UTAH ENERGY EFFICIENCY STRATEGY: POLICY OPTIONS

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Executive Summary

Governor Jon Huntsman announced on April 26, 2006 a goal of increasing energy efficiency in the state of Utah 20 percent by 2015. The goal covers all sectors and applies to all forms of energy use in the state, including electricity, natural gas, gasoline, and other petroleum products. It is intended to make Utah one of the nation's most energy-efficient states, thereby lowering energy bills paid by consumers, enhancing energy security and reliability, improving business profitability and competitiveness, and reducing air pollutants and greenhouse gas emissions.

In order to help the state achieve the energy efficiency goal, the Governor's Office invited the Southwest Energy Efficiency Project (SWEEP) and Utah Clean Energy (UCE) to prepare a Utah Energy Efficiency Strategy, in collaboration with state officials and other stakeholders. The primary objectives of the strategy are to examine the feasibility of achieving the goal for different forms of energy, develop and evaluate specific options for increasing energy efficiency in Utah, and estimate the economic and environmental impacts of achieving the goal.

The Utah Energy Efficiency Strategy contains 23 major policies, programs, or initiatives that could be implemented in order to accelerate energy efficiency improvements in the state and contribute to achieving the energy efficiency goal. The policies will save electricity, natural gas, motor vehicle fuels, and other petroleum products. These energy sources represent about 85 percent of primary energy use in the state (excluding energy used as an industrial feedstock). We do not consider options for increasing the efficiency of jet fuel use, LPG use, or coal used directly by industry.

Methodology

The methodology begins with a definition of a 20 percent improvement in energy efficiency by 2015. An increase in energy efficiency of 20 percent by 2015 is equivalent to a 16.7 percent (1 – 1/1.20) reduction in projected baseline energy use that year. A 20 percent increase in energy efficiency does not translate to a 20 percent reduction in energy use, in the same manner that a 100 percent increase in energy efficiency does not translate to a 100 percent reduction in energy use (a doubling of energy efficiency represents a 50 percent reduction in energy use).

The baseline scenario is a projection of energy use in the future given expected population and economic growth, but without assuming adoption of new energy efficiency measures and initiatives. Our baseline assumptions, derived from utility forecasts and other sources, include growth in electricity consumption of 3.2 percent per year, growth in natural gas consumption of 1.5 percent per year, and growth in gasoline and diesel consumption combined of 2.0 percent per year during 2006-2020.

We examine the potential of each option in the strategy, and the combination of options, to reduce baseline energy demand. We include the effects of current policies and

programs, policies such as utility demand-side management programs and building energy codes, in estimating energy savings potential in order to give credit for ongoing energy efficiency initiatives. We also project energy use in the baseline scenario and the energy savings from each of our options through 2020. In some cases, the energy savings are moderate by 2015 but increase significantly between 2015 and 2020.

We have taken steps to avoid double counting of energy savings among the various options. This is achieved by reducing the savings potential attributed to certain options that are examined after other overlapping options have been assessed; e.g., we reduce the savings associated with building energy codes, tax credits, and education and training options due to their overlapping with utility demand-side management (DSM) options. In some cases, such as in the transportation area, adjustments are made when summing energy savings in order to avoid overstating energy savings potential.

For the economic analysis, all values are presented in 2006 dollars, with costs and benefits after 2006 discounted using a five percent annual discount rate. Energy prices are assumed to remain constant at their levels in 2006, other than increasing with inflation; i.e., energy prices are assumed to remain constant in real dollars. This is a conservative assumption given that energy prices are rising due to increasing fuel costs, increasing construction costs, and tightening environmental standards. Also, net economic benefits are considered over the lifetime of energy efficiency measures installed during 2006-2015; i.e., we include the full energy savings of measures installed in the latter part of this time period but with discounting the economic value of future savings.

For the environmental impacts analysis, we use the average emissions rates of "avoided" new fossil fuel power plants in the Rocky Mountain region in response to stepped-up energy efficiency efforts. These rates were calculated in another study that made use of the Energy Information Administration's National Energy Modeling System (NEMS) model to determine future power plant emissions in reference and high-efficiency scenarios. Water savings from reduced operation of power plants is based on the average water consumption rates of new coal-fired and natural gas-fired power plants. This value is 0.5 gallons of water savings per kWh of avoided electricity generation.

