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Resource Conservation Management Guidebook is intended only as a guidebook for justifying, developing, and maintaining a Resource Conservation Management Program. The Washington State Department of General Administration and the Oregon Office of Energy are not responsible for program outcomes.

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Acknowledgments

Printed 1998

THE RESOURCE CONSERVATION MANAGEMENT GUIDEBOOK

The purpose of this handy guidebook is to help you, the Resource Conservation Manager, develop and implement a Resource Conservation Management (RCM) program. This guidebook will be a valuable resource during program startup. It describes all the elements that make up an effective RCM program. It includes tools such as forms, spreadsheets and documents that you can use and modify to fit your situation.

By following the approach in this guidebook, you should be able to establish a successful organization–wide RCM program in a relatively short period of time.

➤ **How to Use this Guidebook**

This guidebook is divided into two sections—the **RCM Guidebook** and the **RCM Organizer**.

The **RCM Guidebook** provides everything you need to begin developing and implementing your RCM program. **Chapter 2— The RCM Program Implementation Plan**, provides the foundation on which the rest of the program is built.

Throughout the **RCM Guidebook**, you will see information and icons highlighted in the margins. These refer you to other useful sources of information. In some cases, you are referred to other chapters or the appendices that are pertinent to the particular subject. In other cases, you are referred to the **Resource Disk**—the computer disk that accompanies this guidebook.

The **Resource Disk** contains sample documents, spreadsheets and presentation materials. A complete listing of these documents can be found on the first page of each appendix. These materials were all created using Microsoft software. When reviewing the **Resource Disk**, make sure you include all files "*" and not just the ".doc" files. The last three letters of the file name indicates which Microsoft product was used:

.ppt = Power Point (presentation materials)

.doc = Word (word processing document)

.xls = Excel (spreadsheet)

The **RCM Organizer** accompanying this Guidebook provides the organizational framework for you to file and locate the policies, reports, schedules, and other materials you generate as you develop and implement your own RCM program.

A indicates Appendix material

R indicates Resource Disk material

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WHAT IS RESOURCE CONSERVATION MANAGEMENT?

Resource Conservation Management (RCM) is a management tool that gives you more control over the operating costs of your facilities. It helps you reduce costs, increase efficiency, prepare for deregulated energy purchases and promote environmentally friendly operations.

An RCM program is a well-coordinated effort to manage the resources and services used, and the waste generated, by your facilities. It involves careful tracking of resources and attention to operational efficiency. The program focuses on occupant comfort, cost-effectiveness and assuring that equipment is used only when needed. Operational savings are gained through organization, analysis and communication.

With a comprehensive RCM program in place, you can expect to see quantifiable results in the first one to six months. Most RCM programs achieve 10 to 15 percent savings on utility bills after the first year—depending on the number of facilities involved and level of management commitment.

RCM strategies have been used in industry and large corporations for many years. As markets become more competitive and public-sector budgets shrink, RCM programs are cropping up in many organizations—both large and small.

An RCM program strives to:

- *Reduce the waste of energy and water through low- or no-cost efforts*

- *Identify billing errors*

- *Promote recycling and composting*

- *Modify purchasing practices to reduce garbage*

- *Track resource consumption and revenues*

- *Identify and implement cost-effective capital projects*

- *Monitor efficient activities and communicate program status*

- *Recognize and reward effective participants*

What Are the Key Elements of a Successful RCM Program?

Resource conservation management is not new. Successful RCM programs have been implemented in schools throughout Oregon and Washington for several years. Similar efforts have also been developed in other states such as Texas, Pennsylvania and Ohio.

These programs and their guidebooks have a common set of criteria, which are considered critical to the success of an RCM program.

Key elements of a new RCM program:

- *Identify the RCM Manager*

- *Build top-level administrative support*

- *Organize and analyze resource consumption and services data (energy, water, garbage, sewer, recyclables)*

- *Cultivate the support of maintenance staff*

- *Develop RCM teams within individual facilities and at the organization management level*

- *Set clear goals*

- *Conduct audits and surveys of building resource consumption and use*

- *Provide all staff with resource conservation awareness training*

- *Support "idea champions" at all levels*

- *Provide incentives and recognition*

- *Make the program visible*

- *Monitor program effectiveness and communicate progress*

What Is the Role of the Resource Conservation Manager?

An RCM program needs support and cooperation from staff at all levels. But its initial development and implementation requires the dedicated efforts of one person or a small team. The most effective RCM programs typically are initiated and implemented by a single leader known as the Resource Conservation Manager. This guidebook is written specifically for the person fulfilling that role.

During your first months as the Resource Conservation Manager, you will be consumed with collecting and organizing data, conducting surveys, making recommendations, drafting reports, setting schedules and communicating to all levels of the organization.

Although you will do much of this work yourself, successful implementation of your RCM program will hinge on active participation from management, other staff, building operators and occupants. All of these people will be involved in carrying out the program's recommendations. This means that you will need to focus heavily on team building, encouraging changes in behavior and fostering communication.

How Long Does It Take To Implement an RCM Program?

Resource conservation management is an on-going process. But the bulk of the work occurs during the startup phase, which normally lasts one to three years. This is the period when policies, guidelines and components of the program become a part of day-to-day operations. Capital projects are also identified and scheduled for implementation during this phase.

After implementation is complete, an RCM program can move into a sustained program mode. Although this stage requires considerably less effort, it is critical to maintaining the long-term benefits of the program.

Key Elements of a Sustained RCM Program:

- *Consistent tracking and analysis of resource consumption and services*

- *Monitoring deregulated energy purchases and facility operations*

- *Monthly/quarterly monitoring of program components (recycling efforts and facility surveys)*

- *Semi-annual or annual awareness training for facility operators and occupants*

- *Promotion and communication of program status (newsletters, bulletin boards, presentations, reports to facility operators and administrators)*

- *Recognition of efforts (awards, certificates of achievement, acknowledgment in newsletters).*

Without this minimum level of effort, the efficiencies gained by an RCM program could soon be lost. Changes in key personnel as well as reorganization or changes in management can also greatly impact an RCM program.

COMMUNICATION IS THE KEY

As the Resource Conservation Manager, your most important job is to communicate. You will investigate, coordinate and motivate. These actions require you to ask questions, explain what you learn and encourage others to act. This guidebook is a tool kit to ensure the success of your RCM program. Communication is the tool you will use most often.

A lot of your time will be spent requesting data, investigating problems, discussing ideas and reporting results. Among the most important discussions you will have will be presenting reports to those who have the authority to make decisions supporting efficiency efforts.

To make the most of any presentation, you must develop an effective communication strategy. As part of this strategy you should:

- **Know your information**
- **Know your audience**
- **Choose the best communication method**
- **Make your point clearly and simply**

➤ Know Your Information

Gathering information effectively requires that you know what questions to ask and what information is useful. Before visiting administrators, building staff or occupants be sure you have researched what is already available to you. Don't be afraid to ask questions. There are no "stupid" questions. What you learn might be the solution to a complex problem.

You will make presentations to general audiences with wide interests as well as to specific groups with limited interests. For general audiences, such as an assembly or public presentation, you should be prepared to present your topic in several different ways. For example, use anecdotes, pictures, charts and tables to engage the attention of different listeners. With a group such as a budget council, however, it may be sufficient to present your topic with spreadsheets and only a few graphs. Be prepared in either case to explain details beyond your presentation material such as the source of the data, the assumptions used for projections and the broad impacts of recommended actions. Being prepared will save time and enhance your credibility.

➤ Know Your Audience

One role of the Resource Conservation Manager is to enlist the support of facility operators and occupants to do what they can to reduce resource use. You can inform and motivate them with regular reporting and timely presentations. The presentations may be aimed at changing usage, improving operating habits, or examining proposed efficiency projects. In any case, you must tailor the presentation to the needs, abilities and responsibilities of the audience.

Audiences will fall into three general categories: administration, facility operators and building occupants. Different audiences have different needs:

The administrative audience includes policy and budget decision makers. It may be a single person, such as a director, manager, or superintendent, or a group of people, such as a school board or city council. Administrators need more big-picture information. If they are asked to decide on a general policy issue or make a budget change, they need to be shown the reason for the change and its potential impacts and benefits. They may also be interested in the publicity aspect of their decision, so be prepared to offer suggestions.

Facility operators are usually custodians and/or facilities maintenance staff. In some cases, a designated occupant of the building may be authorized to make minor operational changes such as changing thermostat settings, replacing burned-out lamps or calling for extra trash pickup. Inform facility operators about the building's operating characteristics, how current resource use compares to some period in the past, and how it compares to other buildings of similar size and use. This information allows them to monitor their efficiency gains, develop more efficient operating schedules and target possible improvement projects.

A presentation to building occupants will focus more on the effect of their day-to-day usage habits than on the building's operating systems. This group needs to be aware of how they can directly affect resource expenditures. A facility-level RCM team should receive information that allows occupants to decide how to support the RCM program goals. You should pay particular attention to this audience because changing habits is more difficult and less permanent than changing hardware or policy. Frequent progress updates, reminders, recognition and encouragement will be a part of your communications efforts.

➤ Choose the Best Communication Method

Regular monthly and annual reports are very effective, yet formal, communication methods. Other, more informal means of communication can also enhance the RCM program. For example, a simple congratulatory note may be appropriate to accompany a recognition award. A memo with specific suggestions for facility operators to consider for shutdown procedures may be more appropriate than calling them into a meeting, away from their work. Notices on bulletin boards in hallways and lunch rooms work especially well.

Never underestimate the value of face-to-face communication. Meeting a custodial crew as they begin their evening's work gives them an opportunity to show you how things look from their perspective. Their input is frequently overlooked and it can be extremely valuable to the RCM program. When you meet with them on their own "turf," they can often discuss or demonstrate something that cannot be carried into a meeting. This can save time and avoid misunderstandings. It is also a good opportunity for you to focus on people and issues needing attention.

You will demonstrate credibility and reliability by keeping participants updated on how resource conservation is progressing in the organization. Plan to attend organizational board or staff meetings at least twice a year. Presentations to local government councils, school boards, student councils and governing bodies of special interest groups are certainly appropriate, especially if you are invited to return for regular updates.

How you communicate is as important as what you communicate. Keep looking for better, more effective ways to deliver information and persuade your audiences.

➤ Make Your Point Clearly and Simply

When you make a presentation to any audience, it should be focused and easy to understand. If an action or a decision is the desired result, clearly state this and present enough information to justify the action or decision. Do not waste time or distract your audience with unrelated information or unfounded speculation.

An old axiom of public speakers says "Tell them what you are going to say, tell them, then tell them what you told them." The same could apply in this case. In a presentation, summarize the problem and the desired result. Focus all supporting information (reports, charts, etc.) on the problem and its proposed solution. At the end, restate the desired result with an explanation of how it will solve the existing problem. This is a simple, but very effective method of communication.

THE RCM PROGRAM IMPLEMENTATION PLAN

Getting Started

Chapter 2 provides a step–by–step approach to help you through your first year as a Resource Conservation Manager. This chapter is designed to help you achieve results while increasing management support and your chances of success. Although the tasks appear in order of progression, many of them overlap and some will be ongoing. You need not complete one task before starting another. In fact, some of them will need to be done simultaneously.

Figure 2.1, Resource Conservation Management Implementation Plan, outlines a schedule of activities you will likely perform during the first year. This is only a recommended approach. You may want to modify the tasks to reflect your personal style and your organization's needs. Your familiarity with staff will also play a part in your approach. Refer to Figure 2.1 as you review the following tasks.

➤ TASK **1**

Gain Top–Level Management Commitment and Support

APPENDIX **A**
Reporting/Communications

RESOURCE DISK **R**
present.ppt: Sample RCM presentation to top–level management.

It is essential to have commitment and support at the highest management level for your RCM program to be a success. To start this process, you will probably make presentations to management on the value of Resource Conservation Management. The Resource Disk and Appendix provide a sample presentation for you to use.

Get a Written Demonstration of Support

An excellent way to demonstrate high–level management support is to establish an organization–wide RCM policy. Developing a written policy or resolution shows staff and occupants that management is committed to RCM activities. It clarifies expectations and helps avoid miscommunication. It also provides you with guidance in developing your RCM program.

APPENDIX **A**
Reporting/Communications

RESOURCE DISK **R**
policy.doc: Sample RCM policy.

The RCM Policy

Your policy should be one or two pages and contain the following:

- *Statement of concern regarding the long-range environmental and financial impacts of energy, water and solid waste*

- *Statement of commitment to Resource Conservation Management*

- *A brief implementation plan*

- *Reporting requirements*

- *Allocation of staff and budget resources to get the job done*

. . . .

APPENDIX **A**
Reporting/Communications

RESOURCE DISK **R**
supt_mem.doc: Sample memo from the superintendent or director to staff.

An alternative, or supplemental, way to demonstrate high–level support for the RCM program is a memorandum from the director or superintendent to staff. This memo should introduce the program, emphasize its importance and ask for staff cooperation. It should also introduce you as the Resource Conservation Manager.

Highlight the Potential Savings

To gain adequate high–level support, it may be necessary to provide an estimate of potential savings and revenues from the RCM program. If there are currently no major efforts being made to conserve energy or other resources, you can expect to save 10 to 15 percent of your organization's total annual energy, sewer,

APPENDIX **A**
Worksheets/Spreadsheets

RESOURCE DISK **R**
eui_savg.xls: Spreadsheet to calculate energy savings potential.

See **Task 3, page 2-8,** for an explanation of the Energy Use Index.

water and garbage budget. Based on experience from RCM programs in Oregon and Washington, energy savings alone provide 60 to 80 percent of the total resource savings from an RCM program.

You can make a rough estimate of potential energy savings by comparing the facility's consumption to energy-efficient operation targets. The Energy Use Index (EUI) Comparison table will help you make this estimate.

Consider the Value of Shared Savings

Shared savings is another important element of an RCM program that you may want to consider. Shared savings provides an incentive for staff and occupants to conserve resources. A percentage of the savings from the RCM program may be allocated as "discretionary funds" for each facility or department. These funds can be used as rewards for outstanding achievement and to purchase books, uniforms, computers or other needed equipment.

