SMART ENERGY POLICIES: SAVING MONEY AND REDUCING POLLUTANT EMISSIONS THROUGH GREATER ENERGY EFFICIENCY

Steven Nadel and Howard Geller

with the Tellus Institute

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1001 Connecticut Avenue, NW, Suite 801, Washington, D.C. 20036
202-429-8873 phone, 202-429-2248 fax, http://aceee.org Web site

EXECUTIVE SUMMARY

Multiple Energy Problems Confront the United States

There are a variety of serious energy challenges confronting the United States. California has experienced power shortages and severe electricity price spikes. Power reliability problems could spread to other regions such as the Pacific Northwest or New York. Even if the lights stay on, electricity prices will continue to climb in many regions of the country—utilities in several states have increased electric rates by 40–50% this year. Natural gas prices have also significantly increased in many parts of the country, causing skyrocketing home energy bills this past winter. Furthermore, our reliance on imported oil has grown—oil imports more than doubled during the past 15 years and oil imports now exceed domestic oil production. Rising demand for oil and tight supplies have also caused gasoline prices to rise; the average price of gas in the United States topped $1.70 per gallon earlier this year and while prices have since abated, price spikes are likely to be a periodic phenomenon in the future.

In addition, emissions of the gases that contribute to global climate change continue to rise. In 2000, U.S. greenhouse gas emissions were up 16% relative to levels in 1990. However, under the Global Framework Convention agreed to in Rio de Janeiro in 1992 by then-President Bush and subsequently ratified by the Senate, the United States voluntarily committed to reducing our emissions to 1990 levels by 2000.

Energy Efficiency—A Critical Foundation for U.S. Energy Policy

Most of these problems—reliability, high prices, and reliance on imports—are all fundamentally due to imbalances between energy demand and energy supply. As demand approaches available supply, prices rise and reliability deteriorates. Rising demand for oil (driven primarily by growing transportation sector energy use) combined with declining domestic production feeds the need for more imported oil. Statements by the current Bush Administration suggest that these problems can largely be solved by increasing energy supplies—more oil wells, coal mines, pipelines, refineries, power plants, and transmission lines. However, a supply-only strategy will be expensive (e.g., energy prices will need to be high to sustain private-sector investments in supply), time-consuming (it takes years to develop new energy sources), and harmful to our environment (e.g, adverse impacts on our land and air). Furthermore, available domestic supplies are not adequate to fully support the domestic economy. The United States accounts for one-quarter of global energy demand but has only 8% of known worldwide oil and natural gas reserves, placing limits on how much expanding energy supply can contribute to our energy needs. Instead of a supply-focused energy strategy, a far more rationale approach would be to first reduce energy demand to the extent that it is cost-effective to do so, and then meet the remaining demand with increased energy supplies (domestic or imported).

Energy efficiency improvement has contributed a great deal to our nation's economic growth and increased standard of living over the past 25 years. Total primary energy use per capita in the United States in 2000 was almost identical to that of 1973. Over the same 27-year period, economic output (GDP) per capita increased 74%. In 2000, consumers and businesses spent over $600 billion for total energy use in the United States. Had the nation not dramatically reduced its energy intensity over the previous 27 years, they would have spent at least $430 billion more on energy purchases in 2000.

Even though the United States is much more energy-efficient today than it was 25 years ago, there is still enormous potential for additional cost-effective energy savings. Some newer energy efficiency measures such as hybrid vehicles and sealing home heating ducts have barely begun to be adopted. With proper support, other efficiency measures could be developed and commercialized in coming years. The U.S. Department of Energy (DOE) estimates that increasing energy efficiency throughout the economy could cut national energy use by 10% or more in 2010 and approximately 20% in 2020, with net economic benefits for consumers and businesses. A 1999 ACEEE study estimates that adopting a comprehensive set of policies for advancing energy efficiency could lower national energy use by as much as 18% in 2010 and 33% in 2020, and do so cost-effectively.

Whether the energy savings potential is 20% or 30%, increasing the efficiency of our homes, appliances, vehicles, businesses, and industries should be the cornerstone of national energy policy since it provides a host of benefits. Furthermore, increasing energy efficiency does not present a trade-off between enhancing national security and energy reliability on the one hand and protecting the environment on the other, as do a number of energy supply options. Increasing energy efficiency is a "win-win" strategy from the perspective of economic growth, national security, reliability, and environmental protection.

