UNITED STATES
GENERAL ACCOUNTING OFFICE

Improvements Needed In Department Of Defense Energy Conservation Investment Program

The Energy Conservation Investment Program afforded DOD, the Government's largest energy user, an excellent opportunity to make its existing buildings more energy efficient.

However, the program as conceived and currently structured does not insure that its primary objective of conserving DOD's energy resources will be achieved in the most efficient, effective, and economical manner because:

--The program structure excludes some facilities that are large energy users.

--The program criteria does not require proper economic analyses for evaluating and selecting projects.

--Program directors have not established adequate guidelines and controls to identify energy-saving projects on the basis of consistent and reliable data.

EMD-78-15

JANUARY 18, 1978

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

ENERGY AND MINERALS
DIVISION

B-178205

The Honorable
The Secretary of Defense

Dear Mr. Secretary:

This report summarizes our review of the Department of Defense's Energy Conservation Investment Program. The Department should be commended for taking an early lead in the Government's efforts to conserve energy in its existing facilities by means of this program. However, we believe the program should be restructured to insure that all DOD facilities can compete for program funds. In addition, the program criteria should provide for proper economic analyses to be used in evaluating and selecting all projects for funding.

The report contains recommendations to you on pages 9, 10, 14, and 15. As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the four Committees mentioned above and to the chairmen of energy-related congressional committees. We are also sending copies to the Acting Director, Office of Management and Budget; the Secretary of Energy; and the Secretaries of the Army, Navy, and Air Force.

Sincerely yours,

Monte Canfield, Jr.
Director

GENERAL ACCOUNTING OFFICE
REPORT TO THE
SECRETARY OF DEFENSE

IMPROVEMENTS NEEDED IN DEPARTMENT OF DEFENSE ENERGY CONSERVATION INVESTMENT PROGRAM

D I G E S T

The Department of Defense's (DOD's) Energy Conservation Investment Program (ECIP) was established to help DOD conserve energy in its buildings and facilities. Energy savings were to be achieved through retrofit projects ranging from storm windows and insulation improvements to more advanced projects such as heat recovery wheels and energy monitoring systems.

DOD envisioned the program as covering 6 years with funding requirements of $1.35 billion. The Congress appropriated $130.4 million for this program for fiscal year 1976, $174.4 million for fiscal year 1977, and $79.9 million for fiscal year 1978.

Congressional funding of the program afforded DOD, the Government's largest energy user, an excellent opportunity to make its existing buildings more energy efficient. However, the program as conceived and currently structured does not insure that its primary objective of conserving DOD's energy resources will be achieved in the most efficient, effective, and economical manner because:

--The program is structured so that most Government-owned, contractor-operated plants, which are large energy users, as well as most overseas projects cannot obtain program funding for needed projects. (See p. 2.)

--Proper economic analysis techniques are generally not used in evaluating and selecting projects for funding. (See p. 4.)

--Program directors have not established adequate guidelines and controls to identify energy-saving projects on the basis of consistent and reliable data. (See p. 11.)

GAO met with DOD officials to discuss the above weaknesses in the program. DOD initially did not agree with GAO's suggestion that all Government-owned, contractor-operated plants should be eligible to compete for ECIP funds. Subsequently, however, DOD stated that more projects were planned for these facilities, but it had not been decided whether the projects would be included in the ECIP or in some other program.

On the method used to evaluate and select projects, DOD believed that short payback periods were necessary to obtain congressional funding and that economic analyses were too burdensome. Poor project estimates and data collection were attributed to the short time allowed for their preparation.

In March 1977 DOD issued revised guidelines which addressed some of the weaknesses in the program that GAO had discussed. The main thrust of the new guidelines is to revise DOD's procedures for evaluating and selecting retrofit projects. Energy savings are to be given more emphasis, and a detailed economic analysis is suggested for "larger" projects.

The President, on July 20, 1977, issued Executive Order 12003 which establishes energy conservation goals for federally owned buildings. The goal for existing buildings is a 20-percent reduction in average annual energy use from 1975 levels by 1985. The order specifies that economic analyses, consistent with Office of Management and Budget Circular A-94, shall be used by Federal agencies in developing budget estimates for their energy conservation plans.

