

# **Campus Resource Conservation Program**

**Progress Report  
Since September 2002**

# Potable Water Conservation Results

- Total Campus Usage- 370,605,000 gallons (FY 02-03)
- Total Campus Usage- 326,436,000 gallons (FY 03-04)
- 11.92% Decrease in usage
- 13.9% Decrease in usage per square ft.
- Cost avoided = \$176,674
  
- Total Campus Usage- 326,436,000 gallons (FY 03-04)
- Total Campus Usage- 262,293,000 gallons (FY 04-05)
- 19.64% Decrease in usage
- 19.64% Decrease in usage per square ft.
- Cost avoided = \$256,572
  
- Total Campus Usage- 262,293,000 gallons (FY 04-05)
- Total Campus Usage- 299,012,000 gallons (FY 05-06)
- 14.00% Increase in usage
- 15.16% Decrease in usage per square ft.
- Cost avoided = \$213,675

# Energy Conservation Results

- Total Campus Usage-120,662,203 kWh (FY 02-03)
- Total Campus Usage- 122,073,342 kWh (FY 03-04)
- 1.17% Increase in usage
- 0.90% Decrease in usage per square ft.
- Cost avoided = \$154,270
  
- Total Campus Usage- 122,073,342 kWh (FY 03-04)
- Total Campus Usage- 116,392,110 kWh (FY 04-05)
- 4.65% Decrease in usage
- 4.65% Decrease in usage per square ft.
- Cost avoided = \$670,385
  
- Total Campus Usage- 116,392,110 kWh (FY 04-05)
- Total Campus Usage- 118,087,299 kWh (FY 05-06)
- 1.46% Increase in usage
- 5.62% Decrease in usage per square ft.
- Cost avoided = \$962,502

# Converting Campus Restrooms to Low Water Flow Fixtures

- Completed Engineering center, Porter, Muenzinger, Ekeley and Chemistry buildings successfully.
- Using commercially available Retro-fit kit.
- Will start conversion to low flow fixtures at Duane and Norlin next.
- Water free urinals have been installed in MRS, new Wolf Law, and ATLAS buildings.

# Water Conservation Projects

- Research building system (RBS) has funded this water conservation project for Joint Institute for Laboratory Astrophysics (JILA). Will use process chilled water in closed-loop piping to cool laser generators.
  1. Conserves ~25-million gallons/year
  2. Saves \$100,000/year
  3. Cost ~\$215,000
  4. Implemented: November 2004

# Water Conservation Projects

- Replaced water-driven aspirators in Cristol Chemistry with lab vacuum pumps
  1. Completed July 2003
  2. Conserves 10-million gallons/year
  3. Cost ~\$75,000
  4. Savings ~\$40,000/year
  
- Installed temperature sensor and control valves on two furnaces (electrical eng. Integrated Circuit Fabrication shop) and was able to reduce the water flow from 100gph to 20gph.
  1. Conserves 1.4 million gallons/year
  2. Cost ~\$3200
  3. Savings \$5600/year
  
- Continue evaluating water conservation opportunities during building audit and tips through conservation hotline.

# Resource Conservation Projects

- Working with Pepsi to establish an energy conservation roadmap for 200 campus vending machines (vending machine programming capability/ machines upgrade).
  - Newer vending machines (50 machines) have been programmed according to buildings schedule.
  - Timers have been added to older machines.
  - A special sticker will be installed to vending machines that are programmed for energy conservation.
  - Savings: ~ 400,000kWh, \$22,000 and 530,000 lbs CO<sub>2</sub> per year.



# Resource Conservation Projects

- Office/Classroom occupancy study and motion sensor application for lighting
  - Results favor large classroom and conference room application over offices
  - Occupancy sensor for Henderson Museum was implemented in September 2003
  - Occupancy sensor for Environmental Design Studios was implemented in December 2003
  - Occupancy sensors were added in seven electrical engineering labs in spring 2004.
  - Occupancy sensors were added for Imig. Music main conf. Rm. In spring 2004.
  - More applications under review.
  - Occupancy sensors were installed at Duane Physics main lobby (spring 2006)
  - Occupancy sensors are used to control lighting throughout new Law and ATLAS buildings
  - Nominations are accepted for large classrooms/spaces for lighting control.

