



Transforming Wood Heat in America

A Toolkit of Policy Options

July 2011



About this Report: This year-long project, partially funded by the US Forest Service Wood Education and Resource Center, explores the existing and potential policy options for incentivizing more efficient and clean burning residential wood heat. The project involved intensive stakeholder consultations with industry, non-profits and government. A primary goal was to explore how to increase the ability of Americans of all socio-economic groups to use wood heat and reduce reliance on fossil fuels. The full version of the report can be found at www.forgreenheat.org/toolkit.html. The report was written by John Ackerly and Tatiana Butler of the Alliance for Green Heat with the assistance of the Wood Heat Task Force (see below). Many thanks to Alliance research fellows: Keith Krosinsky, Elizabeth Klusinske and Jordan Townsend.

Alliance for Green Heat: The Alliance for Green Heat promotes high-efficiency wood combustion as a low-carbon, sustainable, local and affordable heating solution. The Alliance for Green Heat educates the public, the media and local, state and national policymakers about the potential of wood and pellet heat and its applications to low and middle-income populations. The Alliance is an independent non-profit organization and is tax-exempt under section 501c3 of the tax code.

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1. Executive Summary

As traditional fossil fuel prices continue to rise and concerns about environmental impacts and dependency on foreign oil deepen, governments are increasingly turning to renewable energy and energy efficiency measures. However, many states and local governments have overlooked a technology that not only addresses these concerns but is also affordable to almost every income level: modern wood heat technology.

This toolkit is designed for policy makers to navigate the issues surrounding residential wood heat incentive programs and to review the incentive options. Wood heat incentive programs can be designed with a wide variety of goals including: renewable energy production, energy efficiency, air quality improvements and low-income energy assistance. Modern wood heat often helps achieve all four of these policy goals. This toolkit will advise on which program types and appliances best meet these diverse goals.

The Alliance for Green Heat interviewed over 150 stakeholders for this project including air quality experts, foresters, incentive program officers, industry leaders, manufacturers, EPA regulators and many others. In addition, a Task Force on Wood Heat Incentives representing these stakeholder groups provided extensive input and feedback.

Scale & Capacity of Wood Heat

Wood is used by 2.8 million American homes as a primary heat source and an additional 8.8 million homes as a secondary source. It also provides 80% of all residential renewable energy while solar produces 15%, and geothermal 5% (EIA). Since 2000, the use of wood for heat has risen in 37 states. Based on a 3 year average, approximately 250,000 new wood and pellet stoves are installed each year in America; though there are millions of second hand and non-EPA stoves currently installed. A wood or pellet stove, purchased and installed for \$2,000 to \$4,000, can replace enough fossil fuels to displace 2-4 tons of carbon a year, the same as a typical residential 3-4 kw solar PV system which can cost 10 times as much.

Emissions Issues

Emissions from wood stoves have been their greatest drawback and older stoves still pose challenges for many airsheds. Of the approximately 12 million stoves in operation today, 60 – 75% of them are not EPA certified. The most problematic class of appliances is the unregulated outdoor wood boilers that are not required to meet EPA or European standards. These appliances can emit excessive smoke and can pose a significant health threat to homeowners and neighbors.

Because of the smoke issues, wood boilers and non-EPA stoves are frequently the target of wood stove changeout campaigns. The stoves that are considered for broader renewable energy or energy efficiency incentives are EPA certified or qualified or those that meet European emission standards. New EPA certified wood stoves, particularly those that produce under 3 or 4 grams of particulate matter per hour are 7-15 times cleaner than older models, 40%-50% more efficient and typically use 30-40% less wood. Pellet stoves, particularly those that produce under 1 or 2 grams of particulates per hour, are clean enough to be aggressively deployed even in densely populated urban and suburban areas as they commonly are in Europe.

Sustainability of Fuel

A commonly expressed concern about wood heat is the impact on the forests, especially if growth of wood appliances is expected. However, wood harvesting for residential use is unique. First, about two thirds of homeowners harvest or gather their own firewood, often from down or dead wood, resulting in a very small ecological impact. Firewood harvesting also generally has a light impact due to its scale and decentralized nature. Second, both pellet and cordwood supply often comes from waste wood sources: A large percentage of purchased cord wood comes from tree trimming services in urban and suburban areas and pellets for domestic heating have often been created from sawdust residue, unlike the oft exported utility grade pellets. Additionally cordwood harvesting in the US in the last several decades has not been linked by any study or report as being a significant threat to sustainability of forests. The height of cordwood harvesting was in 1985 when over 50 million cords were harvested: today's harvest is less than half that number.

Importance of Wood Heat in Rural Low-income Communities

Wood is the renewable fuel of choice for rural Americans, particularly for low and middle-income families. Purchasing firewood in rural areas is likely to keep those energy dollars in the immediate community and provide local jobs. Wood heat can act as an energy lifeline for financially stressed households since it can be harvested for free. Low-income homes that heat with wood often require less government heating assistance or can provide for themselves when government assistance is reduced or runs out. Moreover, wood heat mitigates the "heat or eat" dilemma for hundreds of thousands of poor, rural families whose budget constraints might require them to choose between fuel and food if they have to purchase expensive fossil fuels.

Incentives

Federal - The only significant federal incentive was a tax credit for energy efficiency equipment in 2009 and 2010 that provided 30% of total cost up to \$1,500 for a primary residence. In 2011 the incentive was lowered to 10% capped at \$300. Unlike these small energy efficiency credits, the renewable energy provisions that apply to solar, wind and geothermal provide for 30% with no cap, and the credit is not limited to a primary residence. Since modern wood heat is a cost effective way to move the country towards less dependence on fossil fuel and is affordable to low and middle-income families, it makes little sense for it to be left out of federal renewable energy tax policy.

State - Some state renewable energy programs are beginning to include biomass appliances. Three of the most prominent state-wide programs are the Oregon and Montana tax credit for stoves and the New Hampshire rebate for pellet boilers. Alabama provides a tax deduction to switch from electric or gas heat. Five states have low interest loan programs that include wood burning appliances. Several states have long-standing incentive programs to change out older stoves, and replace them with new EPA certified ones including Idaho and parts of California and Washington State. Both Vermont and Michigan had statewide rebates for changeouts that have expired. While these programs are primarily designed for air quality goals, they also are a very cost-effective ways to more efficiently encourage renewable energy production and reduce fossil fuel use.

Conclusions

The cleanest and most efficient modern wood heat appliances can reduce residential fossil fuel usage much more cheaply than solar or geothermal systems. Based on extensive interviews with incentive program managers and policy makers, there is no consistent reason why modern wood systems have not been included in renewable energy programs. Many interviewees were not aware why the legislature did not include wood heat; some responded that wood was not eligible because of emission concerns but were not familiar with emission levels allowed by EPA or what the cleanest systems today are capable of. Most interviewees were not familiar with the extent of incentives provided to wood heat in Europe.

Key Recommendations

- **Renewable Energy Incentives:** Federal and state renewable energy programs should work to include the cleanest, most efficient wood/pellet stoves and boilers. Compared to other renewable energies, wood heat requires much smaller incentives and can help many more families, particularly lower income families, to quickly reduce fossil fuel heat. Renewable energy/ energy efficiency programs should include pellet appliances in both urban and suburban programs, but may want to restrict incentives for wood appliances to rural areas or areas with no wood smoke particulate air quality issues. To date, renewable energy incentives have mainly gone to very wealthy families.
- **New Source Performance Standards for Wood Burning Appliances:** The EPA is currently undertaking New Source Performance Standards (NSPS) for wood heating appliances. Stricter emission and efficiency standards are needed for all major wood burning appliances. Mandatory emission limits are now being developed for pellet appliances, indoor and outdoor wood boilers and other appliance classes which is an important step for incentive programs. Additionally, all new installations, including installation of second hand stoves, should be required to be EPA certified, as they are in Washington and Oregon.
- **Research & Development:** The Department of Energy (DOE) should be urged to support research and development of next generation thermal biomass systems. The DOE provides extensive support and funding for less efficient uses of biomass: biofuels and biomass for electricity while there is tremendous untapped potential in developing clean and efficient biomass heating systems at the residential and institutional level. Europe is outpacing the U.S. in this area, particularly in the development of automated pellet boilers that come with thermal storage and can be inter-connected with other renewable energy systems.
- **Changeout Old Appliances:** Programs to changeout existing outdated wood appliances with modern efficient equipment are crucial to efforts to modernize America's aging fleet of wood heating stoves and boilers that cause air quality issues. Changeouts help low-income families to afford cleaner, more efficient stoves that would otherwise be out of financial reach. The EPA should focus more funds toward this, and local jurisdictions should ensure that heavily polluting equipment is not re-installed in an area that has conducted a changeout program- as is too often the case. Changeouts should first focus on lower income families that use their stove or boiler as a primary or substantial secondary heat source. Additionally, changeout programs should invest in education and



outreach, as clean burning education is vital to ensuring the new stoves are utilized as cleanly as possible.

- **Energy Star:** An Energy Star program for wood and pellet stoves would steer consumers toward the cleanest and most efficient appliances. Higher efficiency wood and pellet equipment are more effective at quickly and cleanly reducing fossil fuel heat and consumers would benefit from a recognizable and trusted way to make purchasing decisions.
- **Low-Income Heating Assistance:** State energy assistance directors should consider providing full subsidies to qualified families to replace an existing uncertified stove with a new efficient wood burning device if the family uses wood as a heat source. The State of Montana has shown this to be a cost effective measure for LIHEAP programs. Additionally, benefits should not be primarily based on per unit price of fuel, which favors the highest priced fossil fuels. Under this system, families are more likely to choose a benefit for fossil fuels, instead of a locally produced renewable fuel like wood. This disincentive towards wood use keeps energy dollars flowing out of the state, and often out of the country.



2. Background

A. Wood Heat in America

Wood heat in America has been an energy and money saving phenomenon that has been overlooked for years. Currently, 1-in-50 American homes, or 2%, use wood as a primary heat source.¹ Wood can also be used to partially replace an existing heat source, with 8% of U.S. homes reporting the use of stoves and fireplace inserts as secondary heating appliances.² Biomass³ fuel can be self harvested or purchased for much less than the cost of most conventional fuels, meaning that its use for residential heating represents one of the most cost effective ways to utilize one of America’s most abundant renewable energy sources. Furthermore, unlike other uses of biomass, such as electricity and liquid fuel that only utilize 25-50% of the potential energy contained in the fuel, biomass used for heat can capture up to 90% of this energy for its use in heating the home (Fig 1).

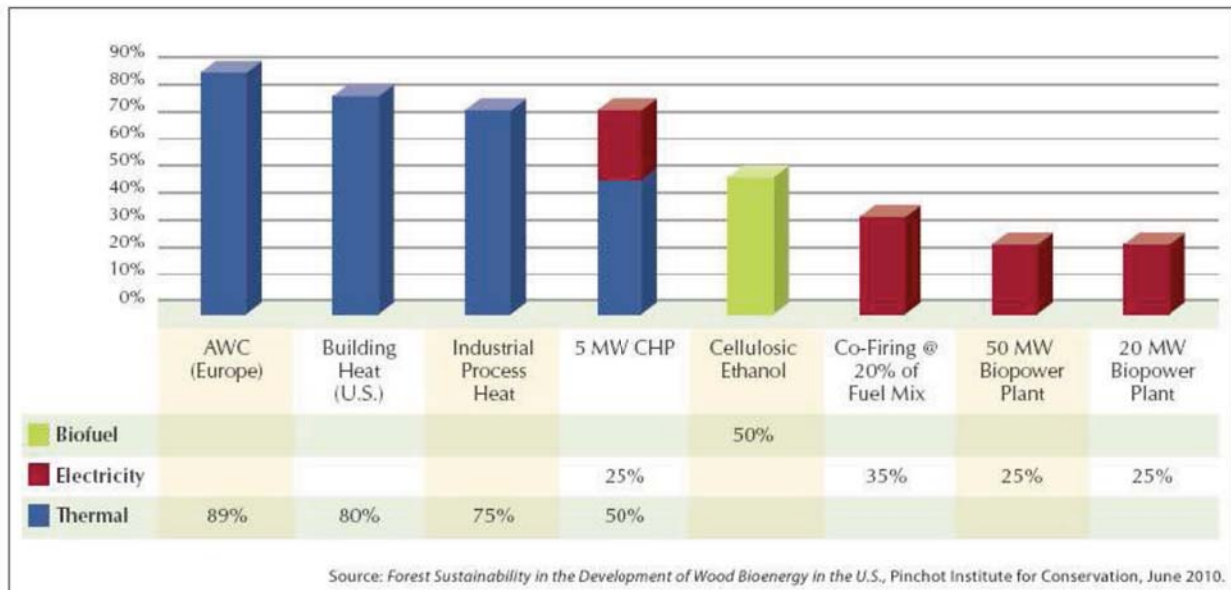


Figure 1: Relative Biomass End-use Efficiencies (Pinchot Institute for Conservation) * AWC is advanced wood combustion; CHP is combined heat and power; co-firing is with both coal and biomass

¹ US Census Bureau. 2005-2009 American Community Survey 5-Year Estimates. 2009

² US Census Bureau, 2009 American Housing Survey. 2009

³ In general, "biomass" is a very comprehensive term and *can* include a variety of fuels including wood, wood pellets, ag residues, organic material, algae, MSW, etc...In the residential sector, however, the types of biomass used for heating are typically cordwood, wood pellets, and corn pellets. Herein, the term 'biomass' is meant to include these home heating fuels, while the term 'wood' mainly refers to cordwood, but can *more generally* refer to cordwood or wood pellets. The term pellets refers to wood and corn pellets. For the full discussion on the 14 different definitions of biomass, see [Biomass: Comparison of Definitions in Legislation Through the 111th Congress](#) by the Congressional Research Service.

Reliance on wood for home heating is not exclusive to the more northerly regions of the US; New Mexico and Arkansas rank in the top fifteen wood burning states. Wood burning varies greatly across the states and communities. Maryland, for example, has a state-wide wood use rate around the national average, but has counties such as Garret County with 12.4% of the population using wood as a primary heat source.⁴ Vermont has the highest state-wide percentage of wood use with 11.8% of households relying on wood as a primary heating source (Fig. 2), and 32% using wood as a secondary heating source.⁵

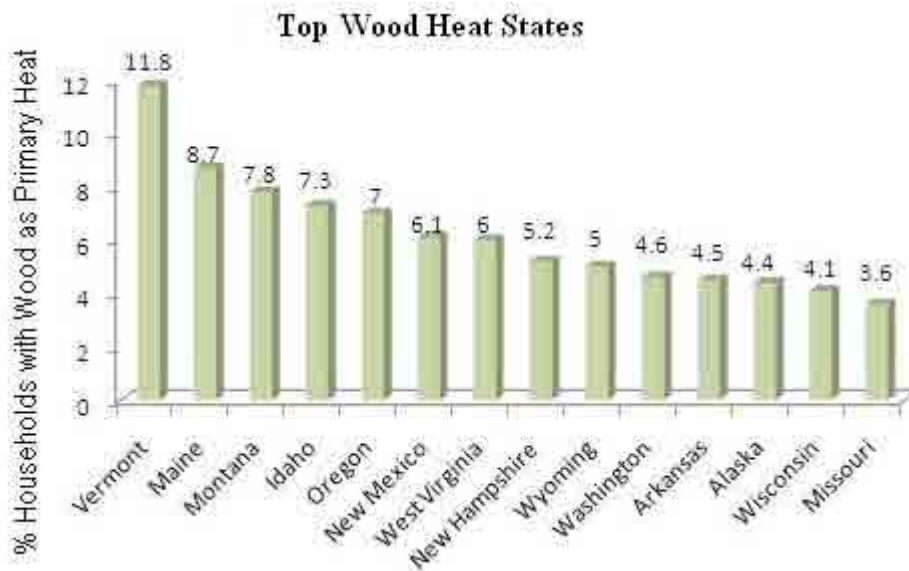


Figure 2: 2009 Wood burning as the primary heat source (U.S. Census Bureau)

Residential wood heat has been on the rise in the majority of U.S. states since 2000 (Fig. 3). Wood use has always been very responsive to the prices of other fuels; historically the use of wood for heat has been closely correlated with high oil prices. Prior to 1940, 3-in-4 households used coal or wood for heating, but in subsequent decades natural gas and electricity came to dominate.⁶ Fortunately, the use of coal as a home heating fuel has diminished over time, although a certain irony exists in the fact that the majority of electricity used for heating is sourced from coal burning power plants.

Globally, interest in wood for home heating increased in response to the 1970's oil crisis, while today there is renewed interest due to the fuel price volatility and greater environmental

⁴ US Census Bureau. *2005-2009 American Community Survey 5-Year Estimates*. 2009

⁵ White P. *Future of Firewood*. Farming Magazine. April 2011. <<http://www.farmingmagazine.com/print-6687.aspx>>

⁶ US Census Bureau. *Historical Census of Housing Tables*. 2009

considerations.⁷ Unlike fossil fuels, wood prices remain relatively stable over time, meaning that an investment in an efficient wood heating appliance can help to hedge against spikes in fossil fuel prices. This issue is especially poignant in low income communities, where an unexpected increase in heating prices can severely strain tight budgets.

In the last ten years, only twelve states have seen a decrease in wood use as a primary source of heat, while thirty one states have seen an increase in wood use (Fig. 3).⁸ The states where wood has declined the most are primarily the south-eastern states. This trend is possibly due to the relatively low home heating burden of that geographic area. It is likely that the low yearly requirement for home heating does not necessitate the price saving switch to wood heat, while switching from wood often yields large dividends in time and effort saved.

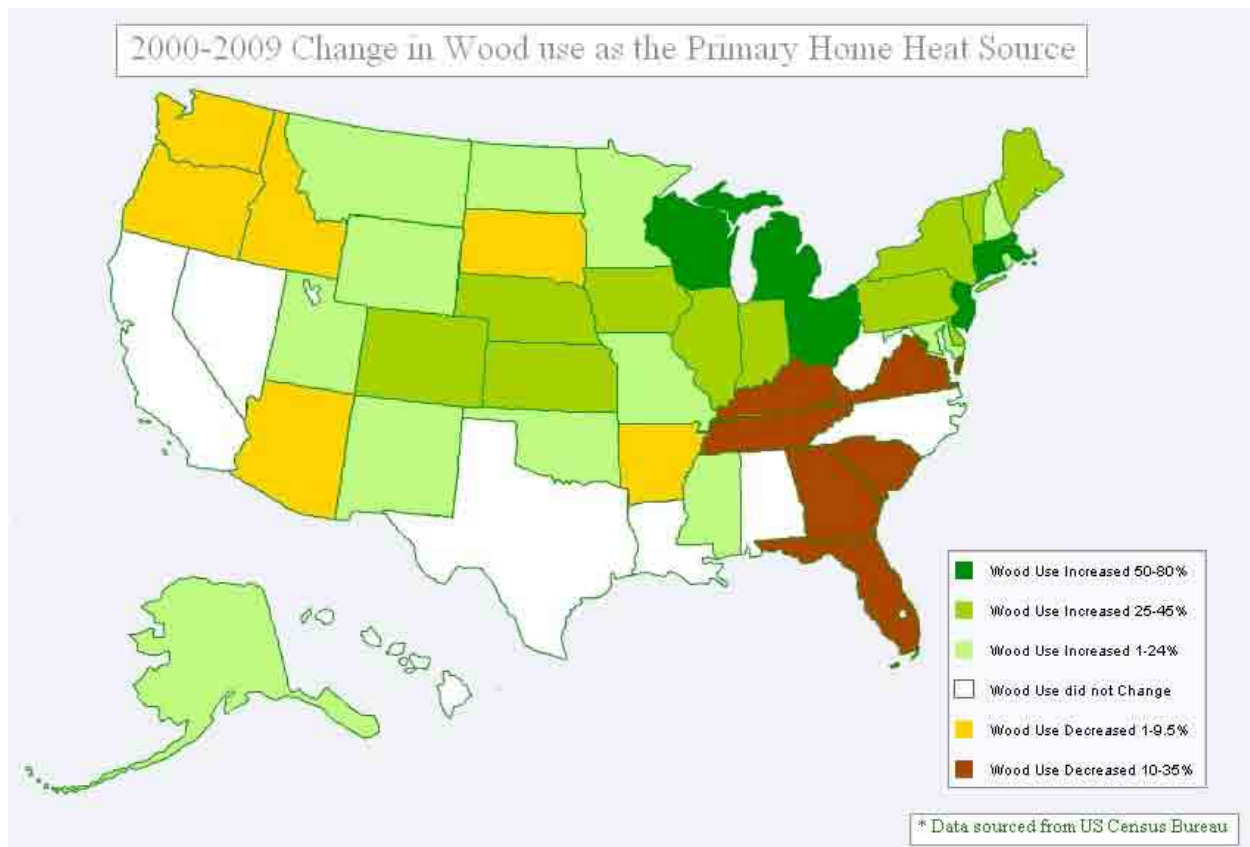


Figure 3: Wood use change in the US between 2000-2009 (US Census Bureau)

⁷ Lindroos, Ola. Residential Use of Firewood in Northern Sweden and its Influence on Forest Biomass Resources. Biomass and Bioenergy 2011.

⁸ US Census Bureau. 2005-2009 American Community Survey 5-Year Estimates, US Census Bureau, *Historic Census of Housing Tables*

B. Jobs and the Wood Heat Industry

The wood heat industry is an overwhelming domestic industry composed of many sectors, and is a significant source of US jobs. Perhaps the most immediately visible sector is the wood and pellet stove manufacturers and retailers, but other vibrant wood heat associated industries include replacement parts, accessories, installation, fuel harvesting and processing.⁹ Contractors generally charge \$1-2,000 for wood or pellet stove installation, and the accessory industry is able to capitalize on the decorative, atmospheric function of wood and pellet stoves. The wood fuel industry has an incredibly job-dense supply chain; from forestry management officials, loggers and truck drivers, to pellet fuel manufacturers and distributors.

The fragmentary and localized nature of the thermal-biomass industry makes gaining specific statistics on employment in the sector difficult. However, some figures are available: A 2009 study by

the USDA found that an estimated 2,300 people were employed in the pellet industry alone, a comparatively small part

of the overall biomass market.¹⁰ The wood pellet sector produced 4.2 million tons of pellets in 2008,¹¹ but due to the economic crisis, the production in 2009/2010 was lower than predicted. The industry group Hearth Patio and Barbeque Association (HPBA) reports that there were over 170,000 wood or pellet stoves sold in 2010 (Fig. 4).

Much like other durable goods, the wood and pellet stove industry was hard hit by the 2009 economic recession.¹² However in the last two years, sales figures have been stabilizing according to HPBA sales data, as the rise in fossil fuel price has traditionally corresponded to

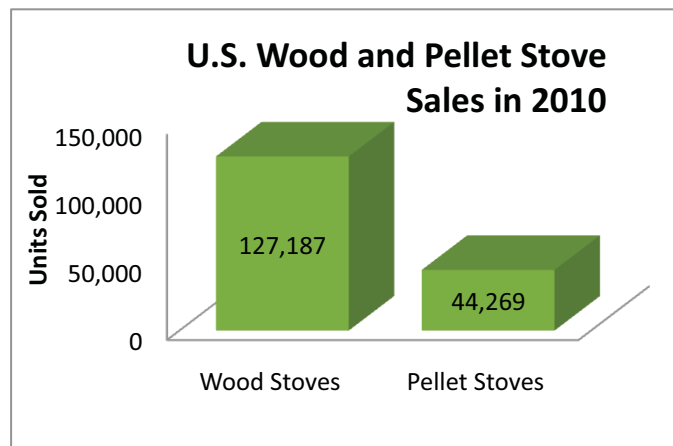


Figure 4: 2010 wood & pellet stove shipping figures (Hearth Patio and Barbeque Association)

⁹ Many wood stove companies derive a large section of their profits from the replacement part industry-which for some regions looking to eliminate old wood stoves can have a negative effect of keeping poorly designed stoves operational longer.

¹⁰ Spelter, Henry and Toth, Daniel, *North America's Wood Pellet Sector*. United States Department of Agriculture, 2009.

¹¹ Toth, Daniel, *North America's Wood Pellet Sector*. United State Forest Service. 2009. Pg 2

¹² Don Johnson, *HPBA 1998-2010 Shipping figures*. Hearth Patio & Barbeque Association. 2010

stronger interest in renewable wood heat. Regardless, *the Hearth Industry is valued at roughly five billion a year.*¹³

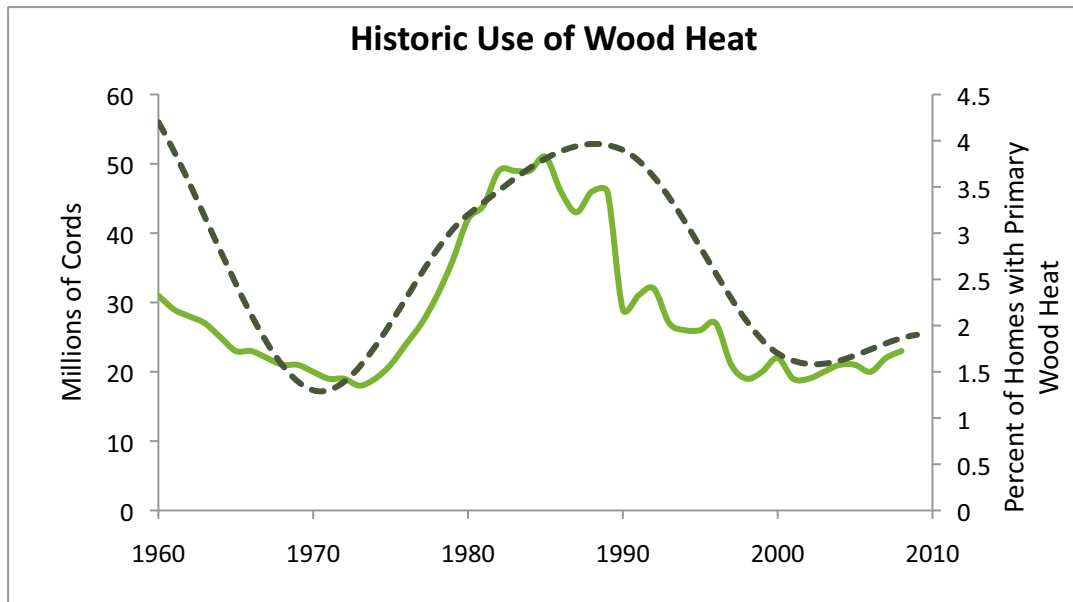


Figure 5: Fifty year consumption of cordwood & use of wood as a primary heating source (US Census Bureau & Energy Information Administration)

The firewood industry is notoriously hard to quantify due to the localized nature of most firewood harvesters. Many firewood dealers, for instance, are individuals who operate out of their flat bed trailer and engage in the business as a secondary source of income. The Department of Energy calculates that 23 million cords of firewood are combusted for residential heating purposes annually¹⁴ and residential wood heating expenditures are almost 1.5 billion per year.¹⁵ ¹⁶ The firewood industry is spread throughout the country. With regards to the wood products industry as a whole, the EPA reports that:

“Most of the industry is concentrated in the Pacific Northwest and the Southeast. However, concentrations are also found across the Midwest, the Northeast, and in Appalachia. Approximately 1/3 of the U.S. is forested. The area east of the Mississippi still contains a significant amount of forested acreage; 155 million acres are in the Northern States and 195 million acres are in the South. About 130 million acres of forested land is in Western States.”¹⁷

¹³ Don Johnson, *HPBA 2010 Shipping figures*. Hearth Patio & Barbeque Association. 2010

¹⁴ Energy Information Administration State Energy Data System. *Table 8: Residential Sector Energy Consumption Estimates, Selected Years, 1960-2008*. 2008.

<http://www.eia.gov/states/hf.jsp?incfile=sep_use/res/use_res_us.html&mstate=UNITED%20STATES>

¹⁵ Energy Information Administration State Energy Data System. *Table F25: Wood and Biomass Waste Price and Expenditure Estimates, 2009*. 2009 <http://www.eia.gov/states/hf.jsp?incfile=sep_fuel/html/fuel_pr_ww.html>

¹⁶ The disparity in cords burned and expenditures indicates the large percentage of wood users who self-harvest.

¹⁷ EPA Office of Compliance. *Profile of the Lumber and Wood Products Industry*. 1995. Pg 4.

While wood resources may be concentrated in particular regions, there is likely to be small-scale wood harvest and sale going on wherever there are forest resources or other sources of wood available such as urban wood waste. It is because firewood is so affordable and easy to self-harvest in so many communities that the firewood industry is largely untracked.

Concrete employment figures are available in some European countries like Germany, which have aggressively supported local biomass industries. Between 2000 and 2004 Germany witnessed the creation of 280,000 jobs in the renewable energy sector, 95,800 alone in biomass, the largest proportion of the total (Fig. 6).¹⁸ This total is only expected to grow as renewables increasingly dominate Germany’s energy sector, and it represents the potential for similar job growth in the United States.

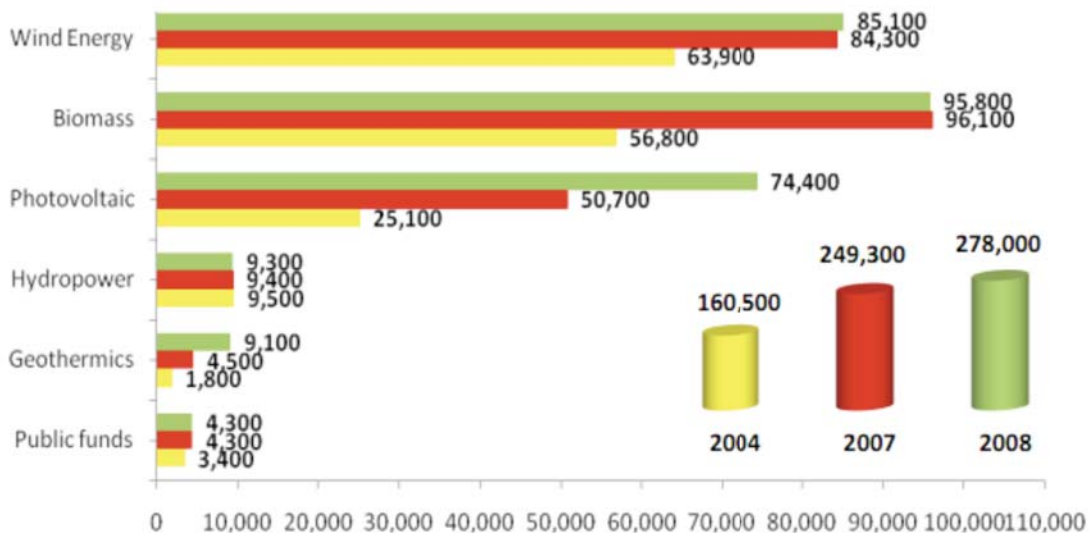


Figure 6: German renewable energy job growth (Heinrich Boll Foundation)

The collaboration project, *Heating the Northeast with Renewable Energy: A Vision for 2025*, envisions a similar future for the northeastern section of the US if 25% of home heating fuel was derived from biomass. Part of this study was an estimate of the number of permanent jobs that would be created if this scenario were to be realized. It was found that over 140,000 jobs would be created across the region using conservative estimates of extractable biomass potential.¹⁹ Similar if not greater job creation could occur in the southeast and northwest.

Some incentive programs are designed specifically with an economic focus and seek to stimulate some aspect of this industry (see [New Hampshire Rebate Program](#) pg. 53). Generally all biomass appliance programs will assist several sectors of this industry, which in turn will provide

¹⁸ Arne Jungjohann & Björn Jahnke, *Europe: Creating New Jobs with Renewable Energies*, Heinrich Boll Foundation, 2009

¹⁹ *Heating the Northeast with Renewable Energy. A Bold Vision for 2025*. Pg. 11

continuing support for local economies. Even programs that assist the consumer with the upfront purchase of a wood heating device will have a lasting effect on the local economy as these consumers connect with local fuel suppliers.



C. Clean Stove Research

The advances in reducing emissions from biomass stoves and furnaces in the US have been largely the result of engineering innovation in the private sector with virtually no government support for research and development. The Department of Energy has funded extensive research on many other renewables, but advances in residential biomass heat have not been as fast or as complex as those in the solar PV industry. The government’s interest (as well as funding) towards biomass as a renewable energy source has been almost exclusively focused on its conversion to ethanol fuel for use in the transportation sector (Fig 7).

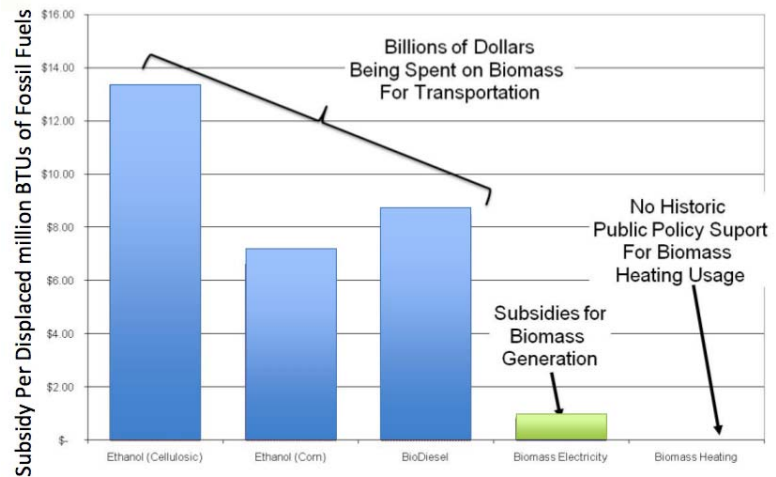


Figure 7: Government subsidies by biomass use (DSIRE)

For produces that may sell only 10,000 units or less in a year, the cost of testing is a significant barrier in bringing a product to market. Unlike the “white” appliances (refrigerators, dishwashers, dryers, etc.) that sell hundreds of thousands of units, wood and pellet stove makers have a harder time absorbing regulatory costs. Alleviating this with *federal or state funding may spur a wave of new technological advances, making stoves even cleaner burning.*

Comparison of Biomass Appliance Emission Rates

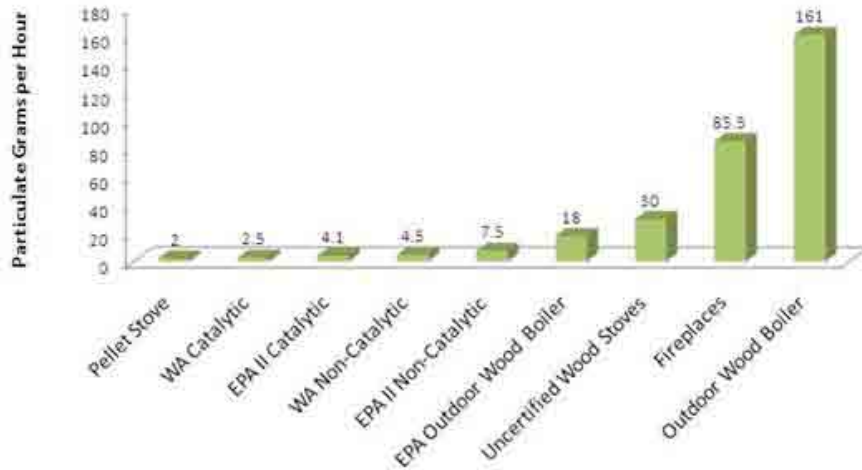


Figure 8: Comparison of biomass appliance emission rates (Alliance for Green Heat, EPA, NSCAUM, WA State) * EPA and WA State Figures are maximum allowable, all other figures are typical emissions as reported by the EPA

Technological advances made in Europe with wood and pellet boilers and furnaces have generally outstripped most American companies, partly because there is a much greater demand for cleaner burning furnaces in Europe, which is driven by strong incentives and renewable energy policies. Currently many European boiler designs and companies are being imported to America. In order for the American market to compete internationally in producing the cleanest and most efficient stove models, the prices of the American models need to be reduced to make them more available to low and middle-income families.

D. Wood Heat Compared to Other Renewable Energy

Wood is arguably the most successful residential renewable energy technology in the US today. While there are thousands of homeowners purchasing solar panels, wind turbines and hybrid cars, there are millions of wood stoves heating US homes with a renewable energy (Fig. 9).

How Will New EPA Standards Impact Incentives?

The EPA's new wood heater standards, the New Source Performance Standards, will come into effect starting in 2013, and are expected to usher in an era of cleaner wood stoves and boilers. While wood and pellet stoves will only be marginally cleaner overall, many appliances that previously were not regulated or certified, notably single burn wood stoves and indoor and outdoor boilers, will become much cleaner and more efficient. Appliances will also have to meet efficiency standards for the first time and stoves are likely to be held at least 70% efficient using the higher heating value test.

What does this mean for incentive programs? Stricter emission standards and more comprehensive coverage of appliances will likely result in more confidence in wood heating appliances. However, because the emission requirements for wood and pellet stoves are only marginally stricter, incentive programs looking to drive the market to cleaner, more efficient appliances should still consider allowing only a subset of the cleanest appliances to be eligible. A three gram an hour limit on wood stoves and a two gram an hour limit on pellet stoves, or equivalent efficiency thresholds, can act as a *de facto* Energy Star designation, and steer consumers toward the most efficient appliances. In terms of boilers, new standards may open more opportunities for states to look at incentivizing boilers, particularly indoor pellet boilers with thermal storage.

