

A Revenue Positive Economic Stimulus Strategy for Northeast

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Summary

This paper describes how Northeast, with Federal support, can affect an economic stimulus that will create jobs, will improve the environment, will make the Northeast states more energy independent, and will result in a net increase in tax revenues. The pages that follow show how a targeted federal stimulus package can result in economic growth that will generate tax revenues that are more than sufficient to cover the cost of the package. The target is Northeast households that use #2 home heating oil. The tactic is to provide those households with an incentive to convert to a regionally produced and less expensive fuel.

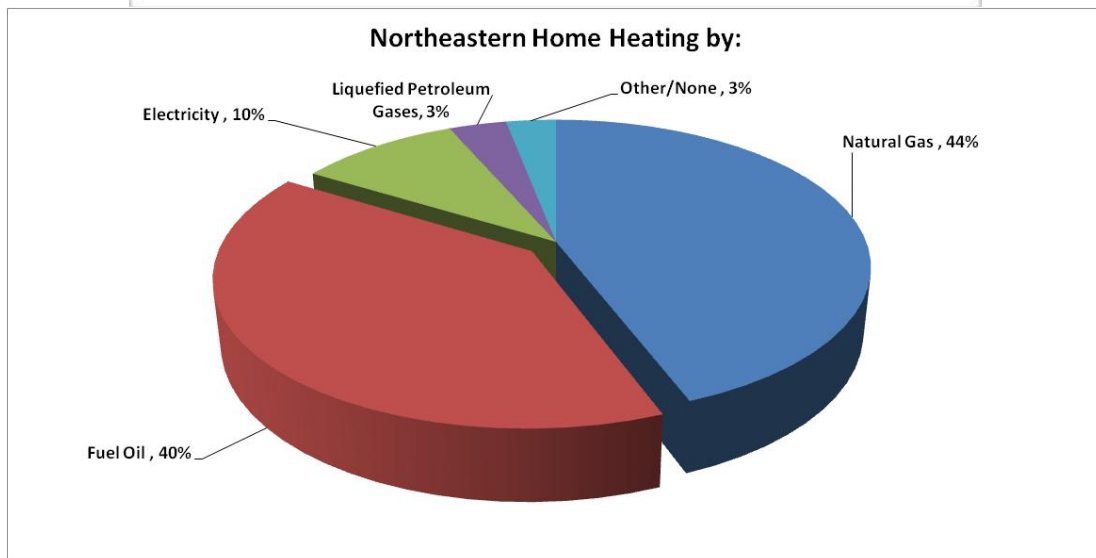
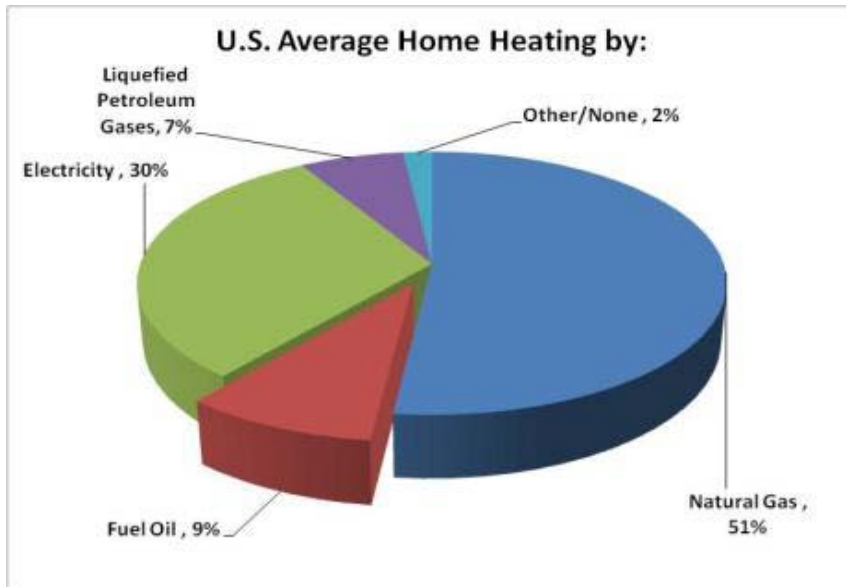
The key points are as follows:

- ✓ The Northeast States are the most heavily dependent on heating oil of all of the states in the U.S. Based on the Energy Information Administration's forecasts, over the next 10 years **an average of more than 13.7 billion dollars per year will be drained from the Northeast economy** by heating oil costs.
- ✓ Northeast's economy will benefit significantly if households convert to regionally produced refined biothermal pellet fuel¹ that can be used in modern automatic central heating systems similar to systems that are widely used in Europe.
- ✓ **More than 145,000 jobs will be created** by the development of the biothermal pellet fuel manufacturing and delivery infrastructure, and by the multiplier effects of the increase in commerce from fuel savings and fact that the fuel is produced in the Northeast region. A significant proportion of these jobs will be in the important forest products sector that is challenged by the falling demand for U.S. produced pulp and paper.
- ✓ If 10% of Northeast's households that use heating oil convert to proven and reliable pellet fuel technology by 2019, those **households will save almost 876 million dollars a year in fuel costs**. Those same 535,000 homes (10% of homes that use oil for heat) would have used more than 2.6 billion gallons of oil over the 10 years. They would have spent more than 10.5 billion dollars on heating oil. Most of those dollars would not stay in the regional economy.
- ✓ Not only would the fuel savings be available for spending within the Northeast economy but all of the money spent on fuel would also remain within the Northeast economy. This would add more than \$10.4 billion to the Northeast economy over the ten year span of this analysis. Using a 3X multiplier, **this would add more than \$31.3 billion to the Northeast economy over the next 10 years**.
- ✓ If 10% of Northeast homes use wood pellet fuel, **that would result in a reduction of 6,420,000 tons per year of greenhouse gas emissions**. That means that Northeast households have the potential to accrue an additional \$64.2 million to \$194.6 million per year from selling the carbon credits while also benefiting the environment.
- ✓ The cost of Federal support for the conversion of up to 10% of the households in each of the 7 Northeast states will generate Federal taxes over the 10 year span of this analysis that are well in excess of the cost of the conversion program. **The net increase (new tax revenues minus the cost of the stimulus policy) to the Treasury is estimated to be about \$7.1 billion over the next 10 years**.

