Thermal RECs: How They Will Provide Economic and Environmental Benefits

presented by
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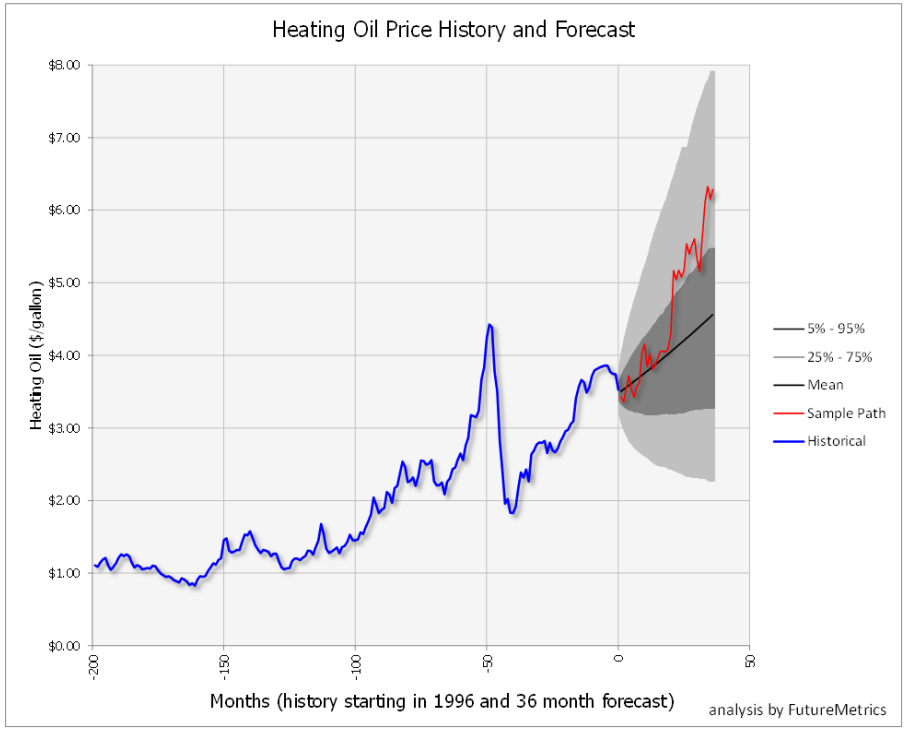
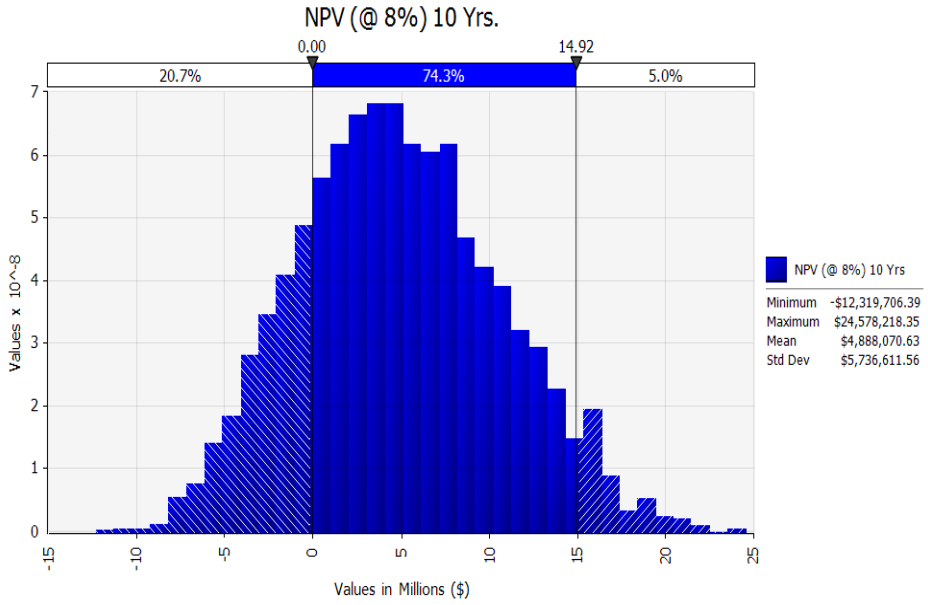




Recipient of the 2012 International Excellence in Bioenergy Award

What is a REC?

