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Energy Efficiency, Business Competitiveness, and Untapped Economic Potential in Maine

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Executive Summary

The economic stresses on Maine's businesses are growing. A slowing economy and rising input costs, particularly for energy, are increasing pressures in a state where concerns about the costs of doing business remain high. But there is much that businesses can do on their own to relieve some of these pressures. Even a quick examination of Maine's energy situation shows that there are both real challenges and opportunities. **Perhaps the single most effective action to enhance Maine's business climate and economic competitiveness is to aggressively increase the energy efficiency of Maine's economy.**

Maine's businesses account for half of the energy used in the state—just to control the temperature in their buildings and to run everything from laptops to paper machines. When business use of transportation such as trucks and ships is included, Maine businesses account for well more than half of the energy used in Maine. But Maine's economy has to find ways to respond to three major challenges:

1. **Energy prices are high and rising.** Petroleum prices are at record highs, and have been steadily climbing for nearly two years. Even when short-term price spikes are gone, energy prices are expected to stay well above the levels that Maine businesses have become used to over the past decade.
2. **Maine pays more for energy than other states.** Prices for electricity, petroleum, and natural gas are higher in Maine than the U.S.
3. **Maine's economy is more energy-intensive.** Thus, Maine suffers a significant competitive disadvantage from energy costs. Energy-intensive industries plus an economy that is spread out at low densities means that Maine needs more energy than other states—far more than other New England states per dollar of output.

The net result is that energy is an absolutely vital consideration for every business in Maine. In comparison to other metropolitan areas in the U.S., energy costs were found to be the most significant difference in the cost of doing business, a far larger factor than taxes.

The importance of energy to Maine's businesses is illustrated by an analysis of the economic impact of implementing some of the most cost-effective energy efficiency measures that have been identified for other states. **If Maine could reduce expenditures by adopting the cost-effective measures identified for other states, businesses in the commercial (non-manufacturing) sector could save $230 million in energy costs, while businesses in the industrial (manufacturing) sector could save up to $129 million, for a total savings to the Maine economy of over $450 million per year at today's energy prices and utilization rates.**

In terms of potential benefits to the Maine economy, the analysis suggests **that by 2020 Maine stands to create between 1,500 and 2,500 new jobs and expand Maine's GDP by between 170 and 260 million depending on overall energy prices.**

Numerous **barriers** stand in the way of becoming more energy-efficient:

- Many businesses do not know what opportunities there are to improve their energy efficiency, or what the costs and benefits of those opportunities are.
- Building codes are inconsistent and often do not address energy efficiency.
- Volatile oil prices increase the apparent risk of investing in energy efficiency.
- Finding funding for energy efficiency improvements can be difficult.
- Those who benefit from energy efficiency investments are not always the same as those who must bear the cost.

The steps needed to address these constraints and to move aggressively to expand energy efficiency measures in Maine businesses fall into four categories:

1. **Better information**, including new comprehensive assessment of the economic potential for energy efficiency in Maine and new pubic-private partnerships to provide technical assistance to businesses seeking to reduce their energy use.

2. Incorporation of enforceable **energy efficiency standards** into building codes whenever such codes are being developed or modified.

3. **Expanded funding** to assist business with energy efficiency investments from public sources and from restructured energy pricing. Examples of the latter include the programs of Efficiency Maine and using the proceeds from the auctions of carbon emission permits under the Regional Greenhouse Gas Initiative.

4. **Better alignment of incentives** within organizations and within energy systems as a whole to make sure that those who are bearing the cost of energy use get the benefits from reducing that use.

Why Energy Efficiency is Important Now

Improving the energy efficiency of Maine's industry, transportation, residential and commercial sectors is critical to increasing the competitiveness of our economy. Energy efficiency improvements are a cost-effective way to reduce the amount of money spent on energy sources, most of which are imported from other regions of the nation and the world. Energy efficiency improvements also reduce the production of greenhouse gas emissions and other pollutants. Consideration of these environmental impacts is increasingly important for business decision-making.

Energy Efficiency is a measure of output per unit input. In heating applications, this means the amount of warmth provided by a given amount of fuel. For lighting, being efficient means using compact florescent bulbs that produce the same amount of light as incandescent bulbs, but use less electricity.

Energy Conservation refers to decreases in energy use. Examples of energy conservation are to use motion sensors in rooms to provide light only when needed or to install programmable thermostats that automatically turn heat down at night.

Because Maine has no fossil fuel reserves, it imports all of its petroleum and natural gas for heating, transportation and electricity generation. Maine does have significant hydropower, wind and wood-fired electricity generation. However, the continued availability and security of reasonably priced fossil energy remains key to Maine's economic prosperity for the near future. Some actions such as increasing the production and stability of the world's oil supply are clearly most effectively pursued at the national and international level. Other actions such as increasing the supply and access to natural gas are best done at the regional level. Energy efficiency improvements can be effectively pursued at the state and local level. **Improving our use of energy is something Maine citizens can take leadership on now**.

Many studies show that there is a large potential for energy efficiency improvements that can save significant energy and money. Like any other opportunity, energy efficiency improvements require upfront investments, but by choosing carefully, these investments can pay for themselves and save on operating costs for residences and businesses, and improve Maine's business climate and environment.

Environmental concerns in energy use are increasingly an issue that every business has to confront, not only because of the current measures necessary to minimize environmental impacts, but also because of the need to address climate change. Maine has already committed through the Northeast Regional Greenhouse Gas Initiative (RGGI) to reduce its carbon emissions over the next decade and a recent Supreme Court case enabled the EPA to address greenhouse gas emissions for the first time. Federal law is also shifting to support enhanced energy efficiency.

The Energy Independence and Security Act of 2007 includes a variety of new standards for lighting and for residential and commercial appliance equipment such as refrigerators and freezers. For the transportation sector, the Energy Act increases the automotive fuel efficiency standards from the current (combined fleet average) of about 25 MPG to 35 MPG by 2020.[1]

Energy codes have been proven as a way to increase energy efficiency. Energy codes for commercial buildings are in place in Maine, and an initiative to require minimum energy standards in new residential construction is currently underway in Maine's legislature.