GAO believes that the ECIP program provides DOD a ready means with which to meet the President's goals. Further, the actions taken by DOD have improved the program in some respects. However, the program structure and criteria should be modified to insure that all of DOD's facilities can compete for program funds and that better project evaluation and selection procedures are used.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense:

--Closely evaluate the ECIP program and determine the scope and funding levels that will be needed to meet the administration's new energy conservation goals for existing buildings.

--Revise the ECIP program structure and criteria to:

1. Insure that effective immediately all Government-owned, contractor-operated plants and overseas installations can compete for program funds.

2. Insure that proper economic analysis methods, consistent with OMB Circular A-94, are used to evaluate and select all projects.

3. Include, as a secondary evaluation technique, a measurement of the amount of energy saved per dollar invested for all projects so that energy-saving effectiveness will be highlighted.

4. Insure that, when evaluating proposed projects, the military services determine whether the energy savings to be realized could be accomplished through simpler, less costly energy conservation measures.

5. Include guidelines and controls to obtain consistent and reliable data for use in identifying, evaluating, and selecting energy conservation projects.

--Work closely with the Department of Energy in its development of energy price escalation projections and use these projections in the ECIP program.

Contents

ABBREVIATIONS

Btu	British thermal unit
DOD	Department of Defense
ECIP	Energy Conservation Investment Program
GAO	General Accounting Office
GOCO	Government-owned, contractor-operated

CHAPTER 1

INTRODUCTION

The Energy Conservation Investment Program (ECIP) was recommended by a Department of Defense Energy Task Group and was established in fiscal year 1976 as part of the military construction program. The program objective is to conserve energy at Department of Defense (DOD) facilities by modifying energy-intensive systems and design deficiencies through self-amortizing retrofit projects. The types of projects to be included ranged from storm windows and insulation improvements to more advanced projects, such as heat recovery wheels and energy-monitoring systems.

DOD envisioned the program as covering 6 years with funding requirements of $1.35 billion. Beginning with fiscal year 1978, DOD reduced the program scope to $722.3 million by eliminating projects with relatively long cost recovery periods. The Congress appropriated $130.4 million for this program for fiscal year 1976, $174.4 million for fiscal year 1977, and $79.9 million for fiscal year 1978.

On July 20, 1977, the President issued Executive Order 12003, "Relating to Energy Policy and Conservation," which established energy conservation goals for federally owned buildings. The goal for existing buildings is a 20-percent reduction in average annual energy use from 1975 levels by 1985 for all buildings. DOD believes the ECIP program will have to be expanded in scope--to about $2.9 billion through 1984--to meet the 20-percent goal.

SCOPE OF REVIEW

We made a limited review of the program to determine its scope and structure, evaluate its overall management, and test its implementation. We reviewed program management documents, including the criteria and guidance to the military services which directed the program's operation. As a test of how well the program was working we selected for review 20 projects at 7 military installations and discussed our findings with appropriate officials at the installations and commands, the military services' headquarters, and the Department of Defense.

CHAPTER 2

NEED TO RESTRUCTURE PROGRAM AND IMPROVE CRITERIA

As early as June 1973, the President directed all Federal agencies to find ways to conserve energy in their facilities, including Government-owned contractor-operated (GOCO) facilities. The ECIP program, however, was structured in a way that did not permit most GOCO plants, which are some of the Government's largest energy users, to obtain program funding for energy-saving projects. Neither did the program permit funding for most projects at overseas locations.

Although the program objective is to save energy, its criteria placed undue emphasis on cost savings at the expense of energy saving effectiveness. Furthermore, proper economic analysis techniques were generally not used in evaluating and selecting projects.

THE PROGRAM EXCLUDED MOST GOVERNMENT-OWNED, CONTRACTOR-OPERATED PLANTS AND OVERSEAS INSTALLATIONS

The manner in which the ECIP program was structured precluded many of DOD's facilities from obtaining program funding for energy conservation projects. For example, although projects at a few Army GOCO plants were funded, Navy and Air Force GOCO plants were excluded from the program entirely. In addition, most projects at overseas installations were not eligible to compete for funding.

