Green Heat for Homes:
Benefits and Challenges of Residential Biomass Energy

This Webinar is brought to you by:

Biomass Thermal Energy Council (BTEC)

With the generous support of the
U.S. Forest Service
Wood Education Resource Center

3 PM ET, November 4, 2010

"The work upon which this publication is based was funded in whole or in part through a grant awarded by the Wood Education and Resource Center, Northeastern Area State and Private Forestry, U.S. Forest Service. This institution is an equal opportunity provider."

Quick Notes

- Two Audio Options: Streaming Audio and Dial-In.
  1. Streaming Audio/Computer Speakers (Default)
  2. Dial-In: Use the **Audio Panel** (right side of screen) to see dial-in instructions. Call-in separately from your telephone.

- Ask questions using the **Questions Panel** on the right side of your screen.

- The recording of the webinar and the slides will be available after the event. Registrants will be notified by email.

Presentation Outline

I. **Introduction** - Kyle Gibeault
II. **Market / Appliance / Fuel Overview** – Scott Nichols
III. **An American Carbon Success Story** – John Ackerly
IV. **EPA Activities** – Larry Brockman
V. **Q & A, Next Events** – Kyle Gibeault

[Full presentation will be available online, www.biomassthermal.org/resource/webinars.asp]

Speakers

- Scott Nichols, President, Tarm USA
- John Ackerly, President, Alliance for Green Heat
- Larry Brockman, Team Leader – Residential Wood Smoke, U.S. Environmental Protection Agency

Moderator

- Kyle Gibeault, Deputy Director, Biomass Thermal Energy Council

Kyle Gibeault - Moderator

- Deputy Director,
  Biomass Thermal Energy Council
- Program Manager, Technology
  Transition Corporation

About BTEC – Mission & Composition

- The Biomass Thermal Energy Council (BTEC) is a nonprofit association dedicated to advancing the use of **biomass for heat** and other thermal energy applications.
- BTEC engages in research, education, and public advocacy for the fast growing biomass thermal energy industry.
- Formed in January 2009 by eight companies, BTEC currently has 89 members from 34 U.S. states, Canada, Austria, and Denmark
- Includes landowners, fuel refiners, appliance manufacturers, project developers, nonprofits, universities, and others

Current BTEC Membership

A3 Energy Partners
Abundant Power
ACT Bioenergy
Alliance for Green Heat
American Agriculture Movement
American Wood Fibers
APEX
Bear Mountain Forest Products
Beaver Wood Energy
Biomass Combustion Systems
Biomass Commodities Corporation
Biomass Energy Resource Center
Biomass Energy Works
Biowood Energy
Chip Energy
Clean Power Development
Comact Equipment
Confluence Energy
Control Labs
Corinth Wood Pellet
Cousineau Forest Products
Dejno's
Ecostrat
EnTec Works
Enviva Materials
Ernst Biomass
Ewing Bemiss & Co.
Fuel Pellet Technologies
Forest Energy Corporation
Froling Energy
Fröling GmbH
Fuel Pellet Technologies
Fulton Companies
FutureMetrics
Gavilon Group
Green Clean Heat
Indeck Ladysmith
Innovative Natural Resource Solutions
Integrated Biomass Resources
International Renewable Energy Technology Institute
International Silica Technologies
International WoodFuels
Jesse E. Lyman Pellets
Krieg DeVault
Lignetics of Virginia
M aine Energy Systems
M aine Pellet Fuels Association
M arth
Montana Community Development Corporation
National Network of Forest Practitioners
New England Wood Pellet
New Horizon
Northeast Mill Services
Ontario Sawdust Supplies
Oregon Forest Industries Council
Paraclete Bioenergy
Piney Woods Pellets
Plum Creek
PowerStock
Pratt & Whitney Power Systems – Turboden
Price BIOStock
Proe Power Systems
Public Policy Virginia
Rainforest Alliance
Resource Professionals Group
Richmond Energy Associates
Sandri Companies
Santa Energy Corporation
Scandtec
Sewall Company
Skanden Energy
Southland Bio Energy
State of Montana DNRC
State University of New York (SUNY – ESF)
Tarm Biomass
Twin Ports Testing
Vapor Locomotive Company
Vecoplan
Vermont Wood Pellet
Viability
Viessmann
West Oregon Wood Products
Western Ag Enterprises
Westervelt Renewable Energy
Wilson Engineering Services
WoodFuels Virginia
WoodPellets.com
Woodstone
Zilkha Biomass Energy

Project made possible by the USDA FS WERC

- BTEC awarded a grant from the USDA Forest Service's Wood Education and Resource Center (WERC) in June 2010 to advance education and outreach on biomass thermal energy
- The Center's mission is to work with the forest products industry toward sustainable forest products production for the eastern hardwood forest region.
- Previous webinar - "The Opportunity of Biomass Energy: Renewable Heating and CHP," available online, www.biomassthermal.org/resource.
- Next webinar – Overview of Biomass Thermal Policy and Regulatory Issues, *January 2011.*
- All questions and attendee feedback will help form future activities.

