



## Future of Wood Pellet-Fired Heating in Western Europe and Maine

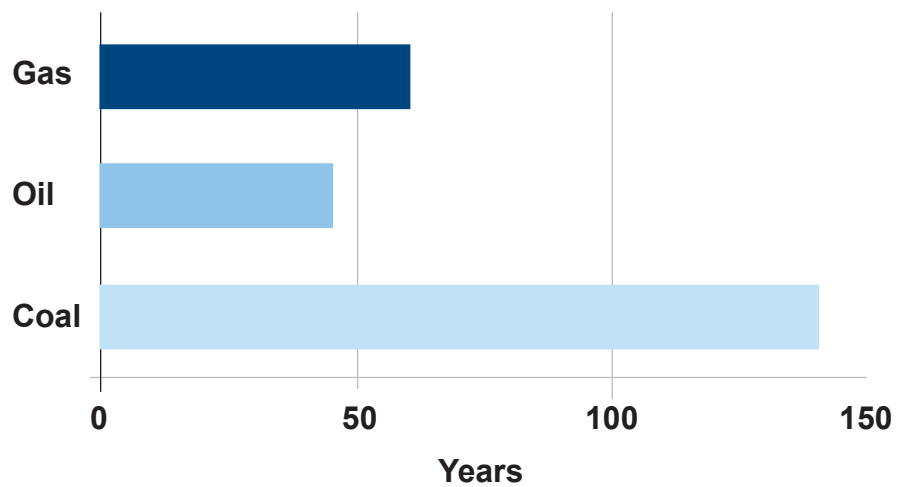
*This is adapted from a presentation made to the Efficiency Maine Trust by Harry "Dutch" Dresser, Director, Maine Energy Systems, and Herbert Ortner, owner ÖkoFEN Pelletsheizung, Niederkappel, Austria, and Maine Eco Pellet Heating, LLC, Bethel, Maine, at a public hearing on January 22, 2010. The presentation was intended to share the experiences of Western European countries in their efforts to reduce their dependency on fossil fuels as a means of informing your efforts with similar goals.*

### Availability of Fossil Fuels

The European Union became interested in reducing consumption of fossil fuels much earlier than the United States has developed that interest. Several factors drove their decision to foster the use of renewable resources for heating use.

European Union scientists regularly predict the lifespan of current energy sources. Gas and oil, two of the sources of energy upon which Western Europe is highly dependent, are predicted to be effectively depleted around the middle of this century. Coal, the third common energy source in Europe, has a somewhat longer projected period of availability but is also difficult to use in environmentally friendly ways.

Conversion of heating fuels to those which are sustainably renewable and environmentally friendly, such as sunlight and biomass, could help lengthen the availability of necessary petroleum products and greatly reduce dependency on those who extract them from the Earth.

