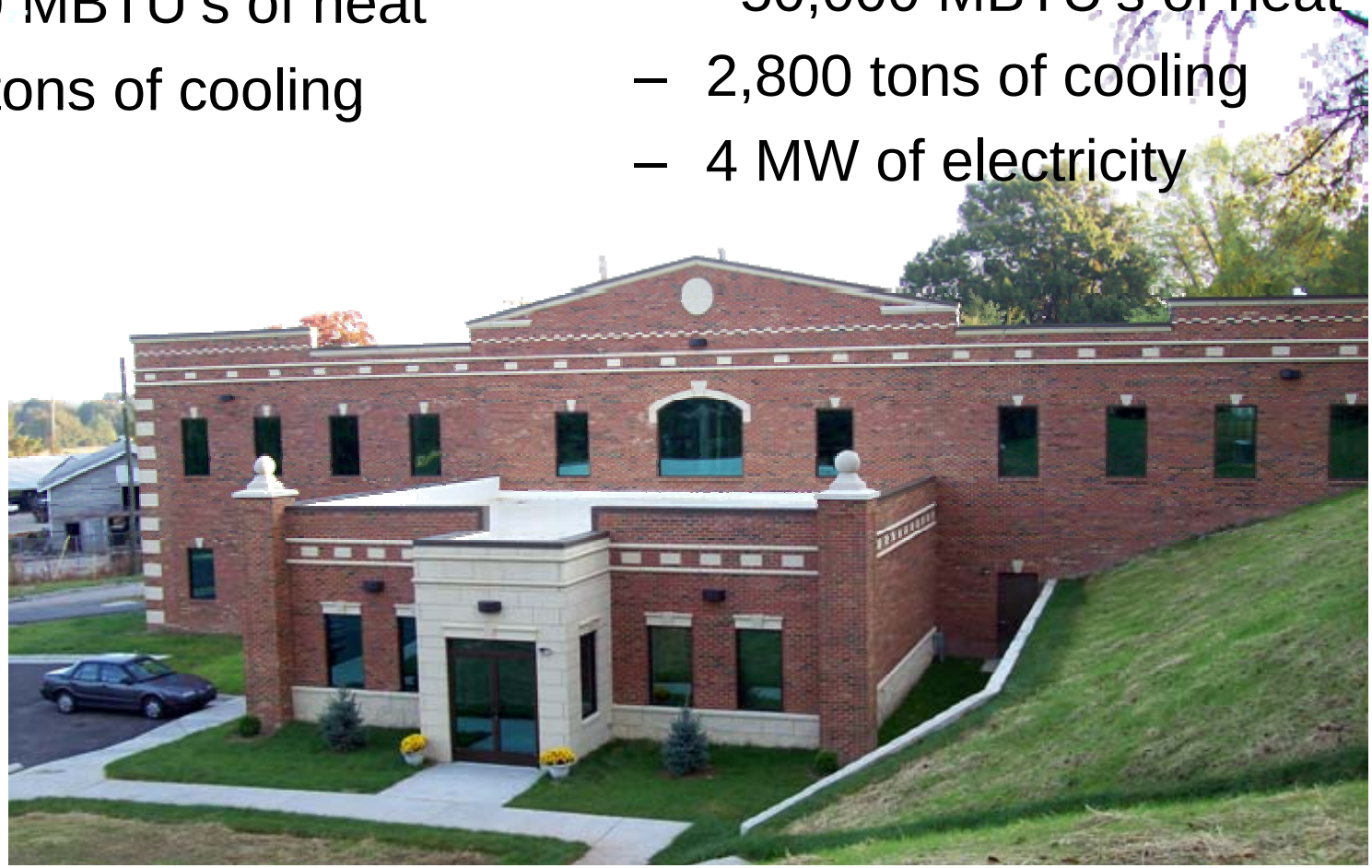
Central Plant Production

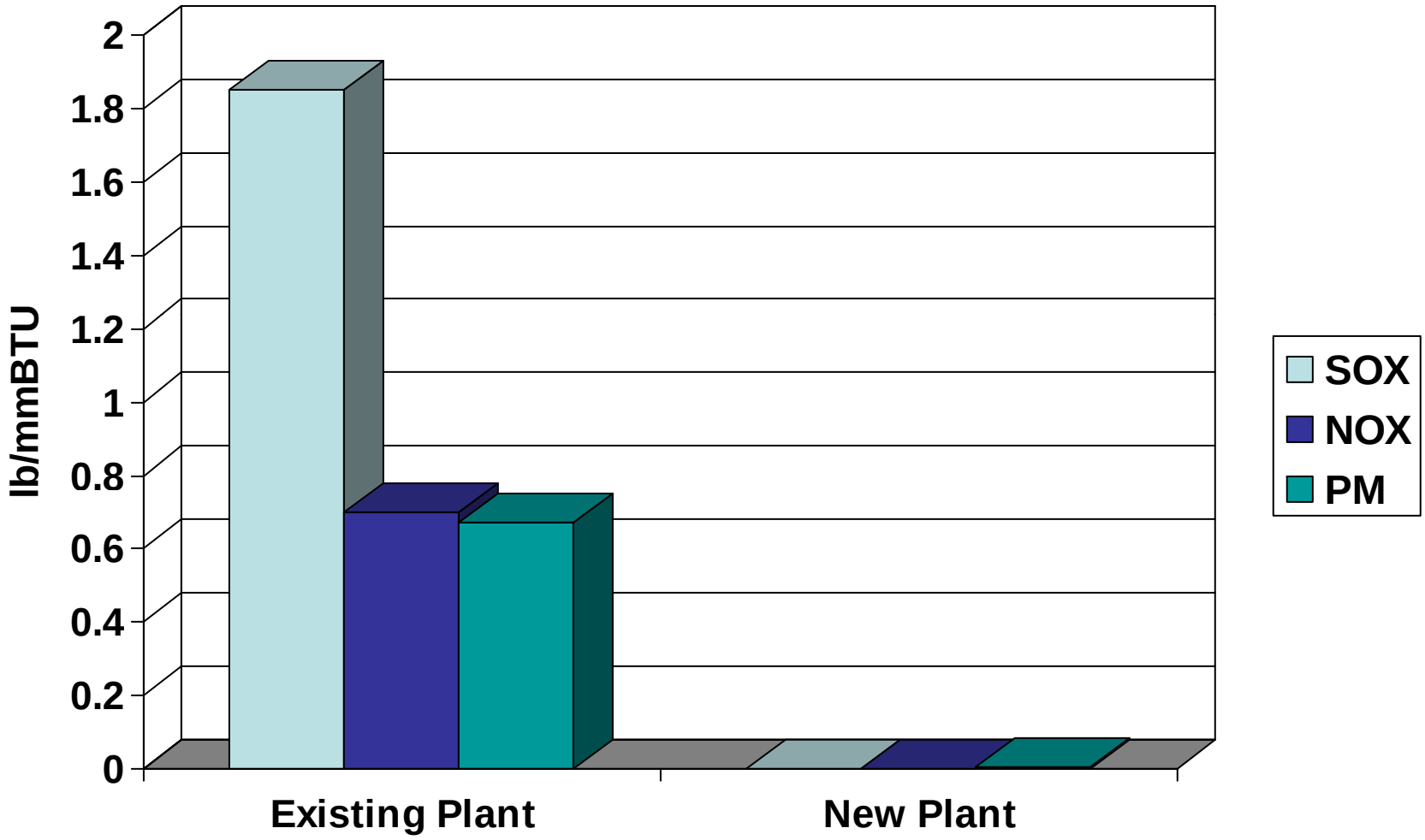
- **New Plant Capacity:**
  - 30,000 MBTU's of heat
  - 1,400 tons of cooling
- **Future Capability:**
  - ~50,000 MBTU's of heat
  - 2,800 tons of cooling
  - 4 MW of electricity