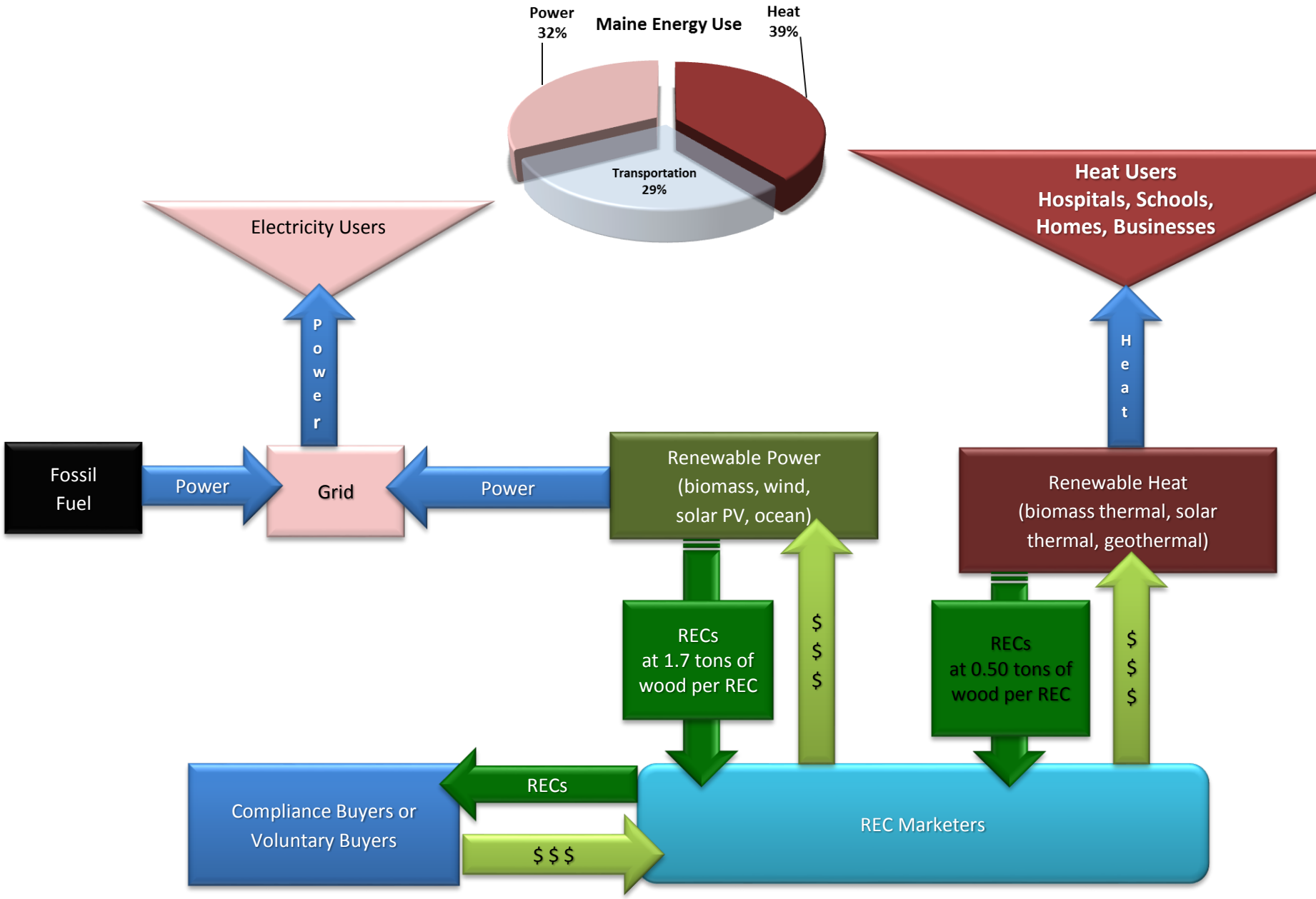
Renewable Energy Certificates (**RECs**) are tradable, non-tangible energy commodities that represent proof that 1 megawatt-hour (MWh) of electricity was generated from an eligible renewable energy resource. These certificates can be sold and traded or bartered, and the owner of the REC can claim to have purchased renewable energy. RECs represent the environmental attributes of the power produced from renewable energy projects and are sold separately from commodity electricity. (Wikipedia)

Notice what is missing?