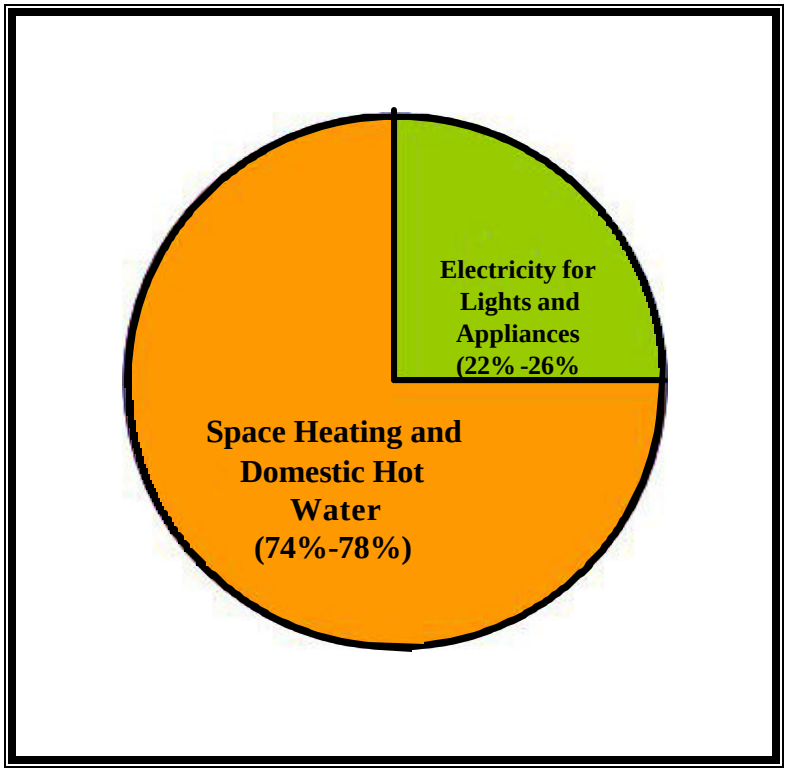
Remember to answer the survey at the webinar's conclusion!

Scott Nichols

- President,
  Tarm USA
- Secretary,
  Biomass Thermal Energy Council

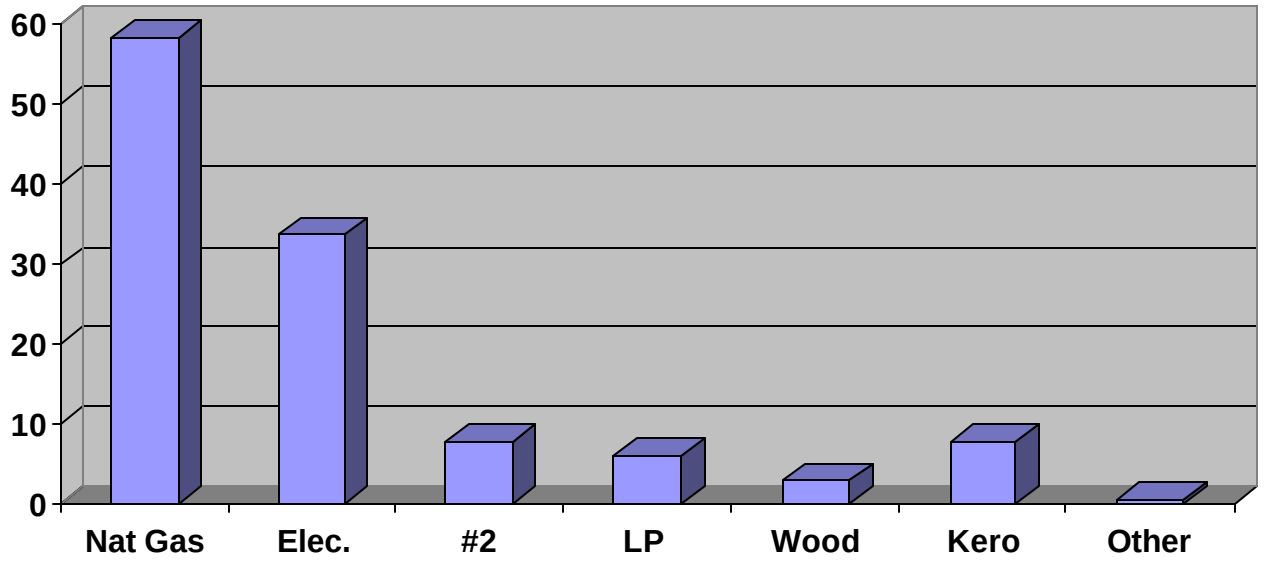
Market Overview – Conversion Technologies and Fuels

Typical Residential Energy Use in the Cold Climate States of New Hampshire and Vermont



