UNITED STATES POSTAL SERVICE®

Facility Energy Management Guide

Handbook AS-558 September 1998

A. Purpose. The United States Postal Service is committed to reducing waste and providing service to its customers in a cost-effective manner. One method for accomplishing this commitment is to implement and maintain facility energy management programs. The Postal Service will be a leader in energy management while enabling operational efficiency, promoting cost-effectiveness, and providing a safe environment.

B. Disclaimer. Handbook AS-558, *Facility Energy Management Guide,* is only intended to enhance the internal management of the Postal Service and is not intended to, nor does it, create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity by any party against the United States Postal Service. This handbook is not a Postal Service regulation; it concerns internal procedures and practices that do not affect individual rights and obligations, and it does not create any right to judicial review involving compliance or noncompliance with the procedures established by this handbook.

C. Contents. This handbook is a reference tool for managing energy consumption in postal facilities. It supplements Management Instruction AS-550-97-4, *Facility Energy Management Program.* The handbook represents the latest policy guidance and specific postal procedures for field implementation of energy management in the Postal Service. Field review and comments have been obtained.

D. Revisions. This handbook will be revised as needed to reflect new legislation and regulations.

E. Distribution.

1. Initial. This handbook is being distributed to all Headquarters functions, facilities service offices and major facilities offices, purchasing and materials service centers, vehicle maintenance facilities, area offices, customer service areas and districts, processing and distribution centers, and CAG A–E post offices.

2. Additional Copies. Organizations not included in the initial distribution or those requiring additional copies should order copies from their material distribution center (MDC) using Form 7380, *MDC Supply Requisition.* The handbook is also available on the internal environmental web site at *http://blue.usps.gov/environmental* and the external environmental web site at *http://www.usps.com/environ.*

F. **Comments and Questions.** If you need further clarification of the policies and procedures outlined in this handbook, send your request to:

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G. **Effective Date.** These instructions are effective immediately.

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1 Introduction

1-1 Objective and Targeted Audience

The objective of this guide is to provide overall programmatic guidance and procedures for implementing the Postal Service's facility energy management program. The targeted audience for this guide comprises the following Postal Service personnel: facility managers, environmental coordinators, area maintenance managers, field maintenance supervisors, purchasing specialists, and designated facility energy coordinators. This directive is intended to serve as a hands-on, practical guide for these Postal Service "energy managers." It is a dynamic document that will be updated as laws, policies, and other circumstances change.

Throughout this guide, the term *energy manager* is used as a general term to indicate all Postal Service employees who are responsible for implementing the energy program at any level of the organization. The term does not have the same definition as the Department of Energy's formal definition of energy manager, which encompasses requirements, including training, that do *not* apply to Postal Service energy managers. The Postal Service reserves the flexibility to tailor the energy manager's job requirements to fit its business objective.

1-2 Purpose of the Postal Service Energy Program

The purpose of the Postal Service energy program is to reduce the cost of energy used to run its facilities without harming customer satisfaction or employee working conditions. Facility energy management is one of the Postal Service's important business strategies for the reduction of total operating expenses (TOE). The Postal Service cannot afford to waste energy, particularly in these days of limited funds and other resources. The inefficient use of energy adds to TOE and affects the Postal Service's ability to be competitive. The effort to improve energy efficiency is a 10-year program. Investment in the program is a long-term business strategy that promises both economic and environmental benefits.

Note

Facility energy management is an important business strategy for the reduction of total operating expenses.

The Postal Service spends about $350 million annually for facility energy (not including vehicles). Most experts agree that an aggressive drive to use that energy more efficiently can significantly reduce energy costs without any adverse impact on the postal mission. An overall reduction in energy use of 20 percent is not unreasonable to expect and would result in cost avoidance of about $70 million per year. A reduction of 30 percent would result in annual savings exceeding $100 million.

Note

The Postal Service reduced facility energy use by 27 percent between 1975 and 1985.

The Postal Service has a successful history of using energy more efficiently. In the 10 years between 1975 and 1985, the Postal Service exceeded federal energy goals by reducing facility energy use by 27 percent. Between 1985 and 1995, energy use went down another 6 percent; energy reductions bottomed out in that period as plants installed energy-intensive equipment to automate mail distribution.

However, many opportunities remain for using energy more efficiently, particularly by installing more efficient lighting and replacing heating, ventilation, and air-conditioning (HVAC) equipment, as it wears out, with high-efficiency equipment.

1-3 Federal Energy Goals

Since the mid-1970s, the President and Congress have promoted energy efficiency in federal agencies, explicitly including the Postal Service. Although the policy emphasis has varied over the past 20 years, each statute and Executive Order (EO) represents a milestone in implementing the federal government's energy conservation strategy. Appendix A summarizes federal energy legislation and EOs.

The federal facility energy goals can be summarized as follows:

- To reduce energy use, measured in British thermal units (Btus) per gross square foot, in facilities by at least 20 percent between 1985 and the year 2000 (Energy Policy Act of 1982 (EPACT)).
- To reduce Btus per square foot by 30 percent between 1985 and the year 2005 (EO 12902).

1-4 Postal Service Goals and Scope

Goal

The Postal Service's key energy goal is to invest in projects that reduce overall facility energy use, measured in dollars per square foot, by at least 30 percent, if feasible.

The mission of the Postal Service is to provide communications services to the nation in the most cost-effective manner possible. Although the laws and EOs discussed earlier set energy goals measured in Btus per gross square foot, those goals are not central to the postal mission and could conceivably reduce the cost-effectiveness of postal operations.

The Postal Service has adopted a business strategy of saving energy *dollars* per square foot rather than *Btus* per square foot, while simultaneously striving to meet the federally mandated energy reduction goals detailed earlier. The Btu reductions are goals, not requirements. Energy reduction investments must pass conventional financial tests by providing added economic value.

The effort to save energy dollars must not impair the performance of the postal mission, customer satisfaction, or employee working conditions. For example, the installation and operation of energy-using, automated mail handling equipment, which is central to the Postal Service's mission, should take precedence over efforts to reduce facility energy.

Policy

The installation and operation of automated mail handling equipment should take precedence over efforts to reduce facility energy.

Energy management strategies should emphasize reducing energy consumption at buildings owned by the Postal Service more than improving leased buildings or buildings operated by the General Services Administration (GSA). Similarly, leased buildings in which the Postal Service pays the energy bills should take precedence over leased buildings in which energy utility bills are the owner's responsibility.

This energy program covers facility energy, not alternative fuel vehicles (AFVs) or water conservation. The Postal Service has an aggressive program to increase the use of AFVs, but that program is not part of the energy program described in this guide.

1-5 Energy Planning and Environmental Policy

The Postal Service's energy report is submitted annually to the Department of Energy (DOE). The *Strategic Energy Management Plan* (SEMP), required by Section 165 of EPACT, was submitted to DOE on December 21, 1993. The strategies in the existing SEMP include demand-side management, energy savings performance contracting, energy management training, improved building operation and maintenance, and increased energy awareness. These energy strategies are discussed fully in the chapters that follow.

Note

Environmental Management Policy is the Headquarters organization responsible for policies on energy efficiency.

Environmental Management Policy (EMP) is the Headquarters organization responsible for policies regarding energy efficiency. The SEMP's strategy states that the purpose of the Postal Service facility energy management program is to make all Postal Service facilities as energy-efficient as possible and to reduce life-cycle operating costs. To achieve the federally mandated energy reduction goal and to reduce operating costs, the Postal Service must:

- Develop appropriate programs to reduce electricity and other fuel costs.
- Purchase energy-efficient products.
- Construct, operate, and maintain energy-efficient facilities.
- Promote efficient use of energy among Postal Service employees.

Because EMP is to fine-tune this strategy in the coming months as necessary, Postal Service energy managers and others concerned

Fact

A 10 percent reduction in electricity used in the United States would cut annual carbon dioxide emissions by over 200 million tons, sulfur dioxide emissions by 1.7 million tons, and nitrogen oxide emissions by 900,000 tons.

with energy management should keep up to date on any changes to the Postal Service's energy strategy. In addition, EMP is now responsible for the development, implementation, and update of the annual energy report and SEMP to accomplish the National Energy Conservation Policy Act (NECPA) and EO 12902 goals.

Environmental Management Policy has taken responsibility for energy policy because of the strong links between energy efficiency, resource conservation, and pollution prevention. Energy efficiency directly benefits the environment, helping promote the Postal Service's environmental leadership. Reducing energy use reduces the amount of air pollutants resulting from the direct burning of fossil fuels and indirect burning when generating electricity. Less electricity consumption means less air pollution. Use of less energy to heat large Postal Service facilities means less worry about meeting legally permitted emissions levels.

1-6 Energy Management

1-6.1 Challenges of Energy Management

A major challenge facing each Postal Service facility manager is to reduce energy use and energy costs as much as possible without jeopardizing operational capabilities or reducing the quality of life for Postal Service personnel. The facility manager, working within the guidelines established in this guide, must develop and orchestrate the implementation of an integrated facility energy management program. This program affects every energy user at a facility and, therefore, every employee should be involved.

Note

Postal facilities could reduce their energy consumption by 20 to 30 percent.

Although some improved energy efficiency can be obtained at little or no cost, fully successful facility energy management programs need adequate investment and funding. There are ways to obtain these needed resources, but to do so, managers must be convinced of the cost savings and benefits that can be realized through energy reduction efforts. Taking full advantage of energy cost-reduction opportunities requires that management place a high priority on energy conservation projects. Convincing the management team to readjust resource priorities usually requires a well-planned energy program and effective "salesmanship."

Many energy conservation opportunities exist at Postal Service facilities. To achieve the best energy and cost savings, those opportunities need to be ranked in terms of life-cycle costs. Poorly conceived energy projects often generate poor returns on investment (ROIs). For information on calculating ROI, see Appendix B.

Various methods of financing projects, including alternative financing mechanisms such as shared energy savings (SES) and demand-side management (DSM) programs, are available. Chapter 6 discusses funding sources.

Policy

Visit the energy section of the web site at *http://blue.usps.gov/environmental* to learn about the latest energy technologies.

Facility managers need to stay abreast of changes in the energy field. For example, fluctuating energy prices change the return on investment of energy projects, which may require project reevaluation. Changing technologies tend to make projects more attractive. Lighting and thermal storage are examples of technologies that continue to evolve.

Professional development of Postal Service energy management personnel is an important part of the energy program. Attendance at professional forums and seminars is a good way to exchange useful ideas. The National Center for Employee Development (NCED) offers Postal Service-tailored energy training classes.

1-6.2 Benefits of Energy Management

The federal government is the largest single energy user in the United States. The many postal facilities spread throughout every corner of the country provide the Postal Service with a unique opportunity to influence the national energy management strategy. By providing leadership in this worthwhile effort, Postal Service facilities can set a highly visible example.

Energy conservation is really improved energy management. Energy management does not mean simply turning off the switch, it means using energy more efficiently to provide the same or an improved level of benefits at lower cost. The energy management program helps facilities deal with resource limitations without reducing operational capabilities, productivity, or the quality of life for Postal Service personnel.

Note

Better energy management has a positive impact on economic value added (EVA).

Energy management delivers a wide range of tangible as well as intangible benefits. Tangible benefits include dollar savings resulting from the improved operating efficiency of energy-using systems. The improved efficiencies result in reduced operating costs as well as reduced energy expense.

Crude oil is one of the most important sources of energy used in the United States. Over 50 percent of that oil is imported, and much of it comes from politically volatile areas. An intangible benefit of reducing energy demand is reducing America’s dependence on imported crude oil. Although a large percentage of petroleum is consumed by ground vehicles (mobility energy), reducing facility energy use also helps to reduce America’s oil import bill. Moreover, reduced crude oil prices help reduce prices for all other energy sources. Aggressive worldwide energy conservation in the early 1980s played a major role in sharply reducing overall energy costs.

1-6.3 The Air Quality Connection

Energy production from fossil fuels is the greatest source of air pollution in the United States. Although the United States has made great strides toward reducing air pollution over the past two decades, there are three areas of concern connected with the 83-percent increase in electricity generated nationally from 1970 through 1990:

- *Nitrogen oxide* emissions from electric utilities increased by 67 percent between 1970 and 1990. Nearly 57 percent of the nitrogen oxides in the atmosphere are a result of combustion of fossil fuels for electricity production. Effects on health include irritation to lungs and lowered resistance to respiratory infection such as influenza. Nitrogen oxides contribute to smog and the formation of acid deposition (e.g., acid rain).
- *Sulfur dioxide* emissions have declined slightly since 1970, but not nearly as much as those of particulates, lead, and carbon monoxide. Nearly 80 percent of sulfur dioxide emissions are from fossil fuel combustion, of which nearly 85 percent is from electric power production. Sulfur dioxide affects breathing and causes respiratory illness and symptoms, alterations in the lungs' defenses, and aggravation of existing respiratory and cardiovascular disease. Sulfur dioxides are also responsible for the formation of acid deposition.
- *Carbon dioxide* emissions increased by 20 percent between 1970 and 1988, and the contribution of coal to total carbon dioxide emissions increased from 22 percent to 38 percent during that period. Carbon dioxide is the major man-made contributor to global climate change. Worldwide increases in temperature could alter weather patterns to a degree that would significantly affect agricultural areas and raise the sea level by heating and expanding ocean water, melting mountain glaciers, and partially melting the polar ice caps. A rise in sea level would flood coastal areas around the world, which support nearly 80 percent of the world's population.

By the year 2000, all electric utilities with capacities greater than 25 megawatts are expected to meet new government-mandated emission limits. As a result, nitrogen oxide levels are expected to decrease by 11 percent from 1990 to 2000. Similar reductions are expected for sulfur dioxide, which will be controlled by a market-based allowance system that allows utilities to decide which combination of pollution control equipment, low sulfur fuel, and energy conservation measures they believe is suitable to ensure compliance with the number of emissions allowances they have.

1-7 Facility Energy Management — A Systems Management Approach

The purpose of energy management is to minimize energy consumption and costs while meeting operational requirements and providing quality working conditions for Postal Service personnel. Energy management requires a careful balance between efforts to use energy efficiently and meet quality-of-life requirements while ensuring that core business operational requirements are met. Effective energy management strives to avoid conflicts between the two while achieving substantial energy-use reductions, cost savings, and TOE reductions.

To establish a successful energy program, the key postal personnel must have a keen understanding of both the technical and managerial aspects of energy management. The technical aspects require an understanding of physical energy systems and the development of engineering solutions to increase efficiency. The managerial aspect requires the ability to communicate with people, to establish an effective organization, and to shepherd projects from design through to completion.

Energy management begins by establishing a set of energy reduction and cost savings goals to which top management is committed. The goals are followed by the creation of an organizational structure and the allocation of sufficient resources, usually beginning with the identification of key personnel at all levels of the organization. Once the new organizational structure (and the effective use of existing structures) is in place, an energy manager should implement a facilitywide energy awareness program that makes all facility personnel the manager's energy allies. At the same time, the Postal Service energy manager needs to identify the best energy and cost saving opportunities, typically by conducting an energy audit. While the manager is uncovering and ranking major energy projects, all personnel can involve themselves by saving energy using no-cost or low-cost techniques and by discovering additional energy saving opportunities.

The energy manager determines the most appropriate tools and technologies, puts the projects together, and seeks to obtain the necessary resources, which can be obtained through sources such as construction or investment projects, SES contracts for energy conservation and DSM services, improved operations and maintenance, etc. No-cost and low-cost projects can often use internal resources, both money and personnel, whereas major energy investments usually require additional outside resources.

Note

Energy managers must evaluate options and make the sound investment decisions.

Finally, project feedback is important for measuring the effectiveness of each approach and for readjusting the initial goals based on actual savings. To the extent possible, Postal Service energy managers should *measure* actual savings, not simply assume that estimated savings have occurred.

2 Organizations and Responsibilities

This chapter describes the key personnel, along with their duties and responsibilities, involved in the energy program. To establish a successful energy program, the key postal personnel involved need to understand both the technical and managerial aspects of energy management. The technical aspects require an understanding of physical energy systems and the development of engineering solutions to increase efficiency. The managerial aspect requires the ability to communicate with people, to establish an effective organization, and to shepherd projects from plan through completion.

2-1 Headquarters

2-1.1 Vice President, Engineering

The vice president of Engineering, as the chief environmental and energy officer for the Postal Service, is responsible for the development of policies, plans, and programs for implementing the Postal Service's national energy program.

2-1.2 Environmental Management Policy

EMP is responsible for the following:

- Program development and oversight — EMP develops program elements and oversees the implementation of the national SEMP in compliance with requirements of EPACT and applicable EOs. Management Instruction (MI) AS-550-97-4, *Facility Energy Management Program,* and this guide form the bases for this program.
- Goal determination — EMP determines annual goals, based on past performance, targeting national EPACT and EO goals. See Chapter 3 for further implementation procedures.
- Economic value added — EMP develops and tracks EVA elements of the facility energy management program.

Note

EMP advocates and determines funding level needs of the areas to meet national energy cost saving goals.

- Program funding — EMP provides national funds to the areas to implement specific energy projects based on ROI criteria. See Chapter 6 for further information regarding specific program funding.
- Review of area plans — EMP annually reviews the area SEMPs for consistency with energy program goals and objectives.
- National energy tracking system — EMP develops and manages the national energy tracking system. EMP also reviews and ensures the accuracy of reported data and annually prepares and submits a performance report to DOE and Congress. See Chapter 5.
- Awareness and communications — EMP develops awareness and communications programs, using existing corporate resources, to promote energy technologies. See Chapter 7.
- Training — EMP reviews and upgrades, as necessary, existing training courses to ensure that they incorporate applicable energy conservation practices.
- National awards and recognition program — EMP initiates an internal awards program to recognize outstanding energy conservation efforts. See section 7-7.

2-1.3 Maintenance Policies and Programs

Maintenance Policies and Programs (MPP) is responsible for continuous improvements of operations and maintenance (O&M) procedures for various energy-consuming systems. Maintenance personnel throughout all levels of postal operations are an integral part of the facility energy management program, and they serve as the technical liaison for program implementation.

2-1.4 Maintenance Technical Support Center

The Maintenance Technical Support Center (MTSC) is responsible for the development and dissemination of maintenance management orders (MMOs) to field maintenance. The MTSC is to update the existing MMOs as appropriate.

2-1.5 Facilities

Facilities is responsible for implementing applicable energy conservation policies, plans, and programs into new construction and major renovations. They are also responsible for ensuring cost-effective energy saving features in new designs, monitoring energy performance of new facilities to verify efficiency, and including facility energy management program measures in building design criteria. Most of the proven energy-efficient technologies have been incorporated in the *Building Design Standards* and Handbook AS-503, *Standard Design Criteria.*

2-1.6 Headquarters Energy Workgroup

As appropriate, a Headquarters energy workgroup is formed to coordinate policy issues relating to facility energy management. The membership of this workgroup can vary depending on the nature of new initiatives and the expertise required.

2-1.7 Facilities Service Office

The facilities service office (FSO) is responsible for incorporating energy conservation in new construction and major renovations. The FSO has a standing membership in the area energy program committee (AEPC) and is also responsible for ensuring that new designs have the most cost-effective energy saving features, monitoring energy performance of newly constructed facilities to verify efficiency, and employing building design criteria to incorporate facility energy management program features.

2-2 Areas

2-2.1 Vice President, Area Operations

The vice president of Area Operations is responsible for implementing the area's facility energy management program.

2-2.2 Area Energy Program Committee

The AEPC is to be chaired by the area environmental compliance coordinator (AECC), who has been tasked with providing overall energy program leadership and program element coordination, including budgetary support. The AEPC should include representatives from the key stakeholders and support functions at the area level, such as the FSO managers and area managers of Maintenance Support, Finance, In-Plant Support, and purchasing and materials service centers (PMSCs). Chapter 4 provides a detailed discussion of organizations from which representatives should be considered for inclusion in the AEPC.

The committee is responsible for developing and implementing the area SEMP. In addition, it provides program oversight that includes training, support responsibilities, accounting and monitoring, and new facility design review. The AEPC has the authority to approve funding for these types of projects in the facility energy management program and serves a similar function at appropriate levels as the capital investment committee (CIC). The AEPC supplements the area environmental strategic planning committee, which establishes the overall environmental direction for the area and its reporting performance clusters.

The overall objective of the AEPC is to prioritize energy projects submitted to it by the district energy planning committees so that proper budgetary allotments can be requested from EMP at Headquarters. This AEPC process also should be closely aligned with the efforts of the CIC at the area to ensure that projects currently under consideration by the CIC, the AEPC, and the area environmental strategic planning committee are consistent with the overall business plan for that area.

2-2.3 Area Environmental Compliance Coordinator

AECCs are responsible for the following program management functions:

Note

The AECC informs the vice president of Area Operations and other area managers about energy issues and evaluates energy performance in the area.

- Area program oversight — AECCs implement and oversee national energy policies developed by EMP and Headquarters and provide feedback to EMP. As the direct line of communication from EMP, they keep each vice president of Area Operations and other area managers informed about energy issues. AECCs are also responsible for evaluating energy performance in each area.
- Performance cluster (or district) goals — AECCs review and approve annual energy goals for the performance cluster (or district) to ensure compliance with the national SEMP (see EMP responsibilities).
- Project review and funding approval — AECCs review and prioritize energy projects based on ROI. EMP provides AECCs with funding for the top priority projects to meet each area’s energy goals. AECCs provide a mechanism to fund energy project studies, surveys, and designs.
- Area performance tracking — AECCs ensure the completeness and validity of energy data and conduct trend analyses as needed.
- Awareness and communications — AECCs identify and communicate SEMP status, progress, and initiatives.
- Training — AECCs develop and implement a structured training program for energy coordinators and annually review training needs.

- Awards and recognition program —AECCs identify exemplary energy projects in coordination with district environmental compliance coordinators (DECCs). Award nominations are to be submitted to the DECCs and AECCs. AECCs review all nominations and forward the finalists to EMP for consideration.

2-2.4 Maintenance Support

The area Maintenance Support units are responsible for providing technical energy program support to the AECC. Representatives from Maintenance Support serve on the AEPC and assist the AECC in the development of the area SEMP. They are also responsible for disseminating technical guidance and daily support to the program, including instructions for maintaining the existing energy reporting system.

2-2.5 Finance

The area Finance units are responsible for tracking energy expenditures at the area level. These units assist the AECCs in the development and implementation of energy cost tracking systems as described in Chapter 5.

2-2.6 Facility Managers

The primary responsibility for each part of the energy program ultimately rests with the facility managers. Designated energy coordinators and key stakeholders are responsible for assisting area facility managers in becoming familiar with, and responsible for, compliance with EPACT and energy opportunity requirements.

2-3 Performance Clusters

2-3.1 Performance Cluster Energy Program Committee

The performance cluster energy program committee (PCEPC) should be composed of the DECC and representatives as designated by the district managers of Administrative Support, Operations Support, Finance, the lead plant, and lead plant Maintenance. The DECC serves as the chair of the PCEPC, which is responsible for developing the performance cluster (or district, if appropriate) SEMP. In addition, the PCEPC provides program oversight that includes energy audits, training, program implementation, support responsibilities, and accounting and monitoring. Chapter 4 provides a detailed discussion of organizations from which representatives should be considered for inclusion in the PCEPC.

2-3.2 District Environmental Compliance Coordinator

Note

The DECC chairs the PCEPC and is also responsible for coordinating funding requests from field or local projects identified by facility energy coordinators, among other duties.

DECCs are responsible for the following program management functions:

- Performance cluster program oversight — DECCs implement and oversee national energy policies developed by EMP as well as those of the area SEMPs developed by the AECCs. DECCs also provide feedback from the performance cluster and facility energy coordinators (FECs) to the AECC and provide coordination between the area and the performance cluster. DECCs are responsible for evaluating energy performance in all performance cluster facilities.
- Facility goals — DECCs base energy goals for individual facilities on actual performance and analyze the goals to ensure their compliance with the performance cluster's annual goals and the goals of the national SEMP (see AECC responsibilities).
- Project funding request — DECCs coordinate the funding requests from field or local projects identified by the FECs and approved by the PCEPC.
- Performance cluster performance tracking — DECCs review consumption data submitted by FECs to ensure its completeness and accuracy.
- Awareness and communications — DECCs are responsible for keeping facility managers and energy project managers aware of program information. DECCs are also responsible for disseminating energy information and providing information on local energy conservation opportunities and measures such as local utility incentive programs.
- Training — DECCs implement a structured training program for the FECs consistent with the training program developed by the AECC. Training requirements are to be reviewed annually.
- Awards and recognition program — DECCs support the national awards and recognition program (see EMP responsibilities) by identifying facilities and individuals for awards and submitting the nominations to the AECC.

2-3.3 Finance

The district Finance units are responsible for tracking energy expenditures at the performance cluster (or district) level. These units assist the DECCs in the development and implementation of energy cost tracking systems as described in Chapter 5.

2-3.4 Facility Managers

The primary responsibility for each part of the energy program ultimately rests with the facility managers. Designated energy coordinators and key stakeholders are responsible for assisting district facility managers in becoming familiar with, and responsible for, compliance with EPACT and energy savings opportunity requirements.

2-3.5 Facility Energy Coordinator

At maintenance-capable offices, the manager of Maintenance is the FEC. At all other locations, the facility manager is the FEC. FECs are responsible for the following:

- Program implementation — FECs apply and implement the program initiatives developed by the PCEPC. They provide direct support to DECCs on the facility energy management program.
- Compliance and opportunity review — FECs review plant and facility operations for energy conservation goals and energy savings opportunities. They also assist in design review to ensure that energy efficiency measures are incorporated. These reviews are used to develop funding requests to the PCEPC.
- Facility program management — FECs assist in developing the energy management program for facilities. They recommend energy projects and energy conservation opportunities to the PCEPC.
- Operations and maintenance — FECs assist in implementing energy conservation practices by integrating them into preventive maintenance activities. The primary focus for O&M in the facility energy management program is on lighting, HVAC, HVAC controls, and motors.
- Monitoring — FECs monitor overall performance of the facility and recommend O&M changes.
- Facility awareness training — FECs provide awareness training on the performance cluster SEMP and energy conservation.

Note

The manager of Maintenance serves as the facility energy coordinator at maintenance-capable offices. At all other locations, the facility manager serves as the facility energy coordinator.

2-4 National Center for Employee Development

The NCED is responsible for developing the training requested by EMP. This includes awareness and technical training programs in support of the facility energy management program.

3 Energy Goals and Planning Strategies

3-1 Overview

This chapter describes the broad framework of a Postal Service energy program. It includes 10 specific approaches to energy savings that have been successful in the past and can guide the energy manager to increased energy savings in the future. Specific energy program implementation policies and goals are provided in MI AS-550-97-4*.*

3-2 Energy Reduction Goals

The Postal Service's energy goal is to invest in projects that reduce overall facility energy use, measured in dollars per square foot, by at least 30 percent, if feasible. Although the Postal Service is committed to improved energy resource management, its primary goal is to reduce energy costs while maintaining quality operational support and working conditions for Postal Service personnel. Everyone in the Postal Service has an obligation to manage energy responsibly.

Note

The Postal Service energy goal is to reduce the energy used by at least 20 percent between FY85 and FY00, and at least 30 percent between FY85 and FY05.

As a secondary target, the Postal Service aims to meet the following federal facility energy goals:

- Reduce the energy used in facilities, measured in Btus per gross square foot, by at least 20 percent between FY85 and FY00 (EPACT).
- Reduce Btus per gross square foot in facilities by at least 30 percent between FY85 and FY05 (EO 12902).

3-3 Strategy for Reducing Energy Use

EMP has developed a strategy for implementing a facility energy management program designed to improve energy efficiency and eliminate energy waste. The following priority energy programs, which will help to achieve the Postal Service's goals to reduce energy use, constitute the major elements of EMP's facility energy management program.

Tip

Estimate potential energy savings that could be achieved by employing various energy savings strategies.

3-3.1 Establish Energy Awareness Programs

Awareness programs teach energy users to eliminate energy waste without diminishing their quality of life. Awareness encourages users to develop simple, cost-effective energy habits such as turning out lights when spaces are unoccupied, maintaining reasonable room temperatures, and closing doors and windows. Such programs require the investment of few resources, yet offer a high energy savings potential. Strong support from the postal managers is essential in achieving the desired energy savings. Establishing recommended energy consumption benchmarks (dollars per square foot or Btus per square foot) for various types of buildings will help the managers to measure the progress. See Chapter 7 for details.

3-3.2 Improve Facility Operations and Maintenance

The goals are to improve O&M at facilities and for energy systems and to provide related training to increase efficiency in the production and use of energy. These efforts require strong support from the maintenance community. See Chapter 9 for details.

3-3.3 Implement Energy Conservation Investment Projects

The Postal Service advocates increased funding for energy conservation projects. Projects with simple paybacks of less than 3 years or ROI higher than 30 percent should be funded. If postal funds are not available, an alternative financing option should be explored. See 3-3.5.

3-3.4 Participate in Public Utility Programs

Postal Service facilities are strongly encouraged to participate in energy utility conservation programs known as DSM when and where such programs are offered by regulated public utilities. Postal Service facilities are encouraged to take immediate advantage of such programs.

3-3.5 Pursue Alternative Financing and Shared Energy Savings

Alternative financing options should be explored when postal funds are not available. The SES mechanism allows the Postal Service to finance energy projects when internal funds are not available. Each PMSC will assist the requirements offices to initiate an SES contract.

3-3.6 Retrofit Lighting Systems

Lighting retrofit projects are relatively small in scope and easy to implement. Their potential savings opportunities often exceed ROI of 30 percent or higher. Because of these advantages, focusing on lighting retrofit projects can result in a substantial energy savings with limited expertise and resources. Each area is responsible for improving the quality of information available to facility managers on selecting efficient lighting systems and equipment. See Chapter 6 for details.

Fact

Lighting is 40 percent of Postal Service electricity usage — a big opportunity for savings.

3-3.7 Increase Use of Alternative, Renewable, and Clean Energy

Postal facilities are encouraged to use alternative, renewable, and clean energy sources wherever such use is cost-effective over the life of the facility. For example, the use of solar energy and other renewable forms of energy is encouraged. All Postal Service facilities are encouraged to participate in DOE demonstration programs when participation is cost-effective and compatible with the facility. EMP has the lead for the development of strategies for using all energy sources, technology applications, and resource development. See Chapter 11 for details.

3-3.8 Investigate Energy Cost and Load Management

Due to the recent deregulation of the utility industry, interest in reducing energy costs through switching to cheaper fuels and managing the peaks and valleys of utility demand has increased. Substantial energy savings can be achieved by renegotiating the rate structure or shaving the energy demand peaks. Postal Service managers should take particular care to ensure that they understand their energy usage pattern. A better understanding of the energy usage and the energy market will allow the postal managers to choose the most cost-effective energy options.

3-3.9 Implement Energy Efficiency Standards for New Postal Buildings

Each facility should develop and implement a plan, based on PCEPC guidance, to reduce overall energy use in buildings, measured in Btus per gross square foot, by 20 percent between FY85 and FY00. For the construction of new buildings and facilities, managers must contact the FSO manager to address the minimum requirements for energy management systems and design standards outlined in 10 *Code of Federal Regulations* (CFR), Part 435, Section 110.

3-3.10 Purchase Energy-Efficient Products

Each facility should select for procurement the most energy-efficient products (e.g., heating, ventilation, and air-conditioning components; lighting systems; and office equipment) on the basis of their life-cycle cost-effectiveness.

3-3.11 Measure the Progress Toward Goals

EMP will use data from the Facilities Management System for Windows (FMSWIN) to set individual area energy goals annually for FY97 to FY05. The areas must then establish individual performance cluster goals to meet their annual area goals. Those goals should be in either dollars per square foot or Btus per square foot.

Note

The key to a successful energy program is to develop the most appropriate and cost-effective energy conservation measures for each facility without affecting the mail operations and the quality of the work environment.

3-4 Steps for Initiating the Energy Program Management Cycle

Although AECCs and DECCs can develop successful energy programs in many ways, the process shown in Exhibit 3-4 shows the logical elements needed to simplify program management. The key to a successful energy program is to develop the most appropriate and cost-effective energy conservation measures for each facility without affecting the mail operations and the quality of the work environment. AECCs and DECCs must build effective organizations to perform these tasks and provide needed leadership.

3-4.1 Step 1. Understand Energy Consumption Patterns

To develop the most appropriate energy conservation measures, energy managers must understand energy consumption patterns at each facility, recognize wasteful energy usage, and develop methods for eliminating energy waste. Energy managers need to understand the types of energy systems, fuel sources and their costs, and other efficiency indicators such as dollars per square foot and Btus per square foot. Reviewing energy bills and conducting trend analyses of consumption patterns should be the first steps in initiating the energy program. Exhibit 3-4.1 charts the process the energy program committee (EPC) should follow.

3-4.2 Step 2. Develop or Revise the 5-Year SEMP

The essential elements of a SEMP should include a description of energy saving goals, a list of specific tasks to achieve those goals, a schedule for implementing the tasks, and a strategy for obtaining required resources. In preparing area and performance cluster SEMPs, energy managers should incorporate the Postal Service energy saving goals and other corporate policies relating to the energy program.

Exhibit 3-4.2 charts the process the EPC should follow for developing the SEMP.

AECCs and DECCs must ensure that sufficient resources are available to implement the SEMP. If enough resources are not available to execute a robust plan, then the scope of the program should be revised on the basis of resource constraints. The purpose of this chapter is to help energy managers identify and achieve energy savings. During the preparation of the SEMP, AECCs and DECCs should identify and prioritize specific energy tasks that will result in energy savings.