Options

The energy efficiency strategy contains the following 23 options, grouped by category. The options are a mixture of educational, financing, incentive, and regulatory policies intended to stimulate additional cost-effective energy efficiency improvements on a large scale. For each option, we provide background discussion, a description of the specific proposal, estimated energy savings in 2015 and 2020, cost and cost effectiveness, estimated reductions in criteria pollutant and carbon dioxide emissions, other environmental and social impacts, and a discussion of political considerations. In addition, we include our recommended priority (high, medium, or low) for each option.

Utility Demand-Side Management and Pricing Policies

Option 1: Adopt Energy Savings Standards or Targets for Electric Utility Demand-Side Management Programs – savings standards or targets for Rocky Mountain Power, ramping up over four years to savings of approximately 1 percent of projected electricity sales from DSM programs each year.

Option 2: Adopt Decoupling and/or Shareholder Incentives to Stimulate Greater Utility Support for Energy Efficiency Improvements – either decoupling or performance-based incentives to encourage Rocky Mountain Power to maximize the amount of cost-effective energy savings it achieves.

Option 3: Adopt Innovative Electricity Rates in Order to Stimulate Greater Electricity Conservation and Peak Demand Reduction – critical peak pricing or real-time pricing for residential customers with central air conditioning.

Option 4: Expand Natural Gas Utility Energy Efficiency Programs and Establish Energy Savings Targets for these Programs – expansion of natural gas DSM programs implemented by Questar Gas Company in order to cut total gas sales at least 5 percent by 2015 and nearly 9 percent by 2020.

Buildings and Appliances Policies

Option 5: Upgrade Building Energy Codes and Provide Funding for Code Training and Enforcement Activities – upgrade of the statewide building energy code every three years, considering innovative features of energy codes adopted in other states; provision of training to builders, contractors, and local code officials.

Option 6: Adopt Residential Energy Conservation Ordinances (RECOs) to Upgrade the Energy Efficiency of Existing Homes – energy efficiency requirements at the time a home is sold, beginning with a RECO for rental property in Salt Lake City.

Option 7: Adopt Lamp and Appliance Efficiency Standards for Products Not Covered by Federal Standards – efficiency standards on general service lamps and four other products not covered by federal standards.

Option 8: Expand Low-Income Home Weatherization – state funding to double the number of low-income homes weatherized each year and distribution of 40,000 energy efficiency kits to low-income households.

Option 9: Adopt State Tax Credits for Highly-Efficient New Homes, Commercial Buildings, and Heating and Cooling Equipment – state tax credits for new homes, heating and cooling equipment, and commercial buildings that qualify for the federal energy efficiency tax credit, as well as for modern evaporative cooling systems.

Industrial Policies

Option 10: Undertake an Industry Challenge and Recognition Program to Stimulate Industrial Energy Intensity Reductions – an Industry Challenge and Recognition Program to encourage industrial firms to set voluntarily energy intensity reduction goals and to commit to implementing cost-effective energy efficiency projects at a higher rate than in the past.

Option 11: Remove Barriers and Provide Incentives to Stimulate Greater Adoption of Combined Heat and Power (CHP) Systems – appropriate environmental regulations, utility interconnection policies, and utility tariffs; promotion of fuels other than natural gas for fueling CHP systems; and reasonable financial incentives for high performance CHP systems.

Public Sector Policies

Option 12: Adopt Energy Savings Requirements for State Agencies – require state agencies, including state universities and colleges, to reduce energy use per unit of floor area at least 20 percent by 2015, and technical assistance to help agencies achieve the requirements.

Option 13: Energy Efficiency for Local Government and K-12 Schools, Including the Expansion of Utah's Revolving Loan Fund – expansion of the Revolving Loan Fund, promotion of performance contracting, and other efforts to reduce energy use per unit of floor in local government and K-12 schools at least 15 percent by 2015.

