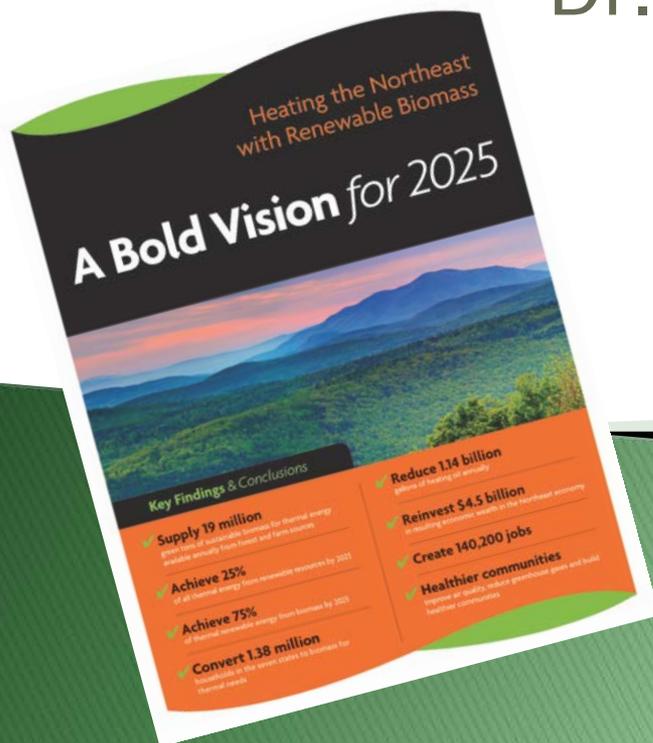


How to Cure our Heating Oil Addiction:

a roadmap based on the 25x25 Vision

Dr. William Strauss, Chief Economist,
Biomass Thermal Energy Council;
President, FutureMetrics



**Woody Biomass Energy Research Symposium
for the Northern Forest
April 28 to 30, 2011 at the University of Vermont**

Organizations involved in developing the Vision:

- ▶ **Biomass Thermal Energy Council**
- ▶ **Alliance for Green Heat**
- ▶ **Maine Pellet Fuels Association**
- ▶ **NY Biomass Energy Alliance**
- ▶ **Pellet Fuels Institute**

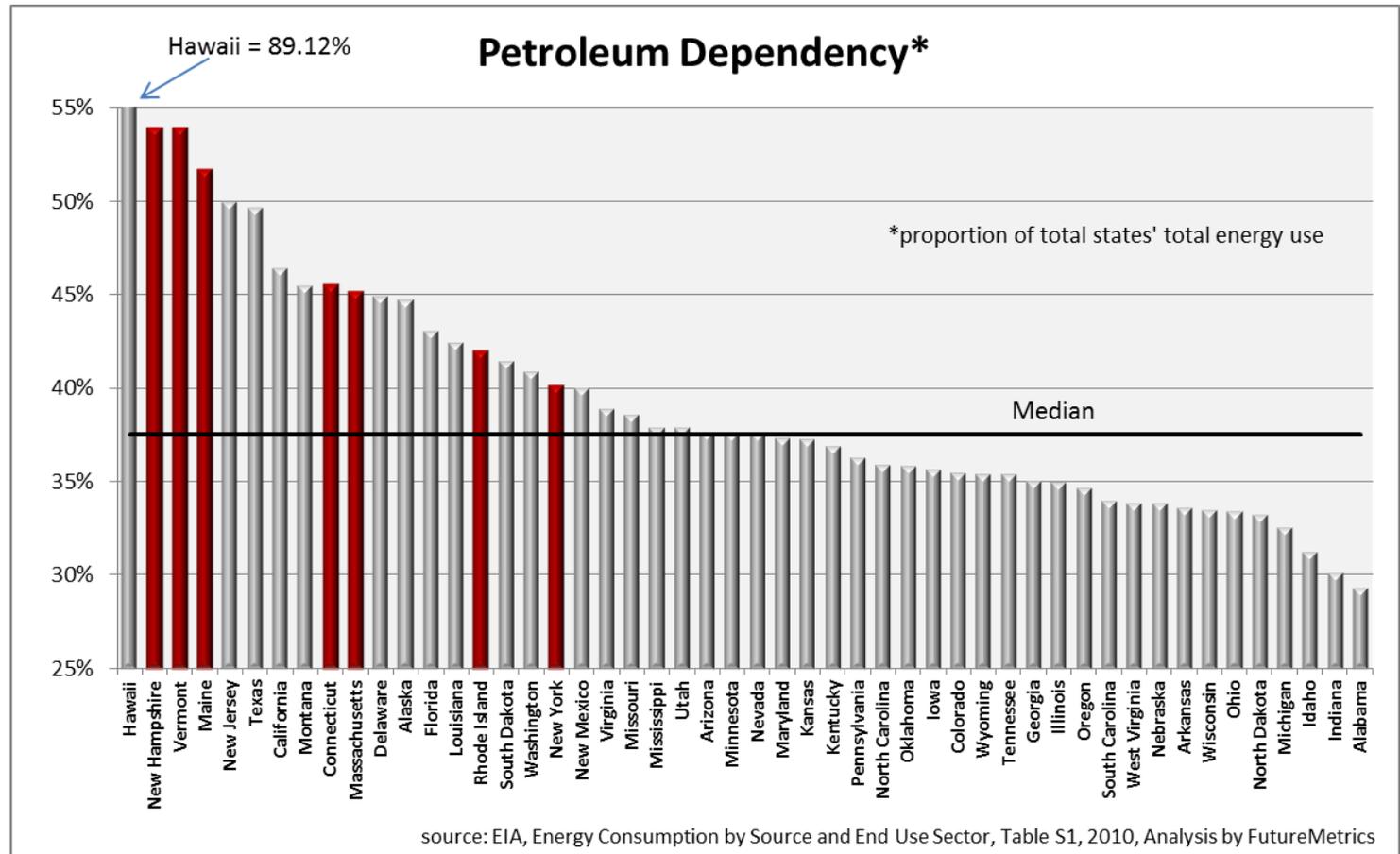


Feedstock Supply and Economic Impact

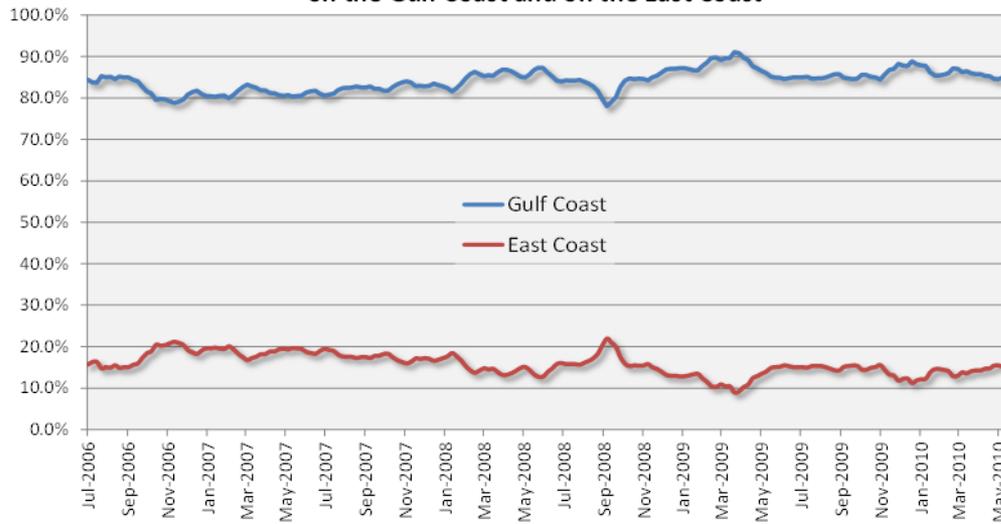
Analysis by *FutureMetrics*

Addiction?

The northeastern US states are uniquely and overwhelmingly dependent on #2 oil for heat.



