Outline

- Stage setting
- Success stories
  - Technology
  - Quality vendors and installations
  - Wood fuel quality
  - Investments in fuel supply chain
  - Outreach and market awareness
  - Program successes
  - State level policies and incentives
- Parting thoughts



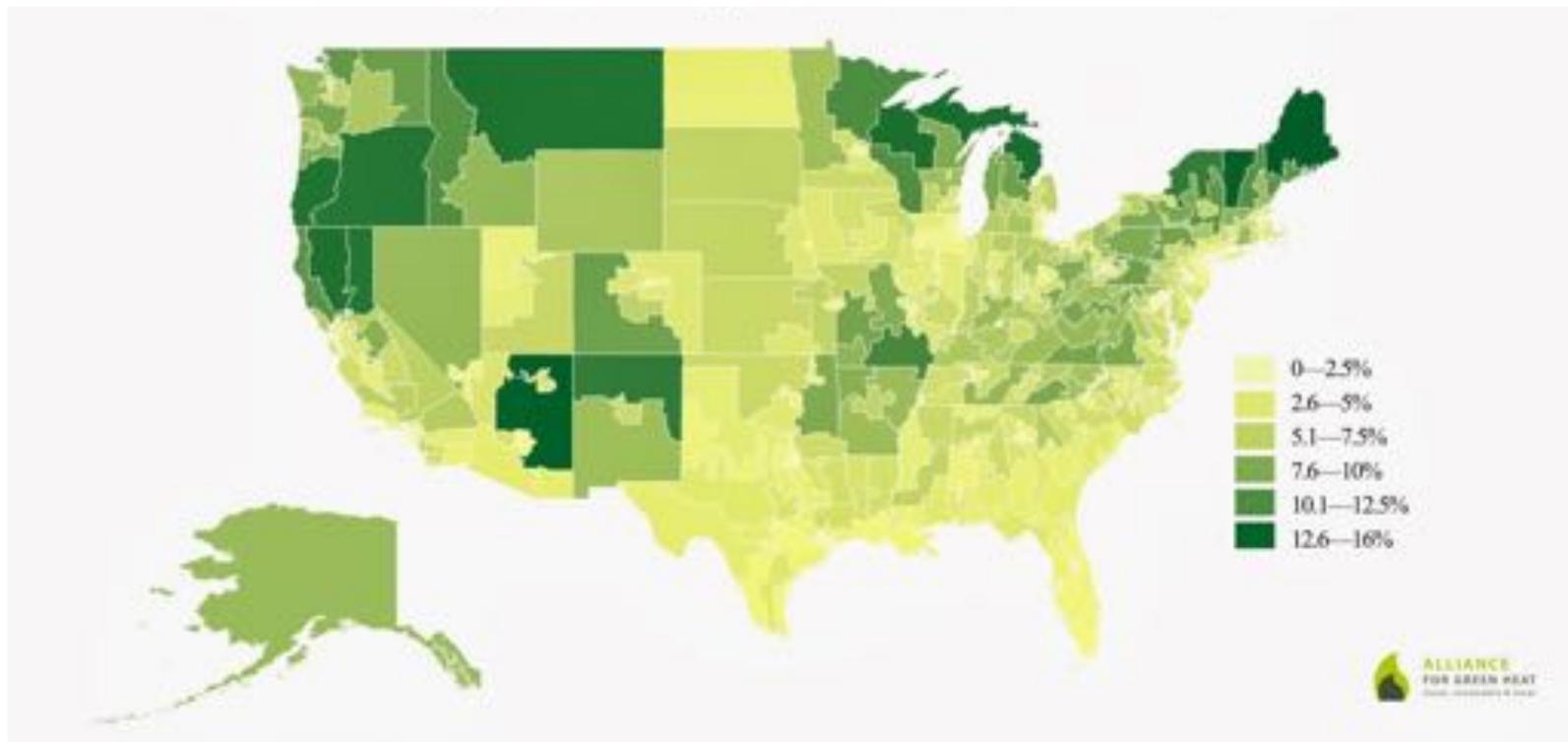
Context

# Residential Space Heating Sources in the US



Source: U.S. Census Bureau, 2012 American Community Survey

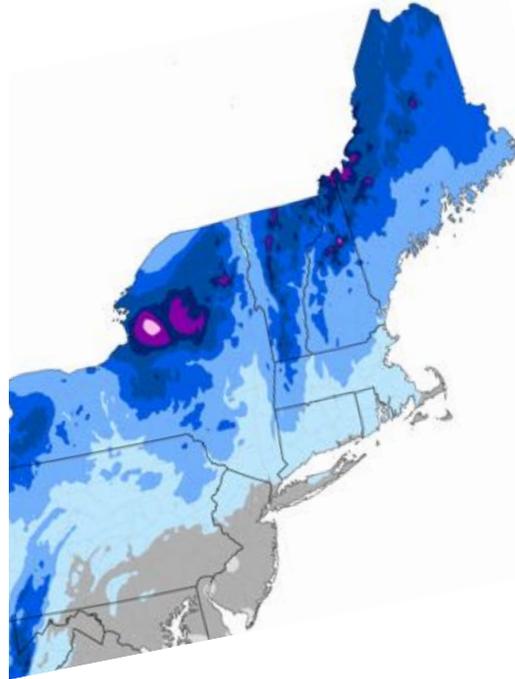
# Residential Wood Heating in US



# Market Conditions in Northeastern US



Natural Gas  
Pipeline Service



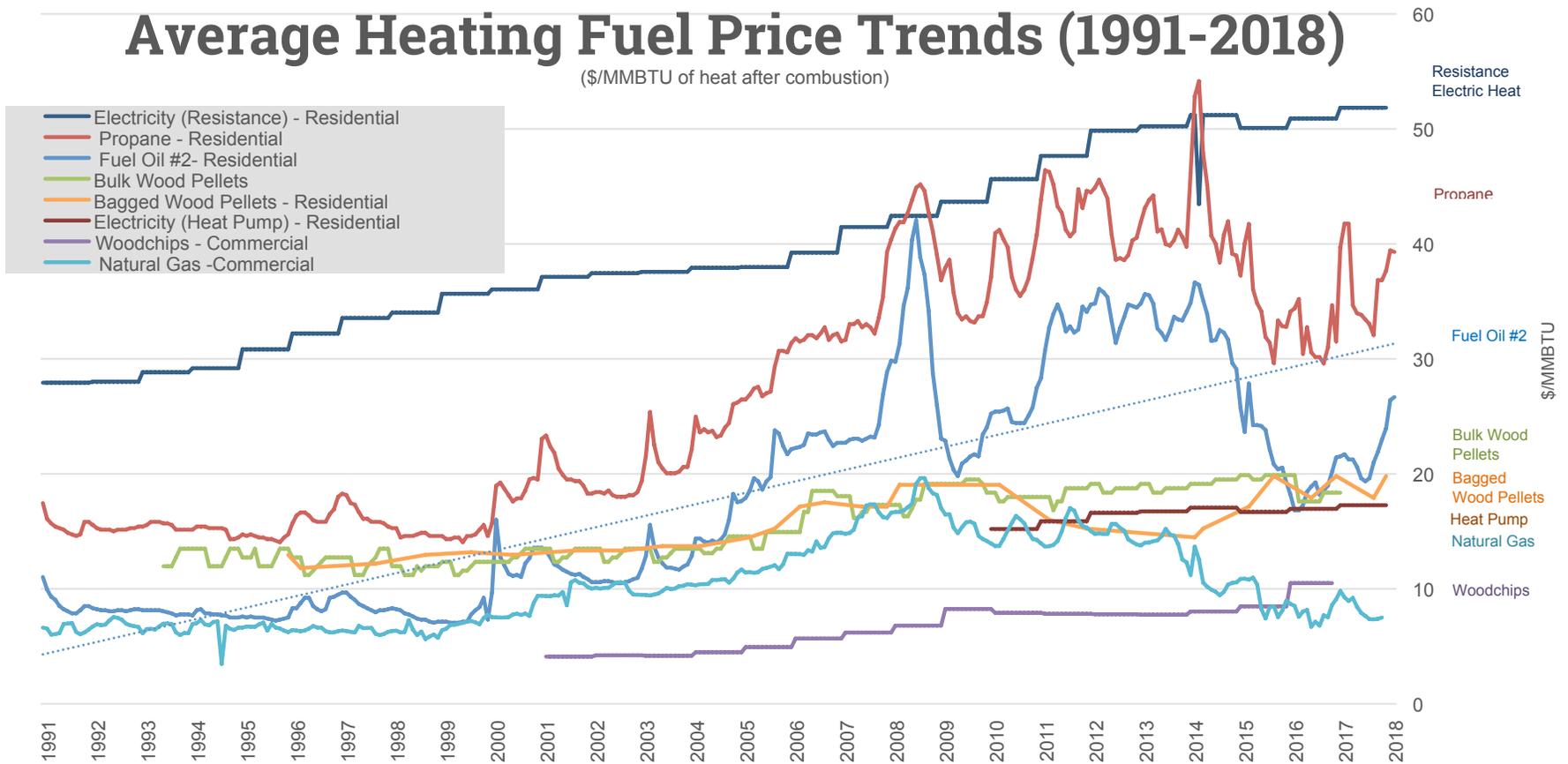
Heating  
Degree Days



Forestland  
Area

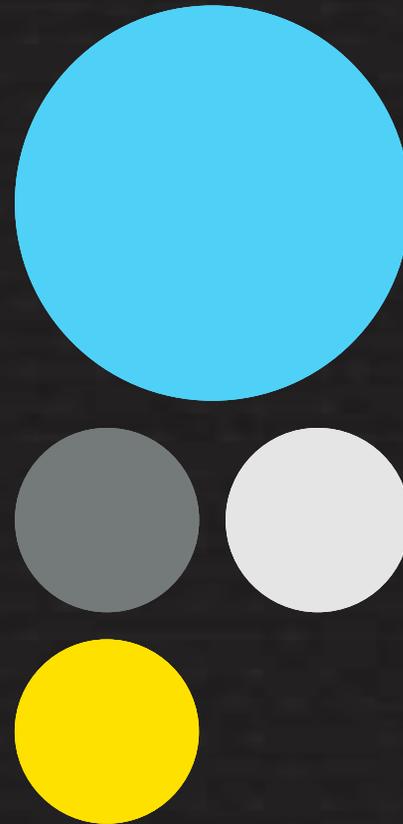
# Average Heating Fuel Price Trends (1991-2018)

(\$/MMBTU of heat after combustion)