Option 14: Implement Energy Efficiency Education in K-12 Schools – incorporation of energy efficiency and conservation themes into curriculum and energy education blocks taught to K-12 students.

Transportation Policies

Option 15: Adopt Clean Car Standards for New Cars and Light Trucks – the greenhouse gas emissions standards for new cars and light trucks already adopted by eleven other states.

Option 16: Adopt Incentives to Stimulate Purchase of More Efficient Cars and Light Trucks – fees and rebates (a so-called feebate program) for new cars and light trucks based on the rated fuel consumption of each new vehicle.

Option 17: Adopt Pay-As-You-Drive (PAYD) Auto Insurance – payment of a portion of auto insurance based on the number of miles driven each year, starting with a three-year pilot program followed by mandatory phase-in until PAYD insurance is universal.

Option 18: Reduce the Rate of Growth in Vehicle-Miles Traveled – keep the percent growth in vehicle-miles traveled (VMT) to no more than the percent growth in population through a requirement in the State Transportation Improvement Plan.

Option 19: Improve Enforcement of Highway Speed Limits – better enforce highway speed limits through increased use of radar, lasers, and speed cameras, as well as education.

Option 20: Improve the Efficiency of Heavy-Duty Trucks and the Goods Movement System – low-interest loans to promote the purchase of new trucks or the retrofit of existing trucks with energy efficiency technologies and electrification of truck stops.

Option 21: Replacement Tire Efficiency Standards – require that replacement tires have a rolling resistance no greater than that of tires used on new vehicles.

Cross-Cutting Policies

Option 22: Undertake a Broad-Based Energy Efficiency Public Education Campaign – educate the public regarding energy efficiency and conservation measures through a mass media campaign and other messaging techniques.

Option 23: Increase Energy Efficiency Expertise through Training and Certification – training and certification of energy efficiency professionals through community college, vocational, and other types of courses.

Results

Table ES-1 shows the electricity savings results by option. The options that offer the largest savings potential are expanded electricity DSM programs, enhanced and better enforced building energy codes, state lamp and appliance efficiency standards, and the industrial challenge and recognition program. The total electricity savings potential in 2015, 6,189 GWh per year, represents an 18.0 percent reduction from projected baseline

Table ES-1 – Total Electricity Savings Potential

	Savings Potential (GWh/yr)		
Option	**2010**	**2015**	**2020**
Electricity DSM expansion	894	2,375	4,108
Building code upgrades	214	674	1,391
Lamp and appliance standards	137	1,334	2,137
Industrial challenge	130	615	1,183
Public sector initiatives	169	421	604
Public education	226	393	420
Other	202	377	476
TOTAL	**1,972**	**6,189**	**10,319**

electricity consumption that year. Thus the electricity saving options meet Governor Huntsman's energy efficiency goal. Furthermore, the electricity savings continues to grow rapidly after 2015, reaching 25.7 percent of projected electricity demand in 2020 in the baseline scenario. In addition to the substantial electricity savings, implementing these options would also greatly reduce peak power demand.

Figure ES-1 shows the growth in electricity use during 2005-2020 in the baseline and high efficiency scenarios; i.e., assuming implementation of all electricity savings options. In the baseline scenario, electricity demand grows 3.2 percent per year on average. In the high efficiency scenario, electricity demand growth is limited to 1.2 percent per year on average during 2005-2020. Thus, implementing all of the electricity savings options would not entirely eliminate load growth, but it would reduce it by over 60 percent.