Appliance	1990 Limit	2014-2015 Proposed Limits
Wood Stoves (Non-cat)	7.5 g/hr	4.5 g/hr
Wood Stoves (Catalytic)	4.1 g/hr	2.5 g/hr
Pellet stoves	Mostly exempt	4.5 g/hr
Single rate stoves	exempt	3.0 g/hr
Wood boilers	exempt	.32 lb/MMBTU/ 18 g/hr
Forced air furnaces	exempt	.93 lb/MMBTU
Masonry heaters	exempt	.32 lb/MMBTU
Fireplaces	exempt	exempt

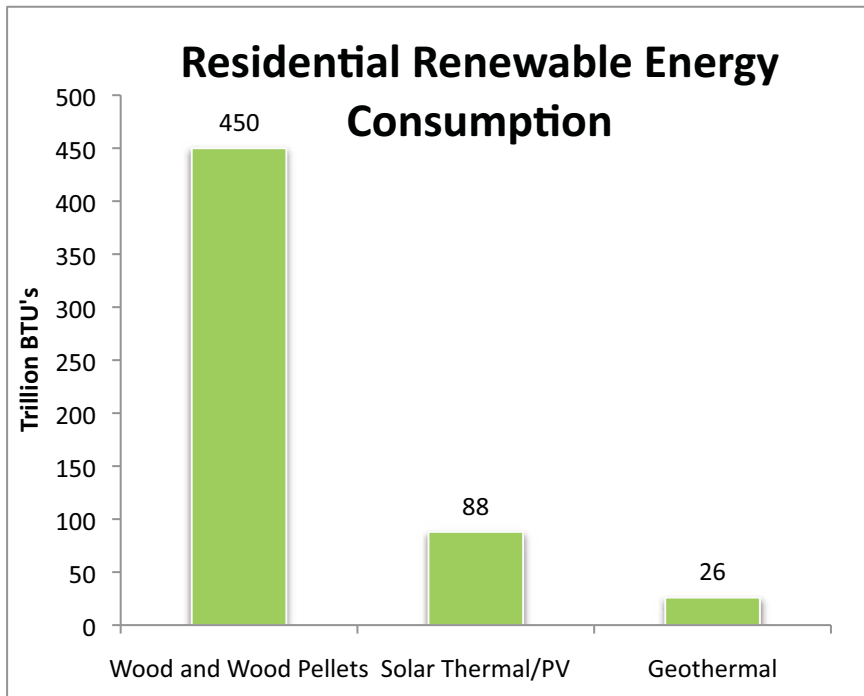


Figure 9: Renewable Energy Consumption in the Residential Sector (Energy Information Administration)²⁰

This is not a surprising trend, as wood heat not only has a few thousand year head start, but it is also only a fraction of the cost of other residential renewable energies. Residential solar PV panels cost upwards of \$20,000, as do most wind installations and the entire involved geothermal installation process.²¹ Solar panel purchase is driven primarily by the consumers' income level, with more wealthy families the primary solar purchasers.²² Clean modern wood stoves on the other hand can be bought and installed for under \$3,000. If stoves are used to replace a traditional fossil from of home heat, they can displace 1-10 tons of carbon a year (Fig. 10), depending on heating requirements, type of fossil fuel displaced and if the stove is being used as a primary or secondary source of heat.²³

²⁰ Energy Information Administration. *Renewable Energy Annual*. 2010

²¹ Solar City <<http://www.solarcity.com/residential/solar-pricing.aspx>>

²² Schelly, C. "Testing Residential Solar Thermal Adoption." *Environment and Behavior* 42.2. Mar. (2010) 167

²³ This is assuming the wood is harvested sustainably so over time the CO2 emissions amount to a virtually zero-carbon output.

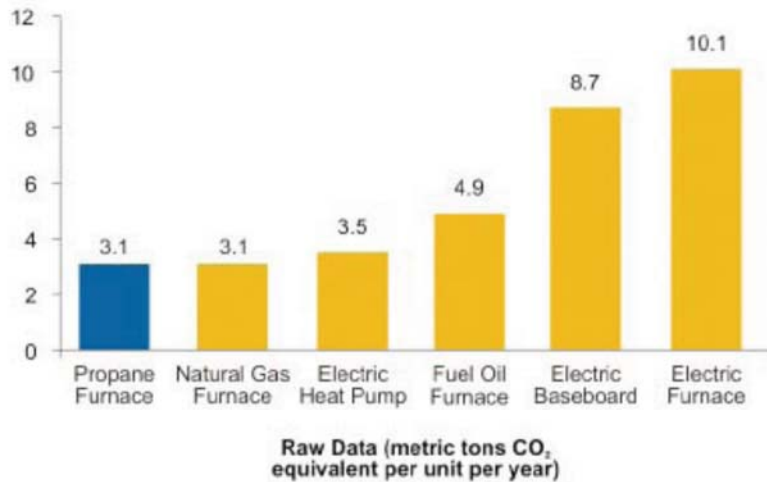


Figure 10: Tons of carbon per year per residential space heating unit (Hbh Gas Systems)²⁴

Due to the overwhelming prevalence of wood stoves, US wood stoves displace more carbon than nearly any other renewable energy (Fig. 11).

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	1.5 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 ***	1 million	2.5 tons	2.5 million

Figure 11: Renewable Energy Carbon Calculations (EIA, EPA, DOE) *Based on an average home's carbon footprint from heating, assuming a cordwood appliance displaces 50% of fossil fuels for heating, and the more automated pellet stove displaces 100% of the average fossil fuel heat²⁵, although either could be used as a primary or secondary heating source. **Based on EIA Domestic Solar PV Shipments, EPA Greenhouse Gas Equivalency Calculator ***DOE Alternative Fuels and Advanced Vehicles Data Center, EPA Greenhouse Gas Equivalency Calculator

²⁴ Hbh Gas Systems. *A Qualitative Comparison: Carbon Dioxide Emissions from Residential Space & Water Heating Using Propane vs. Electricity*. 2008. Pg. 4 <<http://www.blossmangreen.com/CO2%20Emissions%20Analysis.pdf>>

²⁵ NPR. *The Energy Costs of Cooling and Heating a Home*. August 2007. <<http://www.npr.org/templates/story/story.php?storyId=13941744>>

Because of the relative affordability of biomass stoves (Fig. 12), the payback period is generally shorter for the stoves than for most other renewable energy technologies. Of course, the pay back periods depend on many factors. For wood or pellets, it primarily depends on what fuel is being replaced. If pellets are replacing gas, it will take longer to recoup the investment, as pellets generally cost the same yearly as gas, but if pellets are replacing oil, propane or electric, the payback period will be much shorter. If self-harvested wood is replacing any of these energy sources, the payback period could be as short as a year.

Technology	Cost
Wind	\$6,000-30,000 ²⁶
Solar PV	\$16,000-20,800 ²⁷
Geothermal	\$7,500 ²⁸ - 14,000 ²⁹
Pellet	\$1,200-4,000
Wood	\$1,000-3,000
Masonry stove	\$7,000-15,000
Biomass boiler	\$7,000-20,000

Figure 12: Typical Renewable Energy Cost (Alternative Energy Resources)

State and Federal renewable energy programs have often overlooked biomass for residential heat, which is an unfortunate oversight. Biomass technology is not only much more accessible for low and moderate income consumers, but due to the low cost of each unit, incentive programs can afford more installations and so will yield greater environmental benefits than more expensive technologies.



²⁶ Alternative Energy Resources. As accessed May 2011. <<http://www.alternativeenergyinc.net/aboutus.html>>

²⁷ Pinkham L. *What is the Average Cost to Install a Solar-Electric System to Power your Home*. Mother Earth News. May 2009. <<http://www.motherearthnews.com/ask-our-experts/solar-electric-system-cost-z10b0blon.aspx>>

²⁸ US Department of Energy. *Selecting and Installing a Geothermal Heat Pump System*. August 2008

²⁹ Hughes, P. *Geothermal (Ground-Source) Heat Pumps: Market Status, Barriers to Adoption, and Actions to Overcome Barriers*. Oak Ridge National Laboratory. 2008

3. Why Wood Heat Should be Incentivized

- A. The Case for Wood Heat Incentives
- B. Biomass for Heat is a Low-carbon Renewable Energy
- C. Biomass is an Affordable Heating Source
- D. Biomass Heating Creates Jobs
- E. Biomass Heating Reduces Domestic and Foreign Oil Dependency

Summary: Wood is a unique heating fuel with some advantages over both fossil fuels and other renewable energies. It combines the best traits of renewable energy with an affordability to rival or exceed the least costly fossil fuel currently used for heating- natural gas. Wood is a renewable, low carbon alternative energy that is affordable to the average American. It can reduce foreign oil dependency, cushion homeowners from volatile fossil fuel price fluctuations and keep money in communities while simultaneously growing local industry. The affordability of this fuel makes it possible for low-income families to save money and can alleviate public assistance requirements, thus providing further public policy benefits. Unlike other renewable energies that depend on substantial sums to incentivize purchase-30% of the cost is subsidized by an uncapped US tax credit, 30% of typical wood stove purchases and installations can cost less than \$1,000. Wood heat opens the doors to a local renewable energy future that even low-income Americans can participate in.

The only significant downside is the emissions, which is one of the primary reasons incentives are so beneficial; they help to lower the cost of the more expensive clean burning modern wood stoves for everyday Americans (See [Emissions](#) pg 34).

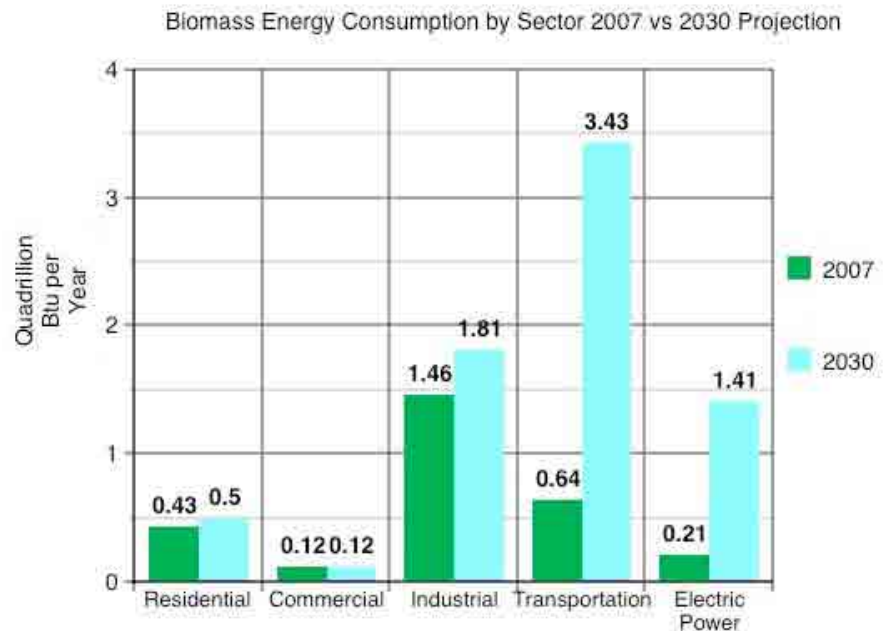


Figure 13: Biomass Usage Projection. Based on current policies and incentive structures, the EIA projects America's use of biomass to soar in transportation and electric power, the least efficient uses.

A. The Case for Wood Heat Incentives

In general, biomass heat fulfills the same public policy objectives that are the basis for the incentives and subsidies that other renewable energies receive, such as reducing consumption of foreign oil to increase American energy independence, reducing emissions of greenhouse gasses and air pollutants such as mercury and sulfur dioxides, and strengthening local economic development and job creation. Specifically, incentivizing clean, efficient home heating appliances can achieve these goals in an economically efficient manner while at the same time empowering more homeowners to use renewable energy.

Despite the widespread use of traditional wood stoves, modern biomass combustion systems have a relatively small market penetration and pose a significant price barrier to consumers—especially the low-middle income consumers to whom renewable energy technology is financially out of reach. Over 95% of Americans believe that improved appliance efficiency is important for personal financial reasons.³⁰ Although these cleaner and more efficient systems represent a new class of technology, they are still typically less expensive than other renewable technologies such as solar and geothermal. This means that applying a similar incentive amount enjoyed by other renewables will not only be effective in encouraging more widescale adoption of this technology, but that it can also make this technology affordable for lower income homes. Even traditional stove installations are still nowhere near the scale that they could be at. A 1994 report indicated that wood heat consumption could double within the next twenty years,³¹ but instead it declined for many years and is only now beginning to come back. Incentives are needed to make biomass heat more competitive in the market, and to bring the cost of the cleanest burning, most efficient stoves down to an affordable level for low income Americans. As market penetration increases, the incentives can be scaled back or eliminated completely.

Incentives can help transform biomass heating in the US into a cleaner, more efficient and more effective renewable energy. Since the only major public policy downsides of wood heat are emissions and sustainability concerns (See [Sustainability](#) pg 38), incentive programs are well-suited to address these concerns by encouraging adoption of the cleanest and most efficient equipment and hastening the removal of old, polluting stoves. Incentive programs can drive the industry to become cleaner, while helping to lower the cost of the cleanest equipment so it can be more affordable to average American families.

³⁰ Cooper, M. *Public Attitudes Toward Energy Efficiency and Appliance Efficiency Standards: Consumers see the Benefits and Support the Standards*. Consumer Federation of America. March 2011. Pg. 1

³¹ Warsco K. *Conventional Fuel Displacement by Residential Wood Use*. Forest Products Journal. Vol 44. No 1. Jan. 1994. Pg 68.

B. Biomass for Heat is a Low-carbon, Renewable Energy

As a low carbon source of energy, residential wood heating has the capacity to play a much larger role in the movement to reduce fossil fuel use in American homes. The sustainable harvest of biomass can accrue environmental benefits as well. This section will discuss the numerous ways in which biomass heat is a low-carbon energy source, a renewable fuel with the substantial capacity to displace fossil fuels, a powerful incentive to keep forests as forests, and a source of other environmentally beneficial effects.

Low Carbon Fuel Source

Biomass for heating use is considered a low-carbon energy source for many reasons. The primary reason is that the carbon released from combustion of wood does not add to the existing atmospheric carbon pool; rather, the carbon released during combustion would have been released due to natural forces of decomposition or forest fire. Given that the forest is managed sustainably, the carbon released from burning wood is re-sequestered by the next generation of growth. Since the scale of residential biomass heat is much smaller than biomass for ethanol or electricity, and has a more favorable carbon profile due to the increased efficiency of utilization for equivalent energy output, the initial ‘carbon debt’ from combusting trees is more easily replaced by sustainable re-growth.³²

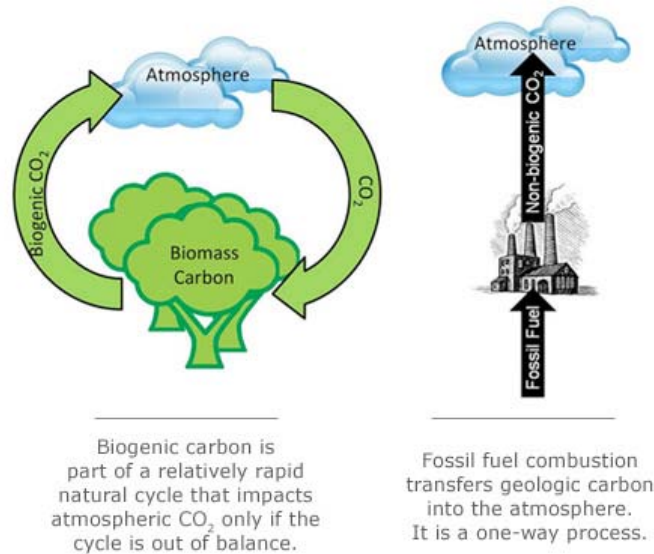


Figure 15: Carbon Pathways (Washington Forest Protection Association)

While the period between the initial release and re-sequestration of CO₂ is a concern, one study that recently explored this issue, the Manomet Center for Conservation Sciences’ “Study of Wood Biomass Energy” in 2010 suggests that biomass for *thermal use* is climate positive.³³ When paired with highly efficient heating technologies and sustainable forest management regimes, carbon emissions from wood combustion can be short lived in the atmosphere, providing substantial greenhouse gas reduction benefits over time by virtue of reducing fossil fuel use.

³² Walker et al. Biomass Sustainability and Carbon Policy Study. Manomet Center for Conservation Sciences. June 2010. Pg 7

³³ Walker et al. 2010. Pg 7

Burning fossil fuels takes carbon out of a stabilized form under the ground and introduces it to the mobile carbon pool, resulting in a long-term increase in the net atmospheric concentrations of CO₂. On the other hand, burning a tree merely re-releases carbon that was absorbed from the atmosphere during the lifecycle of the organism.³⁵ Because of this, clear definitions of sustainable forest management and effective policies that govern cordwood extraction and pellet production are viewed as an important component for maintaining a robust natural carbon cycle and thus ensuring that the low carbon benefits of wood heat are realized.

“Clearly, burning this wood for domestic heating is likely to result in very little net emission of CO₂ per unit of energy generated.”³⁴

Renewable Energy Source/Displaces fossil fuels



Sustainable harvesting ensures the fuel used for heating is replaced with new growth. Questions of carbon aside, wood is an energy source that can be regenerated with sustainable forestry.

Fossil fuels combusted for energy are the largest source of greenhouse gases being added to the atmospheric carbon pool, and are the origin of many other pollutants such as the sulfur, which can result in acid rain. The destructive extraction methods of traditional fossil fuels pose an additional threat on top of the pollutants.³⁶ The forestry activity associated with cord wood and pellet production has a very small environmental footprint and avoids negative impacts associated with the production of fossil fuels.



³⁴ Paul K. et al. *Net Carbon Dioxide Emissions from Alternative Firewood-production Systems in Australia*. Biomass and Bioenergy 30. January 2006. Pg 644

³⁵ “Biomass: A Key Source of Renewable Energy.” <<http://www.wfpa.org/pages/biomasspolicy.html>>

³⁶ Hester & Harrison. Pg 7.

It is notable that wood heat has the lowest emissions of greenhouse gases among the home heating fuels (Fig. 14). The greenhouse gas emissions from the study, *Air Emissions from Residential Heating* are conservative in the estimate of the benefits of wood burning for CO₂ reduction. Rather than assuming a nearly carbon-neutral cycle, the study reduced the CO₂ emissions from wood by a reasonable 40% based on current standard wood harvesting practices (including the fossil fuels used to transport and process the wood).

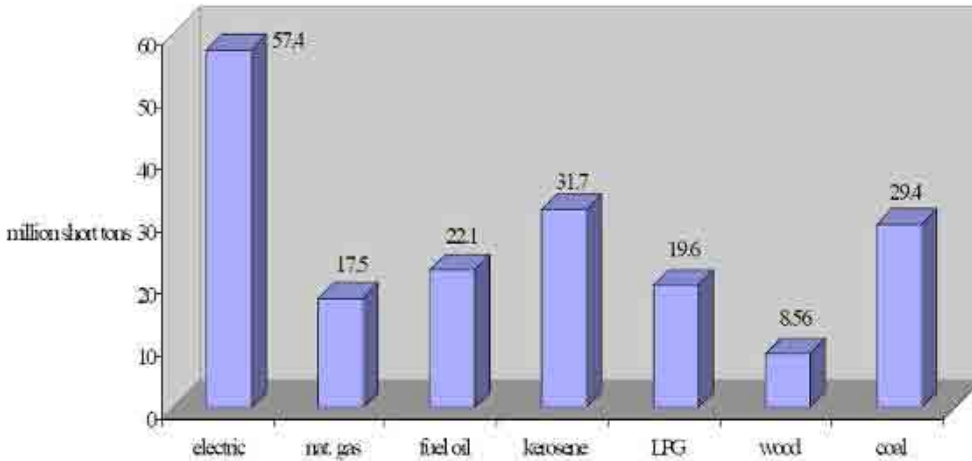


Figure 16: Air emissions from residential heating: The wood heating option put into environmental perspective (EPA)³⁷
Note: the results in all of these graphs reflect the energy trajectory of the fuels rather than just end point emissions

³⁷ U.S. EPA and Air Waste Management Association Conference. *Emission Inventory: Living in a Global Environment*, v. 1, pp 373-384, 1998. <<http://basineducation.uwex.edu/centralwis/pdfs/hpawma.pdf>>

Supports Responsible Forest Management

Consumer demand for fuelwood can create new markets for wood products, which can make it economically viable to remove trees that might otherwise have no value.



“The harvest and use of trees damaged by insects or thinning forests to reduce wildfires is the proverbial win-win-win of improving forest health, creating employment opportunities and producing a clean energy source.” –Al Steel, Forest Service Scientist, USDA Forest Service

Figure 17: Pine bark beetle killed forest, Colorado (The Colorado Independent)

The wood heat industry can support forestry management activities such as controlling invasive species or mitigating fire hazards through forest thinning by providing a market for low value trees that provides enough money to help defray the often large expenses that these operations can incur.^{38 39} Reducing harvesting activities for the purpose of storing carbon can backfire by increasing the risk of a devastating forest fire or insect outbreak that would remove far more healthy trees than well planned cordwood harvest.⁴⁰ Montana State Department of Natural Resources, for example, provides firewood permits (for a small fee) with a two cord minimum harvest in order to help the state manage the pine bark beetle killed trees.⁴¹

“Small diameter, crooked stem, or low value species that might be targeted for removal, often bring little or no value in the market place. This problem of finding markets for this material has been identified as a key goal by the landowners of the Massachusetts Woodland Cooperative.”- David Damery, Journal of Sustainable Forestry

³⁸ Tsai, Katherine. *Forest Service keeps eye on timber industry health*. Associated Press. November, 2010.

³⁹ Arnosti, D., D. Abbas, D. Current, and M. Demchik. *Harvesting Fuel: Cutting Costs and Reducing Forest Fire Hazards through Biomass Harvest*. Institute for Agriculture and Trade Policy, Minneapolis, MN. 2008. Pg 8

⁴⁰ Canadell, Josep, Raupach, Michael. *Managing Forests for Climate Change Mitigation*. Science. Vol 320. June 13. 2008. Pg 1456

⁴¹ Montana Department of Natural Resources and Conservation. Sept. 2007.

http://dnrc.mt.gov/news/news_releases/2007/14Sept07.asp

Provides a Financial Incentive to Conserve Forests as Forests

Firewood harvesting provides an important revenue stream for many landowners, large and small which increases the financial incentives to retain forest land as forest land.⁴² One of the primary causes of U.S. forest loss is the transformation of privately owned forests to development.⁴³ Pre-recession estimates showed that nearly 6,000 acres of forest and open space are converted to other uses in the US on a daily basis.⁴⁴ Firewood harvesting provides an additional financial value to maintain forestland in its undeveloped state.

Additional Benefits

Biomass Heat has numerous other environmental benefits as well. Because cordwood is necessarily a local fuel source, the carbon footprint associated with transporting it to the end user is quite low⁴⁵. Residential heating applications can also utilize low value sources of wood like sawdust and urban wood waste for pellet creation, thus preventing them from ending up in landfills. The value that residential wood heating bestows upon these types of materials also provides economic support for the local municipalities and the forest products industries that provide them. Finally, using wood in one or more stoves can heat the home very efficiently by providing warmth to the most used parts of the home. This is known as ‘zone heating’ and it can significantly save fossil fuel because the low traffic parts of the home are not heated as aggressively as the most used areas.

⁴² Damery D. *Landowner Driven Sustainable Forest Management and Value-Added Processing*. University of Massachusetts Amherst. 2005. < <http://bct.eco.umass.edu/publications/by-title/landowner-driven-sustainable-forest-management-and-value-added-processing/>

⁴³ Stein et al. *Forests on the edge: housing development on America’s private forests*. Gen. Tech. Rep. PNW-GTR-636. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 2005. Pg 16.

⁴⁴ Butler, B. (2008) *Private forest landowners in the United States, 2006*. Newtown Square

⁴⁵ Calculations may be higher with pellet fuel, which requires greater energy investment to process, although their densified nature can allow for enhanced shipping efficiency

C. Biomass is an Affordable Heating Source

Wood is the renewable fuel of choice for rural Americans, particularly low and middle income families. State and federal policies that incentivize purchasing new, clean-burning wood stoves help these families to affordably heat their homes with a low carbon fuel. Biomass stoves typically cost between \$1,000 and \$3,000, making them an affordable investment for most low and middle-income families. In Washington State however, households making over \$20,000 are significantly more likely to own a stove than households making under \$20,000.⁴⁶ This likely reflects the fact that the initial stove purchase, while very cost effective, still requires an investment that the very lowest income households could have difficulty affording.

Biomass stoves are a significant source of heat and can easily displace hundreds of gallons of heating oil as well as this equivalence of natural gas or propane. At today's prices, *purchased* cordwood is often comparable to natural gas and both cordwood and pellets are significantly less expensive than fuel oil, propane or electricity (Fig. 17). The 2009 Bureau of Labor Statistics Consumer Expenditure Survey reported that total home heating expenditures for electricity, fuel oil, natural gas and other fuels averages \$2,000 per year.⁴⁷ The advantage biomass has over these fuels in addition to affordability, is that wood is renewable and local. The money spent on home heating will remain in the local economy, and the money saved on home heating can circulate locally as well.⁴⁸

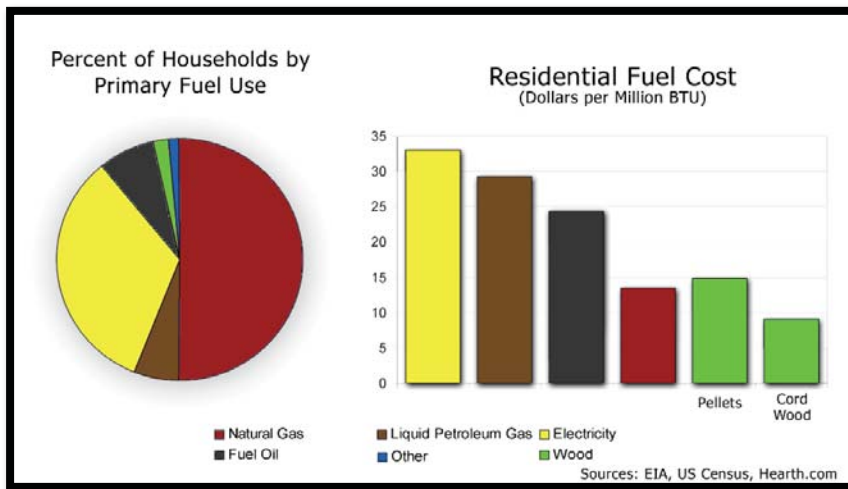


Figure 18: Household fuel cost and use (Biomass Thermal Energy Council)

⁴⁶ Gunnells L. *Smoke Gets in Your Eyes: Wood Stoves, Fireplaces and Chronic Disease*. Washington State Department of Health. October 2009. Pg 22

⁴⁷ Cooper, M. *Public Attitudes Toward Energy Efficiency and Appliance Efficiency Standards: Consumers see the Benefits and Support the Standards*. Consumer Federation of America. March 2011. Pg. 3

⁴⁸ Gulland J. *The Argument in Favour of Wood Heating*. The Fuelwood Project. February 2007. Pg 18

A household switching over to wood or pellet heat can reap significant rewards in yearly savings (Fig. 17). Cordwood price differs vastly depending on geographic location, tree type (hard or soft), size, dryness, split, etc. but the average price for a cord of wood is around \$200. Depending on heating needs, most American households use 1-6 cords a year. However, unlike traditional fuels, cord wood can be harvested at very low cost on most state and federal lands (see [Fuel Incentives](#) pg. 28), or collected from urban and suburban waste wood that otherwise often ends up in landfills.

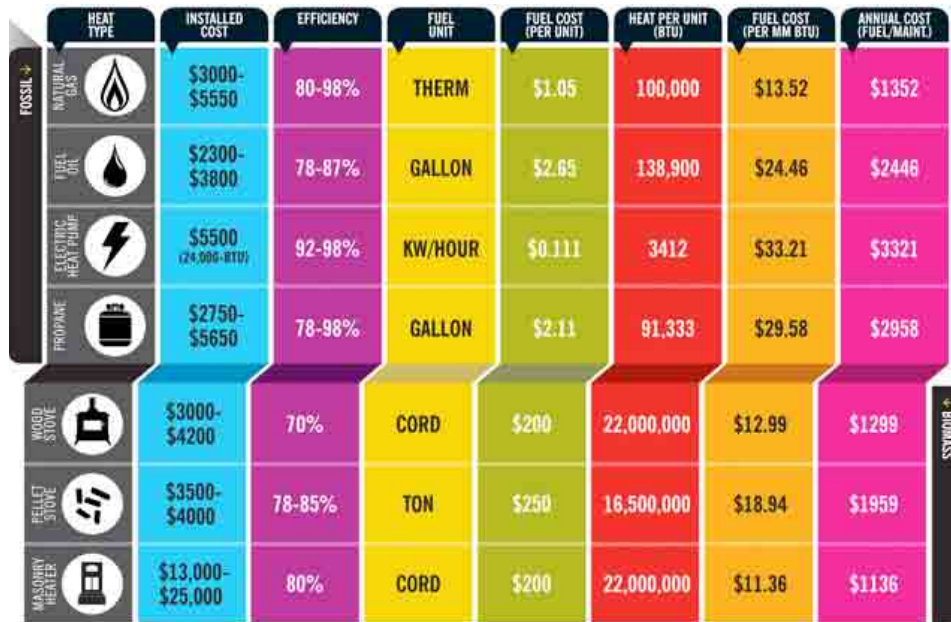


Figure 19: Heating fuel costs (Popular Mechanics)⁴⁹

Replacing	With	Saves
Electric	Wood	\$2,022 per year
Electric	Pellets	\$1,362 per year
Electric	Self Harvested Wood	\$3,321 per year
Natural Gas	Self Harvested Wood	\$1,352 per year
Propane	Wood	\$1,659 per year
Propane	Self Harvested Wood	\$2,958 per year
Propane	Pellets	\$999 per year
Fuel Oil	Wood	\$1,147 per year
Fuel Oil	Pellets	\$487 per year
Fuel Oil	Self Harvested Wood	\$2,446 per year

Table 1: Fuel replacement cost savings (As calculated by the Alliance for Green Heat based off of average yearly fuel costs sourced from Popular Mechanics)

⁴⁹ Ward L. *Is Wood the Best Renewable Fuel for Heating?* Popular Mechanics. January 2011. <<http://www.popularmechanics.com/home/improvement/energy-efficient/is-wood-the-best-renewable-fuel-for-heating>> *

Wood Helps Families Stay off of Public Assistance

Wood heat is a useful safety net for very low-income families as one of the most affordable heating sources. Counties with per-capita income below the federal poverty threshold have almost three times more wood heat users than counties above the federal poverty threshold.⁵⁰ Since counties with per-capita income falling below the federal poverty line are almost three times as likely to heat with wood, we can conclude that the financial benefits of wood heat are a significant benefit to low-income areas. Additionally a study on the wood use patterns of households in the Southeastern U.S. found that on average lower income households consume more fuelwood than higher income households.⁵¹

Numerous reports document the "heat or eat" dilemma in America. "Forty percent [of low-income Americans] reported that they have had to choose between paying for food and utilities in the past year."⁵² Low-income households have lower food expenditures and worse nutritional outcomes than more affluent families during cold-weather periods.⁵³ Wood stoves help mitigate this problem in rural areas where families typically collect or harvest their own wood. Greater energy assistance funding for installing efficient EPA certified wood stoves could decrease energy and food insecurity.

Wood heat not only benefits the local economy, but the county and state in general by potentially allowing Low Income Heating Assistance Program (LIHEAP) eligible families to remain off assistance and helping the borderline LIHEAP eligible demographic save money and avoid the need for LIHEAP assistance. This frees up more funds for other cases and allows people to retain their independence, while saving money on heating.

Note this figure represents the 'average' 2400-square-foot house in the U.S. The amount of heat required in different parts of the country will vary greatly, as will the cost of the different fuels.

⁵⁰ To measure the disparity in wood use between high and low-income communities, we examined a total of 196 counties in six states; Oregon, Maine, New Hampshire, Montana, West Virginia and Maryland. The states selected were chosen for their geographical spread, high percentage of forest land and high levels of residential wood heat use-five of the chosen states are in the top ten highest wood use states. The per capita income for each county was analyzed to determine if families below the Federal Poverty Line (FPL) of \$22,050 (for a family of four, 2009-2010) were more likely to use wood heat than families above the FPL. When the two groups were compared, we found that counties with a per capita income below \$22,050 were 2.8 times more likely to have wood heat users than other counties (P=.001). Counties with a per capita income below the FPL had an average of 10.7% wood heat use compared to 3.8% in higher income counties.

⁵¹ Christiansen E. et al. *Residential Fuelwood Consumption in the Southeastern U.S.* Biomass and Bioenergy Vol. 5. No. 6. 1993. Pg. 492

⁵² Feeding America, *Public Opinion Poll Release*. December 2008

⁵³ Bhattacharya, J. et al. *Heat or Eat? Cold-Weather Shocks and Nutrition in Poor American Families.* American Journal of Public Health. Vol. 93. No. 7. July 2003. Pg 1153

D. Biomass Heating Creates Jobs

Biomass heat provides great benefits to rural and forested economies across the country. The firewood industry employs tens of thousands of rural Americans. Although the jobs in the sector are not well studied or monitored, firewood harvesting is known to be an important primary and secondary source of income in most states. The firewood industry is a sustainable and local job field that is open to most rural Americans in wooded areas. The number of jobs available to blue-collar Americans in the biomass heat sector will only increase as this important energy source replaces fossil fuels. This trend has coincided with greater market penetration of highly efficient boilers and furnaces in many areas of Europe, such as Germany and Austria (see [European Programs](#), pg. 98). Today's firewood, pellet and other residential biomass industries have great potential to expand in coming decades, providing much needed assistance to some of the most economically distressed areas of the country.

Case Study

“This report estimates that fuelwood consumed in Renfrew County in 1979 was 55,000 cords. The total value of this wood is in excess of 3 million dollars, but this wood replaces nearly 5 million dollars worth of fuel oil and electricity. This fuel replacement prevented a very substantial percentage of that 5 million dollars from leaving the county’s economy.”⁵⁴

-Renfrew County Energy Conservation Project

There are jobs in the harvesting and processing (i.e. pellet milling) of wood fuel and the manufacture of stoves and furnaces. Many jobs are also created in the transportation, administration and retail sector as well as in local communities benefitting from an ongoing increase of disposable income. A strong firewood and pellet industry can bring thousands of jobs to areas of the country that have been hit hardest by the collapse of small farms and the timber industry. Since many people in the region lack the ability to move, creating jobs in these areas that draw upon the skill sets already common in the population is smart policy. For a complete discussion of wood heat jobs, see [Jobs and the Wood Heat Industry](#), pg 30.

⁵⁴ Energy Pathways Policy Research Group. *Renfrew County Energy Conservation Project. A Community Energy Study*. Energy Mines and Resources Canada. March 1980

E. Biomass Heating Reduces Domestic and Foreign Oil Dependency

In the average American household, 41% of the total energy used goes toward space heating.⁵⁵ Naturally, this portion is much higher in colder northerly regions. As a consequence, the choices that homeowners make about their heating habits will have substantial effects on their overall energy profile. Residential heating consists mainly of natural gas and electricity, but seven percent of US residential heating is from fuel oil. In parts of the country, especially the Northeast, the proportion of fuel oil use is higher. According to the 2009 EIA residential energy consumption survey, 42% of all homes in New England still use oil as their main source of heat.

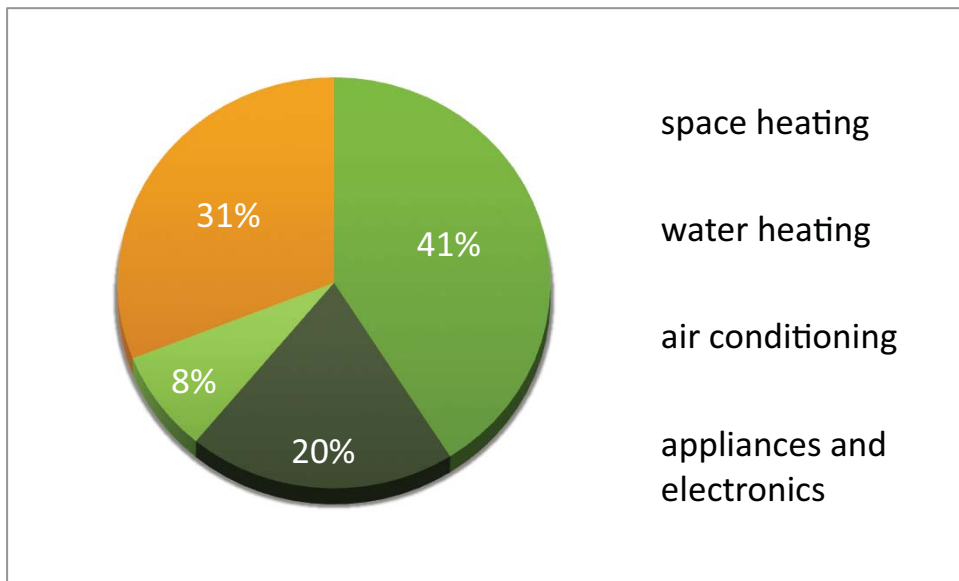


Figure 20: Energy used in the average American home (EIA)⁵⁶

According to the US Energy Administration, 57% of U.S. oil is imported from foreign countries. Importing and burning foreign oil negatively impacts our economy, national security and the environment. Oil contributes to the U.S trade deficit and is subject to major disruptions that cause price spikes, slowing economic recovery. The Center for American Progress has pointed out that the U.S. buys oil from governments that are considered “dangerous or unstable” by the State Department, including Algeria, Chad, Colombia, the Democratic Republic of the Congo, Iraq, Mauritania, Nigeria, Pakistan, Saudi Arabia, and Syria. Additionally, burning fossil fuels contributes to global warming, which poses additional threats to national security. Because direct combustion provides a much more efficient energy pathway, wood used for home heating has a

⁵⁵ EIA. *EIA Residential Energy Consumption Survey 2005*.

⁵⁶ EIA. *Residential Energy Consumption Survey 2005*.



much higher capacity to reduce oil consumption than other uses of biomass, such as ethanol or power production.