The responsibility for formulating the overall ECIP program was assigned by DOD to a facilities planning panel. In meetings during and after February 1975, the panel considered whether facilities such as GOCO plants should be included in the program. Such plants are large energy users. They consume about 18 percent of all energy used in Army facilities.

The panel concluded that the military services had ample authority to fund energy-saving projects at GOCO plants from procurement and research appropriations, and therefore, these plants should generally not be included within the ECIP program. The panel's decision was consistent with a DOD directive which states that funds for construction at GOCO plants, unless on a military installation, should be provided from the procurement and research appropriations and not from the military construction appropriations.

The Army has used ECIP funds for projects at a few of its GOCO plants. DOD officials told us, however, that these particular Army plants were considered to be military

installations and therefore the projects could be approved for ECIP funding under the military construction program. Neither the Navy nor the Air Force have attempted such funding because their GOCO plants are considered to be typical industrial type plants and not military installations.

In our earlier work on energy conservation by Government contractors 1/ we found that GOCO plants have essentially the same types of energy-inefficient design and characteristics that DOD planned to correct with its ECIP program. For example, we noted numerous instances where projects such as installing insulation, thermostat controls, heating and air-conditioning mechanical controls, lowered ceilings, and other typical retrofit projects could save energy. In many instances these projects, including their estimated energy and cost savings, had been proposed by the contractors as part of their regular procurement budgets, but were not approved because funds were not available.

The ECIP program is a rather unique program to save Defense energy in that the funds, once appropriated, are considered to be "dedicated" and can be used only for the program's approved energy-saving projects. The funds cannot be transferred to fulfill a need elsewhere. The traditional method of funding energy projects at GOCO plants through the procurement and research appropriations means the projects must compete for limited funds with such demands as needed equipment and supplies and legally mandated projects to improve plant safety and environmental problems. The practical result is that energy conservation projects are given low priority relative to other needs and therefore are often not funded. Navy and Air Force officials told us there was a need in their GOCO plants for energy conservation projects and pointed out that these types of projects often received low priority in the competition for limited funds.

The facilities planning panel also considered whether the ECIP program should include projects at overseas installations. Initially the panel decided that the program should be limited to the continental United States. However, at a later meeting, the Navy representative on the panel stated he had identified some large energy savers at various overseas bases. Following a discussion of this point, the panel modified its earlier decision and recommended that, starting with the fiscal year 1978 program, overseas projects

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1/See GAO report "Federal Agencies Can Do More to Promote Energy Conservation by Government Contractors" (EMD-77-62, Sept. 30, 1977).

could be considered on a case-by-case basis if they saved U.S.-supplied energy.

In March 1977, DOD again modified its position on including overseas installations. Beginning with fiscal year 1981, the restriction that overseas projects must save U.S.-supplied energy is removed and, presumably, these projects will be able to compete on an equal basis with other projects for funds within the program.

During a concurrent review of energy conservation at overseas installations and bases we found that the military services had identified numerous energy-saving retrofit projects but, in many cases, were unable to obtain the necessary funding. Most projects were not eligible for ECIP funds because they did not save U.S.-supplied energy. Some projects, however, were accomplished through other funding sources.

CRITERIA FOR EVALUATING AND SELECTING PROJECTS DID NOT REQUIRE PROPER ECONOMIC ANALYSES

In carrying out the ECIP program, DOD evaluated and selected projects for funding on the basis of quick intial cost recovery rather than on the basis of sound economic analyses. At the time the ECIP was developed, large scale programs for installing energy-saving retrofit items were something new. In order to help the program gain acceptance, DOD initially placed considerable emphasis on quickly recovering program costs. Projects for fiscal year 1976 were limited to those with savings which would amortize costs within an average of 5 years. During congressional testimony in 1975, DOD stated it expected the entire fiscal year 1976 program to be amortized within 4 years.

