

## Technology Guidelines for Going Green

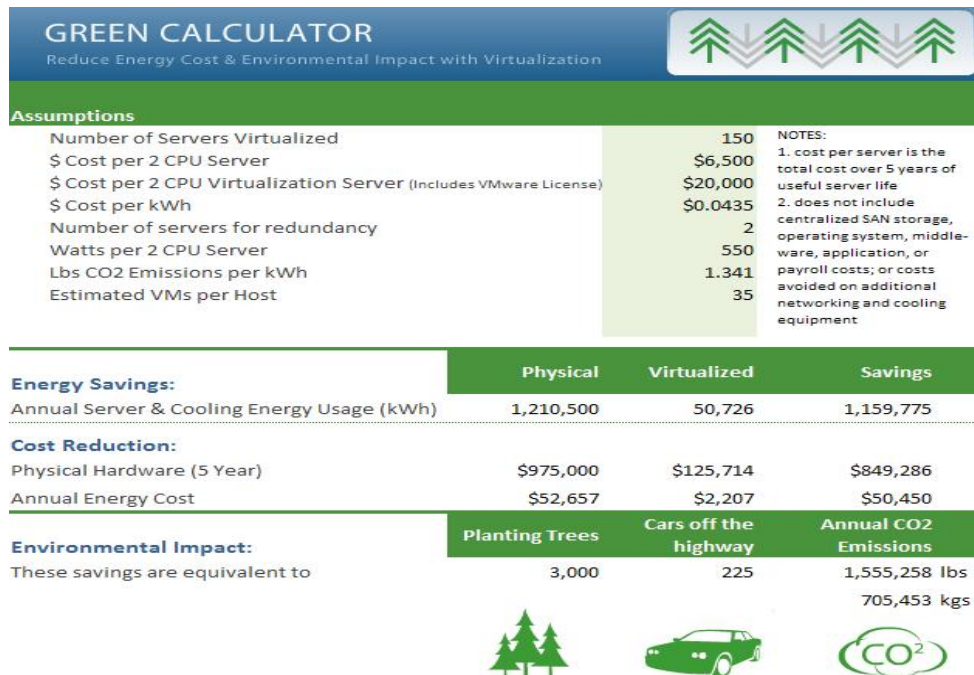
### Reason for Guidelines

The University of Nebraska at Omaha (UNO) is committed to supporting the sustainability of the planet. Toward that goal, there have been great strides in UNO's technology practices/use that moves the campus to a Greener organization. Every UNO employee can take part in reducing energy consumption by using the power savings options on their desktops, laptops, printers, and copiers at the office as well as in their home. Simple Green configuration of equipment can save energy. Turning off equipment every night, weekend and holiday makes a big impact. These guidelines outline a few of the steps to Go Green with technology in your office/home. See *Appendix A* for power management instructions on desktops, laptops, and printers. See *Appendix B* for Green Facts related to technology.

### Technology Actions You Can Do To Reduce Energy Consumption

#### Server Virtualization

Most servers used today utilize between 5 and 15% of their total capacity while consuming 60 to 90% of their maximum energy consumption at idle. Virtualization allows the number of physical servers to be drastically reduced for large power savings. Information Services (IS) has begun virtualizing servers using VMware. Contact IS at 554-HELP (4357) for more information about virtualizing servers. For every server virtualized, approximately 7,000-kilowatt hours, or four tons of CO2 emissions, are saved every year, based on a Dell 2950 server. VMware also allows the implementation of Distributed Power Management (DPM) that monitors server utilization in the data center and powers off unneeded physical servers without interruption to IS services. The following chart shows VMware's Green Calculator.



## Power Management

### Two Power Consumption Facts (EDUCAUSE - <http://net.educause.edu/ir/library/pdf/ENT08002.pdf>)

- PCs and monitors account for more than 1/3 of IT power consumption and CO<sub>2</sub> emissions
- [Nationally,] Power management tools are not active on 90% of desktop PCs

### Powering Down Equipment

When not in use, implement power management settings such as shutting down monitors or putting monitors to sleep, enabling computer standby, and placing a computer into hibernation. See *Appendix A* for specifics on how to set up power management for desktops/laptops (Windows and Mac) and HP printers.