Residential Thermal Fuel Types

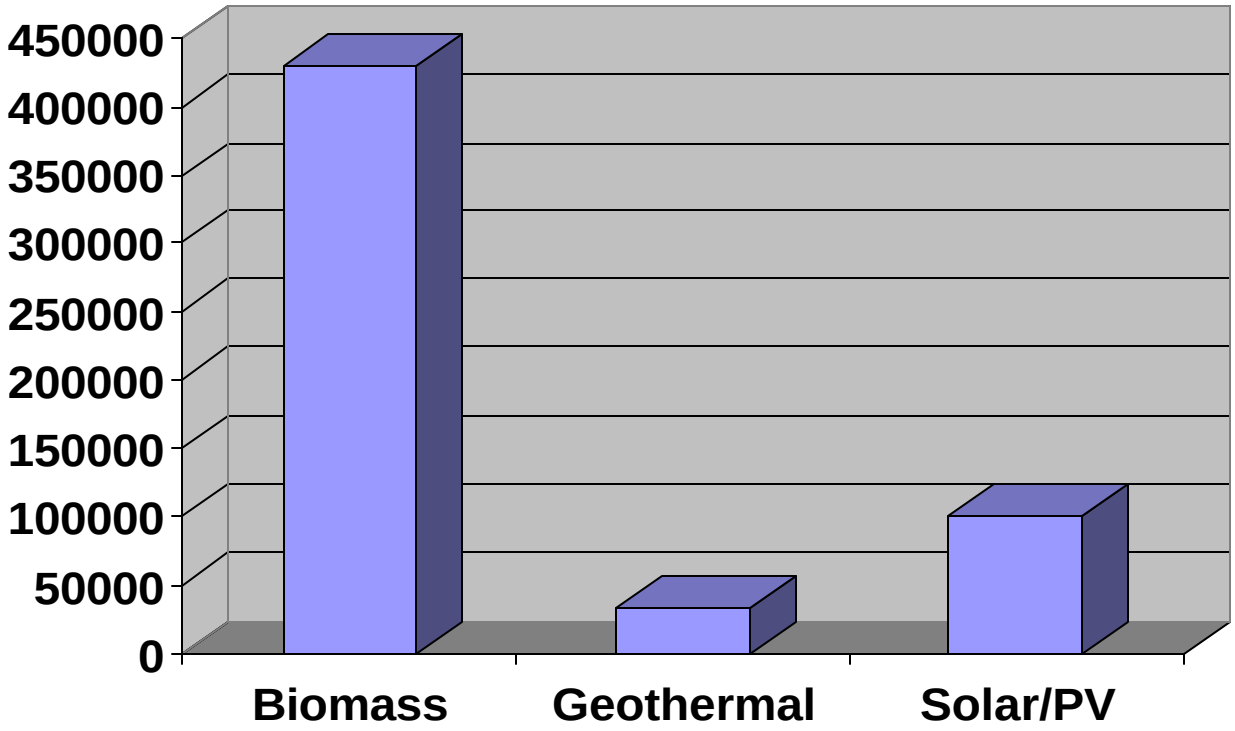
Millions of U.S. Household Units, 2005



http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/hc4spaceheating/pdf/alltables.pdf

U.S. Residential Renewable Energy Use 2009

Billions of Btus:



