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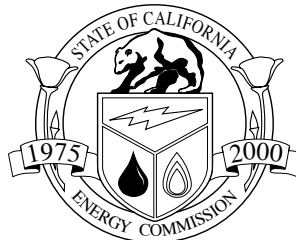
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ENERGY ACCOUNTING: A Key Tool in Managing Energy Costs

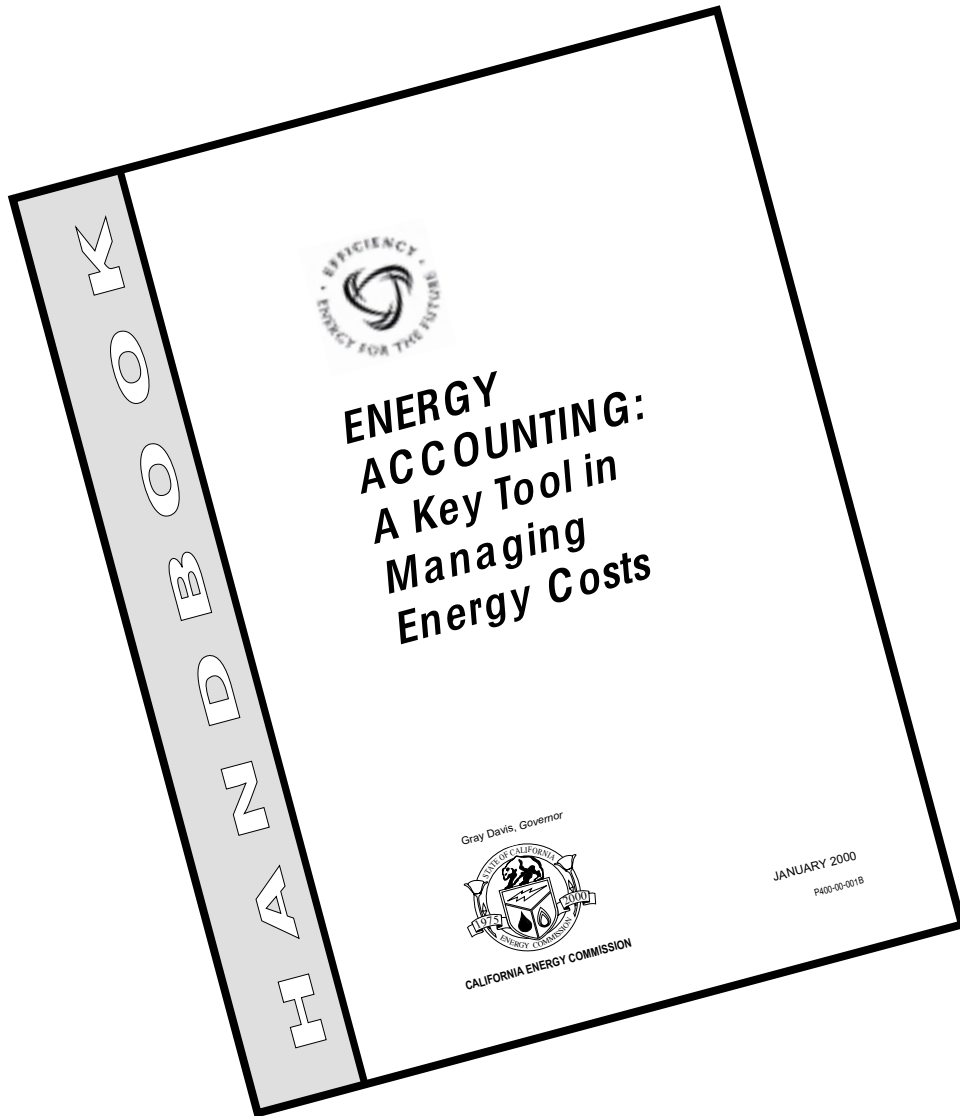
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CALIFORNIA ENERGY COMMISSION

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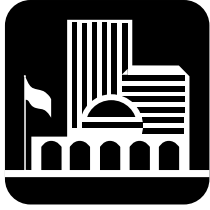
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This document is one of a series of publications contained in the Energy Commission's *Energy Efficiency Project Management Handbook*, which is designed to help local governments, schools and other public entities successfully implement energy efficiency projects in their facilities.

For information on how to obtain a copy of other sections, contact the Nonresidential Buildings Office at (916) 654-4008. All documents can be downloaded from the Energy Commission's Web page at:

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Second Edition, January 2000



Energy Accounting:

A Key Tool in Managing Energy Costs

Energy Efficiency Project Management Handbook

California Energy Commission
Energy Efficiency Division

Energy accounting is a system to record, analyze and report energy consumption and cost on a regular basis. Just as financial accounting is used for the effective management of an organization, energy accounting is critical to energy management. It can be one of the most cost-effective tools school districts, cities, counties, colleges and other organizations can use to cut energy costs.

This guide will discuss some of the reasons for energy accounting, go into background

information needed to understand it, and explain how to get started with a program. With emphasis on computer software, this document will discuss some of the methods and means of energy accounting, focusing in on energy accounting software packages.

The appendix provides information on some of the commercially available energy accounting software packages.