Proportion of Northeast States' Low Sulfur Distillate Fuel Oil Produced on the Gulf Coast and on the East Coast

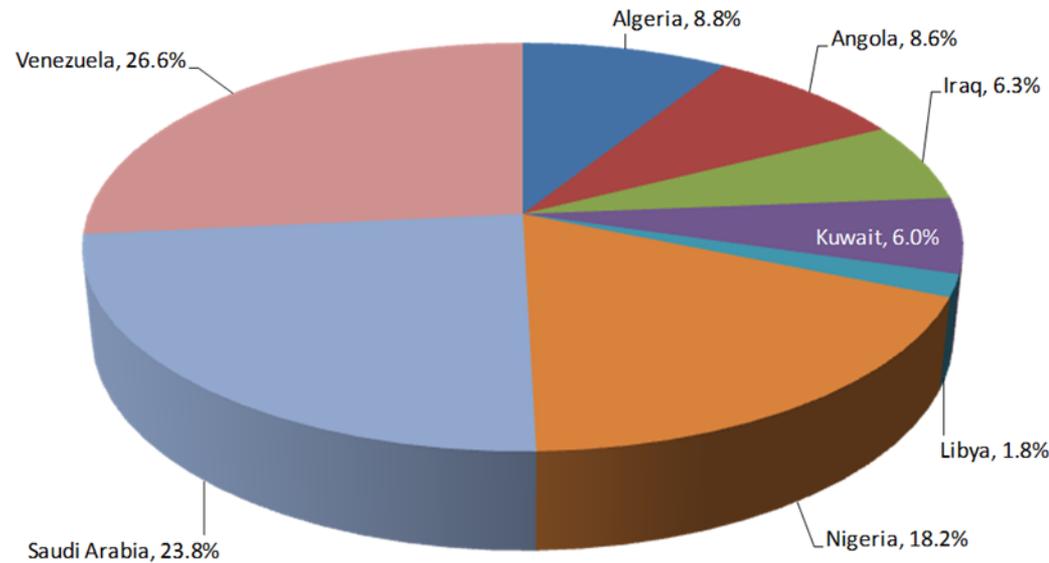


source: EIA Weekly Update for Fuel Oil 15ppm Sulfur and Under, June, 2010, Analysis by FutureMetrics

Only about 21% of the crude oil refined in the Gulf Coast area is from domestic offshore production in the Gulf of Mexico (48 million barrels per month of a total of 228 million barrels per month entering Gulf coast refineries*).

The rest is imported. About 60% of the imports are from OPEC nations and about 19% are from Mexico.

Where Gulf Coast OPEC Oil Comes From



*EIA, Special Report, Gulf of Mexico Fact Sheet, June 15, 2010.

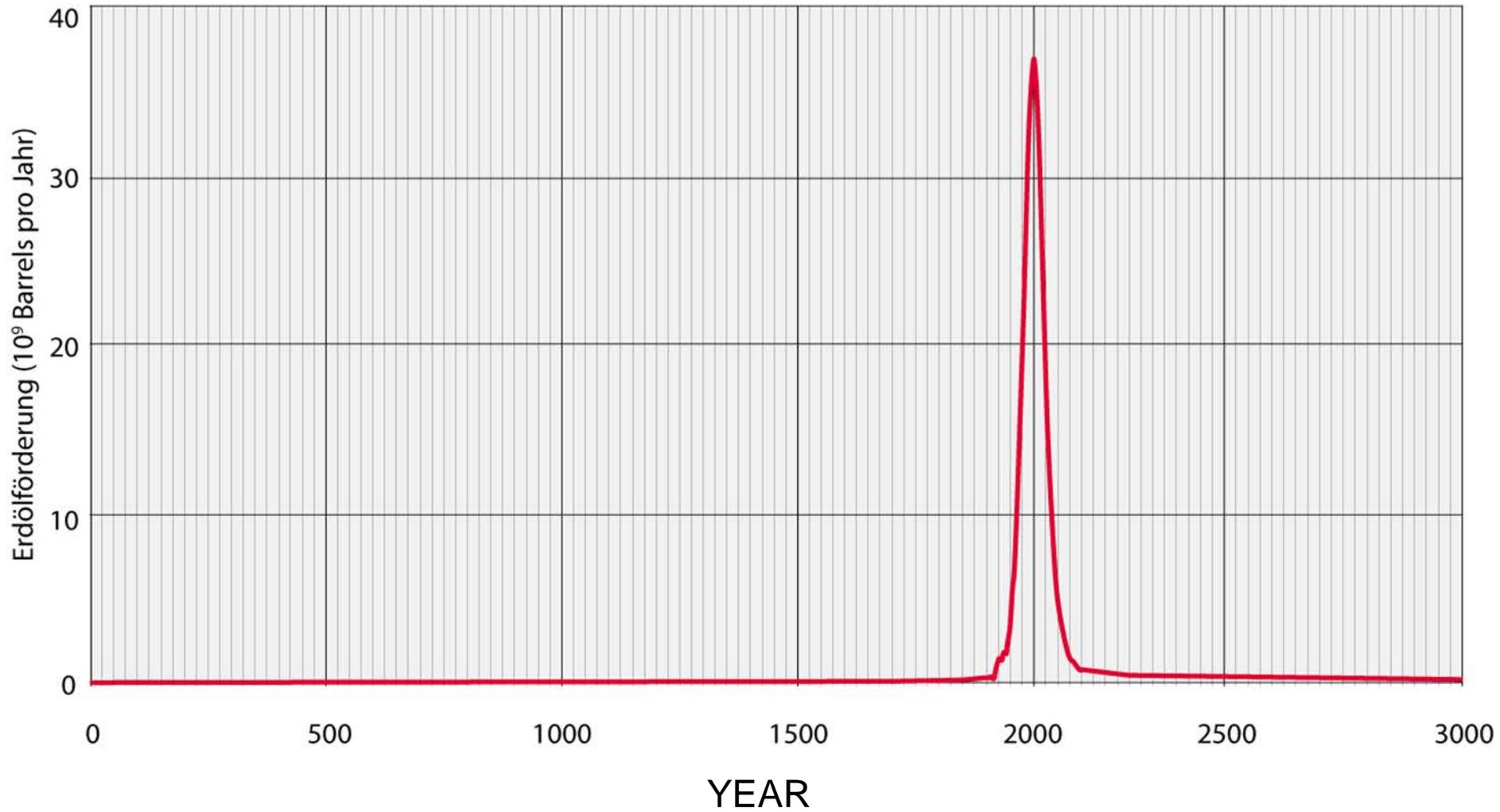
Source: EIA, Gulf Coast Total Crude Oil and Products Imports, June, 2010, Analysis by FutureMetrics