Energy Efficiency Policy Recommendations

We have identified nine specific policy recommendations that could have a substantial impact on the demand for energy in the United States while also providing positive economic returns to American consumers and businesses. We list these policies in approximate order of energy savings, starting with the policies that yield the largest savings.

1. Increase Corporate Average Fuel Economy

The average fuel economy of new passenger vehicles (cars and light trucks) has declined from about 26 miles per gallon (mpg) in 1988 to 24 mpg in 2000 due to increasing vehicle size and power, the rising market share of light trucks, and the lack of tougher Corporate Average Fuel Economy (CAFE) standards. The original CAFE standards for cars were adopted in 1975 and reached their maximum level in 1985. We recommend increasing the CAFE standards for cars and light trucks by 5% per year for 10 years so that they reach 44 mpg for cars and 33 mpg for light trucks in 2012, with further improvements beyond 2012. Alternatively, the standards for cars and light trucks could be combined into one value for all new passenger vehicles, specifically 38 mpg by 2012. This level of fuel economy improvement is technically feasible, cost-effective for consumers, and can be achieved without compromising vehicle safety.

Higher fuel economy standards should be complemented by (1) implementing tax credits for purchasers of innovative, highly efficient vehicles, (2) expanding taxes on gas-guzzling vehicles, (3) increasing labeling and consumer education efforts, and (4) continuing vigorous research and development (R&D) on fuel-efficient, low-emissions vehicles. This combination of policies would facilitate compliance with the tougher standards.

2. Adopt a National System Benefit Trust Fund

Electric utilities historically have funded programs to encourage more efficient energy use, assist low-income families with home weatherization and energy bill payment, promote the development of renewable energy sources, and undertake R&D. Experience with utility energy efficiency programs in the Northeast, Northwest and Great Lakes region shows that these programs have been highly effective. The value of energy bill savings for households and businesses is about double the costs to produce these savings. Unfortunately, increasing competition and restructuring have led utilities to cut these discretionary "system benefit" expenditures over the past 5 years. Total utility spending on all demand-side management programs (i.e., energy efficiency and peak load reduction) fell by more than 50% from a high of $3.1 billion in 1993 to $1.4 billion in 1999 (1999$).

In order to ensure that energy efficiency programs and other public benefits activities continue following restructuring, 15 states have established system benefits funds through a small charge on all kilowatt-hours flowing through the transmission and distribution grid. We recommend creation of a national systems benefits trust fund that would provide matching funds to states for eligible public benefits expenditures. Specifically, we recommend a non-bypassable wires charge of two-tenths of a cent per kilowatt-hour. This policy would give states and utilities a strong incentive to expand their energy efficiency programs and other public benefits activities.

3. Enact New Equipment Efficiency Standards and Strengthen Existing Standards

Federal appliance and equipment efficiency standards were signed into law by President Reagan in 1987 and expanded under President Bush in 1992. Minimum-efficiency standards were adopted because many market barriers (such as lack of awareness, rush purchases when an existing appliance breaks down, and purchases by builders and landlords) inhibit the purchase of efficient appliances in the unregulated market. Standards remove inefficient products from the market but still leave consumers with a full range of products and features to choose among. Appliance and equipment standards are clearly one of the federal government's most effective energy-saving programs. In 2000, federal appliance and equipment efficiency standards reduced consumer energy bills by approximately $9 billion, with energy bill savings far exceeding any increase in product cost. By 2020, standards already adopted will reduce peak electrical demand by an amount equal to the output of more than 400 power plants of 300 MW each.

In order to provide additional cost-effective savings under this program, we recommend that Congress adopt new efficiency standards for products now or soon to be covered by state efficiency standards. Among the products that should be included are distribution transformers, exit signs, traffic lights, and torchiere lighting fixtures. California is now adopting standards on these products and Massachusetts and Minnesota already have standards on distribution transformers. None of these standards have been controversial and all yield highly cost-effective energy savings. Congress should also adopt standards on commercial refrigeration equipment, commercial unit heaters, and standby power consumption for household appliances and electronic products (such as televisions, VCRs, cable boxes, and audio equipment). In addition, DOE, with adequate funding and encouragement from Congress, should complete equipment standard rulemakings in a timely manner. Finally, the Bush Administration should drop its efforts to roll-back the recently set SEER 13 efficiency standard for residential central air conditioners and heat pumps.

