BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

Millions Can Be Saved Through Better Energy Management In Federal Hospitals

A comparison of the energy savings achieved by hospitals of the Navy, Veterans Administration, and Indian Health Service--all of which have energy conservation programs--with that of five non-Federal hospitals having aggressive energy management programs indicated that these agencies could save between $16 million and $55 million more each year if additional energy-saving measures were adopted. The investment required to achieve these savings would be quickly recouped. GAO believes that additional energy-saving opportunities also exist at the Army and Air Force hospitals.

Two important program elements--technical audits to identify cost-effective energy conservation measures and accountability to ensure that the measures are implemented--are generally missing or incomplete in Federal hospitals' energy conservation efforts. By increasing emphasis on these elements, Federal agencies could achieve many of the yet unrealized energy savings.

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

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To the President of the Senate and the
Speaker of the House of Representatives

This report discusses the potential for Federal hospitals to reduce energy consumption and costs through improved energy management. The report compares the energy savings achieved by Federal hospitals with non-Federal hospitals having aggressive energy management programs. It recommends ways in which the Departments of Defense and Health and Human Services and the Veterans Administration can improve the management of their programs.

We are sending copies of this report to the Secretaries of Defense and Health and Human Services; the Director, Office of Management and Budget; the Administrator of Veterans Affairs; and other interested parties.

Charles A. Bowsher

Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

MILLIONS CAN BE SAVED THROUGH BETTER ENERGY MANAGEMENT IN FEDERAL HOSPITALS

D I G E S T

Federal hospitals can substantially reduce energy costs by implementing energy conservation measures that can be accomplished while keeping lighting, temperature, humidity, and airflow within prescribed agency standards and without otherwise affecting patient safety or comfort. Non-Federal hospitals with aggressive energy management programs have achieved energy savings from 20 to 40 percent, much of which resulted from low-cost conservation measures. Comparable savings have not been achieved by most Federal hospitals. (See p. 5.)

In 1981, five agencies--the Departments of the Army, Navy, and Air Force; the Veterans Administration (VA); and the Indian Health Service (IHS)--spent over $230 million for energy at the 345 hospitals they own and operate in the United States. GAO made this review to determine what energy-saving measures had been taken and whether more could be done. (See p. 1 and app. I.)

GAO found potential for additional energy savings at each of the 19 VA, IHS, and military hospitals visited. (For a list of the hospitals included in our review, see app. I.) The hospitals had not implemented numerous cost-effective energy conservation measures, including many low-cost measures, such as

--reducing hot-water temperature,

--installing water-flow restrictors,

--repairing duct insulation, and

--installing low-wattage fluorescent lighting.
(See p. 9 and app. III.)

GAO's consulting engineer, expert in energy management, documented energy-saving opportunities at all four hospitals he inspected. The conservation measures identified at each hospital would reduce energy costs from $184,000 to $766,000 annually and would pay for themselves

in 2.5 years or less. Many of these are low-cost measures which would pay for themselves in 4 months or less. (See pp. 10 to 12 and app. II.)

Federal hospitals are missing opportunities to reduce energy costs primarily because of weaknesses in their energy management programs. Engineering personnel frequently do not know which conservation measures should be done, and even when they do, they are not held accountable for implementing the measures. (See p. 14.)

GAO cannot precisely estimate how much can be saved. However, at just the three agencies where energy-use data were available--VA, IHS, and Navy--the difference between the savings (estimated at $23.2 million) and the 20- to 40-percent savings achieved by hospitals with aggressive programs indicated that from $16 million to $55 million more could be saved annually. GAO believes that additional energy-saving opportunities exist at the 97 Army and Air Force hospitals in the United States. (See p. 13.)

To achieve savings of this magnitude, Federal agencies would first need to finance conservation measures costing about two to three times the estimated annual savings--about $32 million to $165 million. Most of the more costly energy-saving measures recommended by GAO's consultant should result in savings that would recover the required investment in 3 years or less, with additional savings continuing throughout the life of the equipment or building. (See p. 13.)

RECOMMENDATIONS

GAO is making several recommendations to the Secretaries of Defense and Health and Human Services and the Administrator of Veterans Affairs which will improve hospital energy management practices. Collectively, these recommendations will

--ensure that technical audits are conducted using qualified energy experts,

--provide information on low-cost conservation measures applicable in hospitals and require that the feasible measures be implemented,

--initiate or improve energy conservation goal-setting practices for hospitals,

--require hospitals to maintain and report energy-use data, and

--improve agency monitoring practices to ensure that agencies' hospitals achieve greater energy savings. (See pp. 21 and 22.)

AGENCY COMMENTS AND GAO'S EVALUATION

The Departments of Defense and Health and Human Services and VA generally agreed with GAO's recommendations.

Department of Defense officials acknowledged that much would have to be done to improve their energy management program. They pointed out several steps they and the military services have begun to take or plan to take to implement GAO's recommendations. These actions, if properly implemented, should help resolve the problems noted in GAO's review.

VA and the Department of Health and Human Services discussed the actions being taken to save energy in the context of their past initiatives. However, GAO's review showed that their efforts have had only a limited effect at the individual hospitals visited. Thus, despite the positive actions initiated, more needs to be done to ensure that energy savings are realized. GAO believes that the recommendations in this report, if adopted, will achieve that end.

VA believed that rigid implementation of GAO's recommendation that conservation goals should be reset based on technical audits or when former goals are met would be counterproductive by removing incentives to achieve original goals. GAO believes that a goal should not be viewed as an end, in and of itself, but as a benchmark for measuring progress. Once a goal is achieved, energy-saving potential should be reevaluated and goals adjusted accordingly. (See pp. 23, 24, and apps. IV and V.)

Contents

ABBREVIATIONS

Btu	British thermal unit
DOD	Department of Defense
GAO	General Accounting Office
HHS	Department of Health and Human Services
IHS	Indian Health Service
VA	Veterans Administration

CHAPTER 1

INTRODUCTION

Conserving energy in Federal buildings is an important Federal objective--particularly in hospitals, where energy costs are typically about three times as much per square foot as in regular office buildings. Hospitals are energy intensive because they have complex environmental systems, contain sophisticated medical equipment, and are occupied 24 hours a day. Further, because most Federal hospitals were designed before 1974, they are largely energy inefficient by today's standards.

Most Federal hospitals are operated by the Departments of the Army, Navy, and Air Force; the Veterans Administration (VA); and the Indian Health Service (IHS). In 1981, these five agencies spent at least $230 million for energy at the 345 hospitals they own and operate in the United States.

CONSERVING ENERGY IS AN IMPORTANT FEDERAL OBJECTIVE

The Congress and the President have affirmed the importance of conserving energy in Federal buildings. The Presidential Executive Order of July 20, 1977 (E.O. 12003), and the National Energy Conservation Policy Act of 1978 (Pub. L. No. 95-619) collectively directed Federal agencies to

- --develop and implement a 10-year plan for conserving energy in federally owned or leased buildings,
- --establish a goal of reducing energy used in Federal buildings 20 percent by 1985, and
- --retrofit all Federal buildings with energy conservation measures by January 1, 1990, to assure minimum life-cycle costing. 1/

RESPONSIBILITIES FOR ENERGY MANAGEMENT PROGRAMS IN THE AGENCIES REVIEWED

In response to congressional and Presidential mandates, Federal agencies developed energy programs with a primary objective of

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1/Life-cycle costing is a general method of economic evaluation which takes into account all relevant costs of a building design, system, component, etc., over its useful life, adjusting for differences in the timing of those costs.

reducing energy use 20 percent in Federal buildings by 1985. The following briefly describes the responsibilities for energy management programs in the five agencies included in our review.

Department of Defense

The Department of Defense (DOD) provides overall policy and guidance on energy conservation to the military services and also specifies DOD-wide energy conservation goals. The Army, Air Force, and Navy have energy offices that in turn issue policy and guidance and set conservation goals for their major organizational components.

At Army and Air Force bases, the base commander is responsible for conserving energy in all buildings. Because most of the 32 Army and 65 Air Force hospitals are one of several commands located on the bases, hospital commanders must follow the energy program implemented by the base commander. As a practical matter, base commanders delegate responsibility for their energy conservation program to base engineers, who identify and evaluate energy conservation projects.

Unlike in Army and Air Force hospitals, responsibility for conserving energy at the 28 Navy hospitals rests with hospital commanders, who rely primarily on technical support from hospital engineering personnel.

Veterans Administration

Most VA-owned buildings are part of VA's 172 medical centers. Energy program policies, guidance, and conservation goals for hospitals come from VA's Department of Medicine and Surgery. Hospital directors are responsible for implementing energy conservation programs, although they rely on hospital engineers for technical support.

Indian Health Service

The Public Health Service, Department of Health and Human Services (HHS), provides policy and guidance on energy conservation to IHS. IHS' facilities management office oversees the energy conservation program, although 12 area and program offices are responsible for energy conservation programs at IHS' 48 hospitals. IHS relies on HHS' Regional Office Facilities Engineer Corps for technical engineering support.

FUNDING FOR ENERGY CONSERVATION PROJECTS

Except for IHS, the agencies we reviewed had funds specifically designated for energy conservation projects. The Army, Air

Force, and Navy all relied primarily on a DOD-wide Energy Conservation Investment Program for funding all energy projects, including those in hospitals. Between fiscal years 1976 and 1981, the three services obtained over $700 million for energy projects from that program. The director of the Navy's facilities division reported that about $3.6 million of such funds was spent on Navy hospitals. The amount spent on Army and Air Force hospitals was not available. The three services also received funds from several other energy programs. They can also use maintenance and repair funds for limited energy conservation measures.

VA sets aside a portion of its nonrecurring maintenance budget for energy projects. From fiscal years 1977 through 1981, VA spent about $65.5 million in nonrecurring maintenance funds for energy conservation in hospitals. In addition, VA hospitals can use recurring maintenance funds for low-cost energy conservation measures.

IHS has received funding for selected technical energy audits, but has no funds specifically designated for energy conservation projects. As a result, IHS hospitals must rely primarily on their regular maintenance and repair funds for energy projects. The energy coordinator in IHS' facilities management office told us that, through fiscal year 1981, expenditures for energy projects in hospitals totaled $177,000. He estimated that an additional $2 million spent on small maintenance and repair projects may have saved energy as a secondary benefit.

OBJECTIVES, SCOPE, AND METHODOLOGY

Our objectives were to determine whether Federal hospitals

- --had significantly reduced energy consumption since 1975 (our base year),
- --had taken advantage of low-cost measures 1/ that save energy,
- --could reduce energy consumption even more through additional low- and high-cost measures, and
- --had established key elements characteristic of good energy management programs.

