The Opportunity of Biomass Energy: Renewable Heating and CHP

This Webinar is brought to you by:

Biomass Thermal Energy Council (BTEC)

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Quick Notes

- Two Audio Options: Streaming Audio and Dial-In.
  1. Streaming Audio/Computer Speakers (Default)
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- 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. **Biomass Background** – Charlie Niebling
III. **Feedstocks & Fuels**– T.J. Morice
IV. **Biomass User Profiles** – Charlie Niebling
V. **Economic Impacts**– William Strauss, PhD
VI. **Challenges, Policy** – Charlie Niebling
VII. **Q & A, Next Events** – Kyle Gibeault

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

Speakers

- Charlie Niebling, General Manager, New England Wood Pellet
- T.J. Morice, VP of Marketing and Operations, Marth Companies
- William Strauss, PhD, President, FutureMetrics

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
Alternative Heating of North America
American Agricultural Movement
American Wood Fibers
APEX
Bear Mountain Forest Products
Beaver Wood Energy
BioHeat USA
Biomass Combustion Systems
Biomass Commodities Corporation
Biomass Energy Resource Center
Biomass Energy Works
Biowood Energy
Chip Energy
Clean Power Development
Comact Equipment Inc.
Control Labs
Corinth Wood Pellet
Cousineau Forest Products
Dejno's Inc
Ecostrat Inc.
EnTec Works LLC
Enviva Materials
Equustock
Ernst Biomass
Ewing Bemiss & Co.
Forest Energy Corporation
Froling Energy
Fröling GmbH
Fuel Pellet Technologies
FutureMetrics
Green Clean Heat LLC
Indeck Ladysmith, LLC
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
Maine Energy Systems
Maine Pellet Fuels Association
Marth
Montana Community Development Corporation
National Network of Forest Practitioners
New England Wood Pellet LLC
New Horizon Inc.
Northeast Mill Services
Ontario Sawdust Supplies
Oregon Forest Industries Council (OFIC)
Paraclete Bioenergy
Piney Wood 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 Department of Natural Resources and Conservation
State University of New York
The Fulton Companies
The Gavilon Group
Twin Ports Testing, Inc.
Vapor Locomotive Company
Vecoplan
Vermont Wood Pellet
Viability
Viessmann
Western Ag Enterprises
Westervelt Renewable Energy
West Oregon Wood Products
Wilson Engineering Services, PC
WoodFuels Virginia LLC
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 USDA Forest Service's Wood Education and Resource Center (WERC) is located in Princeton, WV, and is administered by the agency's Northeastern Area State and Private Forestry organization. The Center's mission is to work with the forest products industry toward sustainable forest products production for the eastern hardwood forest region.

- Activities on biomass thermal issues:
  webinars, interviews, factsheets, online forum, and comprehensive presentation

- All questions and attendee feedback will help form future activities.

Charlie Niebling

- General Manager,
  New England Wood Pellet
- Chairman,
  Biomass Thermal Energy Council

Biomass Basics – Background on Biomass Thermal Energy

What is biomass thermal energy?

- The use of biomass-derived feedstocks to make thermal energy (heat or chill) for
  - Space heating/cooling
  - District heating/cooling
  - Industrial process heat
  - Combined heat and power (CHP)

- Forms of biomass used:
  - Chips
  - Pellets
  - Biogas derived from woody or herbaceous plant materials
  - Agricultural wastes and by-products
  - Other biomass feedstocks

Why does it matter?

1. Thermal energy makes up $^{1}/_{3}$ of total US energy consumption

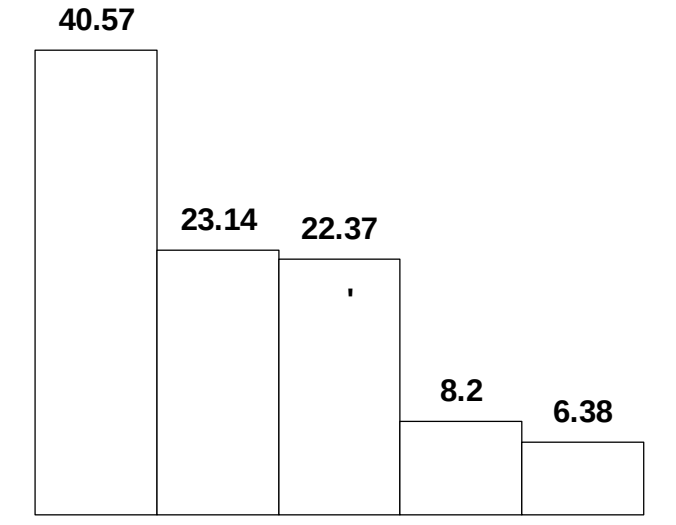
2. Largely ignored in federal/state energy policy

3. Thermal energy represents the **most efficient use** of biomass to make energy

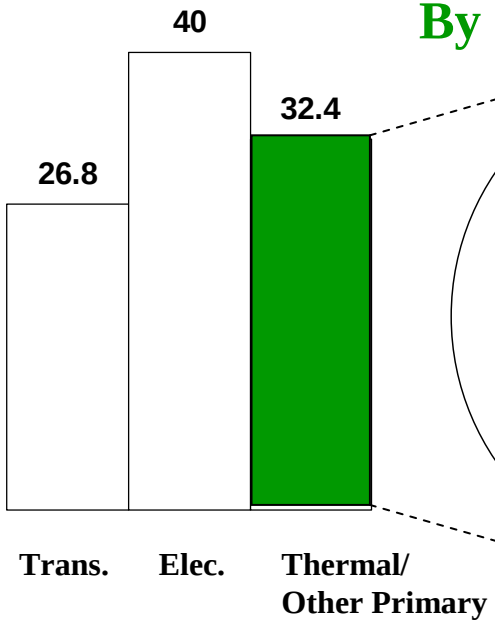
4. Tremendous potential to address major US energy challenges, especially
   - dependence on foreign fossil energy and
   - rural economic development