4. Enact Tax Incentives for Highly Energy-Efficient Vehicles, Homes, Commercial Buildings, and Other Products

Many new energy-efficient technologies have been commercialized in recent years or are nearing commercialization. But these technologies may never get manufactured on a large scale or widely used due to barriers such as their initial high cost, market uncertainty, and lack of consumer awareness. Tax incentives would help manufacturers justify mass marketing for innovative energy-efficient technologies. Tax credits also could help buyers (or manufacturers) offset the relatively high first cost premium for the new technologies, thereby helping to build sales and market share. Once the new technologies become widely available and produced on a significant scale, costs should decline and the tax credits could be phased out.

We recommend tax incentives for advanced, high-efficiency appliances, new homes, new commercial buildings, hybrid and fuel cell vehicles, combined heat and power (CHP)systems, and other building equipment such as air conditioners and heat pump water heaters. The total cost to the Treasury would be on the order of $10 billion. These credits would save energy directly due to purchases of equipment eligible for the credits, but even more importantly, if the credits helped to establish these innovative products in the marketplace and reduced the first cost premium so that the products would be viable after the credits were phased out, the indirect impacts would be many times greater than the direct impacts.

5. Expand Federal Energy Efficiency R&D and Deployment Programs

DOE has made many valuable contributions towards increasing the energy efficiency of U.S. buildings, appliances, vehicles, and industries. Consequently, the President's Committee of Advisors on Science and Technology (PCAST) stated in 1997 that "R&D investments in energy efficiency are the most cost-effective way to simultaneously reduce the risks of climate change, oil import interruption, and local air pollution, and to improve the productivity of the economy." A July 2001 National Academy of Sciences review of some of DOE's R&D programs found that a sample of energy efficiency R&D programs resulted in net realized economic benefits of approximately $30 billion (1999$), substantially exceeding the roughly $7 billion (1999$) in total energy efficiency RD&D investment over the 22-year life of the programs. Similarly, the ENERGY STAR deployment programs operated by EPA and DOE have also been very successful.

Based on specific budget recommendations in the PCAST report, we recommend that instead of cutting funding for DOE's R&D programs as proposed this spring by the Bush Administration, funding should instead be increased by about 17% per year for the next 3 years. Funding for EPA's programs should also be expanded at a similar level.

6. Promote Clean, High-Efficiency Combined Heat and Power Systems

CHP systems produce multiple usable energy forms (e.g., electricity and steam) from a single fuel input. These combined systems achieve much greater efficiency than the usual separate systems for producing steam and electricity because the CHP systems recover heat that would otherwise be wasted in separate power production, and use this heat to displace the fuel that otherwise would be used to produce heat in a separate boiler.

Several inequities in government and utility regulations hinder development of CHP resources. These include environmental standards that do not recognize the efficiency gains of CHP systems, utility rules that make it difficult for many CHP systems to connect to the utility grid, and tax depreciation rules that vary the depreciation period for CHP systems from 5–39 years depending on plant ownership. Each of these problems need to be addressed, including: (1) reforming regulations to regulate emissions per unit of energy output rather than per unit of energy input; (2) developing uniform standards for CHP facilities to be interconnected with the local distribution facilities; and (3) standardizing depreciation periods for CHP systems based on the technical and market life of current systems.

7. Voluntary Agreements and Incentives to Reduce Industrial Energy Use

There is substantial potential for cost-effective efficiency improvement in industry. For example, in-depth analyses of specific energy efficiency technologies for the iron and steel, paper and pulp, and cement industries found a total cost-effective energy savings potential of 11–22%. In order to stimulate widespread energy efficiency improvements in the industrial sector, we propose that the U.S. government establish voluntary agreements with individual companies or entire sectors. Companies or sector trade associations would pledge to reduce their overall energy and carbon emissions intensities (energy and carbon per unit of output) by a significant amount, for example, at least 1% per year over 10 years. Companies that make a more substantial commitment (for example, at least 2% per year) could be given ENERGY STAR or similar recognition. The government could encourage participation and support implementation by: (1) providing technical assistance to participating companies that request assistance; (2) offering to postpone consideration of mandatory emissions reductions or tax measures if a large percentage of industries participate and achieve their goals; and (3) expanding federal R&D and demonstration programs for sectors with high participation.

A number of major companies have already made voluntary energy efficiency commitments on their own. For example, Johnson and Johnson set a goal in 1995 of reducing energy costs by10% by 2000 through adoption of "best practices" in its 96 U.S. facilities. As of April 1999, they were 95% of the way towards this goal, with the vast majority of projects providing a payback of 3 years or less. Voluntary agreements between government and industry along the lines proposed here have resulted in substantial energy intensity reductions in some European nations such as Germany, the Netherlands, and Denmark. The United States should build on this experience.

