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Green Computing Guide



ESI The Environmental Science Institute
UNIVERSITY OF TEXAS AT AUSTIN

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SECO
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THE UNIVERSITY OF TEXAS AT AUSTIN

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Credits

The Environmental Science Institute at the University of Texas at Austin is pleased to present this Green Computing Guide to the University community and to all those interested in the environmental aspects of computer technology. This guide was made possible by funding from the Texas State Energy Conservation Office and the students and staff who contributed their time and energy to make this information available to the greater public.

DIRECTOR: DR. JAY BANNER, ENVIRONMENTAL SCIENCE INSTITUTE
PROGRAM COORDINATOR: ERIC JAMES, ENVIRONMENTAL SCIENCE INSTITUTE
PROGRAM COORDINATOR: JULIA RAISH, CAMPUS GREENLIGHT

AUTHOR AND DESIGNER: PETER HACKMANN, COMMUNICATIONS STUDENT, UNIVERSITY OF TEXAS

GRATITUDE IS OWED TO THE FOLLOWING FOR THEIR CONTRIBUTIONS AND SUPPORT:

PATRICK LIU, 2008 ENGINEERING STUDENT, UNIVERSITY OF TEXAS

JENNIFER JOBST, INFORMATION AND TECHNOLOGY SERVICES

THE UNIVERSITY OF TEXAS CAMPUS ENVIRONMENTAL CENTER

THE CITY OF AUSTIN SOLID WASTE SERVICES

1. Introduction

THIS GREEN COMPUTING GUIDE is intended to provide students, faculty and staff with practical ways to implement information technology energy conservation measures in accordance with the [2008 Campus Sustainability Policy](#) issued by UT President William Powers. Under the general policy guidelines, it mandates that the University:

“...engage in pollution prevention activities and develop and promote practices that maximize beneficial effects and minimize harmful effects of operations, research and activities on the surrounding environment; assess environmental impacts associated with activities; and develop and track measures of progress. The University’s goal is to maximize the efficiencies of its operations and services while minimizing its wastes and footprint.”

As one of the first schools in Texas to implement green energy projects on campus, the University of Texas has initiated a partnership between student and faculty environmental organizations aimed at making our campus as sustainable as possible. The University of Texas Information and Technology Services (ITS), and other technology networks on campus, maintain a retinue of electronic systems on campus. Coordinating and communicating between the various types of technology systems at the University poses a formidable problem given the immense volume of electronics on a forty-acre campus. As a response to this problem, the Green IT @ UT Initiative campaign was launched by ITS to promote campus-wide energy conservation measures and responsible information technology usage. Aimed at everyone from students to lab managers to administrators, the goal of this guide is to disseminate knowledge about the University of Texas’ environmental computer technology stewardship as well as ways of “minimizing its wastes and footprint”.

For more information on the environmental organizations and campaigns at UT, see [Appendix I](#).

Large institutions like The University of Texas at Austin have extensive computer facilities available for student and faculty use year-round. They serve as priceless electronic resources for students and faculty. As such, the University requires vast amounts of energy and money to provide proper services.

This guide is brought to you by Campus Greenlight, a creation of the Environmental Science Institute (ESI) and the Campus Environmental Center (CEC), and funded by the Texas State Energy Conservation Office (SECO)

For example:

- The Perry-Castañeda Library offers 140 workstations equipped with the Internet, online library resources, word processing software, and graphics programs.
- The Flawn Academic Center houses three separate computer laboratories with over 200 high-speed computers, including word processing software and graphics programs, available for student, staff, or faculty use.
- The Cockrell School of Engineering makes approximately 660 desktop computers available for student use, about a 10:1 student to computer ratio.
- The Pickle Research Center contains 1.6 million square feet of research space for engineering, science and technology.
- The new ACES Visualization Laboratory includes one of the highest resolution tiled displays in the world as well as four high-end workstations for visualization development.

However, these resources also consume extreme amounts of energy, often unnecessarily. In addition, discarded computer systems pose a hazard to the environment due to the toxic chemicals that are part of many electronics. The cost of producing newer products also burns nonrenewable fossil fuels.

