

**ENERGY SAVINGS ESTIMATES FROM THE
ENERGY EFFICIENCY PROVISIONS IN THE
ENERGY POLICY ACT OF 1992**

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ABSTRACT

This report estimates the energy savings that are expected to result from the energy efficiency provisions in the Energy Policy Act of 1992 (Public Law 102-486). Most of the energy efficiency provisions are in Title I of the new law, although a few are found in other portions of the law. The energy savings estimates only include incremental impacts from the specific federal policy initiatives. The savings estimates should be viewed as approximate due to the tremendous uncertainty regarding the response to some of the provisions.

We estimate that the energy efficiency provisions in the law will save about 2.0 Quads/yr of primary energy by 2000 and 5.6 Quads/yr by 2010. These savings figures represent 2.1 percent and 5.3 percent of projected energy use in 2000 and 2010, respectively. We estimate cumulative energy savings from the law of about 6.8 Quads through 2000 and 46.0 Quads through 2010. The latter represents about 6.5 months of total national energy use at the current rate of consumption.

Using the latest forecast by the Department of Energy (DOE) as a reference (1), 5.6 Quads of energy savings in 2010 would lower total national energy consumption that year from about 106 Quads to about 100.5 Quads. For comparison, national energy consumption equaled 85 Quads in 1991 (2). Most of the energy savings will be from either coal or natural gas because the efficiency provisions emphasize electrical end uses and the buildings sector. Relatively little oil will be saved because the law ignores vehicle efficiency measures. The failure to include tougher CAFE standards is particularly significant.

We estimate that the electricity savings will reach 107 billion kWh/yr by 2000 and 274 billion kWh/yr by 2010. The savings obtained by 2010 are equivalent to the electricity typically supplied by approximately 104 large (500 MW) coal-fired power plants. The electricity savings also are equivalent to about 20 percent of the projected growth in national electricity demand during 1990-2010, according to DOE.

The estimated carbon emissions reductions resulting from the efficiency provisions are about 43 million metric tons per year by 2000 and 118 million metric tons per year by 2010. The reduction in 2000 represents 2.6 percent of total emissions from fossil fuel use projected for that year, but 30% of the growth in annual emissions between 1990 and 2000 as projected in DOE's latest forecast. Thus, enacting the Energy Policy Act of 1992 represents a significant step towards stabilizing carbon emissions in the United States.

INTRODUCTION

This report estimates the energy savings that could result from the energy efficiency provisions in the Energy Policy Act of 1992 (Public Law 102-486). The provisions discussed below are primarily those included in the energy efficiency title (Title I) of the bill. However, a few energy efficiency-related provisions included in other titles are covered as well.

The energy savings estimates only include incremental impacts from the specific federal policy initiatives. This means that the savings estimates are adjusted to exclude savings from efficiency improvements that are expected to occur without the national legislation (due to market forces, state or utility initiatives, etc.). For example, it is assumed that 30 percent of large motors are energy efficient in the absence of national efficiency standards; thus standards only result in energy savings in the remaining 70 percent of the market. The energy savings estimates pertain to primary energy use.

It should be realized that some of the savings estimates are educated guesses due to the difficulty in projecting savings from encouraging regulatory reform, research and development, adopting voluntary guidelines, providing technical assistance and training, and the like. In these cases, we make conservative assumptions regarding response and savings. Also, in some cases, interactions between different policy proposals are not explicitly taken into account. For these reasons, the savings estimates should be viewed as approximate.

1. Building Energy Efficiency Standards (Section 101)

The Act requires DOE to establish initial federal building energy standards that meet or exceed the CABO Model Energy Code for residential buildings and the ASHRAE 90.1 standard for commercial buildings. New federally-owned buildings would then have to meet the federal building standards as would new public housing and new homes financed through FHA, VA, and FmHA loans. DOE is instructed to promote the adoption of the federal building energy standard at the state and local levels and provide grants to states for upgrading and implementing building energy codes.

The Act also requires that states adopt standards within two years that meet or exceed the ASHRAE 90.1 standard for commercial buildings. If the ASHRAE 90.1 standard is revised in a way that improves energy efficiency, states again must meet or exceed the revised standard. States are encouraged but not required to meet or exceed the CABO Model Energy Code for residential buildings. Finally, DOE is instructed to support the upgrading of the CABO and ASHRAE model standards.

Regarding housing, we assume the Act will lead to a 20 percent reduction in space conditioning energy use in 25 percent of new single family and multi-family housing units built during 1995-2010. Our assumption regarding the number of affected housing units is based in part on the fact that states containing about 50 percent of housing units already meet or exceed the CABO model energy code (3). The estimated energy savings are 0.03 Quads in the year 2000, 0.08 Quads/yr by 2010, 0.06 Quads cumulative during 1993-2000, and 0.57 Quads cumulative during 1993-2010.

Regarding commercial buildings, states representing about 20 percent of commercial building energy use have building codes that already meet or exceed the ASHRAE 90.1 standard for the most part (4). We assume the Act will result in 20 percent energy savings in 50 percent of new commercial buildings constructed during 1995-2010. We assume that the Act affects a greater percentage of commercial floor space as compared with residential floor space because of the more stringent state requirements pertaining to commercial buildings. The estimated energy savings are 0.17 Quads/yr in 2000, 0.51 Quads/yr by 2010, 0.51 Quads cumulative during 1993-2000, and 4.09 Quads cumulative during 1993-2010.