Smart energy conservation measures require careful planning, commitment and cooperation between the state and local governments, Maine businesses, non-profit organizations and Maine citizens. And it is not always easy or obvious to choose which energy efficiency investments are appropriate. There are still barriers to energy efficiency investments which have to be recognized and addressed.

Current record prices for petroleum will probably recede somewhat, but there are very few energy experts who expect them to return to the price levels of only 24 months ago. Eighty or ninety dollar per barrel oil is the most likely norm for some time to come. At these prices, many energy efficiency investments such as home weatherization and upgrades to EnergyStar appliances become cost-effective. Therefore, it is time to take action.

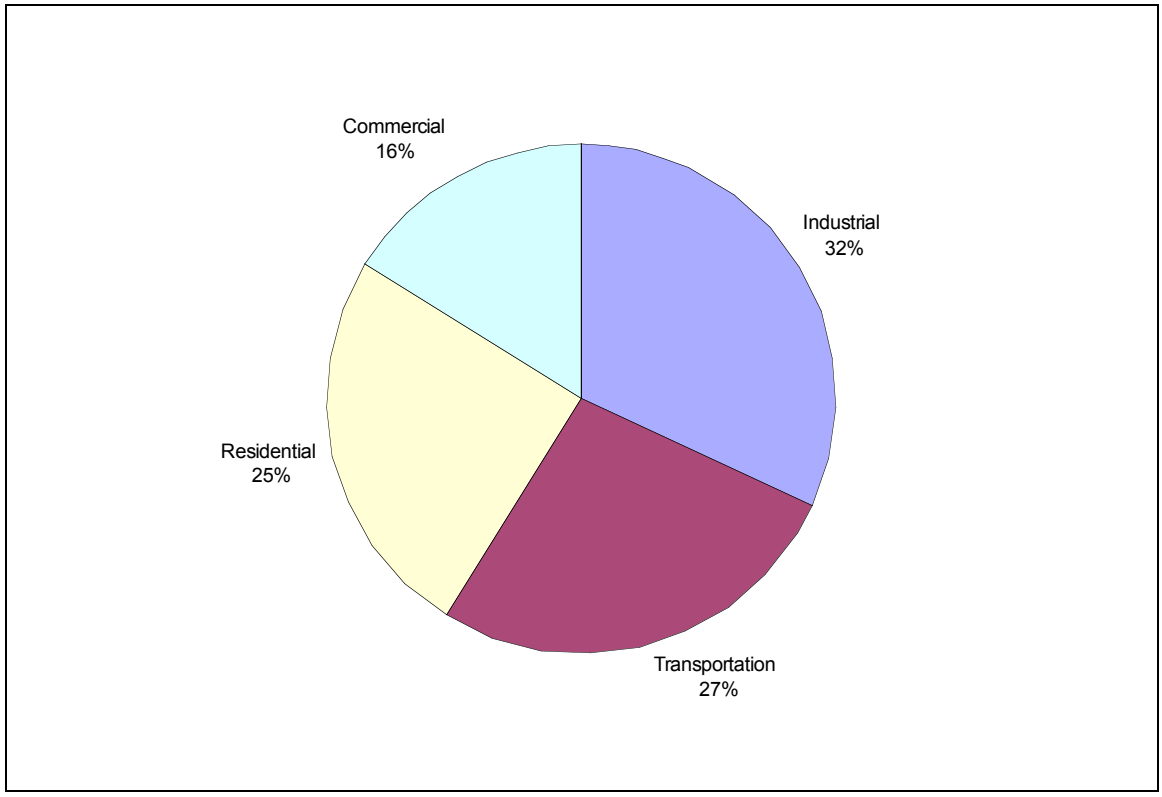
[1] Transportation Energy Data Book (Edition 26), Oak Ridge National Laboratory, Table 4.18

The Current Energy Situation in Maine

The case for energy efficiency investments by business rests on three basic facts about energy in Maine.

First, the commercial and industrial sectors account for half of Maine's energy use. As Figure 1 shows, Maine's industrial sector is the largest user of energy, followed by the transportation, residential and commercial sectors. In this data, energy use by the commercial and industrial sectors does *not* include commercial transportation (which is counted in the transportation sector). When the energy use by commercial trucks, shipping, and aviation is included, the business sectors of the Maine economy account for well more than half of all the energy used in Maine. Businesses throughout Maine thus have enormous potential to invest in energy efficiency improvements that could greatly benefit the bottom line for both the businesses and Maine.

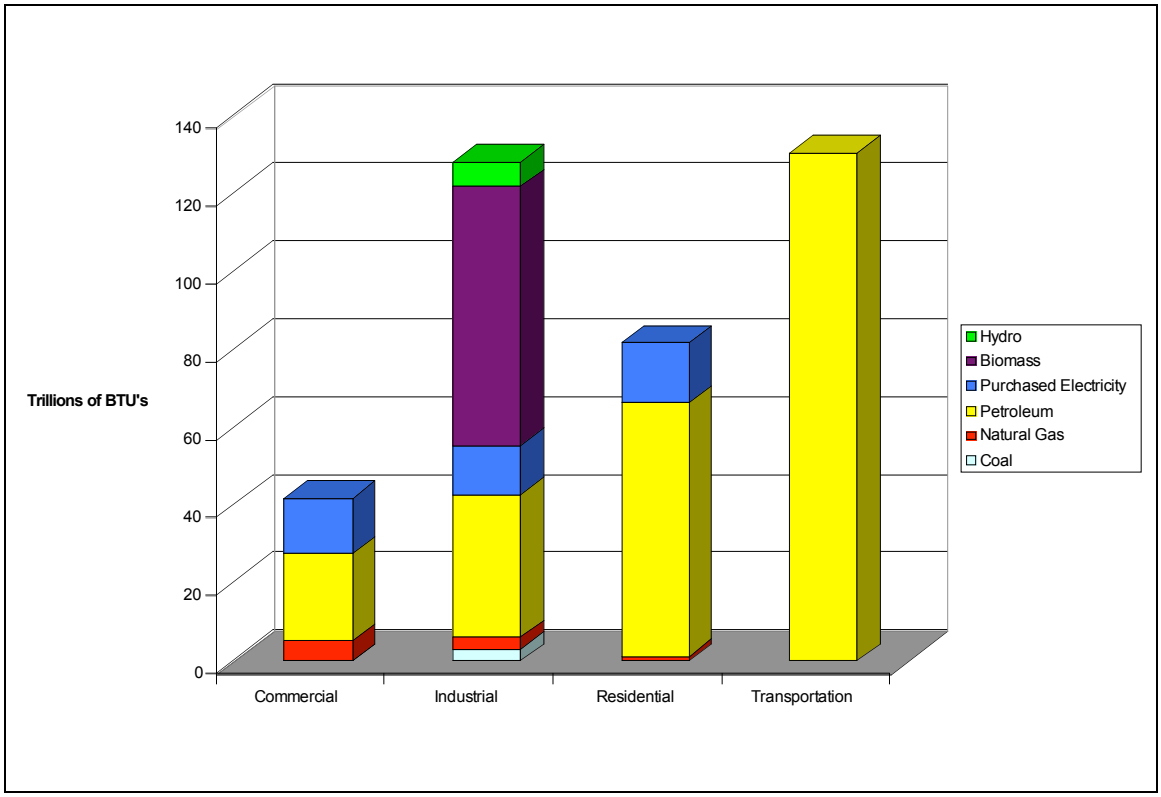
Figure 1: Maine Energy Consumption by End Use, 2005