To accomplish these objectives, we visited 19 Federal hospitals operated by the three military services, VA, and IHS. We also visited five non-Federal hospitals recognized as having successful energy management programs to establish a feasible range

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1/We defined a low-cost conservation measure as one costing $10,000 or less.

of energy savings and to determine how the savings were accomplished. At each hospital, we interviewed hospital personnel and reviewed records concerning its energy management program. We documented hospital accomplishments in saving energy and inquired about additional savings that the hospital could realize.

As an indicator of savings potential, we discussed a list of 56 energy conservation measures applicable to many hospitals to see whether they had been accomplished. These measures were identified from several publications on energy management. 1/ In addition, we hired a consulting engineer, expert in energy management, to visit four of the Federal hospitals and quantify energy and related costs that could be saved from a combination of low- and high-cost measures. We also assessed the adequacy of each hospital's energy management program by comparing its program elements to a generally accepted set of key energy program elements.

Work was also done at the agencies' headquarters. We reviewed records and regulations concerning agencies' energy program organization, technical support, and specific requirements for hospitals, and we discussed policies and procedures regarding energy conservation in hospitals. Our review was performed in accordance with the Comptroller General's current "Standards for Audit of Governmental Organizations, Programs, Activities, and Functions." (See app. I for a list of the hospitals included in our review as well as more details on our work steps.)

1/This list does not represent an exhaustive list of everything that can be done but rather a representative number of measures, both low and high cost, for the major energy-use systems or areas, such as heating, cooling, electrical, kitchen, and laundry.

CHAPTER 2

FEDERAL HOSPITALS CAN SAVE MILLIONS THROUGH FURTHER REDUCTIONS IN ENERGY USE

Federal hospitals can substantially reduce energy costs by implementing energy conservation measures that do not affect agency standards for lighting, temperature, humidity, and airflow or patient safety or comfort. Non-Federal hospitals having aggressive energy management programs have achieved energy savings from 20 to 40 percent, much of which resulted from low-cost conservation measures. Most Federal hospitals have not achieved comparable savings.

At three agencies where data were available, energy savings averaged 11 to 15 percent. While this represents savings of about $23.2 million, we estimate that another $16 million to $55 million in annual energy costs could be saved if numerous feasible energy conservation measures were implemented by these agencies.

ENERGY SAVINGS IN HOSPITALS-- 20 TO 40 PERCENT IS ACHIEVABLE

Many private hospitals have substantially reduced their energy consumption through aggressive energy management programs. We visited five non-Federal hospitals recognized for their energy management programs and concluded that energy-use reductions in the 20- to 40-percent range are achievable. Other studies by HHS and Oak Ridge Associated Universities 1/ confirm that most hospitals can achieve energy savings in the same range as the five we visited.

Over a 4- to 6-year period, the five non-Federal hospitals reduced energy use 23 to 42 percent. According to hospital engineers, these savings were achieved without adversely affecting patient comfort or safety. While a variety of conservation measures were responsible for these savings, at three locations most of the energy saved resulted from low-cost conservation measures. The following briefly describes the conservation measures completed and the estimated costs and savings achieved by each of the five hospitals:

--Mercy Hospital, a 511-bed hospital in San Diego, California, began energy conservation activities in 1974 and by 1981

1/A private, not-for-profit association of 45 colleges and universities that performs work for the Department of Energy under a research contract.

had reduced energy use by 41.8 percent--mostly through low-cost conservation measures. For $115,000, the hospital completed 33 measures, 22 of which were low cost. Completion of the 33 measures resulted in energy cost savings, which in 1981 totaled about $390,000. The hospital plans to implement seven other conservation measures which would reduce energy use by an additional 14 percent by 1985.

--St. Vincent's Medical Center, a 518-bed hospital in Jacksonville, Florida, started an energy conservation program in 1978 and by 1981 had reduced energy use by 38.5 percent. The hospital saved about $354,000 in 1981 energy cost by completing 30 conservation measures totaling $356,000. Over half of the energy savings were achieved through the use of 20 low-cost measures.

--Longmont United Hospital, a 143-bed community hospital in Longmont, Colorado, started energy conservation activities in 1977 and by 1981 had reduced energy use by 33.8 percent. The hospital invested $201,000 in 19 low-cost and 9 high-cost conservation measures which in 1981 saved about $60,000 in energy costs.

--Wesson Memorial Hospital, a 350-bed hospital, which is a branch of Baystate Medical Center, Springfield, Massachusetts, started its energy conservation program in 1974 and by 1981 had reduced energy use by 32.1 percent. This represented savings in 1981 of $170,000 in energy costs and required an investment of $459,000. The hospital realized 23-percent savings from low-cost conservation measures.

--Cincinnati Children's Hospital Medical Center, a 333-bed hospital, started an energy conservation program in 1973. By 1981 the hospital had reduced energy use 22.8 percent by implementing 37 conservation measures at a cost of $313,000. Energy cost savings for 1981 were estimated to be $336,000. Completion of five additional measures currently in process will further reduce energy use an estimated 13.9 percent.

All five non-Federal hospitals achieved their energy savings by completing numerous conservation measures and by focusing on low-cost measures, such as reducing hot-water temperature and installing low-wattage fluorescent tubes and flow restrictors. These measures greatly reduced energy use and paid for themselves within 1 year or less. Overall, the hospitals had completed or had in process most of the 56 energy conservation measures that are applicable at many hospitals. (See p. 9 for further discussion of conservation measures completed and app. III for a list of the 56 measures.)

Other studies show that energy savings achieved by the five non-Federal hospitals, particularly through low-cost measures, are not unique. For example, a 1979 report on hospital energy conservation opportunities by HHS' Division of Energy Policy and Programs estimated that over a 3-year period hospitals can reduce energy use by 30 percent or more. By implementing low-cost projects alone, the report explains, hospitals can achieve energy savings of 15 to 20 percent within 1 year. A 1981 report by the Oak Ridge Associated Universities under a contract with the Department of Energy discussed energy audits conducted at 48 hospitals. Projected first-year energy reductions after implementing feasible conservation measures averaged 20 percent. At some hospitals, first-year energy savings were as high as 49 percent. The report also found that 14 conservation measures, mostly low cost, accounted for three-fourths of all the energy savings.

ADDITIONAL ENERGY REDUCTIONS CAN BE ACHIEVED

Agencies have made some progress in reducing energy use in Federal hospitals. However, they generally have not achieved as large a reduction when compared to the 20- to 40-percent range of savings achieved by hospitals with aggressive energy management programs, because many feasible conservation measures, including low-cost measures, have not yet been implemented.

At three agencies where aggregate hospital energy consumption data were available, energy savings averaged an estimated 11 to 15 percent between fiscal years 1975 and 1981. In 1981, Navy hospitals achieved a 15.2-percent energy savings of about $5.0 million, IHS hospitals achieved a 12.4-percent energy savings of about $0.9 million, and VA hospitals achieved an 11.1-percent energy savings of about $17.3 million. We could not determine overall energy savings at Army and Air Force hospitals since they do not maintain aggregate energy data on hospitals.

While the agencies' average reductions in energy use for hospitals are in the 11- to 15-percent range, reductions at individual hospitals varied considerably. The table below shows, for the 19 Federal hospitals included in our review, energy savings between the base year (fiscal year 1975, except where noted) and the most current year for which energy consumption data were available.

Agency/hospital	Percent energy savings (note a)
Army:	
Madigan Army Medical Center, Fort Lewis, Wash.	22.0
Womack Army Hospital, Fort Bragg, N.C.	b/Unknown
Walson Army Hospital, Fort Dix, N.J.	15.6
Brooke Army Medical Center, Fort Sam Houston, Tex.	b/Unknown
Air Force:	
Wilford Hall USAF Medical Center, Lackland AFB, Tex.	(c)
Wright-Patterson USAF Medical Center, Wright-Patterson AFB, Ohio	b/Unknown
Malcolm Grow USAF Medical Center, Andrews AFB, Md.	d/3.2
Elmendorf USAF Hospital, Elmendorf AFB, Alaska	8.2
Navy:	
Naval Regional Medical Center, Bremerton, Wash.	(e)
Naval Aerospace and Regional Medical Center, Pensacola, Fla.	d/18.3
Naval Regional Medical Center, Portsmouth, Va.	15.7
Naval Regional Medical Center, Oakland, Calif.	3.5
Veterans Administration:	
VA Medical Center, Dallas, Tex.	**f/14.8**
VA Medical Center, Marlin, Tex.	31.3
VA Medical Center, Washington, D.C.	30.0
VA Medical Center American Lake, Tacoma, Wash.	14.0
VA Medical Center, Asheville, N.C.	24.8
Indian Health Service:	
Alaska Native Medical Center, Anchorage, Alaska	22.9
Phoenix Indian Medical Center, Phoenix, Ariz.	f/.3

a/Because we determined that changes in the weather did not significantly influence energy consumption, energy savings presented here are unadjusted (see p. 30, app. I).

b/Although energy consumption data were available for the entire military base, hospital energy use could not be separated from basewide use.

c/This hospital underwent substantial modification and expansion between 1975 and 1980, more than doubling in size. Although we documented a 22-percent increase in energy used per square foot during this period, we believe the substantial changes to this hospital make the data inconclusive.

d/Base year is fiscal year 1977.

e/Since the hospital opened in mid-1980, energy consumption data were available for a 1-year period only.

f/Base year is fiscal year 1976.

While this table shows that Federal hospitals have made progress, additional energy-saving potential was identified at every location we visited. Using a list of 56 energy conservation measures, we found that from 10 to 39 conservation measures that had potential to save energy were not implemented. Our consultant conducted detailed analyses at four of these hospitals and found that from 14 to 20 conservation measures could have been implemented, resulting in additional savings.

A comparison of the extent to which Federal and non-Federal hospitals had implemented these 56 conservation measures showed that non-Federal hospitals had far surpassed Federal hospitals. As shown in the following table, non-Federal hospitals completed or had in process almost twice as many conservation measures as the Federal hospitals. The same was true concerning low-cost measures; the non-Federal hospitals had far fewer potential measures remaining to be implemented than the Federal hospitals.

Comparison of Status of 56 Energy Conservation Measures in Non-Federal and Federal Hospitals (note a)

	Percent completed or in process	Percent remaining with potential
Average of all measures:		
Non-Federal hospitals b/	77	24
Federal hospitals	43	57
Average of low-cost measures:		
Non-Federal hospitals	87	13
Federal hospitals	49	51

a/The table does not include measures which hospital engineers rejected or considered not applicable at their facilities.

b/Due to rounding, total does not add to 100.