How does this waste contribute to greenhouse gas emissions and environmental degradation? According to the U.S. Environmental Protection Agency (EPA):

“The disposal of solid waste produces greenhouse gas emissions in a number of ways. First, the anaerobic decomposition of waste in landfills produces methane, a greenhouse gas 21 times more potent than carbon dioxide. Second, the incineration of waste produces carbon dioxide as a by-product. In addition, the transportation of waste to disposal sites produces greenhouse gas emissions from the combustion of the fuel used in the equipment. Finally, the disposal of materials indicates that

they are being replaced by new products; this production often requires the use of fossil fuels to obtain raw materials and manufacture the items.” ([General Information on the Link Between Solid Waste and Greenhouse Gas Emissions](#))

As a result, the University of Texas has a responsibility to manage its technology systems appropriately for the new energy-minded future. Implementation of the following energy conservation strategies will assure that the University of Texas not only reduces its greenhouse gas contribution, but remains at the forefront of progressive energy policies on campuses and institutions nationwide.

2. Buy Wisely

Much of the energy use and release of toxic chemicals to the environment happens not when you use a computer, but when you buy and eventually dispose of the machine. Up to “70% of heavy metals found in landfills, including mercury and cadmium, come from electronic equipment discards.” (Silicon Valley Toxics Coalition, 2005). Based on the following tables, here is a summary of how you can conserve energy just by making a smart purchasing decision:

- **To Buy or Not to Buy?** Carefully consider the necessity of purchasing a new system before replacing your old one. You might simply upgrade the current system or invest in newer software as opposed to hardware, thus saving the landfill from one more toxic item.
- **Buy ENERGY STAR®.** When the purchase of new equipment is an absolute necessity, research before choosing which make and model is right for you. Always look for the ENERGY STAR® logo on computers, monitors, and printers. ENERGY STAR® is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping to protect the environment through energy efficient products and practices. For more information on ENERGY STAR® certification visit



Do you know the alternatives to purchasing computers at UT?

Not only does UT have multiple computer labs (<http://www.utexas.edu/its/campus-labs>), but it also has a laptop checkout program (<http://www.utexas.edu/its/laptop>) as well as Windows Terminal Services (<http://www.utexas.edu/its/wts>), which allows users to access their files from any computer with an internet connection while storing all of their information on one remote server.

www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CO.

- **Buy With the End in Mind.** Computers come and go. It is wise to buy a computer that you know will be disposed of properly. Avoid contributing to e-waste by purchasing

from companies that will take back old equipment. Check with your computer manufacturer to see if they have implemented an electronics recycling program. (See [Section 5](#) for more details)

- **Watch Your Monitor.** To reduce energy consumption, buy an LCD monitor. LCD monitors use approximately 30% less energy than CRT monitors in the *On mode*. Though energy consumption varies greatly from monitor to monitor, research has consistently shown that LCD monitors are more energy conservative than outdated CRT monitors. (Source: Berkeley National Laboratory 2002).
- **Opt for a Laptop.** Research shows that “laptops offer the potential for major

energy savings relative to desktops,” meaning a tower and CRT monitor. Plus, a laptop is more suited to student life due to its portability and energy savings potential. (Source:

[efficientpowersupplies.epri.com/pages/Sep tNRDCLaptopSummary digital.pdf](http://efficientpowersupplies.epri.com/pages/Sep%20tNRDCLaptopSummary%20digital.pdf))

- **Use Inkjet Printers.** Inkjet printers consume the least amount of energy compared to laser and dot matrix printers. In addition, the University offers free inkjet and toner cartridge recycling services to students and faculty. Visit http://www.utenvironment.org/content/index.php?option=com_content&task=view&id=46 for more details.

2.1 Computer Monitor

- **Look for ENERGY STAR® certification.** When choosing a new computer monitor, always look for the ENERGY STAR® logo.
- **Choose LCD.** Liquid crystal display (LCD) monitors are more energy efficient than cathode ray tube (CRT) monitors. On average, an LCD will use half to two-thirds less energy than a traditional CRT monitor. Over the years, UT Austin has done a good job in replacing old CRT monitors with newer LCD ones at the expiration of each monitor’s lease. For more information on the benefits of LCD displays, visit <http://www.energystar.gov/index.cfm?c=monitors.lcd>.

