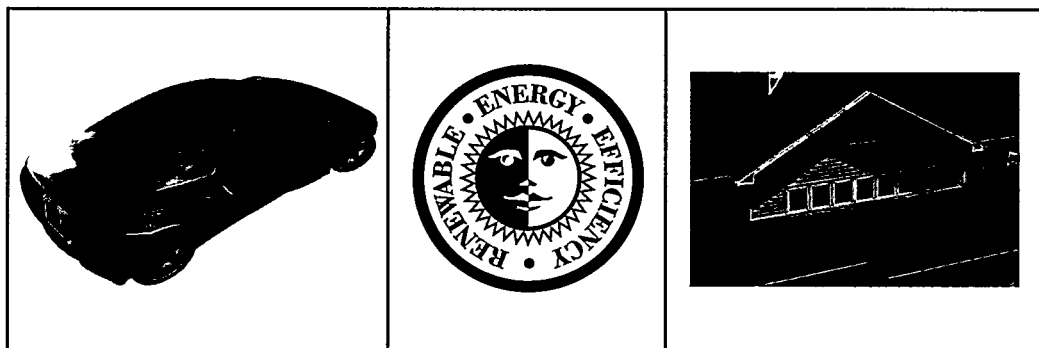


Budget-In-Brief

Fiscal Year 1998

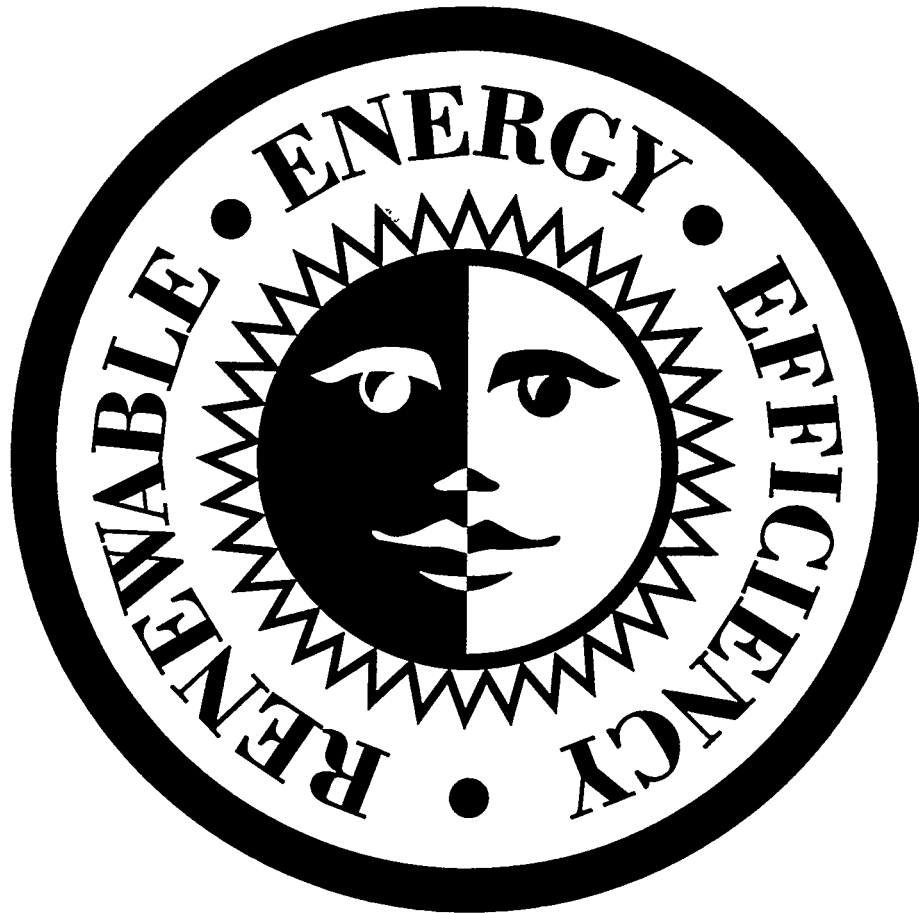
RECEIVED
MAR 03 1997
OSTI



Energy for Today and Tomorrow



U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy



Cover:

Left: Artist's conception of high-fuel efficiency and low-emissions car of the future

Right: Residential application of prototype photovoltaic shingles

TABLE OF CONTENTS

FOREWORD 1

INTRODUCTION:
Energy for Today and Tomorrow 2

OFFICE OF UTILITY TECHNOLOGIES:
Clean, Reliable and Affordable Power 4

OFFICE OF INDUSTRIAL TECHNOLOGIES:
Resource Efficiency for Industry 9

OFFICE OF TRANSPORTATION TECHNOLOGIES:
Cleaner Transportation and Energy Security 12

OFFICE OF BUILDING TECHNOLOGY, STATE AND COMMUNITY PROGRAMS:
Energy Efficiency at Home and at Work 15

FEDERAL ENERGY MANAGEMENT PROGRAM:
Saving Energy and Dollars at Federal Facilities 18

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED *dy*

DISCLAIMER

**Portions of this document may be illegible
in electronic image products. Images are
produced from the best available original
document.**

FOREWORD

Those familiar with energy efficiency and renewable energy have long recognized that these technologies represent some of the most cost-effective tools around for growing our economy, protecting our environment and ensuring our nation's security. Indeed, the Department of Energy sponsors the largest arsenal of voluntary pollution prevention programs in the world through its clean energy programs.

