

Conservation Audit Report

Audit performed by: Greg Smith Date: 1/25/07

Space Audited/Date Audited: Ballard 307 A-H / 1/05/07

Feedback report to: Marge Stevens, Ballard 307 G; Sea Grant Extension

Lighting:

Observations:

- 23 paired (2 bulbs per fixture, 34W per bulb) T-8 fixtures; 6 fixtures in front office; 2 in shared lunch space and offices B,E,F,G and H; 4 in office C; 1 in office A (copy room). All on single switch except for front office, where dual switch controls lights for the two halves of room. Overhead lights off in unoccupied areas and areas with suitable natural or task lighting. *Lights on in unoccupied kitchen common room.*
- Three (3) 300W halogen, dual setting floor lamps; 2 in office B, 1 in office G. On the low setting, consumed 150W. Turned off in unoccupied space B; used in place of overhead lighting in space G.
- Two (2) desk lamps with 75W incandescent bulbs. Used as task lighting; also as alternative to overhead lighting.
- One (1) desk lamp with low-wattage compact fluorescent (CFL) bulb. Used as task lighting.

Recommendations:

- **Replace 300W halogen floor lamps** with floor lamps that use CFL bulbs.
 - ☀ If a single halogen lamp is run at low power (150W) for 6 hours/day, 250 days/year, it will use 225 kilowatt hours (kWh) of energy. At \$.043/kWh, this costs \$9.68/year. Run at full power (300W), energy use would be 450kWh or \$19.36. In contrast, a lamp with a 23W CFL bulb would emit a similar amount of light but would use only 34.5 kWh annually at a cost of \$1.48.
- **Replace 75W incandescent bulbs** with 16W CFL bulbs.
 - ☀ Assuming equal use @ 6 hours/day, 250 days/year, changing a single 75W incandescent bulb to a 16W CFL would save 88.5W or \$3.81 annually.
- **Install added task lighting** at desks and work spaces so that use of overhead bank is lessened.
 - ☀ For each *hour* per day that a *single* overhead fixture is off instead of on, an annual savings of 16 kWh or \$.69 can be realized (based on current use). For example, if an office with two (2) overhead fixtures reduces the amount of time these lights are on by 4 hours/day, an annual savings of 128 kWh or \$5.52 will be realized.

- **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.

- **Install motion-activated occupancy sensor in shared kitchen space.** These types of sensors are efficient and easy to install. They automatically turn off the lights if no motion is detected for 15 minutes.

- ☀ For each *hour* per day that these two (2) overhead fixtures are off instead of on, an annual savings of 32 kWh or \$1.38 can be realized (based on current use).

- ▶ If the department(s) is willing to invest in this energy saving measure, a request for an estimate and potential subsequent work should be emailed to the Facilities Services [Work Coordination Center](#).

Computers and Peripherals:

Observations:

- 8 CPUs (~65 W each), 9 monitors (6 LCD – 20-30 W, 3 cathode-ray tubes (CRTs) – one @ 80W, two @ 50W), 4 uninterruptible power supplies (UPSs) ~5-10W, at least 3 scanners, 5 inkjet printers, 2 LaserJet printers, and 1 Canon copier.

- Most CPUs and monitors had power management settings and were turned off at night.

- UPSs and some printers were left on all the time. Other printers were turned off at night.

Recommendations:

- **Institute a power saving mode on all monitors** that have been inactive for 10 minutes.

- ☀ A LCD monitor uses approximately 25 W on average for its regular functions; while in sleep or standby, it uses less than 5 W. A newer CRT (post-1995) uses less than 5 W in sleep or standby, versus 70-80 W when awake.

- ▶ 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 CPU should enter standby.

- **Turn off computers at night** and have them enter a power saving mode when not in use for extended periods of time.

- ☀ A 65W computer that is on 10 hours/day, 250 days/year uses approximately 162.5 kWh/year while a computer that is on 24 hours/day, all year long uses 569.4 kWh. This is a difference of 406.9 kWh or \$17.50 per year.

- ▶ 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.

- **Replace older model cathode-ray tube (CRT) displays with LCDs.** LCDs are more efficient and cause less eye strain. 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 displaying the desktop and 45W in a standby setting. If replacing the monitor is cost-prohibitive, make sure the monitor is manually turned off at night or when it will not be used for more than 20 minutes.

- **Eliminate excessive UPSs** where not necessary. Non-essential machines and monitors can be plugged into a standard surge-protecting power strip. Non-essential machines and monitors do not need UPS units.
- **Eliminate excessive printers** when possible. From our testing, a small LaserJet printer (like the one located in 307A) used 20W while on and 20W when in a power saving mode. Desktop inkjets are far more energy efficient; we tested one which used 1W when on and not printing.
- **Use a surge protector for computer peripherals and other accessories.** While many computer peripherals like speakers, inkjet printers and fax machines do not use very much energy (>5W), this adds up because of the number of devices. By having them all plugged into 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 a UPS. A laptop docking station allows for desktop-like function while at work or home while allowing the full portability required of a laptop.
- **Decrease time at which Canon copier enters power-save mode from 1 hour to 15 minutes.**

Other Electrical Equipment:

Observations:

- A total of 3 label makers, 3 desk calculators, 1 digital camera charger, 2 coffeepots (3W when idle), and 1 microwave (4W when idle) were 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 use little energy (<5W) individually when not in use. However, their aggregate consumption can be significant. For instance, we found that a printing calculator used 7W when plugged in, regardless if the switch was set to on or off. Total, the above accessories use up to 50W, equivalent to a power consumption of the large Canon copier when it is idle. Running all day, all year, this equals 438 kWh or \$18.83. 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.