Exhibit 3-4, Program Management Cycle

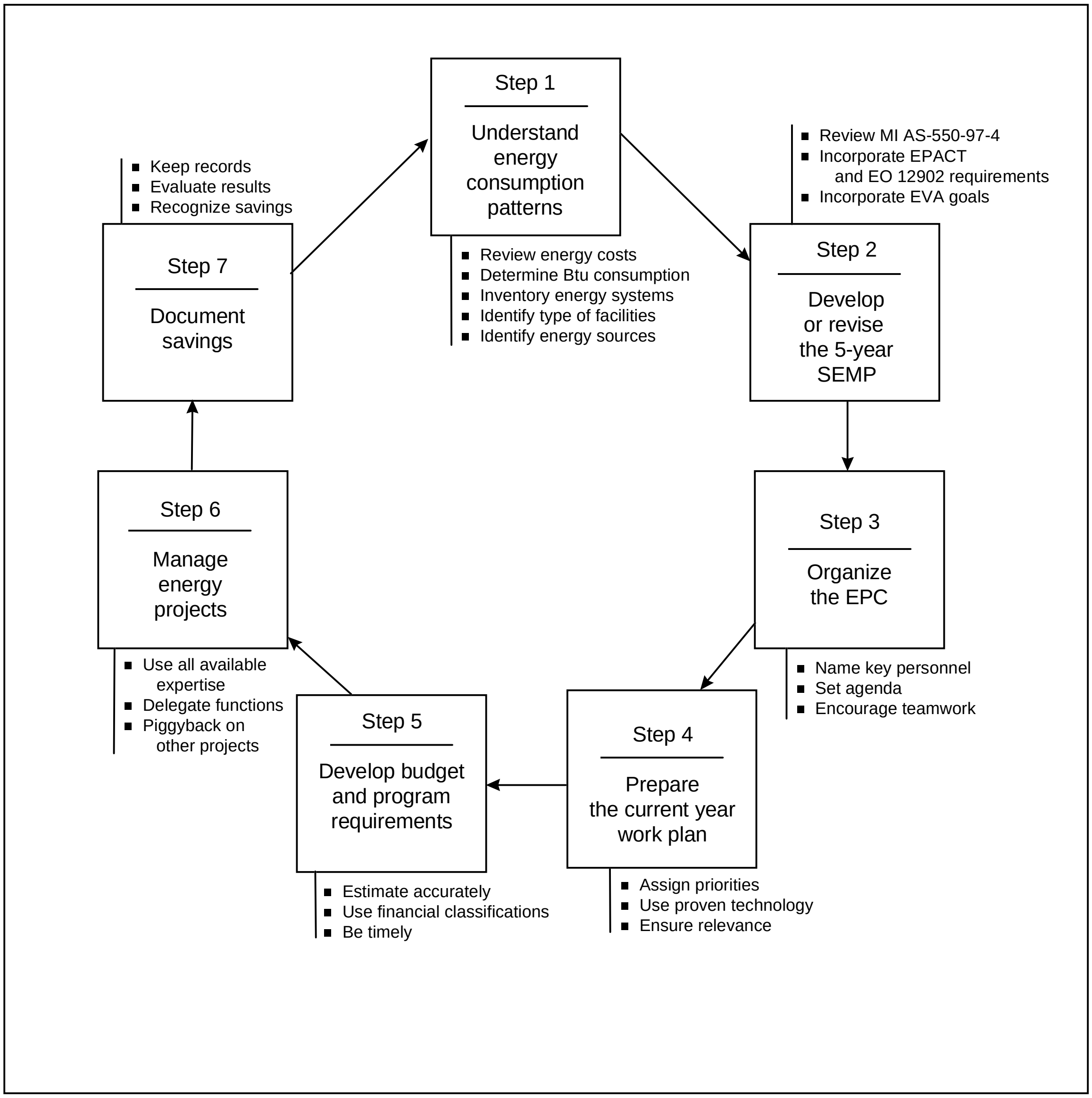
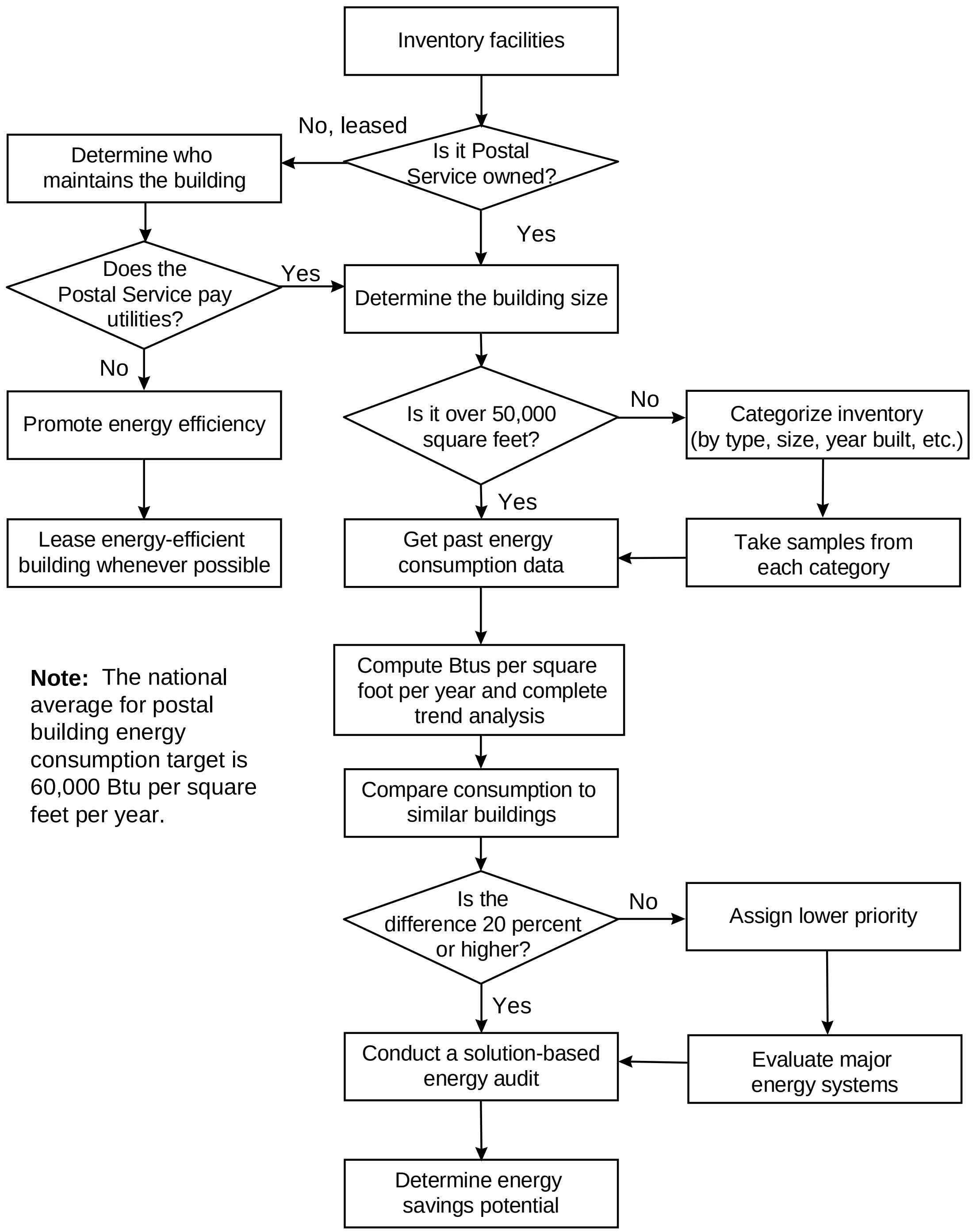
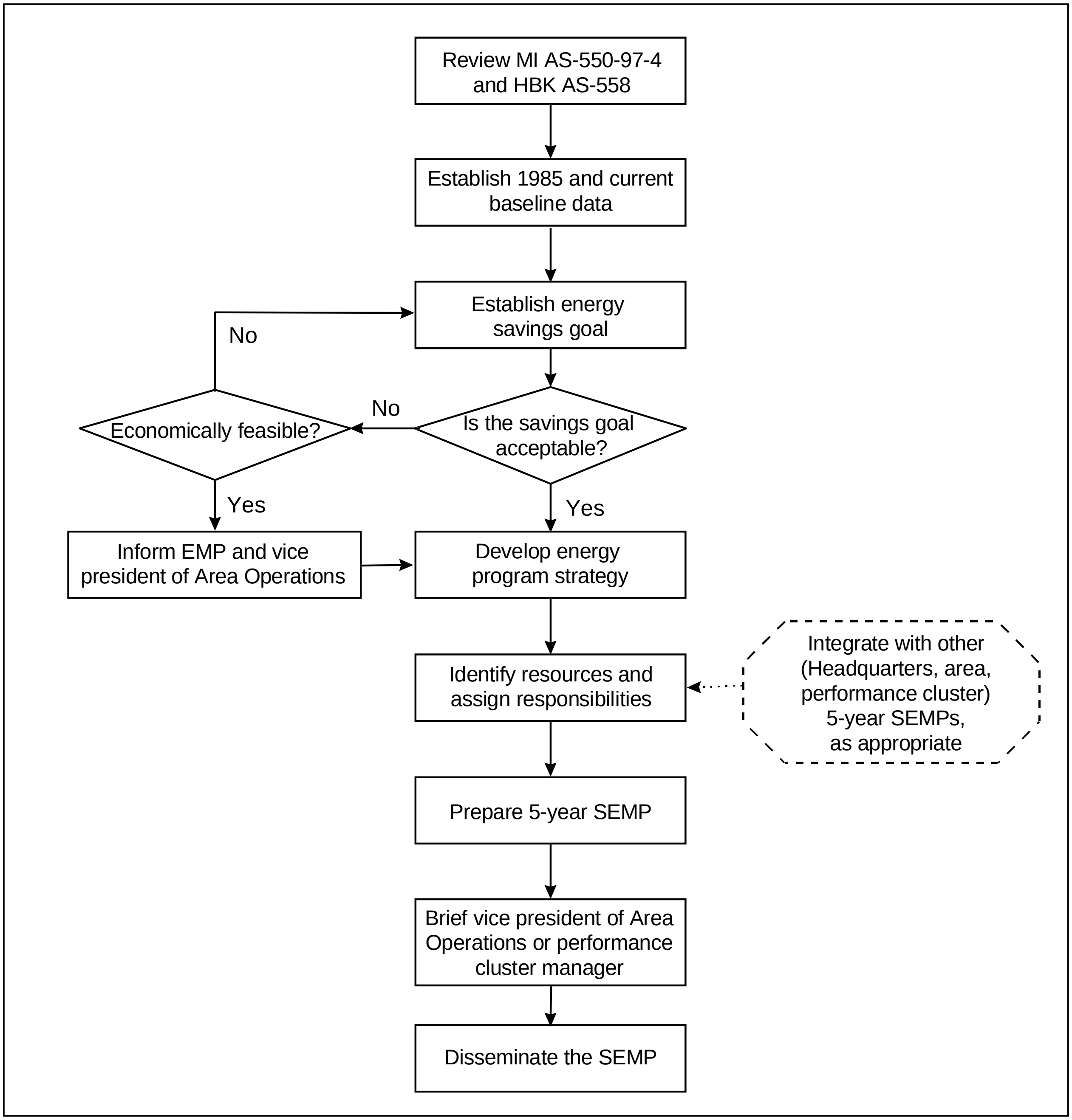


Exhibit 3-4.1, Understand Energy Consumption Patterns



Note: The national average for postal building energy consumption target is 60,000 Btu per square feet per year.

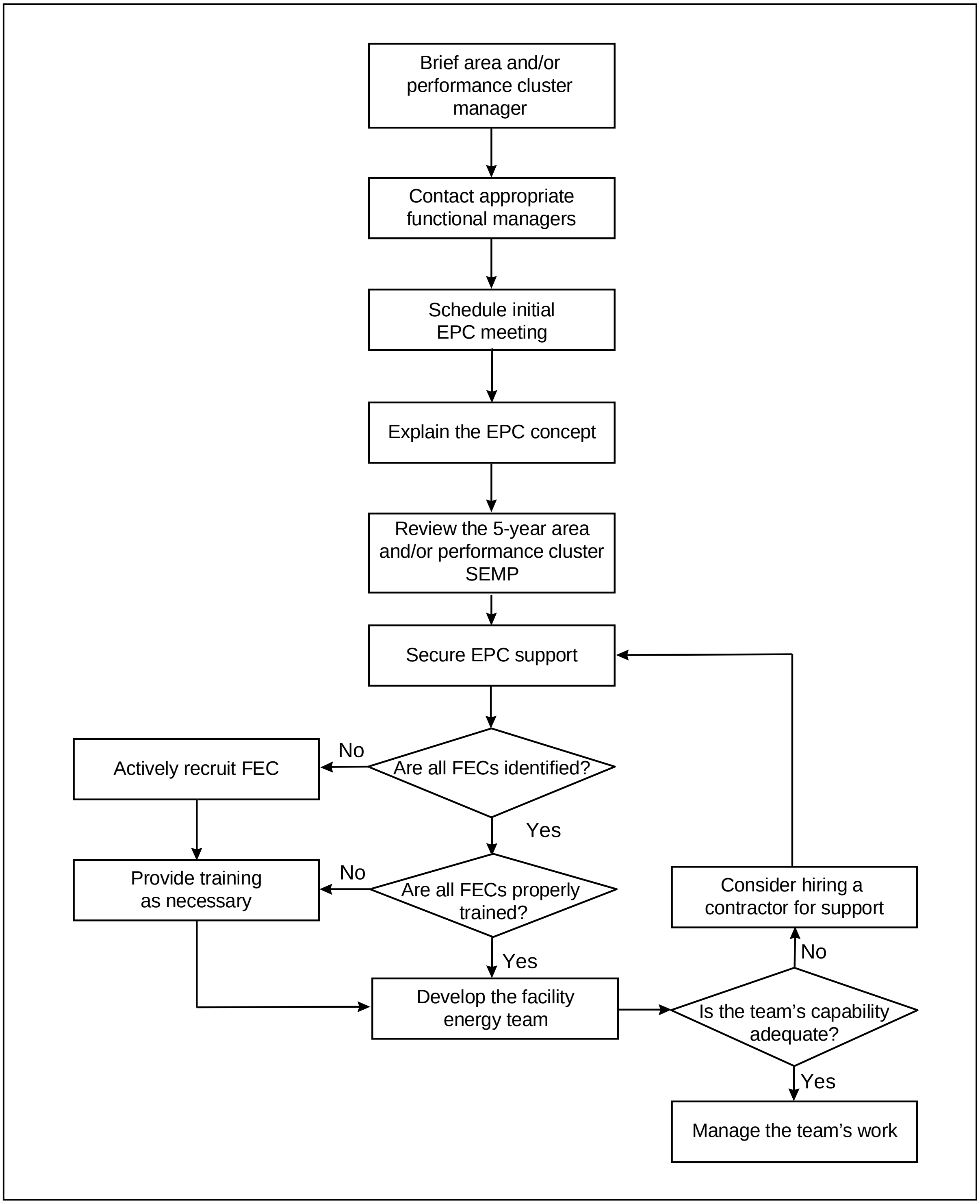
Exhibit 3-4.2, Develop or Revise a 5-Year SEMP



3-4.3 Step 3. Organize the Energy Program Committees

Building an effective AEPC or PCEPC may be the most challenging task in initiating an energy program. MI AS-550-97-4 lists who should be on the energy program committee. See Chapter 4 for additional details regarding EPCs and their possible membership. AECCs and DECCs should review membership as appropriate. Exhibit 3-4.3 shows the recommended process for developing the EPC organizational structure.

Exhibit 3-4.3, Organize the EPC



Making this committee into an effective energy management body requires strong support from the top leadership. The main purpose of this committee is to share the responsibility for implementing the energy tasks identified in the SEMP. When all of the recommended functional organizations participate in the development of the EPC, it will facilitate future implementations.

3-4.4 Step 4. Prepare the Current Year Work Plan

The current year work plan lists activities to be accomplished and schedules these activities during the current fiscal year. The list of activities includes, but is not limited to, conducting energy audits, reviewing preventive maintenance procedures, conducting employee awareness campaigns, and identifying and implementing retrofit projects (shown in Exhibit 3-4.4). The plan should be signed by vice presidents of Area Operations.

3-4.5 Step 5. Develop Budget and Program Requirements

Energy programs should be well-thought-out plans and sustained efforts to implement the plans. The 5-year SEMP should outline a strategy for long-sustained efforts required to achieve the desired savings. AECCs and DECCs can justify and be more proactive in obtaining a budget for energy programs if the SEMP is well laid out and the expected benefits are documented. Energy budget requirements should be developed on the basis of the 5-year SEMP. In order to sustain energy programs long enough to demonstrate success, AECCs and DECCs must build their energy budgets on the basis of the 5-year SEMP and demonstrate return on investments. Exhibit 3-4.5 outlines a process they might follow to achieve this effort and provides further references.

3-4.6 Step 6. Manage Energy Projects

After projects are implemented, AECCs and DECCs must actively oversee their projects to ensure that they achieve the intended results. Much of the work should be delegated to PCEPC committee members or to facility managers for managing these projects. When these projects are delegated, AECCs and DECCs must ensure that they are properly coordinated and that the responsible functional areas have adequate resources and knowledge to accomplish the tasks. Exhibit 3-4.6 shows a recommended process flow for project management.

Exhibit 3-4.4, Prepare the Current Year Work Plan

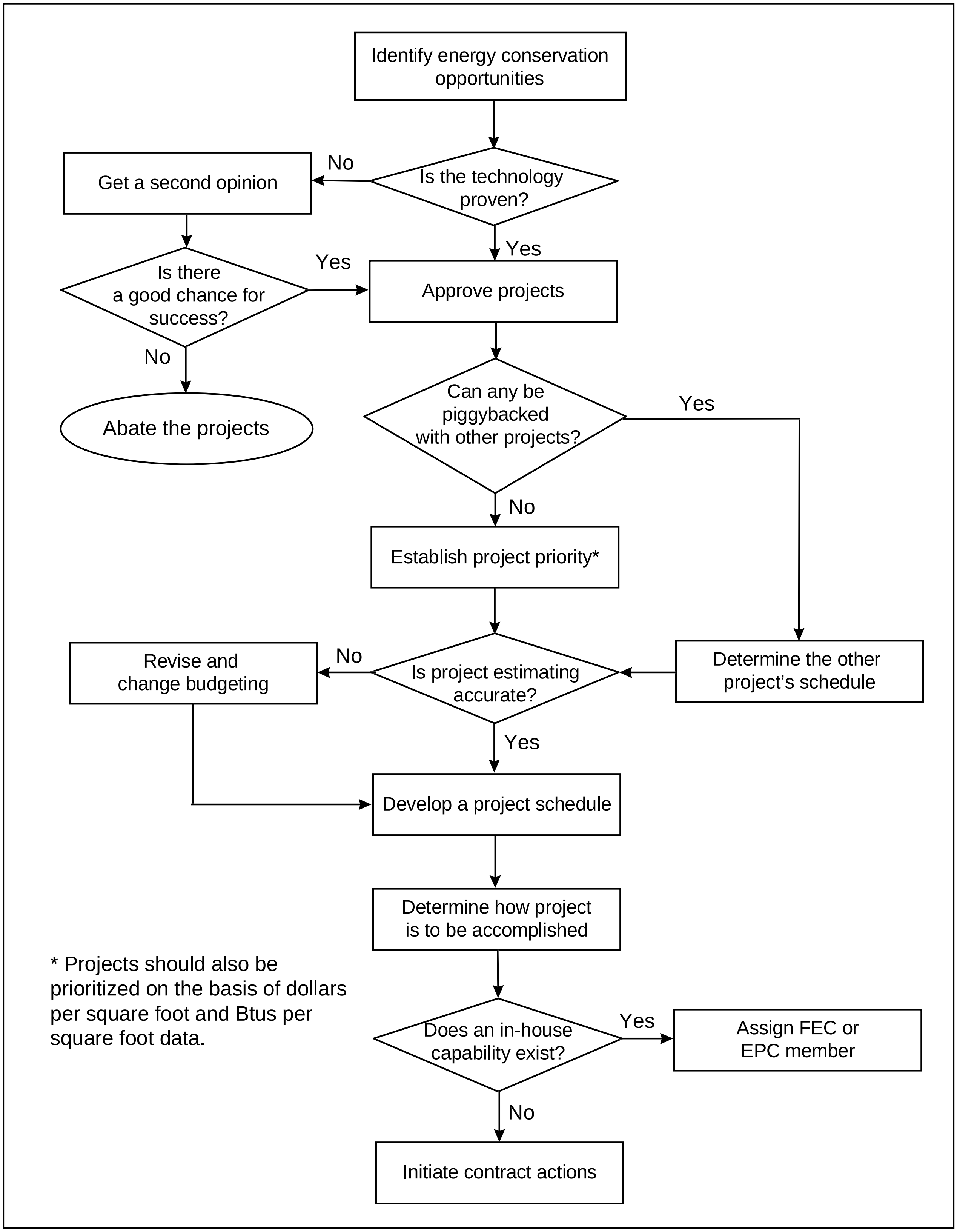
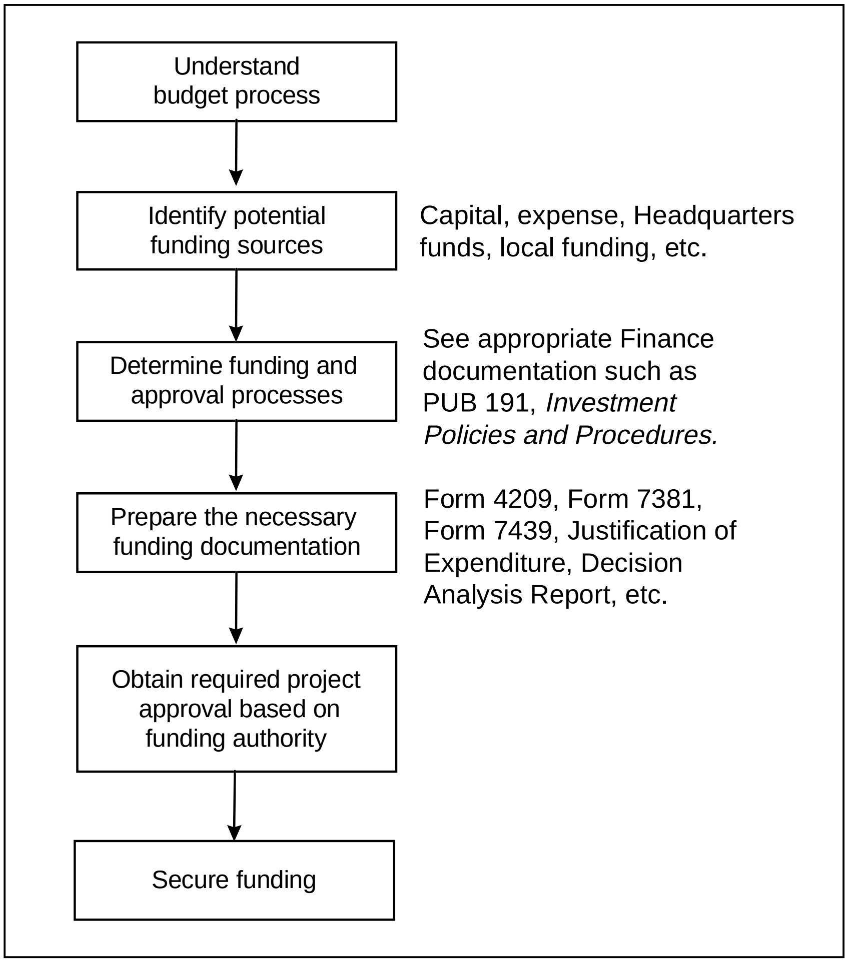


Exhibit 3-4.5, Develop Budget and Program Requirements



3-4.7 Step 7. Document Savings

Documenting savings enables AECCs and DECCs to justify a long-term, sustained energy program. Without that documentation, it is difficult to show the benefits of energy conservation programs. The documentation of savings from energy program initiatives is extremely important and is used to justify future program funding, ascertain EVA improvements, and calculate environmental benefits. Exhibit 3-4.7 defines a process that could show success.

Exhibit 3-4.6, Manage Energy Projects

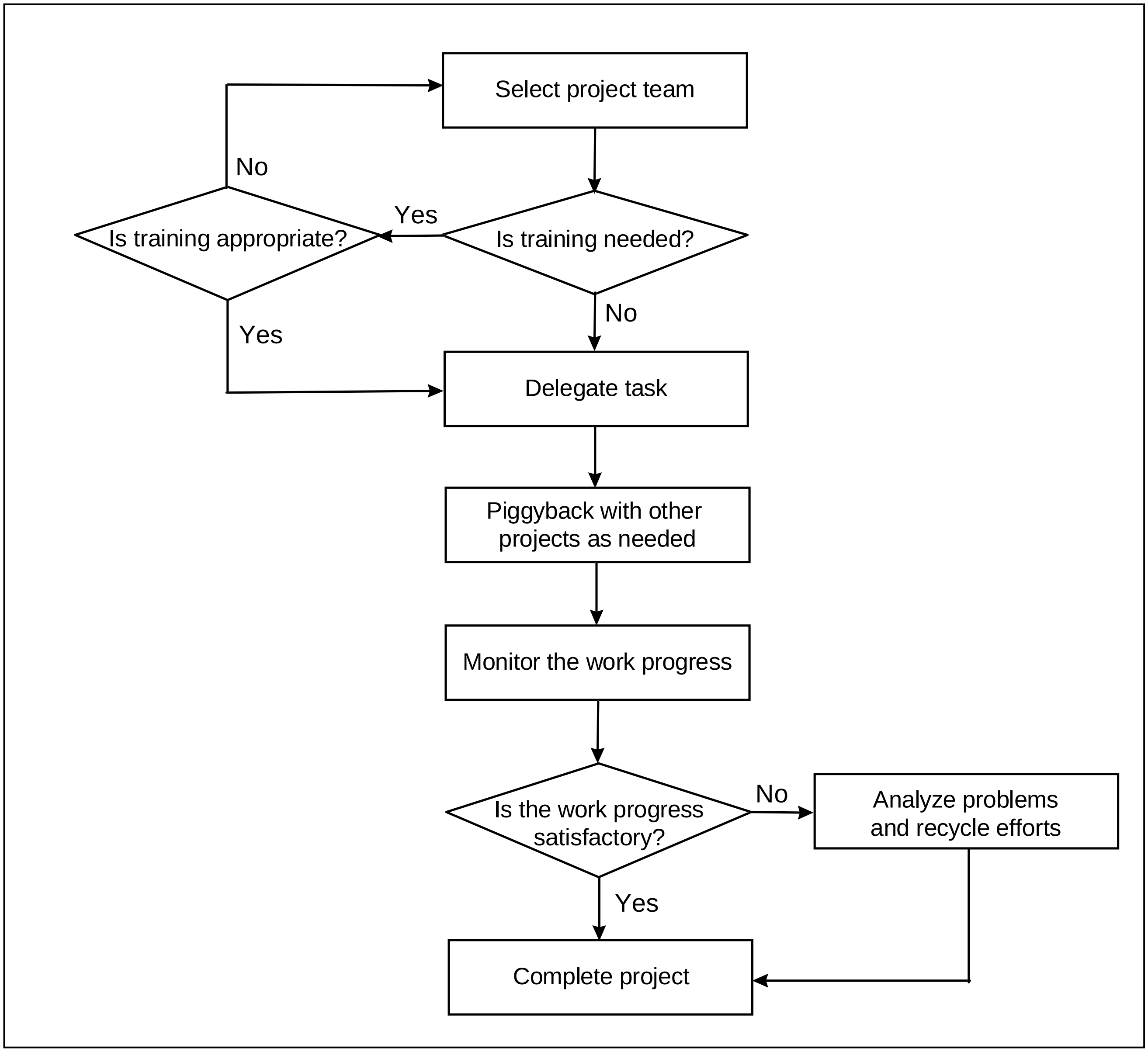
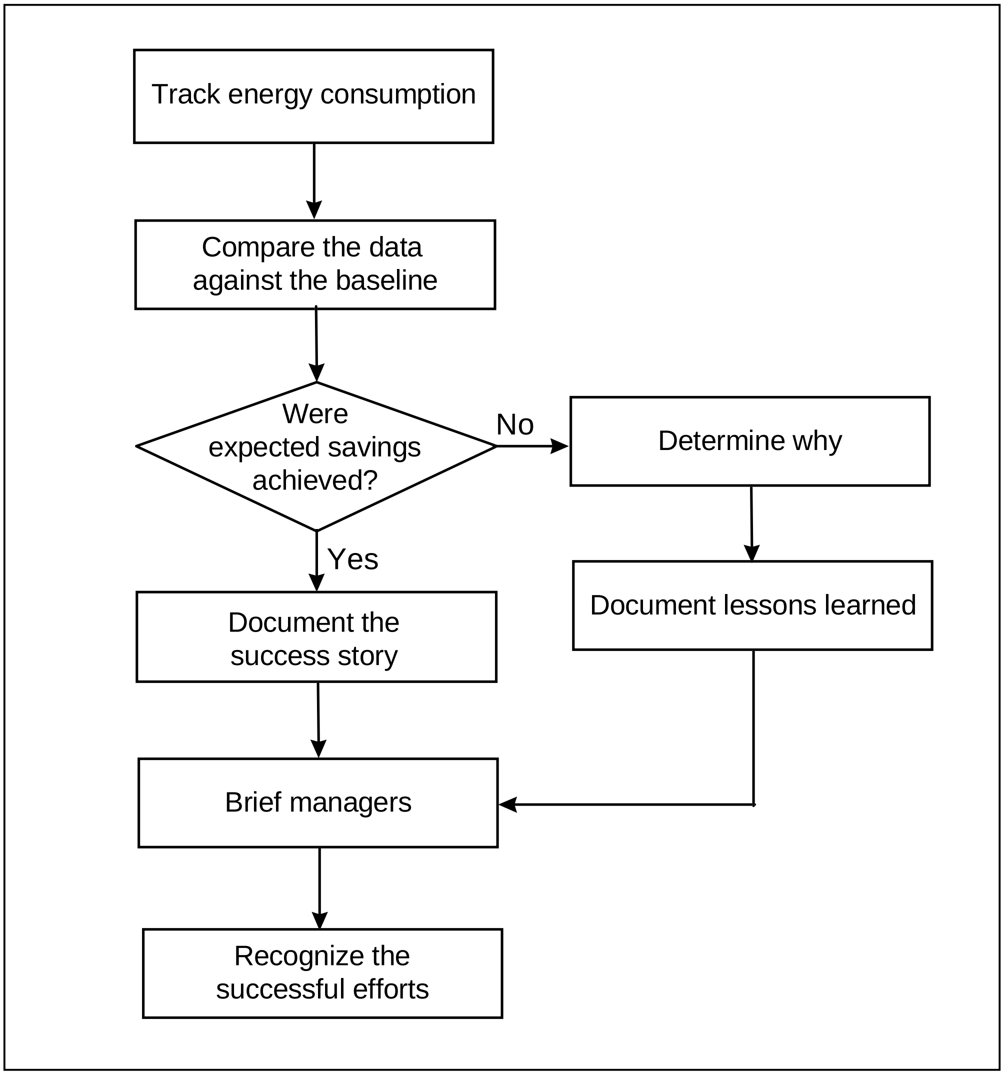


Exhibit 3-4.7, Document Savings



4 Energy Program Management Infrastructure

4-1 Team Concept

The energy manager alone cannot do all the work required to achieve energy conservation goals, so therefore must delegate tasks to others. Organizing a team of managers and representatives to the EPC at appropriate levels (area and performance cluster (or district, as appropriate)) is the first step in sharing that workload. Knowing how best to use the EPC is crucial in implementing a successful energy program because the Postal Service does not have a dedicated, full-time energy person, even though it employs many energy system experts. An effective team can be formed by drawing from the existing expertise within various postal organizations.

Note

An effective team can be formed by drawing from the existing expertise within various postal organizations.

4-2 Designated Energy Manager

Selection of an energy manager is the first and most important step in building an energy team. Behind any successful energy program there are usually several dynamic individuals with a "can do" attitude who take the initiative to accomplish what needs to be done. These employees have been delegated the responsibility of ensuring that the facility is constantly striving to improve energy efficiency. To implement successful programs, energy managers must keep track of the progress of all energy conservation activities and coordinate major decisions through the EPC.

For the area, the designated energy manager is usually the AECC, unless exceptions are approved by the vice president of Area Operations. For performance clusters (or districts), designated energy managers are usually the DECCs, unless exceptions are approved by the district manager. At the facility and plant levels, facility managers should nominate qualified individuals as FECs. That appointment should be approved by the appropriate supervisor.

The designated energy managers develop their own area, performance cluster, and facility strategy for achieving energy reduction goals. A 5-year SEMP should be prepared to address the reduction strategies. This plan should include a list of task assignments for various organizations, resource needs, methods for monitoring goals and progress, etc.

Note

Behind any successful energy program there are usually several dynamic individuals with a “can do” attitude who take the initiative to accomplish what needs to be done.

In most cases, DECCs are responsible for energy management tasks, since DECCs manage and implement energy projects at their facilities within a performance cluster. DECCs must coordinate with and rely on staff from other postal organizations to perform specific energy conservation tasks. Because of these resource constraints and limited authority, DECCs must gain strong support from district managers and AECCs to implement a successful performance cluster-wide energy program, which requires broad participation from all organizations. The performance cluster SEMP is integral in gaining the necessary support.

Exhibit 4-2 illustrates how designated energy managers and the EPCs fit into the overall postal organizational infrastructure.

4-3 Approval of Energy Projects

Although the AECCs and DECCs are responsible for coordinating energy programs, the vice presidents of Area Operations, district managers, and plant managers must set the tone for energy management and conservation efforts and make the sometimes difficult decisions to implement projects that will save energy. With their approval, the resources of various functional organizations can be tapped.

The vice presidents of Area Operations, district managers, and plant managers should be informed and briefed about their energy program. To gain support from top postal managers, AECCs and DECCs must convince them of the benefits of energy conservation.

4-4 Support Organizations

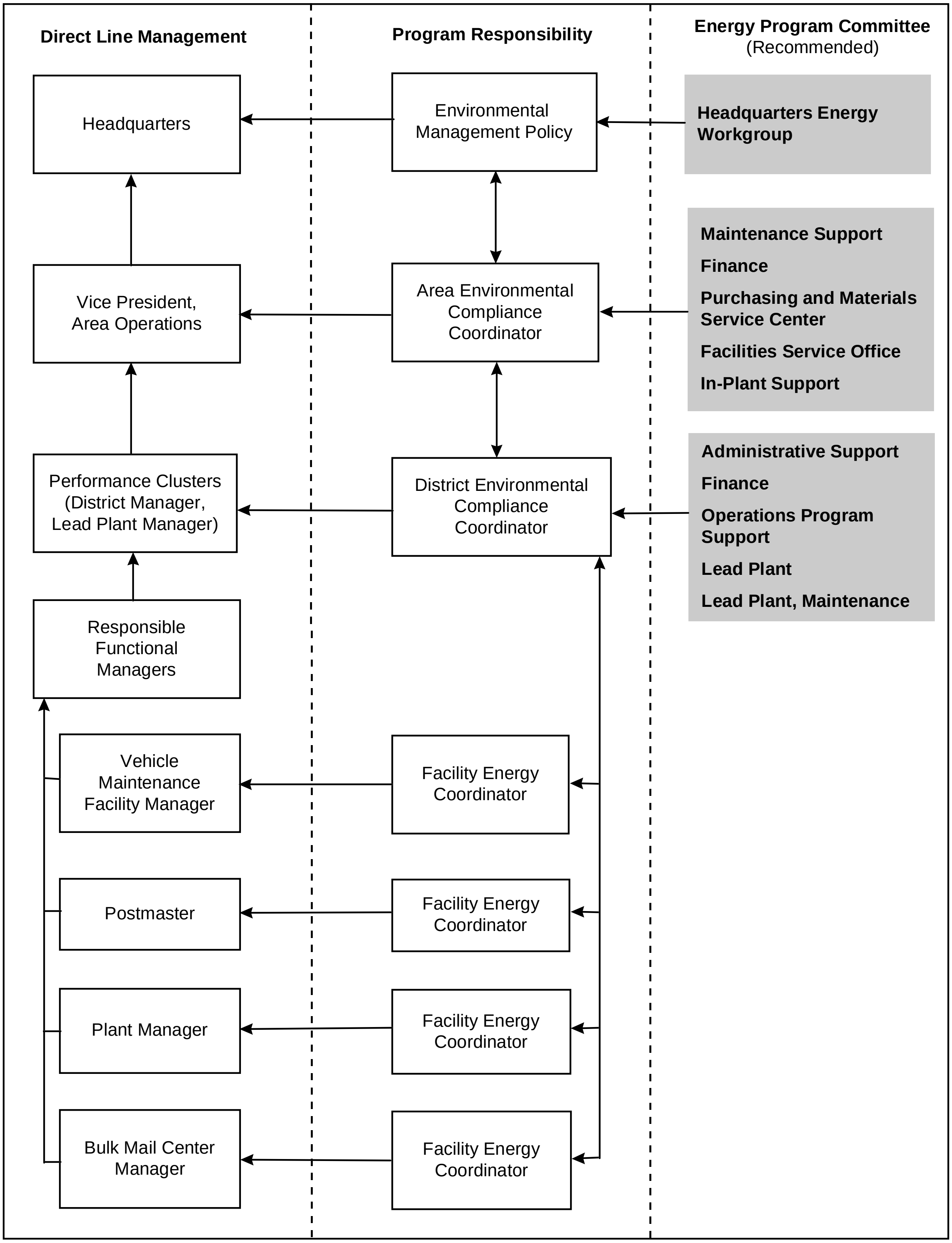
4-4.1 Maintenance Policies and Programs

MPP is responsible for continuous improvements of O&M procedures for various energy-consuming systems. Maintenance personnel throughout all levels of postal operations are an integral part of the facility energy management program, and they serve as the technical liaison for program implementation.