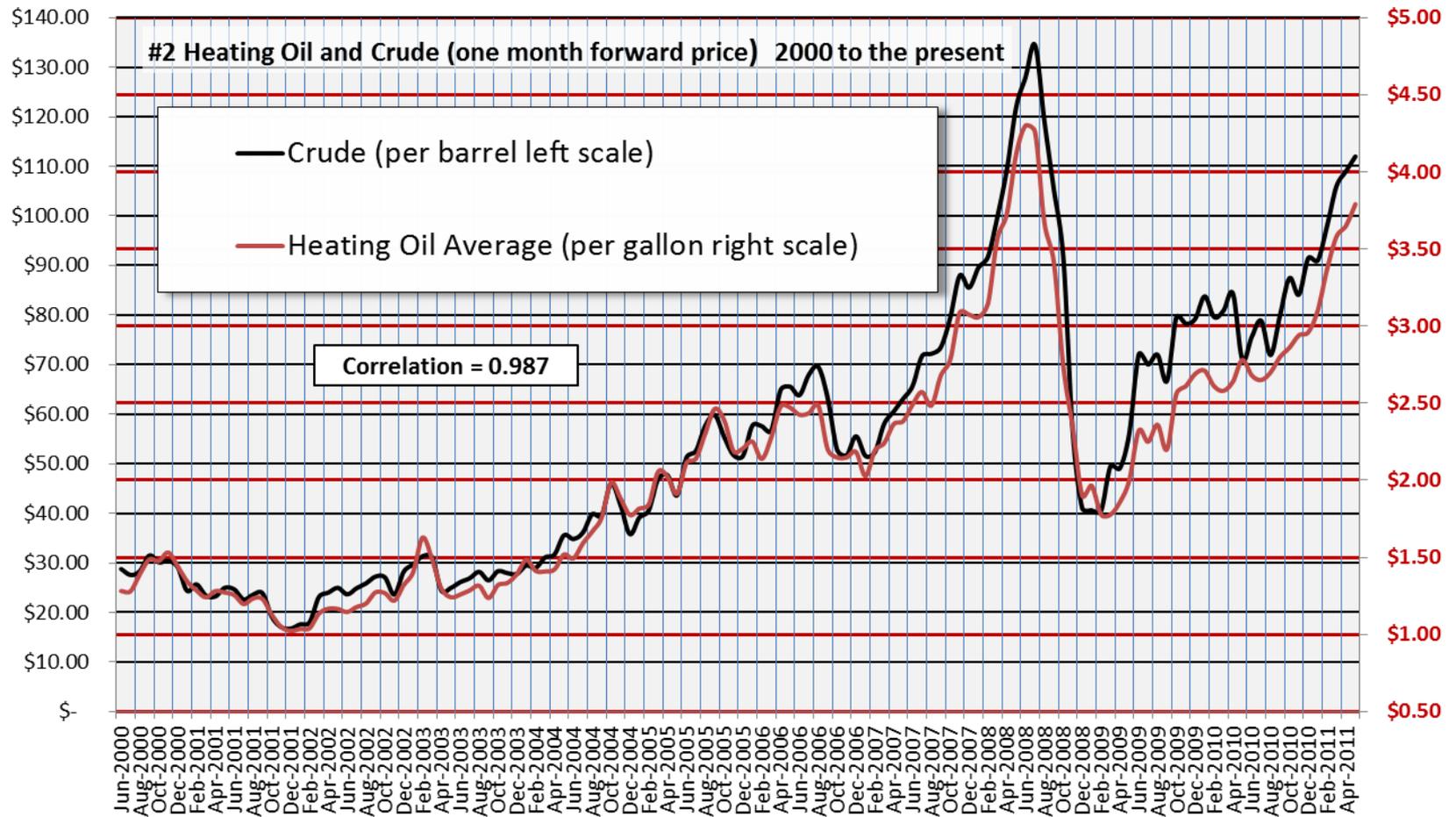
Natural Gas is not available in the most rural states (which are also the MOST dependent on heating oil).

How Homes are Heated						
	Maine		New Hampshire		Vermont	
	Households		Households		Households	
Total:	542,617	100.00%	502,201	100.00%	250,375	100.00%
Utility natural gas	19,957	3.68%	98,276	19.57%	35,478	14.17%
Bottled, tank, or LP gas	33,948	6.26%	63,624	12.67%	37,569	15.01%
Electricity	25,474	4.69%	37,807	7.53%	10,321	4.12%
Fuel oil, kerosene, etc.	410,296	75.61%	269,329	53.63%	134,100	53.56%
Coal or coke	1,074	0.20%	735	0.15%	434	0.17%
Wood	47,475	8.75%	26,098	5.20%	29,603	11.82%
Solar energy	236	0.04%	99	0.02%	102	0.04%
Other fuel	3,129	0.58%	4,039	0.80%	1,744	0.70%
No fuel used	1,028	0.19%	2,194	0.44%	1,024	0.41%

Source: U.S. Census Bureau, 2005-2009 American Community Survey

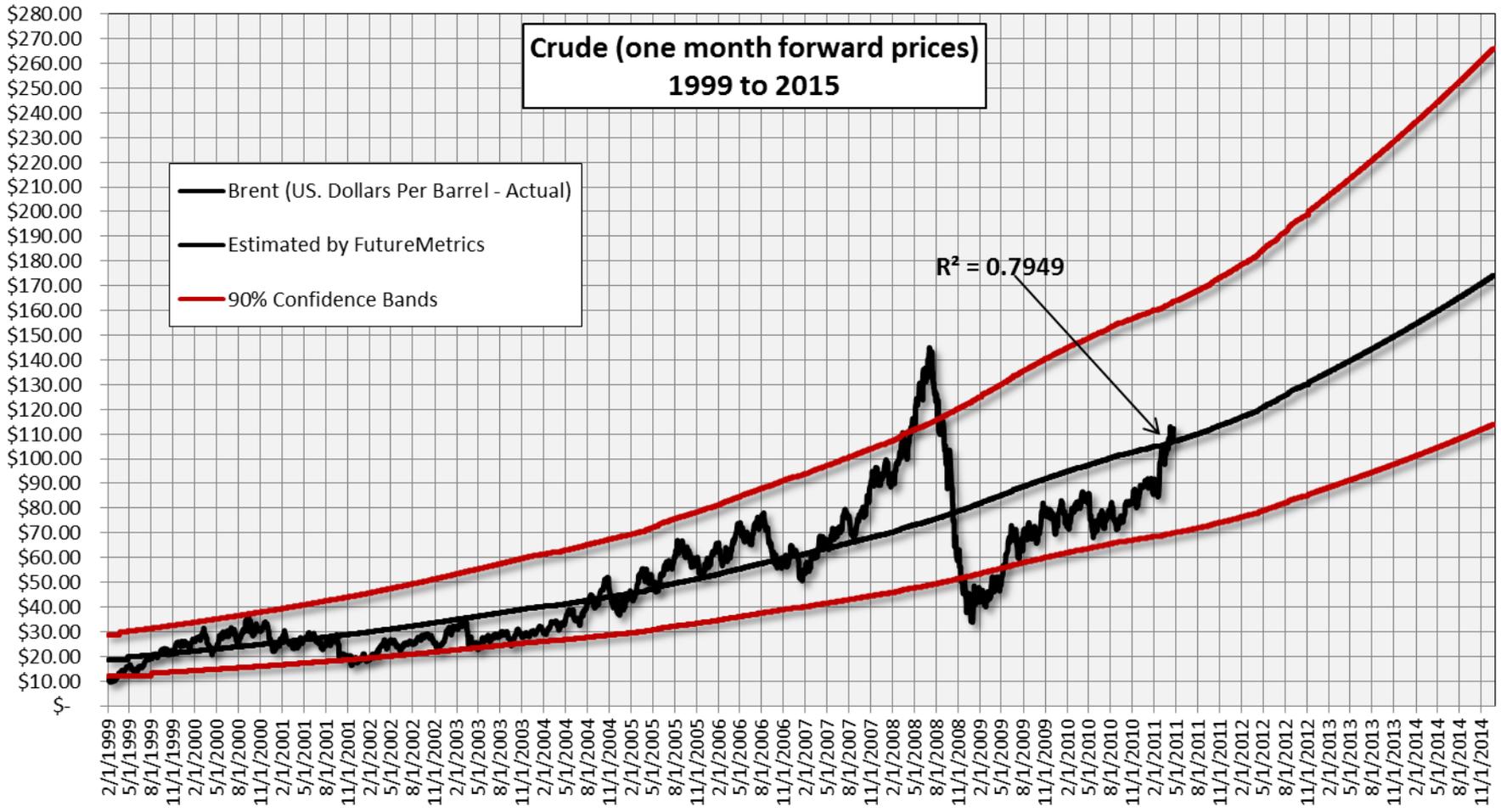
The Oil Age





source: EIA, May, 2011, Analysis by FutureMetrics

**Crude (one month forward prices)
1999 to 2015**



Source, EIA, Analysis by FutureMetrics

These states will “export” more than 17 BILLION dollars per year*

	Number of Households that Use #2 Heating Oil	Average Gallons Used per Year by those Homes	Average Total Expenditure Per Year (#2 at \$3.80/gal)	Amount that Does <u>not</u> Stay in the States (EXPORTED)
Connecticut	688,000	591,680,000	\$ 2,248,384,000	\$ 1,753,740,000
Maine	434,000	373,240,000	\$ 1,418,312,000	\$ 1,106,283,000
Massachusetts	955,000	821,300,000	\$ 3,120,940,000	\$ 2,434,333,000
New Hampshire	291,000	250,260,000	\$ 950,988,000	\$ 741,771,000
New York	2,609,000	2,243,740,000	\$ 8,526,212,000	6,650,445,000
Pennsylvania	1,415,000	1,216,900,000	\$ 4,624,220,000	3,606,892,000
Rhode Island	170,000	146,200,000	\$ 555,560,000	433,337,000
Vermont	148,000	127,280,000	\$ 483,664,000	\$ 377,258,000
Total	6,710,000	5,770,600,000	\$ 21,928,280,000	\$ 17,104,059,000

