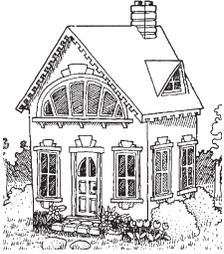


Home Energy Brief



#7 COMPUTERS & PERIPHERALS

Computers and other electronic office equipment represent the fastest-growing electrical load in the United States, keeping at least a dozen 1,000-megawatt power plants fully occupied. While most of this demand comes from the commercial sector, the growing number of households owning personal computers (34% in 1993), printers, fax machines, and photocopiers add significantly to it. Whether you're a full-time telecommuter or you just use your computer to balance your household budget, your patterns of use and choice of equipment can make a big difference—to the environment and to your utility bills.

A basic computer system—computer, monitor, and printer—uses \$35–\$140 worth of electricity a year. Unfortunately, there are few tricks for reducing a given system's energy consumption, other than just turning it off when it's not in use. Efficient computing comes down mainly to purchasing the right equipment in the first place. Since more energy goes into manufacturing the typical computer than into operating it, it's important to weigh such considerations as recycled/recyclable material content and upgradability along with power consumption.

ENERGY-EFFICIENT OFFICE EQUIPMENT Computers

Most **desktop computers** use 80–160 watts of electricity—about the same as one or two standard light bulbs. In contrast, **laptop** models typically use a maximum of 15 watts. Laptops have to be efficient to preserve battery charge, which they do with such energy-saving features as LCD (liquid crystal display) screens and automatic standby. Although many people prefer desktop computers, laptops are the clear winners in energy efficiency.

It's important to read the product literature before you buy a new computer, as energy requirements vary greatly from product to product. Some models exceed the EPA Energy Star standard for at-rest computers even when active, while other models only power down the monitor after a period of inactivity. Computer companies are working to redesign systems, and in the future we can expect a 30–50% improvement in the energy efficiency of desktops.

Other energy-efficiency aspects to consider:

- Faster computers tend to use more power than slower ones.
- Color monitors use twice as much electricity as

EPA'S ENERGY STAR PROGRAM

The U.S. Environmental Protection Agency (EPA) awards Energy Star labels to computers, monitors, and printers that feature an automatic standby or "sleep" mode. (Sleep mode is not to be confused with screen-saving programs, most of which don't save any energy.) The program is expected to be extended to faxes and photocopiers in 1995.

If Energy Star products capture two-thirds of the computer market by the year 2000, as EPA hopes, their use could save up to \$1 billion worth of electricity annually

and reduce carbon dioxide emissions from power plants by 20 million tons—equivalent to the output of 5 million cars.

However, the Energy Star label only indicates the ability to go into a low-power idle, and says nothing about energy use when active. Among Energy Star-qualifying PCs, power demand varies by as much as a factor of 10! If you tend to run your equipment for just a few hours a day, its energy demand when in active use will probably be more critical than the watts consumed in sleep mode.

monochrome ones; however, LCD color monitors are generally more energy-efficient than standard monochrome models.

- Buy internal peripherals. It's more efficient to run multiple devices off your PC's power supply than to power separate boxes for modems, faxes, etc.

Printers

Laser printers are by far the most popular printers on the market, but also the least energy-efficient. The more than 7 million laser printers in the U.S. consume enough electricity to heat and air-condition almost a half a million houses. **Inkjet** and **dot-matrix** printers use as much as 95% less energy than laser printers, and while the quality of their output is lower, it's adequate for most home printing needs.

Manufacturers are working to improve the efficiency of laser printers, and some high-performance models are now available that operate on less than a quarter of the electricity of standard laser printers.

Photocopiers

As of 1993, only 4% of all households had **photocopiers**, but this number is expected to increase with the rise in telecommuting. Energy-intensive machines, office copiers typically use 1,000–1,500 watts of electricity when active. Most home copiers use only about 400 watts, but that's still about twice the power demand of a typical laser printer. The best way to reduce your copier's energy consumption is to use it less; with electronic mail and a modem, it may be possible to eliminate the need for a copier altogether. Your printer can generate copies more efficiently than a photocopier, and most fax machines also have a copy function that is suitable for duplicating a few pages at a time.