4-4.2 Purchasing and Materials Service Centers

The PMSC has the responsibility for coordinating and supporting large multiyear utility purchasing contracts under the deregulated electricity and natural gas markets. Before the deregulation, the prices of electricity and natural gas were governed under tariff, and little or no contracting action was required. Because the total value for most multiyear utility purchasing contracts will exceed local buying authority, PMSC contracting officers may have to sign such contracts.

Exhibit 4-2, Energy Program Management Infrastructure



The PMSC also provides support in implementing SES contracts. SES contracts and utility purchasing contracts can only be awarded by the PMSC. The PMSC has trained contracting officers to support and award SES projects.

4-4.3 Maintenance Technical Support Center

The MTSC is responsible for the development and dissemination of MMOs to field maintenance. The MTSC is to review and approve new technologies, and develop and update MMOs as appropriate.

4-4.4 Facilities

Facilities is responsible for implementing applicable energy conservation policies, plans, and programs into new construction and major renovations. They are also responsible for ensuring cost-effective energy savings features in new designs, monitoring energy performance of new facilities to verify efficiency, and including facility energy management program measures in building design criteria.

4-4.5 National Center for Employee Development

The Postal Service has a centralized training center that has expertise in providing technical support.

4-4.6 Corporate Relations Centers

The Corporate Relations Centers have many ways of communicating energy conservation messages to a wide range of audiences. They can assist in implementing and managing the energy conservation awareness program and they can publish articles announcing energy conservation initiatives and activities.

Note

Organizing an energy program committee is the first step in sharing workload responsibilities.

4-5 Energy Program Committee

Every postal organization has a clear chain-of-command structure that defines authorities, spans of control, and responsibilities. Under that management structure, AECCs and DECCs serve as one of several functional experts. The EPC is an excellent alternative for gathering support from other staff functions without having to overburden vice presidents of Area Operations, district managers, and plant managers with energy-related issues.

Membership in the EPC should consist of senior representatives from the various organizations having different mission requirements and varying energy consumption patterns. Although they may not have technical knowledge about energy conservation, they can be instrumental in implementing a program within their own organization and can serve as valuable points of contact (POCs) for AECCs and DECCs.

The EPC is a good forum in which to propose and evaluate ideas and can serve either in an advisory capacity or as a corporate decision-making body. All major policy and budget decisions should be coordinated among the committee members before they are approved by the appropriate vice president or manager. However, AECCs and DECCs should make minor operational decisions, allowing the committee members to focus on major issues.

MI AS-550-97-4 specifies key area and performance cluster functional experts to participate in an EPC. AECCs and DECCs should understand the responsibilities of committee members and determine how they can be most helpful to energy management efforts. Also, AECCs and DECCs should actively recruit FECs for large postal buildings.

Besides having to involve various organizations by assigning energy conservation-related tasks during EPC meetings, energy managers need to establish informal lines of communication with key staff members whose assistance is critical in implementing energy conservation projects.

Note

It is important to determine which organizations can be helpful in improving energy efficiency.

4-5.1 Headquarters Energy Workgroup

As appropriate, a Headquarters energy workgroup is formed to coordinate policy issues relating to facility energy management. The membership of this workgroup can vary depending on the nature of new initiatives and the expertise required.

4-5.2 Area Maintenance Support

Area Maintenance Support is responsible for providing O&M support to facilities and associated energy systems to performance clusters. In the past, area Maintenance Support was responsible for the energy program, and they will continue to play a critical role and share the responsibility of executing energy programs.

4-5.3 Finance

The Finance representatives should help prepare an annual energy conservation budget and track energy-related expenditures. Their support is critical for keeping track of the allocated energy budget and actual utilities expenses. Also, the Finance unit validates the ROI calculations.

4-5.4 Purchasing and Materials Service Center

The PMSC provides many of the supplies and equipment needed to implement energy conservation efforts. Most of the Postal Service's energy-consuming supplies and equipment (e.g., most of the light bulbs and standard electric motors) are purchased through PMSC contracts. Having informed purchasing specialists in the organization would increase the likelihood of energy-efficient purchasing. Purchasing specialists should be trained in energy conservation technologies and have access to energy conservation documents.

In order to purchase a steady supply of energy-efficient equipment, the PMSC needs to be aware of best purchasing options and sources, including the GSA's major purchasing programs. The PMSC can also procure energy-awareness materials such as specially printed pencils, posters, thermometers, and hats.

4-5.5 Facilities Service Office

For facilities engineering projects exceeding a certain cost threshold, detailed project documentation is required. For example, depending on the size of energy projects, approvals from the vice president of Area Operations or Headquarters are required. FSO staff typically prepare this project documentation. Energy-efficiency measures should be incorporated into the design process. For new construction, design engineers should be familiar with the minimum energy design standards outlined in 10 CFR, Part 43, Section 110, and the *Building Design Standards* specifications "Green Addendum."

4-5.6 In-Plant Support

The manager or designated representative of In-Plant Support participates in the AEPC and provides assistance in enhancing energy efficiency through improving maintenance practices or procedures.

4-5.7 Administrative Support

Managers and Contracting Officer's Representatives

Managers of Administrative Support units are responsible for purchasing architectural-engineering (A-E) services, utility services, construction services, equipment, and supplies. Their role becomes more important with increased use of contractors for energy conservation projects. Repair and alteration (R&A) projects performed by the Administrative Support unit must integrate energy conservation initiatives into their scope of work.

Once a contract is awarded, energy managers must work through a contracting officer's representative (COR) to monitor the contractor's work performance. To avoid contracting problems, some time should be spent with CORs to explain energy conservation requirements and to cultivate good working relationships.

In some districts, managers of Administrative Support are responsible for negotiating utility contracts, including contracts for utility-sponsored DSM programs, and for the O&M of energy systems. It is important to have those managers closely involved in energy conservation efforts.

Repair and Alteration Programs

As part of the R&A process, managers of Administrative Support units are responsible for providing the EPC with a list of planned and ongoing facilities projects that could enhance energy efficiency. These projects must incorporate energy-efficiency measures.

4-5.8 Operations Program Support

The manager or designated representative of Operations Program Support participates in the PCEPC and informs the committee about the planned automation deployment schedule. The manager or designated representative incorporates energy-efficiency measures when modifications to facilities are planned as a result of the automation deployment.

4-5.9 Lead Plant

The managers of performance cluster lead plants provide other plants with administrative support and technical assistance in implementing energy programs.

4-5.10 Lead Plant, Maintenance

The maintenance supervisors are the best candidates for membership in the EPC, and they are in the best position to serve as facility energy managers. They have a wealth of hands-on experience and an excellent working knowledge of technologies that work well. By recruiting these supervisors as FECs, the DECCs can tap into an impressive knowledge base.

Note

Maintenance supervisors often have many good ideas about how to make plant operations more efficient.

Most no-cost or low-cost projects are accomplished by in-house personnel. Maintenance supervisors are responsible for the completion of these projects. For example, the plant's maintenance crew is responsible for maintaining control devices for HVAC systems. Periodic preventive maintenance (PM) of that equipment is required to maintain peak energy efficiency. Typically, the supervisors are responsible for the implementation of PM programs under the direction of a maintenance engineer from an area office.

Maintenance supervisors are responsible for the daily operation of major energy systems such as central heating and chiller plants. The energy manager should visit those plants to understand how they operate. In the case of establishing dual-fuel source capabilities, the possible operational modifications required to implement a fuel-switching option should be discussed with maintenance supervisors.

Maintenance supervisor responsibilities include the following:

- Providing energy auditing assistance.
- Managing the energy awareness programs within their buildings.
- Keeping track of PM schedules.
- Coordinating load-shedding activities.
- Providing user feedback on energy conservation projects. They can serve as the eyes and ears of the energy manager.

4-5.11 Responsible Facility and Functional Managers

Postmasters and managers of vehicle maintenance facilities (VMFs), bulk mailing centers (BMCs), and plants are normally responsible for identifying and initiating work orders when their buildings are too hot or too cold. They also coordinate the energy projects to be done at their buildings and provide liaison between the Maintenance units and building occupants. These facility managers can describe how buildings are used and explain energy-use requirements.

Although facility managers may not be well versed in energy technologies, they must understand the energy consumption patterns of their organization. Appropriate technical education or training background would be helpful to those selected as energy managers.

Because it is not economical for energy professionals to study small post offices and postal facilities to assess energy conservation measures, simple, easy to follow, solution-based projects should be prepackaged for facility managers to implement. For example, the EPC can provide more efficient lamps or lighting fixtures and provide easy-to-install motion sensors that are already pretested and come with detailed instructions. EMP has developed prenegotiated contracts with various vendors of energy-efficient products with whom facility managers can place orders. Samples of these products include light-emitting diode (LED) exit signs, low mercury fluorescent T-8 lamps with electronic ballasts, and energy-efficient motors.

4-5.12 Major Energy Users

Some facilities may consume an unusually large amount of energy, measured in terms of both total consumption (Btus) and consumption rate (Btus per square foot). These large consumers can be identified by reviewing their past energy consumption data. If possible, senior representatives from those high-consuming organizations should be part of the EPC so that they can better understand their significant role in, and serve as a focal point for, conservation efforts. They should have an incentive to participate in energy conservation, since by lowering their energy costs, and hence their facilities' costs, they increase their EVA rating.

4-6 Additional Help From Other Organizations

Additional advice and expertise are available from many other sources. The sections below describe several organizations that have the most energy management expertise and experience, and research could provide the energy manager with other useful contacts. Specific names, addresses, and phone numbers for some of these organizations are listed under the "Energy" program on the environmental internal web site at *http://blue.usps.com/environmental.*

4-6.1 Utility Company Representatives

As part of DSM efforts, most public utility companies now offer cash rebates for implementing energy conservation projects such as lighting retrofits and motor replacements. To increase user participation in such rebate programs, utility companies often offer a free energy auditing service. The utility companies provide expertise and resources as an incentive to participate in rebate programs. The energy manager should work with those representatives to effectively manage load-shedding and peak-demand-limiting programs.

4-6.2 Other Federal and State Agencies

The expertise of other federal and state agencies is available to assist energy conservation programs through the establishment of a memorandum of understanding between the external agency and the Postal Service. Many land-grant, state-supported universities have excellent extension technical services, and the Postal Service can obtain those university services without much administrative work and expense. Some state energy offices can also provide help.

The Federal Energy Management Program (FEMP) and DOE offer technical assistance. Also, DOE operates many national laboratories that are conducting research and development (R&D) efforts in improving energy efficiency.

The Department of Defense (DOD), as the largest energy user in the United States, has devoted considerable resources to improving energy efficiency. The Air Force is supported by the Air Force Civil Engineering Support Agency for improving its energy efficiency. The Army's centralized technical centers of expertise are the Corps of Engineers and the Civil Engineering Research Laboratory. The Navy and Marine Corps have the Naval Facilities Engineering Command and the Naval Energy and Environmental Support Activity. These technical centers are excellent sources of energy management ideas. Often, most information can be obtained for free.

4-6.3 Professional Organizations

Many nonprofit associations and institutions promote energy efficiency and conservation. Some of those organizations provide training and educational assistance at a reasonable price. They can also be a good place to exchange ideas, for example, about which energy conservation efforts work and which do not, and provide names of contractors to use or avoid.

4-6.4 Architectural-Engineering and Energy Consulting Firms

Many A-E and energy consulting firms provide technical and managerial services related to various energy management and efficiency subjects. Those A-E and energy services must be procured through a competitive contract process. Also, small businesses and individual consultants who specialize in energy management are available. Their credentials and references should be reviewed before contracting with them.

5 Energy Consumption Reporting and Trend Analysis

5-1 Overview

This chapter explains how to get the needed energy-use data for the following two purposes:

- Determining which facilities use the most energy and are, therefore, the most likely candidates for energy saving projects.
- Tracking energy use at the facilities under each energy manager's control relative to the Postal Service dollar per Btu goal and the two federal facility Btu per square foot goals.

Note

Control energy costs and demonstrate the economic value added to the organization.

Energy managers have important reasons for tracking energy consumption. In FY96, the Postal Service spent $370 million on energy consumption. The management and efficient use of energy directly links to the Voice of the Business (VOB). Without some means of measuring energy use, managers may find it difficult to reduce energy costs. Managers who are able to measure and control energy costs can better demonstrate the economic value they have added to the organization. Performing trend analyses of the previous energy consumption data is a valuable management tool. Section 5-5 explains some basic steps for conducting a trend analysis.

Because quantitative Postal Service energy goals have been formulated against a 1985 baseline, an important step toward meeting those goals is to establish a baseline for the area, performance cluster, finance number, or facility. Baseline data may or may not be available for all facilities in a particular region. Certainly, facilities acquired after 1985 will not have any 1985 data.

The Postal Service must monitor its energy consumption on a Btu-per-square-foot basis in order to report progress toward the federal facility energy goals. Federal reporting, however, is the responsibility of EMP, and is not required of individual energy managers. Energy managers are accountable for their area and performance cluster goals, however. The better energy use can be measured, the better one can explain progress relative to these goals. Nevertheless, the purpose of the energy program is to reduce energy costs, not to collect energy data; collecting data merely for its own sake should be avoided.

5-2 Where to Get Energy Data

This section explains several sources of energy-use data that exist in the Postal Service. Form 1357, *Request for Computer Access,* may be needed to gain access to these systems.

5-2.1 Energy Consumption Tracking Tool on the IntraNet

The first and easiest place an energy manager should look for energy consumption data is the Energy Consumption Tracking Tool (ECTT) on the IntraNet. Annual energy consumption data at the finance number level (not the facility level) is available from 1993 to the present on the environmental internal web site at *http://blue.usps.gov/environmental.* The ECTT shows dollars spent on the basic energy types (electricity, oil, natural gas, and other), quantities of each type (based on estimated regional costs for fuel), and other useful management data. This site is discussed in more detail in section 5-4.

5-2.2 Form 4841, Fuel and Utilities Record

Facility managers at maintenance-capable facilities are encouraged to record energy use on Form 4841, *Fuel and Utilities Record.* They can use this data for managing their programs and for measuring their performance against the federal facility goals. Energy managers may find it helpful to have major facilities forward a copy of their records. The finance and sublocation numbers on the forms should be checked against street addresses for accuracy.

5-2.3 Facility Management System for Windows

FMSWIN contains detailed data for each facility that the Postal Service owns or leases. The system stores facility information about addresses, whether it is owned or leased, who pays the electricity bills, the type of facility, the number of square feet, and other pertinent physical information, but no energy data. The system identifies each postal facility through a unique combination of finance number and sublocation number. Facility information, especially addresses and square footage, needs to be verified to ensure data integrity.

5-2.4 Postal Service Financial Reporting System

The Postal Service Financial Reporting (PSFR) system contains the amounts paid out for utilities (line number 42). Within the same Corporate Information System (CIS) as the PSFR, the National Consolidated Trial Balance File Finance Number (NCTBFF) contains a more detailed breakdown of fuel type and cost information by accounting period by finance number for the following line 42 subaccount codes:

- Electricity — subaccount code: 54151.
- Gas — subaccount code: 54143.
- Fuel oil — subaccount code: 54142.
- Other energy sources — subaccount code: 54144.

The energy data from the PSFR and other files within the CIS has been summarized and incorporated into the ECTT, which energy managers can access on the IntraNet. For those managers who may have access to the PSFR system directly, it should be noted that even though the financial data allows identification of the finance numbers that have the highest energy bills, that data is not *normalized* by square feet. Normalization is the process of dividing energy data for each facility by the number of square feet in that facility.

5-2.5 Energy Consumption System

The Energy Consumption System (ECS) is an automated system that is no longer being updated, but is important for its historical data — specifically, the 1985 baseline data from which the federal energy goals are to be measured. To meet federal reporting requirements, the ECS was created to measure energy dollars and use (e.g., 500 kilowatt-hours (kWh)) by individual facility. Energy managers recorded each energy invoice for electricity, natural gas, fuel oil, liquid propane gas, coal, and steam. After recording the data, energy managers sent the completed forms to a central processing center where clerks entered the data into the ECS. The ECS became inactive in 1992, when a restructuring deleted the data entry clerk positions.

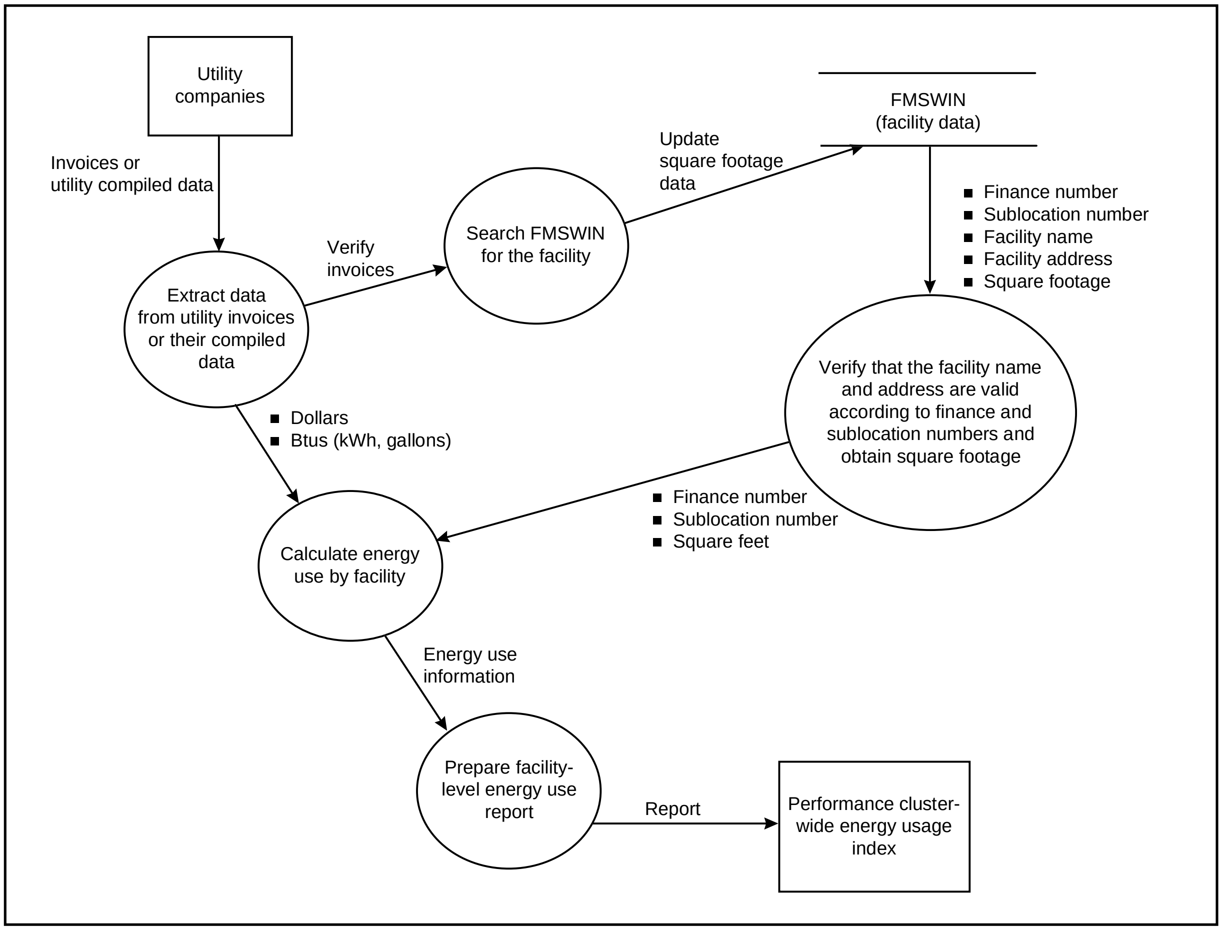
A postal energy management team worked closely with the St. Louis Information Systems Group to ensure that the 1985 ECS data was accurate and available. That 1985 data forms the baseline from which to measure conservation performance to the years 2000 and 2005. That 1985 data is available by facility. ECS data for later years is not available. Databases for the ECS are maintained under the St. Louis production section in the following tables: MTHLY_CONSUMP_T and QTRLY_CONSUMP_T. Data for 1985 can be displayed using the program titled ECSM.

5-2.6 Utility Companies

Many utility companies keep detailed data about their customers. Often they will provide their customers with historical energy-use and cost information about particular facilities, typically without charge. Although some utilities may want to install submeters to monitor portions of a facility, they are usually not cost-effective.

Exhibit 5-2.6 illustrates the general process of normalizing facility-level energy-use and cost data using data from utility companies. First, obtain from utility companies the energy data by facility for the required time periods. Then divide the square foot data available in FMSWIN for each facility. This requires verifying addresses in the billing address from the utility companies with addresses in FMSWIN.

Exhibit 5-2.6, Manual Energy Data Reconciliation at Facility



5-3 Data Integrity

Keep in mind that the data in the systems described above is not always completely accurate. The best persons to detect and correct inaccuracies are those who use the data. If something looks wrong, refer to Exhibit 5-3 for common data problems and their solutions. For example, if the Btus per square foot are much higher or lower than other facilities, check for errors in either the energy-use or square foot data. Before assuming that a facility is a good candidate for energy savings, double check the data and calculations.

Exhibit 5-3, Quality Assurance of Facility and Cost Data

Problem	Cause and Solution
Inaccurate square feet.	Building expansions are not recorded in FMSWIN. Loading dock footage is included. Contact the manager of Administrative Support and request the change.
Utilities billed to wrong finance number.	Small office may be charging to a larger office. Contact local field Finance to correct billing finance numbers.
P&DC* cost per square foot is zero (or extremely low).	P&DC is charging its utility cost to the old customer service finance number. Contact local field Finance to correct billing finance numbers.
Customer service per square foot is extremely high.	P&DC is charging its utility cost to the old customer service finance number. Contact local field Finance to correct billing finance numbers.

*P&DC = processing and distribution center.

5-4 The New Energy Reporting

In the fall of 1995, EMP became responsible for the Postal Service energy program. An energy task group was formed in which facility and environmental personnel could formulate, among other things, reporting requirements. In February 1996, the energy reporting subgroup devised a plan to provide energy information to the energy managers as well as to meet the federal requirements regarding energy reporting. The plan consists of a three-phase approach to most quickly provide energy consumption information to the field on the environmental internal web site. The system that was developed in 1997 is the ECTT, as explained in 5-2.1. As utility deregulation and technology advances continue, the process of gathering and managing energy consumption data will change.

In contrast to the labor-intensive process flow of the old ECS, which is pictured in Exhibit 5-4a, the new ECTT approach uses existing facility (FMSWIN) and financial (PSFR) information to calculate dollars per square foot and then Btus per square foot (based on estimated energy costs) to the finance number level (see Exhibit 5-4b). Because the financial data is tracked only to the finance number, detailed information at the facility level cannot be calculated at this time. In Phase I, Btu per square foot calculations were derived using national average costs for the main energy types from the Energy Information Agency (EIA). Exhibit 5-4b illustrates the process of combining data from three independent sources. The results are posted in the ECTT on the environmental web site.

Exhibit 5-4a, The Old Way: Reporting Energy Use With the Energy Consumption System

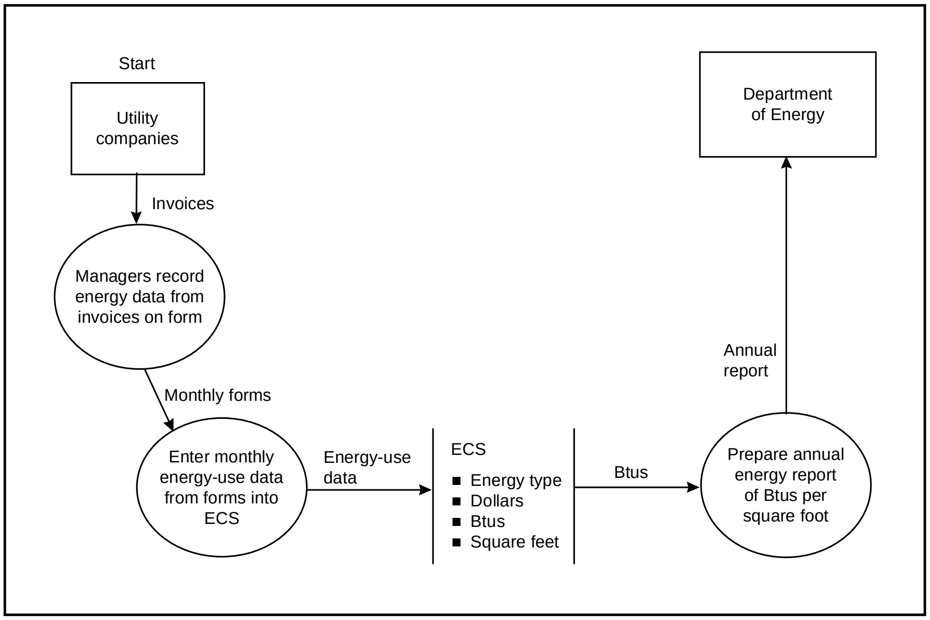
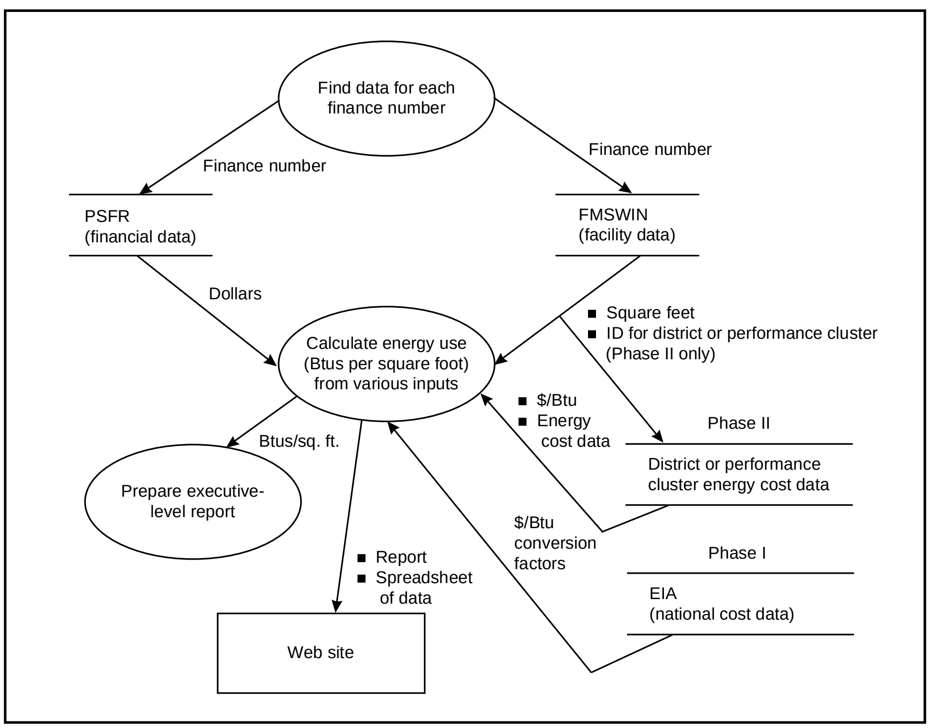


Exhibit 5-4b, The New ECTT Approach: Reporting Energy Use on the Energy Web Page



Phase II replaces the EIA national energy cost figures with more accurate local- or district-level energy cost data. This data is being collected from AECCs and DECCs, who can fill out a feedback page that is part of the ECTT. Also, the Postal Service is performing a national energy survey of facilities that have between 5,000 and 50,000 square feet, which will provide actual utility rates for them. Facility managers should be aware that these management tools are in a state of flux and are being monitored by the national EPC. This phase will provide more accurate information to the users.

Phase III of this approach captures actual quantities and units of the fuel types for which the Postal Service is billed by asking utility companies to send the invoices electronically. This probably will only be possible with some utility companies, but that number is expected to grow with the increasing use of electronic data interchange (EDI).

5-5 Trend Analysis

Trend analysis is a useful tool for energy managers. Trend analysis is a quick means of determining historical performance, current status, and forecasts of future performance. Proper analysis of the key variables that affect consumption patterns can yield insight into the situation, leading to actions to meet energy managers' goals. By utilizing trend analysis, energy managers can identify energy conservation opportunities at their facilities and can take proactive measures to methodically implement a productive conservation program while minimizing disruptions.

The accuracy of trend analysis hinges on making the correct assumptions, which are relevant, realistic, and supported by the facts. The use of flawed assumptions and/or erroneous data will result in a faulty trend analysis. However, a well-designed analysis can overcome these problems.

5-5.1 Steps for Trend Analysis

There are many ways to conduct a trend analysis. The following seven-step approach is recommended. Please note that these steps are only guidelines and should not be considered rigid rules:

- *Step 1.* Identify the energy conservation decisions that need to be made or issues to be analyzed.
- *Step 2.* List the information required to make those decisions and/or analyses.
- *Step 3*. Collect all the necessary information. Collecting information takes time and effort, so be sure to collect only the information necessary to make the decision(s) identified. Apply the “suffice” principle — use the minimum

effort and information that is needed, or sufficient, to conduct a meaningful analysis and make a decision.

- *Step 4.* Compare the information items listed in step (2) with those inventoried in step (3). If more information is required, repeat step (3); otherwise, continue to step (5).
- *Step 5.* Plot the data using line graphs, bar charts, area graphs, or pie charts. Determine whether more statistical analysis is needed to answer the questions in step (1). Even though the use of statistics (e.g., regression lines, distribution curves, or correlation coefficients) is a powerful tool for trend analysis, it is sometimes unnecessary.
- *Step 6.* Look for any change in energy consumption patterns. Determine why these changes or patterns occurred. Compare with other facilities of similar size and functionality.

  If a particular data element needs to be scrutinized further, decomposition analysis may be appropriate. Decomposition analysis simply means breaking down a data point into the supporting subelements that determine the outcome. This analysis can be repeated until the most basic elements have been thoroughly analyzed. For example, the facility may experience a gradual increase in total electricity consumption even though active energy savings projects are in place. Decomposition analysis may reveal that the increase in energy use is a result of increased numbers and/or use of computers and new equipment at the facility.
- *Step 7.* List the energy conservation opportunities identified in the trend analysis and:
  - Evaluate the energy conservation opportunities; relate them to current energy policies and goals.
  - Determine the facility's strengths and weaknesses in managing the energy program.
  - Develop an action plan to resolve the energy-use inefficiencies. This plan should exploit energy program resources.
  - Determine whether implementation of the action plan will address the goals of the national energy program (e.g., meeting the EPACT goal of 20 percent energy reduction by the year 2000 from the 1985 baseline).

5-5.2 Tools for Trend Analysis

Many mathematical methods can be used to perform trend analysis. Detailed instructions for using those methods are beyond the scope of this handbook. Seminars, courses, and reference materials are available to help energy managers to understand the key concepts. Exhibit 5-5.2 lists several common trend analysis techniques.

Exhibit 5-5.2, Forecasting Techniques for Trend Analysis

Technique	Description
Regression	Variations in dependent variables are explained by variations in the independent variable.
Time series	Linear, exponential, S-curve, or other types of projections are used.
Trend extrapolation	Forecasts are obtained by linear or exponential smoothing or the averaging of actual past values.

Source:, John A. Pearce and Richard B. Robinson, Jr., *Strategic Management,* Irwin, Homewood, Illinois, 1988, p. 183.

5-5.3 Illustration of Trend Analysis

Let us assume that the “Bigwatt P&DC” energy manager looked at the ECTT on the IntraNet, but decided that, since the P&DC is one of two buildings within one finance number listed in the ECTT, he wanted to analyze the situation in more detail. He decided to use the utility billing data, which is readily available from 1993 to the present, for the P&DC building to look at the trends in its energy consumption. To illustrate how to conduct a trend analysis using the seven-step approach discussed earlier, the following example of fictional Bigwatt P&DC is used:

Note

Energy managers should keep in mind that the most recent data is the most important in understanding energy consumption behavior and in developing projects.

- *Step 1.* What are the decisions to be made or issues to be analyzed?

  Is Bigwatt P&DC meeting the Postal Service energy reduction goals? **Note:** Bigwatt P&DC uses electricity and fuel oil for its facility’s energy needs.

- *Step 2.* What information is needed for the analysis?
  - Total facility energy consumption data from FY85 (baseline) and as much historical data as is available (including electricity and fuel oil consumption) are needed. Energy consumption data must be converted from kWh and gallons to thousands of Btus (mBtus).
  - Square foot data is needed because Postal Service energy goals are expressed in Btus per square foot.

The Postal Service's major energy reduction goal is to achieve a 20 percent reduction in energy consumption between FY85 and FY00.

- *Step 3.* What information is available now and where can it be obtained?
  - Electricity consumption data can be obtained from utility bills, invoices, and metered data (also see section 5-2).
  - Utility companies can also provide the data; some will provide it in electronic format. However, the utility's billing information will have to be matched with Postal Service finance number data to arrive at the dollars per square foot and Btus per square foot metrics.
  - Total building square footage data is available from FMSWIN.
  - The FY85 baseline data by facility can be obtained from the old ECS system (see 5-2.5), if it is not available in local records. Although the ECTT web page is generally easier to access and does have FY85 baseline data, it only goes down to the finance number level, and for this example, the facility (specifically, the P&DC building) data is needed.
- *Step 4.* Is the information appropriate and adequate?

  Yes. The energy manager at Bigwatt P&DC decides to use hard copy billing data for the years 1993 and forward, plus the FMSWIN data for square footage. Exhibit 5-5.3a shows how the consumption data from the utility bills was converted to mBtus per square foot. With this data, further decomposition analysis can be performed to determine why changes in energy consumption patterns occur. However, recalling the "suffice" principle, determine only whether or not Bigwatt P&DC is meeting the Postal Service's goal and, therefore, whether or not the information level is adequate.
- *Step 5.* How should the data be plotted?

  Before plotting data, some additional calculations are useful in order to show the trend in energy consumption relative to the federal goal of a 20 percent reduction from FY85 to FY00:
  - Goal (Btus per square foot): For 1985, the goal is the actual FY85 value. Each succeeding year's goal is calculated as follows:

    (Previous year's goal) $-$ (0.2 $\div$ 15)(FY85 value)

Exhibit 5-5.3a, Converting Energy Consumption Data to Btus per Square Foot

(1) Bigwatt P&DC Energy Consumption by Fuel Type

Fiscal Year	Electricity (kWh)	Fuel Oil (Gallons)
1985 (Baseline)	17,000,000	16,233
1993	16,101,000	12,317
1994	15,558,617	13,716
1995	14,198,417	12,695
1996	14,826,495	14,615
1997	15,117,819	15,025

Use energy conversion factors (see Appendix C).

(2) Bigwatt P&DC Total Energy Consumption

Fiscal Year	Electricity (mBtu)	Fuel Oil (mBtu)	Total (mBtu)
1985 (Baseline)	58,004,000	2,251,363	60,255,363
1993	54,936,612	1,708,251	56,644,863
1994	53,086,001	1,902,279	54,988,280
1995	48,444,999	1,760,676	50,205,674
1996	50,588,001	2,026,961	52,614,962
1997	51,581,998	2,083,824	53,665,823

Normalize by dividing by square feet and by converting mBtu to Btu (dividing by 1,000).

