Keeping the $6 Million We’ve Saved: UCSD's Data-Driven Persistent Commissioning Program

Presented by Anna Levitt, Assistant Energy Manager at UC San Diego & Grace Junge, Project Engineer at EnerNOC
Investment in Energy Efficiency

Funded by utility incentives and a low interest revenue bond

In five years, UCSD has completed more than $54M of projects, & received $10M in incentives

Program is yielding $6.5M in avoided annual energy costs

More than $47M more are in progress

Graph showing annual savings and 15-year debt service for the years 2010 to 2015, with projected data for 2015 and a total from 2010 to 2015.
Energy Efficiency Program Breakdown

by Savings:
- Lab HVAC Retrofits: 42%
- MBCx: 25%
- Central Plant Retrofits: 12%
- Non-Lab HVAC Retrofits: 8%
- Plug Loads & Other: 3%
- Lighting: 8%
- Data Center: 2%

by Cost:
- Lab HVAC Retrofits: 60%
- MBCx: 18%
- Central Plant Retrofits: 6%
- Plug Loads & Other: 3%
- Lighting: 7%
- Data Center: 1%
- Non-Lab HVAC Retrofits: 5%
- Non-Lab HVAC Retrofits: 5%

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What happens the days & years after we receive the giant check?
Why Continuous Commissioning?

- It is well known that savings degrade
  - Control strategies are disabled
  - Components fail

- But how much?
  - Texas A&M Study on 10 Buildings found degradation of 6% per year for four years after RCx
  - UCSD has seen similar results

(Source: Pike Research)
The Reality - Post-MBCx Project Energy Drift at Geisel Library

Primary Cause
Overridden cold deck supply air temperature reset on one of largest air handlers in the building

Primary Cause
Leaking hot water valve on one of largest air handlers in the building
The Reality - Post-MBCx Project Energy Drift at Pacific Hall

Primary Cause
Overridden cold deck supply air temperature resets and leaking chilled water valves.

Primary Cause
Air handler supply fan left running in hand.
Addressing Drift and Maintaining Savings

1) Methodical monitoring of system health, using automatic fault detection software and bulk data analytics to identify sources of drift.

Automated Fault Detection

Bulk Zone Analysis
Addressing Drift and Maintaining Savings

2) Software platform to manage workflow for energy savings measures and prioritize measures for implementation based on savings values

| Measure Tracking and Workflow Management |
Addressing Drift and Maintaining Savings

3) Easily track achieved savings to show progress and justify expenditures for staffing, repairs, and upgrades.

Measure Tracking and Workflow Management
Addressing Drift and Maintaining Savings

4) Monitor real-time energy performance against weather and occupancy adjusted baseline
The Success – Realized Energy Savings

First UCSD Scorecard 7:30am
S2-N HHW valve is leaking by and heating air to 100°F when setpoint is only 70°F

$\sim$11:30 am
Matt Winklepleck re-calibrated the E/P controller and Anna Levitt released the SAT reset override. The unit immediately stops overheating the hot deck air and the fan speed has stayed at minimum position for the entire following week

Annual savings estimated at $17,304!
These savings do not count electrical savings which are present due to a decreased fan speed in Vigilent controls
The Success — Maintained Energy Savings

Staffing resourced to implement energy savings measures

Savings Achieved

Performance Summary

Performing 13% Under Baseline

Annual Savings of $10,632 Compared to Baseline at $8.33/MMBtu

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Ultimately It’s About People

• Technology is only as good as the people who use it

• UCSD will soon be hiring
  • Continuous Commissioning Engineer
  • Energy Analyst