



UNIVERSITY OF
MARYLAND

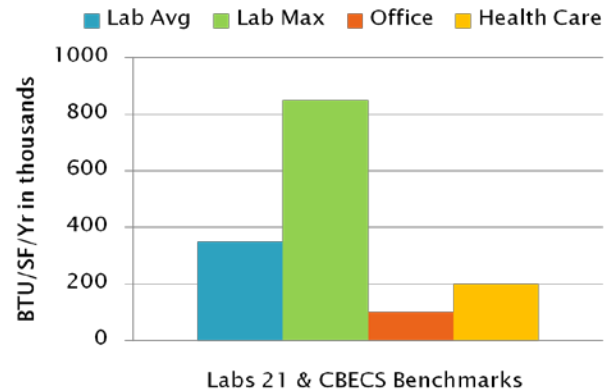
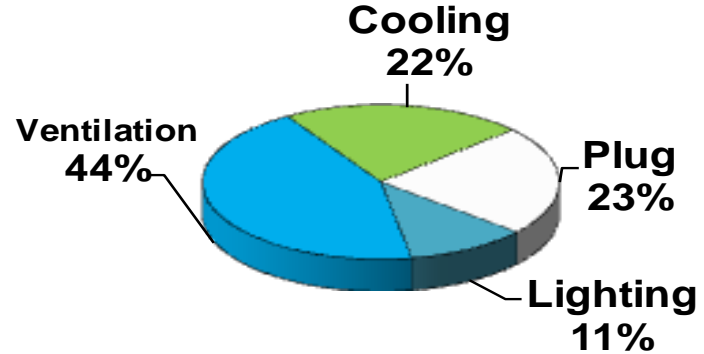
INSTITUTE FOR BIOSCIENCE AND BIOTECHNOLOGY RESEARCH

SIEMENS

Successful Energy Conservation Projects at
University Research Labs

Lab Energy Consumption

Laboratory facilities typically have energy costs that are 3 to 8 times greater than office buildings.



IBBR Process to Evaluate Potential Energy Consumption Reduction Measures

- Identify project requirements (what we need to do and why)
 - Will the project:
 - Improve operational efficiency and reliability?
 - Reduce operational cost and deliver the best payback on the investment?
 - Improve lab/workspace environment?
- Identify impact on labs and occupants (+/-)
 - Will the project:
 - Pose safety risks to contractors and/or lab staff?
 - Impact lab related activities and production?
 - Require special coordination, safety practices, or communication protocols?
- Evaluate the impact on IBBR's Image

Implementation Strategy

- Frame basic scope of work
- Identify and **Engage** stake holders in planning and scheduling
- Identify funding mechanism(s) and procure services
- Communicate the plan to stakeholders
- Monitor, Evaluate and Revise the plan as the situation requires
- Provide what you promise, communicate what you can't
- Obtain stake holder buy in on job completion
- Make adjustments if necessary



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Discussion of Energy Projects at IBBR

Lab and Office lighting retrofit
Lab Ventilation Savings



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Lighting Retrofit



Lighting Retrofit Objective

To optimize fixture spacing in lab spaces to provide an average illuminance on the desktop/bench top of 50 foot candles and 10-20 foot candles on non-working surfaces. In so doing we intended to reduce total lighting consumption by 50%.

Concerns & Strategies

- Safety (workers/researchers/research)
- Respect of work area
- Light levels and effect on working conditions
- Routine communication blasts (early & often)
- Actively engage labs before/during/after lighting change
- Feedback and follow up

Lighting Retrofit Overview

IBBR Building 1

| Number of Fixtures Existing | kW per Space | Annual KWh per Space | Number of Fixtures/ Lamps/ Doors | kW per Space | Peak kW Savings | Annual kWh Savings | Annual Natural Gas Use per Space (therms) | Total Incentive Amount |
|-----------------------------|--------------|----------------------|----------------------------------|--------------|-----------------|--------------------|---|------------------------|
| 1,086 | 58.241 | 584,587 | 590 | 27.153 | 31.910 | 319,917 | -2,061 | \$16,200 |

IBBR Building 2

| Number of Fixtures Existing | kW per Space | Annual KWh per Space | Number of Fixtures to Replace | kW per Space | Peak kW Savings | Annual kWh Savings | Annual Natural Gas Use per Space (therms) | Total Incentive Amount |
|-----------------------------|--------------|----------------------|-------------------------------|--------------|-----------------|--------------------|---|------------------------|
| 2,037 | 94.988 | 906,086 | 1,279 | 47.677 | 52.314 | 510,567 | -3,319 | \$35,125 |

Letters

Hi, all~

I just wanted to say thank you to you and to the lighting people for the light replacement and for how it was handled. I can't speak for Everyone, but I think the lights look great! And I really appreciate how clean the lab and office areas were kept...granted, I still wiped down the benches and some of the equipment and replaced bench paper, but that's because cleaning my bench is like Christmas morning to me :D (I'm not really joking about that, sad as that may seem!).

Thanks again~
Andrea

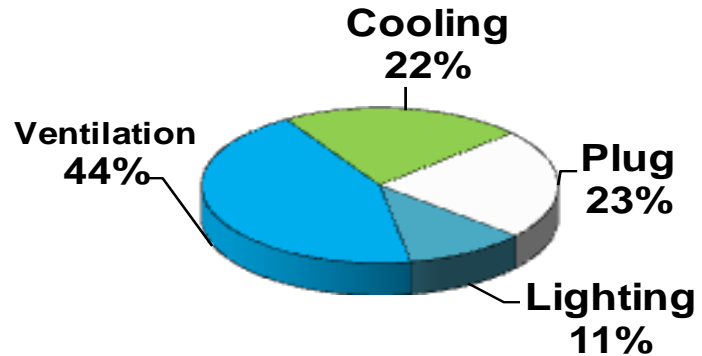
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Lab Ventilation Savings

2/3 of energy use in a laboratory is associated with ventilation.