(3) Bigwatt P&DC Total Building Square Feet and Fuel Type Consumption on a Square Foot Basis

Fiscal Year	Square Feet	Electricity (Btus per Square Foot)	Fuel Oil (Btus per Square Foot)	Total (Btus per Square Foot)
1985 (Baseline)	500,000	116,008	4,502	120,511
1993	500,000	109,873	3,416	113,290
1994	500,000	106,172	3,804	109,977
1995	500,000	96,890	3,521	100,411
1996	500,000	101,176	4,053	105,230
1997	500,000	103,164	4,167	107,332

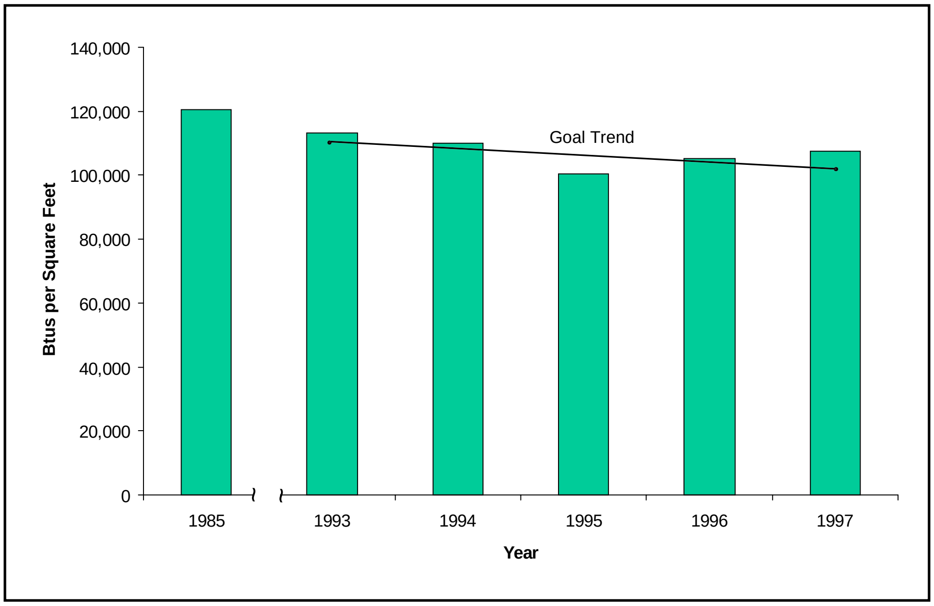
- Percent progress: This number is calculated by subtracting the actual total values (Btus per square foot) from the goal value and dividing that result by the goal value. Note that a positive number is a good result, and the goal by FY00 is to reach 20 percent or more.

Exhibits 5-5.3b and 5-5.3c illustrate ways to plot the data in Exhibit 5-5.3a.

Exhibit 5-5.3b, Bigwatt P&DC Progress Toward Goal

Fiscal Year	Actual Total (Btus per Square Foot)	Goal (Btus per Square Foot)	Total Percent Progress
1985 (Baseline)	120,511	120,511	0
1993	113,290	107,656	-5
1994	109,977	106,049	-4
1995	100,411	104,443	4
1996	105,230	102,836	-2
1997	107,332	101,229	-6

Exhibit 5-5.3c, Bigwatt P&DC Energy Consumption



- *Step 6.* Where have energy-use patterns changed?

  Various statistical analyses can be performed using the preceding information to provide a more informed understanding of the energy consumption trends of the facility.

- *Step 7.* What are Bigwatt P&DC's energy conservation opportunities (ECOs) for improvement?

  The following ECOs should meet Postal Service energy goals and decrease Btu-per-square-foot consumption by FY00:

  - Investigate ways to switch to alternative (more efficient) fuel sources.

  - The facility currently is in an old building with poor insulation and inefficient heating and cooling systems. Install insulation to decrease heating and cooling loads. Also, replace outdated HVAC equipment with more energy-efficient systems.

After completing step (7), energy managers should have a better idea of where their energy program stands in terms of achieving Postal Service energy goals. In the case of Bigwatt P&DC, it is not on schedule to meet the goals. Its energy manager must intervene by taking actions to reverse the trend.

6 Conservation Planning and Savings

6-1 Planning

This chapter summarizes the actions that can be taken to reduce facility energy use and energy costs. Also discussed, in general terms, are the potential savings available from different types of energy reduction actions. Information about funding and budgeting is supplied.

One way to start planning an energy program is to estimate the facility's reasonable potential for energy savings and to set goals consistent with that potential. An energy audit is usually necessary for estimating energy savings potential. An awareness program is also necessary to help achieve significant savings. The facility must eventually go beyond no-cost and low-cost measures to achieve an ultimate energy reduction. As explained in section 6-5, sources of energy funding are available.

6-2 Ways to Increase Energy Efficiency

Note

An energy awareness program helps to ensure that existing energy systems are used to maximum efficiency.

Many ways exist to increase energy efficiency. Almost all efficiency measures can be classified into the following basic categories:

- Awareness — the education of energy users about no-cost and low-cost ways to reduce energy use.
- Maintenance — ways to ensure peak performance from existing systems and continued high performance from new systems.
- Retrofit — technological improvements to existing buildings and equipment.
- Replacement — purchase of high-efficiency equipment when existing equipment wears out. In fact, inefficient equipment should be replaced before its scheduled replacement time if economical to do so.
- New construction — offers an unparalleled opportunity both to install new HVAC, lighting, and energy control equipment and to build in higher value insulation, high-efficiency windows, and even energy saving design considerations such as building placement and window positioning. Postal Service design guidelines address most of these issues.

Recommended No-Cost and Low-Cost Energy Projects

Immediate payback:

- **Seal off unused areas.**
- **Caulk and weather-strip areas of air infiltration.**
- **Add insulating material to unused windows.**
- **Restrict thermo-stat control changes.**
- **Turn off lights in vacated areas.**
- **Improve portable heater usage.**
- **Reduce number of lamps in indi-vidual fluorescent lighting fixtures.**
- **Install energy-efficient lamps.**
- **Clean, remove, or replace diffusers in lighting fix-tures.**
- **Post energy-efficiency re-minder signs.**
- **Reduce hot water temperature.**
- **Reset time clocks on outdoor light-ing to reflect the extended day-light.**
- **Turn off heating or cooling one-half to one hour before closing.**

In addition to those efficiency measures, facilities can look into other ways to reduce their utility bills. These methods can reduce costs (but not Btus per square foot):

- Load shifting of electrical loads away from peak demand periods saves money when the local utility imposes "demand charges," both in total kWh used and the highest kilowatt (kW) demand over a certain period. This method of cost reduction may have limited use in large postal facilities.
- Spot purchases of natural gas from gas marketers tend to be cheaper; however, it is less reliable than purchases from local utilities. This method of conservation may have limited use in large postal facilities. The environmental IntraNet web site provides detailed information and a boilerplate statement of work (SOW) for purchasing gas on the spot market.

To carry out any of the above measures, the following are essential:

- Information — Energy managers, energy users, and maintenance staff members need information on the latest energy saving technologies.
- Audits — Energy managers or contracted professional energy consultants need to determine the energy saving technologies that are applicable and where to apply them.
- Financing — Internal Postal Service financing can be provided through the environmental energy budget fund or through the repair and alteration budget. External funding sources include SES programs or a utility DSM rebate or subsidy.
- Operations and maintenance — The equipment or materials need to be properly installed and maintained to ensure that they operate at maximum efficiencies.

6-3 Ingredients of an Energy Conservation Program

The major ingredients of an energy conservation program are energy awareness and no-cost, low-cost, moderate-cost, and high-cost projects. High-cost projects can include investment programs such as the SES, DSM, and O&M programs.

An energy awareness program can help to ensure that existing energy systems are used to maximum efficiency. Potential savings from an awareness program depend on the facility's current level of efficiency and the motivation of its personnel. An effective awareness program increases motivation and results in action. Energy awareness programs are discussed in Chapter 7.

A successful energy conservation program does not begin or end with merely closing a window or turning off a light. To be successful means to get involved and adopt an energy conservation attitude. This message needs to get across to everyone, and everyone needs to be involved. One way to do this is to have employees act as energy monitors for specific operations. Rotate energy monitors every couple of weeks to keep everyone involved. This makes people realize that they are important and that what they think and do affects energy. Other ways to relay the message to employees are through stand-up talks, posters, stickers, and, more importantly, through actions. Energy managers can set the example through their own actions.

Although most conservation methods require financing, available cost-effective technologies range from no-cost or low-cost to high-cost. For example, a small post office retrofit program could include no-cost or low-cost methods such as programs to turn off lights when work areas are not in use and to install compact fluorescent lights, water heater insulation, and minor weatherization. Moderate-cost programs could include attic insulation, air infiltration reduction, and lighting retrofits. The most costly measures include complete weatherization or installation of high-efficiency HVAC equipment.

The implementation of no-, low-, and moderate-cost measures results in greater savings than can be achieved with information campaigns or audits alone. Thus, an awareness program must be accompanied by retrofits to yield substantial savings.

Awareness programs and minor retrofit programs will enable energy managers to build momentum and accumulate dollar savings. Those projects will accelerate the rate of energy savings, having built upon the solid foundation laid by previous efforts. In addition to laying the essential groundwork for major conservation projects, awareness programs encourage energy users and maintenance staff to use new equipment in ways that keep equipment performing at peak efficiency throughout its useful life.

To ultimately attain postal conservation goals, several more-expensive projects are needed to reach a facility's full energy saving potential. Most of the high-cost projects are associated with large postal facilities. Several financing sources are available. The financial aspects are discussed later in this chapter. Generally, the more resources devoted to energy efficiency, the greater the savings. Information-only programs generally achieve energy savings of 2 percent or less. When an energy audit is performed at a facility, the discretionary savings due to increased awareness, without modifying the existing systems, are estimated to be between 3 to 5 percent.

Recommended No-Cost and Low-Cost Energy Projects

Immediate payback (continued):

- **Install wall and window air-conditioner covers.**
- **Put clean filters in all heating and air-conditioning units.**
- **Replace washers in leaky faucets.**

Payback within 3 months:

- **Disconnect non-electronic ballasts from fixtures from which lamps have been removed.**
- **Reduce outside air intake.**
- **Install a water heater jacket.**
- **Install flow restrictors on all faucets, showers, etc.**

Payback within 6 months:

- **Install setback thermostats.**
- **Install plastic strip curtain at loading and unloading doors.**
- **Install lighting timers or photocells on security or night lighting systems.**
- **Insulate hot water pipes.**

Recommended No-Cost and Low-Cost Energy Projects

Payback within 1 year:

- **Properly locate and calibrate thermostats.**
- **Incorporate task lighting.**
- **Install energy-efficient electronic ballasts in fluorescent fixtures.**
- **Install dimmers or voltage-reduction devices where possible.**
- **Install motion sensors in sporadically used areas such as copying rooms, conference rooms, and bathrooms.**
- **Install aerated faucets.**
- **Install sensor faucets.**

Payback within 1 or 2 years:

- **Install automatic door operators on external doors.**
- **Apply a light finish to interior surfaces.**

6-4 Best Energy Saving Targets

Estimates of potential *cost-effective* energy savings vary.[1] In addition, the range and variety of energy conservation technologies can seem overwhelming. Nevertheless, energy efficiency experts, including those at the Electric Power Research Institute, Lawrence Berkeley Laboratory, and the Rocky Mountain Institute, have reached consensus on some of the most promising areas for energy savings.

Electricity, which constitutes over 60 percent of total postal facility energy use, offers one of the most tempting targets for increased efficiency. For the Postal Service in general, the biggest potential electricity savings are concentrated in the following areas: lighting, compressed air systems, heating systems, space cooling, ventilation and air handling, motors, and windows.

6-4.1 Savings Projections

Experience has shown a marked tendency for actual savings of energy conservation projects to fall below prior engineering estimates. The reasons for the discrepancies vary. Projected dollar savings should be viewed as potential cost avoidance rather than as actual savings. Utility rate increases will magnify the benefits of energy saving projects.

6-4.2 Lighting Savings

About 25 percent of all U.S. electricity is used for lighting; light fixtures use 20 percent directly, while cooling equipment uses another 5 percent to counteract unwanted heat produced by the lighting. In postal facilities, lighting can account for 30 to 40 percent of the electricity used. According to recent estimates, efficient lighting hardware and lamps are now available that can save from 55 to 90 percent of that electricity.[2] Those devices produce the same amount of light as older systems while using less power. They can also provide less glare, less noise, and more pleasant color. Such improvements provide additional benefits in the form of improved quality of life and higher productivity. Lighting retrofits and replacements offer a good return on investment and therefore are considered the best opportunity for energy conservation. For example, exit signs with incandescent lamps can be replaced by LED exit signs that use 95 percent less energy.

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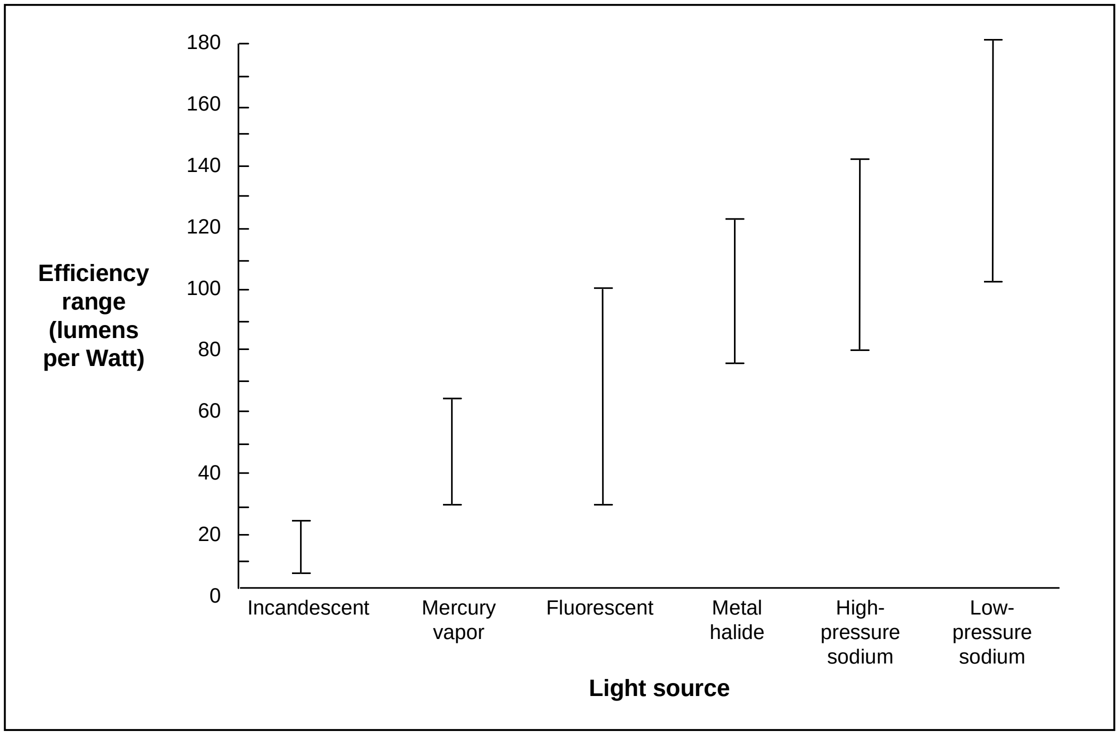
[1] P. Komor and A. Moyad, “How Large Is the Cost-Effective Potential in U.S. Buildings?” *Proceedings: ACEEE Summer Study on Energy Efficiency in Buildings,* Vol. 6, August 1992, pp. 125–134.

[2] A.P. Fickett, C.W. Gellings, and A.P. Lovins, “Efficient Use of Electricity,” *Scientific American,* September 1990, p. 30.

Exhibit 6-4.2a summarizes the efficiency ranges of various light sources, and Exhibit 6-4.2b shows how to move fluorescent lighting from the middle of the efficiency range to the high end. Additional lighting improvements include “daylighting” sensors that adjust lamp output in synchronization with daylight conditions and “occupancy” sensors that automatically turn off lights when rooms are vacated. However, each facility must be examined on a case-by-case basis to determine the appropriateness of these applications. When retrofitting existing lighting fixtures, the proposed lighting levels must meet the requirements of the planned occupants and other special situations such as security.

Exhibit 6-4.2a, Efficiency Ranges for Different Types of Light Sources

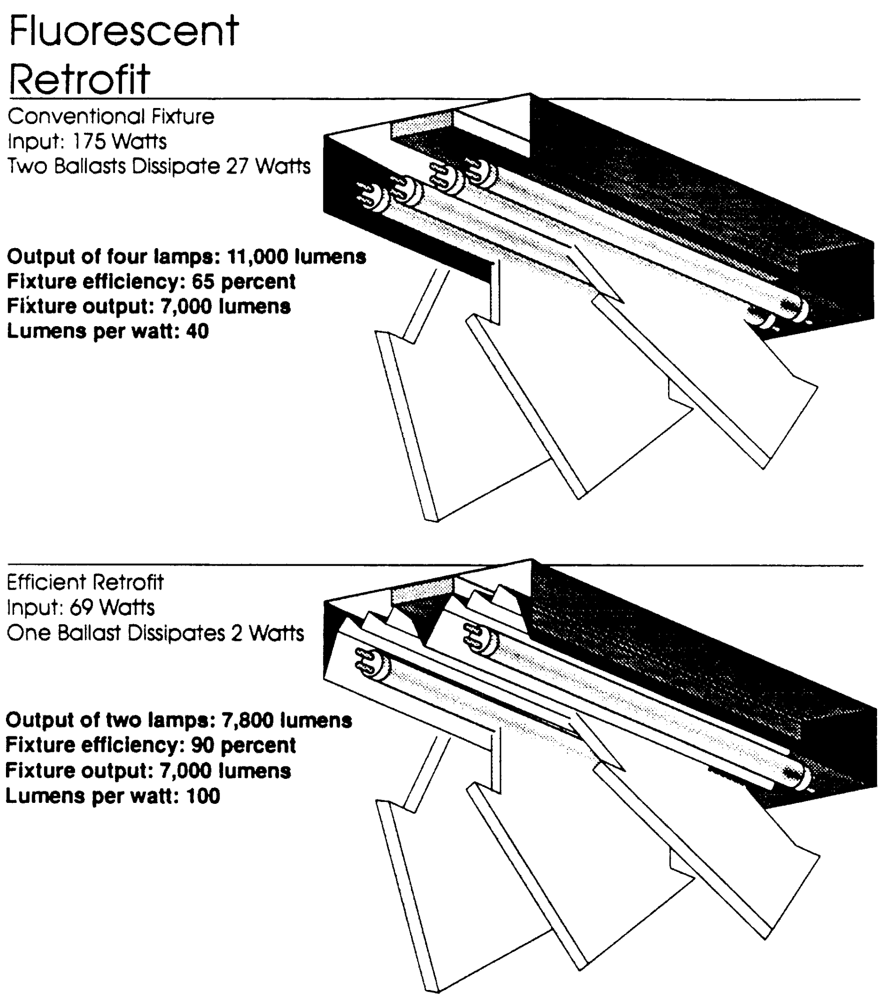


Sources: A. Thumann, *Plant Engineers and Managers Guide to Energy Conservation, Fifth Edition,* Liburn, GA, The Fairmont Press, 1991, p. 96.

Energy Efficient Lighting, Defense General Supply Center, May 1992, p. 72.

The following examples discuss in more detail how small- and medium-sized post offices can conserve energy in their light fixtures. Over the years, lights are installed in buildings and, unless the lamps burn out, little or no attention is paid to them. Lamps become less efficient with each day of operation. A postmaster or manager can do several things to increase the efficiency of lamps and light fixtures and reduce operating costs.

Exhibit 6-4.2b, Potential Savings From Fluorescent Lighting Retrofit



Source: A.P. Fickett, *et al.,* op. cit., p. 31.

Incandescent Lamps

Replace incandescent lamps. This does not require replacing the whole fixture. Low-wattage, screw-in, fluorescent lamps can replace incandescent lamps without changing the fixtures. Purchase such lamps from a local hardware store at low cost.

Fluorescent Light Fixtures

Periodically dust and clean fluorescent light fixtures. Most small- and medium-size post offices employ fluorescent lights throughout the workfloor and office spaces. Dust can act as an insulator and reduce a fixture's ability to dissipate heat, cutting down on the life of the fixture. Dust covering the lamps also reduces the amount of light that the lamp gives off. Simply dusting and cleaning these fixtures will increase their efficiency.

Ballasts

Ensure that the mechanical ballasts have been disconnected on fluorescent light fixtures from which some lamps have been removed or replace the ballasts with electronic ones. Early in the energy program, in an effort to conserve energy, post offices removed some lamps from many fixtures (called "delamping"). However, at the time those lamps were removed, the internal ballast was still connected. Those ballasts that are not electronic continue to use power even without lamps to start them. Disconnect nonelectronic ballasts or replace them with electronic ones that shut off when not engaged.

Switches and Circuit Breakers

Make sure that workers turn off the lights in an area whenever they have completed an operation or task. It is not necessary to leave fixtures burning in an area when operations in that area are completed for the day. Offices with localized switching should use it. If localized switching is not available, shut off the lights from the circuit breaker panel. Those circuit breakers, although available to shut off electricity in an emergency, can also be used as switches. It will not harm them to be used as switches. In fact, using the breakers "exercises" them and ensures that they do not become stuck because of heat, dirt, or old age.

Exterior Lighting and Time Clocks

Use high-intensity discharge (HID) lighting such as high-pressure sodium lamps and automatic switching for exterior lights. Replace all exterior incandescent lamps with high-pressure sodium or metal halide lamps. Most facilities use a time clock to turn those lights on and off. Usually, the lights are set to come on at sunset and then go off about an hour after sunrise. The biggest saving here comes from resetting the time clock to adjust for daylight savings time and the changes during the year in times of sunsets and sunrises. Consider installing a photocell to do this automatically.

6-4.3 Compressed Air Systems

Most large postal facilities use compressed air systems for automation, mechanization, building HVAC controls, and equipment maintenance. Compressing air uses more energy than many other types of electrically driven mechanical systems. Air leaks in the compressed air delivery system are a major source of wasted energy. Correcting such leaks provides a tremendous no-cost or low-cost opportunity because most air leaks can be repaired with local maintenance support.

6-4.4 Heating Systems

The heating system in a typical post office consists of many components, not just the furnace in the boiler room. Thermostats, filters, pumps, and radiators are all parts of the system. Each part contributes in some way to the efficiency and life of the system. The postmaster, facility manager, or designee should check that all parts are in good working order and have PM performed before its seasonal use to identify any potential system deficiencies.

Furnace and Boiler

Clean the furnace periodically. No matter what type of system is used, they all get dirty to some degree and they all need to be cleaned. Clean both the exterior of the furnace and boiler and, more importantly, the internal parts of the system where the heat exchange takes place. If the facility uses oil as the main fuel, a contract probably exists between the Postal Service and the oil company that delivers the fuel. Usually, this contract includes cleaning the furnace and boiler. The postmaster or manager should set up an appointment with the existing contractor or a local service contractor to have the system cleaned at least once a year.

When the service contractor has the equipment apart and ready to clean, this provides an opportunity to see the condition of the interior surfaces before it is cleaned and ensure that the service contractor did a thorough job opening the furnace or boiler. If an excess of soot and ash is built up inside the system, it may indicate that the burner is not adjusted properly. It may be time to have the service contractor do a combustion analysis on the system and readjust, or tune, the burner for more complete combustion. A buildup of soot can also mean that the system does not have enough air available to support good combustion. If the louvers on the fresh air grates are clogged with leaves, dirt, or paper, the service contractor should clear the louvers.

Filters

Clean and replace filters periodically. Filters exist in various places on heating systems. They include oil filters, air filters, and even a filter on a gas line (strainer). Filters remove dirt and minute particles from air, oil, water, or gas and can become clogged. The manufacturer usually recommends filter cleaning and replacement intervals in the equipment literature. If the literature is unavailable, simply check the filters occasionally for dirt buildup to determine if they need to be replaced.

Oil filters and gas strainers should be checked by the service contractor once a year and be cleaned or replaced. Air filters probably have to be replaced or cleaned more often and usually can be done in a few minutes by the postmaster, manager, or designee.

Thermostats and Setpoints

Use good judgment to set the thermostat; vary the setting to meet current conditions. A thermostat is nothing more than a switch. It turns the furnace or boiler on and off depending on how high or low it is set. Obviously, the longer a heating system runs, the more energy it uses and the more it costs to operate. The objective is to make the system run as little as possible without sacrificing customer comfort or worker productivity. Since the thermostat setting determines how long a system runs, the closer a thermostat is set to the outside temperature, the less time it stays on. Although there is no federal guideline for thermostat settings, it is recommended that they be set at 65 degrees Fahrenheit (°F) in the winter and 78°F in the summer.

However, the comfort level inside a space is affected by many things, including activity in the space, sunlight, ceiling height, and lights. All these factors should be considered when setting the thermostat. An area with a lot of activity and sun coming through the windows may seem quite comfortable at 65 degrees. But the setpoint may have to be raised a little to make the area comfortable when the sun is not shining. Use good judgment and remain aware that the thermostat is an energy management tool.

Of course, whenever an area is not in use or is seldom used, the thermostat should be adjusted to conserve energy. Programmable thermostats can do this automatically. They have up to eight setpoints for different temperatures at different times of the workday and weekends. Programmable thermostats are relatively inexpensive and have become easier to install and to program.

Radiators and Convectors

Clean radiators or convectors and keep them clear of obstructions. Heating systems work because they send heat to an area through a medium — water, air, or steam — and transfer that heat to the space by means of radiation or convection. Most small- and medium-sized post offices use steam radiators or hot water convectors. In order for these to work efficiently, it is very important that they remain clean and free of obstructions. Radiators should not have equipment stacked in front of them or items stuffed behind them. Also, areas that are never, or seldom, used can have their radiator valves closed so that those spaces are not being heated.

Special radiator brushes are available that are long and slender and slip between the sections of a radiator to remove dust and dirt. Hot water convectors are usually covered to protect the aluminum fins that surround the pipe. Those fins collect dust and dirt and should be cleaned at least once a year. Additionally, the covers have slits in them to allow air to pass through; those slits also collect dirt and dust and need to be cleaned.

6-4.5 Space Cooling Savings

Systematic efficiency improvements to existing cooling systems can reduce building energy use. Exhibit 6-4.5 lists the most effective efficiency improvement retrofits. A side benefit of increased cooling efficiency is a reduction in peak load and thus lower demand charges. The greatest potential savings come from properly sized, high-efficiency water pumps and fans. In particular, fans and fan motors in air handling systems are often oversized. Leaky ducts, dirty filters, stuck dampers, and poorly operating controls also reduce fan efficiency. Today, some modern high-efficiency compressors use 30 percent less energy than conventional compressors. Another approach to reducing cooling costs is to reduce cooling load. Cost-effective methods include modern glazing and window films that reduce solar heat gain inside the building. Efficient lighting also reduces cooling load.

Some small- to medium-sized postal facilities do not have central air-conditioning. Those facilities usually have one or more medium to large window or wall-mounted air-conditioning units. Even though those units are generally reliable and little is needed to keep them running, several checks are still needed to keep them running efficiently.

Filters

Clean air-conditioner filters periodically. Even the smallest window unit uses some kind of air filter to clean the air while the unit is running. That filter keeps dirt and dust from entering the unit and causing problems. Cleaning the filter is easy. Usually removing the front plastic grill makes the filter accessible. Clean the filter by vacuuming or brushing lightly with a brush. Keeping this filter clean also ensures proper airflow through the machine.

Exhibit 6-4.5, Methods for Increasing Efficiency of Mechanical Cooling Equipment

Circulating Loops	Equipment	Efficiency Strategies
Ambient air	■ Cooling tower fan ■ Cooling tower	■ Improve fan efficiency; install adjustable-speed drive; enlarge air passages to reduce resistance. ■ Increase tower surface area.
Condenser water	■ Condenser pump ■ Condenser	■ Improve pump sizing, efficiency, and control; enlarge pipes to lower friction. ■ Increase condenser surface area.
Refrigerant	■ Compressor ■ Evaporator	■ Improve compressor sizing, efficiency, and control; enlarge refrigerant ducts to lower friction. ■ Increase evaporator surface area.
Chilled water	■ Chilled water pump ■ Chilled water coil	■ Improve pump sizing, efficiency, and control; enlarge pipes to lower friction. ■ Increase cooling coil surface area; widen coil to lower air velocity.
Room air	■ Supply air fan	■ Improve fan efficiency and control; enlarge ducts to lower friction; improve temperature and humidity control.

Source: R.C. Bishop and D. J. Houghton, “Saving Commercial HVAC Energy by the Ton,” *Proceedings: ACEEE Summer Study on Energy Efficiency in Buildings,* Vol. 1, August 1992, p. 3.

Condenser and Evaporator Coils

Clean condenser and evaporator coils periodically. Those coils sit within the cabinet of the air-conditioner and are not readily accessible. However, if it is possible to reach them, the coils should be washed gently with hose water or brushed lightly to remove any dirt and dust that may have gotten into the cabinet. The coils have aluminum fins that are easily bent, so it is important to be extra careful when cleaning these.

Energy Saver Cycle

Use the air-conditioner’s energy saver cycle, if available. That cycle turns the fan off when the thermostat in the unit reaches its setpoint. In those units without an energy saver cycle, the compressor shuts off when a room is cooled, but the fan continues to run, wasting energy.

The Impact of Chlorofluorocarbon Phaseouts

The effort to eliminate another environmental hazard affects buildings that employ chlorofluorocarbons (CFCs) as refrigerants in their HVAC systems. Under an international agreement (known as the Montreal Protocol) to protect the Earth’s ozone layer, CFCs, which historically have been inexpensive and widely available, were not to be produced after December 31, 1995. Affected building owners and managers need to incorporate the CFC phaseout into their energy-efficiency improvement programs.

6-4.6 Ventilation and Air Handling

Ventilation systems more typically affect a building's energy consumption than any other system. Although they consume relatively little energy *directly* (primarily to drive ventilation fans and damper motors), the ventilation systems' interrelationships in large measure determine how much energy is needed to heat, cool, and humidify a building. Why? Because ventilation systems determine how much outside air must be brought into a building, and every cubic foot of outside air brought into a building must be conditioned. The more outside air is brought in, the more energy is used for heating, cooling, and humidifying the air and powering ventilation system fans. Consequently, the energy and dollar savings that can be obtained by implementing ventilation system energy-efficient opportunities can be substantial. The ventilation rate is usually regulated by local building codes, and any modification to a ventilation system must conform to those codes.

Proper maintenance should be done to ensure that:

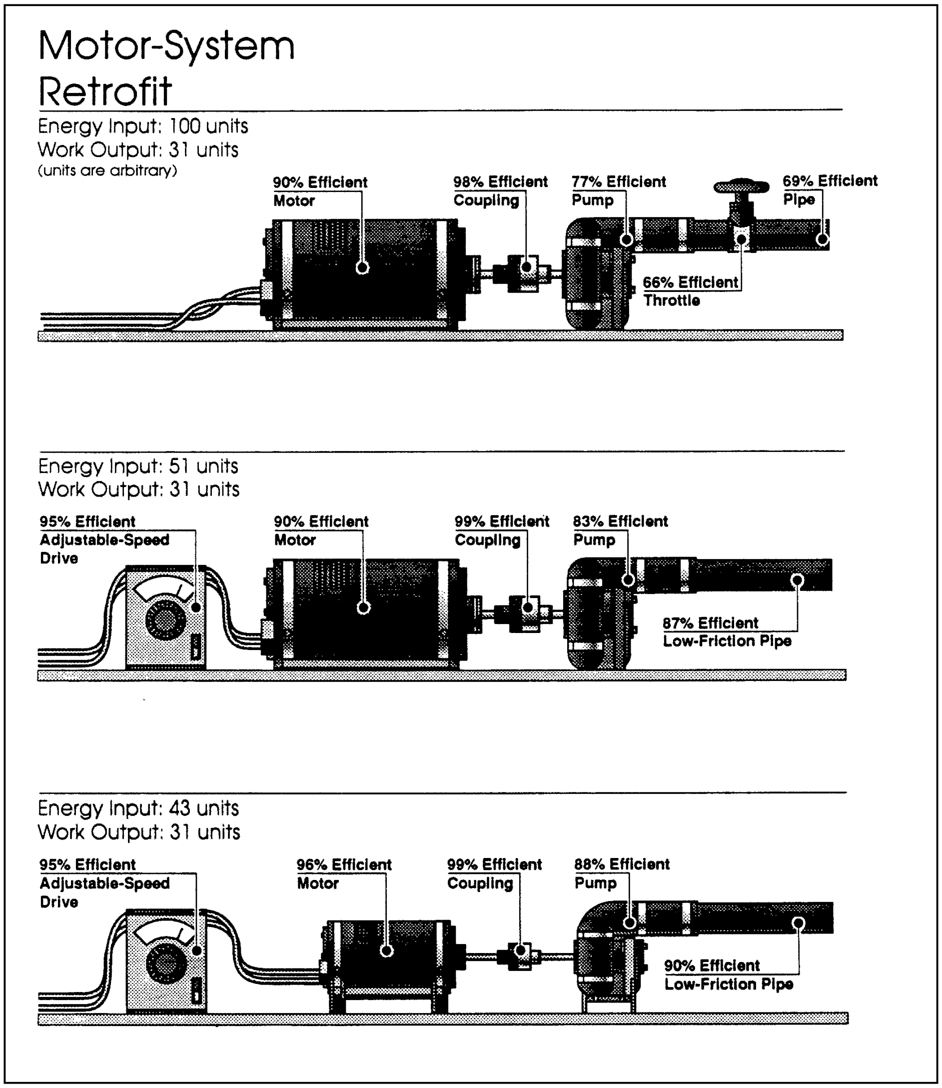
- Dampers are not stuck in one position.
- Air handling units (AHUs) do not leak excessively.
- Dampers are controllable and their opening and closing are properly calibrated.

Given the importance of the ventilation system and the need to comply with local codes and standards for ventilation and indoor air quality, it is a good idea to rely on a consulting engineer to identify appropriate ventilation system energy-efficiency opportunities for each building. The consultant will be familiar with local codes and can identify existing ventilation rates, analyze system operating practices, and determine if any of the problems listed above are occurring in the facility's system.

6-4.7 Motor Savings

Electric motors also offer savings opportunities. Motor system retrofits and replacements are highly cost-effective because the typical capital investment cost of an electric motor is only a few percent of its total life-cycle operating cost, most of which is annual electricity use. Modern electronic variable-speed drives and high-efficiency motors provide about half of the potential electric motor savings. The other half comes from improvements in the choice of motor, better maintenance, alignment, improved pumps, and other efficiency "tune-ups." Exhibit 6-4.7 illustrates possible energy savings that can be realized from the retrofit of a motor and pump system.

Exhibit 6-4.7, Potential Savings From Motor-System Retrofit



Source: A.P. Fickett, *et al.,* op. cit., p. 33.

6-4.8 Windows

The windows in any facility are a likely place for conditioned air (heating and cooling) to escape. Of course, whenever the heating or cooling system is on in a postal facility, the windows should be closed. Most facilities have storm windows fitted on the exterior of openable windows.

Storm Windows

Position storm windows according to the season. Storm windows usually consist of two storm windows and a screen. In the winter months, position the storm windows one up and one down. Doing this provides an extra barrier against the cold and wind. Internal windows should also be closed tightly and locked. The same is true for the summer months when using air-conditioning. Closing the windows in this fashion keeps the heat in during winter and the heat out during summer.

Weather-Stripping

Use weather-stripping to make old, worn windows tight again. Weather-stripping is foam rubber that comes in various widths and lengths and has a peel-and-stick side to keep it in place. This material seals up cracks between the sashes and along the sills of double-hung windows to seal against drafts. Weather-stripping is inexpensive and available at any hardware store.

Caulking

Caulk around the exterior of windows to protect against drafts and water damage. Caulking is a waterproof substance that has the texture of putty but feels like rubber when cured. Caulking is easy to apply and inexpensive.

