How to Buy an Energy-Efficient Computer Monitor

Energy Efficiency and Renewable Energy
Federal Energy Management Program

Why Agencies Should Buy Efficient Office Equipment

- *Executive Order 13123 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE ENERGY STAR® product labeling program.*
- *Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.*
- *As the world's largest consumer, the federal government can help "pull" the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.*

Federal Supply Source:

- General Services Administration (GSA)
  www.fss.gsa.gov

For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
  Phone: (800) 363-3732
  www.eren.doe.gov/femp/procurement
- Environmental Protection Agency (EPA) has ENERGY STAR® product listings and purchasing specifications.
  Phone: (888) STAR-YES (782-7937)
  www.energystar.gov
- EPA's "ENERGY STAR-labeled office equipment" home page has several downloadable guides to help users optimize energy savings from office equipment.
  www.epa.gov/appdstar/esoe/index.html
- TCO is a labeling program for computers, monitors, and other office equipment that includes energy efficiency, environmental, and ergonomic criteria, as well as low electro-magnetic emissions.
  Phone: (312) 781-6223
  www.tco-info.com
- Lawrence Berkeley National Laboratory publishes the *User Guide to Power Management for PCs and Monitors*.
  Phone: (510) 486-7089
  eetd.lbl.gov/EAP/BEA/LBLReports/39466/
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.
  Phone: (202) 646-7950

Efficiency Recommendation

Product Type	Recommended "Sleep" Mode	Best Available "Sleep" Mode
14" – 15" Color	15 watts or less[a]	1 watt
17" Color	15 watts or less[a]	1 watt
19" – 21" Color	15 watts or less[a]	2 watt

a) These models also include a "second-stage" sleep mode of 8 watts or less. Monitors with USB ports may use a few more watts of power in all modes (including "active" and "off").

Definition

"Sleep" mode refers to a low-power standby condition, which is entered automatically after a set period of inactivity. The monitor's active mode is restored when the user touches the mouse or the keyboard.

Where to Find Energy-Efficient Monitors

The federal supply source for monitors is the General Services Administration (GSA). GSA's on-line ordering system, *Advantage!*, can be used to select and order monitors. Make sure that the model you order qualifies for the ENERGY STAR® label. All ENERGY STAR monitors meet this Efficiency Recommendation.

When contracting or buying from a commercial source, specify or select a model with the ENERGY STAR® label; check the EPA's list to see which monitors qualify for the label (see "For More Information").

Buyer Tips

Make sure that the power management features of your monitor have been "enabled" and are compatible with your computer and operating system. In most cases, look for a monitor with "DPMS" (Display Power Management Signaling) or "universal" power management signaling. Some flat-panel liquid crystal display (LCD) monitors use considerably less electricity than comparably-sized cathode ray tube models, but the extra first cost is still much more than the lifetime energy savings.

The time to recover from sleep to active mode varies; for convenience, look for a model with quick recovery time. Some models use an indicator light to signal use of the low-power mode.

Most screen-savers do not significantly reduce power consumption. Some screen-saver software is compatible with ENERGY STAR computers and monitors; it initiates the sleep mode after displaying the screen-saver for a pre-set time.

Usage Tips

Use your computer or monitor software to set the "idle time" delay to the shortest period consistent with your needs (for example, switch to sleep mode after ten minutes), for both first and second stage sleep modes.

Even for monitors with a low-power sleep mode, you can save more energy and possibly extend your monitor's lifetime if you manually shut it off completely at night, on weekends, and during long periods (two hours or more) of non-use during the day. Some monitors, for example those used to program network servers, are actually in use only a few hours per year but are left on constantly (8,760 hours). Leaving these monitors off, except when needed, is a very cost-efffective strategy and will not shorten monitor lifetime.

For older monitors without an ENERGY STAR sleep mode, external control devices are available that shut the monitor off after a preset idle time. The monitor is then restarted when the keyboard or mouse is used. See the EPA's web site or hotline for product information.

