Energy Efficiency in Federal Facilities: Update on Funding and Potential Savings

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Energy Efficiency in Federal Facilities

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Foreword

There is widespread agreement that commercially available technologies could profitably reduce the federal government's $4 billion annual building energy costs by at least 25 percent. Efforts to tap the potential of energy efficient measures have continued to evolve since the mid- 1970s, and have saved several billion dollars to date. Despite this impressive achievement, considerably greater savings still appear possible. As discussed in OTA's 1991 Report, *Energy Efficiency in the Federal Government: Government by Good Example?,* however, there area number of constraints to implementing more energy efficient practices. Two longstanding constraints are: 1) a shortage of finds to invest in efficient equipment; and 2) a lack of information for program planning and budgeting about the extent of investment opportunities and about the best finding mechanisms. This paper, prepared in response to a request from the House Committee on the Budget, reviews advances made in addressing these constraints since 1991.

OTA appreciates the assistance received from several organizations and individuals in the course of this study. To all of them goes the gratitude of OTA and the personal thanks of the project staff



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Energy Efficiency in Federal Facilities: Update on Funding and Potential Savings

Introduction and Findings

Since the mid- 1970s, Congress and the executive branch have developed several programs to improve energy efficiency in federal facilities and operations. Between 1975 and 1991, these programs saved close to $8 billion in energy costs according to the Department of Energy (DOE). This is about three times more than the funds invested in energy conservation measures during that time. Despite this impressive achievement, considerably greater savings still appear possible in federal facilities using commercially available, cost-effective technologies from advanced lighting systems to improvements in heating, ventilation, and air conditioning systems. [1]

There is widespread agreement that commercially available technologies could profitably reduce the federal government's $4 billion annual building energy costs by at least 25 percent. There are, however, a number of constraints to implementing more energy efficient practices. **One of the most challenging constraints is a shortage of funds to**

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1 This paper examines energy efficiency funding and potential savings for federal facilities. There also appears to be considerable potential for savings in "mobility" energy used by federal aircraft, ships and nonhighway vechicles (see John Archibald, U.S. Department of Energy, "Federal Mobility Energy Efficiency Issue Paper, " Mar. 15,1994). These mobility efficiency opportunities have received far less attention than has facility efficiency, and there are fewer authorized programs to address them. While mobility energy is not the focus of this paper, many of the finding and program management issues are closely related and may be worth further attention.

invest in efficient equipment. A related constraint is a lack of information for program planning and budgeting about the extent of investment opportunities and about the best finding mechanisms. This paper, prepared in response to a request from the House Committee on the Budget, reviews advances made in addressing these constraints since publication of OTA's 1991 Report, *Energy Efficiency in the Federal Government: Government by Good Example?*[2]

OTA's 1991 Report found that while the federal government did not make fill use of energy efficient technologies, the best practices formed a strong foundation for further efforts leading to a high level of efficiency and economy, While that finding still appears true, **current energy management efforts are far more intensive than in 1991, which should lead to fuller and faster implementation of efficiency measures and cost savings.** For example, **budget requests and appropriations for efficiency upgrades are continuing to increase rapidly.** Similarly, federal agencies continue to increase their use of private sector finding sources such as electric utility demand side management (DSM) programs and energy saving performance contracts (ESPCs). While there is little doubt that the current level of effort is profitable, there remains a notable lack of government-wide information to help determine the extent to which those efforts could be profitably expanded.

As noted in OTA's 1991 Report, there is no single, simple policy that would ensure the federal government's attainment of the highest level of cost-effective energy efficiency. Rather, policies to improve energy efficiency maybe best viewed as ongoing and evolutionary, as demonstrated by the long (and, to date, only partly successful) history of federal efforts. Two major policy developments have occurred since 1991: passage of the Energy Policy Act

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[2] U.S. Congress, Office of Technology Assessment, *Energy Efficiency in the Federal Government: Government By Good Example?* OTA-E-492 (Washington, DC: U.S. Government Printing Office, May 1991). A two-page Report Brief is attached as appendix A.

of 1992 (EPACT), which includes a subtitle devoted to federal energy management; and signing of Executive Order (EO) 12902 on March 8, 1994. Both include several significant contributions related to finding and identification of energy saving opportunities. They also address a number of other key constraints not reviewed in this paper, such as adequate trained staffing to ensure productive use of available funds.