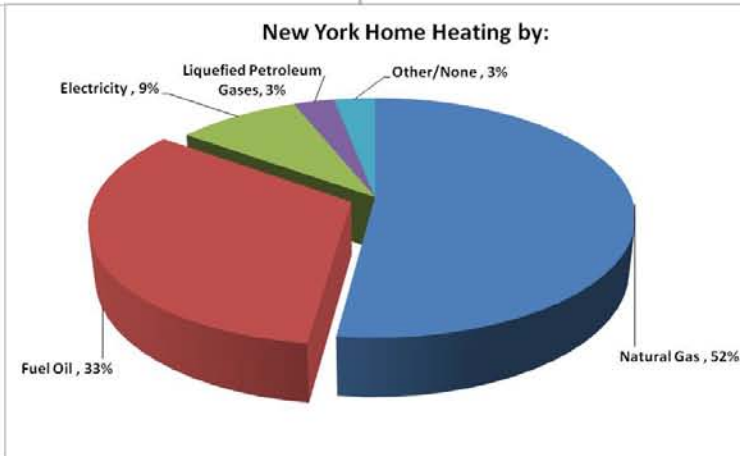
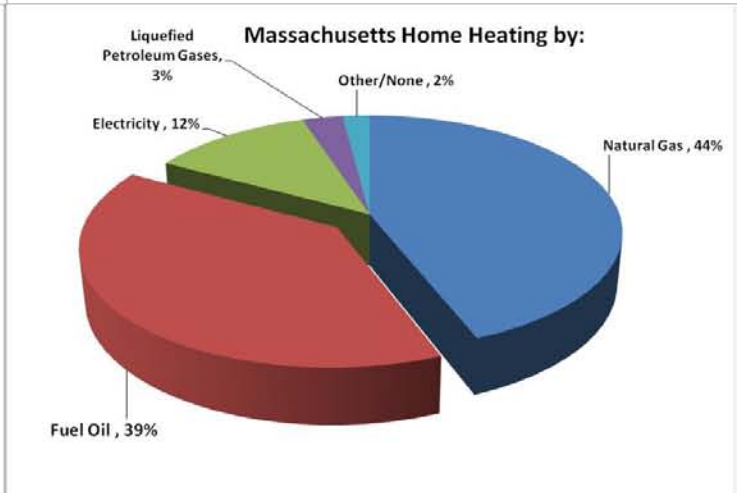
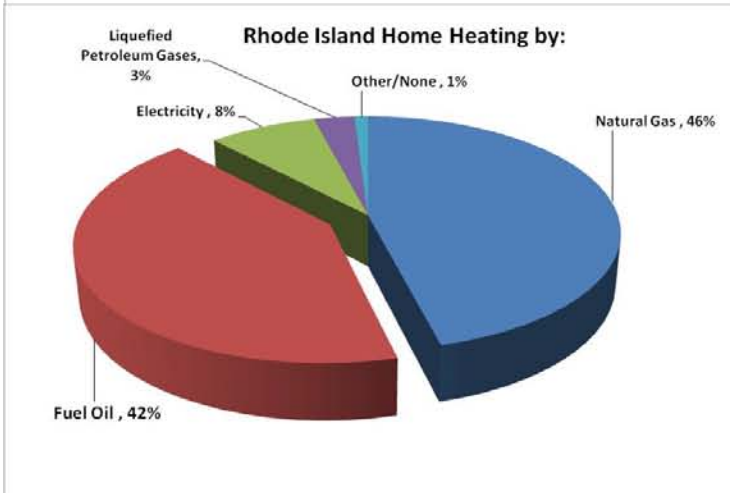
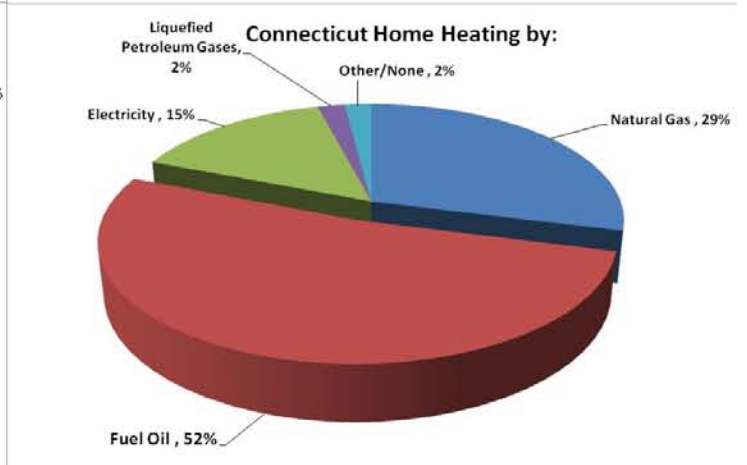
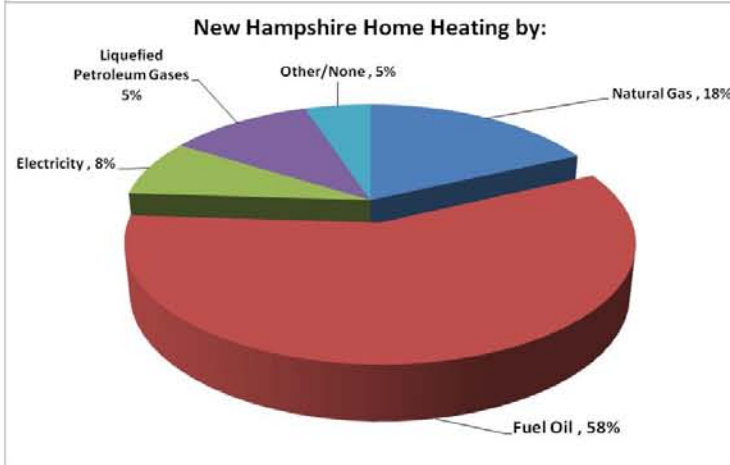
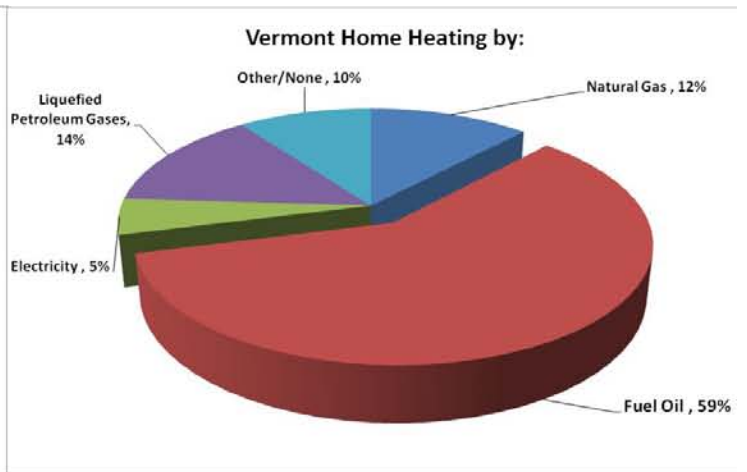
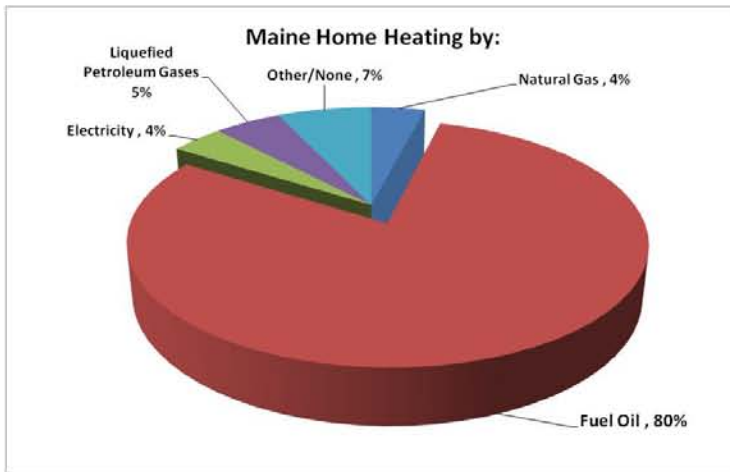
¹ Biothermal fuel refers to biomass that is used for direct heating. This is distinct from biomass used to generate electricity.