Shared savings promotes widespread participation in the program because staff receive a return for their efforts. A shared savings plan should be written into the policy and be approved by management. It can then be updated as needed.

APPENDIX **A**
Reporting/Communications

RESOURCE DISK **R**
shar_sav.doc: Sample shared savings plan/policy.

What To Include in a Shared Savings Plan

A shared savings plan should provide a Resource Conservation Management savings disbursement for:

- *Facility administrators for items or activities that benefit occupants. This encourages participation in the program.*

- *Operation and maintenance improvements. This further increases savings.*

- *Operation and maintenance training for building operators and maintenance staff. This can have a tremendous impact on energy and water use.*

- *RCM projects (capital improvements), deposited in an account designated for this purpose. Such projects enhance facility comfort, usually result in reduced maintenance costs and additional savings.*

- *The organization. Overall savings should also be shared at the organization level to protect against budget shortfalls.*

. . . .

Communicate Regularly with Upper Management

After your RCM policy is adopted and program initiated, it is very important that you keep top-level management "in the loop" with regular communication on the status of the program. Many RCMs include status reports in their organization's board or council's meeting packet.

➤ **TASK 2**

Contact Utility Representatives To Review Program Offerings, Rate Schedules and Billing Histories

Get to know your local utility representatives. They are your gateway to the resources that your facilities use. Contact each of the utilities that serve your facilities. Utilities often provide free or low-cost services that may include assembling resource accounting data or conducting walk-through assessments of your facilities. Ask about grant or loan programs that you can use to help pay for conservation measures. Utility companies may even have resource-use studies on file already prepared for your organization. Get copies, if available.

Understand Utility Rates

Utilities often have several different rates available. More than one rate could be applicable for a particular facility. You can request copies of rate schedules by contacting your utility representatives. They should also be able to provide you with a list of your facilities and the associated rate schedules. Ask your utility representative to explain the different schedules and help determine which ones are best for your facilities.

Chapter 3 provides information on how to read utility bills and rate schedules.

Understanding the different rate schedules can help you identify potential billing errors. It also helps you identify potential resource-saving opportunities. For example, electrical demand costs vary widely from utility to utility. Some utilities don't charge for demand, while others charge more than $6 per kW per month. In a large "all electric" school, demand charges alone could be more than $8,000/month in some cold months. Understanding what makes your bill high is an important part of determining what you can do about it.

Water and sewer rates vary widely in different communities. Some utilities show the use but don't indicate what billing units are used. There are three primary units used in billing for water and sewer—gallons, cubic feet (CF) and hundred cubic feet (CCF). If the sewer is not metered, you are likely billed based on the amount of water used at the site. Many cities base sewer rates on winter water usage when irrigation is not used. Other cities keep the same sewer rate all year, so your sewer bill is high in the summer when irrigation occurs. Check with your water utility to make sure summer irrigation is not a part of your sewer bills.

You may see other fees on your water and sewer bills. One is a systems development charge, usually a flat rate, for the actual construction or upgrade of the system. Many cities charge a fee for surface or storm water disposal. This is usually based on the square footage of impermeable (asphalt, concrete, gravel) area on the property. A street fee may also appear on your bill. This fee (to help maintain the streets) may be based on a number of factors, but is usually based on the building type (government, retail, manufacturing, etc.) and includes an estimate of traffic to and from the building. Verifying how you are billed, comparing it with your records and questioning the utility when you find discrepancies may result in lower fees.

Again, understanding your rates can help you decide where to focus your efforts.

APPENDIX **A**
Audits/Surveys

RESOURCE DISK **R**
aud_form.xls:
Sample audit form

Document Facility Meters (electric, gas and water)

For each facility, document the meter numbers and account numbers and verify the multiplier applied to each. You will find these on your utility bill or the historical data provided by the utility. During your facility walk–through audits (Task 7 in this chapter), you will want to locate all the meters listed by a utility. In some cases, a utility may be billing for a meter that is no longer in use or has been removed. If such situations are found, there may be opportunities for a utility refund.

If you are using (or will be using) resource accounting software that can accommodate uploading of electronic utility billing data, make arrangements with the utility to do so.

➤ **TASK 3**

Gather and Organize Resource Accounting Data

The next task is to accumulate, analyze and track data from all of your energy, garbage, water and sewer bills. You may want to organize this information by putting it into a software package. This process is called *resource accounting*. Consider providing summary data on each facility to your organization's board or council along with their monthly or quarterly meeting agenda packets.

Resource Accounting:
Documenting and analyzing operating resource usage and costs.

Resource accounting is very important because it shows a history of resource consumption and expenditures for your organization and each facility. From the historical data, you will select the *base year* for each facility. When you establish the facility's base year data, you will see the annual consumption

Base Year:
Calendar year, fiscal year, or school year from which baseline usage or costs are drawn.
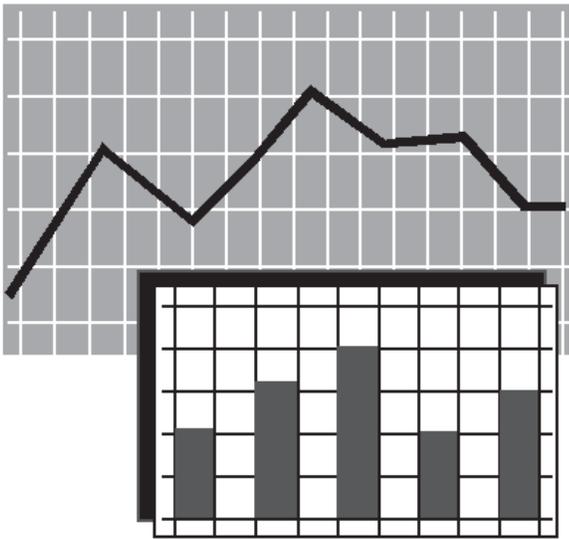
and cost of electricity, gas and water by facility, and how much was spent on garbage and sewer services in a year. This information will allow you to calculate potential savings and revenues from the program. In fact, if you are sharing the savings and revenues with those involved, your organization will have to agree on building-by-building base years as a way to measure savings. Graphs and charts of potential savings and revenue are effective in gaining administrative support.

With resource accounting data and other facility information, you can compare different facilities to target those with the greatest savings potential. Using resource accounting is also very important for tracking the success of your RCM efforts. It is the most practical and objective way to calculate savings and revenues.

Another important use for the historical data is to identify potential billing errors. Most resource accounting software allows you to review the data graphically. A visual comparison of resource consumption from different facilities will help you to see anomalies—some of which could be due to utility errors.

### The Value of Resource Accounting

Resource accounting is critical to any RCM effort. It helps you:

- *Develop an historical base year of consumption and expenditures for each facility*

- *Estimate savings potential for each facility by comparing to target values*

- *Gain management support through presentation of real data*

- *Target conservation efforts based on historical consumption*

- *Track resource conservation efforts to document successes*

- *Determine shared savings for distribution among participants*

- *Identify billing errors that could result in utility refunds*

Select a Resource Accounting Software Tool

If your organization doesn't already have one, you may want to obtain a resource accounting software tool. There are several good software options available. At a minimum, resource accounting software should provide the following features:

• Logical, convenient procedure for logging billing data
• Ability to generate reports from organization level to meter level
• Ability to track multiple resources
• Ability to calculate energy use index (EUI)
• Ability to calculate savings
• Weather correction
• Graphical representation of data and reports
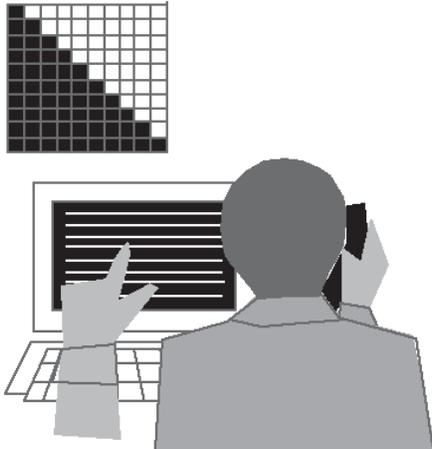
Other features that may be helpful:
• Ability to electronically download utility data
• Ability to adjust building balance points
• Ability to compare the effects of different utility rates
• Ability to view real–time consumption

When comparing the features of various software packages, make sure you take into account the ease of use, cost comparison for what you are getting (some software may provide a lot of "bells and whistles" that you may not really need) and customer service.

Also contact your local electric utility to see if they are using a particular software. The utility may be able to provide data electronically in a format that will upload more easily into some software tools than others. The ability to upload monthly consumption data from your utilities is a desirable feature that will save you a lot of time inputting data.

Obtain Historical Consumption Data

Most utilities can provide a full list of meters for each facility. You will need this information to accurately organize resource use data. Coordinate with your meter reader to locate every meter on site. This is very useful when assembling and inputting resource accounting data.

Some utilities can provide up to five years of historical consumption data. In some cases, the utility may be able to provide the historic data electronically, allowing you to upload it directly into your resource accounting software. This could be arranged as a one–time uploading of historical information, as well as a monthly uploading of current utility data. If your organization has many facilities that operate from the same utility, the monthly upload is a good idea. You will probably need to manually input garbage, water and sewer billing data.

Develop the Base Year for Each Facility

The facility base year usage is a thorough tabulation of annual electricity, natural gas, fuel oil, water, sewer and garbage. You must account for all utility meters in the base year data. You will also need to determine the building square footage associated with those meters (electric, gas and water).

A form is provided on the Resource Disk to help you record the base year data. The base year for electricity usage should include annual consumption in kWh, monthly demand in kW and, if applicable, power factor.

Establish the Energy Use Index

APPENDIX **A**
Worksheets/Spreadsheets

RESOURCE DISK **R**
baseyear.doc: Form to record base year utility consumption and services at a facility.

Energy Use Index–EUI:
Energy use per square foot per year (Btu/SF/Yr).

Your resource accounting software will allow you to calculate the annual energy use per square foot. This is commonly called the *Energy Use Index* (EUI) , and is given in Btu per square foot per year (Btu/SF/Yr.) Using EUIs, facilities of different sizes can be compared. Water, sewer and garbage comparisons between different facilities can also be made by square foot or by occupant.

The EUI of a facility is independent of cost. This is beneficial because energy savings for a facility should be based on the energy consumed not the cost of the energy. If there is a rate increase, it will not affect the EUI.

Facilities that are expanded can also be compared to the original facility using original and updated EUIs (Btu/SF/Yr).

A Note about Shared Savings and EUIs

Shared savings can get complicated when utility rates change, facilities are expanded or new equipment is added. As the Resource Conservation Manager you will need to document significant changes so that they can be accounted for in the evaluation of shared savings. By subtracting out the effects of these changes, you can equitably calculate savings.

If a utility rate changes, you should use the new rate multiplied by the base year consumption data to determine the shared savings. This will provide the new base year utility cost.

Weather can also affect savings. For example, consider if the base year had a mild winter, and your first year on the job as the Resource Conservation Manager has a harsh winter. You should quantify the differences because weather has a significant impact on energy use. Many resource accounting software tools provide a weather correction.

Check for Anomalies in the Data

A quick look at graphs of resource accounting data can alert you to anomalies in the data, such as when two facilities with the same function have significantly different EUIs or if the same facility has a substantial change in water consumption for no apparent reason.

Check with facility operators and maintenance staff when anomalies are identified. They may be aware of an event, such as an operational change, that explains the data. For example, high gas usage could result from high ventilation rates of heated air to exhaust odors from new carpets.

On the other hand, an anomaly could be due to a mechanical failure that was not detected—a water leak under a floor slab, for example. Maintenance staff can act immediately to correct the problem.

An example of a billing error by the utility may be the use of the wrong multiplier on a meter. This could result in an overcharge that may have continued for years. Discovery of this type of error can result in a sizable reimbursement by the utility.

A school district discovered that a middle school athletic field was being billed for enough irrigation water to submerge it under 40 feet of water each year. The Resource Conservation Manager was able to get the error corrected and negotiate a refund, too.
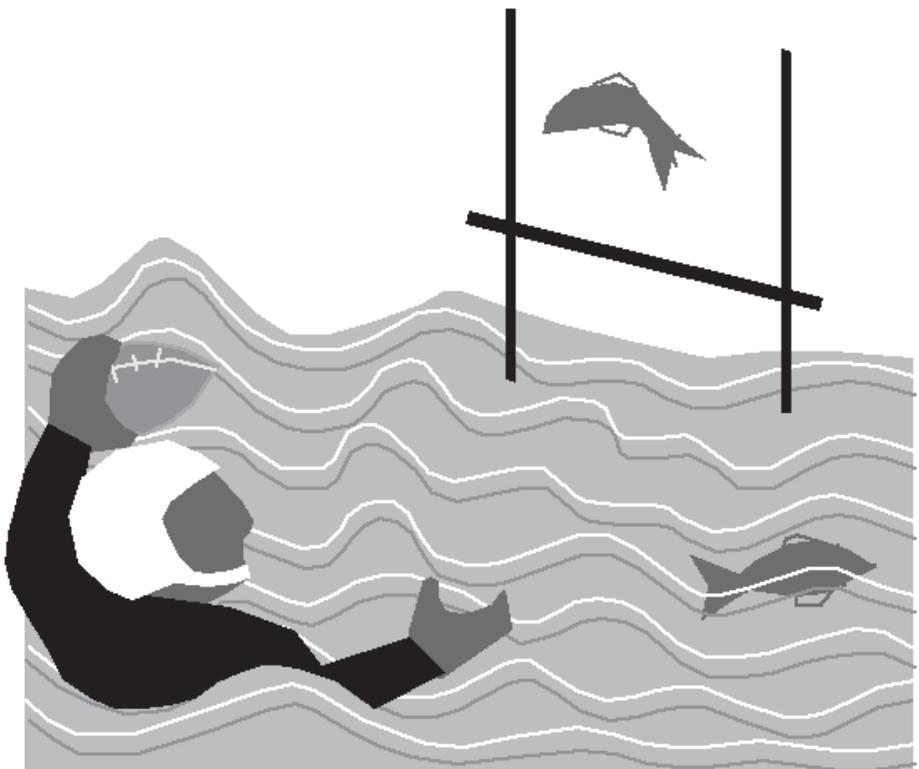
➤ **TASK 4**

Contact Recyclers and County Recycling Coordinators

Recycling is good for the environment, and it's good for business. It reduces garbage and will likely allow you to reduce garbage service either by size of dumpster or frequency of pickup. Even if you are not paid for the value of the recyclable materials, you will cut your garbage expenses. Plus, you'll be easing the load on the local landfill.