Reduced Pollution

- **Demolition of Existing Coal-Fired Boilers (Watch it live!)**
- **Existing Plant**
  - **SOX = 1.85 lb/mmBTU**
  - **NOX = 0.70 lb/mmBTU**
  - **PM = 0.67 lb/mmBTU**
- **Natural Gas Becomes Primary Fuel Source**
- **Low NOx Burners**
- **New Plant**
  - **SOX = 0.00057 lb/mmBTU**
  - **NOX = ~0**
  - **PM = 0.005 lb/mmBTU**

Plant Emissions



Increased Efficiency

- **Decrease in Distribution Energy Loss**
  - Multiple Steam Leaks and Failed Equipment in Existing System
  - New System Factory Insulated with polyurethane insulation and HDPE jacket
  - Current system Losses at > 25% of distribution
  - Expected Heat loss of new system to be <3% of Production

- **Improved Cooling Efficiency**
  - Currently a mixed system, water-cooled chillers, air-cooled chillers, DX Systems, ground source heat pumps and ventilation with no mechanical cooling
  - New system centralized water-cooled chillers
  - Existing System energy usage at 1 to 1.5 kW/ton
  - New System energy usage at 0.8 kW/ton

Building Retrofits and Renovations

- **Reduce energy use 45% by 2015**
- **Retrofit buildings that will be renovated later in the schedule using Berea College standards**
- **Renovate buildings using Berea College standards**

Building Renovations Standards

Developed by Rocky Mountain Institute

- **Lighting**
- **Equipment Usage**
- **Building Envelope**
- **Infiltration**
- **Ventilation Systems**
- **Temperature Controls**
- **Domestic Hot Water**

Lighting

- **Install power density – 1W/sf for Academic Buildings and Residence Halls**
- **Maximize use of daylighting via windows and roof lights**
- **Daylight sensors to dim lighting**
- **Dimmable ballasts**
- **Occupancy sensors – dual movement & ultrasonic sensors**

Lighting

- **Circuiting and switching parallel to window walls**
- **Aim to achieve 10 hours average utilized power of approximately .3 - .5W/sf**

Equipment Usage

- **Replace all CRT monitors with LCD screens**
- **Issue students with laptop computers**
- **Ensure all equipment have their Energy Star software activated**
- **Aim to achieve and average of .1W/sf for Academic Buildings and Residence Halls**

Building Envelope

- **Use Low E glazing systems with thermal breaks. Target values – shading coefficient = .25, U-value = .30**
- **Ensure well sealed units are used**
- **Minimum insulation values – Roof = R30 and Walls = R20**

Infiltration

- **Use entry vestibules with no heating & cooling**
- **Pressure test building as part of commissioning**

