



Network Computer Power Management

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FAST FACTS

- There are more than 110 million personal computers operating in office settings in North America, with millions more in computer labs, libraries, and other institutions. ¹
- Sixty percent of office computers are left on overnight. ²
- Companies could save 25 billion kilowatt-hours (kWh) per year by using proper energy management, translating to \$2.3 billion or 18 million tons of CO₂. ³
- A typical desktop computer that uses computer power-management (CPM) software will save \$25 to \$75 in energy costs per year compared to a machine with no such software. ⁴
- The decreased cooling loads and increased equipment life associated with aggressive computer power management offers an additional potential savings of up to \$50 per employee.
- CPM software prices range from free to about \$20 per computer.

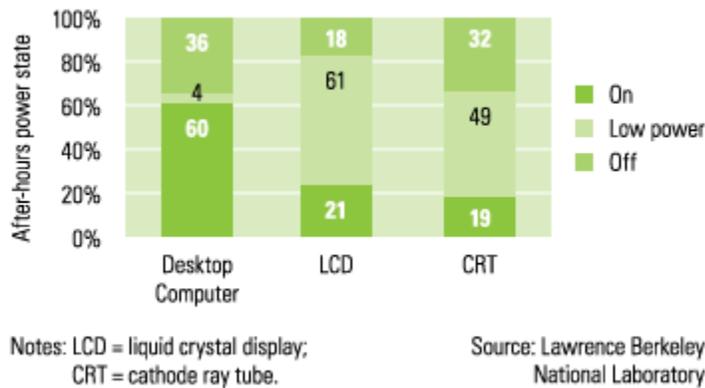
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OVERVIEW

Billions of kilowatt-hours are wasted every year by idle networked computers in offices, libraries, computer labs, and research facilities. A 2004 study by the Lawrence Berkeley National Laboratory revealed that 60 percent of all office computers remain on overnight and during weekends (**Figure 1**), and only 6 percent use aggressive power-management settings. ⁵ Additional studies have found that employees don't turn off computers or disable power settings because it's corporate policy to leave equipment on overnight, because they don't care about saving energy, or because they believe the computer will go into sleep mode (most monitors automatically go to sleep, but few computers do). ⁶

FIGURE 1: Most office desktop computers remain on after-hours

A 2004 study by the Lawrence Berkeley National Laboratory revealed that 60 percent of all office desktop computers, 21 percent of all LCD monitors, and 19 percent of all CRT monitors remain on at night.



Building managers and network administrators can significantly reduce computing costs if these idle machines are switched off. You can achieve this through an effective computer power-management strategy, which, if properly implemented, can substantially reduce wasted electricity and save money without compromising computer performance or security. The most effective strategies include enabling aggressive power settings on individual machines, using log-on scripts, or deploying centrally controlled CPM software.

In the past, centrally controlled CPM software options were tepidly received by IT personnel and computer users alike. IT administrators found that early versions of this software didn't allow them to access machines for after-hours maintenance. Although several of the software packages available today allow network administrators to wake up individual computers, memories of this early programming flaw remain a deterrent at many companies. Meanwhile, individual users were put off by early CPM software because they often experienced long, inconvenient waits while the computer or monitor woke up from a low-power state. In some cases, a reboot was necessary. Modern programs have largely eliminated these issues, but there remains some reluctance to adopt CPM programs among those who have bad memories of past trials.

Operating modern CPM software is relatively straightforward. The software is installed on individual machines and is centrally controlled by the IT staff via the Internet or a companywide network. Depending on the program used, IT staff can manually wake up computers for maintenance, monitor energy consumption and savings, and even apply different settings to different groups of computers. See [Applications and Limitations](#) and [Making the Right Choice](#) for more on how to choose the best package for your application.

There are a variety of CPM software options available. The Windows Vista operating system (OS) has built-in power-management features, so companies that do not yet have Vista might want to take this into account when considering an OS upgrade (for those who already use Vista, Energy Star provides [CPM activation instructions](#)). For the most features and versatility, it's often necessary to purchase dedicated CPM software. These programs generally run \$10 to \$20 per computer and are often available at discounted rates for bulk purchases and for nonprofit or educational users. With average annual savings ranging from \$25 to \$75 per machine, the payback period is usually less than a year for a desktop computer.

Energy Star also offers a free CPM software program called [EZ GPO](#). While the economics are obviously more favorable with a free program, it has fewer features and less customer support than most commercial software options. It's also important to remember that energy savings can be substantially less—or even nonexistent—if you have mostly laptops, your users are already using their computers' power management settings, or your

machines typically get turned off each night. See [Economics](#) for detailed information on costs, paybacks, and potential pitfalls.

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APPLICATIONS AND LIMITATIONS

CPM software is only feasible in a networked environment with multiple computers; home computers or nonnetworked offices aren't compatible. However, adjusting the power settings on individual machines is generally simple and straightforward. And if considering CPM software for networked environments, companies and institutions should be aware that there are various benefits and drawbacks that affect the degree of the success of any computer energy strategy.

CPM Software Versus Individual Computer Settings

Although both approaches aim to achieve the same goal, there is a distinct difference between centrally controlled CPM software and user-controlled power settings. In a nonnetworked office or at home, CPM software won't work. And even in a networked office or institution, controlling power settings on individual machines—either by manually adjusting settings or by using log-on scripts—may still be the best choice for power management.

In many environments, enabling aggressive power settings on individual machines is among the simplest and least expensive approaches to reducing computing energy. Companies and institutions can often gain significant energy savings by adjusting power settings so that individual computers and monitors enter sleep mode and shut off after a period of inactivity.