Contact local recyclers to determine what commodities they recycle and the current rates. If your quantities are high enough, some recyclers may provide pickup service. Shop around for the best deals. In some cases, it may be more cost-effective to hire a hauler to deliver your recyclables to the recycler that pays the highest price.

APPENDIX **A**
Helpful Contacts

Most counties have recycling coordinators. They can help you locate recyclers and may provide assistance with initiating a recycling program at your facilities. Check out Helpful Contacts in the Appendix for the recycling coordinator nearest you.

➤ **TASK 5**

Cultivate the Support of Facility Operations and Maintenance Staff

Every year, state and local governments spend millions of dollars on the construction of schools, prisons, office buildings and other facilities. The operation and maintenance of these large capital investments is, for the most part, the job of custodians and maintenance staff. These people are the first line of defense against energy and overall resource waste. Their budgets, however, are often the targets of cuts. As a result, maintenance and custodial staff typically are expected to do more with less.

Because of their unique position as the operators of the facilities, custodians and maintenance staff can be invaluable allies. Their involvement is critical to your RCM's program success. If you are not part of the maintenance and custodial staff yourself, you will need to cultivate their support. Respect for their concerns and ideas is a key element in developing these very important relationships.

Partner with Facility Operators and Maintenance Staff

As the Resource Conservation Manager, acting with top–level administrative support, you can be of great value to maintenance and custodial staff. They often lack adequate resources to do their

job. These resources include tools, funds for repairs, replacement of equipment beyond its useful life and training.

You can help them acquire the resources, equipment and training they need. You can also help them earn greater recognition and respect for the importance of their job. You are their conduit to management commitment, and the vehicle is the RCM program. The shared savings resulting from resource conservation management can unleash the funds they need.

Maintenance and custodial staff are a valuable resource for you. They are likely to identify several opportunities for saving energy and other resources. They will also be the people largely responsible for implementing resource conservation measures.

Set Up Introductory Meetings

Organize introductory meetings with facility operators, kitchen supervisors and maintenance supervisors. You may want to meet with some staff casually at first during their work day to get a feel for their perspective. This is where personal style may dictate your approach. Eventually, you want to meet with all the facility operators, and kitchen and maintenance supervisors. However, if you choose to have meetings, limit the number of people at the meetings to a manageable number. This allows for good interaction and keeps you from getting overwhelmed.

Use these meetings to:

- Introduce yourself
- Introduce the program
- Learn their operational habits or discuss conservation ideas methods and concerns
- Collect the facility operations checklists (see below)
- Get feedback from staff

When you schedule these meetings, don't underestimate the POWER OF DOUGHNUTS and coffee. Refreshments of some kind will show you care about them, and it helps to break the ice at that first meeting.

APPENDIX **A**
Reporting/Communications

RESOURCE DISK **R**

supt_mem.doc: Sample memo from the superintendent or director to staff introducing the RCM program.

rcm_mem.doc: Sample memo from the Resource Conservation Manager to staff discussing program startup and asking for staff help.

The Resource Disk contains a sample memo you can use to introduce yourself to staff before the meetings. It's a good idea to also attach the memo of introduction from the superintendent or director about the RCM program. You could also attach the appropriate checklist (see below) to get staff thinking about resource conservation prior to your meeting—or save them for distribution and discussion at the initial meeting.

APPENDIX **A**
Audits/Surveys

RESOURCE DISK **R**

guid_fo.doc: Checklist to be completed by facility operators.

guid_mnt.doc: Checklist to be completed by the maintenance staff at each facility.

guid_kit.doc: Checklist to be completed by the kitchen supervisor at each facility.

guid_gnd.doc: Checklist to be completed by the grounds supervisor at each facility.

APPENDIX **A**
Audits/Surveys

RESOURCE DISK **R**

wint_brk.doc: Winter shutdown/ setback checklist.

sprg_brk.doc: Spring shutdown/ setback checklist.

summ_brk.doc: Summer shutdown/setback checklist.

Ask Staff To Comment on Checklists

The Resource Disk contains several checklists to be reviewed by facility operators, maintenance staff, kitchen supervisors and grounds supervisors at each facility. Each checklist allows for staff input to be included in the facility–specific operation guidelines. They will do these checklisted activities in support of resource conservation management. You may want to refer to these checklists as you follow along in this section.

After reviewing the checklists, the staff should check each item. Items that are "not applicable" (NA) or that "can't be done" should be accompanied by an explanation or left for discussion at the initial meeting.

Allow at least two to three working days for the checklists to be completed. Be sure staff keep their checklists and give a copy to you.

Similar checklists should be developed for other specialized facilities not covered above, such as pools, laundries and wastewater treatment plants.

Schedule Monthly Meetings

You should schedule regular meetings with facility operations staff for the subsequent three to nine months. These meetings allow you to work with facility operators and maintenance staff as allies and to glean their knowledge of operation and maintenance issues. They present opportunities to share experiences, review accounting data and get general feedback about the program. After a time, bi–monthly meetings will likely be sufficient. However, resource accounting reports should continue on a monthly schedule. The resource accounting reports will graphically illustrate progress and will show facility operators and others that their efforts do have an impact.

Special meetings prior to extended vacancy periods are also appropriate. For schools, this would be before winter and spring breaks and before summer vacation. A special shutdown/setback checklist for the different seasons should be developed (in brainstorm fashion with staff) and provided to the facility operators and maintenance crews to help them with this effort.

➤ ## TASK 6

Develop RCM Teams

Early development of RCM teams is critical to program acceptance. These teams foster ownership in the program. They are an effective way to disseminate information. Team members also provide different points of view.

You should assemble teams at the facility and organization level. RCM program acceptance is typically easier when teams are involved early.

Organization-wide Team

The initial meeting at the organization level may be the one in which the RCM policy is passed. At the upper management level, involvement will likely be minimal compared to the facility RCM teams. However, upper-level input, support and authority is very important. It's imperative that you keep this team informed of the progress of the RCM program. Work with upper management to determine if reporting should be monthly or quarterly.

Facility and District Level Teams

At the facility level, try to get a representative from each of the main occupant groups.

In a school, this might include:

- Principal
- Student
- Teacher
- Head custodian
- Kitchen supervisor (facility specific)
- Grounds staff member
- Maintenance staff member

At a district level, the team could include:
- Superintendent or assistant superintendent
- Business manager
- Facilities manager
- Operations manager
- School board representative

At the facility level you will likely have considerable interaction and involvement with facility operators as well as maintenance, kitchen and grounds staff. The other team members, however,

will provide a broad perspective and will bring in concerns that should also be addressed. Early involvement with the local team members will speed the development of the facility-specific operation guidelines discussed below.

At school facilities you can also recruit the assistance of students to help with the program. RCM patrols in the elementary schools are a good way to get assistance, instill some resource conservation values and make the program visible. Student patrols have been more successful in some schools than in others. You may want to try them as a pilot first. Involve some students in the program to make sure lights are turned off in vacant classrooms, water is not left running, etc.

Involve Occupants in Facility-Specific Operations Guidelines

After completion of the RCM audit (discussed in Task 7), facility operation guidelines will be developed for each facility and the different areas of that facility, such as the kitchen. Because the guidelines will affect all building occupants, everyone should participate in their development. Each group, whether they be facility operators or teachers, should be asked to help develop and implement ideas. It can be as simple as turning lights out when they leave a room and bringing a reusable lunch container. Be sure to recognize occupants' efforts, no matter how small.

See **Task 7** for more information on RCM audits and guidelines.

A copy of the occupant guidelines should be posted in an area frequented by occupants, such as the lunch room or lounge. It can also be made available electronically, if applicable.

Work with Other Staff

APPENDIX **A**
Audits/Surveys

RESOURCE DISK **R**
guid_occ.doc: RCM guidelines for facility occupants.

You will also be working with other members of your organization that are outside the established RCM teams. After RCM measures have been identified, for example, you may work with the capital programs staff to ensure that these measures will be a part of other capital projects.

➤ ## TASK 7

Conduct RCM Audits of Facilities

APPENDIX **A**

Audits/Surveys

RESOURCE DISK **R**

question.doc: Interview Questionnaire for facility operators.

The RCM audit is a documentation and investigation exercise to uncover resource conservation opportunities and other money-saving strategies. It consists of an interview with building operators and an on-site review of the facility. You will "walk through" the facility to inventory facility systems, conditions and resource conservation opportunities. You will also identify training needs of staff.

Products Developed from the RCM Audit

- *Facility-specific operations guidelines (facility operations, maintenance, kitchen, grounds and occupant) that will help facility operators, cooks, maintenance staff and grounds staff operate their facilities most efficiently*

- *List of maintenance-related items for maintenance staff*

- *List of efficiency improvements (capital projects) for each building*

- *List of training needs, especially for facility operators and maintenance staff*

Decide Which Facilities to Audit First

Use your resource accounting data to determine the facilities with the greatest savings potential. This will typically be the larger facilities with the highest EUI (Energy Use Index). These facilities are likely to be the ones you want to concentrate on first when performing RCM audits.

How To Do the Audit and Report

Figure 2.2 on page 18 illustrates the procedures before, during and after the actual RCM audit. After the initial meetings conduct the pre-audit interview with the facility operator. Then the audit follows.

APPENDIX **A**

Audits/Surveys

RESOURCE DISK **R**

aud_form.xls: Sample audit forms.

measures.doc: Annotated list of the operation, maintenance and RCM measures found on the audit form.

The Appendix contains sample audit forms that will step you through the process. The Appendix also contains descriptions of resource conservation opportunities that you can refer to during the walk-through audit and report preparation. On the Resource Disk, you will find an annotated list of the operation, maintenance and RCM measures found on the audit form. This list corresponds to the numbering on the audit form and provides some "rules of thumb" guidance for recommending and implementing measures.

APPENDIX **A**
Audits/Surveys

RESOURCE DISK **R**
aud_rpt.doc: Audit report format.

An audit report should be prepared using the information gathered during the audit. Use the sample format found on the Resource Disk. Again, refer to the descriptions of resource conservation opportunities. A copy of the report and the completed audit form should be retained at each site. This will serve as a reference for "site-based" RCM efforts.

As part of your audit report, you will need to calculate the cost-effectiveness of some of the resource conservation measures. The Appendix directs you to spreadsheets, worksheets and other analysis tools that will help you.

Develop Facility-Specific Operation Guidelines

With the RCM audit completed and the return of the checklist forms mentioned in Task 6, work can begin on development of facility-specific operation guidelines to be used by facility operators, kitchen personnel, maintenance crews and grounds staff. These guidelines should address the operational opportunities identified in the audit. They should also include a facility-specific reduction goal as outlined in Task 9.

Measures: Improvements, either capital or behavioral, that lead to resource efficiency.

APPENDIX **A**
Helpful Contacts: A list of contacts for technical and financial assistance.

List the maintenance items and low-cost RCM *measures* identified in the audit and pass them on to the maintenance staff. The higher cost RCM measures identified should be discussed during the capital planning process. Some of the higher cost RCM measures may require additional analysis. An engineering firm or your local utility could provide the needed analysis. Also check with your local utility and/or State Energy Office for information on engineering studies that may have been conducted for your site.

➤ How It All Fits Together

Figure 2.2 illustrates the relationship between different tasks. These tasks move from awareness to assessment to implementation of opportunities identified in the facility audit report. Bulleted items in the Awareness and Assessment sections of Figure 2.2 have files in the Appendix and on the Resource Disk associated with them. Reviewing the figure will give you a better feel for how you will use these tools in your own implementation strategy.

The main concept illustrated in Figure 2.2 is to move toward implementation of resource conservation opportunities. These are behavior changes (Facility Operations), no- and low-cost items (Maintenance and Administrative) and efficiency measures (Capital Projects).

The RCM guidebook and the tools contained within it will help you develop your systematic approach for moving your recommendations to implementation.

➤ TASK 8

Provide Training for All Staff

The RCM audit will identify training needs for facility operators, maintenance personnel and occupants. The facility-specific operation guidelines you developed will provide the framework for involving facility operators, other staff and occupants.

Technical Training

The need for additional training on energy management control systems is not uncommon and can enhance the facility operator and maintenance staff's ability to generate greater savings. Optimization of HVAC operation can save hundreds, if not thousands, of dollars per year at a single facility without additional capital expenditure. This is done by simply using the full capabilities of the existing energy management control system.

Training in proper maintenance and testing of HVAC components, such as boilers, chillers, heat pumps, dampers and actuators, also can result in significant savings and make operations easier.