Figure ES-1 – Electricity Consumption by Scenario

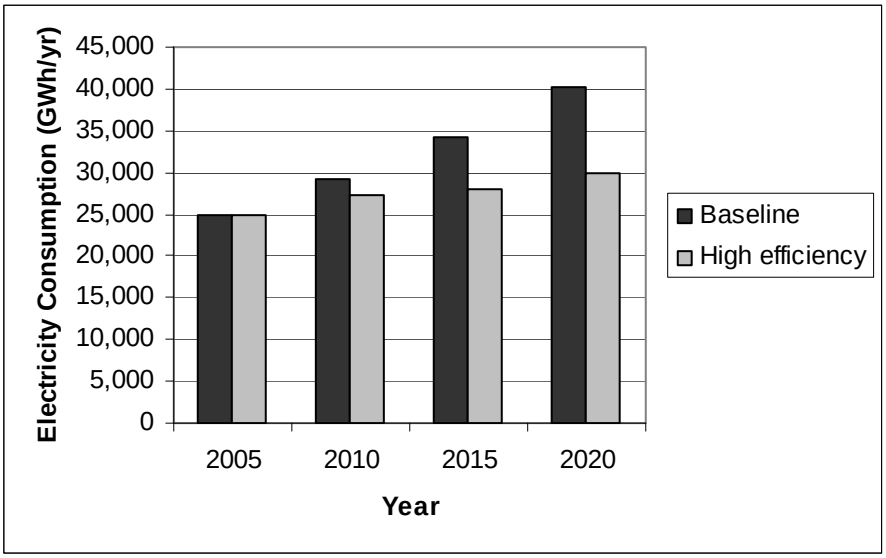


Table ES-2 shows the natural gas savings by option. The options that offer the largest gas savings potential include gas utility DSM programs, building energy codes, and the industrial challenge and recognition program. The total gas savings potential in 2015, 22.2 million decatherms, is equivalent to 14 percent of projected baseline gas consumption for that year. Thus, the natural gas options are not adequate to meet the Governor's goal. However, the gas savings potential continues to grow significantly after 2015, reaching over 22 percent of projected natural gas demand in 2020 in the baseline scenario. The gas savings potential is limited in part by the fact that natural gas use has declined somewhat in recent years due to high gas prices and other factors, meaning that significant efficiency improvements have already occurred.

Table ES-2 – Total Natural Gas Savings Potential

Option	Savings Potential (million decatherms per year)		
	2010	**2015**	**2020**
Gas DSM program expansion	2.33	8.27	14.94
Building code upgrades	1.25	3.74	7.48
Conservation ordinances	0.40	1.20	1.60
Low-income weatherization	0.48	1.28	1.84
Industrial challenge	0.78	3.71	7.25
Public sector initiatives	0.86	2.10	2.96
Public education	1.09	1.75	1.69
Other	0.04	0.14	0.21
TOTAL	**7.23**	**22.19**	**37.97**

Figure ES-2 shows the growth in natural gas use during 2005-2020 in the baseline and high efficiency scenarios. The scenarios do not include natural gas use for electricity generation in the electric utility sector. In the baseline scenario, natural gas consumption increases 1.5 percent per year on average. In the high efficiency scenario, gas demand increases slightly in the early years but then declines in absolute terms. By 2020, total natural gas consumption is slightly below that in 2005. Thus, we estimate that the energy efficiency options are adequate to eliminate growth in natural gas consumption over the medium-term in Utah.

Figure ES-2 – Natural Gas Consumption by Scenario

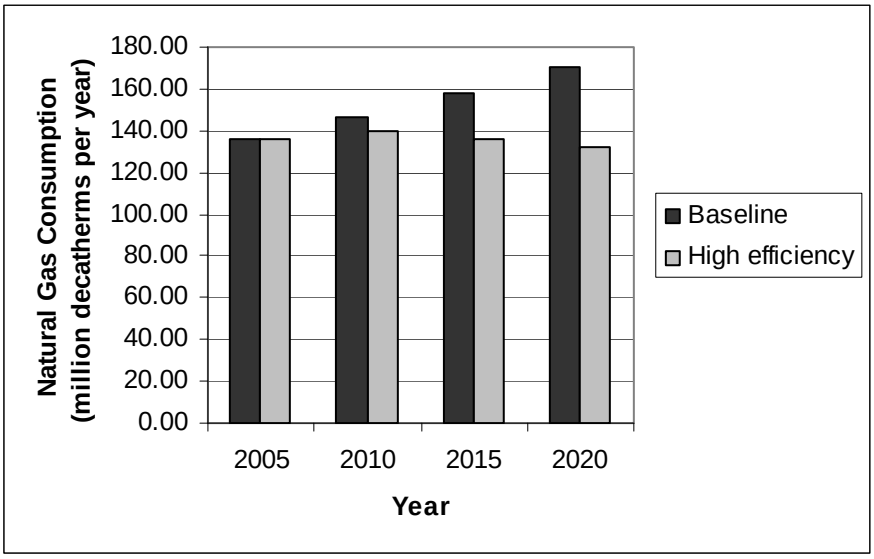


Table ES-3 shows the potential savings of gasoline and diesel fuel. In Chapter VI, each transportation option is analyzed independent of the other options. However, adjustments are made here to consider the gasoline and diesel savings options in

