DRAFT RPT. OF SITE VISITS

hope that the presentation is forward looking in order to be helpful to those looking for ideas on how to save energy. The experience of those who have been in a similar situation could provide the "trigger" leading to a solution, and materials from the individual site visit reports have been selected and arranged with that objective.

MAJOR FINDINGS AND CONCLUSIONS

I. PRESIDENT'S ENERGY GOAL ACHIEVED

A. Energy Usage Reduced. The site visits confirmed the energy reductions presented in the reports of the Federal Energy Management Program. Most of the installations that were visited have met or exceeded the President's FY 75 goal of a 15 percent reduction in energy consumption from FY 73 energy-use rates.

B. Guidelines Implemented. Most of the installations indicated that they had implemented the energy conservation guidelines outlined in Federal Management Circular 74-1. The guidelines pertaining to building operation have been implemented by 92 percent of the affected installations; those pertaining to motor vehicle management by 94 percent; those pertaining to ship and aircraft operations by 98 percent; and those pertaining to employee parking and carpooling by 57 percent. These statistics do not attempt to evaluate the effectiveness of the implementing action; however, they do reflect a broad boncern for energy conservation.

C. Energy Conservation Programs Established. Most of the installations have demonstrated their awareness of energy conservation by establishing conservation programs and designating part-time energy conservation coordinators. The importance attached to conservation varied among installations, but overall was fairly strong.

D. Operations Unhindered. Aside from a few instances, the reductions that have been realized have not impaired the Federal Government's ability to execute its missions. In short, operations have become less costly and more efficient.

II. FURTHER ENERGY CONSERVATION POSSIBLE

Though substantial, the Federal Government's accomplishments thus far can be strengthened and extended to achieve additional energy savings.

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A. Commitment Needs Strengthening. Management and employee commitment to energy conservation--one of the keys to a successful program--is weak at some installations.

1. Management. The managers of several installations displayed a lack of interest in energy conservation. Some managers saw conservation as a hinderance to their ability to perform their missions. The managers of special-purpose installations, such as hoppitals and laboratories, believed that their sites should not be asked to conserve. In a few instances, there was an impression that there was no commitment at the headquarters level.

2. Employees. Energy conservation efforts have been met with indifference or resistance at some sites. The site visit teams reported that many Federal employees have not come to realize the need of energy conservation, particularly when there is little or no evidence of concern on the part of their peers in the private sector.

B. Additional Conservation Opportunities Identified. The teams reported that at many of the installations visited they were able to suggest additional possible conservation measures or more effective implementation of energy conservation guidelines.

C. Need for Technical Assistance. Many of the installations indicated a need for more technical assistance in identifying and implementing energy conservation measures. This was especially true at installations having special missions, such as hospitals or prisons. These installations had difficulty in adapting the general conservation guidelines to their special needs.

D. Funding Needed. The energy conservation efforts of many installations have been limited by a lack of funds for such projects as retrofitting buildings, rehabilitating or replacing antiquated, inefficient equipment, and creating a position for a full-time energy conservation coordinator.

E. Need for Better Energy Accounting. At many installations the existing apparatus for monitoring and accounting for energy consumption is inadequate. Some installations could not readily provide teams with energy consumption data, a fact indicating that they were not monitoring consumption as they should be. Where metering was done on a total-facility basis only, it was virtually impossible to develop reliable energy-use data for individual operating components.

Without these data, it is not possible to identify the equipment or offices that use the greatest amount of energy. There is a clear need to develop more responsive reporting systems that will permit all levels of management to be held accountable for energy consumption by their units.

F. Carpool Use Lagging. According to site survey data, the least successful of the major Federal energy conservation programs has been that relating to employee carpooling. Particularly at installations having extensive employee parking facilities, the use of privileged spaces to encourage carpooling has been only marginally effective. Carpooling is by nature a voluntary arrangement and not easily subject to direct management control. A number of facility managers expressed frustration at their inability to motivate additional employee interest.

III. ELEMENTS OF AN EFFECTIVE ENERGY CONSERVATION PROGRAM.

The installations that were most successful in reducing their consumption of energy were found to have established conservation programs that had certain similar characteristics.

A. Top Management Commitment. Installation manager is personally involved in the program and encourages his subordinates to participate in it by his example and interest.

B. Accountability. Line managers are held accountable for the performance of their units with respect to energy conservation.

C. Formal Planning. A formal conservation plan has been developed, with performance-oriented goals, including specific reductions in energy consumption.

D. Monitoring. Progress in reducing energy requirements is reviewed at installation and headquarters levels to identify and correct weaknesses and to build on successes.

E. Technical Expertise Utilized. Installation employees having technical training participate in the development of the conservation program.

F. Employee Awareness. Employees are reminded of the importance of conservation through education campaigns and directives from installations managers.

G. Contingency Planning. Programs for dealing with another fuel shortage or a change in mission have been developed.

H. Budgeting and Fiscal Support. Resources needed for energy conservation have been made available.

IV. SITE VISITS BENEFICIAL. ~~The site visits accomplished each of the goals intended for them. Besides providing~~ init. caps
The site visits accomplished each of the goals intended for them. Besides providing a vehicle for assessing the conservation efforts of the Federal Government and identifying problems, the visits had others benefits.

A. Triggered Action. The teams noted that their visits stimulated conservation actions at many installations as personnel attempted to present the best possible posture. Moreover, the visits tended to reinforce the commitment of both managers and employees to energy conservation.

B. Technical Assistance Provided. In many instances, the teams served in the capacity of energy-management consultants, pointing out techniques and areas for conservation that the installations had not explored.

C. Ideas Shares. The visits provided a good means of identifying conservation techniques that can be shared with other installations.

D. Evidenced Top-Level Concern. The visits were positive evidence that the energy problem is viewed as immediate and crucial at headquarters levels of Government.

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A majority of the sites visited seemed to be taking positive action in implementing FMC 74-1 guidelines and as a result, it was found that most Federal installations were achieving substantial energy reductions. The goals established by President Ford will be approached or reached by a majority of facilities.

There has been no notable detrimental effect from the reduction of energy consumption on the Federal sites visited. A considerable amount of readjustment has been required in some instances, but in most cases the results have been a more efficient operation.

Energy management can be strengthened through commitment of top level headquarters managers and local manager; by establishing energy accountability as a measure of line management effectiveness; by setting forth formal plans which include specific targets or goals; through reporting and monitoring activities which measure results against expectation; by making full use of technical expertise; by continuing employee awareness efforts through planning for energy contingencies and by supporting energy conservation through existing budgetary, fiscal, and management processes. These principles are clearly illustrated in the several site visit reports that discussed successful energy programs.

The most effective programs appear to have developed at those installations where there is strong top level involvement and management awareness

of the need for energy conservation. Installation managers must take an active interest in the decisions necessary to reduce energy waste and to achieve established energy conservation goals. Energy management should become a regular subject in top level staff meetings. In general, it was found that where such measures were not undertaken, facility programs tended to be less effective.

Interestingly, it was also observed that where top management did not set a visible example of energy conservation, for example, reducing lighting or cooling levels in executive offices and corridors, other employees felt less obliged to comply in their own work areas.

The successful programs were based on a formal conservation plan incorporated into a single document. Two major benefits from this approach were cited:

1. Formalized plans tend to be more comprehensive in scope as well as generally better designed.

2. Program implementation and management tend to be less complicated when staff can reference a single document in lieu of a number of directives, memorandums, and other materials.

Another feature observed in many stronger programs was a provision for periodic adjustment of internal conservation goals to allow for changes

in workload and other demand variables at the individual office or division level. Such adjustment procedures recognize the fact that fixed energy requirements may vary to a significant extent between organizational functions.

Frequently, it was noted that agencies and installations with strong energy conservation programs tended as well to have qually strong fiscal management programs and procedures. Although the impact of rapidly increasing commercial energy costs to some degree may be responsible for this trend, other factors may also be involved. In particular it was noticed that incorporation of energy data into comprehensive fiscal accounting systems has helped to improve both conservation program design and energy use monitoring.

Although none of the Federal sites visited had a specific full-time energy conservation position listed by Civil Service Commission or military classification, virtually all sites had designated an energy coordinator. Most teams agreed that in order to be effective, the energy coordinator should be a top level manager within an organization as well as have sufficient technical background to work with engineers and other technical staff. Where justified, energy management should be designated as a full-time responsibility. It was also felt that the energy coordinator should report directly to the facility manager for all energy-related matters.