Window Blinds

Control temperature using window blinds (or curtains). A simple no-cost method of controlling the temperature inside a space is to open the blinds on cold days when the sun is shining, especially on the south side of the building, to let the sun's rays heat the area. Doing this will cut down on the running time of the furnace, even if only a couple of minutes each day. During the summer months when air-conditioning is on, close the blinds to prevent the sun from heating the area. The air-conditioner should not have to work as hard, thus saving energy.

6-4.9 Other Energy Conservation Areas

Some other areas to consider for conserving energy in small- and medium-sized post offices are discussed in the following sections.

Dock Doors

Be sure dock doors are working properly and are closed all the way. Most importantly, make sure the proper door seal around the doors is in good shape.

Unused Areas

Turn off energy consuming equipment in unused areas. HVAC requirements may be able to be reduced in areas that are seldom used — that is, stockrooms, storerooms, or restrooms. Ensure that environmental conditions are comparable to the use of the room or materials or equipment in the area. Also, those areas are good candidates for motion detector switches, which sense motion and turn the lights on when someone enters and off when no activity is detected.

Ceiling Fans

Facilities with high ceilings may benefit from ceiling fans. Since heat rises, these fans help redistribute the heat back down in winter and dissipate it in the summer. Ceiling fans tend to create a more even temperature within a space.

“Whole House Fans” and Attic Fans

In small buildings, a whole house fan and/or attic fan may be worthwhile. Whole house fans draw air up from floor level and expel it from the building. While doing this, they create an airflow through the window screens. Sometimes, they are all that is needed to remove hot air and cool the building. Attic fans circulate air within the attic to reduce the thermal envelope surrounding the living space.

6-5 Budget and Fiscal Administration

EMP estimates and requests from Headquarters Finance annual budget requirements for capital and expense projects. Planned projects are determined in coordination with AECCs through input directly from the DECCs. EMP manages the fiscal year budget and provides energy-related funding to each area office at the beginning of each fiscal year based on the planned projects that are submitted. Disbursement of these funds to the districts is coordinated by the AECCs.

6-5.1 Capital Versus Expense Projects

Environmental Management Policy needs budget information related to the following:

- Expense projects — these include energy surveys (where not provided as a free service from a utility company), consulting fees, design fees, and certain allowable travel and training expenses related to energy conservation.

- Capital projects — these are repair and alteration replacement or retrofit projects where improved technologies are incorporated into energy consuming building systems, including all related design and support fees. These activities must be coordinated with the FSO and the CIC.

6-5.2 Project Authorizations and Program Activity Areas

Project Authorizations

Upon notice of approval from the AECC, district Administrative Support units generate Form 4209, *Project Authorization,* or Form 7381, *Requisition for Supplies, Services or Equipment,* as required, to cover appropriate expenses and capital projects. Energy program funding falls under the environmental budget for each area office. EMP transfers energy funds to the budget account (BA) finance number in each of the 10 area offices early in each fiscal year. These finance numbers are as follows:

- Allegheny Area 41-9905
- Great Lakes Area 16-9905
- Mid-Atlantic Area 51-9908
- Midwest Area 28-9905
- New York Metro Area 35-9905
- Northeast Area 08-9905
- Pacific Area 05-9909
- Southeast Area 47-9905
- Southwest Area 48-9906
- Western Area 07-9906

Funds are transferred on the basis of funds requested by each area and previous fiscal year energy activities within each area. Areas requesting, but not having used, funding will not receive the same consideration as areas with proven usage in prior years. In addition, an adjustment by Headquarters will recover unused energy funds at the end of accounting period 13.

To enter project information into FMSWIN, the BA finance number is that of the AECC, and “project type” is either 4C (Energy Investment — Capital) or 5C (Energy Investment — Expense).

Generally Acceptable Expenditures

The following are generally acceptable expenditures:

- Independent facility audits where free services are not provided by the serving utility company.
- Contingency funding for SES engineering studies or model energy facility engineering studies.
- Repair and alteration projects that meet Headquarters funding criteria.
- Supplies and services for field energy programs (if items meet AEPC approval criteria).
- Certain travel and training expenses for AECCs, DECCs, FECs, and members of the AEPCs and PCEPCs.

Prohibited Expenditures

The following are prohibited expenditures:

- Replacement materials for facilities already possessing upgraded and equal technologies.
- Non-energy-related activities and/or projects.
- Hazardous material transportation and disposal costs (e.g., lamps and ballasts) if not a part of an approved repair and alteration project.
- Penalties for poor power factor and high demand and other expense charges.
- Energy-efficient motor replacement on automation and mechanization if not approved and where replacement would void equipment warranties.
- Purchase of field energy monitoring equipment if not part of an approved energy project.
- Abatement and monitoring costs for asbestos-containing building materials (ACBMs) and lead-based paint (LBP) disturbed during the course of energy R&A projects.

6-5.3 SES Projects

SES projects do not fall under the same funding criteria as projects completed using Postal Service funding. All investigative, design, construction, and support funding is provided by the utility company or energy service company (ESCO). The cost of these services is reimbursed through long-term expense disbursements after completion of the construction phase. In short, the ESCO provides the energy

Note

SES contracting and DSM programs are sources of investment resources.

improvement and shares the savings with the Postal Service over a 3- to 5-year contract life. See Chapter 10 for details on this process.

It is, however, extremely important to include the local Finance unit in all SES discussions. Financial validation at both the local and area level is an integral part of all SES contracts. Initial stages of the SES contract require local generation of a Form 7381 for contingency funding. Form 7381 should reflect the area or performance cluster environmental finance number for that particular facility. Contingency funds are necessary for feasibility and design work if the project is canceled before the construction phase.

Payments for contract services are made from line 42 savings, account indicator code (AIC) 585, account 54156, for that particular facility's finance number.

7 Energy Awareness

7-1 Program Purpose

The purpose of an energy awareness program is to integrate energy conservation initiatives into the organization to maximize the use of postal resources concerning energy consuming equipment. That is, an awareness program attempts to alter the attitudes of energy users and, through those changed attitudes, to change their behavior as well. An effective program targets specific audiences, involves as many energy users as possible, is widely publicized, and makes energy saving actions and goals as concrete as possible. DECCs should brief their district managers, plant managers, and managers of Post Office Operations each quarter or whenever there is a major change in the energy program.

Note

An awareness program works through publicity and training and should be fun!

Awareness works through publicity and training. The program should be continuous — and fun. A good awareness program avoids a preachy, moralistic approach. Instead, it concentrates on reinforcing opinions that most energy users already hold — energy efficiency reduces pollution, dependence on oil imports, and costs. The program also adds information on exactly how to achieve those results. A subsidiary but important message is that energy efficiency does not mean doing without energy, it means achieving the same results using less. Energy users want bright, adequately heated and cooled spaces, but at less cost.

Thus awareness is an essential foundation for a facility's energy program. First, it helps to change attitudes, thus encouraging users to seek out ways to save energy. Second, this leads to behavioral changes, ensuring that energy users take energy saving actions and continue to use and maintain energy saving equipment after it has been installed. That is, energy awareness helps to increase the "persistence" of energy savings projects so that they continue to achieve savings year after year. Third, the initial savings from awareness can provide the "seed" money for higher-cost energy saving investments.

7-2 Awareness Basics

A good awareness program explains energy efficiency in simple terms, because a simple message competes more effectively with the multitude of other messages being broadcast to energy users. The awareness program should tell users what they can do and how to do it in the most direct way possible, without contradicting other messages about the Postal Service mission.

You Have the Power

Recycling one aluminum can saves enough energy to operate a personal computer for half a day.

In cooperation with DOE, in 1997 the Postal Service launched a program called “You Have the Power.” Using posters, advertisements, and public service announcements, the campaign stresses the importance of each individual in conserving energy, resulting in a cleaner environment. It points out that each person has the power to turn off lights, repair leaks, and recycle. These messages are simple and direct.

Generally, an energy awareness program has a high potential for success because certain valuable elements already exist. First, almost everyone agrees that energy efficiency is worthwhile; the message is not unpopular. Also, personnel who already practice energy efficiency can be potential allies of the energy manager in spreading the message. Moreover, many awareness efforts, such as turning off lights and closing windows, require little or no capital investment.

7-3 Program Design

To develop an effective energy awareness campaign, energy managers should start by defining the audience or audiences. A different message is needed for employees on the workroom floor than for maintenance workers or office workers. Once the audiences are defined, the facility manager should be involved in the energy awareness program to solidify upper management support for the initiative.

Policy

An effective awareness plan should be developed for each area, district, and facility.

In addition to the facility manager, energy managers should get as much help as possible from other facility personnel in developing an energy awareness program. One or two people from each operation on the workroom floor can constitute an “energy team” for that floor. Getting energy users and maintenance staff involved in the planning process both increases their understanding of the program and generates a greater sense of ownership, leading to greater participation.

Having defined the audience, energy managers should suggest the specific actions that each user group should take that can save energy. For example, one promotional campaign could be directed to personnel on the workroom floor, another to office workers, and another to maintenance workers. Energy managers may want to start with a general, overall energy awareness program; however, such overall programs tend to be less action-oriented and, therefore, less effective than specifically focused action campaigns. They can, however, serve as a useful foundation for the more narrowly focused campaigns, which should quickly follow the general campaign or parallel it.

Realistic facility savings goals should be set. These goals, established in terms of dollars per square foot and Btus per square foot, can be used as a benchmark standard. The facility manager should be encouraged to endorse these goals.

Having developed a goal, energy managers should publicize the concrete actions that facility personnel can take to achieve that goal. They should also publicize the progress made toward achieving that goal in the same way that organizations publicize progress toward other goals, such as charitable contributions. In this way, energy savings show tangible progress in addition to the desirable but more abstract benefits of efficiency, reduced pollution, and lower operating costs.

7-4 Action-Oriented Messages

7-4.1 General

As mentioned earlier, the best energy awareness programs can be distilled into short, action-oriented messages. The energy manager, working with the facility, can then communicate those messages in many ways. For example, a generic message such as “use energy wisely” is unlikely to achieve large savings by itself, although it can serve as a basis for more concrete messages. Slogans such as “turn off the lights” and “switch it off when you leave” are more effective because they communicate a direct action that users can implement immediately. Such action-oriented messages have a greater potential to change behavior as well as attitudes. Even better perhaps is a message such as “switch it off for the environment” because it combines an action with a generally desired consequence and rationale.

You Have the Power

Use a desktop light if you do not need the entire room lighted.

The energy awareness program should target action-oriented messages toward different audiences. Some examples of the kind of actions that an awareness program can emphasize are described below.

An energy awareness program targeted to the workroom floor and office occupants can encourage the following (no-cost) actions:

- Turn off the lights (including fluorescent lights) when an area is vacated.
- Turn off computers and printers overnight.
- Do not use space heaters; turn up the thermostat instead (or have maintenance personnel fix the central unit).

An energy awareness program targeted toward maintenance workers can be particularly effective because they are generally responsible for the upkeep of the most energy-intensive systems. Awareness messages can recommend the following (low-cost) actions:

- Fix stuck dampers.
- Install low-flow washers in all hot water faucets.
- Clean steam traps.
- Check for torn or missing insulation and fix it.
- Clean condenser coils on cooling equipment.
- Wash lenses and luminaries on lighting fixtures on a regular basis.

These ideas are only a sampling of the many possible messages that a good awareness program can promote.

7-4.2 Awareness Slogans

The following are examples of slogans that can be used during energy awareness training of employees:

- *You have the power to save energy!*

  Each time energy is saved, three good turns happen: dollars are saved; natural resources, which are becoming scarcer all the time, are conserved; and pollution is prevented, making life safer and healthier.

- *Turn off the juice when not in use!*
  Switch it off for the environment!

  These slogans apply to everything that runs on electricity: air-conditioning, appliances, computers, and lights, including fluorescent lights. Computers and fluorescent lights are not worn out by turning them on and off.

- *Go public!*

  Public transportation uses one-thirtieth of the energy, per person, of driving alone in a car. Even better, walk or ride a bike!

- *Drive cool.*

  A car gets 20 percent better gas mileage at 55 mph than at 70 mph. Experts say gas mileage can be increased 5 percent by smoothly starting and speeding up a car — the same with stopping and slowing down. Anticipating what is ahead and easing into it increases safety and saves energy.

- *Give it new life!*

  Find new uses for old things. Use things as long as they can be used. Do not rush to buy a new appliance if the old one can be repaired. This saves money as well as energy.

- *SOAR above waste!*

  Does the installation already have a Saving of America's Resources (SOAR) program to recycle waste paper, bottles, and aluminum or steel cans? If so, support the recycling program. If not, talk with the installation environmental (or energy) coordinator to start one.

- *Wanted, GREEN VOLUNTEERS!*

  With guidance from the supervisor, join others in the same unit or agency who care about energy conservation. Hold meetings, inspect for energy waste, make suggestions to management, get everybody involved, and keep energy awareness high.

7-5 Publicity Tools and Techniques

Successful public outreach programs about energy information continually present the "need for energy conservation" and "how to save energy" themes. Publicizing conservation information on a *regular basis* tends to increase the program's effectiveness by increasing and maintaining participation.

Note

Publicizing conservation information on a regular basis tends to increase the program's effectiveness.

Note: Contact higher level area energy or environmental coordinators and the FEMP office to obtain the latest information and ideas. The FEMP office is eager to hear from people in the field.

Posters, stickers, and other publicity materials get the message to the facility's personnel. Use of these displays and materials in all postal facilities — cafeterias, lobbies, employee entrances, bulletin boards, and other high-traffic locations — is an effective way to reach many energy users. They are also an excellent way to communicate progress toward energy reduction goals.

Films, videos, slide presentations, and publications on energy and environmental topics are available. Almost all gas and electric utility companies have public outreach programs that make utility representatives available for presentations. The FEMP office in each region may also be able to provide energy awareness materials.

7-5.1 Energy Awareness Month

"Energy Awareness Month" is a nationwide program that recognizes the importance of energy conservation. This national event takes place every October. Energy managers can leverage their own programs with the national attention generated by Energy Awareness Month to generate more attention from management and facility energy users.

Energy Awareness Month provides a good opportunity to demonstrate the facility's progress on existing energy reduction goals and to introduce new goals, if any. Also, it is a good month in which to recognize particular groups and individuals who have done an outstanding job in energy conservation.

Newspaper articles, bulletin board displays, award presentations, training seminars, family outings, "walk" or "hitch a ride to work" weeks, competitions, and other promotional activities occur during the month. Events such as a "run for energy" race or a "bike to work" week encourage individual competition. Events that encourage individual participation and fun should be organized.

7-5.2 Ideas for Energy Awareness Projects

The purpose of the following list is to provide energy coordinators with ideas proven to work. Each energy coordinator should develop an implementation strategy that best fits the needs of his or her facility. Following is a compendium of projects that were successful at many postal facilities in the past:

- Organize Energy Awareness Month or Energy Awareness Week activities:
  - Publish statements on energy consumption costs.
  - Place articles in the internal Postal Service publications.
  - Distribute energy awareness flyers and posters.
  - Place energy awareness signs and posters around the postal facilities.
  - Solicit a visit and a speech by the local mayor or other notables.
- Get the message out using all available communication channels:
  - Write a regular column for the postal internal media.
  - Distribute flyers containing practical energy saving tips.
  - Make promotional energy conservation packages for wide dissemination.
  - Establish an energy conservation information center at the district level.

- Sponsor classes and address meetings where appropriate:
  - Organize periodic energy awareness presentations to major energy users and maintenance personnel.
  - Choose opportunities to address influential or large groups on conservation issues.
  - Conduct energy conservation seminars and periodic meetings for facility energy coordinators.
- Conduct educational walk-through audits:
  - Conduct walk-through audits to point out energy saving opportunities to energy users.
  - Encourage facility energy coordinators to conduct self-audits of their energy use.
  - Perform “unscheduled” inspections concerning energy awareness to evaluate user energy habits.
- Enlist the help of others:
  - Establish an energy program committee consisting of representatives from major energy users.
  - Use brainstorming sessions to develop new energy conservation ideas and projects.
  - Use a suggestion program to solicit energy conservation ideas.
- Use rewards to encourage energy conservation:
  - Reward successful suggestion box ideas with coffee mugs, T-shirts, tote bags, or baseball caps.
  - Hold an energy conservation trivia contest with prizes and an award.
  - Publicize how much was spent on workplace improvements resulting from energy savings.
  - Enlist the local utility to provide speakers and energy awareness materials.
- Other energy awareness suggestions:
  - Develop checklists and operating instructions for energy using systems to ensure that savings endure beyond a single individual’s tenure.
  - Create an energy “mascot” for appearances at major community events.

7-6 Evaluating Program Effectiveness

Since the ultimate purpose of energy awareness is to use energy more efficiently, the most appropriate measure of success should be actual energy reduction. Although it is difficult, if not impossible, to isolate those energy reductions due solely to energy awareness efforts, the facility should achieve some reductions in total energy consumption (or in Btus per square foot).

One way to measure an awareness program's effectiveness is to develop a set of assessment criteria to gauge changes in users' energy habits. These criteria can include the number of incidents where lights are left on after hours, where windows are left open when heating or cooling systems are on, and the number of unauthorized space heaters in use. These criteria can be measured during periodic walk-through inspections.

During facility inspections, the following actions should be completed:

- Find out whether posters and other awareness materials are visibly displayed.
- Conduct interviews to determine whether energy users are familiar with proper energy conservation procedures.
- Evaluate whether there is a general conservation ethic in the workplace.
- Encourage those not yet committed to the program to become more involved.

7-7 DOE Awards Program

Note

Outstanding efforts should be rewarded.

The Postal Service participates in the annual awards program administered by the FEMP office of DOE. Areas and districts are encouraged to nominate candidates to EMP, where the nominees with the most distinguished accomplishments are selected for forwarding to DOE. However, EMP proudly recognizes *all* the nominees for their contributions.

In past years, Postal Service employees have won a number of the awards presented by the FEMP office to all federal agencies and the Postal Service. This program highlights the leadership position of the Postal Service in the areas of energy conservation and efficiency.

7-7.1 Purpose of the FEMP Awards

The purpose of the federal awards program is to promote energy awareness throughout the year among all federal employees, including Postal Service employees. Specifically, the awards program recognizes outstanding achievements in energy and water conservation or efficiency, including renewable energy, source usage, cost-beneficial landscaping practices, and other innovative practices by federal employees.

7-7.2 Eligibility and Categories

Any full-time or part-time postal employee, including previous award winners and operating contractor personnel, are eligible for FEMP awards. The award categories are:

- Energy efficiency and energy management.
- Renewable energy.
- Energy savings performance contracting (shared energy savings).
- Mobility (vehicle) energy efficiency.
- Water conservation.
- Landscaping.
- Best innovative idea.

7-8 Useful Facts for Promoting Energy Conservation

7-8.1 Tips and Facts

Some “rules of thumb” and anecdotes that are useful for promoting energy awareness and conservation are discussed in this section. Energy managers should seek to add more which, based on their own experience, have been effective in enhancing conservation. The following tips and facts are provided as a starter:

- Environmental relationships:
  - A car emits carbon dioxide (CO_2) in an amount equal to that of its own weight every 15,000 miles.
  - Burning 1 gallon of gasoline in a car produces 22 pounds of CO_2.
  - Every kWh of electricity saved avoids over 2 pounds of CO_2 being pumped into the atmosphere.
  - CO_2 is the single biggest contributor to the global warming problem. Exhibit 7-8.1a shows energy conservation measures and CO_2 savings in the home.
- Building insulation — The breakout for the heat loss by a typical residential home with inadequate installation is as follows:
  - Roof or ceiling: up to 40 percent.

Exhibit 7-8.1a, Energy Conservation and CO_2 Savings in the Home

Energy Conservation Measure	CO_2 Savings (Tons per Year)		
	Gas	Oil	Electric[1]
Installing 10 13-watt compact fluorescent lamps in place of 10 60-watt incandescent lamps[2]	-	-	1.1
Replacing a typical 1973 refrigerator with an energy-efficient 1990 model[3]	-	-	1.4
Replacing a 65-percent-efficient furnace boiler with one that is 90-percent-efficient[4]	2.0	3.0	-
Substituting gas or oil heat for electric resistance heat [1,4]	23	19	-
Replacing single-glazed windows with argon-filled, double-glazed windows[4]	2.4	3.9	9.8
Planting shade trees around a house and painting a house a lighter color[5]	-	-	0.9–2.4
Installing a solar water-heating system[6]	0.84	1.4	4.9
Boosting the energy efficiency of a house when it is being built from standard insulation levels to super-insulated standards[7]	5.5	8.8	23

[1]Assumes electricity generated using coal.

[2]Assumes lights on 2,000 hours per year (5.5 hours per day).

[3]An average 1973 model uses 2,000 kWh/year; an energy-efficient 1990 model uses 839 kWh/year.

[4]Assumes an 1,850 square-foot house of average (good) energy efficiency (heating load of 6.95 Btu/ft^2/°F-day) in a northern climate (6,300 heating degree-days).

[5]Data is from the Lawrence Berkeley Laboratory, Berkeley, CA. Based on computer simulations for various locations around the country.

[6]Assumes a two-panel system providing 14.25 million Btu/year (75 percent of demand).

[7]Assumes an 1,850 square-foot house in a northern climate (6,300 heating degree-days). Boosting energy efficiency from 6.95 Btu/ft^2/°F-day (going from R-19 walls, R-30 ceilings, double-glazed windows, and relatively loose construction to R-31 walls, R-38 ceilings, low-E windows, and tight construction).

Source: A. Wilson and J. Morrill, *Consumer Guide to Home Energy Savings,* American Council for an Energy-Efficient Economy, Washington, DC, 1991, p.4.

  - Foundation walls: up to 20 percent.
  - Openings (windows and doors): up to 40 percent.
- Heating, ventilation, and air-conditioning:
  - A well-maintained HVAC system in a family housing unit can save up to $200 per year.
  - Turning down the thermostat from 70°F to 65°F saves about 10 percent of total heating costs.
  - Setting the thermostat back from 70°F to 60°F for 8 hours at night saves about 10 percent of total heating costs.

- Raising the thermostat each degree can save 3 to 5 percent on air-conditioning costs.

- Hot water:
  - A standard showerhead has a flow rate of 4 to 5 gallons per minute (gpm). Retrofitting it with a low-flow showerhead (2 to 3 gpm) can save about $50 per year.
  - Insulating a water heater can save up to 4 to 9 percent on water heating bills.

- Kitchen appliances:
  - Cooking without a lid on pans can take three times the amount of energy it takes to cook with a lid.
  - The cost of energy varies for different methods of cooking the same casserole. Exhibit 7-8.1b shows the different energy costs.

- Lighting:
  - In the United States, lighting uses about 20 percent of all the electricity generated.
  - Incandescent lamps convert only 10 percent of electricity to produce light; the rest dissipates as heat.
  - Compact fluorescent lamps are 3 times more energy-efficient than incandescent lamps and their life is 10 times longer. Exhibit 7-8.1c shows the cost savings achieved by switching from incandescent to compact fluorescent lamps.

Exhibit 7-8.1b, Energy Costs of Various Kitchen Equipment

Appliance	Temp. (°F)	Time	Energy	Cost[1] (¢)
Electric oven	350	1 hr	2.0 kWh	16
Convection oven (elec.)	325	45 min.	1.39 kWh	11
Gas oven	350	1 hr	0.112 therm	7
Frying pan	420	1 hr	0.9 kWh	7
Toaster oven	425	50 min.	0.95 kWh	8
Crockpot™	200	7 hours	0.7 kWh	6
Microwave oven	“high”	15 min	0.36 kWh	3

[1]Assumes 8¢/kWh for electricity and 60¢/therm for gas.

Exhibit 7-8.1c, Savings Achieved by Switching From Incandescent to Compact Fluorescent Lamps

Replace 75-Watt Incandescent With 18-Watt Integral Compact Fluorescent	Savings After 1st Year ($)	Savings After 2nd Year ($)	Savings After 3rd Year ($)	Savings After 5th Year ($)	Savings After 10th Year ($)
Lights on 2 hours per day	(16.17)	(12.34)	(8.51)	(0.86)	18.29
Lights on 4 hours per day	(12.34)	(4.68)	2.97	18.29	36.58
Lights on 8 hours per day	(4.68)	10.63	25.95	36.58	92.65
Lights on 12 hours per day	2.97	25.95	28.92	54.86	129.23

Assumptions	**75-Watt Incandescent**	**18-Watt Compact Fluorescent**
Lamp output (lumens)	1,220	1,100
Lamp life (hours)	750	10,000
Lamp cost ($)	.50	20

Note: Electricity cost: 8¢ per kWh. Numbers in parentheses are negative.

Source: A. Wilson and J. Morrill, op. cit., p. 202.

7-8.2 Energy Star Computers

Computers consume about 5 percent of all electricity used in the commercial sector. This percentage is expected to increase to 10 percent by the year 2000. The majority of computers are not in use most of the time they are on (up to 40 percent are left running at night and on weekends), so much of the electricity used by computers is wasted.

The Energy Star Computers Program, which is sponsored by the Environmental Protection Agency (EPA), is a voluntary partnership between EPA and leading computer manufacturers under which the participating manufacturers agree to produce more energy-efficient computer equipment. Most of the computer companies that sell products in the United States have joined the program, and many have announced new energy-efficient products.

Energy Star products enter a low-power standby mode when they are not being used; in essence, they “sleep” during periods of inactivity. A touch of the keyboard or mouse immediately awakens the system. Depending on computer usage patterns, an Energy Star system can consume 50 to 75 percent less electricity than a conventional system. An added benefit is that these efficient systems give off significantly less heat while they are in sleep mode and thus can reduce the amount of electricity needed to cool a building by 5 to 10 percent.

8 Energy Auditing

8-1 Purpose

The primary purpose of an energy audit is to identify energy conservation and cost saving opportunities among energy-using systems such as lighting fixtures and HVAC equipment. The goal of the energy audit is to evaluate the overall efficiency of building energy systems as well as the efficiency of individual components constituting those energy systems.

Note

Energy audits identify energy conservation and cost saving opportunities.

Many postal buildings were designed and constructed before the energy crisis of 1973 when energy prices and utility rates increased sharply. Before those increases, architects and engineers lacked the incentive to use electricity and gas or oil efficiently, particularly since energy-efficient equipment usually required greater initial capital investment. Also, little energy-efficient equipment or systems were available due to limited technology and market demand. Consequently, many old postal buildings were designed to use lighting, HVAC equipment, and auxiliary fan motors that are inefficient by today's standards.

Although many buildings have been improved over the years by retrofits, most old buildings still offer greater energy saving and cost saving opportunities. Retrofitting entire old energy systems can be an attractive investment because the simple payback for many of these projects is less than 2 years. However, the initial capital outlay is often substantial and may require interruptions to postal operations for some period of time. Initial capital requirements often kill good energy conservation proposals. To encourage good energy conservation projects, energy managers may have to implement a partial or phased upgrade of energy systems.

An energy audit should also determine the performance and efficiency of individual components of an energy system. Although the components of many energy systems have been replaced since they were first installed, many are not energy-efficient by today's standards and should be replaced again with even more efficient components, which are often installed easily. Many no-cost and low-cost opportunities can be identified through a productive energy audit program. For example, high-efficiency fluorescent lamps with electronic ballasts can replace old-style fluorescent or incandescent lamps without major modifications.

Many buildings have never been audited to ascertain energy efficiency. In addition, changes in facility use or building modifications have taken place in many buildings that were audited in the past. The original energy system designs should be checked to ascertain if any have become obsolete. For example, a building designed and constructed for warehouse storage is modified to be used as an administrative office space; therefore, appropriate changes to energy systems may be needed to ensure energy efficiency.

Although many energy cost saving measures can be identified during an energy audit, some measures that help reduce total energy cost may not help reduce energy consumption, for example, by shifting loads away from peak periods. By understanding energy requirements and alternative energy sources, energy managers can pick the most economical energy resources to save money. For example, switching an electric heater to a gas-fired heater may not reduce energy consumption, but can save money since gas is cheaper than electricity. A comprehensive energy audit can identify the best cost saving opportunities.

Energy audits can also follow up on operating energy conservation projects to determine if the expected savings have been achieved. That type of audit becomes increasingly important for SES contracts (or other performance contracting). Installing metering devices on individual systems makes audit follow-up results more credible.

Note

Develop an audit strategy and set priority resources.

8-2 Strategy

Most energy audits can be classified into four categories: self-audit, walk-through, mini-audit, and maxi-audit. Each is described below:

- Self-audit —This type of audit is most appropriate for small facilities. It is accomplished by facility managers or designees who use checklists designed to help them identify energy savings opportunities. These checklists are available through the DECC.
- Walk-through — This type of audit is the least costly and identifies preliminary energy savings. A visual inspection of the facility determines operations and maintenance energy savings opportunities. Information is collected to determine the need for a more detailed analysis.
- Mini-audit — This type of audit requires tests and measurements to quantify energy uses and losses and to determine the costs associated with changes.
- Maxi-audit — This type of audit goes a step further than the mini-audit. It requires evaluating the quantity of energy used for each energy function, such as lighting or industrial processes. It also requires model analyses, such as a computer simulation, to determine energy-use patterns and

predictions on a year-round basis (taking into account such variables as weather data).

Depending on the objectives and circumstances of the energy audit, the energy manager should develop an audit strategy to maximize the use of time and resources. The usefulness of the different types of audits depends on the purposes of those audits. The appropriate level of audit depends on the type of economic justification required to obtain funding. For small projects, detailed economic justification is often unnecessary. Therefore, for these projects, a walk-through audit may be sufficient. Large-scale projects require extensive economic analyses. A maxi-audit is usually required to support these projects since they are closely scrutinized. SES programs usually require extensive audits to ensure accurate calculation of appropriate payments to SES contractors; but, at the same time, those audits are generally carried out by the contractors themselves at the earliest phase of the project.

Note

The best strategy depends on the audit objective and available resources.

8-3 Solution-Based Versus System-Based Audit

Basically, two different strategies exist for energy audits: the “solution-based” approach and the “system-based” approach. Each strategy has its pros and cons; the best strategy depends on the audit objectives.

8-3.1 Solution-Based Energy Audit

The solution-based audit is relatively easy to implement. This strategy takes advantage of proven energy conservation ideas and techniques and applies those techniques where opportunities exist. Normally, walk-throughs and mini-audits are sufficient to obtain the data needed. For example, in any building without adequate ceiling insulation, installation can be cost-effective and easy to implement.

Note

Section 8-9 provides over 100 solution-based energy conservation opportunities in the checklists. Energy managers may need to conduct a mini-audit to calculate economic paybacks.

The solution-based audit attempts to increase the energy efficiency of each energy-using system component. The following are examples of a solution-based audit:

- Replacing incandescent lamps with more efficient lamps such as fluorescent, metal halides, or high-pressure sodium lamps.
- Weather-stripping cracks and openings in the building’s structure.
- Insulating the building envelope by replacing single-pane glass windows with double-glazed windows or by adding a layer of insulation to exterior walls and ceilings.
- Performing preventive maintenance in accordance with the manufacturer’s recommendations.

Using a solution-based energy audit, energy managers can target specific energy conservation opportunities without the time-consuming task of preparing a trend analysis of base energy consumption patterns. Energy managers can use the solution-based approach to start identifying the most attractive energy saving options.

Based on numerous past system-based audits, certain energy conservation opportunities consistently offer very attractive economic paybacks, including fine-tuning HVAC equipment, properly sizing electric power auxiliary equipment, and retrofitting lighting. Although economic paybacks from these projects depend on the cost of the projects, potential energy savings, and the cost of capital, a good portion of these projects will have a payback of less than 4 years.

One of the shortcomings of the solution-based approach is that optimizing an individual piece of equipment does not necessarily optimize overall system efficiency. This is particularly important when doing HVAC audits. Energy managers should audit HVAC systems as a whole, rather than component by component. Also, since more efficient lighting reduces cooling load, a system-based energy audit would take account of the interactions between lighting and HVAC systems.

8-3.2 System-Based Energy Audit

The system-based strategy requires the isolation of an entire energy system and its evaluation as a unit. Also, the efficiency of each element within the energy system must be evaluated. A maxi-audit is usually required to obtain the needed data. Standard reference points are used for comparing energy system performance. For example, the system-based strategy for conducting an energy audit would assess a building’s “shell” for its insulation value, lighting level, heating and cooling efficiency, kitchen appliances, hot water, and other electrical equipment. The major standard reference points are temperature settings (e.g., hot water temperatures), lighting levels, and so forth. The system-based approach enables energy managers to minimize the total energy consumption of a building.

The following are examples of system-based energy audits:

- Consolidating individual air-conditioning units into one centralized unit.
- Installing energy management and control systems (EMCSs) to maximize energy efficiency.
- Appropriately sizing heating and cooling units.

8-4 Preparing for an Audit

One of the most difficult tasks for the energy manager is setting energy audit priorities among the many opportunities for energy savings. Reviewing past energy consumption patterns provides a historical trend that may identify where most energy is consumed, if the facility is sufficiently metered. Calculating energy consumption data in terms of dollars per square foot per year or Btus per square foot per year allows the energy manager to identify energy-intensive facilities. The audit priority should be determined based on this consumption data.

To prioritize the energy systems' audit schedule (based on highest potential energy and dollar savings), collection and analysis of that information is essential. The information analysis helps management to focus and prioritize the workload. Also, that information is needed for calculating the savings-to-investment ratio (SIR) for energy conservation projects. It is important to plan the contents of the final audit report *before* carrying out the audit in order to ensure that the audit gathers the data needed.

Many postal facilities were audited for energy conservation during the mid-1980s. If available, those old audit reports can provide good insight into the extent of prior energy conservation efforts, progress made to date, and the remaining opportunities for conservation. If any projects were implemented as a result of those previous audits, those early audit reports become a good basis for conducting follow-up energy saving audits.

8-5 Organizing the Audit Team

Note

Putting together a qualified audit team is crucial.

Once the scope of an energy audit has been defined, the next crucial task is putting together a qualified energy audit team to perform the audit. It is often difficult to find qualified engineers and technicians to perform energy audits. This is where the district and plant managers' commitment is paramount. If they are committed to energy conservation, organizing the team members will be easier.

Selecting and training in-house personnel to perform energy audits can pay off when it comes time for project implementation. The personnel should be sent to energy training courses at the NCED or local energy training centers. Managers should take advantage of their experience and ideas when developing energy conservation projects. Examples of areas where in-house personnel can participate on the audit team are as follows:

- Lighting analysis — Local facility electricians can assist in conducting lighting surveys.
- HVAC systems and controls — This area is highly technical. Well-trained personnel are essential. A building equipment

mechanic (BEM) can provide help, if one is available. If not, outside help may be available.

- Building envelope — District and area A-Es and facility engineers can help to identify potential energy savings opportunities.

Although many facilities contract out energy audit tasks (for many different reasons), those contracting actions must be managed. Many utilities also offer free or subsidized audits to their customers; however, district or facility personnel must manage this process in order to control the implementation of the program.

Note

Checklists are effective tools for ensuring that an energy audit obtains all the necessary information.

8-6 Performing the Audit

Audit teams should be organized on the basis of the types of energy systems being audited. The most important requirement of an energy audit is to make sure that qualified personnel actually check energy systems for inefficiencies. Checklists are effective for ensuring that an audit has obtained all the necessary information. This guide provides basic checklists for various energy-using systems in section 8-9. These checklists can be modified to meet a building's specific needs.

Maintenance managers or designees should be part of the audit team since they are familiar with the workings of different energy systems. Responsible maintenance staff members can also help conduct the audit.

Energy user involvement is another important part of the energy audit. End users can provide useful information about the past performance of energy systems.

To ensure that energy consumption data is correct, quality control is critical when conducting an energy audit. The proper tools and instruments needed to help accurately evaluate energy systems must be used and purchased if not owned. Section 8-8 lists the names of tools used for measuring energy consumption and efficiency, if a decision to train and equip in-house personnel has been made and it is economically feasible.