While the authorities and direction presented by EPACT and EO 12902 (see tables 1 and 2) appear promising, it is too early to tell how successful they will be. There are some substantial delays in performing critical activities required by law for assessing and promoting alternate funding methods and surveying potential savings. Completion of these activities and implementation of their results will be important to determining the extent to which current efficiency efforts can be profitably expanded. The activities include the following:

. a "Federal Energy Efficiency Funding Study, " required by EPACT to be submitted by April 1993; currently not anticipated before summer 1994;

. promulgation of regulations for energy savings performance contracts, required by EPACT by April 1993; still not published for comment in the Federal Register as of mid-March 1994;

. inclusion by each agency of energy efficiency finding as a line item in the presidential budget submittal, required by EPACT; included for some (including the largest energy users), but not all, agencies in the fiscal year 1995 request;

. DOE's annual report to Congress on federal energy management, required by National Energy Conservation Policy Act (Sec. 548) by April 2 of each year; delivered later and later over the past few years. For example, the fiscal year 1986 report was delivered in June 1987, and the fiscal year 1986 report was delivered in October 1990. As of late March 1994, the fiscal year 1992 report (which ended in

September 1992) remained under review within DOE. Thus, the fiscal year 1992 report may be a year or more late.

. a survey of potential savings, required by EPACT with no statutory deadline; tentative completion date of April 1994 according to DOE's implementation plan.

Table l--Provisions of Executive Order 12902

- Establishes facility energy consumption reduction goals for 2005
- Directs agencies to conduct energy surveys and audits, and to prioritize implementation
- Directs agencies to reduce facility petroleum use
- Provides energy management guidelines for new buildings
- Directs agencies to establish "showcase" facilities
- Directs DOE to report on life cycle analysis issues
- Directs effort promoting innovative financing mechanisms
- Requires elimination of unnecessary barriers to innovative financing mechanisms
- Directs agencies to procure "best practice" technologies
- Promotes energy management incentives for agencies and staff

Table 2-- Federal Energy Management Provisions of EPACT

- Establishes building energy consumption reduction goals for 2000
- Requires implementation of cost-effective energy efficiency measures by 2005
- Directs agencies to conduct energy surveys and audits, and to prioritize implementation
- Requires President's budget submittal to include each agency's request for energy and energy management costs
- Establishes Federal Energy Efficiency Fund
- Directs efforts promoting innovative financing mechanisms
- Promotes energy management incentives for agencies and staff
- Establishes new technology demonstration program
- Requires promulgation of rules for Energy Savings Performance Contracts
- Requires Federal Energy Efficiency Funding Study
- Establishes intergovernmental energy management planning and coordination effort
- Establishes energy manager program for federal facilities
- Directs development of methods to accurately assess facility energy consumption
- Directs program to encourage procurement of energy efficient products

Energy Savings Potential, Goals, and Funding Requirements

Information about the extent of attainable cost-effective energy savings remains sparse. Systematic surveys and audits of energy savings opportunities in federal facilities have been established in legislation and executive orders dating back over 15 years. Although building audits were conducted at most major facilities, the results apparently were neither compiled nor analyzed and were not kept current with changing technology and energy market conditions.