At the Federal hospitals, many of the low-cost conservation measures with remaining energy-saving potential are concentrated in systems using the most energy--heating, cooling, and lighting. For example, 13 of the 19 Federal hospitals could save energy by installing flow restrictors to reduce hot-water flow. Ten of the 19 Federal hospitals could further reduce energy use by improving maintenance procedures to identify and repair malfunctioning steam traps. Other energy savings at 9 of the 19 Federal hospitals could be achieved by installing energy-efficient fluorescent tubes in light fixtures.

Conclusive evidence on the remaining potential for energy savings in Federal hospitals is clearly illustrated by the findings of our consulting engineer. He found at the four hospitals visited that substantial cost-effective energy savings of from 29 to 51 percent were possible, in addition to the savings previously achieved. The annual cost savings ranged from about $184,000 to $766,000, and the measures would pay for themselves in 2.5 years or less. The low-cost measures would pay for themselves in 4 months or less. All this could be accomplished while keeping lighting, temperature, humidity, and airflow within prescribed agency standards, and without otherwise affecting patient comfort or safety. The findings of our consultant at each hospital are summarized briefly below and discussed in detail in appendix II.

Walson Army Hospital

Between fiscal years 1975 and 1981, Walson Army Hospital, located at Fort Dix, New Jersey, had completed 11 energy conservation measures and reduced energy use 15.6 percent. Our consultant identified 20 additional energy conservation measures which would cost about $639,000 to implement and save about $338,000 in annual energy costs. The measures would reduce energy use by 29.6 percent and pay for themselves in about 1.9 years. One measure, installing storm windows, was previously identified by the hospital; our consultant estimates this measure would reduce energy use 7.7 percent.

Fourteen of the measures were low cost and could be completed very quickly (for example, improving steam trap maintenance procedures and repairing duct insulation). Six other measures had higher initial costs but would contribute more to saving energy. For example, a measure to recover exhaust heat from the kitchen would cost about $28,000 but would save over $11,000 in annual energy costs.

According to the hospital engineering supervisor, these measures were not previously identified due to a lack of technical expertise at the hospital. Although the Army funded a basewide energy audit, it covered only the outside of the hospital. As a result, few conservation measures had been identified at the hospital.

Elmendorf Air Force Hospital

Between fiscal years 1975 and 1981, Elmendorf Air Force Hospital, in Anchorage, Alaska, reduced energy use 8.2 percent. The hospital had completed eight conservation measures, such as insulating hot-water pipes and installing photocells to control outdoor lighting. However, our consultant identified 15 additional energy conservation measures which would further reduce energy use by over 38 percent. The measures would cost about $467,000 to implement and save about $184,000 in annual energy costs, thus paying for themselves in about 2.5 years.

Ten of the measures were low cost, such as installing water-flow restrictors and repairing steam traps. These measures would reduce energy use 10 percent and pay for themselves in less than 3 months. Five other measures involved recovering and reusing exhaust air for heating. Though these measures had higher initial costs, they would reduce energy use by 28 percent and pay for themselves in 3.6 years.

Because of the limited technical expertise of the hospital and base engineers, the hospital had not previously considered the conservation measures identified by our consultant. The hospital had no engineers on staff and had to rely on base engineers for technical support. The deputy base civil engineer told us that base engineers do not have the knowledge or experience to conduct comprehensive energy audits.

Naval Aerospace and Regional Medical Center

Between fiscal years 1977 and 1981, the Naval Aerospace and Regional Medical Center, in Pensacola, Florida, reduced energy use 18.3 percent. The medical center completed 17 energy conservation measures, such as reducing corridor and outdoor lighting and raising the chilled-water temperature for air-conditioning. Our consultant identifed 8 low-cost and 9 high-cost projects with the potential to reduce energy use an additional 41 percent. These 17 measures would cost about $717,000 but would save about $601,000 in annual energy costs and pay for themselves in 1.2 years.

The bulk of energy savings came from measures that, while costing more initially, would pay for themselves in a relatively short time. For example, modifying the heating system for about $104,000 would reduce energy use 14 percent, save about $227,000 in annual costs, and pay for itself in less than 6 months. Two measures, installing controls to allow use of outside air for free cooling and reducing lighting, were previously identified by the hospital; our consultant estimates these measures would reduce energy use 2.5 percent. According to the deputy staff civil engineer, the hospital engineering staff have received only limited energy conservation training and therefore are not experts in identifying such energy conservation measures.

Dallas VA Medical Center

Between fiscal years 1976 and 1980, the VA Medical Center, Dallas, Texas, completed 10 energy conservation measures--such as increased insulation, reduced hot-water flow, and reduced lighting--and achieved energy savings of 14.8 percent. Our consultant identified 14 additional energy-saving measures which would reduce energy use an additional 51 percent. Three of the 14 measures were planned by the hospital but not yet implemented; our consultant estimates they would reduce energy 32.7 percent.

The other 11 measures, however, would reduce energy use an additional 18 percent. All 14 measures would cost about $1,319,000 but would save about $766,000 in annual energy costs and pay for themselves in about 1.7 years. In addition, according to our consultant, completing these measures will reduce the demand for steam and thus permit the medical center to cancel a planned project to replace the main steam line, saving another $358,000.

Seven of the measures were low cost, such as repairing steam traps and installing flow restrictors. These measures would reduce energy use 8 percent and pay for themselves in 1 month. The other seven measures were higher cost, such as installing centrifugal chillers and thermal storage for chilled water. These measures would reduce energy use 42.8 percent and pay for themselves in 2.2 years.

The 11 measures recommended by our consultant that were not previously identified by the medical center would cost about $55,000, reduce energy use 18.3 percent, and save about $474,000 annually. According to the Chief Engineer, these measures had not been identified because medical center engineers have had only limited energy management training and are not experts on identifying feasible energy conservation measures. Also, the limited technical audit conducted at the medical center by an outside engineering firm did not recommend these measures.

ENERGY CONSERVATION MEASURES ARE A GOOD INVESTMENT

All of the energy-saving opportunities our consultant recommended had favorable savings-to-investment ratios. Most low-cost measures could be recouped within months, while most of the more costly measures could be recouped in 3 years or less. Based on the types of energy-saving opportunities he identified, the investment required is only 2 to 3 times the annual savings. Savings would continue to accrue throughout the life of the equipment or building.

Without a comprehensive energy evaluation of each Federal hospital, such as those conducted by our consultant, we cannot precisely measure how much additional energy costs can be saved. However, considering just the three agencies where consumption data were available--VA, IHS, and Navy--we believe that the difference between the agencies' cumulative savings and the 20- to 40-percent range achievable by most hospitals provides an order of magnitude of the potential savings. As shown in the table below, we estimate that from $16 million to $55 million more in annual savings can be realized.

Agency	Percent current agencywide savings	Percent additional potential agencywide savings (note a)	Annual savings in 1981 costs
			(millions)
VA	11	9 - 29	$14.0 - $45.2
IHS	12	8 - 28	.7 - 2.3
Navy	15	5 - 25	1.7 - 8.3
Total			$16.4 - $55.8

a/Percentages arrived at by subtracting, for example for VA, 11 percent from 20 percent for additional savings of 9 percent. The total hospital energy costs for 1981 are then multiplied by the 9 percent to arrive at the annual dollar savings.

The lack of energy consumption data for Army and Air Force hospitals precludes any estimate of potential savings. However, the potential energy savings identified at the Army and Air Force hospitals we visited, coupled with the weaknesses identified in their energy management programs (see ch. 3), indicate that the potential annual energy savings at these hospitals are substantial.

Since many low-cost measures have not yet been completed, considerable savings could be obtained for a relatively modest investment. The costs to implement all of the measures to achieve annual energy savings of from $16 million to $55 million may be substantial, but so are the benefits. The Federal agencies would need to finance conservation measures costing about two to three times the estimated annual savings. Therefore, to save $16 million annually, the agencies would have to fund measures costing from $32 million to $48 million. To save $55 million annually, the agencies would have to spend from $110 million to $165 million. In other words, any investment should be recovered in 2 to 3 years, with additional savings continuing throughout the life of the equipment or building.

CONCLUSIONS

Energy conservation in hospitals is a good investment. In Navy, IHS, and VA hospitals, the additional savings are estimated to be from $16 million to $55 million, and we believe additional savings in Army and Air Force hospitals are substantial. Further, the potential savings can be achieved while keeping lighting, temperature, humidity, and airflow within prescribed agency standards and without adversely affecting patient safety or comfort. As discussed in chapter 3, energy-saving opportunities are often foregone in Federal agencies because essential elements of an effective energy conservation program are missing or incomplete.

CHAPTER 3

FEDERAL HOSPITALS NEED TO IMPROVE THEIR ENERGY MANAGEMENT PROGRAMS

Federal hospitals are missing opportunities to reduce energy costs primarily because of weaknesses in their energy management programs. Two important elements are missing or incomplete--comprehensive technical audits to identify cost-effective energy-saving measures and accountability for results. As a result, those responsible for energy conservation frequently do not know which conservation measures should be implemented, and even when they do know, they are not held accountable for implementing the measures.

ELEMENTS OF AN EFFECTIVE ENERGY MANAGEMENT PROGRAM

Federal regulations and studies of energy conservation in hospitals cite several essential elements of an effective energy management program, including

--technical audits,

--financial support,

--accountability for results, and

--commitment from top management.

These elements are among the most frequently cited in energy conservation studies and also appear in the Department of Energy's guidelines for energy management in general operations of the Federal Government. (See 10 CFR 436, App. D)(1982).) In reviewing Federal energy management programs, we considered these elements as having the greatest impact on the effectiveness of an energy program and omitted other important but less essential measures, in terms of saving energy, such as employee awareness, emergency contingency planning, and environmental considerations. Because we have addressed the importance of top management commitment in a previous report, 1/ we did not include it as a part of this effort. With few exceptions, the five non-Federal hospitals we visited also include each of these three elements in their energy programs.

A comprehensive technical audit is essential to identify, evaluate, and rank potential conservation measures. The audit must identify both low- and high-cost measures. A good technical audit requires considerable energy-related expertise, and if in-house expertise is insufficient, outside assistance should be sought.

1/"The Federal Government Needs a Comprehensive Program to Curb Its Energy Use" (EMD-80-11, Dec. 12, 1979).

Adequate funding for technical audits and conservation measures must be planned and provided. Energy conservation is a good investment since most measures pay for themselves within a few years and many within a few months. Furthermore, savings continue over the life of the building or equipment.

Managers must be accountable for the energy conservation performance of their organizations. This includes assigning specific responsibility for energy conservation, setting quantifiable goals, collecting and reporting consumption data, and monitoring to assure that results are achieved. Progress should be reviewed periodically, including a review of changes in energy used and conservation measures implemented to identify program weaknesses or additional areas for conservation actions.

