Computer Energy Use

The annual energy consumption of computers varies widely, from under 30 kilowatt-hours (kWh) for a rarely used laptop to over 1,000 kWh for a large desktop that uses several peripheral technologies and is often left on overnight. While the computer itself usually accounts for the largest share of energy use, the monitor, speakers, printer, modem, router, scanner, and other equipment can all consume significant amounts of electricity as well (**Table 1**). By choosing efficient products and powering down after use, you can significantly reduce your energy costs.

There are four ways to save energy used by computer equipment in most office settings:

1. Upgrade desktop computers to Energy Star–rated computers

2. Replace existing desktops with laptops

3. Replace cathode ray tube (CRT) monitors with liquid crystal display (LCD) monitors

4. Employ networked power-management controls

The first two measures would likely only be economical on a phased-replacement basis if, for example, existing units need to be changed out for higher computing power. Upgrading monitors can also be a phased equipment purchase. Managing the "suspended" or "sleep" settings of networked computers through centralized control software is a whole-network approach with a reasonable payback period, and can generally be implemented very quickly.

Table 1: Annual power draw of computers and monitors
Representative power-draw values for desktop PCs, laptops, and LCD and CRT monitors are shown here.

PC Types	Energy Star maximum allowable power draw (watts)		
	Idle	Sleep	Standby (off)
Desktop	50	4.0	2
Laptop	22	1.7	1

LCD monitors	Energy Star maximum allowable power draw (watts)		
	Active	Sleep	Off
15 in.	23	2	1
17 in. or larger	28/megapixel	2	1

CRT monitors	Power draw (watts)		
	Active	Sleep	Off
15 in.	63	4	1
17 in.	74	4	1
19 in.	107	4	1
20 in.	140	3	1

Note: CRT = cathode-ray tube; LCD = liquid crystal display; PC = personal computer.

© E SOURCE; data from U.S. EPA and DOE

Upgrade Desktops to Energy Star–Rated Computers or Replace Desktops with Laptop Computers

The revised Energy Star efficiency specifications for computing devices are not only more stringent than the old specifications, but also help address the fact that many end users don't take advantage of network-level power management. Version 4.0 of Energy Star's *Program Requirements for*

Computers, which became effective July 20, 2007, regulates the energy performance of internal and external computer power supplies and specifies the maximum allowable power consumption for sleep, standby, and idle modes for desktops, integrated computers, notebooks, and other computer devices.

Based on the U.S. Environmental Protection Agency's estimates, the annual per-unit savings as a result of the new specifications will be 71 to 83 kWh for a desktop, along with demand reduction of 16 watts.

Laptop computers are generally designed to operate with lower power requirements. New laptops have greater computing power than many desktops still in use at some businesses, and they offer energy savings as well as mobility.

Replace Monitors

At about $10 to $20 per unit, the annual energy consumption of monitors can sound insignificant, but this can add up to thousands of dollars every year for a midsize company. On a national scale, yearly office computer monitor energy costs exceed $250 million and account for roughly 4 billion pounds of carbon dioxide.

Figure 1: Flat-panel monitor

Liquid crystal display (LCD) monitors require significantly less energy and produce less waste heat than cathode ray tube (CRT) monitors.

Courtesy: Jupiterimages Corp.

By choosing an Energy Star–certified liquid crystal display (LCD) monitor, you can significantly reduce your computing energy costs.

There are two types of computer monitors available today. The old technology, known as cathode-ray tube (CRT), has been around for decades, but these monitors are bulky, inefficient, and have a relatively short lifetime. Because new flat-panel LCD monitors (**Figure 1**) are now cost-competitive and have a number of additional advantages, they account for over 90 percent of all new monitor sales.

LCD technology allows for greater flexibility than CRT technology. Because the footprint is about half as large, these monitors can fit into tighter spaces. LCD monitors also produce less waste heat.

Pick a monitor with Energy Star labeling. Monitors that meet new Energy Star Version 4.0 requirements offer built-in power-management capability so you can painlessly save energy. Energy Star–certified monitors automatically power down to 2 watts or less when not in use, consuming up to 90 percent less energy than models without power-management features. In the sleep mode, these monitors also emit less heat into the workplace, reducing cooling loads. No CRT monitors currently on the market are efficient enough to qualify for Energy Star status.