Perhaps the best applications for adjusting individual computer power settings are in environments where computers aren't networked, but where you can still effectively target user groups through various communication channels. For instance, students living in university residence halls can be instructed during orientation to enable power-saving features on their computers and regularly reminded through university e-mails to maintain those settings. A 2007 New York State Energy Research and Development Authority outreach campaign directed toward 1,750 students living on a New York college campus succeeded in cutting annual energy costs by an estimated \$35,000 using this strategy. [7](#) And even though a new crop of students had to be educated on the practice every fall, the low cost of this type of effort should help to ensure continued success.

Another application where individual power settings may be the best approach is in environments with shared computers, such as computer labs and public libraries. Because casual and infrequent users are generally less likely to try to adjust power-management settings, these machines should be easier to maintain than those in an office. Setting these machines to enter sleep mode quickly and posting "wake up" directions for users is a simple and inexpensive way to save significant amounts of energy in these applications. For detailed instructions on how to enable individual power settings for various operating systems, see Energy Star's [Activating power management in enterprises: replicating from a template HD image](#).

Although manually adjusting individual power settings is simple and relatively inexpensive, there are several potential disadvantages. Users who don't like having their machines enter a low-power state can simply disable the settings. And on an institutional level, it's not possible to track overall energy savings from this measure, nor is it possible to centrally monitor which computers have power settings relaxed or disabled. And finally, this approach may require more time and effort to maintain than other measures because you have to educate new employees, configure new machines, and periodically remind users not to disable the settings on their computers and monitors.

CPM software overcomes all of these disadvantages: It operates over a local area network (LAN) within an office or over a larger wide area network, which allows for access to machines that are operating remotely. CPM software is generally operated by the IT staff

who remotely control power settings on computers. The primary advantage of this software is that companies and institutions can ensure *all* of their computers enter sleep mode or are turned off when not in use. Additionally, some programs include features that allow companies to track energy savings or customize settings and strategies for groups of workstations. The disadvantages include the fact that some of these programs aren't cost-effective for certain computers and users may protest that control of their power settings is in the hands of someone else.

CPM Software Applications

In many networked environments, particularly those with a high ratio of desktop computers to laptops and those with users who commonly fail to shut down computers when not in use, CPM software is often the most effective option for curbing wasted computing energy.

Because CPM software is sold on a per-computer licensing basis, it is roughly as cost-effective in a small business as in a large corporation. And although maintaining this software does require some time commitments on the part of a network administrator, it's well within the means of even modestly sized organizations. As a rule of thumb, if a company is large enough to have at least one designated IT staffer, it's probably large enough to consider CPM software as a means of cutting costs. See [Maintaining Performance](#) for more information on time and upkeep requirements.

From a practical standpoint, a centralized approach to power management is far easier to implement than sending an IT staffer to manually modify each computer's power-management settings. It also has greater "savings persistence" because the software can prevent users from modifying or disabling those settings. If this sounds unduly authoritarian, note that many of these programs allow the network administrator to establish a wide variety of power-management profiles that characterize the way different people in the organization use their computers. This allows organizations to harvest energy savings without upsetting users and without compromising productivity. This flexibility also means that organizations that perform a wide variety of functions or have highly diverse employee computer-use patterns can generally customize their software to yield maximum savings.

CPM Software Pitfalls

In addition to the fact that it's sometimes preferable to manage energy waste through individual computer settings, there are other obstacles and limitations to using centralized CPM software.

Resistance from IT staff. There are a couple of reasons IT staff may resist using CPM software. Older versions of these programs didn't allow for after-hours maintenance. However, many new programs address this shortcoming with "wake-on-LAN" functionality. Wake-on-LAN gives network administrators access to any computer at any time, thereby overcoming one of the most common obstacles to using CPM software: the need to install software patches and updates on networked computers when they're not in use. But despite widespread availability of wake-on-LAN features, there's still lingering resistance on the part of many network administrators. Also, IT staff have traditionally not been active in cost-cutting or energy-saving projects in companies or institutions. As such, this group often has had no incentive for implementing CPM. It's difficult to imagine a successful power-management program without the full participation from those who manage the network—so it's imperative that management or other stakeholders work with IT staff in overcoming these traditional barriers to implement a successful energy strategy.

Laptops offer less savings. Laptops consume roughly 25 watts in active mode, compared with around 100 watts for a typical desktop computer and monitor combination. As a result, the potential energy, financial, and CO2 savings is significantly less for most laptops. In fact, depending on user habits and power settings on a given machine, the only cost-effective CPM software options for many laptops may be those that are free.

Fewer options available for Apple computers. Adoption has been slower among Mac OS users because there have traditionally been fewer software options available. As several new software options have recently come on to the market, it's reasonable to expect that more

Apple machines will use CPM. Currently, there are at least three programs available for a licensing fee, as well as a Mac OS version of Energy Star’s free EZ GPO software.

Users may resist CPM software. Some computer users simply don’t like the idea of centrally controlled power settings; they prefer to control these functions themselves. These attitudes can be at least partially attributed to lack of education, as some computer users have the inaccurate belief that they can lose unsaved work or that files can be adversely affected when CPM software powers down their machine.

New technologies reduce savings potential. As awareness of energy issues grows, a number of companies and institutions are switching to higher-efficiency computers and power sources. Also, new flat-panel liquid crystal displays (LCDs)—which consume about half the energy of a similar size cathode ray tube display—now account for 90 percent of new monitor sales. When a company chooses these types of high-efficiency equipment, there is obviously less savings potential for CPM software.