Hospital administrators and engineers at the five non-Federal hospitals visited attributed the success of their energy programs primarily to having these elements.

ENERGY PROGRAMS IN FEDERAL HOSPITALS LACK IMPORTANT ELEMENTS

The Federal agencies we reviewed all needed to improve their hospital energy management programs. Although each agency had assigned responsibility for energy conservation and most had fiscal resources available (only IHS officials said that funding for energy conservation measures was limited), improvements were needed in technical audits and accountability for results.

Technical audits

Technical audits either were not being conducted at Federal hospitals or were not identifying all feasible conservation measures. The Army and Air Force were generally not conducting technical audits in hospitals, resulting in many energy conservation measures, including low-cost measures, being overlooked. The Navy, IHS, and VA had recognized the importance of technical audits, although not all hospitals had received them. However, even at some locations where technical audits had been conducted, not all feasible conservation measures were identified.

Army and Air Force hospitals

Comprehensive technical audits were not being done in most Army and Air Force hospitals. None of the eight hospitals visited had received a comprehensive assessment of potential conservation measures. Hospital and base or installation personnel at those locations generally said they were not knowledgeable enough to conduct a technical audit. Even relatively simple measures that save energy (e.g., flow restrictors in hot-water taps and fluorescent instead of incandescent lights) had not been adopted. The general attitude of base and installation engineers was that,

since hospitals generally accounted for only a small portion of a base's or installation's total energy use, they were not worth a technical audit. Some erroneously believed hospitals were exempt from energy conservation.

Because of the limited energy expertise at Army installations, the Army has been contracting for technical audits at each U.S. installation. All four of the installations we visited had received such audits. However, the hospitals located on those installations were often either excluded from the audit or treated only superficially. For example, during the audit at Fort Dix, only the exterior walls of Walson Army Hospital were evaluated, even though many energy-saving opportunities existed inside. Mechanical and electrical systems and equipment were not included in the audit. (See app. II for our consultant's report on energy-saving opportunities at this hospital.)

The Air Force uses computer simulation as a primary means of identifying energy-saving opportunities at its bases. Two of the Air Force hospitals we visited had been evaluated in this way. However, the simulations did not involve a comprehensive assessment of opportunities to save energy. For example, at the Elmendorf Hospital, the simulation considered only three actions--installing a heat recovery system, insulated windows, and low-wattage fluorescent tubes. Our consultant identified numerous additional opportunities to save energy, many of them achievable at low cost. (See app. II.)

Navy, IHS, and VA hospitals

The Navy, IHS, and VA are obtaining technical audits for their hospitals. These agencies have relied on both outside engineering firms and available in-house hospital or agency engineering personnel to conduct the audits. The Navy's Facilities Engineering Command reported that all 28 hospitals had received at least a limited technical audit. The energy coordinator of IHS facilities management said 22 of 48 IHS hospitals have had a technical audit. VA's conservation specialist told us that all 172 VA hospitals have had technical audits by outside consultants or hospital engineers.

Where comprehensive technical audits had not been done, many conservation measures were overlooked. For example, the Phoenix Indian Medical Center had not received a technical audit. We identified 28 measures, such as reducing lighting and raising chilled-water temperature, which had not been implemented. The hospital associate director and the hospital engineer told us that not having a technical audit was the primary barrier to saving energy because they did not have the expertise to determine which conservation measures should be adopted. At the Portsmouth Naval Regional Medical Center, we identified 18 feasible conservation measures, many low cost, that had not been implemented. A

technical audit had not been done, and hospital engineers had not considered many of these measures. However, a technical audit is planned for fiscal year 1982.

Even where technical audits were conducted, feasible conservation measures had not always been considered. For example:

--At the Dallas VA Medical Center, energy managers relied on in-house expertise to supplement a limited outside technical audit which had recommended five conservation measures the hospitals could adopt to save energy. VA hospital engineers had identified 11 additional conservation measures. Our consulting engineer identified another 11 measures which would reduce consumption an additional 18 percent and save about $474,000 annually. These measures included installing speed controls for chillers, using generators to reduce peak electricity-use charges, and installing underground thermal storage for chilled water. Hospital engineers told us that they were primarily concerned with the operations and maintenance of the hospital and had limited training in energy conservation techniques. Consequently, they lacked the expertise to identify all feasible conservation measures.

--At the Pensacola Naval Aerospace and Regional Medical Center, an outside engineering firm conducted a technical audit of the hospital's heating, ventilating, air-conditioning, and lighting systems and recommended eight conservation measures. Our consulting engineer identified 15 additional measures in these systems--such as replacing steam-driven chillers with electric chillers, reducing steam distribution pressure, and reducing cooling-tower water temperature--which could reduce energy use an additional 39 percent and save about $560,000 annually.

Using engineering personnel that lack expertise to conduct technical audits limits the success of hospital energy conservation programs. The engineers at most of the Federal hospitals we visited were not experts on energy conservation techniques and measures, although they may have received some training in energy conservation.

Accountability for results

While the five agencies reviewed had established responsibility for energy conservation in hospitals, all of the agencies can improve on one or more of the other components of accountability--collecting consumption data, establishing quantifiable goals, and monitoring results. Army, Air Force, and IHS hospitals were, for the most part, not held accountable for saving energy. Navy and VA hospitals were held accountable, but improvements can be made in goal-setting procedures and methods to assure that feasible conservation measures are implemented.

Army, Air Force, and IHS hospitals

Most Army, Air Force, and IHS hospitals visited did not maintain consumption data, did not have quantifiable goals, were not monitored to assure that feasible conservation measures were adopted, and were not held accountable for achieving energy savings. Most Army and Air Force hospitals were part of base-wide energy programs, and the hospitals may have received little consideration for energy-saving opportunities. In IHS, energy conservation had a relatively low priority.

Most Army and Air Force hospitals were not maintaining data on energy use. None of the eight Army and Air Force hospitals we visited had actual energy-use data available. Since most Army and Air Force hospitals received energy from the base or installation, they were not separately metered. However, even where the hospital was served by a separate boiler so that monitoring energy use was a relatively simple matter, such as at Madigan Army Medical Center, hospital and installation engineers made no effort to obtain this information. Hospital officials had no idea whether their facilities were increasing or decreasing energy use.

Goal setting was generally not being done in Army and Air Force hospitals. Except for the Elmendorf Air Force Hospital, the Army and Air Force hospitals we visited had not established quantifiable energy conservation goals. Although in principle the hospitals subscribed to the base or installation goals set by the base command, in practice they were not expected to contribute to overall base or installation reductions in energy use. Base and installation engineers at several locations said that the hospitals were exempt from energy conservation requirements because they were critical-care areas or because they received continuous use. While hospital officials at Elmendorf established an annual energy conservation goal to match the base's annual goal, they did not analyze or report data on energy use and, therefore, never knew whether their goal was achieved.

No monitoring of energy conservation efforts occurred at Army and Air Force hospitals to assure that even the simple preventive maintenance and low-cost measures which could save energy were adopted. Although such measures as installing flow restrictors in hot-water taps, caulking and weatherstripping doors and windows, and reducing hot-water temperature are accomplished easily, they were frequently not done at the hospitals visited. These and other measures were not specifically required, and at the hospitals we visited no one assured that the relatively simple, make-sense tasks were accomplished.

Part of the reason that Army and Air Force hospitals were not being held accountable for energy savings was that they were only one of several commands located on the base and, therefore, fell under the energy programs of the base commander. Base commanders

have considerable latitude in determining how they achieve their conservation goals. If they choose, they can completely ignore the hospitals and concentrate their efforts to save energy elsewhere.

IHS hospitals were not required to maintain consumption data. Although hospitals send monthly utility billing reports to the area offices, energy consumption data developed from the billing reports were not routinely provided back to IHS hospitals. At the two hospitals visited, hospital administrators and engineers told us that they did not know whether their energy use was getting better or worse.

IHS hospitals did not have quantifiable energy-saving goals. Although IHS requires area offices to achieve 20-percent reductions in energy use from fiscal years 1975 to 1985, the area offices responsible for the hospitals we visited had not specified the 20 percent or any other savings objective for those hospitals. Also, most hospital officials had not established their own conservation goals.

Hospital and agency personnel did not monitor results. While funding for energy projects in IHS was limited, no mechanism existed to assure that even the low-cost, easily implemented measures were adopted. At the two hospitals we visited, many such measures had not been implemented.

The energy coordinator of IHS facilities management told us that, because energy conservation has a relatively low priority in IHS and limited funds are available for energy projects, procedures for setting goals and monitoring results had not been implemented.

Navy and VA hospitals

Although Navy and VA hospitals maintain consumption data and are held accountable for saving energy, both agencies can improve their procedures to set hospital conservation goals and to assure that feasible conservation measures are implemented.

Both the Navy and VA set hospital conservation goals which may not reflect accurately the potential to save energy in those hospitals. The Navy has a fixed 20-percent energy reduction goal by 1985 for each hospital. Although VA had separate goals for each hospital, the goals represent about a 20-percent overall reduction in energy use by 1985.

As noted in chapter 2, most hospitals can achieve energy savings in the 20- to 40-percent range, and our consultant identified additional savings of 41 percent at the Pensacola Naval Aerospace and Regional Medical Center and 51 percent at the Dallas VA Medical Center. These hospitals had conservation goals of 20 and 32 percent, respectively.

Although Navy and VA hospitals were not restricted to just achieving their goals and were in fact encouraged to exceed the goals, goals set too low can affect the incentive of hospital personnel to achieve all the savings possible. Several Navy and VA hospital engineers told us they were concerned primarily with achieving their conservation goals and not doing everything possible to save energy.

Also, we noted that, when a Navy or VA hospital exceeded its original goal, a new goal was not established for the hospital which could unnecessarily limit the incentives for hospital personnel to save energy.

Neither Navy nor VA had a mechanism to assure that feasible conservation measures were implemented at their hospitals. The hospitals were not specifically required to implement any given conservation measure, even those low-cost measures that could be accomplished easily. At both Navy and VA hospitals low-cost conservation measures had been overlooked.

--At the Pensacola Naval Aerospace and Regional Medical Center, 8 of the 29 feasible low-cost measures on our list were not implemented. For example, the Center had not reduced excessive lighting and failed to use low-wattage fluorescent tubes.

--At the American Lake VA Medical Center, 11 of the 29 low-cost measures were feasible but not implemented. For example, the Center was not using flow restrictors on hot-water taps and had not reduced stairwell heating.

Hospital engineers either were not aware of the low-cost conservation measures or thought that the measures were not worth doing.