Source: EIA State Energy Profiles

Second, energy prices are becoming a major drag on the economy in large part because Maine is so petroleum dependent. In 2005, fossil fuels (coal, petroleum products, and natural gas) accounted for nearly three quarters of all energy use in Maine, and all of this had to be brought in from outside of Maine.[2] Petroleum dominates the transportation and residential sectors; only the industrial sector shows any significant diversification in energy sources because of hydroelectricity and biomass. (Figure 2)

Figure 2: Energy Use by Sector: 2005

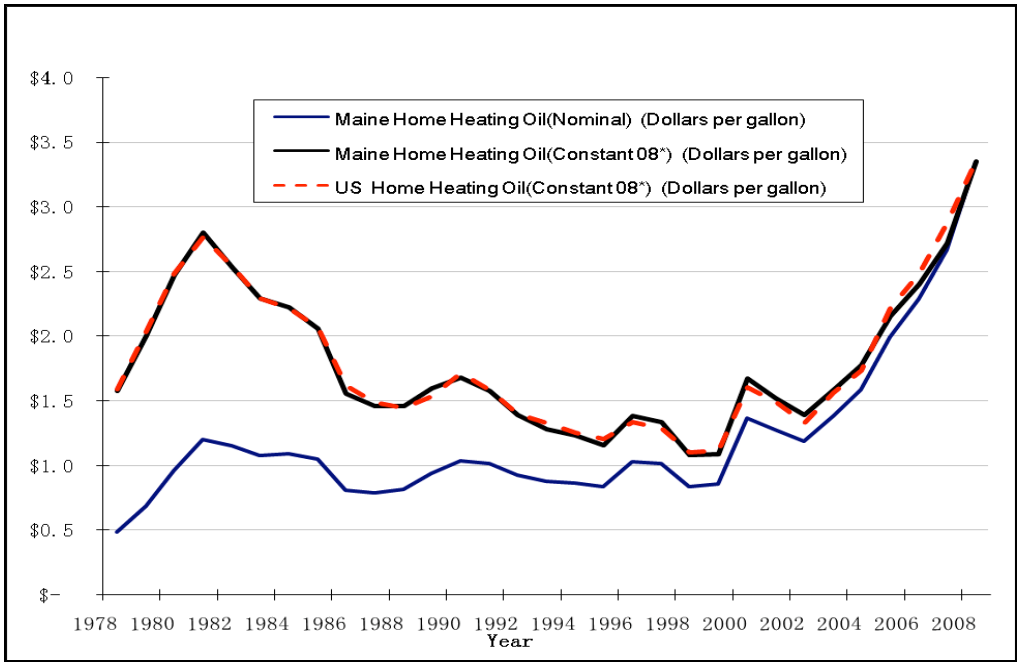


Source: Energy Information Administration

[2] Source: Energy Information Administration, U.S. Department of Energy. These figures assume that 25% of electricity in Maine comes from natural gas-generated electricity.

As Figure 3 shows, petroleum prices (represented here by heating oil) are at or above record high prices in real terms.

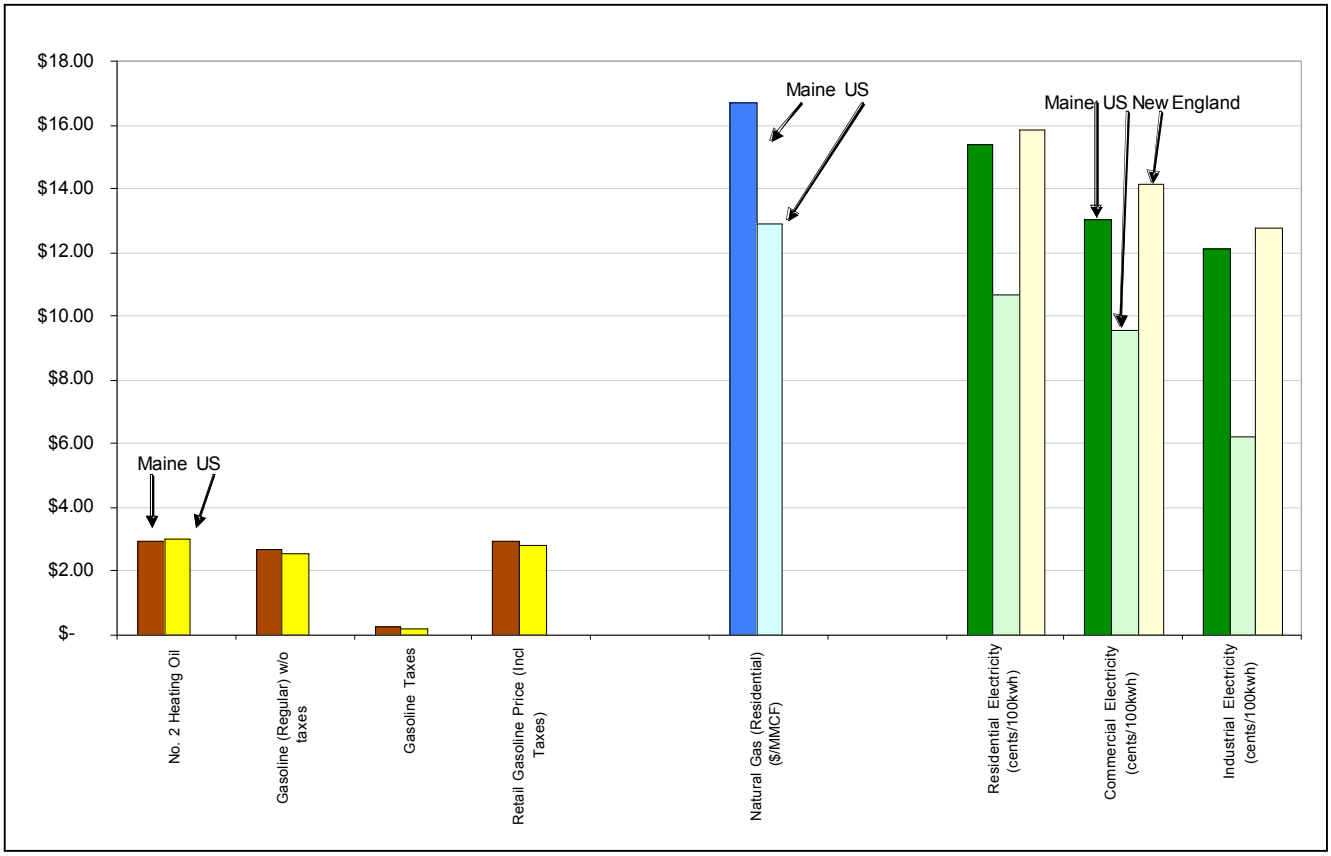
Figure 3: Home Heating Oil Prices 1978 to 2006