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I. SEVEN REASONS FOR ENERGY ACCOUNTING

Before you can manage energy costs, you have to know what they are! Energy accounting provides feedback on how much energy your organization uses, and how much it costs. It also provides a means to effectively communicate energy data that facility staff, building occupants and managers can use to improve cost management. Energy accounting will help your organization:

- **Record and attribute energy consumption and costs.** Energy costs depend on the amount consumed and its price. In an organization with many facilities, energy accounting makes it possible to compare energy use and cost among facilities and to monitor how energy use changes over time. By communicating this information, those responsible for managing energy costs — maintenance staff, site managers, or others — can get feedback on how they are doing.
- **Troubleshoot energy problems and billing errors.** By consistently tracking energy use, you can identify problems. A sudden unexplained increase in consumption, for instance, means it's time to investigate the site for the cause. Billing errors can be caught, too. (See page 2.)
- **Provide a basis for prioritizing energy capital investments.** Find out which facilities have the highest energy costs, and consider targeting them for energy retrofits or other energy management efforts.

- **Evaluate energy program success and communicate results.** Did you save what you thought you would from your energy management efforts? How did the actual dollar savings from your lighting or HVAC retrofit compare to the savings predicted by your vendor or contractor? Without energy accounting, it's virtually impossible to answer these questions.

Once you determine the results of energy management activities, it's important to communicate this information to decision makers and implementers who were responsible for the activities. Energy accounting reports and graphs are the tools for this important feedback.

- **Create incentives for energy management.** It's often difficult to get anyone in an organization to take the time and responsibility required for carrying out energy management activities because there is little incentive to take on the task. A maintenance director or site manager may not see much benefit in reducing energy costs if all of the savings revert to the general fund, or if lower energy bills only result in smaller allocations for utility costs in next year's budget.

To remedy this “disconnect” between responsibility and benefits, many organizations have created incentives for energy cost management by sharing energy savings. Energy accounting makes it possible to set quantifiable energy cost reduction goals. One city plans to reward the facilities team by using realized energy savings to augment the facility management

SACRAMENTO COUNTY RECOVERS \$100,000 IN ELECTRICITY MISCHARGES

Utility billing errors, uncovered while establishing a computerized energy accounting system, led to over \$100,000 in refunds for Sacramento County.

Although most utilities have very good records of accuracy in their billings, sometimes errors can be found. In most organizations, utility bills go directly to Accounts Payable and are routinely paid out of the appropriate budget accounts. Typically there is no analysis of whether the energy cost and consumption makes sense compared to actual utility rate schedules or past billings.

John Matoba, an energy specialist with Sacramento County, reports that the utility bill validation feature of his energy accounting software helped the County identify \$97,503 in electricity mischarges, and \$2,947 in natural gas mischarges. The software feature recalculates bills using the appropriate utility rate structure for each account. In this case, the mischarges were city taxes which should not have been charged on the County's tax-exempt accounts. Ultimately, the County received refunds totaling \$100,450.

Ken Egel, an energy specialist working with Alameda Unified School District, identified \$12,540 in mischarged taxes while setting up the District's energy accounting software. In addition, the software flagged an unusually high cost per kilowatt on a single bill resulting from a decimal point mistake. The District was charged for 314 kilowatts of demand instead of 31.4 kilowatts, resulting in an overpayment of \$2,790 which was later refunded.

City governments have also used energy accounting to catch billing errors. The City of Martinez caught a \$20,000 mathematical error in a utility bill, and the City of Madera found a \$2,000 charge that had been billed twice.

budget for the next year. This way, those responsible for cost-cutting measures reap the benefits.

Many school districts have shared savings with individual schools that cut costs through student energy patrols or other “behavioral” energy management activities.

- **Budget more accurately.** Energy accounting gives a historical look at costs that will help you budget more realistically for the future.
- **Position your organization to shop for lower prices for energy in a changing electricity market.** The market for electricity is changing rapidly due to regulatory reforms and increased competition between electricity suppliers. These changes parallel similar changes that occurred as the natural gas industry was deregulated, which resulted in significantly lower prices for knowledgeable consumers.

In order for your organization to take advantage of the potential for lower electricity prices, you will need to understand how electricity is priced (see the section, “Understanding Utility Bills”), and you will need to know your “electric load profile.” This means knowing how much electricity your organization consumes during different times of the day and different seasons of the year.

By setting up an energy accounting system and understanding the details of how energy is priced, you will be better prepared to negotiate for the best electricity deals in

a changing market. If you are a large user, you may be able to negotiate directly with electricity producers in the future. If you are a small user, you may want to pool with other consumers. An “aggregator” may be able to help small users get a better deal by pooling electricity purchases.

The more knowledge you have of your precise electricity needs, the better chance you will have of paying lower prices. Energy accounting methods and software are likely to change significantly to accommodate the changing electricity market. Now is the time to get in on the ground floor and develop expertise in understanding your energy usage.

II. GETTING STARTED

Before you start tracking energy, you need to get organized. Once you make sure that key people in your organization understand the benefits and costs of energy accounting, you should learn what data you will need to collect, and develop a plan for communicating energy data so it can be used.

- **Identify your goals and objectives, and consider how energy accounting information will be used.** You must be able to clearly explain why you need energy accounting before you can “sell” the idea to your organization. Having clear goals and objectives will help you decide what tools you will need. This box lists sample goals and objectives.

It is important to be clear about how energy accounting information is to be used. Will it be used primarily by the facilities or maintenance department to troubleshoot equipment problems? Will it help track performance of new energy efficient equipment installations? Will it provide feedback to site managers or administrators who are responsible for containing energy costs? Will it be used to annually budget for utility costs?

At Napa Unified School District, monthly energy use and cost reports are sent to school principals, resulting in peer pressure to keep costs from escalating. The Public Works Department of Mariposa County is using energy accounting to track savings from energy projects.