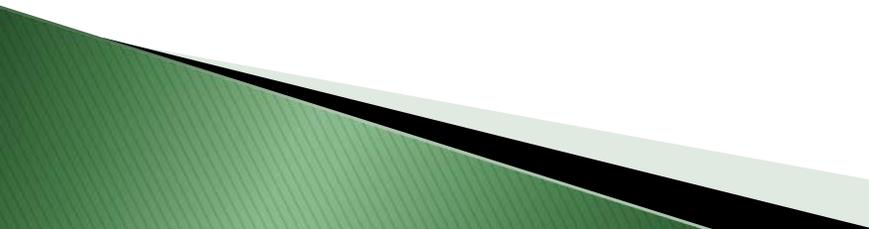
*The US EIA data shows that 78% of every dollar spent on heating oil leaves the region and much of those dollars leave the country.

More than 950,000 jobs would be added to these states' economies if all of that money remained in the region.

The "Vision" is to convert 25% of northeastern homes' THERMAL needs to renewable energy by 2025.

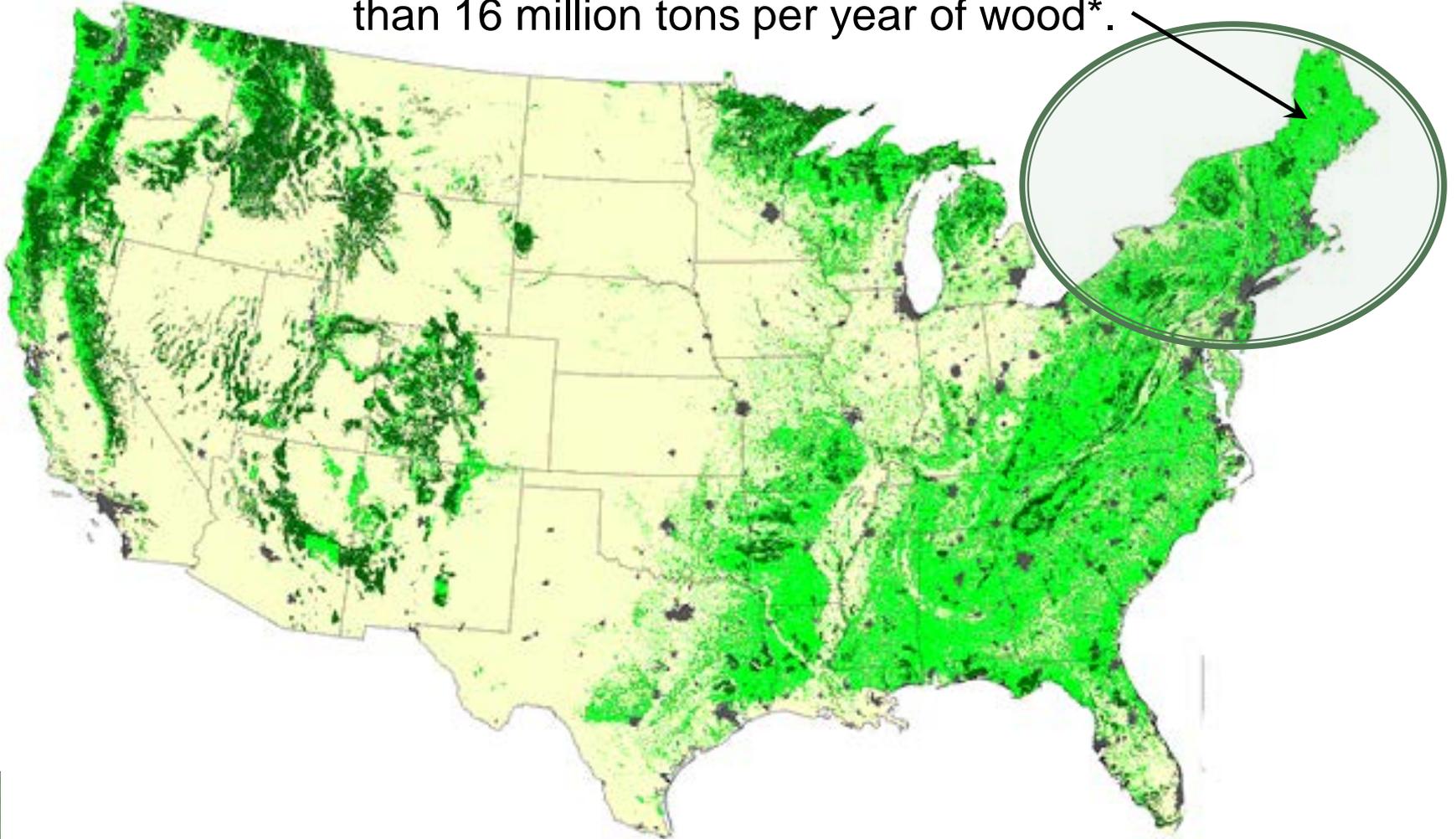


What is Achievable? It Starts with Sustainable Feedstock Supply

- ▶ **Forest and agricultural sources**
 - ▶ **Estimate annual forest growth across seven states**
 - ▶ **Subtract % not available for harvest ($\approx 30\%$)**
 - ▶ **Subtract current and future consumption for all forest products**
 - ▶ **Remaining % available for biomass energy**
 - ▶ **Then reduce this % in half to be conservative**
 - ▶ **Repeat exercise for agricultural sources**
- 