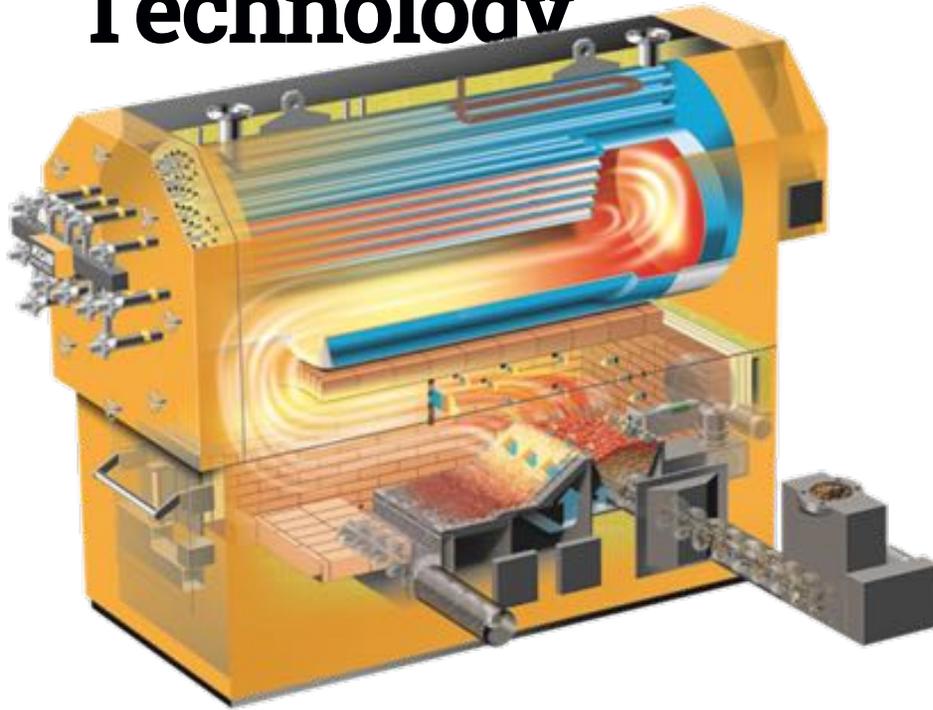
# Success Stories: Technology



# “Biomass Heating”



# “Advanced Wood Heating” Technology



Large-scale Boilers with Horizontal Heat Exchange

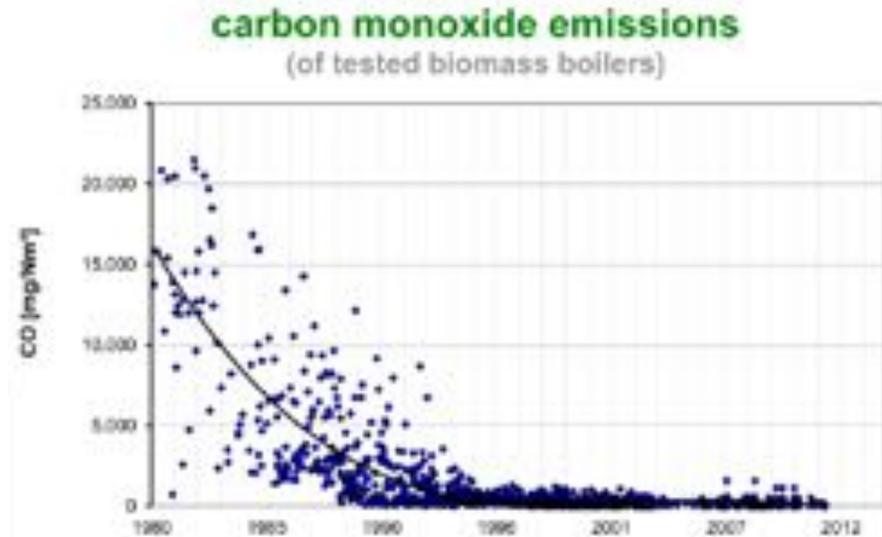
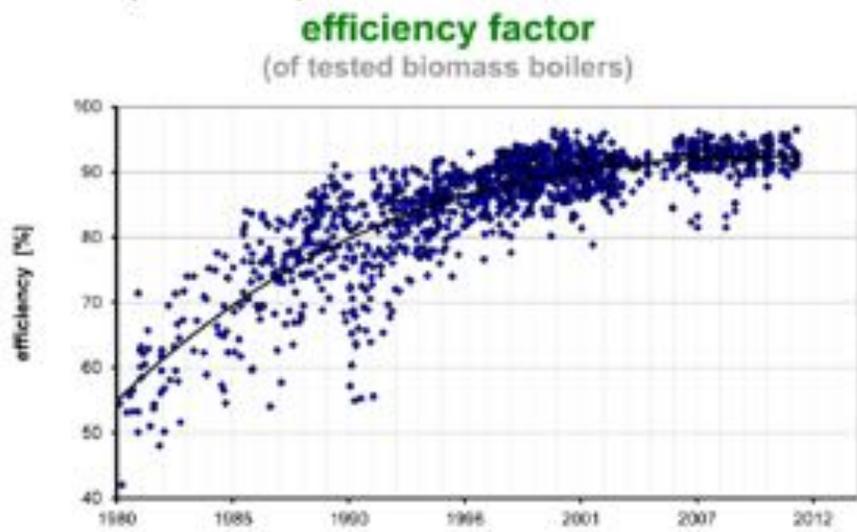
*Image courtesy of Viessmann*



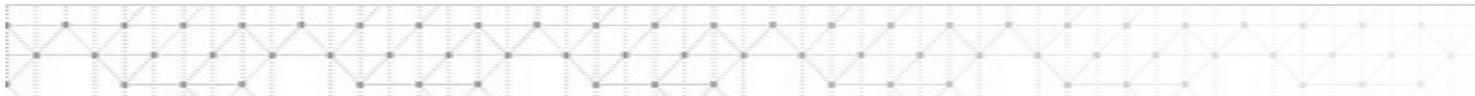
Small-scale Boilers with Vertical heat Exchange