Monitor Cost-Effectiveness Example
(17" Color)

Performance	Base Model	Recommended Level	Best Available
Annual Energy Use	370 kWh	100 kWh	70 kWh
Annual Energy Cost	$22	$6	$4
Lifetime Energy Cost	$75	$20	$15
Lifetime Energy Cost Savings[a]	–	**$55**	**$60**

a) These savings do not include the benefit from reduced air-conditioning costs, which depend on location and building type.

Definition

Lifetime Energy Cost is the sum of the discounted value of annual energy costs based on average usage and an assumed monitor life of 4 years. Future electricity price trends and a discount rate of 3.4% are based on federal guidelines (effective from April, 2000 to March, 2001).

Cost-Effectiveness Assumptions

Annual energy use in the above example is based on typical office operating practices, including a 9.5 hour work day (sleep mode for 5.5 hours/day) and 250 work days per year. Also, the example incorporates the assumption that 76% of monitors are turned on during a typical business day and 35% left on overnight and on weekends. The assumed electricity price is 6¢/kWh, the federal average electricity price in the U.S.

Using the Cost-Effectiveness Table

In the example shown above, a 17" color monitor at the Recommended efficiency level is cost-effective if its purchase price is no more than $55 above the price of the Base Model. The Best Available model will be cost-effective if its price is not more than $60 above the price of the Base Model. Adding ENERGY STAR features (power management) to a monitor does not add significantly to the cost.

Metric Conversion

1 inch = 2.54 cm

What if my Electricity Price or Usage is different?

To calculate Lifetime Energy Cost Savings for a different electricity price, multiply the savings in the above table by this ratio: $\left(\frac{Your\ price\ in\ ¢/kWh}{6.0\ \ ¢/kWh}\right)$. If usage of your monitor differs from the assumptions shown above, your energy operating costs and savings will also vary. For example, in cases where a monitor is left on every hour of the year but only in active use for four hours per workday, the advantages of a low-power sleep mode are even greater. In this case, Lifetime Energy Cost Savings for the Recommended and Best Available models over the Base Model would be $130 and $140, respectively.

FEMP
FEDERAL ENERGY MANAGEMENT PROGRAM

Energy Efficiency and Renewable Energy
Federal Energy Management Program

How to Buy an Energy-Efficient Personal Computer

Why Agencies Should Buy Efficient Office Equipment

- *Executive Order 13123 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE ENERGY STAR® product labeling program.*
- *Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.*
- *As the world's largest consumer, the federal government can help "pull" the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.*

Federal Supply Source:

- General Services Administration (GSA)
  www.fss.gsa.gov

For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
  Phone: (800) 363-3732
  www.eren.doe.gov/femp/procurement
- Environmental Protection Agency (EPA) has ENERGY STAR® product listings and purchasing specifications.
  Phone: (888) STAR-YES (782-7937)
  www.energystar.gov
- EPA's "ENERGY STAR-labeled office equipment" home page has several downloadable guides to help users optimize energy savings from office equipment.
  www.epa.gov/appdstar/esoe/index.html
- TCO is a labeling program for computers, monitors, and other office equipment that includes energy efficiency, environmental, and ergonomic criteria, as well as low electro-magnetic emissions.
  Phone: (312) 781-6223
  www.tco-info.com
- Lawrence Berkeley National Laboratory publishes the *User Guide to Power Management for PCs and Monitors*.
  Phone: (510) 486-7089
  eetd.lbl.gov/EAP/BEA/LBLReports/39466/
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.
  Phone: (202) 646-7950

Efficiency Recommendation

Maximum Continuous Power Supply Rating (or system type)	Recommended "Sleep" Mode Power[a]
≤ 200 watts	15 watts or less
201 - 300 watts	20 watts or less
301 - 350 watts	25 watts or less
351 - 400 watts	30 watts or less
> 400 watts	≤ 10% of max. power supply rating
PC/Monitor ("all in one")	35 watts or less

a) For computers shipped with networking capability that require the processor or memory to be involved in maintaining the network connection during sleep mode, the recommended sleep mode is 15% of the maximum power supply rating.

Definition

"Sleep" mode refers to a low-power standby condition, which is entered automatically after a set period of inactivity. The computer's active mode is restored when the user touches the mouse or keyboard, or in response to a network signal.