The Northeast is heavily Forested

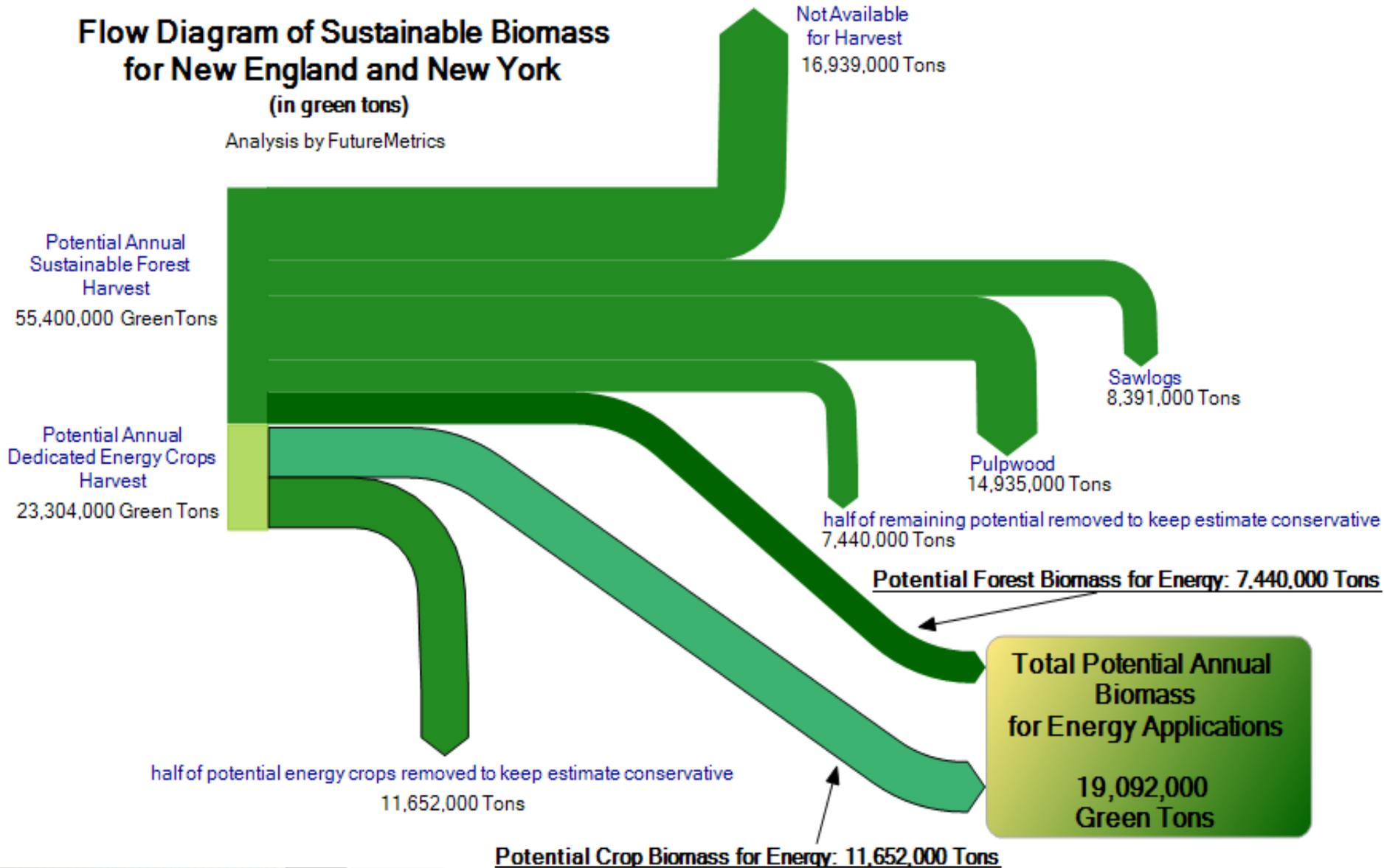
Maine alone sustainably harvests more than 16 million tons per year of wood*.



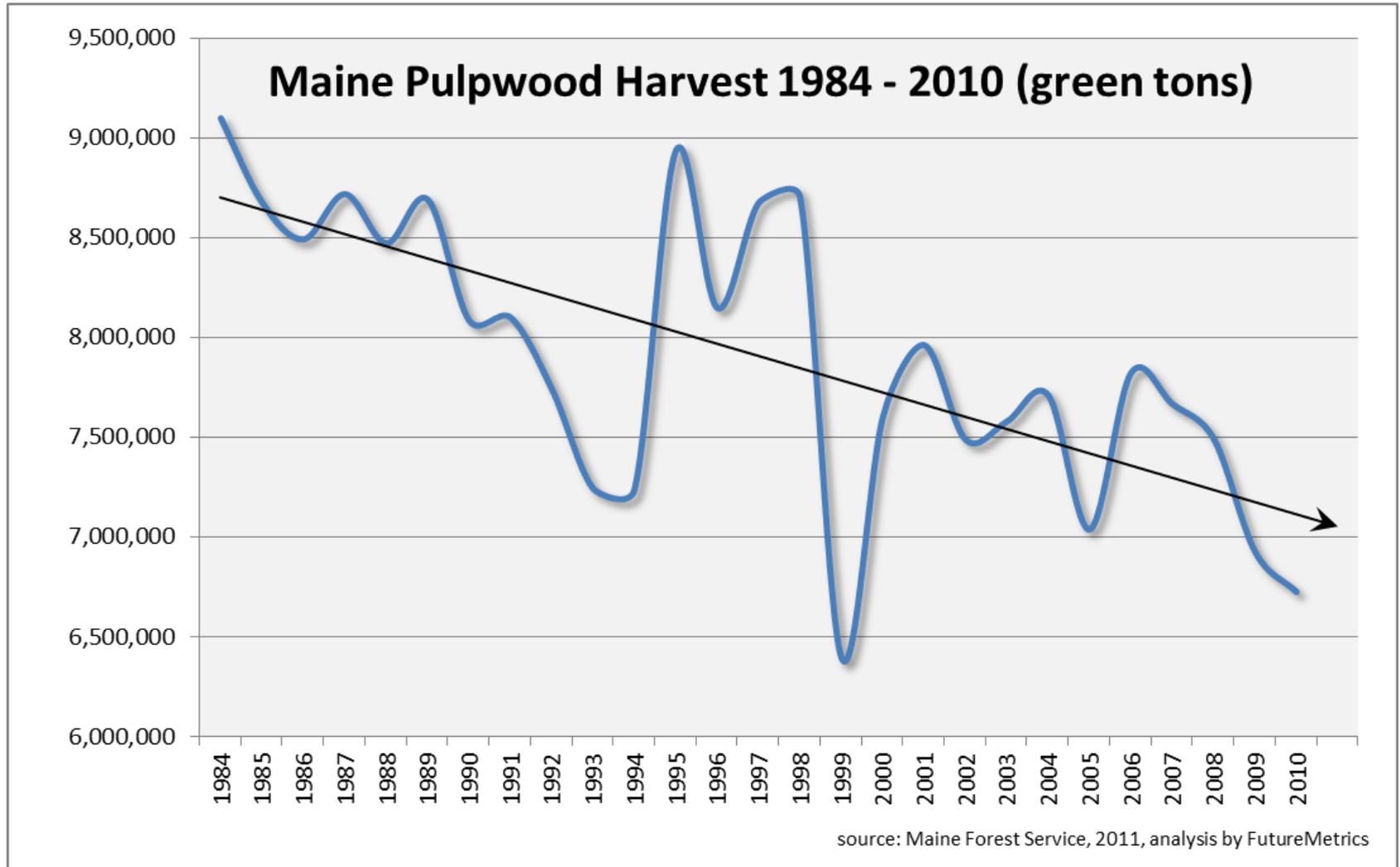
*Maine Forest Service data, 2010

Flow Diagram of Sustainable Biomass for New England and New York (in green tons)