COMPUTER MONITOR ENERGY CONSUMPTION

Monitor Type	Average Energy Consumption (in Watts)
17” LCD	35
17” CRT	80
Sleeping Monitor	0 - 15
Monitor Turned off	0 - 10

(Source: Northwestern University Information Technology, 2009)

According to the table, a 17” CRT monitor consumes more than twice the amount of energy than a 17” LCD monitor. Notice that when any monitor is turned off it still uses energy. Only unplugging the computer can eliminate this phantom load.

2.2 Computer

Computers are becoming increasingly energy efficient. Due to improvements in computer technology, newer computers consume much less electricity than older-generation computers.

COMPUTER ENERGY CONSUMPTION

Computer Type	Average Energy Consumption (in Watts)
Desktop Computer	60 - 250
Computer with Active Screen Saver	60 - 250
Computer in Sleep Mode or Standby	1 - 6
Laptop	15 - 45

(Source: Northwestern University Information Technology, 2009)

According to the table, laptop computers consume the least amount of energy compared to desktop computers. Note that an active screen saver uses the same amount of energy as a computer in active mode. In order to reduce energy consumption when the computer is not in use, put the system to sleep or turn it off and unplug it. For information on how to properly power down a computer system, see [Appendix II](#).

2.3 Printer

- **Choose Ink-Jets.** Inkjet printers are more energy efficient than other types of printers. See the following table.
- **Choose ENERGY STAR®.** As with computers and computer monitors, first look for the ENERGY STAR® logo when selecting a printer.

PRINTER ENERGY USAGE

Type of Printer	Measured Load* (in Watts)
Inkjet	3 (idle) 10 (printing)
Dot Matrix	26 (idle) 50 (printing)
Laser	150 (idle) 300 (printing)

(Source: BarrieHydro Distribution Inc. 2006)

*Measured Load corresponds to average energy usage over a constant period of time.

According to the table, the best type of printer to purchase is an inkjet, using only 10 Watts on average when printing. The most energy-consuming printer is a laser printer, using 30 times more energy than an inkjet printer when printing! Even outdated dot matrix printers use about 6 times less energy when printing than the more modern laser printer. For these reasons, it is strongly suggested to choose inkjet printers when making purchases.

Furthermore, you can recycle your used inkjet cartridges on campus. For information on cartridge and toner recycling, or to schedule a free pickup, visit http://www.utenvironment.org/content/index.php?option=com_content&task=view&id=46.

2.4 Servers & Power Supplies

New innovations in server technology and system virtualization allow more systems to run off less hardware, and consume less energy. Currently, UT Austin is slowly replacing more and more of its traditional servers with “blade centers” than will use significantly less power than the servers they replace.

Some power supplies are now developed to use less heat than traditional power supplies, as many servers consume unnecessary energy in cooling and power conversion. The savings in the use of servers that reduce cooling and power conversion costs can make a large difference when using hundreds of servers for one institution.¹

3. Enable Power Management Features

As mentioned previously, greenhouse gases contribute to climate change. Currently, the biggest emission sector responsible for greenhouse gases is energy production, such as power plants. Transportation is a close second. Both require the burning of nonrenewable fossil fuels that also contribute to the Greenhouse Effect (Woodward and Hynes 66). With proper management and administration of computer lab hardware, peripherals, lighting and cooling systems, significant energy can be conserved - which means fewer greenhouse gas emissions released into the atmosphere. The following section demystifies certain beliefs about computer power management features. In the end, these seemingly small conservation methods amount to larger environmental savings.

ENERGY STAR® PROGRAM

The University of Texas at Austin is now an ENERGY STAR® Partner, and is committed to the ENERGY STAR® Challenge (http://www.utexas.edu/utakecharge/news/documents/UT_ENERGYSTAR.pdf).