Why are there RECs?

Compliance or Mandatory markets are created by a policy that exists in 29 U.S. states, plus the District of Columbia and Puerto Rico, called **Renewable Portfolio Standards (RPS)**. Such standards require electric service providers to have a minimum amount of renewable energy in their electricity supply. Electric utilities in these states demonstrate compliance with their requirements by purchasing RECs.

Voluntary markets are ones in which customers choose to buy renewable power out of a desire to use renewable energy. Most corporate and household purchases of renewable energy are voluntary purchases. Renewable energy generators located in states that do not have a Renewable Portfolio Standard can sell their RECs to voluntary buyers, usually at a cheaper price than compliance market RECs.


Power 32%
Maine Energy Use
Heat 39%
Transportation 29%
Electricity Users
Heat Users Hospitals, Schools, Homes, Businesses
Power
Heat
Fossil Fuel
Power
Grid
Power
Renewable Power (biomass, wind, solar PV, ocean)
Renewable Heat (biomass thermal, solar thermal, geothermal)
RECs at 1.7 tons of wood per REC
$ $ $
RECs at 0.50 tons of wood per REC
$ $ $
RECs
Compliance Buyers or Voluntary Buyers
$ $ $
REC Marketers

For biomass power at 30% efficiency, it takes about 1.7 tons of green wood to generate a megawatt-hour (MWh) of electricity.

That same 1.7 tons of wood used to make pellets used in an 85% efficient pellet boiler will produce 3.4 MWh's of useful thermal energy.

In a 65% efficient biomass thermal application using wood chips, 1.7 tons of green wood chips will produce 2.9 MWh's of useful thermal energy.

Assuming $30/ton for green wood, it costs $51/MWh to generate electricity, $15/MWh for heat from pellets, and $18/MWh for heat from chips.

What does it cost the user?

	Utility Natural Gas at $3.50 per MMBTU	Residential Natural Gas at $12.00 per MMBTU	Propane at $2.70 per gallon	Heating Oil at $3.70 per gallon	Pellets at $220.00 per ton	For Heating If used for Heat with Resistance Heating		
	Annual Output (kWh)	Fixed Capital Cost per kW	Fixed Maintenance and other per kWh	Variable Cost per kWh	Total Cost per kWh (at the generator for electricity)	Assumed Transmission Cost	Total Cost of Electricty	Cost per kWh of Useful Heat
Hydro	7,884,000,000	$ 0.0222	$ 0.0140	$ 0.0100	**$ 0.0462**	$ 0.08	$ 0.1262	**$ 0.1262**
Natural Gas Combined Cycle	1,576,800,000	$ 0.0094	$ 0.0160	$ 0.0210	**$ 0.0464**	$ 0.08	$ 0.1264	**$ 0.1264**
Coal	3,723,000,000	$ 0.0207	$ 0.0270	$ 0.0410	**$ 0.0887**	$ 0.08	$ 0.1687	**$ 0.1687**
Landbased Wind	100,740,000	$ 0.0960	$ 0.0540	$ 0.0050	**$ 0.1550**	$ 0.08	$ 0.2350	**$ 0.2350**
Nuclear	7,884,000,000	$ 0.0309	$ 0.0850	$ 0.0400	**$ 0.1559**	$ 0.08	$ 0.2359	**$ 0.2359**
Biomass (electricity only)	1,489,200,000	$ 0.0282	$ 0.0663	$ 0.0562	**$ 0.1507**	$ 0.08	$ 0.2307	**$ 0.2307**
Offshore Wind	148,920,000	$ 0.1466	$ 0.0740	$ 0.0100	**$ 0.2306**	$ 0.08	$ 0.3106	**$ 0.3106**
Solar PV	262,800,000	$ 0.1679	$ 0.0190	$ 0.0050	**$ 0.1919**	$ 0.08	$ 0.2719	**$ 0.2719**
Propane for Heat	294,336	$ 0.0027	$ 0.0010	$ 0.1120	**$ 0.1024**	N/A	N/A	**$ 0.1024**
Heating Oil for Heat	294,336	$ 0.0034	$ 0.0010	$ 0.9100	**$ 0.0915**	N/A	N/A	**$ 0.0915**
Natural Gas for Heat	294,336	$ 0.0031	$ 0.0010	$ 0.9100	**$ 0.0410**	N/A	N/A	**$ 0.0410**
Pellet Fuel for Heat	294,336	$ 0.0055	$ 0.0010	$ 0.0469	**$ 0.0534**	N/A	N/A	**$ 0.0534**