Currently, DOE is coordinating a government-wide energy survey of a representative sample of federally leased and owned buildings ". . . determining the maximum potential cost effective energy savings that may be achieved. . . ." as required by EPACT (Sec. 152 (h)). Although there is no statutory deadline for the survey, DOE's June 1993 Implementation Plan[3] set a tentative completion date of April 1994, with a report to Congress to follow shortly thereafter. EO 12902 further requires "prioritization surveys" or rapid assessments used to identify facilities with high-priority projects based on the degree of cost-effectiveness. It further requires agencies to implement 10-year plans to obtain comprehensive facility audits. These current efforts can go a long way to addressing questions of the potential and costs of improving federal energy efficiency. For example, the U.S. Army has developed a modeling system called "Renewable and Efficiency Energy Planning" (REEP) for its response to the survey. REEP organizes raw data, has been applied to more than 49 facilities representing about three-quarters of army facilities energy use, and is already being used to optimize the

[3] U. s. Department of Energy, Office of Federal Energy Management programs, "Implementation Plan for the Survey of Federal Buildings Energy Saving Potential as Required by Section 550 of the National Energy Conservation Policy Act as amended by the Energy Policy Act of 1992, " June 1993, p. 17.

Army's energy efficiency purchasing and planning efforts.[4] The Navy and Air Force have adopted REEP as well.

Early detailed audit efforts were criticized by some federal energy management personnel for being uncoordinated with implementation. Any audits or surveys become outdated with changes in energy prices, efficiency technologies, and other conditions (e.g., changing facility missions or base closings). For this reason, the efforts dedicated to identifying potential can be most useful when tailored to program goals and plans. The current planned approach, including initial broad surveys followed by more detailed audits tied to implementation plans should avoid the unnecessary costs that accompanied the earlier detailed efforts.

Better information about the extent of attainable energy and cost savings and the investment required can be useful for setting program goals. For example, EPACT directed agencies to reduce building energy consumption per square foot by the year 2000 by 20 percent relative to 1985. This type of percentage reduction goal, first established in 1978, is simple to understand and easy to track, making it a potentially useful tool. However, a key issue has always been the appropriate target to set. Reflecting the lack of clear estimates of the economically attractive potential, targets have been revised repeatedly in the past several years to require greater energy savings over an increasing horizon (see table). For example, EO 12902 established a new goal of a 30 percent reduction by the year 2005 relative to 1985 energy use. There appears widespread agreement that the current goals are attainable and economically attractive. However, more systematic analyses such as those anticipated from the DOE-led survey noted above should provide a much better basis for goals than has existed to date.

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[4] Steve Siegel, U.S. Army, personal communication, Mar. 25, 1994.

Table 3- Goals for Energy Use/ft^2 Reduction in Existing Federal Buildings

Executive order or law	Goal, implementation date
EO 12003, 1977	20% by 1985 relative to 1975
FEMIA 1988	10% by 1995 relative to 1985
EO 12759, 1991; EPACT, 1992	20% by 2000 relative to 1985
EO 12902, 1993	30% by 2005 relative to 1985

FEMIA = Federal Energy Management Improvement Act, Public Law 100-615.
SOURCE: Office of Technology Assessment, 1994.

Better information about the extent of potential savings, and the capital and other resources required to attain those savings is important for planning and budgeting to meet program goals. Legislation and executive orders have repeatedly established or updated requirements that all cost-effective energy efficiency opportunities be implemented by a certain date. Most recently, EPACT directed each agency to install all energy conservation measures with payback periods less than 10 years by no later than January 1, 2005.[5] Absent systematic analyses such as the current DOE-led survey, however, the consistency between this goal and the percentage reduction targets is unclear. Also, the adequacy of current plans and anticipated budgets to find the investment required remains speculative.

To address the issue of adequate finding, EPACT requires DOE to analyze and report to Congress on the financial investment needed to comply with current goals.[6] That report, the "Federal Energy Efficiency Funding Study," was to be submitted no later than April 1993 but has remained under review by DOE. DOE has recently deferred submittal of the study to allow it to incorporate changes resulting from EO 12902. **Completion and circulation of**

[5]EPACT, Sec. 152(b).
[6]EPACT, Sec. 162.

DOE's "Federal Energy Efficiency Funding Study" and the DOE-led survey results should be useful steps toward assessing the adequacy of current plans and budgets.