- **Standby mode** Use this mode if you're away from your computer for frequent short periods of time. Standby mode conserves energy by cutting off power to your display, hard drive, and peripherals. After a pre-set period of inactivity, your computer switches to a low power state. When you move your mouse or press any computer key, you exit Standby mode and your computer takes you back to its previous operating state. Standby mode is an especially effective way to conserve battery power in a laptop computer. However, if your computer loses power for any reason while in Standby mode, you may lose unsaved work. This is known as Sleep on Mac OS-X and Windows Vista and Suspend on Linux.<sup>1</sup>
- **Hibernate mode** Use this mode if you're away from your computer for an extended period of time. Hibernate mode saves energy and protects your work by copying system data to a reserved area on your hard drive and then completely turning off your computer. It also reduces wear and tear on your components. When you turn power back on, your files and documents appear on your desktop just as you left them. Be sure to set your system to automatically go into hibernate mode. This is known as Safe Sleep on Mac OS-X. On Linux this is known as suspend-to-disk.<sup>2</sup>

### Turning Off Equipment

Nights, weekends and holidays desktops, laptops, printers and copiers should be turned off. It is a known fact that the majority of computer hacking takes place at night or on weekends. Turning off computers provides a higher level of security as well as saving energy.

### Reality of Electricity Cost Savings

U of Wisconsin Oshkosh's experiences

[http://www.energystar.gov/ia/products/power\\_mgt/UofWisc\\_CPM\\_casestudy.pdf](http://www.energystar.gov/ia/products/power_mgt/UofWisc_CPM_casestudy.pdf)

- Activating sleep settings cuts computer energy use by 75%
- Annual cost savings can be as much as \$50 / computer, depending on electricity rates
- Wake On LAN can facilitate night-time updates of sleeping computers
- Up Front User Education Pays Off to reduce helpdesk calls associated with standby features

EnvironmentalLeader.com

<http://www.environmentalleader.com/2009/07/24/utility-incentives-to-drive-pc-power-management/>

- Corporations can save \$20-60 per computer by implementing power management features
- While monitors are often configured to sleep, fewer than 10% of U.S.-based computers are configured to take advantage of energy-saving features
- In a PC-intensive organization, this typically represents a 3-6% annual reduction in total electricity consumption
- Southern California Edison implemented Verdiem's Surveyor software; finding an average saving of 330kWh per computer per year

<sup>1, 2</sup> Marty Poniatowski, Foundation of Green IT: Consolidation, Virtualization, Efficiency, and ROI in the Data Center, (New York, USA: Prentice Hall, 2009), 279.

## Environmental Protection Agency

[http://www.energystar.gov/index.cfm?c=power\\_mgt.pr\\_power\\_mgt\\_ss#ge](http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_ss#ge)

- **Yale University** saves over \$40 per PC by shutting down their PCs after hours, waking them only for nighttime backups and software updates
- **Spring Branch Independent School District** activated Windows sleep settings on 7,000 computers and monitors, and is now saving \$230,000 annually
- **North Thurston Public Schools** used the EZ GPO tool to activate computer power management and save \$45,000 annually
- **FedEx** will reduce energy costs by approximately \$1 million annually by activating sleep features on 20,000 PCs
- **Verizon** is activating power management features on 185,000 PCs to save \$7 million net of project costs
- **Dell** cut energy use by 40% using 1E NightWatchman and SMSWakeUp software on its desktop and notebook computers
- **Fusion Trade Inc.** saved \$70 per PC using EZ GPO and Windows Task Scheduler to accommodate nighttime updates
- **GE** activated system standby on 75,000 computers to save \$2.5 million annually

## Verizon & EPA study

[http://www.energystar.gov/ia/products/power\\_mgt/VerizonCaseStudy.pdf](http://www.energystar.gov/ia/products/power_mgt/VerizonCaseStudy.pdf)

- Windows "sleep" features cut energy costs by \$65 per computer annually
- "What we do know is that PC Powerdown reduces the number of total daily hours that PCs are 'on' from over 23 hours to less than 16 hours on average, providing 7 hours of additional energy savings," Verizon's Maylor said
- **At any given time, at least 25% of standby-enabled machines are in sleep mode.** When weekends are included, PCs are in standby an average of 16 to 17 hours per day