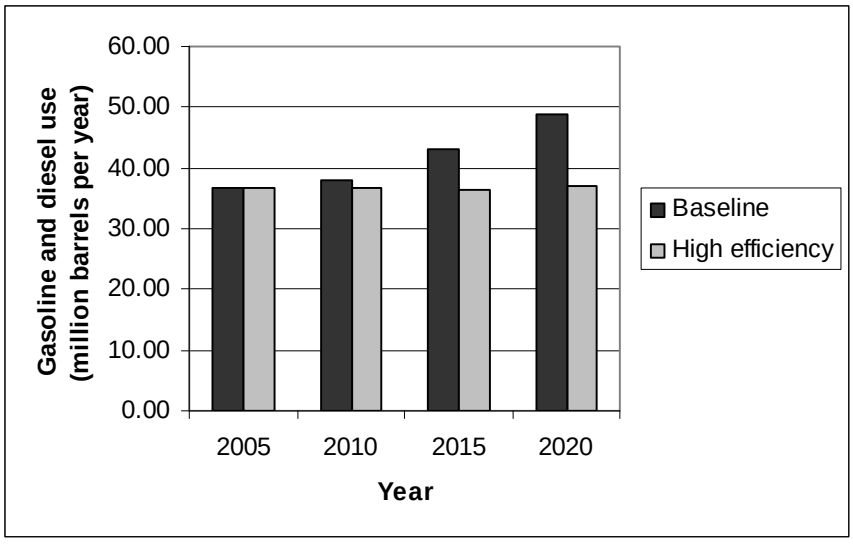
combination and avoid double counting of energy savings. The options that offer the largest potential gasoline savings are the clean car standards and pay-as-you-drive insurance. The gasoline savings potential in 2015 represents 18.3 percent of projected gasoline consumption that year in the baseline scenario. Thus, the gasoline savings options in combination surpass the Governor's energy efficiency improvement goal. However, the diesel fuel savings in 2015 represent only about 9 percent of projected diesel fuel use for that year, in the absence of new efficiency initiatives. Taken together, the gasoline and diesel fuel savings in 2015 represent 15.6 percent of projected fuel consumption that year in the baseline scenario. These energy savings values are conservative in that they do not include the upstream savings in petroleum refining and transport.

Table ES-3 – Total Gasoline and Diesel Savings Potential

	Savings Potential (million barrels per year)		
Option	**2010**	**2015**	**2020**
Clean car standards	0.238	2.076	4.586
Feebates	0.164	0.984	1.784
PAYD insurance	0.030	1.503	3.299
Reduce VMT growth	0.110	0.714	1.423
Enforce speed limits	0.621	0.702	0.796
Truck efficiency measures	0.248	0.992	1.439
Replacement tire standards	0.205	0.676	0.742
TOTAL[1]	**1.518**	**6.718**	**11.803**

[1] The totals do not equal the sum of the values in the columns.

Figure ES-3 – Gasoline and Diesel Fuel Use by Scenario



The gasoline and diesel fuel savings continue to grow significantly after 2015, reaching 11.8 million barrels per year in 2020. This savings potential represents over 24 percent of projected gasoline and diesel use that year in the absence of the efficiency initiatives. Figure ES-3 shows the growth in gasoline and diesel fuel use during 2005-2020 in the baseline and high efficiency scenarios. In the baseline scenario, demand for these fuels increases close to two percent per year on average given expected growth in driving and assumptions about vehicle efficiency. In the high-efficiency scenario, demand for these transportation fuels increases only about 0.3 percent per year on average during 2005-2020. Gasoline consumption actually falls but diesel fuel use still rises.