Highly approximate estimates of investment opportunities have suggested that at least $5 billion of efficiency investments are cost-effective and thus required to meet current statutory goals. For example, the Energy Systems Modernization Office of Battelle Pacific Northwest Laboratories estimated in 1992 that there are $5 to 10 billion of energy efficiency investment opportunities that meet or exceed the federal government's minimum life-cycle cost economic test.[7] Consistent with that estimate, OTA's 1991 Report estimated that $2 to 3 billion worth of highly attractive opportunities (i.e., with annual returns on investment of a lucrative 30 percent or higher) were available then, noting, however, that there was limited available information. Current administration plans are to ramp up annual investments from $154 million in fiscal year 1992 to $600 million by fiscal year 1997. At $600 million annually, full implementation of a $5 to 10 billion investment program would take between 8 and 17 years.[8]

Status of Funding Mechanisms for Efficiency Investments

While relying heavily on direct agency appropriations to fund efficiency investments, Congress and the executive branch have promoted use of alternate financing sources. These include ESPC, utility DSM, and a government-wide Federal Energy Efficiency Fund. The great majority of finding for federal energy efficiency investments to date has come from direct agency appropriations, although the alternative approaches, if successfully implemented, may provide a growing share. For example, in fiscal year 1992, the most recent year for

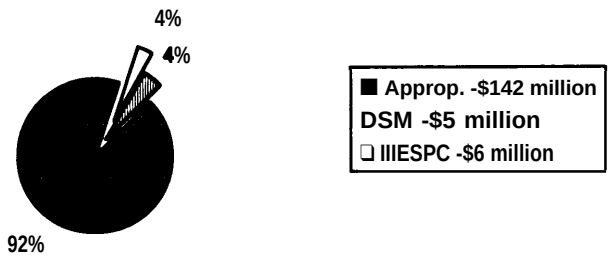
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7 J. William Currie, testimony before the Senate Committee on Governmental Affairs, Feb. 18, 1992.

8 Private sector funding such as DSM or ESPC would increase total annual investment and reduce the time until fill implementation.

which preliminary estimates are available, total efficiency investment finding was $154 million, over 90 percent of which was from direct agency appropriation (see figure 1).[9]

Figure l--Energy Efficiency Funding
Fiscal Year 1992
$154 million total



NOTE: Neither the Federal Energy Efficiency Fund nor Energy Savings Performance Contracts had been established in 1992. ESPC total reflects Shared Energy Savings, a predecessor of ESPC.
SOURCE: Preliminary estimates provided to OTA by DOE/Office of Federal Energy Management Programs. Mar. **17, 1994.**

In keeping with the ongoing tradition of evolution in the federal energy efficiency arena, efficiency proponents within and outside government continue to develop or consider novel approaches. For example, some have suggested consideration of a government-backed loan fund similar to Sally Mae or Fanny Mae (for student loans and home mortgages, respectively) to be used for federal facility efficiency upgrades. DOE is leading an interagency effort examining the benefits and challenges of this type of approach. [10] These proposals, which go by such names as Daisy Mae and Effie Mae, have unique merits and challenges relative to other finding mechanisms. These efforts remain at a preliminary stage of

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[9] U.S. Department of Energy, *Annual Report to Congress on **Federal Government** Energy Management and Conservation Programs Fiscal Year 1991*, (Washington, DC: Oct. 22 1992).

[10] Mark Hopkins, Alliance to Save Energy, personal communication, March 1993; and Greg Katz, U.S. Department of Energy, personal communication, March 1993.

investigation, have not been proposed for legislative action, and are not reviewed in this paper.