APPENDIX **A**

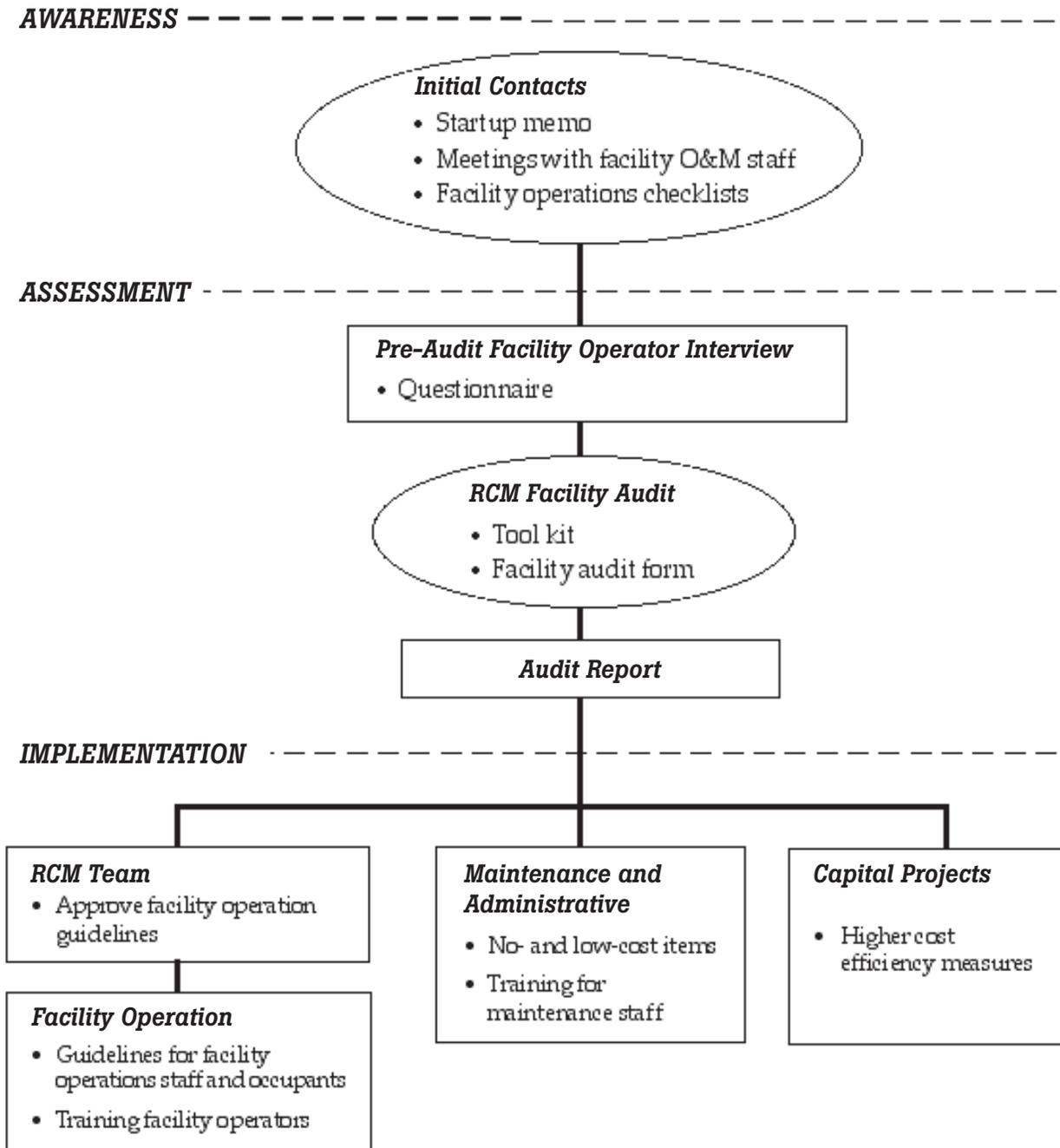**Helpful Contacts:** Contacts that may be able to provide technical training assistance.

Those involved with recycling and composting will likely need additional training. There are experts in these areas that may be available to assist you in training efforts.

FIGURE 2.2

RCM Awareness, Assessment and Implementation Strategy

AWARENESS

Initial Contacts
- Startup memo
- Meetings with facility O&M staff
- Facility operations checklists

ASSESSMENT

Pre-Audit Facility Operator Interview
- Questionnaire

RCM Facility Audit
- Tool kit
- Facility audit form

Audit Report

IMPLEMENTATION

RCM Team
- Approve facility operation guidelines

Facility Operation
- Guidelines for facility operations staff and occupants
- Training facility operators

Maintenance and Administrative
- No- and low-cost items
- Training for maintenance staff

Capital Projects
- Higher cost efficiency measures

Awareness Training

You will want to bring all building occupants "on board" with the RCM program. A presentation to teachers (in the case of a school district) or supervisors (in the case of an agency or local government) is a good way to get information disseminated.

APPENDIX **A**
Reporting/Communications

RESOURCE DISK **R**
guid_occ.doc: Sample occupant guidelines.

The Resource Disk contains sample RCM occupant guidelines. They can be customized for your occupant groups. This is an excellent tool to help train occupants. It provides a list of items that each of the occupants can do to gain efficiency. To set a resource conservation example, use electronic means and bulletin boards to post guidelines and other information. Display them in areas frequented by occupants, such as a lunch room or lounge.

The facility-based RCM teams will benefit from general training on Resource Conservation Management. Awareness training is an effective way to promote the RCM program and gain allies that will increase your chance of success. Schools, in particular, provide a unique setting for involvement of staff, teachers and students. By participating in RCM practices, students learn a life-long lesson—respect for the environment. They will carry this message into their homes and communities, spreading the Resource Conservation Management ethic.

➤ **TASK 9**

Set Facility-Specific Goals

Setting annual facility-specific reduction goals provides program direction and gives management an idea of the magnitude of the RCM program's potential. Annual reduction goals also call attention to the RCM program and renew the commitment of all involved.

Set Initial Goals

Based on the resource accounting data, responses to the checklists, development of the facility-specific operation guidelines, and RCM audits you will be able to develop individual resource reduction goals for each facility. The Resource Disk contains a sample goal statement. This statement could contain historical perspectives and comparisons with other facilities.

APPENDIX **A**
Reporting/Communications

RESOURCE DISK **R**
goalstmt.doc: Facility-specific goal statement.

A 10 percent reduction goal for the first year is a reasonable target. During program start-up and the development of your resource accounting system you may discover billing errors, refund negotiation opportunities (such as sewer charges on irrigation water), and opportunities for utility rate schedule changes that will provide immediate income and/or billing reductions.

Set New Goals Annually

As you empower facility operators and RCM program teams with knowledge and duties, reductions will gain momentum. So set new goals annually.

This will do three things:

- Renew participants' commitment to Resource Conservation Management
- Re-focus attention on the RCM program
- Maintain visibility of the program to management and others

➤ TASK **10**

Conduct Follow-up Facility Efficiency Surveys

After facility-specific operation guidelines have been developed and distributed, check facilities for efficiency.

Perform Periodic Surveys

Conduct periodic facility efficiency surveys to check interior temperatures in different areas, lighting operation (interior and exterior) and other operational characteristics. Surveys should be done during:

- Normal operating hours
- The evening of an operation day (during cleanup and partial setback)
- A weekend or holiday period (total setback)

You may also want to perform facility efficiency surveys during a late-night period, especially if there is a black-out campus policy that goes into effect around midnight and extends to 5 or 6 a.m. As an alternative, your utility may be able to monitor after-hour consumption.

APPENDIX **A**
Audits/Surveys

RESOURCE DISK **R**
fac_surv.doc: Sample facility efficiency survey form.

The Resource Disk contains a sample survey form. The original form goes to the individuals responsible for facility operations, with a copy distributed to the facility administrator (principal, in the case of a school) and a copy retained for your records. The form also has space to document completion of the maintenance recommendations.

Using these surveys, along with the resource accounting data, will help you understand the effects of operational actions on resource consumption. Understanding these relationships will aid in targeting RCM efforts in all facilities under your responsibility.

Make Impromptu Visits

Make quarterly, or at least semi-annual, visits to each facility to check for efficiency. These visits should not be scheduled. This will ensure that special efforts are not being made to meet facility operation guidelines solely because an efficiency survey is scheduled. Keep the survey periods random.

The idea is to make efficiency activities, as indicated in the facility-specific operation guidelines, part of the normal operating procedure.

➤ ## TASK 11
Provide Incentives and Recognition

Based on past experience, building occupants and operators put forth more effort when they benefit from the fruits of their labor. Therefore, incentives and recognition should be included in your RCM program from the outset. Set up a small fund to allow distribution of promotional items for awards and incentives, such as T-shirts, mugs, pens, etc.

APPENDIX **A**
Reporting/Communications

RESOURCE DISK **R**
shar_sav.doc: Sample shared savings plan.

A shared savings plan could be developed so that a portion of the savings and revenues obtained at each facility (or in the organization as a whole) is set aside as discretionary funds to be used by the facility.

Recognition of efforts and successes is another way to keep the program visible and reward participants. Recognition ceremonies and certificates are good motivators. They bolster support and keep commitment strong.

APPENDIX **A**
Reporting/Communications

RESOURCE DISK **R**
**award.doc:** A sample award for excellence in resource conservation.

Consider hosting a resource conservation celebration to thank everyone for their efforts. This is also a casual way to create interaction between RCM teams, building operators, kitchen staff, occupants and maintenance personnel of different facilities. It provides an opportunity to exchange success stories.

➤
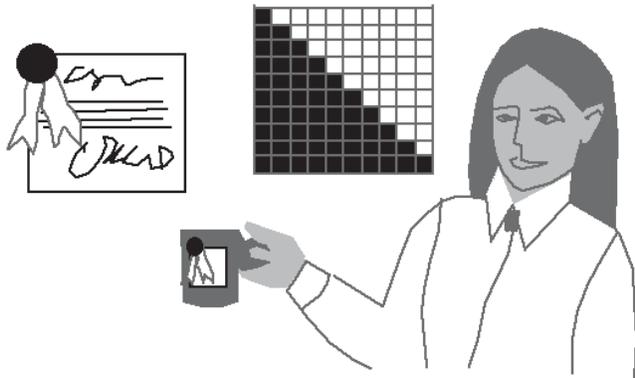
TASK **12**

Communicate Program Status

See **Chapter 1** for more on communications.

The RCM program should be visible to both the general public and the members of your district or agency. Develop strategies to involve and inform the public and the staff. Early involvement with these groups could pay off in extra support when facing personnel and funding issues.

Successful communication:

- Bolsters support for the program
- Gets more people involved in Resource Conservation Management
- Provides feedback to participants on the impacts of their efforts
- Keeps key individuals and groups informed on RCM program activities
- Makes the program visible

APPENDIX **A**
Reporting/Communications

RESOURCE DISK **R**
newsltr.doc: Sample newsletter format.

You can make the program visible through newsletters; presentations to occupants, management and local citizen groups; bulletin boards; and contests between facilities. The Resource Disk contains a sample newsletter format.

Prepare Regular Reports

Plan to submit monthly or quarterly status reports to management at the facility and organization level. Facility operators should receive monthly progress reports.

These reports can be in written form, or you can make in-person presentations. Choose a method that will keep the program visible and in the forefront. Highlight successes and provide recognition where appropriate.

UNDERSTANDING UTILITY COSTS

Utility Bills, Rate Schedules, Data Analysis

This section provides information about utility bills and rate schedules, and terminology relating to utility billing. Information about analyzing historical utility consumption data and discussion about possible causes of anomalies or high consumption is also covered in this section.

The utilities and services covered in this section include:

- **Electricity**
- **Natural gas**
- **Oil**
- **Propane**
- **Water and Sewer**
- **Garbage**
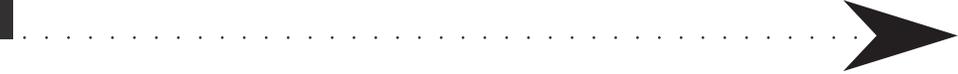
Electricity

The following is an overview of electricity terminology and some insights into electricity use analysis. Figure 3.1 below is a sample electric bill. The bold italic comments provide explanation of the bill components. Terminology used on the bill, such as "demand," is discussed in more detail later in this chapter.

FIGURE 3.1
Sample Electric Bill
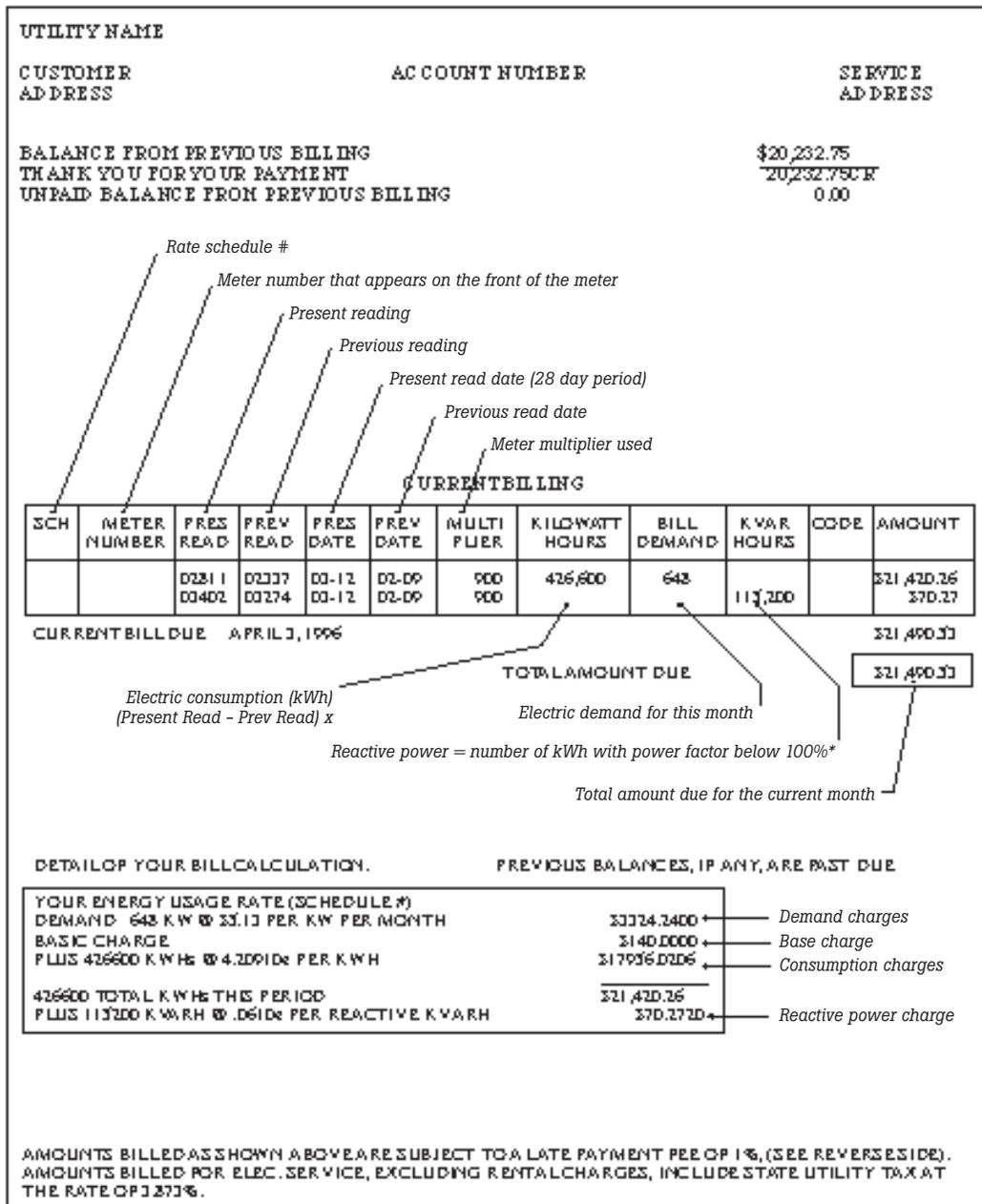
** Percent may vary with each utility*

Electric Meters

All electricity used at a facility goes through a meter. Some equipment may have a separate meter, such as for large irrigation pumps, stadium lighting or a scoreboard. In most cases each portable building has its own electric meter.