2. Residential Energy Efficiency Ratings and Energy Efficient Mortgages (Sections 102, 105 and 106)

The Act directs DOE to promulgate voluntary uniform guidelines for home energy rating systems and provide assistance to state and local organizations in support of adoption of home energy rating programs based on these guidelines. Also, the Act establishes an energy-efficient mortgage pilot program pertaining to FHA and VA loans in five states. Energy-efficient mortgages involve higher loan amounts for homes that meet certain energy efficiency criteria.

The home energy ratings provisions should have a modest influence on housing energy efficiency by standardizing and increasing the use of home energy ratings. This in turn will facilitate the use of energy-efficient mortgages. Assuming that these proposals lead to efficiency upgrades in approximately 7 percent of homes at the time of sale, we estimate savings of 0.04 Quads/yr by 2000, 0.10 Quads/yr by 2010, 0.13 Quads cumulative during 1993-2000, and 0.78 Quads cumulative during 1993-2010. For the purposes of this analysis, we do not assume further energy savings from the mortgage pilot program.

3. Regional Lighting and Building Centers (section 103)

This provision directs DOE to fund ten regional centers to demonstrate and promote energy-efficient lighting and building technologies. While such centers can be of considerable value (a few successful centers already exist), no energy savings are assumed in this analysis due to the uncertainty about response and

the fact that lighting building efficiency improvements are expected to result from a number of other sections of the law. The lighting and building centers will facilitate the implementation of more stringent building codes, lamp efficiency standards, labeling and education programs, and utility demand-side management programs.

4. Manufactured Housing Standards (section 104)

The Act directs HUD to assess and make recommendations concerning energy efficiency standards for manufactured housing (i.e., mobile homes). The Act also removes federal preemption of state standards if more stringent federal standards are not issued within one year of enactment of the legislation. Since HUD proposed new, more stringent standards for manufactured housing in early 1992, we assume that this provision does not directly lead to any additional energy savings.

5. Electric Utility Regulatory Reform (section 111 and 112)

The Act amends the PURPA legislation and require states to consider regulatory changes that would make investments in both power supply efficiency and end-use efficiency at least as profitable as investments in new power plants. The Act also authorizes DOE to provide grants to states for conducting rulemakings on these issues. These provisions should result in some states reforming their regulations sooner than they otherwise would, which will result in both more aggressive end-use conservation programs and efficiency improvements in power supply. However, the Act only requires consideration of these objectives.

Regarding potential improvements in end-use efficiency, we first acknowledge that utility expenditures on demand-side management are already substantial and are increasing. However, utilities in some states are doing relatively little while those in other states are fairly advanced. We assume that this portion of the Act will lead to an expansion in utility-sponsored end-use electricity conservation programs by \$100 million/yr starting in 1994, increasing to \$900 million/yr by 2000, and further increasing to \$2.0 billion/yr by 2006 and thereafter. This implies maximum additional expenditures on conservation programs that are equivalent to about one percent of current nationwide utility revenues. Of course the Act will not have same effect on all utilities; some will take additional action because of the Act while others will not. The estimated energy savings from this portion of the initiative are 0.11 Quads/yr by 2000, 0.60 Quads/yr by 2010, 0.30 Quads cumulative during 1993-2000, and 4.1 Quads cumulative during 1993-2010.

Regarding potential improvements in power supply efficiency, it is assumed that the provisions lead to 1 percent and 2 percent average energy savings in all coal, oil, and gas-fired power plants

by 2000 and 2010, respectively. The estimated energy savings from this portion of the initiative are 0.3 Quads/yr by 2000, 0.7 Quads/yr by 2010, 1.1 Quads cumulative during 1993-2000, and 6.1 Quads cumulative during 1993-2010.

6. Least-Cost Planning at TVA (section 113)

The Act contains requirements for least-cost integrated resource planning by TVA and implementation of programs to acquire cost-effective energy efficiency resources through its electricity distributors. Since TVA has largely abandoned its energy efficiency programs in recent years, this provision should have a significant impact. We assume that it leads to 5 percent electricity savings by 2000 and 12 percent savings by 2010. The resulting energy savings estimates are 0.08 Quads/yr by 2000, 0.24 Quads/yr by 2010, 0.29 Quads cumulative during 1993-2000, and 1.95 Quads cumulative during 1993-2010.

7. Least-Cost Planning at the Western Area Power Administration (section 114)

The Act contains a number of provisions that require and support least-cost integrated resource planning by the customers of the Western Area Power Administration (WAPA). We assume that these provisions will lead to 5 percent electricity savings by 2000 and 12 percent savings by 2010 in the WAPA service area. The resulting estimated energy savings are 0.03 Quads/yr by 2000, 0.09 Quads/yr by 2010, 0.11 Quads cumulative during 1993-2000, and 0.74 Quads cumulative during 1993-2010.