The amount of funding that can be reasonably provided by alternative funding approaches remains speculative. Each alternative approach has advantages and disadvantages, and agencies are gradually gaining practical experience as the approaches continue to evolve. To better determine the extent of federal finding required to meet federal energy management goals, EPACT directs DOE to conduct a detailed study of financing options as part of the Federal Energy Efficiency Funding Study mentioned earlier. [11] That analysis, which should be useful in guiding federal agency finding requests, was due in April 1993 but remains under review within DOE. **Completion and circulation of the Funding Study should be a useful step toward assessing the extent to which private sector funds can displace federal appropriations.**

Direct Appropriations

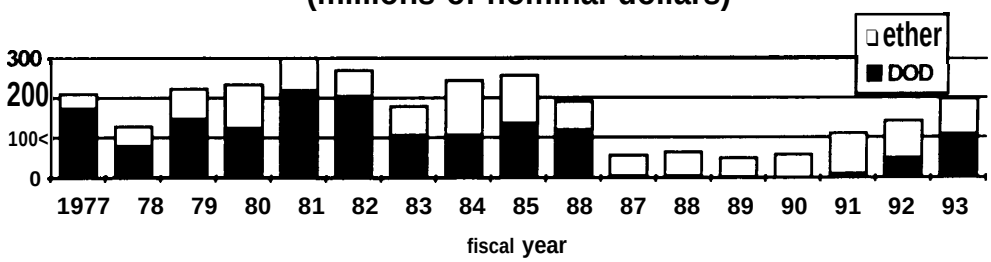
Direct appropriations have the advantage of being administratively simple and well understood. However, federal funds are relatively scarce and energy efficiency appropriations must compete with other agency activities. Because energy efficiency is generally not a primary agency mission and because energy costs are typically a small fraction of total agency budgets, even projects with rapid paybacks have often received low priority for finding. Figure 2 shows how appropriations have fluctuated over the past two decades, with substantial increases in the past few years returning nominal annual investment to about the level of the late 1970s. Current administration plans are to continue escalating efficiency investments to a level of $600 million in fiscal years 1997-98.12

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11 EPACT, Sec. 162.

12 Mark Ginsberg, U.S. Department of Energy, Office of Federal Energy Management Programs, personal communication, Feb. 25, 1994, based on Office of Management and Budget projections for a 4-year period, issued winter 1993,

Figure 2-- Federal Energy Efficiency Funding
direct agency appropriations
(millions of nominal dollars)



SOURCE: Department of Energy data. Fiscal year 1992-93 figures are preliminary estimates.

To help establish explicit priorities, EPACT requires the President's annual budget submittal to include a statement of the amount requested for each agency's energy management activities. [13] That information is provided for some, but not all, agencies in the fiscal year 1995 budget request. The largest energy using agencies, including the Department of Defense (DOD), DOE, and the General Services Administration (GSA) are among those providing energy management line items in the current budget request.

Federal Energy Efficiency Fund

EPACT authorized DOE to establish a Federal Energy Efficiency Fund (FEEF) to provide grants to agencies to assist them in energy and water conservation requirements. [14] DOE finalized guidelines for proposals for FEEF support in December 1993, and has distributed those to all federal agencies. [15] Initial year FEEF efforts are a small portion of federal energy management efforts, reflecting the approach's unique and previously untested

[13] EPACT, Sec. 152(e). The U.S. General Accounting Office is conducting a study of this provision, with a report expected for release by the end of April 1994.
[14] EPACT, Sec. 152 (f).
[15] U.S. Department of Energy, Federal Energy Management Program, "Guidelines for Proposals for Federal Energy Efficiency Fund Support," Dec. 22, 1993.

nature. For fiscal year 1994, $6 million is available for all agencies with the exception of DOD, GSA DOE, and Veterans Affairs, which were specifically excluded in the appropriations bill. EPACT authorized $50 million for the find for fiscal year 1995.

FEEF may have the advantage of focusing some energy management finding decisions on DOE, an agency for which energy management is a primary mission. This can help promote activity in agencies for which energy efficiency is a low priority. At the same time, this approach raises questions of coordination of budgets, both among the agencies in their budget planning and among appropriations subcommittees. As with direct agency appropriations, FEEF requires an investment of federal finds. **Early results from the program, if properly assessed, should be useful in determining whether the increase in agency efficiency activity outweighs the budgeting challenges raised and in establishing appropriate longer term funding levels.**

Energy Savings Performance Contracts

Energy savings pertormance contracts are a successor to the Shared Energy Savings (SES) concept first authorized in 1985.[16] Under these contracts, private companies use their own capital and personnel to perform energy efficiency improvements at federal facilities. Their services may include energy audits, purchase and installation of new equipment, efficient operation and maintenance of equipment, and training of personnel. In exchange, the contractors receive a specified portion of the cost savings for a number of years. This system provides agencies a private-sector alternative to federal finding and staffing for energy efficiency investments, although by sharing the savings, it reduces the government's total cost-saving potential (since those savings are shared).