Many of the stronger energy conservation programs reviewed by the survey teams included a regular program review and redesign process, involving experts in a variety of technical areas and not only formally designated conservation monitors. One approach used successfully at several installations involved the formation of in-house energy task groups. Another approach used by the ERDS center in Sioux Falls, Idaho, was to contract energy management studies to private engineering firms.

Possible benefits of such studies might include the time-phasing of energy intensive equipment systems in order to reduce peakload power demands, as well as adjustments to existing heating and cooling systems designed to reduce the severity of temperature imbalances.

Virtually all Federal facilities visited had developed some form of periodic reporting system for energy conservation. In some cases, these systems have been designed to ensure energy accountability at the division or office level, requiring not only the reporting of energy consumption and cost data, but also an explanation to top management of any unusual usage fluctuations.

An energy reporting system should provide both management and operating personnel with up-to-date summaries of energy supply and use. The reports should also reflect performance relative to previous periods or goals, as this seems to be most effective as a guide as to how well the facility or agency is doing. The reporting of just fuel use does not convey a sense

of how well goals are being met or how effective conservation efforts have been. When a clearcut and well-defined method of recording energy consumption is developed, using specific common terminology, the comparative value of energy conservation methods and practices can be better evaluated.

Finally, internal reviews, audits, or inspections are a vital part of effective energy management. This type of activity ensures compliance with policies and procedures and provides an additional means of discovering new areas of potential energy savings.

It is essential to establish energy priorities. While energy savings to date have been accomplished largely without a significant impact on essential facility operations, reports indicate that an initial conservation limit may soon be reached in some areas, particularly in the buildings and motor vehicle management programs. Further reductions will require increased funding for energy-related retrofit as well as test and demonstration projets. Procurement and other operational policy guidelines should be reevaluated in light of energy efficiency requirements. Separate and distinct energy conservation budgets should be established. Establishing these budgets within the agencies themselves is generally the most desirable approach; however, there is considerable risk that projects will be carried out under the guise of conservation that are in fact motivated by other purposes and that would not be valid conservation

Transmittal letter

DRAFT REPORT

ENERGY SITE VISIT PROGRAM

September 18, 1975

alternatives. Some agencies lack the expertise necessary to judge the merits of conservation oriented proposals.

Continual requests were made which emphasized the need for additional support to retrofit many of the Federal buildings. It was observed on many of the sites, particularly those which have been in existence for a number of years, that many of the buildings are in dire need of retrofitting actions; or in some cases, total demolition of the building and replacement. A number of sites visited have developed projects for building or HVAC modifications requiring funding.

The normally strived for 3-year amortization period is not obtainable in many instances. This has resulted in these sites recommending that energy conservation projects be favorably considered with amortization periods of 8-10 years. Guidance is needed to determine what the maximum payback period or minimum rate of return will be.

A problem that several Federal sites complained of was the limited manpower available to accomplish full-time energy conservation. In some cases, the manpower staffing was as low as 80 percent. Most of the individuals are accomplishing energy conservation as a secondary function of their primary duties. However, they are doing an exceptionally fine job for the time that they are able to devote. In many situations the energy conservation savings can far offset the cost of assigning personnel full-time to the energy conservation program.

To help with the limited manpower problem, a Federal cadre of expertise might be established that can be made available to agencies free of charge or on a reimbursable basis. Such a cadre should be able to assist in all areas of program design and the development of conservation techniques. If it is not possible to expect these teams of experts to complete on-site energy surveys, then these experts should be expected to instruct site personnel so that the site personnel might complete the tasks by themselves.

Certain aspects of agency missions or agency programs were felt by some to be in direct contrast to energy conservation goals. For example, certain hospitals have medical staff who feel that certain patient care actions must be taken. Individual patient transportation, high heating requirements, air-conditioning requirements, and so forth must be maintained regardless of energy conservation programs. Administrators of these facilities are continually overruled by medical people who refuse to explore alternatives. At some sites this attitude changed when the site visit team showed that the two were compatible. In fact, the site visit team argued that energy conservation was fundamental to facility operations because continued high rates of use would result in depletion of energy supplies which would in turn mean a complete shutdown.

A concern expressed by many of the installations visited was that they are not currently exchanging energy conservation ideas and techniques on a local or regional basis. It is felt that many conservation problems are

common to a number of sites and might be publicized in a centrally prepared energy clearinghouse document. The National Aeronautics and Space Administration has already implemented an internal energy cross-feed program circulating various conservation techniques through a system of short "Energy Briefs."

It was observed that in a number of cases, the site visits themselves actually helped to stimulate better interagency communication at the local and regional level. It was widely recommended that this trend be encouraged through additional visits, seminars, workshops, and other forums. It was suggested that quarterly or semiannual meetings of energy coordinators within each Federal region might be held. Installations with successful energy conservation programs might be used as models for other sites with similar missions or facilities.

Another idea that was proposed would involve the establishment of Federal Energy Conservation Councils. These Councils would meet on a regular basis working closely with FEA and GSA personnel to encourage interagency coordination of conservation efforts at the regional level. Ideally, the Councils would tie in directly to the conservation efforts of the Federal Executive Boards, Federal Executive Associations, and Federal Regional Councils.

The site visit teams continually experienced the questioning of current building codes and the various statutes and laws in the construction of facilities. There are variances between the States and locales in terms of standards, such as the number of cubic feet per minute per person required in a building. Such factors as these can greatly impact the energy consumed in various building designs. An example of this was cited in the building codes between two States, wherein if the building code of one were elected over the other, an energy cost savings of $40,000 per year could have been achieved in taking the less stringent code.

The use of buildings for purposes other than the original design intention is a problem when considering energy reduction. For instance, warehouses constructed expressly for the purpose of storage and/or material-processing are being used for office space, for laboratory space, and general administrative functions. This type of operation has resulted in the requirement for excessive uses of energy because of unused volume, high ceilings, lights, and poorly insulated walls and ceilings.

In future facility design, it would be desirable to locate facilities for the disposal and recycling of paper, trash, waste fuels, and other solid-waste products near a Government site. Systems which burn these waste products, utilize the heat for steam generation or power generation, and

then recover the waste product (such as metals) would be most economical. Such systems could be worked in conjunction with the general locality or adjacent residential areas.

Now turning to retrofitting, there are numerous retrofit projects that can be cited to show the effect on energy consumption. For instance, one facility has recently completed a project to repair and replace numerous sections of defective steam lines and condensate pumps. This project cost approximately $50,000, but it saved 980,000 gallons of water per month, plus the energy required to heat the water and kilowatt hours required to pump it. Clearly, many energy conservation retrofit projects have a high return on investment both in terms of energy and dollars.

One possible general method of retrofitting and building design has been formulated by GSA. The GSA has "energy efficient specialization" in its Federal buildings, with many areas being converted into open-bay space under its office excellence program. Building managers have reported that this allows for more consistent temperatures and makes it easier to achieve the required lighting levels of FMC 74-1.

A widely found retrofit project concerned ceiling levels. Many of the Federal facilities contained high ceilings ranging from 10 feet to 16 feet in height. This type of room has created problems in lighting and heating. A close look at such facilities and their continued usage or modification

should be given careful consideration. Federal facilities are heating thousands of cubic feet of unused volume and providing higher energy-consuming lighting from excessively high light fixtures.

Even simple retrofits are beneficial. For instance, in one building, heat generated by operating equipment was previously ducted to the outside. A simple modification to the ducting rerouted this heat to the ventilation system and was used to heat the building. Numerous facilities have not yet seriously tried to utilize waste heat for space heating that can be accomplished at a minimal cost.

Many installations have the capability to expand their steam plant for the production of electric power to meet part or all of their needs. Consideration should be given to providing this capability where justified for economic and/or security reasons in the event of fuel or power cutbacks. This is another, low-cost retrofit project with substantial potential savings.

Some Government facilities have converted from the use of coal to natural gas over the past 20 years. These efforts were done to reduce pollution and provide more efficient, economical systems. A few Federal facilities visited still have the capability of possibly converting back to coal-burning energy products. Since these facilities have large central heating plants that service a complex of buildings and have high pressure plants, they

should be seriously considered for conversion to coal firing. These plants are more amenable to the installation of air pollution control devices than would be the heating plants in individual office buildings. Any studies for such possibilities should now be weighted not only in terms of coal conversion but perhaps in light of the possibility of using solar heating of facilities as well.