http://www.eia.gov/emeu/states/sep_sum/html/sum_btu_res.html

Residential Biomass Heating Appliances

Space Heaters-Comfort Zone Specialists

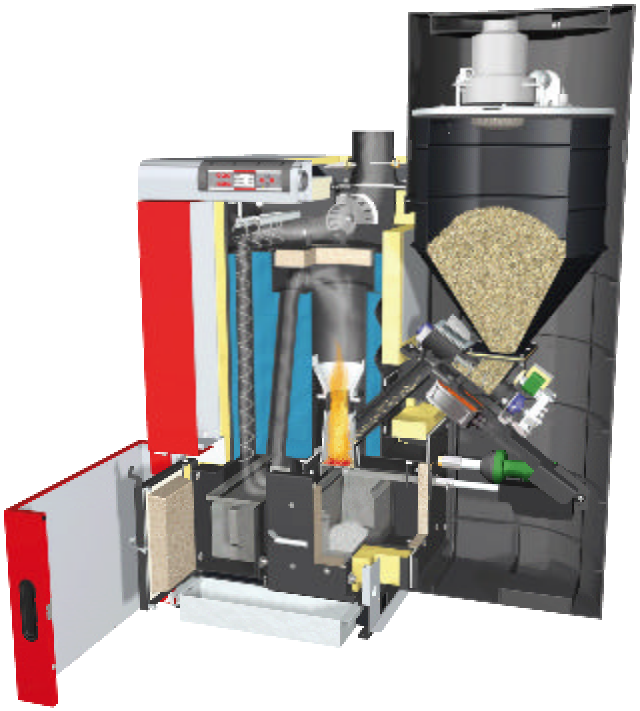
- Stoves, Fireplaces, Fireplace Inserts

Wood, wood pellets, corn

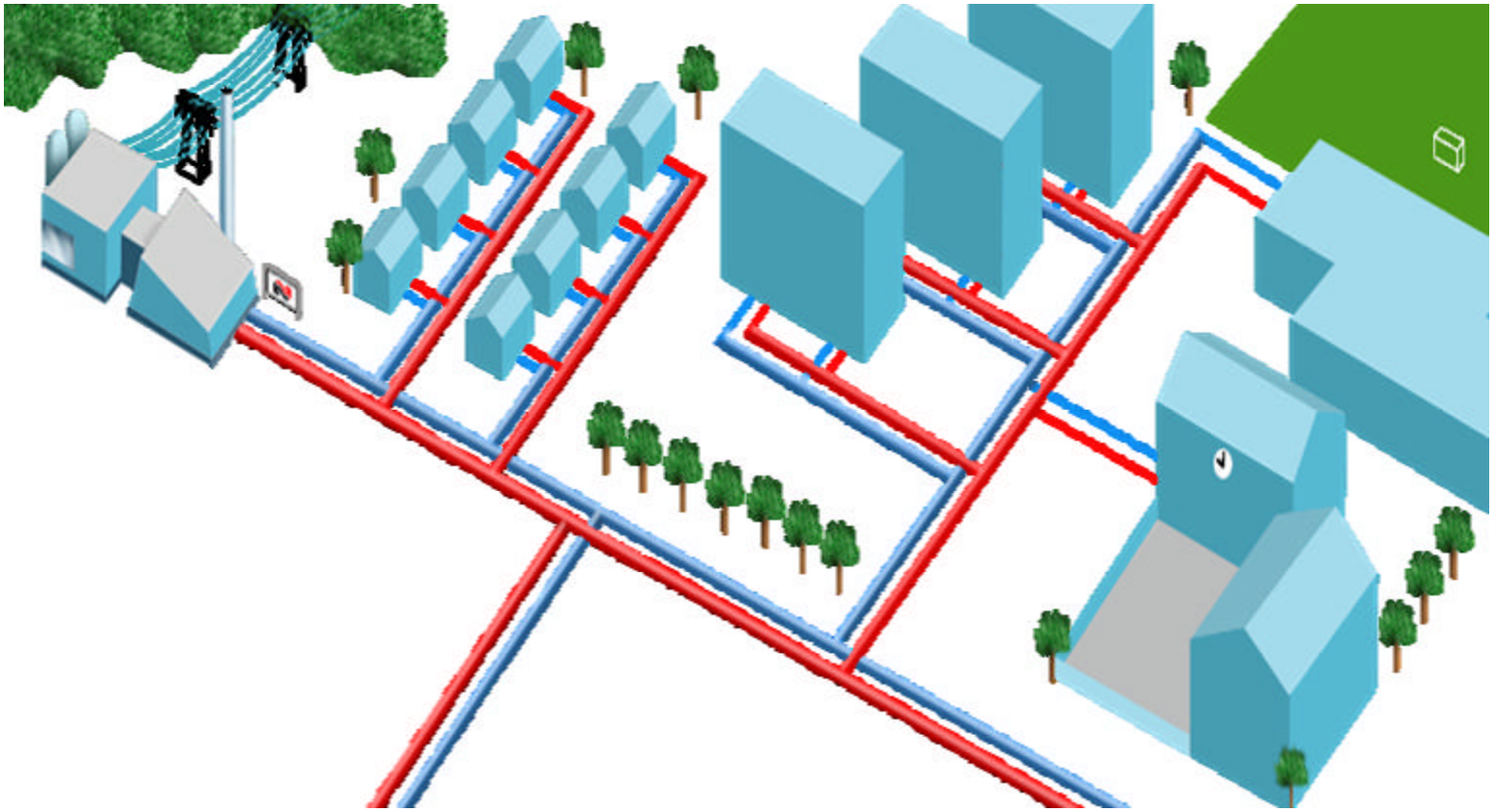
Residential Biomass Heating Appliances

Central Heaters-Whole Home Heating

- Boilers, Furnaces-Burn wood, pellets, corn



District Heating



Typical In Home District Heating Equipment

Residential Thermal Biomass

Benefits

#1 Benefit: Fuel Cost Savings

- From $600.00/year with wood pellets to $1900/yr. w/self cut cord wood.
- Non-toxic fuel can be stockpiled by the residential user to hedge against price increases.
- Guilt free = higher comfort
- Self sufficiency with self owned forest and cropland
- Low cost per Btu compared to other residential renewable energy

General Biomass Thermal Advantages

- Use of biomass enhances value of timberland as a resource and carbon sink if properly harvested
- Fuel dollars are kept in the local economy
- Enhances national energy security and rural economic strength
- Greenhouse gas emissions reductions are possible
- No or low sulfur and/or metal emissions

Residential Thermal Biomass

Challenges

#1 Challenge: Finding the Capital

- Purchasing and installing a fully automatic pellet boiler may cost $25,000 or more. The savings = about $75.00 for each ton of pellet fuel burned compared to burning fuel oil. Most homes use about 8 tons of pellet fuel per year.

- 8 x $75.00= $600.00 savings annually

Challenges

Image and Regulations

- Indoor air quality, dirt, ash, and bugs
- Outdoor air quality-EPA and public recognition of emissions epidemic.

Challenges

Market Penetration / Maturation:

- Product and parts distribution
- Dealer service/installation build out
- Transportation and handling of fuel
- Lack of automation
- Standards for installation, fuel, fuel storage, and delivery are lacking
- Industry professionalism

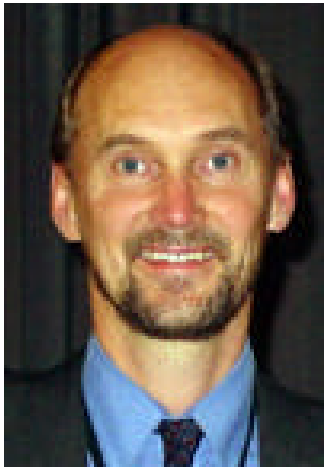
How to overcome these challenges

- New technology is quiet, cleaner, and more automated. Integration with solar thermal is becoming more popular.
- Owner involvement with biomass thermal appliances is decreasing, especially with regards to operational and emissions controls.
- Industry and regulators are emphasizing fuel quality and burning techniques that improve the experience and keep emissions lower.
- A broader assortment of energy suppliers are getting involved with supply and service chain for appliances and fuel. Trade associations are bringing industry together.

Overcoming Challenges - Fuels

- Wood pellet fuel standards in development
- Bulk wood pellet delivery growth
- Pellet appliances feed themselves from bulk storage
- Oil companies are becoming energy companies, delivering wood pellets
- New fuel storage containers are coming to market.
- Remaining challenge: How to handle peaks and valleys of fuel demand?

John Ackerly



- President,
  Alliance for Green Heat
- Board Member,
  Biomass Thermal Energy Council

Residential Wood Heat:
An American Carbon Success Story

ALLIANCE FOR GREEN HEAT
clean, renewable & local

About the Alliance for Green Heat

- Mission: to promote cleaner and more efficient residential biomass systems
- Legal: We are a non-profit, 501c3 educational and advocacy organization founded in May 2009
- Based in Washington DC area
- Boards: mix of environmental, industry, renewable energy and energy efficiency leaders
- Staff: 2 full-time paid staff; 2 fulltime fellows/researchers
- Funding: USDA's Wood Education and Resource (WERC), foundations, companies and individuals

ALLIANCE FOR GREEN HEAT
clean, renewable & local

Overview – Size of the Industry

- 27 – 30 million cords of firewood are burned annually, about 60 – 80 million green tons per year.

•$3.1 billion industry- equivalent to:

-US solar industry
(at 0.4% of nation's electricity)