Where to Find Energy-Efficient Computers

The federal supply source for computers is the General Services Administration (GSA). GSA's on-line ordering system, *Advantage!*, can be used to select and order computers. Make sure that the model you order qualifies for the ENERGY STAR® label. All ENERGY STAR computers meet this Efficiency Recommendation. When contracting or buying from a commercial source, specify or select a model with the ENERGY STAR® label.

Buyer Tips

Make sure that your PC power management features have been enabled by the supplier or installer, and are compatible with your monitor, software, and network (see LBNL's *User Guide* under "For More Information").

Laptop PCs offer many of the same features as desktop models, plus portability. However, combining a laptop with an external monitor or docking station will increase power use.

Usage Tips

Use your computer software to set the "idle time" delay to the shortest period consistent with your needs (for example, to switch to sleep mode after ten minutes).

Even for PCs with a low-power sleep mode, you can save more energy and possibly extend your computer's lifetime if you manually shut it off at night, on weekends, and during long periods of non-use during the day. If your networked computer(s) must stay on and connected at night for file backup or other purposes, make sure the monitor is shut off. Look for network features that provide a timed shutdown, automatic shutdown after file backup, or alternatively, auto-boot-up before backup. Using sleep and off modes will not shorten your PC's lifetime.

Plug-in power supplies for laptop PCs typically use 15 watts or less but cannot be shut off completely. To save energy, unplug your power supply after the laptop battery is charged, or use a power strip with an on-off switch.

Many laptop PCs (and some desktops) offer a "hibernate" or "bookmark" feature, which saves active programs and files before shutting off, then restores the same status when the PC is turned on. This added convenience encourages users to shut off their computers when not in use.

Computer Cost-Effectiveness Example
(Desktop PC, 500+ Mhz, 300 W Power Supply)

Performance	Base Model (No Power Management)	Recommended Level (Power Management Enabled)
Annual Energy Use	252 kWh	133 kWh
Annual Energy Cost	$15	$8
Lifetime Energy Cost	$53	$28
Lifetime Energy Cost Savings[a]	–	**$25**

a) These savings do not include the benefit from reduced air-conditioning costs, which depend on location and building type.

Definition

Lifetime Energy Cost is the sum of the discounted value of annual energy costs based on average usage and an assumed computer life of 4 years. Future electricity price trends and a discount rate of 3.4% are based on federal guidelines (effective from April, 2000 to March, 2001).

Cost-Effectiveness Assumptions

Annual energy use in the above example is based on typical office operating practices, including a 9.5 hour work day (in active use 4 hours/day) and 250 work days per year. Also, the example incorporates the assumption that 76% of personal computers are turned on during a typical business day and 35% left on overnight and on weekends. The assumed electricity price is 6¢/kWh, the federal average electricity price in the U.S.

Using the Cost-Effectiveness Table

In the example shown above, a personal computer at the Recommended efficiency level is cost-effective if its purchase price is no more than $25 above the price of the Base Model. Adding ENERGY STAR® features (power management) to a computer does not add significantly to the cost.

What if my Electricity Price or Usage is different?

To calculate Lifetime Energy Cost Savings for a different electricity price, multiply the savings in the above table by this ratio: $\left(\frac{Your\ price\ in\ ¢/kWh}{6.0\ ¢/kWh}\right)$. If usage of your computer differs from the assumptions shown above, your energy operating costs and savings will also vary. For example, if the computer is left on constantly, the savings from a low-power sleep mode are substantially greater.

Energy Efficiency and Renewable Energy
Federal Energy Management Program

How to Buy an Energy-Efficient Computer Printer

Why Agencies Should Buy Efficient Office Equipment

- *Executive Order 13123 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE* ENERGY STAR® *product labeling program.*
- *Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.*
- *As the world's largest consumer, the federal government can help "pull" the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.*

Federal Supply Source:

- General Services Administration (GSA)
  www.fss.gsa.gov

For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
  Phone: (800) 363-3732
  www.eren.doe.gov/femp/procurement
- Environmental Protection Agency (EPA) has ENERGY STAR® product listings.
  Phone: (888) STAR-YES (782-7937)
  www.energystar.gov
- TCO is a labeling program for computers, monitors, and other office equipment that includes energy efficiency, environmental, and ergonomic criteria, as well as low electro-magnetic emissions.
  Phone: (312) 781-6223
  www.tco-info.com
- Buyers Lab, Inc. publishes detailed printer test reports and a *Printer Specification Guide.*
  Phone: (201) 488-0404
  www.buyers-lab.com
- Lawrence Berkeley National Laboratory maintains a Web site devoted to office paper reduction issues and strategies.
  eetd.lbl.gov/paper
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.
  Phone: (202) 646-7950

Efficiency Recommendation

Printer Speed	Recommended "Sleep" Mode	Best Available "Sleep" Mode	
	All Types	Inkjet	Laser, LED
< 7 pages/min.	15 watts or less	2 watts	3 watts
7-14 pages/min.	30 watts or less	6 watts	6 watts
> 14 pages/min.	45 watts or less[a]	13 watts	10 watts

a) Also applies to all color printers.

Definition

"Sleep" mode refers to a low-power standby condition, which is entered automatically after a set period of inactiviy. The printer's active mode is restored when a print command is received.

Where to Find Energy-Efficient Printers

The federal supply source for printers is the General Services Administration (GSA). GSA's on-line ordering system, *Advantage!*, can be used to select and order printers. Make sure that the model you order qualifies for the ENERGY STAR® label. All ENERGY STAR printers meet this Recommendation, though some come without duplexing capability (see "Buyer Tips," below).

When contracting or buying from a commercial source, specify or select a model with the ENERGY STAR® label. Check the EPA's list to see which printers qualify for the label (see "For More Information").

Buyer Tips

If you are buying a laser (or LED) printer at 12 pages/minute or more, choose a model with duplexing (two-sided printing). Printers with duplexing features offer substantial savings in paper costs (see "Printer Cost-Effectiveness Example" on reverse side), as well as associated benefits such as lower postage, reduced file space, etc. The added cost of a printer duplex attachment is often repaid in two years or less.

Usage Tips

Make sure the power management and duplexing features of your printer have been "enabled" at the printer and that duplexing is the default setting within each user's software.

Even for printers with a low-power sleep mode, you can save more energy if you manually shut them off completely at night and on weekends. A few printer models do not have a manual on/off switch; these can be shut off using an external "power strip" (surge protector).

Networked systems that allow several nearby users to share a single (faster) printer generally save time, cost, and energy compared with each computer having a dedicated printer.

In some cases, an older printer that does not have an ENERGY STAR sleep mode can still be power-managed using an external control device. External controls switch the printer off (rather than into sleep mode) after a preset time, and switch it on again when a "print" signal is received. EPA's web site and hotline provide a list of external printer controls.

Printer Cost-Effectiveness Example
(12 pgs./min. Networked Laser Printer)

Performance	Base Model	Recommended Level (with duplexing)	Best Available (with duplexing)
Annual Energy Use	641 kWh	279 kWh	100 kWh
Annual Energy Cost	$38	$17	$6
Lifetime Energy Cost	$190	$80	$30
Lifetime Energy Cost Savings	–	**$110**	**$160**
Annual Paper Use	60,000 sheets	45,000 sheets	45,000 sheets
Annual Paper Cost	$300	$225	$225
Lifetime Paper Cost	$1,600	$1,200	$1,200
Lifetime Paper Cost Savings	–	**$400**	**$400**
Lifetime Total Cost Savings	–	**$510**	**$560**

Definition

Lifetime Energy or Paper Cost is the sum of the discounted value of annual energy or paper costs based on average usage and an assumed printer life of 6 years. Future electricity price trends and a discount rate of 3.4% are based on federal guidelines (effective from April, 2000 to March, 2001).

Cost-Effectiveness Assumptions

Annual energy use in the above example is based on typical office operating practices, including a 9.5 hour work day with 8.5 hours of standby (inactive) time and 250 operating days per year. Also, the example incorporates the assumption that 80% of all shared, networked printers are left on overnight and on weekends. In the Recommended and Best Available models, 50% of pages are assumed to be printed on both sides. The assumed electricity price is 6¢/kWh, the federal average electricity price in the U.S. The average paper cost is assumed to be 0.5¢/sheet.