Based on numerous site visits, there seems to be a need for a separate monitoring system at each building on an installation. Energy inefficient operations and buildings cannot be identified when a multibuilding activity has only one meter recording energy use.

As a possible answer to the monitoring problem, the latest advances in electronic application have made centralized analysis and control of facilities a most desirable, economical, and effective management method. Current state-of-the-art equipment can provide monitoring and control of all system functions in a building, a building complex, or at remote separate facilities. Utilization of centralized control equipment to minimize energy consumption is an effective approach which should be considered for buildings and facilities.

Within several facilities, climate systems have been installed to maintain adequate comfort conditions and some of these do not have adequate standard operating procedures. For instance, in some situations, both

heating and air-conditioning systems are being used simultaneously in the same area and in some cases, both used continually throughout the whole year. The energy teams themselves experienced certain areas where heating units along the walls were operating simultaneously with air-conditioning units installed in the ceilings. Also, many Federal buildings have had their lighting and heating systems connnected in such a manner that they cannot be zoned for segregated operations. In some cases, this may mean that entire floors are lighted and air-conditioned whereas only one portion of that floor is actually in use. However, the installation of package units for air-conditioning and heating within large buildings has substantially reduced the cost and power consumption for buildings which were not zoned for local heating and lighting.

There arose some concern about thermostat controls. Some of the older buildings using steam heat have one thermostat outside the building (weatherstat) located on the north side and set to stop the heat to the building when the temperature goes above 55 F. Such controls are very undesirable in terms of balanced heating and represent considerable contention among the personnel occupying the facilities. However, these thermostats do act as positive controls for excessive heat usage. Another finding regarding thermostats was that several facilities have installed thermostatically-controlled radiator valves on radiators that are presently manually controlled.

One concern of many site personnel regarding automatic controls was with equipment shutdown. In some facilities, steam boilers have been completely shutdown when not required. This has caused some leaks and some valve problems, but the overall energy savings far outweighed the extra maintenance costs.

Selected equipment can easily be shutdown during non-business hours. Two very simple but effective ideas could be implemented at many facilities regarding turning off equipment during offhours. All exhaust fans (i. e., toilet, kitchen) should be turned off at the end of the business day. Paper-copying machines often are run on a continuous basis. Timers should be installed to turn such equipment off after normal working hours. Also, at one site, sequence timers have been installed on machinery so that automatically controlled equipment cannot come on line all at once, an action which would cause an excessive peaking of the electrical load.

At several facilities, the lighting in some areas cannot be controlled due to a lack of switches. Switches should be installed so that the lights in any unused area can be turned off without extinquishing lights in adjacent working areas.

Problems can arise from automatic controls. For example, at one installation exterior lighting was reduced by 50 percent, but because

In the two years since the establishment of the Federal Energy Management Program (FEMP), a concerted effort has been made to reduce energy consumption in the Federal Government. Some of the goals of FEMP have been to issue guidelines for energy conservation to Federal agencies, to educate Government employees about the need for conservation, and to monitor and review energy-use patterns in Federal establishments.

FEMP's First Annual Report, released in December 1974, attested to the success of these efforts. A saving of 24 percent in anticipated energy consumption was realized in fiscal year 1974. Projections for FY 75, based on figures for the first 9 months of the fiscal year, indicate that the previous year's record will be sustained.

During April and May of 1975, 287 representative Federal installations throughout the Nation were visited to survey the scope and effectiveness of energy conservation activities. The Federal Executive Boards (FEB) have established energy conservation as a major objective during FY 75. The FEBs participated in and coordinated the site visits in furtherance of this objective. The visits were conducted by teams from the Federal Energy Administration, General Services Administration, and other agencies.

The enclosed report is based on the site visit program findings, problems, and conclusions. The report is envisioned as a resource for managers responsible for preparing energy conservation procedures and programs at installations comparable to those sites visited. Since the size of sites visited ranged from a small two-man office to large Air Force bases, national parks, and facilities having 50,000 persons, the application of this report to energy conservation managers is widespread.

Several noteworthy findings and conclusions from the site visit program are as follows:

- Energy conservation works best in sites that have strong and thorough energy management programs.
- Major energy reductions are a result of numerous individual decisions and actions.
- While significant results have been achieved, there is still a potential for further energy conservation.
- Further savings, in most instances, must be tied to a substantial investment program.

of safety concerns (including increased vandalism), all exterior lights were reactivated with the exception of outdoor decorative lighting.

As a solution to the lighting problem, the use of photo cells on exterior lighting is an effective method of reducing energy consumption. In a number of instances, night lighting has been left on throughout the full 24 hour period. A reduction of this lighting during the day not only decreases the use of energy, but also presents a better picture to the public.

In another facility the attempt to reduce lighting and heating consumption caused decreased effectiveness of the power factor. As a possible solution to power factor problems, capacitor banks have been installed at another site in the electrical power system to correct the power factor. The power factor has been corrected to 95 percent at peak load. Since the local power company bills for power factor were based on 85 percent (under is a charge, over is a credit) the installation of corrective capacitors was amortized in less than a year.

In general, a complete review of energy consumption within any given facility should be conducted and equipment time-phased such that peak power demands can be reduced. This produces a more economical cost savings in energy usage. Also, control of the use of electrical

equipment and lighting which is used only at certain times of the day could be improved through the installation of timers on the equipment. At several sites studies of the electrical distribution system are suggested to highlight the need to de-energy excess transformer capacitor to provide sub-metering to identify peakloads at various locations.

As a possible solution to the monitoring of peak loads, electrical energy is monitored with a dual metering system at one facility; one that monitors "essential" energy which is that supplied to electronic controls, computers, and radar, and another that services other non -essential" uses. The latter monitors those uses that conservation measures may be applied to.

In the future infrared equipment should be considered to precisely examine electrial distribution systems for excessive consumption of energy. Such equipment can detect heat losses in HVAC systems as well.

Most Federal sites have made an attempt to reduce energy consumption by consolidating cleaning and maintenance functions within normal daytime working hours. While this has created a problem in some areas by increasing the cost of maintenance contracts, or by conflicting with the day jobs of the current night staff, it does not appear to have had an adverse impact on other normal facility operations. There are, however, certain cleaning functions (i.e. waxing of floors) which, because of their special nature, must still be performed after working hours.

Many engineering and maintenance personnel have been actively checking and repairing leaking steamlines, water lines, dripping faucets, and other energy waste which could be effectively remedied within the limits of the facilities' budgets.

In a number of instances, teams observed outmoded, over capacity, or inefficient use of facilities and equipment. Often this is surplus military equipment obtained inexpensively by civilian agencies. These items range from oversized electric engines, pumps and transformers to overpowered or poorly maintained trucks and motor pool sedans. Careful examination of the maintenance and operation of outmoded equipment in terms of energy consumption would improve the energy savings of many facilities.

In virtually all installations visited, large numbers of nonessential fluorescent and incandescent lamps and bulbs have been removed. In the case of fluorescent lights, many installations, foreseeing possible future shifts or

relocation of employees, have left ballast connections intact. While it is recognized that even with the lights removed the ballast themselves can pull between six and eight watts of power, such energy costs must be balanced against the manpower costs of disconnecting and/or later reconnecting them. This decision is probably best made at the installation level.

In most facilities, initial employee grumbling over reduced lighting level was relatively short lived and eventually subsided without further problems. It was observed that a number of other factors including color and texture also affect the acceptability of the work environment. In a number of cases, lighting levels have been substantially reduced without serious complaint where an otherwise acceptable environment is held intact.

A lighting problem concerns building personnel who have removed the diffusers and reflectors from fluorescent lights in the mistaken belief that these deletions would increase the output of the fixtures. Actually the reverse happens. With the reflectors removed, roughly half the output of the lamps is directed upward where it winds up illuminating the ceiling. Because of the dirty condition of the ceilings and in the case of suspended ceilings with poor reflective capabilities, most of this light is absorbed. In order to obtain higher light levels on desk tops, reflector fluorescents should be used in place of the standard 40 watt, T-12 bulb. This will result in much less light being directed upward and approximately 20 percent

more light being directed on the desk top. Either reflector bulbs should be used wherever the reflectors have been removed or the reflectors should be washed and remounted on the fixtures.

Several facilities have experienced problems in implementing their reduced lighting programs due to the nature of the facility operations. In some hospitals, for example, security is an important factor to be considered. In a few areas where night lighting had been reduced, hospital staffs felt that it was inadequate to insure their safety. In addition, patient morale must be given top consideration. Moves which detract from a feeling of well-being cannot be undertaken.

