

GIVING UNIVERSITY OF COLORADO-BOULDER LABS MONEY TO BE MORE ENERGY-EFFICIENT! HOW IS THAT POSSIBLE?!

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I²SL CONFERENCE 2016

LEARNING OBJECTIVES

- Understand the process that allows CU Green Labs to obtain dollar incentives from Facilities Management to offer to labs
- Learn how CU Green Labs meters a variety of equipment to get energy consumption data
- Learn about specific examples of incentives given to CU Boulder labs
- How incentives raise awareness in labs and help promote energy conservation

BACKGROUND

- Work with labs on a case by case basis in order to receive dollar incentives from Facilities Management for:
 - Energy savings
 - Water savings



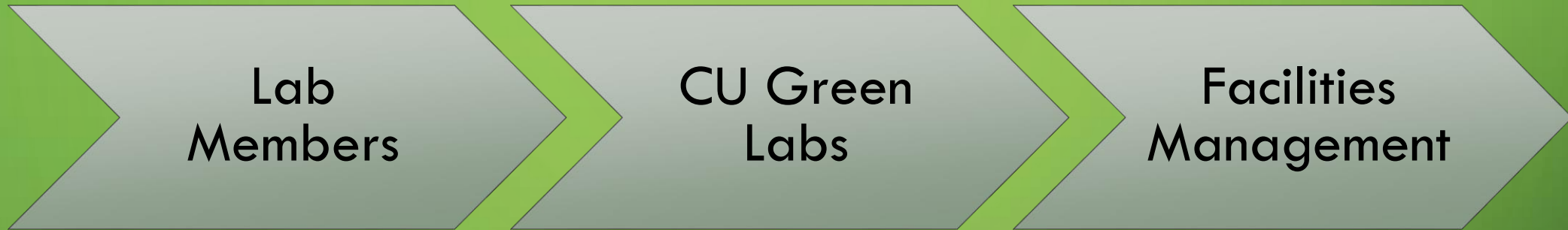
ENERGY SAVINGS

- Purchasing energy efficient lab equipment
- Covering disposal costs for lab equipment being retired without replacement
- Piloting Room Temperature Sample Storage (RTSS)

WATER SAVINGS

- Purchasing water efficient equipment
- Replacing the use of faucet aspirators with a vacuum pump
- Replacing water cooled condensers with waterless condensers
- Installing free low flow aerators for lab faucets

COLLABORATION IS KEY



- Identifying the opportunity for energy or water savings
- Metering equipment or contacting manufacturers to determine the energy consumption
- Calculate the energy savings possible
- Connect with Facilities Management

INCENTIVES

- Facilities Management offers financial incentives through CU Green Labs typically *equivalent to five years of electrical or water savings*
- Amount determined by comparing the consumption of the efficient product to existing equipment
- Help offset a larger upfront cost
- Actions that labs are willing to take are also considered

METERING

- Database created to compare:
 - Consumption
 - Unit performance
- Helps with incentives calculation
- Common equipment metered:
 - ULT Freezers
 - Lab grade freezers
 - Chromatography refrigerators
 - Low Temp Incubators
 - Drying Ovens
 - Biosafety cabinets
- Awareness → Industry response



ULT FREEZER EXAMPLE

- Fleshner Lab in Integrative Physiology Dept
- \$3,670 incentive for an annual savings of ~6,970 kWh

Inefficient ULT
Freezer:
25.4 kWh/day



Stirling ULT
Freezer:
6.3 kWh/day

≈0.7x



REFRIGERATOR EXAMPLE

- Fierer Lab in Ecology and Evolutionary Biology Dept
- \$400 incentive for an annual savings of $\sim 1,420$ kWh

Inefficient
refrigerator:
 5.9 kWh/day



Energy Star
refrigerator:
 $\sim 2 \text{ kWh/day}$

$\approx 0.15x$



BIOSAFETY CABINET EXAMPLE

- Neu Lab in Mechanical Engineering Dept
- \$1,075 incentive
- Purchased an energy-efficient biosafety cabinet as their lab was being established
- Have committed to turning the unit off at night and weekends while keeping the sash lowered between uses

ENVIRONMENTAL CHAMBER EXAMPLE

- McKnight Lab in the Institute of Arctic and Alpine Research (INSTAAR)
- \$3,252 incentive for an annual savings of $\sim 8,030$ kWh

Inefficient
environmental
chamber:
 33.2 kWh/day



New environmental
chamber:
 $\sim 11.2 \text{ kWh/day}$

$\approx 0.8x$



FREEZER EXAMPLE

- Johnson Lab in the Institute for Behavioral Genetics
- FREE -20 °C Energy Star Freezer replaced highly consumptive ULT Freezer
- From ~15-23 kWh/day to ~2 kWh/day (conservatively saving 4,745 kWh annually)

≈0.5x



RECIRCULATING ASPIRATOR EXAMPLE

- Wuttke Lab in Biochemistry Dept
- \$266 incentive
- Savings of 17,591 kWh over five years (\$1,454 in electricity savings)

Chiller &
vacuum pump:
10 kWh/day



Recirculating
aspirator:
< 4.5 kWh/day

$\approx 0.37 \times$



DRYING OVEN EXAMPLE

- Jimenez Lab in the Chemistry & Biochemistry Dept
- \$1,000 incentive
- Purchased as a new piece of equipment
- Uses 5.04 kWh/day compared to an average of 8.75 kWh/day for the drying ovens on the rest of campus
- Comes with a timer that is set to turn off the oven overnight and during weekends

DISPOSAL EXAMPLE

- Environmental Engineering Dept
- \$340 incentive to dispose of three refrigerator/freezer combos and one refrigerated incubator
- Retired without replacement during the department move

MEMBRANE VACUUM PUMP EXAMPLE

- Vaida Lab in Chemistry Dept
- 66,000 gallons of water saved annually (equivalent to \$452 per year)

Water
aspirator



Oil-free
membrane
vacuum pump

WATERLESS CONDENSER EXAMPLE

- Weber Lab in the Joint Institute for Laboratory Astrophysics (JILA)
- Water condensers use 158 gallons of water per hour (at 0.66 gpm) while waterless condenser options use none at all

**Water
condenser**



**Waterless
condenser**

WHY DO WE DO THIS?

- Conservation in labs
- Tool of engagement
- Raises awareness
- Gives lab members a push to be more efficient
- Win-win situation!

CU Green Labs/Facilities Management resource conservation funds contributed to the purchase of this equipment!



**Make your
research dollars
go further!**

**Contact Green
Labs for \$\$\$
incentives**

For more info visit:
ecenter.colorado.edu/greenlabs/incentives

CUMULATIVE IMPACT 2009-2015

- 770,000 kWh in electricity savings per year!
- \$65,500 per year saved plus more than ~\$50,000 per year in heating and cooling savings

$\approx 80\times$



QUESTIONS?

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