analysis by FutureMetrics

Let's look at Maine
(same logic works for any state with RPS)

Thermal RECs are a pathway to lowering RPS compliance costs, lowering ratepayer and generating costs, and, adding significant jobs and commerce.

We estimate that this strategy will add about 17,000 new permanent man-years of work in Maine over the next 12 years.

What is the Thermal REC Strategy?

Maine's original *Renewable Resource Portfolio Requirement* was passed as part of the state's 1997 electric-utility restructuring law. In 1999, Maine's Public Utility Commission (PUC) adopted rules requiring each electricity provider to supply at least 30% of their total electric sales using electricity generated by eligible renewable resources.

At the time of passage, the required percentage of renewables was actually lower than the existing percentage supplied.

Eligible facilities include those up to 100 megawatts (MW) in capacity that use fuel cells, tidal, solar, wind, geothermal, hydro, biomass or municipal solid waste in conjunction with recycling.

[NOTE – this is all for electricity generation.]

(From USDA Database of State Incentives for Renewables and Efficiency – DSIRE)

Since 1999, the renewables portfolio standard (RPS) has been amended several times and two separate classes designated.

Class II includes existing renewables, which are eligible to meet the 30% requirement described above.

Class I is composed of new renewables that have come on-line after September 1, 2005. Unlike Class II, municipal solid waste facilities and CHP facilities are not eligible for Class I and there are more stringent hydropower qualifying requirements. In addition, new wind installations may exceed 100 MW.

The schedule for the Class I standard is as follows:

1% for the period from 1/1/2008 to 12/31/2008
2% for the period from 1/1/2009 to 12/31/2009
3% for the period from 1/1/2010 to 12/31/2010
4% for the period from 1/1/2011 to 12/31/2011
5% for the period from 1/1/2012 to 12/31/2012
6% for the period from 1/1/2013 to 12/31/2013
7% for the period from 1/1/2014 to 12/31/2014
8% for the period from 1/1/2015 to 12/31/2015
9% for the period from 1/1/2016 to 12/31/2016
10% for the period from 1/1/2017 to 12/31/2017, and for each year thereafter

Following the example of New Hampshire, Maine can establish a modest incentive for renewable thermal energy (solar thermal, geothermal, biomass thermal) in Class I (new renewable energy projects) of the Maine RPS.

The mechanism is a “carve-out” that incorporates 2.6% of thermal RECs into the current Class I obligation of 10% by 2026.

The 2.6% thermal carve-out would be implemented at a rate of 0.2% per year for 12 years, starting in 2014. This gradual implementation would not disrupt the markets.

At an assumed $14/MWh value for the thermal RECs, the total compliance cost on a residential ratepayer's bill for the thermal portion is estimated to be about $0.105/month or about $1.265/year.

This is based on an average REC compliance cost of $0.0007/KWh from 2008-2010 (from ME PUC) and an incremental increase of $0.00017/KWh assuming a use of 600KWh/month.

That modest increase in electricity cost is expected to be offset by the benefits of the higher efficiency of using biomass for direct thermal and the reduction of Maine's reliance on heating oil.

When the full 2.6% carve out is achieved in 2026, there is the potential for more than $46 million in net savings to the ratepayers of Maine.