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ECONOMICS

Cost-effectiveness is one of the most important considerations for energy managers and IT staff when evaluating CPM software. The economics, in turn, depend on the power consumption of the computers, local electricity prices, and the number of hours the computers are idle. For example, a person who uses a low-power laptop and regularly turns it off when not in use will see virtually no benefit from CPM software. By comparison, a graphic artist or web designer who has a high-powered workstation and leaves their computer on continuously can save more than 1,300 kWh per year with aggressive energy management. This translates to about \$130 in avoided utility bills and an annual reduction of nearly a ton of CO2 (**Table 1** and **Table 2**).

TABLE 1: Annual energy consumption of computers

The annual energy consumption of computers depends on several variables including the monitor, computer type, and hours of on-time.

Computer system	Average active-mode power (watts)	Annual energy consumption (kWh)			
		40 hours/week	50 hours/week	70 hours/week	168 hours/week
High power with large LCD monitor	200	416	520	728	1,747
Standard with CRT monitor	136	283	354	495	1,188
Standard with LCD monitor	106	220	276	386	926
Laptop with docking station with LCD monitor	56	116	146	204	489
Laptop only	30	62	78	109	262

Notes: LCD = liquid crystal display; CRT = cathode ray tube.

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TABLE 2: Energy, financial, and emissions benefits from using computer power-management software

If activating power-management software can reduce a standard desktop computer’s operation from 168 to 45 hours of weekly operation, energy consumption, costs, and CO2 emissions will decline dramatically.

Computer systems (standard desktop with flat panel monitor)	Energy reduction (kWh/year)	Annual savings (\$)	Annual CO ₂ emission reduction (tons)
1	680	61	0.4
100	68,000	6,120	40.8
10,000	6,800,000	612,000	4,080.0

Notes: kWh = kilowatt-hour.

Assumes each system consumes 106 watts while on; electricity costs \$0.09/kWh; 1.2 pounds CO₂ emitted per kWh; savings based on reducing operating time by 123 hours per week.

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To determine the savings potential for a given facility, Energy Star provides a powerful [Computer Power Management Savings Calculator](#) (130 KB Microsoft Excel worksheet). The calculator is fully customizable, enabling companies and institutions to accurately estimate energy, financial, and carbon savings based on the specific computers, energy prices, and other factors at a given location. Alternatively, this calculator can also run on national averages for all these variables, so that users can get a quick ballpark estimate without first having to gather data on individual computers and employee habits.

The typical license fee for CPM software is \$10 to \$20 per computer, although discounts are often available for educational or nonprofit use. Several vendors also offer volume discounts. Additionally, Energy Star offers a free software tool called [EZ GPO](#). Given the wide range of free and inexpensive programs, CPM software can be made cost-effective in most situations.

CPM has additional economic benefits. First, reducing operating hours can increase equipment lifetime. Assuming a 25,000-hour lifetime, an LCD monitor will last for less than 3 years if left on continuously. But if operating time is cut to 40 hours per week, that lifetime will stretch to over a decade. Assuming an initial cost of \$200, this represents almost \$50 per year in long-term avoided equipment expenditures per employee. Other computer components, such as cooling fans, can also fail after extended use. By reducing equipment wear, CPM software helps ensure that companies and institutions maximize their IT investments. Additionally, Energy Star estimates that cooling loads are reduced in a typical building by 15 percent if computers are turned off. ⁸ This reduction is even greater in hot climates and in facilities with particularly dense computer concentrations—such as a university computer lab. The savings from reduced cooling loads alone can add up to thousands of dollars per year in a large building.

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MAKING THE RIGHT CHOICE

There are three main approaches to harnessing energy savings via the power-management settings of networked computers:

- Encourage employees to establish an energy-efficiency policy by simply enabling the built-in power-management capabilities of their computers.
- Engage the IT department to develop and deploy log-on scripts that control power-management settings.
- Use CPM software.

It's important to consider which of these options is the best approach for your organization, and if you elect to use CPM software, you'll need to consider which package to select and how to deploy it.

How Do Power-Management Strategies Compare?

Activating built-in power-management features is obviously inexpensive. Start with a meeting or two that includes IT staff, energy management staff, and executive management, follow up with an e-mail or two telling employees how to enable power management on their computers and exhorting them to do so, and you're done. Unfortunately, this approach doesn't offer any way to ensure that employees comply with the recommended policy, or any way to measure energy savings. Certainly some fraction of employees would comply with such a request, but given the studies that indicate a very small percentage of computers currently have power-management settings enabled, it appears likely that this approach would be only marginally successful. In addition, any savings will likely degrade over time as computers are replaced and users disable power-management settings.

Using log-on scripts to control power-management settings can address the compliance and savings-persistence problems, but scripts also pose their own set of problems. Log-on scripts are customizable lines of code uploaded onto a machine by network administrators—the scripts can control various computer operations, including power management. Perhaps the biggest hurdle in deploying log-on scripts is that the IT department will rarely be motivated solely by the prospect of energy savings to create a script flexible enough to accommodate the variety of hardware, operating systems, and users found on a company's LAN. Scripts tend to be static, one-size-fits-all solutions, so they are likely to either establish such lenient power-management settings (so that the settings will work for all users) that they capture little of the energy savings potential, or alienate some users if settings interfere with their work habits. Scripts also provide no information on the level of energy savings.

CPM software solutions at least have the potential to address all of the problems associated with relying on individual built-in settings or log-on scripts. Each CPM program has advantages and disadvantages, and any one product might turn out to be the most appropriate solution for a specific organization. For example, if you only want to ensure that computers are shut down at a specified time or after a specified period of inactivity instead of going into sleep or hibernate mode, a free solution like EZ GPO may be the most appropriate. However, if you want added features like savings tracking or wake-on-LAN capability, some of the more sophisticated commercial programs will be more suitable.