Using the Cost-Effectiveness Table

In the example shown above, a 12 pages-per-minute printer at the recommended efficiency level (with duplexing) is cost-effective if its purchase price is no more than $510 above the price of the Base Model. The Best Available model (with duplexing) is cost-effective if its price is not more than $560 above the price of the Base Model.

What if my Electricity or Paper Price is different?

To calculate Lifetime Energy Cost Savings for a different electricity price, multiply the savings in the above table by this ratio: $\left(\frac{Your\ price\ in\ ¢/kWh}{6.0\ \ ¢/kWh}\right)$. To calculate Lifetime Paper Cost Savings for a different paper price, multiply the savings in the above table by this ratio: $\left(\frac{Your\ price\ in\ ¢/sheet}{0.5\ \ ¢/sheet}\right)$.

FEMP FEDERAL ENERGY MANAGEMENT PROGRAM

How to Buy an Energy-Efficient Fax Machine

Energy Efficiency and Renewable Energy
Federal Energy Management Program

Why Agencies Should Buy Efficient Products

- *Executive Order 13123 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE* ENERGY STAR® *product labeling program.*
- *Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.*
- *As the world's largest consumer, the federal government can help "pull" the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.*

Federal Supply Source:

- General Services Administration (GSA)
  http://www.fss.gsa.gov

For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
  Phone: (800) 363-3732
  www.eren.doe.gov/femp/procurement
- Environmental Protection Agency (EPA) has ENERGY STAR® product listings.
  Phone: (888) STAR-YES (782-7937)
  www.energystar.gov
- TCO is a labeling program for computers, monitors, and other office equipment that includes energy efficiency, environmental, and ergonomic criteria, as well as low electro-magnetic emissions.
  Phone: (312) 781-6223
  www.tco-info.com
- Buyers Lab, Inc. publishes a *Facsimile Specification Guide*.
  Phone: (201) 488-0404
  www.buyers-lab.com
- Lawrence Berkeley National Laboratory maintains a Web site devoted to office paper reduction issues and strategies.
  eetd.lbl.gov/paper
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.
  Phone: (202) 646-7950

Efficiency Recommendation

Fax Speed	Recommended "Sleep" Mode	Best Available "Sleep" Mode	
	All Types	Inkjet	Laser, LED
< 7 pages/min.	15 watts or less	2 watts	1 watt
7-14 pages/min.	30 watts or less	7 watts	1 watt
> 14 pages/min.	45 watts or less	N/A	2 watts

Definition

"Sleep" mode refers to a low-power standby condition, which is entered automatically after a set period of inactivity. The active mode is restored when the user touches the keypad to send a fax or when an incoming fax is received.

Where to Find an Energy-Efficient Fax Machine

The federal supply source for fax machines is the General Services Administration (GSA). GSA's on-line ordering system, *Advantage!*, can be used to select and order fax machines. Make sure that the model you order qualifies for the ENERGY STAR® label. All ENERGY STAR fax machines meet this Efficiency Recommendation.

When contracting or buying from a commercial source, specify or select a model with the ENERGY STAR® label; check the EPA's list to see which fax machines qualify for the label (see "For More Information").

An ENERGY STAR fax machine must have a low-power standby ("sleep") mode of 15-45 watts or less, depending on the print speed; some models use even less power in sleep mode. The low-power mode is triggered after 5-15 minutes of inactivity, and the active mode is automatically restored to send or receive a fax.

Buyer Tips

Look for a model with the lowest available power level in "sleep" mode, because most fax machines are in standby mode most of the time. The ENERGY STAR product listing includes information on sleep mode power consumption.

Consider a fax machine that scans duplex (two-sided) originals; this avoids the need to recopy a two-sided

document before faxing it. Some models also offer two-to-one image reduction for incoming faxes; this reduces transmission time and saves paper.

Usage Tips

Make sure that the power management features of your fax machine have been "enabled."