Over the past two years, fundamentally different paths toward our energy future emerged. One path leads to cuts in spending on the research, development and deployment of energy and environmental technologies. The other path, advanced by the Clinton Administration and the bipartisan Renewable Energy Caucus in Congress, fought to protect our investments in energy efficiency and renewable energy from crippling reductions. A groundswell of public support for this path carried the day for the Department's efficiency and renewable programs. That support was underscored by a post-election survey of 1,200 registered voters who made it clear, once again, that support for energy efficiency and renewable energy is high on their list of budget priorities.

The challenge is far from over. Over the course of the next year, we will lay the groundwork for how we choose to meet the challenge of human-induced climate change, how we restructure our energy supply network, and how we respond to changes in clean air regulations to better protect our health. As you'll see in the following pages, the President's 1998 budget calls upon Congress to renew a bipartisan commitment to investments in efficiency and renewable technologies as investments in a prosperous and healthy future for our children.

That clarion call is backed up by some of the nation's most respected leaders and scientists. In December 1996, the President's Committee of Advisors on Science and Technology starkly pointed out that federal spending on energy research and development has fallen more than three-fold in real terms in the last 15 years. Government spending on energy R&D by the Japanese, however, is more than twice as high as the United States. Further, the Committee calls for greatly increased work on renewable energy and energy efficiency among other recommendations. This report confirms many of the findings from the prestigious Yergin Committee two years earlier.

Sitting on the sidelines is no longer an option for determining the kind of world our children will inherit. Clean energy technologies are the single most important tool for reconciling economic prosperity with environmental quality. But tomorrow's technologies will be there only if we make the investments today.

Please take a few moments to read the 1998 Budget-in-Brief. I think you'll find that the Department of Energy's successful partnerships with businesses, states, environmental groups and others are delivering winning technologies for today and tomorrow.



Christine A. Ervin
Assistant Secretary
Energy Efficiency & Renewable Energy

INTRODUCTION

Energy for Today and Tomorrow

The President's request for Energy Efficiency and Renewable Energy program funding reflects the Administration's commitment to making sure that future generations of Americans will have sustainable energy to power a productive economy. This commitment addresses four concerns:

- Conventional energy production and use is causing environmental damage worldwide,
- Oil imports from unstable regions are on the rise,
- Human health is being jeopardized by energy-related pollution, and
- The nation needs more energy efficiency for a stronger economy

Each day, Americans depend on the benefits of energy, usually without considering how energy both adds and subtracts from our quality of life. We may turn on lights without thinking about breathing pollutants from combustion at power plants. We may fill our fuel tanks without remembering the long gas lines in the 1970s after international oil markets were disrupted. We may purchase products without realizing that the cost depends in part on whether manufacturers are taking advantage of sophisticated technologies to optimize their use of energy resources. And not all Americans are aware that using conventional energy systems to heat, cool, and light their homes and offices and run their appliances produces greenhouse gas emissions that may be affecting global climate.

The Energy Efficiency and Renewable Energy program supports research, development and deployment of energy technologies and practices that have saved Americans an estimated ten to fifteen billion dollars in energy costs over the past decade. These savings continue to mount as new energy technologies developed by the program for buildings, transportation, utilities, and industry are put to use and as research continues. Energy savings are accompanied by parallel

Award Winning Technologies

Year after year, research and development funded by the Office of Energy Efficiency and Renewable Energy wins awards for innovative technologies that bring energy and environmental benefits. By working with partners in industry, universities and laboratories, and by listening to our customers and stakeholders, our programs are producing technological advances that serve real needs in today's global marketplace. One example is the UV Waterworks, a water purifier developed at the Lawrence Berkeley Laboratory. Running on only 40 watts, the UV Waterworks kills pathogens in water with ultraviolet light. This innovation could help prevent the deaths of many of the four million children who die each year from waterborne diseases such as cholera, dysentery and typhoid. Such advances are well recognized by the scientific and engineering community. The UV Waterworks was among four Office of Energy Efficiency and Renewable Energy technologies to win a 1996 *Popular Science* Award as among the 100 "best of what's new" achievements in science and technology. The technology was also recognized with a *Discover* magazine award. The Department of Energy will be working with Water Health International, Incorporated to install demonstrations of this water purifier in South Africa in early 1997.

reductions in the emission of pollutants that affect human health. Our programs have worked in voluntary partnership with the nation's utilities, industries, states, and communities to cost-effectively reduce greenhouse gas emissions.

Energy Efficiency and Renewable Energy programs support the President's Climate Change Action Plan to reduce carbon emissions by over 15 million metric tons by 2000. The Climate Change Action Plan responds to international agreements on reducing the greenhouse gas emissions that may contribute to climate change. Our programs also implement the National Energy Policy Plan as required by the Energy Policy Act of 1992.