8. Improve the Efficiency and Reduce the Emissions of the Existing Power Plant Fleet

Many old, highly polluting power plants are "grandfathered" under the Clean Air Act. This means that they do not need to meet the same emissions standards for nitrogen oxides (NOx), sulfur dioxide (SO_2), and particulates as plants built after the Clean Air Act of 1970 was enacted. Currently, 850 plants built before 1970 are still operating, with a combined power output of 145,400 MW. In 1999, these plants produced about 21% of our nation's electric generation. These older, dirty power plants emit 3–5 times as much pollution per unit of power generated as newer, coal-fired power plants and 15–50 times as much NOx and particulates as a new combined-cycle natural gas power plant. These older plants also are less efficient than most new plants; the pre-1970 plants have an average heat rate of 11,025 Btus of fuel per kWh generated, compared to modern combined-cycle plants with heat rates of 7,000 or less. When the Clean Air Act was adopted, it was expected that these dirty power plants would eventually be retired. However, many utilities are continuing to operate these plants beyond their "design life" due to their low capital and operating cost.

If old, grandfathered plants were required to meet the same emissions standards as new plants, some plants would be modernized and cleaned up, but many would be shut down and replaced with much more efficient and cleaner generating sources such as combined-cycle natural gas power plants. We recommend that a policy to end "grandfathering" be enacted soon but not take effect until 2010 or thereabouts. This phase-in period would allow owners of these old plants to make plant upgrade vs. replacement decisions and then have sufficient time to implement these decisions without unduly disrupting power markets. Alternatively, the same general objectives would be achieved by adopting new emissions standards as part of a Clean

Air Act "four pollutant" strategy that has been proposed in order to address SOx, NOx, mercury, and carbon dioxide (CO_2) emissions in an integrated fashion. Such a strategy would include tradeable emissions permits, with the number of emissions allowances based on the phase-out of old, dirty, inefficient power plants.

9. Greater Adoption of Current Model Building Energy Codes and Development and Implementation of More Advanced Codes

Building energy codes require all new residential, commercial, and industrial buildings to be built to a minimum level of energy efficiency that is cost-effective and technically feasible. "Good practice" residential and commercial energy codes have been adopted by just over half the states. However, some major states (such as Arizona, Illinois, Michigan, New Jersey, and Texas) have not adopted these "good practice" energy codes. Furthermore, building codes can and should be upgraded. In the case of residential codes, codes can be further improved by including several measures to reduce use of air conditioning in hot climates and by reducing energy losses due to air infiltration and duct leakage. In the case of commercial codes, a new national model standard was published in 1999 that reduces energy use approximately 6% compared to the old "good practice" code. Here too, substantial additional improvements are possible as measures with 10–20% additional savings were included in early drafts but dropped as part of a political process to gain "consensus."

In order to capture the available savings, states should be directed to review their codes and encouraged to revise them. DOE should continue to provide technical assistance for these efforts, with preference given to states that adopt statewide mandatory codes at or above the model codes. The model code organizations (International Energy Conservation Code [IECC] and American Society of Heating, Refrigerating and Air-Conditioning Engineers [ASHRAE]) should also be encouraged to regularly update their codes to incorporate the latest in cost-effective energy-saving measures. IECC has been doing well in this regard, but ASHRAE's 1999 standard revision achieves far less savings than ASHRAE had targeted. Given ASHRAE's conservatism, DOE should broaden its funding activities to include organizations and consortiums of states that are interested in achieving higher levels of energy savings than ASHRAE is able to deliver.

Integrated Analysis

In order to estimate the energy and emissions savings of these nine policies as well as their costs and benefits, we conducted an integrated analysis using the DOE/EIA National Energy Modeling System, known as NEMS. Most of our assumptions for the base case were taken from the NEMS model, specifically as it was applied to produce the *Annual Energy Outlook 2001*. We then modeled each of our policies individually and together to estimate the overall impacts of our policy set and the contribution of each policy towards these combined impacts.

Energy Impacts

Key results of the analysis are summarized in Table ES-1. Overall in the base case, total U.S. primary energy consumption grows1.3% per year on average. Relative to the base case, the nine policies reduce primary energy consumption by 11% by 2010 and by 26% by 2020. Primary energy use rises slightly during the next decade but falls significantly during 2010-2020 (see Figure ES-1).