4. Wood Heat Concerns

Summary: There are four main environmental challenges commonly identified with residential wood heating: particulate emissions, sustainability of supply, high initial CO₂ release and pest transportation. Emissions are by far the most serious drawback, but equipment is getting steadily cleaner and incentive policies can have a positive impact in deploying the very cleanest burning models. There are not yet significant sustainability issues with biomass for residential heat, but if other uses, such as electricity generation, are deployed on a larger scale, then overall sustainability issues may arise due to the high volume of wood required. The concern over the high initial CO₂ release is complex, but because of harvesting patterns and high combustion efficiency, residential wood heat provides significant carbon savings compared to fossil fuels in the short-term, and can approach carbon neutrality in the long-term. Pest transportation poses very real challenges in firewood, but more so in firewood brought to campgrounds than used for home heating⁵⁷, and requires careful management and consideration. This chapter will explore these issues as well as incentives and other policy options that can be employed in order to mitigate them.

⁵⁷ National Firewood Task Force. *Recommendations* March 2010. Pg. 3

A. Particulate Emissions

Summary: Particulates from wood heaters are a serious health concern, particularly in areas where high concentrations of particulates from wood smoke builds up. The cleanest burning modern stoves have drastically reduced indoor and outdoor particulates. Scores of mitigation strategies can be employed in those areas to improve air quality, including banning new installations altogether. Incentive programs provide the government with leverage to steer consumers towards the cleanest burning appliances and, for example, to only incentivize the cleanest pellet appliances in urban areas.

The combustion of biomass releases a wide variety of pollutants into the air, including carbon monoxide, [volatile organic compounds](#), toxics (such as benzene and acrolein), and small incompletely combusted [particles](#). Particulate matter with diameters under $2.5\mu\text{m}$ ($\text{PM}_{2.5}$) is considered a hazard to human health in concentrations found in many U.S. cities. For reference, one μm (micrometer) is one thousand times smaller than a mm (millimeter). $\text{PM}_{2.5}$ can increase the risk of asthma and lung disease.⁵⁸ The emission of all particulates from stoves is measured in grams per hour (g/hr) and is the primary way that consumers – and policymakers – can assess the level of emissions of $\text{PM}_{2.5}$.⁵⁹

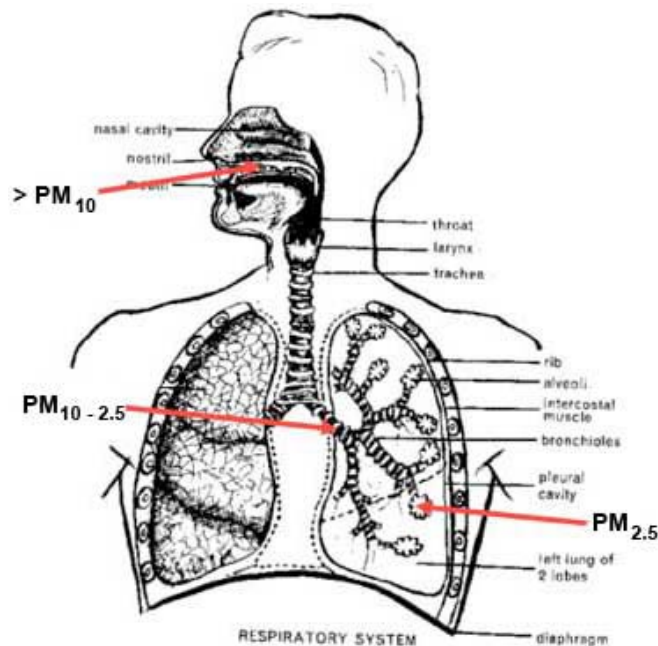


Figure 21: Particulate matter diagram (Minnesota Pollution Control Agency)

⁵⁸ EPA. Burnwise. Last updated Feb. 8, 2011. < <http://www.epa.gov/burnwise/healtheffects.html> >

⁵⁹ Hereafter the grams per hour emissions of $\text{PM}_{2.5}$ will be referred to as g/hr.

Older adults, young children and those suffering from heart or lung diseases face an increased risk of complications from breathing particles found in the smoke from older, inefficient wood stoves. The dangers of indoor and outdoor wood smoke are likely to be greater in low-income communities, where wood burning is more common, and older, more heavily polluting wood heating appliances are often more prevalent.

There are several ways to mitigate the adverse health effects of wood smoke: changing out old polluting wood burning appliances for the much cleaner burning modern models (see [Changeout Programs](#), pg. 70), restricting installation of all but the very cleanest burning (under 1 g/hr) appliances in urban areas and valleys prone to inversions,⁶⁰ expanding property line set-backs and other restrictions for outdoor wood boilers (see [Outdoor Wood Boilers](#), pg. 109), and implementing clean burning education for the users of wood heating appliances to reduce user error derived wood smoke.

Pellet stove technology has reached a point where scores of models have very low (under 1 g/hr) particulate emission rates and are generally not considered to pose a significant health threat. The average fuel oil boiler emits twice as much PM_{2.5} per unit of heating value (British thermal units) than a pellet stove.⁶¹ A life cycle particulate analysis, as opposed to a combustion particulate analysis, may point to a more comparable emissions profile between fossil fuels and the cleanest pellet stove and boiler emissions since it takes into account all of the emissions released in the extraction and refinement of fossil fuels. In Europe, pellet stove and boiler particulate levels are considered reasonable and not a barrier to installations even in urban areas.⁶²

Strategies for Reducing Residential Wood Smoke
Air Quality Planning Division, EPA
<http://www.forgreenheat.org/resources/10-09.pdf>

⁶⁰ Gulland J. *The Argument in Favour of Wood Heating*. The Fuelwood Project. February 2007. Pg 7

⁶¹ U.S. EPA. *Technology Transfer Network Clearinghouse for Inventories & Emissions Factors*. WebFIRE.
<<http://cfpub.epa.gov/webfire/>> SCC 210400400.

U.S. EPA Residential Wood Calculator. Contact Roy Huntley. #2 fuel oil 115.11 lb PM/MMBtu compared to pellet stove 48.96 lb/MMBtu.

⁶² Fiedler, Frank. The state of the art of small-scale pellet-based heating systems and relevant regulations in Sweden, Austria and Germany. Solar Energy Research Center, Dalarna College.

EPA certified wood stoves manufactured today typically emit 2 – 4 grams per hour, roughly ten times less than the 15 to 40 g/hr that older stoves typically emits. However, about 80% of the residential wood stoves manufactured prior to the EPA standards are still in operation⁶³, potentially posing health risks to local populations while at the same time negatively influencing public opinion about the viability of wood heat as a clean renewable energy technology. Wood stoves tend to last a long time and are replaced less frequently than other major appliances, so many of the older stoves are still used regularly for heat. For this reason, the replacement of older stoves (See [Changeout Programs](#), pg. 70) and the removal of loopholes that allow unregulated new stoves to stay on the market are vital to improving air sheds across the country.

The EPA jump-started cleaner residential stoves in 1988 with their New Source Performance Standards, and is only now revisiting these regulations in 2011. The original standards dictated a maximum of 7.5 g/hr for non-catalytic wood stoves and 4.1 g/hr for catalytic wood stoves. Many stove types were exempt from regulation for various reasons (see [Appliance Types](#) for a complete discussion, pg. 102). The proposed New Source Performance Standards are likely to at least partially follow the lead of Washington State, where, in 1995, officials sent a strong message to the industry and Federal Government by setting stricter standards for wood stoves sold in the state. The current emissions standard in Washington is 4.5 g/hr for non-catalytic wood stoves and pellet stoves and 2.5 g/hr for catalytic wood stoves. The burgeoning residential biomass boiler market in Europe provides clear evidence that wood stoves have the capacity to become much cleaner (see [European Programs](#), pg. 98).

Like all forms of renewable energy, wood heat is well suited for some areas of the country, but not so well suited for others. Strict regulations on new installation of cordwood appliances in certain major urban non-attainment areas like Los Angeles and Denver, as well as valleys subject to inversions is often a necessary air quality step, though the cleanest pellet appliances may still be permitted. These local restrictions also prevent incentive programs, like the federal tax credit, from encouraging installations in places that already have very poor air quality.

Wood Smoke Health Resources

- [Health Effects for Consumers, EPA](#)
- [How Smoke from Fires Can Affect Your Health, EPA](#)
- [Carbon monoxide health effects, Minnesota Department of Health](#)
-  [What is Particulate Matter? American Lung Association](#)
- [Health Effects of Wood Smoke from Outdoor Wood Boilers, Washington State Department of Ecology](#)
-  [Smoke Gets in Your Lungs, State of New York Office of the Attorney General, revised 2008](#)
- [Guidance for Health Professionals, Wisconsin Division of Public Health](#)
- [US EPA, National Ambient Air Quality Standards \(NAAQS\)](#)

⁶³ Broderick, D.R.; Houck, J.E. Projected Residential Wood Burning Appliance Installations; OMNI Environmental Services Inc.: Beaverton, OR, 2005.

For purposes of this report, incentive programs that involve government funding offer a clear opportunity to mitigate health impacts of high emitting wood burning appliances by leveraging public funding to maximize the benefits of wood heat while minimizing the potential health impacts. Strategies include making only the cleanest appliances eligible or by only incentivizing pellet stove installation in urban areas (since they have consistently low emissions), but not installation of wood appliances unless they meet or exceed air quality restrictions and are accompanied by wood moisture requirements. In Europe, extensive incentives for qualified pellet appliances has likely steered many consumers towards these very clean burning appliances. The same could hold true in the United States.

B. Sustainability

Summary:

The subject of sustainability is necessarily very complex, and all but the most in depth analysis of this issue is subject to some degree of overgeneralization since the definition of ‘sustainable harvest’ is highly dependent upon a number of factors. Furthermore, a report conducted by the USDA outlines seven different criteria for sustainability ranging from conservation of ecosystem health and productivity, to carbon cycle maintenance and socio-economic stability.⁶⁴ From this perspective, wood heating can be shown to be sustainable by actively addressing these latter criteria (see the [Why Wood Heat Should be Incentivized](#) section, pg. 20 for details about the low-carbon and economic potential of wood heating). The purpose of this section is to show that wood heating is sustainable for the following reasons: first, residential wood harvesting generally has a light ecological impact due to its scale and dispersed nature, second, both pellet and cordwood supply often comes from waste wood sources and third, cordwood harvesting on a larger scale has not been linked by any study or report as being a significant threat to sustainability of forests.

⁶⁴ USDA National Report on Sustainable Forests. 2010

Disperse Harvest/Homeowner Collected Wood

On the residential scale, firewood harvesting is generally very distributed and tends to exert little ecological pressure on forests. Personal firewood harvesting across the nation is much more likely to have small scale impacts on forests than larger operations, so although individuals will not be well acquainted with forest management practices, they will likely never exert a very large effect in one area. In many areas of the country, there is an abundance of forest resources that small-scale firewood collection/harvesting can utilize.

The Forest Service's Forest Products Laboratory calculated that in the 1980-1981 heating season, the amount of firewood consumed was 42.1 million cords. Just as importantly, they also estimated the amount of wood that was self-cut as compared to wood that was purchased. It was found that about **30 million cords (more than 70% of all firewood) was self-cut by users, with 3.9 million households obtaining wood from their own land, and an additional 3.4 million cutting wood from private land that they did not own.**⁶⁵ The remainder, according to the report, was either purchased or obtained from mill residues. As for more recent statistics on firewood consumption, EIA data suggests that current consumption rates are around 20 million cords per year, or about half of the 1980 rate (Fig. 21). This suggests that, as there were no documented sustainability issues associated with the firewood harvesting twenty years ago, wood heat use today could theoretically double without having a significant negative impact on the forests.

⁶⁵ Wood Use: U.S. Competitiveness and Technology. (Washington, D.C: U.S. Congress, Office of Technology Assessment, OTA-ITE-210, August 1983).

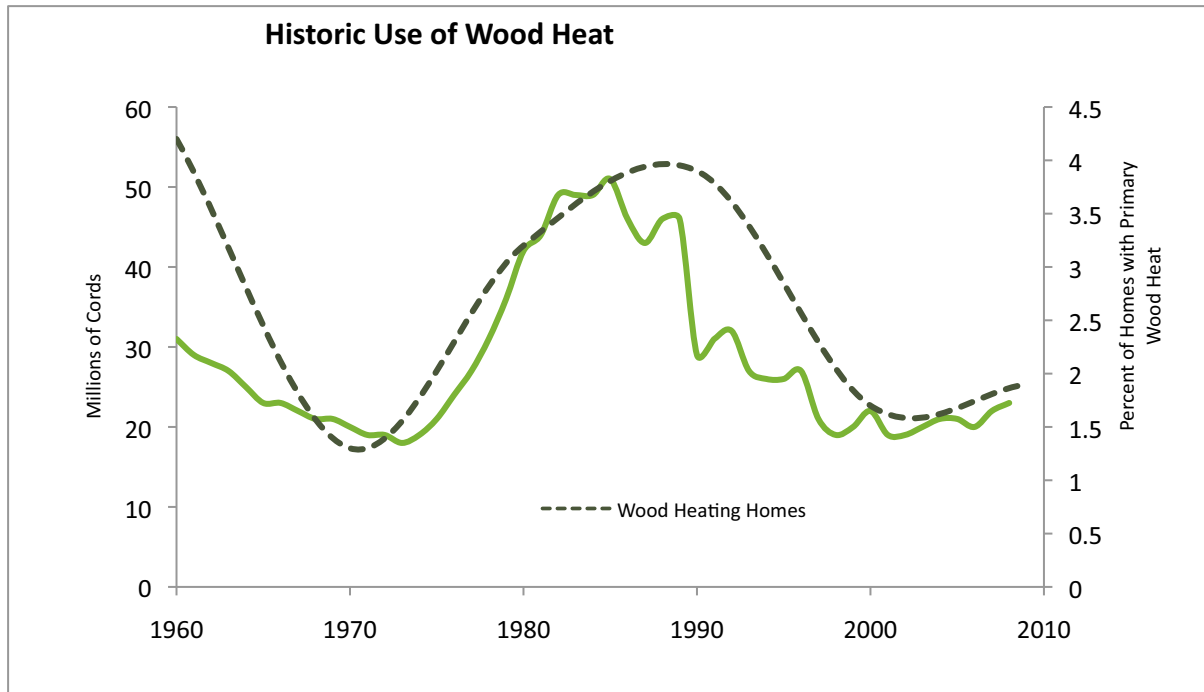


Figure 22: Historic Residential Wood Consumption and Homes with Wood as a Primary Heating Source (EIA⁶⁶ & Census)

The above figure includes wood pellets since the energy source is listed by the EIA as ‘wood and wood-derived fuels’. However, this only suggest how much wood is being used for home heating, but does not reveal how much individual homeowners typically use or where they source their firewood. Although nationwide data on firewood harvesting is lacking, many regional studies and surveys offer insight into how residents procure their firewood. In New Hampshire and Vermont, the majority of firewood is either harvested by individuals or small scale logging operators.⁶⁷ A detailed survey from Minnesota found that 80% of residential firewood was harvested by households, with the majority of the material being sourced from dead trees (Fig. 22).⁶⁸ This dispersed nature is further demonstrated in Minnesota (which serves as a fairly good proxy for other states since Minnesota has a mix of both rural and metropolitan areas, as well as a percent forest cover that is very close to median for all states) by the fact that no wood vendor in Minnesota has over 1% of the market share.⁶⁹ Many other surveys throughout the country reveal trends similar to these.⁷⁰

⁶⁶ EIA State Energy Data System. Residential Sector Energy Consumption Estimates, Selected Years, 1960-2008, United States. <http://www.eia.gov/states/hf.jsp?incfile=sep_use/res/use_res_us.html&mstate=UNITED%20STATES>

⁶⁷ White P. *Future of Firewood*. Farming Magazine. April 2011 <<http://www.farmingmagazine.com/print-6687.aspx>>

⁶⁸ Minnesota Department of Natural Resources. *Residential Fuelwood Assessment, 2007-2008 Heating Season*.

⁶⁹ Barber R. *Certified Firewood Marketing Plan for Certified Wood from Central Minnesota*. CAP Report 031. January 2001. Pg 8. <<http://www.cura.umn.edu/publications/CAP-reports/cap031.pdf>>

⁷⁰ Houck, J, Broderick D. *Compilation of Residential Wood Combustion Surveys and Related Studies*. Omni Test Laboratories. August 2003. <<http://www.omni-test.com/publications/Comp2.pdf>>

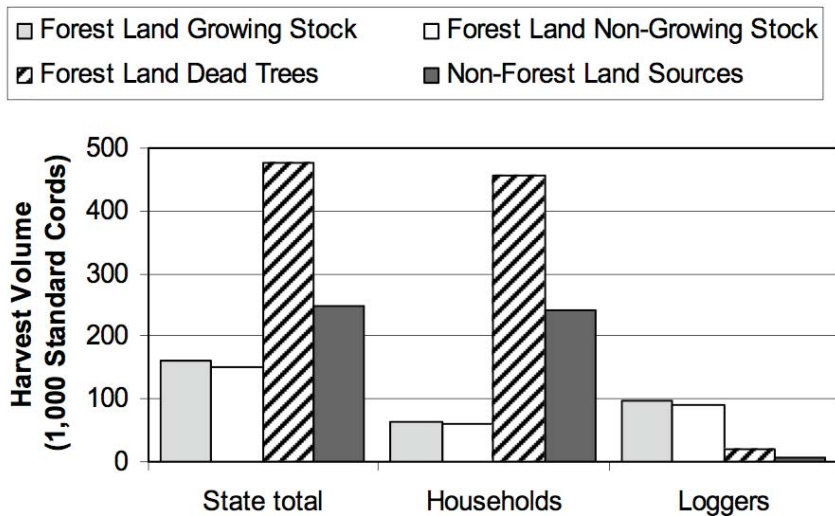


Figure 23: Volume of Fuelwood Harvested by Fuel Source (MN Dept. of Natural Resources)⁷¹

Perhaps the most interesting trend that the Minnesota survey reveals is that the majority of homeowners still typically harvest their own firewood to heat their homes. A 1994 report described a similar trend in the Southeastern U.S. with 55% of residential cordwood gathered by the homeowner, 27% purchased and a full 12% of cordwood consumed gathered from waste wood sources.⁷²

Dealers that sell firewood to the public typically operate on a rather small scale. Often a dealer might only deliver several cords per year out of the back of a pickup as an income supplement. Larger dealers might have a small fleet of delivery trucks, splitting equipment, and employees capable of producing 2-3,000 cords per year.⁷³ Larger dealers sometimes do not actually harvest trees themselves, but rather purchase whole length logs from logging companies and simply process those into firewood.

Fuelwood is Often Derived from Waste

Many tree services also process and sell firewood derived from urban tree trimming/removals. In fact, much of the wood utilized for pellets and even in many wood stoves, is derived from waste wood. Waste wood is either sourced from urban wood waste (generally in the form of tree trimmings and storm-felled trees) and the residues from logging and the pulp and paper industry. Despite the wide variety of end-uses for wood waste, 29 million tons of waste wood is produced each year,⁷⁴ with a significant portion needlessly ending up in landfills.⁷⁵ A similar trend is often evidenced in commercial lumber harvesting as well: A West Virginia University study found that

⁷¹ Minnesota Department of Natural Resources. *Residential Fuelwood Assessment, 2007-2008 Heating Season*.

⁷² Christiansen E. et al. *Residential Fuelwood Consumption in the Southeastern U.S.* Biomass and Bioenergy Vol. 5. No. 6. 1993. Pg. 491

⁷³ Dolan, Thomas. *Firewood Business Heed's Market's Call*. Timberline, June 2006.

⁷⁴ Heinze Bioenergy report, pg 11

⁷⁵ Araman et al. 1997. *Potential Material Sources for Board Products: Used Pallets and Wastewood at Landfills*. Proceedings, 31st International Particleboard/Composite Materials Symposium. 189-195.

8.4 tons/acre of wood residue was left after commercial lumber harvest that could have been utilized for heat.⁷⁶ A thriving residential biomass heating culture could reduce wood going to landfills.

Large Scale Harvest Sustainability Regulations

Finally, cordwood harvesting can occur on a larger scale than individual homeowners in an environmentally friendly manner. While every forest in the country has different levels of sustainable harvest (i.e., sustained yield), there are still millions of tons of biomass that could be harvested yearly without exceeding the yearly growth rate of forests.⁷⁷ The USDA's Forest Inventory and Analysis Program can be used to evaluate a forest's health and to assess how current management strategies will affect the forest years down the line. There is a range of adverse effects that can occur if wood harvest is not done properly.⁷⁸ These effects include reducing biodiversity, exposing soil to drying and erosion, eliminating habitats, decreasing the food supply for beneficial insects and wood-boring species and limiting flower growth.⁷⁹ To protect against these impacts of environmentally unfriendly harvest, there are currently over 276 state agencies across the country with oversight of forestry activities or forestry environmental impacts and every state has Best Management Practice Programs,⁸⁰ as well as other policies and regulatory levers. These guidelines focus on a range of important issues including the amount of biomass debris to be left on the forest floor, wildlife and biodiversity, water quality and riparian zones, silviculture and soil productivity.⁸¹ In a study by California Agriculture, it was found that local level education in environmentally sound harvest practices increased canopy level retention over four years of the programs.⁸² This suggests that education on these practices may be important to the sustainability of firewood harvest.

Forest Inventory and Analysis

<http://www.fia.fs.fed.us/>



⁷⁶ Grushecky, S. *Wood Biomass in West Virginia*. WVU Appalachian Hardwood Center. 1995

⁷⁷ Perlack et al. *A Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion Ton Annual Supply*. Oak Ridge National Laboratory. April 2005. Pg. 16. * This study is now recognized to have been an overestimate and is currently being revised downward to perhaps half of that number. Much of this biomass will be diverted to the biofuel and power industries which are much less efficient than thermal uses of wood.

⁷⁸ Some definitions of 'sustainable harvest' include measures to prevent these harms, while other definitions only address 'sustainable yield'.

⁷⁹ Gibson L., *Balancing Act*. Biomass Magazine. July 2009. <<http://www.biomassmagazine.com/articles/2814/balancing-act/>>

⁸⁰ Evans et al. *Revised Assessment of Biomass Harvesting and Retention Guidelines*. Pg. 2

<http://www.forestguild.org/publications/research/2009/biomass_guidelines.pdf>

⁸¹ Evans et al. *Revised Assessment of Biomass Harvesting and Retention Guidelines*. Pg. 3

<http://www.forestguild.org/publications/research/2009/biomass_guidelines.pdf>

⁸² Standiford R. et al. *Impact of Firewood Harvesting on Hardwood Rangelands Varies with Region*. California Agriculture 50 (2):7-12. DOI: 10.3733/ca.v050n02p7. March-April 1996.

<<http://ucanr.org/repository/cao/landingpage.cfm?article=ca.v050n02p7&fulltext=yes>>

As explored earlier in the “[Supports Responsible Forest Management](#)” section (Pg. 25), cordwood harvesting can actually increase ecosystem health and forest productivity in many forest ecosystems with sustainable harvesting techniques. Many forests throughout the country are severely overloaded with biomass due to the culture of fire suppression that has existed during the last century. For example, ponderosa pine forests in Arizona have 5-50 times the trees per acre as they did in the 1800’s, while the amount of forest floor fuel loads has increased by a factor of 100. Local officials in that area encourage firewood removal as a critical thinning activity by giving it away to residents for free.⁸³

Wood heating also has the potential to form synergistic relationships with other wood processing industries like sawmills, that focus on higher grade trees.⁸⁴ Since the wood heating market only requires lower value wood, it can provide an additional market to these industries, and thus provide increased management options that allow managers to avoid high grading.⁸⁵ In this same manner, using urban waste wood for home heating can ease the financial burden that local municipalities face from tree trimming, removal, and landfill costs.

Further Resources: Firewood Harvesting Guidelines⁸⁶

- Missouri: Best Management Practices for Harvesting Woody Biomass
<http://mdc4.mdc.mo.gov/applications/MDCLibrary/MDCLibrary2.aspx?NodeID=2055>
- How to Choose Firewood Trees- A guide for the small scale landowner
<http://cce.cornell.edu/Environment/Documents/PDFs/Choosing%20Firewood%20FCFS.pdf>
- Managing your Woodlot for Sustainable Yield
<http://affluentpeasant.barkie.net/forest/susyield.htm>
- Small scale firewood management
<http://cce.cornell.edu/Environment/Documents/PDFs/Choosing%20Firewood%20FCFS.pdf>

⁸³ Farnsworth, A. et. al. Flagstaff’s Wildfire Fuel Treatments: Prescriptions for Community Involvement and a Source of Bioenergy. Biomass and Bioenergy. 2003.

⁸⁴ Lockhart & Nyland. Teaching professional codes of ethics to forestry and wildlife students. Natural Resources and Environmental Issues. Volume 12, Issue 1. Pg. 78. Jan. 2004

⁸⁵ Taylor & Tankersley. Biomass Harvesting and Forest Stewardship: A Healthy Balance. University of Tennessee Agricultural Experiment Station. Dec. 2007 pg 1.

⁸⁶ Evans et al. *Revised Assessment of Biomass Harvesting and Retention Guidelines*. Pg. 33
<http://www.forestguild.org/publications/research/2009/biomass_guidelines.pdf>

C. Initial CO2 Release

The Manomet Center for Conservation Sciences' "Study of Wood Biomass Energy" in 2010 examined the complex question of biomass CO2 emissions and the life-cycle effect of various biomass harvest and combustion scenarios in Massachusetts. Although their results were drastically misconstrued by the press, they concluded that *thermal* biomass can drastically reduce net carbon emissions compared to fossil fuels.

The confusion stemmed from the findings that all biomass burning will initially release some carbon and the "pay-back period" or period of time before the next generation tree growth recaptures that carbon can vary and may be quite a long time in some cases. While the Manomet study cautions that the carbon pay-back period for replacing traditional electricity sources with biomass can be very long, it was concluded that using biomass for thermal energy has a short CO2 payback period because of the higher relative efficiency. They state that, "replacement of oil-fired thermal/CHP capacity with biomass thermal/CHP fully offsets the carbon debt and lowers greenhouse gas levels."⁸⁷ There is a potential for biomass to be 'carbon neutral,' but this is dependent on future forest management strategies. Other reports on the subject disagree with the carbon 'debt-then-dividend' viewpoint, because it only considers one stand rather than the forest as a whole. The alternative argument is that as long as the forest continues to grow, then it is a case of dividend-then-debt.⁸⁸

A 2006 study on Australian firewood found that, "***the use of firewood for domestic heating has lower net CO2 emissions than non-renewable energy sources such as gas and electricity, particularly when firewood is collected from thinning slash and other residues of commercially grown plantations.***"⁸⁹

Additionally a study by the Stockholm Environment Institute has found that utilizing woody biomass harvesting residue for residential heating to displace fossil fuels, "provides the greatest reduction in net GHG emissions relative to the common practices of on-site combustion and on-site decomposition."⁹⁰ The practice of burning harvest residues (slash piles), which takes place across much of the Pacific Northwest, produces far more green house gasses than using that

⁸⁷ Walker et al. "Biomass Sustainability and Carbon Policy Study"- Manomet Center for Conservation Sciences. June 2010. Pg 7

⁸⁸ Struss W. *How Manomet got it Backwards: Challenging the "debt-then-dividend" Axiom.* FutureMetrics. May 2011

⁸⁹ Paul K. et al. *Net Carbon Dioxide Emissions from Alternative Firewood-production Systems in Australia.* Biomass and Bioenergy 30. January 2006. Pg. 645

⁹⁰ Lee. C, et al. *Greenhouse gas and air pollutant emissions of alternatives for woody biomass residues.* Stockholm Environment Institute. November 2010. Pg. 17



biomass to displace fossil fuel would. For a discussion on the low carbon implications of biomass heat, see [Biomass for Heat is a Low Carbon Renewable Energy](#), page 22.

D. Pest Transportation

A relatively new problem associated with wood heat is the movement of invasive pests in firewood. Most of the cases of pests being transported in firewood involve it being brought to campgrounds, not for home heating.⁹¹ Regardless, safeguards are being developed to minimize the transportation of invasive species, such as the emerald ash borer or the asian longhorn beetle, from overseas and within the US. The US Department of Agriculture Animal Plant Health Inspection Service (APHIS) is responsible for addressing the problem. Laws requiring large-scale commercial firewood producers to heat treat firewood in a kiln or efforts to control shipment of logs over long distance can help, but the job is much too big for APHIS alone. Un-paralleled cooperation amongst producers of firewood, the forestry community, agencies and the consuming public will be necessary to avoid what a city forester from Detroit, where the majority of local ash trees have succumbed to the emerald ash borer, called "a slow motion tornado."⁹² Governmental websites aimed at educating stove users on clean burning techniques should also provide information and resources on how to control invasive pests.



Further Firewood Pests Resources

[NC Dept. of Environment and Natural Resources: Invasive Pests & Firewood Movement](#)

[Colorado Department of Agriculture's Cooperative Agricultural Pest Survey](#)

[APHIS: Canadian Firewood Requirements](#)

[Missouri: Emerald Ash Borer Program](#)

[University of Wyoming Article on Bark Beetles](#)

[Mid-south Entomologist](#)



[Asian Long Horned Beetle](#)



[Gypsy Moth](#)



[Root Disease](#)



[Pine Bark Beetle](#)

⁹¹National Firewood Task Force. *Recommendations* March 2010. Pg. 3

⁹² Al Steele, Forest Scientist, U.S.D.A. Forest Service. Email to Author February 2011

E. Practical Limitations of Widespread Wood and Pellet Stove Adoption

There is a common perception that using wood for heating is simply an unrealistic amount of work for most modern Americans. The vast majority of Americans may not be willing to do the extra work to heat with wood or pellets, but millions remain committed to it and their ranks appear to be growing. For every solar thermal installation installed in 2009, there were four pellet stoves installed, and thirteen EPA certified cordwood stoves.⁹³ Residential pellet boilers have become so automated that there are now models that are as simple to operate as the traditional oil boiler. Areas of the country with bulk pellet delivery routes can have bulk pellet bins or silos filled twice a year with pellets, which are then automatically fed into the boiler/furnace to achieve a pre-programmed temperature. In parts of Europe, installation of these units far outstrips installations of fossil fuel furnaces due to higher fossil fuel prices and more generous incentives. In Austria, for instance, pellet boilers are being installed in thousands of homes each year, while the number of oil furnaces installed is approaching zero. As wood and pellet heat becomes more automated, cleaner and more economical, there is little reason that the number of families heating with wood could not double or triple in the next decade.

⁹³ EIA. *Renewable Energy Annual. Domestic Shipments of Solar Thermal Collectors by Market Sector, End Use, and Type, 2008 and 2009*. 2009. HPBA 2009 Sales Data

4. Residential Appliance Incentives

Residential Biomass Appliance programs designed to incentivize the purchase of new biomass appliances are motivated by a wide variety of policy goals. These policy goals can include: phasing out outdated appliances to achieve EPA air quality requirements, promoting energy efficient appliances, assisting low-income families to invest in an affordable heat source or reducing fossil fuel consumption by switching to a sustainable fuel. One of the primary benefits of incentive programs is that they encourage those interested in buying wood stoves to buy the cleaner burning appliances. The programs can support homeowners in either purchasing a heating device or replacing an old one. The policy motivation and available funding may determine the shape a residential wood heat incentive program will take. Among the suite of policy options available are rebates, tax credits, tax exemptions, tax deductions and loans. Each program type has various strengths and weaknesses. A 2009 study on solar incentives found evidence that states are “taking advantage of their situation as ‘laboratories of democracy’ and designing incentives that match their local needs.”⁹⁵ This chapter will also specifically discuss wood stove changeout programs in detail because successful changeout programs require the consideration of many factors.

“States cannot expect any one of these incentives by itself to remove all the barriers to renewable energy technology development.”

- Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy. National Renewable Energy Laboratory.⁹⁴

Further Resources:

Cooper, M. *Public Attitudes Toward Energy Efficiency and Appliance Efficiency Standards: Consumers see the Benefits and Support the Standards*. Consumer Federation of America. March 2011.

Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September 2002.

Kubert C, Sinclair M. *Distributed Renewable Energy Finance and Policy Toolkit*. Clean Energy States Alliance. December 2009.

Sarzynski, A. *The Impact of Solar incentive Programs in Ten States*. George Washington Institute of Public Policy. November 2009.

⁹⁴ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September 2002. Pg. x

⁹⁵ Sarzynski, A. *The Impact of Solar incentive Programs in Ten States*. George Washington Institute of Public Policy. November 2009. Pg. 7

A. State Appliance Incentives

Rebates

Although rebates are the incentive type that is most directly felt by the consumer, only one statewide rebate program for residential biomass heating units is active (in New Hampshire), and four statewide programs are expired. There are likely several factors contributing to this. The first is that rebates require a dedicated funding stream or pot of money, which in tough economic times is hard to come by (and easy to use up). Second, residential biomass heat has been overlooked in existing state renewable energy or energy efficiency grant programs, even though pellet stoves and boilers provide very affordable and clean heat. Rebates have been overwhelmingly used for smaller-scale changeout programs across the country, which are often driven by air quality concerns rather than renewable energy adoption. Regardless, rebates have often proved a successful incentive type for these programs. For more information, see [Changeout Programs](#), pg. 70.

Rebates are lump sums of money designed to cover a portion of the purchase cost of an appliance. The rebate is either given directly to the consumer upon proof of purchase or distributed through the wood/pellet stove retailer. Rebate sums can either be a flat rate, or a percentage of the total cost, which may be capped at a ceiling. The funds for rebates are often administered from a designated pot of money generally derived from public benefits funds⁹⁶. The fund is usually overseen by an affiliated government agency, in the case of wood stoves, Air Pollution Control Districts or State Energy Administrations. As a policy tool, rebates can be finely tuned in order to realize very specific policy goals. For example, some programs can provide greater rebates to low-income consumers, only allow consumers who have had an energy audit to be eligible, or only incentivize ultra-clean pellet systems.

Some rebate programs work by providing vouchers to the consumer to redeem at partner stores. The store cannot receive the reimbursement from the government agency until it first meets certain terms and conditions, for example, providing proof that the uncertified stove which is being replaced has been destroyed.

⁹⁶ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September 2002. Pg. vii

Strengths

- **Supports Market Transformation:** The rebate provides one of the most direct and powerful means to influence consumers, drive market demand, and bring down costs over time.⁹⁷ If rebates are deployed to only incentivize a certain type of appliance, such as stoves with over 75% efficiency or particulate emissions under 3 grams/hour, then the market in that region will favor more efficient or cleaner appliances.
- **Upfront Capital:** Since a primary barrier to investing in biomass appliances is the upfront capital cost to homeowners, the prospect of cash-back often provides the needed impetus to purchase a new heating unit.
- **Attractive to Low-moderate Income Consumers:** Since rebates effectively reduce the up-front cost, they offer low to moderate income households an opportunity to make an investment on an appliance for which they might otherwise have been unable to acquire sufficient funds.
- **Adjustable:** Year to year grant amounts can be altered depending on the amount of funding, demand for the grant, or a scaling down process.⁹⁸

Weakness

- **Rebate Dependency:** Customers may only purchase wood stove systems when there is a rebate offered, thus influencing the *timing* of the appliance purchase more than the decision to purchase an appliance. Consumer demand may diminish if a rebate is phased out too quickly or if the purchasing cost remains too high in the absence of this incentive.⁹⁹
- **Economically Unstable:** If the purpose of the rebate program is to create jobs and grow the forestry/biomass heat industry, inflated consumer demand created by rebates can create a financial structure for industry that has the potential to become unsustainable without them. Fluctuating rebate amounts can make it difficult for industries to plan long-term growth strategies when faced with uncertain demand or demand *cycles* created by continual rebate programs.¹⁰⁰
- **Initial Administrative Burden:** Rebate programs require agency oversight for the funding pool, the development of a dedicated funding stream and initial program development. If a rebate application is not carefully designed, it can be confusing and might act as a deterrent to interested consumers.

⁹⁷ Kubert C, Sinclair M. *Distributed Renewable Energy Finance and Policy Toolkit*. Clean Energy States Alliance. December 2009. pg. 7

⁹⁸ Kubert C, Sinclair M. *Distributed Renewable Energy Finance and Policy Toolkit*. Clean Energy States Alliance. December 2009. Pg 7

⁹⁹ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September 2002. Pg. viii

¹⁰⁰ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September 2002. Pg. 3

- **Unsecure Funding:** Unlike tax incentives, or loan programs from bank partnerships, rebate programs require a dedicated source of funding. This capital is vulnerable to appropriation for other programs¹⁰¹ if there is not sufficient consumer interest and participation. Additionally, rebate programs use up their funding with no recovery, so program funds are depleted over time.¹⁰²

Recommendations

- **Educate:** Any program promoting new wood burning appliances should be coupled with educational materials on clean burning practices. If new appliances are used incorrectly, the resulting air pollution could turn the public against wood burning and the program.
- **Ensure Program Continuity:** The rebate programs should only be the beginning of a market transformation; one of the greatest after-effects of a rebate program is increased awareness of the technology. Additionally, since heating units are purchased infrequently, selecting a unit is a long-term decision, and a program spanning several years might be necessary to capture the largest market.¹⁰³
- **Partner with Dealers and Installers:** Local dealers and installers can assist policy makers in promoting the rebate and provide valuable input into designing the rebate program.
- **Provide Straightforward Eligibility Rules:** Consumers may be discouraged from the process if the rebate application is confusing or complex.¹⁰⁴
- **Effective Program Marketing:** One of the most common downfalls of rebate programs is a lack of consumer participation due to a lack of awareness. If the program is not effectively marketed, it will not actually incentivize new consumers into purchasing a stove, but merely reward those who were already planning a purchase.
- **Declining Funding Blocks:** Higher incentives at the beginning of the incentive program will encourage people to buy into the program early-on and stimulate interest. As the market develops, the grant amount should decline to wean the market and the industry off the incentive.¹⁰⁵ This also acts to reflect cost reductions over time as the industry becomes more efficient.¹⁰⁶

¹⁰¹ Sarzynski, A. *The Impact of Solar Incentive Programs in Ten States*. George Washington Institute of Public Policy. November 2009. Pg. 6

¹⁰² Kubert C, Sinclair M. *Distributed Renewable Energy Finance and Policy Toolkit*. Clean Energy States Alliance. December 2009. Pg 8

¹⁰³ Kubert C, Sinclair M. *Distributed Renewable Energy Finance and Policy Toolkit*. Clean Energy States Alliance. December 2009. Pg 9

¹⁰⁴ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September 2002. Pg. viii

¹⁰⁵ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September 2002. Pg. 3

¹⁰⁶ Kubert C, Sinclair M. *Distributed Renewable Energy Finance and Policy Toolkit*. Clean Energy States Alliance. December 2009. Pg 9

- Require Professional Installation/Inspection:** While there are many individuals who may be able to safely and effectively install residential biomass heaters, there is still a large risk of people installing these units in an unsafe or incorrect manner.¹⁰⁷ Professional installation avoids this risk while simultaneously providing an additional boost to the local economy. This does propose an added cost, which should be figured into the incentive program design.