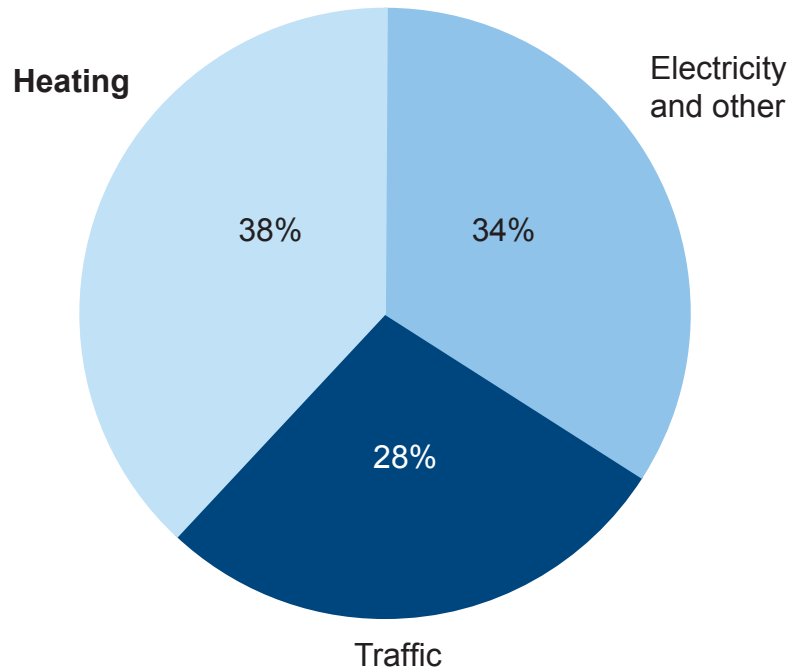


Source: [www.energy.eu](http://www.energy.eu); eurostat

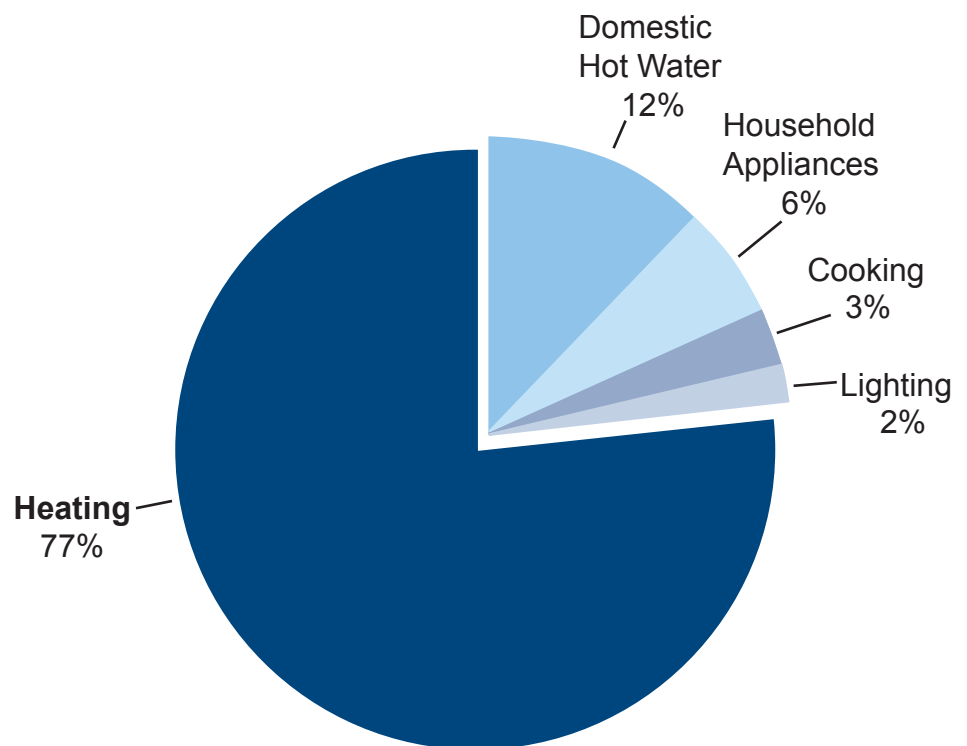
## Energy / Household Energy Consumption

European research showed that energy consumption for heating of buildings represented nearly 40% of the region's energy consumption. That made the heating sector an obvious target for reduction in fossil fuel use.

With strict attention paid to electrical efficiency in the EU, energy for heating of space and domestic hot water represents approximately 90% of household energy consumption with electricity based consumption of smaller proportion than in the U.S. In the Northeastern U.S., heating represents more than 80% of the energy consumption of an average household.