*Image courtesy of Windhager*

# Advancements in Modern Combustion

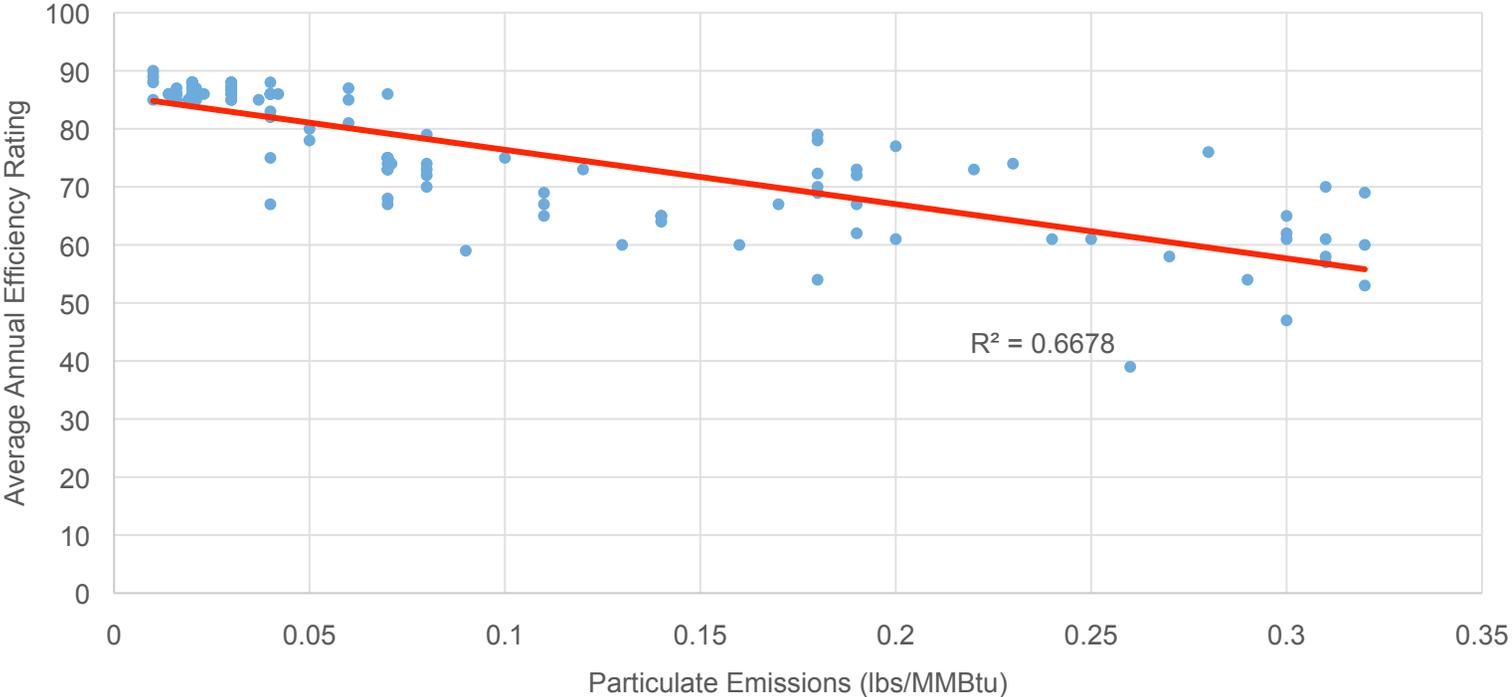


Source: BioEnergy 2020+



# Emissions and Efficiency Relationship

EPA Certified Hydronic Heaters



# Other Technology Innovations - CHP



Pellet boiler + Sterling engine