Table ES-1. Summary of Overall Results for the Base and Policy Cases

	1990	1999	2010 Base Case	2010 Policy Case	2020 Base Case	2020 Policy Case
End Use Energy (Quads)	63.9	71.6	86.5	79.4	98.3	78.9
Primary Energy (Quads)	84.6	96.1	114.6	102.2	128.1	94.2
Energy Use by Fuel (Quads)						
Coal	19.1	21.4	25.2	18.1	26.2	9.5
Oil	33.5	38	44.9	41.9	51.7	42.1
Natural gas	19.3	22	28.7	26	35.5	27.5
Nuclear	6.2	7.8	7.7	7.8	6.1	6.3
Hydro	3	3.2	3.1	3.1	3.1	3.1
Other renewables	3.5	3.4	4.8	5.1	5.2	5.5
Carbon Emissions (Million Metric Tons)	1,338	1,505	1,817	1,540	2,063	1,338
Other Emissions (Million Metric Tons)						
Sulfur dioxide	19.3	20.5	16.5	14.9	16.9	13.1
Nitrogen oxides	21.9	15.8	12.8	11.6	12.7	6.6
Particulate matter (PM-10)	1.7	1.5	1.5	1.4	1.6	1.4
Cumulative Net Savings ($ billions)			-	152	-	591

In the base case, oil consumption would increase by about one-third by 2020, and oil imports would increase by more than 60% over that period. Thus, the oil import fraction is projected to rise from a little over 50% today to about 70% of total U.S. oil use by 2020. The policies evaluated here would significantly reduce overall oil imports. Relative to the base case, annual oil use would be reduced by about 19% and imports by about 40% by 2020. With implementation of the nine policies, U.S. total energy use in 2020 would be about 2% lower than energy use in 1999. Within this overall trend, use of some fuels would increase and use of other fuels would decrease. For example, use of coal would decline 56% over this period, primarily due to substantial retirements of old coal-fired power plants and replacement with natural gas. Due to increased use of natural gas for electricity generation, natural gas use would grow 25% under the policy case relative to 1999 consumption, indicating that increased natural gas supplies would be needed. This growth in natural gas use in the policy case would be substantially less than the 62% increase in natural gas use in the base case. As for petroleum, even with substantial efficiency improvements, petroleum use in the policy case would be 11% higher than use in

1999. With domestic production at best stagnant, this would mean that oil imports would grow modestly, even with a full array of efficiency policies. (By way of comparison, petroleum use would grow 36% in the base case.) Finally, electricity use in 2020 would be about the same as 1999 use, although growth in CHP systems would decrease the need for centrally generated power relative to 1999. In total, while our nine policies would dramatically reduce the need for new energy supplies, even with these policies, there would be some need for new supplies, particularly natural gas.