Ventilation Systems

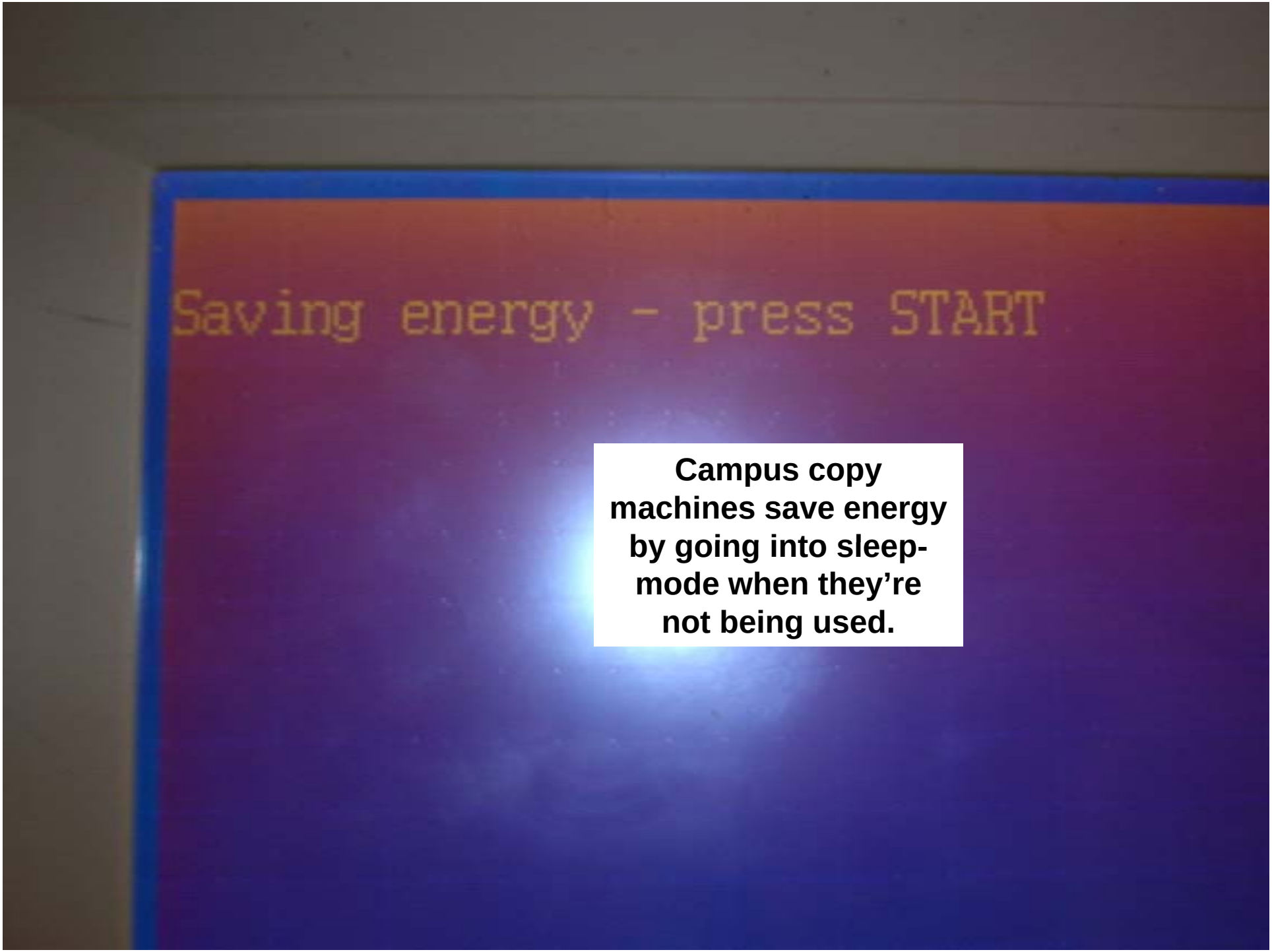
- **Design for natural ventilation where plan dimensions are appropriate – 25’ for single sided and 50’ for cross ventilation. Use operable windows and encourage cross ventilation via internal openings**
- **Use more efficient HVAC systems, ideally using less energy to heat and cool buildings. Target power consumption - .5W/cfm**
- **Include high efficiency heat recovery – (Heat Wheels)**

Temperature Controls

- **Use wider temperature controls – 68 degree winter and 78 degree summer**
- **Use ceiling fans to allow air temperatures up to 82 degrees at peak**
- **Only condition building when they are occupied. Use night, weekend and off semester setback**