The Northeast States Need Alternatives to Home Heating Oil

The northeastern states² are the most dependent in the United States on heating oil. There are a total of 13.4 million occupied households in the Northeast states. 40% of those households use, on average, 900 gallons per year of heating oil. That is 13.4 million households using 4.77 billion gallons per year of #2 heating oil in the Northeast states. The charts on the following pages show the proportions of households heated by various fuels for the US, the Northeast, and each of the northeastern states.



² This include all of the New England states and New York.



This dependence on heating oil makes the northeastern states particularly vulnerable to high oil costs.

Based on the Energy Information Administration’s (EIA) 2009 Energy Outlook, the average price of heating oil over the next 10 years will be \$3.59. That means that the average expenditure by all of the northeastern states will be about \$18.1 billion per year. The EIA also estimates that 76% of the cost of heating oil is from the cost of crude oil and refining. As the table below shows, that means that **an average of more than 13.7 billion dollars per year will be drained from the northeast’s economy by heating oil costs.**

	Occupied Households	Percent that Use #2 Heating Oil	Average Gallons Used per Year	Average Total Expenditure Per Year	Amount that Does <u>not</u> Stay in the States
Maine	542,000	80%	390,240,000	\$ 1,480,726,656	\$ 1,125,352,259
Vermont	251,000	59%	133,281,000	\$ 505,721,426	\$ 384,348,284
New Hampshire	501,000	58%	261,522,000	\$ 992,319,077	\$ 754,162,498
Connecticut	1,323,000	52%	619,164,000	\$ 2,349,355,882	\$ 1,785,510,470
Rhode Island	405,000.0	42%	153,090,000	\$ 580,884,696	\$ 441,472,369
Massachusetts	2,449,000	39%	859,599,000	\$ 3,261,662,446	\$ 2,478,863,459
New York	7,907,420	33%	2,348,503,740	\$ 8,911,162,591	\$ 6,772,483,569
Total	13,378,420		4,765,399,740	18,081,832,773	13,742,192,908

The Northeast’s Economy will Benefit Significantly if Households Convert to Regionally Produced Wood Pellet Fuel that is Used in Modern Automatic Central Heating Systems³

This analysis assumes that over the next 10 years, 10% of the households that use heating oil in the northeast states will be converted to modern biothermal pellet fueled central heating systems. This analysis assumes that 1.0% of those households are converted each year for the next 10 years. Using this baseline scenario in which 10% of Northeast’s households convert from #2 oil to wood pellet fuel by 2019, the following outcomes would be realized.

Of the 13,378,000 households in Maine, New Hampshire, Vermont, Connecticut, Rhode Island, Massachusetts, and New York (the Northeast), and average of 40% use heating oil. The average home uses about 900 gallons per year. The average oil bill per household over the next 10 years will be about \$3,400 per year. The expected average cost of wood pellet fuel over the next ten years is \$312/ton (see the section on wood supply for a discussion on this price assumption). Based on these expected prices, this regionally produced renewable fuel would cost that same household 61% the cost of heating oil by 2019. The resulting savings per household will be more than \$1637 in 2019. By 2019, if 10% of Northeast’s homes use pellet fuel instead of heating oil the aggregate savings to those households and small businesses would be about \$876,000,000 just for the year 2019. The total saved over the 10 years would be almost 3.6 billion dollars. These forecasts are based on the EIA forecast for oil prices (which says that heating oil will be \$4.71/gallon in 2019). Many independent analysts believe that oil prices will be significantly higher than the EIA forecast. If so, the economic benefits outlined in this analysis will be significantly larger.

The table below summarizes these numbers.

³ See the appendix for a description of modern central heating systems that run on renewable and carbon neutral wood pellet fuel. These systems are in common use in many European countries.

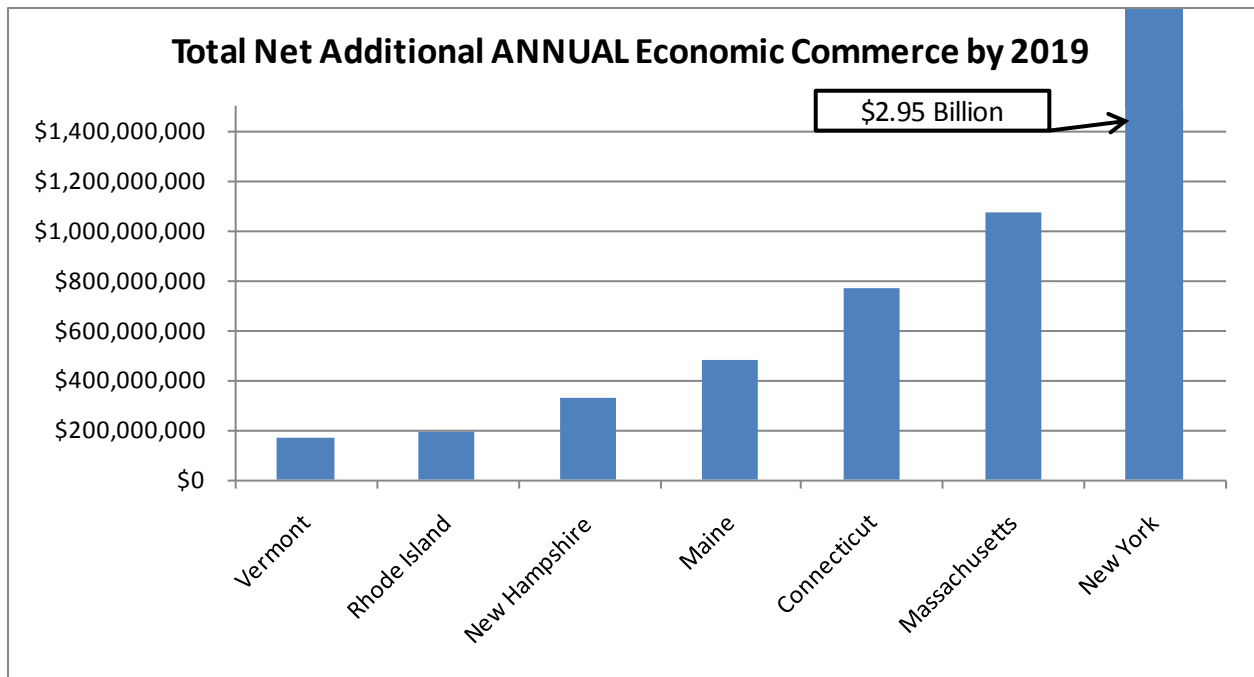
Northeast States Households	13,378,000
percent that use heating oil	40%
average oil per season per house (gallons)	900
Average heating oil price over 10 Years	\$ 3.59
Avg. annual oil bill per house	\$3,231
Average Annual savings per household over 10 years	\$1,033.23
If 10% of NE homes that use oil convert to pellets then the Total Annual Fuel Savings in 2019 will be	\$876,093,324

The economic benefits are not just from the savings in heating costs but are also from the spending on pellets made in the region. Those same 535,000 homes (10% of homes that use oil for heat) **would use more than 2.6 billion gallons of oil over the 10 years. They will have spent more than 10.5 billion dollars on heating oil.** As noted above, more than 76% of that spending does not stay in the Northeast economy.