8. Gas Utility Regulatory Reform (section 115)

The Act amends the PURPA legislation and requires states to consider adopting gas least cost planning as well as regulatory changes that would make energy efficiency investments profitable for gas utilities. This initiative should result in more aggressive conservation programs sponsored by gas utilities in some states.

To evaluate energy savings, it is assumed that the initiative will lead to an expansion in gas utility-sponsored conservation programs of \$70 million/yr starting in 1994, \$490 million/yr by 2000, and \$700 million/yr by 2003 and thereafter. This implies maximum additional expenditures on conservation programs that are equivalent to about 1 percent of nationwide gas utility revenues at the retail level. Also, we assume that gas utility conservation programs save 34 MBtu/yr per \$1000 of expenditure. The resulting energy savings estimates are 0.07 Quads/yr by 2000, 0.30 Quads/yr by 2010, 0.2 Quads cumulative during 1993-2000, and 2.1 Quads cumulative during 1993-2010.

9. Testing and Labeling for Windows (section 121)

This section of the Act establishes a national program for rating and labeling the efficiency of windows and window systems. Since window efficiency testing and labeling is not yet systematically occurring, this initiative should result in some energy savings. Specifically, we assume that this initiative will lead to a moderate efficiency improvement (i.e., use of one low-emissivity coating or its equivalent) in 25 percent of the windows produced during 1993-2000 and a somewhat greater efficiency improvement in 25 percent of windows produced during 2001-2010. The estimated energy savings are 0.06 Quads/yr by 2000, 0.23 Quads/yr by 2010, 0.23 Quads cumulative during 1993-2000, and 1.68 Quads cumulative during 1993-2010.

10. Equipment Efficiency Standards (sections 122, 123 and 124)

These sections contain minimum efficiency standards on certain types of lamps, motors, commercial heating and air conditioning equipment, and plumbing fixtures (showerheads, faucets, and toilets). In addition, DOE is directed to set standards on other types of lamps, small motors, and utility distribution transformers. The standards were agreed to by conservation advocates and equipment manufacturers.

Our analysis involves assumptions about the prescribed or expected efficiency standards for each product type, estimated energy savings per affected product, projected sales of each type of product, and fraction of sales influenced by the standards. The details of our analysis are provided elsewhere (5). The total estimated energy savings are 0.64 Quads/yr by 2000, 1.17 Quads/yr by 2010, 1.98 Quads cumulative during 1993-2000, and 11.61 Quads cumulative during 1993-2010. These savings estimates are based only on initial standards for all the covered products; the savings could be greater if DOE revises the initial standards according to the procedures and timetables set out in the legislation.

11. Efficiency Testing and Ratings for Office Equipment and Luminaires (section 125 and 126)

Since efficiency ratings for office equipment (i.e., personal computers, printers, copiers, etc.) and luminaires (i.e., fluorescent light fixtures) are not readily available at present, establishing test procedures and efficiency ratings will help purchasers who are interested in conserving energy. It also will enable utilities and others to promote the manufacture and purchase of energy-efficient equipment. To analyze these provisions, we assume that efficiency ratings for the covered products first become available in 1995 and that it results in an average efficiency improvement of 8 percent for new luminaires and 17-25 percent for new office equipment. The resulting energy savings are 0.10 Quads/yr by 2000 and 0.19 Quads/yr by 2010. Cumulative

savings are estimated to be 0.39 Quads during 1993-2000 and 1.93 Quads during 1993-2010.

12. Advanced Appliance Development and Early Replacement Programs (section 127 and 128)

The Act directs DOE to prepare a report on the potential for the development and commercialization of highly efficient new appliance technologies (so-called "golden carrot" programs). The Act also requires DOE to evaluate and report on the potential for early replacement programs for appliances. These types of programs can be extremely useful, but the Act only requires DOE to prepare evaluations and make recommendations in reports to the Congress. Since it is not clear that any additional program activity will result from these provisions, no energy savings are assumed.

13. Energy Efficiency in Industrial Facilities (section 131)

The Act authorizes DOE to provide grants to industry associations for programs to promote energy efficiency improvements by industries. In order to be eligible for a grant, an industry association must establish voluntary energy efficiency improvement targets for its members. This provision also requires DOE to evaluate and report to Congress on the feasibility of new energy efficiency reporting requirements and Federally-established voluntary energy efficiency improvement targets for energy-intensive industries.

We assume that this provision has a small impact on manufacturing energy use. Specifically, we assume that the savings targets and grants lead to a 1 percent average reduction in energy intensity in companies responsible for 25 percent of industrial energy use by 2000 and a 2 percent average reduction in energy intensity in these companies by 2010. The resulting estimated energy savings are 0.09 Quads/yr by 2000, 0.20 Quads/yr by 2010, 0.27 Quads cumulative through 2000, and 1.72 Quads cumulative through 2010.

14. Grants to States for Industrial Energy Efficiency Programs (section 132)

This section of the Act authorizes grants to states for information, training, and assistance programs related to promoting energy efficiency in the industrial sector. Such efforts are to be conducted in conjunction with utility conservation programs. In order to be eligible for a grant, a state must encourage its utilities to provide process-oriented energy efficiency assessments and financial incentives for energy efficiency improvements by industries.