Domestic Hot Water

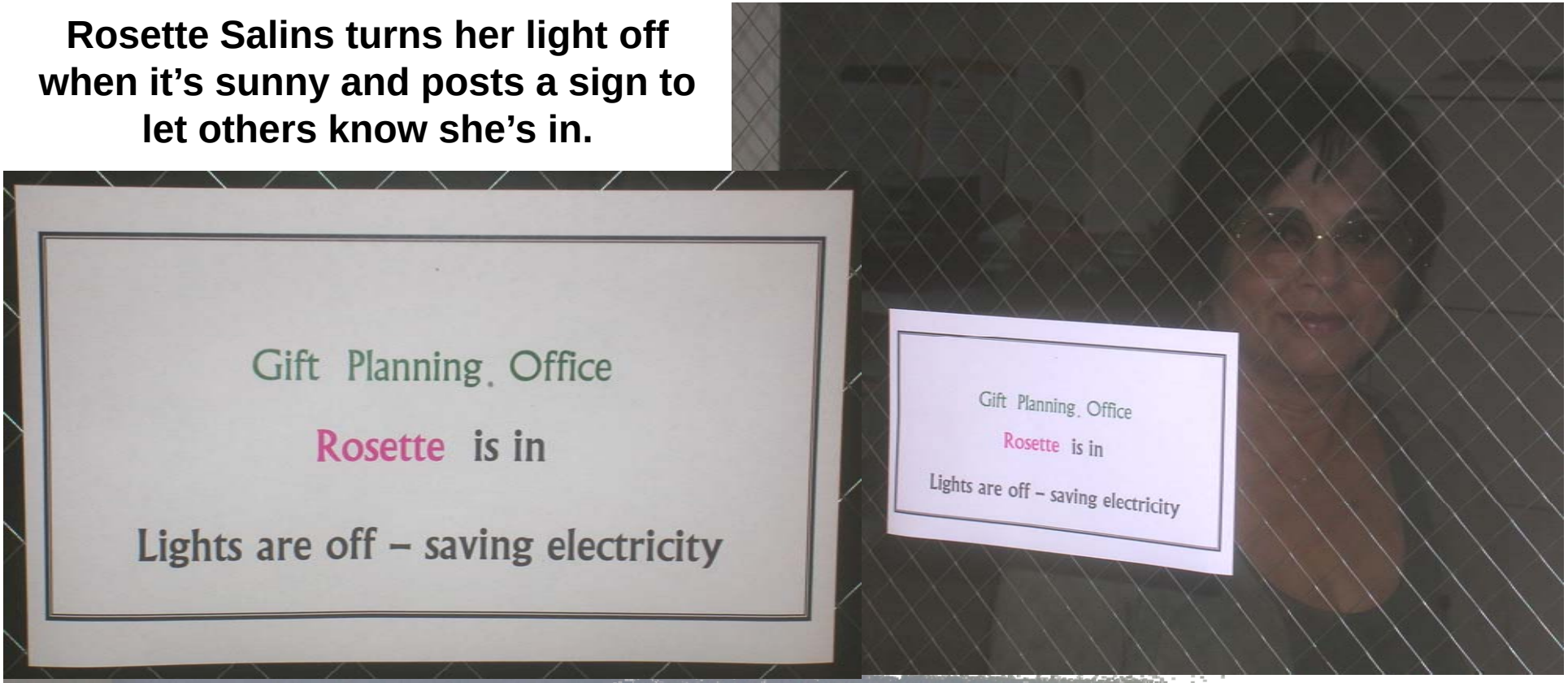
- **Use low flow fixtures**
- **Use solar hot water heating systems**
- **Avoid thermal storage heating for low demand Academic Buildings**