GOALS
■ <i>Manage energy costs</i>
■ <i>Promote energy/environmental awareness</i>
■ <i>Manage water and other resource costs</i>

OBJECTIVES
■ <i>Verify savings from energy retrofits</i>
■ <i>Motivate staff to manage energy costs</i>
■ <i>Set energy cost savings goals and monetary incentives</i>
■ <i>Prioritize sites for energy retrofits</i>
■ <i>Troubleshoot unusual consumption increases</i>
■ <i>Find billing errors</i>
■ <i>Prepare to negotiate for price and service as electricity undergoes deregulation</i>

- **Get commitment from decision makers or management.** Once you know how energy accounting can serve organizational goals, you need to get sufficient organizational “buy-in” to make your program a success.

Energy accounting is often part of a larger energy management effort. If so, a city council or school board resolution in support of the program goals can help create visibility and encourage participation. In large organizations, the decision to allocate resources to energy accounting may be made by senior facility management staff. Since energy accounting and energy management is likely to involve staff across departments, it's best to get "buy-in" at the highest and broadest level possible.

As you involve decision makers in the process, make sure to discuss both your organization's needs and the constraints of energy accounting. Consider the cost of purchasing software, and, especially, the amount of staff time needed to set up and maintain an energy accounting system.

It may take more than 40 hours over several months to make the contacts and obtain and input the data needed to set up a computerized energy accounting system. Once the system is set up, acquiring and entering monthly data will take competent clerical staff one to eight hours per month or more, depending on the number of meters tracked. (Electronic data transfer can reduce the time but may increase the cost.) Additional professional staff time will be needed periodically to prepare reports and communicate energy accounting results. If you plan to have a consultant assist with energy accounting, be sure the consultant costs and responsibilities are clear.

- **Consider a system of communication.** What kinds of reports and graphs will be needed, and by whom? When and how will information be reported? Make sure you get the right information to the right people, at the right time. With rapid feedback, maintenance staff can respond to changes in energy consumption by looking for a problem at the facility. Monthly or quarterly reports to site administrators comparing present to baseline usage, or analyzing trends in consumption, can help to periodically direct attention to energy management.
- **Consider what tools (including software) you will need for an energy accounting system.** Based on your organization's needs and constraints, what kind of energy tracking software (if any) will you purchase? See the sections on *Means of Energy Accounting* (pages 15-18) and *Tips for Selecting Software* (pages 23-24).
- **Obtain necessary data.** The information you collect will depend on the level of detail you wish to track and on the type of system and/or software you will use.

Generally, this will include an inventory of buildings detailing square footage, utility accounts and meters for each building or facility, and billing histories going back at least 12 months — preferably 36 months — for each meter. Weather data and information on such variables as occupancy rates and schedules may also be required.

Do not underestimate the time involved in this step! It may take several months to

get billing data from your utility. In some cases, it may be difficult to correlate accounts with buildings, particularly if records of meter locations are not available.

One of the purposes of this guide is to help you answer these questions. But first, we need to examine some of the causes of changing patterns in energy consumption and costs.

III. WHAT CAUSES VARIATIONS IN ENERGY USE?

Before considering what methods and means of energy accounting will best serve your organization, it is important to look at what causes building energy use to vary. These are some of the major factors:

- **Weather.** Energy used for heating and cooling varies as a result of changing temperatures. Seasonal changes cause increased heating energy use in winter, and increased use of electricity for cooling during the summer.

Only a portion of a building's total energy is weather dependent. While energy use for cooling or heating (chillers, boilers, heat pumps, and use of some fans) is weather dependent, for example, lighting, office equipment, and ventilation energy use is not.

Figure 1 shows that the highest electricity consumption occurred during July and August in both years graphed. This is due to summer electric use for cooling at this year-round elementary school.

It is important to remember that weather changes can affect energy costs as much as installing a new lighting system or starting a conservation program. Software reviewed in this guide takes account of the effect of temperature when calculating energy and dollar savings. Although clouds and humidity also affect energy

costs, temperature is the most important weather related factor.

- **Building area changes.** Changes in building size will also strongly influence energy consumption. If square footage is added to a facility, energy use can be expected to increase. Most energy accounting software can correct for changes in building area by assuming that energy use will increase (or decrease) proportionately to square footage. Some software programs can account for non-proportional changes by adding or subtracting a fixed amount or percentage to the baseline consumption for each month.
 - **Operations and schedule changes.** Changes in building occupancy or schedules for building and equipment operation will affect energy use. If a building is open longer, more energy will be used for heating, cooling, and lighting. If a school cafeteria brings in pre-cooked meals in disposable containers instead of doing local cooking and dishwashing, kitchen energy use will be reduced.
- In Figure 1 on page 10, the big decrease in consumption between the two years is due to operations and schedule changes resulting from an energy conservation program at the site.
- **Changes in building equipment.** When new equipment is added or existing heating, cooling, ventilation, hot water, lighting, or other energy using equipment is replaced,