8-7 Reporting

To get the full potential from an energy audit, the results must be documented. At a minimum, the energy audit report should record the types of equipment used in the audit, energy consumption patterns, and potential areas for saving energy. That information will be useful in the future for calculating actual energy savings (by comparing historic consumption data with new data obtained after taking corrective actions). These reports are necessary to ensure that good conservation projects are implemented.

An important function of an energy audit report is to inform approving authorities about the audit findings and to convince them to allow funding for the correction of any deficiencies. Using briefing slides to show why the approving authorities should commit resources to energy conservation is often an effective way to communicate audit findings. Energy managers should concentrate on the actions to take, not on the audit itself, and should explain deficiencies and proposed corrective actions, supporting them with an economic justification.

Note

Inform approving authorities about the audit findings.

8-8 Auditing Instruments

Some knowledge of the tools and techniques available for conducting energy audits is useful, even if audits are contracted out. This section describes some of the most common instruments for use in installation energy audits.[1] Consult with an energy audit specialist or trained engineer for their appropriate use.

8-8.1 Electrical Energy

The following equipment is most useful for measuring electrical energy:

- **Voltmeter** — an instrument that measures the difference in electrical potential — the voltage drop — between two points on a circuit. A measurement of the voltage drop, together with electric current, is needed to measure electrical energy use on a particular line. Many available voltmeters read up to 600 volts, the maximum that is needed in most applications.
- **Ammeter** — an instrument that measures electrical current in amperes. Both electric current and voltage are needed to measure electrical energy use. Ammeters are rated in terms of the number of amperes they are capable of reading. Commonly available instruments usually read up to 1,000 amperes continuously, while some models extend up to 4,000 amperes.

  Portable ammeters that can be easily attached to a circuit are useful for audits. Auditors can use such attachable "snap-on" ammeters to monitor variations in current over a period of time. Snap-on ammeters can be either

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[1]A. Thumann, *Plant Engineers and Managers Guide to Energy Conservation,* 5th Edition, Liburn, GA: The Fairmont Press, 1991, pp. 52 to 62.

"indicating" — read from a meter — or produce a printout. Ammeter/voltmeter combinations are also available.

- **Wattmeter** — an instrument that directly reads electrical energy in watts. Wattmeters are available that measure up to 300 kW, 600 volts, and 600 amperes; they can measure both one-phase and three-phase circuits.
- **Power factor meter** — an instrument that measures the electrical power factor, the angle between voltage and current in alternating current circuits. The power factor is essential for calculating usage of electrical energy in alternating current circuits.
- **Kilowatt-hour and kilowatt demand unit** — meters that provide direct readouts of kWh and kW demand. Meters are available that provide instantaneous or continuous readouts. Portable meters are particularly useful for localizing electrical energy use within facilities that lack fixed, local meters.

8-8.2 Illumination

The following equipment is most useful for measuring illumination:

- **Footcandle meter** — a meter that measures illumination. Auditors use portable footcandle meters to check the illumination levels provided by indoor lighting. Unlike photographic light meters, footcandle meters are color corrected.

8-8.3 Temperature and Humidity

The following equipment is most useful for measuring temperature and humidity:

- **Thermometer** — an instrument that measures and indicates temperature. Portable, battery-run thermometers that measure between 50°F and 250°F are useful for general audits of HVAC systems. Separate probes measure surface, liquid, or air. Dial thermometers are good for measuring boiler stacks up to 1,000°F, and thermocouples measure higher temperatures.
- **Surface pyrometer** — an instrument to measure surface temperature. It is particularly useful for inspecting heat losses and for checking steam traps. Specialized pyrometers include suction pyrometers for measuring gas temperatures, high-temperature units (over 600°F), noncontact surface pyrometers that measure infrared

radiation, and optical pyrometers for measuring very hot, incandescent surfaces.

- **Infrared scanning devices** — these instruments are useful for checking the effectiveness of building envelopes by detecting "hot spots" that indicate energy losses. Infrared devices can identify poor or missing insulation, leaky windows, and other sources of building heat losses. In addition, an aerial infrared survey will detect underground steam pipe leaks, hot gas discharges, poor roof insulation, and other efficiency losses. Aerial scans are normally contracted out to specialized companies.
- **Psychrometer** — although it does not measure temperature, a psychrometer is a valuable instrument for evaluating HVAC systems and drying operations. It measures relative humidity based on the relation of dry-bulb temperature to wet-bulb temperature.

8-8.4 Combustion Systems

The following equipment is most useful for measuring combustion systems:

- **Boiler test kit** — a test kit consisting of analyzers for carbon dioxide, oxygen, and carbon monoxide gases.
- **Orsat apparatus** — an apparatus used to test for concentrations of combustion products in a stack. The apparatus is time-consuming and requires an expert operator.
- **Fyrite gas analyzer** — an apparatus used to test for concentrations of combustion products in a stack. This analyzer is easier to use and less expensive but less accurate than the Orsat apparatus.
- **Combustion analyzer** — an electronic stack gas analyzer that measures gas measurements using a probe. It is faster and easier to use than an Orsat apparatus.
- **Draft gauge** — a gauge that measures gas pressure.
- **Smoke tester** — an instrument that measures the completeness of combustion. Its use requires a visual comparison of test results with a standard scale.

8-8.5 Other Instrumentation

Other instruments are available to help the energy auditor to measure energy use directly and to help diagnose inefficient energy use. For example, drafts and leaks can be detected using inexpensive smoke pellets or anemometers. Instruments for HVAC work include various types of manometers for measuring air pressure and bourdon tube gauges for measuring fluid pressures.

8-9 Energy Audit Checklists

Energy audit checklists can be used by installation energy managers to inspect and identify the energy efficiency, safety, and environmental soundness of lighting, steam systems, chilled and hot water systems, HVAC systems, and so forth. These checklists are provided in Exhibits 8-9a through 8-9g.

Exhibit 8-9a, Lighting Checklist

Item	Check Off or Record Findings
Measure footcandles at workplaces to ensure that illumination levels meet standards. **Note:** The Illuminating Engineering Society (IES) has recommended footcandle levels by type of workplace. Other lighting standards exist that are lower, including one promulgated by DOE.	
Ensure that type of lighting (e.g., fluorescent, incandescent, mercury, sodium, or quartz) is the most appropriate for the application. Record type of lighting.	
Reduce illumination level by removing lamp(s). Ensure that wattage of each lamp is appropriate. Evaluate whether there are too many unnecessary lamps. Record.	
Increase the efficiency of existing lighting by periodically cleaning light fixtures (lenses) or adding reflectors. Last date cleaned: ____________	
Determine areas with special lighting requirements. Evaluate whether current lighting arrangements are adequate.	
Turn off lights when not needed. Check for lights that are left on when they are not needed. Investigate the feasibility of installing automatic sensors to control lighting in these areas.	
Reduce the hours of operation when lights are on.	
Evaluate whether workstations are organized and located to take maximum advantage of existing lighting.	
Check that the light source is to one side of the work task area rather than directly in front of or over it, to minimize glare and ceiling reflections.	
Evaluate whether the maintenance of lighting systems has been effective.	
Identify large work areas that are uniformly lit for the entire space. Investigate whether “spot” lighting can replace unnecessary lighting of an entire work area.	
When lamp removal is appropriate, first remove lamps over nonessential task areas.	

Exhibit 8-9a, Lighting Checklist (continued)

Item	Check Off or Record Findings
Consider removing the inner two lamps in four-lamp fluorescent fixtures and/or in every other luminary in the row.	
Disconnect nonelectronic ballasts on fluorescent and HID fixtures after lamp removal.	
Find areas where more efficient lighting components can replace original, inefficient lighting system designs or fixtures.	
Color-code lighting fixtures from which lamps have been removed so that maintenance crews do not replace those removed lamps.	
Check, and if needed install, switches for selective control of illumination where (a) spaces require different lighting levels for different activities, or (b) daylight can be used to supplement or replace electric lighting.	
Check, and if needed install, timer switches or electronic personnel sensor switches in areas used infrequently or for only a few minutes at a time.	
Check, and if needed install, photoelectric cells for turning outside lighting on and off.	
Make maximum use of daylight. Encourage workers to use natural lighting by using windows and skylights. Using daylight also helps lessen heat requirements. Natural sunlight should cross perpendicular to the line of vision.	
Group many light replacement projects together.	
Consider lowering light fixtures so that they are close to task work areas in high bay areas and other spaces. Lighting intensity at the task varies as the inverse square of the distance between source and task.	
Remove lenses from luminaries in corridors, storage areas, high ceiling spaces, equipment rooms, and other spaces if the resulting glare will not be a problem. Since lenses cut out light, removing them may allow fewer lamps to be used.	
Remove or lower room wall partitions where they are not needed, or use low partitions with glass.	
Relocate or remove light fixtures when the light is blocked by overstacked materials or other obstructions.	
Where possible, replace two small wattage incandescent lamps with one large incandescent lamp (of lower total wattage). For example, replace two 60-watt lamps with one 100-watt lamp.	
Evaluate the use of several types of reflective incandescent lamps to receive the light needed, but using fewer watts (depending upon type and application). For example, in recessed “top-hat” fixtures, elliptical reflector (ER) lamps or screw-in fluorescent lamps usually can be used at a lower wattage than regular floodlights, yet they provide equal amounts of usable light.	

Exhibit 8-9a, Lighting Checklist (continued)

Item	Check Off or Record Findings
Check and, if appropriate and practical, convert incandescent fixtures to fluorescent (by changing fixtures or replacing lamps) or to HID (by adding ballasts plus lamps). Mercury vapor fixtures often can be converted directly to high-pressure sodium (HPS) or to metal halides. **Note:** Payback for lamp conversion varies depending on wattage reductions, electricity rate structures, and the number of hours electric lighting is used in a particular location.	
Replace existing fixtures with more efficient types. Check them, and if possible replace fluorescent lamps with T-8 lamps and electronic ballasts.	
When replacing ballasts in fluorescent fixtures, use 430-milliampere (mA), high-power factor, low-wattage ballasts with appropriate lamps. **Note:** Reduced wattage *electronic* ballasts are also available that use less electricity, last longer, and operate at lower temperatures than standard types.	

Exhibit 8-9b, Steam System Checklist

Item	Check Off or Record Findings
Learn how a central system actually operates by reviewing the operations manuals.	
Check for excessive consumption of boiler makeup water, which indicates steam leaks or bad traps.	
Check whether condensate return systems are functional. Condensate return should be at least 85 percent.	
Check for steam leaks and condensate leaks.	
Check all traps and tag bad steam traps.	
Check for uninsulated steam and condensate lines and tanks.	
Determine what the steam is used for and if a cheaper substitute (e.g., natural gas) is available.	
Understand boiler and burner controls. Record settings.	
Perform a "flue gas" analysis to determine boiler combustion efficiency and whether a tune-up is required. If the boilers are already tuned, have less than three passes, and the flue gas temperature is above 400°F, consider installing turbulators in fire-tube boilers.	
Record boiler capacity and operating pressure.	
Determine steam requirements to see if boilers can be staged or if one or more boilers can be fully loaded while shutting down another.	

Exhibit 8-9b, Steam System Checklist (continued)

Item	Check Off or Record Findings
Determine if blowdown systems can recover the energy lost from hot boiler water and steam generation during blowdown. **Note:** By piping the vent off a blowdown unit's recovery unit to the deaerator, steam normally lost to the atmosphere can be recovered. By installing heat recovery coils in the heat recovery unit, heat from boiler blowdown to the drain can be recovered and used to preheat boiler makeup water, combustion air, and domestic hot water.	
Study water treatment and analyze boiler and makeup water.	
Consider installation of stack heat recovery units such as economizers if stack gas temperatures are high. Economizers should only be considered if all other recommendations have failed to reduce stack gas temperatures below 420°F for low load (200 to 600 horsepower) boilers.	

Exhibit 8-9c, Chilled Water System Checklist

Item	Check Off or Record Findings
Understand chilled water systems and determine the capacity of auxiliary equipment.	
Check for chilled water leaks.	
Determine the proper chilled water operating temperature.	
Raise the chilled water supply temperature. **Note:** The temperature of leaving chilled water in centrifugal chillers is usually maintained at 42°F to 45°F by a chilled water thermostat. This may be lower than required to meet the cooling demand of the building air handling systems, particularly in moderate weather. Chilled water supply temperatures of 50°F or higher can be used if humidity control and other comfort requirements are satisfied.	
Consider manually raising the setpoint of the chilled water thermostat to the highest possible temperature while still satisfying humidity control and other comfort requirements. Install controls that reset the chilled water supply temperature based on the return chilled water temperature. **Note:** This allows the supply chilled water temperature to rise as the return chilled water temperature drops. The chiller follows the actual building load more efficiently, rather than supplying chilled water according to design conditions.	
Install controls that reset the chilled water supply temperature according to the cooling coil with the highest cooling demand. In this manner, the chiller delivers only as much cooling as is actually required.	
Determine condenser water temperature. Lower the entering condenser water temperature as much as possible.	

Exhibit 8-9c, Chilled Water System Checklist (continued)

Item	Check Off or Record Findings
Determine the condition of cooling towers on installations with a cooling tower bypass valve. Ensure that the bypass valve closes completely before the cooling tower fans operate. If chilled water is not needed during the winter, close the tower bypass valve permanently.	
Determine the condition of forced draft cooling towers. If chilled water is not needed in the winter, make sure the fan discharge dampers are kept completely open or remove them, if possible.	
Determine the condition of induced draft towers. Replace sections of fill that are damaged or deteriorated.	
Check whether hot gas bypasses are operating properly. Sometimes bypasses are not needed and can be discarded.	
Check controls to ensure that they are calibrated and functional.	
Determine whether heat transfer surfaces on the evaporator and condenser coils are clean.	
Determine whether the refrigerant level is too low.	
Investigate whether units can be shut off when not needed.	
Determine whether lights in walk-in coolers and freezers can be shut off automatically upon exit.	
Check whether time clocks are installed on window air-conditioners. Verify usage of units with high energy-efficiency ratios (EERs).	
Check for ways to control solar gain to reduce the cooling load on buildings.	
Investigate whether computer center cooling demands are the basis for setting the entire facility's chilled water temperature. Consider using separate cooling units for computer rooms.	

Exhibit 8-9d, Domestic Hot Water Checklist

Item	Check Off or Record Findings
Measure and compare existing water temperature versus required temperature (e.g., 105°F from faucets). Lower the water temperature when appropriate.	
Measure the flow rate from showers and sinks. Consider using water flow restrictors.	
Determine the method of hot water generation. Investigate the feasibility of installing decentralized water heating.	
Inspect circulating pump controls. Consider using variable speed pumps.	
Inspect the hot water system for any leaks. Repair them if required.	
Check for any waste heat that can be used for water heating.	

Exhibit 8-9e, Building Envelope Checklist

Item	Check Off or Record Findings
Verify that outside wall insulation is adequate.	
Verify that ceiling and roof insulation is adequate. About 40 percent of energy loss can occur through poor ceiling insulation.	
Check the type of windows used. Determine the feasibility of replacing single-pane windows with double-glazed windows.	
Identify areas with infiltration or wind draft problems. Seal leaking areas if possible.	
Determine if any passive measures can be taken to reduce solar loading on buildings. The use of passive measures depends on the orientation of the building and its surrounding shrubs and trees.	
Check the type and number of doors in the building. Ensure that these doors are appropriate for their intended purpose. Consider installing revolving doors for high traffic areas.	
Check for ways to minimize heat loss (or heat gain) from loading dock doors or hangar doors.	

Exhibit 8-9f, Electrical Motor Checklist

Item	Check Off or Record Findings
Check whether motors are properly sized for their loads. Load motors fully where possible. Replace or switch motors as necessary. A 50 percent reduction in motor size results in over 80 percent reduction in energy use.	
Ensure that the highest practical power factor is used for electric motors.	
Consider shutting down elevators during unoccupied hours in buildings.	

Exhibit 8-9g, HVAC Systems and Controls Checklist

Item	Check Off or Record Findings
Study blueprints and determine the type of HVAC system being used.	
Determine the operations areas being served by all fans (i.e., supply, return, exhaust).	
Study control drawings and develop a design control strategy.	
Perform at least one inspection of all mechanical equipment.	

Exhibit 8-9g, HVAC Systems and Controls Checklist (continued)

Item	Check Off or Record Findings
Sketch each AHU as you see it, showing the exact location of their sensors, fans, filters, coils, and dampers.	
Determine if the controls are installed as shown on the original manufacturer's drawings.	
Determine if the controls are functioning correctly.	
Determine the percentage of outside air being used.	
Determine the actual supply cubic feet per minute (cfm).	
Determine if there are capacity reduction possibilities. Determine if there are adjustable sheaves.	
Determine the actual amount of power drawn by each fan system.	
Determine if modifications to controls are possible to conserve energy.	
Check whether HVAC systems are operating when the spaces they serve are not being used. **Note:** Often large-capacity HVAC equipment is kept running to serve a relatively small area requiring continuous conditioning. In these cases, separate smaller HVAC units may be more efficient.	
Check for HVAC systems that draw in excessive outside air or recirculate more air than necessary. Readjust the air mix if required.	
Check whether the central heating and cooling plants are partially loaded most of the time because they were originally sized according to maximum-use design conditions that seldom occur. Large boilers and chillers operate at their peak efficiency only at full load. Consider installing smaller boilers or variable-speed drive motors for chillers.	
Identify any HVAC systems that simultaneously heat and cool the same air to produce a desired temperature, since that method of operation wastes energy.	
Reduce peak electricity demands by installing load limiters to turn off unessential loads upon reaching a preset demand level. Load-shedding reduces the demand charge assessed by utility companies.	
Consider using duty cycling that turns off a compressor, pump, or air handler for a brief period every hour or half hour, and that regulates HVAC systems by turning off the maximum number of units that can be turned off at any given time. Duty cycling can reduce peak energy demand without sacrificing the comfort of the facility occupants.	
Consider installing temperature controls that allow the HVAC system to use fresh air for ventilation. **Note:** These controls monitor the outdoor temperature and signal the HVAC system to use outdoor air depending on whether outside air temperature is cooler or warmer than indoor air.	
Shut down AHUs or exhaust fans during unoccupied periods.	
Minimize outdoor air intake during unoccupied periods to eliminate the unnecessary heating and cooling of outside air. **Note:** Outside air brought into, and exhausted from, a facility uses a majority of the heating, and a significant portion of the cooling, energy consumed by HVAC systems.	

Exhibit 8-9g, HVAC Systems and Controls Checklist (continued)

Item	Check Off or Record Findings
Determine the minimum number of outside air changes required per hour for each space served by an air handler.	
Reduce the cfm moved by exhaust fans by restricting flow or changing sheaves. Adjust the minimum position of outdoor air dampers on AHUs to meet minimum requirements.	
Install time clocks to shut down unnecessary exhaust fans and to close ventilation air dampers during unoccupied hours.	
Determine the present cfm being delivered by the AHU and reduce the cfm as appropriate. **Note:** Many fans circulate more air than necessary to satisfy space requirements. Reducing airflow dramatically reduces the brake horsepower (bhp) used by the fan motor.	
Determine the volume of each area served by the AHUs and the cfm delivered to those areas. Using this information, determine the total cfm required from the AHU. Size fan motors accordingly.	
Consider installing a mixed air controller. Most AHUs are designed to maintain a constant mixed air temperature of 55°F. When outdoor air has a higher heat content than return air, the economizer should change over to minimum outside air and maximum return air. The general practice is to approximate heat content by changing over when the outside air temperature reaches 70°F.	
Check for any stratification of outside and return air occurring in ducts or mixing plenums.	
Check controls on the economizer. Find out whether the controls are based on dry-bulb temperature or on enthalpy. **Note:** At low outside temperatures, the economizer should admit only the minimum amount of outside air required. This is often not the case with parallel-blade dampers. During cool weather, the economizer should mix outside and return air to supply air at a temperature no lower than needed to cool the area with the greatest cooling demand.	
Consider installing a set of relief dampers or a gravity ventilator to vent return air to the outdoors for fixed air handlers.	
Check humidity sensors for damage and for sensors out of calibration. **Note:** In most AHUs, humidification is accomplished by spraying steam into the supply air stream. AHUs are usually controlled by maintaining the desired relative humidity (RH) of supply air, by resetting supply air RH (by return air RH), or by maintaining the desired RH in one area.	
Find out whether humidification is required when the AHU is set in a mode other then “cooling only.”	
Check the steam control valve on the humidifier. If the valve fails to close completely, it may leak steam through the humidifier into the airstream.	

Exhibit 8-9g, HVAC Systems and Controls Checklist (continued)

Item	Check Off or Record Findings
Ensure that load optimization with reheat systems occurs by leaving at least one reheat coil off (which minimizes the amount of reheat in the other areas). **Note:** Most central HVAC systems are designed to provide sufficient cooling and/or heating to satisfy the worst condition in any one area. By supplying an air temperature that satisfies the area with the greatest energy demand, energy wasted is reduced to an absolute minimum.	
Consider installing nonelectric thermostatic steam valves with wall-mounted thermostats. Sometimes it is practical to control all radiators in an area with an automatic valve on the steam supply line.	
Minimize electrical reheat by adjusting thermostats and reheat setpoints and balancing the air system. **Note:** Much of the required heat output is then shifted from the electric reheats to the steam and hot water heating coils located at the AHUs. During the summer, power can be shut off to all electric reheats within a selected AHU area.	

9 Maintenance of Energy Systems

9-1 Maintenance Planning and Benefits

Maintenance is one of the most cost-effective methods for ensuring energy conservation. Inadequate maintenance of energy-using systems is a major cause of energy waste in both the Postal Service and the private sector. Energy losses from leaks, uninsulated lines, and maladjusted or inoperable controls and other losses from poorly maintained or antiquated systems are often considerable. Good maintenance practices can generate substantial energy savings. Moreover, improvements to physical plant maintenance programs can often be accomplished immediately and at a relatively low cost.

Note

Inadequate maintenance is a major cause of energy waste and the failure of energy conservation measures to achieve energy savings goals.

Sophisticated modern heating and cooling systems require ongoing, comprehensive maintenance for peak operating efficiency. Maintenance is both necessary for existing systems and essential to sustain the savings gained from new energy conservation projects. A comprehensive energy management program should include preventive maintenance that is custom-designed for each building or system at the facility. The cost of maintaining each system or component must be considered when upgrading or replacing systems.

Maintenance programs normally include the components described in the following six sections.

9-1.1 Preventive Maintenance

PM is preplanned work carried out on a regular schedule to reduce the potential for sudden failures in energy-using systems. Typically, critical equipment (for which failures are detrimental to normal operations) is scheduled for PM, which includes minor lubrication and adjustments.

Note

Preventive maintenance corrects excessive energy use before it occurs.

9-1.2 Routine Maintenance

Routine maintenance is minor work carried out in response to maintenance routes or incoming requests (work orders), such as replacing burned-out lamps, changing filters, and recording equipment settings.

9-1.3 Scheduled Maintenance

Scheduled maintenance is major work carried out according to plan, usually on a rotating schedule, that restores equipment to peak operating condition.

9-1.4 Emergency Maintenance

Note

Routine and preventive maintenance help avoid expensive repairs by averting crises and extending the useful life of energy system equipment.

Emergency maintenance is work that must be done immediately to preserve safety, maintain critical mission requirements, or prevent major damage to equipment. By its nature, emergency maintenance is unplanned (although maintenance plans should include such contingencies) and requires quick or immediate response.

Preventive and scheduled maintenance are often accorded a low priority in favor of solving the most immediate problems. As a result, the backlog of maintenance and repair grows. PM reduces energy use by catching and correcting excessive energy waste before long-term losses occur. In addition to saving energy, PM also dramatically reduces the need for eventual corrective repair and extends equipment life (thus lowering operating costs).

The emphasis on solving immediate maintenance problems is understandable because of limited available funds and staffing. However, a good PM program, once in place, frees up maintenance personnel to complete other productive jobs, including more and better maintenance. By investing funds and staff effort on PM, facilities can save time and money in the long run.

9-1.5 Obtain Management Support

Note

Approaching energy efficiency and savings by equating them with increased productivity is one way to gain management attention and support.

Energy managers should make sure that they obtain full support from their facility manager in order to carry out an effective maintenance program. A good way to start is by establishing maintenance schedules and obtaining approval. Such a facilities-supported schedule is important because it enables required maintenance or PM to be scheduled with the same priority as other facility needs.

When planning management reports, energy managers should compare energy use by each system to a base period. For example, compare monthly energy use against the same month for the prior year, or against the same month in a particular base year (such as 1985). If efficiency standards for a particular system are available, compare the system’s performance against that standard as well. The point of such comparisons in management reports is to motivate efficiency improvements through improved maintenance and energy savings, not to assign blame for poor maintenance and inefficient systems.

9-1.6 Maintenance Planning

The fundamental purpose of a facility maintenance program is to maintain equipment in optimum operating condition. The result of this effort maximizes energy efficiency and savings. To refine a facility maintenance program, the energy manager should do the following:

- Review the schedule for PM.
- Define specific maintenance procedures for the operations staff.
- Train the operations staff in the principles and technologies applicable to their buildings or systems.
- Provide continuous technical assistance to the operations staff by completing periodic reviews of the facility's performance.
- Keep staff informed of new energy maintenance technologies.
- Monitor energy consumption costs regularly (usually monthly) and compare them to a base period, the prior period, or with other energy-efficiency standards.

Note

Successful maintenance programs require organizational coordination.

Maintenance managers need to plan maintenance activities and provide clear lines of responsibility for all maintenance tasks. As described above, the first planning step is to develop a PM schedule. The system should be designed to provide a tracking database of historical records of repairs and alterations made to energy systems. The Maintenance Activity Reporting and Scheduling (MARS) system is designed for this purpose; it provides maintenance personnel and management with real-time access to information for improving the efficiency of facility maintenance operations. (The MARS system is sponsored by Maintenance Policies and Programs, Engineering.)

Note

A well-maintained physical plant is a more efficient plant. Maintenance is easy to defer, but it is essential to energy efficiency. Experienced managers, supervisors, and maintenance staff are key to good maintenance.

Scheduled PM should also be entered into the MARS system. Ideally, the system assigns priorities to work orders and estimates the time and staff required for each job.

In addition to scheduled and routine maintenance, energy managers and their staff members must develop maintenance and replacement requirements by inspecting systems for potential and developing problems. Catching such problems in advance of breakdowns saves energy and money and reduces unexpected downtime.

9-2 Maintenance Duties

Selection of the specific maintenance procedures to use depends on the facility's particular energy systems and circumstances. The Postal Service publishes a series of MMOs and *Design and Construction*

Technical Notes that incorporate best maintenance practices. Sample ideas for lighting retrofit guidance are provided in 6-4.2. General guidelines for the types of things to look for during an inspection and the actions to be performed in any maintenance program are described below.

9-2.1 Steam System Maintenance

Some postal facilities use steam systems to distribute thermal energy. Those systems are often prime candidates for improved maintenance because they are less efficient than “direct delivery” of energy. Steam system efficiency rapidly degrades without proper maintenance. A PM program should require regular inspections and the prompt repair of leaks, malfunctioning traps, and bypass valves.

To keep steam plants operating at top efficiency, the maintenance staff should do the following:

- Continuously survey the steam system to identify and repair all steam leaks.
- Use acoustic or temperature probes to find invisible steam leaks.
- Tune up the boiler frequently.
- Inspect and repair steam traps periodically to ensure that all traps are properly sized.
- Annually inspect insulation on pipes and pressure vessels and repair or replace deteriorated or missing insulation.

Steam traps enable condensation, air, and noncondensable gas to pass out of the system while trapping steam within the system. Air and noncondensable gases act as insulators that reduce system efficiency. Improperly sized traps can be replaced either immediately or when the trap reaches the end of its useful life. Keeping track of component lives is one essential function of a good maintenance plan. Damaged or missing insulation on steam lines is a major energy waster.

Generally, continual inspection and upkeep of condensate lines ensure adequate return of condensed boiler water with a minimum loss of energy. To maintain condensate systems, the maintenance staff should do the following:

- Look for steam coming from the collecting tank or deaerator vent and for evidence of malfunctioning traps.
- Check condensate line temperatures, since temperatures above 190°F indicate a malfunctioning steam trap.

- Insulate all condensate lines, since condensate usually returns at about 190°F.
- Continually repair and replace all worn or damaged components and insulation, including tanks, valves, strainers, and piping.

9-2.2 Lighting System Maintenance

Light output from electric lamps tends to decrease as fixtures get older because the dirt accumulating on lamps and lenses reduces the amount of light supplied. Light emanating from recessed fluorescent fixtures can drop 15 percent in just 1 year, even in a fairly clean environment. Designers compensate for light reductions by overlighting the space so that adequate illumination is still provided as the lenses get older (and dirtier). Dirty lenses can reduce illumination by as much as 50 percent. Therefore, cleaning the lenses can sometimes reduce the amount of light degradation, even allowing some of the lamps to be removed without reducing illumination below the required level.

To help remove some redundant lamps (luminaries) from service while preserving the same illumination levels, energy managers should recommend the following:

- Maintain interior illumination levels in accordance with design requirements.
- Establish scheduled cleaning routes for lamp lenses and luminaries.
- Replace discolored plastic diffusers in fluorescent fixtures. Prismatic lenses are generally the most efficient type for the degree of glare control provided; fresnel-type lenses are the most efficient for recessed incandescent and high-intensity discharge fixtures.
- Use light-colored paints, carpets, tile, and upholstery when redecorating.
- Consider replacing the lamps on a single switch at 70 to 80 percent of their average lamp life. If delayed much longer, lamps will start to burn out in a relatively short time, creating a maintenance problem. In areas with similar hours of operation, replace all lamps in a group to reduce labor costs.

9-2.3 Cooling System Maintenance

Many maintenance actions essential for proper and efficient cooling system operation may be covered by a contract with the manufacturer's service representative. Those contracts usually address the following items:

- Check for leaks and proper purge system operation.
- Brush condenser tubes of water-cooled open tower systems.
- Check condition levels of refrigerant and oil.
- Check chiller safety devices.

Ideally, maintenance staff should be trained in the field of refrigeration systems. This ensures proper system operation between service intervals and reduces the potential for breakdowns. Detailed maintenance procedures for particular machines are often found in the operating instructions. Maintenance is responsible for maintaining operating logs that provide information needed to determine equipment efficiency.

9-2.4 Heating, Ventilation, and Air-Conditioning System Maintenance

To ensure that HVAC systems operate at peak efficiency, the maintenance staff should complete the following routine maintenance procedures:

- Check, adjust, calibrate, and repair all controls such as thermostats, controllers, and valve and damper operators.
- Replace dirty filters and keep economizer dampers clean.
- Keep all heating and cooling coils clean.
- Eliminate all duct work leaks at joints and flexible connections.
- Keep hot and cold ducts adequately insulated.
- Repair or replace all defective dampers.
- Check, adjust, or replace fan belts.
- Lubricate all bearings and other friction points, such as damper joints.
- Inspect fan wheels and blades for dirt accumulation and clean them as required.
- Adjust or repair packing glands and seals on valve stems and pumps.
- Ensure that no oil or water enters the main air supply for the control systems.

Most AHUs have both heating and cooling coils. Leaking steam, hot water, and chilled water valves to those coils and leaky dampers impose excessive heating and cooling loads that could be avoided. Proper maintenance eliminates that inefficient use of energy.

Building automation and pneumatic controls are the sensitive nerve ends of the HVAC system. Improperly calibrated controls degrade comfort conditions and waste energy dollars. It is important to have a staff member trained to inspect and service those controls.

Excess HVAC capacities often hide the need for improved maintenance procedures. In many cases, the institution of a PM program enables the elimination of excess capacity, saving even more in energy costs.

9-2.5 Gas Line and Compressed Air Maintenance

Leaks in combustible natural gas and propane lines are both a waste of expensive fuel and highly dangerous. Left untreated, such leaks can result in fires and explosions.

Leaks in compressed air lines are less dangerous but also expensive. Like steam lines, compressed air lines distribute energy throughout a facility. Left untreated, such leaks waste air-compressor horsepower and result in either higher fuel consumption, less capability available from the compressed air, or both.

9-3 Maintenance Involvement

Computerized energy management systems can be an important component of an energy maintenance program but are no substitute for manual inspections and repair by qualified personnel. Inspections completed by experienced maintenance personnel can detect slight leaks, faulty connections, loose or missing parts, frayed belts, and other danger signs that computerized systems might overlook or detect only after failure.

Note

The staff needs to be well trained in the principles and technologies used in the buildings and systems they service.

9-3.1 Required Manpower Positions

An effective energy maintenance program requires someone to be in overall control, usually the energy manager, maintenance manager, in-plant manager, or plant manager. That person shares with the facility manager the overall responsibility for planning, implementing, and supervising the program. The energy manager must coordinate with the responsible person to link the facility structure with maintenance operations. Through proper management, an effective maintenance program minimizes disruptions to postal operations and the quality of life at the facility. It is also the maintenance manager's responsibility to balance routine, scheduled, preventive, and emergency maintenance.

Note

The key to effective energy system maintenance is the availability of "hands-on" maintenance and operations personnel — the more experienced and well-trained the better.

The energy maintenance program also needs experienced coordinators to carry out specific portions of the maintenance plan. The superintendent makes sure that work is carried out according to schedule, that records of repair and inspection results are kept, and that visits are made to physical systems to assess progress.

A highly motivated maintenance repair department is essential. It completes maintenance and repair tasks and observes additional problems on inspection rounds. It must stock the necessary parts and tools, process work orders, and record completed work. In addition to fulfilling work order requests and performing scheduled PM, maintenance workers need to spend some time periodically inspecting energy system components for such instances as sophisticated automated control systems "controlling" air handlers when the belts driving the fans are actually broken or missing. If the maintenance staff does not inspect each energy consuming piece of equipment at scheduled intervals, the energy management program will be flawed.

9-3.2 Training Requirements

Note

Contact the NCED for specific energy training opportunities.

One of the hallmarks of a good energy management program is training. The operations staff need to be well trained in the principles and technologies used in the buildings and systems that they service.

Training for maintenance staff should, however, concentrate on the following practical, hands-on aspects of maintenance:

- Concentrate on the training that is specific to the systems for which the maintenance staff is responsible; some general energy systems management training is also useful.
- Keep records on the effectiveness of different training courses; know which ones work and which ones are ineffective or not applicable to a particular facility's circumstances. Maintain records to avoid duplicate or inconsistent training.
- Provide building staff who are not involved in maintenance with some cross-training from the maintenance staff so that building staff members become additional eyes for recognizing potential system problems. They can also be trained to assist the operations staff by monitoring energy use within each building.

10 Shared Energy Savings Contracting

10-1 Using the Private Sector to Finance Energy Savings Projects

Definition

SES is a contracting procedure whereby an energy service company finances, installs, and maintains energy saving equipment.

Shared energy savings is a low-risk contracting procedure that can significantly increase energy efficiency at Postal Service facilities. Most utility companies provide technical and financial services for their customers to improve their energy efficiency. Companies that provide these services are known as energy service companies. Most large utility companies own an ESCO as a subsidiary, but there are also many independent ESCOs.

The ESCO is invited to identify, design, install, and finance an energy conservation opportunity project that is installed in a building owned by the Postal Service. In return, the ESCO receives a portion of the resultant energy savings. If the ESCO is the same company providing a utility to postal buildings, a sole source contract can be awarded. Otherwise, competitive contracting is required.

The scope of work for the project may involve whole packages of energy consuming systems of a building or group of buildings. The responsible ESCO surveys the building(s) and identifies energy conservation opportunities relating to the system(s) identified by the scope of the project. The ESCO submits separate technical and financial proposals for the retrofit recommended. The contract length is determined by the financial proposal, but normally spans a period of 3 to 5 years. Under this energy savings performance contract, the Postal Service agrees to pay a percentage of the measured energy cost savings associated with the installed energy conservation opportunities.