To evaluate the impact of this provision, we assume that states receive a total of \$10 million per year, that this funding

leverages efficiency investments at a 10:1 ratio, and that the conservation measures have a typical payback period of three years. The estimated energy savings are 0.05 Quads/yr by 2000, 0.09 Quads/yr by 2010, 0.16 Quads cumulative during 1993-2000, and 0.80 Quads cumulative during 1993-2010.

15. Industrial Insulation and Audit Guidelines (section 133)

The Act requires DOE to develop voluntary guidelines for industrial audits and for insulation levels in industrial facilities, and to conduct education and technical assistance programs to promote use of the voluntary guidelines. These actions could lead to better identification of cost-effective energy savings measures in factories. But we assume this provision will have a modest impact since it does not include any mandatory requirements or financial incentives. We estimate 0.03 Quads/yr of energy savings by 2000, 0.13 Quads/yr of savings by 2010, 0.22 Quads cumulative during 1993-2000, and 1.0 Quads cumulative during 1993-2010.

16. Amendments to State Energy Conservation Program (section 141)

The Act contains a number of amendments regarding how states can use funds received under the state energy conservation program (SECP). The first amendment allows DOE to directly support state-based revolving funds designed to finance energy efficiency improvements in state and local government buildings. The second amendment allows SECP funds to be used for the training of building designers and contractors, programs to develop and promote the adoption of building retrofit standards, feasibility studies for renewable energy projects, and programs to encourage the use of renewable energy technologies by participants in other Federal programs. A third amendment requires states to allow vehicles to turn left from one-way streets onto one-way streets at a red light, in order for the state to be eligible for SECP funds.

We assume that the first amendment leads to a total of \$200 million of additional money dedicated to revolving funds for efficiency improvements in state and local government buildings. The resulting energy savings estimates for this provision are 0.01 Quads/yr by 2000, 0.02 Quads/yr by 2010, 0.02 Quads cumulative during 1993-2000, and 0.16 Quads cumulative during 1993-2010.

Promoting retrofit ordinances could be useful since very few cities have adopted them. We assume that this provision results in retrofit ordinances in cities that contain 5 percent of total U.S. housing units by 2000 and 10 percent of total housing units by 2010. In addition, a 20 percent reduction in space conditioning energy use is assumed in half of homes sold in jurisdictions with such laws. The resulting energy savings estimates are 0.01 Quads/yr by 2000, 0.04 Quads/yr by 2010, 0.02 Quads cumulative during 1993-2000, and 0.21 Quads cumulative during 1993-2010.

While state programs dedicated to training building designers and contractors also could be useful, the energy savings are very uncertain and could overlap with savings assumed from other provisions. Thus, we assume no direct energy savings for this part of the amendments. Allowing left turns on red from/to one-way streets is assumed to have minimal impact and again no energy savings are assumed.

17. Amendments to the Low-Income Weatherization Program (section 142)

One amendment encourages partnerships between local organizations that receive funds from DOE's low-income weatherization program and utilities or other private organizations. This should lead to greater funding for retrofits of homes occupied by low-income households. But in order to avoid double counting of savings already assumed from utility-related provisions, no additional energy savings are assumed. Another amendment allows weatherization funds to be used for the installation of solar water heaters or wood-burning stoves. Again, no energy savings are assumed.

18. Federal Energy Management (sections 151-168)

The subtitle on Federal energy management contains a wide range of provisions intended to stimulate the implementation of cost-effective energy conservation measures in federal buildings. It establishes in law energy savings goals, requires agencies to itemize their energy costs and conservation investments in their annual budgets, authorizes \$60 million for an energy efficiency fund, allows agencies to retain 50 percent of energy cost savings they achieve, creates financial incentives for facility energy managers who do an outstanding job, establishes a demonstration program for new energy-conserving technologies, initiates training programs and technical assistance from national laboratories, encourages Federal procurement of energy-efficient products, and authorizes performance contracting, use of utility rebate programs, and a retrofit program for the U.S. Capitol.

While it is difficult to directly attribute energy savings to each provision, the comprehensive package of measures should lead to major reductions in Federal energy use. Assuming that all agencies aggressively pursue cost-effective energy conservation opportunities, we estimate energy savings of 0.08 Quads/yr by 2000, 0.22 Quads/yr by 2010, 0.33 Quads cumulative during 1993-2000, and 1.93 Quads cumulative during 1993-2010.

19. Energy Information (section 171)

The Act directs the Energy Information Administration to collect more data and issue annual reports on energy use and

conservation efforts. While these activities are useful for understanding energy use and conservation trends, they do not directly lead to energy savings.

20. District Heating and Cooling (section 172)

The Act requires DOE to study district heating and cooling technologies, feasibility, and the barriers to wider implementation. DOE is instructed to report to Congress its findings and recommendations. While district heating and cooling can save energy particularly if power plant waste heat is used, we assume that the study and report by themselves do not result in energy savings.

21. Demonstration and Commercial Application of Renewable Energy and Energy Efficiency Technologies (section 1202)

This provision sets up a five-year program within DOE to demonstrate and commercialize new renewable energy and energy efficiency technologies. Projects are to be funded through competitive solicitation, and at least 50 percent of the funds for projects must come from non-Federal sources. The Act authorizes \$50 million of federal funding for fiscal year 1994.