Source: Energy Information Administration

But that is not the whole story. As Figure 4 shows, Maine generally pays higher prices for energy than the U.S. average. Maine pays a little less for No. 2 (home) heating oil and electricity prices are somewhat lower in the commercial and industrial sectors than the very high New England average. But Maine pays higher costs for gasoline (both for the fuel and taxes) and significantly higher prices for natural gas in residential uses.

Figure 4: Prices for Selected Energy Sources: 2007



Source: Energy Information Administration

Third, Maine is an energy-intensive economy, using more energy to provide goods and services than other New England states. As the following table shows, Maine ranks as the 24th most energy-intensive economy among the 50 states plus the District of Columbia in terms of amount of energy per dollar of gross domestic product, and 20th among the states on a per-capita energy consumption basis. Maine ranks significantly higher in energy intensity on both of these measures than any other New England state. While high energy industries like pulp and paper account for some of this difference, Maine's energy intensity remains a challenge.

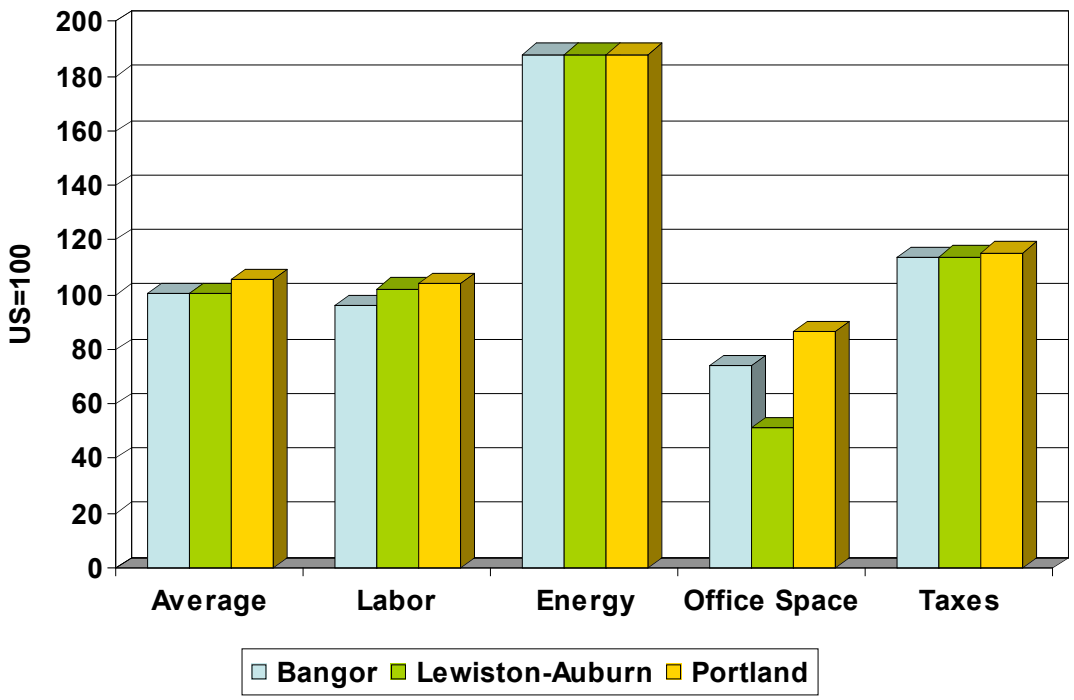
Table 1: Energy Intensity of the Maine Economy

Energy Intensity of the Economy		
	Rank among states and D.C. 1= Most Energy Intensive 50=Least Energy Intensive	
	Energy/$GDP	Energy Per Capita
Maine	24	20
New Hampshire	37	44
Vermont	44	42
Massachusetts	48	48
Connecticut	49	43
Rhode Island	46	51

Source: Energy Information Administration, Bureau of Economic Analysis
MCBER calculations

The result of these trends can be seen in Figure 5, which compares the cost of doing business in the three major metropolitan areas compared with the U.S. (U.S. average=100). Energy costs show up as the most significant difference in the costs of doing business in Maine's cities—a far larger factor based on costs than taxes. This data suggests that effectively addressing Maine's energy use may be the most effective thing the state and its businesses can do to increase competitiveness.