II. Biomass Background – Niebling

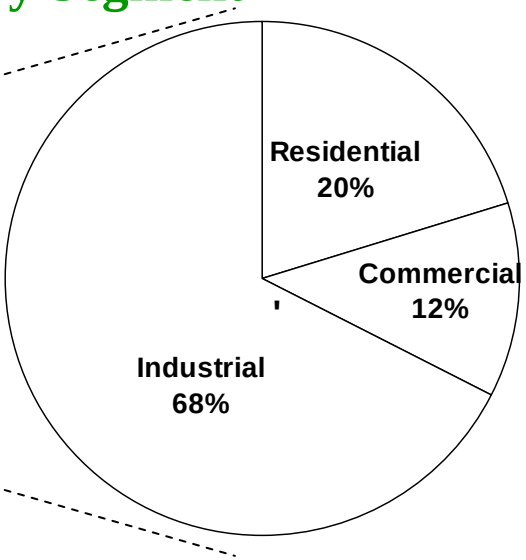
By Fuel Type



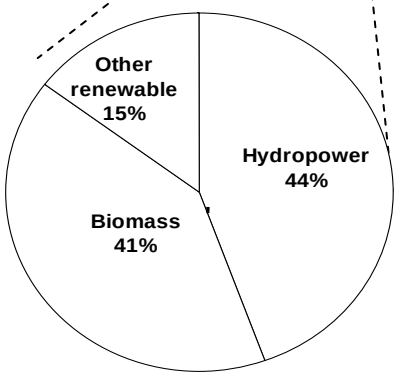
By Use



Thermal/Other Primary By Segment



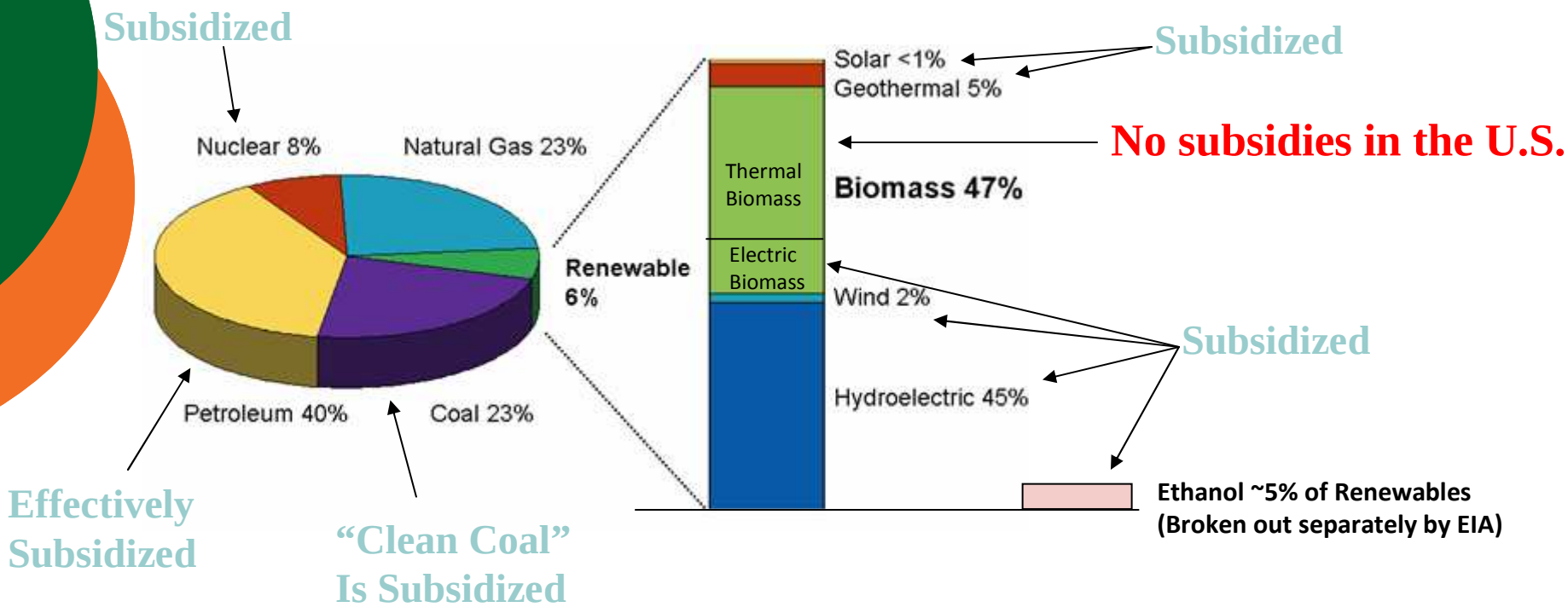
Renewable Energy Consumption



Source: USDOE Energy Information Administration

Biomass thermal is the only unsubsidized energy

Breakout of US Energy Sources, 2008

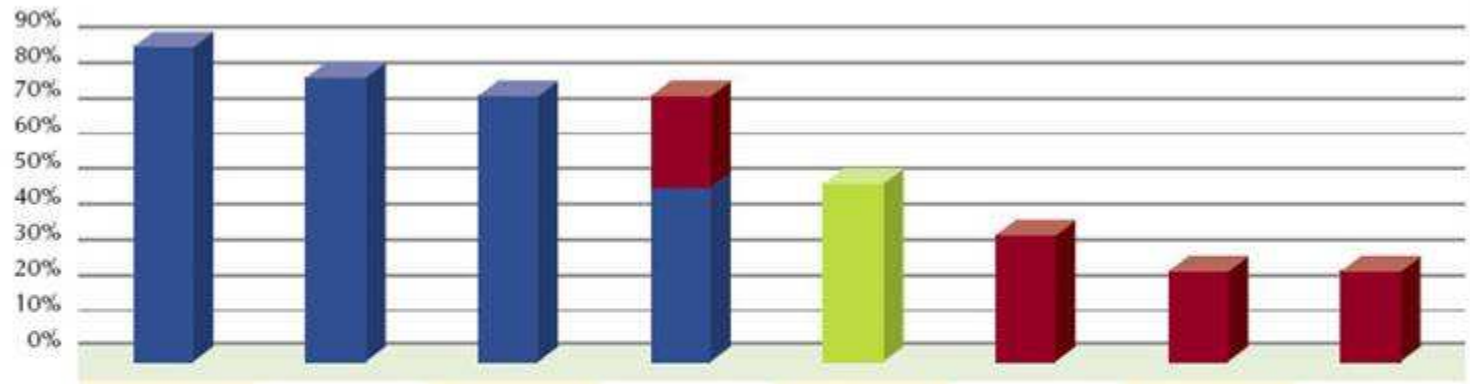


Sources:

Michael Pacheco, Director, National Bioenergy Center, NREL; Renewable Energy Trends 2004 data; Energy Information Administration, August 2005. Note: Total U.S. Energy Supply was 100.278 QBtu; Energy Information Administration, August 2005.

Biomass thermal is the most efficient use

Relative biomass conversion efficiency of bioenergy technologies.



	AWC (Europe)	Building Heat (U.S.)	Industrial Process Heat	5 MW CHP	Cellulosic Ethanol	Co-Firing @ 20% of Fuel Mix	50 MW Biopower Plant	20 MW Biopower Plant
Biofuel					50%			
Electricity				25%		35%	25%	25%
Thermal	89%	80%	75%	50%				

Source: *Forest Sustainability in the Development of Wood Bioenergy in the U.S.*, Pinchot Institute for Conservation, June 2010.

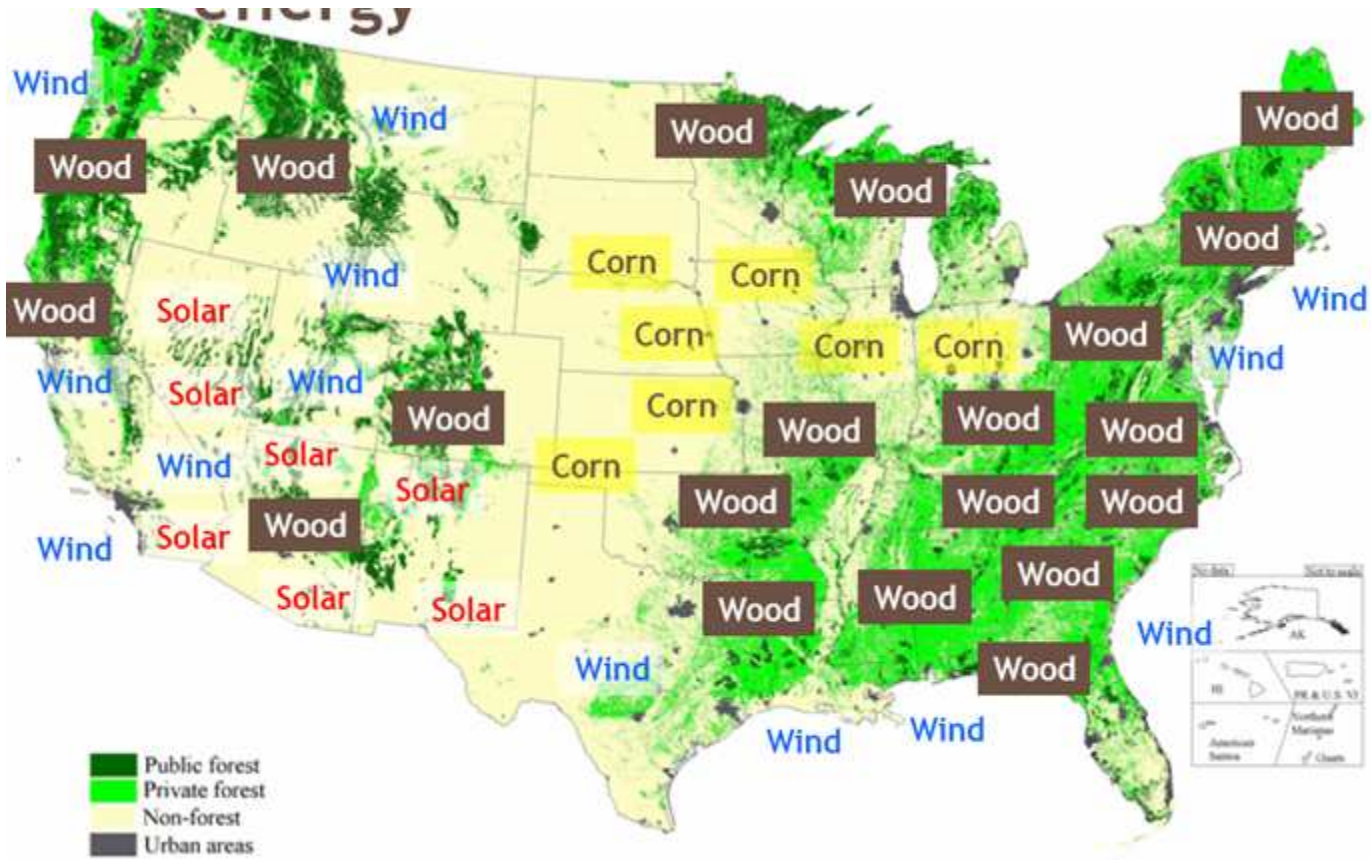
More info? – BTEC Fact Sheets

T.J. Morice

- VP of Marketing and Operations, Marth Companies
- Vice Chairman, Biomass Thermal Energy Council