Table 2: State Rebate Programs

State	Policy Goals	Qualification	Type of Funding	Amount	Comments
New Hampshire	Renewable Energy/ Industry Development	1 st time purchase	Rebate	30% up to \$6,000	Only biomass boiler systems that use a bulk delivery system.
Vermont*	Air Quality	Replace non-EPA stoves. Replace old catalytic converter	Rebate	\$450, \$75	Replacement wood and pellet stoves must be WA State certified. The \$75 is to replace the catalytic converter only.
Vermont	Air Quality	Replace Outdoor Wood Boiler	Rebate	\$1,000-\$6,000	Rebate amount on a sale of air quality damage. Replacement OWB must be EPA II, some wood/pellet stoves allowed.
Michigan*	Air Quality/Energy Efficiency	Replace old stoves	Rebate	\$290	Partnership between Michigan United Conservation Clubs, MDEQ and HPBA
Pennsylvania*	Energy Efficiency	1 st time purchase	Rebate	10% of cost up to \$250	New stove must be 78% efficient
Alaska~	Energy Efficiency	1 st time purchase	Rebate	Max \$10,000	If the AKWarm software recommends a wood stove after an energy audit, it would qualify. Very few have been recommended.
~Very little affect on biomass appliances					
* Expired Program					

¹⁰⁷ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September 2002. Pg. vii

Case Study: New Hampshire Rebate Program

There is currently only one statewide program that significantly¹⁰⁸ incentivizes new, first time purchases of biomass: the New Hampshire Wood Pellet Boiler Rebate Program. This program was launched April 1, 2010 and has undergone very specific changes. Unlike many rebate programs where the rebate is used as the funding tool in a changeout program (see [Changeout Programs](#), pg. 70), the New Hampshire program goal is not primarily to address air quality issues, but rather to support the burgeoning New Hampshire pellet industry that holds great promise for the state economically, and to promote a renewable energy. To accomplish this goal, state officials worked with New Hampshire pellet industry leaders to discover where dollars could be best spent to grow the industry. They received a very specific answer: help develop the crucial bulk delivery system by incentivizing whole-house biomass boilers that *require* bulk delivery. The industry leaders pointed to one facet of their industry that was hindering further development. Pellet production was being inhibited by lack of consumer confidence in a secure supply of pellets, so incentivizing systems that require bulk delivery was the policy solution to this issue.

The program offers 30% of the unit purchase cost up to \$6,000 dollars. While this is a large sum of money, it was not enough to significantly entice consumers to buy the expensive systems that met the original program requirements. Those top of the market systems cost around \$21,000 and offer efficiency standards of 85% and other features such as self-cleaning capacity. In March, 2011, after only receiving six applicants, the program administrators altered the requirements to allow less-expensive boilers that require certain cleaning maintenance procedures for approximately every ton of premium pellets used, and are 80% efficient or greater to qualify as well.

The New Hampshire program serves as a good case study of rebate's ability to serve as a highly focused policy tool, and the challenges of gauging the correct incentive amount. It also showcases the need for flexibility in the program so that it can be altered according to consumer response.

Policy considerations

Compared to tax credits, rebates are a particularly important incentive tool for wood and pellet stoves because these often appeal to lower income populations who generally cannot take advantage of tax credits (See [Tax Credits](#), pg. 55). Rebate programs for stoves could be combined with weatherization assistance programs to provide low-income populations with a very cost effective way to dramatically reduce fossil fuel usage, secure their own fuel (in the case of wood stoves) and reduce reliance on fuel assistance programs.

¹⁰⁸ The Alaska Home Energy Rebate Program technically does allow wood stoves, but it is very rarely recommended by the energy auditing software, and has likely only been used for three or four units since the program's inception.

As of April 2011, 19 states had programs that provided rebates for solar photovoltaic panels.¹⁰⁹ This does not even include the local, utility or non-profit rebate programs. The cost to the states to displace fossil fuel use through solar PV rebates is enormous compared to rebates for the cleanest wood and pellet stoves, and most moderate and low-income residents are not served by these programs. Including certain biomass appliances in rebate programs could help states better serve lower income populations while accomplishing many of the same policy goals. While rebate programs could include the cleanest pellet appliances in any jurisdiction, as they are in Europe, cordwood appliances should be limited to rural areas, and could target families that rely on oil, propane or electricity – all very expensive fuels that also have significant environmental impacts.

While rebate programs offer the most tangible incentive to consumers, they also require the most funding and must either be a short-term program or require a dedicated funding stream. For this reason rebate programs are often used in changeout programs, which have discreet goals (for example to replace non-EPA stoves in an area) that can be accomplished with a shorter program. If the policy goals are more long-term, seeking to shift people toward energy efficient or renewable energy lifestyles, then they should be accompanied by a long term program in order to reach full effectiveness.

¹⁰⁹<http://www.dsireusa.org/incentives/index.cfm?EE=1&RE=1&SPV=0&ST=0§or=Residential&implementingsector=S&searchtype=Rebate&technology=Photovoltaics&sh=1>

Tax Incentives

Tax incentives are a popular method for all levels of government to fund wood stove programs. These programs do not require an upfront cost or a direct source of funding, but do take away future revenue. This loss must be quantified and accounted for before a tax program is passed. Additionally, a drawback all tax incentive programs share is that they are of little use to low-income households that pay little if any taxes. If a program goal is to address low-income issues, tax incentives are not the correct incentive type.

Tax Credits

Tax Credits are a set dollar amount that represents a reduction in the amount of money owed toward State or Federal Taxes. Tax Credits are the most valuable end-of-year benefit, because they directly reduce the amount of taxes owed dollar for dollar. By subtracting directly from taxes owed instead of from income calculations, a tax credit can be over three times as valuable than a tax deduction. State renewable energy tax credit programs are generally administrated by state revenue departments or other state agencies, and range in amount from \$1,000 to \$10,500 (although the higher incentives are primarily for solar or wind installations).¹¹⁰ The National Renewable Energy Laboratory's report on renewable energy programs discovered the tax credits are generally, "not the primary motivating factor influencing purchasing decisions but often help to 'seal the deal'."¹¹¹ However a 2009 study of solar incentive programs found that income tax incentives reached more participants than the cash incentive programs.¹¹²

Example	A tax credit of \$500 for someone in the 28% tax bracket is equivalent to a tax deduction of \$1,700.
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¹¹⁰ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September 2002. Pg. vi.

¹¹¹ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September 2002. Pg. vi.

¹¹² Sarzynski, A. *The Impact of Solar incentive Programs in Ten States*. George Washington Institute of Public Policy. November 2009. Pg. 5-6

Strengths

- **Easy to Administer:** Tax credits do not require a dedicated funding stream or agency oversight for the fund.¹¹³
- **Strongest Tax Incentive:** The tax credit is the most tangible financial tax incentive and can act as a strong spur to purchasing a certain type of wood stove.
- **Easy to Alter:** Tax credit levels can be modified based on changes in funding availability, market shifts or program participation.¹¹⁴

Weaknesses

- **Drain on Budget:** Since tax credits do not draw from a pot of money, and thus do not restrict the number of applicants, more applicants than anticipated can place an unexpectedly large burden on the budget.¹¹⁵
- **Excludes Portion of Wood Stove Users:** Unlike rebate or loan programs, tax credits are not useful to low-income consumers who pay little to no taxes. This can be an egregious oversight since a higher percentage of low-income households rely on wood heat as their primary heating source.
- **Tax Credit Amounts too Small to Make Wide Air Quality Improvement:** The results of a tax credit program in Oregon suggest that a state-wide tax credit will have too dispersed an effect to have a positive influence on air quality throughout the state. If seeking to improve air quality, more resources should be applied to the non-attainment areas first.
- **Too weak of an Incentive for those not in the Market:** The same Oregon program, as well as the Montana State tax credit program, suggest that the tax credit likely only influences those already in the market for a stove, rather than drawing new consumers.

Recommendations

- **Administer program through energy office:** The state revenue department is often the first choice to administer a tax incentive, but the state energy office can contribute additional advantages to the program. Among these are “better coordination with the design and administration of other energy programs and outreach activities, enabling more detailed tracking of program performance data and fostering partnerships with the renewable industry in promoting the incentive.”¹¹⁶

¹¹³ Kubert C, Sinclair M. *Distributed Renewable Energy Finance and Policy Toolkit*. Clean Energy States Alliance. December 2009. Pg 26

¹¹⁴ Kubert C, Sinclair M. *Distributed Renewable Energy Finance and Policy Toolkit*. Clean Energy States Alliance. December 2009. Pg 26

¹¹⁵ Kubert C, Sinclair M. *Distributed Renewable Energy Finance and Policy Toolkit*. Clean Energy States Alliance. December 2009. Pg 26

¹¹⁶ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September

2002. Pg. vi-vii

Table 3: State Tax Credit Programs

State	Objective	Replacement or 1st time	Type of Funding	Amount	Comments
<u>Oregon</u>	Energy Efficiency/renewable energy	1 st time	Tax credit	25% of cost up to \$300	Only wood stoves under 4.5 g/hr, pellet under 2.5
<u>Montana</u>	Renewable Energy	1 st time	Tax credit	Max \$500 per person	Income Tax Credit. Households filing jointly can receive up to \$1,000
~Very little affect on biomass appliances					
* Expired Program					

Case Studies/Policy Considerations

Oregon and Montana are the two states that have instituted tax credits for biomass appliance purchases. These programs have been in existence for a relatively long time and incentivize first time purchases for the purposes of promoting energy efficiency and renewable energy. The Oregon Residential Energy Tax Credit is a larger renewable energy/energy efficiency program that was amended in 2007 to include thermal biomass stoves that meet the strict state emission standards of under 4.5 grams/hour (g/hr) of particulates for wood stoves and under 2.5 g/hr for pellet stoves. Although providing a tax incentive with a \$300 cap might not be enough to entice those not already in the market, the program does steer some consumers away from dirtier or uncertified stoves.

The Montana program offers an incentive of \$500 per taxpayer (spouses filing jointly can claim up to \$1,000). Roughly 1,400 wood stoves have been financed by this program. The credit was introduced in 1977 and was initially designed to address non-attainment issues. This program may have experienced one of the possible drawbacks of incentive programs. Some Montana retailers have raised their appliance prices by \$500 compared to surrounding states to effectively take the \$500 tax incentive as profit to their company. Price adjusting among retailers to compensate for incentive funds is a danger facing many long-term incentive programs, but it can possibly be avoided with loan or incentive programs with a limited lifespan or declining funding blocks.

Tax Deductions

Tax Deductions are subtracted from taxable income and reflect an expense. They are only valuable to the consumer if they itemize their deductions instead of taking the standard deduction. If itemized, a deduction is generally worth about 28% for many households; less for lower tax brackets and more for higher tax brackets. For example, if a tax deduction of 30% is offered for a \$10,000 renewable energy system- such as a pellet boiler, then the homeowner can deduct \$3,000 from his taxable income. The actual savings, however, is equal to the amount of the deduction multiplied by the tax rate. For someone in a 28% tax bracket, this would correspond to an \$840 savings.

Strengths

- **Low Budget Impact:** Tax deductions have a relatively small impact on the budget, and can therefore be a primarily educational/symbolic program for small cost. Even offering a small incentive can be effective in signaling support for certain technologies and increasing awareness of them.

Weaknesses

- **Not a Significant Incentive:** Most tax deductions are too insignificant to influence consumers to purchase a biomass appliance.
- **Excludes Portion of Wood Stove Users:** Renters and those who do not invest large amounts of money often do not find itemized deductions worthwhile. Additionally, tax deductions are not useful to low-income consumers who pay little to no taxes. This is an egregious oversight because a higher percentage of low-income households rely on wood heat as their primary heating source.

Table 4: State Tax Deduction Programs

State	Objective	Replacement or 1 st time	Type of Funding	Amount	Comments
Alabama	Renewable Energy	Replace fossil fuel	Tax deduction	100%	Must be the primary heating source, switch from gas/electric heat to wood
Arizona	Air Quality	Replace fireplace	Tax deduction	Max \$500	EPA Certified Stoves Required
Idaho	Renewable Energy, Air Quality	Replace uncertified stoves	Tax deduction	Max \$20,000	40% of cost the first year, 20% the next three years

Case Studies/Policy Considerations

Alabama is the only state that uses tax deductions with a non-changeout program; instead it required that a gas or electric heating device be replaced by wood without mention of appliance type or certification. The Arizona program is a 100% deduction capped at \$500 for the purchase and installation of an EPA certified wood stove to replace a wood burning fireplace.

Unfortunately, the tax deduction is not well publicized and likely not widely utilized. The state does not monitor the number of deductions taken for wood stove purchases specifically, so there are no clear numbers on how successful this tax incentive has been at increasing adoption of renewable energy technology.

In order for consumers in Arizona to utilize the tax deduction, they must be replacing an existing fireplace, and in Idaho they must be replacing an uncertified wood stove. These two programs are focused on replacing some of the highest particulate matter emitting devices with much cleaner stoves (see [Changeout Programs](#), pg. 70). The Idaho tax deduction was established in 1995 and in 15 years has replaced over 3,800 stoves.¹¹⁷ This is a very high level of stoves impacted for a tax program. Notably, the Idaho statute also requires that the old stove is “surrendered to the department of environmental quality or its agent for destruction”, thus ensuring that it will not be resold or used again in the future.

¹¹⁷ Tessa Stevens, Dept. of Environmental Quality-Air Quality Division email message to author, October 2010

Property Tax Exemptions

Property tax exemptions are applied for the value of renewable energy systems. Generally either the assessed value of the biomass heating system or the cost of purchase and installation are exempted from the property taxes. Since this incentive is only accessible to those who own the property, it is not a helpful incentive when addressing the needs of renters. In the US, 13% of wood burners rent their homes.¹¹⁸ Often the renters are the most likely to have older or uncertified stoves since statistically renters are more likely to be in a low-income bracket, and thus more likely to use the least expensive appliances: uncertified wood stoves.

Strengths

- **Assists the purchase of whole-home systems:** Since whole-home heating systems are on the more expensive end of the biomass heating appliance spectrum, a capped rebate is likely to cover a comparatively smaller portion of the total cost. The property tax exemption can fill this funding gap.
- **Low Budget Impact:** Property tax exemptions have a relatively small impact on the budget, and can therefore be a primarily educational/symbolic program for small cost.

Weaknesses

- **Not a Significant Incentive:** Smaller stoves that do not supplant a home's complete heating bill might require a more tangible rebate type funding.
- **Limited Applicability:** Since property tax assessments tend to vary between counties with many property tax assessors excluding wood stoves in the first place, a state property tax exemption might not provide any benefits in many areas.
- **Excludes Portion of Wood Stove Users:** Renters do not find property tax exemptions worthwhile. Around 13% of wood stoves in use today are used by renters.¹¹⁹

¹¹⁸ EIA Residential Energy Consumption Survey, Fuels Used and End Uses in U.S. Homes, By Owner/Renter 2009. 2009

¹¹⁹ EIA Residential Energy Consumption Survey, Fuels Used and End Uses in U.S. Homes, By Owner/Renter 2009. 2009

Table 5: State Property Tax Exemption Programs

State	Objective	Replacement or 1 st time	Type of Funding	Amount	Comments
New Hampshire	Renewable Energy	1 st time	Property Tax Exemption	100%	Local option rule, so details vary, stoves & fireplaces don't qualify
New York	Energy Efficiency	1 st time	Property tax exemption	100%	Energy Conservation Improvements Property Tax Incentive. Stoves must be EPA certified.
Montana	Renewable Energy	1 st time	Property tax exemption	Max \$20,000	Deductable for 10 years, only low-emission appliances are eligible,

Case Studies: Property Tax Exemptions

Unfortunately residents have rarely claimed the Montana property tax exemption. Generally the small scale residential stoves are not even assessed for their value in most counties, so people wouldn't derive any benefit from applying for this type of tax exemption. The majority of applicants for the property tax exemption in Montana are large-scale commercial biomass system operators. The two incentive programs in Montana are both tax related, which has the positive effect of not actively removing funds out of the current budget or requiring as much administrative oversight as other programs such as rebates. However, neither program is particularly useful to many low-income households that do not pay enough taxes to make this incentive significant.

New Hampshire merely has a local option rule on the books, not a statewide program. While smaller scale programs such as this can sometimes bypass complex state politics, and allow local areas to adopt policies that may be unpopular in the rest of the state, this also creates confusing variation in the state and uneven incentives.

New York offers 100% of the assessed value of an EPA certified wood or pellet stove as a property tax exemption. The property tax exemption in New York is coupled with a low-interest loan program for EPA phase II stoves.

Policy Considerations

Property tax exemptions are rarely utilized by the homeowner, and it is unlikely that they act to incentivize new stove purchases. As a relatively small incentive, property-tax exemptions might need to be bundled with other incentive programs to be significant; otherwise, they will more



likely act as a signal of support for the technology only. Additionally, if states only had a property tax exemption, they would be overlooking the large percentage of wood burners who are renters and not incentivized by property tax exemptions.

Sales Tax Exemptions

Sales Tax Exemptions are an upfront discount on the purchase price of a biomass heating system. In the case of the larger biomass boiler systems, this exemption could be significant. Sales tax exemptions for appliance purchases currently only exist in Virginia. Several other states have tax exemptions to help finance biomass *fuel* purchases. In Maryland, New York and Oregon, fuels such as pellets or cordwood used for heating purposes are exempt from the sales tax (See [Fuel Incentives](#), pg. 86).

Strengths

- **Assists the purchase of whole-house systems:** For larger, more expensive units such as whole –house heating systems, a sales tax exemptions can help to fill the funding gap after other incentives such as rebate are applied to the purchase.

Weaknesses

- **Not a Significant Incentive:** Smaller stoves that don't supplant the home's complete heating bill might need a more tangible type of funding.

Policy Considerations

Virginia has a sales tax exemption for multifuel heating appliances, and there have been similar exemptions for other renewable energy technologies in other states. This incentive could be significant for the more expensive whole-house heating systems where an exemption from a 6% sales tax on a \$20,000 system yields \$1,200 in savings. Many Virginia residents could also benefit from an expansion of eligible technologies to include the cleanest burning modern cordwood stoves as well. A simple policy fix in many states of adding biomass heating systems to the existing sales tax laws would be a straightforward method of reducing the disparity in renewable energy incentives.

Table 6: State Sales Tax Exemption Programs

State	Objective	Replacement or 1 st time	Type of Funding	Amount	Comments
Virginia	Multifuel heating device support	1 st time	Sales Tax Exemption	100%	Multifuel heating stoves (not cordwood stoves) are eligible.

Loan Programs

Loan programs are designed to provide low-interest or interest free secure loans that are more appealing and more available to the consumer than other loans on the market. The loans are backed by the state and are often more forgiving of poor credit history, providing assistance to cash-challenged customers who can neither purchase a system outright nor secure a loan from a traditional lending institute. Loan interest ranges from 0-6%, and repayment terms can range from three to twenty years. There have historically been a larger percentage of loan programs for wood heat than either grant or tax credit programs,¹²⁰ and many loan programs have an unprecedented longevity. Several loan programs, such as the Nebraska, Idaho and Connecticut State programs, have been in operation for over 20 years, primarily due to the loan investment returning to the fund. State loan programs are funded through a number of different means including revolving loan funds created with the petroleum violation escrow funds (also known as “oil overcharge” funds), air-quality noncompliance fees, bond sales, annual appropriations or public benefit funds.¹²¹ All but one of the loan programs for wood heat has an energy efficiency goal as opposed to a renewable energy goal.

Strengths

- **Sustainable:** When loans are given for biomass appliances that have a proven short payback period, the loan fund becomes self-sustaining as the initial investment is returned by the homeowner to be reinvested in other homes.
- **Fills Lending Gap:** Private lenders may be less familiar with the renewable energy technologies, and so are sometimes less likely to approve loans for biomass appliances than the state program.¹²²
- **Does not Require Dedicated Funding Stream:** Unlike rebate programs, loan programs do not rely on a pot of money or dedicated funding stream that is subject to political reallocation and requires a constant influx of money.
- **Avoids Retailer Price Adjustment:** Retailers sometimes take advantage of rebate or tax incentive by deliberately increasing retail prices equal to the incentive amount. This is far less likely to happen with loan programs.
- **Provides Up-front Capital on Expensive Systems:** Whole-house heating systems, such as advanced pellet boilers, can cost around \$20,000. This high up-front capital investment

¹²⁰ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September 2002. Pg. viii

¹²¹ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September 2002. Pg. viii

¹²² Kubert C, Sinclair M. *Distributed Renewable Energy Finance and Policy Toolkit*. Clean Energy States Alliance. December 2009

can be a significant barrier to technology adoption, and requires much greater incentives than most programs provide. Even the 2009-2010 federal tax credit only allowed up to \$1,500 for eligible systems, rendering most people either unwilling or incapable to spend \$20,000 of their own money. Loan programs overcome this barrier by providing low-interest upfront capital.

- **Can be Created by Agencies:** Unlike tax code programs which require legislative approval. Loan programs (as well as rebate programs) can be designed and implemented without getting involved in a lengthy legislative process.

Weaknesses

- **Not a Significant Incentive for Less-expensive Systems:** For stoves costing a few thousand dollars, a loan program may not be as tempting of an incentive as an upfront rebate.
- **Limited Consumers:** As it is a loan program, some consumers with poor credit may not qualify, which could cut off some segments of the population in need of assistance switching to an affordable fuel source.
- **High Capital Requirements:** The establishment of a loan fund requires a large initial source of funding. Public loan funds are also not able to leverage dollars in the same manner private lenders can.¹²³
- **Principle Risk:** The fund is responsible for defaulted loans, which can deplete it over time.
- **Competition with private lenders:** Low-interest loan programs can have an edge over private lenders and be perceived as competing with them.¹²⁴

Recommendations

- **Calculate Potential Cost Savings Individually:** Calculate savings on a case-by-case basis to ensure switching from the existing system to a particular biomass system is worth the financial investment. The Idaho and Nebraska state loan programs implement this tool.
- **Joint Programming:** Couple the loan program with an energy auditing program to ensure maximal energy efficiency gains for the investment. Loan programs are generally most effective when coupled with a program that offers up front discounts on purchase price.¹²⁵ The very low-income consumers may still be unqualified for even the typically

¹²³ Kubert C, Sinclair M. *Distributed Renewable Energy Finance and Policy Toolkit*. Clean Energy States Alliance. December 2009. Pg. 14

¹²⁴ Kubert C, Sinclair M. *Distributed Renewable Energy Finance and Policy Toolkit*. Clean Energy States Alliance. December 2009. Pg 15

¹²⁵ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September

2002. Pg. ix

more generous state loan programs, so a grant provision for this sub-section would help to fill this gap.¹²⁶

- **Outreach with Stakeholder Groups:** Partner with renewable energy advocacy groups and businesses to build support and awareness of the program and to leverage marketing activities.¹²⁷

Table 7: State Loan Programs

State	Objective	Replacement or 1 st time	Type of Funding	Amount	Comments
Connecticut	Energy Efficiency	1 st time	Low interest loan	\$400-\$25,000	0% or 3% dependent on income, family size and location. 10 year loan.
Idaho	Energy Efficiency	1 st time	Low interest loan	\$1,000-\$15,000	4% interest rate. 5 years
Kansas	Energy Efficiency	1 st time	Low interest loan	Max \$20,000	Loan requires an energy audit, improvements are made in order of highest energy saving measures first, beginning with building envelope. Wood stoves are theoretically eligible.
Montana	Renewable Energy	1 st time	Low interest loan	Max \$60,000	4% interest rate 2011, MT DEQ. Low emission wood or biomass. 15 yr loan
Nebraska	Energy Efficiency	Replacing inefficient heat source, or fireplace	Low interest loan	\$35,000 - \$75,000	2.5% and 5%. Includes fireplace inserts, and EPA certified devices upon approval of energy savings calculation
New York	Energy Efficiency	1s time purchase upon energy auditor recommendati on.	Low interest loan	\$2,500-\$20,000	4% below lender rate, floor rate 3%. 10 year loan. Wood or pellet, EPA phase II stoves.
Minnesota ~	Energy Efficiency	1s time purchase upon energy auditor recommendati on.	Loan	\$2-\$35,000	5.57% interest rate. Biomass stoves technically eligible upon auditor recommendation.

~Very little affect on biomass appliances

¹²⁶ Guardardo E. Connecticut Housing and Investment Fund. Personal Conversation with the Author. April 2011

¹²⁷ Gochoe S., Everette V., Haynes R.. *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy*. National Renewable Energy Laboratory. September

Case Studies: Loan Programs

The New York Residential Loan Program administered by the New York State Energy Research and Development Authority (NYSERDA), offers loans at 4% less than the current lender rate. Both pellet stoves and EPA phase II wood stoves are eligible for the loan if they are to be used as the *primary heating source*. Since the overall policy goal of this program is to assist New Yorkers to become more energy efficient, consumers must first participate in the NYSERDA Home Performance with Energy Star Program that conducts a home energy audit and makes recommendations on what the Loan Program should finance. Coupling an incentive program for wood heat appliances with an overall energy audit is sound policy since it guarantees a greater return on investment in terms of the amount of energy conserved and money saved. The program further maximizes its impact by focusing on lower income households that are less likely to be able to afford energy improvements. Only individuals at or below 80% of the State or Area Median Income (whichever is greater) are eligible for the loan.

Built into the New York Residential Loan Program, is a flexible interest of 4% less than the current lending rate (with a floor of 3%). This financing mechanism ensures the program will almost always be more attractive than other loans on the market.

Key features to this program's success:

- **Requires an energy audit**
- **Focus on less wealthy families**

The Idaho Residential Loan Program has been in operation for over twenty-three years, and interest in wood and pellet stoves has fluctuated throughout its relatively long history. Generally there has been greater and more consistent interest in the wood stoves, perhaps because of the relative newness of pellets as a technology and the fluctuation in pellet fuel prices. Over the course of the program there have been less than ten whole home biomass heating systems purchased using this incentive. This loan program is also designed to be quite flexible, allowing it to adjust to new technologies and focus on new products and emerging technologies (such as pellet stoves). One notable feature of the program is that a mathematical model is used to assess whether to approve the loan. This model calculates the individual's savings based on the ten year payback calculation and calculates whether or not the loan is a wise financial energy investment.

Key feature to this program's success:

- **Mathematical model to calculate potential energy & cost savings over 10 years.**

The Nebraska Dollar and Energy Saving Loan Program, which is one of the oldest loan programs in the country, was established in the 1970's with Oil Overcharge Funds. The initial endowment was \$10-20 million, and due to the regenerating nature of the loan program, that money has lasted over twenty years. Recently, the program was increased to \$36 million with American Recovery and Reinvestment Act (ARRA) funds. More than 26,000 loans that have been made during the life of the program, which have allowed for an estimated \$250 million in energy savings.¹²⁸ Fireplace inserts automatically qualify for a loan, as they represent a potential energy source, along with sealing the building's envelope by plugging the fireplace. Wood and pellet stoves must meet EPA Phase II requirements to be eligible for the loan, but are only approved if the homeowner can prove using a departmental calculation ([Appendix D](#) pg 121) that their particular household will achieve significant money savings. The homeowner must recycle their current heating source so it does not tempt the wood stove owners to switch back to the fossil fuel heat after a year or two of wood.

In my opinion the loan program is better than a grant, because the money comes back to the program. Because of this, the program could virtually last forever without additional funds.”

-Bruce Hauschild
P.E.

Key feature to this program's success:

- **Applicants must prove they can meet a 15 year payback period, or their loan is denied.**

The Connecticut Energy Conservation Loan Program does not require that stoves meet any emissions or efficiency requirements, which could lead to air quality issues and the purchasing of stoves that might not produce optimum heat for the fuel burned. The program is primarily designed to assist low-moderate income residents afford their energy bills, and it has several tailored provisions that truly focus on this policy goal. Only those within 200% of the federal poverty line are eligible (there is a separate loan program with no income restrictions), the state does not require a set credit score and accepts applicants that private institutions

“With this program, the state gets it's money back and helps homeowners lower their energy costs.”

-Ernesto Guardardo,
CHIF

would not. The state also makes 'health and safety' exceptions and can delay the loan repayment requirements for a year. For senior citizen applicants, payment can be delayed up until sale of the home, and the very lowest income loan applicants (who can demonstrably not pay the loan back in the regular time frames) may receive a loan coupled with a limited grant program.

Key feature to this program's success:

- **Low-income focused program that will delay loan payment or give grants to very low-income families.**

¹²⁸ Bruce Hauschild, P.E.. Conversation with the Author. April 2011

The Montana Alternative Energy Revolving Loan Program is the only state loan program with a renewable energy focus. As a renewable energy program, it has been able to take advantage of the allocated air quality penalties gathered by the Montana Department of Environmental Quality. It also received funding from the ARRA funds. This program has seen much more interest toward solar and ground source heat pumps than for biomass heating appliances. Out of the 137 loans that the program has administered since its inception, only 15 have been for biomass heating equipment (including EPA Phase II stoves, pellet stoves, and outdoor wood boilers). Since the program has a minimum closing fee of \$250 for each loan, the comparatively smaller loans for wood or pellet stoves are not as attractive as the loans for larger, more expensive solar PV or geothermal systems.

Policy Considerations

Loan programs can be useful to many low-income consumers, however those with exceptionally poor credit might not be eligible and would benefit more from an alternate incentive type. Some families with adequate credit will be able to afford a system's down-payment and the over-time payment schedule of a loan far better than a rebate assisted purchase. Interestingly, low-interest loans have been the most common state incentive method used for biomass technology. This is perhaps because almost all of the state programs are broader renewable energy/energy efficiency loan programs that include biomass with other eligible technologies.

Many of the state loan programs have been in existence for several decades, a claim few other stove incentive programs can make. Since loan programs do require significant start up funds, they are hard to establish in lieu of special circumstances providing a large pool of money, such as the Oil Overcharge Funds in the 1970's. The longevity of loan programs is primarily due to the fact that with careful administration and only approving loans that have demonstrated energy savings, a loan program can be self-sustaining. This is a very valuable trait for an incentive aimed at achieving long-term policy goals. Since heating appliances typically have a long lifespan, effecting a significant market shift towards efficient wood heating devices necessarily takes many years. Loan programs are well poised to maintain long-term support.

Changeout Programs

A wood stove changeout program is a campaign to replace high-particulate emitting old stoves, with new cleaner ones. Policy goals include reducing air pollution caused by wood smoke, assisting low-income households to afford a more efficient heating source and removing unsafe older stoves from circulation. Financing programs on the state level generally take the form of rebates. On the local level, financing is almost always through rebates or grants, though currently two on-going statewide programs rely on the somewhat weaker incentive of a tax deduction. The majority of changeout programs require certified proof of destruction and/or recycling of the old heating unit either from the retailer or a local recycling program. Funding is often sourced from a combination of state, federal, and industry groups like the Hearth, Patio and Barbeque Association (HPBA) or smaller wood stove retailers.

Crucial Resources

Burn Wise

EPA's Burn Wise Campaign:

<http://www.epa.gov/burnwise/how-to-guide.html>



HBPA's Wood Stove Changeout Program:

<http://woodstovechangeout.org/index.php>

Because woodstoves traditionally have a very long lifespan, they often remain in use for 30 – 50 years. As a result, the majority of wood stoves in the US are still not EPA certified, even though the EPA certification program began in 1988. Pollution from older stoves or exempt stoves can be a serious health concern, and one of the best ways to remove them from circulation is a changeout program. Changeout programs can be carefully designed to meet a wide variety of policy goals, such as the program in Klamath Falls that focuses on low income families.

Example:

Klamath, OR

The Klamath Falls Program is designed to assist low-income families in replacing polluting stoves. Low-income households are eligible for 100% of the cost to upgrade from an uncertified wood stove to a premium efficiency wood or pellet stove, while non-low income households are only eligible for \$500 towards a premium efficiency wood stove or \$750 for a pellet stove. However this program benefited greatly from a unique opportunity of a large quantity of one-time only stimulus funds.

Changeout programs have been part of the public mindset on the West Coast for years which gives program officers in the area a distinct advantage: The “why” of a changeout program is a more understood subject since many communities already have a baseline idea of the harms that polluting wood stoves can cause. On the East Coast and other areas however, there is a much greater need for education before the changeout program can occur. Eastern changeout coordinators are often unprepared for the level of public indifference since much of the literature on the subject is sourced from Western communities.¹²⁹

One of the most important aspects of a successful changeout program is clean burning education and outreach to communities with air quality issues. The EPA’s Burnwise Campaign is a useful resource on how to optimize clean burning education.

Strengths

- **Improves Air Quality:** The Libby Montana changeout program (described in detail below) demonstrated that removing high polluting stoves has the potential to significantly improve both outdoor airsheds and indoor air quality and help an EPA non-attainment area reach attainment for particulate matter and remain that way.
- **Politically Attractive:** A changeout program allows for the removal of polluting appliances without denying a source of heat to vulnerable populations. Instead of banning the use of polluting appliances outright, providing a cash incentive for an upgrade coupled with a sunset clause on old appliances is much more beneficial.
- **Increases Public Safety:** Old stoves (pre-1990) often have age-damage, such as a cracked firebox, which can make the units likely to leak smoke into living areas or be a fire hazard. These stoves are also more likely to be installed improperly due to lack of building permit requirements.
- **Concise Program:** The goal of replacing EPA exempt or uncertified stoves from an airshed is easily measured and can result from a short term program. A focused 6-12 month campaign can raise awareness about clean burning and emissions, build excitement, help generate in-kind donations, etc.
- **Most Efficient use of Public Funds for Air Quality:** If a program’s goals are improving air quality, focusing public funds on non-EPA stoves is the best return on investment.
- **Improves Heating Efficiency of a Home:** New stoves offer drastic efficiency improvements, especially compared to an old, uncertified device. This will also result in yearly savings since a more efficient stove requires less fuel.

¹²⁹ Crouch J. HPBA. Personal Correspondence with the Author. June 2011.

Weaknesses

- **Requires a Large Incentive:** Unlike programs offering money to install a first time system, changeouts attempt to entice people to exchange what may be a functional heating device with a new purchase. Because of this, a substantial incentive must be offered, especially if the target is demographic is lower income households or if the program is operating in an economically stressed time.
- **Higher Administrative Burden:** The additional paperwork associated with certifying the exchange/recycling/destruction of the old/uncertified stoves can be significant if the program is not designed smoothly.
- **Rebate/changeout Dependency:** Due to the increasing frequency of changeout programs, especially in states such as California or Washington, some stove owners may wait to replace an older stove until a changeout incentive is offered.
- **Abuse Potential:** When absent a mechanism to minimize abuse, people can be tempted to take advantage of the program by changing out high-polluting stoves that were not actively used, or by changing out multiple stoves for the same dwelling and then selling the new stove at a profit. Some programs counter this by requiring pictures of the old stove installed in the home, the address of each dwelling, etc.

Recommendations

- **General:** Rebates are the best source of funding for a change out program, as people generally need a larger and more tangible incentive to replace an appliance that is still functional. Tax incentives are likely to miss a large section of the wood stove using population: low-income households who pay little taxes. This is a particularly egregious oversight since low-income households are more likely to own older, pre-1990 stoves.
- **Air Quality:** To achieve air quality goals, the changeout program must have an educational component to reach its full potential of cleaner burning,¹³⁰ and to ameliorate poor burning practices in older stoves.
- **General:** Program designers should consider settlement agreement projects as a valuable source of funding- both Supplemental Environmental Projects and mitigation project are a flexible means to fund a program.
- **General:** To alleviate governmental staff hours, negotiate the responsibility of certifying the destruction of the old stoves on retailers.
- **General:** Partner with appliance dealers to implement a strong advertising campaign.

EPA Changeout Guide

- [Identify potential partners.](#)
- [Identify sources of funding.](#)
- [Develop a project plan.](#)
- [Implement the Wood Stove Changeout Campaign.](#)
- [Measure success.](#)

¹³⁰ Ward, Tony, et al. *Lessons learned from a woodstove changeout on the Nez Perce Reservation*. The Science of the Total Environment. January, 2011; 409(4):664-70.

- **General:** Time the changeout to begin in the heating off-season in order to avoid overloading dealers.
- **General:** One possible way to create a funding stream is to add a small fee onto the sale of new stoves in order to finance changeout campaigns or clean burning education. Although the low level of new stove sales, relative to the number of existing stoves, ensures that it will take a long time to accumulate enough resources for a meaningful program.
- **General:** The incentive amount should not be much less than what the stove would be worth on the second hand market (the conveniences of not having to locate a buyer for an old stove is an additional enticement).
- **Air Quality:** In high air pollution areas, when possible ban future installation of second hand older stoves that are not EPA certified, and certain wood stoves exempt from EPA regulation.
- **Air Quality:** Require that new stoves meet emission standards stricter than the current, lax EPA standards. Most changeouts require the Washington State 4.5 g/hr emission maximum, but a few require even stricter limits.
- **General:** Provide larger rebates for lower income families and/or give them priority when funding is limited.
- **Air Quality:** In high air pollution areas, restrict non-EPA qualified fireplace installation
- **Air Quality:** Requiring the replacement of non-EPA stoves upon sale of a home is a more passive way to run a changeout program, as it is slower acting. However, over time, it is an excellent way to effect change, as it bundles the cost of a stove changeout with the sale of the house, making it very affordable to the homeowner.
- **General:** Community block grants are interesting options where the local area can offer low- or no-interest loans to homeowners to replace the stove. The city then places a lien on the house until the loan is paid off.
- **General:** Middle income households may respond to a low interest loan program administered through a local bank.