Monthly Electricity Usage at Amy Blanc Elementary School

Kilowatt hours

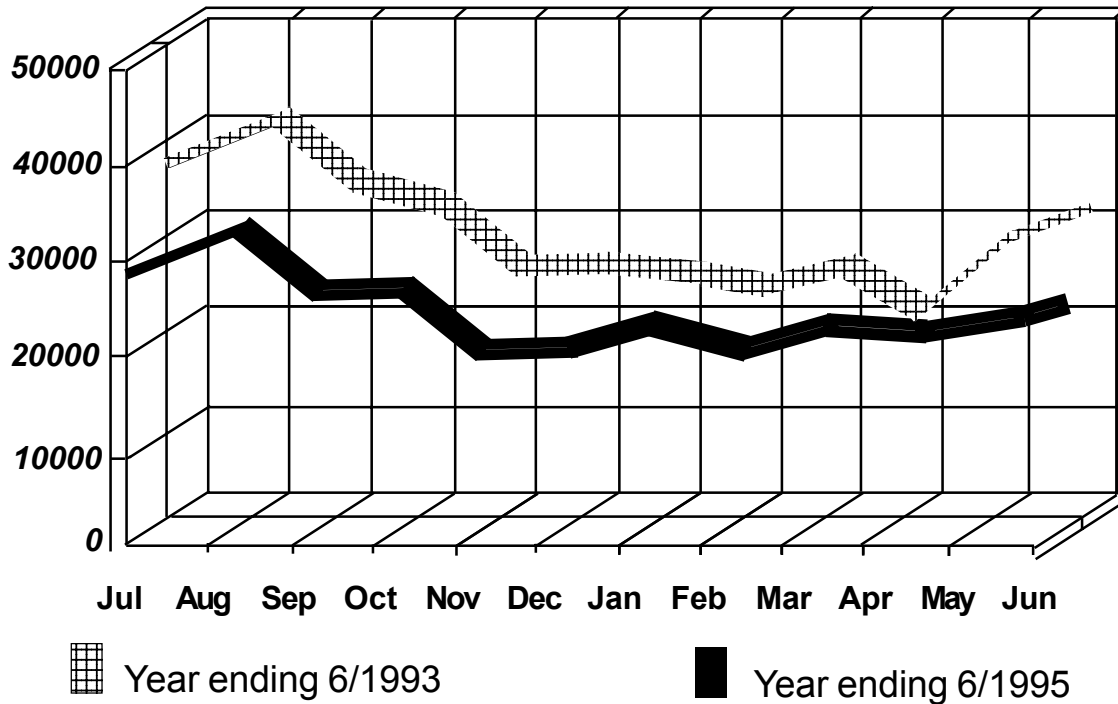


Figure 1. Note high electricity use each summer (July and August) reflecting increased air-conditioning at this year-round school. The reduction in energy use in 94/95 compared to 92/93 is due primarily to operations and schedule changes instituted as part of an energy conservation program at the school.

modified, or abandoned, energy consumption will change. Energy accounting can document savings due to energy efficiency retrofits, or other changes in equipment.

It is critical to be aware of the factors that cause energy use to vary, before

attempting to analyze energy data, or evaluate a facilities efforts to use energy more efficiently. Even though it is impossible to accurately account for every variable, awareness of the factors can prevent such mistakes as over- or underestimating savings do to energy management efforts.

IV. UNDERSTANDING UTILITY BILLS

Monthly energy bills provide the basic data for energy accounting. To understand and analyze changes in energy costs, it is important to know exactly what you are paying for!

The two most common energy commodities are electricity and natural gas. Some organizations may also track alternative heating fuels such as propane and fuel oil, and transportation fuels like gasoline and diesel.

Charges for electricity and natural gas can be especially difficult to understand, while tracking other heating fuels can be difficult when only delivery dates, rather than consumption dates, are known. Here are billing practices for the most common fuels.

- **Natural Gas.** Natural gas is commonly measured in *therms*. If your organization buys gas directly from a utility, you will pay a per therm price, which may vary by season and by how much is consumed. However, now that the natural gas industry has been deregulated, many organizations buy gas from an independent supplier, or from an aggregator that acts as a gas broker. In this case, there is a per therm charge for the natural gas itself, and another per therm charge for its transportation and distribution to the customer. These charges may be billed separately, and must be added together to obtain the full cost.
- **Electricity.** Electricity costs usually include several different components.

Nearly every electric rate schedule includes a fixed service (or customer) charge that is constant no matter how much electricity is used, and a per kilowatt-hour (*kWh*) rate for the amount of electricity consumed.

Most accounts (except for very small ones) also include a demand charge, per kilowatt (*KW*). The demand charge is based on the highest (or peak) electricity use each month, averaged over a short time period (usually 15 minutes). Demand charges (*KW*) may account for a greater fraction of the total electric cost than consumption charges (*kWh*).

Although you are charged for demand on most rate schedules, the total demand charge may or may not show up as a separate line item cost on your bill. On some bills, demand cost and *kWh* cost are rolled into a single line item for cost.

Many rate schedules also include time-of-use charges. These rate schedules will have different prices per *kWh* and per *KW*, depending on the time electricity is consumed. For example, prices are likely to be higher during summer weekday afternoons when demand is high, and lower at night and on weekends.

Another common component of electrical costs on large accounts is a charge for reactive power. These charges are based on the kinds of electrical loads in your building. Facilities with many electric motors, for example, may pay a penalty due to the increased electric transmission capacity needed for large inductive loads.

Usually, reactive power charges show up on your electricity bill as “*kvar*” charges or as a penalty based on “*power factor*.”

As the electricity industry moves toward less regulation, time-of-use and other complex rates are likely to become more common. “*Real-time pricing*” may also become available, at least to large electricity users.

With real-time pricing, what you pay per KW and per kWh will be based on what your utility pays for wholesale electricity. Wholesale prices vary based on supply and demand. Customers will be notified hours in advance what prices will be; they may act to reduce energy use based on this real-time information.

Taking advantage of real-time pricing will require computerized energy and price tracking, as well as sophisticated control of equipment.

Making sense of your facility’s electricity costs can be complicated. For more information, talk to your utility representative. Your electricity supplier can provide you with a copy of the rate schedule applicable to each of your accounts. Your utility representative can verify that each of your accounts is on the rate schedule that results in the lowest possible electricity charges.