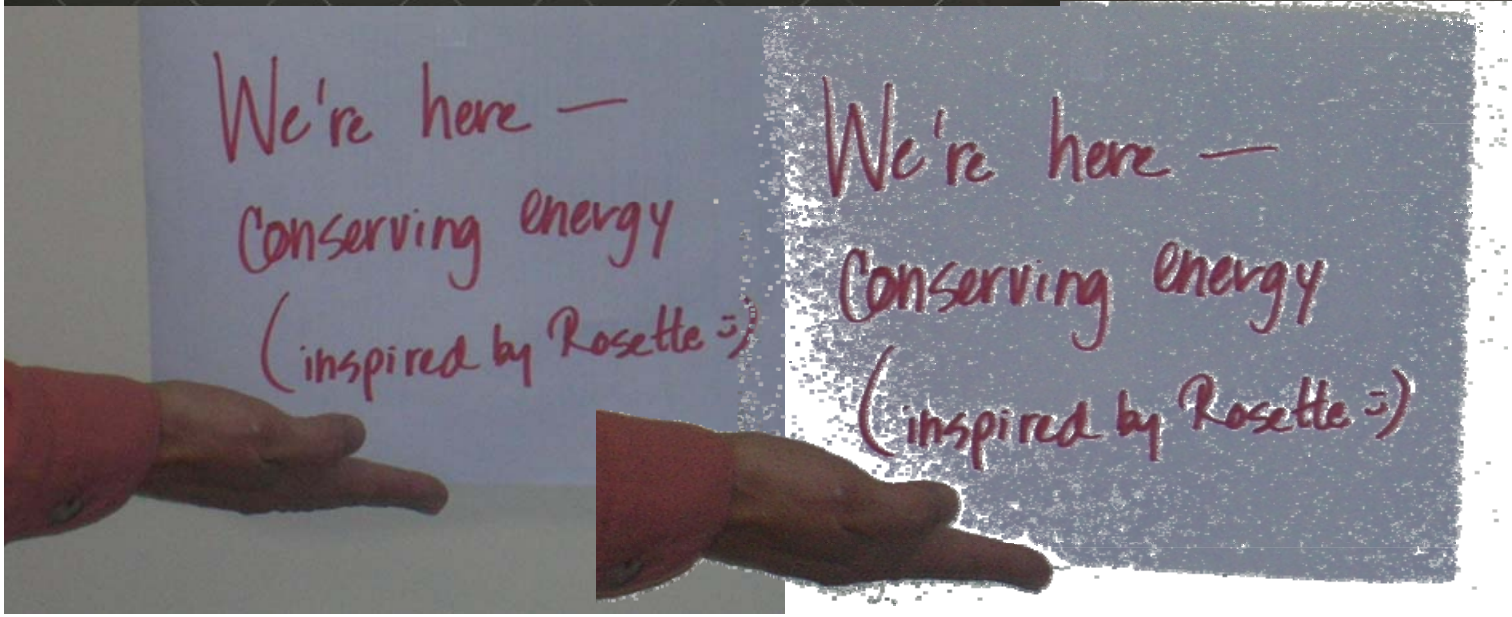


Campus copy machines save energy by going into sleep-mode when they're not being used.


Rita Fox keeps her thermostat set at 68 degrees in the winter. Sometimes it varies a couple of degrees, but it’s always near 68.

Rosette Salins turns her light off when it's sunny and posts a sign to let others know she's in.





She's also inspired co-workers in College Relations to do the same!

IS&S disconnected 2 of 3 fluorescent bulbs in most light fixtures in their Bruce-Trades offices, which still provide adequate light for working. They also created a policy for employees to turn off lights in their workspaces when they leave.

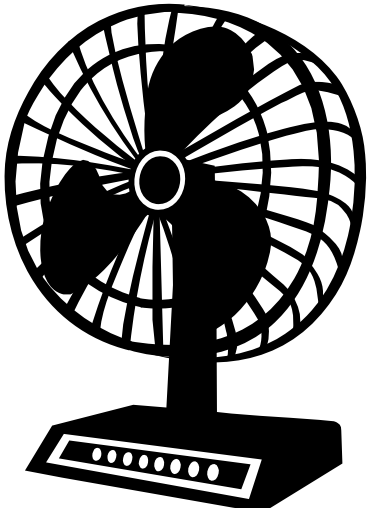
Joe Wilkie is working with Jim Dontje and students on a project to use biofuel in campus grounds equipment.


Facilities Management replaced 13
gas vehicles with 14 electric carts.

Public Safety has set up several solar emergency phones around campus.