Several areas of most facilities have continuous lighting requirements. For instance, elevator shafts have lights constantly burning which is about 8,760 hours per year. These are usually incandescent bulbs varying in size from 25 watts to 100 watts. One solution is to replace these bulbs by fluorescent adapters. The unit to be used is the 22 watt adapter which uses 25 watts including ballast. The power savings accrued by using these devices will more than pay for the cost of the fixture within 1 year, not counting reduced lamp replacement labor and material costs.

Conventional "EXIT" signs are utilized throughout most installations and in some instances red lights are employed to indicate exits. One recommendation from several sites indicated that self-energized, tritium-powered exit signs be used to replace the existing ones.

Areas such as custodial rooms, equipment rooms, etc., which should be occupied infrequently, and then only for short periods of time, were fully lighted though empty at many sites. Timers should be installed in these locations and set for 5-10 minutes to insure that the lights do not burn needlessly.

Water heaters are large energy users. In addition to reducing temperatures in heaters, it is suggested that several heaters be taken out of use to reduce the supply of hot water. A reevaluation of standard practices using hot water should be considered in areas such as bathroom facilities.

Several facilities have installed separate hot water heaters for high temperature operations to reduce the usage of high hot water temperatures throughout the facility.

Another means of conservation on domestic hot water boilers is to equip them with a low-and high-fire rate capability. This can reduce fuel consumption by up to 50 percent during mild weather when operated on the low-fire rate.

To reduce energy consumption in water-heating units, it is suggested where possible that all water tanks on Federal facilities be drained at least one time per year. This reduces the amount of material buildup in the tank and increases the efficiency of the units.

A steam plant operator at one facility indicated that as the outside temperature increases, the steam consumption also tends to increase because of widespread opening of windows to cool the rooms. The only solutions to this problem are to educate facility personnel in energy conservation, provide sealed windows for the facility, or better control space heating during transitional weather seasons.

To reduce heat loss in many buildings, additional insultation should be installed between the room and the ceiling. Estimates have shown at one site, for example, that the most economical way of insulating was to use the "blown insulation" method. Using this system the cost for the site's 10,000 square feet would be about $970.00 and the agency would easily recapture its investment in one heating season based on the accrued energy savings.

Several Federal facilities with older heating and cooling systems were found to have energy transfer lines without insulation or with inadequate insulation. Many steam and hot water processing systems and their associated operations are without proper standard operating procedures. Greater effort should be made to use heat recovery systems if found to be economically feasible. It is suggested that where possible, facilities should install condensate return lines so that the steam condensate is returned to the power plant and not wasted.

Energy conservation surveying is a continuous part of the building maintenance program at one installation. In the area of conservation, a mechanical survey of the building and equipment was conducted to determine energy-efficient operating procedures. The most significant result of this survey was the decision to abandon the use of "semi-automatic" heating controls and to control heating manually to permit more accurate adjustment of heating levels throughout the building. The manual control system has also been used to minimize the introduction of outside air into the system. Generally however, manual control should be discouraged in most systems due to possible misuse.

Ventilation standards require approximately 15 cubic feet per minute per person. Maintenance personnel in many sites do not turn on the ventilators for complete days. For example, by not circulating air inside the building, the temperatures in the core areas will rise to high levels. The ventilators should be employed so that air is circulated from the perimeter to the core which, when augmented by a moderate fresh air intake of approximately 10 percent, should cure many stagnation problems and lower the core temperatures.

In areas of low humidity and cool night air, increased consideration should be given to the use of night air for ventilation and cooling of buildings. Buildings could be overcooled at night in the summertime and this residual coolness used during the day, thus lessening the demand on the air-conditioning systems.

Certain functional areas require the total use of outside air. This is generally required because of safety reasons. Such conditions require a high concentration of thermal conditioning to the air from the outside. Where this is prevalent, methods should be considered for preheating the air from the waste heat of equipment or other facilities.

Based on site visit observations, it is suggested to always start air-conditioning systems at the lowest loads possible and gradually increase to the required setting in order to reduce electrical demand usage. Also a warmup cycle on HVAC systems should be installed to stop any intake air from entering the building during the first half hour of operation and prior to building occupancy.

Another suggestion for air-conditioning is an automatic temperature control system that would provide more economical heating and cooling, using as much free heating and cooling from outside air and return air as is practical. Hot decks could be used for the coldest rooms and cold decks for the warmest rooms.

Other ideas from site visits concerning air-conditioning operations are as follows. In buildings which require air-conditioning for special occupants for hours other than normal duty hours, a feasibility study should be done to determine if separate air-conditioning systems are justified: the use of two-speed fans on air handling equipment is an

excellent way to conserve energy and should be considered for many applications; the addition of solar film or other type heat-load reducing material should be considered as modification projects in high use air-conditioned areas; in air-conditioned space having skylights and for which there are no special requirements, the skylights should be covered and insulated.

Several general maintenance and operations problems arise out of the confusion of landlords and tenants in multi-tenant sites. Some agencies in multiple-tenant buildings conveyed the attitude that energy conservation was a concern of GSA and that it did not affect them. More interaction is needed among Federal agencies abour energy conservation, and conservation must be given a higher priority by agency headquarters in order to insure the implementation of effective programs. For instance, many installations suggest that in multi-tenant sites the individual agencies should be responsible for energy costs, not GSA.

It is suggested that GSA should increase its efforts to enlist tenant cooperation, and tenant agency headquarters should insist that lessees support the conservation effort. GSA might wish to enlist tenant participation in the conservation effort by encouraging and rewarding suggestions, forming committees that develop and agree upon conservation procedures, or asking tenants to participate in an

We wish to express our deep appreciation to the hundreds of Federal personnel who participated in this program. Both those who participated on the site visit teams and those at the installations visited generally felt the experience was profitable and would be of value to them and their organization as we continue to work toward greater efficiency.

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Assistant Administrator	Deputy Administrator	Deputy Associate Administrator
Federal Energy Administration	General Services Administration	Office of Management and Budget

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energy monitoring program on a regular basis. Tenant parent agencies should be encouraged to issue conservation directives for lessee offices and to require that lessees report their compliance efforts. Joint GSA-parent agency issuances and reporting procedures might be helpful.

One sultion to multi-tenant building energy waste has been attempted at several military sites. At one base, major saving in the family housing area have been accomplished by providing a monetary incentive to enlisted personnel. Any energy saving made in housing complexes are passed on to occupants by a reduction in rental charge. This policy has accounted for large reductions in fuel, oil, and electrical usage despite a colder winter situation.

At the LBJ Space Center, Houston, Texas, several individuals have used the theory of general energy balance and applied those criteria in an engineering analysis and investigation of equipment or processes for which they are responsible. Also, maximum benefit is being made of a Utility Control System which monitors utilities, alarms abnormal conditions, remotely controls equipment, and logs data and actions. It is significant that excessive power demand is a functional action within the system.

The Department of Commerce Building in Washington, D.C., has a monitor console in place that gives instant temperature readings at the fan outlets. The temperature is monitored and logged several times a day. Plans are in to computerize this operation. The building is being used as a demonstration project for installation of mylar reflective film. Additional windows will be added to provide more significant testing. Two 50-ton chillers are being installed for use by the computer facility in order to not have to operate the main 1,000-ton chiller just for the computer facility.

At the Veterans Administration Hospital in Lake City, Florida, the system is computerized on a large Univac computer. This provides management with monthly energy consumption data. The system provides for a retrieval system which allows management to pull any one of the 128 variables shown on the data form and compare it with all the other (141) VA hospitals. These

criteria will provide Washington management with a tool to detect inefficient practices by hospitals and initiate timely action to correct the deficiencies before large quantities of energy are wasted. It would be worthwhile to point out that the baseline data are established using "BTU per square foot per degree day," which affords measurement of hospitals performance regardless of location and comparison against any hospital regardless of location.

At the Puget Sound Naval Shipyard a computer was installed to manage industrial waste. Excess computer capacity was employed to automatically control and monitor space heating, lighting, and process steam. This reduced energy use and manpower required for control procedures and was directed to other functions.

A considerable expenditure for a single item of capital equipment is being spent at the Rocky Mountain Laboratory in Hamilton, Montana. A new incinerator system is being installed which requires a significantly lower energy consumption for effectively destroying hazardous waste materials. This unit is the first of its kind and consumes approximately one-eighth of the energy consumption of conventional incinerators performing similar functions while meeting all EPA (spell out) standards. No actual figures are available, however, since this unit is still in the construction stage. The cost savings in operation will far exceed the initial large investment.