16 Comprehensive Omnibus Budget Reconciliation Act, 1985, Public Law 99-272.

Early results from the SES program were far less promising than originally anticipated, with a cumulative total of 4 contracts awarded by fiscal year 1990 and 13 by fiscal year 1992. SES contracts must contain generally complex terms distributing benefits and risks between the contractor and the federal government. Agencies reported that developing these novel contracts in a reamer consistent with the Federal Acquisition Regulations proved to be even more complex and time-consuming. The typical lack of reliable energy use data at federal facilities further exacerbates the uncertainty and risks associated with these contracts. Finally, as private businesses, energy service companies have a cost of capital exceeding that of the federal government. Thus, some efficiency investment opportunities that are moderately cost-effective based on the federal cost of funds may not be attractive under ESPCs.

EPACT modified some SES contracting requirements, adopted the term ESPC, and directed DOE to develop uniform contracting procedures with the concurrence of the FAR Council. [17] Those procedures, which were to have been adopted by rule by April 1993, remain under review and are expected to be released for comment in late March or April 1994.18 EO 12902 further directs GSA to develop procurement methods including ESPCs to speed the adoption of energy efficient technologies. **Eventual adoption of an ESPC rule should be a useful step enabling more widespread use of the approach. Continued experience with this evolving program is needed to determine its long-term potential contribution to overall federal energy efficiency funding.**

17 EPACT, Sec. 155.

18 Mark Ginsberg, U.S. Department of Energy, **Office** of Federal Energy Management Programs, personal communication, Feb. 25, 1994.

Utility Demand Side Management Programs

Where offered, utility rebate programs encouraging the use of highly efficient equipment and methods can be a substantial supplement to federal finds. [19] For example, in its fiscal year 1991 annual report on federal energy management, DOE noted announcements of DSM rebates government-wide totaling about $15 million, with over half of that total coming from a single facility-wide effort at Fort Lewis, Washington.[20] Besides reducing the federal finding required for energy management projects, this approach allows agencies to make use of utility expertise in project design and implementation. Not all utilities have programs, however, and for those that do, there is a wide range of programs reflecting the needs and approaches of the local utility.

OTA's 1991 Report found that in the past, procurement policies may have hindered federal facilities from participating in utility rebate and incentive programs. While Federal Acquisition Regulations appeared to include no specific prohibitions against participation in such utility programs, there were no specific allowances either to accept what might be construed as a gift. To clarify that federal participation in utility programs is indeed legal and in the national interest, Congress specifically included language to that effect for GSA and for DOD in 1990, and for agencies generally in EPACT.[21] There remains, however, a potential conflict with federal life-cycle cost requirements that provide for a "fuel-neutral" analysis rather than one oriented to the type of energy provided by the utility. DOE staff have

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19 For an indepth discussion of electric utility demand side management programs, see U.S. Congress, Office of Technology Assessment, *Energy Efficiency: Challenges and Opportunities for Electric Utilities, OTA-E-561* (Washington, DC: U.S. Government Printing Office, September 1993).

20 U.S. Department of Energy, *Annual Report to Congress on Federal Government Energy Management and Conservation Programs Fiscal Year 1991,* Oct. 22, 1992, p. 19-22. The report does not note whether the DSM rebates were received in 1991 or would be spread over several years.

21 EPACT, Sec. 152(f).

identified this potential conflict as an issue that may need to be addressed to allow fill use of DSM programs.