Source: BDH - Germany



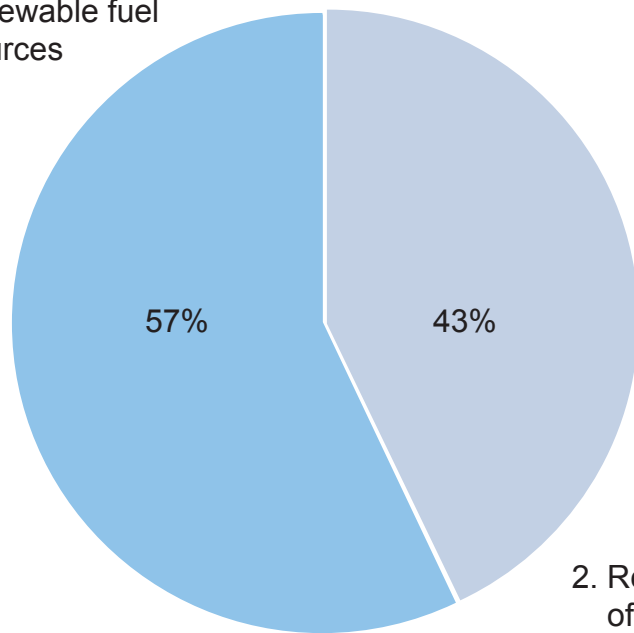
Source: Global 2000

## Heating Policy Strategy

With several possible options available, the countries of the European Union carefully considered best courses of action to achieve their goals of reducing fossil fuel dependency, reducing overall energy consumption, and reducing CO<sub>2</sub> greenhouse gas emission. They discovered that switching to renewable fuels could reduce their consumption of fossil fuels by 57% while reduction of heat demand could be used to achieve the remaining 43% reduction.

Given the greater benefit of fuel-switching practices, the governments of many European countries, undertook programs to incent citizens to switch heating systems to eliminate fossil fuel demand for heating purposes.

