

Sustainability Audit Report

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Space/Date Audited: Gilbert Hall, 6/11/09

Building contact: Tim Rogers

This report contains observations of Gilbert Hall and recommendations to enable building occupants to make their workspace and processes more sustainable. These recommendations aim to respect the unique nature of each space while encouraging occupants to make changes that will reduce environmental impacts.

If you have any questions or comments regarding the format, observations or recommendations of this energy audit, do not hesitate to write or call: sustainability@oregonstate.edu or 737-3307. Other staff or departments interested in receiving a Sustainability Audit are also welcome to contact the email and phone number listed above. Thank you for your time and participation.

Recommendation Summary

Conservation Measure	Annual Energy Savings (est.)	Annual Savings (est.)	Implementation Cost (est.)	Return on Investment (years)
Replace all incandescent lights with CFLs. Estimated impact is 6 lamps.	2,332 kWh	\$122.81	\$58.05	0.47
Replace T12 fixtures with T8 fixtures	110,239 kWh	\$5,806.45	\$27,115.00	4.67
Install occupancy sensor to reduce lighting hours. Estimated impact is 30 fixtures.	1,384 kWh	\$65.88	\$169.76	2.58
Enable standby modes on computers that typically run during working hours; estimated impact is 70 computers.	17,226 kWh	\$861.30	\$0.00	Immediate
Turn off or standby computers at night that typically run 24/7; estimated impact is 50 computers	24,750 kWh	\$1,237.50	\$0.00	Immediate

Turn off all printers at night that typically run 24/7; estimated impact is 25 printers/copiers. Enable standby modes.	2,767 kWh	\$138.34	\$0.00	Immediate
Unplug (or switch-off using a surge protector) lab equipment (scales, pumps, ovens, computer accessories, etc.) at night and when not in use.	2,930 kWh	\$146.48	Avg. \$3/power strip;	0.20
			\$90 total	
Total savings if above changes are implemented	161,626 kWh	\$8,378.75	\$27,432.81	3.27

By implementing the changes listed above 326,485 lbs of CO₂¹, 2,101 lbs of SO₂² and 1,099 lbs of NOx² will not be emitted into the environment each year.

1- PacifiCorp; 2 - Phil Carver, Oregon Department of Energy

Lighting

Observations:

- Majority of fixtures are 4 & 2 lamp T12 fluorescent, hanging with opaque, shield-type diffuser
- Lights were usually off in unoccupied areas
- Some bulbs were burnt out

Fixture Type	Quantity	Energy use per fixture (Watts)	Energy use per fixture type (Watts)
4 lamp T12	204	160	32640
2 lamp T12	259	80	20720
1 lamp T12	30	40	1200
4 lamp T8	141	128	18048
3 lamp T8	21	96	2016
2 lamp T8	157	64	10048
200W incandescent	5	200	1000
60W incandescent	1	60	60
18W CFL	2	18	36
		Total	85768

Recommendations:

- **Replace all incandescent lamps with compact fluorescent lamps (CFL).** CFLs produce light much more efficiently than incandescent and halogen lamps. CFLs also produce less heat, an important factor to consider during the summer months. CFLs come in a wide-range of spectra and intensities, so a suitable CFL can be found for almost any application. As part of the audit process, the Sustainability Office will distribute CFLs to building occupants. If you would like a CFL and have not yet received one, please contact [us](#).
- **Replace all T12 fixtures with twin or single T8 fixtures.** T8 lamps have a higher efficacy (light output per watt) than T12's so the same level of light can be maintained while using fewer fixtures and lamps. It is a goal of Facilities Services to replace all T12 lamps on campus, however, due to the quantity of T12's, this will be a long process. If a department is eager to replace inefficient lighting, and is willing to participate in a cost-sharing mechanism, certain areas can become a priority. Please contact the [Sustainability Office](#) for more information.
- **Report instances of improperly-timed outdoor lighting.** Outdoor lighting is usually controlled by either timers or photosensors. If these controls fail, lighting will remain on even if natural light provides sufficient illumination. If you notice outdoor lighting that is improperly timed please contact the [Sustainability Office](#).
- **Request occupancy sensors in common areas such as restrooms, kitchens and copy rooms where lights are typically left on.** These types of sensors are efficient and easy to install. They automatically turn off the lights if no motion is detected within a specified period of time. Detailed recommendations for specific spaces can be provided upon request. Also available are manually-activated switches that have a multi-option timer so lights go out after the specified amount of time. These timer switches are ideal for rooms with windows where electrical lighting may not be necessary during the day.
- **Request delamping for areas that are over lit** or areas where natural or task lighting provides sufficient illumination. Please email sustainability@oregonstate.edu for more information on delamping procedures.
- **Consider natural light sources when arranging furniture and work spaces.** Natural light is full-spectrum, aesthetically-pleasing and free. Even on overcast days, natural light can provide sufficient illumination for many tasks.
- **Request replacement or delamping of burnt-out fluorescent lamps.** Unlike incandescent lamps, burnt-out fluorescents still consume energy. If the light level in the area is adequate without the lamp lit, please email sustainability@oregonstate.edu for more information on delamping procedures. If the lamp has been out for more than two weeks and needs to be replaced, contact Facilities Services by email at FacilitiesCustomerServ@oregonstate.edu or by phone at 7-2969. Notes on specific areas in your building with burnt-out lamps are available upon request.