As you work to establish the most effective energy strategy for your company or institution, it's also important to keep purchasing habits in mind. As old equipment breaks down or otherwise warrants replacement, it's often cost-effective to replace with high-efficiency units. The Energy Star program maintains up-to-date savings calculators, product lists, and additional resources for efficient desktop [computers](#), [monitors](#), and [notebook computers/tablet PCs](#).

Choosing the Right CPM Software

If you've determined that CPM software is the best option, there are a number of products from which to choose. Depending on your organization's needs, the software may have to operate remotely over the Internet, have wake-on-LAN functionality, or even simulate different power-management policies that can allow you to estimate the savings of various approaches.

Another feature some organizations may desire is *dynamic power management* settings that allow for different operational parameters at different times or on different days. This would allow, for example, aggressive settings overnight or on the weekends, but more lenient settings during the workday—thereby avoiding the risk of frustrated workers who might leave their desk frequently only to return to a sleeping machine.

Another feature known as *custom inactivity thresholds* allows IT staff to determine what constitutes inactivity. Traditionally, CPM software has operated after mouse and keyboard

inactivity of a particular duration. But this feature allows inactivity instead to be determined by a minimum amount of computer hard drive activity or only after certain programs are closed. This can help avoid shutting computers down when they are unattended but are performing critical functions. **Table 3** summarizes the functionality and costs of different software packages.

TABLE 3: Comparing network-based power-management software solutions

There are a variety of software packages that manage power consumption in networked computers. Each product has unique capabilities.

Feature	Software package						
	SURVEYOR	EZ GPD	Windows Vista	NightWatchman	BigFix	Faronics PowerSave	Apple Remote Desktop
Monitor control	▪	▪	▪	▪	▪	▪	▪
Computer control	▪	▪	▪	▪	▪	▪	▪
System shutdown	▪	▪	▪	▪	▪	▪	▪
Group-specific settings	▪	▪	▪	▪	▪	▪	▪
Dynamic settings	▪				▪	▪	
Custom inactivity thresholds	▪					▪	
Consumption/savings monitoring	▪			▪	▪	▪	
Policy simulation	▪			▪	▪	▪	
Wake-on-LAN	▪		▪	▪ ^a	▪	▪	▪
Control over Internet/LAN	▪	▪		▪	▪	▪	▪
Mac OS support		▪			In development	▪	▪ ^b
OS support	Windows 98, 2000, XP, Vista	Windows 2000, XP	Windows Vista	Windows NT, 2000, XP, Vista	Windows NT, 2000, XP, Vista	Mac OS 10.3 and later; Windows 98 and later	Mac OS 10.4 and later
Cost per licence	\$20, less for large volumes	Free	Included with OS	\$13.50	\$12 to \$13, depending on volume	\$14.40 corporate and government; \$7.20 education	Up to 10 licenses: \$299; Unlimited licenses: \$499

Notes: LAN = local-area network; OS = operating system;
a = requires companion software module; b = Mac OS only

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Consider software that lets you estimate energy savings and payback. Some software packages can track the time each computer spends in each operating mode—active, sleep, and off—and use these data to estimate the energy savings. If you’re not sure whether CPM software is a cost-effective choice, you can run a trial on a few computers with software that tracks savings to determine if a larger CPM software purchase is feasible. These data also help the administrator accurately determine energy savings after a given policy has been implemented.

Consider software that permits different settings for different users. A one-size-fits-all approach to computer power management will rarely be successful because employees have differing work schedules and use their computers in different ways. Ignoring this fact and trying to implement a policy that works for everyone will either be so lenient that it leaves a lot of potential energy savings on the table, or it will be unduly restrictive for some users, negatively affecting their productivity and leaving them frustrated. Some CPM software packages allow the network administrator to define multiple groups of workstations and establish different power-management settings for each group. For example, one group might consist of workers who are at their machines continuously on a regular 9-to-5

schedule; another group might include factory workers who need to intermittently monitor a production process that runs three shifts per day; and a third group might include staff who monitor real-time data on computer screens but only rarely use the keyboard or mouse. And if the organization wishes to allow it, another profile could be established for specific employees who would be permitted to opt out of the power-management program.

Consider software that identifies the hardware and operating system used at each workstation. This information is critical to categorizing similar machines into groups and identifying machines for which power management is inappropriate. For example, machines running Windows NT have no low-power modes.

Consider software that can shut computers down. In addition to controlling the amount of idle time after which computers will enter a low-power state, some software packages can establish a turn-off schedule. In most cases, the shutdown procedure is terminated if any application running on a computer reports that there is unsaved data. The shutdown feature can be used even with computers running operating systems that are incompatible with power management (like Windows NT) to ensure that those machines are not left on overnight or over the weekend.

Consider "wake-on-LAN" capability. This feature can bring a networked computer into the active state from the off state. Wake-on-LAN capability is built into most newer computers, and some CPM software takes advantage of it. Because wake-on-LAN gives network administrators access to any computer at any time, it overcomes one of the most common obstacles to using CPM software: the need to install software patches and updates on networked computers when they are not in use.

Consider software that allows the administrator to define inactivity. This unique feature, which is currently available on two commercial products, allows the administrator to customize the definition of idle time. Typically, a computer is considered inactive when the mouse and keyboard are not being used. With this customization feature, the administrator can define the computer as being active based on processor- and disk-use thresholds or while specific applications are running. For example, if the administrator wants inactivity to be based on processor use, the inactivity definition can be tailored so that the computer will still be considered active when the processor use is higher than some threshold such as 30 percent. Alternatively, the administrator might specify that the computer never enter sleep mode when a specific application is open. This avoids the potential problem of critical systems going off-line accidentally.