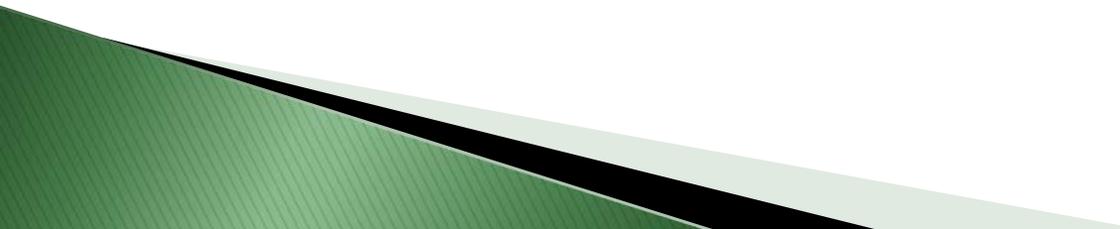
Analysis by FutureMetrics



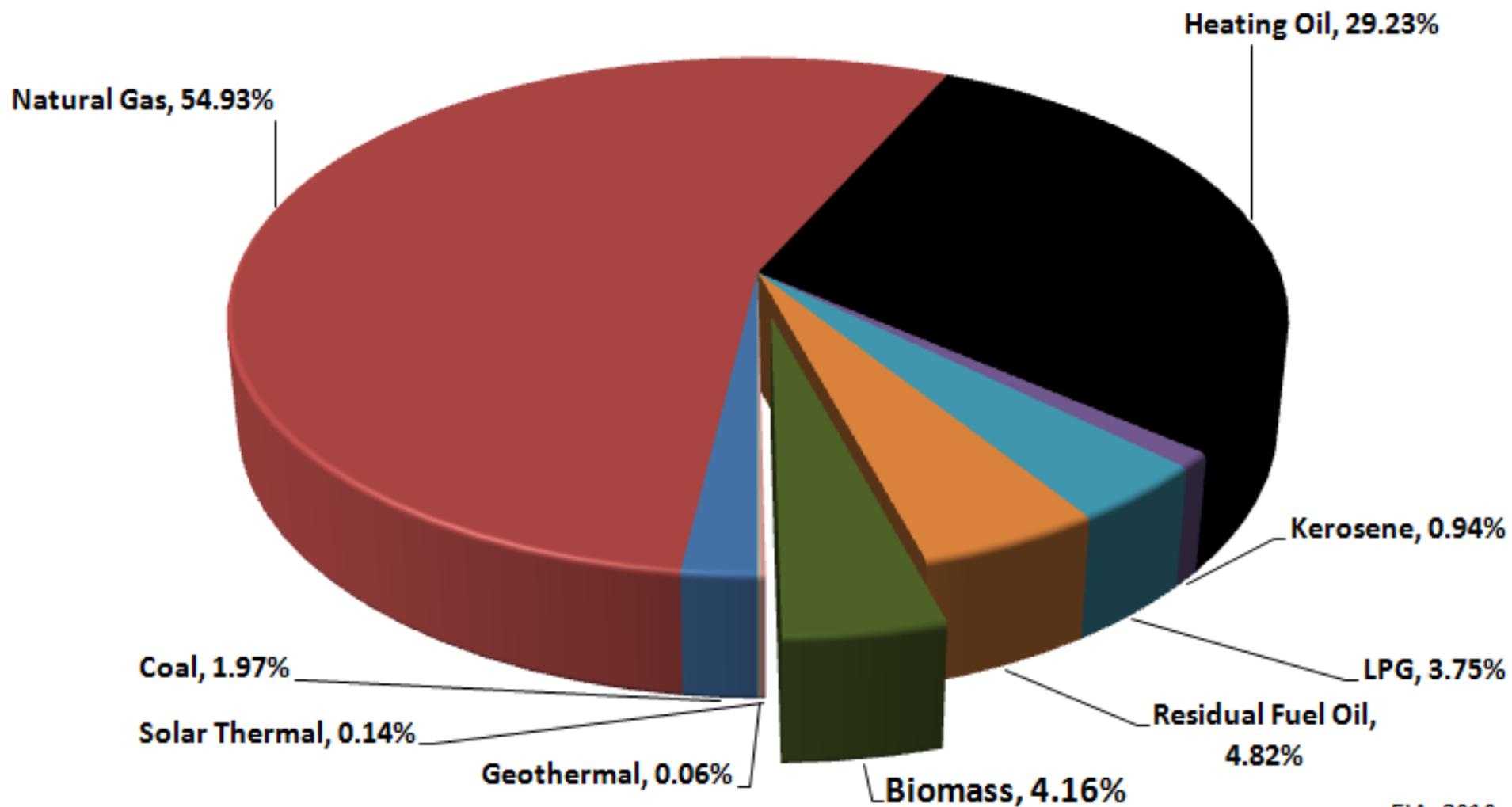
Pulpwood demand is shrinking!



The “Vision” is about:

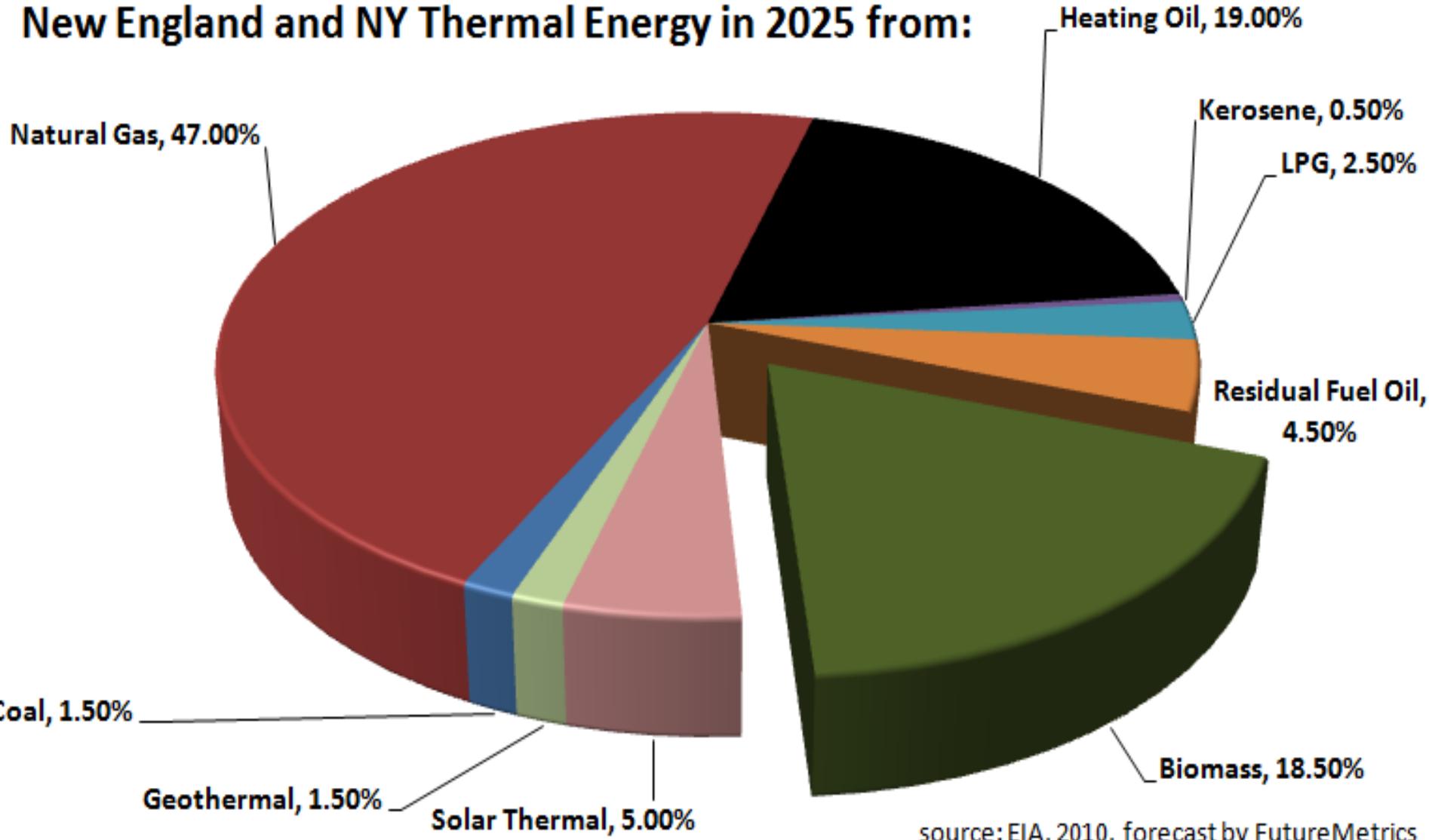
- ▶ A transformation to thermal renewable energy, to start in the Northeast
 - ▶ 25% of all thermal energy in Northeast from renewable energy by 2025
 - ▶ 75% of renewable thermal energy from biomass by 2025 (balance from solar thermal and geothermal)
- 

New England and NY Thermal Energy is Currently from:



source: EIA, 2010

New England and NY Thermal Energy in 2025 from:



source: EIA, 2010, forecast by FutureMetrics

Potential Economic Benefits

- ▶ Conversion to biomass thermal will **displace over 1.14 billion gallons of oil annually by 2025.**
- ▶ Conversion of 1.39 million homes and businesses will enable the **retention of more than \$1.6 billion in annual income in our economy** instead of exporting to other economies.
- ▶ By 2025, the Northeast would have more than **\$4.5 billion new dollars per year injected into the regional economy.**
- ▶ This retention of wealth and the expansion of the biomass thermal industry will result in a total of **140,000 new or sustained permanent jobs.**
- ▶ The increase in jobs and commerce will result in huge increases in tax revenues (more than \$960 million per year by 2025).