It is difficult to evaluate the potential energy savings from this provision for a number of reasons. It is uncertain how much federal money will be appropriated, it is uncertain how much funding will go to energy efficiency projects, and it is impossible to know if any technologies will be improved and/or commercialized sooner because of the program. Rather than trying to estimate energy savings for individual R&D and demonstration programs, we present one savings estimate for all of these programs combined (see item 25 below).

22. Global Climate Change Provisions (sections 1601-1609)

The global climate change title of the Act calls for assessments and reports on the feasibility of reducing greenhouse gas emissions in the United States, the development of a least-cost national energy strategy, and a voluntary program for reporting and recording reductions in greenhouse gas emissions. All of these provisions could either directly or indirectly encourage energy efficiency improvements. However, it is impossible to predict what specific actions and impacts will result from these provisions. For this reason, and to avoid double counting of savings assumed from other provisions, no energy savings are assumed.

23. Tax Treatment of Employer-Provided Transportation Benefits (section 1911)

This provision limits the amount of non-taxable money employers can provide to their employees to pay for parking and

makes employer-provided vouchers for mass transit non-taxable up to \$60 per month. To analyze this provision, we assume that 26 percent of commuters nationwide are "eligible" (an estimate of the fraction of commuters that receive employer-provided parking and live within 1/4 mile of public transportation. Of these "eligible" commuters, we assume 1 percent and 2.5 percent shift to mass transit by 2000 and 2010, respectively. Given these assumptions, the estimated energy savings are 0.01 Quads/yr by 2000, 0.02 Quads/yr by 2010, 0.03 Quads cumulative during 1993-2010, and 0.16 Quads cumulative during 1993-2010.

24. Tax Treatment of Utility Rebates (section 1912)

This provision excludes from taxable income a large portion of the rebates that utilities provide to consumers to promote the adoption of energy efficiency measures. The Act makes 100 percent of rebates non-taxable for residential consumers starting in 1993. For commercial and industrial consumers, 40 percent of the value of rebates is excluded from taxable income starting in 1995, 50 percent is excluded in 1996, and 65 percent is excluded after 1996.

Greatly reducing taxation of utility rebates would make these programs more attractive to utilities and consumers, thereby leading to more extensive and effective conservation programs. For the sake of analysis, we assume that this provision increases the budget of utility conservation programs by \$250 million/yr by 2000, increasing to \$500 million/yr by 2010. The estimated energy savings are 0.03 Quads/yr by 2000, 0.18 Quads/yr by 2010, 0.09 Quads cumulative during 1993-2010, and 1.15 Quads cumulative during 1993-2010.

25. Energy Efficiency R,D&D (sections 2021-2028, 2101-2108, 2201-2202)

The Act authorizes approximately \$850 million for energy efficiency and renewable energy research, development, and demonstration (R,D&D) during fiscal year 1994, about a 48 percent increase compared to funding in 1993. Energy efficiency and renewable energy programs are combined in a number of areas, and some specific new program initiatives are called for. If this R,D&D authorization is supported by the Appropriations Committees, it should accelerate the development of new energy efficiency technologies. It also could set in motion much greater funding and priority for energy efficiency and renewable energy R,D&D over the long-term.

While estimating the impacts from increased R,D&D is obviously difficult, significant impacts could occur nonetheless. For example, one study estimates that three highly successful R,D&D projects previously conducted by DOE (low-E window coatings, electronic ballasts, and flame retention head oil burners) are expected to save around 2 Quads cumulatively by 2000 (6). To

estimate the impacts of the R,D&D provisions in the Act, we assume that additional funding begins to have an impact by 1995, with savings building up to 0.10 Quads/yr by 2000, 0.25 Quads/yr by 2005, and 0.50 Quads/yr by 2010. The cumulative savings are 0.31 Quads by 2000 and 3.26 Quads by 2010.

CONCLUSION

The energy efficiency provisions in the Energy Policy Act of 1992 should result in moderate energy savings (Table 1). Specifically, we estimate that these provisions will save about 2.0 Quads/yr by 2000 and 5.6 Quads/yr by 2010. Compared to DOE's most recent reference case forecast (the 1992 Annual Energy Outlook published by the Energy Information Administration), the savings figures represent 2.1 percent and 5.3 percent of projected energy use in 2000 and 2010, respectively. National energy consumption in 2010 would be cut from about 106 Quads as projected by DOE to 100.5 Quads (Figure 1). For comparison, national energy consumption equaled 85 Quads in 1991.

We estimate cumulative energy savings from the Act to be 6.8 Quads through 2000 and 46.0 Quads through 2010. The latter is equal to over six months of national energy use at the current rate and about 2.6 percent of projected national energy use during 1993-2010 according to the Energy Department.

Estimates of energy savings by fuel type are shown in Table 2. This breakdown refers to the cumulative energy savings during 1993-2010 (7). Coal represents 49 percent of the total energy savings, gas represents 36 percent, and oil 10 percent. The high coal fraction is due to the emphasis on electricity savings measures and the expectation (based on DOE's forecast) that much of the avoided electricity generation will come from coal-fired power plants.