To save on both paper and energy, use stick-on labels in place of a separate cover sheet for outgoing faxes. Whenever possible, use e-mail, post your documents on the World Wide Web, or take advantage of "paper-less" faxing from a desktop or network fax-modem. Consider using waste paper with one blank side for receiving faxes.

Fax Machine Cost-Effectiveness Example
(Laser Print Engine,10 pgs. per minute)

Performance	Base Model	Recommended Level	Best Available
Annual Energy Use	356 kWh	314 kWh	45 kWh
Annual Energy Cost	$21	$19	$3
Lifetime Energy Cost	$110	$95	$15
Lifetime Energy Cost Savings[a]	–	**$15**	**$95**

a) These savings do not include the benefit from reduced air-conditioning costs, which depend on location and building type.

Definition

Lifetime Energy Cost is the sum of the discounted value of annual energy costs based on average usage and an assumed fax machine life of 6 years. Future electricity price trends and a discount rate of 3.4% are based on federal guidelines (effective from April, 2000 to March, 2001).

Cost-Effectiveness Assumptions

Annual energy use in the above example is based on typical office operating practices. Fax units are assumed to be left on continuously, day and night, with a total of 350 hours per year in "active" (sending or receiving) mode. The assumed electricity price is 6¢/kWh, the federal average electricity price in the U.S.

Using the Cost-Effectiveness Table

In the example shown above, a 10 pages-per-minute fax machine at the Recommended efficiency level is cost-effective if its purchase price is no more than $15 above the price of the Base Model. The Best Available model is cost-effective if its price is not more than $95 above the price of the Base Model.

What if my Electricity Price is different?

To calculate Lifetime Energy Cost Savings for a different electricity price, multiply the savings in the above table by this ratio: $\left(\frac{Your\ price\ in\ ¢/kWh}{6.0\ \ ¢/kWh}\right)$.

FEMP FEDERAL ENERGY MANAGEMENT PROGRAM

Energy Efficiency and Renewable Energy
Federal Energy Management Program

How to Buy an Energy-Efficient Copier

Why Agencies Should Buy Efficient Products

- *Executive Order 13123 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE* ENERGY STAR® *product labeling program.*
- *Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.*
- *As the world's largest consumer, the federal government can help "pull" the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.*

Federal Supply Source:

- General Services Administration (GSA)
  www.fss.gsa.gov

For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
  Phone: (800) 363-3732
  www.eren.doe.gov/femp/procurement
- Environmental Protection Agency (EPA) has ENERGY STAR® product listings.
  Phone: (888) STAR-YES (782-7937)
  www.energystar.gov
- EPA provides a "Toolkit" for manufacturers, buyers, and users of ENERGY STAR copiers.
  enduse.lbl.gov/esoe/CTKIntro.htm
- TCO is a labeling program for computers, monitors, and other office equipment that includes energy efficiency, environmental, and ergonomic criteria, as well as low electro-magnetic emissions.
  Phone: (312) 781-6223
  www.tco-info.com
- Buyers Lab, Inc. publishes detailed copier test reports, a *Copier Specification Guide*, and an electronic selection guide.
  Phone: (201) 488-0404
  www.buyers-lab.com
- Lawrence Berkeley National Laboratory maintains a Web site devoted to office paper reduction issues and strategies.
  eetd.lbl.gov/paper
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.
  Phone: (202) 646-7950

Efficiency Recommendation

Copier Type (copies/minute)	Recommended		Best Available		Automatic Duplex Copying
	Watts in "Sleep" Mode[a]	Watts in Off Mode	Watts in "Sleep" Mode	Watts in Off Mode	
≤ 20 cpm	N/A	5 or less	0	0	N/A
21-44 cpm	5 + (cpm * 3.85) or less[b]	15 or less	cpm * 3. 0 or less	0	Default Setting
> 44 cpm	5 + (cpm * 3.85) or less	20 or less	cpm * 1.3 or less	0	Default Setting

a) "Sleep" mode refers to a low-power standby condition, which is entered automatically after a set period of inactivity. The copier's active mode is restored when the user touches a control button, or by a motion sensor.

b) For example, a 30 cpm copier can only use 120.5 watts (5 + (30 * 3.85)) in sleep mode.