Potential Environmental Benefits

- ▶ Replacing oil (a high carbon fuel) with biomass (a low carbon fuel) **reduces greenhouse gas emissions** that contribute to climate change.
- ▶ The enhanced value of biomass will contribute to healthy rural communities through **improved economics and viability of forest and farm ownership** because ***Working forests are healthy forests.***

Key Strategies

- ▶ **Research & development**
- ▶ **High efficiency & ultra-clean emissions technology that is fully automatic and convenient**
- ▶ **Investment in fuel collection, storage, transportation, and delivery systems**
- ▶ **Investment in pellet & chip manufacturing and refining**
- ▶ **District-heating and CHP**
- ▶ **Education & Promotion**



Maine Energy Systems has the only ASME approved European state-of-the-art pellet fueled boiler in the US. ÖkoFEN systems from Austria are in more than 40,000 homes in Europe.



 **MESYS**
MAINE ENERGY SYSTEMS
www.maineenergysystems.com

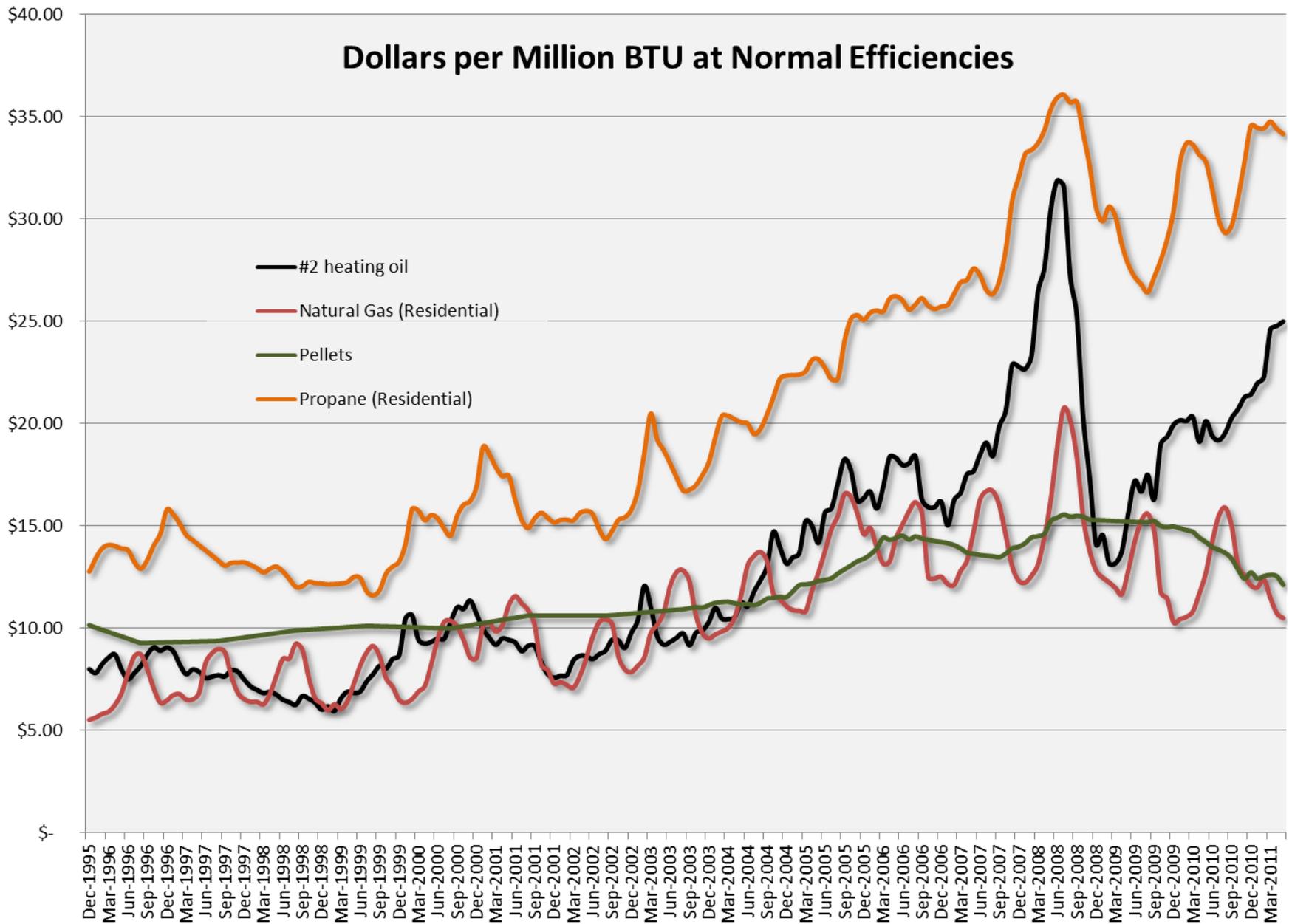
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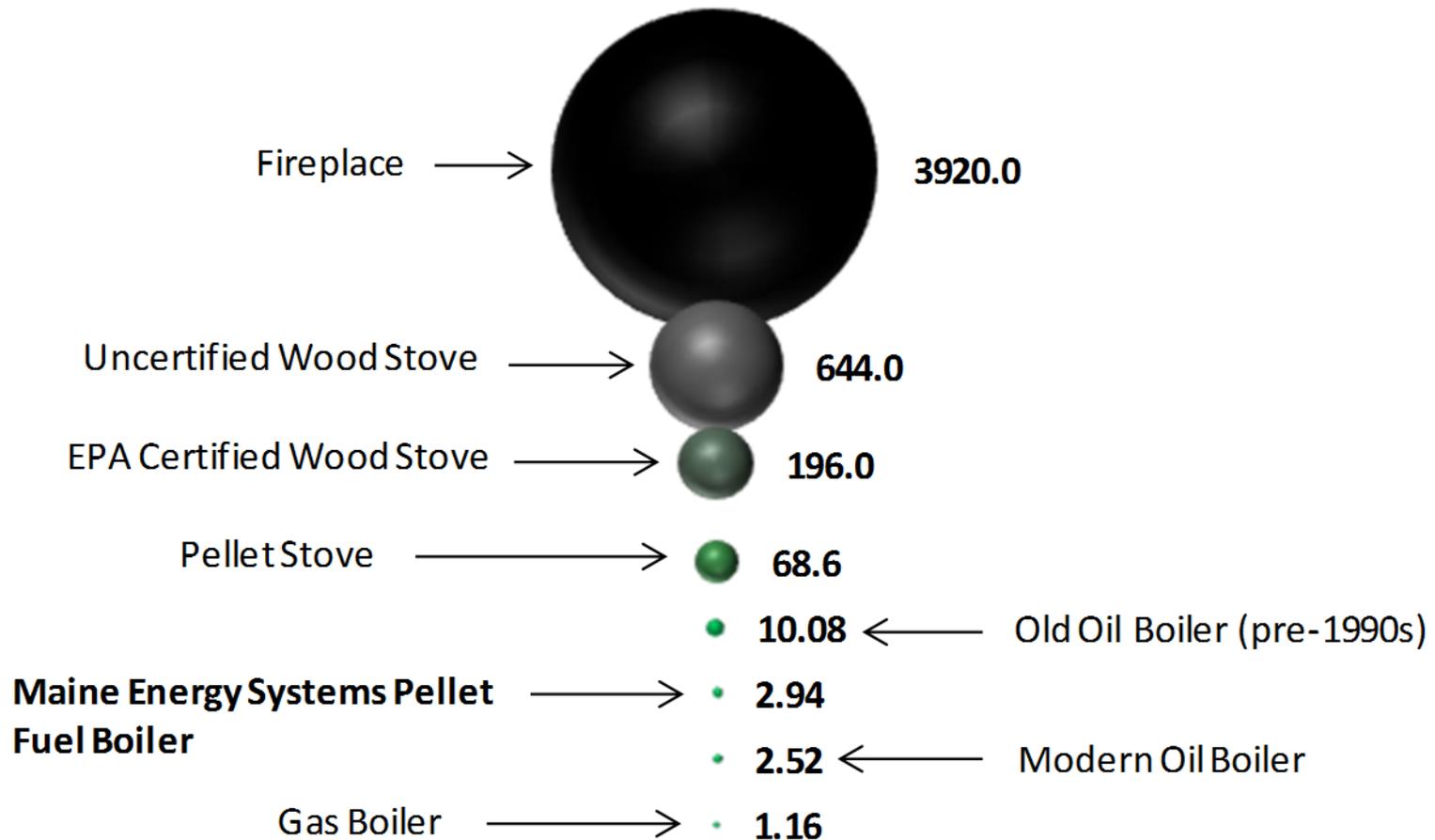
Dollars per Million BTU at Normal Efficiencies



source: EIA, regional sources, FutureMetrics

Total Pounds of Particulate per Year

normalized to the equivalent of the BTU from 1000 gallons of heating oil per year



Source: USEPA, Swedish National Testing and Research Institute, Typenprüfberichte BLT Wieselburg, 2009

The European experience can help the northeast...