This document provides a brief overview of how the Energy Efficiency and Renewable Energy programs plan to improve:

- environmental quality,
- energy security,
- public health, and
- economic productivity.

Substantial opportunities remain to improve the nation's energy future without incurring high costs or imposing overly restrictive regulations. Current restructuring of electricity markets and international agreements on global climate change are focusing attention on some of these opportunities. With energy demand in countries such as China and India projected to grow exponentially in coming decades, U.S. exports of clean energy technologies will be important for mitigating world environmental degradation and climate change—and for fostering strong U.S. industries in sustainable energy products and services. Enabling developing countries to grow without the negative consequences of pollution is one of the most valuable forms of leadership the United States can exercise in world affairs in the years ahead.

Office of Energy Efficiency and Renewable Energy Funding (in millions of dollars)				
	FY 1996	FY 1997	FY 1998 Request	Change (FY 97-98)
Utility Technologies	237.6	224.5	285.6	+61.1
Industrial Technologies	114.3	117.6	139.6	+22.0
Transportation Technologies	204.3	202.9	243.3	+40.4
Building Technology, State and Community Programs	214.5	231.0	302.4	+71.4
Federal Energy Management Program	18.3	19.8	31.0	+11.3
Other *	50.7	44.0	50.5	+10.5
Total Budget Authority	839.7	839.7	1,052.4	+212.7

* Includes Solar Program Direction, Policy and Management, and the National Renewable Energy Laboratory.

OFFICE OF UTILITY TECHNOLOGIES

Clean, Reliable and Affordable Power

The Office of Utility Technologies works with electric power industries to advance clean, reliable and affordable power for the nation's sustainable energy future. We develop renewable energy technologies that use solar, wind, geothermal and biomass energy and that will enable a hydrogen energy infrastructure in the future. Our program also develops advanced technologies that will improve the energy efficiency and effectiveness of the nation's electric systems. Finally, the program demonstrates and promotes the export of renewable energy power generation domestically and internationally.

The Office of Utility Technologies works through cost-shared research partnerships with industry and laboratories. We expect that by 2010 these efforts will add 20 gigawatts to the nation's capacity to generate electricity from renewable energy, enough to supply the electricity needs of 9,000,000 homes. This will increase production and sales of renewable energy technologies and create jobs.

Renewable energy continues to become more attractive in the marketplace. Since 1980 the cost of electricity from photovoltaics has declined by a factor of 5, and the cost of wind energy has dropped by a factor of 10. Foreign and domestic sales of U.S.-produced renewable energy systems exceeded \$600 million in fiscal year 1996, with over 400 megawatts of renewable energy installations worldwide.

Fiscal Year 1998 Highlights

Photovoltaics

In photovoltaic technology, our partnerships have achieved a new world record for the efficiency of thin film cells. The Office of Utility Technologies and its partners are in the process of introducing photovoltaic systems in 350 installations in 12 states. Due to heavy demand for photovoltaic systems, the entire manufacturing capacity of U.S. industry is already "sold out" for 1997, and additional capacity will come on line this year.

Photovoltaic Roofing Shingles

Conventional photovoltaic panels convert sunlight into electricity in an array of solar cells mounted on panels. One of our research partnerships with industry has developed flexible thin-film photovoltaic modules that resemble ordinary asphalt shingles. These photovoltaic shingles can be mounted on rooftops to generate power right where it is needed—at home. As a source of renewable energy, these solar electric systems need no other support than a roof and avoid the transmission and distribution losses of conventional electricity supply. Estimates show that if the 30 percent of the 12.6 billion square feet of south-facing roofing throughout the nation were to be covered with these shingles, they would generate about 19,000 megawatts of electricity. Our development of this technology in cooperation with Energy Conversion Systems, Inc. and United Solar System, Inc. won the 1996 Popular Science "Best of What's New" Grand Award in the Environmental Technology category.

The Office of Utility Technologies will conduct research on semiconductor materials to continue to improve the efficiency of the way solar cells capture the sun's energy. This research is expected to result in a more efficient thin-film solar cell with significant reductions in manufacturing costs. We will continue to conduct research to extend the reliable lifetime of photovoltaic systems. In cooperation with the Utility Photovoltaic Group, we are also conducting research on integrating photovoltaic systems into a restructured electricity market.

Biomass

Biomass power will reduce greenhouse gas emissions, provide for rural economic development, enhance energy security, and improve the nation's balance of trade. Our Biomass Power program promotes renewable energy production from "dedicated energy crops" raised solely for this purpose. Through research and development of integrated biomass power technologies that improve the energy conversion process, the program is laying the groundwork for an unsubsidized energy-crop-to-power industry.

The program will complete testing of a commercial-scale biomass gasification and gas turbine arrangement at the Vermont Project. This will demonstrate the use of energy crops such as willow in combination with coal at existing coal-fired power plants. The program will also improve gas turbine blades for biomass systems.

Geothermal

In geothermal energy, technology advances funded and developed domestically have led to U.S. industry leadership in world markets. For example, the use of slimhole drilling technology has reduced the cost of exploring for geothermal energy by 30 percent. Today, the nation has over 2,500 megawatts of geothermal energy capacity in four states: California, Nevada, Hawaii, and Utah.