Over the 10 years those homes that would then use wood pellet fuel instead of heating oil would spend a total of about \$6.8 billion on about 21.4 million tons of biothermal fuel that would be manufactured in the northeast region from a sustainable renewable resource. Not only would the fuel savings be available for spending within the Northeast's economy but all of the money spent on fuel would also remain within the northeastern states' economy. **This would add more than \$10.4 billion to the Northeast economy over the ten year span of this analysis.** Using a 3X multiplier, this would **add more than \$31.3 billion to the Northeast economy.** The following tables and chart (in 2008 dollars) summarize these estimates.

If 10% of Households Convert Over the 10 Years at 1% per Year:	
Total gallons of oil that would have been used	2,600,683,200
Total money that would have been spent on oil	\$10,562,285,135
Total tons of pellets that will be used	21,383,395
average pellet price over 10 years	\$307
Total Spending on Pellets	\$6,810,189,996

Taking the fuel savings and the value of keeping the money spent for fuel in the northeast instead of sending most of it overseas:	
Total Net Added to the Economy over 10 Years	\$10,445,156,560
Total Net over 10 Years with 3X multiplier	\$31,335,469,679



More than 145,000 Jobs will be Created

Jobs will be created directly in the important forest products sector and indirectly from the increase in commerce discussed above. The diversification of the Northeast forest products sector into wood based fuels, including the production of 3.9 million tons per year of pellet fuels, will directly create new jobs, and will sustain existing jobs that are being lost in the declining pulp and paper sector. If 10% of the households that use #2 oil convert to pellet fuel **about 21,800 jobs in the forest products and pellet fuel sectors will be created. Those workers will earn nearly a billion dollars per year in gross income.**

Number of Forest Products Jobs Created or Sustained	18,669
Number of Biothermal Home Heating Jobs Created	2,118
<i>Total Annual Income to Workers Supporting the Biothermal Heating Sector</i>	\$935,412,995

The development of a biothermal pellet fuel delivery infrastructure will also create jobs as delivery trucks and fuel depots are built throughout Northeast⁴. By 2019 there will be between 4,000 and 5,000 pellet fuel delivery trucks servicing the region’s heating systems. The trucks cost about \$130,000 each and are built in Northeast. There will also be between 1000 and 1800 storage depots located throughout Northeast each costing approximately \$325,000 to construct.

The additional commerce generated by the fuel savings (providing higher disposable income) and the fact that the money spent on heating fuel stays in the regional economy instead of going offshore will have significant positive job creation impact. By 2019, the combination of fuel savings and the biothermal fuel

⁴ See the appendix for photographs of the fuel storage and delivery infrastructure that has already been developed by Maine Energy Systems of Bethel, Maine.

sector value chain multiplier effects will add about 2.25 billion dollars per year to the regional economy. **This additional commerce will support more than 145,000 new jobs.**

By 2019 if 10% of the Homes that Use #2 Heating Oil Convert to Pellet Fuels then:					
	Tons of Pellets Used per Year	Wood Supply and Pellet Making and Delivery Jobs	Home Heating Jobs	Multiplier Effect Jobs	Total Jobs
Maine	325,200		173	10,090	
Vermont	111,068		59	3,453	
New Hampshire	217,935		116	6,789	
Connecticut	515,970		275	16,105	
Rhode Island	127,575		68	3,990	
Massachusetts	716,333		382	22,447	
New York	1,957,086		1044	61,447	
Total	3,971,166	18,669	2,118	124,321	145,108

Wood Supply and Value Added from Pellet Manufacturing

The wood supply for the manufacturing of wood based fuel is of course a concern. The wood supply must be provided from sustainably managed forest resources. Currently in the Northeast region there are more than 1,190,000 tons per year of wood pellets being manufactured from sustainably managed forests in Northeast. Expansion plans at some of those mills will take regional capacity to nearly 2 million tons per year by 2011. In Maine, more than 16,000,000 tons per year of wood is sustainably harvested (and the growth to harvest ratio is greater than one meaning that the forest resource is growing larger each year). The annual sustainable harvest can be increased significantly. The Maine Forest Service has shown⁵, that the Maine woods have the capacity to sustainably⁶ produce biothermal fuel at levels significantly higher than is currently being produced both in the short term, by harvesting stock that is available but is not being harvested, and in the long term by implementing forestry management practices that increase the sustainable per acre yield of Maine’s forests. This is also true for the other Northeast states. The current amount of biomass in the Northeast states exceeds 4.6 billion tons and the annual sustainable harvest exceeds 108 million tons⁷. This is summarized in the following table.

⁵ See “Maine Forest Service Assessment of Sustainable Biomass Availability: Absolute Supply is not the Issue. Improving Utilization and Silviculture while Keeping Costs Low.” July 17, 2008 (www.maine.gov/doc/mfs/). Note that the assessment fully accounts for the need to apply well established standards for maintaining the sustainability of the forest resource. From page one, “MFS developed its estimate of available wood taking into account concerns for soil productivity, water quality protection, and biodiversity based on Maine’s ‘benchmarks of sustainability.’ As a result, the maximum quantities available were discounted significantly.”

⁶ Think of Maine’s forests as money in the bank and the annual harvest as the interest payment. The principal will never decline as long as we do not “spend” more than the interest. Currently, Maine sustainably harvests about 18 million tons per year. That could increase to about 25 million tons per year with improved forestry methods.

⁷ USDA Forest Service, Mapmaker 3.0 data.