DOD originally planned that the program's emphasis would later focus more on energy savings than on quick cost recovery. Projects for fiscal years 1977 and later could amortize their costs within 10 years instead of 5 years. In August 1976, however, the Secretary of Defense reemphasized cost savings over long term energy savings by reducing the maximum amortization period from 10 to 6 years for fiscal years 1978 and later. This action reduced the program scope from $1.35 billion to about $722 million because projects with payback periods longer than 6 years were eliminated. Consequently the program's total energy saving potential was substantially reduced.

Benefit-cost analyses should be used

As discussed above, the program criteria provided for ECIP projects to be evaluated and selected on the basis of

payback periods--the time required to recoup the project's cost through reduced energy costs and other related cost savings. Valid comparisons between alternative projects of different lifetimes cannot be made using only the payback method. This method of evaluating and selecting projects is incomplete because it does not consider benefits over the project's expected life cycle or reflect the time value of money. 1/

The payback method is not consistent with Office of Management and Budget (OMB) Circular A-94 because it fails to include discounting to present value or differing lengths of project economic life. Circular A-94 requires that discounting of benefits and costs be used by an agency when its programs or projects commit the Government to costs or benefits extending over 3 or more years. It is expected that almost all energy conservation projects have benefits that extend beyond the minimum time period required by the circular.

DOD, however, did not require benefit-cost analyses for the program's project evaluation and selection mechanism. Neither did the Office of Management and Budget require these types of analyses when it reviewed the ECIP program proposals that were submitted to the Congress for funding.

Recently, in Executive Order 12003, the President reinforced the use of economic analysis concepts as set forth in Circular A-94 for making decisions on which energy conservation retrofit projects should be funded. The Executive Order clearly states that the method developed is to be consistent with Circular A-94.

Energy savings should be highlighted

The benefit derived from a DOD energy conservation project is usually the savings in energy costs as a result of the project. In addition, some projects have nonenergy-related benefits such as reduced labor and maintenance costs or lowered electrical demand charges. 2/ The inclusion of all cost savings is, of course, important and necessary for any complete and accurate economic analysis. However, cost

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1/The time value of money is the difference between the value of a dollar today and its value at some future point in time if invested at a stated rate of interest.

2/Demand charge is a "surcharge" paid to the power company which reflects the maximum rate of energy usage during a period rather than the actual amount used.

savings derived from nonenergy-related benefits, such as reduced labor and maintenance, do not provide an indication of a project's merits as an energy saver. An evaluation measure which would highlight energy savings is the amount of energy saved per investment dollar, or inversely, the cost to save each unit of energy.

Although the program criteria required only payback period calculations, the Army, for its fiscal year 1978 program, developed two separate project rankings--one based on payback period and the other based on the ratio of project cost per million British thermal units (Btu's) saved annually. The two ranking methods produced quite different results. For example, a project to save low-priced natural gas ranked poorly by the payback method--number 60 out of 61 projects. In fact, the project's estimated payback period of 15.8 years was too long for approval under the criteria requiring amortization in 6 years or less. However, the project ranked number 11 on the basis of the estimated project cost per million Btu's saved each year. If DOD had used this type of analysis to assist its decisionmaking process, these types of potentially good projects to save low-priced fuels could have been noticed and considered for funding.

We computed the ratio of project cost per million Btu's saved annually for the projects we reviewed. The results ranged from $1.05 to $263.51, and showed that some of DOD's projects are obviously much more effective than others in terms of what it costs to save a unit of energy. Projects with relatively high estimated investment costs per million Btu's saved each year ($23.17 to $263.51), included steam system replacements and relamping projects. Three of these projects relied substantially on saving costs other than energy costs, and therefore, we believe they were not the most appropriate projects for funding under the ECIP program. For example, a project at Puget Sound Naval Shipyard to replace a central fuel oil steam system with natural gas boilers was approved with an estimated payback period of 4.1 years based on an estimated cost of $546,000 and annual savings of $134,000. Most of the estimated savings resulted from the difference between the prices of fuel oil and natural gas and from reduced maintenance costs. This project was to save about 2,072 million Btu's annually, which resulted in an investment cost per million Btu's saved each year of $263.51--the highest of all the projects we reviewed. We do not believe that this project is a very good one in terms of energy-saving effectiveness.