Under this pledge, the University of Texas has agreed to:

- Measure and track energy performance of facilities
- Reduce energy consumption by at least 10%
- Encourage the campus community to make positive personal changes in their energy use in the workplace and at home through various campus initiatives
- Encourage other higher education institutions in Texas to take the ENERGY STAR® Challenge

Many resources are available to help organizations reduce energy consumption and save money through this partnership with the U.S. Environmental Protection Agency and the U.S. Department of Energy. For more information on ENERGY STAR® Partners and the ENERGY STAR® Challenge visit:

ENERGY STAR® Partners: http://www.energystar.gov/index.cfm?c=join.join_index

ENERGY STAR® Challenge: http://www.energystar.gov/index.cfm?c=challenge.learn_challenge

¹The latest power conversion devices generate 45% less heat than traditional power supplies resulting in 30% less overall server-power consumption. This is significant because a server that consumes 200 Watts of electricity will actually consume 511 Watts after power conversions and cooling. This technology could equate to approximately \$50,000 in savings a year for a facility running 400 servers. (Source: Austin Business Journal 2007)

3.1 Common Myths About Computing

The following information derives from Northwestern University research statistics:

✘ Myth #1: It's Good to Leave the Computer On

Two reasons many people choose to never shut their computers down is that they believe that frequently shutting down will damage the hard drive and ultimately shorten the lifespan of the system, or that booting the computer back up consumes so much energy it is better to just leave it running.

However,

- Modern computers are not harmed by frequent shutdowns (modern computers are designed for 40,000 shutdown cycles - the equivalent of turning your computer off and on over 100 times per day for one year) and may actually lengthen the lifetime of a computer by reducing mechanical heat damage.
- The energy consumed when booting up the computer is equivalent to just a few seconds of a normal active computer's energy usage.

Consequently, shutting the computer down conserves energy, whether away for a short time or all night long. Turning a computer on and off multiple times during the day does no damage to a computer system.

✘ Myth #2: Screen Savers Save Energy

Screen savers do not conserve *any* energy. Screen savers were initially incorporated into computer systems to prevent the phosphors that light up your monitors from "burning-in" on CRT and plasma monitors. "Burning-in" is the result of the same image being left on the screen for too long. The phosphor coating in these areas of the screen would change properties and end up leaving a shadow on the screen. However, because of the improvements made in phosphor coatings in modern CRT monitors (and the fact that LCD monitors do not even use phosphors), "burn-in" is no longer an issue. Consequently, a computer running a screen saver actually consumes the same amount of electricity as an active system. (See [Section 2.2](#) for more information)

✘ Myth #3: Putting the Monitor to Sleep Saves the Most Energy

While computers in sleep mode consume drastically less energy than computers in active mode, the best way to conserve the most energy is by unplugging the computer from the wall when you are not using it. However, phantom loads (or aptly named vampire loads) consume energy even when the computer is "off" and still plugged into the wall.

AVERAGE PHANTOM LOAD ENERGY CONSUMPTION PER MONTH (kWh)

Appliance	Sleep Mode Consumption	Turned off (plugged in)	Turned off (unplugged)
Computer (Monitor & Tower)	28.3	2.8	0
Inkjet Printer	-	3.7	0
Copy Machine	-	3.8	0
Fax Machine	-	1.1	0

Notice in the table that a computer system turned off but still plugged in still consumes a noticeable amount of energy, while a computer that is turned off and unplugged consumes no energy. Though it

Source: Schatz Energy Research Center, Humboldt State University

seems to be a small difference, the energy savings that result from unplugging a computer versus putting it in sleep mode are large considering the thousands of computers used on campus every day.

For shorter periods of inactivity, computer systems can be set to automatically enter low-power modes. Need instructions on how to power manage for a specific system? See [Appendix II](#) for more details.

3.2 Lab Management Software

There is software on the market that allows easy management and automation of an entire computer lab with only a few clicks of a mouse. However, UT Information Technology Services (ITS) does not regulate every lab on campus. In fact, the majority of UT computer labs are not regulated by ITS. ITS regulated labs do follow the same protocols, though: UT has developed in-house lab management software called “Labman”. For labs that are not regulated by lab management software already, it is strongly suggested that the lab manager or staff implement energy efficient policies in lab management. [Appendix II](#) gives information on proper sleep settings for computers.

There are many lab management programs that allow an individual to update, suspend, shutdown, or turn on an entire unit of computers simultaneously, including the option to update computers during a shutdown. This will ultimately relate to more efficient allocation of resources, reduced energy consumption, and reduced energy costs.