Knowing what factors determine your electricity costs is especially important in managing them. This will likely become more important as the electricity industry is restructured and becomes more competitive.

Understanding rates is also important in planning energy efficiency retrofits. To predict energy cost savings with the highest accuracy, savings must be calculated based on the time they occur and the rates in effect during each time period.¹

- **Other fuels.** Fossil fuels such as propane and fuel oil are commonly used for heating when natural gas is unavailable. These fuels are difficult to track accurately because consumption is not usually metered. Monthly consumption is typically estimated based on fuel delivery dates and may not correspond to actual consumption.

¹ See the *Guide to Preparing Feasibility Studies for Energy Efficiency Projects*, California Energy Commission, May 1996, for information on how to calculate weighted average rates to use in predicting cost savings from energy efficiency projects.

V. **METHODS OF ENERGY ACCOUNTING**

There are several ways to compare information that will affect how you choose to track energy data for your organization. Three methods that vary in how they account for changes in weather are explained in the following paragraphs. In all of the methods, a correction must be made for the varying numbers of days in utility billing periods. Corrections for square footage are also discussed.

- **Present-to-past comparison.** This is the simplest method of comparing energy use, requiring only monthly utility bill data. In this method, energy usage for a given period — a month, quarter, year, or other period — is compared with the same period of the previous year or a base year.

This method, however, does not account for changes in weather. It works well for facilities which use electricity for lighting and small motors, but not for heating and cooling.

To obtain reasonable comparisons between time periods, it is necessary to prorate by month the amount of energy consumed in each billing period, since the number of days in billing periods may vary. To calculate savings, present use is subtracted from last year's use for the same month. The difference in use is multiplied by the current cost per unit of natural gas or electricity to determine cost avoidance.

- **Multiple year monthly average.** This method gives a more accurate reflection of historical heating and cooling usage than the present-to-past comparison, especially if other factors such as square footage and hours of equipment operation have remained constant.

Energy use from the same time period over a number of years is averaged to develop a baseline. For example, energy use in January 1996 could be compared to an average of energy use for January 1993, 1994, and 1995. This way, variations in weather are “smoothed out” to create a more realistic base.

The main drawback for this method is that it does not account for unusual temperatures during the current year. If winter is colder or summer is hotter than normal, savings might be underestimated. (In this method, as in the present-to-past comparison, an adjustment must be made if the number of days in the billing period varies.)

- **Temperature corrected method — heating degree days/cooling degree days.** Because most building energy use is affected by weather, this method will most accurately reflect energy savings due to changes in building equipment or energy management.

This method requires collection of weather data as well as utility bill information and uses a statistical model to adjust the current year to the baseline.

Most energy accounting software packages use heating and cooling degree days (**HDD** and **CDD**) to correct data before calculating energy savings. A correction should be made only if there is a statistically significant correlation between HDD or CDD and energy consumption of a particular fuel.

- **Correction for changing square footage.** Most energy accounting software packages correct for changes in building square footage. The software uses the assumption that changes in energy use are proportional to changes in building area. This correction can also be done manually.

VI. MEANS OF ENERGY ACCOUNTING

Energy accounting can be done manually, on computerized spreadsheets, or with dedicated software. There is no single “right choice” of what method to use — the best method depends on the characteristics of your organization, what you want to track, and how you plan to communicate your energy accounting data.

A. Manual Energy Accounting.

For a small organization such as a single elementary school, a manual worksheet to record monthly energy bills may be sufficient.

Table 1 is an example of a simple worksheet with one year’s worth of data. The table includes columns for consumption amount, cost, and number of days in the billing period, as reported on most monthly utility bills. There is also a column for cost per day which may be included on the bill, or can be calculated.

With this simple system, you can compare “raw data” for energy consumption and cost between months or years. The comparison may not be meaningful if the data is not corrected to account for variable lengths of billing periods. If you have heating and cooling degree data, kWh per day per HDD can also be calculated. With more than a few meters, it becomes very tedious to track energy manually.

B. Energy Accounting Using A Spreadsheet.

One step up from manual energy accounting is using a computer spreadsheet program (like Excel or Lotus) to track energy expenses. The spreadsheet can record the same information as a manual system and automatically calculate energy use per day, energy use per square foot, or energy use per square foot per HDD. Spreadsheets also provide graphing capabilities.

A homemade spreadsheet is unlikely to check the accuracy of data, analyze weather/energy consumption relationships, or provide pre-programmed graphs and reports. This means of tracking energy is most appropriate for organizations with a limited number of sites and meters. However, San Diego State University and other large consumers of energy have successfully used their own spreadsheets to monitor energy costs and help keep them low.

Public domain spreadsheets are also available. Sacramento Municipal Utility District, for example, has a spreadsheet that records three years of monthly energy use and demand for five accounts and estimates costs based on one of the municipal utilities' rates. You may be able to find other spreadsheets through networking with organizations similar to your own.

C. Commercial Energy Accounting Software.

For large organizations with many facilities, it makes sense to consider purchasing

TABLE 1

Energy Accounting Worksheet					
Facility: Fairfield School			Year: 1995		
Account: TPY 47 6209			Meter #: 2S5987		
Month	Usage kWh	Demand KW	Cost	Number of Days	Cost/Day
January	53,000	210	\$5,013.80	30	\$167
February	50,100	195	\$4,739.46	29	\$163
March	52,300	203	\$4,947.58	31	\$160
April	49,700	191	\$4,701.62	29	\$162
May	55,200	245	\$5,221.92	31	\$168
June	62,800	270	\$5,940.88	32	\$186
July	71,200	280	\$6,735.52	30	\$225
August	70,600	284	\$6,678.76	30	\$223
September	68,000	275	\$6,432.80	31	\$208
October	53,200	210	\$5,032.72	30	\$168
November	54,700	198	\$5,174.62	29	\$178
December	53,900	204	\$5,098.94	34	\$150
Total	694,700		\$65,718.62	366	\$180

commercial energy accounting software, which can cost from \$395 to \$11,000, or more.