One unique idea from Fitzsimmons General Hospital, Denver, Colorado, is the recycling of sewage effluent for the use of irrigation of the grass areas surrounding the facility. The water from this source is used from June through October of each year, thus ~~saving~~ the cost of utilizing fresh city water for irrigation, CAN be SAVED.

At Mather AFB, Sacramento, California, the no-heating, no-cooling period is planned to be extended from 4 to 6 weeks in Spring and Fall of this year.

At one site, action taken was the installation of "dummy" thermostats were installed. ~~thermostats in certain areas~~. The affect was strictly psychological. People felt that they were controlling the environment by setting the temperature, while actually the temperature was controlled by central equipment.

One energy savings practice used in most Federal buildings is shutting off the heating, ventilating and airconditioning systems after 5:30 p.m. and returning them to operation early in the morning. This can be easily accomplished except in extreme cold weather ~~through much of the region~~. The residual heat (or cold) in the building is retained, and while some areas of the building may drop 10°- 20°F, it does not take as much energy to condition the temperature in the mornings.

At Fitzsimmons Army Medical Center the highest cooling setting on the airconditioning controls has been eliminated on all window units, AN ACTION making it impossible to turn the controls to the highest setting.

The Federal Building in Ogden, Utah, has incorporated a number of modifications to its HVAC systems. For example, the perimeter heating system has been rescheduled and balanced. By implementing this change and utilizing zone heating to pick up the load, the requirements for heating the outside air in winter have been reduced by 20°F. This change, in conjunction with reduced air flow and reduced power consumption for the fans, has produced a significant savings in the energy consumed. Fan speeds have been reduced from 700 - 800 rpm down to 600 - 700 rpm and are still meeting the required circulation through the building.

The VA (spell out) hospital in Salt Lake City has repiped the intermediate steam used in their laundry from the flash tank directly to the main condensate tank in the basement of the building, a change which raises the condensate water temperature from 150°F to 185°F. This eliminates venting the steam to the atmosphere, and results in an energy savings in reheating return steam.

At the Denver Federal Building, excess heat accumulated in the ceiling of the boiler room. This heat is now being put to efficient use by venting the heat through additional ductwork up into the entrance hall where a high heat loss exists. This modification reduced overall heat consumption and utilized heat which would otherwise have gone to waste.

Computer facility air conditioning equipment has been adapted to accept 100 percent fresh air when the outside temperature

is 45° or less. This change eliminates the cooling of recirculated air at the Defense Depot in Ogden, Utah.

In some buildings, vestibules are being added to various high traffic entrances to reduce heating and cooling losses.

Air blower fans are being ~~deleted~~ removed from computer consoles, and the units are being placed over air plenums in the floor at the FAA (spell out) in Denver Center in Longmont, Colorado.

One 5-ton unit and ~~2~~ two window air-conditioners were installed in the headquarters building at Hickam Air Force Base in Honolulu, to allow shut down of a 400-ton chiller during off duty hours.

A suggestion was made that Defense Personnel Support Center in Philadelphia to explore the possible use of a heat wheel in the cloth sponging process. The nature of this process results in vast amounts of extremely warm, contaminated air being discharged and replaced with outside air which requires heating. A heat wheel would transfer the heat contained in the contaminated air to the fresh intake air AND would thereby greatly reduce the air heat requirement.

Elimination of a 20-ton multizone heating unit has been accomplished at the Forest Service Area Office, Ogden, Utah, by redirecting the building exhaust air into the underground garage; now the garage is heated ~~thus heating the garage~~ at no additional energy cost.

Wood-burning heating stoves are being installed at Big Bend National Park, Texas, in all housing units and are being widely used since firewood is easily obtainable in the Park.

At the Public Health Service, Indian Health Service Hospital, Albuquerque, New Mexico, turbulators are being used in the main firetube boilers to increase thermal efficiency. Substantial savings in gas consumption have been recorded.

At the EROS Center in Sioux Falls, South Dakota, the requirements for humidity control were ~~deleted~~ removed from non-critical areas and reduced when possible in others. An analysis should be made of facilities requiring stringent humidity controls, and those areas which are deemed non-critical should be isolated from other critical areas.

During the winter, window air conditioners should be wrapped in plastic sheeting to prevent outside air from infiltrating through the intake vents. These vents normally to not shut down tight.

The Terminal Annex of the Main Post Office in Denver is being used in a pilot program in the Western Region for an energy conservation test. A control system has been placed on the HVAC system, such that the system shuts down for 5 minutes out of every 15 minutes of operation.

GSA has recently completed a study of the Federal Office Building in Seattle, Washington, comparing the heating and lighting efforts of a new 34-watt fluorescent tube to a standard 40-watt tube. Energy consumption and resulting ballast temperature variances were closely monitored.

Comparison studies of steam versus lighting for space heating are also being conducted. Test results indicate a 13 percent saving in electric energy when replacing 40 watt tubes with 34-watt.

One DOD facility has instituted the use of lighting charts in the entranceways of each building. A person is assigned as energy conservation monitor for each facility to be sure that the lights are ~~appropriately~~ turned off. The chart acts as a constant reminder to save energy.

A reflectorized substance has been placed on the hangar floor at Andrews AFB, Camp Springs, Maryland, to increase lighting intensity without additional wattage.

Building management personnel are replacing incandescent bulbs with self-ballasted mercury vapor bulbs, in corridors, loading docks, and open work areas. A mercury vapor lamp with auxiliary equipment designed to produce proper voltages will yield approximately twice the lumens for the same wattage as an incandescent lamp but a self-ballasted mercury vapor lamp similar to that used in the GPO relamping program yields slightly fewer lumens for the same wattage of the incandescent lamp it is replacing. Conversions should be made with higher output lamps than self-ballasted mercury lamps. One possibility to be explored is the use of a fluorescent adapter lamp. This lamp can be screwed into existing incandescent sockets, and rewiring expenses are eliminated. The lumen output of this lamp is roughly 2 1/2 times that of an

incandescent bulb, and it has a useful life of approximately 15 times than of an incandescent bulb roughly equal to that of a mercury vapor lamp.

A computerized central control system is being planned for Fort Ord, Salinas, California, to operate large equipment during non-peak power periods where possible; for example, well pumps would not refill storage tanks during peak power periods.

The Main Post Office Building in Baltimore, Maryland, is installing a power demand controller to reduce peak demand charges by shutting down (through a pre-selected sequence) less critical usages when overall power demand rises temporarily.

The Federal Youth Center in Denver improved the efficiency of the heating system by installing a new de-aerator feedwater heater. This raised the preheat feedwater from 208°F to 220°F before water entered the boiler. While this is already done in most modern systems, because of the large number of older facilities in use this may be one method of improving efficiencies of older systems. The anticipated gain in efficiency from this change was 5 percent.

~~It is recommended that~~ Facilities should install timed setbacks in steam and hot-water valves to close them at pre-set times. At one site this technique is estimated to save 10 percent on fuel oil use.

Unplugging water coolers during the winter months saves in energy consumption in the water unit, while the cool water in the water pipes will provide adequate cool water.

The EROS Center in Sioux Falls, South Dakota is an example of proper energy design for buildings. This building was one of the best designed buildings for energy conservation found among all ~~20~~ the sites visited, because it ~~This facility~~ was designed specifically with energy conservation in mind. There are no windows on the north and west sides; all windows are double-pane and tinted, ~~with~~ closable window shades are ~~placed~~ between the two thicknesses of window panes. It is a total electric facility designed to utilize the local hydroelectric power available to provide the bulk of the energy consumed. The boilers for steam, which are used in the processing equipment, use heating oil, ~~for energy consumption~~. A study is underway to convert this to an electric system.

The main structure of the FAA facility in Longmont, Colorado, incorporated ~~the use of~~ sun louvers on the west side of the building. These louvers automatically open or close to provide protection from the sun during the cooling season and open to allow the sun to enter the building through the windows during the heating season. They can also be adjusted as necessary to provide the most beneficial energy savings. These louvers also afford considerable protection to the glass areas of the building during periods of high winds, ~~velocities.~~ A similar system is part of the Six Route Traffic Control Center in Fort Worth, Texas.

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Motor Vehicle Mgmt.