The military services are also funding automated building control systems, sometimes called energy management systems or energy monitoring and control systems, under ECIP.

These systems afford remote control, usually by computer, over services such as heat, light, security, fire alarms, etc., in a building or a complex of buildings. We observed that some of these systems will result in significant cost savings in areas other than energy--for example, reduced labor and maintenance costs.

Furthermore, in some cases, much of the energy savings achieved by automated systems derives from simple switching operations such as turning off fans and other equipment. The Department of Energy's manual Identifying Retrofit Projects for Federal Buildings, cautions against unwarranted investment in these expensive systems when simpler, less costly options are available that will save nearly as much energy.

The primary purpose of the ECIP program is to save DOD's energy. It appears to us, therefore, that if the energy-saved-per-investment-dollar analysis were done for all projects the results would provide DOD management with a useful evaluation tool by underscoring each project's potential energy savings. Although we are not suggesting that this evaluation procedure should be used instead of the economic analyses required by OMB Circular A-94, it could be used in conjunction with these analyses to help DOD select the best energy-saving projects within existing budget limitations.

AGENCY COMMENTS AND ACTIONS AND OUR EVALUATION

At the conclusion of our field work we met with DOD officials to discuss the above weaknesses which we believed existed in the ECIP program structure and criteria. The officials did not agree with our suggestion that all GOCO plants should be eligible to compete for ECIP funds. Subsequent to our discussion, however, we received comments from DOD on a GAO draft report which also recommended greater GOCO participation in the ECIP. 1/ The Department's comments, dated May 19, 1977, stated "* * * we concur with the GAO recommendations that Government-owned, contractor operated (GOCO) plants be included within the program." The Department further stated that a planning document for next year's budget will provide the opportunity to accomplish more energy conservation projects in these facilities.

A DOD official later told us that, although next year's budget-planning document will provide for energy conservation projects at GOCO plants, it was too early to determine

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1/"Federal Agencies Can Do More to Promote Energy Conservation by Government Contractors," (EMD-77-62, Sept. 30, 1977).

whether the projects will be included in the ECIP or in some other program. He expressed the belief, however, that funds for these projects would be in some sort of "fenced" or "dedicated" program. That is, as with ECIP funds, they could be used only for the program's approved energy-saving projects and not for other competing needs.

On the method used to evaluate and select projects, DOD officials expressed the view that, in order to obtain congressional funding, projects must be justified in terms of dollars saved. This is the reason the allowable payback periods were short and that energy-saved-per-dollar-invested analyses were not required.

With respect to using economic analyses in lieu of simple payback calculations to evaluate and select projects, officials in DOD headquarters and the Army and Air Force advised us that these types of analyses were either too burdensome or involved too many assumptions and variables. Navy officials, however, believed that economic analyses were desirable and, in fact, started to use this method early in the program. They dropped this method, however, after DOD decided that only payback period estimates were needed.

In March 1977, DOD issued revised guidelines for the ECIP program which addressed some of the weaknesses in the program that we had previously discussed with them. The main thrust of the new guidelines is to revise DOD's procedures for evaluating and selecting retrofit projects. For instance, projects are no longer to be selected solely on the basis of their payback periods. Instead, energy savings is given added emphasis because projects are to be placed on a priority basis and selected by the amount of energy saved per investment dollar, after first meeting the payback criteria of 6 years or less. A more detailed economic analysis is suggested for "larger" projects.