1. Switching to renewable fuel sources

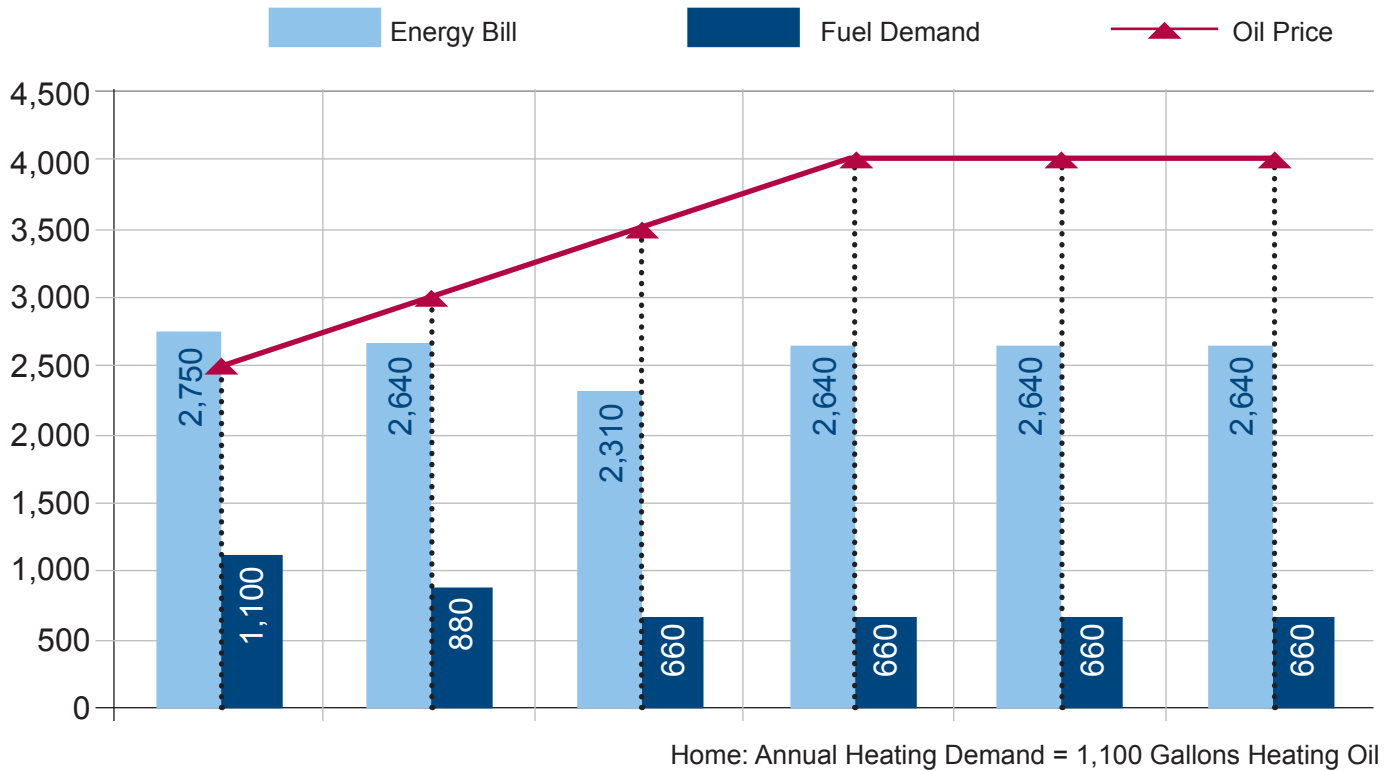


2. Reduction of heat demand

Source: BDH -Germany

## Reduction of Fuel Demand - 40%

Austria was intent upon reducing heating cost to homeowners. With extensive insulation and weatherization it appeared that a 40% reduction in oil demand per residence was possible. As their graph shows, using Northeastern U.S. quantities and values, consumption reduction did not lead to meaningful heating bill reduction for any significant period of time when conservatively projected oil price increases were considered.