Figure ES-1. U.S. Energy Consumption Over Time in the Base and Policy Cases

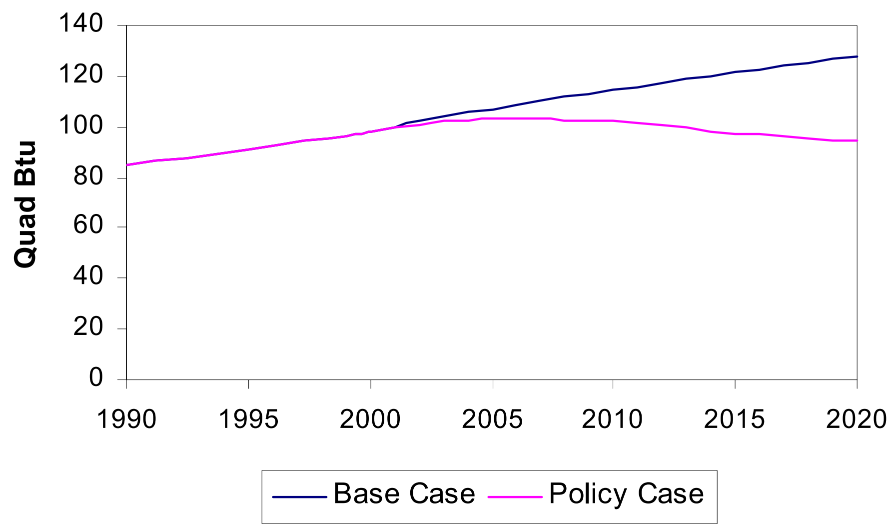


Table ES-2 summarizes savings from the different policies. Each of the policies would have a substantial impact on U.S. energy use, with all saving at least 1.5 quad by 2020 (although tax credits are listed with lower savings since a substantial portion of their savings would be subsumed under the CAFE standards, CHP, appliance standards and building code policies). The largest savings would be achieved by CAFE standards and related policies to improve the fuel economy of light duty vehicles. Public benefit funds and industrial voluntary programs would have the next largest savings. These three policies together would account for about 60% of the savings in our policy case. However, for these policies to achieve such savings, they would need to be stringent along the lines discussed above, with the equivalent of a 38 mpg CAFE standard, a two-tenths of a cent per kilowatt-hour matching public benefit fund, and an industrial targets program backed by significant "carrots and sticks." Scaled-back versions of these policies would result in significantly lower savings.

Intermediate levels of energy savings would be achieved by updated and expanded appliance and equipment efficiency standards, expanded federal R&D and deployment efforts, increased use of CHP systems, and tax credits. Finally, more moderate, albeit still substantial, savings would be achieved by building codes and retirement of old, inefficient power plants. Savings from this latter policy are somewhat limited by our analytical approach, whereby demand-side measures are applied before supply-side measures. With this convention, efficiency programs would lead to substantial power plant retirements, leaving only about half of the old "grandfathered" plants to be affected by the power plant policy. If we had instead considered supply-side policies first, power plant retirements would be included among the policies with intermediate energy savings.

Table ES-2. Energy Use Reductions by Policy

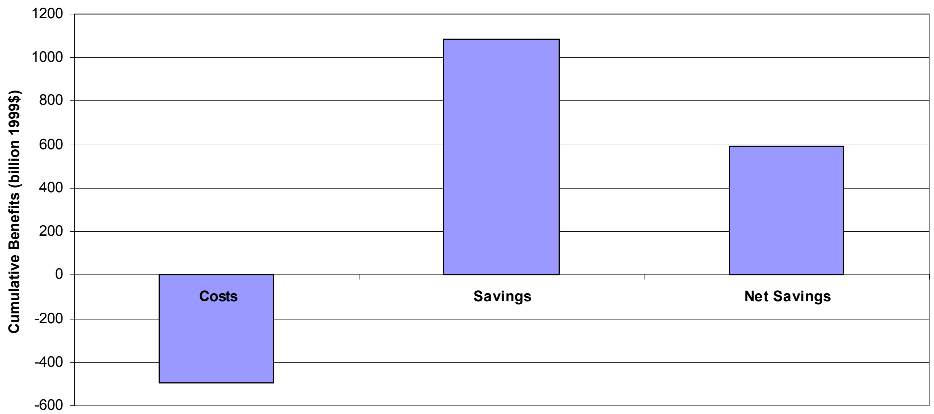
	2010	2020
Total Policy Case Consumption	102.2	94.2
Reduction from industrial policies	4.5	9.5
Reduction from commercial policies	2.7	7.9
Reduction from transport policies	2.1	7.7
Reduction from residential policies	2.5	7.2
Reduction from electric supply policies	0.6	1.5
Total Base Case Consumption	114.6	128.1

Economic Impacts

Figure ES-2 summarizes the direct economic costs and benefits in the policy case. The policies would induce incremental investments in advanced industrial processes; more efficient buildings, lighting, and appliances; more fuel-efficient cars and trucks; cleaner and more efficient power plants; and so on. We estimate a total investment of $127 billion through 2010 and $495 billion through 2020, expressed in 1999 dollars using a 5% real discount rate. To place these figures in context, total U.S. energy expenditures (excluding on-site renewables) equaled a little over $600 billion in 2000. Overall, we estimate that end-users would save over $1,100 billion through 2020 as a result of these policies. The energy bill and operating savings would more than offset the investments costs, with net savings of about $170 billion through 2010 and over $600 billion through 2020. The net savings would grow over time since energy efficiency measures would have more time to pay back their initial cost.