Refrigeration:

Observations:

- A 1998 Kenmore –model # 25378821890- freezer-on-top refrigerator in shared break area.
- Door seals were tight and in good condition; fridge was pushed back against wall.

Recommendations:

- **Keep fridge at least one and a half inch away from the wall** to allow for more efficient cooling. Placing a wood block on the floor behind the fridge would keep it from being pushed back against the wall.
- **Place jugs of water in fridge and blocks of ice in freezer** if units are consistently empty. Filling empty air space lessens the amount of warm air that needs to be cooled each time the fridge or freezer door opens.

Paper Use:

Observations:

- 100% post-consumer recycled paper used in most printers and copiers.
- A bin of used, single-sided paper was readily available.
- 7-10 reams of paper were used each month.
- 2-sided printing is used whenever available.

♦ Office occupants were interested in taking part of a bulk, 100% post-consumer recycled paper purchase, noting that a delivery would be necessary.

Recommendations:

No changes are recommended for this section.

Heating, Ventilation and Air Conditioning (HVAC):

Observations:

- 8 ceiling fans, 3 free-standing oscillating fans, 1 small space heater (110W) and 1 ventilation fan (250W).
- Windows in all offices were very drafty.
- Occupants' offices became uncomfortably hot during summer, forcing workers to leave early or work from home on the hottest days. Winter air infiltration also causes comfort issues.

Recommendations:

- **In winter, limit air infiltration with removable draft stopper.** I found two different products to stop drafts: 1) a 'snake' filled with insulating material and 2) peel-off caulk. These stop cold air from entering in winter and could be removed during the summer when windows must be opened. Links to vendors are found below:
<http://www.improvementscatalog.com/home/improvements/55378-Draft-Stopper.html>
<http://www.nextag.com/draft-stopper/search-html>
http://www.dap.com/product_details.aspx?product_id=20

Recommended and Potential Energy Conservation Measures		
Conservation Measure	Annual Savings (kWh)	Annual Savings (\$0.00)
Reduce fixture-hours (1 fixture on for 1 hour) by 45 per day (ex. 6 fixtures off 9 hours/day)	720 kWh	\$30.96
Replace three (3) 300W halogen floor lamps (3) with similar output compact fluorescent (CFL – 23W) lamps	1346.5 kWh¹ (448.8 kWh per fixture)	\$57.90¹ (\$19.30 per fixture)
Replace two (2) 75W bulbs with similar output compact fluorescent (CFL – 16W) lamps	177 kWh¹ (88.5 kWh per fixture)	\$7.62¹ (\$3.81 per fixture)
Unplug (or use surge protector switch-off) all small office equipment (calculators, coffeepots etc.) at night that are typically plugged in 24/7/365; estimated 50W total	338 kWh	\$14.53
Replace two (2) cathode ray tube (CRT) monitors with LCD	200 kWh² (100 kWh per monitor)	\$8.60² (\$4.30 per monitor)
Increase efficiency of refrigerator by implementing changes recommended in that section	Maximum 50kWh	Maximum \$2.15
Total savings if above changes are implemented	2831.5 kWh	\$121.76

1 - Assuming appliances running at full power for 6 hours/day, 250 days/year

2 – Assuming CRT energy usage of 58W-on, 45W-standby, 5W-off and LCD 25W-on, 2-standby, 2-off, run 9 hours/day, 250 days/year, with computer eligible for power management 25% of the day

Additional Notes:

Hibernate vs. Standby: An office occupant was interested in the difference between a hibernating computer and a computer on standby. In standby mode, the hard drives, RAM and a few other essential computer functions enter a low-power state and applications are kept open. Sometimes hardware such as disks and fans will continue to make some noise. In hibernate, the desktop state, including all open files and programs, will be saved in a special spool file. The system is then entirely powered down. Upon reboot, the saved spool file will be loaded and computer will return to its full state. These two modes are very similar, but differences exist. Standby uses more power, but starts up more quickly, while hibernate uses a bit less power, takes more time to load and must save a relatively small, but nonetheless significant, file. Hibernate is useful when using a laptop, where battery life is especially important.

Energy use of cable modems, switches and routers: An office occupant was also interested in the energy use of these networking devices. We will follow up with more detailed information at a future date.

If you have any questions or comments regarding the format, observations or recommendations of this energy audit, do not hesitate to write or call. I can be reached at sustainability@oregonstate.edu or 7-3307. Thank you for your time and participation.

Greg Smith
Sustainability Office