Computers and peripherals:

Observations:

- Several computers and monitors were observed on in unoccupied spaces
- Few printers had standby modes enabled
- Most computer peripherals (speakers, external hard drives etc) were on in unoccupied areas

Table 3: Office Equipment Energy Usage					
Equipment	Quantity	Energy consumption on (est.)	Energy consumption standby/sleep (est.)	Energy consumption off (est.)	Total (Watts w/ units on)
Computer	132	65W	2W	0W	8,580W
Liquid crystal display (LCD) monitor	73	35W	2W	0W	2,555W
Cathode Ray Tube screens (CRT)	60	60W	2-45W	0W	3,000W
Laptops	22	15W	1W	1W	330W
Misc. printers/copiers /faxes (ave.)	53	531W	30.5W	2W	28,143W
				Total	42,608W

Recommendations:

- **Turn off or standby computers at night** and have them enter standby when not in use for extended periods of time (30 minutes or longer). Standby or shut off monitors that have been inactive for 10 minutes.
 - On most computers, power management options can be found under the Control Panel (from Start → Settings → Control Panel). Click 'Power Options'. Here you can designate when your monitor or computer should enter standby.
 - Turning a computer on and off does not damage its hardware like it once did. Most hard disks are rated at 20,000 on/off cycles. If turned on/off once a day, it would take 55 years to reach this rating number.
- **Manually turn off cathode-ray tube (CRT) monitors at night** or during prolonged downtime (10 minutes or longer). Older (pre-1995) CRTs consume considerable energy even while in standby or sleep modes. In one case, we measured a 17" CRT using 58W while on and 45W in standby. Turning them off (using the hard switch) guarantees that these monitors are not drawing a large phantom load.

- **Purchase liquid crystal display (LCD) monitors** when replacing CRT monitors or for new workstations. LCDs use considerably less energy and cause less eye strain, and their slimmer profile increases useable workspace. Consider **EPEAT™** or Energy Star® certified products (<http://www.epeat.net/>, <http://www.energystar.gov/>) which meet stringent energy-saving and environmental criteria.
- **Turn off printers at night (especially laser printers)** that typically are on all day. Laser printers consume considerable amounts of energy even while in standby mode; according to manufacturer's specifications, several laser printers inventoried during the audit consume over 80W while in standby! The average standby power draw is 37W. If high volume printing is not necessary, recommend that staff use inkjet printers, which typically use considerably less energy (<5W) when in standby.
- **Network printers within workgroups** so that the total number of printers can be decreased. Using the high-capacity printers to their fullest capability will save energy as well as decrease the need for purchasing numerous different print cartridges. These larger printers are also more commonly capable of printing on two sides, decreasing the volume of paper purchased. The cost of a conduit to network a printer is around \$100. For more information, please contact sustainability@oregonstate.edu.
- **Use a surge protector for computer peripherals and other accessories.** While many computer peripherals like speakers, scanners and external hard drives do not use very much energy (<5W), the accumulated energy consumption is significant. By having them all plugged in to a surge protector, not only are they protected from fluctuations in current, they also can be easily shut off at night or during extended periods of downtime.
- **Use laptops in place of desktops when appropriate.** Laptops use considerably less energy than a desktop (20-30 W vs. 100-150 W) and do not require an uninterruptible power supply. A laptop docking station allows for desktop-like function while at work or at home while allowing the full portability required of a laptop.
- **Decrease time at which copiers and printer enters power-save mode to 15 minutes.**

Other Electrical Equipment

Observations:

- 43 regular size refrigerators and 13small refrigerators were observed
- 8 microwaves and numerous coffeepots, space heaters and fans were also noted

Recommendations:

- **Plug accessories into a surge protector** so they can be easily shut off at night and on weekends. Many of the accessories listed above require a constant power supply to power displays and maintain system functions. While this phantom load is usually small for an individual piece of equipment, the aggregate power consumption can be surprising. A surge protector is a safe and convenient way to protect these devices while allowing the user a fast and simple way to shut them off when they are not in use.