The total estimated oil savings during 1993-2010 from the Act are about 770 million barrels. This represents only about a 0.7 percent reduction in total oil consumption projected over this period by DOE. The relatively small amount of oil savings is due to the fact that the Act contains very few energy efficiency provisions pertaining to the transportation sector. The failure to adopt tougher CAFE (i.e., vehicle fuel economy) standards is particularly significant.

Adopting meaningful vehicle fuel economy standards such as those contained in the Bryan-Gorton bill (S. 279 in the 102nd Congress) could result in nearly 64 Quads of total energy savings during 1993-2010, virtually all in the form of petroleum. This is equivalent to 11 billion barrels of oil savings during 1993-2010, about 14 times as much oil savings as estimated for all the efficiency provisions in the 1992 Energy Policy Act. In fact,

tougher CAFE standards alone could produce more energy savings than everything in the Act combined. While the Act contains many useful provisions, it ignores the single most important step our nation can take to raise efficiency and conserve energy.

The estimated electricity savings from the energy efficiency provisions reach 107 billion kWh/yr by 2000 and 274 billion kWh/yr by 2010 (Table 3). The equipment efficiency standards account for 43 percent of the total electricity savings in 2000 and 29 percent of the electricity savings in 2010. Based on DOE's projections of growth in electricity demand, the efficiency provisions would reduce projected national electricity consumption by 3.3 percent in 2000 and 6.9 percent in 2010 (Figure 2). The savings by 2010 are equivalent to the electricity typically supplied from approximately 104 large (500 MW) coal-fired power plants.

Table 4 shows the estimated reductions in carbon dioxide emissions (expressed in million metric tons of carbon) by 2000 and 2010. Carbon emissions would fall about 43 million metric tons per year by 2000 and 118 million metric tons by 2010 as a result of the efficiency provisions. The reduction in 2000 represents 2.6 percent of total carbon emissions projected for that year, but 30 percent of the projected growth in annual emissions between 1990 and 2000 in DOE's most recent reference case forecast. The reduction in 2010 represents 6.3 percent of total carbon emissions projected for that year and 34 percent of the growth in annual emissions between 1990 and 2010 as projected by DOE. Thus, enacting the Energy Policy Act of 1992 does represent a significant step towards stabilizing carbon dioxide emissions from the burning of fossil fuels in the United States.

Notes and References

1. **Annual Energy Outlook 1992**, DOE/EIA-0383(92), Energy Information Administration, U.S. Department of Energy, Washington, DC, Jan. 1992. Our use of this forecast as a reference does not that we endorse it or agree with it.
2. We follow the energy accounting assumptions used in the Annual Energy Outlook. This report, unlike other DOE/EIA data series, includes renewable energy sources such as biomass and solar energy.
3. B. Howard and W. Prindle, **Building Better Codes for Energy Efficiency**, Alliance to Save Energy, Washington, DC, June 1991.
4. Personal communication with Mr. David Conover, Battelle Pacific Northwest Laboratories, Washington, DC, Oct. 1992.
5. H. Geller and S. Nadel, "Consensus National Efficiency Standards for Lamps, Motors, Showerheads and Faucets, and Commercial HVAC Equipment", **Proceedings of the ACEEE 1992 Summer Study on Energy Efficiency in Buildings**, American Council for an Energy-Efficient Economy, Washington, DC, Aug. 1992.
6. M.A. Brown, L.G. Berry, and R.K. Goel, **Commercializing Government-Sponsored Innovations: Twelve Successful Buildings Case Studies**, ORNL/CON-275, Oak Ridge National Laboratory, Oak Ridge, TN, Jan. 1989.
7. Fuel savings are based in part on dividing up electricity savings in proportion to the fuel shares projected for new power plants during 1990-2010. According to DOE, coal-fired power plants will contribute 63 percent, gas-fired plants 30 percent, and oil-fired plants 4 percent of new electricity supplies between 1990 and 2010 (see Ref. 1).

Table 1

ESTIMATED ENERGY SAVINGS FROM THE ENERGY EFFICIENCY PROVISIONS
IN THE ENERGY POLICY ACT OF 1992

Proposal	Savings in 2000 (Quads/yr)	Savings in 2010 (Quads/yr)	Cumulative savings 1993-2000 (Quads)	Cumulative savings 1993-2010 (Quads)
Building standards				
Residential	0.03	0.08	0.06	0.57
Commercial	0.17	0.51	0.51	4.09
Home energy ratings and mortgages	0.04	0.10	0.13	0.78
Electric utility regulatory reform				
Demand-side	0.11	0.60	0.30	4.10
Supply-side	0.30	0.70	1.10	6.10
Least-cost planning at TVA	0.08	0.24	0.29	1.95
Least-cost planning at WAPA	0.03	0.09	0.11	0.74
Gas utility regulatory reform	0.07	0.30	0.20	2.10
Window testing and labeling	0.06	0.23	0.23	1.68
Equipment efficiency standards	0.64	1.17	1.98	11.61
Luminaire and office equipment testing and ratings	0.10	0.19	0.39	1.93
Energy efficiency in industrial facilities	0.09	0.20	0.27	1.72
State industrial efficiency programs	0.05	0.09	0.16	0.80

Table 1 (cont.)