If you must have a photocopier at home, there are more efficient alternatives to standard heat-fusing copiers. If premium copy quality isn't necessary, **liquid ink** copiers use slightly less energy than conventional ones. **Inkjet** copiers require substantially less energy, although you'll pay more for these slower units, and **digital duplicators** are more efficient still for high-volume commercial applications.

Other considerations:

- Copiers with standby or sleep modes can reduce energy demand when inactive. Look for models that go into standby mode automatically, or you'll

have to remember to press the standby button after each job.

- Higher-volume copiers use more energy per copy—choose a copier sized for your needs.

Fax Machines

Fax machines draw anywhere from 30 to 500 watts when operating, and 10 to 115 watts when on standby. A low standby energy rating can contribute greatly to energy efficiency, since fax machines generally run 24 hours a day and most of the energy consumption occurs during periods of inactivity. Combination **phone-faxes** are particularly efficient for home use, since they add only slightly to the amount of electricity already consumed by telephone answering machines.

Fax machines can actually help save energy—according to one study, faxes have the potential to save up to half the carbon dioxide typically generated by transporting documents via courier services.

What to look for in a fax machine? As with printers, **inkjet** faxes typically use the least energy. They can also use plain paper, which costs 60–80% less than thermal paper. **Thermal** fax machines use more energy than inkjets because of the heating mechanisms used for printing, but they are still more energy-efficient than laser faxes. However, you may end up spending more money and energy photocopying faxes printed on curly thermal paper. **Laser** and **LED** fax machines also use plain paper, but they cost more and their energy consumption is typically higher than that of other fax machines.

If you use a **fax modem** with your computer or have a **fax card** installed in your printer you may not need a fax machine at all, and by viewing your fax messages on screen rather than printing them out, you can also save printing energy and paper (and the energy it takes to make paper).

Integrated Systems

Machines that can combine printing, scanning, faxing, and copying in a single piece of equipment are gaining in popularity. The standby energy use of these **integrated systems** or hydras can be substantially lower than the sum of several separate peripherals.

THE GREAT ON-AGAIN, OFF-AGAIN DEBATE

Turn off your equipment or keep it running? Computer folk continue to debate the question.

Computers

Arguments that thermal cycling harms the internal components of computers don't seem to be well founded. Modern computers are designed to handle 40,000 on-off cycles before failure, and you're not likely to approach that number during the average computer's five- to seven-year life span. In fact, IBM and Hewlett Packard encourage their own employees to turn off idle computers, and some studies indicate it would require on-off cycling every five minutes to harm a hard drive.

Meanwhile, turning off your computer not only saves electricity, it reduces pollution created by the power plant that supplies electricity for the computer—and in an office setting, it also decreases the air-conditioning load, which saves more energy and pollution.

In light of all this, we recommend turning off your monitor whenever it will be idle for 15 minutes or more, and turning off the computer when it will be idle for two hours or more.

Printers and Photocopiers

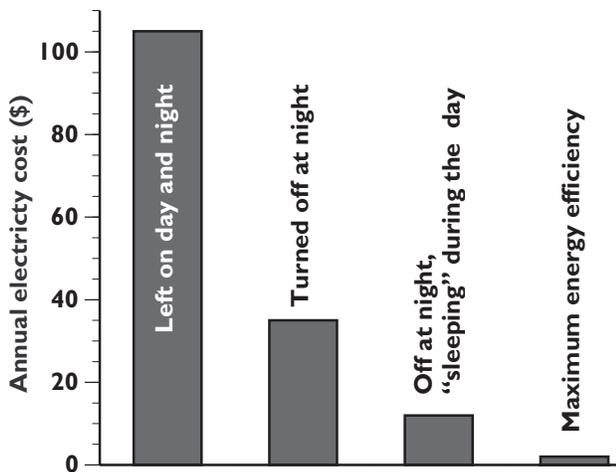
Many laser printers and most photocopiers feature sleep modes that can lower energy consumption for idle equipment by anywhere from 25% to 99%. Even if your machine has this feature, you can reduce energy consumption still further by doing your printing/copying in batches and leaving the equipment off the rest of the day.

Hewlett Packard advises its customers that small printers (those that warm up in less than a minute) can be turned off when idle for 15 minutes or more. For printers with longer warm-up times it may be advantageous to turn them off only if they will be idle for a minimum of one to three hours.