Biomass Basics – Feedstock and Fuels

Geographic Variances for Renewables Especially Biomass Feedstocks



Forest Resources

Primary

- Logging residues from conventional harvest operations and residues from forest management and land clearing operations
- Removal of excess biomass (fuel treatments) and other forestlands
- Fuelwood extracted from forestlands

Secondary

- Primary wood processing mill residues
- Secondary wood processing mill residues
- Pulping liquors (black liquor)

Tertiary

- Urban wood residues---construction and demolition debris, tree trimming, packaging wastes and consumer durables

Agricultural Resources

Primary

- Crop residues from major crops—corn stove, small grain straw and others
- Grains (corn and soybeans) used for ethanol, biodiesel and bioproducts
- Perennial grasses
- Perennial woody crops

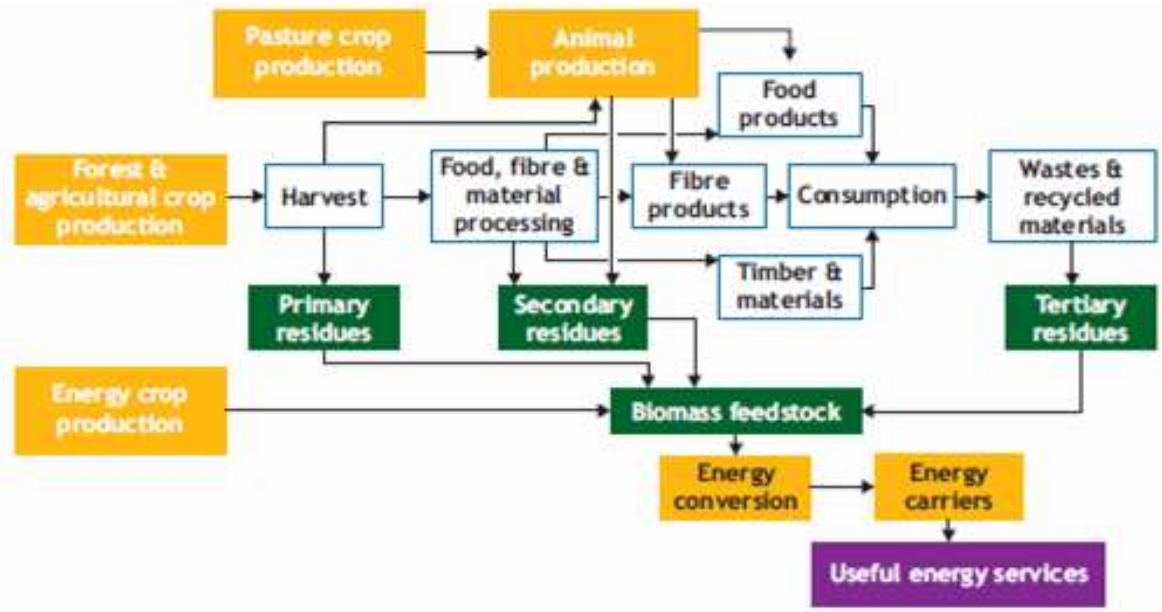
Secondary

- Animal manure
- Food/feed processing residues

Tertiary

- MSW and post-consumer residues and landfill gases

Supply Processing Variations



Credit for Source: International Energy Agency (IEA), Head of Publications Service, 9 rue de la Fédération, 75739 Paris Cedex 15, France.

Fuel Variations

Understanding of the complexities of varied biomass fuel variations aren't new

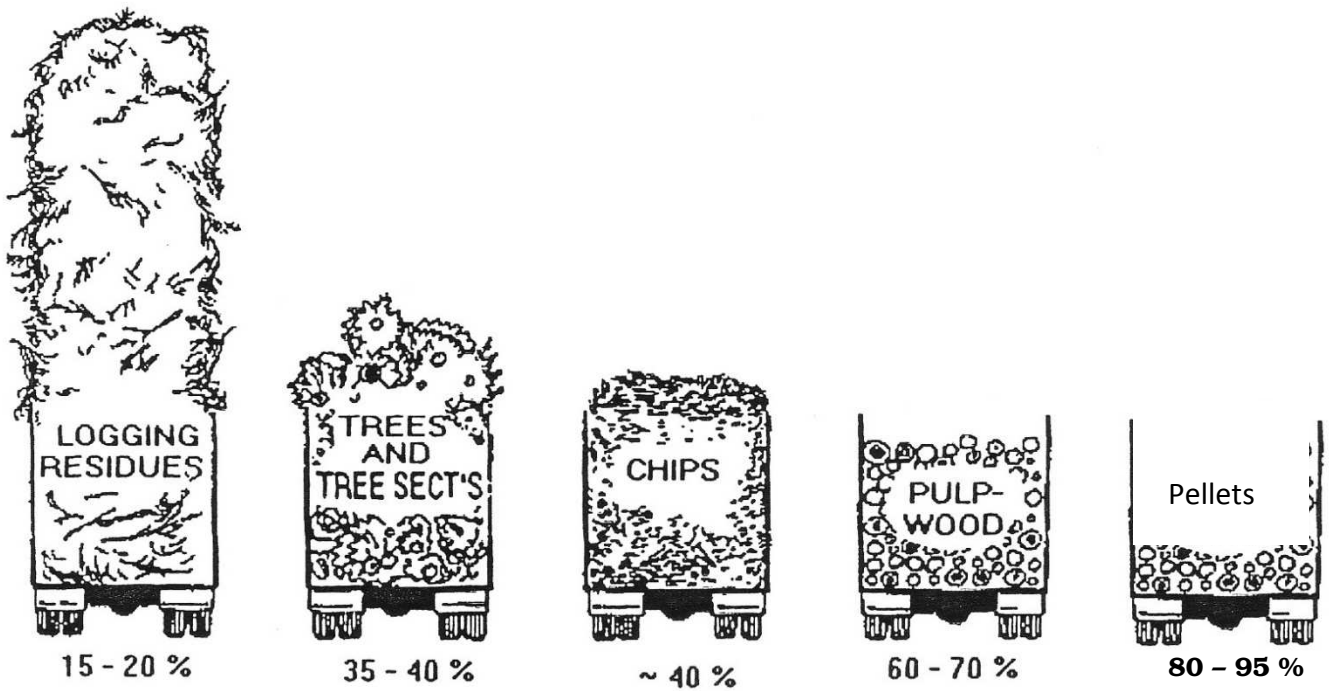
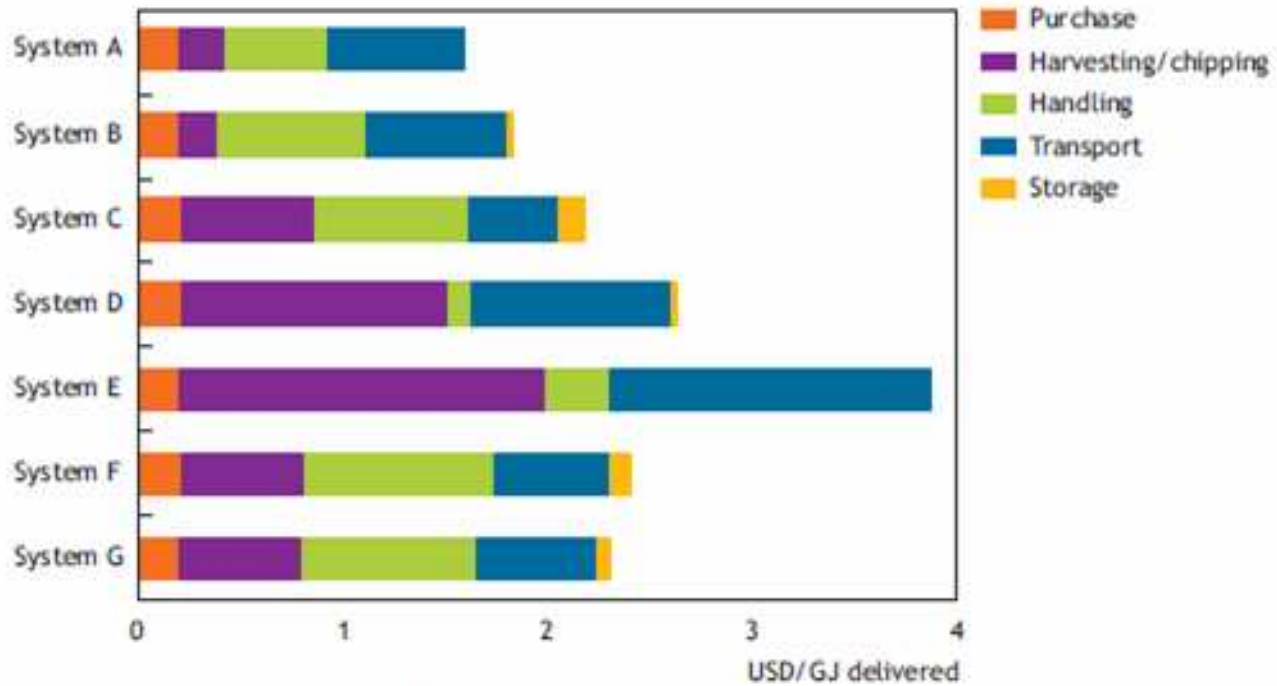