We also examine the overall energy savings from all fuels and options combined by converting fuels and electricity to primary energy units (Table ES-4). In doing so, we account for energy losses in electricity production and delivery. The primary energy values cover only those fuel types considered in this study; i.e., we do not include other forms of energy such as jet fuel or coal consumed by industry. The options combined lead to 128 trillion Btu of primary savings in 2015, a 16.8 percent reduction relative to primary energy use in the baseline scenario. Thus, the 23 options in combination achieve Governor Huntsman's energy efficiency goal at least for the major forms of energy considered in this study. Furthermore, the primary energy savings reach over 217 trillion Btu in 2020, a 25 percent reduction relative to primary energy use in the baseline scenario.

Table ES-4 – Primary Energy Savings Potential

	Primary Energy Consumption or Savings (trillion Btu per year)			
	2005	**2010**	**2015**	**2020**
Baseline Scenario	598.5	669.3	762.0	868.7
High Efficiency Scenario	598.5	631.4	634.0	651.3
Energy use per capita – Baseline Scenario [1]	237.8	236.3	241.1	249.2
Energy use per capita – High Efficiency Scenario [1]	237.8	222.9	200.6	186.8
Savings in High Efficiency Scenario	0.0	37.9	128.0	217.4
Savings as percent of baseline energy use	0.0	5.7	16.8	25.0

[1] The unit is million Btu per capita.

Figure ES-4 shows projected primary energy per capita over time in each scenario. In the baseline scenario, energy use per capita is projected to increase slightly during 2005-2020. But energy use per capita is projected to decrease over 21 percent between 2005 and 2020 in the high efficiency scenario.

Figure ES-4 – Energy Use per Capita by Scenario

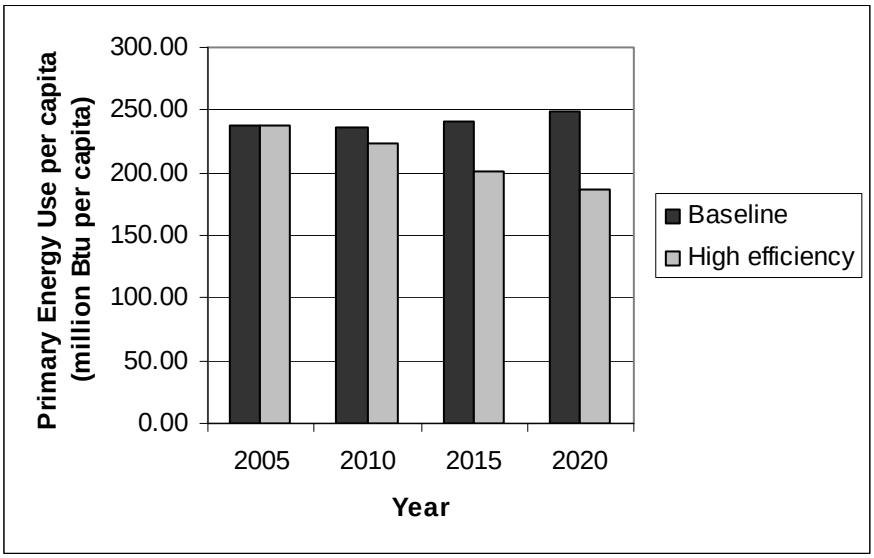
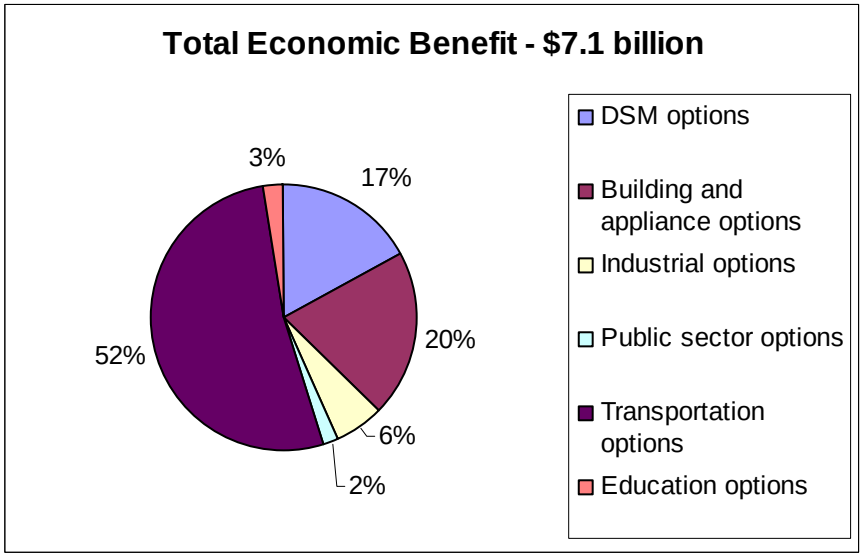