Deploying CPM Software

Choosing the right software is only part of implementing a successful CPM program. To help ensure successful deployments, we offer the following lessons learned from early adopters.

Start with a rough calculation. A back-of-the-envelope calculation based on the number of computers on your LAN, combined with the energy consumption data in **Table 1**, should give you an idea of the energy savings you might expect from software that shuts down computers automatically.

Get management buy-in. In most organizations, the IT staff is unlikely to leap at the chance to maintain and support an unknown application solely to save energy. Demonstrating the potential energy cost savings to upper management may therefore be essential to obtaining the support you'll need from the IT department.

Involve IT early. IT staff will probably want to test any software extensively before allowing it to be installed on even a subset of the machines on the company LAN. By involving them early in the decision-making process, you can give them sufficient time to get comfortable with the software and give yourself time to address any objections they raise.

Keep it simple; add complexity over time. Many of the software options allow you to devise extremely complex power-management strategies, but it may be counterproductive to make full use of that capacity at first. It's often best to start with a very small number of power-management groups and a simple policy, then add complexity gradually over time. This approach allows the software to be deployed and to start producing energy savings

fairly quickly. As time allows and users become accustomed to how the program functions, additional groups can be created and new power-management settings can be evaluated and deployed.

Communicate the power-management policy to all affected users. Under ideal circumstances, employees will barely be aware that CPM software is operating on their machines. Nonetheless, it's important to let them know that the software is being deployed and to explain the power-management settings that will be going into effect. If the software creates problems for certain employees on initial deployment, it's important to address those problems quickly, either by moving users into a power-management group that better conforms to their work style and schedule or by exempting them from power management entirely.

Consider putting administrative responsibility for programs in the hands of energy-management staff. In most organizations, the IT staff is overburdened and may have little motivation to ensure that CPM software is fully deployed or that power-management settings are achieving the organization's energy-saving goals. Deployment may be more successful if the software is administered by someone who is motivated to reduce the organization's energy expenditures.

Determine the appropriate configuration. Configuring the power-management settings too lax will result in lower energy savings, while too-stringent settings will inconvenience users. To balance maximum savings with optimum user satisfaction, the Energy Star program recommends setting CPM software so that monitors enter a low-power mode after 5 to 20 minutes of inactivity and computers do so after 15 to 60 minutes. To further refine this balance and maximize savings, you can choose software that offers dynamic power-management settings—this feature allows IT staff to set lax power settings during the day to maintain user satisfaction and more aggressive ones at night to maximize energy savings.

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MAINTAINING PERFORMANCE

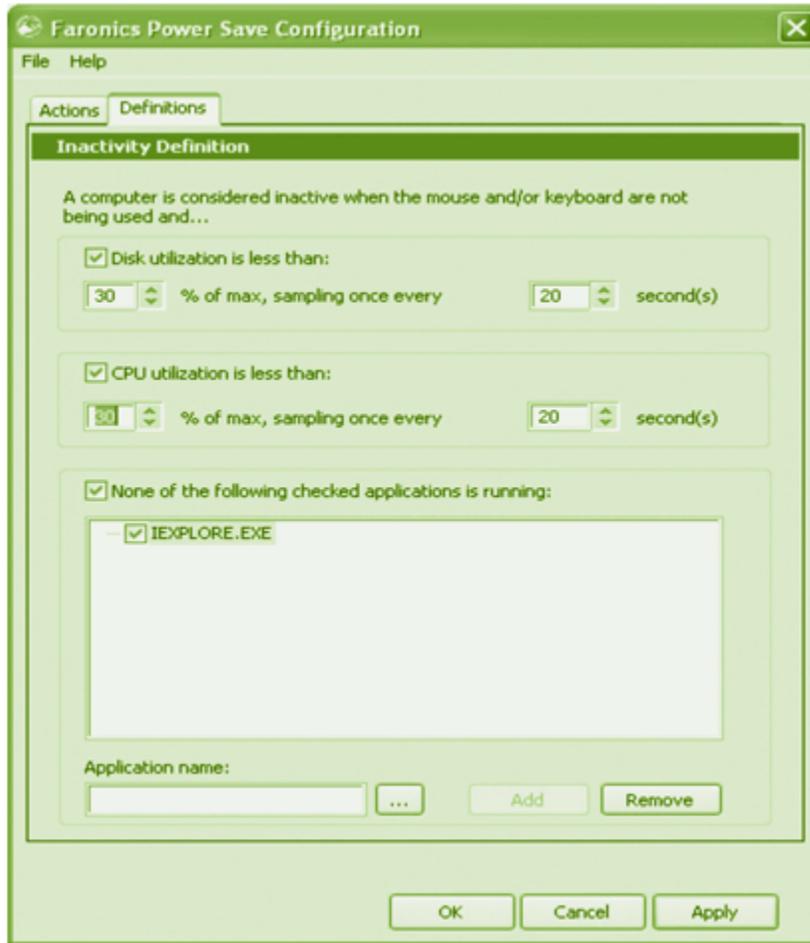
Maintaining the performance of CPM software isn't difficult, but it's important that IT and facility staff take certain steps to ensure the longevity of energy savings after the software is installed. In terms of time commitment, expect that the maintenance, which includes conducting energy savings audits, will only require around 20 to 40 hours annually. [10](#)

Education, especially of the computer users, plays a key role in maintaining the reliability and effectiveness of the software. Before enforcing any CPM settings, it's important to inform and educate users about the upcoming changes and the implications of those changes. [11](#) If people know the benefits of the new settings, they are less likely to become dissatisfied with the changes. CPM software gives the network administrator the option of allowing or prohibiting users from modifying the power-management settings on their own computers. If such changes are permitted, energy savings may be reduced over time. Also, when using log-on scripts, users might be able to fiddle with the settings (although the settings get reset each time the computer runs the scripts) [12](#).