For these reasons, and because no two labs are alike, it is wise that lab managers without management software research the best program for the overall efficiency of the lab.

3.3 Lab & Office Lighting Strategies

Proper lighting is critical in any working environment. If your office or computer lab currently uses incandescent bulbs, replace them with compact fluorescent bulbs (CFL) when they expire. CFLs can last up to 10 times longer than incandescents, and are better for the environment, though they still contain mercury. A 22-Watt CFL has the same light output as a 100-Watt incandescent bulb. Furthermore, a single 18-Watt CFL used in place of a 75-Watt incandescent will save approximately 570 kWh over its lifetime, or approximately \$45 at \$0.08/kWh. To put this in environmental terms, the energy conserved by replacing an incandescent bulb with a CFL will keep half a ton of carbon dioxide out of the atmosphere over the life of the bulb. UT has begun operation to replace over 3,200 old incandescent bulbs with CFLs, for a total estimated annual electricity savings of \$47, 287. (Source: *Synergies*, Vol. 1, 3, 2008)

If you work in an office or environment with lighting controls, consider using natural light. Situate computers near windows and turn off lights. You may be surprised at how well the natural Texas light rivals artificial light.



CFLs reduce mercury emissions only when they replace incandescent bulbs.

One particular dilemma is that CFLs contain mercury, a hazardous element that causes severe health and environmental problems. Unfortunately, the City of Austin Solid Waste Services currently does not offer special disposal measures for CFL bulbs. Consequently, Austin residents must discard spent CFLs in the trash, preferably in a sealed bag.

However, according to the U.S. Environmental Protection Agency:

“Electricity use is the main source of mercury emissions in the U.S. CFLs use less electricity than incandescent lights, meaning CFLs reduce [but don’t reverse] the amount of mercury into the environment. As shown in the table below, a 13-Watt,

8,000-rated-hour-life CFL (60-Watt equivalent; a common light bulb type) will save 376 kWh over its lifetime, thus avoiding 4.5 mg of mercury. If the bulb goes to a landfill, overall emissions savings would drop a little, to 4.0 mg. EPA recommends that CFLs are recycled where possible, to maximize mercury savings.” (Source: Information on CFLs and Mercury, July 2008)

MERCURY, LIGHT BULBS & ENVIRONMENTAL IMPACT

Light Bulb Type	Watts	Hours of Use	kWh Use	National Average Mercury Emissions (mg/kWh)	Mercury from Electricity Use (mg)	Mercury From Landfilling (mg)	Total Mercury (mg)
CFL	13	8,000	104	0.012	1.2	0.6	1.8
Incandescent	60	8,000	480	0.012	5.8	0	5.8

(Source: Information on CFLs and Mercury, July 2008)

While CFLs still contribute to mercury emissions, switching from incandescent bulbs to energy-saving CFLs actually decreases mercury emissions. Though a mercury-free light bulb does not exist in the common market, CFLs save energy and thus result in fewer mercury emissions.

4. Efficient Printing Practices

4.1 Recycle printing paper

The *University of Texas Sustainability Guide* reveals the amount of paper consumed at UT:

“In 2007, UT used 24,646 cartons of paper or 123,230,000 sheets of paper! Of that paper used in 2007, 18,072 cartons or 90,360,000 sheets were made of virgin paper from forests that were not certified by the FSC [Forest Stewardship Council] or SFI [Sustainable Forestry Initiative]. That is 73% of the paper used at UT in 2007! Paper consumption at UT is huge, and all faculty, staff and students have the opportunity to use less and encourage the purchase of recycled and sustainable paper. By changing our behavior we have the opportunity to make a big impact.”