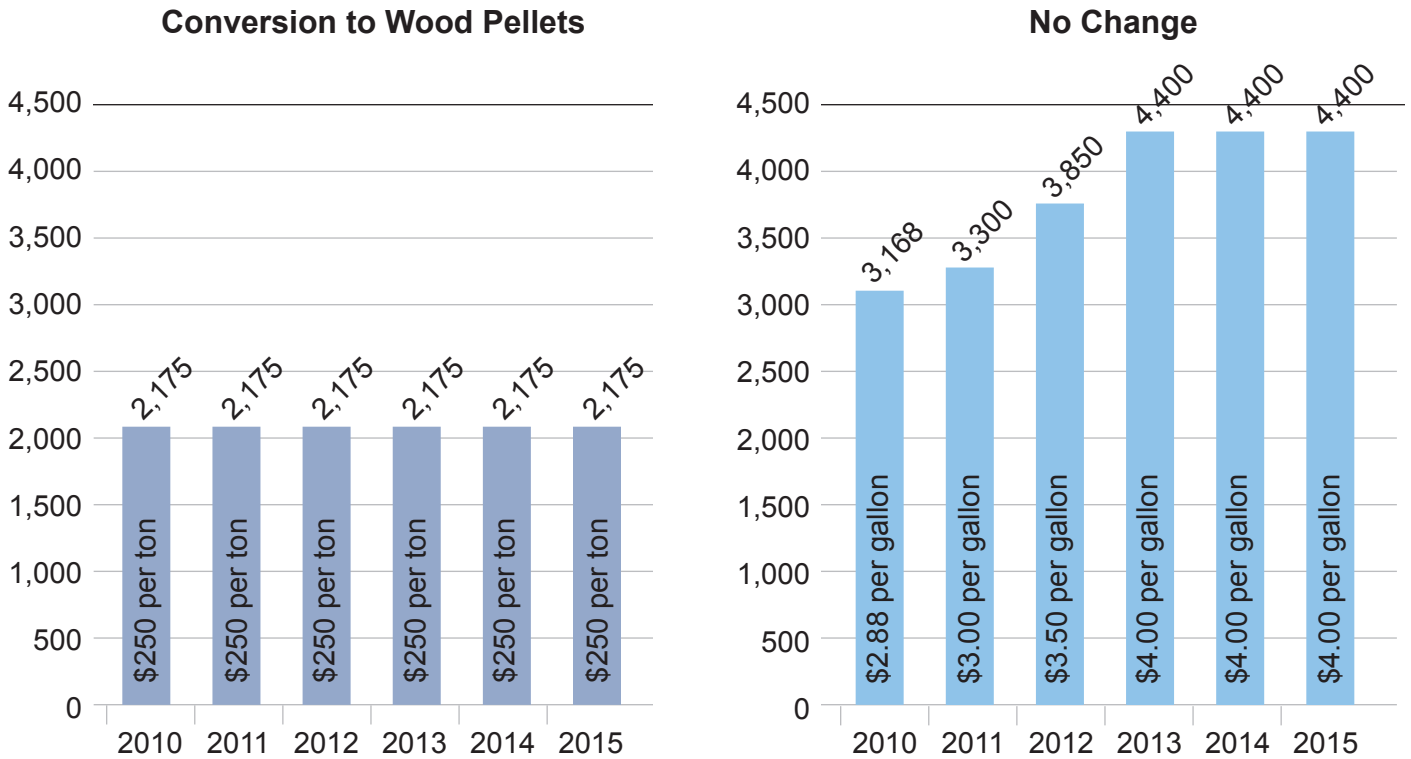


## Conversion to Wood Pellet Fuel

Again using U.S. values, fuel switching from oil to wood pellets showed a projected homeowner heating fuel savings of more than \$10,000 over six years when compared with no change to the home.

Along with projected cost savings and the elimination of dependency on oil, fuel switching to wood pellets reduces the carbon footprint of each house converted by approximately 25,000 pounds of greenhouse gas CO<sub>2</sub> for every 1,000 gallons of oil saved.

European decision-makers favored fuel switching to pellet fired central heating over insulation/weatherization for their initial attempt at reducing oil consumption, greenhouse gas, and dependency because the rate of return on their investment was greater.



Energy cost reduction: \$10,468 over 6 years  
Released CO<sub>2</sub> annually: 862 lb

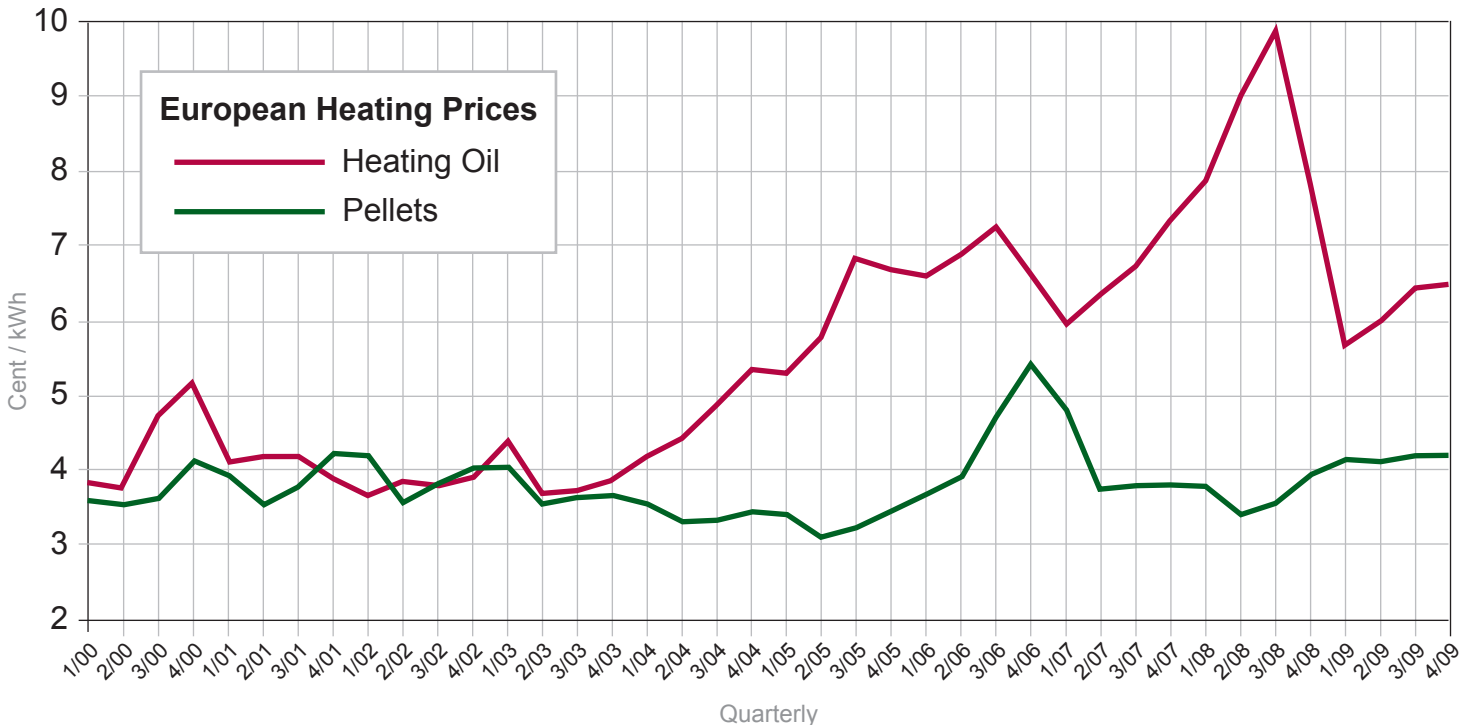
Released CO<sub>2</sub> annually: 27,454 lb