## UNO Power Consumption and Savings Estimates \*does not account for savings from computers sleeping between 7am-5pm

- Each workstation with monitor costs (at \$.043 kWh):
- \$51.00 per year if on 24hr/7d/52wks
- \$29.00 per year if on 17hr/6d/49wks
- \$14.00 per year if on 10hr/5d/48wks
- 5000 computers on campus
- Best average current cost per PC is.....\$29.00
- After Power Management average is.....\$15.55
- Total Current Electricity cost for 5000....\$145,000 annually
- Total After Power Management cost.....\$ 77,750 annually
- **Total estimated Savings to Campus...\$ 67,250 annually**
- 45% Average Reduction in computer electricity consumption campus wide and per computer
- Reduction of 2.021 million pounds or 1,011 tons of CO2 annually
- Equivalent of Planting 4,555 Trees
- Equivalent to Removing 342 cars off the highway

## Purchasing Green

When purchasing new computers, printers, copiers, and other office equipment make sure the equipment is Energy Star compliant.

### **Energy Star Compliant Facts**

- A new ENERGY STAR compliant PC or laptop uses 15 to 25 percent less energy on average than a standard new computer.
- ENERGY STAR 4.0 is expected to save consumers and businesses more than \$1.8 billion in energy costs over the next 5 years and prevent greenhouse gas emissions equal to the annual emissions of 2.7 million vehicles. (Source: Forrester Research)

The following web site will help when looking for Energy Star compliant products for the office.

[http://www.energystar.gov/index.cfm?fuseaction=find\\_a\\_product.showProductCategory&pcw\\_code=OEF](http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductCategory&pcw_code=OEF)

Information Services (IS) buys desktops, laptops, and HP printers on a yearly basis in bulk order. Bulk orders always buy Energy Star Compliant equipment. Savings are realized in three ways:

1. UNO receives an additional cost savings with bulk purchases.
2. Standardization of computers allows for shorter time-to-fix across the campus.
3. Energy consumption and costs are reduced.

The bulk order is placed in July. For more information contact IS Customer Services at 554-HELP (4357).

### **Reducing printing** (also see Appendix B)

- IS implemented a print solution in all IS and partnered labs in 2004. This process was changed to provide a more selective method of choosing what gets printed in order to reduce paper waste. For more information on this solution please contact IS at 554-HELP (4357).
- When purchasing new laser printers choose the printer that is capable of doing full duplex. IS is currently moving toward full duplex printing in offices and IS labs across campus.
- The University of Nebraska's WebTop service allows departments to receive SAP and SIS reports online at the desktop. This has reduced printing costs on paper by nearly \$15,000 per year at UNO alone.

### **Recycling Green** (also see Appendix B)

IS has a hardware recycling program that has been in existence for over 2 years. The total number of components recycled annually is over 200. IS also gathers and recycles ALL electronics, CD/DVD discs, and batteries; in addition to the standard campus recycling of paper, cardboards, and plastics. All electronic items that are sent to surplus at UNO are destined for electronic recycling. When your department is ready for recycling please contact IS Customer Services at 554-HELP (4357).

## Appendix A Power Management Settings for Desktop, Laptops and HP Printers

### Recommended Power Scheme

- Turn Monitor Off: after 10 Mins
- Turn Hard Disks Off: after 15 Mins
- System Standby: after 30 Mins
- Select "Prompt for Password when computer resumes from standby"

### Laptops

Setting power management on laptops should be adjusted for battery (DC) as well as when the laptop is plugged in (AC).