It's also inevitable that some users will find the CPM settings intolerable for a host of reasons. Users may find the settings disruptive. [13](#) For example, teachers might find CPM settings to be a hindrance because their computer powers down during class lectures. In this case, the problem could be resolved by establishing group policy settings available in many software packages (see [Making the Right Choice](#)). Other users might find that their computer is powering down while running important applications. To combat this issue, at least two CPM products allow IT managers to customize computer power settings outside of the standard Windows power-management settings. For example, the Faronics package allows the administrator to immunize computers from power-management settings while running certain applications (**Figure 2**). Beware that inactivity definitions that are too lenient or too strict might cause some computers to never power down or to continually power down unexpectedly.

FIGURE 2: Defining inactivity thresholds

Two commercial software packages allow administrators to define inactivity for individual users. For example, this feature can disable power-management settings from affecting computers while certain applications are running, such as a web browser.

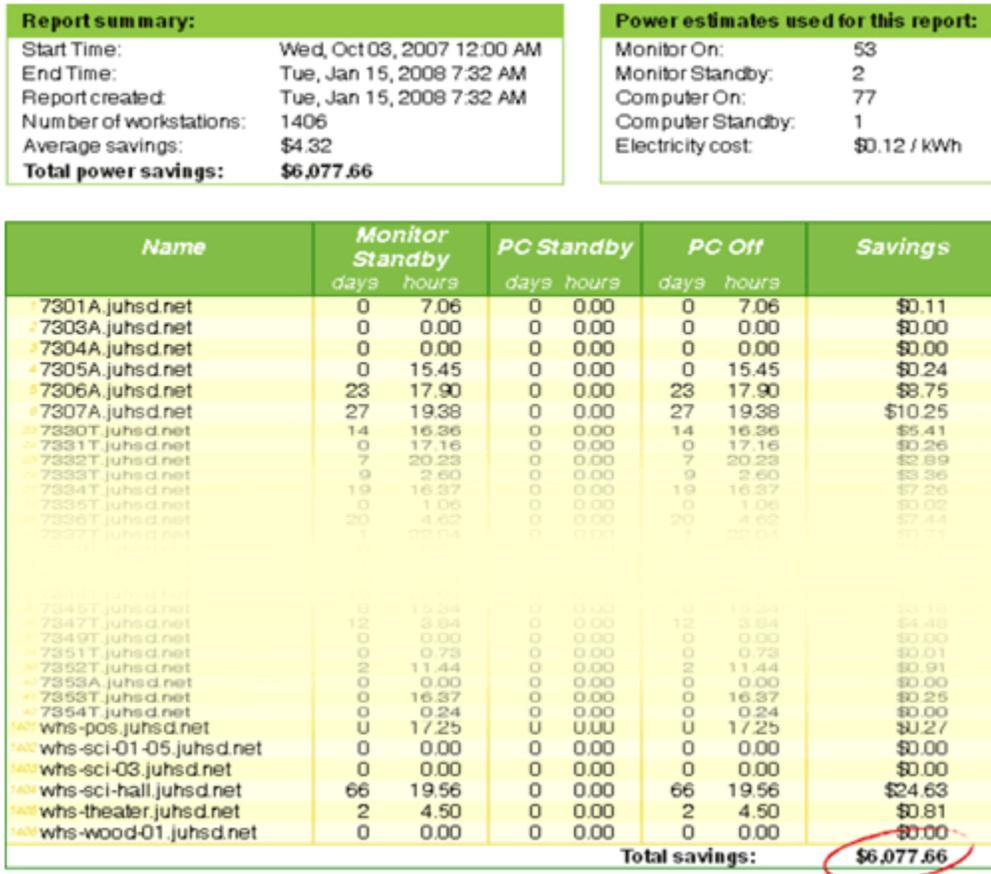


Courtesy: Faronics

Accurately measuring and verifying computer power consumption after enabling power-management settings can help manage and maintain the performance of CPM software. In some cases, measurement and verification can identify issues related to computers not going into sleep mode. For example, running certain applications or screen savers that use intensive graphics can sometimes inhibit computers from entering sleep states even with power-management settings enabled. ¹⁴ Some commercial software packages—SURVEYOR, NightWatchman, BigFix, and Faronics—have an advanced feature that allows the CPM operators to automatically measure and verify energy savings. The software tracks the time spent in each operating mode and reports these data back to the administrator (**Figure 3**). For systems that lack a reporting feature, it might be useful to connect a plug-in power monitor to computers and monitors in order to verify that equipment is indeed entering a low-power state during times of inactivity.

FIGURE 3: Estimating energy savings with reporting features

Some software packages offer detailed reporting that informs the administrator about energy and cost savings provided by the power-management settings.