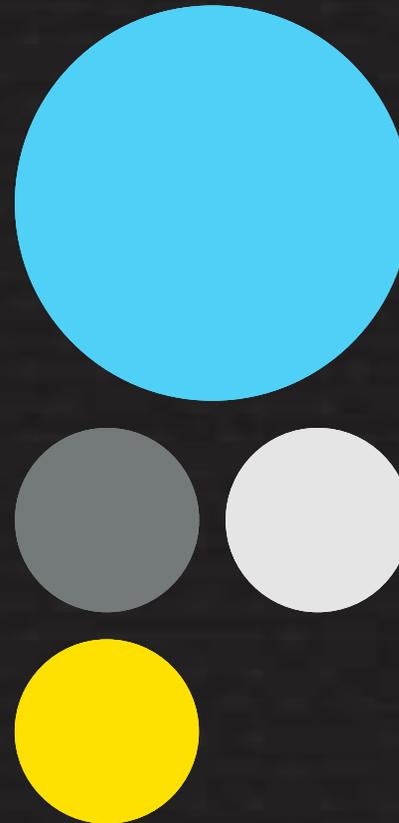
Down-draft gasifier coupled with IC engine



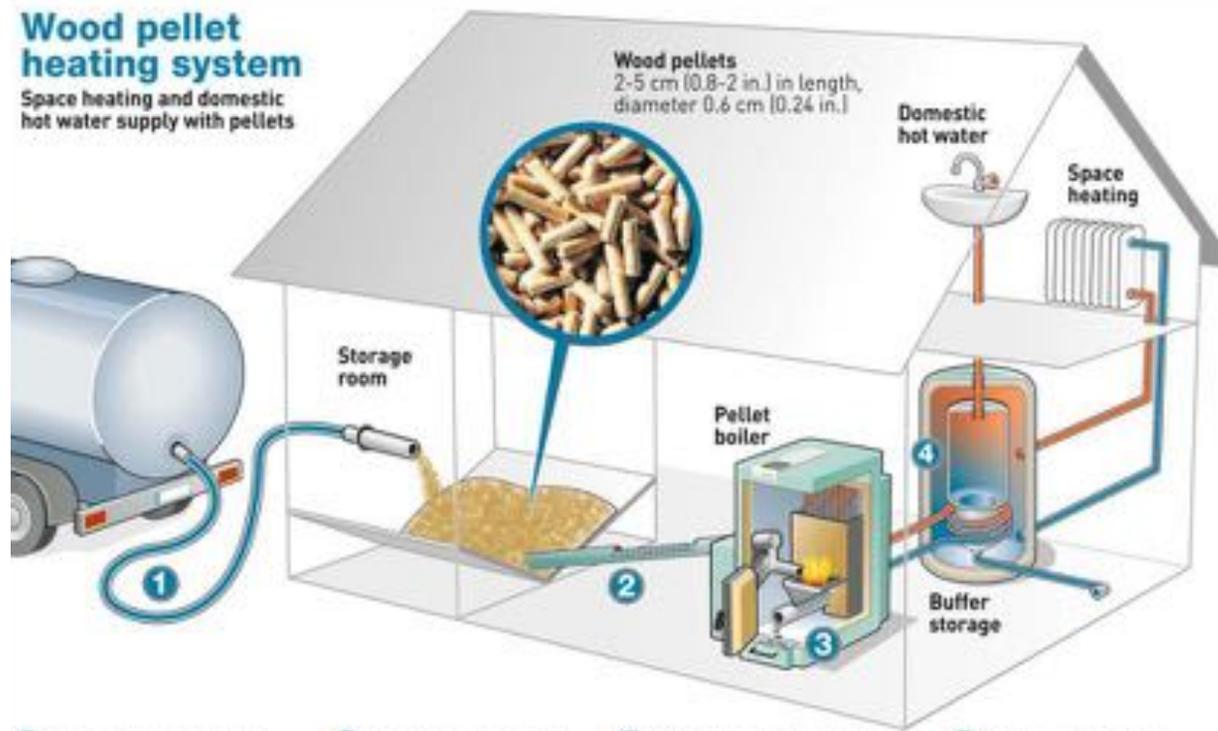
Organic Rankine Cycle (ORC) system



**Success Stories:**  
High-Quality  
Installations



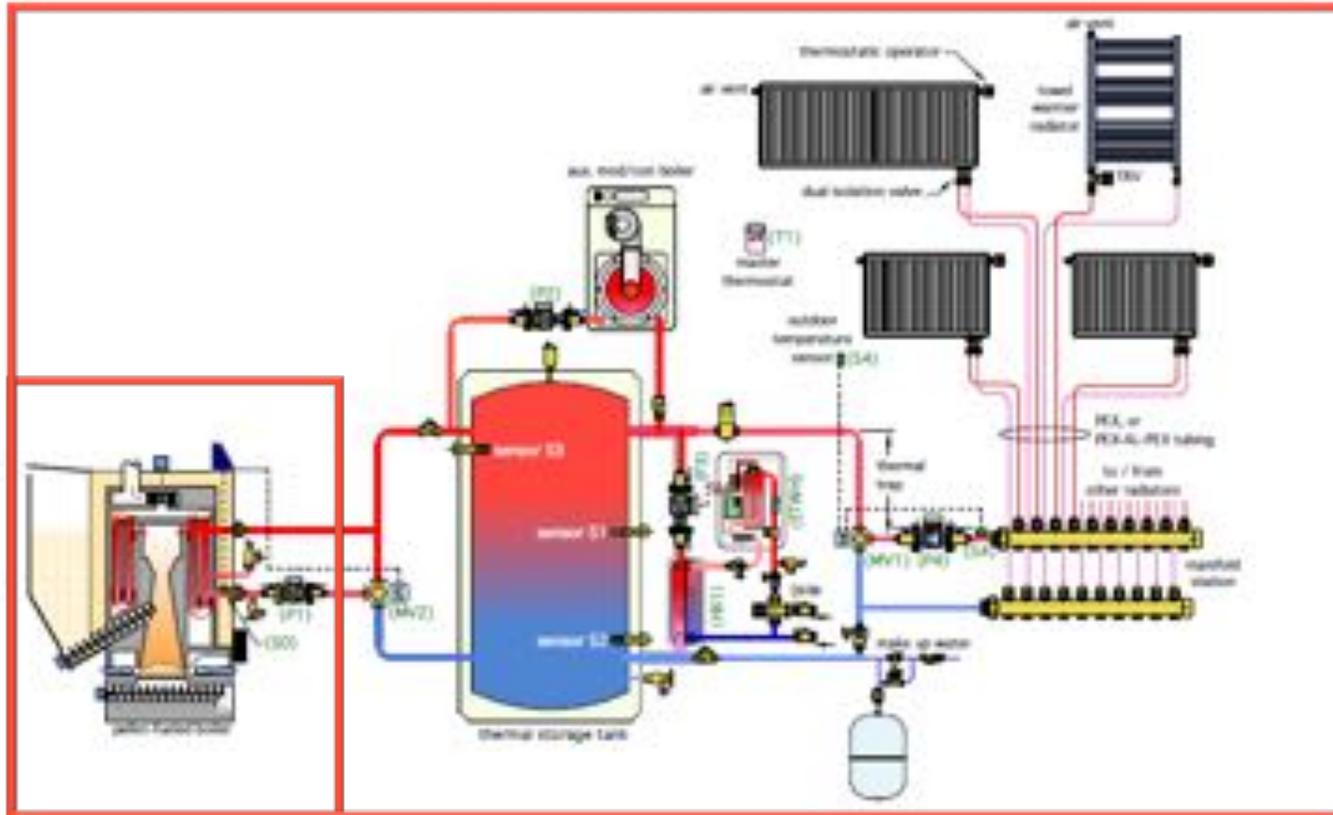
# Whole-Building Heating with Hydronic Systems