Figure 3.2-7. Proportion of solids in uncompacted logging residues and tree-sections, wood chips and conventional pulpwood. All loads have the same solid content. (After Nilsson 1983).

Supply Chain Variances

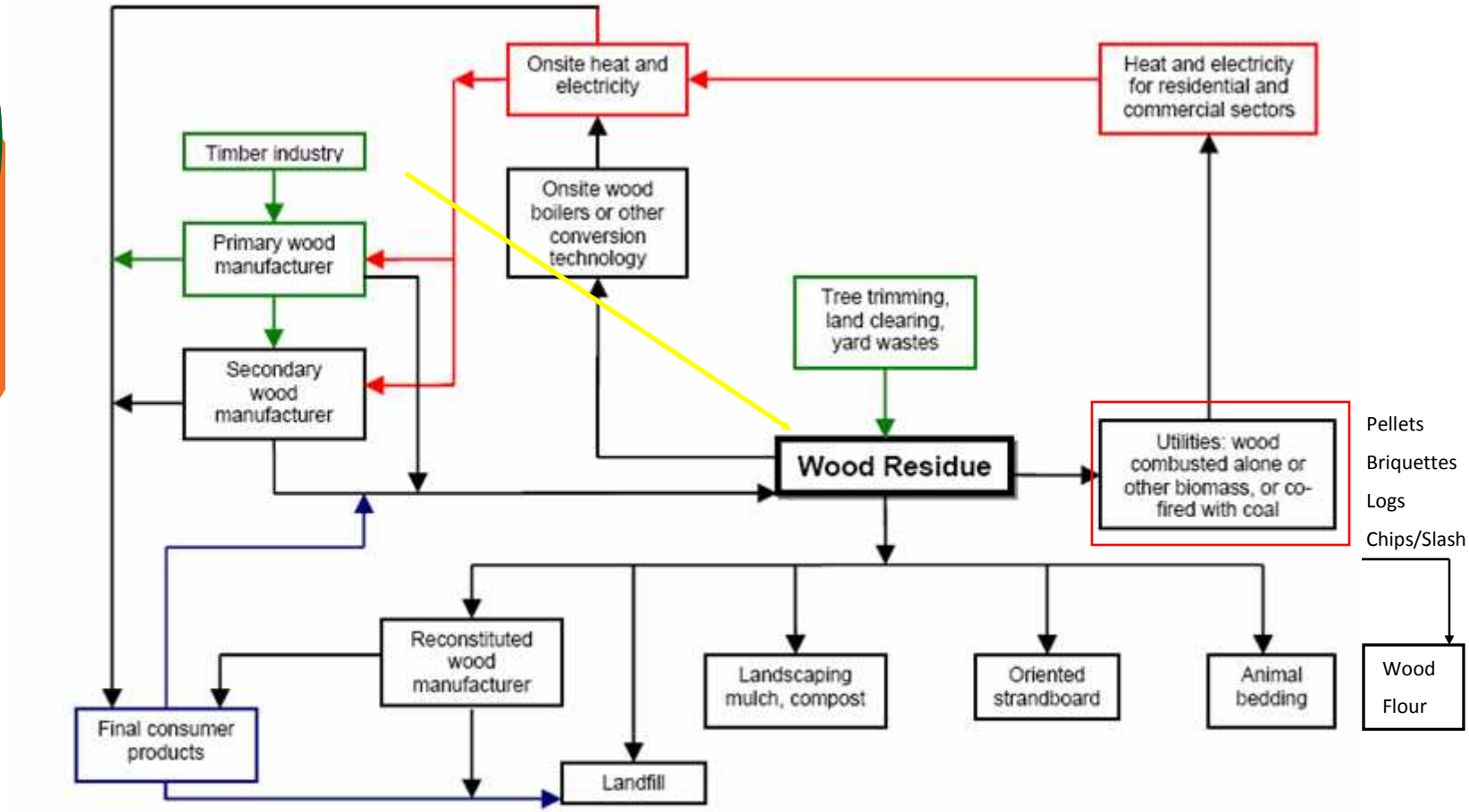
Vast differences even within similar feed stocks, costs and impacts



Arisings taken from a single forest site, purchased for USD 4/dry tonne, then delivered 80km over an identical route to a proposed bioenergy processing plant gate, using 7 different options (A-G) for collection and transport systems result in a wide range of costs (Sims, 2003).

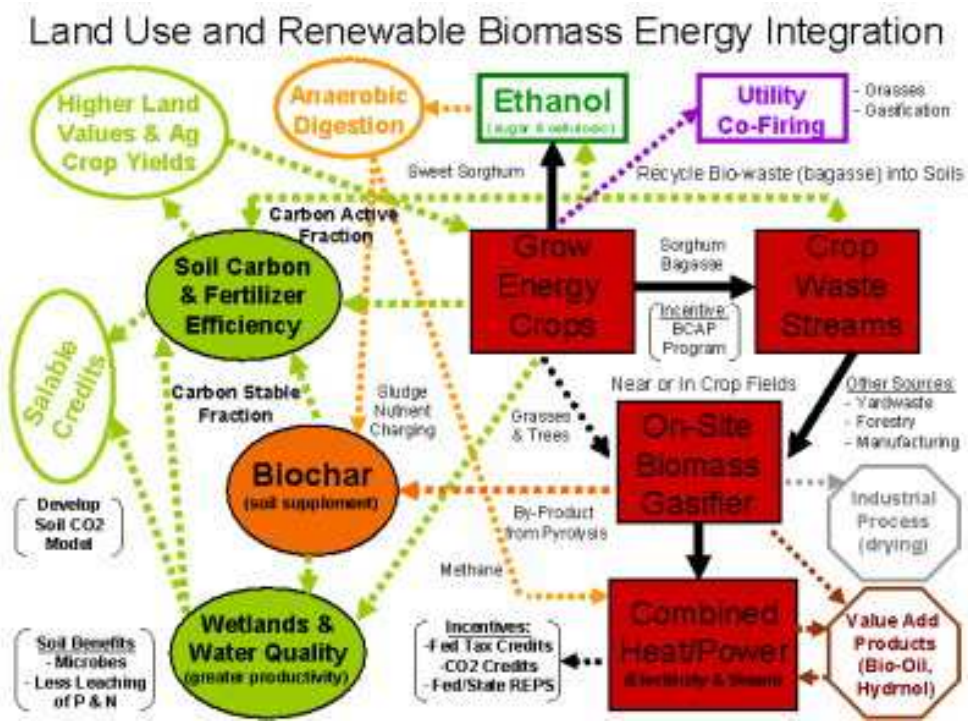
Credit for Source: International Energy Agency (IEA), Head of Publications Service, 9 rue de la Fédération, 75739 Paris Cedex 15, France.