- **Consolidate contents of seldom-used refrigerators to reduce the number of total refrigerators.** Also consider consolidating the contents of mini-fridges into large, shared refrigerators, which are more efficient. Small ‘mini’ refrigerators use between 200 to 300 kWh annually. A new, full-sized refrigerator uses only about 600 kWh to cool a volume many times greater.
- **Consider replacing fridges that are made before 1990.** Due to technological advances, newer fridges are at least 50% more efficient than pre-1990 models. Contact the [Sustainability Office](#) for information on rebates and incentives, as well as potential cost-sharing opportunities.
- **Tips for efficient refrigerator and freezer use:**
 - Keep fridges 2” away from the wall and clean coils every 6 months
 - Clean or replace gaskets on doors to maintain an effective seal
 - Set refrigerator temperature to 40°F and freezer to 0°F
 - Fill empty space with jugs of water in the fridge and blocks of ice in the freezer. This minimizes the cooling loss of opening the fridge or freezer door.
- **Consider unplugging industrial and scientific equipment when not in use.** A number of small pieces of scientific equipment appeared to be always on. Several heating and cooling units were observed on while not in use. Small scientific equipment may not use much electricity individually (5-25 W) but the cumulative impact can be significant.

Recycling

Observations:

- Most areas lacked sufficient commingled and paper recycling containers

Recommendations:

- **Ensure enough recycling bins are located to be convenient for all office occupants.** Ideally, a commingled recycle bin would be adjacent to every trashcan in a common area. For more information on recycling, please visit the Campus Recycling website at <http://recycle.oregonstate.edu/> or contact them [via email](#).

Additional Notes:

- If your office space generates electronic waste, **consider participating in a new electronic media recycling program offered by Campus Recycling.** Items such as CDs, CD cases, 3.5” floppy discs, and audio/visual tapes are accepted. For more information on this program, contact [Campus Recycling](#).

Purchasing

Recommendations:

- **Consider Energy Star® products when replacing appliances and office equipment.** These products are typically 10-30% more efficient than non-rated models and the purchase price difference is oftentimes negligible.

- **Consider EPEAT™ -certified computers and accessories** when purchasing new equipment. EPEAT™ evaluates products on a wide-range of environmental criteria, ranging from energy consumption and materials to toxic content and end-of-life management.

Paper Use

Observations:

- About 20 reams of 30% post consumer paper are used per month

Recommendations:

- **On all computers, set double-sided printing as the default setting for printers with this capability.**
- **Encourage printing on clean side of single-sided paper.** Add small boxes near printers containing this draft paper or leave a stack of this paper in printer bypass feeders.
- **Consider purchasing recycled paper with a high post-consumer content (50%+)** for your space. Recycled paper is compatible with all printers and costs only slightly (15%) more than virgin material, while significantly reducing the environmental impacts of printing.

Heating & Cooling

Observations:

- Many building occupants commented on inefficient environmental controls

Recommendations:

- **Consider alternatives to forced air space heaters.** While effective in small, well-insulated spaces with low ceilings, forced air space heaters are inefficient in areas where the warm air can easily escape or rise above the occupied zone. Alternatives allow for equal comfort while using significantly less energy. Radiant heaters use 100-200W, compared to 1500W for forced air heaters, and users report increased comfort at lower air temperatures. Radiant heaters are also preferred from a fire safety standpoint.
- **Try these energy-saving tips to keep yourself comfortable:**
 - Dress appropriately for the weather: wear light, breathable clothing in summer and layer clothing during the winter
 - Use fans instead of AC units, and radiant heaters (which heat you and not the air) instead of space heaters
 - Close shades or blinds during hot days (keeps heat out) and on cold nights (keeps heat in)
- **In winter, limit air infiltration with a draft stopper.** There are many different options, but a simple and inexpensive solution is to use a towel or a window 'sock' to block air from entering the space. Other options like interior storm windows are available. [Contact us](#) for more info.

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Water Conservation

Observations:

- Some hand washing sinks had aerators that limited flow to .5 gallons per minute (gpm), an accepted industry standard

Recommendations:

- **Request aerators to limit flow on hand washing sinks to 1.0 gpm maximum.** Unless a sink is used for filling, 1.0 gpm is an adequate amount of water for hand washing while conserving water.
- **Report leaking faucets** to the [Sustainability Office](#). A leaking faucet with 30 drips per minute can waste over a thousand gallons of water per year.