-US wine industry

ALLIANCE FOR GREEN HEAT
clean, renewable & local

Overview – Prevalence of Wood Heat

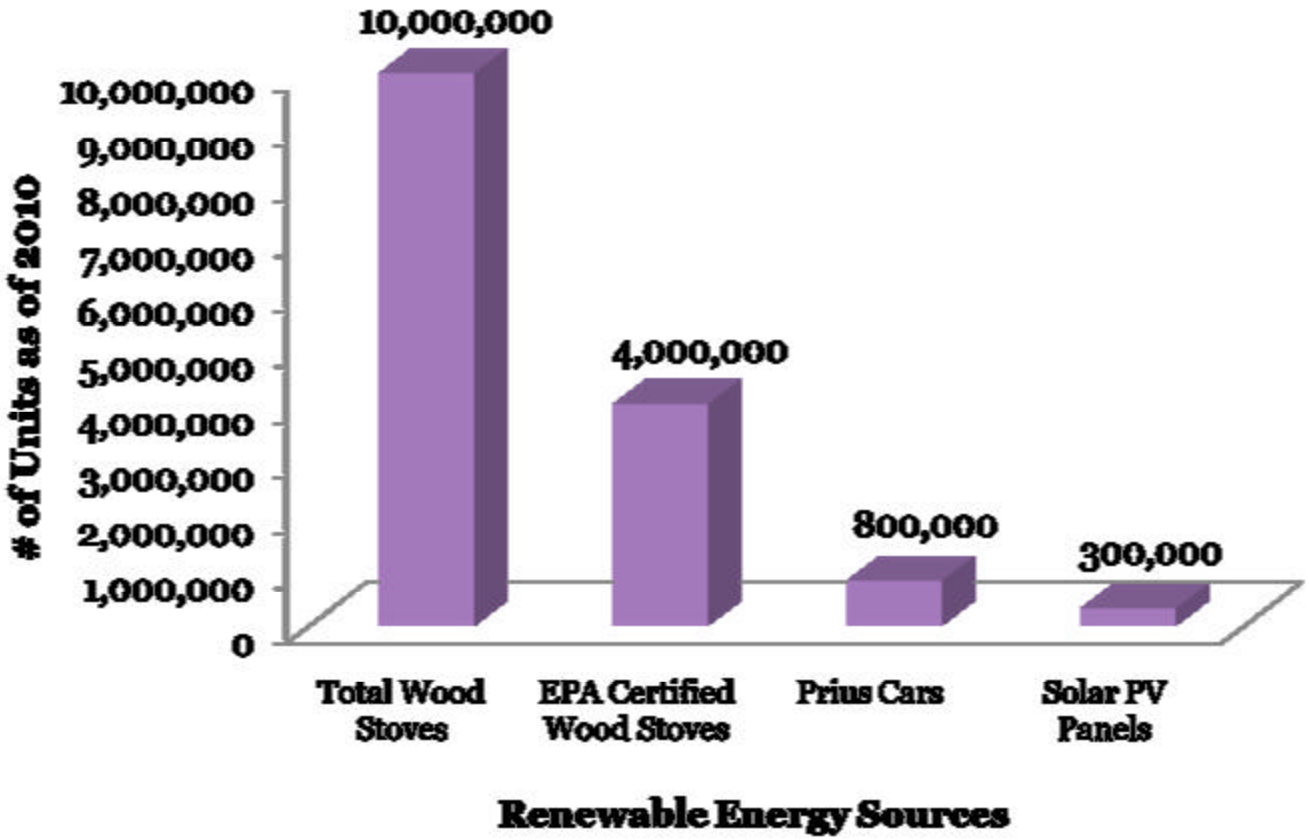
- One in 10 American homes, or 10% of Americans, use wood as a secondary heat source. (US Census).
- One in 50 homes, or 2%, use it as a primary heat source. (US Census).
- Top 10 residential wood heat states per capita: AR, ID, ME, MT, NH, NM, OR, VT, WA & WV.

III. Carbon Success Story – Ackerly

Fossil Fuel Reduction of a $3,000 Wood Stove
=
Fossil Fuel Reduction of a $30,000 Solar PV

- Both systems displace equal amounts of carbon from fossil fuel: 3 – 4 tons.
- 1 kW system, 1 cord of wood or 1 ton of pellets all displace about 1 ton of carbon from fossil fuels.

Residential Renewable Energy in the US



Wood Stove vs. Prius and Solar PV:

Technology	# of appliances installed as of 2010	Tons of carbon saved per year per appliance	Total tons of carbon saved per year in US
Pre 1990 stoves	6 million	1.5 tons	9 million
EPA certified stoves	3 million	1.9 tons	5.7 million
Pellet stoves	1 million	3.0 tons	3 million
Total stoves	10 million	1.8 tons	17.7 million
Solar PV panels (4 kw)	0.3 million	3.5 tons	1.05 million
Prius	0.8 million	3.75 tons	3 million

ALLIANCE FOR GREEN HEAT
clean, renewable & local

Wood Stove vs. Prius and Solar PV:

Technology	Average cost with installation	Price per ton of carbon saved over 20 years	Average cost with government incentives	Price per ton of carbon savedover 20 years with incentives	Gov't (taxpayer) price to subsidize one ton
Pre-1990 wood stoves	$2,000	$66	$2,000	$66	0
EPA certified stoves	$3,000	$78	$2,100	$55	$24
Pellet stoves	$4,000	$66	$2,800	$46	$17
Solar PV panels (4 kw)	$30,000	$428	$10,000-$20,000	$142 - $284	$142 - $284
Prius	$21,000	$280	$21,000	$280	0