# Education and Awareness Campaign

## Buff Energy Star Award Program/\$1000 Cash Bonus for Building Proctor

- The Buff Energy Star Award seeks to showcase and recognize the Proctor & occupants of buildings that help the environment and the university budget by conservation.
- Fall 2004 (pilot phase).
- Selection Criteria for FY 05-06
  - Building must reduce energy use by at least 5% per ft<sup>2</sup>.
  - Presence of posters and educational materials in the building.
  - Building proctor must complete an energy audit with CECO.
  - Action in support of Audit findings by building proctor.
  - Building proctor must take active role in communicating and encouraging building occupants to conserve resources.

# Education and Awareness Campaign (contd.)

- 2004 Buff Energy Star Winners are: Fiske, Ketchum, Regent, Muenzinger, and UMC.
- Nomination Process: Building occupants may nominate Proctors and Proctors may also self nominate.
- Will publish our FY 05-06 Buff Energy Star winners next month.

# Nightly Campus Conservation Tour

- Random selection of buildings for nightly tour.
- Focused on discovering conservation opportunities and reporting energy waste.
- Turn Unused Lights off.
- Leave instruction on how to power manage desktop computers (sleep mode).
- Report issues with building Heating/Cooling.

# Recent Initiatives

## Ice/Snow Melt

- Significant energy conservation opportunity through dual control of ice and snow melt using heat tapes (Currently activated by low outside temperature. Dual control system require presence of both moisture & low temperature for activation). The new dual control system was implemented at Old Main (Jan. 2005) and Business school (Dec. 2005)
- Applying the same control technology to the following buildings; Benson, Muenzinger, Porter, Ekeley, Chemistry, and NPL

# Recent Initiatives

## ■ Micro Turbine Energy Production

- Completed implementation of highly efficient 30kW micro turbine at Student Recreation Center swimming pool.
- Micro turbine has been donated by Colorado Governor Office of Energy Management.
- Very low emission
- Highly efficient when used in Combined Heat and Power (CHP) mode.
- Operational as of November 2004 and continue to perform very well.

# Recent Initiatives

- Building Re-commissioning
  
- Expand/Optimize Building Automation Systems, BAS (Andover)
  - Programming optimization & changes.
  - Recommission associated hardware (mechanical controls, thermostats, pressure sensor, actuators, air dampers). Adjust or replace faulty hardware.
  - Review and act on building proctor & occupant's feedback to improve comfort & energy conservation.
  - Weekly status review. Act on suggestions to improve comfort and conservation with input from recommissioning team members.
  - Implement agreed upon building schedule, Night Set Back & Smart Start Programs.
  - Significant reduction of trouble calls/tickets.
  - Average 3-5% energy savings per building, post re-commissioning.

# Recent Initiatives

- Completed buildings show energy usage reduction, improved comfort, and reduction of trouble calls

ARCE  
Armory  
Benson Arts & Sc  
Business  
Cristol Chem.  
CASA  
DLC  
Economics  
Hale  
Humanities  
Engineering center  
Engineering Chemical Wing  
Engineering Civil & Env  
Engineering Classroom Wng  
Imig. Music

Engineering Computer Sc. Dept.  
Engineering Electrical Wng.  
Engineering Mechanical Wng.  
Engineering north tower  
Engineering office tower  
Engineering south tower  
Engineering stores & labs  
Museum Collections  
Norlin Library  
NPL  
IBS1  
IBS2  
IBS3  
IBS4  
Fleming Law

IBS5  
IBS6  
IBS7  
IBS8  
ITLL  
RL1  
Muenzinger  
Ekeley Sc Bld  
Engineering Admin  
Engineering Aerospace  
Ramaley  
Speech & Language  
University Theater  
Woodbury Arts & Sc.  
EH&S

Regent  
ENVD  
Mathematics  
LSTR  
Clare small  
Stadium  
Rec. center

Total: 43 GF Buildings

Recharge Buildings:  
Police and Parking  
RL2  
Wardenburg Student Health

Total: 4 Recharge Buildings

# Recent Initiatives

- **Buildings' systems currently being Re-commissioned**

Dalward

MCDB

Carlson gym

Continuing education

Hellems

Education

- **Re-commissioning work will start in the following buildings:**

Ketchum

Fiske Plnt.