(Data shown is the annual electricity use in the Louis Stokes Laboratory, National Institute of Health, Bethesda, MD)



Objective

To reduce the ventilation rate of the labs and thus the amount of energy consumed to ventilate the labs. In so doing we intended to reduce total building energy consumption by 25%.

Concerns & Strategies

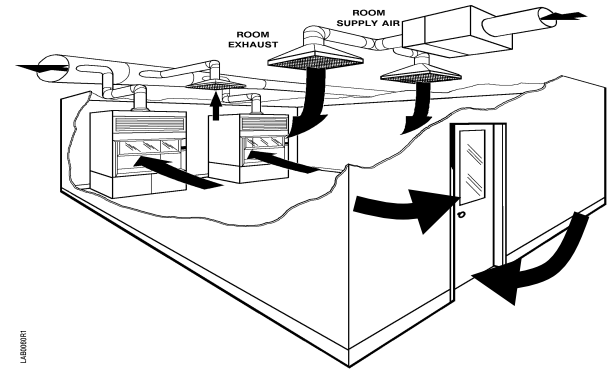
- Safety
- Build up of odors and/or toxins
- Unsafe environmental conditions

- Engage Safety personnel early
- Engage lab personnel before, during and after lab is converted
- Communicate plan to faculty/staff early and often
- Monitor and report (visibility)

The Lab Control System Has A Critical Safety Role

Plays a part in worker safety, research integrity, and compliance with regulations

- Provide air for adequate primary containment exhaust (FH, BCS)
- Maintain proper face velocity for fume containment
- Provide Adequate room ventilation (ACH)
- Avoid loss of containment overall
- Plus:
 - Condition supply air to maintain required room ambient conditions
 - Energy efficient applications as appropriate



LABOR

Aircuity Advisor™ Aircuity
University of Maryland - IBBR Building 2

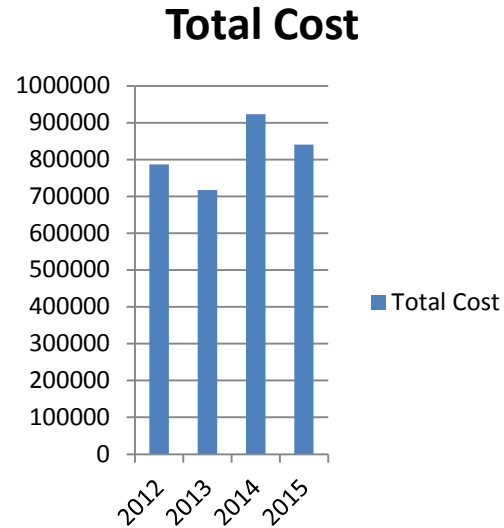
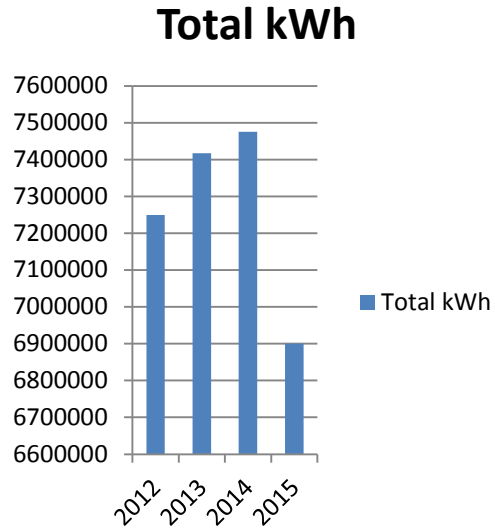


Summary Date: Monday, September 12, 2016 5:00:01 AM

Weekly Report: Sunday, September 4, 2016 - Saturday, September 10, 2016

| Floors AHUs | IEQ Performance | | | | | | Comfort | | | | | | Ventilation | | | | |
|-------------------------------|--------------------------|-------------------------------------|--------------------------|----------------|----------------------------------|-------------------------------------|-------------------------------|------------------------|------------------------|--------------------------|------------------------|------------------------|---------------------------------|--|----------------------------------|-------------------------------|----------------------------|
| | PID TVOC Levels (ppm) | | MOS TVOC Levels (ppm) | | PM2.5 Particle Levels(Kpcf) | | Temperature (°F) | | | Relative Humidity (%) | | | Total Measured Flow (cfm) | | Differential CO2 Levels (ppm) | | |
| | Average | Extreme Max | Average | Extreme Max | Average | Extreme Max | Average | 90th Percentil e | 10th Percentil e | Average | 90th Percentil e | 10th Percentil e | Total Measure d Flow | Comparis on To Last Period | Average | 90th Percentil e | 10th Percentile |
| CARB2_A HU1-5 | .20 | 2.40 | .00 | .90 | 508.72 | 1873.02 | 73.50 | no data | no data | 51.70 | no data | no data | 21204.30 | down by .10% | 15.90 | 37.70 | -9.63 |
| Most Affected Locations | | ROOM 3124 DUCT PROBE #1 | | | | ROOM 2124 DUCT PROBE #2 | ROOM 1216 DUCT PROBE | | | | | | | | ROOM 1125 DUCT PROBE | ROOM 1128 DUCT PROBE | ROOM 1125 DUCT PROBE |

IBBR Energy Consumption 2012-15



Future Green Initiatives at IBBR

- Solar Array (Parking Lots and Roof)
- Exterior lighting
- Bio-Diesel Conversion of 1.3 MW Gen Set
- Building 1 Chiller Plant Upgrade