ALLIANCE FOR GREEN HEAT
clean, renewable & local

17,700,000 Tons of CO2=

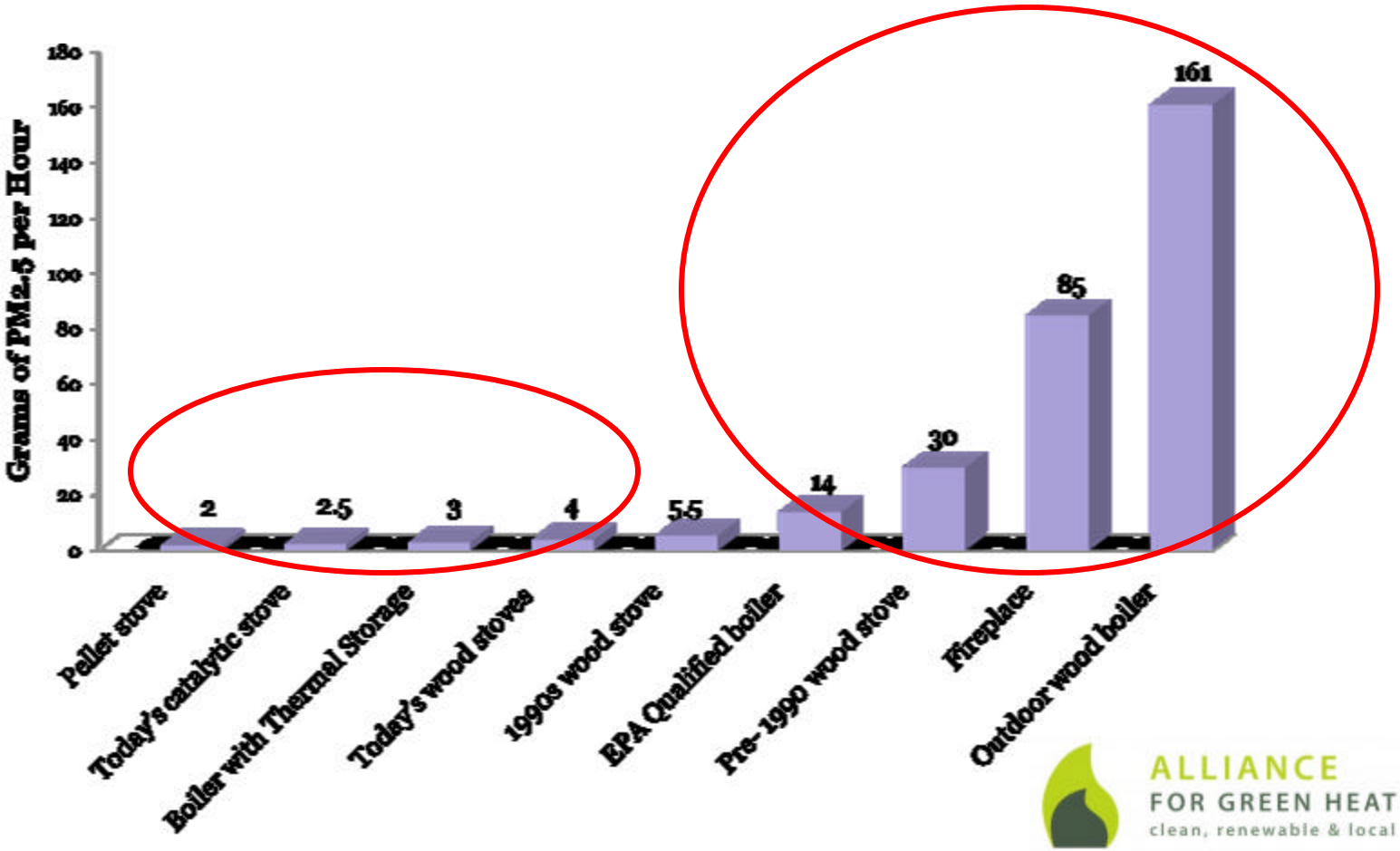
- Annual emissions of 4.2 coal fired power plants

- Annual greenhouse gas emissions of 3,070,204 cars (equals 16% of cars sold each year)

- Annual emissions of 1,948,686 homes' electricity usage

ALLIANCE FOR GREEN HEAT
clean, renewable & local

Typical Biomass Appliance Emission Rates



ALLIANCE FOR GREEN HEAT
clean, renewable & local

EPA Has Lacked Resources to Regulate Stoves and Boilers.

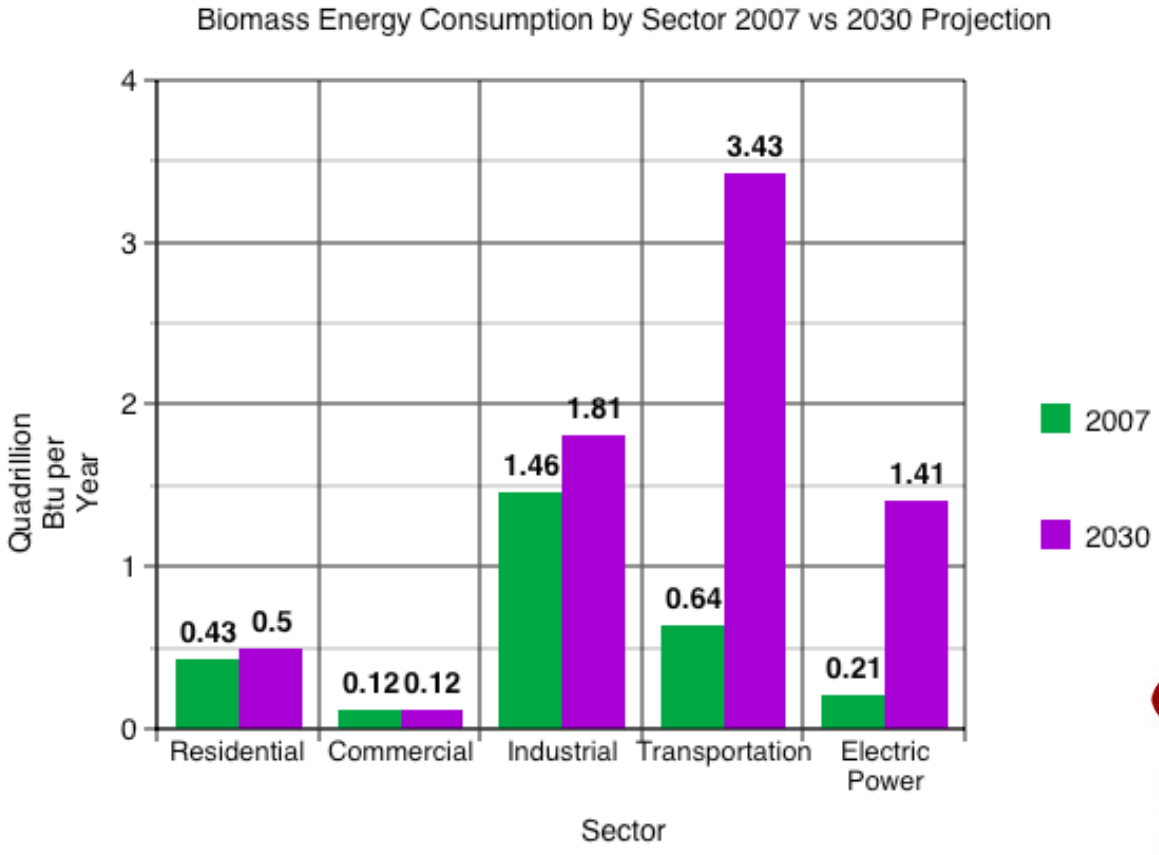
- 20 year lapse in regulations has left EPA emission standards outmoded and irrelevant. Washington state standards drive the market.
- 43 out of 50 states allow polluting, unqualified outdoor wood boilers to be installed.
- Myth: new stoves must be EPA certified; thousands of new, uncertified stoves are sold every year, often made in China.