We expect to reduce geothermal well drilling costs by 10 percent, lowering the cost of typical geothermal power to 3.5 cents a kilowatt hour. We expect that 15,000 megawatts of new geothermal capacity will be installed worldwide by U.S. firms over the next decade. Our research continues to develop advanced geothermal technologies and enhance geothermal reliability and efficiency.

Wind

With the support of the Department of Energy over the past two decades, research and development of wind energy technology has resulted in the installation of roughly 1,700 megawatts of U.S. wind energy capacity. Today, "wind farms" across the nation are producing 3.1 million megawatt-hours per year of energy, enough to power more than 300,000 households. The international market for wind energy is growing rapidly, with strong competition coming from governmental subsidized wind industries in the Netherlands and Germany.

Our wind program will focus on the U.S. wind energy industry achieve technological leadership in world markets for sustainable energy. In cost-shared research, we will begin proof-of-concept testing for two innovative wind turbines. National laboratories and universities will continue their applied research to further increase wind turbine efficiency and reduce costs. Other cost-shared projects will increase U.S. competitiveness in wind technologies both for isolated villages and for central power generation.

Solar Thermal Electric R&D

Solar thermal energy systems collect heat from sunlight to power electricity generation. Our Solar Thermal Electric R&D program works with U.S. industry to develop reliable and efficient renewable power to diversify the nation's energy supply and bring environmental benefits. Solar thermal electric power is well suited to providing for costly "peak" and intermediate power usage. The program is developing storage technologies that will allow solar thermal energy to provide also for "base-load" power.

Our partnership with electric utilities and industry will continue to test and demonstrate operations at the new Solar Two Power Tower in California's Mojave Desert. Solar Two, the world's most advanced solar power plant, uses a molten salt technology and 1,926 heliostats (mirrors) around a 300-foot tower to capture and store the sun's energy. Another partnership is expected to continue their work on dish/engine units. By 2002, we expect to add 500 megawatts of solar thermal capacity and reduce the cost of solar thermal power to from 17 cents per kilowatt/hour to 8 cents per kilowatt/hour.

Hydrogen

Our Hydrogen Research program is developing electrolyzer and reversible fuel cell technologies for use with renewable energy sources. In addition, we are evaluating means of using wind, solar, hydropower and other renewable resources to produce hydrogen for use in utility, transportation and industrial applications. We are also pursuing research and development on cost-effective hydrogen storage and transport technologies.

In fiscal year 1998, we will complete the design of a 200-kilowatt electric phosphoric acid fuel cell, using hydrogen as fuel. This first-of-a-kind technology will be installed by the private sector as a cogeneration power plant that provides heat and electricity for roughly 600 dwellings.

Superconductivity and Energy Storage Systems

The Office of Utility Technologies is working to develop advanced power systems that will make the delivery of electric power more efficient and effective. High temperature superconducting wires will bring major improvements in energy efficiency throughout the nation's electric systems. In fiscal year 1998, the program will continue to exploit recent technological breakthroughs at Los Alamos and Oak Ridge National Laboratories in high temperature superconducting wires. Our research partnerships will develop prototype electric

generators, transformers, motors and transmissions cables that use these superconducting wires.

Superconductivity

The Department of Energy leads the national effort to capture the energy saving potential of superconductivity—the ability of certain materials to carry electricity without resistance losses. The program has mobilized the resources of U.S. industry, national laboratories and universities to solve the difficult problem of manufacturing electrical wires from the family of brittle ceramic materials discovered in 1986 while, in parallel, creating designs of superefficient motors, transmission cables, generators, transformers and current limiters that use these wires. Research at Los Alamos and Oak Ridge National Laboratories have yielded impressive gains. Global competition in high temperature superconductivity is intense. For example, Japan is investing over \$100 million a year in research and development in high temperature superconductivity for energy applications and Germany is spending over \$50 million a year on similar research.

Energy storage research programs are developing systems for reliable and sustainable low-cost energy. Transportable power quality systems for industrial use and storage for renewable generation are being demonstrated. We expect the cost of energy storage systems to decline by 20 percent by the year 2000.

Climate Challenge

The Office of Utility Technologies encourages electric utility industries to voluntarily reduce, avoid or sequester greenhouse gas emissions using currently available means, in response to the 1992 international treaty on the Framework Convention on Climate Change. In fiscal year 1998, we expect to complete the signing up of over 750 member utilities with commitments to individualized, flexible plans to achieve these reductions.