Energy accounting software makes it easier to enter or import data, provides ready-made reports, and calculates corrections for some factors that affect energy use.

Energy accounting software generally incorporates weather and square footage corrections, and will pro-rate energy

consumption and cost by calendar month. Commercially available programs also offer tracking of non-energy utilities, such as water, garbage, sewer, and recycling.

Some commercial energy accounting software also offers the opportunity to download energy consumption and demand data directly from electric meters. This capability provides a level of detail that will be increasingly important as utilities move toward real-time pricing.

D. Energy Accounting as a Service.

Some utilities and energy consultants will provide energy accounting services to your organization for a fee.

On your own, it may be difficult or too time-consuming to obtain detailed time-of-use demand information by tracking bills. This data may only be available from the electricity provider or by directly monitoring your own utility meters and sub-meters. For organizations wishing to minimize electricity costs through careful limiting of demand during peak demand periods, an energy accounting service may be the best option.

VII. FEATURES OF ENERGY ACCOUNTING SOFTWARE

Because software varies in terms of complexity, user friendliness, application and cost, comparing different programs can be challenging. A good start is examining the following basic features found in virtually all software:

- Organization/Site Records
- Billing and Climate Records
- Reports and Graphs
- User Friendliness
- Documentation and Support

Appendix A summarizes features of the most common commercial energy accounting software currently available.

A. Organization/Site Records.

Each software program must record basic site information, including the name of the site, its address, and associated accounts and meters.

A site is any physical location where energy is used and metered. It could be a group of buildings, a separately metered part of a building, a well, a sewage treatment plant, or traffic lights. Additional information such as site contacts, telephone numbers and a description of the site can also be helpful.

Site records should also record the square footage of each building, gallons of water for each pump, or other appropriate units of measure.

Some software programs may limit the number of sites or meters that can be tracked, or the software price may depend on the number of meters, so it is important to ensure that the software you choose can accommodate growth of your organization.

Most energy accounting software uses a hierarchical organization structure for buildings, accounts, and meters. More levels, such as departments, areas within buildings, or submeters (if used), may also be useful for more detailed tracking. The ability to group sites into departments, for example, is useful if each department has its own energy budget.

Grouping helps to compare similar sites, such as elementary schools, rather than comparing a high school with an elementary school.

B. Billing and Climate Records.

All of the reviewed commercial software programs record total monthly energy consumption and cost based on monthly utility bills for each fuel. All allow at least some additional detail, such as recording and breaking out the cost of electrical demand, different charges for different times of use, and power factor charges from electricity bills.

Be sure that the software you choose can track the detail you need. Many school districts, for example, have found that tracking total usage and cost is sufficient. More detail is needed if you are monitoring a performance contract, since dollar savings will depend on reductions of all billed components of your energy services.

All reviewed software also records monthly billing period dates. This allows the program to prorate consumption and cost by calendar month. To make meaningful comparisons of current to past energy use, you need to be able to record at least one year of historical data to use as a baseline. With some software, the baseline may include more than one year's worth of historical energy consumption data. Some programs may be limited in how many years of data can be stored. All of the commercial software reviewed here can store at least ten years of data, and most are limited only by your hard disk size.

Different software programs vary in what non-energy utilities can be tracked — water, sewer, garbage, or recycling revenue, for example. It may be worth paying extra to purchase software that can track non-energy utilities if that data is useful to your organization.

Commercial software also requires entering HDD and CDD or other weather data — average monthly temperature, or daily temperatures — to support adjustments for the affect of weather on energy consumption. Some software providers offer periodic installments of weather data for your weather station(s) for an additional cost. Weather data is also available from commercial and government sources, or directly from your local weather station.

Each program uses a different model for applying weather corrections to energy savings calculations. Explanations of the models are included in each program's user manual. Some software allows the user to adjust parameters such as the temperature at which cooling or

heating use is required (balance temperature). This can result in greater accuracy in estimating savings, but requires sufficient technical expertise on the part of the user.

The ability to electronically import billing data provided by utilities can be a significant time saver. Some of the software providers will create additional software needed to import billing information provided in a specific format by your utility. Some energy accounting software also allows weather data to be imported electronically.

You may also choose to download energy use data electronically, directly from your meters. One of the software providers listed in the appendix specializes in providing this service. California utilities may also offer this service directly to large customers.

Linking directly to your meters is the best way to get precise demand period (15-minute) energy use information. This amount of detail will be useful if you are trying to shed demand during peak periods, or if you are considering using real-time pricing when purchasing electricity.

C. Output Data, Reports, and Graphs.

Basic reporting needs include:

- **Monthly and yearly energy usage and cost reports for each site.** Often a single report will combine monthly and year-to-date totals.

- **An executive summary of the organization as a whole.** Ideally this report should be no longer than a few pages and should show at a glance the performance of major departments and the entire organization, including dollar savings.

Reports or graphs with this information are critical in providing administrators with easy to understand information on your energy management efforts.

- **Monthly direct side-by-side comparison of current energy use to base line or previous year's use for each site.** This kind of report or graph allows you to note changes in energy use patterns that result from operational changes, equipment failures, retrofits or other factors.

A 2-year comparison graph provides an easy way to track progress in reducing costs, or to spot problems at individual sites.