Conclusion

As noted above, while the authorities and direction presented by EPACT and EO 12902 appear promising, it is too early to tell how successful they will be. There are some substantial delays in performing critical activities required by law for assessing and promoting alternate finding methods and surveying potential savings. Completion of these activities and implementation of their results will be important to determining the extent to which current efficiency efforts can be profitably expanded. However, while some activities have been delayed, current energy management efforts are far more intensive than in 1991, which should lead to filler and faster implementation of efficiency measures and cost savings. In particular, budget requests and appropriations for efficiency upgrades are continuing to increase rapidly.

OTA Report Brief .

May 1991

Energy Efficiency in the Federal Government: Government by Good Example?

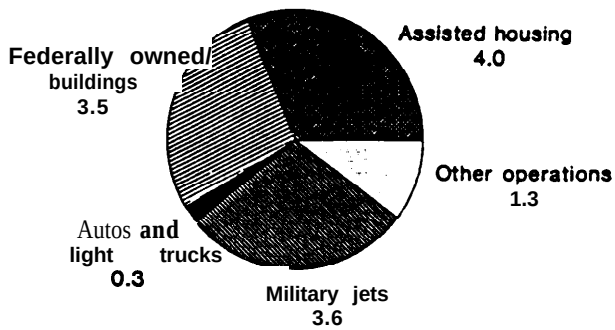
The Federal Government is the Nation's largest **single energy consumer. In fiscal year** *1989,* **it spent** $8.7 **billion on direct energy purchases for its own facilities and operations, and about $4 billion more subsidizing the energy expenses of low-income households (see figure 1). Much of this energy is inefficiently used. For example, it appears that commercially available, cost-effective measures including high efficiency lighting and carefully op crated heating, ventilating, and air-conditioning (HVAC)** equipment **could profitably conserve at least 25 percent of the energy used in Federal buildings with no sacrifice to comfort or productivity.**

Improving energy efficiency has several benefits both for the government and for the Nation. Inefficient use of energy needlessly exacerbates reliance on imports of oil from foreign sources, contributes to local and global environmental concerns such as smog and climate change, and consumes capital and operating expenditures which could be better invested elsewhere.

The Federal Government has an **opportunity to set a good example for efficient energy use while reducing Federal spending, reliance on imported oil, and adverse environmental impacts. There is no single technology which will revolutionize Federal (or** private sector) energy **use. Rather, for nearly every application of energy, there are measures available that can improve efficiency. From lighting to HVAC equipment to automobiles, revised Federal procurement rules could expand market opportunities for producers of efficient technologies, demonstrate measures useful in the private sector, and encourage more research and development by manufacturers.**

The best practices found in Federal facilities and operations today demonstrate that Federal energy inefficiency is not inevitable. Since the mid-1970s, the government has worked to improve its energy efficiency, although the level of effort has varied. According to the Department of Energy, between 1975 and 1989 these efforts saved close to 7 billion dollars' worth of energy (about 5 percent of the government's direct energy spending), far more

Figure I-Federal Spending on Energy, Fiscal Year 1989



SOURCE: OTA, adapted from data provided by U.S. Department of Energy, U.S. Department of Housing and Urban Development, and U.S. Department of Health and Human Services.

than the $2.5 **billion invested in energy conservation measures. Despite this achievement, considerably greater savings are still possible, since existing programs have not been fully implemented and the use of many cost-effective energy efficient measures is low. For example, inefficient, costly-to-operate lighting is still common throughout the millions of square feet of office space owned or leased by the Federal Government.**

The failure of Federal **agencies** to fully employ energy efficiaent measures results from several constraints, **many of which also apply to the private sector (see table 1). All of the constraints could be overcome using existing and new initiatives to implement the best practices in use today (see table 2).** However, **overall, energy efficiency is not central to most agencies' missions and has received a relatively low priority. Reflecting the low priority, there is a shortage of trained personnel to select and implement measures. Successful implementation typically requires site-specific engineering and financial analyses, and an ongoing effort to ensure that measures work initially and continue to work. For example, the benefits of adding an energy monitoring and control system to a facility depend** on the type of **HVAC** equipment in **place and** possible plans to replace existing equipment, as well as the buildings' external **characteristics and internal layout and occupancy.**

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Table I-Constraints on Improved Federal Energy Efficiency

Resource constraints:
Low priority
Lack of investment funding
Shortage of personnel
Information constraints:
Opportunities not systematically assessed
Uncertain technical and economic performance
Lack of Incentive:
Dollar savings do not accrue to energy savers
Procurement policies favor status quo

SOURCE: Offica of Technology Assessment, 1991.

