

20  
19



**ANNUAL REPORT**

**ENERGY OFFICE, Facilities Services**





# Year in Review

The revitalized Energy Office (EO) tracks, monitors, and manages energy usage campus-wide to improve design, performance, and operation of buildings; reduce energy costs; and increase awareness of energy and water usage. Through monitoring the operations and maintenance of campus facilities, we work with the campus community to develop and implement projects that reduce electricity, steam, natural gas, and water consumption.

In 2019, the EO focused on two programs (LED lighting retrofit and Curtailment) and various low and no cost projects that totaled an estimated \$1,311,000 in avoided annual utility costs. These projects also improved system operation, occupant comfort, and ongoing maintenance needs. Special thanks to our 2019 interns, Jose De Casas and Tyler Onderdonk, for their contributions, insight, and analytic skills.

## Meet the Team



Bruce Chamberlain  
Energy Manager



Ahmed Hassani  
Energy Engineer



Kume Wolde  
Energy Engineer



Catherine Patton  
Energy Analyst

Connect with us at: [energyoffice@berkeley.edu](mailto:energyoffice@berkeley.edu)



# Project Snapshots

## LED Project - Tan Hall and Hildebrand Hall

The campus-wide LED conversion project is working through each building on campus, replacing end-of-life T8 fluorescent lighting with LED technology. In 2019, two large Chemistry lab buildings with complex, sensitive work spaces were completed. The new LED lighting has an expected lifetime of 70,000 hours!

Net Cost: \$434,335

Annual Savings: \$48,580

57

CARS OFF THE ROAD  
EACH YEAR



## VFD Installations

Installing Variable Frequency Drives (VFDs) on fans enables us to reduce energy usage by modulating fan speed to match the process requirements. The campus also benefits from a soft-start, quieter and cooler equipment operation, increased lifetime, and less ongoing maintenance. We also received PG&E rebates for each installation.