Learn to read your electric meter. This will allow you to spot check the energy consumption. This is done by monitoring the meter to determine the energy consumption for a certain period. For facilities that do not have an energy management control system (EMCS) this approach will allow you to develop daily load profiles for any facility.

**FIGURE 3.2**
Consumption kWh Dials on an Electric Meter

When reading the meter, if the pointer is between the numbers, read the lower number.

kWh Reading 6159

kWh Reading 6773
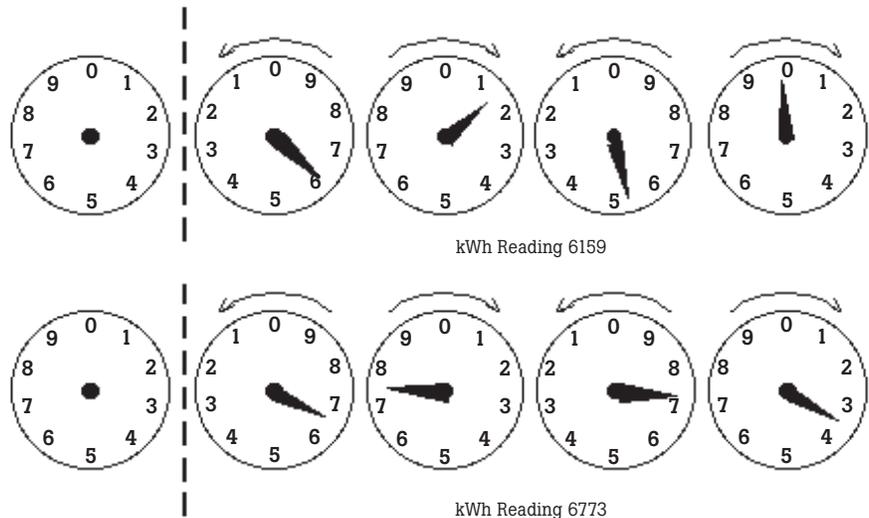
When visiting a facility, read the meter. Then check it again after 10 to 20 minutes to determine the electrical load for that period of the day during that time of year. Spot–checking a meter like this several times during a typical day will help you develop **load profiles** for each facility. If your facility has electronic digital meters, your utility may be able to provide daily load profiles. Load profiles are useful in understanding how energy is consumed at a facility. This information will become even more important when you begin making purchases in a deregulated energy market.

Load Profile:
Chart of electrical demand over time. Usually documents distribution of building heating, cooling and electrical loads.

FIGURE 3.3
Consumption kWh Meters with Demand
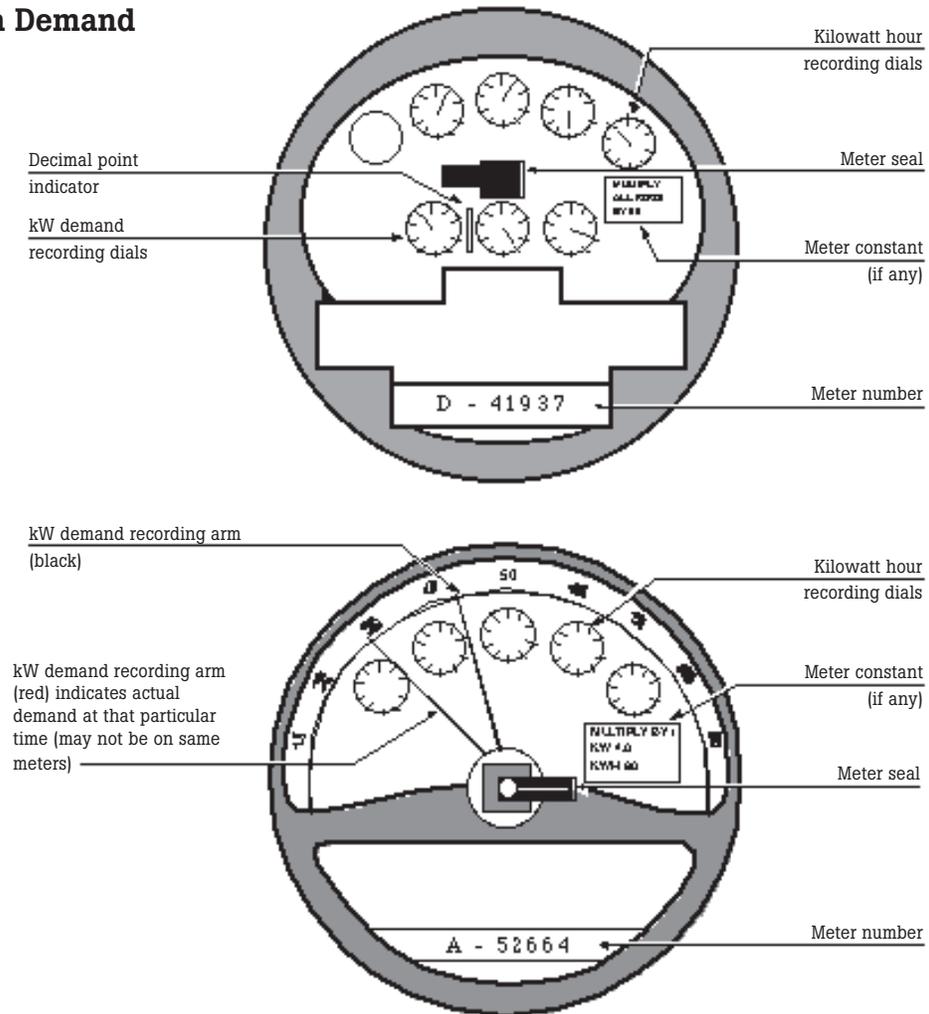
Rate Schedules

Electric utilities typically offer several different "rate schedules" to their customers. These include a residential rate, a commercial rate, a large commercial rate, an industrial rate, an irrigation rate, and sometimes a separate rate for street lighting. Some utilities may have more than one rate that would be applicable for a particular facility.

The difference between these rate schedules is that the utility will charge different rates for different "chargeables." Residential rates, for example, do not typically charge for electric demand. An industrial rate, on the other hand, may charge for consumption, electric demand and power factor as discussed below. Copies of the different rate schedules that are offered can be obtained from your utility.

FIGURE 3.4
Sample Electrical Rate Schedule

CITY POWER & LIGHT COMPANY
TARIFF

SCHEDULE 56
GENERAL SERVICE DEMAND

AVAILABILITY
Available to single phase commercial and industrial consumers (whose load requires a demand meter) and all three-phase services.

TYPE OF SERVICE
Single-phase and three-phase, 60 cycles, at available secondary voltage.

APPLICATION
All three-phase service and single-phase service with a demand over 25 kW or a monthly usage exceeding 5,000 kWh.

ENERGY CHARGE
1st   100 kWh @ $0.20/kWh
Over   100 kWh @ $0.0455/kWh
Demand Charge   kW $3.50/kW

MINIMUM MONTHLY CHARGE
The minimum monthly charge, under the above rate, shall be $20 per month or fraction thereof. Payment of the monthly minimum charge shall entitle the member to the use of up to 100 kilowatt hours within the billing period.

DETERMINATION OF BILLING DEMAND
The billing demand shall be the maximum kilowatt demand established by the consumer for any period of fifteen (15) consecutive minutes during the month for which the bill is rendered as indicated or recorded by a demand meter and adjusted for power factor as provided below.

POWER FACTOR ADJUSTMENT
Demand charges will be adjusted to correct for average power factors lower than 90%. Such adjustments will be made by increasing the measured demand 1% for each 1% by which the average power factor is less than 90% lagging.

WHOLESALE POWER COST ADJUSTMENT
A surcharge or credit may be applied to each billing for service under this schedule to reflect increases or decreases in the wholesale cost of power based on the rates charged by the Bonneville Power Administration.

GENERAL PROVISIONS
1. The rated capacity of any motor shall not exceed 10 hp single-phase and 30 hp three-phase.
2. Loads in excess of 10 kW are to be stepped, so that no load over 10 kW single-phase and 30 kW three-phase shall come on line simultaneously.
3. Consumer agrees to allow the Utility, at its discretion, to install automatic load management controls.

Effective Date: _____

John Doe
General Manager

Consumption Charge—Kilowatt-hour (kWh)

This is a charge for the amount of electricity consumed. In the Northwest, rates vary from less than $.01 to more than $.06 per kilowatt-hour (kWh).

Most utilities have commercial rate schedules with declining "block" charges. The more energy you use, the cheaper it gets. For example;

- first 20,000 kWhs billed at $.0565/kWh
- next 50,000 kWhs billed at $.0450/kWh
- greater than 70,000 kWhs billed at $.0415/kWh

An increasing block rate does the opposite. The more energy you use, the more it costs per kWh.

Declining block rates are more common for commercial customers. Increasing block rates are very rare. Typically, if you do find an increasing block rate, it will be a residential rate schedule.

Some utilities have seasonal rates, with the cost per kWh going down during the warmer months. This is because the Northwest is a winter peaking region. Electricity usage goes up in the winter. The basic law of supply and demand causes utilities to charge a higher rate during the winter months, and a lower rate during the summer months.

Factors That Can Increase Electrical Consumption Costs

1. *Equipment (HVAC, kitchen, etc.) is left on when not needed*

2. *The energy management control system (EMCS) is not programmed to match the occupancy patterns*

3. *The EMCS battery, which protects the customer-programmed schedules, has failed and the factory installed default program is operating*

4. *Providing 100% outside air for ventilation during cold weather conditions*

5. *Leaky ducts in electrical HVAC systems*

6. *Engine block heaters operating uncontrolled*

7. *The meter is read incorrectly*

8. *Incorrect multiplier applied to your meter reading*

Although not yet common in the Pacific Northwest, utilities are moving toward a less expensive charge for electricity consumed during the "off-peak" part of a day. For example, between 9 p.m. and 6 a.m. (off-peak hours) the rate per kWh could be $.02 less than the rate for electricity consumed between 6 a.m. and 9 p.m. (peak hours). Such off-peak rates make strategies such as thermal storage and earlier building warm-up more cost effective.

As deregulation of electricity becomes more widespread, the option of "time of day" off-peak rates will become more available.

Demand Charge

Demand:
The rate of electrical usage measured over increments of time (usually 15 or 30 minutes). Measured in kilowatts (kW).

This monthly charge is billed for your peak kilowatt (kW) use, averaged over a set time period (usually 15 to 30 minutes). Each month, when the meter is read, the demand indicator is reset to zero. Demand charges in commercial rate schedules vary greatly from no charge to more than $6 per kilowatt (kW). Some utilities in the Northwest now offer an off-peak demand rate.

Example of an Off-Peak Demand Rate

- *First 50 kW - no charge*

- *Everything greater than 50 kW:*

  $0.63 per kW of billing demand per month during "off-peak" periods as defined by Bonneville Power Administration

  $4.50 per kW of billing demand per month during "on-peak" periods as defined by Bonneville Power Administration

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Some utilities have a "ratchet" charge on the demand. The highest monthly demand experienced for the year becomes your annual peak. The annual peak is then used to "ratchet" the monthly demand peaks for the next 11 months. For example, the minimum demand charge for any month is 60 percent of the highest demand in the preceding 11-month period. Demand is a very important target for reduction if your utility has a ratchet clause on the demand.

Example of a Ratchet Demand Charge

Your demand in December is 800 kW, and you pay $5 per kW. You will pay a $4,000 demand charge for December.

The following June, the demand meter reads 150 kW. You are charged $2,400 rather than $750.

(60% x 800kW = 480kW , 480kW x $5 = $2,400)

This increase in demand cost of $1,650 ($2,400 - $750 = $1,650) is due to the ratchet clause in the rate schedule. This same ratchet will be charged in all the other warm months, even when demand is low.

APPENDIX **A**
Audits/Surveys

RESOURCE DISK **R**
measures.doc: Annotated list of resource conservation opportunities.

The list below outlines several situations that can increase electrical demand. If they occur during peak or near peak conditions, they can cause a "spike," or sharp increase, in the electric demand. Peak conditions occur when all or most of the facility lighting is on and there is a peak heating or cooling condition, such as morning warm–up during cold weather or afternoon cooling during hot weather. The reference to heating only applies if the heating is electric. A spike in the demand will result in additional costs on the utility bill and, with some utility rate schedules, may impact demand charges year round.

Factors That Can Increase Demand Costs

1. *Turning on football field lighting if it's on the same meter as adjacent facilities**

2. *Operating electric kiln**

3. *Operating a large motor such as on a sump pump or sewage lift station**

4. *Turning on all the electric resistant heating units at the same time during warm–up*

5. *Extensive use of portable electric heaters*

6. *Providing 100 percent outside air for ventilation during cold weather conditions*

7. *A large electric domestic hot water tank that operates all (or most) heating coils any time it heats water*

8. *Starting all the kitchen electric ovens simultaneously*

9. *Starting engine block heaters simultaneously*

10. *The meter is read incorrectly*

11. *Incorrect multiplier applied to your demand reading*

* if during facility peak load periods

Base or Basic Charge

The base charge is a "minimum cost of service" charged for each utility meter. A commercial base charge can range from less than $5 to well over $100 per month. The base charge could become important for those services that are not used for several consecutive months, such as field lighting or irrigation pumping. It may be cost–effective to cancel service to save the base charge for the months of non–use. The re–activation charge should also be considered in your cost–effectiveness calculation.