Paper Recycling Tips from City of Austin’s Zero Waste Program

- Print Double-Sided! Double-sided printing conserves paper. If the printers have double-sided printing capabilities, it should be set to the default.
- Buy paper with recycled content.
- “Sleep” your printer. Activating the energy saving mode allows the machine to automatically power down after a set period of time.
- Use Ink Jets. Ink jet printers consume many times less energy than a laser printer, and still provide excellent print quality of both text and images.
- Recycle your Ink. Be sure to recycle your ink and toner cartridges also. This can be done on campus through the University Services.
- For more information visit:
<http://www.ci.austin.tx.us/sws/benefits.htm> or
<http://www.ci.austin.tx.us/sws/0waste.htm>

The use of recycled paper versus virgin paper reduces overall energy consumption by 27%; moreover, it reduces greenhouse gas emissions by 47% (Source: Environmental Paper Network). According to a *Pulp and Paper Factbook* study, the total number of virgin cartons (18,072) from UT's 2007 usage is equivalent to:

- 10, 843 trees (40 ft. in height and 6 - 8 inches in diameter)
- 3,162,600 gallons of water
- 1,852,380 kWh of energy consumption
- 27,108 lbs. of air pollution

To offset paper waste, UT provides convenient services like Blackboard and WebSpace. These applications are good alternatives to printing because many people can access documents without having to buy or use paper.

For more information about Blackboard visit

https://courses.utexas.edu/webapps/portal/frameset.jsp?tab_id=222_1

For information on WebSpace visit

<https://webspace.utexas.edu/>

The [Campus Environmental Center](#) (CEC) also recycles used paper and makes notepads for purchase. For information on how to donate used paper for notepads, visit

http://www.utenvironment.org/content/index.php?option=com_content&task=view&id=95

4.2 Recycling Bins

One way to assist in recycling efforts is to provide recycling bins in convenient locations around your buildings, labs and offices. These can be requested online through the UT Facilities Services website.

<http://www.utexas.edu/vp/ecs/recycle.html>

The University of Texas at Austin is committed to doing what it can to recycle. In 2007, UT-Austin won top honors for waste minimization in the Recyclemania Competition against more than 200 other colleges and universities across the nation. <http://www.recyclemaniacs.org/results2007.asp>



5. Proper Equipment Disposal

All computers and some electronics contain materials that can be harmful to people and the environment if they are not disposed of properly. E-waste can be removed or recycled if old computers are turned in to the proper facilities and not left at the dump.

According to a Public Research Works study, "E-waste accounts for 70% of heavy metals in our garbage dumps...50% to 80% of e-waste taken to U.S. recyclers actually ends up in developing countries...E-waste once belonging to Texas school districts, state and local governments has been found in illegal dumps in Travis County, Missouri and even Nigeria" (Public Research Works, 2008).

At the university, retired departmental computers are transferred to [Surplus Property](#). As required of all state agencies, these computers and monitors are then transferred to the Texas Department of Criminal Justice for recycling. This program allows the equipment to be put to good use through a variety of methods such as updating current systems in schools, as well as recycling tons of hardware for reuse.

When buying computers, it is wise to think about which companies will dispose of your old electronics equipment properly. Most technology manufacturers have extensive take back policies and will accept your computer for free, but others may use credit toward the purchase of another computer (Computer Take Back Campaign, 2007).

Visit the websites of the largest computer and technology manufacturers for recycling information:

Acer	https://usspringpromo.acer.com/Recycle/index.aspx
Apple	http://www.apple.com/environment/recycling/
Dell	http://www.dell.com/content/topics/segtopic.aspx/dell_recycling?c=us&cs=19&l=en&s=dhs
Gateway	http://www.gateway.com/about/corp_responsibility/env_options.php
HP	http://www.hp.com/hpinfo/globalcitizenship/environment/recycle/
IBM	http://www.ibm.com/ibm/recycle/us/
Intel	http://www.intel.com/intel/environment/sustainable-operations/recycling.htm
Lenovo	http://lenovo.ecotakeback.com/
Microsoft	http://www.techsoup.org/mar/default.aspx
Motorola	http://www.motorola.com/staticfiles/Business/Corporate/US-EN/corporate-responsibility/environment/products-recycling-take-back-programs.html
Sony	http://www.sony.com/recycle
Toshiba	http://toshiba.eztradein.com/toshiba/
Xerox	http://www.xerox.com/about-xerox/recycling/enus.html

**Please search the World Wide Web for additional up-to-date information on computer recycling. Mention of brands in no way implies a recommendation.*

On Campus Computer Recycling

Surplus Property will pick up and recycle your computer equipment, free of charge.