Computing Center

Guggenheim

\*Denison Arts & Sc.

\*Old Main

RL 4

Macky Auditorium

Duane Physics

\* By CU Staff

- **Will focus on Tools/Technologies for data crunching from BAS, trend analysis and discovery of inefficient HVAC operations.**

# Recent Initiatives

## ■ Steam Traps Managements

- Systematic inspection process to detect faulty steam traps
- Replaced all 194 high pressure steam traps with new technology traps with failure indicator, “trap alert” December 2004.
- Will Focus on medium and low pressure steam traps
- Installed smart master steam valve for buildings. Regulating steam flow to buildings based on out door temperature.
- Buildings with Smart master steam valves (completed fall 2005)  
Hellems, McKenna, Old main, Ketchum and ENVD
- Next phase of Smart steam valve (will complete fall 2006)  
Alumni, Carriage house, Guggenheim and Henderson

# Recent Initiatives

- All 50 campus boilers were Re-commissioned during Feb. & March 2005.
- Boiler Re-commissioning project focused on testing safety features, testing all hardware, adjusting combustion settings and improve efficiency.
- Improved fuel efficiency (natural gas) and fewer customer complaints.

# Leadership in Energy and Environmental Design (LEED)

- Student and campus leadership have decided to apply LEED sustainable design principles to new building construction.
- New law & ATLAS building design have been updated for LEED principles (site, water, energy, materials and indoor air quality) with Goal of Silver or better rating.
- Through extensive design reviews and pragmatic approach to LEED elective points, we expect enough points for strong LEED Silver rating (pending USGBC review & approval). Will submit final documentation package to USGBC in Sept. 2006.
- Campus design & construction standards have been updated in support of LEED Silver rating.

# Weather Strip Older Building Windows to Conserve Energy & Improve Comfort

- RL-1, Imig Music, Theater, Henderson, Norlin, Economics completed in 2005/2006
- Weather stripping will start on continuing education windows.
- A special sticker is being applied to common area windows to remind occupants to close windows.



# Long-Term Initiatives (2006-2007)

- Make building occupants aware of
  - Relationship of budget to energy usage
  - Energy cost data (per building) was recently added to Conservation website.
  
- Explore renewable energy/alternative energy for selected campus applications
  - Solar, Wind, Biomass, Micro turbine, Fuel Cell
  - Take advantage of amendment 37 and tax credit to cost justify large scale PV project on campus.

# Long Term Initiatives

- Academic/ Research Labs are 5-10 times more energy intense than offices and classrooms.
  - Bench mark lab fume hoods operation and lab air changes (maintain safety).
  - Apply Labs 21 principles for new labs construction.
  - Labs equipment power management/ sleep mode (Autoclaves, sterilizers)
  - Economical replacement/ consolidation of older, high energy usage equipment (freezers, refrigerators).
  - Labs energy audits and conservation tips are posted at conservation website.

# Infrared Technology Aids Campus Conservation

- An infrared camera mounted on the side of the helicopter flew about 200 feet overhead the entire campus. Images of all campus building structures were taken.
- The camera scans walls and rooftops to identify areas that are losing energy. To assess energy efficiency and to locate moisture leaks in the rooftops
- Four hours of Infrared footage was superimposed on campus building drawings to pinpoint areas that need attention.
- fix trouble spots before they develop into bigger problems
- The camera identified approximately 50 buildings with potential roof problems



# Campus Resource Conservation Program

See energy waste at CU-Boulder?

Call (303) 735-6202

or hotmail: [energyconservationhotline@fm.colorado.edu](mailto:energyconservationhotline@fm.colorado.edu)



Water waste?

Call (303) 735-6202

Or Repair – (303) 492-5522



Too Bright? Go to <http://fm.colorado.edu> – click on “Delamp Request”

Or Call (303) 735-6202

Or for Repair – (303) 492-5522