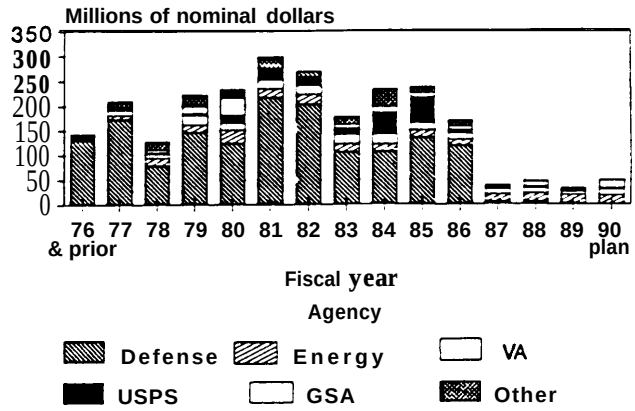
Table 2—Policy Options To Improve Federal Energy Efficiency

Dedicate resources:
Designate funds for economic investments
Support a staff of energy management professionals
Promote applied R&D:
Demonstrate full potential at model facilities
Publicize successful efforts
Encourage agency efforts:
Set performance standards based on opportunities
Create incentives for agencies and individuals
Revise and simplify procurement

SOURCE: Of fice of Technology Assessment, 1991.

The capital needed to make even short-term investments is also scarce, again reflecting energy efficiency's low priority. Although many measures have potential annual returns on investment of **30** to over 100 percent, the **total capital budget earmarked specifically for energy efficiency projects in federally owned facilities dropped from a high of $297 million in 1981 to under $50 million in 1990, a decline of over 80 percent in nominal dollars (see figure 2). Adjusted for inflation, that decline was nearly 90 percent. The trend has begun to reverse, with the General Services Administration and the Department of Defense alone increasing their energy effiicency investments from under $7 million in fiscal year 1989 to $40 million in 1991. Private sector financing in the form of utility rebate programs and shared energy savings contracts are being used to supplement direct Federal funds. Taking full advantage of cost-effective energy efficiency measures would require inital investment of several billion dollars. These investments would be rapidly paid** back and **continue to reduce Federal energy expenditures for years.**

Figure 2—Direct Federal Energy Efficiency Funding, Fiscal Years 1976-90



SOURCE: U.S. Department of Energy, Federal Energy Management Program, "Annual Report to Congress on Federal Government Energy Management and Conservation Programs," fiscal years 1981 -89; and "Federal Ten-Year Building Plan," DOE< E-0047, September 1983.

Other constraints are also **important. For example, program planning and budgeting have been hampered by a lack of governmentwide analyses of the potential energy and cost savings and of the resources required to attain those savings. There is also a lack of incentive for agencies and for facility personnel, although there are notable exceptions which could be more widely applied. Finally, Federal procurement is naturally complex, reflecting the diverse goals of the process and the great variety of goods and services. Difficulties of identifying and** justifying novel energy-efficient **products and** services **impede their use. Efforts to ease constraints on energy efficieny imposed by procurement policies are under way** but, **again, could be accelerated if given a higher** priority.

Copies of the report for congressional use are available by calling **4-9241.**

Copies of the report for non-crongressional use can be ordered from the Supenintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325 (202) 783-3238. The GPO stock number/w the *OTA report, "Energy Efficiency in the Federal Government:* Government by *Good Example?" is 052-003-01242-1. The price is $5.00.*

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