Courtesy: Faronics

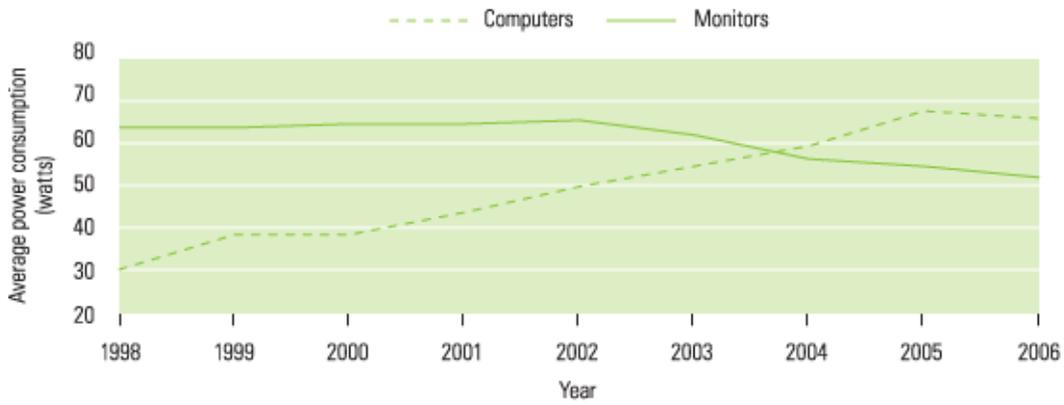
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MARKET OUTLOOK

Computer power management has received much attention as the energy consumption of office computers continues to grow (Figure 4). Despite improved computer efficiency, the U.S. Energy Information Administration projects that there will be no stoppage of growth in computer energy consumption as the equipment population grows and operating hours increase (Figure 5). But as the CPM software market develops, compatibility issues are likely to decrease and flexibility will increase. Commercial software manufacturers have already begun rolling out Mac OS-compatible software packages, for example, which were nonexistent a couple of years ago, and this trend will likely continue.

FIGURE 4: Computer power consumption continues to grow

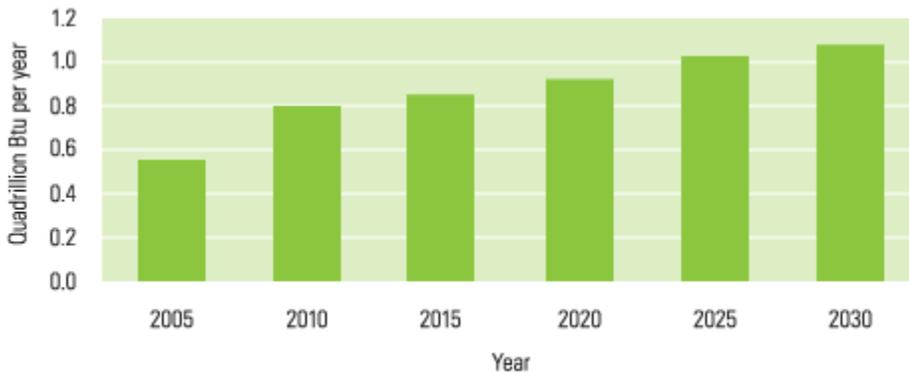
From 1998 to 2006, the average power consumption of a computer has increased from about 30 watts to almost 70 watts, while the average monitor power consumption has decreased slightly from 65 watts to about 50 watts.



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FIGURE 5: Projected energy consumption of office computers

The U.S. Energy Information Administration projects a cumulative average annual growth rate of 1.9 percent over at least the next 20 years in energy use by office computers and monitors—meaning that power management will likely play a larger role in organizations.



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Over time, it's plausible that centralized power-management features appearing in operating systems, such as Windows Vista, will phase out the need to install any CPM software. ¹⁵ However, some commercial CPM manufacturers assert that the Vista features, such as the group policy settings, are not as flexible as those provided by stand-alone CPM software products. ¹⁶ In addition, some of the advanced features found in stand-alone products, such as consumption monitoring and inactivity definition customization, are not yet available with free or built-in solutions.

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MANUFACTURERS

There are several power-management solutions on the market today, including a free solution from Energy Star as well as a long list of commercial products. In addition, both Microsoft and Apple now offer products that feature a network power-management solution.

- Energy Star—EZ GPO
- Verdiem—SURVEYOR
- edu Business Solutions—Energy Saver Pro
- 1E—NightWatchman
- Faronics—Power Save
- RTSECURITY—RSHUT Pro
- BigFix
- Enterprise Infrastructure Partners—eiPower Saver Solution
- Altera
- Apple—Apple Remote Desktop
- Microsoft—Windows Vista

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SUCCESS STORY

As part of a campuswide power-saving program, the University of Wisconsin–Oshkosh (UWO) installed Energy Star’s EZ GPO software on 485 computers in campus computer labs. Using the free software and about 3 hours of staff time to install it, the payback of the project was essentially instantaneous and now saves the university \$9,000 annually.

The UWO had previously activated monitor sleep settings on campus monitors and determined it could further reduce energy consumption by activating computer sleep settings. The software helped set the system standby idle timer to 20 minutes on each of the 485 computers. To reduce the number of help desk calls, the UWO sent out a mass e-mail to users notifying them of the changes.

Typically, system standby settings are void when users are not logged in because power-management settings are user based as opposed to machine based. Because lab computers are shared and are usually inactive when users are not logged in, computers with user-based power-management settings will rarely power down. The UWO was able to use EZ GPO’s advanced features to activate standby settings that are machine-based. In addition, after activating the computer sleep settings, the staff soon encountered the problem of not being able to access sleeping computers for nightly maintenance and software updates. Fortunately, they easily addressed this issue through the built-in Windows wake-on-LAN functions.