The methods that are used to calculate and distribute the energy cost savings are included in the contract. The portion of gross energy cost savings required by the ESCO to make the investment economically attractive varies. The ESCO may require a higher percentage of the energy cost savings in the early years to quickly recover invested funds. The contract includes installation and may include maintenance and additional energy management services such as personnel training or follow-up monitoring.

10-2 SES Contracting

Note

SES contracting is an alternative means to fund energy projects at Postal Service facilities.

Contracting for SES opportunities requires solid communication and effective coordination among the environmental coordinators, plant and district managers, maintenance and finance personnel, and appropriate contracting officer. This communication should begin the moment an environmental coordinator believes that an SES opportunity would benefit postal facilities within his or her area. PMSCs provide the contracting expertise and documents to complete a contract award for SES projects.

10-2.1 SES Purchase Request

Environmental coordinators should inquire with installation managers whether facilities are a good candidate for SES opportunities. The process is started by the development of a Justification of Expenditure (JOE), a Decision Analysis Report (DAR), and a completed Form 7381, *Requisition for Services, Supplies, or Equipment.* In addition, the request includes a support plan that identifies individuals who will be responsible for evaluation of technical and financial proposals and the administration support contact at the facility or facilities planned for SES opportunities. The completed documents containing all appropriate signatures evidencing approval are then sent to the PMSC for review and processing.

Note

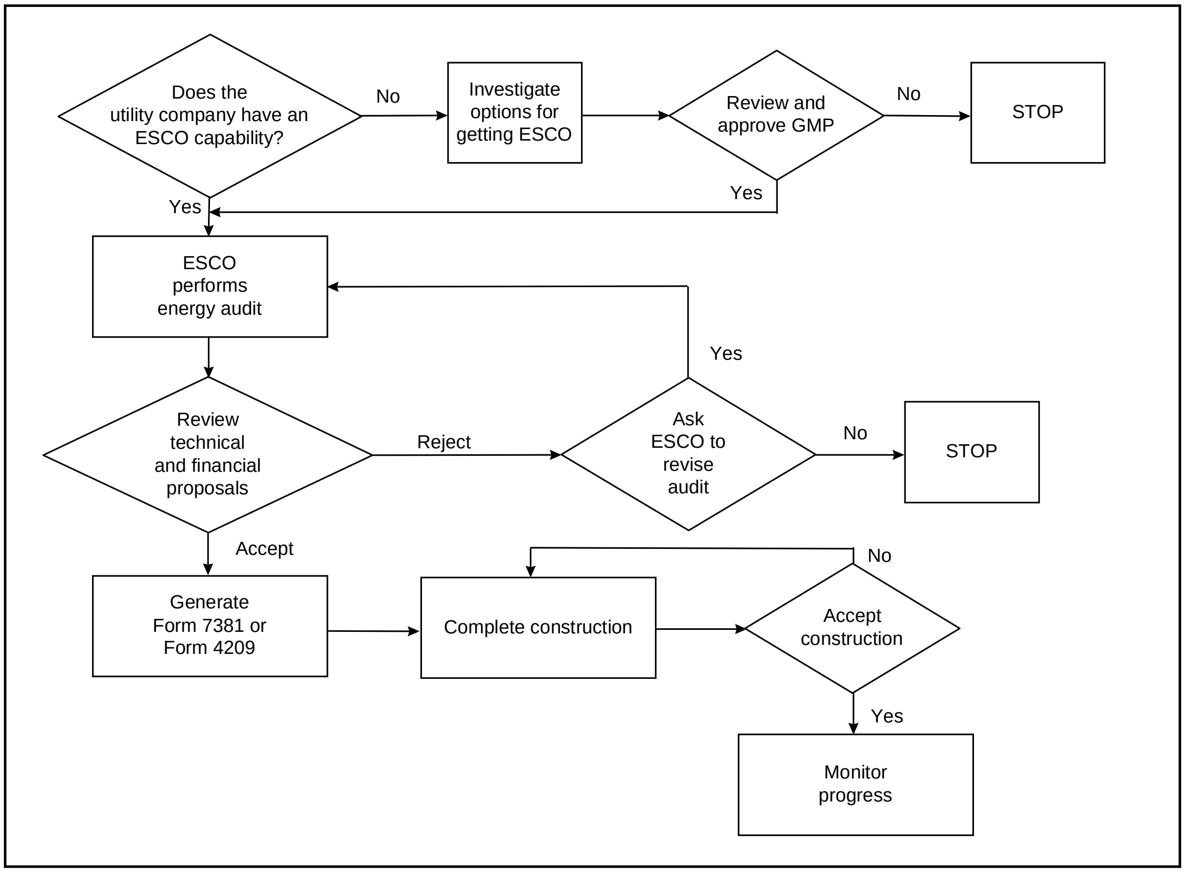
An SES contract at New Jersey International and Bulk Mail Center — ERI Services — remanded them $411,782 energy rebate check. They expect rebates of more than $870,000 per year for 10 years, for an annual energy savings of nearly $540,000.

To ensure that prospective ESCOs understand Postal Service requirements, it is important to hold a preproposal meeting after issuing the SES solicitation. The environmental coordinator, an appropriate contracting officer from the servicing PMSC, the installation manager, and representatives from Maintenance and Finance should attend that meeting.

SES solicitations and contracts are normally made with local utility companies or their ESCO. Exhibit 10-2.1 shows the overall flow for initiating an SES project. A more detailed step-by-step process for SES contracting is described in section 10-3. Postal Service policy enables the PMSCs to contract directly with local utilities or their ESCO. In some cases, it may be in the best interest of the Postal Service to competitively compete the requirement with several interested parties capable of performing energy services. The documents for contracting SES opportunities have already been developed for the PMSCs. The solicitation contains an appropriate statement of work and evaluation factors to determine the best qualified ESCO to receive contract award.

The ESCOs must first submit a general management plan (GMP) to show their competency. The GMP should provide an overall view of how the company can meet the Postal Service requirements. If their GMP is approved after review, ESCOs must submit a separate

Exhibit 10-2.1, Process for Shared Energy Savings Project



technical proposal and financial proposal. The technical proposal should detail all planned energy savings measures, and the financial proposal should address the proposed cost savings.

10-2.2 Evaluation and Contract Award

The team of employees responsible for technical proposal evaluation should fully understand the Postal Service requirement for SES projects. The team should examine the **technical** proposal to make certain that it is feasible and practical relative to its potential impact on installation activities. The team should be wary of leading edge technologies, although it should not dismiss them out of hand. The technical evaluation of the proposed energy conservation opportunities may consist of the following factors, listed in descending order of importance:

- Factor 1 — Energy surveys.
- Factor 2 — Maintenance and operations.

- Factor 3 — Facility energy use and baseline.
- Factor 4 — Implementation plan.

The financial evaluation team must examine the price proposal for its accuracy, including utility cost projections. Estimates of cost savings have a tendency to exceed what can be accomplished practically. The team must ask whether the cost savings make unrealistic assumptions about energy users' behavior and/or system reliability and performance. The team should pay close attention to the relative financial strengths of the ESCOs from the point of view of their abilities to remain in existence for the life of the contract period. Ideally, the team should look for a solid company with the financial ability to finance and operate the capital improvement necessary to achieve the promised energy savings.

A contract is awarded to the offeror whose proposal contains the combination of those criteria offering the “best overall value” to the Postal Service. This is determined by comparing differences in the value of technical and management features with differences in the net present value to the Postal Service. In making this comparison, the Postal Service is concerned with striking the most advantageous balance between technical and management features and the net present value to the Postal Service, with technical features carrying a higher percentage of the overall evaluation weight. The financial evaluation of the offeror's proposal is based on the total net present value of the energy dollar savings to the Postal Service.

The contracting officer is responsible for making the final decision for contract award. This decision is based on the recommendations from the technical and financial evaluation committees. Their review is the most important part of the overall award process.

Important note: Before awarding a contract, internal financial resources need to be reevaluated to ascertain if the Postal Service should fund the project internally to capture all the savings or whether to continue with the contract for alternative financing. Contact the requiring office before award.

10-2.3 Contract Administration

Contract administration begins after the contract has been awarded to the successful ESCO. Although contract administration requires the efforts and skills of many people, the contracting officer is ultimately responsible for all contract administration functions. The contracting officer designates in writing one or more CORs to perform any administrative function that does not involve a change in the cost or duration of contract performance. CORs may not themselves appoint representatives without the prior written approval of the contracting officer. CORs may not perform any function or exercise any authority not specifically delegated by the contracting officer. The contracting officer notifies the ESCO in writing of the appointment of any representative or representatives, specifying the authority delegated and cautioning the ESCO to notify the contracting officer any time the ESCO believes the representative is exceeding the authority granted by the delegation.

Note

SES makes sense when postal funds are unavailable.

Disputes with ESCOs are an obstacle to contract performance. Contracting officers and their supporting staff should seek to resolve contract disputes through a businesslike approach that promotes efficiency and cost-effectiveness and enforces the Postal Service's interests. The specific functions required to be performed under any contract are determined by the contract clauses and the particular contract situation, as well as the policies in the *Purchasing Manual.* The contracting officer and each representative should together carefully review the contract immediately after award to determine the functions to be performed and the person or persons responsible for performance.

10-3 Overall SES Process

A recommended step-by-step process flow for SES contracting is shown in Exhibit 10-3. Each of the steps is explained in the following sections. Members of the AEPCs and PCEPCs have received detailed training regarding this SES process.

10-3.1 Step 1: Form Project Team

Form a stable team that will follow SES projects from start to finish. This team must designate resources for the technical evaluation committee and the financial evaluation committee and establish team protocols.

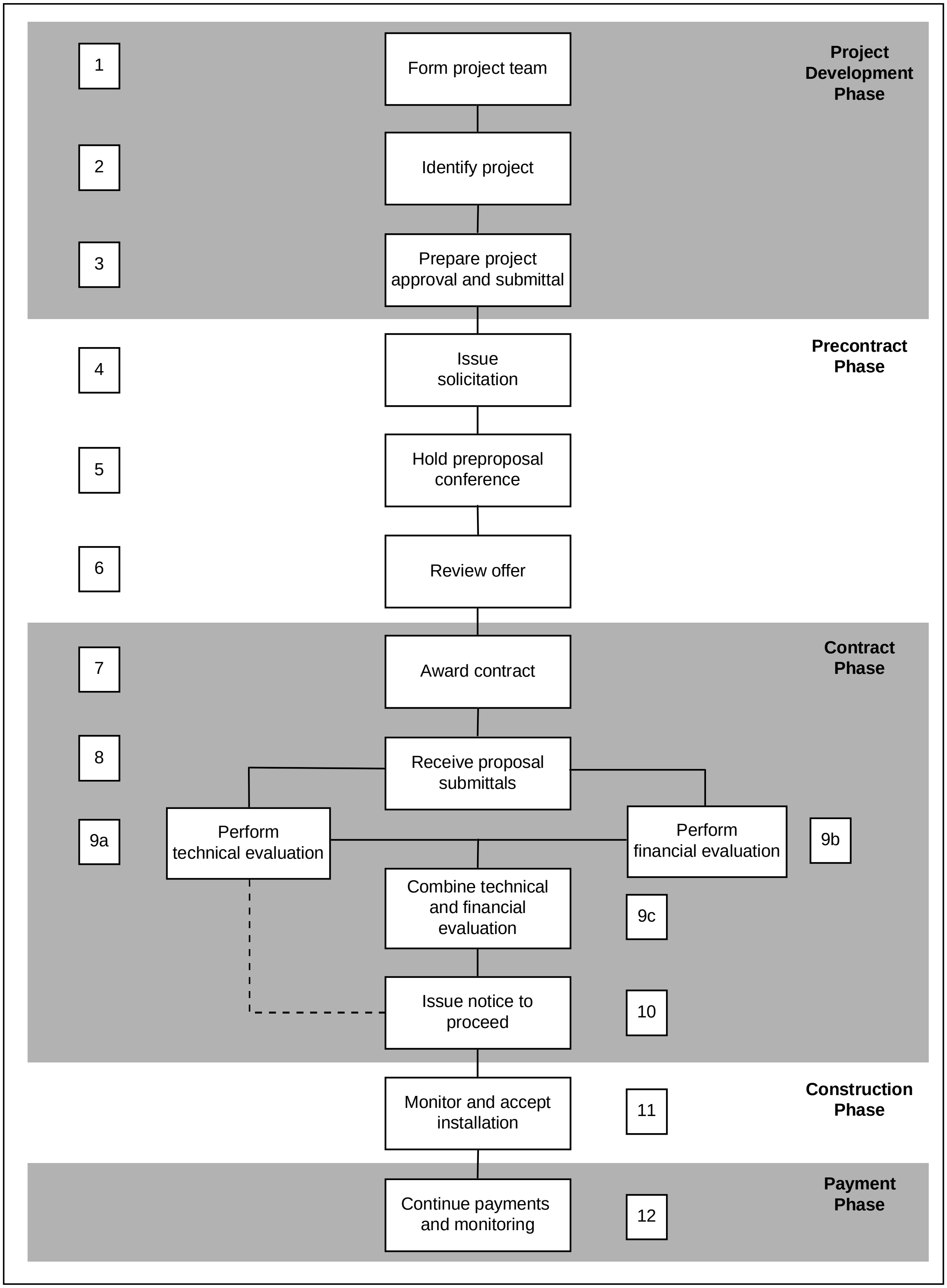
10-3.2 Step 2: Identify Project

Identify potentially successful shared energy savings projects and estimate expected cost, savings, and payback. When identifying projects, consider some of the following: determine the scope, whether it will be a single facility or multiple facilities; check FMSWIN for existing projects; check facility replacement plans; and select energy saving technologies.

10-3.3 Step 3: Prepare Project Approval and Submittal

Discuss the potential project with the PMSC. Obtain local approval from appropriate managers and other personnel. Prepare JOE and Form 7381 for approval and submit them to the PMSC.

Exhibit 10-3, Shared Energy Savings Process Flow



10-3.4 Step 4: Issue Solicitation

Modify a standard SES contract to reflect the scope of the projects and issue it to the selected utility company.

10-3.5 Step 5: Hold Preproposal Conference

Meet with the utility company to clarify the project and revise the proposal, if necessary.

10-3.6 Step 6: Review Offer

Receive and evaluate the utility company’s financial data and general management plan.

10-3.7 Step 7: Award Contract

Award a basic SES contract to the utility company. Issue a postal data center (PDC) commitment document.

10-3.8 Step 8: Receive Proposal Submittals

Review the utility’s submittal and convene evaluation committees.

10-3.9 Step 9: Perform Technical and Financial Evaluations

Step 9a: Perform Technical Evaluation

Confirm estimated savings and review impacts on operations and maintenance.

Step 9b: Perform Financial Evaluation

Meet to perform the financial evaluation. Select the preferred financing option.

Step 9c: Combine Technical and Financial Evaluations

The evaluation committees send the combined recommendations to the contracting officer.

10-3.10 Step 10: Issue Notice to Proceed

Review committee findings for consistency and issue formal notice to proceed (NTP). Request bonds from the ESCO.

10-3.11 Step 11: Monitor and Accept Installation

Arrange for construction and check that performance specifications are met. Conduct a preconstruction conference (optional). Generate a punch list if necessary during final inspection. Ensure that all acceptance procedures, such as transferring the title and warranties, are accomplished.

10-3.12 Step 12: Continue Payments and Monitoring

Pay the utility company, monitor project performance, and periodically review termination options to ensure that SES projects achieve their intended goals.

11 Renewable Energy

Generally, alternative, renewable, and clean forms of energy are produced by nontraditional sources and/or conversion processes. They have low emissions and minimal negative impact on the environment. Examples are solar thermal, photovoltaic (PV), geothermal, wind, landfill-generated methane, fuel cell, hydrogen combustion, and hydroelectric energy generation. This chapter provides a brief overview of how to apply the technologies that are most appropriate for Postal Service facilities (i.e., using solar thermal, PV, geothermal, and wind energies).

11-1 Energy Conversion Policies

The Postal Service's goal is to demonstrate the feasibility of renewable energy technologies at the designated showcase facilities, replacing some current fuel sources with any form of alternative, renewable, and clean energy sources or with solid fuels (e.g., coal, municipal trash, coal-water, or coal-oil mixtures). The postal facilities must actively seek out life-cycle cost-effective applications for alternative, renewable, and clean energy sources.

Note

The Postal Service's goal is to demonstrate the feasibility of alternative, renewable, and clean energy.

The Clean Air Act (CAA) Amendments of 1990 renewed emphasis on the wider application of alternative, renewable, and clean energy technologies. The Amendments limit emissions of sulfur dioxide (SO_2) and establish an SO_2 trading system for annual emission allowances. Any offender who does not have enough allowances to cover the emissions will be severely penalized and fined. It will become more difficult to meet these emission limits in future years, because annual allowances are to be reduced each year by an established amount over the preceding year. Postal Service facilities can reduce SO_2 emissions and obtain additional SO_2 emission allowances, if necessary, by investing in renewable technologies, which in turn will help to achieve compliance with the CAA and avoid the imposition of heavy fines.

11-2 Solar Energy

Solar energy is abundant and perpetually renewable, making it an ideal energy source in many ways. The amount of solar energy a site can receive depends on location, time, and environmental conditions. Solar radiation is the "resource" of solar energy. The maximum amount of solar radiation that a site can receive is approximately 2,550 kWh per square meter (m^2) per year.

Note

Solar energy has been proven to be life-cycle cost-effective in many applications, but, as with most renewable energy systems, the "cheap" energy is offset by the initial capital investment costs. The use of private sector financing can help reduce the initial burden on an installation.

Solar energy can be converted to either thermal energy (solar thermal) or electric energy (photovoltaic). Solar energy systems may be further classified as either active or passive systems. Active solar systems incorporate pumps to circulate liquids and/or motors to provide movement of fans or collectors. Conversely, passive systems do not utilize active components such as pumps and motors.

Due to energy security and cost-effectiveness issues, relying on solar energy as the primary energy source for meeting all facility energy requirements is generally not practical. However, selective use of solar energy as a supplementary energy source offers a wide range of attractive applications. In addition, many other factors must be weighed before considering a solar energy system. The availability of engineers and technicians qualified to operate and maintain a solar energy system so that it is in harmony with a building's primary energy system is critical. Many solar energy systems have been shut down in the past because of a lack of operations and maintenance knowledge.

Before deciding to use a solar energy application, energy managers should seek assistance in determining whether potential solar projects are technically and economically viable. The DOE's National Renewable Energy Laboratory (NREL) offers technical and operations assistance with solar energy systems. NREL can provide assistance in determining project feasibility. NREL also has a wealth of data on solar isolation at Postal Service facilities. Location is a critical factor in determining viability of solar energy applications. In certain locations in the United States, such as the northwest, solar projects are usually not viable options. However, in the southern states solar applications can be very practical.

11-2.1 Solar Thermal Application

Solar thermal energy is the most widely used form of solar energy. There are many types of solar thermal system designs, ranging from a simplistic direct gain system to a solar-absorption cooling system. All solar thermal systems absorb the sun's radiant heat energy and convert it to a usable thermal energy.

Passive solar thermal systems are virtually maintenance free and can be easily integrated into building designs. All new building designs should incorporate some sort of passive solar thermal technology, such as the orientation of docks and platforms. Similarly, renovations to existing facilities should not be made without consideration of passive solar thermal technologies. Other appropriate solar thermal applications are process hot water and hot air applications and low- and high-pressure steam applications. In many cases, the use of solar energy for preheating process hot water or providing domestic hot water has been shown to be economically competitive with conventional practices.

11-2.2 Photovoltaic Application

Although PV energy systems are not as numerous as solar thermal systems, their application is rising due to the advances in solar cell design. The PV technology has improved steadily. New PV systems are more reliable at a lower cost than previous systems. The output configurations for PV systems are virtually unlimited. Modules of solar cells can be connected in either parallel and/or series to provide different current and voltage outputs. This modularity also factors heavily in system expansion and repair.

Because the application of PV technology is relatively new, its full potential is still being developed. Based on past performance, PV technology is well suited for use at remote locations where access to the power grid is not feasible. Some examples of effective use of PV technology are a remote power supply for lighting, range instrumentation, navigational aids, and communication repeater stations.

A good way to identify potential PV projects is to consider remote or stand-alone applications that are currently being powered by portable gasoline or diesel units or by batteries. PV generator hybrid systems can also be viable and they reduce energy vulnerability. When life-cycle costs (LCCs) are calculated, replacing or retrofitting an existing system with a PV system is attractive because the conversion greatly reduces the need for maintenance and fuel delivery. In some cases, economic payback for remote site applications is less than 1 year.

11-3 Geothermal Energy

11-3.1 General

Geothermal energy is derived from the thermal energy of the earth. Geothermal energy is generally thought of as tapping the hot thermal energy in fluid saturated rocks that are in close proximity to magma. These circumstances occur only in very few areas. Most geothermal producing sites of this type in the United States are located on the west coast and in Hawaii and Alaska. Such locations are often marked by geysers, hot springs, and fumaroles. Furthermore, although various geographical signs suggest the potential for such productive geothermal resources, their definite existence can only be determined by drilling costly exploratory wells into the reservoir. It is highly unlikely that an installation resides on geothermal resources of this type.

The exploration and development of magma-related geothermal resources require specialized expertise. They are also highly risky and expensive. Geothermal production facilities of this type typically require large up-front capital costs. Although the fuel is essentially free, maintenance is expensive because the “brine” (i.e., liquid pumped from underground reservoirs) is often corrosive. Furthermore, because of the nature of the geology and flow of mineral content in the fluid, the extraction and reinjection wells often have to be redrilled at new locations.

11-3.2 Geothermal Application

Geothermal (or ground source) heat pumps for heating and cooling are the most common application of geothermal energy. The ground is used as a reservoir from which heat can be extracted during winter and to which heat can be dissipated during summer. Geothermal heat pumps are more efficient than conventional heat pumps, because the Earth's ground keeps a constant temperature of about 55°F year round and also because the only energy consumed is electricity to drive the pumps. Also, the initial geothermal system construction typically is less than the cost of separate heating and air-conditioning systems.

11-4 Wind Energy

11-4.1 General

Several assemblies of equipment are used for extracting the power from the wind to generate electricity; they are windmills, wind turbine generators, and aerogenerators. The power generated by the wind is proportional to the mathematical cube of the wind speed. Therefore, it is critical to locate windmills in areas of persistent high winds. A correct reading of the wind power potential of a selected site is crucial to the economical operation of the system.

11-4.2 Wind Application

Because it is likely that there will be times when the lack of wind power will result in a shortage of installation power, use of wind power as the primary installation electricity source is risky. By conducting a demand analysis of installation electricity consumption patterns, energy managers can determine whether wind power can be a good secondary power source for lowering peak demands. The excess power generated from wind power can be stored by constructing a thermal storage unit or sold to utility companies.

Wind power farms often need a large land area because, by design, windmills must be large. Thus, extensive application of wind power may present a problem in "visual pollution." This problem can be alleviated somewhat by designing more attractive windmill structures or by locating sites where they will not be seen by the public.

12 Utility Deregulation

Deregulation of the utility industry is creating opportunities for energy managers to save money by driving better bargains in negotiating electricity and natural gas contracts. The deregulation of utilities can be expected to allow the Postal Service to reduce its utility costs by 10 percent, or approximately $38 million a year, when all states have completed the process. The natural gas industry has been deregulated since the early 1980s, and the electricity industry is in the process of being deregulated. The EPCs at the area and performance cluster levels are responsible for taking advantage of these new opportunities for savings.

Note

The Postal Service may be able to reduce its utility costs by 10 percent, or approximately $38 million a year.

12-1 A Purchasing Alternative

In the past, utility service purchases, such as for electricity and natural gas, have been based on nonnegotiable, regulated rates (tariffs). Many consumers became concerned that utilities were taking advantage of their protected monopolies and were not providing energy as cheaply as was feasible. In response to the public concerns, many state public utility commissions are in the process of revising their rules in order to introduce competition and remove the current monopoly protections.

The interstate natural gas market is now deregulated, and in many areas the Postal Service energy managers can choose their suppliers. In 1996, California announced a determination to deregulate electricity markets in much the same way, and since that time over a dozen states have become intensively involved in similar processes.

Utility deregulation is not in itself a “program” in the Postal Service, but is a change in the business environment which focuses on different ways to buy utility services. Therefore, it is an integral part of the purchasing strategy as well as of the maintenance function of providing utility-supplied energy to facilities. Because the purchasing of energy must be done under contracts that commit the Postal Service to buy large quantities over time (rather than pay monthly bills), the total dollar values require the PMSC signature authority. Energy managers need to work with the PMSC and provide technical support in determining energy usage profiles so that contracts can be written to best meet the demand.

12-2 Deregulation Management Structure

The EPCs at all levels serve as purchasing oversight teams with the following deregulation activities:

- Establishing innovative or forward-looking purchasing policies and procedures.
- Finding ways to use emerging regulatory frameworks to buy energy more cost-effectively.
- Carrying out these new practices within the Postal Service's standard purchasing practices as defined by the *Administrative Support Manual* and the *Purchasing Manual*.
- Relating procedures to natural gas as well as electricity.

The EPCs receive guidance and technical support from a national EPC that alerts decision-makers to the issues and provides them with the tools and insights needed to make sound decisions. Area and performance cluster EPCs are given responsibility to execute deregulation efforts state-by-state and areawide. This structure and the committee membership were approved by the cognizant vice presidents.

Originally, the national EPC (formerly the Utilities Deregulation Oversight Committee (UDOC)) issued a notice in *Postal Bulletin* 21940 in which local postmasters were cautioned to seek advice from the UDOC before accepting small rate reductions in return for long-term utility service contracts. Now that the Postal Service has more experience with deregulation, all offers must be referred to the PMSC (because of authority levels). Generally, guaranteed rate reductions should not be accepted for a period of more than 2 years (with option years beyond that if desired).

The energy section of the environmental internal web site provides energy purchasing documentation and other pertinent material and a list of national EPC members who can provide additional insights. If the web location changes so that the material is not found there, please contact the energy program manager to find out how to access this information resource. Some of the products (available as of March 30, 1998) are:

- National EPC Deregulation Action Plan.
- Area EPC action plans (including deregulation component).
- Article from *Postal Bulletin* 21940.
- Utility rate SOW.
- Gas analysis at over 200 facilities.

- Process flowchart.
- Facility electricity usage database and data elements and format.
- Facility profiles.
- National EPC meeting minutes.
- Nondisclosure certification agreement.
- U.S. status maps of electricity and natural gas deregulation, by state.
- Communications plan.
- Links to natural gas SOWs.
- Links to electricity SOWs.
- Purchase plan.
- Local Energy Alternative Proposal Evaluation Spreadsheet (LEAPES).

12-3 Cost Savings Opportunities

In a deregulated market, the Postal Service is allowed to seek competitive bids from potential suppliers. Many experts believe that the competitive market environment will help drive down the utility costs across the board by 10 percent. More substantial energy cost savings are possible for large consumers who can manage their energy consumption profile and match the most economical energy sources to meet the demand.

Also, many experts believe that market-based utility energy prices will fluctuate more than the current fixed rate. Consumers with energy load profiles that fluctuate widely will often have to meet their peak demand by paying premium prices or face severe curtailment of energy use. The energy manager’s role is to smooth out the peaks and valleys in demand profiles by shifting or shaving the peak demands. Several techniques are available for smoothing the demand peaks:

- Load aggregations — combine the different load profiles to smooth out the profile of aggregated demand. The deregulated market makes this option possible. The Postal Service can aggregate the energy loads among many postal facilities. Also, aggregated load allows the benefits of economy-of-scale.
- Dual fuel capability — use of alternative fuel sources, typically less expensive, to satisfy the peak demand.
- Duration of contracts — signing long-term contracts can extract a better bargain from vendors and is a good way to

hedge against fluctuating energy prices. On the other hand, those contracts reduce the flexibility to take advantage of windfalls if energy prices go lower.

Although potential savings are available from sophisticated manipulation of energy loads, these savings generally are not worth the operational disruptions they can entail. In addition, if operations do not meet the anticipated profiles, specialized rates often come laden with heavy penalties. Guidelines for the type of service to be procured follow:

- Natural gas — purchase firm (uninterruptible) service unless the facility has alternate energy sources available. Purchase at fixed prices for summer and winter loads; avoid index or spot pricing.
- Electricity — purchase only electricity and ancillary services (see the SOWs for amplification). Purchase at fixed prices per kWh, encompassing as many facilities as vendors will accept. Avoid real-time (constantly fluctuating) pricing completely.

12-4 Confidentiality and Conflict of Interest

Because all EPC meetings may involve procurement-sensitive discussions of energy purchases, all EPC members must execute a conflict of interest statement, a copy of which can be found at the environmental web site. EPC chairpersons are responsible for maintaining a file of those signed statements.

A Summary of Legislation and Executive Orders Fostering Federal Energy Efficiency

The following information is extracted from the U.S. Congress Office of Technology Assessment (OTA), *Energy Efficiency in the Federal Government: Government by Good Example?,* OTA-E-492, U.S. Government Printing Office, May 1991.

A-1 Legislation for Federal Facilities and Operations

Congress has addressed the issue of improving energy efficiency in the facilities it owns and leases and in its operations several times since the mid-1970s. Each new piece of legislation has combined past experience with new approaches in an effort to promote further efficiency gains in federal agencies.

A-1.1 Energy Policy and Conservation Act

The Energy Policy and Conservation Act (EPCA) of 1975 was the first major piece of legislation to address federal energy management, directing the President to develop a comprehensive energy management plan, including procurement practices, and a 10-year building plan. EPCA included few details, leaving those to the executive branch. EPCA also amended the Motor Vehicle Information and Cost Savings Act to require that the federal automotive fleet meet or exceed the corporate average fuel economy mileage standards.

A-1.2 Department of Energy Organization Act

Section 656 of the Department of Energy Organization Act (DOEOA) of 1977 established the Federal Interagency Energy Policy Committee (often called the “656 Committee”). The 656 Committee is a senior agency management group comprising an assistant secretary or assistant administrator from each of the Departments of Defense, Commerce, Housing and Urban Development, Transportation, Agriculture, and Interior; from the U.S. Postal Service; and from GSA. The National Aeronautics and Space Administration and the Department of Veterans Affairs have also designated members for the committee.

The committee is intended to strengthen energy conservation programs that emphasize productivity through the efficient use of energy and to concurrently encourage interagency cooperation in energy conservation. It meets periodically to discuss policy options and review agency progress toward federal conservation goals. One of its purposes is to focus the attention of top federal agency management on the tasks and missions related to national energy objectives rather than on the tasks of a particular agency.

A-1.3 National Energy Conservation Policy Act

In the National Energy Conservation Policy Act (NECPA) of 1978, Congress took a more active role in defining detailed steps to be followed by the executive agencies. Several of the steps included in this legislation had been set forth by the President in EO 12003 in 1977 (see A-2.2). For example, where the EPCA directed the President to develop an energy-related procurement policy, the NECPA specified the use of a “life-cycle costing methodology” as the basis of policy. Similarly, where the EPCA directed the President to develop a 10-year building plan, the NECPA included details such as which buildings were subject to energy audits (all those exceeding 1000 square feet). Both of these NECPA provisions were part of EO 12003.

Unlike EO 12003, the NECPA set no goal for percentage reduction in energy use, but instead specified the minimum rate at which federal buildings had to be retrofit with all cost-effective measures. All buildings were to have been retrofit by 1990. The main provisions of the NECPA were codified as the federal Energy Initiative.

A-1.4 Comprehensive Omnibus Budget Reconciliation Act

The Comprehensive Omnibus Budget Reconciliation Act (COBRA) of 1985 amended the NECPA to provide federal agencies with an alternative source of funding for energy-efficiency investments during a time of fiscal constraints. Under COBRA, agencies were encouraged to seek private financing and implementation of energy-efficiency projects through SES contracts (discussed more in A-1.5).

A-1.5 Federal Energy Management Improvement Act

The Federal Energy Management Improvement Act (FEMIA) of 1988 amended the NECPA and modified and added several provisions to the federal Energy Initiative. A central provision was the establishment of a goal to reduce energy consumption per square foot in federal buildings by 10 percent between 1985 and 1995. Operations energy (i.e., energy used for transport or in energy-intensive activities such as nuclear reactors) was not included. FEMIA marked the first time that Congress specified the level of savings that should be achieved.

Also, as an incentive to encourage use of SES contracts, Congress allowed agencies to retain a portion of cost savings for future energy conservation measures. Furthermore, FEMIA created an Interagency Energy Management Task Force and directed DOE to carry out an energy survey in a representative sample of federal buildings to: (a) determine the maximum potential cost-effective energy savings that may be achieved, and (b) make recommendations for cost-effective energy efficiency and renewable energy improvements.

A-1.6 Energy Policy Act of 1992

In EPACT, Subtitle F, Federal Agency Energy Management, establishes federal agency goals and requirements and amends NECPA to reflect and supplement goals and requirements set forth in EO 12759. Subtitle F of EPACT:

- Requires that all energy and water conservation measures with LCC paybacks of less than 10 years be installed in all U.S.-owned federal buildings by January 1, 2005.
- Contains provisions regarding energy management requirements, LCC methods, budget treatment for energy conservation measures, incentives for federal agencies, reporting requirements, new technology demonstrations, and agency surveys of energy saving potential.
- Authorizes GSA to receive rebates, other incentive payments, or goods and services from utilities and deposit funds into the federal buildings fund for use in energy management improvement programs, and requires GSA to report annually to Congress on its activities related to federal agency energy management.
- Amends sections of NECPA relating to shared energy savings, provides new language giving agencies authority to enter into energy performance contracts, and describes the method of contract implementation.
- In regard to intergovernmental energy management planning and coordination, required GSA, along with the Interagency Energy Management Task Force, to hold five conference workshops in FY93 on energy management, conservation, efficiency, and planning strategy, and requires them to hold biennial workshops in each of the ten standard federal regions thereafter.
- Requires federal agencies to establish and maintain programs to train energy managers and to increase the number of trained energy managers within each agency.

EPACT defines a "trained energy manager" as "a person who has completed a course of study in the areas of: (1) fundamentals of building energy systems, (2) building energy codes and applicable professional standards, (3) energy accounting and analysis, (4) LCC methodologies, (5) fuel supply end pricing, and (6) instrumentation for energy surveys and audits."

- Requires DOE to make available energy audit teams for federal facilities and to establish programs to monitor the implementation of energy-efficiency improvements based on energy audit team recommendations.
- Directs the Office of Management and Budget to issue guidelines for accurately assessing energy use in federal buildings or facilities to be used in agency reports to DOE, and directs GSA to report annually on the estimated energy costs for leased space where the government does not pay these costs directly.
- Directs agency Inspectors General to assess agency compliance with existing energy management requirements as well as the accuracy of energy-use and cost data reported by federal agencies and encourages periodic review.
- Directs GSA, DOD, and the Defense Logistics Agency to identify on the federal supply schedules energy-efficient products that offer significant potential for LCC savings.
- Requires DOE to report to Congress on options for financing energy conservation measures, including an assessment of the investment required and the possible use of revolving funds.
- Directs agencies to establish criteria for improving energy efficiency in federal facilities operated by contractors and to include such criteria in all cost-plus, award-fee contracts.
- Confirms and expands upon the activities and goals of Section 11 of EO 12759 dealing with federal fleets. Amends the Alternative Motor Fuels Act (AMFA) to include all types of alternative fuels and all types of light-duty trucks, and changes the definition of fleet to "20 or more vehicles in metropolitan areas of more than 250,000 people." Requires consideration of pollution reduction potential, requires alternative fuel use in dual-fuel use, requires 50 percent domestic fuels, requires heavy-duty use and disposal reports, and repeals termination of the AMFA. Requires the use of commercial refueling facilities if available, but authorizes funds for refueling facilities if necessary.