Year	2014	2026	TOTALS
Class I Thermal Carve Out %	0.20%	2.60%	
MWH of thermal energy[1]	24,000	312,003	
Projected Cost @ $14/MWh[2]	$344,403	$5,874,524	$37,391,850
Worst Case Projected Cost with ACP @ $28/MWh	$688,806	$8,736,074	$61,169,320
Reduced Heating Oil (Gallons)[3]	593,396	7,714,153	53,999,068
Retention of Heating Oil Expenditures in Maine Economy[4]	$1,748,528	$35,004,812	$214,739,597
Direct Savings on Heating Bills to Maine Homes and Businesses[5]	$874,264	$17,502,406	$107,369,798
Net Savings to Maine (@$14/MWh)	$2,278,390	$46,632,694	$284,717,546
Net Savings to Maine (@$28/MWh)	$1,933,987	$43,771,144	$260,940,075
Number of Homes Converted from Oil to Pellet Fuel at 900 gallons per year per home	659	8,571	
Percentage of Homes in Maine that use Heating Oil that are Converted	0.17%	2.23%	
Jobs Created (for biomass supply and using IMPLAN multipiers for indirect and induced jobs)	17	220	
Jobs not "Exported" + multiplers	186	2,423	
Jobs from increased disposable income + multiplers	88	1,768	
Net Jobs Created	292	4,411	

Almost 30,000 Man-Years of new labor. ←

Assumes ACP grows at an annualized rate of 2.5% and heating oil at a rate of 3.5% per year.

A typical home in Maine that uses 1000 gallons of heating oil could instead use a pellet boiler burning Maine-made pellet fuel.

The annual cost of heating that home at $3.65/gallon would be $3,650. Using pellet fuel at $220/ton the cost would be about $1,760.

Each ton of pellets contains about 4.7 MWh of energy (assuming 8000 BTU/lb). Assuming 85% efficiency, the user would be qualified to receive about 4.0 thermal RECs per ton of pellets.

If the REC price is $14/MWh, then the user would receive about $56/ton for each of the eight tons used per year, or about $450/year of added income (i.e., lowered cost). That is about a 25% reduction in heating cost on top of the already 50% reduction from oil to pellets

The economic benefits of the thermal provision for RECs are significant. Maine is heavily dependent on imported fossil heating fuels. Maine consumers export over $1 billion from its economy annually for heating oil alone.

Benefits include:

- Reduction in imported heating oil estimated at 54,000,000 gallons over 12 years.

- Retention of wealth in Maine economy by investment in the local economy rather than purchasing imported fuel estimated at more than $214,000,000 over 12 years.

- Homeowner, government and business savings on cost of heating buildings estimated at more than $107,000,000 over 12 years.

The incentives provided by thermal RECs will create significant numbers of permanent jobs and economic development in the biomass heating (pellet, wood chip), solar thermal, and geothermal industries in Maine.

Thermal RECs have significant **permanent** job creation effects.

The permanent jobs created per REC/year are many orders of magnitude higher for thermal RECs as compared to electric RECs from wind power.