US Government Vision for Renewable Energy

- Solar: Cut the cost of solar power in half between 2009 and 2015
- Combined Heat & Power (CHP):
  - 2001: EPA and DOE set goal of doubling capacity by 2010
  - 2009: 20% of industrial facilities use CHP
- Biofuel: Produce 36 billion gallons by 2022

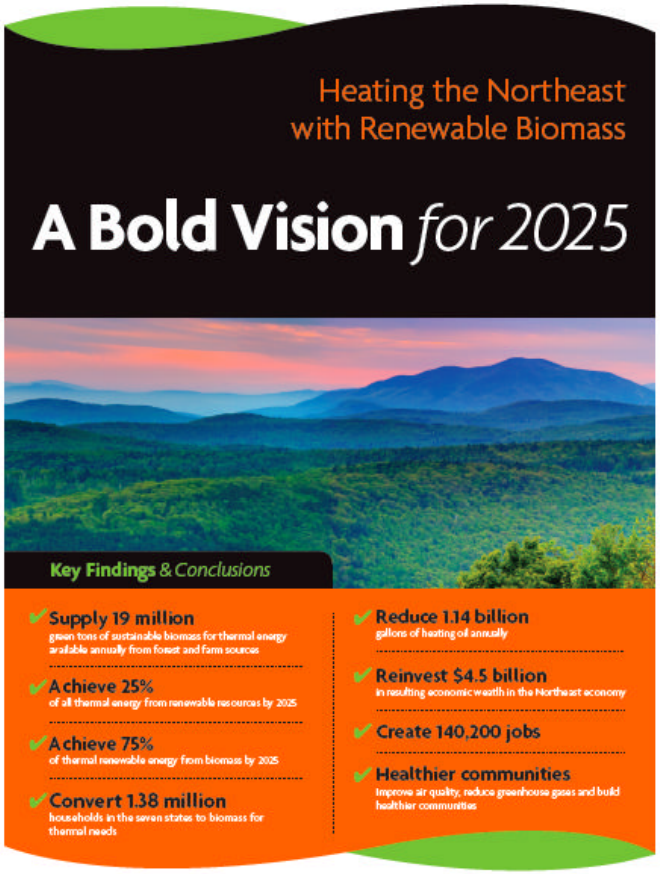
- *Thermal biomass: No clear vision/goal*

Biomass Future with Current Government Vision



Energy Information Administration/An Updated Annual Energy Outlook 2009 Reference Case

III. Carbon Success Story – Ackerly



Coalition of business and non-profits developed goals for:

- **25%** of thermal energy from renewables by 2025 for northeast
- Install **1.3 million** ultra-clean biomass units in homes
- Reduce heating oil by **1.1 billion gallons**
- Create **140,200 jobs**
- Keep **$4.5 billion** heating dollars in Northeast economy

ALLIANCE FOR GREEN HEAT
clean, renewable & local

Possible Federal Programs in 2011

Home Star (cash for caulkers). House version offered 30% rebate up to $1,500:

-For a wood stove only if you have existing stove (would be first national change-out program)
-No change-out requirement for pellet stoves
-Strict emission threshold: 3.0 g/hr
-EPA qualified outdoor boilers with 80% efficiency qualify

25C tax credit of 30% up to $1: to $1,500

-Congress will probably restrict 25C
-Senate draft adopted 3.0 g/hr requirement but *raised* maximum to $3,000
-Would it be better to drop 3.0 g/hr requirement and adopt stricter efficiency test, possibly using Category 2 medium low burn test?

Options for the Future of Wood Heat

European model	Address legacy of old stoves
Promote pellet stoves and boilers and de-emphasize wood appliances o Focus on pellet boilers with thermal storage o Expand district heat systems	Promote resources and regulations to retire old stoves and non-qualified outdoor boilers o More change-out programs o More state (or national?) laws requiring old stoves be recycled when home is sold o More states ban installation of 2nd hand, old stoves

How to Move Forward

- Need vision and leadership to leverage the potential of thermal biomass.
- Government R&D funding from DOE, USDA and/or EPA to spur innovation.
- Short term funding to subsidize testing of new stoves required by EPA.
- Development of an Energy Star program for wood stoves and boilers.
- Aggressive assistance for rural, low-income families to affordably heat their homes with biomass.

III. Carbon Success Story – Ackerly

Get involved, and support the Alliance for Green Heat!

www.forgreenheat.org

ALLIANCE FOR GREEN HEAT
clean, renewable & local

Larry Brockman

- Team Leader – Residential Wood Smoke, U.S. Environmental Protection Agency

EPA Activities – Education and Outreach Programs

IV. EPA Initiatives – Brockman

- Why do we care about wood smoke?
- Great American Woodstove Changeout
- Voluntary Fireplace Program
- Voluntary Hydronic Heater Program
- Burn Wise Education Campaign
- Wood Heater New Source Performance Standard

Why do we care about wood smoke?