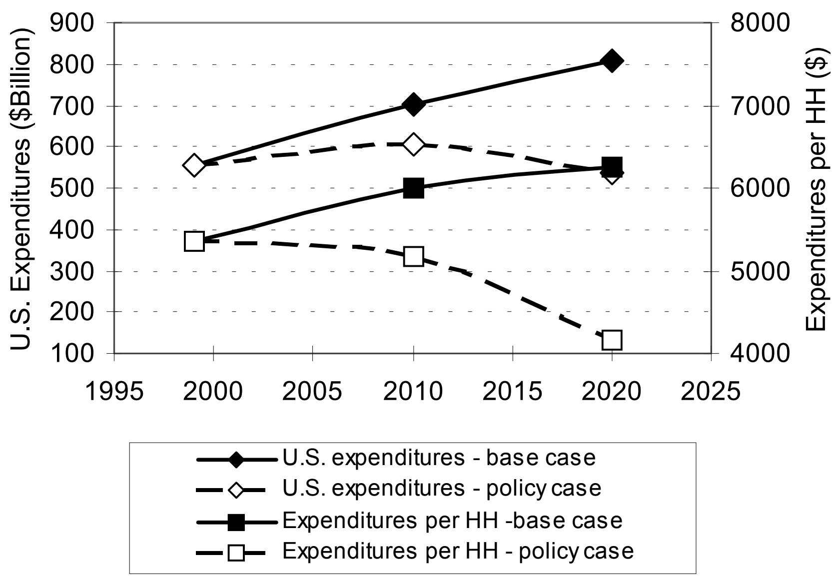
The nine policies would also have a positive impact on the economy by weakening demand for different energy sources, which would result in lower energy prices. In the base case, NEMS projects that domestic electricity and coal prices will decline somewhat in real terms over the 1999–2020 period (e.g., declines of 8% and 25%, respectively), while natural gas prices will increase by 49%. Under the policy case, electricity and coal prices are projected to drop by an additional 7% and 1%, respectively. More dramatically, natural gas prices are projected to decline to below 1999 levels (e.g., to $1.9 per million Btus in 2020), a *37%* decline from the base case.

Figure ES-2. Costs, Savings, and Net Savings for the Policies by 2020



These price declines would have a substantial and positive impact on the U.S. economy and would benefit all consumers and businesses. These indirect benefits are in addition to the direct benefits discussed above. Figure ES-3 summarizes our model results for energy expenditures in the base and policy cases, incorporating both the direct and indirect effects. Viewed on a per household basis, in the base case, energy expenditures per household would gradually climb from $5,355 in 1999 to $6,249 in 2020 (1999$). In the policy case, expenditures per household would be only $4,156, an annual savings of $2,093 per household (a savings of one-third).

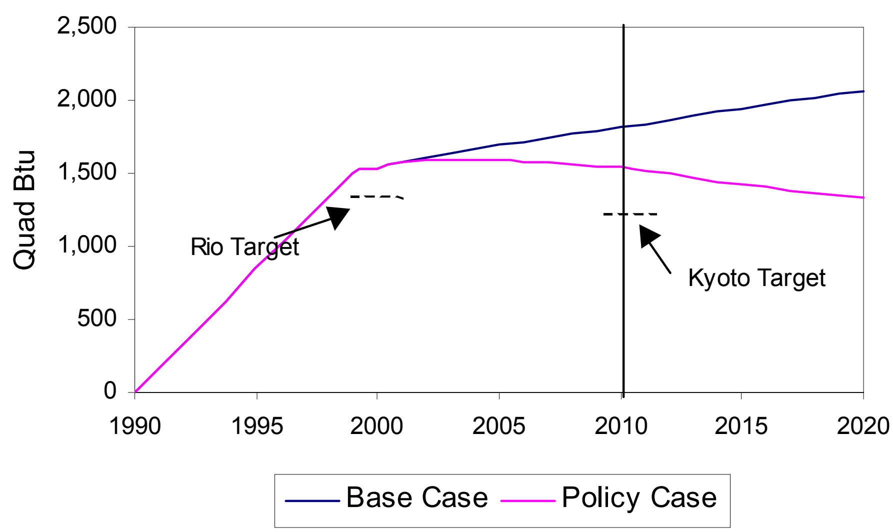
Figure ES-3. Energy Expenditures in the Base and Policy Cases



Emission Impacts

U.S. carbon emission trends in the base and policy cases are illustrated in Figure ES-4. In the base case, carbon emissions would reach 1,817 million metric tons (MMT) carbon equivalent by 2010 and 2,063 MMT by 2020, a 1.5% annual average growth rate during 2000–2020. Base case emissions would be 36% greater than the 1990 level by 2010 and 54% greater by 2020. In the policy case, carbon emissions would decline by 2010 so that they would be the same as 2000 emissions and about 15% above 1990 emissions. While this would not be enough to reach America's Kyoto Protocol target of 7% below 1990 emissions during 2008–2012, it would be strong steps in that direction. It should be possible to achieve the Kyoto target (i.e., a further 290 MMT annual reduction) through some combination of: (1) further domestic reductions from additional policy initiatives, such as policies to promote use of renewable energy sources and policies to reduce energy use for air and truck transportation and vehicle miles traveled for passenger cars; (2) reductions in emissions of other greenhouse gases; (3) purchase of emissions reductions from other Annex 1 countries; and (4) reductions in developing countries from Clean Development Mechanism projects.