Green Tons of Biomass	
State	Total
CT	191,111,159
ME	996,820,362
MA	337,308,346
NH	443,132,528
RI	35,644,022
VT	432,773,581
NY	2,219,705,180
Total	4,656,495,178
Annual Sustainable Harvest	
108,290,586	

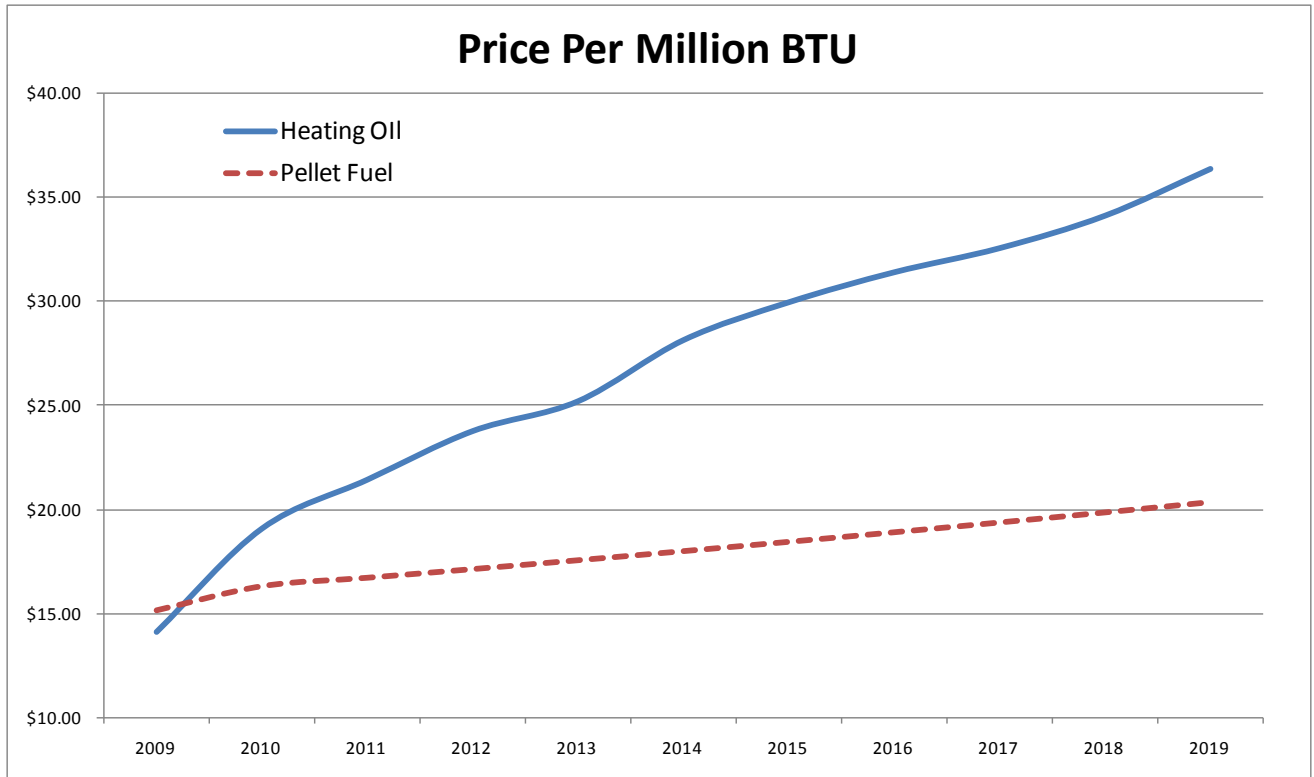
There is sufficient sustainable wood supply in Northeast to provide wood for current and future wood based fuels production for at least 10% of the households that currently use heating oil.

Also, wood pellet fuel prices will not only be far less volatile than oil prices, but there are also market forces that will prevent the price of wood (and thus biothermal fuel) from rising too much. Already in the region millions of tons per year of wood demand has disappeared as pulp mills have closed. If the price of wood exceeds a threshold, those still operating pulp mills that are only marginally profitable will lose their ability to remain competitive in the global pulp market⁸. What this means is that if wood prices rise too much, some of the region's pulp makers will not be competitive in the global pulp market and they will close down. Wood prices would fall as wood demand falls. **There is effectively a price ceiling on wood prices.**

This chart below compares the price per unit of energy provided by heating oil and biothermal pellet fuel⁹. Because refined pellet fuel is a renewable resource and because production of pellet fuel is only marginally effected by the cost of fossil fuels, the gap between the price per BTU from heating oil and from pellet fuel is expected to increase continuously over time. **Biothermal fuels are a true hedge against the harm that will be inflicted on our economy by ever more scarce and expensive fossil fuels.**

⁸ There are literally millions of tons per year of new pulp making capacity coming online in areas that grow trees in 1/3 of the time as Maine and have lower labor costs and relaxed environmental standards (see the table at the back of this report).

⁹ Based on EIA forecasts and wood pellet fuel price forecasts by FutureMetrics (a Maine economic consulting firm).



To put the importance of the pulp and paper sector in perspective vis-à-vis a growing wood pellet fuel manufacturing sector, the pulp and paper sector generates a value added per ton of greenwood of about \$240¹⁰. The following table shows the value added per ton of greenwood generated by the pellet manufacturing sector at various combinations of heating oil prices and biothermal pellet prices¹¹. As the table shows, given the expect prices of heating oil and pellet fuels, pellet fuel manufacturing will provide about \$280 of value added per ton of green wood. This exceeds the value added from using the wood to make paper.

¹⁰ The Economic Importance and Wood Flows from Maine’s Forests, 2007, North East State Foresters Association <http://www.nefainfo.org/publications/2007%20Publications/NEFAEconomicImportME.pdf>

¹¹ Computed by FutureMetrics. The analysis considers the aggregate savings on fuel costs, which is a net positive cash flow to the state, created by the low cost of pellet fuel versus heating oil plus the aggregate value added to the wood in pellet manufacturing.

Value Added by Pellet Production per Ton of Green Wood								
	Pellet Prices per Ton							
	\$260.00	\$270.00	\$280.00	\$290.00	\$300.00	\$310.00	\$320.00	
Heating Oil Prices per Gallon	\$2.80	\$191.43	\$190.56	\$189.64	\$188.66	\$187.63	\$186.55	\$185.44
	\$2.90	\$200.66	\$199.79	\$198.87	\$197.88	\$196.85	\$195.78	\$194.67
	\$3.00	\$209.89	\$209.02	\$208.09	\$207.11	\$206.08	\$205.01	\$203.90
	\$3.10	\$219.12	\$218.25	\$217.32	\$216.34	\$215.31	\$214.24	\$213.13
	\$3.20	\$228.35	\$227.48	\$226.55	\$225.57	\$224.54	\$223.47	\$222.36
	\$3.30	\$237.58	\$236.71	\$235.78	\$234.80	\$233.77	\$232.70	\$231.58
	\$3.40	\$246.81	\$245.94	\$245.01	\$244.03	\$243.00	\$241.93	\$240.81
	\$3.50	\$256.04	\$255.17	\$254.24	\$253.26	\$252.23	\$251.16	\$250.04
	\$3.60	\$265.26	\$264.40	\$263.47	\$262.49	\$261.46	\$260.38	\$259.27
	\$3.70	\$274.49	\$273.63	\$272.70	\$271.72	\$270.69	\$269.61	\$268.50
	\$3.80	\$283.72	\$282.85	\$281.93	\$280.94	\$279.92	\$278.84	\$277.73
	\$3.90	\$292.95	\$292.08	\$291.16	\$290.17	\$289.14	\$288.07	\$286.96
	\$4.00	\$302.18	\$301.31	\$300.38	\$299.40	\$298.37	\$297.30	\$296.19
	\$4.10	\$311.41	\$310.54	\$309.61	\$308.63	\$307.60	\$306.53	\$305.42
	\$4.20	\$320.64	\$319.77	\$318.84	\$317.86	\$316.83	\$315.76	\$314.64
	\$4.30	\$329.87	\$329.00	\$328.07	\$327.09	\$326.06	\$324.99	\$323.87
	\$4.40	\$339.10	\$338.23	\$337.30	\$336.32	\$335.29	\$334.22	\$333.10
	\$4.50	\$348.32	\$347.46	\$346.53	\$345.55	\$344.52	\$343.44	\$342.33