Home: Annual Heating Demand = 1,100 Gallons Heating Oil = 8.7 ton pellets

	Conversion to wood pellet fuel	Insulation measure for 25% reduction
Investment costs	\$18,000	\$18,000
Heating cost reduction during a six year period	\$10,468	\$5,879
CO <sub>2</sub> reduction annually	26,592 lb	6,863 lb
Fuel independence	Yes	No
Availability of fuel	Sustainable	Declining
CO <sub>2</sub> emission	Nearly 0	Substantial

### Conversion to Wood Pellet Fuel

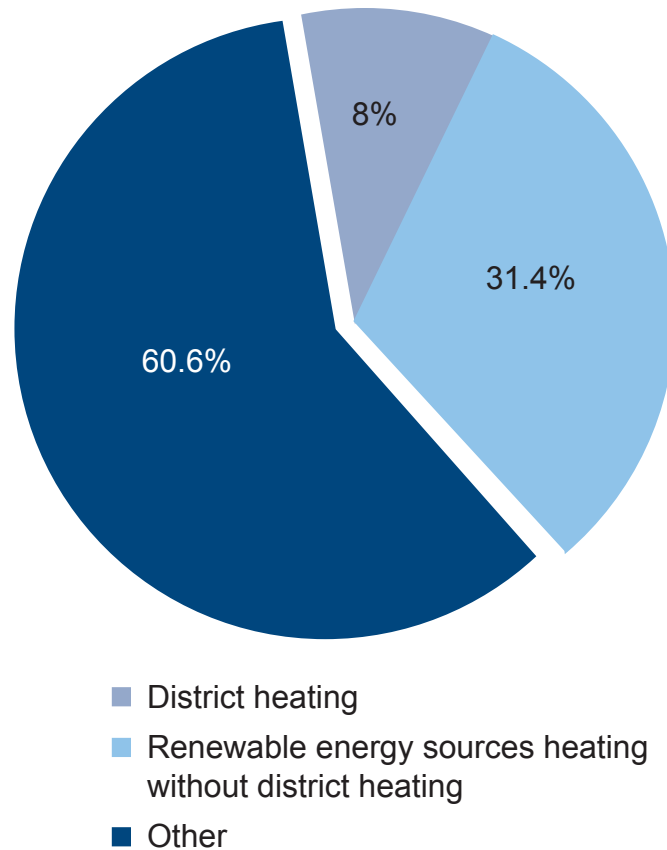
It is noteworthy that European pellet prices are projected to remain relatively constant. Historically that pattern has been demonstrated over more than a decade in Austria with costs per unit of heat output varying only very small amounts showing no significant volatility. Projections made by FutureMetrics for the Northeastern U.S. market reflect that same absence of volatility in bulk pellet price. Historically Northeastern pellet prices have varied less than 50¢ per million BTUs over the past thirteen years while heating oil varied approximately \$8 per million BTUs during the same period.