Power Factor

Power factor is a measure of the apparent power compared to the real power. This can be a difficult concept to understand. The important thing to note is that utilities will charge extra if a facility has a power factor problem (for example, below 90 percent). It may show up on the bill as "KVAR HOURS" or "PFA" (Power Factor Adjustment).

Facilities with a large number of motors, light fixtures with magnetic ballasts and other equipment that have capacitors, can have significant power factor charges. Some plug-in items, such as computers, can also have a negative impact on the power factor of a facility. If power factor is a big problem, you can install components on the electrical distribution system of a facility to help correct the problem. These devices can be quite expensive. But they may be cost-effective if power factor charges are a significant part of the bill. Contact your utility representative to discuss options for correcting power factor problems.

Analyzing Electric Utility Data

Electrical use profiles from different facilities can have different shapes based on the type of heating (electric or gas) and cooling equipment (if any), and the other electric loads (computers, pumps, dryers, etc.)

Base Load:
Demand for electricity which is consistent and is unaffected by variables such as seasonal climate.

Base load consists of non-weather dependent loads such as lighting, fans, plug loads (computers, etc.) and electric domestic hot water.

Variable Load:
Demand for a resource which fluctuates over a period of time, usually a year.

Variable loads are typically weather related, such as heating and cooling loads. Other loads that could be considered part of the "variable load" are loads that are not a part of normal operations (electric kilns) and seasonal loads (stadium lighting).

You can better determine areas of potential savings by graphically displaying monthly electric consumption and electric demand profiles. Figure 3.5 illustrates a demand and consumption profile with base and variable loads.

FIGURE 3.5
Sample Annual Demand and Consumption Profile

Consumption:
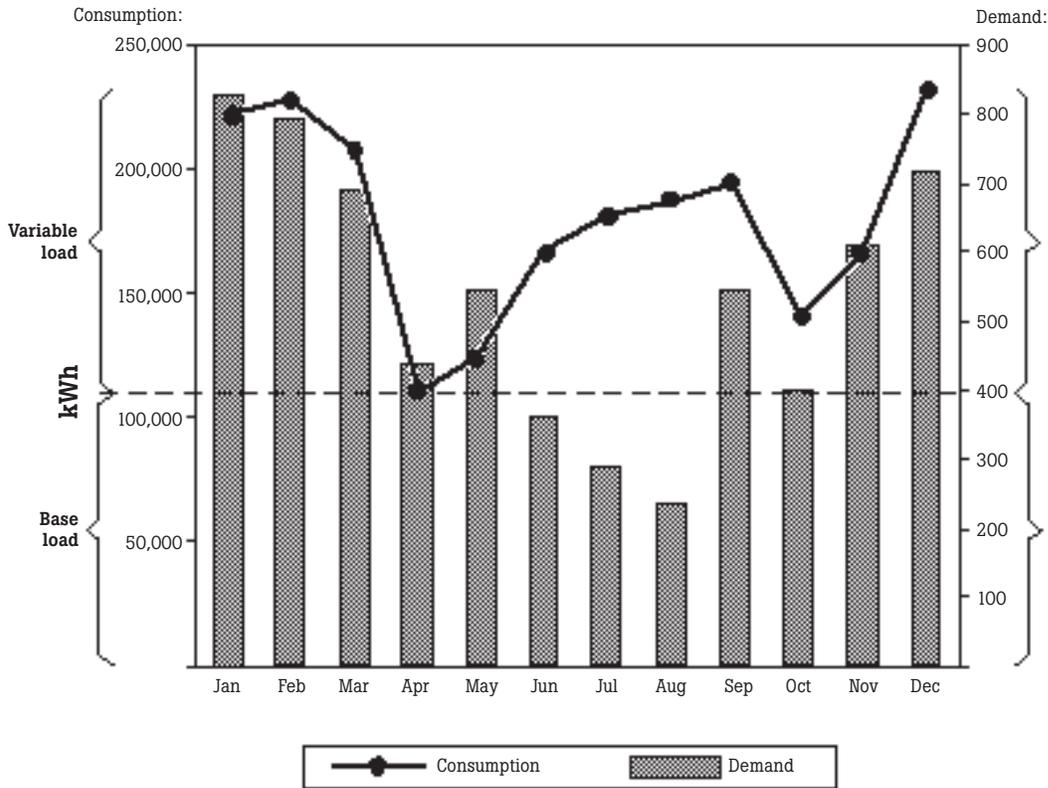
Demand:

This is the profile of an all-electric school. Note that the consumption and demand are both high in the winter. However during the summer, consumption fell but demand rose. This was caused by cooling equipment used on just a couple of hot days. Even brief peaks can affect overall monthly demand, increasing costs. April and October are very close to representing the "base load" because minimal heating and cooling happens during those months. If this were a gas-heated facility, there would be much lower electrical consumption and demand during the winter. Electrical consumption would increase some during the winter due to longer periods of lighting and use of electric resistance heaters.

Natural Gas

The following is an overview of gas terminology and some insights into gas use analysis.

Therms

The therm is a unit of measure related to natural gas consumption. One therm is equivalent to 100,000 British thermal units (Btu). Like electricity, gas rate schedules for commercial accounts typically have a declining block rate. The more you buy, the cheaper it gets.

Base Charge

Similar to electricity, natural gas has an associated base charge or meter charge. This will vary depending on the utility and the size of the meter. If operations have changed significantly at a facility and a smaller meter could be installed, there may be considerable savings in base charges.

If the operation is seasonal, such as an outdoor pool, there may be some advantage to canceling service during periods of non-use. If you consider this approach, include the cost of re-activation in your cost-effectiveness calculation.

Rachet Charge

Some natural gas utilities have a "ratchet" on consumption. The charge in the rate schedule is based on a percent (say 40 percent) of the highest month's consumption in the past 11 months. This type of rate schedule is typically reserved for large commercial users and is designed for facilities with a relatively even annual load. If, for example, a facility uses 20,000 therms during the coldest winter month, this would then "set" the charge for the next 11 months. During the summer months the boilers are turned off and gas is only used for some kitchen equipment and some domestic hot water heaters. The consumption may drop to 2,000 therms for a month. However, because of the 40 percent ratchet clause on the rate schedule, the facility is charged for 8,000 therms (20,000 x 40%). Study rate schedules and your facility gas use profiles closely to determine which rate schedule is best for each facility.

Firm vs. Interruptable

Natural gas companies are limited in their capacity to deliver gas by the capacity of the main gas transmission lines. During extremely cold conditions, shortages can occur. To accommodate customers with different needs, gas companies offer gas as a "firm" or "interruptable" commodity. A firm gas rate costs more than an interruptable rate. If you select a firm rate schedule, the utility will

not cut service to you due to high regional demands for gas. Some gas companies offer different degrees of "interruptability." Those customers interrupted first, as specified in the rate schedule, will likely pay the lowest price for gas.

The price for interruptable gas is typically 15 to 30 percent less than firm gas, depending on the volumes used and the local gas company. Facilities that have, or can add, a back–up source of fuel (such as oil or propane) should consider buying interruptable gas.

In the Northwest, gas interruptions have been rare. However, if you are on an interruptable rate, are notified of a curtailment, and you can't comply because your back–up systems are not working, you will pay a penalty as specified in the rate schedule.

Factors That Can Increase Natural Gas Consumption Costs

1. *Equipment is left on when not needed (is uncontrolled)*

2. *The energy management control system (EMCS) is not programmed to match the occupancy patterns*

3. *The EMCS battery, which protects the customer– programmed schedules, has failed and the factory installed default program is operating*

4. *HVAC system is providing 100 percent outside air for ventilation during cold weather conditions*

5. *Leaky ducts in gas–fired ducted systems*

6. *Gas kitchen equipment operating when not needed*

7. *There is a major leak in the heating distribution lines from steam or hot water boilers*

8. *The meter is read incorrectly*

9. *Incorrect multiplier is applied to your meter reading*

Fuel Oil

Fuel oil is typically sold in gallons. The two most common types of oil sold are #2 or diesel, which is a light oil and #6 or bunker C which is a heavy residual oil. The bunker C oil typically requires a heater to keep the viscosity low in the storage tank. Boilers that use the heavy oil usually have a second heater (electric) at the burner to further heat the oil before combustion.

Because oil is sold by individual dealers, the price can vary. Usually, the larger the volume purchased, the lower the price per gallon. For customers with large tanks (more than 10,000 gallons) the price reduction can be significant.

If you have a large oil–heated facility (greater than 40,000 square feet), it may be worthwhile to purchase oil on a contract that is put out for bid. Establishing a contract based on low bid will provide the best price as well as a price guarantee. Be sure to specify the type of oil needed. Low sulfur oil is the best, but is more expensive. Also check the reliability of the bidders.

There may be other options available to get a good price for oil. It may be available to your organization through your state procurement office, such as the Department of General Administration, Office of State Procurement (OSP) in Washington State. OSP contracts with suppliers to get a good price for state facilities and other public entities that subscribe to OSP.

To track oil consumption, have a facility operator or maintenance staff "stick" the tank (check the level) daily or at least weekly, at about the same time, and record the level. This will allow you to profile consumption and make it easy to recognize problems that may occur.

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See **Helpful Contacts** for a contact number.

Factors That Can Increase Oil Consumption Costs

1. *Equipment is left on when not needed (is uncontrolled)*

2. *The energy management control system (EMCS) is not programmed to match the occupancy patterns*

3. *The EMCS battery, which protects the customer– programmed schedules, has failed and the factory installed default program is operating*

4. *HVAC system is providing 100 percent outside air for ventilation during cold weather conditions*

5. *There is a major leak in the heating distribution lines from steam or hot water boilers*

6. *A leak in the underground tank or lines to the boiler*

Factors that can increase propane consumption are the same as those for oil.

Propane

Propane or LPG (low pressure gas) is sold in gallons and is provided by a dealer. Some dealers have tanks available to lease. However, leasing the tank locks you into a commitment to one dealer and often a higher price.

Unlike oil, propane tanks are always above ground. Customers with large tanks (greater than 10,000 gallons) usually can get a very good price. If your facility is large enough, pursue a bid price for the best deal.

APPENDIX **A**

See **Helpful Contacts** for a contact number.

There may be other options available to get a good price for propane. It may be available to your organization through your state procurement office, such as the Department of General Administration, Office of State Procurement (OSP) in Washington State. OSP contracts with suppliers to get a good price for state facilities and other public entities that subscribe to OSP.

Water and Sewer

Water is typically sold by the local municipality. It can be sold in several different units. Hundreds of gallons, thousands of gallons, hundreds of cubic feet and acre feet are the most common. Although water is usually relatively inexpensive, local or seasonal water issues may impact the cost of your water. Penalties can also be incurred if you don't abide by restrictions during critical water periods.

If your facilities are connected to a municipal wastewater system, sewer charges are usually based on the water consumption read from the meter. The reason for this is that water used at your facilities will end up in the sewer. Sewer rates can vary greatly depending on the type of wastewater treatment provided. Some sewer rates are more than four times higher than the water charge.

Water uses that bypass the sewer are:

Make-Up Water:
Water added to the system due to leaks, evaporation, blow-down or consumption (eg. humidifiers).
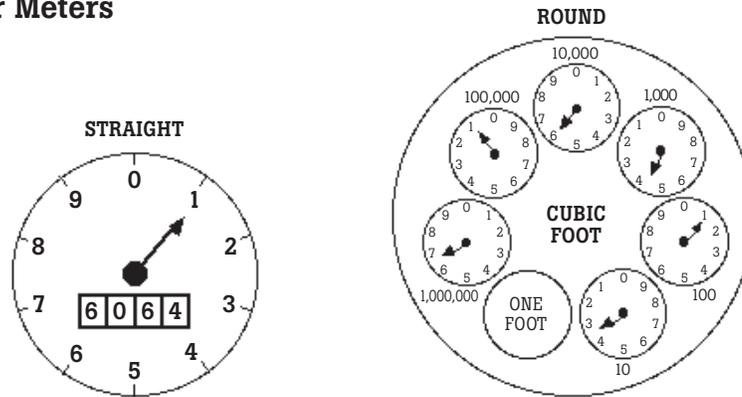
- Irrigation
- Most cooling tower *make-up water*
- Most boiler water make-up
- Condenser water that empties to a storm drain not connected to the sewage treatment plant

FIGURE 3.6
Sample Water Meters

For these uses, a separate meter or a submeter may be appropriate. Negotiate with your water provider to establish an agreement that allows for water that does not go to the sewer. A submetered water volume could be subtracted from the main meter reading to give a corrected volume for sewer charges.

If this kind of disparity has been going on for some time (i.e. sewer charges on irrigation water), you may be able to negotiate a refund.

Factors That Can Increase Water Consumption Costs

1. *Leaks (domestic use or irrigation)*

2. *Incorrect reading of the water meter*

3. *Plumbing fixtures stuck in the on (or flush) position*

4. *Auto-flush urinals with high-volume flushing*

Garbage

Garbage service can be provided by public or private entities. For commercial–sized facilities, dumpsters are usually provided, and the charge is based on the volume of the dumpster used and the number of times emptied per week. The unit of measurement is usually cubic yards. Garbage service charges can be significant.

APPENDIX **A**

Audits/Surveys.Conducting Waste Characterizations: How to conduct waste characterizations.

Before you consider using a trash compactor as a way to reduce volume and costs, check with your refuse hauler. Garbage may be charged on a weight basis as well, and the compactor will not reduce the weight, only the volume. You could get a price break for fewer pickups. However, you may not get a reduction for a smaller dumpster if you are compacting and the facility remains on the same pick–up schedule.

RESOURCE DISK **R**

wst_char.xls: Waste Characterization Data Sheet.

Many garbage service providers also provide free recycling pickup. Separation of recyclable materials coupled with reduction in the dumpster size and/or pickup schedule can lead to substantial savings.