Utility Technologies Program Funding (in millions of dollars)				
	FY 1996	FY 1997	FY 1998 Request	Change (FY 97-98)
Solar Building Technology Research	1.9	2.5	4.0	+1.5
Photovoltaic Energy Systems	61.3	60.0	77.0	+17.0
Solar Thermal Energy Systems	19.0	22.3	19.8	-2.5
Biomass Power	20.3	23.7	36.5	+9.9
Wind Energy Systems	31.4	29.0	42.9	+13.9
Renewable Energy Production Incentive Program	.7	2.0	4.0	+2.0
Geothermal Energy Systems	29.4	30.0	30.0	0
Hydropower Development	3.5	1.0	1.0	0
Hydrogen Research and Development	14.3	15.0	15.0	0
High Temperature Superconductivity	22.3	19.8	32.5	+12.8
Energy Storage	2.0	4.0	4.0	0
Electric Magnetic Fields	9.5	8.0	8.0	0
International Energy Program [†]	10.7	3.4	9.9	+6.6
Climate Challenge	0	0	1.0	+1.0
Indian Energy Resource Program	0	4.0	0	-4.0
Total Budget Authority*	237.6	224.5	285.6	+61.1

* Does not include Solar Program Direction or National Renewable Energy Laboratory

† Includes both Interior and Related Agencies appropriations and Energy and Water Development appropriations

OFFICE OF INDUSTRIAL TECHNOLOGIES

Resource Efficiency for Industry

Efficient use of energy by industry strengthens productivity in ways that will enable the United States to remain competitive in today's global economy. Increasing industrial energy efficiency is also indispensable for preventing industrial pollution and protecting human health.

Industry consumes over a third of the energy delivered in the United States. Five industry groups account for 82 percent of the energy used in manufacturing: pulp and paper; steel, aluminum and metalcasting; chemicals; petroleum refining; and stone, clay and glass. U.S. industry also spends tens of billions of dollars annually for pollution abatement and control. The Office of Industrial Technologies focuses on developing innovative technologies to assist industry in becoming more resource efficient.

Fiscal Year 1998 Highlights

Industries of the Future

The Office of Industrial Technologies works with the nation's most energy-intensive industries to focus cooperative research on increasing energy and resource efficiency. These efforts, known as the Industry of the Future program, are expected to save over \$10 billion in industry energy-costs by 2010. Partnership agreements have been signed with the metalcasting industry, glass industry, aluminum industry, forest products industry, and steel industry to achieve "Industry Visions of the Future."

Visions for Industries of the Future

Two key elements of the Industries of the Future strategy are a "vision of the future" created by each industry and a "technology roadmap" to outline how that vision will be achieved. With the help of the vision and roadmap, industry- and government-funded research is brought into sharp focus to advance U.S. industrial technology and to bring about economic and environmental benefits.

Collaboration between manufacturers and the Department of Energy over the past decade has significantly improved the competitiveness of the U.S. steel industry. The Vision of the Future for the steel industry, signed in 1995, is aimed at further improving production efficiency, recycling steel scrap and iron wastes, and achieving reductions in air and water emissions and the generation of hazardous wastes.

The Office of Industrial Technologies has been working with the metalcasting industry to increase energy and resource efficiency. The industry, which employs 210,000 workers, produces over \$20 billion of cast metal products each year. The costs of stringent environmental regulations have contributed in the annual loss of about 100 metalcasting firms during the last two decades. The Vision of the Future for Metalcasting was also signed in 1995.

In October 1996, the Aluminum Industry launched a Vision of the Future collaboration to address remaining challenges in worldwide competition, energy costs and compliance with U.S. environmental regulation. New sensors and controls will enhance the industry's competitiveness.

The program will build on advances and opportunities such as the following:

For the pulp and paper industry, our partnership is developing a new catalyst for the kraft pulping process that will destroy the toxic compounds produced in conventional processes and reduce energy costs by over \$300 thousand each year.

For the steel industry, a scrap dezincing process could significantly reduce energy use and save \$140 million a year in operating costs—while allowing the nation to avoid the need to import \$100 million of zinc each year.

For the aluminum industry, titanium diboride-graphite elements for cathodes can reduce energy use in primary aluminum production by seven to eleven percent. For the metalcasting industry, advances in lost foam casting technology will increase industry competitiveness through significant energy savings and result in major reductions in carbon dioxide, nitrous oxide and sulfuric oxide emissions.

For the refining industry, improvements in fluid catalytic cracking technology will deliver an estimated seven percent more gasoline out of each barrel of crude oil, once this improvement has fully saturated the market. The program is researching cost-effective and environmentally benign ways to remove sulfur from gasoline using biotechnologies.

For the chemical industry, research and development in computational fluid dynamics, chemical sciences, biochemical processes, catalysts and new measurement techniques are expected to yield energy and environmental improvements.

Our efforts to develop advanced turbine systems for industry and utilities will improve the efficiency of gas turbines by 15 percent and reduce their emissions by 80 percent. The program is also developing ceramic materials for industry that resist corrosion and high temperatures. We are developing additional materials to increase industrial productivity, including nickel aluminides for steel mills.

Technology Access

Our Technology Access programs work with Industry of the Future partners to bring to the marketplace advanced energy-efficient technologies that prevent pollution. We assist U.S. manufacturers in all sectors with near-term technology implementation.