Figure 5: Cost of Business Index for Maine Metropolitan Areas: 2007
U.S. Average=100

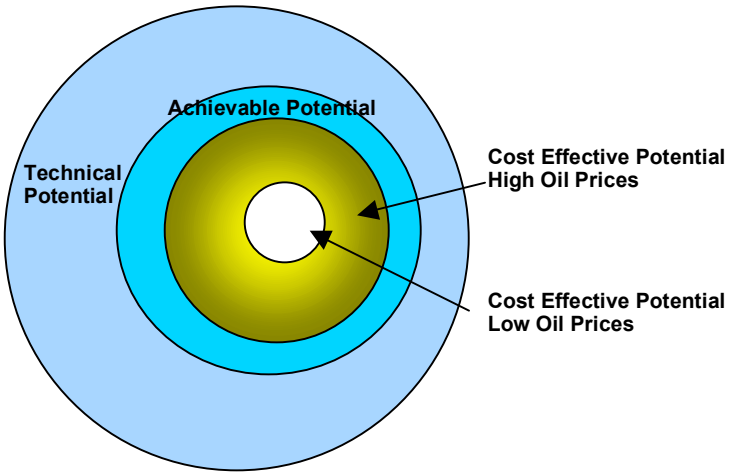


Source: Moody's/Economy.com

Potential and Benefits of Energy Efficiency

Energy efficiency and energy conservation measures can lower the cost of doing business in Maine. Fortunately, the opportunities for improving energy efficiency are substantial. The technological and economic potential of energy efficiency has been well documented for more than thirty years, beginning with the work of Amory Lovins in the 1970's.[34] More recent studies have identified the potential savings and economic benefits from energy efficiency on a comprehensive basis for a number of states. In Maine, a study of the technical and economic potential was conducted in 2002 for the Office of Public Advocate. These studies indicate the types of actions that Maine could take to improve energy efficiency and suggest the possible range of economic effects that these investments might have on the overall economy.

In any study of the potential for energy efficiency it is necessary to distinguish between technology and economics. A large array of energy efficiency measures can be technically implemented. It is technically possible, for example, for every business to replace its heating system. However, it would not be economically sensible for every business to make this change at the same time.



Studies of potential energy efficiency divide the array of possible actions to improve efficiency into three broad categories:

- **Technically possible.** This is a full penetration of the market by all measures that have been demonstrated to be technically feasible from an engineering perspective. This group includes many actions that are technically feasible but not economically feasible.

[3] US Census, Fact Finder
[4] Lovins, Amory B. 1975 *World Energy Strategies: Facts, Issues, and Options*. San Francisco: Friends of the Earth.

- **Achievable Potential.** A level of penetration of technologies that would be adopted given aggressive funding and a concerted, sustained campaign involving highly aggressive programs and market interventions over a given period (for example a decade).

- **Achievable cost-effective potential.** This level of technology penetration limits the results to those which pass a social benefit-cost test, which measures the internal and external cost-savings from various efficiency technologies. As with achievable potential, it is assumed that aggressive incentive programs are utilized and sustained over the estimation period. The amount of cost-effective potential changes with oil prices; it significantly expands with high oil prices such as those currently in place.

The 2002 studies of electricity efficiency in Maine illustrate the differences between these concepts of potential. The technical potential for electricity savings was estimated in the study for the Public Advocate to be between 1.8 to 2.2 million MWh per year, which was nearly 16 to 20% of electricity consumption. On further review, the Public Utilities Commission found the state's achievable cost effective potential to be between 1.2 to 1.6 million MWh per year, 11 to 14% of current state consumption.

Examples of Energy Efficiency Investments for Commercial and Industrial Sectors

Heating
- New boilers, water heaters
- Tune up old boilers
- Adjust water temperature to ambient temperature
- Insulation of pipes
- Heat recovery

Buildings
- Insulation of roofs and windows

Electricity
- More efficient electric motors
- Lighting
- Energy efficient computers and electronics

The highest impact energy efficiency measures identified for Vermont concentrate on greatly improving the efficiency of heating and ventilating for commercial and industrial buildings. Some of the steps involve replacing older equipment with newer, more efficient equipment. Some involve retrofitting existing installations to retain heat to a greater extent. Process improvements are also indicated through the use of lower energy equipment such as dishwashers, controllers and pumps, and electric motors. All of the technologies examined are commercially available, and all are projected to return more in benefits to those making the investments than they cost.

The projection of the rate and extent of adoption of energy efficiency technologies is by its nature uncertain. As noted in a recent study for Connecticut[5], assumptions regarding the levels of support for early adoption of technologies and the effectiveness of awareness campaigns are required, but over any reasonable time horizon there is substantial potential for fossil fuel price changes. There are also new technologies that are not currently known but can be expected to be on the market in the future.

[5] GDS Associates Inc. June 2004. *Independent Assessment of Conservation and Energy Efficiency Potential for Connecticut and the Southwest Connecticut Region* Mariertta, Ga: GDS Associates. Prepared for Connecticut Energy Conservation Management Board.

Studies for Maine and Vermont focus primarily on the potential end users to adopt new technologies for improved energy management. Other studies of the potential for energy efficiency identify possible measures that could be used in the electric utility sector as well as in greatly improving the energy use of new buildings compared with retrofitting older buildings.[6] These studies and others suggest that the potential for reducing energy use is both technically and economically substantial.

In order to make a preliminary estimate of the potential benefits to the Maine economy of investments in energy efficiency, a range of likely cost-effective savings from the studies of Maine, Vermont, Connecticut, and Florida are used. Those savings assessed as achievable and cost-effective were selected. The studies were undertaken at different times and by different organizations However, as Table 2 indicates, at least for estimates of electric cost savings, the variance of estimates is not large. The total estimates of savings shown in Table 2 are converted to annual average changes for analysis. Comparable recent estimates for Maine suitable for use in the simulation analysis discussed here are not available, but the estimates from other states are roughly comparable to a study of energy efficiency possibilities in Maine conducted in 2002 for the Maine Public Advocate.[7]

Table 2: Estimates of Energy Cost Savings from Selected Energy Efficiency Studies

Commercial					
State of Study	Base Year	Target Year	Oil	Propane	Electricity
Vermont	2006	2016	24.2%	21.7%	21.3%
Connecticut	2004	2012			24.2%
Florida	2007	2023			30.0%
Mean					25.2%
Industrial					
	Base Year	Target Year	Oil	Propane	Electricity
Vermont	2006	2016	10.2%	6.7%	14.5%
Connecticut	2004	2012			24.2%
Florida	2007	2023			24.4%
Commercial and Industrial					
Maine	2003	2012			24.0%