Case Studies: Changeouts

Crested Butte

Beginning in 1986, the Crested Butte Colorado Changeout represented the first time that air quality officials partnered with industry to replace non-EPA certified stoves. Not only was Crested Butte facing particulate matter issues, but more importantly to the town, it was facing visibility impairments that threatened to damage the area's reputation as a vacation destination. The community voted to authorize three years of "real estate changeouts" (requiring replacement of uncertified stoves upon sale of home) assuming that those would remove the majority of old stoves, followed by another campaign to encourage the maximum number of changeouts.¹³¹ With the state closely monitoring air quality, the Hearth Industry arranged discounts on a small number of models for a single summer. The town of Crested Butte also adopted an ordinance based on the concept that any home which had not changed out would be levied a 'polluters fee' on their municipal water bill, of \$30/month for up to three years. At the end of three years, it would be illegal to use any old, non-certified stoves. Most of the residents took action during the key summer, and the result was a 59.5% reduction in particulates from one winter to the next, (after modeling for similar meteorology) according to the Colorado Department of Health.

Key Components of Crested Butte Changeout

- 1) Upgrade of existing woodstoves to certified units whenever a home was sold.
- 2) Stiffer insulation standards for new homes.
- 3) A requirement that all woodstoves in town be upgraded within three years (September 1989) or every household that had not upgraded would be required to pay a \$30/month polluter's fee. The fee option would expire after three years, at which time it would be illegal to use any uncertified appliance.
- 4) An exemption from this ordinance for residents who had burned coal since the 1930's .

-John Crouch, Hearth, Patio, & Barbeque Association

By charging a 'polluter's fee' on the continued use of non-certified woodstoves after a set date, the changeout rebate became even more attractive since fees paid during the three year drawdown could have been used to buy a new stove. This 'carrot and stick' method, which incorporated both incentives and regulations, has seldom been replicated in other changeouts, but is a very effective way to increase changeout participation. The program was overall successful, partly because it set several deadlines discouraging uncertified stoves before finally outlawing them.

¹³¹ Crouch, J. *Upgrading Woodstoves in a Small Town as a Primary Strategy Towards Visibility Improvement*. Air and Waste Management Association. June 1991. Pg 3

Libby Montana

The Libby Montana Changeout Program is one of the most publicized and ambitious changeout programs to date. The Hearth Patio and Barbeque Association (HPBA) partnered with the EPA, the Montana Department of Environmental Quality (DEQ) and Libby County Officials to replace all uncertified wood stoves in a single air shed.¹³² Over four years they replaced 1188 stoves,¹³³ with significant funding coming from partnering organizations as well as other sources.¹³⁴

The Libby, Montana Changeout program was extremely successful on a number of counts. In addition to reaching the goal of switching out 1,200 old/uncertified stoves within the allotted time frame, the program was also able to strike a balance between ensuring that those who could not afford a stove, regardless of rebate amount, received one, and not spending too many funds

on too high of a rebate for those who could afford it. The program first targeted lower income families by giving away the first 300 stoves to qualified households, and then replacing 900 more stoves by offering a rebate. Though the program could have benefited from more time to complete the changeout, experts suggest that it took place in the minimum amount of time necessary to be a success. The public was educated about proper stove use while the program itself was well publicized, making it a model for future changeout programs.¹³⁵ Most importantly, independent research demonstrated that both indoor and outdoor levels of PM 2.5 and other toxic air pollutants were reduced from

Table 8: Local Scale Changeouts

Fairbanks	AK	Washoe County	NV
Apache & Navajo County	AZ	Washington County	OH
Feather River	CA	Greater Dayton	OH
North Coast Unified	CA	Klamath	OR
San Joaquin Valley Air Pollution Control District	CA	Oakridge	OR
Sacramento	CA	Pendleton	OR
Yolo-Solano	CA	Jackson County	OR
Butte County	CA	SW Pennsylvania	PA
Placer County	CA	Christiansburg	VA
Bay Area	CA	Tacoma	WA
Shasta County	CA	Darrington	WA
Town of Truckee	CA	Ferry and Steven County	WA
Marin County	CA	Lummi Tribe	WA
Tuolumne	CA	Marysville	WA
Delta County	CO	Pend Oriella County	WA
Fort Collins	CO	Spokane	WA
Presten	ID	Swinomish Tribe	WA
Pinchurst	ID	Yakima	WA
Nez Perce Tribe	ID	Whatcom/Island County	WA
West Springfield	MA	Dane County	WI
Ravalli	MT	Oneida Tribe	WI
Gallatin County	MT	Sublette County	WY
Libby	MT		
Keene	NH		
Questa	NM		

¹³² Hooper, Kathi. *Woodstove Changeout Program: Libby Montana*. Department of Environmental Health, Libby Montana. <<http://www.epa.gov/burnwise/workshop2011/Libby-WoodStoveChangeout-Hooper.pdf>> pg. 8

¹³³ Ibid. pg. 15

¹³⁴ *Preliminary Report: Clearing the Smoke: The Woodstove Changeout in Libby, Montana*. Hearth Patio & Barbeque Association. Arlington, VA <http://woodstovechangeout.org/fileadmin/PDF/Libby_Report-Final.pdf> pg. 10

¹³⁵ Ibid. pg. 20

pre-changeout levels.¹³⁶ Some sources cite a reduction of as much as 37% for outdoor particulate pollutants and a 72% reduction indoors.¹³⁷ Three key lessons from Libby include: 1) even offering full replacements for low income families did not ensure that everyone who qualified applied for the program, many needed direct one-on-one contact, 2) when addressing a whole town, there may be old units (such as wood furnaces) and consumers (particularly older men) who consume a disproportionate share of the local coordinators' time, and 3) it may be very useful for the local coordinator to be an older man, particularly with experience in construction, and definitely from a household that heats with wood.¹³⁸

Great Lakes States

The Great Lakes States program was perhaps the largest changeout to date, geographically speaking. The areas covered included the Georgian Bay region of Ontario, Canada, and the states of Illinois, Indiana, Iowa, Michigan, Minnesota, Nebraska, western New York, North Dakota, Ohio, South Dakota and Wisconsin. One of the most notable aspects of this program is the number of different partnerships involved; the program was led by the North Central Hearth Products Association (NCHPBA), in partnership with the industry groups Hearth, Patio & Barbecue Association (HPBA), MidStates HPBA and Midwest HPBA. Supporting government and participating organizations included the EPA, the Minnesota Pollution Control Authority (PCA), the Wisconsin Department of Natural Resources (DNR), and the Michigan Department of Environmental Quality (DEQ), as well as various other state government agencies. There were 124 retailers and 57 manufacturers participating in the program as well. Running from 2000 until 2001, the program received wide publicity and 1,287 individuals were reported to have upgraded to EPA certified models.¹³⁹ During the campaign over 2,250 individuals called the information hotline and the program website received over 200,000 hits.¹⁴⁰

Preceding the Libby, Montana changeout, this program could have benefited from some of the improvements implemented in Libby. Although the overall number of upgraded stoves was relatively small compared to the size of the region, the campaign was primarily focused on education and outreach, and in that regard it can be used as a model for future campaigns. The most changeouts occurred in the 37 counties where the local governments offered some matching funds in order to address air and water quality issues. Lessons from this program include; 1) higher funds make for much greater participation, 2) a compelling external reason for a changeout, e.g. air or water quality improvements in the local area is helpful, 3) changeouts may be most effective on a local scale.

¹³⁶ Tony J. Ward, et al. *A Community Woodstove Changeout and Impact on Ambient Concentrations of Polycyclic Aromatic Hydrocarbons and Phenolics*. Center for Environmental Health Sciences, The University of Montana, 2009.
<<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2735050/>> pg. 7

¹³⁷ *Preliminary Report: Clearing the Smoke: The Woodstove Changeout in Libby, Montana*. Pg 18

¹³⁸ Crouch J. HPBA. Personal Correspondence with the Author. June 2011.

¹³⁹ *Ibid.* pg. 22

¹⁴⁰ "Great Lakes States: Promising First Steps." <<http://woodstovechangeout.org/index.php?id=25>>

Outdoor Wood Boilers

Although outdoor wood boiler (OWB) or hydronic heater replacement programs face particular challenges, changeout programs focusing on outdoor wood boilers are likely to be more common in coming years. Often those who purchase these whole home heating units are interested in the affordability of the fuel and the independence associated with these appliances. These units can cost anything from a couple thousand dollars to over ten thousand, and given that owners have already assumed a significant financial investment, convincing them that a replacement is needed is often difficult. For this reason, incentive programs seeking to replace old OWBs with cleaner units must be able to offer a significant incentive to consumers. The EPA has [a voluntary certification program](#) with certain hydronic heating units certified as ‘Phase II’ appliances,¹⁴¹ which can be allowed as replacement appliances in some areas. However, even these units are unsuitable in some densely populated areas, or areas with air quality issues. In these locations, an alternate heating source (such as a high end pellet boiler) should be eligible as a replacement.

The Vermont OWB Changeout Program offers an example of how policy makers were able to stretch their limited funds by focusing on the OWBs determined to be the greatest threat to human health. The governmental interest in the OWB changeout is to assist in the mandatory retirement of non-EPA OWBs in certain locations by the end of 2012.

To help households meet this mandatory retirement, the Vermont Air Pollution Control Division created a rebate voucher program targeting the biggest air quality threats by focusing the greatest financial incentive of \$6000 on eligible OWBs that have “resulted in valid complaints regarding emissions”¹⁴². The other primary target of this program was OWBs “located within 200 feet of a residence, school, or health care facility not served by the OWB”¹⁴³. Funds became available for this second phase after the first phase ended in May, 2011, and vouchers were reduced to \$5,000. The final facet of this program was a \$1,000 voucher to match manufacturer rebates, which begins a month after the first program. By staggering the funds in this manner, the state was able to focus on what they have identified as the worst offenders, so that even if the program runs out of money or faces unforeseen difficulties, they will have already succeeded in a large part.¹⁴⁴

The [Fairbanks North Star Borough](#), Alaska has a combined wood stove and outdoor boiler changeout program that is addressing the Borough’s air quality issues by providing both a \$1,500 municipal tax credit and \$1,000 cash to replace old wood stoves or the tax credit and \$6,000 cash for replacing non EPA phase II qualified outdoor wood boilers.

¹⁴¹ EPA Burn Wise Program Website. Last updated April 4, 2011 <<http://www.epa.gov/burnwise/participation.html#hydronic>>

¹⁴² 10 V.S.A. 584 (g) The Vermont Statutes Online

¹⁴³ 10 V.S.A. 584 (g) The Vermont Statutes Online

¹⁴⁴ Proposed legislation in Rhode Island would phase out older OWBs by requiring their removal before selling or renting the property. H5783 Substitute A, introduced by Pre. Flaherty, McNamara and Bennet on March 3, 2011.

Table 9: State Changeout Programs

State	Objective	Qualification	Type of Funding	Amount	Comments
<u>Arizona</u>	Air Quality	Replace fireplace	Tax deduction	Max \$500	EPA Phase II stoves
<u>Idaho</u>	Renewable Energy, Air Quality	Replace uncertified stoves	Tax deduction	Max \$20,000	40% of cost the first year, 20% the next three years. Requires surrender of old stoves.
<u>Michigan</u> *	Air Quality, Energy Efficiency	Replace old stoves	Rebate	\$290	Partnership between Michigan United Conservation Clubs, MDEQ and HPBA
<u>Nebraska</u>	Energy Efficiency	Replacing inefficient heat source/ fireplace	Low interest loan	\$35,000 - \$75,000	2.5% and 5%. Includes fireplace inserts
<u>Vermont</u> *	Air Quality	Replace non-EPA stoves, old catalytic converter	Rebate	\$450, or \$75	Replacement wood and pellet stoves must be WA State certified, or to replace the catalytic converter
<u>Vermont</u>	Air Quality	Replace Outdoor Wood Boiler	Rebate	\$1,000-\$6,000	Rebate amount on a sale of air quality damage. Replacement OWB must be EPA II, some wood/pellet stoves allowed.

*** Expired Program**

Policy Considerations

Changeout programs are an essential policy device to address air quality in non-attainment areas, while avoiding outright bans that could potentially deny a source of heat to vulnerable populations. They also face the unique challenge of convincing an owner that a functional appliance should be replaced at some level of cost. Because of this, most changeout programs must offer a significant financial incentive. This amount of money is generally the most compelling factor a changeout program can offer, followed by the messaging associated with air quality mitigation and human health.

Any changeout program must invest significant time and resources into educational and outreach components of the campaign if they hope to maximize air quality improvements.

Modern, EPA certified wood stoves that emit low levels of particulates in the lab can burn much dirtier in households if clean burning practices are not employed. Even in communities where

“Messaging is much more difficult than it appears. The in-depth analysis of the Libby Changeout can be very helpful with this.”

-John Crouch, HPBA

wood burning has a long tradition, a surprising number of households do not practice basic clean burning techniques such as only burning well seasoned (under 20% moisture content) wood.

An effective amount of time is often a crucial factor for changeout programs, especially those seeking to target lower-income households that may not have access to all of the media outlets being used to promote the campaign, and instead are more effectively reached by word of mouth. Many changeout programs have to overcome a time barrier between the first-adopters and those who wait to determine if the program was too good to be true. In shorter term programs, if this gap-time falls towards the end of the program time-frame, a large segment of interested stove owners miss their opportunity.

The second major challenge incentive programs face is determining the correct percentage of the total cost of a new heating unit to cover. If the percentage is too high, the program will run out of funds way before it runs out of applicants, but if the percentage is too low, it will not garner enough interest for the funds to be utilized. Ideally, a program would run a pilot program to gauge the optimal amount to incentivize middle-income households, and then run a full program the following year. The very low-income households will almost always require 80-100% of the total cost to be covered, as there is little to no disposable income. A small level of payment is often necessary to encourage buy-in, but in some cases the administrative cost of collecting this sum may not outweigh the benefits of increased low-income household buy-in.

Changeout programs also greatly benefit from local coordinators and advocates. For instance, in Eastern Arizona, the grant to the American Lung Association included staffing to organize the program. Libby depended on full time local coordinator for two years, who made sure the program only removed stoves that had really been used, and that the new stoves were safely installed. While this represents additional cost, it can greatly increase the efficacy of a program.

Some experts point out that the 30% federal tax credit up to \$1,500 in 2009-2010 should have had a changeout requirement, or an additional tax credit to changeout an older stove (see [Individual Tax Credit, Section 25c](#), pg. 90), but that would have involved very costly administrative burdens and greatly undermined the renewable energy benefits of the credit by drastically limiting who could take it. A \$10 million earmark for changeout funds was put into a Congressional bill in 2009, but it did not pass. The Home Star program, designed with input from the Alliance for Green Heat, would have implemented the first significant national changeout program as one of its components. While anyone would have been eligible for rebate on a pellet stove, changing out a non-EPA certified woodstove would have been required to receive a stove rebate (see [Home Star](#), pg. 97).

A key issue to consider for an area requiring significant changeouts, such as a federal air quality non-attainment area, is the value of prohibiting the use of old stoves after a certain date. This involves enforcement and should not be undertaken lightly, but it does potentially lower the

required incentive amount. Conversely, if the local community has no restrictions on wood stove usage, such as burn-bans or stringent building codes, old stoves will be more expensive to eradicate from the community. Communities faced with clean air deadlines, or those that don't wish to wait for 'real estate transfer changeouts' to slowly roll over the inventory of old stoves, should consider this trade off; the value of a 'date certain' prohibition on usage, vs. the need for higher changeout incentives.

Renewable Portfolio Standards

Renewable portfolio standards (RPSs) set requirements for the amount of renewable energy or renewable energy credits that utility companies must use by a specific deadline. Though there is not yet a national standard, at least 38 states have RPSs or renewable energy goals.¹⁴⁵ This commonly takes the form of requiring utility companies to meet a standard, such as 20% of their delivered power by the year 2025 or 2030, through the use of a variety of renewable energy technologies. Many states focus their RPSs on the electricity sector and have varying goals set for different forms of utility companies, breaking them down by Investor Owned Utilities, Municipal Utilities, Electric Cooperatives and Retail Suppliers.

Some states also have "carve outs" requiring a specific form of clean technology to be used for a percentage of the total renewable technology. For example, a number of states have a solar carve out, which requires that a certain portion of the electricity delivered by utilities is derived from solar photovoltaics. Additionally, a number of states have provisions for customer-sited renewable use, requiring that a portion of the renewable energy generated comes from customers. For example, Arizona and Colorado require that part of the required renewable energy is derived from distributed resources and that half of this comes from residential/customer-site applications. These programs serve as good examples of how residential renewable energy can contribute to state-wide goals.

Policy Considerations

Although states could benefit from applying the contribution of biomass stoves as a source of renewable energy, so far none of the eligible residential technologies include wood or pellet stoves. The argument commonly made against including wood/pellet stoves is that it is too difficult to determine the precise amount of electricity displaced by the appliances producing thermal energy. However, some state programs do include solar thermal, such as New Hampshire, New York and Ohio, which presents the same challenge in tracking electricity displacement as wood and pellet stoves. One possible way to gauge electricity in a home is to do a 'before and after' energy audit, but this can be costly. This cost could be addressed by partnering with non-profits, many of which already work to offer energy audits to households in need. Although existing RPSs don't include residential heat from biomass stoves and boilers, it would be a simple policy fix to include them in the definition of eligible energy sources. Including residential biomass would incentivize an important renewable energy as well as helping states meet their renewable energy goals.

¹⁴⁵ Pew Center on Global Climate Change. *Renewable and Alternative Energy Portfolio Standards*. 2011. <www.pewclimate.org>

Green Building Projects

Green building projects (also labeled as incentives or programs) are a type of government initiative focused on environmentally sound building practices. Undertaken at the state and local level, these projects generally reward the use of environmentally sound building practices through monetary incentives, a streamlining of the review and construction process or a combination of the two methods. They are usually based on one of a number of recognized third party ratings systems that award ‘points’ under a variety of criteria such as undertaking energy efficiency measures, using renewable energy, recycling building materials, etc.

Specific program types include tax credits, abatements and rebates as well as utility rebates and loan guarantees. Non-monetary incentives are generally focused on expediting permit and building processes as well as fee refunds or reductions. For examples of these types of regional programs see the following table.

Table 10: Green Building Incentive Programs

Location	Program Description
Burbank, CA	Utility rebate
Baltimore, MD	Property Tax Credits
Howard County, MD	Property Tax Credits
Montgomery County, MD	Property Tax Credits
Nevada	Tax Abatement Program
New York	Property Value Rebate
Pennsylvania	Loan/Loan Guarantees
King County, WA	Loan/Loan Guarantees
San Bernardino County, CA	Accelerated Plan Review, Priority Inspections & Design Assistance
Santa Monica, CA	Expedited Permitting
Miami-Dade County, FL	Expedited Permitting
Chicago, IL	Expedited Permitting
Hawaii	Expedited Permitting
North Carolina	Full/Partial Fee Reductions
Delaware	Rebate worth \$3-6,000

The most well-known and accepted ratings system, upon which qualification for these incentives most often relies, is the Leadership in Energy and Environmental Design (LEED) certification program. This widely respected ratings system was developed by the United States Green Building Council (USGBC), a Washington DC based non-profit dedicated to ‘regenerating and sustaining the health and vitality of all life by emphasizing construction practices that are

environmentally and socially responsible and promote a healthier environment.’ Other recognized certification systems exist throughout the country including;

- [Chicago Green Homes Program](#)
- [Green Globes Rating Certification](#)
- [National Association of Home Builders- NAHBGreen](#)

The LEED certification program is a point-based verification system designed to ensure, “energy savings, water efficiency, CO₂ emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.”¹⁴⁶ Guidelines provided by the USGBC in eight categories cover a wide variety of building practices including everything from materials used, to the location of the structure. A maximum of 136 points is available, with at least 45 required to earn a label as ‘certified’- the lowest possible accreditation. The more points earned, the more prestigious the labeling; with Silver requiring at least 60 points, Gold 75 and Platinum 90.¹⁴⁷

Biomass heating systems are only included in the ratings system under the indoor environmental quality (IEQ) section. To earn IEQ credit a structure must receive at least 6 points. Up to 2 points can be received for installing a certified combustion appliance with a back-draft potential test (wood stove) or power/direct-venting (pellet stove), which is considered ‘best practice.’ However, a household installing no wood-burning device automatically gains 2 points.¹⁴⁸ This means that a homeowner would experience zero net gain from the LEED ranking system *despite investing time and money in a clean energy heating system.*

Policy Considerations

The equal point system for approved biomass stoves versus *no stove installation* shows a narrow-minded view of carbon reducing technologies on the part of the LEED program. Despite the fact that about 40% of the energy used in an average home goes toward space heating,¹⁴⁹ LEED chooses to focus its incentives on high-dollar systems displacing grid electricity use. Although this is a worthwhile endeavor, it ignores the more cost-effective solutions to offsetting the carbon footprint of thermal energy. Biomass heating should also be considered under the Energy and Atmosphere Section of the certification guidelines for its potential to serve as a highly efficient source of renewable energy in the home.

¹⁴⁶ United States Green Building Council. <www.usgbc.org>

¹⁴⁷ United States Green Building Council. *LEED for Homes Rating System*. Jan 2008 pg. iv

¹⁴⁸ *Ibid.* pg 86-88

¹⁴⁹ Energy Information Administration. *Residential Energy Consumption Survey*. 2009

Weatherization Assistance Programs

The Department of Energy (DOE) provides funding for weatherization assistance programs (WAP) in every state, U.S territories and Native American Tribes. Over the course of the last thirty three years, this program has provided weatherization services to 6.4 million low-income households through collaboration with local community agencies and non-profits.¹⁵⁰ The program can also provide a relatively easy way for states to help low-income families better use wood heat. In 1988, the DOE issued guidance saying that wood stoves were an approved weatherization assistance measure and states could include them in their programs.¹⁵¹ In 2002 the DOE further addressed wood stoves by adding guidance that states should have procedures in place to identify potentially dangerous creosote build-up in chimneys and wood stove flues.¹⁵²

Most state programs include the repair and/or replacement of wood stoves, though some states such as New Mexico limit repairs and replacement to homes where a wood stove is the primary source of heat. California allows replacement only if the existing unit is a safety hazard, or if the absence of the unit would be harmful.¹⁵³ Other states allow replacement if it is recommended by the energy auditor.

Policy Considerations

Although this program is very extensive, the framework for wood stoves could do much more to recognize the role of wood heat as a cost-effective source of renewable energy and as a way to reduce reliance upon fossil fuel heating assistance. Just like energy efficiency measures, wood heating can provide long-term savings in energy costs. This is because wood heat allows homeowners to procure their own fuel in an inexpensive manner, which is especially important in the event that assistance funds are cut back. In this manner, programs should allow necessary repair of wood and pellet stoves, as well as the replacement of the stove if it is beyond repair.

In many cases, eligible homeowners may now know that their wood stoves can be repaired or replaced. As programs consult with local organizations and agencies, it would be beneficial to overall program success if officials partnered with the hearth industry and local retailers.

¹⁵⁰ U.S. Department of Energy. Weatherization Assistance Program. <www.eere.energy.gov>

¹⁵¹ U.S. Department of Energy. *MEMORANDUM, Approval to Include Wood Stoves As A Weatherization Assistance Program Material*. 1988. <http://www.waptac.org/data/files/website_docs/government/guidance/woodstove.pdf>

¹⁵² U.S. Department of Energy. *Interim Health and Safety Guidance*. Weatherization Assistance Program. July 2002. <http://www.waptac.org/data/files/website_docs/government/guidance/2002/wpn%2002-5.pdf>

¹⁵³ U.S. Department of Energy. *CSD LIHEAP/DOE Weatherization Programs Health and Safety Appliance Replacement Policy*.



Industry groups can help to raise awareness of the program and provide expertise to auditors and weatherization technicians.



B. Fuel Incentives

Fuel incentives come in two general forms: tax incentives or affordable wood harvesting permits. Tax incentives are generally offered for “biomass fuel.” Biomass fuels often refers to cordwood or wood pellets but can also apply to energy crops as well as qualifying residues including sawdust and wood chips. These incentives come in the form of tax exemptions or credits and can be applied at the production, sale or use of fuels. Although these fuel incentives are not strong enough to motivate the purchase of biomass stoves, they do serve as a signal of governmental support for this technology.

Many states including Connecticut, New Jersey, Wisconsin and Michigan have state forest firewood programs that allow residents to apply to harvest a designated amount of firewood each year. The number of applications is often limited and distributed by lottery or on a first come first serve basis. These programs provide a source of fuel for low income families while maintaining forest health through thinning and removal of debris. Most national forests allow people to cut dead or downed wood for their personal use after obtaining a permit, typically about \$10-30 a cord for two to six cords, although prices will change yearly depending on demand. Individuals should contact their local forest supervisor’s office for information available on programs and how to apply.

The following states have notable cut-your-own programs in some or all of the state owned forest lands:

Table 11: State Sponsored Self Harvest Firewood Programs

State	Cost	Website/Contact Info
CT	\$30 per cord	http://www.ct.gov/dep/cwp/view.asp?A=2697&Q=429464
MI	\$20 for 5 cords	http://www.michigan.gov/dnr/0,1607,7-153-30301_30505_30816-24382--,00.html
NJ	20 per cord	http://www.state.nj.us/dep/parksandforests/forests/njfs_firewood_prog.html
NY	\$14 per cord	http://www.dec.ny.gov/press/61465.html
WI	N/A	http://dnr.wi.gov/forestry/stateforests/SF-Knowles/timber.html
VT	\$10 per cord	http://www.vermont.gov/portal/government/article.php?news=782

Wood harvested from state and national forests is an often-overlooked component of the wood fuel market. In 1982 the Forest Service issued 655,000 permits for the removal of firewood from national forests. Some officials estimated that over 4 million cords were cut.¹⁵⁴

Policy Considerations: Pellets

[Missouri](#) offers an energy production tax credit of \$5 per ton (or dry cord) of materials to any facility processing forestry residues into fuel within the state, with credits being carried over year to year.¹⁵⁵ This type of incentive can help buoy local industry and create jobs while ensuring a strong local fuel market. A bill has been proposed in the West Virginia legislature providing a one-time \$300 tax credit for the purchase of wood pellets. Although a positive development in a state that often lags on biomass friendly policies, its effectiveness is dubious due to the short-term benefits it would have for consumers, especially those of a lower-income. A simple policy consideration is to apply sales tax exemptions for the purchase of pellet fuels. Furthermore, current sales tax exemptions for heating fuels should be amended to include pellet fuels.

Currently there are no industry wide, third-party enforced pellet standards, which has resulted in the creation of some very dirty burning pellets that are not only detrimental to air quality, but will damage pellet stoves and boilers. The Pellet Fuels Institute, a “North American trade association promoting energy independence through the efficient use of clean, renewable, densified biomass fuel,”¹⁵⁶ passed voluntary industry standards in 2008 to mandate stricter codes concerning pellet production. These standards include third-party monthly inspections and an established criterion for a variety of pellet properties such as ash content. As the pellet industry moves toward a more robust certification program, incentive schemes should only apply towards certified pellets to help guide consumers to cleaner burning fuel that will not damage the stove, or create undue levels of emissions.

Policy Considerations: Cord Wood

[Georgia](#), [Virginia](#), [Wisconsin](#) and [Maryland](#) all offer 100% sales tax exemptions on heating fuel—although the specific qualifiers for each incentive program differ state by state. Georgia has the widest definition of qualifying fuels, including agricultural and construction waste on top of more common biomass fuels used to generate steam or electricity.¹⁵⁷ Wisconsin’s exemption,

¹⁵⁴ U.S. Congress, Office of Technology Assessment. *Wood Use: U.S. Competitiveness and technology, Vol. 1* Washington, D. C. August 1983. Pg 160

¹⁵⁵ DSIRE. *Missouri Wood Energy Production Credit*. Last updated October, 2010 <http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO02F&re=1&ee=1>

¹⁵⁶ Pellet Fuels Institute. Accessed May 6, 2011. <<http://pelletheat.org/about-us/who-is-pfi/>>

¹⁵⁷ DSIRE. *Georgia: Biomass Sales and Use Tax Exemption*. Last updated August 2010 <http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=GA08F&re=1&ee=1>

dating back to 1979, has exempted cordwood from 100% of the state's Sale and Use Tax and was amended in 2007 to expand the definition of biomass.¹⁵⁸ Maryland provides a similar tax exemption for refuse-derived fuel (forestry residue) and both residential and commercial heating applications apply.¹⁵⁹

Oregon, a national leader on biomass, offers a unique tax credit providing \$10 per bone-dry ton or cord of fuel burned (not purchased) meaning that even wood harvested by individuals and used for heating can qualify. Credits are limited to a maximum of \$200 per taxpayer per year¹⁶⁰. This program works well in terms of supporting self-sufficient Oregonians but could be expanded so as to increase its economic benefits.

The self-harvest programs on government lands provide options for low-income consumers who may not otherwise have access to affordable wood. These programs are the only source of heating fuel for some families. An additional benefit of these programs is that they provide a valuable tree thinning service to the National Forestry Department.

¹⁵⁸ DSIRE. Wisconsin: Renewable Energy Sales Tax Exemptions. Last updated September 2010
<http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=WI62F&re=1&ee=1>

¹⁵⁹ DSIRE. Maryland: Wood Heating Fuel Exception. Last updated October 2010
<http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MD01F&re=1&ee=1>

¹⁶⁰ Oregon Department of Energy. Premium Efficiency Wood and Pellet Stoves. Last updated January 2011
<<http://www.oregon.gov/ENERGY/CONS/RES/tax/HVAC-Biomass.shtml>>

C. Federal Programs

The Federal Government has very few programs addressing residential wood heat compared to other types of renewable energy. The EPA office of Air Quality Planning sets emission limits and educates consumers, but their underfunded efforts are more focused on regulating appliances such as non-EPA qualified outdoor wood boilers that tend to be the most polluting rather than developing ever cleaner indoor boilers. The Department of Energy tracks some data on wood heating but has no programs to incentivize it as they do for other end uses of biomass. The U.S. Department of Agriculture is the sector's most natural home and has considerable expertise and understanding, but most funds still go to biofuels (primarily transportation fuels derived from biomass). The only significant federal residential wood heat incentive program came from Congress in the form of an individual tax credit up to \$1,500 for the purchase of an efficient heating appliance in 2009 and 2010. Today that credit is capped at \$300.

“Currently, national renewable energy policy does not include a thermal energy component; yet this sector is best suited to capture the most total energy from biomass resources and support economic health in rural communities. To develop this important energy sector successfully, public policy must play a critical role in addressing issues of scale, efficiency, biomass supply and harvesting, environmental and socioeconomic impacts and investment and financing.”

-Rural Voices for Conservation Coalition and the Coalition for Eastern Forests and Communities. *Sustainable Biomass Energy: The Need for a Comprehensive Energy Policy that Includes Thermal Biomass*. May 2011

Not only can federal incentives spur the creation of state programs, but they can also complement the programs as well; increasing the efficacy of both. A 2009 study on solar incentives found “a strong participation response to incentives in many states after 2006, when the federal investment tax credit was reinstated for residential installations and was increased for non-residential installations. Recent participation, therefore, is attributable to the combination of the state and federal incentives.”¹⁶¹

¹⁶¹ Sarzynski, A. *The Impact of Solar Incentive Programs in Ten States*. George Washington Institute of Public Policy. November 2009. Pg. 6

Individual Tax Credit (Tax Code Section 25c)

High-efficiency wood stoves have had a tax credit since 2008, although it has been lowered as of December 31, 2010. The \$858 billion Tax Cut Compromise Package of 2010 reduced the biomass heater tax credit to 10% with a \$300 cap. Congress also removed the lower heating value measurement and will only allow the credit to go towards the purchase price but not for installation. The \$500 tax credit (only \$300 allowed for heating appliances) is a lifetime maximum, meaning that if a homeowner has used this credit anytime since 2005, it cannot be used again.

The original intent of the [25C tax credit](#) was to advance home energy-efficient appliances and upgrades to existing homes by providing a modest tax credit. As part of the 2010 amendments, Congress tightened the specifications for oil furnaces and boilers and gas boilers to 95% efficiency, up from the 90% efficiency.

The tax credits for biomass stoves are included as a Residential *Energy Efficiency* Tax Credit, all of which are capped at \$500, instead of a Residential *Renewable* Energy Tax Credit, which are uncapped. Even though the EPA and DOE accept biomass as a carbon neutral fuel, biomass is not yet considered a top tier renewable.

Table 12: Tax Code Section 25c Timeline

2005- Non-business Energy Property Tax Credit (25c) was added to the Internal Revenue Code by the Energy Policy Act of 2005 with a 10% credit not to exceed \$300 for any item of energy-efficiency improvements (defined as any energy efficient building envelope component meeting the criteria set by the 2000 International Energy Conservation Code) and a total credit capped at \$500.

2007- Section 25c expired.

2008- Section 25c was revived by the Energy Improvement and Extension Act (EIEA), a part of the Emergency Economic Stabilization Act (EESA) rescue package by President Bush. EIEA clarified the original act by specifically including biomass stoves and boilers under energy-efficient building property.

2009- American Recovery and Reinvestment Act of 2009, expanded the scope of the earlier 25c and increased the credit up to 30%, and capped it at \$1,500. The efficiency standard for biomass boilers was defined as over 75% efficient appliances as measured using a lower heating value.

2010- Section 25c was extended for one year by re-instating the credit as it existed before 2009, which lowered the credit to 10% capped at \$300. Biomass stoves and boilers remained

in the bill but the lower-heating value measurement was removed.

Strengths

- **National Recognition:** This program was the first federal program recognizing wood/pellet stoves in a national energy efficiency incentive program.
- **Significant Incentive:** The \$1500 tax credit in 2009-2010 could be a significant incentive for a \$4,500 system.
- **Long Time Frame:** The \$1,500 tax credit was at least a two year program which gave the industry more time to take full advantage of it, and promote it.
- **Clear Requirements:** Simple and straightforward requirements made it easy for people to claim the credit and understand the program.

Weaknesses

- **Weak Incentive for Some Consumers:** As with all appliance incentives, 25c might not have provided an actual incentive to buy the appliance, but just altered the timing of the purchase by people who were already interested. Additionally, as a tax credit, many low income households were unable to take advantage of it.
- **Lacked Air Quality Measures:** There was no change out component. It did not exclude using the credit to install wood stoves in urban, non-attainment areas. Phase II outdoor wood boilers were allowed to be installed in states that lacked appropriate regulations such as property setbacks or stack height requirements.
- **Did not Drive the Market:** The Tax credit did not incentivize the top percentage of the market in efficiency or in PM emissions, rather virtually all new EPA certified stoves were eligible under the 75% efficiency rule, using lower heating value.
- **Lack of Enforcement:** Non-EPA phase II outdoor wood boilers were sometimes claimed under the credit.

Drawbacks of the 2011 Tax Credit Program

- The 2011 version of 25c is a lifetime credit, which limits people who took the credit before for windows (for example) from purchasing a stove.
- Removed the explanation of what heating value measurement should be used to calculate the efficiency of the stove. Removing the clarification of lower heating value could result in confusion between manufacturers and the IRS.

Recommendations

- High efficiency wood and pellet appliances should be included in Section 25D, the renewable energy technologies tax code section. This would provide a 30% uncapped tax for eligible technologies.



- Defining a selective subset comprised of the cleanest and most efficient appliances for eligibility would help to steer the market toward these units.



Department of the Treasury
Internal Revenue Service

Low Income Energy Assistance Program

The Low Income Energy Assistance Program ([LIHEAP](#)) is a federally funded block grant program that is implemented and administered at the State and Tribal levels. LIHEAP has been operating since 1982 and its stated purpose is "to assist low-income households, particularly those with the lowest incomes, that pay a high proportion of household income for home energy, primarily in meeting their immediate home energy needs." The program considers wood and pellets among the eligible fuel sources and will also provide funds to repair or replace wood stoves.¹⁶²

The Department of Health and Human Services that oversees LIHEAP funds has an opportunity through the Sustainable Communities initiative and other programs, to direct and urge states to use LIHEAP funds to help families use less fossil fuel. The State of Montana undertook a study that demonstrated states can save funds by providing efficient wood stoves to replace older, inefficient ones since the new stoves require less fuel and use the cheapest fuel available: wood. If more families used this renewable fuel efficiently, the state could harness this savings and apply LIHEAP dollars to more families.

Strengths

- **Stove Repair Component:** This is one of the only programs that provides funds to repair or replace stoves in low-income households. Providing funding to repair old stoves can improve safety, enhance efficiency and reduce emissions and is less costly than replacing the unit.
- **Protects Low-income Families:** Families who cannot afford even relatively inexpensive cordwood, and cannot harvest their own (due to location, physical or time constraints) will have a social safety net that includes wood stoves.

Weaknesses

- **Administrative Burden for Small Scale Wood Suppliers:** Individuals and small businesses that sell wood and pellets are not as well equipped to handle the administrative and fiscal hurdles as large fossil fuel suppliers are.
- **Uncertain Federal Funding:** The LIHEAP funds were raised due to the American Recovery and Reinvestment act, and over the years, demand for the program has increased. Unfortunately, the funding was severely cut in 2011. The variability of this

¹⁶² [CSD LIHEAP/DOE Weatherization Programs](#)

funding source can have a very negative impact on families who have come to rely on this financial assistance for heating their homes, only to have it unexpectedly disappear.