- **Calculations of comparison parameters.** These can include the percentage change in fuel use, dollar cost per square foot, total BTUs per square foot, and actual fuel use in therms or kWh per square foot. These parameters make it easier to compare similar buildings.

Depending on how you will use your data, the most appropriate parameters may vary. Percent of change is useful because goals are often set in these terms. Cost information is more meaningful to most people than kwh and BTUs.

- **Graphs.** Visual presentation of data usually is more effective in getting the point across. Many energy accounting software programs now have the capability of attractively formatted color graphs.

Most energy accounting suppliers will provide you with a trial copy of the software. As you review software for possible purchase, consider the data entry methods, and review many of the standard reports. Try customizing reports or creating user-defined reports. Check to see if they will meet your organization's needs for both content and presentation format.

D. User Friendliness.

Most of the main energy accounting software programs are Windows-based. There are a variety of procedures for entering data, creating reports and graphs, and flagging possible errors.

Ideally, the basic functions should be simple, easy to use, and offer automatic feedback when suspect data is entered. Conversely, the greatest accuracy is obtained with programs offering maximum flexibility in setting rates and in choosing parameters for weather, square footage, and other corrections. Your requirements will depend on what level of staff will be inputting data, creating reports and using other software functions. People with a specialized background in energy or engineering will be better able to make use of sophisticated features.

If you plan to avoid manual data entry by importing billing data electronically, make sure the software you choose can accept, or can be

modified to accept, billing data in the format provided by your utility. Note that generic import formats can only be used if your utility will agree to provide data in that format, or if you can “translate” data from a utility-provided format to a generic input format.

E. Documentation and Support.

Documentation should, at a minimum, explain each entry screen or window and menu option, and preferably show the screen image. A glossary or explanation of specialized terms in the text will be helpful, as will on-line help.

It is important to have access to technical support by telephone and/or fax. When you try out an energy accounting software program using a demo version, it makes sense to try out the telephone support as well.

The quality of support services is also something to consider. Help in setting up the system, obtaining billing histories, and inputting data — either electronically or manually — can save you time. Most software providers will provide these services along with training in use of the software for an additional cost.

Finally, you can contract with most of the software providers (or energy accounting consultants) to maintain your energy accounting system and provide you with periodic reports.

VIII. TIPS ON SELECTING SOFTWARE

A. Know Your Applications and Needs.

Develop a clear idea of your specific software needs and applications. Although you may be tempted to skip planning and get on with the program, the more you know your applications, the more successful your software selection will be. Many organizations have found it advantageous to essentially set up the energy accounting system on paper before purchasing software.

Be sure that your software will meet anticipated future needs as well as existing needs. Some things to consider are:

1. What level of personnel will be responsible for establishing and maintaining your system?
2. Who will be receiving reports and graphs from the system?
3. What will they want to know? Will information on building energy use be enough, or are they interested in tracking water, solid waste, and other utility costs as well?
4. Will the system be used in developing departmental budgets, identifying sites for retrofit, monitoring performance contracts or other tasks?

B. Examine Software Demos and Documentation.

Examine a demo version of the software, look through the user manual and sample the reports prior to purchase. Most suppliers will provide a demo or trial version with a limited life or with some aspects disabled. Read enough of the documentation and use the demo or tutorial enough to know how different functions work. Get a feel for the user-friendliness of the software.

C. Talk to Users of the Software.

Experienced users can provide a wealth of frank information and could save you from making a costly mistake. Ask the supplier for references of other users with applications similar to your own and get their opinion. What do they like, and what would they want to change about the software? How much time did it take to set up the system? Would they buy it again?

Talking to current users is especially important because many of the software programs reviewed here are changing rapidly.

D. Know What Support you are Buying.

Understand the level of support you are buying with the software. Will you have ready access to assistance over the telephone? Is training available, and if so, at what cost? Will you receive free or low-cost updates of newer versions? Are services such as on-line weather data and utility rate schedules available? Will the software company assist you in importing

available electronic billing information? If so, at what cost?

You may wish to consider contracting with your software supplier or other consultants to set up and run your energy accounting system for you. Even if you have a consultant run your system, however, interpretation of the data will require specific site knowledge available only within your organization.

E. Don't Compromise on Important Features.

Obtain the best software for your needs. Compromising on essential features or ease of use to save money is often unwise in the long term. A much larger investment of staff time will be required to set up and maintain the system than the initial cost of the software.

IX. SUMMARY

Energy accounting can help your organization understand how energy is used and can help motivate people to take actions that can result in significant utility cost savings. However, many organizations do not realize the full benefit of tracking energy consumption and cost.

The biggest pitfalls that keep organizations from effectively using energy accounting data are:

- Lack of staff time and commitment in maintaining the system.
- Failure to communicate the results to the right people.

To make the most of energy accounting, it is crucial to allocate sufficient staff time for setting up and maintaining the system, and to develop a system of communication with administrators, facilities staff, and others whose decisions affect energy use.

Energy accounting by itself will not save energy. But when used as a tool of energy management, it can help you make changes in operations or equipment that save energy dollars. Energy accounting can also help in budgeting, allocating resources for capital investment, and verifying the results of all of your energy management activities.

APPENDIX A

DESCRIPTIONS OF SOME ENERGY ACCOUNTING SOFTWARE

This section describes some of the common energy accounting software programs used to analyze commercial building energy use. This information was derived from descriptions in the Web Sites for the U. S. Department of Energy's Office of Building Technology, State and Community Programs, and those of specific energy accounting software companies. As software programs change, please contact these Web Sites for updated features.