**\* Depending on the type of computer, to bring the tower out of sleep mode you may have to:**

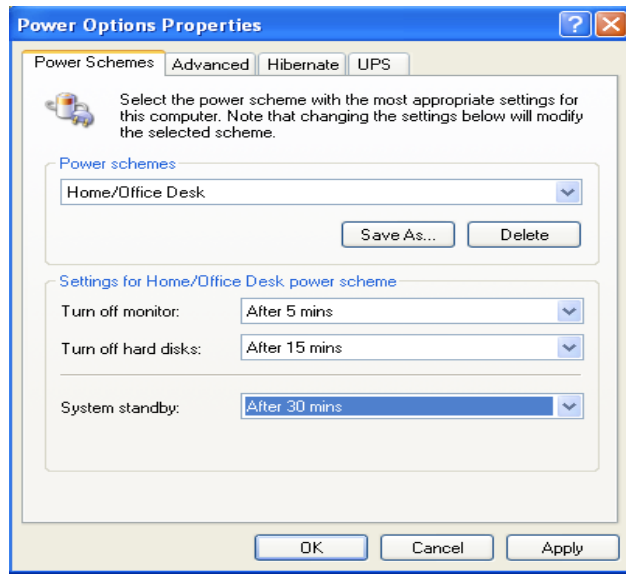
- 1) Press the tower's power button
- 2) Press a key on Keyboard
- 3) Move the mouse and/or click

**To set the computer to wake on Mouse and/or Keyboard movement follow these steps:**

- 1) Right click my computer >
- 2) Click Properties>
- 3) Select Hardware Tab >
- 4) Click Device Manager >
- 5) Expand "+" sign next to Keyboards and/or Mouse >
- 6) Double Click HID Keyboard Device / HID-compliant Mouse Device >
- 7) Select Power Management Tab >
- 8) Check Box "Allow this device to bring computer out of standby" >
- 9) Click OK and exit the My Computer Properties page

### Windows Power Management Settings

1. Open **Control Panel** and select **Power Options** or open **Control Panel** select **Performance and Management**, then **Power Options**.
2. In **Power Schemes**, click the down arrow, and then select a **power scheme**. The time settings for the power scheme are displayed in **System standby**, **Turn off monitor**, and **Turn off hard disks**.
2. To turn off your monitor before your computer goes on standby, select a time in **Turn off monitor**.
3. To turn off your hard disk before your computer goes on standby, select a time in **Turn off hard disks**.

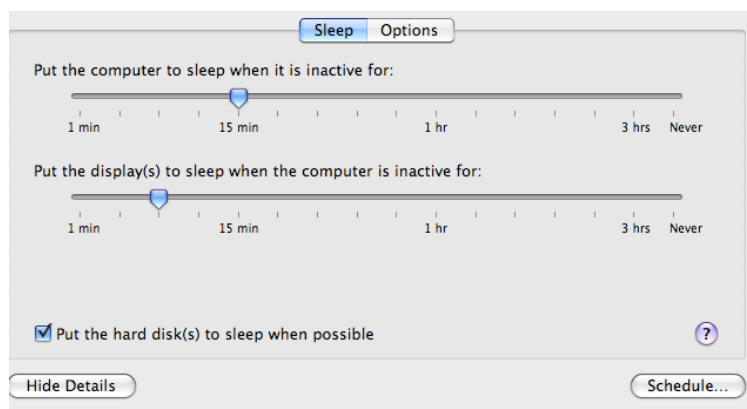


Notes:

- Using Power Options in Control Panel, you can adjust any power management option that your computer's unique hardware configuration supports. Because these options may vary widely from computer to computer, the options described may differ from what you see. Power Options automatically detects what is available on your computer and shows you only the options that you can control.
- You might want to save your work before putting your computer on standby. While the computer is on standby, information in computer memory is not saved to your hard disk. If there is an interruption in power, information in memory is lost.
- To create a new power scheme, specify the time settings you want, and then click **Save As**.
- To put your computer on standby, you must have a computer that is set up by the manufacturer to support this option.

## Macintosh Power Management Settings

1. Choose **Apple menu > System Preferences**, and then click **Energy Saver**.
2. Click **Sleep**. Click **Show Details**, if necessary, to see the sleep settings.



3. Drag the top slider to set how long the computer should be idle before going to sleep.
4. To place the display in sleep mode before the whole computer, select the checkbox labeled "Put the display to sleep when the computer is inactive for" and drag the bottom slider to set the timing for putting the display to sleep.
5. To place only the computer's hard disk to sleep whenever it's inactive, select the checkbox labeled "Put the hard disk(s) to sleep when possible."
6. To wake your computer from sleep, press a key on the keyboard or click the mouse.