We believe the actions taken by DOD have improved the ECIP program in some respects; however, there are certain areas in which improvements are still needed. For example, an economic analysis consistent with OMB Circular A-94 is not required for all projects. And, in general, projects must still be self-amortizing within 6 years. The new ECIP guidelines complicate the project evaluation and selection process by specifiying two different methods of computing amortization periods. Simple payback periods are to be determined for "most" projects, whereas a more detailed economic analysis is suggested for "larger" projects. It appears that valid comparisons between projects evaluated by different methods would be difficult, at best. Furthermore, the new guidelines do not indicate what a "larger" project is

and, therefore, when to use the more detailed analysis is not clear.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Congressional funding of the ECIP program afforded DOD, the Government's largest energy user, an excellent opportunity to retrofit existing buildings and facilities to make them more energy efficient. However, the program as conceived and currently structured does not insure that its primary objective of conserving DOD's energy resources will be achieved in the most efficient, effective, and economical manner. We believe the program should be structured so that all GOCO facilities have the opportunity to compete for ECIP funds. In addition, funding projects at overseas installations which use foreign-supplied energy could serve to reduce our overall dependence on foreign energy sources. We believe, therefore, that energy conservation projects at overseas locations should be considered on a case-by-case basis effective immediately, providing they meet DOD's criteria for qualifying projects. A factor that DOD should consider is our vulnerability to supply disruptions at these locations.

In view of the requirement in Executive Order 12003 for agencies to reduce energy consumption in existing buildings by 20 percent and the impact this requirement may have on the ECIP program, we believe the overall program should be closely evaluated and a determination made of the program scope and funding levels needed to meet the Administration's new goal.

We also believe that the program criteria for evaluating and selecting projects should be revised to include an economic analysis for all projects that is consistent with OMB Circular A-94. DOD should also consider evaluating projects on the basis of the amount of energy saved per investment dollar. By so doing, both good and poor energy-saving projects would be highlighted and DOD could use this additional information to select the best projects within the program's budget limitations. The program guidelines should also include a provision that, when evaluating proposed projects, the military services determine whether the savings to be realized could be accomplished through simpler, less costly energy conservation measures.

Recommendations

We recommend that the Secretary of Defense restructure the ECIP program to provide that all Government-owned,

contractor-operated plants and overseas installations can compete for program funds effective immediately. We also recommend that, in view of the requirements of Executive Order 12003, a determination be made of the program scope and funding levels that will be needed to meet the Administration's energy conservation goal for existing buildings.

We further recommend that the program guidelines be revised to

--insure that proper economic analysis methods, consistent with OMB Circular A-94, are used to evaluate and select projects;

--include, as a secondary evaluation technique, a measurement of the amount of energy saved per dollar invested for all projects so that energy saving effectiveness will be highlighted; and

--insure that, when evaluating proposed projects, the military services determine whether the energy savings to be realized could be accomplished through simpler, less costly energy conservation measures.

CHAPTER 3

NEED TO IMPROVE QUALITY OF PROJECT ESTIMATES

In developing estimates of project costs and savings, the military services did not develop reliable data or deal with it consistently. Consequently, the original estimates did not provide reliable forecasts of potential energy savings or amortization periods--the principal criterion used for selecting projects. While reviewing the fiscal year 1976 projects, the Senate Armed Services Committee questioned whether the funds would be used for purposes outside the program objective and whether the services were consistent in developing projects for the program. The Committee expressed doubts on the validity of the reported payback periods and directed the services to revalidate the projects before obligating funds.

Although revalidation improved most of the estimates, higher revised cost estimates caused substantial reduction in the scope of some projects. In addition, estimates of energy and cost savings were still erroneous. Service officials attributed the poor estimates to the short time allowed for their preparation and attributed the lack of consistency to the absence of clear guidance from DOD.

ESTIMATES OF PROJECT COSTS

None of the services prepared and documented their cost estimates with due care. As indicated by the following examples, many of the estimates omitted relevant data or contained inaccuracies or erroneous assumptions.

--A $610,000 project to insulate 114 buildings at Wright-Patterson Air Force Base, Ohio, was revalidated by installation personnel. They found labor costs to install the insulation were excluded in the original cost estimate. When these costs were added to the estimate, costs increased about $235,000 over the approved project cost. To meet the approved funding level, 60 of 114 buildings were removed from the project.