Our National Industrial Competitiveness through Energy, Environment and Economics (NICE³) program will award about 25 competitive grants in fiscal year 1998 for cost-shared state and industry projects in 27 states. The Inventions and Innovation program will provide about 20 technical assessment and financial assistance grants to help independent inventors and small companies commercialize energy-efficient technologies. The Industrial Assessment Centers will continue to provide roughly 750 energy, waste and productivity assessments to small and medium-size manufacturers through the services of 30 university engineering departments. The Motor Challenge program, in partnership with industry, will increase the

use of energy-efficient motors, drives and equipment through demonstrations. The Climate Wise program will continue toward its goal of signing up 500 industrial partners by 2000 who will commit to undertake voluntary actions that will reduce greenhouse gas emissions in their industrial operations.

Industrial Technologies Program Funding (in millions of dollars)				
	FY 1996	FY 1997	FY 1998 Request	Change (FY 97-98)
Industries of the Future (Specific)	41.7	46.3	55.7	+9.4
Industries of the Future (Crosscutting)	38.7	39.4	39.1	-0.2
Technology Access	26.7	25.0	37.1	+12.0
Other	7.3	7.0	7.7	0.7
Total	114.4	117.6	139.6	+22.0

OFFICE OF TRANSPORTATION TECHNOLOGIES

Cleaner Transportation and Energy Security

The Office of Transportation Technologies funds research and development that can radically alter current trends in energy demand, particularly for oil. Commercialization of innovative transportation technologies is the nation's premier strategy for reducing economic reliance on imported oil. As oil imports from unstable regions of the world are projected to rise over the next decade, the programs conducted by the Office of Transportation Technologies are of primary importance to the nation's energy and economic future.

Fiscal Year 1998 Highlights

Advanced Automotive Technologies

The Advanced Automotive Technologies program is the technological cornerstone for the nation's initiative to significantly improve the energy efficiency of and reduce emissions from our light duty vehicles. As a major part of this program, the Partnership for a New Generation of Vehicles, a cost-shared research partnership among several federal agencies and the nation's major auto manufacturers, is developing enabling technologies for vehicles with significantly improved fuel economy. The Partnership's research is aimed at demonstrating a prototype car of the future by 2004.

The Department of Energy sponsors research and development on automotive alternative fuels, heat engines, hybrid propulsion systems, fuel cells, energy storage, and advanced lightweight materials. Funding for these activities is directed at high risk research and development that industry would not likely undertake on its own. This work is the backbone of Partnership efforts to reach the goal of tripled fuel economy by 2004.

For fiscal year 1998, the Partnership will complete the development of two hybrid propulsion systems, aimed at doubling current fuel economy of mid-sized passenger cars. We will begin testing of the systems in current year models. A third hybrid test-bed vehicle will also be ready for testing and analysis. Plans for the transition of research to the effort to achieve an 80-mile-per-gallon vehicle will be finalized. The Partnership will also continue development of fuel cell propulsion systems, complete the initial building and testing of an advanced heat

Fuel Cell Propulsion for Cars

The Partnership for a New Generation of Vehicles is evaluating a transportation technology breakthrough developed through research supported by the Department of Energy. The fuel-flexible fuel processor can reform gasoline, ethanol, methanol and natural gas into hydrogen. The fuel processor, designed to be installed on-board a fuel cell vehicle, overcomes a major challenge to the introduction of fuel cell technology for cars—the current lack of an infrastructure to supply hydrogen, the gas used in fuel cells to produce electrical power. This new technology can not only make use of existing gasoline stations: it also promises to speed the transition to domestic and renewable transportation fuels. The Chrysler Corporation recently announced that it hopes to demonstrate a complete system in a vehicle within two years. Fuel cell vehicles are expected to be exceptionally clean, operating at near zero emissions.

engine technology for hybrid vehicle engine systems, and continue development of ceramic gas turbine components.

The Office of Transportation Technologies is also a partner with the U.S. Advanced Battery Consortium. This consortium, which includes the major U.S. automobile manufacturers, conducts research to improve the range and performance of electric and hybrid vehicles, as well as evaluating new electric vehicle models. For fiscal year 1998, the program will begin extensive in-vehicle testing of lithium polymer batteries which offer 3 to 4 times the range, and significantly greater performance and life, than conventional lead acid batteries.

Advanced Heavy Vehicle Technologies

The Office of Transportation Technologies has requested funding to work with industry partners to develop the technology to double the fuel efficiency of light trucks by improving the efficiency of diesel engines and using them in these vehicles. Light trucks, including vans, pickups, and sport utility vehicles, represent the most rapidly growing segment of today's vehicle market. Improving their fuel economy while simultaneously reducing their emissions would have a dramatic impact on the nation's transportation energy consumption situation. We will undertake preliminary design and cycle analysis of the diesel engine for sport utility vehicles and pickup trucks in fiscal year 1998.

Also in fiscal year 1998, program efforts to improve the efficiency in large diesel engines will be coordinated with alternative fuels research and development efforts to accelerate the use of alternative fuels in the largest truck classes. The advancements in alternative fuel enabling technologies developed within the Office of Transportation Technologies have proven that fuels, such as natural gas and biodiesel, are technically viable and have major benefits.

Transportation Materials Technology

New materials and material technologies are critical to the development and engineering of advanced transportation vehicles. The Office of Transportation Technologies supports materials research and development on both automotive and heavy vehicle needs. We focus on the development of lightweight vehicle materials which can reduce the weight of vehicles and thereby decrease fuel consumption. Our efforts also encompass propulsion systems materials for hybrid vehicles, as well as for heavy duty and multi-purpose diesel engines.