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DOD has recognized the need to improve energy conservation in its hospitals and, in February 1981, formed an ad hoc committee to address the problem. The committee developed materials to be used by hospitals to survey hospital energy-use characteristics and a list of energy conservation measures commonly applicable at hospitals. Although these steps will help, the committee had not addressed other important, but heretofore missing, program elements, such as collecting consumption data, establishing quantifiable goals, using technical audits, and monitoring results. The committee chairman told us that the committee lacked the authority to require DOD hospitals to implement these energy program elements.

CONCLUSIONS

Federal hospitals have achieved mixed results from their energy programs. Although most hospitals can achieve energy savings in the 20- to 40-percent range, only 5 of the 19 hospitals we visited had realized savings in that range. Numerous opportunities for additional savings exist at the 19 hospitals, often from low-cost energy conservation measures.

With increased emphasis on basic elements of effective energy management programs--technical audits and accountability for results--Federal hospitals could achieve many of the as yet unrealized potential energy savings.

RECOMMENDATIONS

The recommendations listed below need to be implemented by one or more departments or agencies--DOD and the military services, HHS and IHS, and/or VA--to improve the energy management programs and reduce energy costs in Federal hospitals. The chart on page 22 identifies, by use of an X, which recommendations apply to each department and agency.

- --Technical audits should be conducted in Federal hospitals using qualified energy personnel.

- --Each Federal hospital should establish quantifiable energy conservation goals based on its energy-saving potential.

- --Federal hospitals should be directed to maintain data and report on their energy use.

- --Agencies should provide to their hospitals comprehensive information on low-cost conservation measures applicable to hospitals.

- --Federal hospitals should be directed to implement cost-effective low-cost conservation measures.

- --The results of energy-saving efforts in Federal hospitals should be monitored and action should be taken to assure that feasible energy conservation measures are implemented when these results are not satisfactory.

- --Hospitals' energy conservation goals should be reset based on results of technical audits or when formerly established goals have been reached and cost-effective measures still remain.

Heads of Departments and Agencies to Whom Recommendations Are Made

Recommendation	We recommend that the Secretary of Defense require that: The Army	The Navy	The Air Force	Secretary of HHS require that IHS	Administrator of VA
Conduct technical audits in Federal hospitals using qualified energy personnel	X	X	X		X
Establish for each Federal hospital quantifiable energy conservation goals based on its energy-saving potential	X	X	X	X	
Direct Federal hospitals to maintain data and report on their energy use	X		X	X	
Provide their hospitals comprehensive information on low-cost conservation measures applicable to hospitals	X	X	X	X	
Direct Federal hospitals to implement cost-effective low-cost conservation measures	X	X	X	X	X
Monitor the results of energy-saving efforts in Federal hospitals, and take action to assure that feasible conservation measures are implemented when these results are not satisfactory	X	X	X	X	X
Reset hospitals' energy conservation goals based on results of technical audits or when formerly established goals have been reached and cost-effective measures still remain	X	X	X	X	X

AGENCY COMMENTS AND OUR EVALUATION

We requested comments on a draft of this report from DOD, HHS, and VA. DOD provided oral comments, and HHS and VA provided written comments.

DOD comments

DOD officials concurred with our conclusions and recommendations. They acknowledged that much would have to be done to improve their energy management program. They pointed out several steps they and the military services have begun to take or plan to take to implement our recommendations. These actions, if properly implemented, should help resolve the problems noted in our review. DOD also offered some technical suggestions for clarifying the report which were considered in finalizing the report.

HHS comments

In a July 7, 1982, letter, HHS' Inspector General stated that HHS generally agreed with our recommendations. He indicated that (1) IHS area offices established individual goals for most hospitals based on building size, (2) each IHS service unit is required to maintain energy consumption records, (3) the IHS Albuquerque Office has repeatedly forwarded data on low-cost conservation measures to each area office, (4) many low-cost measures have been implemented, (5) monitoring of energy conservation is accomplished by analyzing quarterly consumption data, and (6) goals will be reestablished based on the results of energy audits. These actions are discussed in the Inspector General's letter in the context that they have been implemented in the past.

However, our review showed that IHS efforts have had only a limited effect at the hospitals we visited. As discussed on page 19, at the two IHS hospitals many conservation measures, including low-cost measures, were overlooked; the hospitals were not required to maintain consumption data at the hospital; quantifiable goals were not being set; results were not being monitored; and hospital officials were unaware of whether their energy use was getting better or worse. These hospitals were among IHS' larger hospitals which HHS acknowledges have the greatest potential for achieving sizable energy savings. Thus, despite the positive actions HHS has initiated, more needs to be done to assure that energy savings are realized. We believe that the recommendations in this report, if adopted by IHS, will achieve that end.

As a general comment, the Inspector General stated that the majority of IHS hospitals are relatively small units when compared with the more sophisticated hospitals operated by VA and DOD, and IHS' potential energy savings "should be viewed from a scaled down level." While we agree that the dollar value of energy savings at smaller hospitals would be lower than at larger hospitals, potential energy savings in the 20- to 40-percent range still exist at small hospitals.

VA comments

In a July 27, 1982, letter, the Administrator of Veterans Affairs stated that he concurred with our recommendations. He believed, however, that rigid implementation of our recommendation that conservation goals should be reset based on technical audits or when former goals are met would be counterproductive. The Administrator stated that goals are regularly monitored and adjusted based on changes in conditions.

We agree that any substantive change in conditions should be closely monitored and goals adjusted, if warranted. We further believe that a goal, once set, should not be viewed as an end, in and of itself, but as a benchmark against which progress can be measured. Once a goal is achieved, energy-saving potential should be reevaluated and goals adjusted accordingly. As pointed out in our report, several hospital engineers told us they were concerned primarily with achieving their goals and not doing everything possible to save energy.

The Administrator stated that implementation of our other recommendations is an ongoing activity and outlined the actions VA has taken and which are continuing.

Regarding our recommendation that technical audits be conducted using qualified personnel, he stated that all VA medical centers have been audited by trained VA personnel and over half have been audited by consultant specialists. As discussed in our report, the Dallas VA Medical Center identified energy conservation measures through a limited outside technical audit, supplemented by in-house expertise. However, our consulting engineer identified additional measures that could save about $474,000 annually. While we do not know why VA's efforts met with only limited success, we point out that using engineering personnel that lack expertise, and engineers at most Federal hospitals visited were not experts in energy conservation, limits the success of conservation programs.

The Administrator stated that our report identified no low-cost measures not in VA's program, and that our recommendation that hospitals be directed to implement cost-effective low-cost measures had been implemented, to varying degrees, at all VA medical centers, depending on individual requirements. As we point out in this report, however, the American Lake VA Medical Center had not implemented 11 feasible low-cost measures, and the Dallas VA Medical Center had not implemented 7. The Administrator stated that VA policy and program guidance is being updated to reemphasize the need to consider all conservation measures at the medical center level.

With regard to our recommendation that the results of energy-saving efforts should be monitored and action taken to assure that feasible measures are implemented, the Administrator referred to a comprehensive monitoring program which requires a quarterly energy consumption report. VA's central office monitor the performance of each medical center using such data. While we acknowledge that VA's central office does collect such data and monitor performance, it had no mechanism to assure implementation of feasible measures, nor were hospitals specifically required to implement any given measure, even low-cost measures that could be accomplished easily.

The Administrator stated in his letter that measures which can strengthen VA's energy management program will be instituted. We believe full implementation of our recommendations will accomplish this.

OBJECTIVES, SCOPE, AND METHODOLOGY

We initiated this audit to determine whether Federal hospitals (1) had significantly reduced energy use, (2) had taken advantage of low-cost opportunities to save energy, (3) could achieve additional reductions in energy use through a combination of low- and high-cost projects, and (4) had established the key elements characteristic of good energy management programs.

To accomplish these objectives, we visited 19 Federal hospitals operated by the three military services, VA, IHS, and their headquarters offices. We also visited five non-Federal hospitals recognized as having successful energy management programs. The review work was performed between March 1981 and January 1982. The following is a list of hospitals reviewed, date of occupancy, and size in square feet.

Hospitals Included in Review

Hospital	Date of occupancy of main hospital building	Hospital size in square feet
Non-Federal:		
Mercy Hospital San Diego, Calif.	1966	491,241
Children's Hospital Medical Center Cincinnati, Ohio	1920	599,373
Wesson Memorial Hospital Springfield, Mass.	1970	240,344
Longmont United Hospital Longmont, Colo.	1958	116,341
St. Vincents Medical Center Jacksonville, Fla.	1928	515,000
Army:		
Madigan Army Medical Center Fort Lewis, Wash.	1944	640,000
Womack Army Hospital Fort Bragg, N.C.	1958	411,000
Walson Army Hospital Fort Dix, N.J.	1959	427,165
Brooke Army Medical Center Fort Sam Houston, Tex.	1934	585,743

APPENDIX I

Hospital	Date of occupancy of main hospital building	Hospital size in square feet
Air Force:		
Wilford Hall USAF Medical Center Lackland AFB, Tex.	1957	1,009,985
Wright-Patterson USAF Medical Center Wright-Patterson AFB, Ohio	1956	417,000
Malcolm Grow USAF Medical Center Andrews AFB, Md.	1959	330,865
Elmendorf USAF Hospital Elmendorf AFB, Alaska	1954	263,000
Navy:		
Naval Regional Medical Center Bremerton, Wash.	1980	260,668
Naval Aerospace and Regional Medical Center Pensacola, Fla.	1976	286,350
Naval Regional Medical Center Portsmouth, Va.	1960	1,144,000
Naval Regional Medical Center Oakland, Calif.	1968	770,808
Veterans Administration:		
VA Medical Center Dallas, Tex.	1940	755,946
VA Medical Center Marlin, Tex.	1950	210,165
VA Medical Center Washington, D.C.	1965	642,000
VA Medical Center American Lake Tacoma, Wash.	1923	585,000
VA Medical Center Asheville, N.C.	1967	512,879
Indian Health Service:		
Alaska Native Medical Center Anchorage, Alaska	1953	250,474
Phoenix Indian Medical Center Phoenix, Ariz.	1971	197,186

We selected the non-Federal hospitals based on their (1) successful energy management programs, (2) geographic location, (3) age, and (4) size. To identify non-Federal hospitals with successful energy management programs, we contacted many State hospital associations and the American Hospital Association

and reviewed health care industry publications. Our purpose in visiting the non-Federal hospitals was to document what hospitals with aggressive energy management programs could accomplish and how they did it. We used the range of results achieved by the non-Federal hospitals as a standard of comparison for the Federal hospitals.

We selected the Federal hospitals based on their (1) geographic location, (2) age, and (3) size. When we selected the hospitals, we had information on hospital energy use only for VA and the Navy. In those two agencies, in addition to the above selection criteria, we tried to select some hospitals with good results and some with poor results in saving energy.