--At Fort Riley, Kansas, the Army estimated costs at $422,000 for a storm door and window project for 285 buildings. Revalidation by the Corps of Engineers reduced the project scope to 68 buildings to stay within the funding limit. Fort Riley plans called for 11,400 storm windows and 1,425 storm doors. The reduced scope included 3,876 storm windows and 211 storm doors.

--The Navy originally estimated a cost of $643,000 to modify a condensate return system at the Puget Sound Naval Shipyard. The Navy later revised the estimate to $720,000. After contract award the total project cost was estimated to be about $943,000, or about 47 percent more than the authorized amount, even though the project scope was reduced from about 34,900 feet of condensate line to about 19,000 feet, or 54.6 percent.

ESTIMATES OF SAVINGS

Estimates of savings also contained inaccuracies and erroneous assumptions. At Puget Sound Naval Shipyard the Navy reported estimated annual savings of $134,099 for a project to replace a central fuel oil steam system for 43 buildings with natural gas boilers at an estimated cost of $546,000. The actual cost was $903,600. The estimated cost savings included $43,200 a year based on an incorrect fuel oil rate of $4.40 per million Btu's compared to an actual rate of $2.44. The estimate did not include increased maintenance costs of $42,200 a year. Correction of these and other errors would have reduced annual savings to about $4,600. At this rate the savings would not equal project costs for almost 200 years.

Wright-Patterson Air Force Base engineers found that the original annual savings estimates submitted to justify three projects were erroneous. Our analysis showed that the revised savings estimates were also inaccurate. For example, after revalidation, base engineers reduced the scope of a lighting project from 110 to 13 buildings and, accordingly, reduced the annual cost savings estimate from $125,441 to $8,645. The revised cost savings estimate was based on electricity savings of 320,221 kilowatt hours. We found, however, that energy savings were overstated by 146,911 kilowatt hours because several factors, such as too many lights and too many workdays, were erroneously included in the computation.

At Fort Riley, Kansas, the Army computed heat-loss savings for three projects on the basis of maintaining a temperature of 68 degrees inside warehouse and ship areas compared to 55 degrees required by service regulations. The energy required to heat buildings to 55 degrees is substantially less than that required for 68 degrees.

ESCALATION OF ENERGY COST SAVINGS

A major part of estimated cost savings frequently came from the services' escalation of energy costs. Accordingly,

use of reliable escalation factors was important for developing acceptable cost savings estimates. The program's criteria provided for an energy cost growth of 9 percent a year or actual local experience. For actual experience, the criteria did not explain what base year or time period to use in developing cost growth rates. The criteria did not recognize differences in the cost growth potential for natural gas, coal, fuel oil, or electricity.

The Air Force instructed its commands to use current prices for purchased utilities and to escalate these prices 9 percent a year through 1980. The Army prescribed escalation rates of 30 percent for its fiscal year 1976 projects. The Navy provided for annual energy cost escalations ranging from 3 percent for electricity to 9 percent for fuel oil for its fiscal year 1976 projects.

Selected installations frequently used inconsistent energy cost escalation rates. For example, Wright-Patterson Air Force Base computed revised annual dollar-savings estimates various ways. The engineers did not escalate the energy-cost savings for a project to modify heating controls, however, they used an escalation rate of 20 percent a year for both an insulation project and a project to alter the lighting system.

At Fort Riley, a one-time 40 percent energy-cost-escalation factor was used in the original computations for a storm door and window project. In the final revalidation computations, Fort Riley engineers used a one-time 60 percent energy-cost-escalation factor for the same project. The use of the 60 percent escalation factor increased the estimated annual cost savings by about $6,400, thereby making the project appear more favorable for funding.

AGENCY COMMENTS AND ACTIONS

In discussing the quality of the estimates that were developed for the projects with Army, Navy and Air Force personnel, we were told that the time for developing the projects was short. During the early stages of the program the Corps of Engineers did much of the Army projects justification work at Corps headquarters, frequently obtaining data from the commands and installations by telephone. Navy personnel stated that energy conservation projects for fiscal year 1976 were accepted if the projects looked reasonable. However, more intensive reviews were made for subsequent year projects. Air Force personnel stated that detailed surveys were needed to come up with reliable project payback periods and that it is difficult to get commands to spend operations and maintenance funds for adequate surveys.