Figure ES-5 shows the estimated net economic benefits of the options where net economic benefits have been quantified. The net economic benefits are the net present value of benefits minus costs for efficiency measures installed during 2006-2015. In total, the estimated net economic benefits of about $7.1 billion is equivalent to saving about $6,700 per household on average, based on the number of households projected in 2015. And again this estimate is conservative in that it assumes energy prices do not rise (in real dollars). In addition, it does not include valuation of non-energy benefits, which in some cases could be substantial.

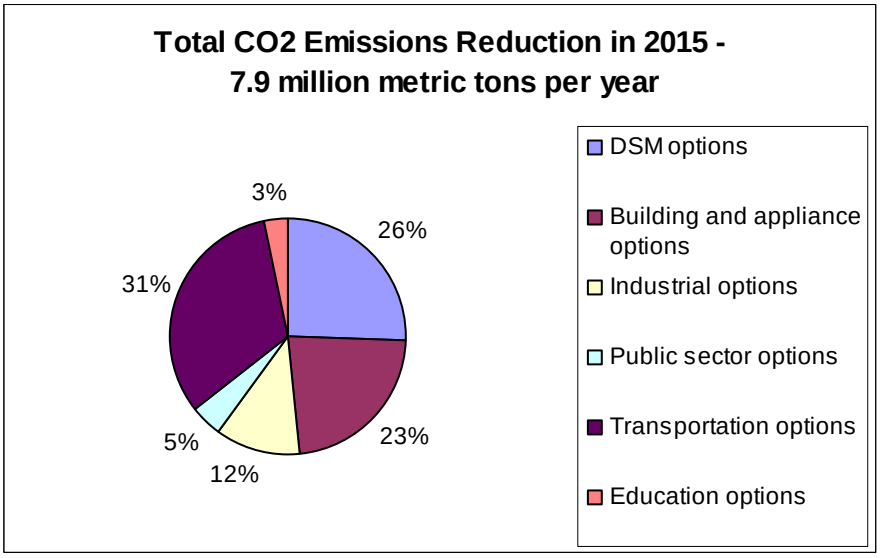
Figure ES-5 – Net Economic Benefit of Energy Efficiency Options



Regarding the potential costs and benefits to Utah's state government, upgrading energy efficiency in state buildings and facilities is the most costly option but also results in a significant net economic benefit to state government. With an investment of about $14 million per year in efficiency measures in state facilities, we estimate net economic benefits of $88 million over the lifetime of efficiency measures implemented during 2007-2015, on a net present value basis. This is more than adequate for offsetting the cost to state government of all the other options combined. These costs to the state are estimated to equal about $9 million per year on average during 2008-2015. The largest item, representing nearly half the total, is the additional state contribution to low-income home weatherization.

Implementing the energy efficiency options would provide substantial environmental benefits within and beyond the state of Utah. Carbon dioxide (CO_2) emissions, the main pollutant contributing to global warming, would be reduced as a result of decreased fossil fuel consumption for power generation, vehicle operation, space heating, and other purposes. Figure ES-6 shows the estimated CO_2 emissions reductions in 2015 by option cluster. Of the total of 7.9 million metric tons of avoided CO_2 emissions that year, transportation options provide about 31 percent, DSM options about 26 percent, and building and appliance options about 23 percent.