Motor Vehicle Management

To date, the Motor Vehicle Mangement program has produced a sizable reduction in both mileage and gasoline consumption. Ninety-four percent of the installations using motor vehicles for official business reported implementation of a local mileage reduction program. While the overall Federal goal of 15 percent reduction in vehicle miles traveled is being met, it is questionable whether significant additional savings can be anticipated under the current program without seriously jeopardizing the effectiveness of some agency programs. Some additional fuel savings will be achieved as older vehicles are replaced with newer models capable of greater fuel economy.

Some of the strategies adopted by individual facilities to reduce mileage and gasoline consumption include:

1. Allocation of gasoline through the use of credit cards assigned to individual operating divisions. Consumption levels are checked on a monthly basis and corrective action taken where justified.

2. The use of internal rationing coupons to control gasoline allocation at onsite pumps.

3. A requirement for formal approval by supervisors of any motor vehicle trip of more than 25 miles.

4. Daily monitoring of mileage logs to insure that mileage allocations are not exceeded, as well as to check for nonofficial use of vehicles.

Experience at several installations has shown that a well-designed data processing and reporting system can contribute significantly to motor vehicle-related conservation efforts. For example, the timely review of gas mileage for individual vehicles through the use of a monthly computer listing may facilitate early identification of vehicles requiring tuneups as well as isolate any improper gasoline usage practices. In developing such a system care must be taken that all input procedures and output documents are coordinated with operating personnel so as to insure the generation of information useful to management.

In many instances, installation motor pool fleets contained large over-powered vehicles recording very poor gasoline mileage. There are few instances in which large V-8 engines or various power equipment packages are required for routine Federal usage. A hard look should be directed at previously accepted procurement standards and an effort made to eliminate larger, less efficient vehicles in favor of others more specifically suited to Federal needs.

The Postal Service has been testing the use of electrically powered vehicles in its mail delivery operations. Small electric carts are used in conjunction with conventional vehicles to service postal routes. As electricity may be

generated by other more abundant energy sources (i.e., coal, hydropower and nuclear based systems), more widespread use of such vehicles would reduce the consumption of gasoline. There appeared to be many operations at the sites which would lend themselves to the use of electric vehicles. This area needs further investigation by the Federal Government.

Serious consideration should be given to reducing the current Federal motor vehicle replacement standard of 6 years or 60,000 miles.

Other ideas for better motor vehicle management which have been implemented include:

- A traffic study analysis at one facility showed where the use of motor vehicles and idling time could be significantly reduced. As a result, there was a redirection of the traffic light system.

- A radio link was established between two facilities 60 miles apart, enabling facilities to communicate through audio-video equipment; eliminating the need for transportation between the facilities.

- The increased use of buses in place of combat vehicles to return troops from maneuvers is an effective energy conserving practice. The old aspect of walking is also being employed very effectively.

- Counter to eliminating all extra power equipment, one agency stated that all of their vehicles have automatic transmissions and have not had standard transmissions for over 10 years. It was pointed out that a number of drivers cannot efficiently operate standard transmissions, and as a result of improper handling, the agency had encountered high costs of repairs in the past.

Finally one of the most important aspects of management is training. While many of the facilities had available driver's training courses in energy savings, it was apparent that other facilities did not. There is a need for energy conservation driving training courses for all licensed Government personnel. Individuals who have been driving for years need an update to review the best ways to conserve energy when driving a vehicle.

SPECIFIC EXAMPLES

1. To conserve motor gas at Andrews AFB, MD, flight line personnel are using three-wheel bicycles for transportation and hauling of light supplies from the hangars to parked aircraft, rather than jeeps and pickup trucks.

2. One direct approach currently being used by the military is to allocate a limited number of gallons of fuel for a specific period of time, whereupon missions and training are planned around fuel availability. While in some areas it may represent a detriment to certain planning functions, it is an extremely effective method for conserving fuel. It was also noted that in the event of future military activities, fuel supplies will play a very significant role, and that by training based upon limited amounts of fuel now, it is in effect a true preparation for probable actual conditions.

3. The Postal Service has instituted a program to take maintenance to the vehicle, thus, eliminating the need to bring the vehicles into a single maintenance facility in the district for service. This has been accomplished through greatly expanded usage of commercial facilities. The Postal Service employs the following measures:

- o A mobile fueler is used to refuel vehicles at all stations located throughout the city. This precludes individual vehicles having to be refueled at one central point.

- o A mobile repair shop is used to perform scheduled maintenance and minor repair on all vehicles at outlying stations.

- o All vehicles are washed at their duty station by a contractor with mobile equipment to eliminate shuttling vehicles back and forth to the main garage for washing.

- o Within the Postal Service preventive maintenance cycles have been changed from 4 to 24 weeks for one ton and under vehicles. Thus, engines are tuned twice each year and approximately eight oil changes per vehicle are eliminated annually.

4. A practice at the Los Alamos Scientific Lab motor equipment repair shop is the use of chemical analysis on motor oil to determine the need for change in lieu of operating time or miles driven. This practice has saved many gallons of oil because in some cases oil is not changed for 6 to 12 months.

5. At McChord Air Force Base, WA, all 480 base vehicles use multiple viscosity oil which can be reclaimed. The base has established a procedure of recycling this oil and has reclaimed an average of 7,000 gallons per year. Waste motor oil is also being used as a dust control agent in road maintenance at Big Bend National Park in Texas.

6. The Main Post Office in Newark, NJ, has a sizable fleet of vehicles which they service themselves. They presently pay a vendor to cart away the used engine oil. Many oil companies, the State of Hawaii, and paper and pulp mills reuse this engine oil for space heating. The drained engine oil is passed over a screen to remove filings and allowed to stay 24 hours, after which the moisture is drained from the bottom of the tank. It can then be used for heating, without any adjustment to the furnace, in quantities up to 25 percent for No. 6 oil furnaces and up to 5 percent for No. 2 oil furnaces.

7. At the Public Health Service Administration and the Main Post Office, Portland, OR, a chart is made by the vehicle management officer which reflects the cost and time purchased of gasoline and oil for each of the 39 locations. If a significant difference exists among other offices and cities with comparable routes, the operation of both is reviewed.

8. To "get a hand" on the number of miles traveled, who does the traveling, the number and types of vehicle necessary, and the maintenance required, a comprehensive and responsive computer generated reports system is utilized at Peterson Field, CO. Through this system and the efforts of the Transportation Squadron's Reports and Analysis Section, transportation and management personnel have been able to isolate areas with potential for fuel conservation, make necessary operational changes, and measure results. For example, data available for the computer on base employee work schedules, residence locations, and work locations

- The increased use of two-way radios has improved the efficiency of singular vehicles for full utilization.

- The conversion of gas-operated heaters to air heat for eight transporters.

- The remodeling of transporter beds so that they will fit a two-ton truck cab and chassis; thus, they can haul more of a load with less fuel consumption.

- The establishment of more dispatch locations so that vehicles do not have to return to carpools for overnight storage.

11. At the New Executive Office Building in Washington, DC, a policy to walk to near destinations was established. Destinations under 20 minutes required that OMB personnel walk. Official travel was reduced by 32 percent.

12. Vehicles at the Stanford Linear Accelerator Lab in Palo Alto, CA, operate on fuel blended with 10 percent Methanol (wood alcohol). The advantage of using Methanol is that it can be produced from any organic materials such as wood, coal, oil shale, natural gas, and even garbage.

13. The Rocky Mountain Laboratory has reduced its lunch periods from 1 hour to 1/2 hour to encourage the use of sack lunches and discourage the use of vehicular travel to go to offsite restaurants and cafeterias.

were provided to personnel working on carpooling and better city bus service. Timely reports and analyses were provided to vehicle operations on shuttle bus operations, detailing dispatch and taxi service, vehicle utilization, and fuel consumption by vehicle and operational unit. This resulted in express shuttle bus runs initiated, elimination of some runs, and utilization of 12 passenger vans or limousines at slow periods and coaches at peak periods.

9. When a route is set up by the Post Service in Miami, a card is made for that route with the number of miles that should be driven for that route. If the mileage varies from that average, it is followed up to see if the vehicle is being used for private use, a mechanical problem exists, or whatever the case may be. Street surveys are made by an internal inspection department to verify that the delivery man is following all rules, such as: turning the engine off when leaving the jeep, and following the park and loop system rather than driving to each delivery.