For fiscal years 1978 and later, DOD is requiring that about 35 percent of the design work be completed before projects are submitted to the Congress for funding.

DOD officials told us that one problem with developing accurate and reliable fuel price escalation factors is that no one knows how to do this. The new ECIP guidelines attempt to alleviate the problems with fuel price escalation rates discussed in this chapter, by specifying to the military services the rates to be used. In addition, Title VIII of the Department of Energy Organization Act (Public Law 95-91) requires DOE to evaluate and develop projections of foreseeable trends in the price of energy. These projections should be satisfactory for use by all Federal agencies and will insure consistent treatment of this important element when evaluating and selecting retrofit projects.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

How DOD's analyses are conducted may be as important, or more important, to the final result than the type of analysis used to evaluate and select energy conservation retrofit projects. Even the best analyses are no better than their data inputs. DOD provides only general, unstructured guidance to the military services for their use in developing, analyzing, and recommending proposed projects. For example, types of benefits and costs (other than energy) to be considered are not clearly defined; "larger" projects are not defined; and acceptable and consistent ways to collect and summarize information are not defined. Unless better guidelines and controls for project identification and analysis are developed, we believe one could expect to find many instances of poor data, faulty assumptions, various types of benefits and costs included, and poor estimates of proposed savings.

Recommendations

We recommend that the Secretary of Defense develop improved guidelines and controls to obtain consistent and reliable data for use in identifying, evaluating, and selecting energy conservation retrofit projects. In developing these guidelines and controls, consideration should be given to (1) providing greater specification for data collection, (2) providing for monitoring and validating project data collection and energy-savings estimates, and (3) conducting project analyses at DOD headquarters, based on data input from field installations.

We also recommend that the Secretary of Defense work closely with the Department of Energy in its development of energy price escalation projections, and use these projections in the ECIP program.

ENERGY CONSERVATION INVESTMENT PROGRAM

AUTHORIZED PROJECTS SELECTED FOR REVIEW

Scott AFB, Illinois

- Alter mechanical systems 1/
- Install insulation and hangar door interlocks
- Install energy monitoring and control system

Wright-Patterson AFB, Ohio

- Install insulation
- Alter heating systems
- Alter lighting systems

McChord AFB, Washington

- Alter temperature controls
- Alter hangars

Fort Riley, Kansas

- Install attic insulation
- Install storm windows and doors
- Alter mechanical system

Fort Knox, Kentucky

- Install air curtains 1/
- Alter heating and air-conditioning controls
- Install storm windows and shades 1/

Naval Air Station, Memphis, Tennessee

- Replace steam and condensate lines

Naval Ship Yard, Puget Sound, Washington

- Modify buildings
- Replace steam system
- Modify condensate system
- Install heat recovery system 1/
- Relamp piers

1/Canceled--not feasible.

PRINCIPAL DEPARTMENT OF DEFENSE OFFICIALS RESPONSIBLE FOR ADMINISTERING ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
SECRETARY OF DEFENSE:		
Harold Brown	Jan. 1977	Present
Donald H. Rumsfeld	Nov. 1975	Jan. 1977
James R. Schlesinger	July 1973	Nov. 1975
SECRETARY OF THE ARMY:		
Clifford L. Alexander, Jr.	Jan. 1977	Present
Martin R. Hoffmann	Aug. 1975	Jan. 1977
Norman R. Augustine (acting)	July 1975	Aug. 1975
Howard H. Callaway	May 1973	July 1975
SECRETARY OF THE NAVY:		
W. Graham Claytor, Jr.	Jan. 1977	Present
J. William Middendorf II	Apr. 1974	Jan. 1977
John W. Warner	May 1972	Apr. 1974
SECRETARY OF THE AIR FORCE:		
John C. Stetson	Apr. 1977	Present
Thomas C. Reed	Dec. 1975	Apr. 1977
John L. McLucas	May 1973	Dec. 1975

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