Factors That Can Increase Garbage Costs

1. Illegal or unauthorized dumping into facility dumpsters

2. Service provided for partially filled or empty dumpsters

3. Recycleable items in the garbage

RCM AUDIT AND REPORT PREPARATION

The purpose of the RCM facility audit is to document existing equipment, conditions and resource use patterns. In the audit process data is gathered to develop strate–gies for improving resource efficiency. The audit is an essential analytical tool. Information from the audit is summarized in reports, complete with calculations of cost, savings and payback for different strategies. This audit report becomes the basis for preliminary decisions about resource efficiency investments. Additional analysis will likely be needed when capital funds are necessary to implement a project.

This chapter includes discussions of:

- **Pre–audit activities**

- **Facility operator pre–audit interview**

- **The RCM audit**

- **Report preparation**

Custodians, facility operators and maintenance staff are critical to the development of the RCM audit. They are your best sources for learning how your facilities operate. Every day they respond to the needs of the occupants, equipment and structure. They can be invaluable allies. But they may also be apprehensive about how resource conservation may affect their daily work. Cultivate your relationships with them carefully and patiently.

. . . .

Pre-Audit Activities

APPENDIX **A**
Audits/Surveys

RESOURCE DISK **R**
aud_form.xls:
Walk-through audit forms.

Begin by reviewing all resource accounting data. Note any anomalies or areas of interest that you may want to investigate during your discussions with the facility operator or during the facility walk-through portion of the audit. From the utility data, document the number of utility meters assigned to each facility. Locate these meters (water and energy) during your visit.

Review any previous energy studies, condition surveys or other relevant studies that were done by previous administrations. To locate these studies, check with the facilities director, mainte-nance manager, your State Energy Office and the local utility. Previous surveys or studies could provide useful information and may be a source of resource conservation analyses that have not been incorporated into action plans.

APPENDIX **A**
Audits/Surveys

RESOURCE DISK **R**
question.doc: Interview questionnaire for facility operators.

guid_fo.doc, guid_mnt.doc, guid_kit.doc, guid_gnd.doc: Facility-specific operations checklists.

Provide resource conservation training and information (facility-specific operation checklists) to the facility operators, cooks and maintenance staff. This will enable them to provide useful input during the audit. It will also heighten their awareness and get them thinking about resource usage at their facilities.

Prior to your visit, fill out as much as you can of the facility and occupancy description on the RCM Audit Form. Most of this can be done using resource billing information and facility architec-tural plans.

The balance of Section A of the RCM Audit Form can be com-pleted during the pre-audit interview with the facility operator(s) just before commencing the walk-through audit. Use a question-naire to make your time with the facility operator as productive as possible.

Keep in mind that RCM activities are added duties for facility operators and staff. Be sure to let them know their input is valuable and their efforts are greatly appreciated.

Obtain a copy of an uncluttered floor plan on 8-1/2 x 11 or 11 x 17 inch paper (a fire escape plan works well). You may have to draw a simple floor plan from the architectural plans. This will be used to document:

- Age of each section of the facility
- Building identification number(s) and room numbers
- Square footage
- Meter locations
- Heating fuel
- Location of HVAC equipment and other major equipment
- Location and direction from which photos are taken

Facility Operator Pre-Audit Interview

Set up an interview with the facility operator(s) and appropriate maintenance staff. Be sure to include people who:

- Can demonstrate the use of the HVAC control system
- Know about the maintenance of the HVAC equipment
- Have access to mechanical spaces
- Know the occupancy patterns of the facility

Select a room at the facility where you won't be disturbed. The interview should take between 30 and 60 minutes, depending on the amount of discussion generated.

Bring an annual summary of the resource accounting data showing monthly profiles of energy consumption, electric demand, water use and garbage service. Discuss any anomalies that may be present in the data. Also have Energy Use Index (EUI) figures (Btu/SF/Yr) for comparison with other facilities in the organization.

Refer to **Chapter 2, Task 3** for more on EUI.

You may want to use the questionnaire in the appendix and on the Resource Disk together with the audit form. The questionnaire provides some of the probing questions that will help you complete sections of the audit form prior to performing the walk-through portion of the audit.

APPENDIX **A**

Audits/Surveys

RESOURCE DISK **R**

question.doc: A questionnaire for facility operators that can be used during pre-audit interviews.

With the facility operator, review the floor plan you obtained. Add any changes. Make sure to keep a clean set of floor plans. These will be used at the completion of the audit for the transfer of field notes.

The RCM Audit

When you schedule audits, be sure to set them up so people who know the facilities can accompany you. This includes those who have access to all mechanical spaces and who are knowledgeable about operations, occupancy schedules, etc. Include staff who can demonstrate how to operate the HVAC controls and the energy management control system (EMCS), if there is one.

How Long Will the Audit Take?

The amount of time is based on:

- The level of detail you want
- The size and complexity of the facility
- How many potential RCM measures you find

For facilities that are 30,000 to 200,000 sq. ft., expect to spend three to six hours.

Some opportunities are more complex and take more time to quantify. A lighting upgrade recommendation may require that you count all the fixtures in the facility. This is time consuming, but is necessary to determine whether the project is worth pursuing. In this example, you could take representative samples that you can analyze to determine if a full count is warranted.

Come equipped to perform the audit

Be Thorough During the Audit

Take detailed photos to document mechanical equipment, light-ing, interior spaces, windows, roofs, walls, doors, etc. Indicate on floor plans the location and direction from which the photos are taken. Get the film developed soon after performing the audit, so the information is fresh in your mind and you can document what the photos show.

Talk to building occupants for their perspectives regarding comfort, lighting levels, occupancy patterns, indoor air quality and hours of operation. This may lead to additional ideas for RCM opportunities.

Identify RCM Opportunities

What you learn during your audit and what you observe through resource accounting will help identify areas for efficiency opportunities. As you consider the possibilities, involve the people who are impacted to ensure that any change will be well accepted. Use the RCM teams when applicable.

APPENDIX **A**

Audits/Surveys

List of tools for the walk-through audit.

APPENDIX **A**
Helpful Contacts

If you feel you are lacking the technical expertise to properly evaluate certain capital improvements, simply make a note that additional analysis may be needed. You may want to recruit the assistance of an engineer for that analysis. See the **Helpful Contacts** section of the Appendix for a list of sources for free or low–cost assistance.

Efficiency measures can be generally grouped into four broad categories:

- *Administrative —usually no–cost, such as removing sewer charges from irrigation meters.*

- *Operational—usually no–cost, such as getting night staff to turn the lights on only in the rooms where they are working.*

- *Maintenance —usually no– to low–cost, such as repairing steam traps for better heating efficiency.*

- *Capital —usually mid– to high–cost, such as a lighting upgrade or chiller replacement.*

APPENDIX **A**
Audits/Surveys

RESOURCE DISK **R**
measures.doc: Annotated list of resource conservation opportunities.

The RCM audit form also contains a key–word list of RCM opportunities. These correspond to the RCM opportunities descriptions presented in the Appendix and on the Resource Disk. Review the list of opportunities and their descriptions so you are familiar with them before conducting the audit. You may want to take the list along as a reference. The list of descriptions is somewhat generic, and your situation may vary from the explanation given. In your audit report, you can "cut and paste" descriptions from the Resource Disk. However you may want to modify the descriptions to more closely match your situation.

Organize and Verify Your Findings

Immediately after completing the audit, take time to review and clarify your notes. Review your findings with the facility operator(s) and maintenance staff to get their input. Revise the list of opportunities you identified based on these discussions.

Organize the audit forms, photos and field notes into a three–ring binder, such as the "Organizer" that accompanies this Guidebook. Resource auditing is an on–going process. By keeping all the building information in a dedicated binder or file, records can be easily added or updated. This can be very useful to architects and engineers who perform future building upgrades.

Audit Report Preparation

The audit report includes a facility description, resource accounting summary information, identification of training needs and resource conservation opportunity recommendations. Your report could also include an implementation plan. Or you can present the plan separately after the report is completed.

APPENDIX **A**

Audits/Surveys

RESOURCE DISK **R**

aud_rpt.doc: Sample format for the RCM report.

When developing your report, use the RCM opportunity descriptions provided on the Resource Disk. You can use "copy" and "paste" computer commands to insert the applicable descriptions into your report. Modify the descriptions as appropriate.

Present the draft report to the facility team for their review and comment. Include their feedback as a part of the final report.

Once finalized, copies of the report should be directed to facilities staff, the organization's administration, and of course, retain a copy for your records.

RESOURCE CONSERVATION OPPORTUNITIES ACTION PLAN

The action plan should consider time schedules, funding issues and the logistics for implementing the:

- **Maintenance measures list**

- **Resource–efficient capital project recommendations**

- **Facility operator and maintenance staff training recommendations**

- **Facility-specific operation guidelines**

Each of these subjects is discussed in this chapter.

➤ Maintenance Measures List

The maintenance measures list that results from the RCM audit should be presented to the maintenance supervisor for review. Work with the maintenance supervisor to develop a list of "do-able" measures and a timeline for completion of those measures.

Some maintenance measures may require hiring a contractor so that maintenance measures can be addressed in a timely fashion. Again, work with the maintenance supervisor to determine the best approach.

➤ Resource Efficient Capital Project Recommendations

Some resource efficiency measures identified in the RCM audit will require additional analysis. You may want to seek engineering assistance to determine the feasibility of some resource efficiency measures.

Check with your local electric, gas and water utilities to determine if incentives (rebates or grants), services or low-interest loans are available. Financial incentives may make a big difference in the affordability of the different resource efficiency measures.

Meet with the capital programs staff to share the results of the audit and utility funding inquiries. Work with them to develop an implementation time schedule for the efficiency measures.

If you manage implementation of the measures yourself, follow these tips:

- *Utility Assistance*
  Utilize the assistance of your local utilities as much as possible. They can often assist with project implementation and/or project commissioning. Some water, electric and gas utilities may even have grant funds available.

- *In-house Project Implementation*
  Discuss projects with the maintenance staff and capital programs staff to determine which they can do. Maintenance staff may be able to do lighting improvements and minor controls work as part of their normal work duties or over a shutdown period. You may still be involved in assembling a list of materials. Capital programs may have a major remodel schedule that could include the projects you have identified.

- *Small Projects*
  If the project is small enough, you may not have to "bid" the project. You may only need three qualified bids from contractors or distributors you contact. Check with the purchasing staff from your organization. They will likely know the budget limits requiring a bid.

- *Preparing the List of Materials*
  As much as possible, use the expertise of your own maintenance staff and others in your organization in preparing the materials list. Local electrical and mechanical distributors may also be good resources to determine what may be needed for your project.

- *Larger, More Complex Projects*
  If a project is relatively complex, requiring some design work, you may have to employ a qualified architect or engineer. An engineer could also prepare the specifications needed for a project. Your purchasing or construction division should have examples of specifications used in bidding a project.

  If the project is large enough to require a full bid, you will need to advertise the project in a trade journal. The Business Commerce Daily and the Daily Journal of Commerce are examples of publications used to solicit bids for projects. Major newspapers can also be used.

- *Contracting*
  Each organization will have a unique set of "boiler plate" documents. These are legal and contracting documents that are common to all bid packages. Again, check with your purchasing or construction division for assistance.

- *Project Management*
  Monitor implementation of the projects to ensure that correct materials are being delivered and inventoried. Also make sure that the materials are stored in a secure area prior to installation so that items are not used on other projects occurring at your facilities. For larger projects, consider commissioning as a part of project implementation. Document all phases of project implementation:

See **Chapter 7** for more on commissioning.

  1. Materials delivery

  2. Installation

  3. Testing

  4. Equipment failure

  5. Replacement

  6. Final testing/commissioning

Keep a record of all the resource efficiency measures completed at each facility as well as those that remain to be implemented.

APPENDIX **A**
Audits/Surveys

RESOURCE DISK **R**

guid_fo.doc: Checklist to be completed by facility operators.

guid_mnt.doc: Checklist to be completed by the maintenance staff at each facility.

guid_kit.doc: Checklist to be completed by the kitchen supervisor at each facility.

guid_gnd.doc: Checklist to be completed by the grounds supervisor at each facility.

APPENDIX **A**
Audits/Surveys

RESOURCE DISK **R**

question.doc: Pre-audit questionnaire sample.

Building Operator and Maintenance Staff Training Recommendations

Perhaps the most significant impact on the efficiency of facilities lies in the knowledge and understanding of those who operate and use those facilities. Based on the pre-audit interview, the RCM audit, and discussions with the facility operations manager and maintenance supervisor, you should now be able to identify training needs. Proper training will give staff the means to optimize operations using their expanded knowledge in their area of responsibility.

There are no- and low-cost courses available. But even if more expensive, specialized training is needed, it can prove to be cost-effective over time.

Work with the supervisors and managers to develop a list of training recommendations. Investigate available courses, then prepare a recommended training schedule with input from targeted staff and management.

Facility-Specific Operation Guidelines

Develop guidelines specific to the facility and the area of responsibility (e.g. kitchen, irrigation, vehicle maintenance shop, etc.). Use the operation checklists, pre-audit questionnaires and the information gathered during the audit as a starting point. Meet with the facility team to discuss and agree on the operation guidelines for each facility. Make sure that the person responsible for the selected area is present during development of the guidelines. It's important for staff to have input and play a part in the development of the guidelines they will be implementing.

Get commitment to the guidelines from the operators who are affected by them. A signature, memorandum or other written commitment from the operator regarding the guidelines will help give the operator a sense of ownership. This commitment should be voluntary. Without the desire to voluntarily make the guidelines work, that portion of the program will likely not succeed.

Commitment is the most difficult part of the RCM program and should be nurtured with praise and rewards. Although behavior changes may be difficult at first, after successes occur and the guidelines activities become routine, they will be much easier to follow.

Periodic review and revision of the guidelines will be necessary. Keep this in mind, and include reviews as a regular part of your program.