# Typical Residential Pellet System



# Integration with Heat Distribution System





**Success Stories:**  
Wood Fuel  
Quality

# Wood Heating Fuels

## Chunkwood



- Requires hand firing
- Sold based on volume (4'x8'x4')
- Wide range of energy value based on moisture (10 – 55%)

## Woodchips



- Automated fuel feed
- Sold by the green ton
- Variable energy value based on moisture (15-50%)
- Quality specifications

([www.woodchipstandard.org](http://www.woodchipstandard.org))

## Wood Pellets



- Automated fuel feed
- Sold by the ton
- Very consistent energy value (6-8% moisture)
- Quality specifications

([www.pelletheat.org/pfi-standards](http://www.pelletheat.org/pfi-standards))

# Integration of Fuel Quality into System Performance



Know-how to produce given grades of fuel



Fuel that consistently meets the specs.



State of the art combustion technology engineered to burn specific fuel

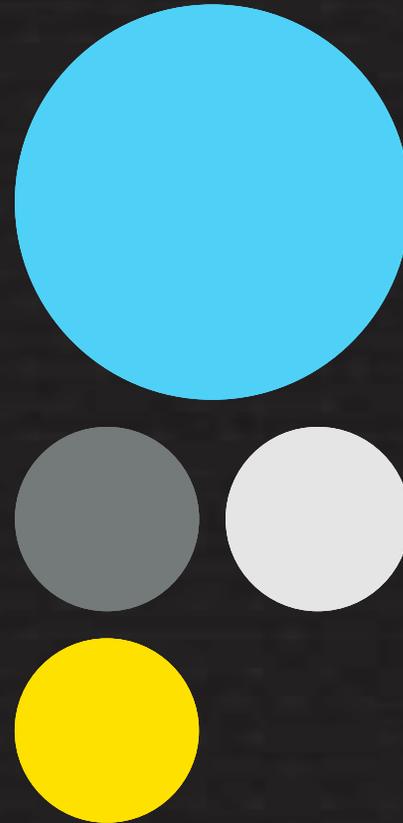


Optimal system performance (low emissions, high efficiency, & minimal O&M)

***Market and Regulatory Confidence and Trust***



**Success Stories:**  
Fuel Supply  
Chains





# Specialized Pneumatic Bulk Pellet Delivery



# Dried Woodchip Production



# Pneumatically Loading Silos with Dry chips





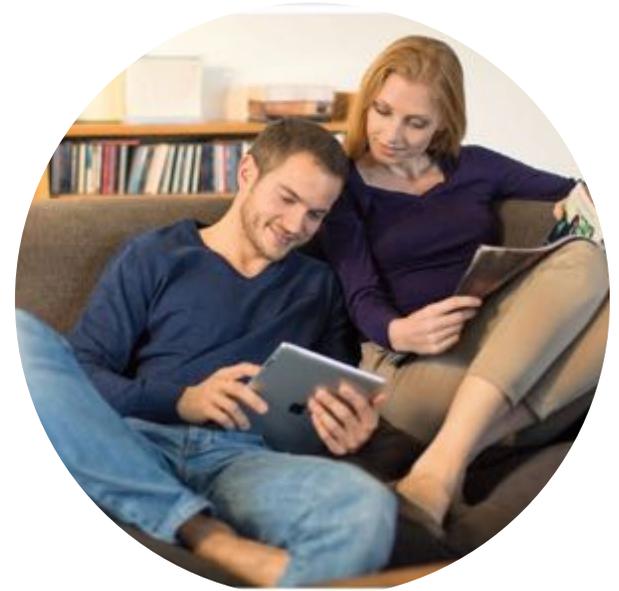
**Success Stories:**  
Outreach and  
Market  
Awareness

# “Biomass Energy”



Large-scale, low-efficiency power plants burning wood fuel from half-way around the world from poorly managed forests

# “Advanced Wood Heat”



High-efficiency, clean-burning systems directly displacing fossil fuels, using local wood fuel from well-managed forests

# Feel Good Heat Campaign

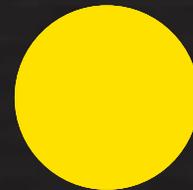
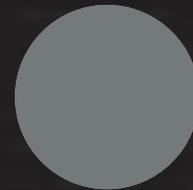
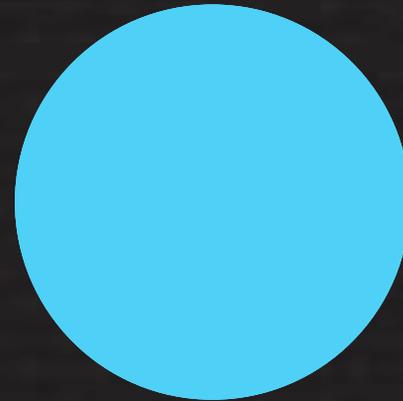