Total Renewable Energy Production in Europe (EU-25) in 1000's of tons of oil equivalent						
	2001	2002	2003	2004	2005	2006
Hydro (excl. pumping)	30,613	25,551	24,932	26,135	24,284	24,572
Wind	2,320	3,071	3,815	5,057	6,060	7,045
Solar	483	532	594	675	807	987
Geothermal	3,616	3,946	5,287	5,384	5,280	5,526
Biomass (wood)	49,081	49,837	54,638	57,588	58,922	61,905
Municipal Solid Waste	7,947	8,120	8,588	8,964	9,858	10,399
Biogas	2,670	3,292	3,274	3,747	4,267	4,750
Total	96,730	94,349	101,128	107,550	109,478	115,184

source: Eurostat, Energy Statistics, 2008

In Europe, using wood for energy is a mature and well established market. Energy from wood makes up more than half of all of the energy from renewables in Europe.

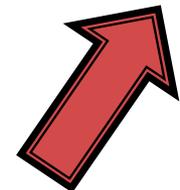
Although wind and solar get most of the attention, the “workhorse” of renewable energy is wood fuels (pellets and chips).

Renewable electricity sources are important;
but heating homes is not done with electricity!

The penalty for failure is dire!

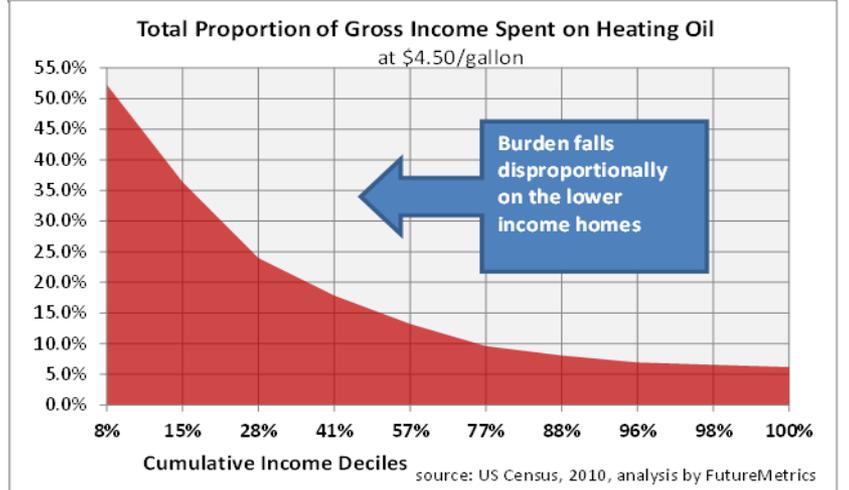
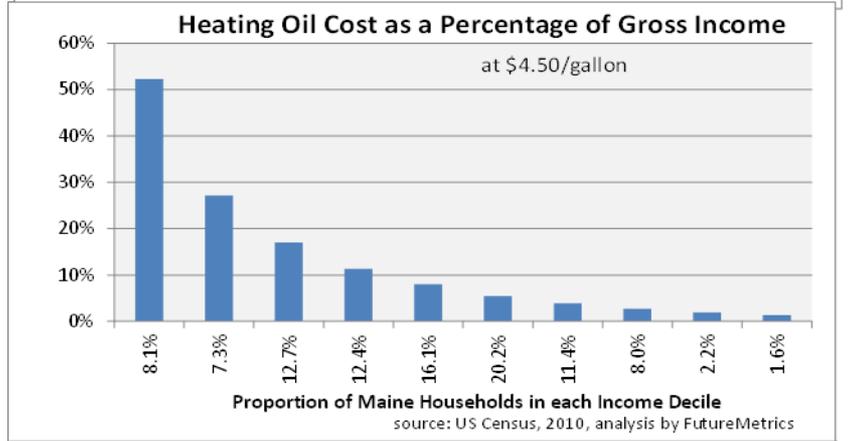
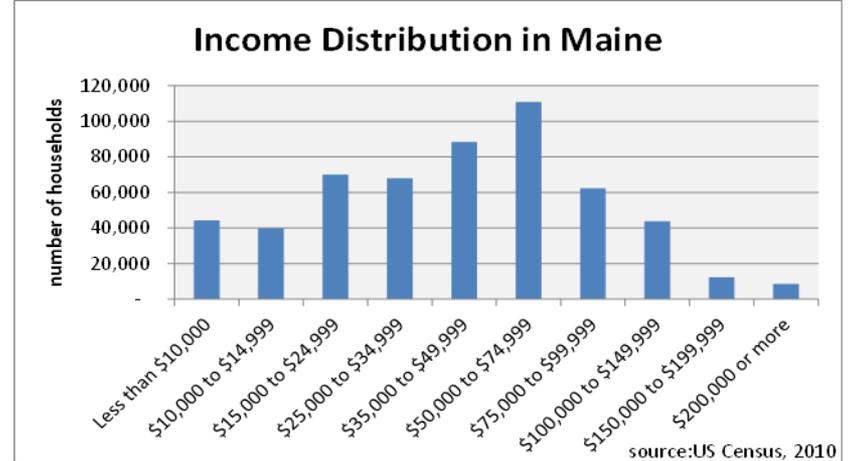
When heating oil prices rise from the current \$3.00/gallon to \$4.50/gallon, hundreds of thousands of jobs will be lost if the northeast does not end its heating oil addiction.

#2 Distillate Fuel use in Residential, Commercial, and Industrial (not Transportation)	Average Gallons per Year	Money Exported from Regional Economy at \$3.00/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	\$969,913,620	\$1,454,870,430	(\$484,956,810)	-31,966
Vermont	130,435,000	\$305,217,900	\$457,826,850	(\$152,608,950)	-11,191
New Hampshire	242,029,000	\$566,347,860	\$849,521,790	(\$283,173,930)	-17,405
Connecticut	672,464,000	\$1,573,565,760	\$2,360,348,640	(\$786,782,880)	-44,896
Rhode Island	148,551,000	\$347,609,340	\$521,414,010	(\$173,804,670)	-12,216
Massachusetts	818,841,000	\$1,916,087,940	\$2,874,131,910	(\$958,043,970)	-59,939
New York	1,818,841,000	\$4,256,087,940	\$6,384,131,910	(\$2,128,043,970)	-126,728
Pennsylvania	840,580,000	\$1,966,957,200	\$2,950,435,800	(\$983,478,600)	-55,075
New Jersey	459,420,000	\$1,075,042,800	\$1,612,564,200	(\$537,521,400)	-29,026
	5,545,654,000	\$12,976,830,360	\$19,465,245,540	(\$6,488,415,180)	-388,443



The poorest households suffer the most.

The lowest decile in the Maine income distribution will spend more than 50% of their income on heating oil at \$4.50/gallon!



Fully automatic pellet fueled central heating systems are HERE NOW.

The fuel is about ½ the price of heating oil. This is a solution that can make a difference NOW

Thank You

William Strauss, PhD

Papers on the economic impacts of the Northeast's addiction to heating oil can be downloaded from the FutureMetrics' website: www.FutureMetrics.com