Notes:

- To set a daily schedule for putting your computer to sleep (or turning it off and on), click Schedule and select options.
- You can set more detailed options for waking and restarting your computer in the Options pane of Energy Saver preferences.
- On iBooks and PowerBooks, the computer automatically sleeps when you close the lid.
- For more information about putting your computer to sleep, click "Tell me more."

## HP Laser Printer Settings

Other brands of printers have similar power saving settings.

### Older HP Models

Go to **Configuration Menu > PowerSave** = 1 minute for non heavily used printers  
 = 5 – 15 minutes for heavier used printers

### Newer HP Models

Go to **Configure Device > System Setup > Sleep Delay** = 1 minute for non heavily used printers  
 = 5 – 15 minutes for heavier used printers

\*These can also be configured through the printers IP address if the JetDirect configuration enabled on the printer itself.

## Advanced Settings for Windows Computers

**One needs to be knowledgeable when working with BIOS in any computer.**

### Dell BIOS Settings

**Power Management** (options may differ on newer computers)

- Low Power Mode = ON
- Suspend Mode = S3
  - \* S3 conserves more power than S1
  - \* Auto Power On can be configured here.

## Appendix B Technology Green Facts

Green technology is being adopted to offset the environmental impact of the industry. The impact of IT was the topic of a **presentation given by Dianna Oblinger at the Educause National Enterprise Information and Technology Conference in May, 2008.**<sup>1</sup>

- In the last 250 years, the carbon dioxide in the earth's atmosphere has increased 30% due to human activity. 50% of that increase has occurred in the last 50 years. PCs and monitors account for over one third of IT power consumption and CO2 emissions. Power management tools are not active on 90% of desktop PCs
- The Internet requires 14 power stations for power, turning out the same amount of CO2 emissions as the airline industry. One small server generates as much CO2 as a SUV with a fuel efficiency of 15 mpg. At current growth rates the Internet will consume as much energy in 25 years as all of humanity does today.
- An Estimated 133,000 PCs are discarded by US homes and businesses each day.
- Less than 10% of electronics are recycled. In 2005 EPA estimated that unused/unwanted electronics amounted to 1.9 to 2.2 million tons of waste, with 1.5 to 1.8 million tons discarded in landfills. Globally, it is estimated 50 million tons of e-waste is generated each year
- The cost of data center power doubled from 2000 to 2006. It is estimated to double again in 5 years. US data centers consume as much power as is generated by 5 power plants. Data center servers, AC and networking equipment used 1.2% of US power in 2005.
- Paper consumes 10 times the energy of the printing process. A typical office worker prints 1,000 pages or 40 pounds a month.
- Production of IT products such as semiconductors, displays, printers and batteries involves multiple toxins and energy. Energy involved in manufacturing an IT product is greater than the product will use in its lifetime.

In addition to addressing environmental impact, most green technology initiatives support ubiquitous sharing of information, which is essential for business continuity planning.

<http://net.educause.edu/ir/library/pdf/ENT08002.pdf>

**How is green technology accomplished – According to Cynthia Green, Vice President of Educause,** information technology departments' green efforts include:

- Going "virtual" - Server virtualization has the potential, through resource sharing and reduced numbers of equipment, to reduce utility consumption and save on the costs of space and power.
- Purchasing green - By selecting energy efficient machines from manufacturers who demonstrate a concern for reducing toxins and waste. Additionally, buying post consumer recycled paper for printing/copying and evaluating the supplier's processes for bleaching paper.
- Recycling – If equipment cannot be reused, then it should be recycled. Items to be recycled include hardware, paper, and printer cartridges.
- Reducing printing – When possible share information electronically by using web based shared folders and files. Use networked printers that are shared among groups of faculty and staff. Use recycled paper and encourage duplex printing.

- Providing alternative work arrangements for staff – With widespread access to broadband, many faculty, staff and students have the opportunity to occasionally or regularly work from a home office.
- Minimizing Carbon Footprint – Consider supporting the reduction of greenhouse gases by using energy efficient lighting, reducing travel of meeting by investing in teleconferencing and/or web meeting equipment /software.