<https://feelgoodheat.org>



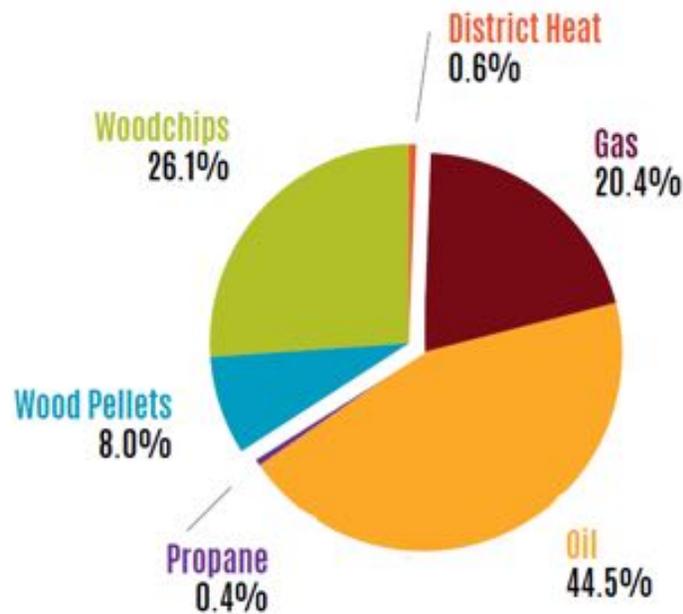


**Success Stories:  
Programs**



# Fuels for Schools

# State Wood Energy Teams



**Over 1/3 of public K-12 school space in Vermont is heated with wood!**

We can Help You  
Assess the Opportunity to Switch to  
**MODERN WOOD HEATING!**




**STAY WARM.**  
Woodchip and pellet heating systems are proven technologies used in hundreds of Vermont buildings for the past 20+ years.

**SAVE MONEY.**  
Woodchips and pellets commonly cost considerably less than heating oil and propane.

**HEAT LOCAL.**  
Heating with wood avoids exporting fuel dollars out of the local economy and supports local forest management.

**Vermont State Wood Energy Team**  
**Advancing the Use of Modern Wood Heating in Schools and Affordable Housing Across Vermont**

The Vermont State Wood Energy Team is a public-private partnership of experts providing outreach and technical assessment services to public schools and affordable housing providers to evaluate installing modern wood heating systems.

- **Offering no-charge initial assessments** - just send us 3 years of heating fuel records and we will provide a "first look" assessment of the savings opportunity.
- **Providing 80% of costs for in-depth "feasibility" studies** - We will conduct a site visit and a prepare more in depth report detailing the costs, savings, and specific design considerations.

To request these assessment services, please contact Adam Sherman with the Biomass Energy Resource Center at: [Asherman@biomasscenter.org](mailto:Asherman@biomasscenter.org) or (802) 540-7863.

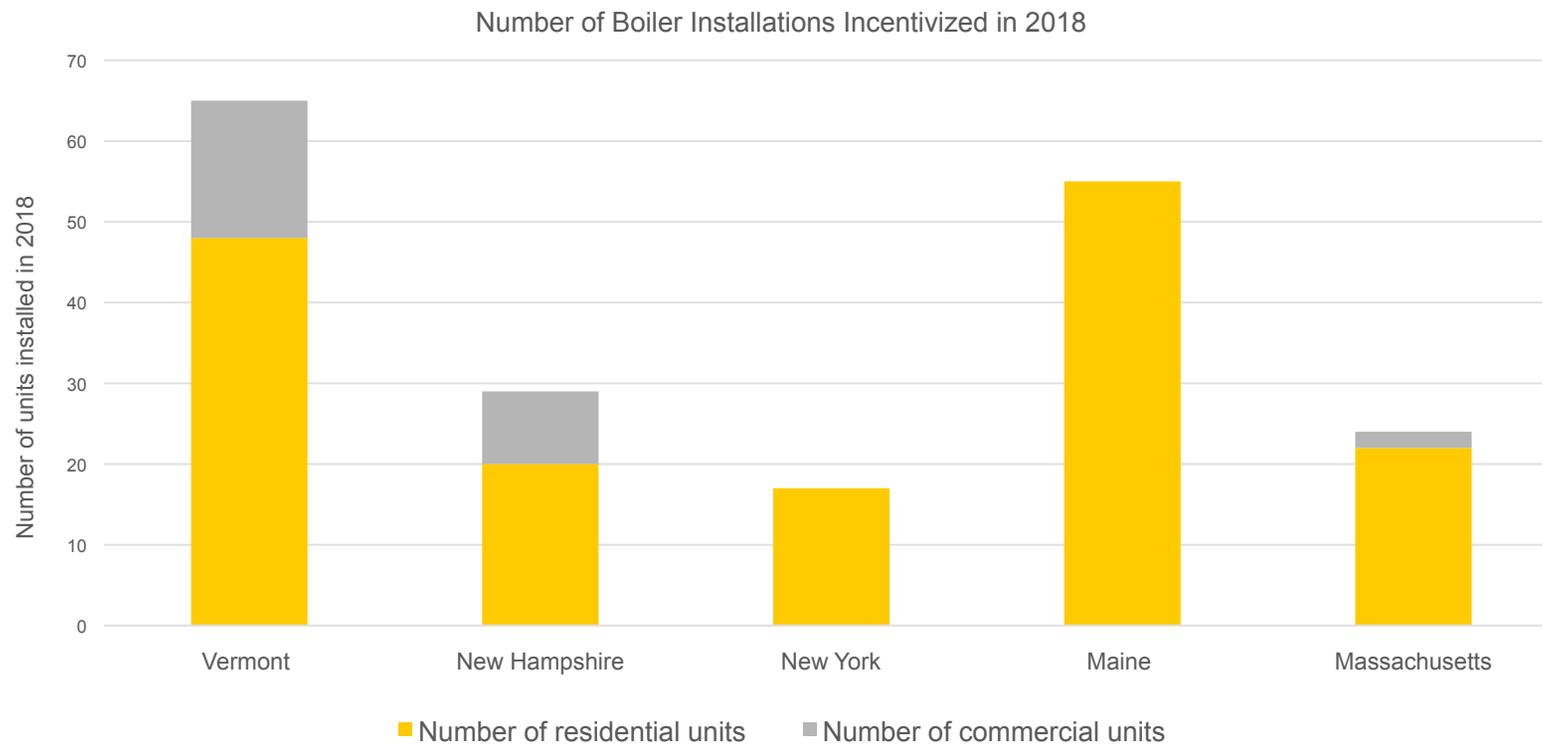
We gratefully acknowledge the financial support provided by the Wildland Fire Hazardous Fuels, FIRET Program of the U.S. Forest Service, Department of Agriculture. This institution is an equal opportunity provider.