Competing Markets & Technologies for Forest Resources



[43] This figure is based in part on wood residue generation and use mapping by Bibhakar Shakya in *Directory of Wood Manufacturing Industry of Ohio*, Ohio Biomass Energy Program, August 1997.

Competing Markets & Technologies for Agricultural Resources



Fuel Characteristics & Values

Average Heat Content of Selected Biomass Fuels

Fuel Type	Heat Content	Units
Agricultural Byproducts	8.248	Million Btu/Short Ton
Biodiesel	5.359	Million Btu/Barrel
Black Liquor	11.758	Million Btu/Short Ton
Digester Gas	0.619	Million Btu/Thousand Cubic Feet
Ethanol	3.563	Million Btu/Barrel
Landfill Gas	0.490	Million Btu/Thousand Cubic Feet
MSW Biogenic	9.696	Million Btu/Short Ton
Methane	0.841	Million Btu/Thousand Cubic Feet
Paper Pellets	13.029	Million Btu/Short Ton
Peat	8.000	Million Btu/Short Ton
Railroad Ties	12.618	Million Btu/Short Ton
Sludge Waste	7.512	Million Btu/Short Ton
Sludge Wood	10.071	Million Btu/Short Ton
Solid Byproducts	25.830	Million Btu/Short Ton
Spent Sulfite Liquor	12.720	Million Btu/Short Ton
Utility Poles	12.500	Million Btu/Short Ton
Waste Alcohol	3.800	Million Btu/Barrel

U.S. Energy Information Administration
Independent Statistics and Analysis

Charlie Niebling

Biomass User Profiles

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Applications for assorted biomass end users

Residential Scale

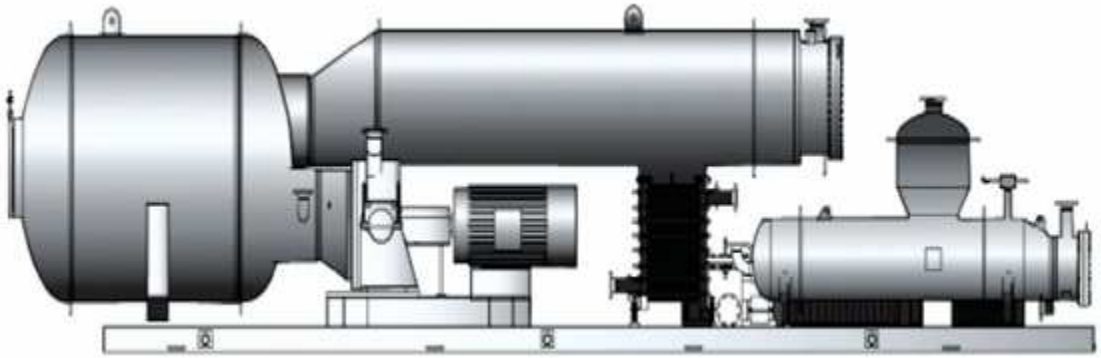
- Primarily solid wood and pellets
- Stoves, boilers, furnaces

Commercial-Scale

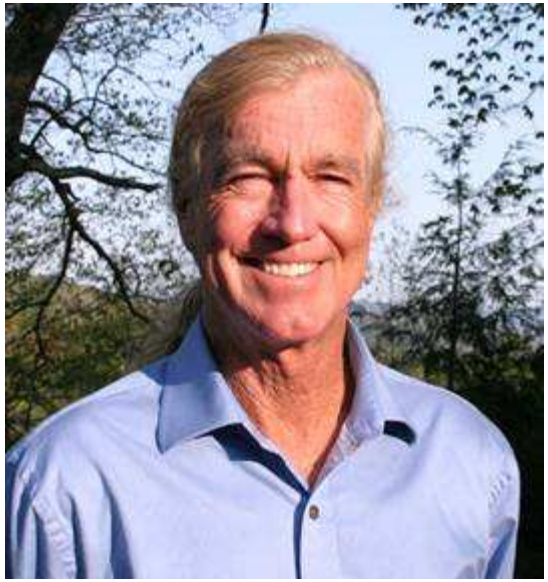
- Office buildings, hospitals, shopping malls, apartment complexes
- Pellets on smaller systems; chips on larger systems

Industrial-Scale

- Large scale heating (>5 MMBTU)
- Industrial process heat, e.g. food processing
- Combined heat and power (CHP) production



William Strauss



- President and Founder, FutureMetrics
- Director, Maine Energy Systems

Economic Impacts and Benefits of Biomass Thermal Energy

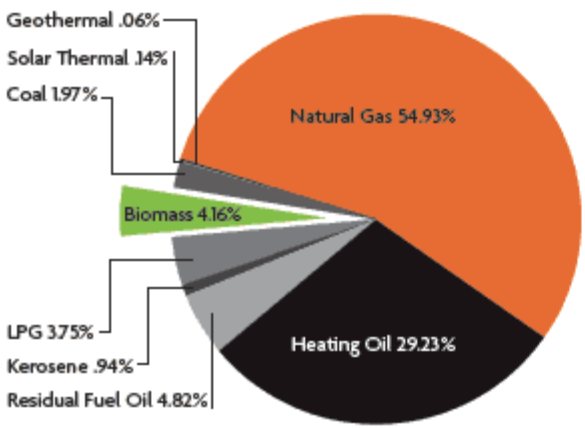
Heating the Northeast with Renewable Biomass

A Bold Vision *for* 2025

Maine Pellet Fuels Association | Pellet Fuels Institute | New York Biomass Energy Alliance | BTEC Biomass Thermal Energy Council | Alliance for Green Heat

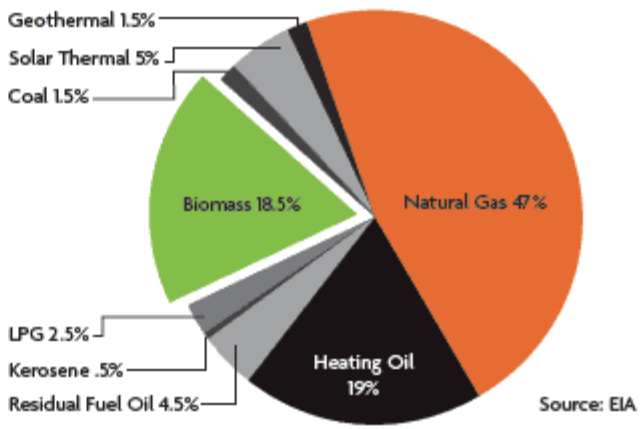
2010

New England and New York thermal energy from:



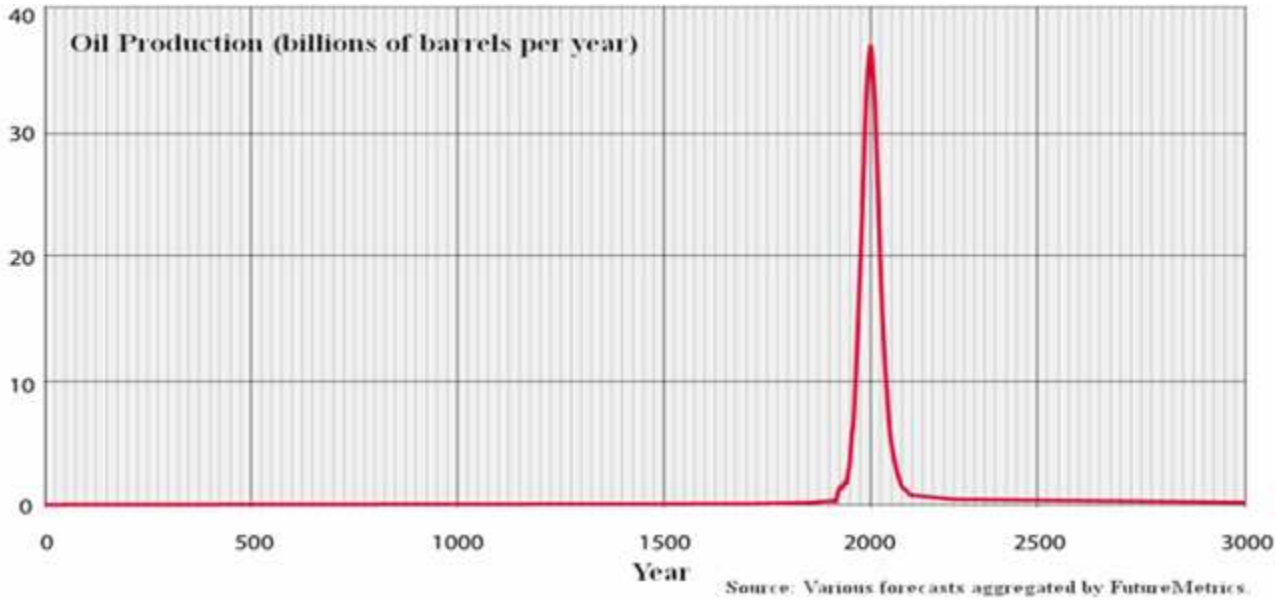
2025

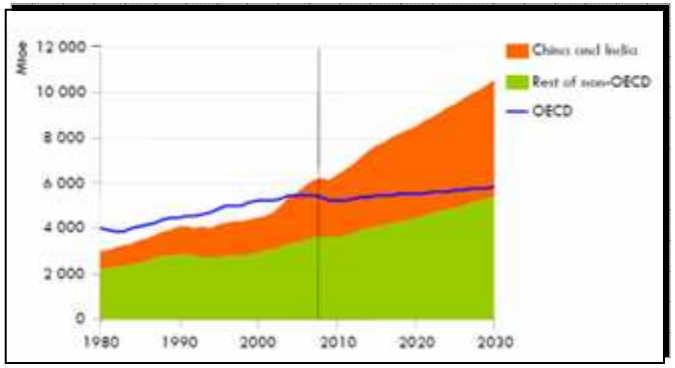
New England and New York thermal energy from:



Source: EIA

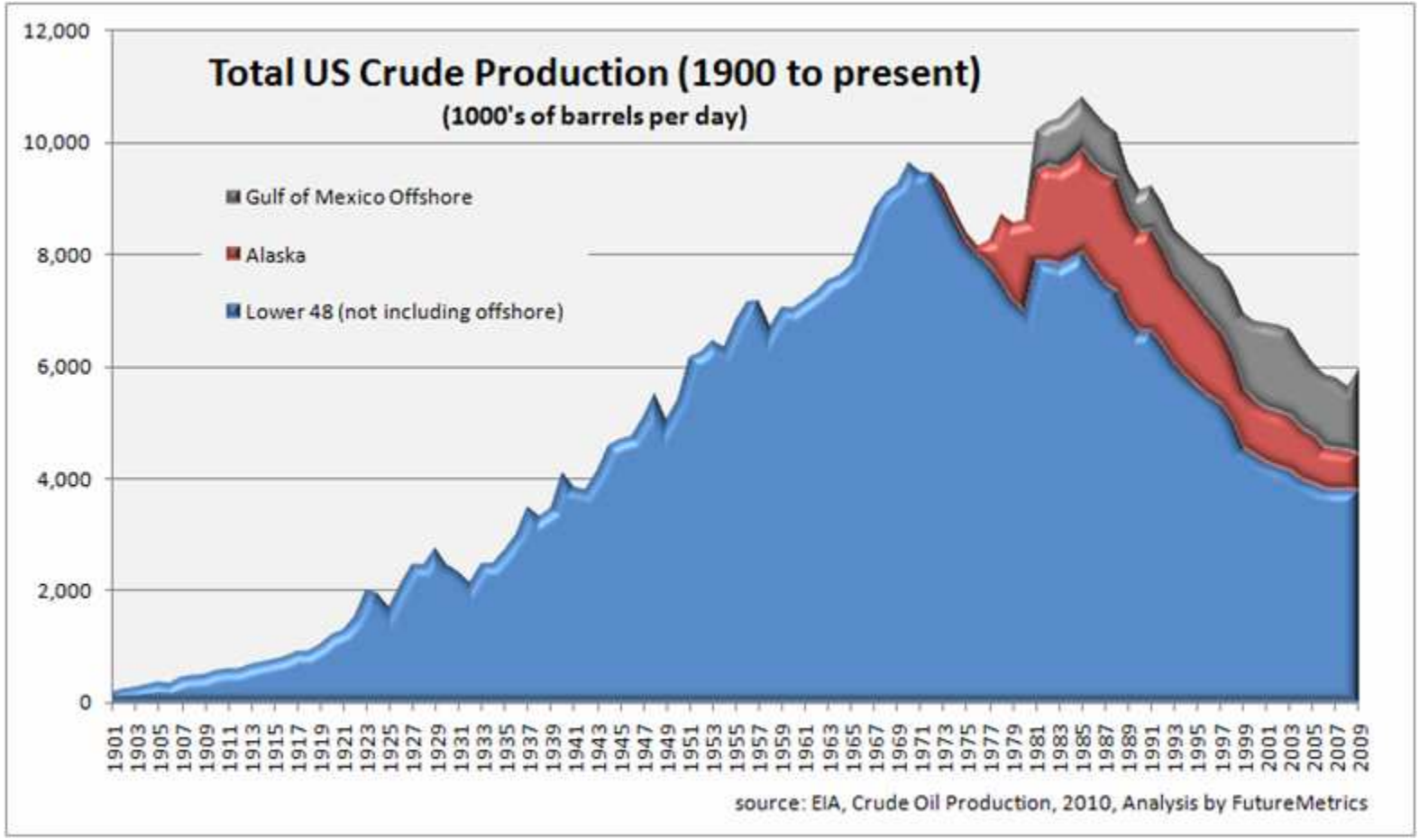
Fossil Fuels, “Long Run” View





Source: IEA

US Petroleum Production Peaked in 1988



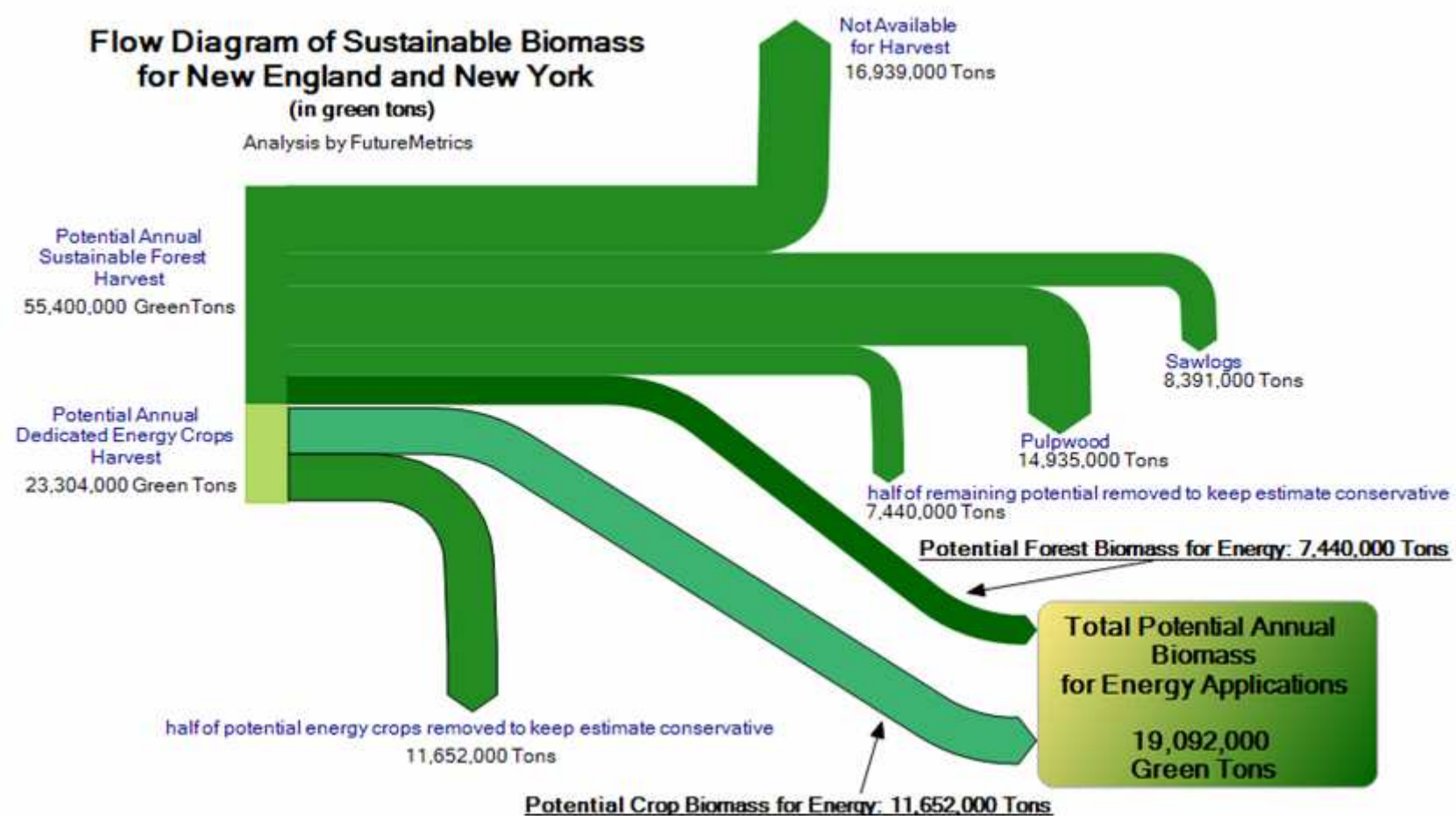
Fuel Prices and Job Losses in New England