Source: See notes 2-5

The estimates of energy savings from these studies can be approximately translated into current dollar terms in Maine. In 2005, the Energy Information Administration estimated that the commercial sector in Maine spent $288.1 million on fossil fuels and $441.8 million on purchased electricity.[8] Adjusted to current price levels, this would imply expenditures of about $560 million[9] on fossil fuels, and $463 million in electricity.[10] A

[6] Elliott, Neal, M. Eldridge, A. Shipley, J. Laitner, S. Nadel, P. Fairey, R. Viera, J. Sonne, A. Silverstein, B. Hedman, and K. Darrow. *Potential for Energy Efficiency and Renewable Energy to Meet Florida's Growing Energy Demands.* June 2007. Washington: American Council for an Energy Efficient Economy.

[7] See Letter of Steven G. Ward, Public Utilities Commission Docket 2002-162,

[8] See http://www.eia.doe.gov/emeu/states/sep_sum/plain_html/sum_ex_com.html.

[9] Using $50/bbl for oil in 2005 and $100/bbl for current prices Data from EIA

[10] Based on estimates for average commercial sector electricity prices in Maine from EIA

24% savings from the Maine study would result in a savings of $135.5 million on fossil fuels, and a 25% reduction in electricity (the average of these states) would result in a savings of $116 million, for a total savings to the commercial sector of over $230 million.

For the industrial sector, the comparable expenditure figures for 2005 are $345.8 million in fossil fuels and $269.3 million in electricity.[11] Again, adjusting to current prices and using the estimates of possible savings from other states' studies, the savings for the industrial sector could be $70 million in petroleum and $59.4 million in electricity, for a total of $129.4 million. These figures for the industrial sector are very conservative because the energy-intensive nature of manufacturing in Maine almost certainly opens many more avenues for possible savings than in other states.

The resulting estimates of annual improvements in energy efficiency were then analyzed using the econometric models of Maine developed by Regional Economic Models Inc. and maintained by the Maine Center for Business and Economic Research at the University of Southern Maine. These models permit analysis of reductions in cost of oil, electricity, and natural gas for the commercial and industrial sectors. Reduced costs in the models lead to increased competitiveness for Maine businesses with resulting increases in employment and output for the economy. These effects on the Maine economy in the year 2020 are shown in Table 3.

Table 3: Estimated Changes in Maine Economic Activity: 2020

Change in 2020 Relative to Base Case	Change in Energy Use, Constant Prices	Change in Energy Use & Price Escalation of 5%/year
Employment	2,596	1,543
GDP (Millions of 2000 Dollars)	$272	$167
Personal Income (Millions of Dollars	$159	$97

Source: Maine Center for Business and Economic Research Estimates

Two different estimates are presented. The first shows the change in employment, gross domestic product (GDP) and personal income if the energy efficiency savings estimated from the other state studies are realized and energy prices remain constant. In this case, implementing energy efficiency savings would increase employment in Maine by nearly 2,600 jobs in 2020 compared to a less energy-efficient economy. In this case, the output of goods and services (GDP) would increase by more than $270 million. This is just a little less in value of output than the output of the computer and electronics industry in Maine in 2005. Personal income would increase by nearly $160 million.

However, the assumption that energy prices will remain constant and thus all of the gains from increased efficiency will be realized in higher output is too optimistic. A second scenario was examined in which energy prices were first assumed to rise at 5% per year for all sources, but without any increases in efficiency; this was then compared with a

[11] See http://www.eia.doe.gov/emeu/states/sep_sum/plain_html/sum_ex_ind.html Figures do not include biomass fueled power.

scenario in which fuel prices rise at 5% but energy efficiency gains of the type examined are realized. In this second analysis, energy efficiency has the effect of reducing the negative effects of ever-rising energy costs. Under these assumptions, the Maine economy has more than 1,500 more jobs in 2020, output is more than $167 million greater, and personal income almost $100 million larger.

The estimates in this analysis only partly reflect the impacts on the Maine economy. They do not include the jobs and economic activity generated in the process of manufacturing, distributing, and installing some energy-efficient technologies, particularly in such activities as the retrofitting of buildings.

There are also benefits from the avoided costs of providing new energy supply. In particular, a 2005 New England-wide study found that saving electricity costs 67% less than supplying it.[12] Also, because peak power demand occurs in predictable schedules and intensities, and pricing is most strongly associated with peak demand patterns, reducing peak demand through increases in energy efficiency can be expected to reduce power prices. This will have the benefits of providing lower costs for those with limited ability to pay, and of inducing additional economic growth through savings obtained.

Other costs that could be avoided if efficiency improvements are made are in future costs to upgrade the transmission and distribution infrastructure needed to deliver electricity. Maine electricity consumers may have to pay up to a billion dollars over the next decade to upgrade the wires that bring electricity just to handle even modest load growth.

Importantly, increased energy efficiency opportunities would also address an often-intractable societal dilemma: the perception that there is little an individual can do to reduce our environmental difficulties. By enabling a broader range of individual choices that pay back initial investments in short periods, more people and businesses will be encouraged to take action.

A recent study by the Wisconsin Focus on Energy Program points to health and safety benefits that will be less visible but will also have economic benefits: [13]

- Increased safety resulting from a reduction of gasses emitted into the atmosphere, such as carbon dioxide.
- Fewer illnesses resulting from elimination of mold problems due to proper sealing, insulating and ventilation of a home.
- Reduced repair and maintenance expense due to having newer, high quality equipment.
- Increased property values resulting from installation of new equipment.

[12] Optimal Energy Inc. May 2005. *Economically Achievable Energy Efficiency Potential in New England*. Bristol, VT: Optimal Energy. Prepared for Northeast Energy Efficiency Partnerships, Inc.
[13] State of Wisconsin Department of Administration Division of Energy, Focus on Energy Public Benefits Statewide Evaluation, *Quarterly Summary Report: Contract Year 2*, Second Quarter, March 31, 2003, Evaluation Contractor: PA Government Services Inc. Prepared by: Focus Evaluation Team.