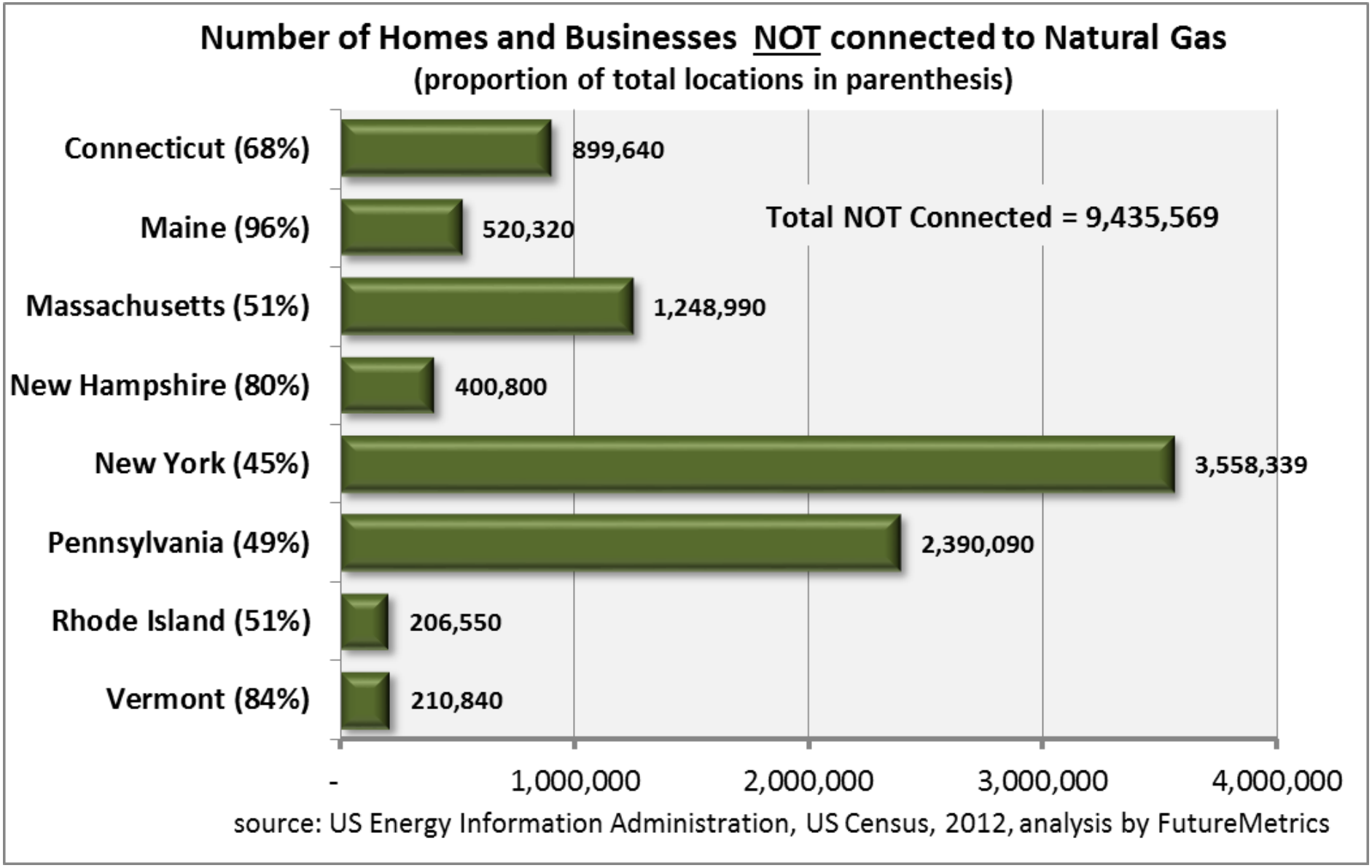
Wind produces 0.063 jobs per 1000 RECs/year.

Biomass thermal from pellet fuel produces 14.14 jobs per 1000 RECs/year.

Conclusion

The state, with no cost to the treasury, incentivizes via a small change to the RPS statue, switching from imported heating oil or propane to locally produced pellet or chip fuel, geothermal heat pumps, and/or solar thermal panels all of which results in heating costs being lowered significantly.

The jobs created in the wood fuel supply chain, the effects of keeping money in the state rather than sending it away, and the increase in disposable incomes for the owners of renewable thermal energy systems, will improve the economy, create jobs, and increase tax revenues to the state's treasury.


Number of Homes and Businesses NOT connected to Natural Gas
(proportion of total locations in parenthesis)
Connecticut (68%)
899,640
Maine (96%)
520,320
Massachusetts (51%)
1,248,990
New Hampshire (80%)
400,800
New York (45%)
3,558,339
Pennsylvania (49%)
2,390,090
Rhode Island (51%)
206,550
Vermont (84%)
210,840
Total NOT Connected = 9,435,569
-
1,000,000
2,000,000
3,000,000
4,000,000
source: US Energy Information Administration, US Census, 2012, analysis by FutureMetrics

Thanks – WilliamStrauss@FutureMetrics.com

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