The U.S. Department of Energy Web Site <www.eren.doe.gov/buildings/tools_directory/> contains reviews of over 170 energy-related software tools for buildings. A few of the reviews include those for energy accounting and utility billing analysis. These reviews contain information on software, the audience, the level of expertise needed to use the software, the data inputs and outputs, computer system requirements, program strengths and weaknesses, and cost.

The Energy Commission and the State of California make no warranty, expressed or implied, and assume no legal liability for information in this appendix. Discussions of specific software products do not constitute an endorsement by the Energy Commission or the State of California.

FASER® (Fast Accounting System for Energy Reporting)

Omnicom, Incorporated
220 Regent Court
State College, Pennsylvania 16801

Telephone: 800-726-4181
Fax: 814 – 238-4673
Web: www.omni-comp.com

FASER® has been available since 1980 and is a sophisticated program with considerable flexibility in reporting and customizing energy information. There are over 1,500 users both internationally and within the United States. The users of FASER® include colleges and universities, school districts, corporations, retail, local and state government, performance contractors, military bases and health care networks.

FASER® consists of a series of modules. These include Utility Bill Tracking, Cost Avoidance, Meter Readings, Accu-Weather Link, Rate Library, Accounts Payable Link and Report Writer. These modules help identify utility bill errors and system problems, establish energy budgets, and determine the impact of certain building activities on energy use.

FASER® has the capability to import utility data that are provided in the Electronic Data Interchange (EDI) format. Several California utilities offer electronic billing in EDI format.

The software allows the user to modify the baseline year and weather within the Cost Avoidance module, which increase the accuracy of the savings calculations. There is a rate schedule library and many packaged reports and graphs. OmniComp offers additional services such as specific utility rates, periodic weather data, companion programs, and on-site training, which are available at an additional cost.

The minimum computer requirements are as follows:

- Windows 95 or later
- 133 MHz Pentium Processor
- 32 MB RAM
- 31 MB hard disk space for the program. Hard disk space for the data depend on the number of meters and accounts, number of bills, and complexity of billing detail. A general rule is 1 MB for setup data and 5K per meter/year.

Users should have a basic knowledge of Windows and data entry. Professional training and implementation services are available.

METRIX™

SRC Systems, Incorporated
2855 Telegraph Avenue
Berkeley, CA 94705

Telephone: 510 – 848-8400
Fax: 510 – 848-0788
Web: www.src-systems.com

METRIX™ has been available since 1996. There are over 700 users in the United States and internationally. The main users include facility managers, performance contractors, energy managers and consultants, utility customer service representatives, and energy engineers.

The program operates in the Windows environment. The data are entered into a Windows-based interface. METRIX™ breaks energy tracking into a tuning period, a project installation period, and a performance period. The tuning period is used to establish the relationships between energy consumption and weather or other factors. The tuning process allows corrections to be made for buildings with seasonal changes in energy use. Energy savings are tracked during the performance period, which begins at the end of a project installation period. The program projects a base line and target scenario for the performance period. Actual use is compared against both projections.

This program allows users to manually choose weather correction parameters, and it can correct for heating degree-days, cooling degree-days, and user-defined production variables on a single meter. Project data can be imported from Market Manager, a building energy analysis program, for setting target energy consumption levels. METRIX™ also has a variety of options for electronic data input via ASCII or EDI formats.

The minimum computer requirements include:

- Microsoft Windows (version 3.1, Windows for Workgroups, Windows 95, Windows NT)
- 8MB RAM minimum
- 12 MB hard disk space

It is helpful for users to have an energy management background. Regional and private training available.

An evaluation copy of METRIX™ can be downloaded from their Web Site: <www.metrixcentral.com/metrix/metrix_info.htm>.

THE UTILITY MANAGER™

Utility Management Services
36 Spring Avenue, P. O. Box 463
Lagunitas, CA 94938

Telephone: 415-488-4652
800-313-3201
(Illinova Energy Partners)
Web: www.eqnetwork.com/ps/um/index.asp

Illinova Energy Partners and Utility Management Services distribute the UTILITY MANAGER™ in California. The program was first released in 1995, and an upgraded version was released in 1997. There are more than 350 users across the United States and internationally.

This software targets both the private and public sector markets such as school districts and local governments. The manufacturer has worked with several California and Northwestern utilities to develop electronic importing of billing data. UTILITY MANAGER™ is user friendly and provides a good basis for an on-going energy management program.

The program tracks line items from utility bills and can be used to track many utilities in addition to energy. The UTILITY MANAGER™ has a hierarchical organization and can provide reports at the site, department, organization or other user defined level. Some reports and figures track individual utilities, while others combine information on the site's energy, water, sewer and recycling activities. Reporting capabilities emphasize high quality graphics. One-page summary reports combine data and graphs at both the site and organizational level.

The software can be purchased as part of a package consisting of initial data collection and entry, initial reports and on-site training. Several generic electronic formats are included in the software for uploading utility billing data. Custom import formats may also be created for an additional fee.

UTILITY MANAGER™ can handle up to 500 sites. For facilities with more than 500 sites, another product, EQ Network is available. EQ Network is a multi-user software that can handle more than 500 accounts and sites. Another product, EQ Rates Tool, is a database module that contains thousands of rate schedules.

The minimum computer requirements include:

- IBM Compatible 386, 486 or Pentium PC
- Microsoft Windows (version 3.1, Windows or higher)
- 8MB RAM minimum
- 12 MB hard disk space

It is helpful for software users to have an energy background, but it is not essential. Regional and private training available.

An evaluation copy of UTILITY MANAGER™ can be downloaded at www.eqnetwork.com/ps/um/general_info.asp.