Recommendations

- States should more aggressively use LIHEAP funds to provide new, EPA certified stoves to any family receiving LIHEAP funds who uses a stove as a primary or secondary heating source. The state of Montana served as an example that states can cut costs by providing high efficiency stoves to anyone who uses wood as a primary heating source, rather than providing higher, prolonged assistance to heat with a low efficiency stove.¹⁶³
- States should also consider biomass appliance incentive programs targeted at rural families who heat with the most expensive fuels (electricity, propane and oil) and who are on energy assistance. A generous rebate could lead to more energy self-sufficiency and lower costs if the family collects wood themselves.
- States should calculate benefits in a way that encourages, not discourages, families to use lower costs fuels like wood and pellets. States that provide benefits based on cost of fuel, such as New Hampshire, give larger benefits to less efficient forms of heating. The oil heat industry becomes the major beneficiary of this method of calculation. This could push thousands of families to choose funding for oil, rather than a wood since there is little motivation to choose the latter.
- State and local officials, and the hearth industry, should do more to advertize the availability of LIHEAP funds to be used for wood or pellet stove repair.

¹⁶³ Quenemoen, K. *Montana Low Income Wood Stove Changeouts Study Project*. Montana Department of Energy. February 2010

Property-Assessed Clean Energy Loans

Property-Assessed Clean Energy ([PACE](#)) loans were promoted by the DOE and many states were passing enabling legislation until federal housing loan agencies put a stop to the programs. Property-Assessed Clean Energy financing loans were a series of local government initiatives that allowed property owners to finance renewable and energy efficiency projects in residential and commercial structures. This financing, which would have funded projects as diverse as insulation, energy efficient boilers (including biomass), new windows, and solar installations were to be repaid over a 20 year period via property tax assessments. This enabled the costs of an energy efficiency project to be spread out over a longer period of time, and it also allowed for repayment obligations to be transferred to new property owners in the case of the property changing hands. Municipalities that adopted PACE like legislation were free to setup their own guidelines for financing. The twenty five States adopted legislation that enabled PACE programs included CA, CO, DC, FL, GA, IL, LA, MA, ME, MD, MI, MN, MO, NV, NH, NM, NY, NC, OH, OK, OR, TX, VT, VA and WI. Out of those twenty five states, nine specifically mentioned biomass as eligible for PACE financing: CO, FL, LA, ME, MO, NV, NH, OH and VT.

PACE was pioneered in Berkeley, CA in 2008 and was quickly adopted by a number of states with support of the Obama Administration and the Department of Energy. The program was unfortunately shutdown, as announced in a Federal Housing Finance Agency (FHFA) Statement in June of that year, after protests by the government-chartered agencies Fannie Mae and Freddie Mac. These firms, responsible for buying and selling home mortgages, claimed that said mortgages would be put at risk due to the nature of PACE financing. Their concerns were derived from the question of who would be responsible for the senior lien in the case of a default on the mortgage (PACE is notable for the loan being attached to a property as opposed to an individual). They argued that taxpayers would be footing the bill for irresponsible homeowners, leading to an order by the FHFA to no longer underwrite mortgages on PACE assessed properties, effectively killing the program.

Despite this setback, there was originally some optimism that the program could be restarted. Litigation was filed by Sonoma County, California and Babylon, New York among others attempting to reaffirm the right of local and state governments to define public purpose. It also would have required that PACE assessments be treated no differently than any other assessments, however this legislation failed to accomplish its goals. There was also a discussion of PACE being reintroduced in the first quarter of 2011 with bipartisan support in Congress, but the heated climate on the hill has apparently stalled this effort. No other efforts aimed at reviving PACE are currently being discussed.

Strengths

- Attached loan payments to the property tax, loan remained with the home when sold.

Weaknesses

- Fannie Mae and Freddie Mac did not want an energy-related lien to be senior to a mortgage.

Recommendations

- PACE loans would be ideal to fund larger, whole house biomass heating systems, but some of the regulatory infrastructure was not in place for biomass systems in the initial program. If either PACE, or a similar program, re-emerges states should specifically identify which biomass systems are eligible and which are not. Since the EPA exempted biomass boilers from regulation, PACE loans might have funded low efficiency high emission equipment rather than just the top-performing, efficient units. Traditional, non-qualified outdoor wood boilers could have been funded in states with no property set-back, or stack height limits.

Home Star



[Home Star](#) is another major federal program that could have provided a boost to residential wood heating but was not approved, and appears increasingly unlikely to be in the foreseeable future. Nevertheless, its components provide an important starting place for discussing potential federal incentive programs. The Home Star Energy Retrofit Act of 2010 (H.R. 5019), authorized the creation of a national energy retrofit program for American homeowners. This bill was introduced by Representative Peter Welch of Vermont and was passed by the house May 6, 2010, but later failed to pass in the senate.

Home Star was intended to provide rebates on energy efficiency measures, including high efficiency biomass heaters. The bill would have given a \$1,000 rebate for stoves with 75% thermal efficiency that could meet 75% of a home's heating needs and emit less than 3 grams of particulates per hour. For a wood stove to qualify, the homeowner would have had to trade in an existing wood stove, but a pellet stove would have qualified without any changeout requirement. A lower \$500 rebate would have applied to stoves that could not meet 75% of a home's heating needs. Boilers were eligible for the \$1,000 rebate as well as long as they fulfilled 80% of home heating needs. Only some of the EPA-qualified Phase II outdoor boilers would have met these criteria based on the third party efficiency numbers. All biomass appliances were also required to have a heat distribution system of some kind, such as vents, fans or blowers.

Strengths

- **National Changeout:** This would have been the first national changeout program and could have taken tens of thousands of older, dirty wood stoves out of circulation and replaced them with stoves that have a much greater capacity to reduce fossil fuel use and save homeowners money.
- **Attractive to Consumers:** It was designed as a point-of-sale rebate program, which is far more attractive to consumers and particularly to lower income consumers than tax credits or other incentives.

Weaknesses

- **Complicated:** The program had many requirements and sought to achieve many policy goals. It was likely to be somewhat confusing for consumers. The requirement of a heat distribution system was confusing for many in the wood stove industry.

D. European Programs

Many countries throughout Europe have experienced a substantial increase in residential wood heating—especially in the form of ultra-clean pellet stoves and boilers—due to strict policy measures combined with generous incentives. This has allowed for more widespread adoption and technological advancement of biomass appliances than is currently being realized in the United States.

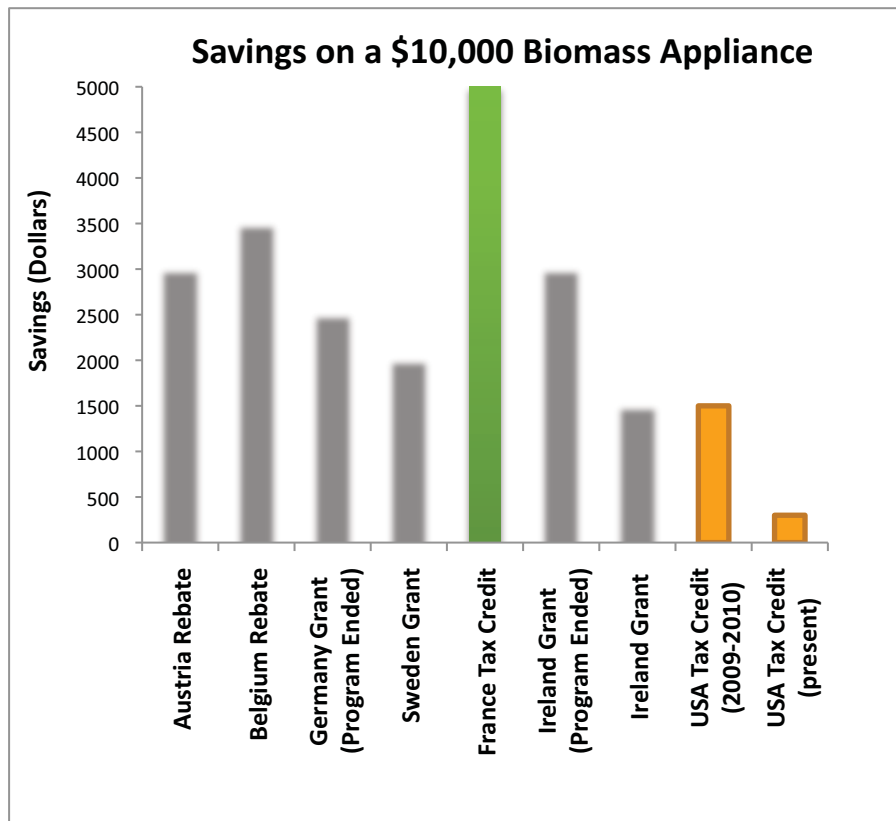


Figure 24: Savings on a \$10,000 Biomass Appliance (stoves, masonry stoves, boilers, etc) (International Energy Association)¹⁶⁴

In many cases the motivation is to reduce CO₂ emissions and to meet renewable energy targets, but in many countries with abundant biomass resources, incentives are put into place in order to stimulate job growth. This has largely been the case in Upper Austria—a state about the size of New Hampshire—where consumers can take advantage of multiple incentives to purchase pellet

¹⁶⁴ International Energy Association. *Global Renewable Energy-Policies and Measures*. Accessed May 2011. <
<http://www.iea.org> >

boilers. The manufacturing of these boilers and the fuel distribution network, in turn, supports 4,500 jobs in the region.¹⁶⁵

Often, incentive programs are implemented in tandem with regulatory policies that progressively tighten emission limits and efficiency requirements over time. The result is stronger investment in biomass boilers that are both cleaner and more efficient (Fig. 24). Public information and education campaigns are also used to reinforce these positive trends.

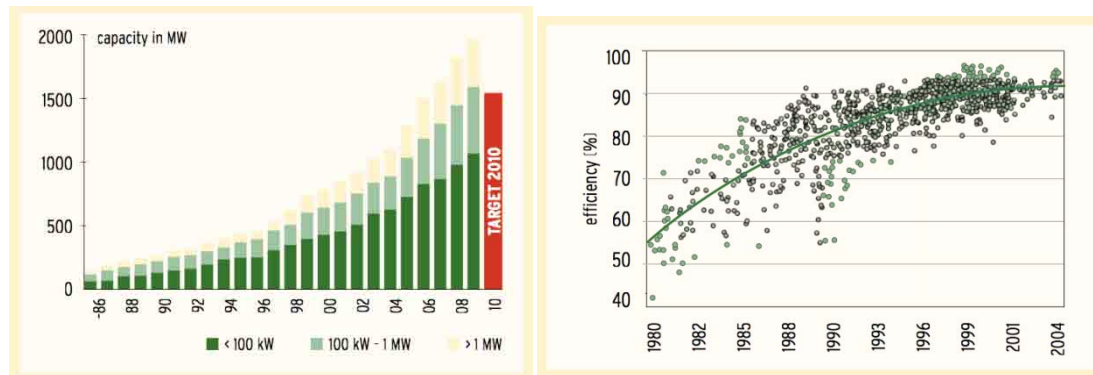


Figure 25: Upper Austria Installed Capacity of Biomass Boilers & Unit Efficiency Increasing Yearly (Biomass Heating in Upper Austria)

One reason that many European countries provide such strong incentives for home biomass heating is that they are mandated to increase their renewable energy production under a directive from the European Union Parliament. This requirement is similar to the U.S. state Renewable Portfolio Standards (see [Renewable Portfolio Standards](#), pg. 81). The European mandates, however, are much more far reaching, requiring each nation within the European Union to commit to the directive by drafting Energy Actions Plans.¹⁶⁶ Unlike many Renewable Portfolio Standards in the United States which typically only target electricity production, the European standards have provisions for renewable heating. The result is that many European nations have sought to reach their renewable energy targets by incentivizing biomass appliances.

The success that many of these programs have realized in terms of growing the market for the cleanest, most efficient biomass heating systems is well documented. It also offers a good example of the effect that well crafted incentive programs can have. The Market Stimulation Program in Germany, for example, uses both grants and loans, which are flexible so that they can be adjusted according to budget constraints or to maintain program goals. Additional grants and bonuses are even provided for more innovative technologies such as secondary emission

¹⁶⁵ Egger, Christiane et. al. *Biomass Heating in Upper Austria: Green Energy, Green Jobs*. O.O. Energiesparverband. 2010

¹⁶⁶ European Commission. *Renewable Energy*. Accessed on May 7, 2011
http://ec.europa.eu/energy/renewables/targets_en.htm

reduction devices.¹⁶⁷ Furthermore, if a stove or boiler does not meet certain standards for efficiency and emissions, the government will not offer a subsidy. One drawback of the program is that it operates on a fixed yearly budget, which is sometimes exhausted before the end of the year, as was the case in 2006. This can cause consumer uncertainty and can have a drastic effect on the market (Fig. 25).

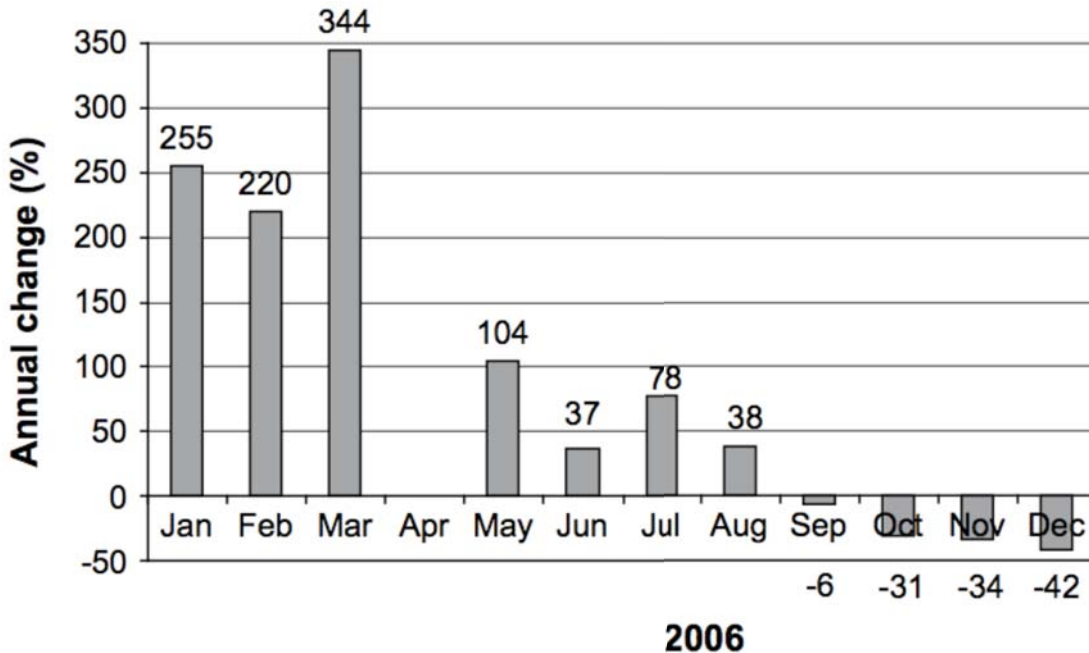


Figure 26: The Effect of an Incentive Halt on the German Pellet Heating Market (Verma V.K. et al.)

Another good example of European incentives is a finance law passed in France, which altered the tax code to promote sustainable development, energy conservation, and renewable energy. Under this law, a tax credit was created that covers 50% of the cost of a biomass heating device. A 50% tax credit is also provided for a home energy audit when otherwise not required by law. Like many European incentive programs, biomass heating systems must meet a minimum efficiency standard as well as other technical requirements.¹⁶⁸ The effects that these tax incentives had toward growing the biomass heating market--and thus reaching toward national renewable energy goals--are abundantly clear in figure 26.

¹⁶⁷ Verma, V.K. et al. *Small scale biomass heating systems: Standards, quality labeling and market driving factors-An EU outlook*. Biomass and Bioenergy. 2009.

¹⁶⁸ International Energy Agency. *Tax Credit for Energy-saving and Renewable Energy Equipment*. Accessed on May 7, 2011 <<http://www.iea.org/textbase/pm/?mode=re&id=2327&action=detail>>

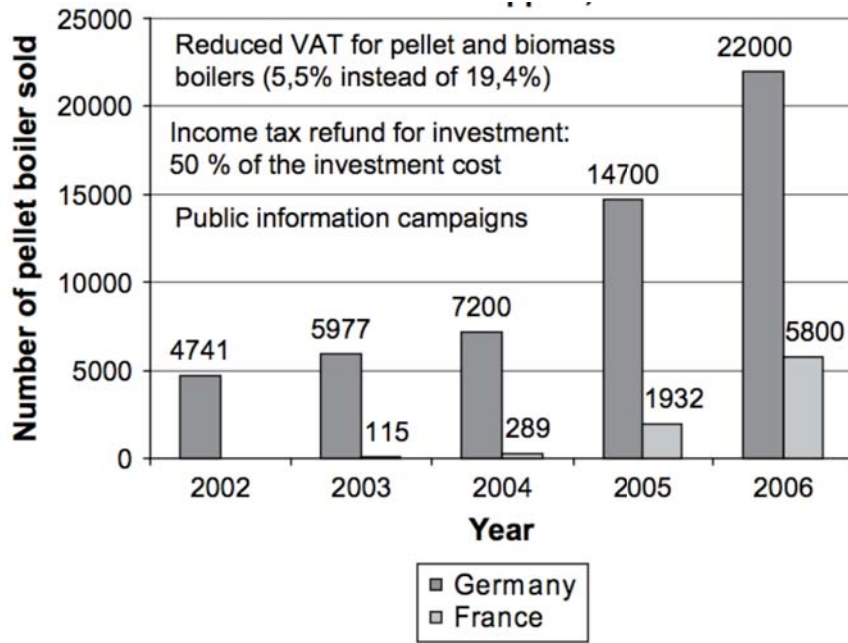


Figure 27: Incentives' Effect on the French Pellet Heating Market (Verma V.K. et al.)

6. Appliance Types and Policy Goals

Residential biomass heating appliances come in many different variations. Each technology presents unique issues and benefits, and not all technologies are suited for every geographic area or incentive program. Some wood burning appliance classes are better suited for the needs of low-income households, some are designed to burn very cleanly and eliminate user error so to be well suited for areas with air quality issues, while others are better able to optimally displace fossil fuels by heating the whole home.

A. Pellet Stoves

In many ways the pellet stove represents the pinnacle of innovation in residential wood combustion because it blends traditional wood heat with automation and convenience. This appliance and its unique fuel were invented in America in the early 1980's. Pellets revolutionized wood fuel by densifying the wood in order to make it more efficient to transport. Furthermore, the uniformity in size and low moisture content of the fuel, combined with the automated combustion system removed much of the user error associated with traditional wood burning.

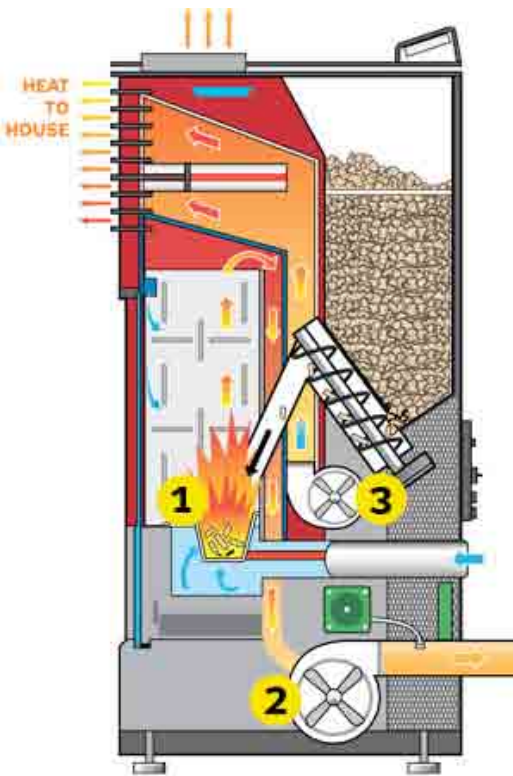


Figure 28: Pellet Stove Diagram

Pellet stoves tend to be more efficient than cordwood stoves because they use a low moisture fuel and automatic controls maintain a more ideal combustion environment, which produces fewer emissions per unit of heat output as compared to a conventional wood stove. The stove self-regulates by feeding a pre-determined amount of fuel and air to the stove over time to maintain a constant temperature and efficient burn. While the fuel intake and temperature are automated, the maintenance often is not, requiring periodic ash removal and cleaning. Pellet stoves also require a small amount of electricity to power their blower fans and automated hopper. This creates a small monthly electrical bill and leaves the stove vulnerable to power outages.

Pellet stoves approved for use in Washington state range in emissions from 0.5 to 4.4 g/hr with over 70% of them at 2 g/hr or lower. There are higher emitting pellet stoves in production, but since pellet stoves are not required by the EPA to undergo testing, there is no comprehensive list

of the pellet stoves that exceed Washington's standard of 4.5 g/hr. Pellet stoves range in price from \$1,200-\$4,000+.

Pelletized fuel can be purchased in easy-to-handle bags, which can be fed into a hopper on the stove unit or in bulk delivery to a storage bin attached to a home. Pellets cost \$250 per ton on average, comparable in price to natural gas and cheaper than most other fossil fuels (see Fig. 17). Aside from pelletized wood, many stoves are designed as multi-source fuel appliances, which can burn other forms of biomass such as pelletized grass, corn, cherry pits, etc. The pellet industry is currently moving forward on establishing a consistent set of pellet standards, which will do much to guarantee a consistent burn in stoves.

Policy Considerations

Due to the relatively low, consistent emissions of pellet stoves, they are well suited for suburban and even urban environments that often have more air quality issues than rural areas. European countries have long provided a range of incentives to pellet stoves and boilers and many believe it is only a matter of time before the US and individual states do the same. Particularly in the Northeastern US, there are obvious opportunities to encourage a switch from fuel oil or propane to pellet fuel as a primary or secondary heating source. Many changeout programs in air quality non-attainment areas already provide a greater incentive to switch from an older, non-certified wood stove to a pellet stove, and programs focusing on urban areas should consider providing greater benefits to those purchasing pellet stoves to encourage adoption of the cleanest burning appliances in these areas. Another factor that should be noted is that the pellet industry is relatively new and so not all areas have access to bulk delivery services. To counter this, some incentive programs are designed specifically to assist the pellet fuel industry in building a stronger bulk fuel distribution network (see [New Hampshire Program](#), pg. 53).

Since pellet stoves require purchasing fuel (unlike self-harvested cord wood), they are not as well suited for rural low-income households; incentive programs should take this price difference between pellets and cordwood into account when designing the program.

B. Catalytic and Non-catalytic Wood Stoves

The modern stove emerged in the early 1990s after Oregon State established emissions and testing requirements, which were then adopted by the EPA as national requirements. Emissions can be further reduced using catalytic combustors, like those used in vehicles, which work as smoke afterburners, or using non-catalytic systems. The original EPA certification program had

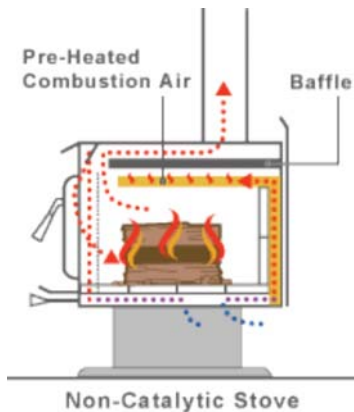


Figure 29: Non-Catalytic Wood Stove (EPA)

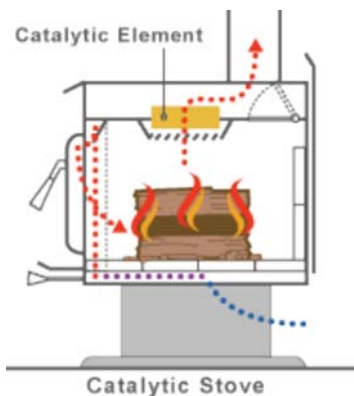


Figure 30: Catalytic Wood Stove (EPA)

two phases of implementation several years apart, with gradually tightened emissions regulations, giving the industry some time to adjust to the more strict standards. The Phase II EPA certification required non-catalytic wood stoves to emit less than 7.5 grams of particulate matter per hour (g/hr) and catalytic wood stoves to emit less than 4.5 g/hr. The EPA Phase II generation of wood stoves is typically 7-15 times cleaner than older models, 40%-50% more efficient and typically uses 30-40% less wood. Naturally, these improvements save homeowners work and money. The EPA is currently in the process of developing a New Source Performance Standard (NSPS), which early discussions indicate will recommend non-catalytic wood stoves to be 4.5 g/hr or under and catalytic wood stoves to be 2.5 g/hr or under.

Generally, non-catalytic stoves are the less expensive option and most range in price from \$800 - \$3,500, but as their combustion is less complete than catalytic stoves, they tend to burn through wood more quickly. Catalytic stoves have longer burn times and use wood more efficiently than most non-catalytic wood stoves¹⁶⁹, but are often on the higher end of the price range. They also tend to burn cleaner at lower burn rates than other stove

models, which is an important characteristic since many stove owners operate their appliances at low temperatures when the weather is milder.¹⁷⁰ Because of this, catalysts are well suited for situations when a long low burn is desired or for whole home heating needs since the firebox on catalytic stoves tends to be larger than non-catalytic stoves (which tend towards smaller, hotter fireboxes designed to decrease particulate emissions).

¹⁶⁹ Houck J., Pitzman L. *Catalytic Comeback?*. Hearth & Home. February 2011. Pg. 30

¹⁷⁰ Houck J., Pitzman L. *Catalytic Comeback?*. Hearth & Home. February 2011. Pg. 34

Though the catalyst does contribute to a cleaner burn, the drawback of older catalytic stoves is that when the catalyst is damaged or wears out, the stove then burns less cleanly than advertised. New catalytic stoves have greatly improved the durability of the catalyst and now should perform as consistently as non-catalytic stoves (both types of stoves may degrade for different reasons over time). For a more in-depth discussion of the pros and cons of catalytic and non-catalytic stoves, please click [here](#).

For some, there remains the perception that catalysts are inherently short-lived. This was the case in the early nineties when many wood stove companies raced to meet the new EPA standards by adding poorly designed catalytic converters to stoves not equipped to utilize them. However, those models have now been taken out of production due to their fallibility, and the catalysts on the market today are well designed and long lasting, provided that dry, untreated wood is burned.¹⁷¹ An OMNI laboratory study showed that the average increase in emissions was less than 1 g/hr over nine years¹⁷².

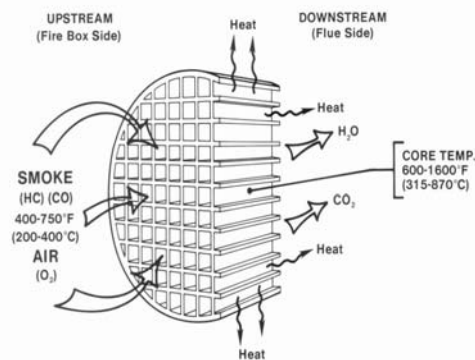


Figure 31: Catalytic Diagram (Catalytic Hearth Coalition)

Policy Considerations

Older wood stoves are by far the most common technology prioritized to be replaced in air quality changeout programs, but high-efficiency stoves have not often been incentivized on their merits as a *renewable* energy technology.. However, wood stoves (along with pellet stoves) did receive recognition as an energy *efficient* technology in the form of a federal tax credit for energy efficient heating appliances (see [Individual Tax Credit, 25C](#), pg. 90). Generally, wood stoves are not favored in incentive programs outside of changeout programs but there are circumstances where they should be. For example, in rural areas, wood stoves could be a good option for incentive programs (particularly for low-income families) that seek to reduce fossil fuel usage, and they could specifically target families who heat with oil. This same approach can be taken to

¹⁷¹ Houck J., Pitzman L. *Catalytic Comeback?*. Hearth & Home. February 2011. Pg. 32

¹⁷² Omni Environmental Laboratories. *Aging Study*. Catalytic Hearth Coalition power point. December 2009

target homes heating with electricity in states that have mandates to reduce electricity usage. Wood stoves are also particularly suited to rural areas where electricity outages are an issue as they can continue to heat the home regardless of power.

C. Masonry Stoves

Masonry stoves have a small, powerful firebox and a large masonry mass that can absorb tremendous amounts of heat from the fire and then re-radiate that heat into the living space for many hours afterwards. A basic heater core (prefabricated or built on-site baffle system) costs about \$5,000, often with an additional \$5,000 or more for installation and larger mass. They have been used for centuries in Europe, Scandinavia and parts of Asia. Masonry stoves require less fuel and can radiate the heat from a single fire for much longer than smaller stove styles. Soapstone masonry stoves generally emit between 18 and 20 hours of radiant heat from a single burn period. Some high thermal mass units on the market today can produce 30 or more hours of heat.

The EPA has not yet regulated the emissions from Masonry stoves, so there is no required third



party emission testing. However, a few companies actually go through the required testing independently, and the emissions from masonry stoves are low, averaging 2.9 grams of particulate matter per kilogram of fuel burned, and range from 1.4 to 5.8 g/kg with some stove at .9 g/kg. Since the actual burn time is much shorter than the time the heat is radiating, the EPA's grams per hour (of burn) emissions measurement does not reflect the emissions of this unique technology very well. However, the small firebox size and hot fires do produce very low hourly emissions—generally under 2 g/hr.

Policy Considerations

Masonry stoves have often been left out of biomass incentive programs, which is perhaps the result of both lacking federal standards in the absence of EPA requirements and a general lack of awareness about masonry stoves in the United States. Another main reason is that because most regulators agree that masonry heaters are not causing air quality problems, they have adopted the viewpoint that investing in regulation of these appliances would not yield significant air quality returns. Jeremy Johnson from the masonry stove company Tulukivi notes that, “While this makes sense on a monetary level, it doesn’t make sense on a clean air level; promoting a cleaner product group would help to educate the public.”

In contrast, masonry stoves are one of the main types of biomass heating equipment that are incentivized in Europe. Masonry stoves that can meet third party emission thresholds should be included in more incentive programs. Though many of these stoves did receive the federal 30% tax credit in 2009-2010, the maximum allowable credit was \$1,500, so it was not a major incentive for appliances that often costs more than \$15,000. It is very likely that all masonry stoves would have qualified for the tax credit, but only a few had the testing to prove their emission and efficiency numbers. As of this publication, the EPA plans to include masonry stoves in their 2015 New Source Performance Standards, and as a result they will be better suited for inclusion in incentive programs. While these stoves can be quite expensive, they are a renewable energy that requires very little fuel wood to produce hours of radiant heat and should not be overlooked when designing incentive programs.

D. Indoor Boilers/Furnaces

By 2014, indoor boilers and furnaces are expected to be regulated by the EPA, which will ensure that particulate levels are within set limits. Once that occurs, it will pave the way for programs to provide incentives for these whole house systems aimed at switching 100% of home heating needs from fossil fuels to renewable biomass. Scores of incentive programs in Europe can provide a wealth of data and experience about this process. However, due to the elevated cost associated with these units, they are less suited for programs targeting low-income consumers, and units will require a larger financial incentive. In addition to the heating units, policies aimed at building the fuel delivery infrastructure for wood pellets will also be needed.



Figure 33. Pellet Fired Boiler

Indoor wood and pellet boilers and furnaces are widespread in Europe and are beginning to gain traction in the United States as a replacement for fossil fuel furnaces. However, since indoor boilers have been exempt from EPA regulation, many cord wood models emit levels of particulate matter unacceptable to areas facing high levels of particulate pollution. Pellet boilers and furnaces using bulk pellets offer homeowners virtually the same convenience as a fossil fuel furnace by feeding fuel automatically from a large storage area. This pellet fuel storage bin can be filled once or twice yearly by bulk pellet delivery.

Wood and pellet boilers/furnaces can heat an entire house through forced air or radiator systems, as well as provide a household's hot water supply. Some units have automated ash removal making them virtually as convenient as a conventional fossil fuel furnace. Just like a smaller-scale pellet stove, the pellet furnace automatically draws fuel from a storage site and feeds it into the combustion chamber at the rate needed to achieve a pre-set temperature. Unlike conventional fossil fuel furnaces, however, furnaces that use cordwood are not automated and require the homeowner to re-fuel the furnace periodically. If a homeowner is willing to put in this maintenance time, wood furnaces can provide huge savings on home heating bills. These biomass boilers/furnaces can range in price from \$4,000 to \$20,000 for pellet appliances and \$3,000 to \$12,000 for cord wood appliances. Cordwood stoves, on the other

hand, allow the user to self-harvest wood, and therefore could theoretically be operated with minimal cost (just the electricity to run the system), which might be more appealing to low-income households

Policy Considerations

By 2014, indoor boilers and furnaces are expected to be regulated by the EPA, which will ensure that particulate levels are within set limits. Once that occurs, it will pave the way for programs to provide incentives for these whole house systems aimed at switching 100% of home heating needs from fossil fuels to renewable biomass. Scores of incentive programs in Europe can provide a wealth of data and experience about this process. However, due to the elevated cost associated with these units, they are less suited for programs targeting low-income consumers, and units will require a larger financial incentive. In addition to the heating units, policies aimed at building the fuel delivery infrastructure for wood pellets will also be needed.

E. Outdoor Wood Boilers

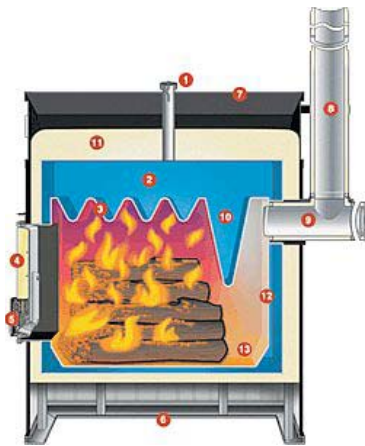


Figure 34: Outdoor Wood Boiler Diagram

Outdoor wood boilers (OWBs) are whole home water-heating devices that are located in small shed-like shells set away from the home. These boilers provide both hot water and space heating through pipes running from the outbuilding heater into the home. These units are popular due to their ability to heat the entire home affordably without having to bring fuel into the home or basement. Unfortunately, due to the low combustion rate of these units caused by the water jacket design, most outdoor wood boilers are very polluting and inefficient. Outdoor wood boilers produce large plumes of opaque smoke periodically as they re-heat after a cooling period. The short smoke stacks pictured here are common and cause heavy particulate matter loads close to ground level.

Outdoor wood boilers have gained some popularity in rural areas due to the lower heating costs before the EPA and states began to regulate their emissions. The EPA now offers a voluntary certification program for Phase II boilers. These Phase II OWBs are now cleaner than traditional ones, but most states still allow the installation of any OWB, no matter how polluting. Some states have banned all units and some are imposing regulations requiring a minimum stack height and set back limits from homes and property lines.

Policy Considerations

Any program that is interested in including OWBs should only consider EPA Phase II boilers and implement setback and stack height requirements on new installations. Even EPA phase II boilers may be unsuitable for suburban areas (certainly for urban areas) and should have minimum setback requirements. As of 2014, EPA emissions standards for OWBs will be mandatory, providing protections that have been lacking the past few decades. Many organizations believe that even Phase II boilers require at least 100 feet setback due to the frequency that high moisture content wood could be used; causing higher particulate emissions than testing lab reported emissions. Policy debates around outdoor wood boilers will continue for years to come as states try to deal with the legacy of these devices. Change out programs for OWBs are likely to grow and groups will be pushing for sunset laws, such as in Vermont, where non-EPA qualified OWBs in certain locations (ex: proximity to a school) must be removed by 2012. There is also some interest in retrofitting OWB's with catalytic converters or designing a new class with catalytic converters¹⁷³.



¹⁷³ Houck J., Pitzman L. *Catalytic Comeback?*. Hearth & Home. February 2011. Pg. 30

F. EPA Exempt Wood Stoves

When the EPA promulgated rules on wood stove emissions, they first defined a wood stove under a set of very particular characteristics including air-to-fuel ratio, firebox volume, burn rate and maximum weight (Fig. 35). Since then, some stove companies have sought to escape the EPA emissions and efficiency standards by designing their stoves in such a way that the appliance does not meet one of the criteria that defines a wood stove.

Most consumers are not aware that tens of thousands of new polluting stoves are still sold in the US every year because they fall outside the EPA's purview. Numerous local jurisdictions do not allow their installation and three states do not allow the installation of new or old stoves that are not certified by the EPA: [Washington](#), Oregon (OR's law also applies to *sale*) and California. In addition, the state of Colorado does not allow the sale or installation of new, uncertified stoves, but does allow the sale and installation of second-hand uncertified stoves.

Policy Considerations

The EPA is in the process of requiring all wood stoves to meet emission standards so this class of stoves only has a few more years to be considered exempt from emission standards. States and jurisdictions may still want to ban their sale and installation, as Oregon has implemented since March 2011 to avoid more installations before the new EPA standards for single burn rates stoves come into effect, which will likely be in 2015. Oregon and Washington State may continue to adopt stricter standards than even the EPA's NSPS. The primary policy consideration for exempt stoves is for jurisdictions conducting changeout programs. If those jurisdictions continue to allow the installation of these stoves (either new or used), while putting resources into changing out older polluting stoves, then the former policy will likely undermine the latter.

Incentive programs should not support these inefficient,

***Wood heater* means an enclosed, wood burning appliance capable of and in-tended for space heating or domestic water heating that meets all of the following criteria:**

(1) An air-to-fuel ratio in the combustion chamber averaging less than 35-to-1 as determined by the test procedure prescribed in § 60.534 performed at an accredited laboratory;

(2) A usable firebox volume of less than 0.57 cubic meters (20 cubic feet);

(3) A minimum burn rate of less than 5 kg/hr (11 lb/hr) as determined by the test procedure prescribed in § 60.534 performed at an accredited laboratory; and

(4) A maximum weight of 800 kg (1,760 lb). In determining the weight of an appliance for these purposes, fixtures and devices that are normally sold separately, such as flue pipe, chimney, and masonry components that are not an integral part of the appliance or heat distribution ducting, shall not be included. 40 CFR Ch. I (7-1-02 Edition)

Figure 35: EPA Wood Stove Definition (40 CFR Ch. I (7-1-02 Edition))



highly polluting designs and should specify that the only EPA exempt appliances eligible for the incentive are masonry or pellet stoves that meet certain specifications.