Figure ES-4. U.S. Carbon Emissions Over Time in the Base and Policy Cases



In addition to carbon emission reductions, the set of nine policies would also reduce emissions of criteria air pollutants. Implementing the nine policies would reduce SO_2 emissions the most— 48% by 2020. Emissions of NOx would be cut 19% by 2020 and fine particulate emissions would drop 13% by 2020. Clearly, taking action to reduce energy use as proposed in the policy case would provide significant public health and local/regional environmental benefits.

Discussion and Conclusion

Energy efficiency should be a cornerstone for America's energy policy. Taken together, the nine policies recommended here could reduce U.S. energy use by more than 20% in 2020. These efficiency policies alone would not solve all of our energy problems—energy use would continue to grow for a decade or more while these energy-saving policies would gradually take effect. Furthermore, sustaining current rates of energy use into the long-term future would require new sources of energy supply and distribution. However, these efficiency policies would substantially reduce our energy problems, making it easier to find reasonably priced and environmentally acceptable energy supplies to meet U.S. energy demand. In other words, relative to a supply-focused energy strategy, a balanced energy strategy that complements efforts to expand supplies with a major focus on improving efficiency, would have a greater chance of success in terms of ensuring the reliability of the U.S. energy system, reducing economic costs (since all the efficiency strategies incorporated here save consumers and businesses money at projected future energy costs), and protecting the environment.

The general public voices strong support for increasing energy efficiency and a balanced energy strategy. For example, a recent nationwide poll conducted for the *Los Angeles Times* found that when people were read a list of 11 actions to deal with the energy situation, the top four actions (supported by 85–91% of respondents) were "invest in new sources of energy," "mandate more energy-efficient appliances," "mandate more energy-efficient new buildings," and "mandate more energy-efficient cars." Options for increasing the supply and delivery of traditional energy sources received significantly less support.

Ten years ago the previous Bush Administration issued its National Energy Strategy. It gave considerable priority to greater energy efficiency and called for expansion of energy efficiency R&D and technology deployment programs, new policies to stimulate utility energy efficiency programs, establishing new appliance and equipment energy efficiency standards, and new federal incentives to increase energy efficiency. Many of these proposals were incorporated in the Energy Policy Act of 1992, and the budget for and impacts of DOE's energy efficiency programs rose throughout the previous Bush Administration.

In May 2001 the current Bush Administration released its *National Energy Policy*. This policy calls for "advanc[ing] new, environmentally friendly technologies to increase energy supplies and encourage cleaner, more efficient energy use." Unfortunately the policy details do not bear this rhetoric out. Instead, the plan proposes many specific policies for increasing energy supplies, but the major specific efficiency policy is a call for tax incentives for efficient vehicles and CHP systems (a subset of the tax credits we propose). In addition, the plan calls for "reviewing" CAFE and "tak[ing] steps" to set new appliance efficiency standards. These latter suggestions fall well short of our specific policy prescriptions.

Congress is now beginning to consider energy legislation, and these efforts so far go farther than the Bush Administration proposes, but are still well short of what is needed. As of this writing, legislation passed by the House of Representatives includes many of the tax incentives we call for, some of the appliance standards we call for, and an extremely modest increase in CAFE standards. At the same time, both houses of Congress have passed appropriations bills that reverse the budget cuts proposed by the Bush Administration, but do not provide the growth in funding that is needed. All of our other policies are not included in the House legislation. Congress is so far doing much less than what polls show the American people want. Congress needs to redouble its efforts in order to properly value and support energy efficiency in new energy legislation and in appropriations for energy programs.

This report shows that energy efficiency policies would make a very large contribution towards meeting U.S. needs for new energy sources, while reducing emissions and saving consumers and businesses billions of dollars. However, without aggressive policy intervention, many of these benefits will be lost, costing the United States dearly in terms of economics, public health, dependence on imported energy, and adverse impacts on our environment.