Moreland Sustainability Audit Report

Audited: May 18, 2011
Submitted: June 10, 2011
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Building contact: Ann Leen and Shirley Dodsworth

This report contains observations of Moreland 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

<table>
<thead>
<tr>
<th>Conservation Measure</th>
<th>Annual Energy Savings (est.)</th>
<th>Annual $ Savings (est.)</th>
<th>Implementation Cost (est.)</th>
<th>Simple Payback (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace or retrofit all T12 florescent fixtures with efficient T8 fixtures; estimated impact is 191 fixtures.</td>
<td>34,772 kWh</td>
<td>$1,655.55</td>
<td>$22,092.00</td>
<td>13.3</td>
</tr>
<tr>
<td>Replace all incandescent lamps with CFLs. Estimated impact is 28 lamps.</td>
<td>2,791 kWh</td>
<td>$133.00</td>
<td>$88.00</td>
<td>0.7</td>
</tr>
<tr>
<td>Install occupancy sensor on the 1st and 3rd floor hallways; est. impact is 28 fixtures</td>
<td>2,943 kWh</td>
<td>$140.14</td>
<td>$1,115.00</td>
<td>4.9</td>
</tr>
<tr>
<td>Delamp fluorescent fixtures in hallway H102; est. impact is 8 fixtures</td>
<td>1,682 kWh</td>
<td>$80.08</td>
<td>$240.00</td>
<td>3.0</td>
</tr>
<tr>
<td>Retrofit electric water heater in room 128 with a high efficiency heat pump water heater.</td>
<td>2,628 kWh</td>
<td>$184.00</td>
<td>$700.00</td>
<td>3.8</td>
</tr>
<tr>
<td>Replace older refrigerators with efficient Energy Star rated refrigerators; estimated impact is 1 refrigerators</td>
<td>233 kWh</td>
<td>$12.44</td>
<td>$90.00</td>
<td>7.2</td>
</tr>
<tr>
<td>Turn off or standby computers at night that typically run 24/7; estimated impact is 23 computers</td>
<td>16,698 kWh</td>
<td>$834.90</td>
<td>$0.00</td>
<td>Immediate</td>
</tr>
</tbody>
</table>
Turn off all printers at night that typically run 24/7; estimated impact is 12 printers/copiers. Enable standby & powersave modes.

<table>
<thead>
<tr>
<th>Total savings if above changes are implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,825 kWh</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total savings if above changes are implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>28,749 kWh</td>
</tr>
</tbody>
</table>

By implementing the changes listed above 58,074 lbs of CO$_2$, 373.7 lbs of SO$_2$ and 195.5 lbs of NOx will not be emitted into the environment each year.

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

In addition to the savings in the table below, an estimated 61,230 gallons of water ($359.19) can be saved per year by installing aerators on all bathroom faucets. Estimated impact is 9 faucets.

**Lighting**

Observations:

- Typical fixture is a 4 lamp T12 fluorescent, pendant, shield-type diffuser
- Lights were usually off in unoccupied areas
- Some lamps were burnt out

<table>
<thead>
<tr>
<th>Table 2a: Lighting Energy Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixture Type</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>4 lamp T12</td>
</tr>
<tr>
<td>3 lamp T12</td>
</tr>
<tr>
<td>2 lamp T12</td>
</tr>
<tr>
<td>4 lamp T8</td>
</tr>
<tr>
<td>3 lamp T8</td>
</tr>
<tr>
<td>2 lamp T8</td>
</tr>
<tr>
<td>100W incandescent</td>
</tr>
<tr>
<td>75W incandescent</td>
</tr>
<tr>
<td>60W incandescent</td>
</tr>
<tr>
<td>40W incandescent</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
Table 2b: Delamping Information

<table>
<thead>
<tr>
<th>Location</th>
<th>Recorded lighting level (fc)</th>
<th>IES-recommended lighting level (fc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hallway H102</td>
<td>47-60</td>
<td>20</td>
</tr>
<tr>
<td>Hallway H201 (Add lights)</td>
<td>6-10</td>
<td>20</td>
</tr>
</tbody>
</table>

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 lamp 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 overlit** or areas where natural or task lighting provides sufficient illumination. Please email sustainability@oregonstate.edu for more information on delamping procedures.