Environmental Benefits from Using Wood Pellet Fuel and the Additional Potential Benefits from Carbon Offsets

There are clear economic benefits to the Northeast states from the conversion of homes' central heating systems from using fossil fuel to using renewable refined pellet fuel. There are also environmental benefits¹². The average home in Northeast that displaces oil for pellets will offset about 12 tons of CO₂ per year. If 10% of Northeast homes use wood pellet fuel, that comes to 6,420,000 tons per year of greenhouse gas emissions reductions.

This is important for Northeast since five of the worst six states for residential greenhouse gas emissions are Northeast states¹³.

Residential CO ₂ Emissions per Person		
	U.S. Rank	lbs. per Capita
Maine	1	7,440
Vermont	2	5,368
Connecticut	3	5,321
Rhode Island	5	5,128
New Hampshire	6	4,870
Massachusetts	8	4,604
New York	9	4,060

When cap and trade is implemented in the US, the value of carbon credits are expected to be between \$10 and \$30 per ton. **That means that Northeast households have the potential to accrue an additional \$64.2 million to \$192.6 million per year from selling the carbon credits.**

¹² See the charts in the appendix of this report for emissions comparisons.

¹³ U.S. EPA for the most recent year, 2005.

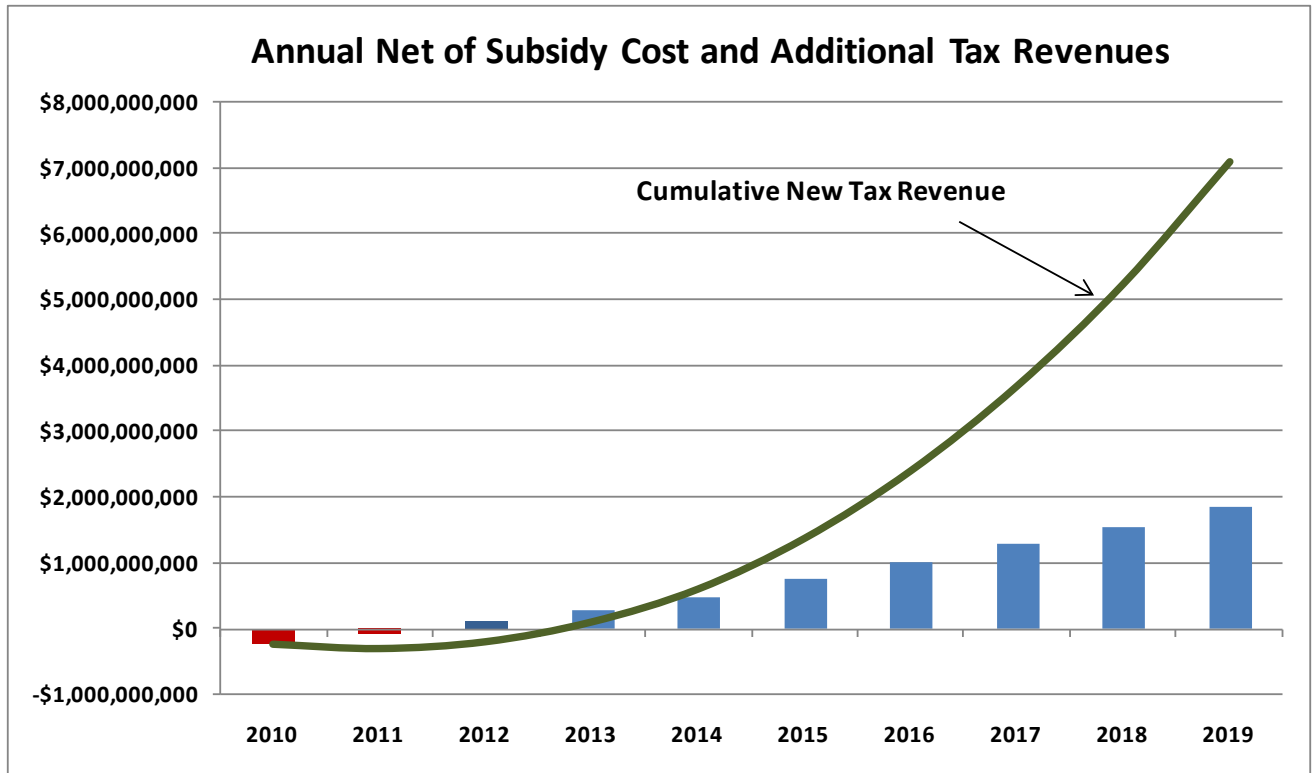
Overcoming the Barrier to Actualizing these Economic and Environmental Benefits – Federal Support for Conversion and the Significant Long-Term Benefits to Tax Revenues

There is a significant barrier to entry for households and small businesses in Northeast. The installed cost of a modern fully automatic pellet fueled boiler system is between \$14,000 and \$18,000. This compares to a cost of between \$8,000 to \$12,000 for a similarly sized modern oil fueled boiler for homes and small businesses. By eliminating the \$6,000 differential with a tax credit from the federal government, homes and small businesses will be able to choose to switch to a renewable fuel that is produced and refined in the region. This will, as has been shown above, have very positive benefits to the Northeast economy in terms of jobs and commerce and increases the states' energy independence.

This policy paper forecasts that the cost of Federal support for the conversion of up to 10% of the household and small businesses in each of the 7 Northeast states will be more than offset with the significant positive economic benefits and the creation of at least 145,000 jobs; both of which will generate Federal taxes over the 10 year span of this analysis that are well in excess of the cost of the conversion program. The details of this forecast are discussed in the following paragraphs.

If 1% of the homes in Northeast that currently use #2 heating oil convert each year for 10 years then there will be a total of 535,120 households using biothermal pellet fuel by 2019. If the federal government were to provide those households in each state with a tax credit of \$6,000 and limit the conversion rate to 1% per year of those eligible households, the government's cost of converting those homes to a locally produced renewable carbon neutral fuel would be about \$321 million per year for each of the next 10 years. After homes convert, the commerce and the job creation would generate federal tax revenue every year thereafter. The one-time cost to the federal government would provide an annual tax benefit going forward.