10. The following effective measures have been implemented at the Defense Supply Depot, Ogden, UT:

- Storage of all large trucks. These have been placed in normally heated buildings so they no longer require warmup time.

FEDERAL ENERGY MANAGEMENT PROGRAM
ENERGY CONSERVATION SITE VISIT REPORT

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14. The Entomology Resident Station at Gainesville, FL, has replaced several pickup trucks with golf carts. This practice has been widely accepted by the personnel and is believed to be a more effective means of transporting people between facilities than the pickups. It is believed that this practice will save large quantities of energy as well as dollars.

15. Pudget Sound Naval Shipyard, and the City of Bremerton, WA, have joined in a cooperative effort to conserve energy and reduce the cost of bus transportation to and from the facility. City buses are turned over to the shipyard during off-peak hours and are operated by shipyard personnel on regular routes to the facility from civilian and military housing areas. Management reports this has reduced costs to both the shipyard, its employees, and the city, and has reduced the use of private autos and the need for onsite parking.

15. Fort Benning, GA, constructed a centrally located refuse transfer point which reduces the number of trips by 30 percent to a land fill for disposal of refuse. This provides an estimated reduction of 1,500 to 2,000 miles per day, and is accomplished by dumping refuse into a 75 cubic yard compaction trailer which in turn travels to the landfill only two to three times.

Attempts to increase carpooling have not met with favorable results in most Federal facilities. Unlike regulation of building heating and lighting levels, employee carpooling is not easily subject to direct management control. Pointing out that carpooling is by nature a voluntary arrangement, a number of facility managers expressed frustration at their inability to motivate employee interest in this area.

In general, the use of privileged parking spaces for the purpose of encouraging carpools, particularly at those sites with extensive parking facilities, has not been successful. During the oil embargo, it was noted that carpooling became almost a necessity. However, as gasoline supplies began to ease during 1974 and 1975, carpooling tended to wane.

A commonly mentioned disincentive to carpooling involved variations in employee hours at many installations, particularly for those which required 24-hour operations.

One observation in regard to carpooling made in most DoD facilities was the problem of continual turnover of personnel. One base indicated that with a military population of some 50,000 troops, the turnover rate was 12 percent to 16 percent per month. This type of situation does not lend itself to routine dependable carpooling situations or centralized carpooling systems.

Serious consideration should be given to allow personnel to change operating shifts or starting times to coincide with the same shift hours of those personnel who live in close proximity to each other and wish to carpool.

Some possibilities for decreasing the number of single-passenger automobiles have been suggested.

1. An encouraging method for increased use of carpooling techniques is illustrated wherein Federal personnel are encouraged to carpool with industrial personnel located in adjacent facilities, where common residential locations are available to them. This requires direct coordination between Federal and industrial sites in working out the appropriate personnel location data.

2. To encourage carpooling, one suggestion was to adopt vanpooling, which has been used with some success--by private industry. Groups of employees have jointly leased a van with one employee acting as driver. Another suggestion involved overnight use of existing Federal shuttle and motor pool vehicles. However, specific legislative authority would be required for the nonofficial use of Government-owned vehicles.

3. It was suggested that if the price of gasoline continues to rise, military and other Federal installations, located at a distance from residential areas, should consider the feasibility of contract bus services.

In an attempt to provide alternatives to carpooling, a number of facilities indicated they have tried to work with local officials to provide mass transit services to their installations. In addition, many of these facilities maintain centrally located information boards of available public transportation schedules. Unfortunately, where local areas have provided mass transit, it has generally benn underutilized by Federal personnel.

Specific Examples

Lowry Air Force Base, Denver, Co, has initiated a computerized carpooling system which requires all personnel to fill out carpooling data when entering the facility. Computer printouts are available for a constant review and every effort is made to facilitate individuals wishing to participate in the carpooling program. To date, approximately 20 percent of the commuting population has participated. However, approximately 50 percent of the total base personnel are non-commuting. Upon transfer to other facilities, personnel data are removed from the computers.

The NORAD facilities in the Cheyenne Mountains , located 16 miles from town, have implemented an effective carpooling program. The site has 75 parking spaces available, and during the three shifts there are 225 carpools for approximateiy 300 personnel.

The Salt Lake City area has encouraged the use of rapid transit through an increase of 1/4 percent in the tax structure, with the taxes being used to subsidize the bus service. Fares are now set at 15 cents for points anywhere within the city. In fact, the public can ride from as far away as Ogden to Salt Lake City at the same low rate of 15 cents, a distance of about 35 miles. Such subsidies are encouraging the increased use of mass transit systems.

The National Bureau of Standards in Boulder and the FAA Center in Longmont, CO, have worked closely with the city to promote the expansion of bicycle paths entering from various directions into the Federal site.

The classified section of the Base newspaper of Fort Knox, KY, provides free space for those interested in carpooling, either as drivers, passengers, or those interested in sharing driving responsibility. On a recent survey at the front gate, approximately 50 percent of the cars entering contained two or more passengers.

Education & Motivation

Employees have not yet developed a genuine commitment relative to their responsibility for energy conservation. Energy conservation will require a significant long-term commitment by Federal personnel at all levels, particularly on the part of management. Often the survey teams found weak conservation programs at sites where the director or conservation coordinator did not have an understanding of the real reasons why conservation is important. Apparently some feel that conservation is necessary only to protect against future potential shortages similar to that experienced during the 1973 oil embargo. They appear to assume that technological advances will soon cure the need to conserve as solar, geothermal, and nuclear sources are developed.

The most effective energy conservation program did exist where people from all levels were given the opportunity to contribute to the energy conservation program. A variety of programs have been initiated by the facilities visited.

1. One facility maintains a 45-member speaker's bureau which is available to schools, service clubs, and other organizations. The bureau works with State and local service organizations to assist them in developing their own conservation programs. This group has helped organize teacher workshops on energy conservation; sponsored energy management conferences with managers from utility companies; cosponsored a symposium on Energy Conservation Techniques in the Design of Buildings; and conducted several

one-day seminars with utility customers. A film "Energy Management" has been produced and is available on loan to any interested group.

2. Another facility has developed a "Conservation Kit" which is issued to department heads. The kit includes a copy of the facility's conservation plan, example speeches for the use of supervisors in promoting and implementing conservation practice, posters, and stickers for light switches, elevators, and machinery controls.

3. At one site, energy conservation is a frequent topic during a 5-minute radio program aired three times a month.

4. One site encouraged the conservation of energy in motor vehicles through the media of motor vehicle competition. The goal was to achieve vehicle care, improved appearance, and mechanical efficiency. The competition was serious and the scoring tough. Quarterly, a trophy was awarded to the unit which had achieved the best overall vehicle usage.

5. GSA building management annually encourages and reminds each tenant to conserve energy in an official letter. Many unsolicited conservation suggestions have been voluntarily submitted to the building manager by tenants because of this annual letter.

6. Some sites have energy conservation suggestion months and special energy conservation documentation and publications. Ideas

Chapter V: Education and Motivation

Findings and Conclusions
Specific Examples

Chapter VI: Aircraft, Ships and Tactical Equipment

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Appendix A-1 - Survey Methodology
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and suggestions for these publications are solicited from all levels of personnel within the facilities.

Education was observed to be a continuing problem in the conservation effort. Many well-meaning and skilled managers and technical experts have never before applied their skills to conservation and lack the specific knowledge necessary to do so. Few of the working level personnel in the various sites have attended seminars and/or various energy conservation meetings. Government training courses for conservation coordinators, buildings and facilities operations staff, engineers and architects with conservation responsibility, ship and aircraft operators may be valuable both in terms of information transfer and of stimulating employee enthusiasm and commitment.

It was suggested that a universal energy conservation methods manual be developed for distribution to all Federal agencies. The manual might be organized by functional area (i.e. lighting, HVAC systems, transportation, hospital, etc.). Conservation information or techniques developed subsequent to initial publication might be reported to a central location for issuance in continuing manual supplements.

In addition to the manual, there is a real need for a document which publicizes the energy equivalency or energy required to run certain pieces of equipment. As an example, one publication stated that a 100-watt light

bulb, burning for 10 hours, costs the equivalent of 1 pound of coal or 1 pint of fuel oil. Most statistics of this nature, relating to everyday appliances and pieces of equipment, let the average citizen know the energy cost for what he is using. This was requested by a number of facilities and would be highly beneficial information.