Power Management Systems

There are dozens of software and hardware products on the market that can power down or shut off equipment after a specified period of inactivity. Most of these **power management systems** are likely to be cost-effective only for commercial users. However, if you leave your home computer or fax machine on all day to receive communications, you can save energy by installing controls that power down the system when it's not actively sending or receiving messages.

POWER DOWN AND SAVE



A typical 150W computer will cost \$105 a year to run if you leave it on all the time. Turning it off at night instantly cuts electricity consumption by two-thirds, and a computer with a "sleep" mode will reduce consumption by another two-thirds. The most efficient models on the market, operated efficiently, use just \$2 worth of energy a year. Adapted from EPA/Energy Star Computers.

THE PAPERLESS OFFICE

It was once believed that computerization would create a "paperless" society, yet computers and printers have enabled office workers to routinely consume more paper than they did before these conveniences were introduced. Few computer users are willing to rely solely on electronic storage, despite the fact that copies of documents can be backed up on disk, tape, or CD-ROM. In *The Green PC*, Steve Anzovin estimates that more than 9 million trees a year are cut down to "feed the world's computer printers." In fact, a recent study by Lawrence Berkeley Laboratory indicated that greater energy savings can be realized by reducing paper consumption than by improving the energy efficiency of printers and copiers. Manufacturing a piece of paper requires 10–70 times as much energy as the electricity it takes to print on it.

The following are some suggestions that can help reduce your paper use by as much as 75%:

- Use narrower margins and smaller (but still readable) typefaces to eliminate wasteful spacing.
- Edit drafts of documents on-screen and print only

the final version.

- Print or copy on both sides of the paper. Some laser printers are now available offering two-sided printing, and most copiers offer this feature.
- Use the flipside of scrap paper for draft copies, notes, and messages.
- Consider using **recycled paper** for your printing needs. Conservatree, a San Francisco-based recycled paper distributor, calculates that substituting a ton of recycled paper for virgin stock saves enough energy to power a house for six months.

TELECOMMUTING, E-MAIL, & INTERNET

As well as saving paper, computers and telecommunications may eliminate the need for many office workers to commute every day or to travel long distances for business meetings. For many, **telecommuting** and teleconferencing are already here. Some estimates indicate up to 20% of the work force will be home-based by the year 2004. Working from home offers many benefits, including reduced commuting time, transportation energy use, and vehicular emissions. In theory, it should also mean less road congestion, less blacktop, and more green spaces.

In addition to communicating via faxes, today more than 18,000 U.S. organizations save time, paper, postage, and energy by exchanging messages and documents via **E-mail** (electronic mail). E-mail allows documents to travel around the world in little more time than it takes to type the directives into the computer.

Networking via the **Internet**, the world's largest on-line information network, allows millions of users to access databases, journals, libraries, directories, and other information, and to communicate with people around the world. Internet offers the potential to eliminate much of the hard-copy production and duplication of information (i.e., books and periodicals), which can translate into tremendous energy and resource savings.

For more on saving energy and money in the home, see Rocky Mountain Institute's forthcoming *Homemade Money: How to Save Energy and Dollars in Your Home*. Other titles in this series of Home Energy Briefs include *Lighting; Windows; Water Heating; Refrigerators and Freezers; Cooking Appliances and Dishwashers; and Washers, Dryers, and Miscellaneous Appliances*. Written by Maureen Cureton. © Rocky Mountain Institute 1995.

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RECYCLING COMPUTERS

As with any other product, the more computers and peripherals can be reused or **recycled**, the greater the energy savings and the lower the impact on the environment. A 1993 study by the Land Institute estimates that it takes up to 4,000 kilowatt-hours—nearly half the average American household's annual consumption of electricity—to manufacture a PC and monitor. The study also states that 95% of a typical PC can be recycled, recovering a substantial amount of the energy that went into its manufacture.

The computer hardware industry is making efforts to take back old products. Some newer models use recycled or **recyclable** materials and are designed for easy disassembly and recovery of materials. Despite these efforts, the U.S. is still far behind Europe in recycling initiatives for electronic goods.

When shopping for a new computer or peripherals, consider purchasing **upgradable** equipment so that, in the future, you can put in a bigger hard drive if necessary, or add a new microprocessor. If your computer is outdated and you want to buy a new one, don't throw it away—it may make a welcome electronic addition to a school or community group. Several organizations now facilitate such exchanges or donations of used equipment and there are a number of brokers who buy used computer equipment.

RESOURCES

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