Our High Temperature Materials Laboratory is a modern research facility that houses a unique collection of instruments for characterizing materials in six user centers. By providing access to state-of-the-art equipment that few individual companies and institutions can afford, the laboratory enables scientists and engineers to solve materials problems that limit the efficiency and reliability of advanced energy conversion systems.

Biofuels Energy Systems

The transportation biofuels program is aimed at reducing oil imports, creating jobs in rural areas, and providing environmental benefits through the development of transportation fuels from biomass. Production of biomass transportation fuels by 2000 could reach 600 million gallons a year at a cost of 90 cents a gallon through this effort. The program includes research on production of ethanol from rice straw and other wastes, hybrid poplar trees and other energy crops.

Technology Deployment

The Technology Deployment program promotes the acquisition of newly developed transportation technologies for government and private fleets to encourage widespread market penetration in both domestic and foreign markets. The primary efforts of this program are the Clean Cities program, public education, training, field testing and evaluation, and the fleet programs established by the Energy Policy Act of 1992.

Through the Clean Cities program, local governments and organizations are encouraged to form public/private partnerships for developing alternative fuel vehicle markets. Over 50 Clean Cities now have a combined fleet of over 125,000 alternative fueled vehicles, saving over 11 million gallons a year in oil consumption. Several of these local programs plan to link across regional and state boundaries to establish Clean Corridors with refueling infrastructures. These corridors will allow alternative fuel vehicles to travel between major cities.

In fiscal year 1998 the program will complete field testing and evaluation of electric vehicles using first generation advanced batteries developed with the support of the U.S. Advanced Battery Consortium program. Federal fleet experience will be a key element of that effort. Fleet and infrastructure programs will be evaluated in the context of the Energy Policy Act's replacement fuel goals. The Clean Cities program will expand to 65 participating communities and launch several new corridor development projects.

Transportation Technologies Program Funding (in millions of dollars)				
	FY 1996	FY 1997	FY 1998 Request	Change (FY 97-98)
Advanced Automotive Technologies	100.7	104.6	129.0	+24.4
Advanced Heavy Vehicle Technologies	14.7	19.5	18.0	-1.5
Transportation Materials Technologies	34.3	32.9	30.5	-2.4
Technology Deployment	16.8	10.8	17.0	+6.2
Biofuels Energy Systems	30.0	27.7	40.4	+12.4
Other	7.8	7.4	8.7	+1.3
Total	204.3	202.9	243.3	+40.4

OFFICE OF BUILDING TECHNOLOGY, STATE AND COMMUNITY PROGRAMS

Energy Efficiency at Home and at Work

America's buildings—our homes and offices—consume roughly \$220 billion worth of energy each year. The average family spends about \$1,300 on home energy. Energy for buildings has both economic and environmental implications: its production, distribution and use affect our health through the emission of sulfur dioxide and nitrogen oxides. The Office of Building Technology, State and Community Programs is working with its partners in the private sector and in state and local government to make the nation's building stock more energy-efficient, comfortable, affordable, and sustainable.

The Administration has designated the building and construction industry as one of nine priority areas for federally assisted research. The efforts of the Office of Building Technology, State and Community Programs are focused on integrating efficient building designs; improving building equipment and appliances; developing effective energy codes and standards; and providing funding for state and local energy programs, including home weatherization assistance for low-income households.

Fiscal Year 1998 Highlights

Buildings for the 21st Century

The Office of Building Technology, State and Community Programs is launching a Buildings for the 21st Century initiative to create a new generation of high quality, energy efficient, affordable, and environmentally sustainable buildings. This will be achieved through the

Building America

Along with our building industries partners, we have turned to the "systems approach" as a way to bring more energy-efficient housing to the nation. Several major U.S. home builders, working with U.S. Steel, General Electric, Carrier Corporation, U.S. Gypsum and over 50 other organizations, are applying systems engineering and cooperative development to demonstrate new homebuilding concepts. Architects, builders and manufacturers work together to construct homes that are highly energy-efficient, environmentally friendly, and affordable. This "whole building" approach is central to the Buildings for the 21st Century Initiative, currently illustrated by the Department of Energy's Building America program. The early success of these demonstrations has attracted the interest of other large U.S. builders, which have committed to adopting the Building American concept for major developments.

application of a "whole buildings" or systems engineering approach that examines buildings as integrated systems rather than a collection of individual components. The integrated approach will assist decision makers in optimizing siting, design, material and equipment selection and financing. One of the first activities of the program will a community-based program designed to integrate photovoltaic technology into new and existing buildings. We are undertaking this activity in conjunction with the Office of Utility Technologies.

Building System Design

Our Building America program brings together all segments of the building industry to improve the quality and performance of new homes through improved design and building practices—without increasing costs. In collaboration with federal, state and local government entities, communities, utilities and financial institutions, we work to make housing more energy and resource efficient.

Through our Rebuild America program, the Office works with community and regional organizations, private businesses, utilities and technical experts to renovate commercial and multi-family buildings. These partnerships are primarily funded by the private sector.