Some of these unregulated stoves may look deceptively like more efficient stove designs.



Other unregulated stoves have designs more obvious in their lack of efficiency and emission technology.

Figure 36: EPA Exempt Wood Stoves

G. Fireplaces

Traditional fireplaces are the least efficient indoor wood burning technology of all; their open design limits the user's ability to control a fire or burn at temperatures high enough to ignite all wood combustion products. However, most fireplaces are used only occasionally, not as a source of home heating, and pose a smaller air quality threat than wood stoves.¹⁷⁴ The EPA estimates that 42% of fireplaces are not used at all, and those used for heating and aesthetic purposes consume only .656 and .069 cords per year respectively.¹⁷⁵ Some consumers mistakenly believe that a fireplace can function as a home heating device; however, fireplaces usually only warm the surrounding few feet and actually act as a heat vacuum, sucking the warm air out of surrounding spaces and sending the heat up the chimney.

New technology has been recently developed to help make fireplaces a cleaner wood-burning option. The EPA has also developed a set of voluntary standards for fireplaces, [available here](#). The site includes a list of qualifying fireplaces as well as program partners. Some modern fireplace designs seal off the fireplace to only take in outside air, preventing heat from leaving the house and achieving a more complete combustion. Another company created a hybrid gas and wood fireplace model that uses hot gas fires as a secondary combustion to more completely burn particulates.

Policy Considerations

Some incentive programs, such as the Arizona state program, provide incentives to replace open fireplaces with wood stoves or fireplace inserts. This serves the dual purpose of helping the homeowner obtain an appliance that actually produces heat and burns cleanly, as well as inhibiting that homeowner from using the fireplace in its traditional manner. Depending on funds, Fort Collins, Colorado periodically has a zero loan program that allows homeowners to upgrade from a fireplace or wood stove to a certified wood stove/insert or pellet stove¹⁷⁶. Upgrading from a traditional fireplace to an insert not only will result in air quality improvements, but will actually increase overall home energy efficiency by acting to better seal the building envelope.

Many changeout programs focus only on replacing uncertified wood stoves without accounting for the effects that fireplaces have on air sheds. While it is difficult to calculate these effects due

¹⁷⁴ Gunnells L. *Smoke Gets in Your Eyes: Wood Stoves, Fireplaces and Chronic Disease*. Washington State Department of Health. October 2009. Pg 19

¹⁷⁵ EPA, Technical Report, Volume 09. pg. 1, <<http://www.epa.gov/ttn/chief/eiip/techreport/volume09/firplc3.pdf>>

¹⁷⁶ City of Fort Collins <http://www.fcgov.com/utilities/img/site_specific/uploads/zilch_loan_application.pdf>

to periodic and unpredictable fireplace usage, these devices often emit very high levels of particulates per hour. One EPA report estimates the average (non-EPA qualified) fireplace can emit 85.4 g/hr¹⁷⁷ while the EPA Burnwise program reports uncertified wood stoves at between 15-30 g/hr.¹⁷⁸ Replacing uncertified wood stoves will generally have the greatest effect on air quality since they are typically used more often, but because of the potential of some fireplaces to emit large levels of particulates, they should not be overlooked when considering air quality improvement programs.

¹⁷⁷ E.H. Pechan & Associates, Inc. *Emission Factor Documentation for AP-42 Section 1.9, Residential Fireplaces*. EPA Pg. A-2 <<http://www.epa.gov/ttn/chief/ap42/ch01/bgdocs/b01s09.pdf>>

¹⁷⁸ EPA, Burnwise Program. Last updated Jan. 7, 2011 <<http://www.epa.gov/burnwise/woodstoves.html>>

7. Evaluation and Monitoring¹⁷⁹

Equipment performance issues can be potentially significant, as they have been for solar installations.¹⁸⁰ Many factors can reduce the renewable energy generating capacity that underlies the motivation for many incentive programs. In the case of wood and pellets, the primary issue is that, unlike solar and geothermal, performance requires the operator to consistently load the stove with fuel. This is an even more significant issue with biomass appliances that have to be loaded often. Pellet stoves require more upkeep and downtime related to repairs that can impact short and long-term energy production if not promptly identified and remedied.

Incentive programs can help contribute to the growing base of knowledge about performance issues by conducting long-term performance monitoring and thorough post-installation inspections, identifying specific performance issues that have arisen.

Naturally, biomass appliances are the most cost-effective to use when they are in good working condition. However, there is often lack of awareness of the financial ramifications of potential performance issues, and a lack of the knowledge and means to address these issues. Incentive programs can leverage this fact by helping customers become more educated owners and operators of biomass appliances and more skilled at assessing the performance of their system.

Inspectors and Installers

State and local building codes go a long way towards ensuring that biomass systems function safely and reliably. However, these codes are not always followed or effectively enforced, as building inspectors and installers may lack a solid understanding of standards. Incentive programs can improve the effectiveness of these codes by directly verifying compliance through the program's post-installation inspection process, by requiring a sign-off by the building inspector, by sponsoring training of local installers and building inspectors, and/or by requiring that installers meet minimum hearth training requirements.

¹⁷⁹ This section heavily relies upon this report; Margolis, R. *Designing PV Incentive Programs to Promote Performance: A Review of Current Practice*. CASE STUDIES OF STATE SUPPORT FOR RENEWABLE ENERGY, Berkeley Lab and the Clean Energy States Alliance. October 2006

¹⁸⁰ Margolis, R. *Designing PV Incentive Programs to Promote Performance: A Review of Current Practice*. CASE STUDIES OF STATE SUPPORT FOR RENEWABLE ENERGY, Berkeley Lab and the Clean Energy States Alliance. October 2006

Warranty Requirements

Solar legislation enacted in California, requires that all systems funded through the state's incentive programs are covered by a 10-year warranty against breakage and undue degradation. Providing these types of requirements for biomass systems would protect homeowners from faulty equipment and hold manufactures to a high standard of quality.

Acceptance Testing

Acceptance testing involves spot measurements to verify that the stove or boiler is functioning properly and producing heat at the expected level. Incorporating acceptance tests into the post-installation inspection process would add a small incremental cost relative to the value that such tests can provide by quickly identifying improperly installed systems or defective equipment. Programs that do not conduct post-installation inspections for all projects should consider requiring that installers conduct acceptance tests and submit satisfactory results prior to fully disbursing incentive payments, if applicable.

Finally, given the costs of incentives to taxpayers, ensuring that biomass systems perform well is an important issue in incentive program design. Therefore, programs should evaluate and share information about the effectiveness and costs of alternate approaches in order to provide a solid foundation for program design going forward.

Appendix A- Additional Resources

Programs/Reports

DOE Energy Savers Appliance Selecting

http://www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12570?print

Don't Move Firewood Campaign:

<http://www.dontmovefirewood.org/>

EPA Burnwise Campaign:

<http://www.epa.gov/burnwise/>

EPA Incentive Schemes for Energy Efficiency Programs:

http://www.epa.gov/cleanenergy/documents/suca/program_incentives.pdf

EPA Guidance for Using Supplemental Environmental Projects to Implement Wood Stove

Changeout Programs: http://www.epa.gov/ttncaaa1/t1/memoranda/wschangoutguide_042807.pdf

EPA Strategies for Reducing Residential Wood Smoke:

<http://www.forgreenheat.org/resources/10-09.pdf>

EPA Standards of Performance for New Residential Wood Heaters:

<http://www.epa.gov/oecaerth/resources/policies/monitoring/caa/woodstoverule.pdf>

HPBA Woodstove Changeout Resources:

<http://www.woodstovechangeout.org/index.php>

National Firewood Task Force

<http://www.agdepartment.com/Programs/pp/EABFiles/NationalFirewoodTaskForceRecommendations.pdf>

USDA Invasive Pest Resources:

<http://www.aphis.usda.gov/hungrypests/overview.shtml>

Appendix B- Definitions

25c: Federal tax code section under which tax credits for efficient appliances (including wood heaters) exist.

Biomass: In general, "biomass" is a very comprehensive term and *can* include a variety of fuels including wood, wood pellets, ag residues, organic material, algae, MSW, etc...In the residential sector, however, the types of biomass used for heating are typically cordwood, wood pellets, and corn pellets. Herein, the term 'biomass' is meant to include these home heating fuels, while the term 'wood' mainly refers to cordwood, but can *more generally* refer to cordwood or wood pellets. The term pellets refers to wood and corn pellets. For the full discussion on the 14 different definitions of biomass, see [*Biomass: Comparison of Definitions in Legislation Through the 111th Congress*](#) by the Congressional Research Service¹⁸¹.

Catalytic Wood Stove: Wood stove with a catalytic unit similar to those used to control car emissions.

EPA Exempt Stoves: Stoves that avoid EPA regulation through intentional design features that fall outside of the EPA's wood stove definition.

Indoor Pellet Boiler: Whole home heating units that operate much like traditional boilers by combusting pellets automatically fed from a large storage bin in order to achieve temperatures controlled by a thermostat.

HPBA: Hearth Patio and Barbeque Association

LIHEAP: Low Income Energy Assistance Program

Masonry Stove: Highly efficient units with a small, powerful firebox and a large masonry mass that absorbs heat and reradiates it throughout the home.

Non-catalytic Wood stove: A wood stove that lacks a catalytic unit, but rather uses preheated air and other design features to regulate emissions.

NSPS: New Source Performance Standards

Outdoor Wood Boiler: Large heating units that are stationed outside the home that deliver heat via hot water. These units typically emit large volumes of opaque smoke due to low combustion rates.

PACE: Property Assessed Clean Energy Loan Program

Pellet Stove: A self-regulating stove that works by feeding a controlled amount densified biomass "pellets" and air into the stove to maintain a constant temperature and efficient burn.

Particulate Matter (PM): A complex mixture of extremely small particles and liquid droplets. The main pollutant of concern from wood burning units.

USDA: United States Department of Agriculture

WERC: Wood Education and Resources Center

¹⁸¹ Bracmort K. & Gorte R. *Biomass: Comparison of Definitions in Legislation Through the 111th Congress*. Congressional Research Service. October 2010.



Wood Stove: General term for home heating devices that heat areas of the home with split wood logs (cord wood)

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Appendix D: Biomass Heating Appliance Price Saving Calculation

Nebraska Energy Quarterly, June 30, 2007

By Bruce Hauschild P.E., CEM

Q: *We're considering buying a Maxfire Stove that is fueled with corn made by [Bixby Energy](#). The stoves cost approximately \$3,400, and I'm estimating a 60-70 percent reduction in gas heating cost once installed. Would this qualify for a Dollar and Energy Saving Loan?*

A:

Considering the current price of shell corn, I doubt that a project like this would qualify for a Dollar and Energy Saving Loan.

If you would like to submit an application, you would need to complete loan application [Form 32, Energy Saving Improvement Analysis](#), and [Form 33 Energy Billing History](#). Instructions for these application forms are detailed in [Steps to Obtain a Low-Interest Loan Using an Energy Saving Improvement Analysis](#).

You will need to submit either an Annual Fuel Utilization Efficiency, or a Steady State Thermal Efficiency report for the new unit, from a third party qualified to do such tests. The advertised combustion efficiency of 99.7 percent is only a measure of how much of the fuel is turned into heat within the unit and says nothing about the amount of heat being provided to the home. A common fireplace can have a combustion efficiency of near 90 percent while the efficiency of heat transferred to the home may be as low as 15 percent — 85 percent of the heat goes up the chimney.

We see a number of advertisements for these type systems claiming a British thermal unit — Btu — content for corn at 504,000 Btus per bushel. This Btu content is called the higher heating value which is based on a laboratory test for a substance with all moisture removed. Clean corn at 15-15.5 percent moisture will have a Btu content of 380,000 Btu per bushel. Foreign matter, such as dust, pieces of cobs, leaves and stalk commonly found in off-the-farm corn will further reduce the Btu content of corn. You will need to use 380,000 Btu per bushel in your energy analysis.

A typical energy analysis calculation would be as follows:

1. Current annual fuel costs: From copies of your most recent years bill for heating list the dollars you spent on fuel. \$ _____
2. The price per unit of fuel: From your heating bills, find the price paid per unit of fuel (such as \$1.00 per therm for natural gas, \$1.30 per gallon for propane, \$0.05 per kWh for electricity, \$140 per cord for wood, etc.). \$ _____
3. Annual Fuel Use: Divide your current annual fuel costs, line 1, by the price per unit of fuel, line 2, to find your annual units of fuel use (therms for natural gas, gallons for propane, kWh for electricity, cords for wood, etc.). _____
4. Decimal Efficiency: In decimal form, list the efficiency of your current heating system. Divide percent Steady State Thermal efficiency or percentage AFUE by 100 percent, 80 percent AFUE = 0.80, 96 percent AFUE = 0.96. NOTE: ***Do NOT use combustion efficiencies!*** Combustion efficiencies are no measure of the amount of heat delivered to your home. Divide HSPF by 3.412 Btu/watt-hour, 9.0 HSPF = 2.64. NOTE: HSPF takes into account an average for backup heat — No conversion is needed for COP, 4.6 COP = 4.6, etc., use 0.99 for electric strip heat.

5. Fuel units felt as heat: Multiply annual fuel use, line 3, by the decimal efficiency, line 4, to find the amount of heat that actually entered your home from your current heating system. _____
6. Btu per unit of fuel: List the number of Btus per unit of fuel (100,000 Btus in a therm, 85,000 Btus in a gallon of propane, 3,412 Btus per kWh electricity, 18,000,000 Btus per cord of wood). _____
7. Btus felt as heat: Multiply fuel units felt as heat, line 5, by Btu per unit of fuel, line 6, to find the amount of heat, in Btus, that entered your home and were felt as heat. _____
8. Decimal efficiency of new unit: List the decimal efficiency of the stove you intend to purchase (80 percent AFUE = 0.80, 96 percent AFUE = 0.96, etc. NOTE — ***Do NOT use combustion efficiencies!*** If using a steady state thermal efficiency for the new unit, and you used AFUE, HSPF, or COP in line 4 above, you must deduct 5 to 10 percentage points from the steady state thermal efficiency of the new unit to get to an AFUE for an equal comparison, 85 percent steady state thermal efficiency would equal 75-80 percent AFUE = 0.75 to 0.80). _____
9. Btus required by new unit: Divide the Btus felt as heat, line 7, by the decimal efficiency of the new unit, line 8, to find the Btu input that will be required by the new unit for an equal amount of heat in your home. _____
10. Btu content of corn: Use 380,000 Btu/bushel for clean corn, or 380,000 Btu/bushel for corn with foreign matter, at 15-15.5 percent moisture content. (Do not use 504,000 Btu/bushel. This is a laboratory condition for zero percent moisture and clean corn). _____
11. Annual bushels of corn required: Divide Btus required of new unit, line 9, by the Btu content of corn, line 10, to find the number of bushels of corn you will use for an equal amount of heat in your home. _____
12. Price of corn: Obtain a quote for corn delivered to your home and list the price here. Use market price plus \$0.20 elevator handling charge, or current market price if you are a producer, or loan value if market price is below loan value and you are a producer. \$ _____
13. Annual cost of heating with corn: Multiply the annual bushels of corn required, line 11, by the price of corn, line 12, to find the cost of heating with corn. \$ _____
14. Comparison: Subtract your annual cost of heating with corn, line 13, from your current annual fuel costs, line 1, to find if changing to corn heat will save you money. Note that if this number is negative, it will actually cost you more for corn heat. \$ _____

Dollar and Energy Saving Loans are for replacement equipment. Unless your current heating system consists of pre-approved equipment, ratings for which can be found on loan application [Form 3](#), you would not be able to keep your current heating system for use as a backup. If you can keep your current system as backup, you should only enter a percentage of your current annual fuel costs — nothing greater than 75 percent of current use, in line 1 of the sample calculations above.

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Appendix F- State Legislation

Alabama

Tax Deduction Section 40-18-15 (16)

DSIRE Summary:

“This statute allows individual taxpayers a deduction for the purchase and installation of a wood-burning heating system. The deduction is equal to the total cost of purchase and installation for the conversion from gas or electricity to wood when the system is used as the primary energy source for heating a home. The deduction must be taken for the taxable year during which the conversion was completed. Note that this incentive is for the conversion of an existing system and not for the first-time installation of a wood-burning system.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=AL01F&re=1&ee=1

Alaska

Home Energy Rebate Program

http://www.ahfc.state.ak.us/energy/weatherization_rebates.cfm

DSIRE summary:

Under the Home Energy Rebate Program, homeowners who want to make their own energy efficiency improvements on their home can receive a rebate for some of their expenditures. The program requires a home energy rater to evaluate homes before and after the improvements. Rebates are dependent on the relative amount of efficiency gained and the actual cost of improvements, when the eligible improvements are selected by the homeowner from the energy rating’s improvement options list. The Home Energy Rebate Program provides rebates up to \$10,000 to homeowners who make energy efficiency improvements to an existing home. In addition, the rebate program provides a \$7,500 rebate for qualified, new, 5 Star Plus homes.

To participate in the program, the homeowner can either sign up for an energy rating by contacting the Alaska Rebate Call Center at 1-877-AK-REBATE or the homeowner can sign up on the [Alaska Rebate web site](#). Alaska Housing Finance Corporation (AHFC) will reimburse the homeowner up to \$375 for the cost of the first rating and up to \$175 for the post-improvement rating. Extensive information on the program, including “The Home Energy Rebate Program Consumer Guide”, is available on the AHFC website or by calling AHFC at 1-800-478-2432 or 907-338-6100. Recorded information on the programs is available by calling The Home Energy Rebate & Weatherization Hotline at 1-877-325-2508 (statewide except Anchorage; in Anchorage call 330-8300).

Arizona

Tax Deduction 43-1027

DSIRE Summary:

“This incentive allows Arizona taxpayers to deduct the cost of converting an existing wood fireplace to a qualifying wood stove. The cost to purchase and install all necessary equipment is tax deductible, up to a maximum \$500 deduction. Qualifying wood stoves must meet the standards of performance for new wood heaters manufactured after July 1990, or sold after July 1992 pursuant to [40 Code of Federal Regulations part 60, subpart AAA](#). This deduction is for taxable years after December 31, 1993.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=AZ10F&re=1&ee=1

California

Burbank Water and Power Utility Rebate (LEED Incentive)

<http://www.burbankwaterandpower.com/incentives-for-businesses/leed-incentive-program>

San Bernardino County Green Building Incentive

<http://www.sbcounty.gov/greencountysb/>

DSIRE Summary:

“San Bernardino's Board of Supervisors launched Green County San Bernardino in August 2007. The program includes a number of incentives to encourage residents, builders, and businesses to adopt more sustainable practices.

Builders who participate in San Bernardino County's [Green Building program](#) will receive accelerated plan review, priority inspections, design assistance, and recognition for all qualified projects. Builders can earn their green building designation by following any one of these County-approved green rating systems: California Green Builder, Leadership in Energy and Environmental Design (LEED), or the County's Green Building Basics Checklist.

Residents in the County's unincorporated areas can also receive incentives for reducing their home's energy usage. [Permit fees are waived](#) for the installation of solar energy systems, wind-generated electrical systems, tankless water heaters, and highly efficient heating, ventilation and air conditioning systems.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA173F&re=1&ee=1

Santa Monica Expedited permitting for Green Buildings

http://www.smgov.net/Departments/OSE/Categories/Green_Building/Incentives.aspx

DSIRE Summary:

“The City of Santa Monica adopted an ordinance in August 2005 to encourage the construction of sustainable buildings. The ordinance, incorporated into the Municipal Code of Santa Monica, allows for priority plan check processing for building projects that are registered with the United States Green Building Council for certification under the Leadership in Energy and Environmental Design (LEED*) Green Building Rating System. The ordinance applies to all new buildings and major renovations which total an amount exceeding fifty percent of their replacement cost. All applicants wishing to receive priority plan check processing must submit proof of LEED registration and a checklist indicating all of the credits they plan to pursue before they can receive expedited permitting. Applicants must also clearly specify the materials, systems and strategies they will use to achieve the credits in the plans submitted to the City for plan check approval.

**The USGBC LEED Rating System is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. Click [here](#) for more information on the national LEED program.”*

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA136F&re=1&ee=1

California ConSol

<http://www.consol.ws/>

DSIRE Summary:

“ConSol has been providing energy solutions for builders, government agencies, utilities, trade associations and developers since 1981. ConSol services include: energy code (Title 24 and IECC) compliance documentation; energy efficiency, retrofit, and green program design and management; builder energy code and Building Performance Institute (BPI) training; and Home Energy Rating System (HERS) inspections. In addition, as a team lead for one of the Department of Energy’s Building America teams, ConSol offers leading-edge research and energy consulting in systems and technologies to improve sustainability of new and existing residential developments.

We are dedicated to helping our clients in Arizona, California, Colorado, Hawaii, Idaho, Nevada, New Mexico, Oregon, Utah and Washington provide resource-efficient homes that are affordable and comfortable. We strive to provide value-added services and form long term partnerships with our clients throughout the planning and construction process.”

Connecticut

Tax Exemption Sec. 12-412k

DSIRE Summary:

“In Connecticut, *residential* weatherization products *for residential use only* are exempt from the state's sales and use tax. Eligible residential weatherization products include CFLs, programmable thermostats, window film, caulking, window and door weather strips, insulation, water heater blankets, water heaters, natural gas and propane furnaces and boilers that meet the federal Energy Star standard, windows and doors that meet the federal Energy Star standard, oil furnaces and boilers that are not less than 84% efficient and ground-source heat pumps that meet the minimum federal energy efficiency rating.

For additional information about this exemption, please visit the Connecticut Department of Revenue Services [website](#).”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CT15F&re=1&ee=1

Energy Conservation Loan

http://www.chif.org/owner_borrowers/index.shtml#energy

DSIRE Summary:

“Note: this loan program is not currently available for widespread energy conservation improvements; it is only available for emergency, energy-related improvements. There may be changes to the program during Fall 2010; this summary will be updated when additional information becomes available.

Energy Conservation Loans for single families are available through the Connecticut Housing Investment Fund, Inc. (CHIF) to owners of one- to four-family homes who meet established income limits for family size and location. These loans may be used for emergency-energy related improvements only. Interest rates vary in accordance with the borrower's family size and income, and the loan may be repaid over 10 years.

Loans for large residential properties are available through the Multi-Family Energy Conservation Loan Program. The terms of this loan are similar to loans for single-family dwellings, with a higher principal available on the loan.

Applications for these programs are available from the program web site above. In addition to the application, the borrower must submit copies of the past two years' federal tax returns (with schedules) and a copy of a monthly mortgage statement or coupon (or a release of mortgage or deed).”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CT05F&re=1&ee=1

State Forest Firewood Program

<http://www.ct.gov/dep/cwp/view.asp?A=2697&Q=429464>

Summary:

“Firewood harvesting from State land can provide several benefits. As a public service, firewood provides people an opportunity to reduce home heating costs. Wood is a renewable resource. Carefully planned harvests can provide residents with wood for many years. When wood is substituted for fossil fuel there is a net savings in carbon release to the atmosphere. A firewood harvest can also provide aesthetic improvements in the State Forest by reducing post harvest woody debris on the forest floor.

DEP Foresters conduct firewood harvests in a sustainable manner for a long term wood supply. It will take 30 – 50 years for an area to re-grow the firewood that is harvested depending on the species and available sunlight. Not all forests will be harvested every year. **The amount of wood sold yearly is limited.**

DEP Forestry reserves the right to suspend firewood sales in order to comply with federal or state quarantines to limit the spread of non-native insects.

Live trees and wood on the ground is sold in 2-cord lots. The cost is \$30.00 per cord. Firewood

lots are generally offered during the warm months when forest roads are accessible. Connecticut residents may apply for one Forest Products Harvesting Permit per household per year.

Firewood lots are assigned by lottery. Process for applying for a Forest Products Harvesting Permit:

Florida

Miami-Dade Green Buildings Expedite Process

<http://www.miamidade.gov/building/home.asp>

DSIRE Summary:

“In an effort to promote environmentally sensitive design and construction, the Miami-Dade County Commissioners passed an ordinance in June 2005 to expedite the permitting process for “green” buildings certified by a recognized environmental rating agency.* Commercial, industrial, and residential projects are all eligible as long as they are located in unincorporated Miami-Dade County and the City of West Miami. Additionally, solar water heating and solar photovoltaic projects are included in the "fast track" for permitting review. See the Miami-Dade County Building Department [web site](#) for additional information. [Certain repairs and replacements](#) may be exempt from permitting.

**Recognized environmental rating agencies include Florida Green Building Coalition, the National Home Builder Association and the U.S. Green Building Council.”*

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=FL73F&re=1&ee=1

Florida Green Building Coalition

<http://floridagreenbuilding.org/>

Summary:

“The Florida Green Building Coalition (FGBC) is a nonprofit 501(C)3 Florida corporation dedicated to improving the built environment. Our mission is "to lead and promote sustainability with environmental, economic, and social benefits through regional education and certification programs.”

FGBC was conceived and founded in the belief that green building programs will be most successful if there are clear and meaningful principles on which "green" qualification and marketing are based. We are a membership-based organization governed by a Board of Directors and corporate officers who are elected by the general membership.

The FGBC is continually finding new and innovative ways to educate builders, developers, local governments, and consumers about how to achieve a healthier, more environmentally sustainable future.”

Georgia

§ 48-8-3. Biomass Sales and Use Tax Exemption

DSIRE Summary:

“Georgia enacted legislation in April 2006 (HB 1018) creating an exemption for biomass materials from the state's sales and use taxes. The term "biomass material" is defined as "organic matter, excluding fossil fuels, including agricultural crops, plants, trees, wood, wood wastes and residues, sawmill waste, sawdust, wood chips, bark chips, and forest thinning, harvesting, or clearing residues; wood waste from pallets or other wood demolition debris; peanut shells; pecan shells; cotton plants; corn stalks; and plant matter, including aquatic plants, grasses, stalks, vegetation, and residues, including hulls, shells, or cellulose-containing fibers."

To qualify for the exemption, the biomass material must be utilized in the production of energy, including the production of electricity, steam, or both electricity and steam. Pellets and fuels derived from biomass are generally eligible.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=GA08F&re=1&ee=1

Hawaii

Priority Permit Processing for Green Buildings

http://www.capitol.hawaii.gov/hrscurrent/Vol02_Ch0046-0115/HRS0046/HRS_0046-0019_0006.htm

DSIRE Summary:

“Hawaii Revised Statutes (HRS) §46-19.6 requires each county agency that issues building, construction, or development-related permits to establish a procedure for priority processing of permit applications for construction projects incorporating energy and environmental design building standards. The priority processing will be provided at no additional cost.

Buildings eligible for priority processing are those that meet the "energy and environmental design building standards". These standards can be achieved by earning either a LEED silver rating, a two Green Globes rating, or a comparable state-approved, nationally recognized, and consensus-based guideline, standard, or system.

For further information, contact the appropriate county building department.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=HI25F&re=1&ee=1

Idaho

Tax Deduction 63-3022C

DSIRE Summary:

“This statute allows taxpayers an income tax deduction of 40% of the cost of a solar, wind, geothermal, and certain biomass energy devices used for heating or electricity generation. Taxpayers can apply this 40% deduction in the year in which the system is installed and can also deduct 20% of the cost each year for three years thereafter. The maximum deduction in any one year is \$5,000. The total maximum deduction is \$20,000.

Eligible biomass energy devices include a pellet stove or EPA-certified wood stove if:

- it is in the taxpayer's residence,
- it replaces an old wood stove that does not meet EPA requirements,

- the purchase and replacement occurs within the same year, and
- the old wood stove is dropped off at a Department of Environmental Quality (DEQ)-approved site within 30 days.

(Also applies to new natural gas or propane heating units that meet these criteria.)”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=ID01F&re=1&ee=1

Low Interest Energy Loan Program

<http://www.energy.idaho.gov/financialassistance/energyloans.htm>

DSIRE Summary:

“The Idaho Office of Energy Resources administers low-interest loan programs for energy efficiency projects, and for active solar, wind, geothermal, hydropower and biomass energy projects. The interest rate is 4% with a 5-year repayment term. Applicants must pay the fees associated with processing and closing a loan. Loans are available for retrofit only, with the exception of some renewable resources.”

“Residential customers may choose one of two loan options: the standard Residential Loan Program or the Home Performance with Energy Star program. Eligible energy efficiency improvements for residential customers under both programs include insulation, space heating upgrades and water heating system improvements. The Home Performance with Energy Star loan program also provides funds for improvements to windows and air conditioning.”

“Non-residential customers may undertake projects to improve insulation, windows and doors, heating systems, building commissioning, or custom-designed projects. Specific energy-efficient agricultural equipment may also be eligible. Note that the commercial and industrial loan has a minimum lending amount of \$1,000, but loans for the agricultural and public sectors do not have a minimum loan amount.”

“Certain restrictions apply to this program. For existing homes or businesses, the savings from reduced usage of conventional fuel must be sufficient to pay for the project’s installation cost (i.e., simple payback of 15 years or less). For new off-grid projects, use of a renewable energy resource must be the least cost alternative. For grid-tied renewable energy projects, the payback period must be 15 years or less. Solar photovoltaic systems are not subject to this requirement; there is no payback requirement for solar photovoltaic systems, though loans for solar photovoltaic systems are limited to \$15,000. Renewable energy projects that are intended to sell energy generated or the commodity produced are not eligible. While the program’s financing requires repayment within five years, a further stipulation for existing homes and businesses states that the project’s cumulative energy savings over a fifteen year period must be great enough to offset the cost of the project.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=ID02F&re=1&ee=1

Illinois

Green Permit and Green Homes Program

http://www.cityofchicago.org/city/en/depts/bldgs/provdrs/green_permit.html

DSIRE Summary:

“The City of Chicago encourages building design, construction and renovation in a manner that provides healthier environments, reduces operating costs and conserves energy and resources through their Green Permit Program. The Chicago Department of Buildings (DOB) Green Permit Program provides developers and owners with an incentive to build green by streamlining the permit process timeline for projects which are designed to maximize indoor air quality and conserve energy and resources.

Chicago Green Homes Program

http://www.cityofchicago.org/city/en/depts/doi/supp_info/chicago_green_homesprogramoverview.html

Summary:

“[The Chicago Green Homes Program](#) (CGHP) is a voluntary certification program for Chicago homeowners, residential builders, and developers looking to incorporate sustainable design into their residential building. The CGHP provides a flexible framework for innovative construction, while promoting environmental awareness and sustainable living throughout the City. The CGHP was modeled after U.S. Green Building Council guidelines, and grants certification to new and renovated, single and multi-family unit homes according to a point-based, three-star rating scale. Recognition opportunities are also available for condos and apartment buildings. The CGHP strives to achieve sustainable environments, and lower carbon dioxide emissions in support of [Chicago Climate Action Plan](#) goals

Kansas

Efficiency Kansas Loan Program

<http://kcc.ks.gov/energy/>

DSIRE Summary:

Using money made available to the state through the federal American Recovery and Reinvestment Act (ARRA), the Efficiency Kansas *revolving loan program** allows homeowners and small businesses to receive financing to pay for energy improvements and renewable energy systems for their existing homes and buildings. Some utilities will administer the loan program for the state. Customers of utilities not participating in the program can contact a [partner lender](#) for direct financing. Homeowners may borrow up to \$20,000 and small businesses may borrow up to \$30,000, but monthly loan repayments may not exceed the estimated monthly energy savings. Participants will have up to 15 years to repay the loan.

Participants must first have an energy audit performed by a [program qualified auditor](#) to identify the best efficiency improvements to pursue. Participants are responsible for paying for the energy audit, but the cost can be rolled into the loan amount. Additionally, the first 1,500 participants may be eligible for a \$100 audit. The \$100 audit program ends April 1, 2011, or when all offers have been claimed. After receiving the recommendations from the audit, the participant must solicit bids from contractors. The participant must then submit the Energy Conservation Plan to the participating utility or lender who will then submit it to the State Energy Office for review and approval. If the State Energy Office approves the plan, the lender or utility may then proceed with the financing.

Program participants may also qualify for a \$500 rebate toward the cost of thermal envelope improvements. Qualifying efficiency improvements may include caulking, insulation, weather stripping, window sealing, and door sealing. The first 1,500 energy audits submitted between August 1, 2010 and April 1, 2010 qualify for this rebate.

Homeowners or business owners participating through their utility will repay the loan directly through their utility bills. The loan is attached not with the individual but with the utility account. In the event the homeowner or business moves, the loan obligation will remain with the property. Participants are required to notify future occupants of the remaining loan repayment obligations associated with the property. Failure to make proper disclosure could result in the customer being responsible for immediate repayment of the remaining balance.

Maine

Maine State Forest Firewood Program

<http://www.maine.gov/doc/mfs/>

AGH Summary: The Maine Bureau of Parks and Lands offers firewood permits to individuals with a chain saw and pickup truck. Foresters mark suitable firewood trees near roads, for easier hauling and minimal disruption deeper into the forest. Firewood is sold for \$25 per cord, with a 10-cord maximum for any one permit holder each year.

http://www.forgreenheat.org/consumer_resources/wood.html

Maryland

§11–207. Wood Heating Fuel Exemption

DSIRE Summary:

“This statute exempts from the state sales tax all wood or "refuse-derived" fuel used for heating purposes. The law does not make any distinctions about whether the qualified fuels are used for residential or commercial heating so both purposes should qualify. As of October 2010 the Maryland sales tax rate is 6%.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MD01F&re=1&ee=1

Baltimore County Property Tax Credit for High Performance Buildings and Homes

<http://www.baltimorecountymd.gov/Agencies/environment/sustainability/residents.html>

DSIRE Summary:

“The state of Maryland permits local governments (Md Code: Property Tax § 9-242) to offer property tax credits for high performance buildings if they choose to do so. Baltimore County exercised this option in 2006 by creating property tax credits for new and existing multi-family residential (50+ units) and commercial buildings that meet certain high performance building standards. In 2008, the county also adopted a similar provision creating property tax credits for newly constructed high performance homes, and in 2010 added provisions for energy efficiency improvements in existing homes.

**Click [here](#) for more information on the United States Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Building Rating System."*

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MD62F&re=1&ee=1

Howard County High Performance Building Property Tax Credit

http://www.howardcountymd.gov/DOF/DOF_RealPropertyTaxInformation.htm

DSIRE Summary:

"The state of Maryland permits local governments (Md Code: Property Tax § 9-242) to offer property tax credits for high performance buildings if they choose to do so. Howard County has exercised this option by offering property tax credits on new and existing multi-family residential and commercial buildings that meet certain high performance building standards. The tax credits apply only to tax years beginning after June 30, 2008. Minor amendments were made in 2009 to update the tax credit to reflect current green building standards. The amendments do not affect buildings that qualified under the prior standards.

The tax credit generally uses the U.S. Green Building Council's LEED* rating system as a metric for determining how "green" a building is, although buildings that achieve comparable ratings under other green building standards are also eligible for the tax credit. Tax credits are available for buildings that achieve minimum ratings under the 2009 LEED Core and Shell (CS) and Existing Building (EB) categories, or that meet a comparable standard adopted by the director of inspections, licenses and permits. The amount (10-75% of total county property tax assessed on the building) and term (3-5 years) of the tax credit varies based on the type project and the rating.

Montgomery County High Performance Building Property Tax Credit

http://www.montgomerycountymd.gov/content/finance/countytaxes/Green_Buildings_Tax_Credit_Application.pdf

DSIRE Summary:

The state of Maryland permits local governments (Md Code: Property Tax § 9-242) to offer property tax credits for high performance buildings if they choose to do so. Montgomery County has exercised this option by offering property tax credits on new or extensively modified multi-family residential and commercial buildings that meet certain high performance building standards. An "extensive modification" is defined as a structural modification that alters 50% or more of the building's square footage.

The tax credit generally uses the U.S. Green Building Council's LEED* rating system as a metric for determining how "green" a building is, although buildings that achieve comparable ratings under other green building standards are also eligible for the tax credit. Tax credits are available for buildings that achieve minimum ratings under the LEED New Construction (NC); Core and Shell (CS); and Existing Building (EB).

The amount (10-75%) and term (3-5 years) of the tax credit varies based on the type project and the rating it achieves. See the table below for details. The term "covered" refers to new or substantially reconstructed non-residential and multi-family residential buildings over 10,000 square feet, which are already required by county law to meet the basic LEED certification

standard or its equivalent. Thus the minimum standard for property tax credits on buildings of this type is correspondingly higher.

Michigan

Great Lakes States Stove Change-out

<http://woodstovechangeout.org/index.php?id=25>

State Forest Firewood Program

http://www.michigan.gov/dnr/0,1607,7-153-30301_30505_30816-24382--,00.html

Summary:

The Forest Management Division administers the issuance of fuelwood permits for the state forests in the Upper and Northern Lower Peninsulas. The permits are issued by [Management Unit offices](#), not by the Lansing office. The issuance of these permits are dependent upon the availability of wood suitable for fuelwood purposes. Most of the permits are issued for wood left over after commercial logging operations.

Missouri

Wood Energy Production Credit

<http://www.dnr.mo.gov/energy/deprograms.htm>

DSIRE Summary:

“The Wood Energy Tax Credit, as effective January 1, 1997, allows individuals or businesses processing Missouri forestry industry residues into fuels an income tax credit of \$5.00 per ton of processed material (e.g., wood pellets). A multiplier of 4 applies to charcoal, based on the amount of Missouri forest industry residue required to produce one ton of charcoal. Any amount of credit exceeding the tax due by a company in the year of production may be carried over to a subsequent taxable year, not to exceed four years. A credit earned under this program may also be transferred to third parties for use within this five-year period. To be considered an eligible fuel, forestry industry residues must have undergone some thermal, chemical or mechanical process(es) sufficient to alter the residues into a fuel product. As a result of H.B. 2058 enacted in June 2008, no new credits will be issued after June 30, 2013.