#2 Distillate Fuel use in Residential, Commercial, and Industrial (not Transportation)	Average Gallons per Year	Money Exported from Regional Economy at $2.75/gal	Money Exported from Regional Economy at $4.50/gal	Annual Increased Loss of Money if Heating Oil goes to $4.50/gal	Permanent Increase in Jobs Lost
Maine	414,493,000	$889,087,485	$1,454,870,430	($565,782,945)	-32,777
Vermont	130,435,000	$279,783,075	$457,826,850	($178,043,775)	-10,091
New Hampshire	242,029,000	$519,152,205	$849,521,790	($330,369,585)	-17,867
Connecticut	672,464,000	$1,442,435,280	$2,360,348,640	($917,913,360)	-43,842
Rhode Island	148,551,000	$318,641,895	$521,414,010	($202,772,115)	-9,685
Massachusetts	818,841,000	$1,756,413,945	$2,874,131,910	($1,117,717,965)	-54,867
New York	1,818,841,000	$3,901,413,945	$6,384,131,910	($2,482,717,965)	-117,823
Pennsylvania	840,580,000	$1,803,044,100	$2,950,435,800	($1,147,391,700)	-54,452
New Jersey	459,420,000	$985,455,900	$1,612,564,200	($627,108,300)	-29,761
	5,545,654,000	$11,895,427,830	$19,465,245,540	($7,569,817,710)	**-371,165**

If #2 heating fuel goes from $2.75/gallon to $4.50/gallon, the increase in "exported" money leads to <u>massive job losses</u>.

Sustainable Biomass Supply

What if homes and businesses convert to biomass for heating?



Economic Benefits

Two main economic benefits from converting biomass to thermal energy:

- New or sustained jobs (direct, indirect, and induced) created from the fuel production and delivery infrastructure;

- New jobs created due to the money spent on fuel remaining in the regional (mainly rural) economy.

Economic Impacts

New or Sustained Direct, Indirect, and Induced Jobs (and their total annual income)

	Forest Biomass Production per Year	Crop Biomass Production per Year	Total Biomass Production per Year	Direct Jobs	Income at $37,000 per Year per job	Indirect and Induced Jobs	Multiplier Income at $37,000 per Year - Tax Rate 35%	Total ANNUAL Income
CT	100,000	354,000	454,000	776	$ 28,725,000	609	$ 7,888,000	$ 36,613,000
MA	110,000	498,000	608,000	1,040	$ 38,468,000	931	$ 12,058,000	$ 50,526,000
ME	3,190,000	450,000	3,640,000	6,224	$ 230,303,000	6,261	$ 81,084,000	$ 311,387,000
NH	400,000	294,000	694,000	1,187	$ 43,909,000	1,141	$ 14,778,000	$ 58,687,000
NY	3,330,000	8,766,000	12,096,000	20,684	$ 765,314,000	18,232	$ 236,110,000	$ 1,001,424,000
RI	10,000	156,000	166,000	284	$ 10,503,000	211	$ 2,736,000	$ 13,239,000
VT	300,000	1,134,000	1,434,000	2,452	$ 90,729,000	3,041	$ 39,385,000	$ 130,114,000
TOTAL	7,440,000	11,652,000	19,092,000	32,647	$1,207,951,000	30,428	$ 394,039,000	**$ 1,601,990,000**

Job Creation

- Case Study: Jobs created by the fuel expenditures remaining in the North East regional economy by 2025

	Current Prices				2025 Prices			
	Spending on Heating Oil and Propane Equivalent at $2.75/gallon	Amount that Would be Spent on Pellet Fuel at $265/ton for equivalent heat	Annual Savings	**Total Jobs Due to Heating Cost Savings**	Spending on Heating Oil and Propane Equivalent at $5.43/gallon	Amount that Would be Spent on Pellet Fuel at $459/ton for equivalent heat	Annual Savings (in 2025 dollars)	**Total Jobs in 2025 Due to Heating Cost Savings**
CT	$ 406,780,000	$ 314,502,000	$ 92,278,000	3,052	$ 803,273,711	$ 532,279,800	$ 270,994,000	8,964
MA	$ 584,155,000	$ 451,639,500	$ 132,515,500	4,684	$1,153,538,411	$ 764,378,550	$ 389,160,000	13,754
ME	$ 262,515,000	$ 202,963,500	$ 59,551,500	2,484	$ 518,391,756	$ 343,506,150	$ 174,886,000	7,295
NH	$ 196,295,000	$ 151,765,500	$ 44,529,500	1,734	$ 387,626,268	$ 256,855,950	$ 130,770,000	5,092
NY	$ 1,617,660,000	$ 1,250,694,000	$ 366,966,000	12,539	$3,194,414,062	$ 2,116,740,600	$ 1,077,673,000	36,823
RI	$ 104,060,000	$ 80,454,000	$ 23,606,000	812	$ 205,488,624	$ 136,164,600	$ 69,324,000	2,384
VT	$ 104,060,000	$ 80,454,000	$ 23,606,000	963	$ 205,488,624	$ 136,164,600	$ 69,324,000	2,829
			$ 743,052,500	**26,268**			**$ 2,182,131,000**	**77,141**

Total Permanent Annual Income and Jobs by 2025

	Total Permanent ANNUAL Income	Total Permanent Jobs in 2025
CT	$ 324,020,541	10,349
MA	$ 462,336,713	15,725
ME	$ 625,867,221	19,780
NH	$ 215,766,274	7,420
NY	$ 2,528,033,543	75,740
RI	$ 88,498,019	2,879
VT	$ 257,767,868	8,322
	$ 4,502,290,180	**140,216**