Most Government facilities have an effective mass communications means via their newsletters, bulletins, and posters. To be effective, however, facilities need support in terms of ideas, data, suggestions, and promotional ideas. The teams saw a wide variety of attempts to instigate an energy conservation awareness program, but they also saw a need for some centralized help.

Many of the facilities visited expressed a great desire for the interchange of ideas with other agencies and the private sector. Facilities, too often, find themselves acting within a vacuum, and have no idea what similar facilities are experiencing. A definite need exists for a clearinghouse of energy conservation ideas to help surface common problems. It is anticipated that the Federal Energy Management Program will provide the ongoing mechanism for the worthwhile exchange of energy conservation ideas within the Federal establishment.

While much has been attempted to educate and motivate employees as to the need for energy conservation measures, some problems have surfaced and need to be addressed.

1. There appeared to be some union resistance to energy conservation measures at some of the sites visited. A series of meetings with union leaders to explain the energy program and solicit their support would be beneficial.

2. A motivational problem which appeared concerns prison inmates. The support of inmates is essential to any effective conservation program, as they operate most of the prisons' mechanical equipment, accounting for a gread deal of a prison's energy consumption.

3. A major problem most facilities experienced deals with the apparent lack of interest by non-government personnel in conserving energy. Employees question why they must conserve when all around they see little evidence of energy conservation commitment by the general populace.

Aircraft, Ships and
Tactical Equipment

AIRCRAFT, SHIPS AND TACTICAL EQUIPMENT

Site personnel in one installation mentioned that conservation measures applied to the use of aviation fuels had resulted in reductions in flight time; however, no negative impact on operating or mission responsibilities was noted as missions have been combined to provide more efficient use of aircraft. Reduced flight time will also reduce maintenance cost and related energy use and prolong the useful life of equipment, a positive impact upon operations.

In training programs at several military installations, emphasis has been placed on ground simulation devices for training pilots. Also separate instrument landing and emergency approach procedures were combined into a single training session.

The following measures have been implemented at several air fields:

- The flight checklist now includes emphasis on enroute descents and cruising at optimum (fuel economy) altitudes and air speeds commensurate with FAA regulations.

- Instead of discarding the contaminated high grade jet fuel, it is tested for the degree of contamination to determine what portion can be used as lower grade jet fuel. One installation alone saved 105,000 gallons of jet fuel in this manner in one year.

- All external appurtenances; i.e., fuel tanks, weapon racks, etc., are removed from the aircraft when not needed to lessen the gross weight and to provide a "clean" airframe configuration and, thereby, decrease fuel consumption. In addition excess weight of aircraft has been reduced by carrying only the required fuel.

- Aircraft engines are shut down while emergency maintenance is performed and during prolonged waiting periods.

- During air refueling exercises, launching time for the tanker and receiver plan is synchronized as much as possible to minimize the fuel wasted while cruising. In case the refueling is canceled or delayed while the receiver plane is already airborne, the airtime is used for other required student pilot training.

Since the end of Vietnam activities, the requirements to support ships in port and "cold iron" status have increased facility energy requirements. Also, Navy directives curtailing steam time (ship underway) thereby increase energy demand by ships moored at dockside. To better manage the increased energy demands, it is suggested that at most naval stations, shore power should be metered to individual vessels to permit monitoring of power use while vessels are in port.

Finally, it is proposed for appropriate airfields that segmented electric circuitry be installed to allow for partial system use. For example, a radio remote control switching system for runway lighting is now being studied for inclusion in the new air control tower facilities at one base.

Specific Examples

At McChord AFB, WA, technical measures implemented are those prescribed by headquarters, and principally involve a reduction in flying speed from . 77 MACH to . 74 and routing computed jet stream corridors. Training flights have been reduced and combined where possible with operational missions. Aviation gasoline utilization is being phased out as training aircraft requiring this fuel are taken out of service.

At one site, aircraft and flights are being economically planned by rerouting and by reduction in number of flights. Based on 1,400 flights per day, this represents a fuel savings of approximately $21 million per year.

At Mountain Home AFB, ID, all F-111F aircraft, after landing, shut down one engine prior to taxiing back to their parking spot.

When facility operations were reviewed at the DOT Air Traffic Control Tower, Atlanta, GA, many energy conserving actions were begun. These included such diverse efforts as programming runway lights, substitute running requirements for back up diesel/electric generation, and recapturing equipment heat for other heating needs.

At Fort Lewis, WA, an analysis was made of the fuel savings to be expected if tank trucks refueled aircraft at base location rather than using the rapid refill fuel facility located some distance away. Since adoption of the tanker refuel system, it is estimated 5,800 gallons per year of JP4 are saved while 500 gallons of diesel per year is necessary for the tanker trucks. Reduced air speed probably saves 1,000 gallons JP4 per year.

Although the savings in energy at Cannon AFB, NM, are tactical in nature, it is highly significant and Cannon's F-111D air training simulator is being programmed to the maximum extent possible. The flight simulator section has been averaging 16 missions (32 training hours) per day since the fuel crunch began. Every hour which is flown in the simulator saves about 900 gallons of fuel. It is a progressive program with far reaching application which has been managed well.

A search was made throughout the Suisun Fleet for residual diesel oil in ships' tanks. When found, the ship's pumps were activated for pumping off. A small strap tanker was partially activated to receive the oil. The oil in many cases was found to be partly contaminated with dirt and water. This problem was solved by allowing the oil to settle in the tanker. The oil is now used by skimming it off the top. There is enough oil stored for anticipated needs for several years. At an annual consumption of over

70,000 gallons, it is estimated that yearly savings of $21,000 in fuel costs will be made. A search was made for lubricating oil and when found, samples were sent for testing in a laboratory. Oil found suitable for use is salvaged and to date 1,600 gallons have been recovered at a savings of $1,360. Formerly, lube oil was discarded after 200 hours of use or when it became dirty and contaminated. A purifier now recycles 2,000 gallons a year at a savings of $1,900 per year.

Most of the fuel assigned to the Coast Guard Base, Miami, FL, is consumed by the boats used for patrol and rescue duties. The steps taken to conserve fuel include scheduling and combining of missions among the patrol boats; assigning smaller boats to duties once assigned to larger boats; modifying engines to reduce RPM speeds; and keeping the engines in top mechanical condition for peak performance.

The runway and flightline snow removal at Elmendorf AFB, Alaska, is a major operation. Prior to each snow season, snow removal equipment operators are required to attend a 30-day training session in which they are taught how to maintain a strict pattern of travel during the snow removal operation. This results in fuel savings, reduces manpower requirements and equipment operating time and maintenance.

EXECUTIVE SUMMARY

Background

In June 1973 the President directed Federal departments and agencies to reduce their energy consumption and established a goal for fiscal year 1974 of 7 percent below that which was used during the baseline year of FY 73. This Government-wide effort, known as the Federal Energy Management Program (FEMP), implemented specific conservation measures which resulted in a saving of 24 percent in FY 74. This was the equivalent of 250,000 barrels of oil per day, representing a cost avoidance of $725 million. The effort was continued in FY 75 with a goal of a 15 percent reduction from that which was used during the baseline year of FY 73. In the first three quarters of FY 75, conservation actions by departments and agencies have cut consumption 25 percent, equivalent to 272,000 barrels per day oil or $675 million for the 9-month period.

The Site Visits

During April and May, visits were made to a representative sample of 287 Federal installations throughout the Nation.

The purpose of making the site visits was fivefold: (1) to confirm implementation of energy conservation guidelines, (2) to identify problems and hinderances, (3) to discover techniques for saving energy which could be shared, (4) to provide assistance wherever possible to installations in developing and managing their energy conservation efforts, and (5) to re-emphasize the importance of energy conservation. The Federal Executive Boards (FEB) have established energy conservation as a major objective during FY 75. The FEBs participated in and coordinated the site visits in furtherance of this objective. The site visits were conducted by interagency teams composed of representatives of Federal Energy Administration, General Services Administration, and other FEB member agencies. The site visit teams collected information within the framework of a pre-developed site survey guide and questionnaire. This summary is based on the findings of the site visit teams, which are contained in the reports on each of the installations visited.

The visits provided a broad cross-section of Federal activity representing 14 agencies' installations such as office buildings, military bases, hospitals, laboratories, and others. While information was collected and conclusions drawn, the visits were in no way an attempt to audit or police local energy conservation programs. The success of the visits is due in large measure to the full cooperation received from installation personnel.

Using the Summary Report

An attempt has been made to capture the range of energy conservation actions taken, problems encountered, and successes achieved. It is our