Similarly, an earlier Wisconsin report documented the following non-energy benefits for businesses:

- Increased productivity
- Improvement in morale
- Reduced repair and maintenance costs
- Reduced waste
- Reduced defect or error rates[14]

Energy efficiency investments will reduce Maine's exposure to costs of carbon in a more emissions-regulated New England, and buffer impacts from price volatility. If energy efficiency improvements are substantial enough, opportunities would be created for export of Maine expertise to neighboring states.

Finally, underlying all these benefits is the larger societal imperative of addressing the challenges of global climate change. Increased energy efficiency is in the interest of all Mainers because of the combined threats of sea level rise, extreme weather events, national security concerns, and other large-scale problems now confronting humankind. Put simply, becoming as energy-efficient as possible, as soon as practicable, is the right thing to do. When it clearly saves money and provides an ample breadth of other opportunities, as summarized above, it is also the only smart thing to do.

[14] State of Wisconsin Department of Administration Division of Energy, Focus on Energy Public Benefits Statewide Evaluation, *Non-Energy Benefits Cross-Cutting Report, Year 1 Efforts,* Evaluation Contractor: PA Government Services Inc., Prepared by: Nick Hall, TecMarket Works, Oregon, Wisconsin Under Contract to PA Consulting, January 20, 2003.

Barriers and Constraints

Numerous barriers exist that could prevent timely implementation of energy efficiency measures in Maine. The most significant of these are described briefly below.

- **Lack of energy efficiency standards, particularly in buildings and enforcement of them.** Significant improvements would be possible if a statewide building code were to be enacted and enforced. These should also include energy efficiency standards as well.

- **Investment risks.** Businesses and individuals often perceive that an energy efficiency investment will not pay for itself, or at least not in a short enough time period. High volatility in petroleum prices reinforces the idea that an energy efficiency investment today may not be worthwhile if oil prices go back to $50/bbl.

- **Imperfect information.** Businesses need good and easily accessible information about how to gain from energy efficiency investments. Updating content and methods for communicating the cost-benefit relationships of energy efficiency investments will help Maine businesses and residents make better decisions about the costs of inaction and benefits of significant targeted action. Businesses also worry about replacing older but familiar equipment, particularly in critical applications, with new untried technology.

- **Inadequate funding for weatherization and other improvements.** Many businesses and individuals that might take major steps to increase energy efficiency do not do so because of upfront costs of the upgrades, even if they know the investments will pay back in a short period. The Public Utilities Commission found that current funding levels for its Efficiency Maine program will achieve between one sixth and one eighth of the economically achievable efficiency potential.[15] This problem can be overcome through state funds for these improvements, perhaps allocated as proceeds from RGGI (Regional Greenhouse Gas Initiative) auctions[16], or as in the Efficiency Maine program, from contributions by energy users to fund efficiency investments that have widespread benefits.

- **Split incentives.** Energy efficiency opportunities are likely to be foregone if actors cannot appropriate the benefits of the investment. For example, if individual departments within an organization are not accountable for their energy use, they will have no incentive to improve energy efficiency.[17] This can be overcome by harmonizing energy efficiency policies within an organization, to

[15] See note 5.
[16] Merrill, S., and Bogdonoff, S. April 2007. *RGGI Allowances: How to Use the Revenues?* New England Environmental Finance Center Series Report #07-04, Muskie School of Public Service, Portland, Maine. http://efc.muskie.usm.maine.edu/docs/Greenhouse_Gas_Allowances.pdf.
[17] Schleich, Joachim. *The economics of energy efficiency: barriers to profitable investments*. November 2007. EIB Papers Volume 12:2. http://www.eib.org/attachments/efs/eibpapers/y07n2v12/04_Schleich.pdf.

ensure all levels are accountable and recognize benefits that accrue through the improvements.

- **Inaction leads to inertia.** Among the costs of failing to innovate on energy efficiency programming is inertia. Absent forward motion, this inertia inhibits the will to make significant change either by individual businesses or the state.

Ideas for the Future

The quest for energy efficiency is not new. It has been ongoing for a number of years, and Maine State Government has undertaken a variety of initiatives which will be of both direct assistance to businesses looking to take their own steps towards lower energy use and can serve as examples of what can be done. Among these actions are:

- **Regional Greenhouse Gas Initiative (RGGI)** Funds from the sale of carbon credits through RGGI are expected to raise millions of dollars in 2009. These funds will be used as grant funds to support a wide variety of efficiency initiatives in Maine.

- **Efficiency Programs of the Public Utilities Commission** Efficiency Maine is a statewide effort to promote the more efficient use of electricity, help Maine residents and businesses reduce energy costs, and improve Maine's environment. Efficiency Maine is funded by electricity consumers. Cumulatively since 2004, Efficiency Maine has produced 2,103,430 MWh of lifetime savings, equivalent to the annual electrical consumption of 309,000 Maine homes. In 2007, programs resulted in an overall benefit-cost ratio of 3.85 to 1 (every dollar invested in efficiency returned $3.85 in societal net economic benefits).[18] Other PUC programs include Voluntary Renewable Resources Fund for the development of renewable resources for electricity production in Maine, the Maine Home Performance, which informs homeowners of qualified service providers for a whole-house approach to home improvements, the Building Operator Certification offered which educates facilities personnel in the efficient operation and maintenance of building systems and solar energy rebates for thermal and photovoltaic systems.

- **Hybrid Vehicles** In 2000, Maine State Government had only one hybrid vehicle in its fleet. In 2003 it had 18. Today the state has 82.

- **Uniform Building and Energy Codes** A proposal before the legislature would establish uniform building and energy codes statewide. If successful, the codes would be adopted statewide and training would be required for code officials and offered to builders, contractors, designers and architects.

- **MaineHousing** MaineHousing has instituted Green Building Standards for all new multi-family housing that it finances. The energy conservation measures incorporated in these standards are estimated to make housing 30 percent more energy-efficient than conventionally built housing. The standards also apply to new single-family homes that MaineHousing helps finance through its new Affordable Subdivision Program.