At each hospital, we observed mechanical systems, reviewed records concerning the energy management program, and interviewed officials concerning the potential for saving more energy. At the headquarters of the Federal agencies, we interviewed officials and reviewed records and regulations concerning energy conservation policies, energy program guidance, and the agencies' procedures and practices to identify and implement energy conservation measures at hospitals.

ASSESSMENT OF THE HOSPITALS' ACHIEVEMENTS IN SAVING ENERGY

To assess the amount of energy saved at each hospital, we

--developed information on the energy conservation measures completed or underway;

--developed data on energy use per gross square foot for the period 1975 through 1981 (when available); and

--determined, through statistical analysis, the effect of changes in weather on the changes in energy use.

Most hospitals funded projects that were not primarily energy conservation measures but that saved energy as a secondary benefit. We counted those projects as energy conservation measures. However, cost data and expected energy savings usually were not available for those projects.

We attempted to obtain data on energy use from fiscal year 1975 (the base year for most Federal energy programs) through fiscal year 1981. Although some agencies may have initiated programs to reduce energy use before 1975, we determined that none of the hospitals we visited undertook any projects specifically directed at reducing energy before 1975. None of the

Army and Air Force hospitals visited had actual energy-use data available in a form usable for energy management. However, we developed actual energy-use data for one Army hospital, and we obtained estimated data for one other Army and three Air Force hospitals. No data on energy use were available for the remaining two Army and one Air Force hospitals. Navy and VA hospitals had actual energy-use data available. For the two IHS hospitals, we obtained actual energy-use data from IHS area offices.

We expressed energy-use data in British thermal units (Btus) 1/ per square foot per year. We converted each type of energy to Btus, using the following conversion factors.

Type of energy	Conversion factor for Btus
Electricity	a/3,413 per kilowatt hour
Natural gas	1,030 per cubic foot 100,000 per therm
#2 diesel	138,700 per gallon
#5 diesel	144,768 per gallon
#6 diesel	149,700 per gallon
Steam	1,000 per pound

a/Federal agencies have reported on energy savings using a conversion factor of 11,600 for electricity. This factor reflects energy measured "at the source" and considers the transmission losses and excess production that normally occur. Therefore, the 11,600 factor is an average measure of electrical energy at the source. The 3,413 factor we used is an actual measure of electrical energy used at the site, excluding transmission losses and excess production.

We included the energy used for heating, cooling, lighting, and operating medical equipment at the hospitals. We did not include fuels used primarily for purposes other than direct hospital operations (e.g., automotive gasoline). In most cases, square feet figures represented gross square feet of heated and/or cooled space of the hospital and hospital support buildings. We included square feet not heated or cooled only when we could not separate them from total-square-feet data.

1/A British thermal unit represents the amount of energy (heat) necessary to raise 1 pound of water 1 degree Fahrenheit.

We estimated energy cost savings by subtracting each hospital's energy consumption in 1981 from that in the first year when conservation measures were begun and applying 1981 energy costs to the hospital's reduction in energy consumption.

We did not adjust hospital energy use data for any factors except changes in square feet. We did assess the effect of changes in weather on energy use at 17 hospitals where energy-use data were available on a monthly basis. We did not include this information on individual hospitals in our report because, with two exceptions, changes in weather affected energy use not more than ± 3 percentage points. At the Oakland Navy Regional Medical Center, milder weather allowed energy use to drop almost 8 percent more than would have occurred if weather had remained constant. At Mercy Hospital, milder weather accounted for almost 5 percent of the total savings.

ASSESSMENT OF THE REMAINING POTENTIAL TO SAVE ENERGY

To assess the potential for saving more energy at each hospital, we

- --developed information on the energy conservation projects planned but not yet implemented;
- --discussed with hospital officials a list of 56 energy conservation measures which have potential at many hospitals; and
- --documented, at four hospitals, the costs of and savings from the low- and high-cost projects recommended by our consulting engineer.

To develop our list of 56 energy conservation measures found to be applicable in many hospitals, we reviewed hospital energy management publications, such as "Total Energy Management for Hospitals," (HRA) 78-613; "Practical Energy Management in Health Care Institutions," Blue Cross of Greater Philadelphia and Member Hospitals; "Making Cents of Your Energy Dollar," U.S. Department of Energy; "Hospital Energy Management Procedures Workbook," Hospital Research and Educational Trust; and "Energy Conservation in the Veterans Administration," VA Department of Medicine and Surgery. We also discussed these measures with our consulting engineer. Our objective was not to develop an all-inclusive list of measures, but rather to develop a list containing a representative number of measures for the major energy-use systems or areas, such as heating, cooling, electrical, kitchen, and laundry. (See app. III for a brief description of the 56 measures we included.)

We hired a professional consulting engineer, Donald G. Carter of Silver Spring, Maryland, to help us assess the potential to save additional energy at selected hospitals. Mr. Carter is an expert on energy conservation methods and retrofits to save energy in hospitals and other buildings. Mr. Carter conducted comprehensive technical audits at 4 of the 19 Federal hospitals visited, prepared detailed lists of recommended low- and high-cost projects, and documented the anticipated costs and expected savings. He performed economic analyses of individual projects using procedures recommended by the "Life-Cycle Cost Manual for the Federal Energy Management Program" published by the National Bureau of Standards. To calculate savings-to-investment ratios, he used the prescribed 7-percent discount rate and treated investment costs as occurring in the base year and equaling 90 percent of actual investment cost. We selected the four hospitals Mr. Carter visited to include one hospital in each agency (except IHS), each hospital having a different age, size, and climate.

ASSESSMENT OF EACH HOSPITAL'S ENERGY MANAGEMENT PRACTICES

To assess each hospital's energy management practices, we determined whether the hospital had in place key management elements characteristic of good energy management programs. These key elements are found in several publications, including the Department of Energy's guidelines for energy management in general operations of the Federal Government (see 10 CFR 436, App. D)(1982); "Total Energy Management for Hospitals," (HRA) 78-613; and "Practical Energy Management in Health Care Institutions," Member Hospitals and Blue Cross of Greater Philadelphia. We listed those elements having the greatest impact on the effectiveness of an energy program and omitted other important but less essential elements. We determined which elements were most essential based on comments in the publications, comments from officials at the five non-Federal hospitals visited, and the opinion of our consulting engineer.

ENERGY CONSERVATION MEASURES

RECOMMENDED AT FOUR FEDERAL HOSPITALS

BY OUR CONSULTING ENGINEER

From September 1981 through January 1982, Donald G. Carter, Carter Engineering, Inc., visited four Federal hospitals. During these visits, Mr. Carter analyzed each hospital's energy-use characteristics and recommended both low- and high-cost energy conservation measures with additional energy-saving potential. The following summarizes Mr. Carter's recommendations at each location.

WALSON ARMY HOSPITAL

In 1980 the hospital consumed energy at a rate of 295,524 Btus per square foot per year and a cost of $1,026,830. By implementing 14 low-cost and 6 high-cost measures, energy consumption would drop 29.6 percent and reduce annual energy costs by $338,000. Specific conservation measures are listed below. Measure 18 was previously identified by the hospital; our consultant estimates this measure would reduce energy use 7.7 percent.

Conservation measures	Energy savings: Millions of Btus per year	Energy savings: Dollars per year	Implementation cost	Btu savings as a percent of total Btus	Simple payback (years)
Low-cost measures					
1. Reduce power input of chiller by supplying colder water	235	$ 4,558	$ 0	.20	.00
2. Improve steam trap maintenance procedures	1,442	10,095	480	1.21	.05
3. Replace 40-watt tubes with lower wattage fluorescent tubes	438	8,185	310	.37	.04
4. Repair pipe insulation a/	328	2,296	867	.28	.38
5. Recover waste heat from condensing units	710	4,968	2,200	.60	.44
6. Reduce waste heat by installing automatic radiator valves	922	6,455	7,752	.78	1.20
7. Repair heating duct insulation a/	121	744	2,670	.10	3.59
8. Recover dishwasher exhaust heat	358	2,510	9,554	.30	3.81
9. Reduce overheating by lowering primary air delivery temperature	4,241	29,691	0	3.57	0
10. Recover oven bakery heat	205	1,434	7,650	.17	5.33
11. Turn off heaters in stairwells	642	4,500	0	.54	0
12. Increase boiler combustion efficiency a/	6,245	52,355	998	5.26	.02

Conservation measures	Energy savings: Millions of Btus per year	Energy savings: Dollars per year	Implementation cost	Btu savings as a percent of total Btus	Simple payback (years)
13. Reduce electrical demand charges by using generator	0	$ 8,235	$ 6,100	0	.74
14. Reduce overheating by relocating temperature sensing device	255	1,787	1,800	.21	1.01
Total low-cost measures	16,142	137,813	40,381	13.59	.29
High-cost measures					
15. Replace incandescent lights with fluorescent lamps	3,200	62,074	32,020	2.70	.52
16. Recover kitchen hood exhaust air	1,609	11,267	27,557	1.36	2.45
17. Recover exhaust-air heat at 6th floor	1,797	11,968	37,220	1.51	3.11
18. Install storm windows a/	9,141	61,702	203,200	7.70	3.29
19. Add roof insulation	862	6,967	51,300	.73	7.36
20. Replace existing water chillers	2,360	45,780	247,000	1.99	5.40
Total high-cost measures	8,969	199,758	598,297	15.99	3.00
Total all measures	35,111	$337,571	$638,678	29.58	1.89

a/The savings from these measures are affected by the savings from other measures. This interaction is accounted for in the energy savings shown.

APPENDIX II

ELMENDORF U.S. AIR FORCE HOSPITAL

In 1980 the hospital consumed energy at a rate of 623,074 Btus per square foot per year and a cost of $646,000. By implementing 10 low-cost and 5 high-cost measures, energy consumption would drop 38.6 percent and reduce annual energy costs by $184,000. Specific conservation measures are listed below.