<http://www.utexas.edu/facilities/services/surplus.html>

Inkjet & Toner Cartridge Recycling

Just place your used toner cartridges in a box, label the box in big lettering with the word “RECYCLE” and place it at any Campus Mail pickup location. You can also drop cartridges off at the Mail Services Building, or call 512-471-6523 to arrange a pickup.

<http://www.utexas.edu/services/green/services.html>

Media Destruction Services

UT’s Information Technology Services (ITS) accepts electronic media for safe destruction purposes. In adherence with the State of Texas Department of Information Mandates, ITS accepts everything from hard drives to floppy disks.

<http://www.utexas.edu/its/news/102007/hard-drive-destruction-2007.php>

DID YOU KNOW?

Toxins are not restricted by geography. The burned remnants of computer parts release dangerous substances into the atmosphere. Some of these pollutants are known carcinogens, and can travel across the globe in a matter of days. Not only do these substances travel in the air, but through food chains as well. (Silicon Valley Toxics Coalition 2005).

6. Tell a Friend

Don't assume your friends and co-workers know about green practices – tell them! You can start by distributing this computing guide to office listservs, or printing out the Green Computing Office Reminders in [Appendix IV](#) on the wall above the printer.

To attest the lack of general knowledge about green computing practices, a United Kingdom National Energy Foundation study found that:

“Reasons for ... leaving the computer on, were more numerous. The main reasons were simply the hassle factor (17%) and lack of peer pressure – or maybe an implicit company policy, as no-one else did (10.4%). 9.8% thought it to be unimportant” (Source: 1E, 2006)

Many people do not understand the potentially positive aspects of green computing practices. By spreading such knowledge, you are actively contributing to the reduced energy costs of UT and the Austin community. If you see someone wasting paper, or leaving on hardware unnecessarily for example, suggest the green alternative. A small contribution from each of us can make a big difference here at UT and globally!

7. Final Word

As mentioned earlier, green computing practices make consequential environmental differences at many levels. Not only does green computing conserve energy, but it also saves money, reduces green house gas emissions and reduces unnecessary waste. Due to the unique needs of each computer and computer lab at UT, greater lab management and energy protocols are required in order to make the best environmental impact. At an individual level, take time to think about what measures can be taken within your power to reduce unnecessary consumption, whether it be to adjust your computer's sleep settings or to purchase the right printer for your office or home. At the managerial level, don't assume that everyone knows about the effects of information technology on the environment. Spread knowledge, educate others, and provide opportunities for others to obtain information about green computing here at UT. By acting locally first, UT can contribute in large part to significant change.


The Environmental Science Institute wishes to thank all of the University of Texas staff members that have provided information and shared their outstanding energy-conservation practices. We hope that this guide provides a starting point for collaboration on green computing practices across campus and in the lives of our students, faculty, and staff.

Appendix I - Resources

- Alliance to Save Energy
www.ase.org
- Apple and the Environment
<http://www.apple.com/environment/energyefficiency/>
- Campus GreenLight
<http://www.esi.utexas.edu/greenlight/index.php>
- Columbia University Environmental Stewardship
http://www.columbia.edu/cu/environment/docs-wycd/green_guide/index.html
- Dell Energy Smart Computers
http://www.dell.com/content/topics/topic.aspx/global/products/optix/topics/en/optix_energy?c=us&cs=04&l=en&s=bsd&redirect=1
- Earth Easy – Ideas for Environmentally Sustainable Living
<http://www.eartheasy.com/homepage.htm>
- Energy Star Products
www.energystar.gov
- Green IT @ UT
<http://www.utexas.edu/its/services/greenit/>
- MIT Information Services & Technology
<http://web.mit.edu/ist/index.html>
- Northwestern University Information Technology
<http://www.it.northwestern.edu/index.html>
- Texas State Energy Conservation Office
<http://www.seco.cpa.state.tx.us/>
- United States Environmental Protection Agency
<http://www.epa.gov>
- University of Colorado Environmental Center
http://ecenter.colorado.edu/energy/projects/green_computing.html
- University of Texas Campus Sustainability Policy
<http://www.utexas.edu/policies/hoppm/01.A.03.html>
- UT Campus Environmental Center
<http://www.utenvironment.org/content/>
- UT Environmental Science Institute
<http://www.esi.utexas.edu>
- UT Sustainability Policy
http://www.utexas.edu/news/2008/05/06/sustainability_policy/

✕ Appendix II - How to Properly Power Down a Computer

The following tables show how to properly power down two standard operating systems. Be mindful to also turn off peripherals, including printers, fax machines, lighting, etc. For detailed information on powering down operating systems, visit <http://web.mit.edu/ist/initiatives/it-energy/pconfig.html>.