Building Equipment and Materials

Our research and development partnerships with the private sector are expected to save building owners as much as \$700 million a year in energy costs by 2000 through investments in energy-efficient equipment. For example, a lighting technology we funded won three national awards since 1995 for technical excellence. The Sulfur Light uses half the energy typically consumed by conventional, high quality lighting. In addition, our partnerships are helping public housing authorities to utilize apartment refrigerators that incorporate a highly energy-efficient design.

Codes and Standards

As required by law, the Office sets energy efficiency standards for appliances and lighting to achieve the maximum improvement that is technologically feasible and economically justified. These standards are established by a three-phase public process. In 1996, the Department of Energy completed the development of new procedures that make the economic analysis for this process more practical and transparent. New standards for the energy efficiency of refrigerators and other appliances will be set in 1997 implementing principles of this revised regulatory process.

While market incentives are one way of improving energy efficiency in the nation's economy, energy standards have resulted in efficiency gains that have benefitted consumers, businesses, and the nation. Appliance standards have already saved consumers billions of dollars and by 2010 are expected to result in consumer savings of over \$7 billion each year. By 2010, these standards will also produce estimated reductions of 22 million tons of the carbon dioxide and 280 thousand tons of the nitrogen oxides the nation emits annually.

State and Local Partnership Programs

The Weatherization Assistance Program works with states and local agencies to increase the energy efficiency of homes occupied by low-income citizens, particularly the elderly, those with disabilities and families with children. The program saves low-income families about 33

percent on their energy bills. Over 78,000 homes will be weatherized by the program in fiscal year 1998.

The State Energy Program provides funding for state energy programs with flexibility for these programs to implement local and regional energy projects. These programs often reduce local government energy costs to allow tax revenues to be used more effectively.

The Municipal Energy Management Program supports effective energy management in U.S. cities and counties by demonstrating practical technologies and advanced energy management techniques. The program has conducted over 191 projects in 49 communities since its inception in 1978. We plan to assist communities with energy-related projects in the buildings and transportation sectors.

Building Technology, State, and Community Programs Funding (in millions of dollars)				
	FY 1996	FY 1997	FY 1998 Request	Change (FY 97-98)
Building System Design	23.0	23.6	32.8	+9.1
Building Equipment and Materials	27.1	26.5	37.2	+10.7
Codes and Standards	12.5	12.1	21.0	+8.9
State and Local Partnership Programs	139.5	151.4	192.7	+41.3
Other	12.4	17.4	19.2	+1.8
Total	214.5	231.0	302.4	+69.4

FEDERAL ENERGY MANAGEMENT PROGRAM

Saving Energy and Dollars at Federal Facilities

The Federal Energy Management Program is reducing the cost of federal government by advancing renewable energy, energy efficiency and water conservation. As the world's largest energy consumer with about \$8 billion in energy costs each year, the Federal government has the responsibility to lead in putting in place sound energy and environmental practices. The Federal Energy Management Program coordinates Federal agency efforts to reduce energy and water use. With this program, the nation stands to gain a healthier environment along with taxpayer savings.

Fiscal Year 1998 Highlights

The program has achieved impressive gains, exceeding in 1995 the Federal buildings efficiency goal of 10 percent reduction for that year. Federal energy consumption has declined 22.9 percent in aggregate from 1985 levels. These energy savings translate into a \$1.8 billion reduction in annual Federal energy costs since 1985, with a cumulative savings of \$11.7 billion over ten years. Environmental benefits mirror these reductions in lower emission of pollutants and greenhouse gases. The program continues to work toward achieving the statutory goal of improving Federal energy efficiency by 30 percent over 1985 levels, with a target date of 2005.

Innovative Financing for Federal Savings

The Federal Energy Management Program has developed broad, streamlined Super Energy Saver Performance Contracts that allow Federal agencies to reap early benefits from energy efficiency and renewable energy improvements. With these contracts, private firms incur the costs of installing energy retrofits at Federal facilities in exchange for a share of the cost savings that result. In Arizona, for example, the U.S. Army Fort Huachuca will be saving energy costs with an environmentally beneficial solar thermal installation financed by IST, Inc. With up to \$5 billion of these contracts to be awarded, the program will help the Federal government turn billions of dollars in wasted resources into capital improvements and cost savings.

In fiscal year 1998, the program will continue to deliver energy management assistance through six Energy Efficiency and Renewable Energy Support Offices. The Federal Energy Management Program expects to initiate seven Super Energy Saver Performance Contracts, streamlined to make it easier for Federal agencies to retrofit Federal facilities. These contracts use private capital to conduct energy efficiency retrofits in Federal buildings. Federal agencies only pay the contractors for their efforts when the agencies have seen cost savings. The program will also conduct comprehensive audits at several facilities and implement three new renewable energy projects.

Federal Energy Management Program Funding (in millions of dollars)				
	FY 1996	FY 1997	FY 1998 Request	Change (FY 97-98)
Federal Energy Management Program	18.3	19.8	31.1	+11.3

Customer service center: (800) 363 3732 or <http://www.eren.doe.gov>