APPENDIX II

Conservation measures	Energy savings: Millions of Btus per year	Energy savings: Dollars per year	Implementation cost	Btu savings as a percent of total Btus	Simple payback (years)
Low-cost measures					
1. Improve steam trap maintenance procedures	1,442	$ 3,867	$ 480	.88	.12
2. Cycle air-handling units (savings represent 7 units)	11,623	35,317	875	7.08	.02
3. Recover steam condensate for domestic hot-water preheat	608	1,631	200	.37	.12
4. Replace 40-watt fluorescent lamps with 34-watt lamps	462	3,000	327	.27	.11
5. Replace pendant 150-watt incandescent lamps with 44-watt fluorescent lamps	85	556	92	.05	.08
6. Reduce pumping flow by decreasing amount of chilled water	77	499	150	.05	.30
7. Replace recessed incandescent lamps and lenses	1,319	8,565	8,195	.80	.96
8. Install flow restrictors	365	1,506	1,100	.22	.73
9. Replace filters with lower air resistance filters	122	799	408	.07	.51
10. Use well water for air-conditioning	441	2,865	1,100	.27	.38
Total low-cost measures	16,544	58,605	12,927	10.06	.22

APPENDIX II

Conservation measures	Energy savings: Millions of Btus per year	Energy savings: Dollars per year	Implementation cost	Btu savings as a percent of total Btus	Simple payback (years)
High-cost measures					
11. Install bakery exhaust air recovery system	8,923	$ 23,934	$ 13,600	5.45	.57
12. Recover exhaust heat from kitchen hoods	11,428	30,654	74,400	6.97	2.43
13. Recover exhaust heat from operating rooms	5,232	14,035	57,000	3.19	4.06
14. Recover exhaust heat from exhaust fan #9	11,477	30,786	131,400	7.00	4.26
15. Recover exhaust heat from exhaust fan #8	9,659	25,908	178,000	5.89	6.87
Total high-cost measures	46,719	125,317	454,400	28.50	3.63
Total all measures	63,263	$183,922	$467,327	38.56	2.54

PENSACOLA NAVAL AEROSPACE
AND REGIONAL MEDICAL CENTER

In 1980 the hospital consumed energy at a rate of 501,511 Btus per square foot per year and a cost of $1,041,200. By implementing 8 low-cost and 9 high-cost measures, energy consumption would drop 41 percent and reduce annual energy costs by $601,044. Specific conservation measures are listed below. Measures 6 and 14 were previously identified by the hospital; our consultant estimates they would reduce energy use 2.5 percent.

APPENDIX II

Conservation measures	Energy savings: Millions of Btus per year	Energy savings: Dollars per year	Implementation cost	Btu savings as a percent of total Btus	Simple payback (years)
Low-cost measures					
1. Reduce energy used by chiller by lowering supplied water temperature a/	129	$ 2,556	$ 0	.09	0
2. Reduce steam pressure	203	2,295	0	.14	0
3. Reduce domestic hot-water temperature a/	57	643	0	.04	0
4. Discontinue heating in summer and cooling in winter around hospital perimeter	126	2,487	200	.09	.08
5. Replace all inefficient electric motors	703	13,900	1,360	.49	.10
6. Replace conventional 40-watt tubes with more efficient fluorescent tubes	719	14,224	2,087	.51	.15
7. Remove ballasts where fluorescent tubes were already removed	82	1,621	1,059	.06	.65
8. Install more efficient capacitor motors on fan coil units	180	3,559	5,670	.13	1.59
Total low-cost measures	2,199	41,285	10,376	1.55	.25

Conservation measures	Energy savings: Millions of Btus per year	Energy savings: Dollars per year	Implementation cost	Btu savings as a percent of total Btus	Simple payback (years)
High-cost measures					
9. Replace existing absorption chiller with energy efficient electric centrifugal chiller	19,766	$145,072	$335,000	13.76	2.31
10. Properly maintain wheels on rotary heat exchangers	6,294	62,628	20,000	4.38	.32
11. Reduce energy for reheat coils by using recovered heat	20,129	227,265	103,800	14.02	.46
12. Allow higher water temperature on water leaving chiller a/	600	11,867	16,300	.42	1.37
13. Recover exhaust-air energy a/	5,128	51,038	103,719	3.60	2.03
14. Install enthalpy controls for "free cooling" a/	2,890	26,908	58,200	2.02	2.16
15. Relocate present steam humidifiers	674	7,606	11,960	.47	1.57
16. Preheat domestic hot water by using waste heat from refrigerator compressors in kitchen	481	5,428	15,800	.33	2.91
17. Provide separate water flow to each water absorption chiller	1,109	21,947	42,300	.77	1.93
Total high-cost measures	57,071	559,759	707,079	39.77	1.26
Total all measures	59,270	$601,044	$717,455	41.32	1.19

a/The savings from these measures are affected by the savings from other measures. This interaction is accounted for in the energy savings shown.

VA MEDICAL CENTER, DALLAS, TEXAS

In 1980 the medical center consumed energy at a rate of 399,885 Btus per square foot per year and a cost of $1,341,191. By implementing 7 low-cost and 7 high-cost measures, energy consumption would drop 51 percent and reduce annual energy costs by $766,391. Specific conservation measures are listed below. Measures 8, 9, and 11 were previously identified by the hospital; our consultant estimates these measures would reduce energy use 32.7 percent.

The medical center plans to replace its main steam line; however, our consultant estimates that, by completing the measures recommended below, this would not be necessary and would result in a savings of $358,000.

Conservation measures	Energy savings: Millions of Btus per year	Energy savings: Dollars per year	Implementation cost	Btu savings as a percent of total Btus	Simple payback (years)
Low-cost measures					
1. Reduce cooling tower water temperature a/	458	$ 4,449	$ 0	.15	0
2. Improve steam trap maintenance procedures a/	5,055	20,017	720	1.67	.04
3. Install flow restrictors a/	13,948	118,021	7,094	4.61	.06
4. Place laundry preheat recovery system back into operation a/	2,577	10,203	1,000	.86	.09
5. Remove excess lamps and ballasts in corridors	1,033	10,305	892	.34	.09
6. Delete sound traps in duct work	199	1,931	425	.07	.22
7. Use recovered heat for reheat a/	1,628	6,449	6,000	.54	.93
Total low-cost measures	24,898	171,375	16,131	8.24	.09

APPENDIX II

Conservation measures	Energy savings: Millions of Btus per year	Energy savings: Dollars per year	Implementation cost	Btu savings as a percent of total Btus	Simple payback (years)
High-cost measures					
8. Reduce outside air quantities a/	30,500	$ 89,968	$ 36,000	10.09	.40
9. Convert existing absorption chillers to electric chillers a/	44,137	95,152	178,200	14.60	1.87
10. Reduce excessive dehumidification and subsequent rehumidification of heating and cooling system	2,879	16,573	16,300	.96	.98
11. Use energy management system to cycle equipment a/	24,183	107,296	250,000	8.00	2.33
12. Recover exhaust heat where practicable a/	20,456	41,002	368,300	6.77	8.96
13. Recover laundry exhaust heat a/	3,243	12,845	54,400	1.07	4.24
14. Provide thermal storage for chilled water a/	3,962	232,180	400,000	1.31	1.72
Total high-cost measures	129,360	595,016	1,303,200	42.80	2.19
Total all measures	154,258	$766,391	$1,319,331	51.04	1.72

a/The savings from these measures are affected by the savings from other measures. This interaction is accounted for in the energy savings shown.

LIST OF 56 ENERGY CONSERVATION MEASURES APPLICABLE AT HOSPITALS

The following 56 conservation measures are proven energy savers in hospitals. We compiled these measures as a representative sample of the types of conservation measures that can be applied in hospitals. The 56 measures do not represent an exhaustive list of everything that could be done. We identified the measures from several hospital conservation manuals published by Federal and private agencies. 1/ Furthermore, our consulting engineer reviewed and supported the measures as being applicable at many hospitals.

The 56 measures are categorized below in eight major energy-use systems. Low-cost measures are listed first within each category and identified by an asterisk (*).

Heating, ventilating, and air-conditioning

* 1. Shut off air-handling units whenever possible.

* 2. Reduce outside air intake when air must be heated or cooled before use.

* 3. Reduce volume of air circulated through air-handling units.

* 4. Shut off or reduce speed on room fan coils.

* 5. Shut off or reduce stairwell heating.

1/1. U.S. Department of Health, Education, and Welfare, "Total Energy Management for Hospitals" (HRA 78-613).

2. U.S. Department of Energy, "Making Cents of Your Energy Dollar" (HCP/M5250, 1979).

3. Veterans Administration, Department of Medicine and Surgery, "Energy Conservation in the Veterans Administration" (IB 13-8, 1980).

4. Blue Cross of Greater Philadelphia and Member Hospitals, "Practical Energy Management in Health Care Institutions" (Consolidated/Drake Press, 1977).

5. Hospital Research and Educational Trust, "Hospital Energy Management Procedures Workbook" (HRET 9350, 1979).

* 6. Shut off unneeded circulating pumps.

* 7. Reduce humidification to minimum requirements.

* 8. Reduce condenser water temperature.

* 9. Cycle fans and pumps.

*10. Reduce pumping flow.

*11. Reset thermostats higher during cooling and lower during heating.

*12. Repair and maintain steam lines and steam traps.

*13. Use damper controls to shut off air to unoccupied areas.

14. Reset hot and cold deck temperatures based on areas with greatest need.

15. Raise chilled-water temperature.

16. Shed loads during peak electrical use periods.

17. Use outside air for free cooling whenever possible.

18. Reduce reheating of cooled air.

19. Recover heating or cooling with energy recovery units.

20. Reduce chilled water circulated during light cooling loads.

21. Install minimum-sized motor to meet loads.

22. Replace hand valves with automatic controls.

23. Install variable air volume controls.

Boiler plant

* 1. Reduce steam distribution pressure.

* 2. Shut off steam to laundry when not in use.

* 3. Increase boiler efficiency.

4. Repair, replace, or install condensate return system.

APPENDIX III

Lighting

* 1. Shut off lights when not needed.
* 2. Reduce lighting levels.
* 3. Revise cleaning schedules.

Building envelope

* 1. Reduce infiltration by caulking and weatherstripping.
  2. Install storm windows or double pane windows.
  3. Install roof insulation.
  4. Install loading dock seals.
  5. Install vestibules on entrances.

Electrical equipment

* 1. Shut off elevators whenever possible.
* 2. Shut off pneumatic tube system whenever possible.
  3. Install capacitors or synchronous motors to increase power factor.
  4. Use emergency generator to reduce peak demand.
  5. Shed or cycle electrical loads to reduce peak demand.

Plumbing

* 1. Reduce domestic hot-water temperature.
* 2. Repair and maintain hot-water and steampiping insulation.
* 3. Install flow restrictors.
* 4. Install faucets which automatically shut off water flow.
  5. Decentralize hot-water heating.

APPENDIX III

Laundry

1. Install heat reclamation system for laundry wash water.
2. Install heat reclamation system on dryers.
3. Install heat reclamation system on irons.
4. Install thermal fluid heated equipment.

Kitchen

* 1. Shut off range hood exhaust whenever possible.
* 2. Install high-efficiency steam control valves.
* 3. Shut off equipment and appliances whenever possible.
4. Install makeup air supply for exhaust.
5. Install heat reclamation system for exhaust heat.

Miscellaneous

1. Install incinerator and heat recovery system.
2. Install computerized energy monitoring and control system.

Additional explanations for each measure can be found in the the conservation manuals listed in the footnote on page 43.