Over the ten year span of this analysis, the government would provide a total of about \$3.2 billion in tax credits to households. In that same span, assuming an effective tax rate of 30%, the federal government would receive about \$10.3 billion in new tax revenues providing a net benefit to the treasury of about \$7.1 billion. The following chart shows the net to the federal government over the span of this analysis. It should be noted that after 2019, if no further conversions occur, the annual additional annual tax revenue from the Northeast states is estimated to be more than \$2.17 billion per year for every year thereafter with no additional cost to the government.



The internal rate of return on the annual net cash flows over the 10 year span of this analysis is 77.8%. This is an investment that not only creates jobs, engenders energy independence, and improves the environment, but also has is a significant net positive return to the treasury over the 10 year life of this program.

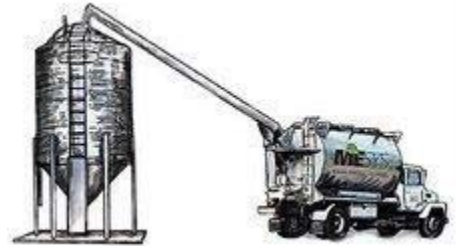
Conclusion

This paper has shown that a federal program that would **convert households in the Northeast from reliance on imported oil to the use of a regionally produced renewable biothermal fuel for central heating** would have many benefits. The program would more than pay for itself with the creation of at least 145,000 jobs that will generate a large source of federal tax revenues. The program will also have strongly positive environmental benefits by significantly lowering the residential greenhouse gas emissions from the worst emitters in the nation. Finally, the program will have a very important and immediate role in revitalizing the regional economy.

Modern Central Heating with Pellet Fuel

Wood pellets are made either from the by-products of other wood manufacturing processes or from whole round wood. The wood is dried, pulverized, and then forced under high pressure through the holes in a die, much like spaghetti is made. Pellets can be made from either hardwood or softwood; premium or super premium pellets are very dry and have very little ash content. Softwood pellets often contain more heat per pound than hardwood pellets because of the resin in the wood. Burning pellets does not create chimney deposits as burning cordwood can; in fact, there is no smoke visible from the chimney when pellets are burning.

Pellets for bulk delivery are stored in large silos where delivery trucks load them for distribution to homes and businesses.



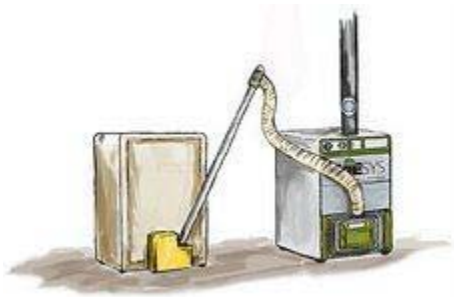
Pellets are taken from silos and delivered to home storage units which can be bins or silos indoors or outdoors. These storage units can be of varying sizes, so that many residences can require only a couple of deliveries a year. A home that burns 1,000 gallons of #2 heating oil would burn approximately 7.5 tons of premium pellets. 4 tons of pellets can be stored in a 6' cube in the basement. Pellets must be kept dry so the storage containers are airtight.



Wood pellets are delivered automatically by auger from the pellet storage bin to the burner on the boiler. The auger is controlled by the burner; as it needs pellets it turns the auger on; when the burner's small storage tank is full, it turns the auger off.

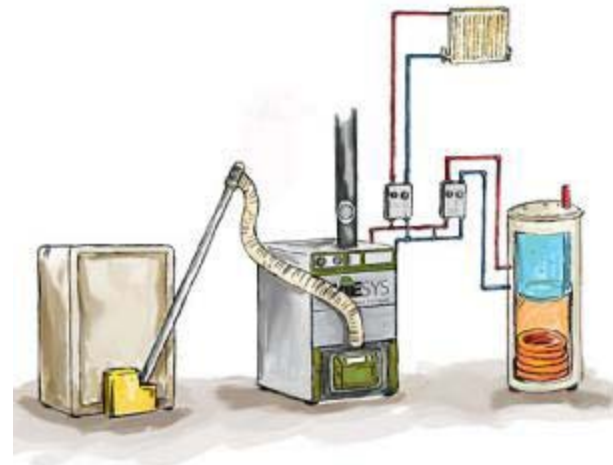


A pellet fired boiler works just as any other boiler does providing hot water to your baseboard radiation, radiators or radiant floor heating system and providing domestic hot water for your kitchen and bathrooms. Unlike oil boilers, pellet-fired boilers do require ash removal. The six-section (~70,000 BTU) Bosch boiler will require ash removal two or three times a year. The ash bin is light, and the ash is actually good for your garden or lawn, so disposal is a simple matter.



The Bosch pellet-fired boiler system distributed by Maine Energy Systems LLC does all this work while burning a carbon neutral fuel.

Systems just like this safely and reliably heat hundreds of thousands of home in Europe.



Pellet Fuel Storage and Delivery Equipment at the Maine Energy Systems Location in Bethel, Maine (18 ton delivery truck and 300 ton storage depot)



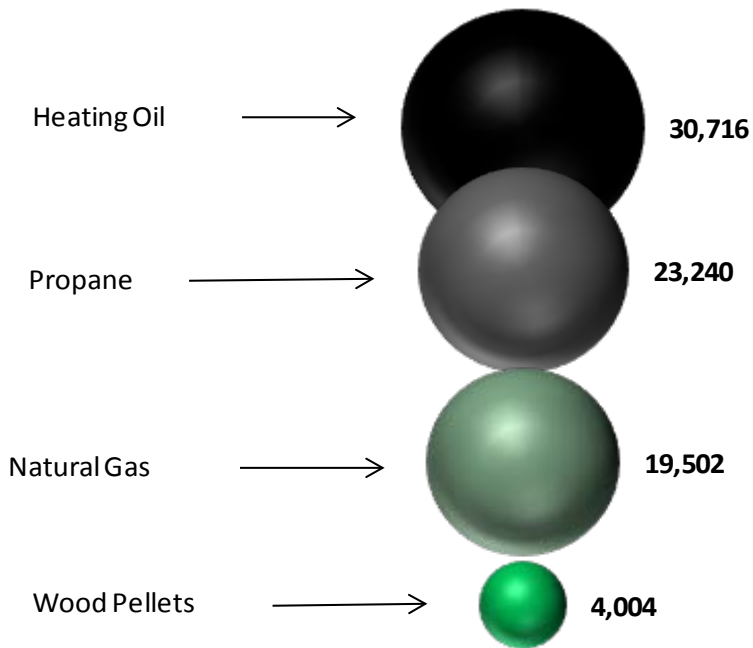
A Modern Wood Pellet Fueled Boiler in a 4200 sq. ft. Maine Home



New Pulp Mills (source RISI: www.risiinfo.com)