**HOUSINGVERMONT**  
balancing possibilities.

**BERC**  
Biomass Energy Resource Center

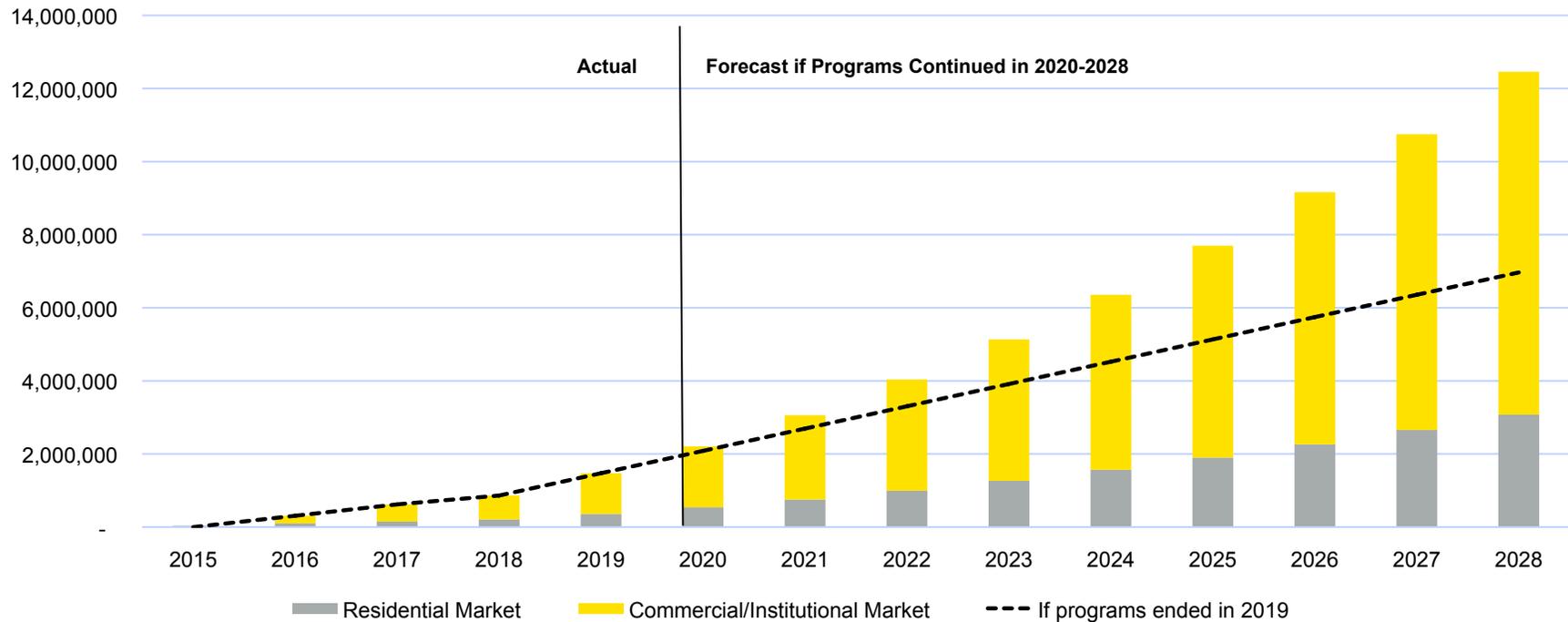
**VERMONT**  
Biomass Energy Resource Center

# Advanced Wood Heating State Incentives



# Vermont's Incentive Program

Cumulative Gallons of Oil Equivalent Displaced by CEDF Programs





**Success Stories:**  
State-level  
Policies &  
Incentives

# Regional Dependence on Oil for Heating

	Annual Gallons of Heating Oil	Population	Gallons Oil/ Capita
Connecticut	473,000,000	3,500,000	135
Maine	263,000,000	1,300,000	202
Massachusetts	596,000,000	6,646,000	90
New Hampshire	137,000,000	1,320,000	104
New York	1,308,000,000	19,570,000	67
Pennsylvania	757,000,000	12,763,000	59
Rhode Island	131,000,000	1,050,000	125
Vermont	89,000,000	626,000	142
Total/Average	3,753,000,000	46,775,000	80

Source: Energy Information Administration (EIA) and 2015 US Census Data

# Greenhouse Gas Goals

## Connecticut

10% GHG reduction by 2020  
80% GHG reduction by 2050

## Massachusetts

25% GHG reduction by 2020  
80% GHG reduction by 2050

## Rhode Island

25% zero-energy new cars by 2025  
State government:  
10% reduction electric use by 2019

## New York

40% GHG reduction by 2030  
80% GHG reduction by 2050  
Coal-free by 2020

## Maine

10% GHG reduction by 2020

## New Hampshire

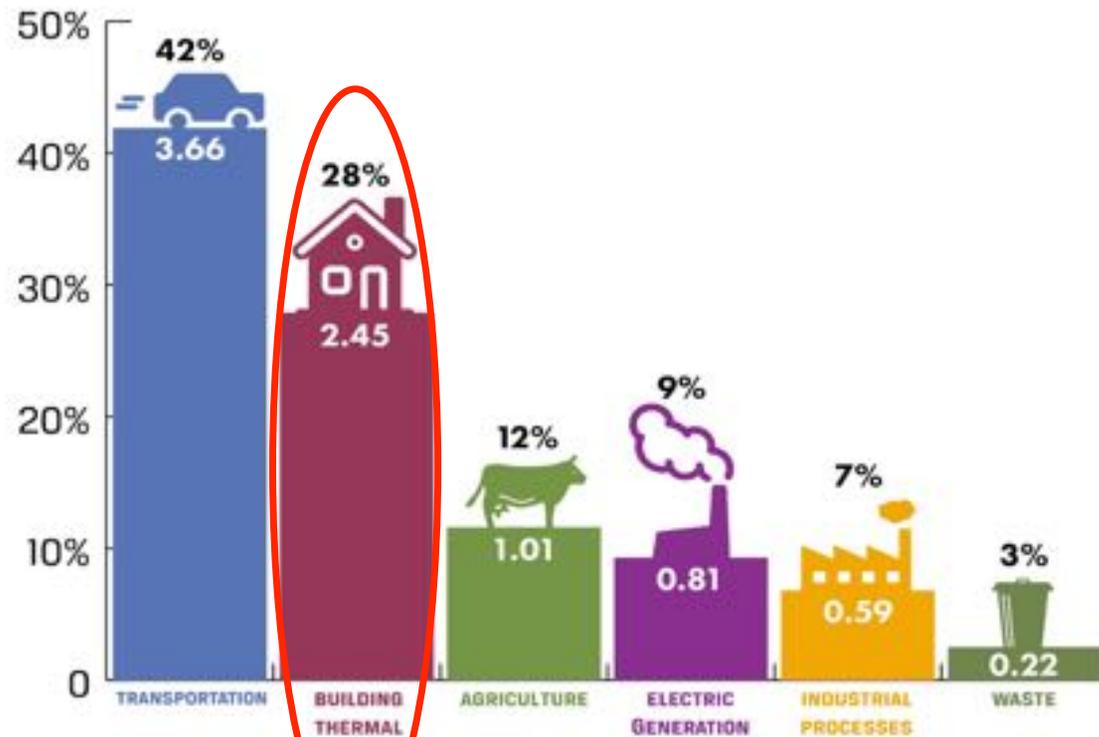
20% GHG reduction by 2025  
80% GHG reduction by 2050