SETTING THE SYSTEM TO POWER DOWN	
<p><i>MAC OS</i></p> <p>Select the Apple Menu </p> <ul style="list-style-type: none"> → System Preferences → Click 'Energy Saver'. Click 'Sleep' → Select 'Better Energy Savings' <p>Use the drag toolbars to customize how long the system must be idle before going to sleep.</p> <p>DESKTOPS:</p> <ul style="list-style-type: none"> → Put the computer to sleep when it is inactive for: 1 hour. → Put the display to sleep when it is inactive for: 10 minutes. → Select the box labeled 'Put the hard disk(s) to sleep when possible'. <p>LAPTOPS:</p> <p>If your laptop is plugged in-</p> <ul style="list-style-type: none"> → Select 'Settings for: Power Adaptor' → Put the computer to sleep when it is inactive for: 1 hour → Put the display to sleep when it is inactive for: 10 minutes → Check the box for 'Put the hard disk to sleep when possible' <p>If your laptop is running on battery power-</p> <ul style="list-style-type: none"> → Select 'Settings for: Battery' → Put the computer to sleep when it is inactive for: 15 minutes → Put the display to sleep when it is inactive for: 3 minutes → Check the box 'Put the hard disk to sleep when possible' <p>To set more detailed options for energy management go to the 'Options' pane under 'Energy Saver' preferences.</p>	<p><i>WINDOWS XP</i></p> <p>Go to the Control Panel</p> <ul style="list-style-type: none"> → Open 'Power Options' → Go to 'Power Schemes' → Click on the drop-down menu and select a pre-set power scheme. <p>The time settings will be displayed for the computer to go into standby, for the monitor to turn off, and for the hard drive to turn off.</p> <p>DESKTOPS:</p> <p>Select the power scheme for 'Home/Office Desk' Under the drop down menus, customize the scheme as such:</p> <ul style="list-style-type: none"> → Turn off monitor: After 10 minutes → Turn off hard disks: After 5 minutes → System standby: After 1 hour → System hibernates: Never <p>LAPTOPS:</p> <p>→ Select the power scheme for 'Portable/Laptop' Under the drop down menus, select the following:</p> <p>If your laptop is plugged in-</p> <ul style="list-style-type: none"> → Turn off monitor: After 10 minutes → Turn off hard disks: After 20 minutes → System standby: After 1 hour → System hibernates: Never <p>If your laptop is running on battery power-</p> <ul style="list-style-type: none"> → Turn off monitor: After 3 minutes → Turn off hard disks: After 5 minutes → System standby: After 1 hour → System hibernate: 2 hours

Appendix III - Sources

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Appendix IV - Green Computing Reminders

Please print and post these Green Computing Reminders in a common workspace to spread the word about green computing practices and energy conservation. Everyone's doing it...

IN THE OFFICE/LAB:



- Use inkjet printers instead of laser printers
- Print and copy double-sided
- Recycle, recycle, recycle! If you don't have a recycling bin, call 471-8438
- Screen savers waste energy. Put your computer to sleep or turn it off and unplug it
- Use CFL light bulbs wherever possible, and only when old bulbs need replacing
- Use Blackboard and WebSpace to conserve paper
- If you see somebody improperly disposing of recyclable materials, politely let them know. It's no different from littering



OUT OF THE OFFICE/LAB:



- Unplug all computers and printers if they are not being used for long periods of time
- Unplug power strips when away for extended periods of time
- Unplug all desk lights, lamps and overhead lights
- Unplug all TV monitors
- Unplug shredders, copy machines and other business equipment. If you expect to receive faxes over the break, keep your fax machine on
- Turn the thermostat off or down in order to minimize the amount of heating or cooling put into empty offices
- Unplug microwaves, hot pads or any kitchen devices, but leave your refrigerator plugged in