Company	Location	Country	Capacity (t/yr)	Cost (US\$)	Completion anticipated
Protavia	Victoria	Australia	700,000	1 billion	-
Gunns	Tasmania	Australia	800,000 – 1.1 million	1.2 billion	-
Aracruz	Rio Grande do Sul	Brazil	1.3 million	-	2010-2015
Suzano	Bahia	Brazil	1.1 million	1.3 billion	2007
Suzano	Bahia	Brazil	1.25 million	-	2010
VCP	Tres Lagoas	Brazil	1.1 million	1.15 billion	2009
Sateri International	Bahia Sul	Brazil	250,000	375 million	2007
Veracel	Bahia	Brazil	900,000	-	-
Stora Enso	Rio Grande do Sul	Brazil	1 million	-	2012-2013
Cenibra	Minas Gerais	Brazil	800,000	-	2013
APP China	Hainan	China	780,000	-	2008
APP China	Zhejiang	China	250,000	142 million	-
APP China	Guangxi	China	300,000	-	2008
APRIL	Shandong	China	1 million	-	-
Oji Paper	Jiangsu	China	700,000	-	2009
Shandong Chenming	Guangdong	China	700,000	1.2 billion	2009
Stora Enso	Guangxi	China	1 million	-	-
Lee & Man	Chongqing	China	125,000	-	2008
West Coast Paper Mills	Karnataka	India	250,000	300 million	2008
ITC	Andhra Pradesh	India	120,000	-	2007
Seshasayee	Tamil Nadu	India	170,000	80 million	2007
APRIL	Sumatra	Indonesia	600,000	-	2007
APP	Sumatra	Indonesia	800,000	-	2007
Kaltim Prima Pulp & Paper	East Kalimantan	Indonesia	1.2 million	1.5 billion	-
UFS	South Kalimantan	Indonesia	600,000	-	-
PT Garuda Kalimantan Lestari	West Kalimantan	Indonesia	1.2 million	-	-
Aditya Birla	Savannakhet	Laos	200,000	350 million	-
BILT	Sabah	Malaysia	125,000	-	-
Larvik Cell	Pskov	Russia	600,000	563 million	2009
Baikal Pulp and Paper	Irkutsk	Russia	200,000	-	-
Mondi	Syktvykar	Russia	1 million	1.5 billion	-
Sappi	Saiccor	South Africa	200,000	290 million	2008
Sappi	Ngodwana	South Africa	225,000	-	-
NCT Forestry Cooperative	Richards Bay	South Africa	140,000	-	-
Forscot	Invergordon	Scotland	550,000	-	-
Botnia	Fray Bentos	Uruguay	1 million	1.2 billion	2007
ENCE	Colonia	Uruguay	1 million	930 million	2010
Stora Enso	-	Uruguay	1 million	-	-
Tracodi	Long An	Vietnam	100,000	93 million	2007
Lee & Man	200 km south of HCM City	Vietnam	150,000	-	2008-2009
Incomex Saigon	Quang Nam	Vietnam	115,000	150 million	-
BILT, Martin Group (?)	Tuyen Quang	Vietnam	130,000	200 million	2009
Vinapimex	Bai Bang	Vietnam	250,000	300 million	-

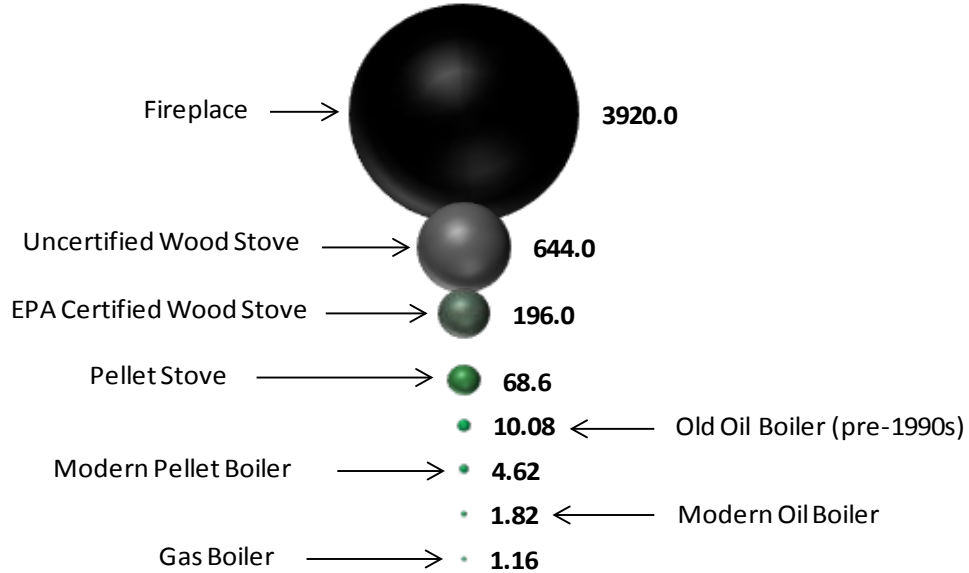
Total Pounds of CO₂ (a greenhouse gas) per Year normalized to the equivalent of the BTU from 1000 gallons of heating oil per year



Source: University of Wisconsin, July, 2007 - With the assumption that Maine's forests will be harvested in a sustainable fashion so that trees can grow to maturity and perform their important role in the sequestration of carbon. Wood pellets are not entirely carbon neutral because some fossil fuel is required for the harvesting of trees and shipment. Extraction, refining, and transport emissions are included for each of the four fuel sources.

Total Pounds of Particulate per Year

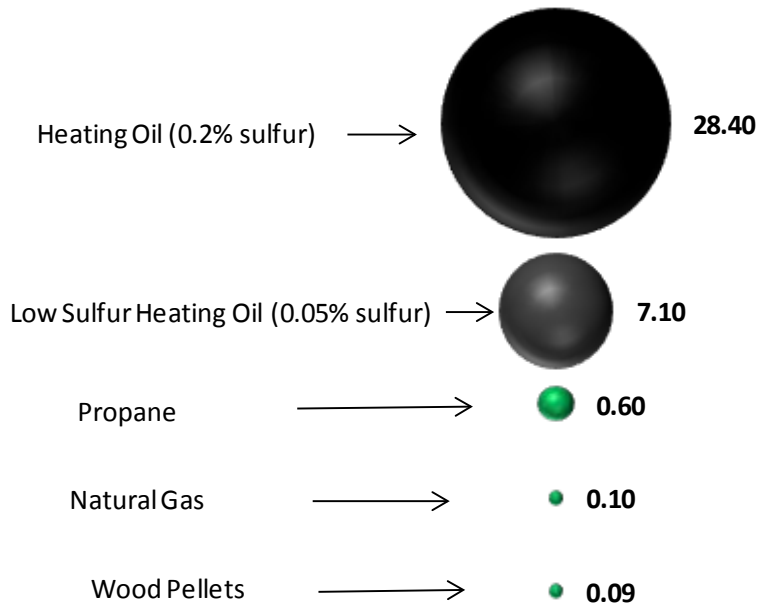
normalized to the equivalent of the BTU from 1000 gallons of heating oil per year



Source: USEPA and Swedish National Testing and Research Institute

Total Pounds of SO₂ (precursor to acid rain) per Year

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



Source: EPA AP42, 5th Ed., Vol, 1, Chapter 1; and "Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region", Mid-Atlantic Regional Air Management Association, Dec., 2006.