APPENDIX IV

DEPARTMENT OF HEALTH & HUMAN SERVICES

Office of Inspector General

Washington, D.C. 20201

JUL 7 1982

Mr. Gregory J. Ahart
Director, Human Resources
Division
United States General
Accounting Office
Washington, D.C. 20548

Dear Mr. Ahart:

The Secretary asked that I respond to your request for our comments on your draft of a proposed report "Millions Can Be Saved through Better Energy Management in Federal Hospitals." The enclosed comments represent the tentative position of the Department and are subject to reevaluation when the final version of this report is received.

We appreciate the opportunity to comment on this draft report before its publication.

Sincerely yours,

Richard P. Kusserow
Inspector General

Enclosure

COMMENTS OF THE DEPARTMENT OF HEALTH AND HUMAN SERVICES TO THE GENERAL ACCOUNTING OFFICE'S DRAFT REPORT "MILLIONS CAN BE SAVED THROUGH BETTER ENERGY MANAGEMENT IN FEDERAL HOSPITALS"

General Comments

Only a few of the 48 hospitals operated by the Department's Indian Health Service (IHS) are over 200,000 square feet in size. Most of the IHS hospitals have an average size of 45,000 square feet. The smaller sizes appreciably reduce the potential energy savings that may be realized.

The General Accounting Office (GAO) report estimates of large unrealized energy savings at the bigger and more sophisticated hospitals operated by the Veteran's Administration and the Department of Defense should be viewed from a scaled down level when applied to the preponderance of smaller units comprising the 48 hospitals operated by the IHS.

GAO Recommendation

Each Federal hospital should establish quantifiable energy conservation goals based on its energy saving potential.

Department Comment

We concur. Each IHS area office has been given the goal of reducing its energy usage in Federal buildings 20 percent by 1985. The IHS area offices, in turn, have set individual goals for most of its service units predicated on building size. To date, IHS has achieved an overall reduction of approximately 13 percent in energy usage. We will continue our commitment in this area, within existing budgetary constraints.

GAO Recommendation

Federal hospitals should be directed to maintain data and report on their energy use.

Department Comment

We concur. Each IHS service unit is required to maintain energy consumption records. Quarterly and annual Energy Consumption Reports are submitted by the IHS area offices to the Health Services Administration (HSA), Office of Property Management. Thereafter, the reports are forwarded to the Public Health Service's Division of Health Facilities Planning, and HHS's Office of Facilities Engineering for review, analysis, and action as appropriate. On March 2, 1982, IHS headquarters forwarded a written reminder on the requirements for energy savings and use reporting to all IHS area offices.

APPENDIX IV

GAO Recommendation

Agencies should provide to their hospitals comprehensive information on low-cost conservation measures applicable to hospitals.

Department Comment

We concur. IHS Headquarters West (Albuquerque) has repeatedly forwarded data on low-cost conservation measures to each IHS area office. The area offices distribute the informational material to all of their service units. At the 45,000 square foot or smaller IHS hospitals, many of the feasible low-cost conservation measures have been adopted or accomplished.

GAO Recommendation

Federal hospitals should be directed to implement cost-effective low-cost conservation measures.

Department Comment

We concur. The GAO report defines low-cost conservation measures as costing $10,000 or less. The IHS has accomplished many low cost measures including weatherstripping, attic insulation, storm window installation, double glazed window installation, thermostat night set back devices, zone control, and others. As resources permit, additional cost-effective measures will be accomplished.

GAO Recommendation

The results of energy saving efforts in Federal hospitals should be monitored and action should be taken to assure that feasible energy conservation measures are implemented when these results are not satisfactory.

Department Comment

We concur. The overall general monitoring of the IHS energy conservation effort is accomplished by analysis of quarterly energy consumption data. During scheduled annual condition surveys, engineers from our regional offices review the performance of energy projects and recommend corrective actions to maximize savings. For example, there are four active solar projects at IHS facilities for which performance is reviewed regularly, and engineering recommendations made for improvements.

GAO Recommendation

Hospitals' energy conservation goals should be reset based on results of technical audits or when formerly established goals have been reached.

Department Comment

We concur. In accordance with the National Energy Conservation Policy Act of 1978 (Pub. L. 95-619), the Department's basic goals are to attain a 20 percent reduction in energy consumption by 1985.

The regional engineering and construction staffs and their engineering contractors in seven regions are performing the technical energy audits of IHS hospitals and related clinics and health centers as funded by IHS' $192,000 budget. At this time, 18 IHS facilities have been surveyed and 17 more are scheduled to be completed by the close of FY 1982, with the balance to be completed in early FY 1983. We are currently reviewing the results of the completed surveys, determining the savings-to-investment ratios of identified energy conservation measures, considering resource requirements, and establishing priorities. These efforts will provide the necessary information base from which to establish new goals and milestones in our conservation plans.

Technical Comments

On page 3 of the draft, GAO states that "IHS has received funding for technical energy audits but has obtained only limited funding for conservation measures." This should be clarified to point out that although the IHS has received $192,000 for technical energy audits, it has received no funding for energy conservation measures beyond that which can be reallocated from the IHS repair and maintenance account.

On page 2 of the GAO report, the number of IHS hospitals is stated at 48 but on page 16 of the report the number has changed to 54. The correct number of IHS-operated Federal hospitals is 48. This number excludes the new IHS hospital under construction at Chinle, Arizona, and the federally-owned but tribal operated hospital at Kanakanak, Alaska (Bristol Bay).

GAO note: Page numbers have been changed to correspond to those in the final report.

APPENDIX V

Office of the
Administrator
of Veterans Affairs

Washington, D.C. 20420

Veterans Administration

JULY 27 1982

Mr. Gregory J. Ahart
Director, Human Resources Division
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Ahart:

Your June 7, 1982, draft report, "Millions Can Be Saved through Better Energy Management in Federal Hospitals," contains four recommendations addressed to the Veterans Administration (VA). I concur in these recommendations but believe rigid implementation of the fourth one, as currently stated, would be counter-productive. The VA instituted many of the energy-saving measures described in this report several years ago. The report does not acknowledge that this Agency has implemented a long-range program, and that we have carefully selected and funded the most cost-effective projects each year. Enclosed are my detailed comments.

Thank you for the opportunity to review this report.

Sincerely,

ROBERT P. NIMMO
Administrator

Enclosure

APPENDIX V

VETERANS ADMINISTRATION'S COMMENTS ON THE GENERAL ACCOUNTING OFFICE (GAO) JUNE 7, 1982, DRAFT REPORT, "MILLIONS CAN BE SAVED THROUGH BETTER ENERGY MANAGEMENT IN FEDERAL HOSPITALS"

RECOMMENDATIONS

Implementation of the recommendations addressed to the VA is an ongoing activity. Outlined below are the actions VA has taken and which are continuing. Measures which can strengthen our energy-management program will be instituted.

--Technical audits should be conducted in Federal hospitals using qualified energy personnel.

VA pioneered in the areas of technical audits and accountability. Our audit program was begun in 1975 and the training program in 1976. Trained VAMC personnel have audited all VA medical centers (VAMC) and continue to do so as part of the annual update of each facility's 5-year energy management plan. Over half of the VAMC's have also been audited by consultant energy specialists. In addition, our VAMC directors' efforts in successfully implementing the energy program are reflected in their annual performance appraisals.

--Federal hospitals should be directed to implement cost-effective low-cost conservation measures.

The report does not mention any low-cost measures which have not been in our program for over 5 years. Many were accomplished before 1975. We have implemented this recommendation to a varying degree at all VAMC's, depending on their individual requirements.

A Department of Medicine and Surgery Manual Supplement, "Energy Management," has been drafted to update policy and program guidance and will reemphasize the need to consider all conservation measures at the medical center level.

--The results of energy-saving efforts in Federal hospitals should be monitored and action should be taken to assure that feasible conservation measures are implemented when these results are not satisfactory.

The VA has a comprehensive monitoring program which requires each medical center to prepare a quarterly report of energy consumption. Central Office maintains systemwide energy consumption data and monitors the performance of each medical center. Data accumulated since 1975 are available and used in this continuous monitoring effort.

--Hospitals' energy conservation goals should be reset based on results of technical audits or when formerly established goals have been reached.

During systemwide energy management workshops held in 1975 and 1979, specific goals, based on each facility's physical conditions and requirements, were set for all VAMC's. The goals, to be accomplished by 1985, considered factors such as type of air conditioning system, number of meals prepared, type of laundry system, and weather zone. The goals delineate what each facility should be able to accomplish on a cost-effective basis. Each goal is regularly monitored and adjusted, based on changes in conditions.

I believe the immediate resetting of goals, once formerly established ones are met, would be counter-productive. There would be no incentive to strive to reach goals if it were understood that as soon as they were accomplished, new, higher goals would be set. Our experience shows that the achievement of an energy-management goal is, in itself, an incentive to seek out additional measures. Continued monitoring of progress, and adjusting goals to adapt them to changing conditions and to incorporate newly developed energy-saving methods would accomplish the intent of this recommendation.

GENERAL COMMENTS

The report refers to non-Federal hospitals which achieve energy savings of from 20 to 40 percent. This is not unusual in the VA. About 10 percent of VA hospitals have received awards for energy savings from the American Hospital Association, compared to about 1.6 percent of non-Federal hospitals. As shown on page 8, 3 of the 5 VA hospitals GAO randomly selected are in the 20 to 40 percent savings category. One of the other two had a very low consumption rate from the beginning, only 266,000 BTU per square foot per year. The other had already prepared a 5-year plan, requesting $1.1 million, which should result in an annual saving of $353,000, or 176 billion BTU.

In Chapter 1, GAO states that the VA spent $65.5 million on energy conservation in Fiscal Years (FY) 1977 through 1981. This expenditure actually began in FY 1975 and has already saved the VA $107 million. Statistics for the first half of the current fiscal year indicate over $40 million will be saved in utility costs during FY 1982. These results could not be realized without a sound energy management program.

On page 7, the VA is listed as achieving an 11.1 percent energy savings in 1981. Our data show that by the end of 1981, VA had achieved a 13.7 percent savings. Even with the upgrading of many buildings, adding the electrical load of increased medical equipment requirements, and a 46 percent increase in ventilation and air conditioning needs, VA's electrical consumption has been held to an increase of only 7.1 percent. The use of boiler fuel, which is another good indicator of VA's overall program, is down 24 percent from 1975.

There are variances in the GAO and VA computations of energy savings estimated or already achieved because VA's calculations are based on the conversion factor stipulated for reporting to the Department of Energy, while GAO used energy consumed at the site of use as the basis for their calculations.

GAO note: Page numbers have been changed to correspond to those in the final report.

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