Wood Heating Success
Stories from the Northeastern US

Alaska-Yukon Wood Energy Conference

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
Presentation Outline

• Stage setting
• Success stories
  o Technology
  o Quality vendors and installations
  o Wood fuel quality
  o Investments in fuel supply chain
  o Outreach and market awareness
  o Program successes
  o State level policies and incentives
• Parting thoughts
Residential Space Heating Sources in the US

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

BERC
Biomass Energy Resource Center
Residential Wood Heating in US

- Source: 2010 US Census Data

[Map showing the distribution of residential wood heating across the United States]
Market Conditions in Northeastern US

Natural Gas Pipeline Service

Heating Degree Days

Forestland Area
($/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

$/MMBTU
Success Stories: Technology
"Biomass Heating"
“Advanced Wood Heating” Technology

Large-scale Boilers with Horizontal Heat Exchange

Small-scale Boilers with Vertical heat Exchange

Image courtesy of Viessmann

Image courtesy of Windhager
Advancements in Modern Combustion

Source: BioEnergy 2020+
Emissions and Efficiency Relationship

EPA Certified Hydronic Heaters

R² = 0.6678
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

BERC Biomass Energy Resource Center
Success Stories:
Fuel Supply Chains
Regional Pellet Mill Capacity
Specialized Pneumatic Bulk Pellet Delivery
Dried Woodchip Production
Pneumatically Loading Silos with Dry chips
Success Stories: Outreach and Market Awareness
“Biomass Energy”

In May 2013, carbon dioxide levels in the Earth’s atmosphere passed 400 parts per million for the first time in 2.5 million years.

We Can’t Burn Our Way Out of Climate Change!
energyjustice.net

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

VEIC
Fuels for Schools

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

State Wood Energy Teams

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

Vermont State Wood Energy Team

Fuels for Schools

State Wood Energy Teams

Biomass Energy Resource Center
Advanced Wood Heating State Incentives

Number of Boiler Installations Incentivized in 2018

- Vermont
- New Hampshire
- New York
- Maine
- Massachusetts

- Number of residential units
- Number of commercial units
Vermont’s Incentive Program

Cumulative Gallons of Oil Equivalent Displaced by CEDF Programs

Actual  Forecast if Programs Continued in 2020-2028

- Residential Market  - Commercial/Institutional Market  - If programs ended in 2019
Success Stories:
State-level Policies & Incentives
## Regional Dependence on Oil for Heating

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

*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

- Transportation: 42%, 3.66
- Building Thermal: 28%, 2.45
- Agriculture: 12%, 1.01
- Electric Generation: 9%, 0.81
- Industrial Processes: 7%, 0.59
- Waste: 3%, 0.22

BERC Biomass Energy Resource Center
Vermont Energy Goal –
35% of Thermal Energy from Wood Heat by 2030

~89 million gallons annually
Advanced Wood Heating

Healthy Forested Working Landscape

Vibrant Communities & Economic Development

Expanded Use of Renewable Energy
Thank you!

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