ANNUAL RESOURCE CONSERVATION ACTIVITIES PLAN

In an effort to institutionalize Resource Conservation Management, you may want to develop an annual resource conservation plan for each area in your organization that has an impact on resource consumption (energy and water) or waste generation (garbage and sewer). The annual plan provides a list of monthly RCM activities. These activities encourage the different disciplines of your organization to work together in a coordinated fashion. Each player will not only have the facility–specific operation guidelines (see Chapter 5) appropriate for his or her area of responsibility, but will also have an annual plan customized for his or her position. As the Resource Conservation Manager, you will be responsible for developing and monitoring this aspect of the RCM program.

This chapter includes an example of an annual plan for a Resource Conservation Manager at a school district. If you are not a school district Resource Conservation Manager, some of these items may not apply (such as spring break shutdown).

Development of these annual plans may not occur until the beginning of the second or third year of your RCM program. Work with your facility–level RCM teams to develop the annual plans after the facility–specific operation guidelines for the different areas have been completed

The following example is provided as a guide. You can modify it to best meet your situation. You may want to develop other annual plans for maintenance staff, kitchen workers and grounds staff.

➤ A Calendar of Activities for the Resource Conservation Manager

RESOURCE DISK **R**

This calendar is on the resource disk: **act_cal.doc**

Monthly

- Prepare and distribute monthly resource accounting reports to facility operators and head facility administrators (principals).
- Determine if there are any new facility operating staff that need orientation training with respect to the facility–specific operation guidelines and/or other RCM program activities.
- Monitor school board activities to determine impact on the RCM program.
- Perform facility efficiency surveys to document facility conditions during different modes of facility operation (e.g. day, night, vacation, etc.). Provide copies of the surveys to the facility operator(s) and facility administrator. Meet with facility operators to discuss opportunities for improvement, if necessary.
- Prepare and distribute monthly (or bi–monthly) newsletter.
- Award and recognize top performers and contributors.
- Update resource accounting data to reflect any changes in facility size, occupant loads or other relevant parameters.

☑ JULY

- Check to make sure garbage services have been terminated (or greatly reduced) for the season.
- Check for water leaks at facilities. If leaks are discovered, determine the extent of the problem, prioritize repairs based on severity and develop a work order for the maintenance or grounds staff.
- Determine annual resource consumption and costs (energy and water), services use and costs (garbage and sewer) and recycling income for the year, July through June, for each facility. Develop a status report.
- Determine the savings from the baseyear for each facility and for the program as a whole.
- Monitor maintenance and resource conservation projects that were scheduled for implementation during the summer months. As the Resource Conservation Manager, you may be expected to act as project manager for installation of some smaller projects (e.g. blown–in ceiling insulation, pipe insulation, lighting retrofits, lighting controls, etc.). Be sure you follow project contracting guidelines for your organization. The larger the project, the more stringent the bidding requirements.
- Meet with building operators and maintenance staff as a large group to brainstorm improvements, lessons learned and other issues. Discuss any of the incentive programs that are offered, upcoming training and other general program updates. Incorporate changes into the program and send out draft changes for review.
- Review proposed changes (above) with appropriate administrative staff, if necessary.

☑ AUGUST

- Meet with the administration and present the status report. Work with the administration to determine financial awards for the different facilities.
- Meet with facility operators and maintenance staff to review program changes proposed the previous month. Finalize changes to the operation guidelines and other RCM program activities for the new school year. Send the new modified documents to the appropriate staff.

☑ SEPTEMBER

- Check with the administration office staff to ensure garbage service is reinstated to the proper levels.
- Reinstate electrical service to meters that only serve field lighting and/or scoreboards.

- Plan for National Energy Awareness Month (October) activities.
- Re-establish facility-level RCM teams at each facility (principal, custodian, maintenance staff, cook, teacher and student). Provide orientation and resource accounting update. Discuss incentives and summarize successes from previous year. Set goals for the new school year and discuss efficiency activities affecting facility staff (incentives, training, survey reports, facility-specific operation guidelines, recycling procedures, etc.). Discuss RCM program kick-off activities.
- Have RCM teams participate in RCM program promotion activities.
- Meet with kitchen staff to discuss guidelines for kitchens. Modify guidelines as appropriate.
- Work with maintenance staff and facility operators to determine if HVAC equipment and controls are working properly. Focus on facilities with a track record of high energy use.

✓ OCTOBER

National Energy Awareness Month

- To celebrate Energy Awareness Month, initiate the RCM program with kick-off presentations for the new school year, RCM awareness presentations and presentation of financial awards for savings and revenues from the previous year.
- Review school calendar to plan extended setback days (breaks of three days or longer) and periods when you will want to cancel garbage service.
- Plan for in-service RCM program orientation for teachers.
- Notify the administration office to discontinue irrigation water service beginning November 1. Also discontinue electrical service to meters serving only irrigation pumps.
- Continue to perform RCM audits where needed. Develop facility-specific operation guidelines, maintenance items lists and capital projects lists. Present information to the appropriate staff. Capital projects may be candidates for inclusion in a maintenance and operations levy or bond.
- Alert facility operators and maintenance staff to change HVAC and lighting controls as appropriate for the end of daylight savings time.

✓ NOVEMBER

- Begin planning for winter shutdown.
- Send out "snow day" procedures to facility operators. During snow day closures, the facilities could remain in a setback mode.

- Review resource accounting data to determine budget needs for utilities for next year.
- Meet with facility–level RCM teams (bi–monthly meeting). Review resource accounting data, discuss facility-specific operation guidelines and other relevant issues.
- Provide a quarterly update of resource accounting (savings and next year budget) and other RCM program activities to the school board.

✓ DECEMBER

- As part of monthly meeting with facility operators and maintenance staff, discuss winter break shutdown procedures.
- Cancel electrical service to meters that only serve field lighting and/or scoreboards, until needed again.
- Notify the administration office about cancellation of garbage service over the winter break.
- Monitor and assist with winter shutdown activities.

✓ JANUARY

- Contact the administration office to ensure that garbage service is started again.
- Meet with facility–level RCM teams (bi–monthly meeting). Review resource accounting data, discuss facility-specific operation guidelines and other relevant issues.
- Contribute to efforts to pass levies and/or bonds, providing data to support the school district's claims of wise use of resources and high efficiency levels obtained.

✓ FEBRUARY

- Provide a quarterly update of resource accounting (savings and next year budget) and other RCM program activities to the school board.

✓ MARCH

- Begin planning for spring shutdown.
- Meet with facility–level RCM teams (bi–monthly meeting). Review resource accounting data, discuss facility-specific operation guidelines, spring shutdown and other relevant issues.

- Plan for Earth Day (April 22) RCM program promotional activities (awards and awareness activities).
- Notify the administration office about cancellation of garbage service over the spring break.

✔️ **APRIL**

**Earth Day
April 22**

- Reinstate electrical service to meters that only serve field lighting and/or scoreboards (only if fields are used in the evening and lights are needed).
- Monitor and assist with spring shutdown activities.
- Contact the administration office to ensure that garbage service is started again after spring break.
- Alert facility operators and maintenance staff to change HVAC and lighting controls as appropriate for daylight savings time.
- Work with the administration to determine requirements for summer use. Determine how to handle those requirements most efficiently (centralization in the most efficient facilities).
- Participate in Earth Day (April 22) celebration with school awards and awareness activities.

✔️ **MAY**

- Cancel electrical service to meters that only serve field lighting and/or scoreboards, until needed again (daylight savings in effect).
- Provide a quarterly update of resource accounting (savings and next year budget) and other RCM program activities to the school board.
- Meet with facility–level RCM teams (bi–monthly meeting). Review resource accounting data, discuss facility–specific operation guidelines and other relevant issues.
- Meet with facility operators and maintenance staff to discuss summer shutdown procedures.
- Reinstate irrigation water service and electricity service to meters serving irrigation pumps, as appropriate.

✔️ **JUNE**

- Monitor and assist with summer shutdown activities.
- Cancel or reduce garbage service for the summer, as appropriate.

NEW CONSTRUCTION

The Planning Process

The most cost-effective time to impact energy, water and other resource use is during the planning process for a new facility or major remodel. Although your role may be limited in the area of new construction, you can make an impact.

Many things that can be done at the time of design are not cost-effective later and are lost opportunities if not addressed during design and construction. Orientation of the building to best utilize solar energy, use of passive and active solar heating, maximum use of daylighting and use of earth berms are all examples of energy design elements that will not be cost-effective after the facility is built.

APPENDIX **A**
Technical Information

RESOURCE DISK **R**
nw_chkst.doc: RCM checklist for new construction, a tool to help you provide guidance during the planning process.

APPENDIX **A**
Helpful Contacts

APPENDIX **A**
Helpful Contacts

Meet with the capital programs division within your organization to discuss having input into new facility planning. You should also bring to the process resource conservation management concerns such as on-site recycling centers and compost bins, separation of building water from water used for irrigation (separate meters), etc. A checklist is provided on the Resource Disk that will help you provide resource conservation management input to the capital programs planning process.

Technological advances such as new lighting technology, gray water reuse systems and ozone water treatment of swimming pools may have a place in your new facility. Contact the experts for the latest advice on new technology. Review the technical resources listed in the appendix. Many vendors will come to your facility to demonstrate their products. Make sure to get several references to confirm their claims. Coordinate with your in-house architect or engineer to invite them to sit in on any vendor presentations. Evaluate which options are most appropriate for your project.

As an organization concerned with resource conservation and the environment, consider developing specifications that could be used for any new facility project. Again, check with some of the technical resources listed in the appendix. Some may have efficient product specifications already developed which you can use.

In Washington State there is a requirement to perform life cycle cost analyses on new or major remodels of all publicly owned or leased facilities that are 25,000 square feet or more. This requirement is based in law: Revised Code of Washington (RCW) 39.35 and the Washington Administrative Code (WAC) 180-27-075.

A guidebook, Energy Life Cycle Cost Analysis (ELCCA), Guidelines for Public Agencies, is available from Washington State, Department of General Administration, Division of Engineering and Architecture. For school facilities, the Superintendent of Public Instruction may refer to this report as the Energy Conservation Report.

Although not required in other states, this is an excellent resource and is available to anyone. As the resource efficiency expert, you may get involved in the selection of the energy systems. The ELCCA Guidelines present a process that can be used to select systems based on their life cycle cost; not just first cost. Costs for energy, maintenance, equipment replacement, and inflation, as well as first cost, are all considered in the ELCCA.

The report generated by the ELCCA process can be used as a decision tool for the owner in the selection of energy using systems. The report is usually prepared by an engineer hired by the design team.

See the **Helpful Contacts** section of the Appendix for a contact regarding the ELCCA Guidelines.

➤ # Commissioning

Commissioning is a systematic process that ensures, through documented verification, that all building systems perform interactively according to the documented design intent and the owners' operational needs. It begins in the design phase, lasts at least one year after project close–out and includes the training of operating staff.

Commissioning results in fewer callbacks, long–term tenant satisfaction, lower energy bills, avoided equipment replacement costs and an improved profit margin for building owners.

Commissioning occasionally is confused with testing, adjusting and balancing (TAB), which measures building air and water flows. Commissioning encompasses a much broader scope of work. It involves functional testing to determine how well mechanical and electrical systems work together. Functional tests of equipment and systems also help determine whether the equipment meets operational goals or whether it needs to be adjusted to increase efficiency and effectiveness.

APPENDIX **A**

Audits/Surveys

RESOURCE DISK **R**

com_chks.doc:
Commissioning checklist.

As the Resource Conservation Manager, you may want to be involved to some degree in the commissioning of a new building. Areas affecting energy and water would be of particular interest. On the Resource Disk there is a commissioning checklist that you can use to check items that will impact energy and water use.

For more detailed information on building commissioning, visit the Oregon Office of Energy's commissioning site on the internet at **http://www.cbs.state.or.us/external/ooe/cons/bldgcx.htm.** Two publications are available for download at this site:

• A 44–page booklet, Commissioning for Better Buildings in Oregon, explains the benefits of commissioning, how to select and manage a commissioning agent, the role of operation and maintenance staff, and how to develop a maintenance plan for the building.

• The Commissioning Tool Kit is a comprehensive guide through the commissioning process: selecting a commissioning agent, drafting contracts, developing and carrying out commissioning plans, and managing commissioning agents and contractors. Included are sample RFPs for design and commissioning agent services, model commissioning specifications, model commissioning plans for the design and construction phases, checklists for contractors who are responsible for verifying equipment operation, procedures for testing and documenting selected equipment, procedures for commissioning tune–ups of existing equipment, tips for project managers on managing the commissioning process and a directory of firms providing commissioning services.

Energy Management Control Systems

Most likely, an energy management control system (EMCS) will be installed in any new facility. Plan to attend any training classes offered to the maintenance and operations staff. Consider video taping the sessions to provide orientation and training for new staff. An EMCS is a powerful tool in the effort to save energy. In some cases, it can also provide historical monitoring functions. This can be useful when attempting to diagnose problems such as a demand spike on an electric bill.

To provide historical monitoring or "trend logs" of equipment performance or space temperature measurements, the EMCS needs to be programmed. For example, you could program the EMCS to give you temperature readings every minute in a particular room. Because an EMCS typically has a maximum number of trend points, it would save only a few days worth of information. If you reprogrammed that to every 10 minutes, you may be able to get a trend log of a whole month. You could also trend the "on" and "off" cycles of equipment.

Many EMCSs also have electric demand shedding capabilities. This is typically accomplished in two ways: 1) by prioritizing loads (e.g. an electric domestic hot water tank could be shed first when the predetermined maximum load is reached), and 2) by duty cycling equipment (e.g. turning HVAC equipment on for only a few minutes over a one–hour period. This "on" period is rotated from one piece of equipment to another.)

Refer to **Chapter 3** for information on demand and other utility charges.

If a facility has a high demand charge (some are greater than $6/kW/month), different load-shedding strategies can provide substantial savings. Reducing the demand by 20 kW each month, at the rate stated above, would provide an annual savings of $1,440. If this could be done at 20 facilities the annual savings from demand shedding alone would be $28,880!

Think Long Term

Proper training and other commissioning efforts are often minimized or eliminated in an effort to save construction costs, time or both. This way of thinking is a formula for disaster for the maintenance and operations staff. New construction can be an excellent opportunity for the Resource Conservation Manager to enhance the process.