Where to Find Energy-Efficient Copiers

The federal supply source for copiers is the General Services Administration (GSA). GSA's on-line ordering system, *Advantage!*, can be used to select and order copiers. Make sure the model you order qualifies for the ENERGY STAR® label and has default duplex (two-sided) copying (for copy speeds above 20 cpm).

When contracting or buying from a commercial source, specify or select a copier that qualifies for the ENERGY STAR® label and has automatic duplexing (if copy speed exceeds 20 cpm).

Buyer Tips

The most effective way to save energy and reduce copying costs is to copy on both sides of the paper (duplex). Look for a model with duplex speed at least 80% as fast as one-sided copying. Ask your dealer or check the product reviews by Buyers Lab, Inc. (see "For More Information").

The time needed to recover from sleep or off modes is very important to most users. ENERGY STAR copiers at 21 cpm or above must be ready to copy within 30 seconds; many low-volume copiers are even faster.

Select a copier that the manufacturer recommends for use with recycled paper. Federal agencies are required to use paper with at least 30% post-consumer waste.

Usage Tips

Make sure your copier was shipped and installed with the default-duplex, auto-off, and sleep mode features enabled. Some existing copiers can be reset to default duplexing. Turn off your copier at night if it does not have an auto-off feature; this will not shorten your copier's lifetime.

It is important to inform copy-machine users about the duplex setting, including benefits from reducing paper use (e.g., cost savings). Show users how to manually select one-sided copying if needed for a specific job (e.g., for faxing or transparencies). Make fewer copies whenever possible by using electronic mail, posting documents on the World Wide Web, or by circulating a single copy. For originals with large print, use 2:1 image reduction to save paper.

Copier Cost-Effectiveness Example
(35 cpm, black-and-white)

Performance	Base Model	Recommended Level (with duplexing)	Best Available (with duplexing)
Annual Energy Use	1,532 kWh	1,138 kWh	974 kWh
Annual Energy Cost	$92	$68	$58
Lifetime Energy Cost	$460	$340	$290
Lifetime Energy Cost Savings	–	**$120**	**$170**
Annual Paper Use	136,000 sheets	108,000 sheets	108,000 sheets
Annual Paper Cost	$680	$540	$540
Lifetime Paper Cost	$3,650	$2,900	$2,900
Lifetime Paper Cost Savings	–	**$750**	**$750**
Lifetime Total Cost Savings	–	**$870**	**$920**

Definition

Lifetime Energy or Paper Cost is the sum of the discounted value of annual energy or paper costs based on average usage and an assumed copier life of 6 years. Future electricity price trends and a discount rate of 3.4% are based on federal guidelines (effective from April, 2000 to March, 2001).

Cost-Effectiveness Assumptions

Annual energy use in the above example is based on typical office operating practices, including a 9.5 hour work day with 8.5 hours of standby (inactive) time and 250 work days per year. Also, the example incorporates the assumption that 70% of all copiers are left on overnight and on weekends. Copy volume is 12,000 copies/month. With the default-duplex feature, 50% of copies are assumed to be two-sided (vs. 11% for the Base Model). The assumed electricity price is 6¢/kWh, the federal average electricity price in the U.S. The average paper cost is assumed to be 0.5 ¢/sheet.

Using the Cost-Effectiveness Table

In the example shown above, a 35 cpm copier at the Recommended efficiency level (with default duplexing) is cost-effective if its purchase price is no more than $870 above the price of the Base Model. The Best Available model (with duplexing) is cost-effective if its price is not more than $920 above the price of the Base Model.

What if my Electricity or Paper Price is different?

To calculate Lifetime Energy Cost Savings for a different electricity price, multiply the savings in the above table by this ratio: $\left(\frac{Your\ price\ in\ ¢/kWh}{6.0\ \ ¢/kWh}\right)$. To calculate Lifetime Paper Cost Savings for a different paper price, multiply the savings in the above table by this ratio: $\left(\frac{Your\ price\ in\ ¢/sheet}{0.5\ \ ¢/sheet}\right)$.

FEMP
FEDERAL ENERGY MANAGEMENT PROGRAM