## Renewable Heating: Market Share

The Austrian, and European, goal is to shift more and more of the regional energy consumption to renewable energy sources. Of course, this should be the goal of us all. Ten years, or more, into their programs to achieve that goal, several European countries, including Austria, have made good progress. Sweden leads the charge.

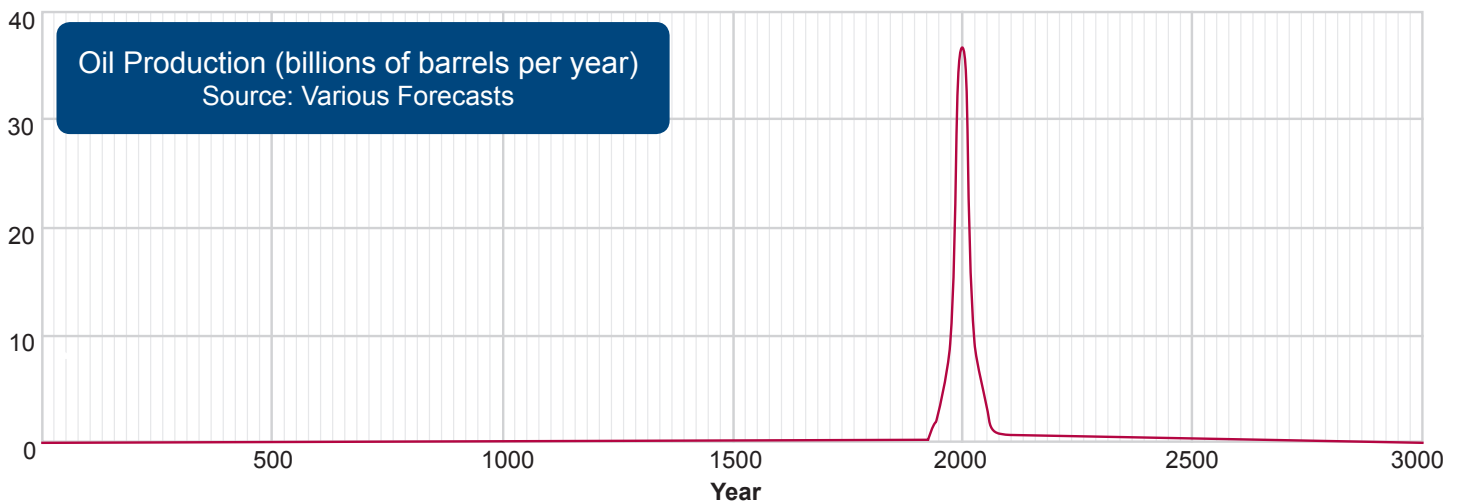
In Austria, it is projected that the last 40% of heating energy currently consumed can be saved by insulation/weatherization after 60% of the heating load has been converted to renewable heating.



Source: Statistik Austria

## Availability of Oil

This graph, partly historical and partly projection, gives us a perspective we might not commonly consider. We are, perhaps, *homo sapiens petroleum*, an intelligent biped which based its culture on a fossil fuel that it was able to deplete in a mere 100 years.



Source: Scientific American Book 1971

## Incentives and Maine's Economy

Maine and the other states have a unique opportunity to shape emerging energy policy. If we learn from those in Western Europe who have a decade of experience working toward goals common with ours, we will use a combination of regulation, education, and incentivization to move us away from the high costs, price volatility, and dependency of fossil fuels for heating.