Choose the smallest monitor that will meet your needs. Power consumption is closely related to screen size in computer monitors. An average 19-inch LCD monitor consumes nearly double the wattage of a 15-inch model. So even if you go out of your way to purchase a high-efficiency model, it could yield little savings if not sized appropriately for the application.

Employ Network Power-Management Software

Despite the fact that most of the 75 million-plus personal computers (PCs) operating in office settings in North

America have the capability to shift to a low-power operating state after a specified period of inactivity, only a small fraction of those PCs actually do so.

IT administrators sometimes disable power management in order to ensure that necessary patches and updates can be uploaded to network computers at any time, with the result that computers are left in full-power mode 24 hours a day, 7 days a week. A May 2004 study by Lawrence Berkeley Laboratory on the power status of office equipment after hours found that 60 percent of desktops are left in full-power mode at night.

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

1. Encourage employees to enable and use the existing power-management capabilities of their PCs,

2. Have the IT department develop and deploy logon scripts that control power-management settings, or

3. Use third-party software to establish and implement a computer power-management policy across the company network.

The first of these approaches is quite inexpensive: Hold a meeting or two with IT staff, energy-management staff, and executive management to explain the plan. Then send an e-mail or two telling employees how to enable power management on their PCs and exhorting them to do so, and you're done. Unfortunately, there is no way of ensuring that employees will comply with the recommended power-management policy, nor is there any method of calculating energy savings. Certainly some fraction of employees would comply with such a request, but given research data indicating that only a small percentage of PCs currently have power-management settings enabled, it's likely that this approach would be only marginally successful. In addition, any savings would likely degrade over time as PCs are replaced and users disable power-management settings.

Wake-on-LAN (Local Area Network)

Energy Star's new Version 4.0 specification requires that new computers be shipped with wake-on-LAN (WOL) capability enabled. WOL is a power-management feature that enables a computer to shift from standby to active mode upon receipt of a unique data signal sent over the network. The network administrator can send out a signal to wake up an individual computer or group of computers to install software patches or emergency virus protection software.

WOL is not an alternative to power-management software, however. This feature will only save energy to the degree that it allows users to turn off their computers overnight so that IT administrators can perform maintenance functions.

If your IT department uses WOL, turn the computer off but do not turn off the power strip, as this would be counterproductive to WOL.

Using logon scripts to control power-management settings can help ensure compliance and sustained savings, but scripts pose their own set of problems. Perhaps the biggest hurdle is that the IT department will rarely be motivated solely by the prospect of energy savings to create a script that is flexible enough to accommodate the variety of hardware, operating systems, and users found on a company network. Because scripts tend to be static, one-size-fits-all solutions, they are likely to either establish such lenient power-management settings (so that the settings will work for all PC users) that they capture little of the potential energy savings or alienate some employees if settings interfere with their work habits. Scripts also provide no information on the level of energy savings.

A number of software products have been developed in recent years with the common goal of simplifying the implementation of power-management policies across large numbers of networked PCs. The amount of energy savings these products can provide depends upon the power draw of the particular computers and monitors in use, how the PCs are being used, and the aggressiveness

of the power-management settings that are implemented. The potential for savings in an office that has lots of 21-inch CRT monitors and an existing policy that discourages employees from shutting down their PCs at night will be much greater than in an office with LCD monitors, laptops instead of desktop computers, and an IT staff that regularly encourages employees to use their PCs' power-management capabilities and to turn PCs off at the end of the day.

Resources

Natural Resources Canada

"Energy Star Simple Savings Calculator for Volume Purchases, Office Equipment, Computers and Monitors"

This online tool calculates the lifetime savings, carbon dioxide savings, and payback for investing in Energy Star–rated computers and monitors. By clicking the Default Values tab, you can edit the calculator's computation values—note at the bottom of the table the "date modified."

http://oee.nrcan.gc.ca/energystar/english/consumers/calculators/OE_Computers_Monitors.cfm

Energy Star Product Guide for Computers, Monitors, and Power Management

Look for recommendations on purchasing equipment and power-management applications.

www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductCategory&pcw_code=OEF

Efficient Products

This site provides energy-efficiency research results on various consumer products.

www.efficientproducts.org

Power-Management Software

For a review of several power-management software applications, view product comparisons on the E SOURCE Business Energy Advisor.

www.esource.com/public/products/PA_Demo