- **Utilize natural lighting wherever possible.** In many cases, natural lighting provides sufficient illumination for a variety of tasks. In locations where windows allow for enough light to enter the work areas, turn off lighting as it is not needed. Also, by arranging spaces and furniture throughout the building in a way that utilizes natural light to the maximum possible extent, electric lighting use is decreased and occupants achieve superior lighting levels and consistency. If necessary, use task lighting to supplement natural lighting.

- **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:

- 23 computers and monitors were observed on in unoccupied spaces
- Some of printers had standby modes enabled
- Most computer peripherals (speakers, external hard drives etc) were on in unoccupied areas
- A number of cathode-ray tube monitors were noted in labs on the first floor

<table>
<thead>
<tr>
<th>Table 3: Office Equipment Energy Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
</tr>
<tr>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Computer</td>
</tr>
<tr>
<td>Liquid crystal display (LCD) monitor</td>
</tr>
<tr>
<td>Cathode Ray Tube screens (CRT)</td>
</tr>
<tr>
<td>Laptops</td>
</tr>
<tr>
<td>Misc. printer/copier/fax (avg.)</td>
</tr>
<tr>
<td><strong>Total (Watts)</strong></td>
</tr>
</tbody>
</table>

**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 157W while in standby! The average standby power draw is 31W. If high volume printing is not necessary, recommend that staff use inkjet printers, which typically use considerably less energy (<5W) when in standby.

- Consolidate printers and copiers with help from Printing and Mailing Services. Printing and Mailing offers a new service starting in 2009 to assist departments in measuring costs associated with printers and copiers and financial savings from device consolidation. Contact Cheryl Lyons for more information or to schedule a free assessment. Several OSU departments have realized significant savings from consolidation.

- 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.

- Set copiers and printers to 15 minutes before entering power-save mode.

**Other Electrical Equipment**

**Observations:**

- 5 small refrigerators and 1 regular size refrigerators were observed
• 2 TVs, 6 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](mailto:sustainability-office@oregonstate.edu) 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.

**Recycling**

Observations:

• Paper and commingled recycling bins were present in various locations around the area

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](http://recycle.oregonstate.edu) or contact them via [email](mailto:contact@oregonstate.edu).

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](mailto:campus-recycling@oregonstate.edu).
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:

- Virgin paper was used for copiers

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:

- The electric water heater was set to a temperature of 135°F

- Windows were typically single pane with wooden frames; air infiltration was significant

- 7 inches of blown in fiberglass insulation were observed in the attic

- Numerous Danfoss valves did not function properly, resulting in excessively hot conditions in some areas

- Poor air circulation throughout the building has led to high temperatures in the summer

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.

- **Remove personal AC units from windows during cool months.** These AC units allow considerable air infiltration, increasing heating demand while providing no benefit.

- During the building audit, many people commented on the **inefficiency of the HVAC system.** Radiators throughout Moreland were emitting excess heat and did not respond to user controls. Currently, the Sustainability Office is placing work orders to inspect & repair malfunctioning Danfoss valves (operable knobs near the steam radiator that control the steam flow) throughout Gilmore. Currently, our list of rooms slated for Danfoss valve inspection and repair are 100, 104, 108B, H110, 128B, 132, 212, 214, 216B, 220A (both valves), 232A, 234, 238, 240B, 242 (south radiator), 244, 244A, 248A, 248. If you know of a malfunctioning Danfoss that is not listed here, please let us know.

- **Add insulation in attic.** The 7 inches of fiberglass insulation in the attic has an estimated R-value of 17-28, which is not adequate. The recommended amount for our region is 15-18 inches of R38 rated fiberglass.

- **Install exhaust fans in attic.** During the summer, heat that builds up in the attic during the day can lead to excessively hot temperatures within the building. The installation of an exhaust fan will increase ventilation and reduce summer temperatures. A customer request will be input to determine the feasibility and cost of installing such a system.

### Water Conservation

**Observations:**

- Hand washing sinks had a flow of 2 to 3 gallons per minute (gpm)
- Drinking fountains faucets had a flow rate of .5 gpm

**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.

• **Install timers on drinking fountains.** A timer can be installed on the existing drinking fountains, which allows them to be used only during peak usage periods.

• **Consider upgrading to high efficiency heat pump water heater.** Two older electric water heaters were observed in the men’s restroom. Energy Star rated heat pump water heaters are 50% more efficient than traditional electric water heaters. While a qualified heat pump water heater costs more upfront, the savings will pay back the difference in 3 to 8 years.

**Additional Resources**

• Occupants commented that their domestic hot water is tepid at best. Sustainability Office staff are investigating this issue.