If we conclude, as they did, that fuel switching is a particularly effective tool to help us achieve our goals, we will create incentives that total approximately 30% of the cost of installed renewable energy heating systems. That level of incentivization is common across Europe and has demonstrated itself effective in encouraging fuel switching largely at private expense.

The spreadsheet on the following page shows that there is a 10% improvement on heating cost reductions for homes which switch from oil to pellet-fired central heating (Line 8).

The spreadsheet, therefore, shows greater fuel savings and annual savings per affected household (Lines 9 and 10).

The spreadsheet shows a greatly reduced exportation of heating dollars (Line 14).

The model demonstrates that not only is incentivization the best use of resources for achieving the stated goals of reducing oil consumption and dependency, reducing heating costs, and reducing greenhouse gases, it is also a wonderful tool for stimulating the Maine economy (Line 17). Retaining virtually all of the money expended on heating in the local economy instead of sending more than three-quarters of that money out of the State and out of the country will have substantial positive impact on Maine's economy.

# INCENTIVES & MAINE'S ECONOMY

Incentivization of fuel switching has been effective in Western Europe both in reducing the consumption of fossil fuels and in reducing greenhouse gas production. In conjunction with Maine's aggressive weatherization efforts, fuel switching incentivization could lead to State-wide economic improvement from which could be drawn on-going funding for Efficiency Maine Trust efforts.

Assumptions	
Program cost	\$6,000,000
Average fuel usage per home in gallons of oil	900 gallons
Average fuel usage per home in tons of pellets	7.5
Tax revenue per dollar spent in the state	12%
Gallons of oil per ton of pellets	120
Tons of CO <sub>2</sub> Per 900 gallons of oil	13.8 Tons
Tons of CO <sub>2</sub> per 900 gallons equivalent of pellets	1.8 Tons
Average equipment change cost	\$18,000
Incentivization rate	17%
Average cost of fuel in next three years (EIA)	\$3.60 per gal
Average cost of pellets in next three years	\$300 per ton

Method	Weatherization	Incentivization
1 Average cost per modification	\$18,000	\$18,000
2 Incentive per installation	\$3,000	\$3,000
3 Homes modified	2,000	2,000
4 Percent reduction in fossil fuels used	23%	100%
5 Gallons of oil saved	414,000	1,800,000
6 Tons of Maine made pellet fuel used	0	15,000
7 Total spent on fuel by affected homes before program	\$6,480,000	\$6,480,000
8 Total spent on fuel by affected homes after program	\$4,989,600	\$4,500,000
9 Fuel costs saved by affected home owners after program	\$1,490,400	\$1,980,000
10 Annual savings to all affected households	\$1,490,400	\$1,980,000
11 Annual savings per affected households	\$745	\$990
12 Proportion of fuel expenditures retained in the state	22%	100%
13 Money not spent on fossil fuel as a result of the program	\$1,490,400	\$6,480,000
14 Maine heating expenditures exported from the State	\$3,891,888	\$0
15 Heating dollars saved by Maine households as a result of the program	\$1,162,512	\$1,980,000
16 Heating dollars kept in the State as a result of the program	\$0	\$4,500,000
<b>17 Total kept in State as a result of the program</b>	<b>\$1,162,512</b>	<b>\$6,480,000</b>
<b>18 Economic multiplier at 1.6</b>	<b>\$1,860,019</b>	<b>\$10,368,000</b>
19 Tax revenue for the State per annum at above rates	\$223,202	\$1,244,160
<b>20 Pounds CO<sub>2</sub> saved as a result of the program</b>	<b>5,700,780</b>	<b>15,615,180</b>
<b>21 Long term jobs created as a result of the program, direct and indirect</b>	<b>0</b>	<b>112</b>

\*Clarifications made to lines 1 and 2 from previously distributed table.