Charlie Niebling

Looking Ahead

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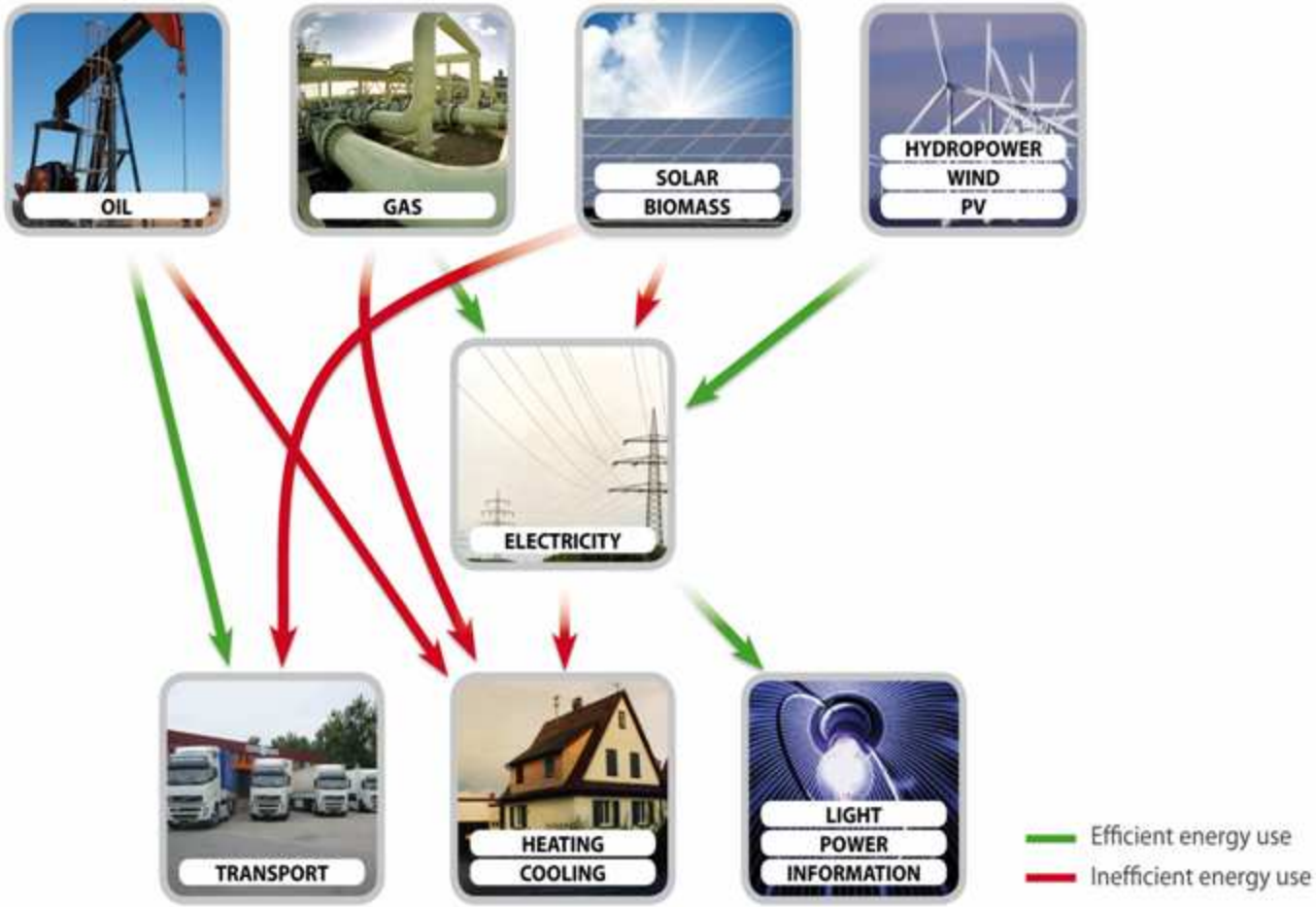
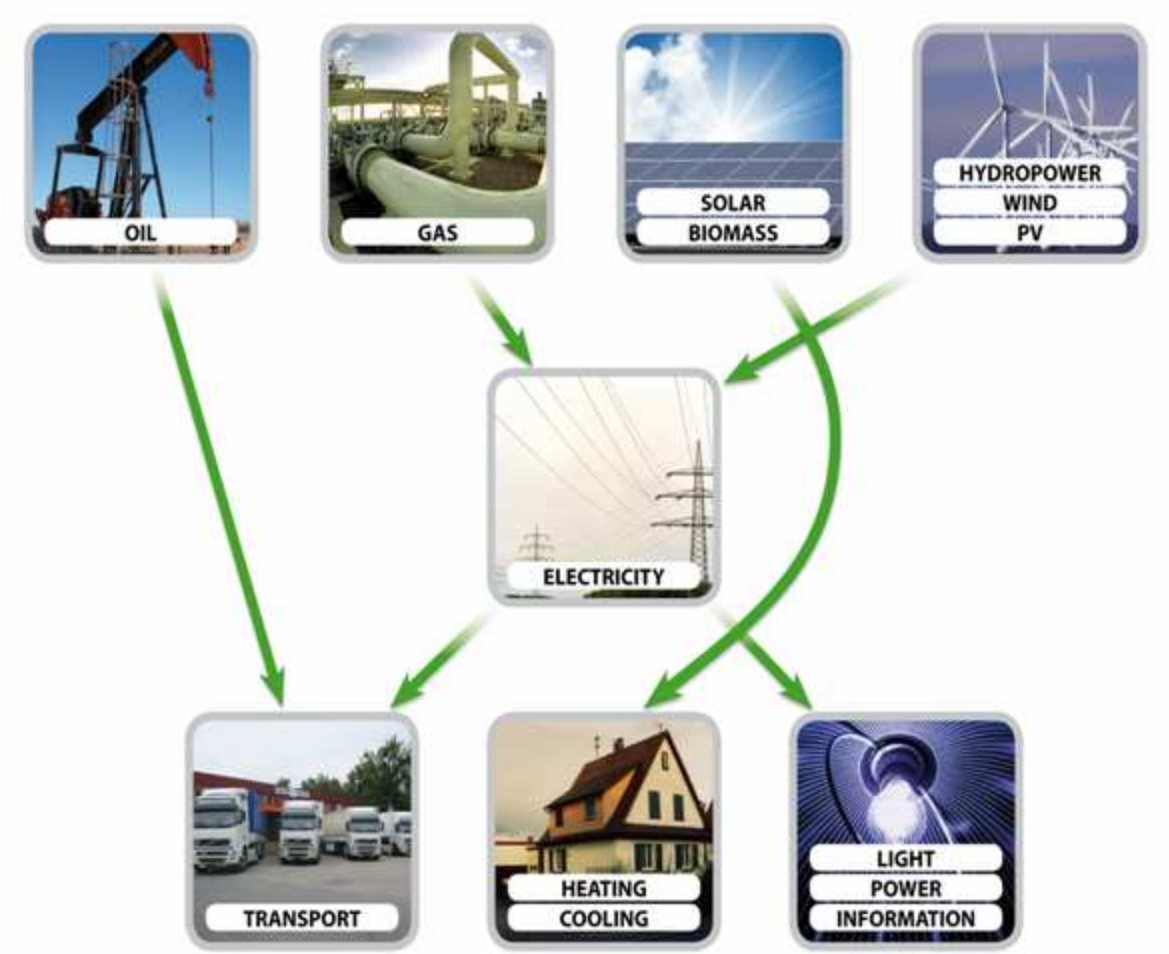
Developments in the Biomass Thermal Industry

Energy Use - Today



Energy Use - Tomorrow



Moving Forward – Industry Challenges 1/2

- **Getting organized** as an industry, still small and fragmented
- **Building effective advocacy and outreach** at regional/state level – continuing work in DC
- **Research and analysis** – e.g. potential impact of biomass thermal to address America's energy challenges – strategic vision to realize this potential
- **Competency in manufacturing** – fuel, heating technology

Moving Forward – Industry Challenges 2/2

- **Risk capital** to build market– e.g. bulk delivery of fuels
- **Air emissions** – major regulatory attention on biomass combustion
- **Sustainability** – increasing attention on how/whether US biomass supply can support growing demand for energy
- How to **compete** when oil/gas stay "cheap"?

Moving Forward – Key Federal/Policy Issues 1/2

- **Elevate profile of biomass thermal** with key federal agencies: USDOE, USDA, EPA
- **Parity with other renewables** in federal treatment: Passage of investment tax credits, production credits (i.e. TREEA)
- **Carbon neutrality** and biomass – make sure biomass retains carbon advantages over fossil fuels in any GHG regulatory scheme

Moving Forward – Key Federal/Policy Issues 2/2

- **Develop research and analysis agenda** working with: USDOE, USDA, EPA
- State policy – make sure biomass thermal treated **equitably** with biomass electric/cellulosic ethanol

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.

Additional Webinar Topics in 2010 & 2011

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

Upcoming Events

- **Congressional Briefing** on Biomass Thermal Energy on Wednesday, October 6, 2010, 10:30 AM, titled:

"Heating and Cooling with Sustainable Biomass Energy"

at the House Energy & Commerce Committee Room (TBD)

- **BTEC Membership Meeting** – November 16/17, 2010 in Washington, D.C.

More Information

- **This Webinar will be available** on www.biomassthermal.org/resource by October 1, 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