Proposal	Savings in 2000 (Quads/yr)	Savings in 2010 (Quads/yr)	Cumulative savings 1993-2000 (Quads)	Cumulative savings 1993-2010 (Quads)
Industrial insulation and audit guidelines	0.03	0.13	0.22	1.00
SECP amendments				
State buildings funds	0.01	0.02	0.02	0.16
Building retrofit standards	0.01	0.04	0.02	0.21
Federal energy management	0.08	0.22	0.33	1.93
Taxation of transport benefits	0.01	0.02	0.03	0.16
Taxation of utility rebates	0.03	0.18	0.09	1.15
Energy efficiency R,D&D	<u>0.10</u>	<u>0.50</u>	<u>0.31</u>	<u>3.26</u>
TOTAL	2.04	5.61	6.75	46.04

Table 2

ESTIMATED FUEL SAVINGS FROM THE ENERGY EFFICIENCY
PROVISIONS IN THE ENERGY POLICY ACT OF 1992

Proposal	CUMULATIVE ENERGY SAVINGS DURING 1993-2010 (QUADS)		
	Oil	Gas	Coal
Building standards			
Residential	0.05	0.25	0.22
Commercial	0.32	1.68	1.92
Home energy ratings and mortgages	0.07	0.34	0.30
Electric utility regulatory reform			
Demand-side	0.16	1.23	2.58
Supply-side	0.40	1.30	4.40
Least-cost planning at TVA	0.08	0.58	1.23
Least-cost planning at WAPA	0.03	0.22	0.47
Gas utility regulatory reform	-----	2.10	-----
Window testing and labeling	0.15	0.74	0.66
Equipment efficiency standards	0.84	4.66	5.83
Luminaire and office equipment testing and ratings	0.08	0.58	1.22
Energy efficiency in industrial facilities	0.46	0.60	0.52
State industrial efficiency programs	0.22	0.28	0.24
Industrial insulation and audit guidelines	0.27	0.35	0.30
SECP amendments			
State buildings funds	0.01	0.07	0.08
Building retrofit standards	0.02	0.09	0.08
Federal energy management	0.15	0.79	0.91
Taxation of transport benefits	0.16	-----	-----
Taxation of utility rebates	0.05	0.34	0.72
Energy efficiency R,D&D	<u>0.94</u>	<u>0.49</u>	<u>0.94</u>
TOTAL	4.46	16.69	22.62

Table 3

ESTIMATED ELECTRICITY SAVINGS FROM THE ENERGY EFFICIENCY
PROVISIONS IN THE ENERGY POLICY ACT OF 1992

Proposal	ELECTRICITY SAVINGS (BILLION KWH PER YEAR)	
	2000	2010
Building standards		
Residential	2.0	5.2
Commercial	11.8	35.5
Home energy ratings and mortgages	1.4	3.5
Electric utility regulatory reform	9.6	52.2
Least-cost planning at TVA	7.2	21.2
Least-cost planning at WAPA	2.7	8.0
Equipment efficiency standards	46.3	80.2
Luminaire and office equipment testing and ratings	9.1	16.8
Energy efficiency in industrial facilities	2.2	5.1
State industrial efficiency programs	2.2	3.9
Federal energy management	6.3	17.2
Taxation of utility rebates	2.6	15.6
Energy efficiency R,D&D	<u>3.5</u>	<u>9.4</u>
TOTAL	106.9	273.8

Note: Additional small electricity savings will result from a few other provisions.

Table 4

ESTIMATED AVOIDED CARBON EMISSIONS FROM THE ENERGY
EFFICIENCY PROVISIONS IN THE ENERGY POLICY ACT OF 1992

Parameter	----- YEAR -----	
	2000	2010
Avoided carbon emissions (million metric tons per yr)	43.1	118.4
Avoided carbon emissions as a percent of projected emissions	2.6	6.3
Avoided carbon emissions as a percent of growth from 1990	30	34

Notes: 1990 carbon emissions - 1518.8 million metric tons
2000 projected emissions - 1664.3 million metric tons
2010 projected emissions - 1869.3 million metric tons
Projections based on 1992 Annual Energy Outlook

Figure 1

Projected Primary Energy Use

(Quads)