Deploying EZ GPO helped the UWO save significant amounts of energy by reducing each computer’s power draw from 70 watts to 2 watts during periods of inactivity. The CPM settings saved about 370 kWh per computer annually. This translates to saving roughly \$18.50 per computer per year, with energy costs at \$0.05 per kWh. **17**

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UTILITY PROGRAM EXAMPLE

CPM software can help utilities develop strategic energy-efficiency programs and help reduce their commercial and institutional customers’ energy use and bottom-line costs. A number of utilities—mostly in the western U.S.—currently provide incentives for customers who purchase CPM software. Providing utility incentives typically reduces the energy payback of the software to just a few months. Prescriptive utility incentives are typically around \$10 per controlled computer.

A number of utilities also offer customized incentives, including Snohomish County PUD in Everett, Washington, which has offered a rebate since 2006. As part of the program, Snohomish must confirm energy savings at the customer site with measurement and verification. Customers are then reimbursed 8.5 cents for every kWh saved during the first

year of operation; however, the rebate cannot exceed 50 percent of the software cost. For example, if the software reduces a computer's energy consumption by 100 kWh over the course of the year and the software costs \$14, Snohomish will only rebate the customer \$7 per license. Customizing this rebate, rather than offering a prescriptive rebate, ensures that customers are in fact reducing their loads, although this does significantly increase the workload for Snohomish due to the customer site visits.

In the two years since the incentive was introduced, Snohomish worked with two school districts to install CPM software on more than 1,000 computers. According to Ronn Larpenteur, energy utilization engineer at Snohomish, the incentive will likely be phased out by around 2010 due to the emerging power-management features offered by Windows Vista. ¹⁸ However, until Vista acquires a reporting feature, commercial products with reporting features—like Verdiem SURVEYOR—will still have a place in utility programs.

In terms of the difficulties it faced, Snohomish has certainly received a fair amount of pushback from IT managers because they have concerns about the software disrupting nighttime virus patch updates. However, the wake-on-LAN feature—now offered by four commercial products—does help to resolve this concern.

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FOR MORE INFORMATION

General

[Network Power Management Software](#), E Source Report, *ER-04-15* (2004)

[Office Equipment: Computer Power-Management Software](#), *E Source Purchasing Advisor*

[American Power Conversion and Cisco Systems Partner to Enhance Remote Power Management for Internetworking Equipment via the Web](#), E Source, *Tech News* (September 1998)

[Office Buildings](#), E Source Market Sector Snapshot, *MAS-S-5* (2005)

[Computer Energy Use](#), E Source Customer Direct Pamphlet, *MAS-P-21* (2008)

Computer Power Initiatives

[Reining in Computer Energy Use: The 80 PLUS Program](#), E Source Report, *EDRP-F-3* (2006)

[New Program Pushes Computer Power Supply Efficiency over 80 Percent](#), E Source, *Tech News* (March 2005)

[80 PLUS](#), Ecos

[Climate Savers Computing Initiative](#)

[Join the Energy Star Low Carbon IT Campaign](#), U.S. Department of Energy

[EfficientProducts.org](#), Ecos

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- 1 1E Ltd, "PC Energy Report: 2007," company brochure (2007).
- 2 Lawrence Berkeley National Laboratory, "After-Hours Power Status of Office Equipment and Inventory of Miscellaneous Plug-Load Equipment," Report no. 53729 (January 2004).
- 3 David Korn, Robert Huang, Thomas Bolioli, and Mike Walker, "Computer Power Management for Enterprises: A Practical Guide for Saving up to \$100 per Seat Annually in Electricity" (2006), www.terranovum.com/docs/energystar/Computer_Pwr_Mgmt_for_Enterprises-Practical_Guide.pdf.
- 4 U.S. Environmental Protection Agency, "Save \$25 to \$75 Annually per Computer with Power Management Features," www.energystar.gov/index.cfm?c=power_mgt.pr_power_management (accessed April 2008).
- 5 Lawrence Berkeley National Laboratory [2].
- 6 1E Ltd [1].
- 7 Carol Sabo, "In Love with Your Plug Load? Energy Star and Other Program Strategies to Reduce Plug Load Equipment Energy Use," web conference, Association of Energy Service Professionals (February 2008).
- 8 David Korn and Mike Walker, "Computer Power Management for Enterprises" (2007) www.fedcenter.gov/_kd/go.cfm?destination=ShowItem&Item_ID=7396.
- 9 John Schott, "Low Carbon IT Campaign," web conference, Energy Star (March 2008).
- 10 Verdiem, "SURVEYOR: Common IT Questions," www.verdiem.com/docs/IT_FAQ.pdf (accessed February 2008).
- 11 James Pepe (February 2008), State University of New York at Fredonia, 716-673-3452, james.pepe@fredonia.edu.
- 12 Carol Sabo (March 2008), PA Consulting, 202-442-2420, carol.sabo@paconsulting.com.
- 13 Chris Hamlin, "Making Power Management Pay Off," ITworld (January 14, 2008), www.itworld.com/Tech/5054/power-management-payoff-080114.
- 14 David Korn and Steve Reynolds (March 2008), The Cadmus Group, 206-428-6013, sreynolds@cadmusgroup.com.

15 David Korn [14].

16 Ina Fried, "Vista Flexes Its Power," CNET News (October 16, 2006), www.news.com/Vista-flexes-its-power/2100-1016_3-6126287.html.

17 Bob Huang, "Computers, On 24/7, Awaiting Updates But Wasting Energy?" Energy Star, www.energystar.gov/ia/products/power_mgt/UofWisc_CPM_casestudy.pdf (accessed April 2008).

18 Ronn Larpenteur (May 2008), Energy Utilization Engineer, Snohomish County PUD, 425-763-8247, ralarpenteur@snopud.com.

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