- CO, NO_x, SO_x, and Particle Matter (PM2.5)
- Toxics, including:
  - Benzene
  - Toluene
  - Aldehyde gases
  - Polycyclic organic matter

IV. EPA Initiatives – Brockman

- Low stacks
- Poor dispersion

What is The Great American Wood Stove Changeout?

- A voluntary, education and incentive-based (cash rebates) effort to encourage owners of old, inefficient wood stoves and fireplaces to "changeout" or retrofit their appliance with a cleaner burning technology, like:
  - Gas stoves, geothermal
  - Wood pellet or corn stoves
  - EPA-Certified wood stoves

Old "Conventional" Wood Stoves Built before 1990

EPA – Certified Woodstoves (after 1990)

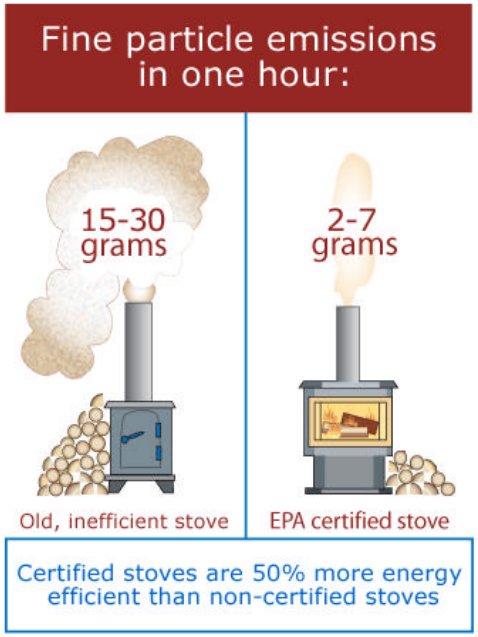
Slide from Wood Heat Organization Inc

Wood Pellet Stove

Gas and Propane Stoves

Benefits to the Home Owner

- **Cleaner Burning Technologies:**
  - Pollute less – 70% less PM2.5 outdoors, improves indoor air
  - Are 50% more energy efficient
  - Use 1/3 less wood for same heat
  - Cut creosote buildup in chimneys, reducing fire risk
  - May save money and require less work



Progress To Date, 2005-10

- 50 communities have implemented or are implementing woodstove changeouts
- Over 18,000 old stoves and fireplaces changed out/retrofitted
- 302 tons of PM2.5 reduced/year from changeouts
- 51 tons of hazardous air pollutants reduced per year
- Resulting in providing approximately $110 to $270 million in estimated annual health benefits.

Voluntary Partnership Fireplace Program

- Goal: Significantly reduce fireplace emission in new construction
- Partnership Agreement b/w EPA and 7 industry partners
- Phase 1 qualification levels 34% cleaner
- Phase 2 qualifications levels 54 % cleaner
- Modeling analysis was completed in Nov. 2009

* New technologies recently developed that may help significantly reduce emissions from existing fireplaces

Hydronic Heater Improvement Program

- January 2007 launched program
- 23 participating manufacturers
- Phase 1 models (70% cleaner) sold: 1636
- Phase 2 models (90% cleaner) sold: 3982
- Total annual tons PM2.5 emissions avoided = 4,770
- $1.7 to $4.2 billion in health benefits in 2009

Burn Wise Education Campaign

- Target Audience: operators of old and new wood stoves, fireplaces and hydronic heaters
- Message: "Burn the right wood, the right way in the right wood-burning appliance."
- Strategy: Develop and distribute materials to states, locals and tribes
- Launched Oct. 22, 2009 in Keene, NH

IV. EPA Initiatives – Brockman

Poster

Factsheet

Tearsheet

New Burn Wise Website www.epa.gov/burnwise

NSPS Residential Wood Heaters Revisions and Timeline

- We plan to :
  - Reduce number/type of “exempt” appliances and tighten emission limits
  - Include other devices (e.g., hydronic heaters)
- NSPS Revision Proposal – June 2011
- Promulgation - July 2012

Strategies for Reducing Residential Wood Smoke Resource Guide:

Includes information on:

- Education and Outreach Tools
- Regulatory Options and Examples
  - Burn bans, opacity limits, removal of old unit upon sale of home
- Wood Stove and Fireplace Changeouts
- Funding Options
- Hydronic Heaters and Fireplace Programs
  - Partnerships
- Emissions and Air Quality Improvements

Q & A

Ask questions using the **Questions Panel** on the right side of your screen.

All questions and comments will be recorded anonymously and submitted to our questions forum or used for our interview series.

Also, please take a few moments to answer the survey questions.

Stay tuned for the **next webinar** on Biomass Thermal Policy and Regulatory Issues, *January 2011*.

Additional Webinar Topics in 2010 & 2011

- Overview of policy and regulatory issues related to the biomass thermal industry
- Biomass thermal and environmental markets
- Biomass thermal energy and air quality: Overview of issues and concerns, existing technologies and those under development

Upcoming Events

- **BTEC Membership Meeting** – November 16/17, 2010 in Washington, D.C.
- Next webinar – Overview of Biomass Thermal Policy and Regulatory Issues, *January 2011*.
- Additional free webinar – "Architects and Engineers: The Missing Link in Wood Energy," Nov. 10, 1:00-2:00 PM ET. Engaging speakers, unique format.
  Read more>>
  http://www.biomassthermal.org/resource/webinars/A&EWebinarNov10.htm

More Information

- **This Webinar will be available** on www.biomassthermal.org/resource by Tuesday, Nov. 9, 2010.

- **Sign up** to receive announcements on future webinars, factsheets, audio interviews, and BTEC news at www.biomassthermal.com/mailingForm.asp

- **Questions or comments on BTEC's WERC resources?**
  Email Joseph Seymour, BTEC Program Associate, joseph.seymour@biomassthermal.org.

Thank you!

If you want to learn more about the biomass thermal industry, BTEC, or membership, visit www.biomassthermal.org