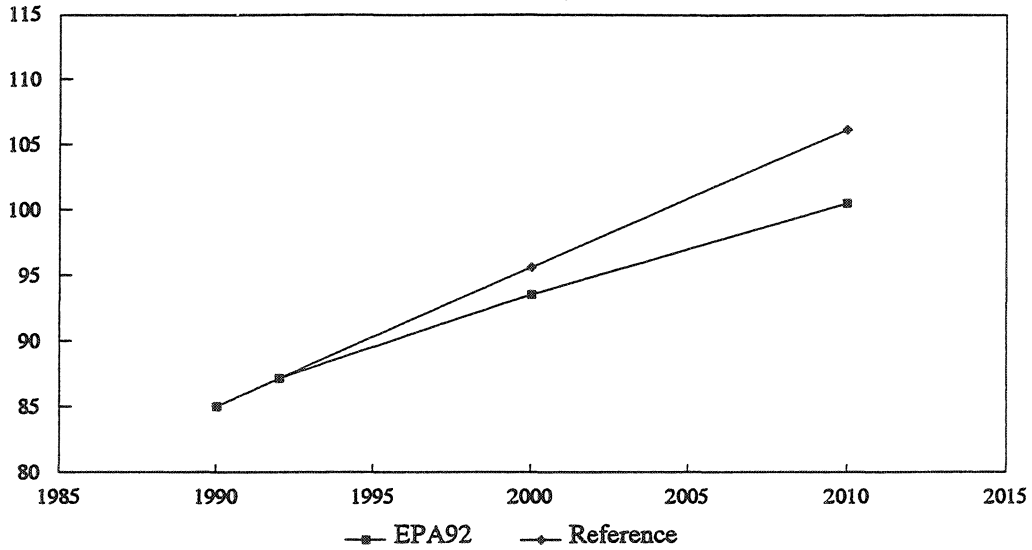
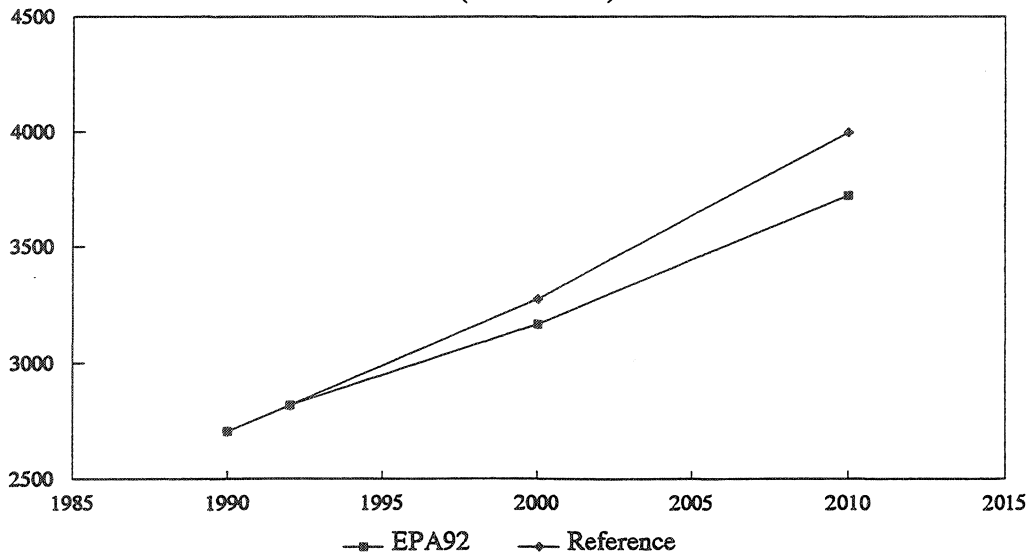


Figure 2

Projected Electricity Use

(Billion kwhs)



ENERGY AND THE ENVIRONMENT REPORTS

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Authors: Howard Geller, John DeCicco and Skip Laitner

The impacts on employment and income that could result from improving energy efficiency are examined in this report. It shows that substantial energy efficiency improvements throughout the U.S. economy could lead to a net increase of 470,000 jobs by 2000 and over one million jobs by 2010. Included is a special analysis of the impact on jobs and income from improved motor vehicle efficiency.

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Authors: Howard Geller, Steven Nadel and Mark Hopkins

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This major study examines the overall role that energy efficiency and renewable energy technologies can play in meeting U.S. energy needs. It demonstrates that the U.S. can reduce its energy intensity by over 50 percent, quadruple the use of renewables, cut carbon dioxide emissions by up to 70 percent, and save consumers about two trillion dollars if energy efficiency and renewable energy measures are aggressively pursued.

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Author: Howard Geller

This paper shows how cost-effective efficiency measures can reduce carbon dioxide emissions at a negative net cost. Examples include more efficient automobiles, refrigerators, appliance standards, utility programs, and national policy initiatives.

33 pp., 1991, \$5.00

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UNITED STATES ENERGY USE FROM 1973 TO 1987: THE IMPACTS OF IMPROVED EFFICIENCY

Authors: Lee Schipper, Richard Howarth and Howard Geller

This study reviews energy consumption and intensity trends in each sector of the economy, showing that about three-quarters of the decline in total energy use per unit of GNP was induced by efficiency improvements.
50 pp., 1990, \$7.00 E901

ESTABLISHING AN INTERNATIONAL ENERGY EFFICIENCY AGENCY: A RESPONSE TO THE THREAT OF GLOBAL CLIMATE CHANGE

Author: Howard Geller

This paper calls for much greater international collaboration in energy efficiency, in part, to respond to the risk of global warming. It suggests how an International Energy Efficiency Agency could be started and what it could do.
20 pp., 1990, \$4.00 E902

GETTING AMERICA BACK ON THE ENERGY EFFICIENCY TRACK

Authors: Howard Geller, Eric Hirst, Evan Mills, Arthur Rosenfeld, and Marc Ross

This study discusses and analyzes energy efficiency improvements during the past 17 years and new policy initiatives that could lead to major efficiency improvements during the next decade.
63 pp., 1991, \$6.00 E903

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