Energy Conservation

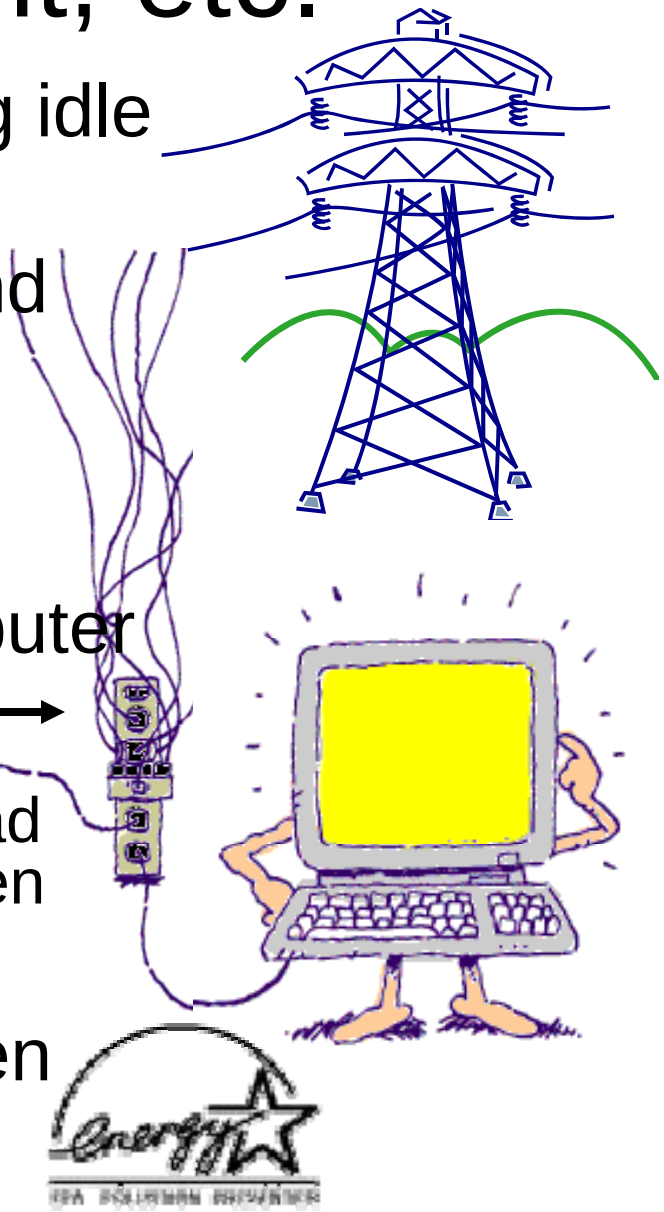
- Office Equipment
  - 16% of office energy use



- Heating/cooling
  - 39% of office energy use

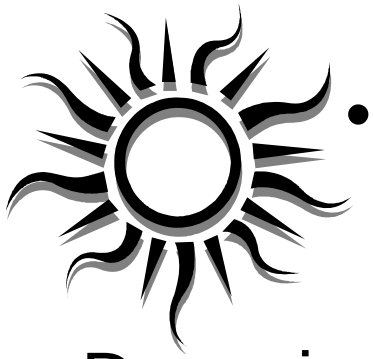
Office Equipment, etc.

- Set computers to “sleep” during idle periods
- Turn off monitors, speakers, and printers every day
- Plug complete workstation equipment into a power strip & simply turn it off once the computer has shut down
  - Also eliminates the “phantom” load that continues drawing power even when equipment is turned off
- Look for ENERGY STAR® when purchasing new equipment



Heating/Cooling Conservation

- Set thermostat no higher than 68 degrees
- Dress in layers to add & remove as necessary
- Lock windows, but open shades to let in sunlight
- Use a lounge throw over shoulders and/or laps
- Take regular stretching/ moving breaks
- Drink something hot!



- Set thermostat no lower than 78 degrees
- Dress in layers to add & remove as necessary
- Close blinds to block direct sun
- Use ceiling fans and/or small oscillating fans
- Open windows for breezes if/when possible
- Drink plenty of water!

Campus Office Energy Use

Office Equipment/ Appliance	Energy Use (kilowatt hours) Turned *ON*	Energy Use (kilowatt hours) Turned *OFF*	Total Number on Campus	Total Energy Used Each Day (Average)
Laptop Computer	0.18 *(6)*	0.06 *(18)*	2544	610 kWhr
Desktop Computer	1.08 *(8)*	0.016 *(16)*	728	902 kWhr
Printer	0.144 kWhr *(8)*	0.016 kWhr *(16)*	271	43 kWhrs
Space Heater	1.2 (1)	____	??	??

Note: 1 kilowatt hour (kWhr) is approximately equal to burning one pound of coal.