- **Home Energy Loan Program** The Home Energy Loan Program (HELP) provides home improvement loans to low- and moderate-income homeowners at

[18] Efficiency Maine, 2007 Annual Report. http://www.efficiencymaine.com/pdf/EM.13833.07.Ann.pdf.

very low interest to improve home energy efficiency. Additional information is available from the Maine State Housing Authority.

- **Home Weatherization** The Keep ME Warm and the Low Income Energy Assistance Program (LIHEAP) programs which provide heating assistance, also fund weatherization of low-income households.

- **Renewable Energy** Starting in 2006, the State procured 100% of its electricity from renewable sources through renewable energy credits. The standard electricity mix in Maine includes 30% renewable power. Moving from 30% to 100% renewable power is comparable with displacing about 20,000 tons of carbon dioxide annually from the atmosphere or removing from the road about 2,400 mid-size cars each driving 15,000 miles per year.

- **Funding for Energy Innovation from the Maine Technology Institute** The Maine Technology Institute offers grant funds to businesses and nonprofit institutions for research and development leading to commercialization. Alternative energy projects in biofuels, wind and tidal power have been funded by the Institute. In a recent round of seed grants 17% of the proposals submitted were alternative energy related.

The way forward is simple: increase the quality and quantity of energy efficiency efforts in Maine. Opportunities abound, and it is essential that all Maine residents and businesses evaluate how they can turn these opportunities into reality. Many actions are needed by both the public and private sector to increase energy efficiency in Maine.

Key actions can be summarized in four categories:

- **Provide Better Information**
- **Implement Efficiency Standards**
- **Provide Funding**
- **Align Incentives**

- **Provide Better Information**

  Among the most helpful actions would be those that help Maine residents and businesses understand the opportunity to make money over time through their energy efficiency investments. One simple step that could be taken is to **update studies on the energy efficiency potential for Maine**. As noted above, the last major study of this subject was conducted in 2002, which was a very different environment than today. At that time, oil prices averaged $30 a barrel, and significant actions to contain greenhouse gas emissions were still in the planning stages. An updated study should take into account not only electricity conservation but also the impacts of recent changes in fuel efficiency standards for vehicles and other measures to reduce petroleum use. A thorough assessment of energy efficiency possibilities would also be the necessary precursor to the necessary next step: **a comprehensive energy plan for Maine.**

Public-private partnerships to improve energy efficiency at facilities throughout should be expanded in Maine. Several models exist for these types of relationships, such as the Northeast Energy Efficiency Partnership (in which Maine is an active participant), the Massachusetts Energy Efficiency Partnership[19]. In this program, numerous technical training sessions and technology transfer opportunities are created to support implementation of energy efficient approaches in small to medium industrial facilities across Massachusetts. Training programs have been delivered about steam, pumps, fans, motor systems, variable speed drives, chiller systems, process heating, and automated energy management systems, among many others. Although these programs will cost money to initiate in Maine, the benefits to the Maine economy can be more than commensurate. Further, federal grants from the Department of Energy are available to support such efforts.

- **Implement Efficiency Standards**
  Building codes incorporating energy efficiency standards can be enormously important in making sure that new buildings—and substantial rehabilitations of old buildings—are energy-efficient. Codes are best implemented on a consistent basis statewide, although some variation for local conditions such as in northern or mountain sections may be appropriate. Well-designed and enforced codes can also be combined with other programs such as tax incentives for exceeding code standards.

- **Provide Funding**
  The high level of volatility in energy prices greatly increases the apparent risk of making energy efficiency investments. Steady funding for such investments helps counter that volatility and greatly increase the level of efficiency-promoting activities. Targeted public investments in energy efficiency education programming can increase chances that Maine people and businesses will act. Many programs already do this, but their reach and impact could be greatly enhanced through additional investment.

  Savings of the type that Efficiency Maine has already demonstrated may be found elsewhere in the Maine economy; *not* investing in programs that can deliver them would be a huge missed opportunity. Importantly, the administrative infrastructure to deliver additional savings of this nature exists through Efficiency Maine. Specific areas where additional investment is expected to pay significant dividends include Efficiency Maine's Businesses Program, Residential Program, Low-income Programs, Building Operator Certification, High Performance Schools Program, and Education and Training Program. As noted above, a tax credit for improving efficiency above and beyond what might be required in building codes can also be a source of funding.

[19] Winkler, E. 2005. http://txspace.tamu.edu/bitstream/handle/1969.1/5601/ESL-IE-05-05-40.pdf?sequence=1.

- **Align Incentives**
  Both within organizations and at the system level, incentives for energy efficiency are necessary but insufficient parts of a comprehensive solution. Structures need to be in place to ensure that the benefits of energy efficiency improvements will accrue to those making the investment. Otherwise, "Principal-Agent" problems tend to emerge, such as the landlord-tenant problem in which landlords provide energy-using appliances but tenants pay the energy bill (so that there is little incentive for the landlord to provide energy-efficient appliances).[20]

There are simple things that businesses can do to make sure that everyone has incentives to pay attention to energy use and efficiency. Providing information about the importance of energy use and efficiency is obviously one key part, as noted above. Making sure departments and other subdivisions can measure their energy use, have energy as part of their budgets, and are allowed to keep the savings from reducing energy use and costs can be enormously helpful. Whenever possible, make energy costs and the responsibility for paying them explicit in contracts, and provide incentives to reduce those costs whenever possible.

At the system level, both current and future efforts to reduce greenhouse gas emissions plus ongoing changes in wholesale electric markets and policy will increasingly look to incentives to achieve the desired objectives of adequate energy supplies to support the economy at competitive prices and with small and decreasing environmental impact.

Conclusion

The challenge of global climate change is reason enough to improve energy efficiency. But for other much more local, short-term, and selfish reasons, making Maine as energy efficient as possible is the obvious choice. This is especially true because Maine's economic competitiveness, more than in most states, stands to benefit significantly from energy efficiency improvements. However, absent a sweeping and coordinated public effort to improve energy efficiency in Maine, a host of economic opportunities will be lost. Given the amount of attention paid in Maine to unfair tax burdens and other causes of an uncompetitive business climate, it now appears time to focus on a new area where major economic gains are possible.

[20] International Energy Agency, 2007. Mind the Gap: Quantifying Principal-Agent Problems in Energy Efficiency. International Energy Agency, Paris.