Figure ES-6 – Carbon Dioxide Emissions Reductions in 2015 from Implementation of the Energy Efficiency Options



In addition to reduced CO_2 emissions, the options will reduce emissions of other pollutants, including NOx, SO_2, hydrocarbons, and mercury. With respect to options that save electricity, the reduction in these criteria pollutants is somewhat limited by the fact that future electricity savings obviates the need for new power plants—plants that are relatively clean due to the emissions standards on new power plants. With respect to cars and light trucks, increasing energy efficiency through policies such as the clean car

standards and feebates should lead to lower tailpipe pollutant emissions. Although it is difficult to quantify these impacts, the energy efficiency options will help to improve air quality in the Salt Lake City basin in particular.

There also will be significant water savings, particularly from options that result in reduced operation of fossil-fuel based power plants, which consume a significant amount of water in their cooling systems. We estimate that the options taken together will lower water consumption in power plants by approximately 3.4 billion gallons per year in 2015 and 5.6 billion gallons per year in 2020. The latter is equivalent to the annual water use of 36,600 average Salt Lake City households.[1] Furthermore, there will be additional water savings from promotion and increased adoption of energy and water-conserving devices such as resource-efficient clothes washers and dishwashers.

Priority

Among the 23 options developed in this report, we suggest that the following 11 options be viewed as high priority by the Governor, the Legislature, the Public Service Commission, and other key decision makers. These options provide the greatest energy savings and consequently the bulk of the economic and environmental benefits.

- Energy Savings Standards or Targets for Electric Utility Demand-Side Management Programs
- Expanded Natural Gas Utility Energy Efficiency Programs and Energy Savings Targets for These Programs
- Upgraded Building Energy Codes and Funding for Code Training and Enforcement
- Lamp and Appliance Efficiency Standards for Products Not Covered by Federal Standards
- Expand Low-income Home Weatherization
- Industry Challenge and Recognition Program to Stimulate Industrial Energy Intensity Reductions
- Energy Savings Targets for State Agencies
- Clean Car Standards for New Cars and Light Trucks
- Pay-As-You-Drive Auto Insurance

[1] Residential water consumption in Salt Lake City averages about 140 gallons per day per capita, or 153,000 gallons per year per household. See *Water Conservation Master Plan 2004*. Salt Lake City Department of Public Utilities. Salt Lake City, UT.

- Reduce the Rate of Growth in Vehicle-Miles Traveled

- Broad-Based Public Education Campaign

In conclusion, Utah would save a large amount of energy if it adopted the high priority energy efficiency policy options, and possibly other options, described and analyzed in this study. By 2015, electricity use could be reduced by 18 percent, natural gas use by nearly 14 percent, and gasoline use by 18 percent, all in comparison to otherwise forecasted levels of energy use that year. By implementing all of the options, the ambitious energy efficiency goal set by Governor Huntsman could be achieved, at least for the forms of energy considered in this study. Furthermore, the energy savings would continue to grow rapidly during 2016-2020, reaching 25 percent primary energy savings by 2020.

Substantial benefits would result from achieving these levels of energy savings. Consumers and businesses in Utah could save over $7 billion net during the lifetime of efficiency measures implemented through 2015. Water savings would reach at least three billion gallons per year by 2015 and over five billion gallons per year by 2020. Pollutant emissions would be cut as well. Most notably, Utah would significantly reduce its carbon dioxide emissions, thereby contributing to the worldwide effort to limit global warming impacts, and would do so very cost effectively. Local air quality would also improve. Aggressively pursuing greater energy efficiency is truly a winning opportunity for Utah's citizens, businesses, government, and environment.

Energy efficiency is a proven, cost effective energy resource that can help meet Utah's growing energy demands. Energy efficiency improves Utah's competitiveness and has the potential to save billions of dollars, while creating jobs, reducing emissions, and preserving resources for future generations. Utah is well-poised to lead the nation toward a more energy efficient future.

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Photo credits:

Salt Lake Valley at Night courtesy Utah Office of Tourism, photographer Jerry Sintz

Bryce Canyon National Park courtesy Utah Office of Tourism, photographer Frank Jensen

FrontRunner commuter train courtesy of Utah Transportation Authority