## Vermont

40% GHG reduction by 2030  
80-95% GHG reduction by 2050

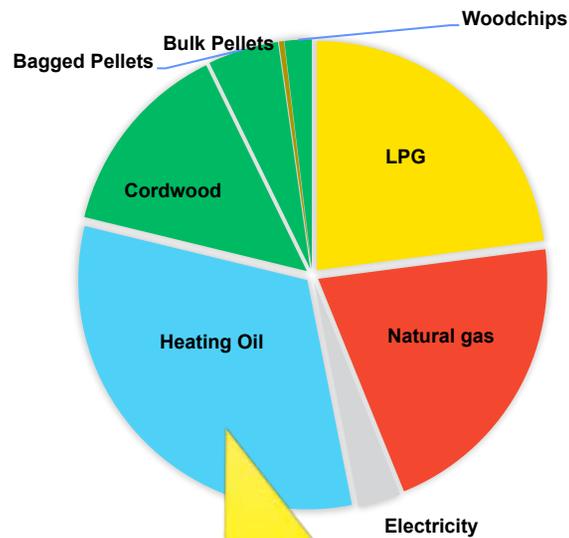
Source: State websites

# Vermont Greenhouse Gas Contributors



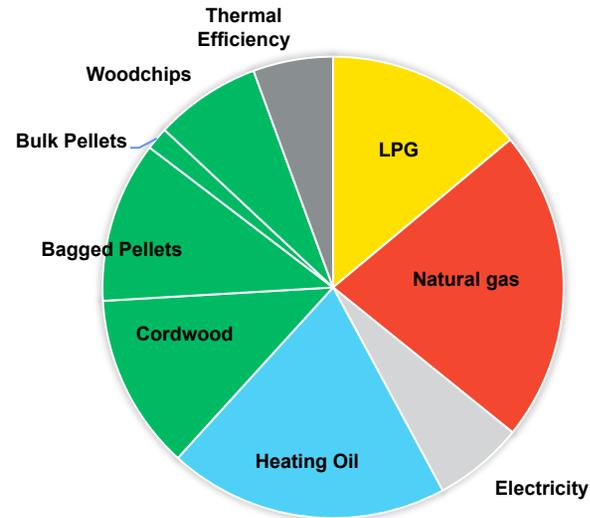
# Vermont Energy Goal – 35% of Thermal Energy from Wood Heat by 2030

2016 THERMAL FUEL MIX

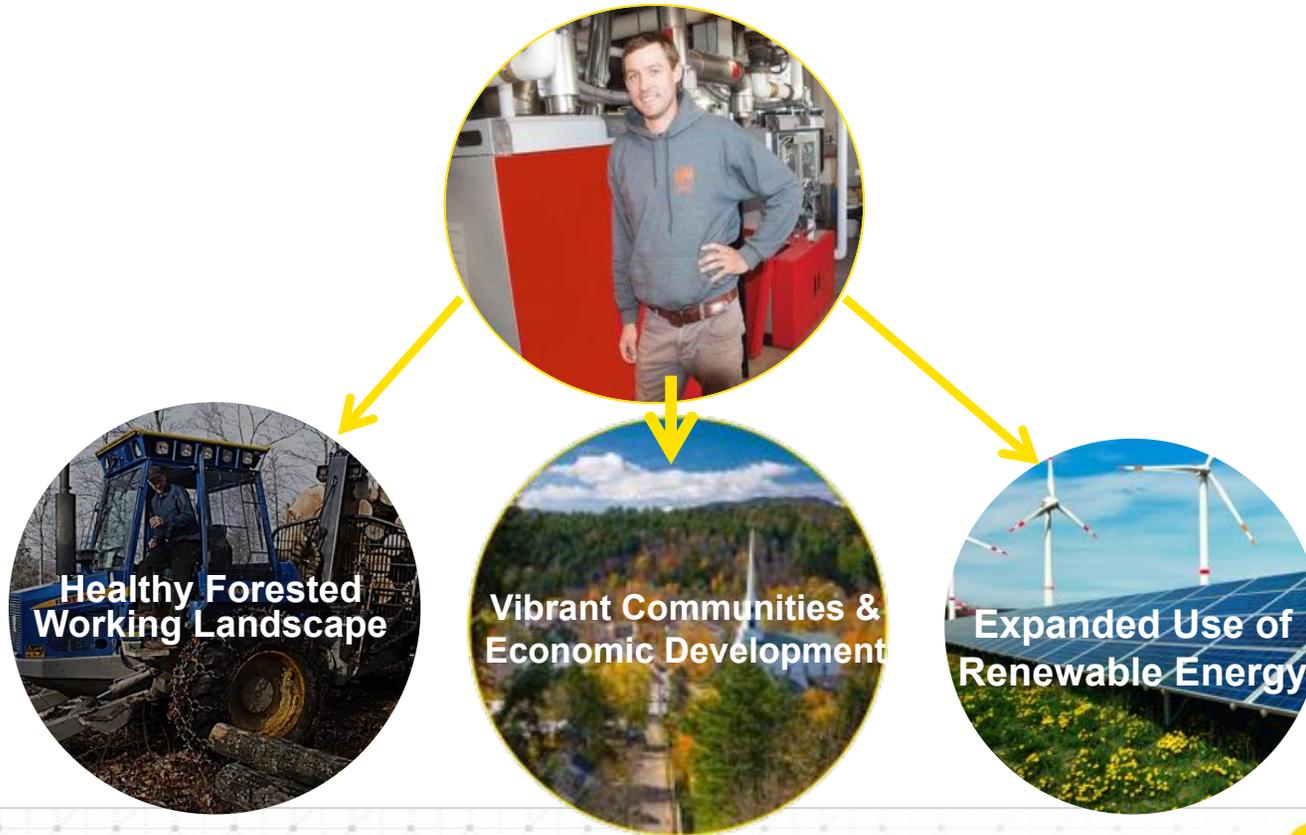


~89 million gallons annually

2030 THERMAL FUEL MIX



# Advanced Wood Heating



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Thank  
you!

 VEIC