- Mandates fleet requirements for new acquisitions to the federal fleet. These requirements were first expressed in numbers of new vehicles and in later years as percents of new acquisitions (i.e., FY93, 5,000 AFVs; FY94, 7,500 AFVs; FY95, 10,000 AFVs; FY96, 25 percent; FY97, 33 percent; FY98, 50 percent; and FY99, 70 percent). Allows allocation of AFV incremental costs to be spread over all agency vehicles and authorizes funds as necessary for fiscal years 1993–1998.
- Requires DOE and GSA to establish an agency promotion, education, and coordination program; allows GSA to offer leased AFVs at lower costs as an incentive for 3 years; requires GSA to establish a recognition and incentive program for federal employees; directs GSA to measure the use of alternative fuels in dual-fuel vehicles; and reduces data collection required to a representative sample.

A-2 Executive Orders for Federal Energy Efficiency

The following information is also extracted from the OTA.

A-2.1 Executive Order 11912

Several EOs have related to federal energy efficiency. The earliest was EO 11912 of 1976, which delegated authorities related to energy policy and conservation. Among other things, this order defined the roles of various cabinet departments with responsibility for federal energy use:

- The administrator of GSA was designated to take on the functions assigned to the President by the Motor Vehicle Information and Cost Savings Act, as amended, directing that rules be established to require the federal fleet to achieve an average fuel economy of at least that applicable to vehicle manufacturers.
- The administrator of the Federal Energy Administration (now the Secretary of Energy) was made responsible for coordination of a 10-year energy conservation plan for federal buildings, energy conservation and rationing contingency plans, and preparation of annual reports to be submitted to Congress as required by EPCA.
- The administrator of the Office of Federal Procurement Policy was required to provide policy guidance for application of energy conservation and efficiency standards in the federal procurement process as mandated by EPCA.

A-2.2 Executive Order 12003

EO 12003, issued in 1977, amended EO 11912 and aggressively expanded the requirements of the EPCA of 1975. For example, it specified a goal of a 20-percent reduction in energy use per square foot in existing federal buildings and required the federal automobile fleet to exceed the minimum statutory requirement by 4 miles per gallon beginning in fiscal year 1980. As noted above, some of its provisions are also found in NECPA. Key provisions of EO 12003 include the following:

- The administrator of the Federal Energy Administration (now the Secretary of Energy) was directed to:
  - Develop, implement, and oversee a 10-year energy conservation plan for federal buildings over 5,000 square feet for the 1975–1985 period that would achieve a 20-percent reduction in energy use in existing buildings and a 45-percent reduction in all new buildings.
  - Establish an LCC methodology.
  - Report to Congress annually on the progress of the plan.
- The administrator of GSA was directed to ensure that:
  - All passenger automobiles purchased by executive agencies exceed the manufacturers' corporate average fuel economy standard under the Motor Vehicle Cost and Information Act.
  - The federal passenger automobile fleet exceeded minimum statutory requirements by 2 miles per gallon in fiscal year 1978, and by 4 miles per gallon beginning in 1980.
  - The federal light truck fleet also meets minimum standards, although not required under the Motor Vehicle Cost and Information Act.

A-2.3 Executive Order 12083

In 1978, EO 12083 created an Energy Coordinating Committee composed of the secretaries of the major federal agencies. Its mission is to assure federal coordination on energy-related matters, including both policy initiatives and resource allocation. In addition to the committee, an Executive Council was formed — consisting of the Secretary of Energy, Chairman of the Council of Economic Advisers, and Assistant to the President for Domestic Affairs and Policy — to fulfill the functions of the committee during periods when the committee is not meeting.

A-2.4 Executive Order 12375

Executive Order 12375 of 1982 further amended EO 11912 to reduce the required federal passenger automobile fleet efficiency established in EO 12003. Whereas EO 12003 required the federal passenger fleet to exceed manufacturers' average fleet efficiency by 4 miles per gallon, EO 12375 required only that the federal fleet meet the manufacturers' average efficiency and that light trucks meet standards set by the Secretary of Transportation. This EO contrasted sharply with EO 12003, which was far more ambitious and went beyond some minimum requirements set by Congress.

A-2.5 Executive Order 12759

On April 17, 1991, EO 12759 was issued with provisions to:

- Extend the FEMIA federal building reduction goal to the year 2000, requiring Btu per gross square foot to be reduced 20 percent from 1985 levels.
- Require agencies to prescribe policies for improving energy efficiency of industrial facilities by at least 20 percent in the year 2000 compared to 1985.
- Minimize petroleum use.
- Procure energy-efficient goods and products by federal agencies based on LCC.
- Provide for federal agency participation in demand-side management services offered by utilities.
- Provide new federal vehicle fuel-efficiency requirements and outreach programs.
- Promote procurement of AFVs for the federal fleet.

A-2.6 Executive Order 12845

Executive Order 12845, issued on April 21, 1993, establishes energy-efficient acquisition standards for computer equipment. Microcomputers, including personal computers, monitors, and printers, must meet the EPA "Energy Star" requirements for energy efficiency (i.e., a standby, low-power feature), as long as the additional costs of the equipment are offset by the potential energy savings. Exemptions to this requirement are permitted on a case-by-case basis (as approved by the agency head).

Note: All exempted acquisitions must be reported annually to the GSA.

A-2.7 Executive Order 12902

On March 4, 1994, EO 12902 was issued to set goals and reporting requirements for energy and water efficiency in federal facilities. Some of the provisions are:

- Each agency is to develop programs with the intent of reducing energy consumption by 30 percent by the year 2005, based on energy consumption per gross square foot of its buildings in use, and using 1985 as the baseline.
- Agencies are to conduct energy and water surveys and audits.
- For every five new buildings an agency constructs, at least one is to be a showcase facility highlighting advanced technologies for energy efficiency, water conservation, or use of solar or renewable energy. Of existing facilities, each agency also designates one of its major buildings to become a showcase facility.
- Each agency reports annually to the Secretary of Energy and Office of Management and Budget on its progress in achieving these goals.
- Agencies are to use innovative financing and contractual mechanisms, including utility DSM programs and SES contracts, to meet the goals.

B Calculating Return on Investment

Energy projects costing between $25,000 and $1 million are required to have a JOE filled out and a cash flow analysis done. However, it is useful to do a cash flow analysis on *all* projects before making an investment. Based on this analysis, a manager can determine whether investing in a particular project will provide cost savings “in the long run.” Although some projects may pose unknown risks and other factors that make such calculations complex, many projects can be adequately evaluated by estimating the “simple payback time,” comparing life-cycle costs, or calculating the internal rate of return (IRR), all of which are ways of determining return on investment.

The estimated simple payback time is the number of years needed to recover the additional costs incurred by investing in an energy project, without considering future price changes or inflation. The initial and operating costs (LCCs) of the two alternatives (investing in the project or not) must be estimated. The IRR is the rate expected to be earned on an investment project and is explained in section B-4.

The cost of borrowing money for the investment is not included in these examples for the sake of simplicity. However, managers should normally consider the interest that would be charged on a loan for the initial investment, especially when the initial costs (and hence the interest payments) are very large or when the estimated payback period is lengthy.

B-1 Example — Replacing Fluorescent Lighting Components

At a facility having 500 fluorescent light fixtures that operate 24 hours a day, determine the economic feasibility of replacing the two 34-watt lamps (T-12) and a magnetic ballast (a total of 82 watts) with two low mercury, high-efficiency lamps (T-8) and an electronic ballast (a total of 62 watts). Alternative A (keeping the T-12 lamps and magnetic ballasts) and Alternative B (replacing the components with T-8 lamps and electronic ballasts) are evaluated to calculate the ROI based on simple payback time. The high-efficiency components will reduce the electricity bills, but the lamps are more expensive than and have about the same service life (20,000 hours) as the T-12 lamps. Also, the large initial cost of buying and installing the new components must be considered. How many years would it take to recover the additional costs of installing new components (Alternative B over Alternative A)?

All costs of both alternatives are summarized, as shown in Exhibit B-1. (The backup calculations and assumptions resulting in the hypothetical figures shown in Exhibit B-1 are provided in sections B-1.1 and B-1.2.) The costs should include the initial investment costs of the new alternative and the annual recurring costs, such as utilities, supplies, labor to replace components, and disposal costs. In this example, the disposal costs are zero since they are considered to be equal, because both types of lamp eventually will have to be disposed of when they burn out. (In reality, disposal costs could be significant because waste that contains mercury must be disposed of as hazardous waste in certain cases. However, this is not always true and must be calculated on a case-by-case basis.) For an estimate of the simple payback time, divide the initial costs by the annual savings.

Exhibit B-1, Comparison of Costs of Alternatives A and B

Alternative	Initial Costs	Annual Costs			
	Total Purchase and Installation	Utilities	Supply Costs	Labor (for Replacement)	Total
Alternative A (keep T-12)	$0	$25,141	$878 (lamps) $550 (ballasts) $1,428	$1,756 (lamps) $250 (ballasts) $2,006	$28,575
Alternative B (install T-8)	$30,000	$19,009	$0	$0	$19,009
		Annual Savings			$9,566

The formula to calculate simple payback time is as follows:

$$\text{Simple payback time} = \frac{\text{Initial cost}}{\text{Annual savings}}$$

Therefore, ROI based on simple payback time is:

$$\frac{\$30{,}000}{\$9{,}566 \text{ per year}} = \mathbf{3.14\ years}$$

B-1.1 Cost of Alternative A

The costs of keeping the T-12 lamps and magnetic ballasts can be divided into three categories: utilities, supplies, and labor to install replacement lamps and ballasts. The steps for calculating each of these costs are detailed below:

- Cost of utilities:
  - Watts per fixture:
    (2 lamps ∗ 34-watt lamps) + 1 ballast @ 12 watts

    (Although the total of rated power consumption adds up to 80 watts per fixture, the most power with this combination (two 34-watt lamps with one 12-watt ballast) will draw 82 watts according to the manufacturer's specifications.)
  - Watts for 500 fixtures:
    500 ∗ 82 watts = 41,000 watts
  - Convert watts to kilowatts:
    41,000 watts ÷ 1,000 = 41 kW
  - Electricity cost for 1 year for all 500 fixtures at $0.07 per kilowatt-hour:
    41 kW x $0.07/kWh x 24 hours/day x 365 days/year = **$25,141 per year**

- Cost of supplies (replacement lamps and ballasts):
  - Postal Service costs (e.g., $3 per fluorescent lamp and $22 per magnetic ballast). (The expected life of a lamp is 20,000 hours (2.28 years), and the ballast failure rate is 5 percent per year (based on vendor statistics or maintenance records for past years)).
  - Number of lamps replaced per year:
    Since each lamp lasts 2.28 years, all of the 1,000 lamps will have to be replaced (500 fixtures ∗ 2 lamps per fixture) every 2.28 years:

    1,000 lamps ÷ 2.28 years = 439 lamps/year
  - Cost of lamps used per year:

    439 lamps/year ∗ $3/lamp = **$1,317 per year**
  - Number of ballasts used per year (with a failure rate of 5 percent per year):

    500 ballasts ∗ 0.05/year = 25 ballasts/year
  - Cost of ballasts used per year:

    25 ballasts/year ∗ $22/ballast = **$550 per year**
- Cost of labor for replacing lamps and ballasts — this includes time to set up to change both lamps and ballasts whenever one needs replacing. Assume 0.2 hour, at $20 per hour, to change a lamp and 0.5 hour to change a ballast:
  - Labor cost of replacing lamps:

    439 lamps/year ∗ 0.2 hour ∗ $20/hour = **$1,756 per year**
  - Labor cost of replacing magnetic ballasts:

    25 ballasts/year ∗ 0.5 hour ∗ $20/hour = **$250 per year**

B-1.2 Cost of Alternative B

The costs of replacing current T-12 lamps and magnetic ballasts with T-8 lamps and electronic ballasts can be divided into four categories: initial cost of buying and installing new components, utilities, supplies, and labor to install replacement lamps and ballasts. The steps for calculating each of these costs are detailed below:

- Initial cost of buying and installing T-8 lamps and electronic ballasts:
  - The Postal Service negotiated prices for the T-8 lamps and electronic ballasts at a cost of $60, including installation costs.

    Note: Labor costs should be included if postal employees are installing the fixtures.
  - Replacement of components:

    500 fixtures ∗ $60 per component = **$30,000** initial investment
- Cost of utilities:
  - Watts per fixture totals 62 watts.

    (Although the components add up to 64 watts per fixture, the manufacturer's specifications state 62 watts for the system.)

- Watts for 500 fixtures:
  500 ∗ 62 watts = 31,000 watts
- Convert watts to kilowatts:
  31,000 watts ÷ 1,000 = 31 kW
- Electricity cost for 1 year for all 500 fixtures at $0.07 per kWh:
  31 kW ∗ $0.07/kWh ∗ 24 hours/day ∗ 365 days/year = **$19,009 per year**

■ Costs of supplies and labor (replacement lamps and ballasts) are $0 because old light fixtures have been retrofitted.

B-2 Example — Motors

In addition to the cash flow analysis, various postal policies may play a role in making an investment decision. There are two types of decisions to make for motors: (1) what type of motor to use when a motor fails, and (2) whether to refurbish or replace an old motor when it fails.

B-2.1 Standard Versus Efficient Motors

According to a National Institute of Standards and Technology (NIST) estimate, a standard efficiency 10-horsepower (hp) motor costs $400 and has a lifetime of 20 years, over which time it will incur $6,500 in energy costs and $500 in maintenance and repair costs. Energy costs, therefore, account for 88 percent of a standard motor's $7,400 lifetime costs.

A new efficient motor's initial purchase price is higher. According to NIST's estimate, an efficient 10-hp motor costs $500, $100 more than a standard motor. However, the LCC of the efficient motor is estimated to be $1,000 less due to lower energy, operation, and maintenance costs. Therefore, it is important that decision-makers purchase efficient motors for replacements when older, less-efficient motors fail. Exhibit B-2.1 plots the available data, showing the long-term benefit of investing in the more efficient motor.

Exhibit B-2.1, Life-Cycle Costs of Motors

Type of Motor	Initial Costs	20-Year Energy and Maintenance Costs	Total Life-Cycle Costs
Standard efficiency motor	$400	$6,500 + $500 = $7,000	$7,400
Efficient motor	$500	$6,000	$6,500

Again, this example does not take into account the interest on a loan that might have to be taken to pay for the initial investment.

B-2.2 Refurbished Versus Replacement

When a 75-hp (or smaller) open drip-proof motor fails, Postal Service policy is to replace it with a new energy-efficient motor (EEM) if the refurbishment will cost more than 60 percent of an EEM. All new installations must use new EEMs. This policy is based on common percentages used in industry and calculations assuming a motor life of 40,000 hours, average electricity costs of $0.08 per kWh, motors operating at a 75 percent load, and operating hours exceeding 4,000 hours annually. Motors larger than 75 hp should be evaluated on a case-by-case basis.

New EEMs differ from standard design motors in several ways: new EEMs are about 5 percent higher in efficiency and operate about 10 degrees cooler. The lower operating temperature reduces heat load. EEMs are better able to handle inverter duty, phase voltage imbalances, high ambient temperatures, impaired ventilation, and cycling. EEMs operate just under their operational design current. In contrast, standard motors typically exceed their operational design amperes by about 4 percent. Refurbished motors will have a reduction in efficiency of at least 1 percent compared with the original design efficiency as shown on the manufacturer's nameplate.

B-2.3 Calculating Energy Savings With an EEM

Importance of Correct Motor Design

Fan and pump installations are areas where actual motor loads will have to be measured to ensure that a new EEM will achieve projected savings. When energy savings are the justification for motor replacement, the replacement motor should have operational design revolutions per minute (rpm) equal to or slightly less than the motor being replaced. This is important, because a motor running faster increases its power consumption (as it delivers a greater quantity of fluid) and could eat up all the savings estimated by the efficiency alone.

Be aware of the sensitivity of load and energy requirements to rated motor speed. Replacing a standard motor with an EEM in a centrifugal pump or fan can result in increased energy consumption if the EEM operates at a higher speed. A standard efficiency motor with an operational design speed of 1,750 rpm should be replaced with a high-efficiency unit of similar rpm in order to capture the full energy conservation benefits associated with the EEM retrofit. Additionally, sheaves or trim pump impellers can be used to ensure that systems operate at their design conditions.

Annual Savings

Annual energy savings associated with an EEM can be calculated using the following formula:

$$\text{Energy savings} = hp * L * 0.746 * hr * C * ((100 \div \text{E-std}) - (100 \div \text{E-ee}))$$

where

hp = motor-rated horsepower

L = load[3] factor (percentage of full load)

hr = annual operating hours

C = average energy cost per kWh

E-std = standard motor efficiency rating from nameplate

E-ee = energy-efficient motor efficiency rating from nameplate

Conversion from hp to kW: 1 hp = 0.746 kW

Example: A chilled-water pump from a P&DC has an existing motor with 200 hp, 1,800 rpm, and an efficiency rating of 85.0 and operates over 8,760 hours annually. It was replaced with an EEM with the same hp and operational design rpm and an efficiency rating of 95.8.

Note: hp = 200, L = 0.85, hr = 8,760, C = $0.059, E-std = 85, and E-ee = 95.8.

Using the formula shown earlier, the annual energy savings are calculated as follows:

200 hp ∗ 0.85 ∗ 0.746 ∗ 8,760 hr ∗ $0.059 ∗ ((100 ÷ 85) – (100 ÷ 95.8)) = **$8,693**

The initial costs associated with the EEM are as follows:

- Cost of EEM = $4,689.
- Installation cost = $1,500.
- Utility company rebate = $2,250.
- Therefore, initial costs are calculated as follows:
  $4,689 + $1,500 – $2,250 = **$3,939**

The ROI is calculated as follows using the simple payback formula shown in section B-1:

$$\frac{\$3{,}939}{\$8{,}693 \text{ per year}} = \textbf{0.45 year} \text{ (less than 6 months)}$$

B-3 Example — Replacing Exit Signs

Many of the exit signs at Postal Service facilities use two intentionally redundant incandescent lamps rated at 20 to 25 watts each. These lamps are rated to last 750 to 2,000 hours, and therefore need to be changed approximately every 60 days. Energy-efficient LED exit sign replacement fixtures are rated at 2 watts per fixture. The Postal Service currently has a contract for these fixtures at a cost of **$24.50** each. Their lamp lifetime is estimated to be 25 years, thus the average payback for LED exit sign replacement ranges from 6 months to 1 year.

The following calculations indicate the annual costs associated with incandescent exit signs:

- Energy cost (exit signs must be lit 24 hours/day, 365 days/year):
  40 watts ∗ $0.07/kWh ∗ 24 hours/day ∗ 365 days/year ∗ (1 kW/1,000 watts)
  = **$24.53 per incandescent exit sign per year**

- Replacement supply and labor costs for each incandescent exit sign:
  - Cost of 2 incandescent lamps is $2.00.
  - Cost of labor for replacement (0.2 hours @ $20/hour) is $4.00.
  - Total replacement cost is **$6.00**.
- The number of times a year lamps in each incandescent exit sign must be replaced (assume an incandescent lamp lasts 2,000 hours):
  8,760 hours/year ÷ 2,000 hours = **4.38**
- Annual replacement cost:
  4.38 ∗ $6.00 = **$26.28**

The ROI is calculated using the simple payback formula as follows:

$$\frac{\text{Investment cost}}{\text{Total cost}} = \frac{\$24.50}{\$24.53 + \$26.28} = \mathbf{0.5\ \ year}$$

B-4 Internal Rate of Return

The IRR of a project is another tool for helping a manager determine if it is worthwhile to undertake an investment project or to make a decision when comparing various energy investment projects.

Tip: The IRR is related to the payback period. It closely approximates the inverse of the payback period. If the payback period is 4 years, the IRR should be about 25 percent.

The IRR is the rate that can be expected to be earned on an investment project. To determine this number, estimates of the annual cash flow for a number of years and the cost of the initial investment are required. An investment's IRR, signified by "r," is that rate which satisfies the following relationship:

$$I = \frac{CF_1}{1+r} + \frac{CF_2}{(1+r)^2} \ldots\ldots + \frac{CF_n}{(1+r)^n}$$

where

CF_1 = cash flow from year 1

CF_2 = cash flow from year 2 (and so on)

I = initial investment

Coordinate with the district Finance unit for the calculation of IRR from the necessary supporting data provided by the energy managers.

B-4.1 Advantages of IRR Projections

The IRR can be helpful in several ways:

- The rate of return should always exceed the cost of capital in order not to lose money on the project. For example, if the IRR is 0.07 and interest on a loan for the investment is 8 percent, this investment would be expected to lose money.

  Note: The number of years considered in calculating the IRR should be related to the service life of the equipment, expected changes in technology, and other factors.

- Among several different energy projects, funding priority should be given to the projects having the highest IRRs, all of which should exceed the cost of capital.

B-4.2 Analysis Assistance

A more detailed and complete example of a calculation of an IRR and other indicators of ROI for a hypothetical investment have been created in an Excel® spreadsheet by members of a Postal Service energy working group in 1996. For a copy of this spreadsheet, check the environmental web site under the “Energy” program.

For more sophisticated methods of measuring return on investment and more complicated investment projects, such as major HVAC systems, a manager can seek help from the local Finance unit and from contractors.

C Energy Values and Factors

Exhibit Ca, Unit of Measurement Conversion Factors

Unit of Measurement	Is Equal to This Unit of Measurement
1 U.S. barrel	= 42 U.S. gallons
1 atmosphere	= 14.7 pounds per square inch absolute (psia) = 760 millimeters (29.92 inches) of mercury with density of 13.6 grams per cubic centimeter
1 pound per square inch	= 2.04 inches head of mercury = 2.31 feet head of water
1 inch head of water	= 5.20 pounds per square foot
1 foot head of water	= 0.433 pound per square inch
1 Btu	= heat required to raise the temperature of 1 pound of water by 1°F
1 therm	= 100,000 Btu
1 kW	= 1.341 horsepower
1 kWh	= 0.746 horsepower-hour = 3412 Btu[a]
1 horsepower	= 0.746 kW
1 horsepower-hour	= 0.746 kWh = 2,545 Btu
1 ton refrigeration	= 12,000 Btu per hour[b]
1 standard cubic foot	= volume measured at standard conditions of 60°F and 14.7 psia
1 degree day	= 65°F minus mean temperature of the day, °F
1 year	= 8,760 hours
1 mBtu	= 1,000 Btu
1 kW	= 1,000 watts
1 trillion barrels	= 1 x 10^{12} barrels
1 U.S. gallon	= 3.785 liters
1 liter	= 1,000 cubic centimeters (cm^3)
1 inch	= 2.54 centimeters
1 foot	= 12 inches
1 mile	= 5,280 feet
1 meter	= 100 centimeters
1 kilometer	= 1,000 meters
1 pound	= 453.592 grams = 16 ounces
1 kilogram	= 1,000 grams
1 short ton	= 2,000 pounds

Source: A. Thumann, *Plant Engineers and Managers Guide to Energy Conservation*, Fifth Edition, The Fairmont Press, Liburn, GA, 1991, p. 14.

Note: In these conversions, inches and feet of water are measured at 62°F (16.7°C), and inches and millimeters of mercury at 32°F (0°C).

[a]To generate 1 kWh requires 10,000 Btu of fuel burned by the average utility.

[b]One ton of refrigeration requires about 1 kW (or 1.341 hp) in commercial air-conditioning.

Exhibit Cb, Btu Content Value for Energy Sources

Energy Sources	Product Code	Btu Content	Reporting Requirements
Electricity	ELC	3,412,000 Btu per megawatt-hour (MWh)	Report in MWh for all commercially purchased electricity.
Natural gas	NAG	1,031,000 Btu per thousand cubic feet (KCF)	Report in KCF.
Coal, anthracite	ANC	25,400,000 Btu per short ton	Report in short tons.
Coal, bituminous	COL	24,580,000 Btu per short ton	Report in short tons.
Coke	COK	25,380,000 Btu per short ton	Report in short tons.
Purchased steam or hot water	SHW	1,340 Btu per pound of steam delivered	Report in pounds of steam.
Fuel oil, distillate	FSD	5,825,000 Btu per barrel	Report in barrels.
Fuel oil, residual	FSR	6,287,000 Btu per barrel	Report in barrels.
Fuel oil, mixed	FSX	6,000,000 Btu per barrel	Report in barrels.
Fuel oil, reclaimed	FOR	5,000,000 Btu per barrel	Report in barrels.
Propane, liquefied propane gas, and Butane	PPG	95,000 Btu per gallon	Report in gallons.
Photovoltaic	PHO	3,413 Btu per kWh	Report in kWh for self-generated photovoltaic. Do not report if it is reported as ELC.
Solar thermal	SOL	1,000 Btu per mBtu	Report in mBtu for self-generated solar thermal actually used.
Wind power	WND	3,413 Btu per kWh	Report in kWh for self-generated wind power. Do not report if it is reported as ELC.
Wood	WUD	17,000,000 Btu per short ton	Report in short tons for wood pellets, chips, and logs.
Geothermal (heat)	GEO	1,340 Btu per pound of steam delivered	Report in pounds of steam for self-generated geothermal.
Geothermal (electricity)	GLC	3,413 Btu per kWh	Report in kWh for electricity self-generated from geothermal. Do not report if it is reported as GEO or ELC.
Refuse-derived fuel	RDF	6,000,000 Btu per short ton	Report in short tons.
Hydroelectric	HYD	3,413 Btu per kWh	Report in kWh for self-generated hydroelectric power. Do not report if it is reported as ELC.

D Abbreviations and Acronyms

°F	—	degrees Fahrenheit
ACBM	—	asbestos-containing building material
A-E	—	architectural-engineering
AECC	—	area environmental compliance coordinator
AEPC	—	area energy program committee
AFV	—	alternative fuel vehicle
AHU	—	air handling unit
AIC	—	account indicator code
AMFA	—	Alternative Motor Fuels Act
BA	—	budget account
BEM	—	building equipment mechanic
bhp	—	brake horsepower
BMC	—	bulk mailing center
Btu	—	British thermal unit
CAA	—	Clean Air Act
CFC	—	chlorofluorocarbons
cfm	—	cubic feet per minute
CFR	—	*Code of Federal Regulations*
CIC	—	capital investment committee
CIS	—	Corporate Information System
cm^3	—	cubic centimeter
CO_2	—	carbon dioxide
COBRA	—	Comprehensive Omnibus Budget Reconciliation Act
COR	—	contracting officer’s representative
DAR	—	Decision Analysis Report
DECC	—	district environmental compliance coordinator

DOD	—	Department of Defense
DOE	—	Department of Energy
DOEOA	—	Department of Energy Organization Act
DSM	—	demand-side management
ECO	—	energy conservation opportunity
ECS	—	Energy Consumption System
ECTT	—	Energy Consumption Tracking Tool
EDI	—	electronic data interchange
EEM	—	energy-efficient motor
EER	—	energy-efficiency ratio
EIA	—	Energy Information Agency
EMCS	—	Energy Management and Control System
EMP	—	Environmental Management Policy
EO	—	Executive Order
EPA	—	Environmental Protection Agency
EPACT	—	Energy Policy Act of 1982
EPC	—	energy program committee
EPCA	—	Energy Policy and Conservation Act
ER	—	elliptical reflector
ESCO	—	energy service company
EVA	—	economic value added
FEC	—	facility energy coordinator
FEMIA	—	Federal Energy Management Improvement Act
FEMP	—	Federal Energy Management Program
FMSWIN	—	Facilities Management System for Windows
FSO	—	facilities service office
GMP	—	general management plan
gpm	—	gallons per minute
GSA	—	General Services Administration
HID	—	high-intensity discharge
hp	—	horsepower

HPS	—	high-pressure sodium
HVAC	—	heating, ventilation, and air-conditioning
IES	—	Illuminating Engineering Society
IRR	—	internal rate of return
JOE	—	Justification of Expenditure
KCF	—	thousand cubic feet
kW	—	kilowatt
kWh	—	kilowatt-hour
LBP	—	lead-based paint
LCC	—	life-cycle cost
LEAPES	—	Local Energy Alternative Proposal Evaluation Spreadsheet
LED	—	light-emitting diode
m^2	—	square meter
mA	—	milliamperes
MARS	—	Maintenance Activity Reporting and Scheduling system
mBtu	—	thousand British thermal unit
MI	—	Management Instruction
MMO	—	Maintenance Management Order
MPP	—	Maintenance Policies and Programs
MTSC	—	Maintenance Technical Support Center
MWh	—	megawatt-hour
NCED	—	National Center for Employee Development
NCTBFF	—	National Consolidated Trial Balance File Finance Number
NECPA	—	National Energy Conservation Policy Act
NIST	—	National Institute of Standards and Technology
NREL	—	National Renewable Energy Laboratory
NTP	—	notice to proceed
O&M	—	operations and maintenance
OTA	—	Office of Technology Assessment

P&DC	—	processing and distribution center
PCEPC	—	performance cluster energy program committee
PDC	—	postal data center
PM	—	preventive maintenance
PMSC	—	purchasing and materials service center
POC	—	point of contact
PSFR	—	Postal Service Financial Reporting system
psia	—	pounds per square inch absolute
PV	—	photovoltaic
R&A	—	repair and alteration
R&D	—	research and development
RH	—	relative humidity
ROI	—	return on investment
rpm	—	revolutions per minute
SEMP	—	Strategic Energy Management Plan
SES	—	shared energy savings
SIR	—	savings-to-investment ratio
SO_2	—	sulfur dioxide
SOAR	—	Saving of America's Resources
SOW	—	statement of work
TOE	—	total operating expenses
UDOC	—	Utility Deregulation Oversight Committee
VMF	—	vehicle maintenance facility
VOB	—	Voice of the Business

E Glossary

area energy program committee	Chaired by the AECC, the AEPC develops and implements the area SEMP and provides program oversight, including training, support responsibilities, accounting and monitoring, and new facility design review.
contracting officer	The government official responsible for all contracting actions related to a project.
contracting officer's representative	The COR is designated by the contracting officer to oversee a project and make decisions.
demand-side management	DSM consists of utility-sponsored programs that increase energy efficiency and water conservation or the management of demand. For example, utility companies offer various incentives, including rebates to their customers, to conserve energy. The energy that is saved can be used to satisfy new demands for power (such as from residential and commercial development), instead of building additional power-generating plants.
emergency maintenance	This type of maintenance is work that must be done immediately to preserve safety, maintain critical mission requirements, or prevent major damage to equipment.
EMP internal web site	*http://blue.usps.gov/environmental*
energy audit checklist	Obtained from the DECC, this checklist is used by installation energy managers to inspect and identify the energy efficiency, safety, and environmental soundness of lighting, steam systems, chilled and hot water systems, HVAC systems, etc.
Energy Awareness Month	Energy Awareness Month is a nationwide program, taking place every October, that recognizes the importance of energy conservation.
energy conservation	Energy conservation uses energy more efficiently to provide the same or an improved level of benefits with less energy output.
Energy Consumption Tracking Tool	Accessible through the IntraNet, this management tool shows dollars spent on the basic energy types (electricity, oil, natural gas, and other) by finance number, as well other useful energy consumption data.

energy management	Energy management minimizes energy consumption and costs while meeting operational requirements and providing quality working conditions for Postal Service personnel.
energy manager	*Energy manager* is a general term to indicate all Postal Service employees who are responsible for implementing the energy program at any level of the organization.
facility energy coordinator	At maintenance-capable offices, the manager of Maintenance is the FEC. At other locations, the facility manager is the FEC. They are responsible for program implementation, compliance and opportunity review, facility program management, operations and maintenance, monitoring, and facility awareness training.
Facility Management System for Windows	FMSWIN contains detailed data for each facility that the Postal Service owns or leases. In addition, the system stores facility information about addresses, who pays the electricity bills, the type of facility, square footage, and other pertinent physical information, but no energy data.
geothermal applications	Systems (generally heat pumps) that use the temperature of the earth to extract or dissipate heat for heating and cooling buildings.
high-cost projects	These projects could include complete weatherization or installation of high-efficiency HVAC equipment, and are usually associated with a large postal facility.
load shedding	This is a method used to keep electrical loads from peaking to unwanted levels.
load shifting	This is a method of cost reduction by shifting electrical loads away from peak demand periods to save money when the local utility imposes “demand charges,” both in total kWh used and the highest kW demand over a certain period.
low-cost projects	These projects could include the installation of compact fluorescent lights, water heater insulation, and minor weatherization.
maxi-audit	This type of energy audit goes a step further than the mini-audit, and requires evaluating the quantity of energy used for each energy function, such as lighting or industrial processes. It also requires model analyses.
mini-audit	This type of energy audit requires tests and measurements to quantify energy uses and losses and to determine the costs associated with changes.
moderate-cost projects	These projects could include attic insulation, air infiltration reduction, and lighting retrofits.

national energy program committee (formerly UDOC)	Postal Service steering group that is responsible for overseeing the execution of an energy program.
no-cost projects	These projects could include implementation programs to turn off lights when work areas are not in use.
peak-demand-limiting program	Program designed to reduce electrical load below a certain demand level where it is the most cost-effective to operate.
performance cluster energy program committee	Chaired by the DECC, the PCEPC develops the performance cluster (or district, if appropriate) SEMP and provides energy program oversight, including energy audits, training, program implementation, support responsibilities, and accounting and monitoring.
photovoltaic applications	These are systems that use solar cells to capture the sun's energy and store the electrical energy (direct current). Some examples are remote power supply for lighting, range instrumentation, navigational aids, and communication repeater stations.
preventive maintenance	PM is preplanned work carried out on a regular schedule to reduce the potential for sudden failures in energy-using systems.
return on investment	This concept is useful for decision-makers in that it expresses the relationship between profit (or savings incurred by making an investment in an energy-efficiency project) and the investment. The ROI for a specific period of time (e.g., a year) is calculated by dividing the savings by the investment.
routine maintenance	Routine maintenance is minor work carried out in response to maintenance routes or incoming requests (work orders), such as replacing burned-out lamps and changing filters.
savings-to-investment ratio	SIR is the ratio of the total investment value divided by the total savings value achieved through that investment.
scheduled maintenance	Scheduled maintenance is major work carried out according to plan, usually on a rotating schedule, that restores equipment to peak operating condition.
self-audit	This type of energy audit is accomplished by resident facility managers who use specific instructions or checklists designed to help them identify energy savings opportunities.

shared energy savings	This is a contracting procedure whereby an energy service company (ESCO) finances, installs, and maintains energy saving equipment and, in return, receives a portion of the energy savings.
solar thermal applications	These are systems that absorb the sun's radiant heat energy and convert it to a usable thermal energy.
solution-based audit	This strategy takes advantage of proven energy conservation ideas and techniques and applies those techniques where opportunities exist to increase the energy efficiency of each energy-using system component, such as replacing incandescent lamps with more efficient lamps.
Strategic Energy Management Plan	Required by Section 165 of EPACT, the SEMP currently includes DSM, energy savings performance contracting, energy management training, improved building operation and maintenance, and increased energy awareness efforts. The Postal Service establishes SEMPs at the national, area, and performance cluster levels.
system-based energy audit	This strategy requires the isolation of an entire energy system, which is then evaluated as a unit. The efficiency of each element within the energy system must be evaluated; therefore, a maxi-audit is usually required to obtain the needed data. Examples of this type of audit are consolidating individual air-conditioning units into one centralized unit, installing EMCSs to maximize energy efficiency, and appropriately sizing heating and cooling units.
trend analysis	A trend analysis provides a quick means of determining historical performance, current status, and forecasts of future performance.
Voice of the Business	This is the part of *CustomerPerfect!* that represents elements or factors in the industrial business environment that may shape, influence, or direct future work.
walk-through audit	This type of energy audit is the least costly and identifies preliminary energy savings. A visual inspection of the facility often determines O&M energy saving opportunities.