Click [here](#) to access Missouri's Wood Energy Tax Credit Application Form.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO02F&re=1&ee=1

Montana

Alternative Energy System Credit 15-32-201-202, MCA

http://revenue.mt.gov/forindividuals/ind_tax_incentives/default.mcp#enrgb

DSIRE Summary:

“Residential taxpayers who install an energy system using a recognized non-fossil form of energy on their home after December 31, 2001 are eligible for a tax credit equal to the amount of

the cost of the system and installation of the system, not to exceed \$500. It should be noted that this cap is for individual taxpayers, so married taxpayers filing jointly can get a tax credit up to \$1,000 per household. The tax credit may be carried over for the next four taxable years.

Recognized non-fossil forms of energy generation means:

1. A system that captures energy or converts energy sources into usable sources, including electricity, by using:
 - solar energy, including passive solar systems;
 - wind;
 - solid waste;
 - the decomposition of organic wastes;
 - geothermal;
 - fuel cells that do not require hydrocarbon fuel; or
 - an alternative energy system;
2. A system that produces electric power from biomass or solid wood wastes; or
3. A small system that uses water power by means of an impoundment that is not over 20 acres in surface area.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MT13F&re=1&ee=1

Renewable Energy System Tax Exemption MCA § 15-6-224 MCA § 15-32-102

<http://www.deq.mt.gov/Energy/renewable/taxincentrenew.mcp#15-6-224>

DSIRE Summary:

“Montana's property tax exemption for recognized non-fossil forms of energy generation or low emission wood or biomass combustion devices may be claimed for 10 years after installation of the property. The exemption is allowed for up to \$20,000 in value for single-family residential dwellings and up to \$100,000 in value for multi-family residential dwellings or non-residential structures. This property is class 4 property and otherwise would be taxed on 3.01% of assessed value.”

“Recognized forms of energy generation include solar photovoltaics, passive solar, wind, solid waste, decomposition of organic wastes, geothermal, small hydropower plants, low-emission wood or biomass combustion systems, and fuel cells that do not require hydrocarbon fuel. “

“Use Montana Department of Revenue Form [AB-14](#) to claim this exemption.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MT03F&re=1&ee=1

Alternative Energy Revolving Loan Program MCA § 75-25-101 et seq.

<http://www.deq.mt.gov/Energy/Renewable/altenergyloan.mcp#>

DSIRE Summary:

“The Alternative Energy Revolving Loan Program (AERLP) provides loans to individuals, small businesses, local government agencies, units of the university system, and nonprofit organizations to install alternative energy systems that generate energy for their own use. The program has historically been funded by air quality penalties collected by the Department of Environmental Quality (DEQ) and is also using funding from The American Recovery and

Reinvestment Act of 2009 (ARRA). The program is administered by the Department of Environmental Quality, which is responsible for developing the rules.”

“Alternative energy systems are defined by the Montana Code as "the generation system or equipment used to convert energy sources into usable sources." Technologies included in this definition are fuel cells using non-fossil fuels, geothermal, low emissions wood or biomass, wind, photovoltaics and small hydropower (under 1 megawatt). DEQ provides a technical review and approval of systems proposed for the loan program.”

“In 2005, [SB 50](#) added local government agencies, units of the university system, and nonprofit organizations to the list of eligible sectors, and allowed energy conservation measures to be financed when installed with an eligible renewable energy project. Interest rates are set annually and are fixed for the term of the loan. The rate for 2010 is 4.0%. With the addition of funding from ARRA in 2010, the maximum loan amount was raised to \$60,000 (subject to available funds), with a maximum loan term of 15 years.”

“DEQ will accept and process loan applications throughout the year. Approved projects will be ranked according to criteria published in the Administrative Rules of Montana (ARM) Title 17, Chapter 85. This criteria includes items such as system reliability, return on investment and avoided fossil fuel consumption. Once a loan is approved, the applicant will be informed as to whether funds are currently available and when new funds are anticipated if funds are not currently available.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MT06F&re=1&ee=1

Nebraska

Dollar and Energy Saving Loan

<http://www.neo.ne.gov/loan/>

DSIRE Summary:

“This program makes available low interest loans for residential and commercial energy efficiency improvements. The Nebraska Energy Office administers this program, which was created in 1990 using oil overcharge funds. Only improvements to existing buildings that are at least 5 years old are eligible for loan assistance. As of March 31, 2010, 25,618 loans have been made totaling \$205.3 million and financing \$210.8 million in eligible projects.”

“Through the American Recovery and Reinvestment Act, the federal government awarded close to \$31 million to Nebraska's State Energy Program. The Nebraska Energy Office routed \$11 million of the total to the Dollar and Energy Savings Loan Program to finance additional 2.5% loans for commercial and industrial sector building improvements, including K-12 schools. Loans of up to \$750,000 are available using these funds.”

“This incentive applies mainly to energy efficiency improvements. However, renewable energy projects are eligible under one of two criteria. A project may be eligible if it is included in a list of "pre-qualified improvements." This list includes a variety of energy efficiency measures as well as the purchase of alternative fuel vehicles. Pre-qualified improvements have minimum

efficiency standards which are listed on their respective forms. Projects not listed as pre-qualified improvements may be eligible with the submission of an energy audit that verifies that the project will have a reasonable payback period (varies by improvement type).”

“Much of this program’s success is due to the leveraging of state funds through collaboration with individual banks, savings institutions, and credit unions. Those seeking a loan under this program first approach their own financial institution, which approves the project on financial terms before contacting the State Energy Office for its approval. The State Energy Office then purchases either 50% or 75% of the loan at 0% to deliver an interest rate of 5% or 2.5%, respectively, to the borrower. All qualifying work should be completed within 5 months of Energy Office's commitment of funds. Of the money lent out so far, over \$103.7 million has been from the State Energy Office's revolving fund.”

“Though they are eligible, loans for renewable energy projects have not previously been widely sought and only a handful of renewable energy projects have been funded to date. It is felt that the program has potential benefits for renewables in Nebraska as well as other states where this structure could be replicated.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NE01F&re=1&ee=1

Nevada

Property Tax Abatement for Green Buildings

<http://energy.state.nv.us/energy-efficiency/green-building-abatement.html>

DSIRE Summary:

“Non-residential buildings and multi-family residential buildings that earn certification under the United States Green Building Council's Leadership in Energy and Environmental Design (LEED*) program may be eligible for a partial abatement of property taxes. As directed by the statutes, the Director of the Office of Energy, through Adopted Regulation R116-07, selected the LEED rating system, but with specific requirements for energy conservation. To qualify for the tax abatement, buildings must earn at least three points for energy conservation through the LEED rating system. More valuable abatements are awarded to buildings which earn more energy conservation points.

**Click [here](#) for more information on the United States Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Building Rating System.”*

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NV10F&re=1&ee=1

New Hampshire

Tax Exemption Statutes Chapter 72:69-70.

<http://nh.gov/oep/programs/energy/RenewableEnergyIncentives.htm>

DSIRE Summary:

“New Hampshire allows cities and towns to offer an exemption from residential property taxes in the amount of the assessed value of a renewable-energy system used on the property. Eligible technologies include solar-energy systems (photovoltaic systems, solar space-heating systems, solar water-heating systems, passive solar-energy systems); wind-energy systems, and wood-

fired central heating systems. Stoves and fireplaces do not qualify. Cities and towns must adopt an exemption provision separately for each energy source. As of September 2010, 84 cities and towns in New Hampshire have adopted a property tax exemption for one or more of these energy sources.”

“Visit the web site above for a list of New Hampshire municipalities that offer property tax exemptions for renewables. Contact your local tax collector or assessor for further details.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NH01F&re=1&ee=1

New Hampshire State Forest Firewood Program

<http://www.maine.gov/doc/mfs/>

AGH Summary:

The New Hampshire Division of Forests and Lands offers cut-your-own programs on several state reservations. Residents can cut a maximum of two cords during the cutting season, at \$25 per cord. All permits are for dead and down wood only, and individuals must have their own truck, chain saw, and basic safety equipment.

Residential Bulk-Fed Wood-Pellet Central Boilers or Furnace Rebate Program

<http://www.puc.nh.gov/Sustainable%20Energy/RenewableEnergyRebates-WP.html>

DSIRE Summary:

“Utilizing funds from the American Recovery and Reinvestment Act, the New Hampshire Public Utilities Commission is offering rebates of 30% of installed cost (up to \$6,000) for residential bulk-fed, wood-pellet central heater boilers or furnaces. Eligible systems include those installed (and operating) between April 14, 2010 and February 15, 2012 (end date subject to change). The systems must be at least 85% efficient and must be certified as meeting air quality standards (specifically, the required particulate matter emissions rating is 0.32 lb/MMBtu). Additional system requirements must be met as specified in the program application.”

“Systems must be installed by a qualified installer, including companies authorized to do business in the state and those that are "normally commercially engaged" in installing such systems, or a licensed plumber with wood-pellet central boiler system training. To receive a rebate, applicants must submit a pre-approval application to ensure funding availability. After receiving verification of eligibility and securing a place in the queue, applicants have three months to complete the installation. Post installation, applicants must submit a final rebate request along with required documentation.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NH41F&re=1&ee=1

New Jersey

NJ State Forest Firewood Program

http://www.state.nj.us/dep/parksandforests/forest/njfs_firewood_prog.html

Summary:

Through the **Homeowner Firewood Program**, the [Division of Parks and Forestry](#) opens up state land to individuals interested in cutting firewood for personal use. New Jersey residents have the

opportunity to cut firewood at any of seven participating state parks and forests for \$20 a cord while supplies last.

All wood available through the program is standing timber in designated areas of the forests. All cutting areas are reviewed by the DEP's Technical Forest Management Team. Homeowners are responsible for cutting and removing their own firewood.

The Department of Environmental Protection's Homeowners Firewood Program, which provides low-cost wood to the public and improves forest health, will expand this winter to Brendan T. Byrne State Forest in Woodland Township and Parvin State Park in Pittsgrove.

The Division of Parks and Forestry received federal stimulus money through the American Recovery and Reinvestment Act of 2009, which has been used this winter to hire a logging service to cut down dead, dying and hazardous trees at Brendan T. Byrne State Forest and Parvin State Park. Many of those trees had been ravaged by gypsy moths.

State residents can seek permits to cut up and cart away as much as six cords of the felled trees at Brendan T. Byrne State Forest and Parvin State Park, for \$20 a cord.

The Homeowner's Firewood Program has been sponsored by the state since 1973.”

[Read more about the benefits of homeowner firewood.](#)

[Homeowners Firewood Application form](#) *(PDF)

[Homeowners Firewood Program information sheet](#) *(PDF)

New York

Tax Exemption Section 4.01 - RPTL Section 487-a

<http://www.orps.state.ny.us/assessor/manuals/vol4/part1/section4.01/sec487-a.htm>

DSIRE Summary:

“Qualifying energy-conservation improvements to homes are exempt from real property taxation to the extent that the addition would increase the value of the home. The exemption includes general municipal property taxes, school district taxes, and special ad valorem taxes, but does *not apply* to special assessments. Eligible properties include single-family to four-family dwellings. The exemption applies directly to a variety of equipment and measures, but the statute also states that any conservation-related state or federal tax credit or deduction is also exempt from New York's property tax under this statute. The [federal energy efficiency tax credit](#) can be applied to energy efficient central air conditioners, electric heat pump water heaters, natural gas, propane, or oil water heaters, advanced main air circulating fans, and certain biomass-fueled stoves. In addition, the state Tax Assessor's Manual also specifically identifies solar and wind energy systems specifically as eligible for the exemption.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NY27F&re=1&ee=1

Residential Loan Program

<http://www.nyserda.org/resloanfund.asp>

DSIRE Summary:

“The New York Residential Loan Fund, administered by the New York State Energy Research and Development Authority (NYSERDA), provides reduced-interest rate loans through

participating lenders to finance renovation or construction projects that improve a home's energy efficiency. The level of interest rate reduction may be up to 4%, but is adjusted to maintain a floor rate of 3%. Loans are limited to residents in 1-4 family homes that are customers of one of the state's six investor-owned electric or natural gas utilities -- Central Hudson Gas & Electric Corporation, Consolidated Edison Company of New York, Inc., National Grid, New York State Electric & Gas Corporation, Orange and Rockland Utilities, Inc., or Rochester Gas and Electric Corporation -- and that pay the System Benefits Charge (SBC) or the Renewable Portfolio Standard (RPS) charge. Customers are generally eligible for loans of up to \$20,000 for up to a 10-year loan term, but Consolidated Edison customers are eligible for loans of up to \$30,000.

In order to qualify for the program, the customer must participate in the [NYSERDA Home Performance with Energy Star Program](#) and abide by the accompanying program rules and regulations. Formerly the loan program allowed participants in the NYSEERDA Wind Incentive and Photovoltaic (PV) Incentive programs to apply for assistance; however, recent revisions to the Wind Incentive and PV Incentive programs do not allow participants to also take advantage of the Residential Loan Fund.

Please consult the Residential Loan Fund and NYSEERDA Home Performance with Energy Star websites for additional program information.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NY06F&re=1&ee=1

Broome, Chenango and Madison County State Forest Firewood Program

<http://www.dec.ny.gov/press/61465.html>

Summary:

“The New York State Department of Environmental Conservation (DEC) is accepting applications from homeowners to cut firewood on State Forests in Chenango, Madison and Broome Counties.

"Since DEC launched the Homeowner Firewood Program in 1978, it has been welcomed by the surrounding communities looking for quality firewood to reduce home heating costs and keep families warm through the winter months," said DEC Regional Director Ken Lynch.

Due to increased demand, firewood will be offered through a sealed bid auction and by lottery. Lottery firewood will be available in volumes of three, five, and ten standard cords for \$15 per cord and is limited to 10 cords per household. Auction firewood will be sold to the highest bidder and is also limited to a maximum of 10 cords. A standard cord is a pile of wood measuring 4'x4'x8' when cut and stacked. All firewood for sale is standing, live trees located off-road and will require a chainsaw, tractor and cart, or a 4-wheel drive truck for cutting, access and hauling. The trees available for cutting are marked by DEC foresters. This is done to ensure that the only wood removed is done for conservation and habitat reasons.

In an effort to prevent the spread of invasive insect species such as the Emerald ash Borer and the Asian Long-horned Beetle, state regulations prohibit moving firewood that has not been heat treated more than 50 miles. Persons applying to cut firewood under this program may transport cut trees no more than 50 miles from where the wood is felled. They also must complete a "[Self-Issued Certificate for Transport](#)," form and carry it with them when transporting the wood. For

more information on [firewood movement restrictions](#) visit the DEC website or call 1-866-640-0652 or e-mail firewood@gw.dec.state.ny.us.

Green Residential Building Program

<http://www.getenergysmart.com/GreenBuilding.aspx>

DSIRE Summary:

“The Green Residential Building Program, administered by the New York State Energy Research and Development Authority (NYSERDA), offers incentives to residential building owners for the construction or substantial renovation of buildings that are built or permanently sited in New York State and meet certain green building requirements. The program is available to owners of buildings with 1 - 11 residential dwelling units that meet the minimum green building requirements and have a Certificate of Occupancy or Certification of Completion dated between January 1, 2010 and October 30, 2013.

An eligible building owner may be the developer or builder if the developer or builder holds title to the building on the date a Certificate of Occupancy is issued. The definition of what constitutes a substantial renovation is detailed, but in basic terms requires a whole building approach that involves building envelope improvements, installation or replacement of at least two of three major building systems (electrical, plumbing, and HVAC), and equipment (e.g., lighting, appliances) that meet or exceed program efficiency requirements.

Incentives under the program are offered at up to \$3.75 per qualified occupied square foot but are capped according to the number of units in the building. Maximum incentives range from \$5,125 for single family dwellings, up to \$13,375 for an 11-unit multi-family residential dwelling. Building owners may receive up to \$120,000 through the program per calendar year.

In order to qualify for incentives, buildings must meet the following requirements:

- Certification at the Silver level or higher, using the National Green Building Standard, or either the LEED for Homes or LEED for New Construction Rating Systems.
- Energy-efficient lighting and appliances must achieve at least 500 kWh of annual electric saving per dwelling unit
- Combustion appliances must have been tested for operational safety
- For low-rise (3 or fewer stories) with 4 or fewer dwelling units (including detached single family homes and townhouses), buildings must meet additional requirements for HERS rating, ventilation, HVAC system efficiency, and water heater efficiency.

Builders or contractors of residential green homes must have prior green building experience, hold professional certification in green building, or have completed a green building professional training course approved by NYSERDA. Owners apply for incentives once the building is substantially completed, a Certificate of Occupancy or a Certificate of Completion is issued, and the building has been certified under one of the qualified rating programs.

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NY83F&re=1&ee=1

North Carolina

Green Building Incentives (local option)

http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/BySection/Chapter_153A/GS_153A-340.html

DSIRE Summary:

“To encourage sustainable building practices, North Carolina law allows all counties and cities to provide reductions or partial rebates for building permit fees. To qualify for a fee reduction, buildings must meet guidelines established by the Leadership in Energy and Environmental Design* (LEED) program, the Green Globes program, or another recognized certification program.

[SB 1597](#) of 2008 also granted authority to a few select jurisdictions to provide density bonuses, make adjustments to otherwise applicable development requirements, or provide other incentives to a developer or builder who builds or reconstructs developments which make a significant contribution to the reduction of energy consumption. The local jurisdiction is free to determine their own eligibility criteria based on generally recognized standards including LEED or other national or regional certification programs. Originally limited to just 1 county, 7 cities and 7 towns, this authority was granted to all counties, cities and towns by SB 52 of 2009.

**The U.S. Green Building Council's LEED rating system is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. Click [here](#) for more information on the LEED program.”*

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NC48F&re=1&ee=1

Oregon

Energy Conservation Program 469.860

<http://egov.oregon.gov/ENERGY/CONS/RES/tax/HVAC-Biomass.shtml>

DSIRE Summary:

Energy Efficiency Incentives

Only appliances recognized as premium efficiency by the Oregon Department of Energy are eligible for the tax credit. The Oregon Department of Energy maintains a list of qualifying appliances. The tax credit is the lesser of: (1) \$0.40 per kWh saved in the first year, or (2) 25% of the net cost of the appliance.

Performance-tested duct systems qualify for a tax credit for 25% of the cost of the work, not to exceed \$250. The testing must be performed by a contractor certified by the Oregon Department of Energy.

Qualifying air-source heat pump systems are eligible for a tax credit of \$300 to \$500 when installed by a contractor on the Oregon Department of Energy's certified contractor list. Qualifying condensing furnaces and boilers are eligible for tax credits of \$350 and \$225, respectively. If the heat pumps and furnaces are connected to a performance-tested duct system, they are eligible for an additional \$150 tax credit.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=OR17F&re=1&ee=1

Biofuel Consumer Income Tax Credits

OHPBA Summary:

The tax credit applies to companies and people who collect and consume bio fuels such as bio diesel, bio home heating oil, and biomass, such as cord wood and pellets in the case of home heating.

Rules take effect December 14 and are intended for calendar year starting January 1, 2008.

The credit is \$10 per bone dry ton of pellets or \$10 per cord of wood.

The credit is for fuel burned (not bought) regardless of the source. In other words, if you burn cordwood that came from a tree that fell in your backyard, that qualifies. There will be more detail on type of wood that qualifies once the rules are out.

The credit only applies if a pellet stove is used or a woodstove on the list of EPA certified wood stoves.

<http://www.ohpba.org/taxCreditIntro.htm>

Pennsylvania**Keystone HELP Energy Efficiency Loan Program**

<http://www.keystonehelp.com/index.php>

DSIRE Summary:

“The Keystone HELP Energy Efficiency Loan Program is designed to help homeowners improve energy efficiency with special financing for high-efficiency heating, air conditioning, insulation, windows, doors, geothermal and “whole house” improvements. Principally supported by the Pennsylvania Department of Environmental Protection, the Pennsylvania Treasury Department and the Pennsylvania Housing Finance Agency, the Keystone HELP program is administered by AFC First Financial Corporation, a Pennsylvania energy efficiency lender.

Pennsylvania homeowners who own and make qualifying improvements to their one- or two-unit primary residence located in the state and whose combined annual household income does not exceed \$150,000 are eligible to apply for loans under this program. Eligible applicants may receive only one loan during each fiscal year, but they may apply for additional loans in future years, as long as the additional projects comply with the published guidelines current at the time of application. Loans are available only for projects initiated after February 23, 2009. All installed equipment and material must be new, and work must be performed by a qualifying contractor. A list of qualifying contractors is available on the program web site.

For more information please see the program website, which contains detailed program guidelines and also lists several private loans that are available for people and projects that do not qualify for the Keystone loan programs.”

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=PA19F&re=1&ee=1

High Performance Buildings Incentive Program

<http://www.newpa.com/find-and-apply-for-funding/funding-and-program-finder/high-performance-building-program>

DSIRE Summary:

“In July 2008, Pennsylvania enacted a broad \$650 million alternative energy bill designed to provide support for a variety of renewable energy and energy efficiency technologies. Included in this legislation was a provision authorizing the creation of a \$25 million grant and loan program for high performance buildings. The program is jointly administered by the Department of Community and Economic Development (DCED) and the Department of Environmental Protection (DEP), under the direction of Commonwealth Finance Authority (CFA). Program guidelines were issued in April 2009 and revised in November 2009. Incentives are available to both in-state small businesses (100 or fewer total employees) and individuals for the construction or major renovation of homes or commercial buildings. Homes must be primary residences in order to be eligible.

Virginia**Tax Exemption 58.1-609.10.****AGH Summary:**

Virginia Code § 58.1-609.10 18 provides that beginning July 1, 2007, and ending July 1, 2012, the retail sales and use tax does not apply to "multi-fuel heating stoves used for heating an individual purchaser's residence. Multi-fuel heating stoves are stoves that are capable of burning a wide variety of alternative fuels, including, but not limited to, shelled corn, wood pellets, cherry pits, and olive pits." Boilers and furnaces that use pellets or other alternative fuels are also exempt from sales tax, but not boilers or stoves that burn wood. The fuels used in the stoves are still taxed.

Vermont**Vermont Outdoor Wood Boiler Change-out Program**

<http://www.anr.state.vt.us/air/htm/OWBchangeoutprogram.htm>

Summary:

“The Air Pollution Control Division (APCD) of the State of Vermont is pleased to offer a voluntary OWB Change-Out Program that provides financial incentives to encourage people to replace their old OWBs with cleaner, more efficient heating systems as approved by the APCD. Eligible replacement heating systems may include Vermont Phase II certified OWBs (including pellet boilers), propane or natural gas furnaces or boilers, indoor wood or pellet boilers as approved by the APCD, or sustainable heating systems, such as geothermal heat pumps, as approved by the APCD.

Most OWBs sold in Vermont before March 31, 2008 create significant amounts of smoke and many have caused problems for neighbors. In contrast, OWBs sold for use in Vermont today emit 70-90 percent less pollution. Cleaner air means fewer cases of asthma and other [health problems caused by the particles and gases in wood smoke](#). In addition, replacing your old OWB with a new OWB may ultimately [save you money](#) by burning less wood for more heat. There are also a variety of [alternate heating units](#) available that are efficient and even cleaner than new OWBs. Finally, many older OWBs are required by law to be permanently retired on or

before December 31, 2012. For all these reasons, the APCD is pleased to offer financial incentives to help pay for the costs of installing cleaner heating sources and is providing enhanced financial incentives for those OWBs that must be retired by December 31, 2012.

If you own an operational OWB that is installed in Vermont and does not appear on the list of "[Vermont-certified Phase I and Phase II OWB Models](#)" you may be eligible to receive financial incentives to replace your OWB with a cleaner heating source.

Burn Clean Woodstove Change-out Program

<http://www.anr.state.vt.us/air/hm/woodstoverebate.htm#woodstove>

Summary: Voucher applications were available [on this website](#) on march 9, 2009. Depending on available funding, after receiving the application form a \$450 voucher was sent to applicants if funds were available. The applicant could use this voucher toward the purchase of a new stove from a participating retailer.

Contact:

Heidi Hales

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Email: heidi.hales@state.vt.us

Burn Clean Woodstove Catalyst Change-out Program

<http://www.anr.state.vt.us/air/hm/woodstoverebate.htm#woodstove>

Summary:

The Vermont Air Pollution Control Division (VT APCD) offered a rebate vouchers of \$75 for the replacement of old catalyts (>5 years old) in EPA-certified catalytic wood stoves. Applications for rebate vouchers were accepted from March 9-April 30, 2009. In order to have qualified for this program, one must have first applied for a rebate voucher. Then, after a voucher is issued, one may purchase a new catalyst under this program, provided the voucher is valid and the program requirements have been met.

“OPTION 1. After you receive a rebate voucher for \$75 you may purchase your new catalyst from the retailer of your choice and pay the full price to the retailer. After you have purchased your new catalyst, then submit an invoice with your receipt, tracking form (to be sent to you with your voucher) and old catalyst to the APCD for reimbursement to you. Reimbursement will be made within 30 days.”

“Option 2. After you receive a rebate voucher for \$75, you man contact Condar, a participating factory, to purchase your new catalyst. They will provide an additional incentive of \$25 for a **total rebate of \$100.** See <http://www.woodstovecombustors.com/Vermont.html> or call (828) 949-8383 extension 232 for further details. Condar will deduct \$100 from the price of your new catalyst, and you will be required to submit your old catalyst to Condar.

The VT APCD reviews applications to determine if the preliminary qualifaction requirements have been met. Qualified applicants will receive a rebate voucher that will be valid for three weeks.”

Contact:

Heidi Hales

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Email: heidi.hales@state.vt.us**Vermont Wood Warms**<http://www.vermont.gov/portal/government/article.php?news=782>**Summary:**

“The Department of Forests, Parks and Recreation (FPR) announced today that sign-ups will be accepted for personal use firewood lots in selected state forests January 2nd through February 6, 2009. Wood Warms builds upon the successful 1970s state firewood program when Vermonters took to the forests and harvested their own firewood.

FPR’s foresters mark trees to be harvested in a limited number of roadside 3-cord lots. Individuals can buy the standing wood on these lots to cut and transport over the summer months for home use. Individuals may purchase only one lot per year for personal use. The costs for the lots in 2009 will rise to \$10/cord, and no mechanized “skidding” of wood to the roadside will be allowed. All participants are strongly encouraged to learn chainsaw safety skills to use this equipment on firewood lots.

Virginia<http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+58.1-609.10>

Beginning July 1, 2007, and ending July 1, 2012, multifuel heating stoves used for heating an individual purchaser's residence. "Multifuel heating stoves" are stoves that are capable of burning a wide variety of alternative fuels, including, but not limited to, shelled corn, wood pellets, cherry pits, and olive pits.

Washington**King County Green Building Grants Program**<http://your.kingcounty.gov/solidwaste/greenbuilding/index.asp>**DSIRE Summary:**

“King County's Department of Natural Resources and Parks awards grants and provides free technical assistance to new construction and major renovation commercial building projects in King County. King County's Commercial Green Building Grants Program provides resources to projects built in King County that meet stringent criteria for resource conservation. Minimum performance requirements include LEED* Gold or Built Green** 4-Star certification. Private, nonprofit, and public projects are eligible to apply for grant awards.

In 2009, five grants were awarded to projects meeting at least LEED Gold standards and incorporating low impact design strategies. A new round of grants for 2011 is expected. In

previous years, eligible projects could receive a grant of up to \$35,000. The award levels have not yet been determined for 2011. Updated information about the 2011 grant cycle will be posted on the above-referenced program website.

**Click [here](#) for more information on the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Building Rating System.*

Click [here](#) for more information on the Built Green Rating System.

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=WA124F&re=1&ee=1

Seattle Area Built Green:

<http://www.builtgreen.net/>

Summary:

Our builders and other associates provide sustainable housing in an area of more than 4,000 square miles in the State of Washington, covering King and Snohomish Counties. Built Green homes are designed to provide homeowners with comfortable, durable, environmentally friendly homes that are cost-effective to own and operate. These resource-efficient homes are crafted to exceed building codes and provide homeowners with years of healthy, quality living, while protecting the precious Northwest environment.

Wisconsin

Wisconsin State Forest Firewood Program:

<http://dnr.wi.gov/forestry/stateforests/SF-Knowles/timber.htm>

Summary:

“Timber sales on the Governor Knowles State Forest are established through a systematic, multi-step process that involves both state forest staff and various DNR resource managers. In addition to timber sales, firewood permits are issued to the public to salvage up to 10 cords of dead trees per year for personal use. Christmas tree permits are also issued to the public.

Woody Biomass Harvesting and Processing Tax Credit

DSIRE Summary:

In May 2010 Wisconsin enacted legislation allow taxpayers to claim a tax credit from income or franchise taxes of 10% of the cost of equipment primarily used to harvest or process woody biomass for use as a fuel or as a component of fuel. The adopted law creates identical tax credits in the portions of the Wisconsin tax code relating to income taxes on individuals (§71.07), income and franchise taxes on corporations (§71.28), and income and franchise taxes on insurance companies (§71.47). Woody biomass is defined as "...trees and woody plants, including limbs, tops, needles, leaves, and other woody parts, grown in a forest or woodland or on agricultural land." For equipment use to be considered "primarily" for an eligible purpose, other uses of the equipment are limited to no more than 25% of total use. The credit may not be claimed for any business or trade expenses deducted by the taxpayer under 26 USC §162.

The credit will be available for 5 years, from January 1, 2010 to December 31, 2015. Allowable credits in excess of a claimant's tax liability for a given year will be refunded. Credits are limited to \$100,000 per claimant in aggregate, and \$900,000 in total each fiscal year. In addition the Department of Commerce is required to allocate \$450,000 in tax credits each fiscal year to businesses that individually have no more than \$5 million in gross receipts in Wisconsin for the taxable year in which the credit is claimed. Taxpayers will need to be certified by the Wisconsin Department of Commerce (DOC) in order to claim the tax credit. The DOC, in cooperation with the Department of Revenue, is required to develop regulations to implement the law.

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=WI85F&re=1&ee=1

National Home Builder Association

<http://www.nahbgreen.org/AboutNAHBGreen/default.aspx>

Summary:

“NAHB educates its members and the home building industry as a whole about green building practices. The [Certified Green Professional \(CGP\)](#) and Master Certified Green Professional (MCGP) are designations available to help home building professionals demonstrate their expertise in green building. Additionally, extensive green building educational and networking opportunities are available through such venues as the [National Green Building Conference & Expo](#), the [International Builders' Show](#), and other industry-sponsored events.

Each year, NAHB honors excellence in green residential design, construction practices, and outstanding green advocacy efforts at the [National Green Building Awards](#).

National Green Building Standard

In 2007 the [National Association of Home Builders \(NAHB\)](#) and the International Code Council (ICC) partnered to establish a much-needed and nationally-recognizable standard definition of green building. The resulting ICC 700 National Green Building Standard™ is the first and only residential green building rating system to undergo the full consensus process and receive approval from the American National Standards Institute (ANSI). The Standard defines green building for single- and multifamily homes, residential remodeling projects, and site development projects while still allowing for the flexibility required for regionally-appropriate best green practices.

<http://www.nahbgreen.org/NGBS/default.aspx>

United States Green Building Council

<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=124>

Summary:

“The Washington, D.C.-based U.S. Green Building Council (USGBC) is a 501 c3 non-profit organization committed to a prosperous and sustainable future for our nation through cost-efficient and energy-saving green buildings.

With a community comprising 79 local affiliates, more than 16,000 member companies and organizations, and more than 160,000 LEED Professional Credential holders, USGBC is the driving force of an industry that is projected to contribute \$554 billion to the U.S. gross domestic product from 2009-2013. USGBC leads an unlikely diverse constituency of builders and

environmentalists, corporations and nonprofit organizations, elected officials and concerned citizens, and teachers and students.

LEED:

“LEED is an internationally recognized green building certification system, providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO₂ emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

Fireplace or stove	Enhanced combustion-venting measures	
	Better practice (1 point)	Best practice (2 points)
None	See 'best practice'.	Granted automatically.
Masonry wood-burning fireplace	Install masonry heater as defined by American Society for Testing and Materials Standard E-1602 and International Building Code 2112.1.	Meet requirement for 'better practice', and conduct back-draft potential test to ensure $\Delta P \leq 5$ Pascals (see "conducting a back-draft potential test" below).
Factory-built wood-burning fireplace	Install equipment listed by approved safety testing facility (e.g., UL, CSA, ETL) that either is EPA certified or meets the following: equipment with catalytic combustor must emit less than 4.1 g/hr of particulate matter, and equipment without catalytic combustor must emit less than 7.5 g/hr of particulate matter.	Meet requirement for better practice, and conduct back-draft potential test to ensure $\Delta P \leq 5$ Pascals (see "Conducting a Back-Draft Potential Test," below).
Woodstove and fireplace insert	Install equipment listed by approved safety testing facility that either is EPA certified or meets following requirement: equipment with catalytic combustor must emit less than 4.1 g/hr of particulate matter, and equipment without catalytic combustor must emit less than 7.5 g/hr of particulate matter.	Meet requirement for better practice, and conduct back-draft potential test to ensure $\Delta P \leq 5$ Pascals (see "conducting a back-draft potential test" below).
Natural gas, propane, or alcohol stove	Install equipment listed by approved safety testing facility that is power-vented or direct-vented and has permanently fixed glass front or gasketed door.	Meet requirement for better practice, and include electronic (not standing) pilot.
Pellet stove	Install equipment that is either EPA certified or listed by approved safety testing facility to have met requirements of ASTM E 1509-04, "Standard Specification for Room Heaters, Pellet Fuel-Burning Type."	Meet requirement for better practice, and include power venting or direct venting.

<http://www.usgbc.org/ShowFile.aspx?DocumentID=3638>

Tax Code 25 C

http://www.energystar.gov/index.cfm?c=tax_credits.tx_index

DSIRE Summary:

“Note: This tax credit was amended and extended through December 31, 2011, by the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010. On January 1, 2011, several characteristics of this credit changed from their 2010 form. Most significantly, the cap was reduced from \$1,500 to \$500. The cap pertains to the total amount of credits a homeowner may claim from 2006 to 2011 -- not just in 2011. If a homeowner has already

claimed \$500 or more under this credit, the homeowner may not claim an additional credit for improvements made in 2011.

This credit applies to energy efficiency improvements in the building envelope of existing homes and for the purchase of high-efficiency heating, cooling and water-heating equipment. Efficiency improvements or equipment must serve a dwelling in the United States that is owned and used by the taxpayer as a primary residence. The maximum tax credit for all improvements made in 2011 is \$500. The cap includes tax credits for any improvements made in 2006 - 2010. If a taxpayer claimed \$500 or more of these tax credits in any previous year, any purchases made in 2011 will be ineligible for a tax credit.

LIHEAP

<http://www.acf.hhs.gov/programs/ocs/liheap/>

Summary:

“The mission of the Low Income Home Energy Assistance Program (LIHEAP) is to assist low income households, particularly those with the lowest incomes that pay a high proportion of household income for home energy, primarily in meeting their immediate home energy needs. *Block Grant:* States, territories, and Indian tribes and tribal organizations that wish to assist low income households in meeting the costs of home energy may apply for a LIHEAP block grant. Congress established the formula for distributing funds to States based on each State's weather and low income population. Home energy is defined by statute as a source of heating or cooling in residential dwellings.

PACE

<http://pacenow.org/blog/>

DSIRE Summary:

“Property Assessed Clean Energy (PACE) financing may be used to encourage the installation of renewable energy and energy efficiency technologies by helping customers overcome the financial barrier associated with high up-front equipment costs. Some states are also allowing water conservation improvements to be financed using this mechanism. This financing mechanism is similar in some regards to a loan program. While it does not reduce the price tag of solar systems, it can help make purchases more affordable by spreading the cost of the system over time.

PACE financing effectively allows property owners to borrow money from the local government to pay for renewable energy and/or energy-efficiency improvements. The amount borrowed is typically repaid via a special assessment on property taxes, or another locally-collected tax or bill, such as utility bills, or water or sewer bills. Only the property owners within the local jurisdiction that opt into the PACE program will be subject to this special assessment. In addition to reducing the upfront costs of renewable energy and/or energy efficiency improvements, PACE financing allows the cost of home improvements to be linked to the property. If a property owner participating in a PACE program sells the property, then the repayment obligation will legally transfer with the property.

<http://www.dsireusa.org/solar/solarpolicyguide/?id=26>

Home Star Program

Summary:

“HOME STAR provides two types of consumer incentives:

1. The **SILVER STAR *prescriptive path*** provides a near-term incentive for specific energy saving investments that is simple to administer and easily introduced into the existing marketplace. Homeowners receive between \$1,000 and \$1,500 for each measure installed in the home, or \$250 per appliance, with a benefit not exceeding \$3,000 or at least 50% of total project costs (whichever is less). Covered measures include air sealing; attic, wall, and crawl space insulation; duct sealing or replacement; and replacement of existing windows and doors, furnaces, air conditioners, heat pumps, water heaters and appliances with high-efficiency models. The legislation will utilize existing standards for qualifying products at a level sufficient to significantly increase consumer demand for highly energy efficient building materials and mechanical systems. SILVER STAR improvements may be implemented by any appropriately licensed and insured contractor, but all participating contractors will receive information about opportunities for accreditation and training programs.
2. The **GOLD STAR *performance path*** offers an incentive to households that choose to conduct a comprehensive energy audit and then implement a variety of measures that are designed together to provide greater total returns in energy savings. This performance path represents the future of home efficiency: state-of-the-art building science is used to identify problems, present solutions and deliver verifiable energy savings, generating confidence among homeowners and investors alike. This technology-neutral approach is based on performance, not specific products, so market forces will direct funds to solutions that achieve the best results. A certified professional with accreditation from the Building Performance Institute (BPI), the Residential Energy Services Network (RESNET) or an approved equivalent conducts an energy audit before work begins, and a test-out when the performance retrofit is complete. Consumers receive \$3,000 for modeled savings of 20%, plus an additional \$1,000 incentive for each additional 5% of modeled energy savings, with incentives not to exceed 50% of project costs. Contractors implementing the GOLD STAR performance path must be BPI accredited. “