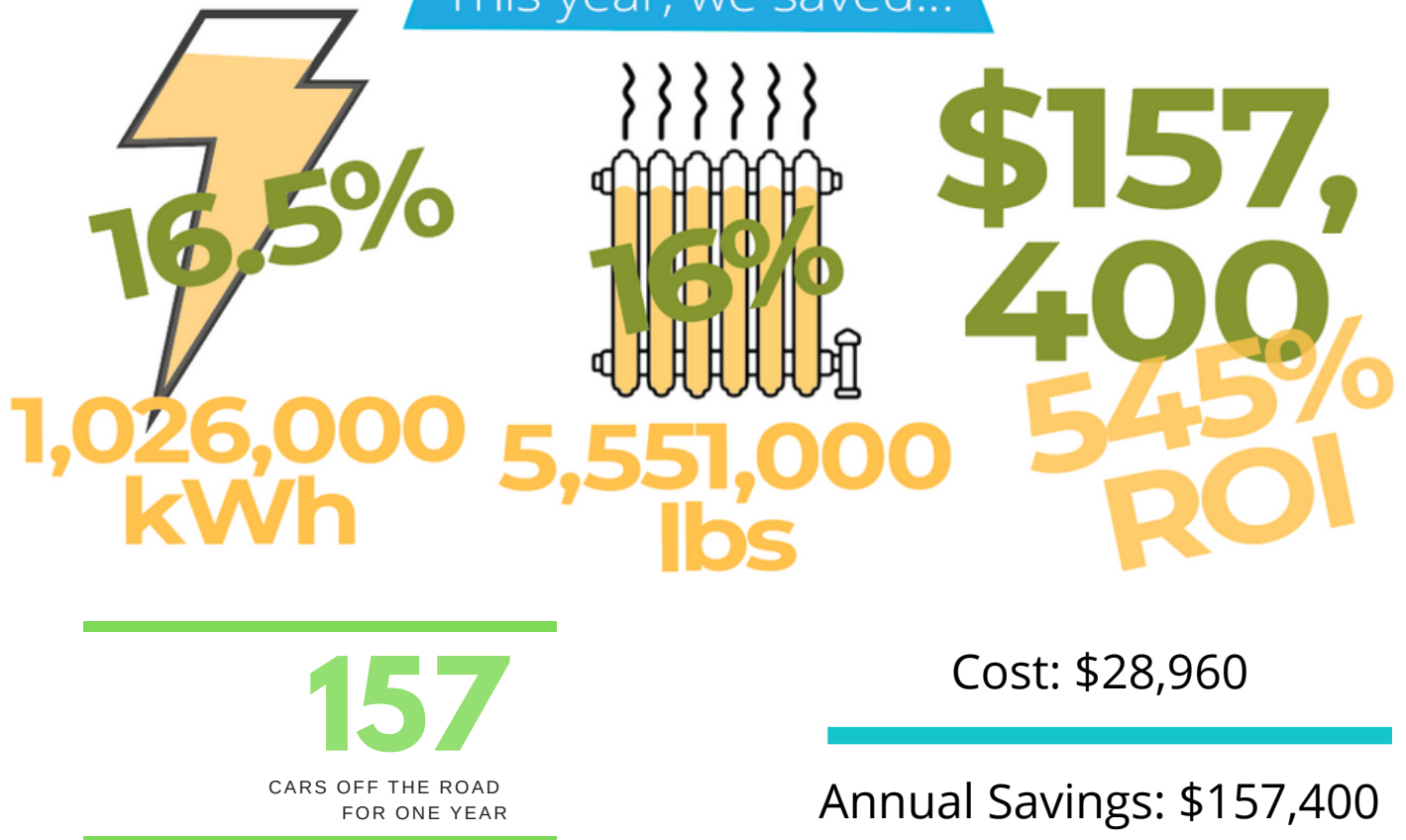
Cost: \$85,442

Annual Savings: \$157,847

# Curtailment

In 2019, the UC Berkeley Campus curtailed buildings over the winter holiday for 12 days, Dec 21st - Jan 1st. The EO worked with the Energy Management Services (EMS) group, stationary engineers, and the electric shop to curtail 60 buildings. We updated the process including being more stringent when granting exemptions. These improvements paid off and our savings increased substantially. In total, curtailment saved the campus 673 metric tons of carbon dioxide emissions.

This year, we saved...



# Retro-commissioning (RCx)

The goal of our RCx program is to implement permanent and/or automated operational improvements of equipment or systems that result in energy savings, including:

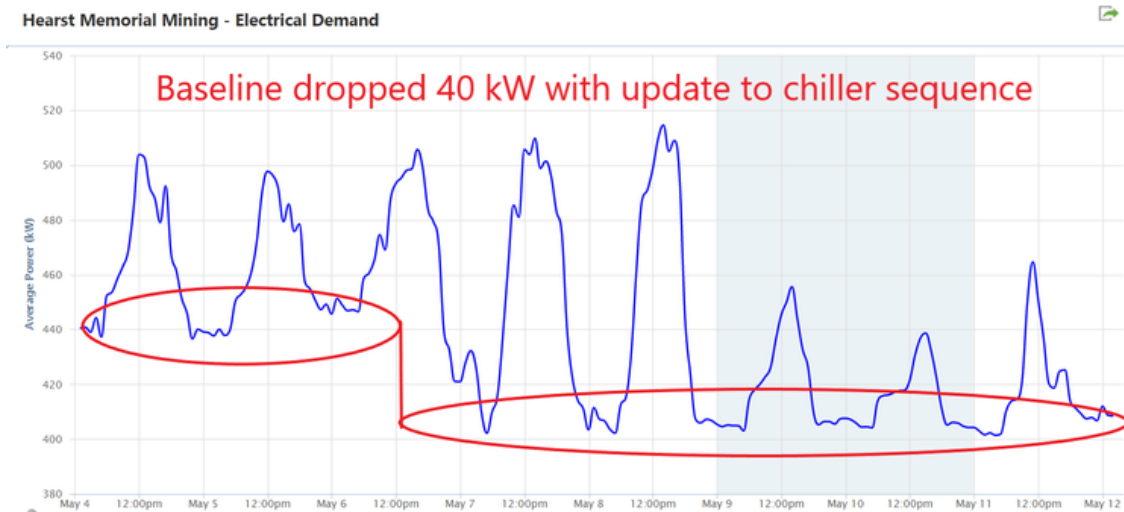
- Changes or adjustments in controls software (such as sequences of operation, setpoints, schedules)
- Optimizing operation of existing controls hardware (such as sensors, controllers, actuators, relays, variable frequency drives (VFDs))
- Installation of additional controls hardware that enables advanced sequences of operation to operate existing equipment more efficiently.

# Hearst Mining Chiller Sequencing RCx

The EO has been working with the EMS and HVAC teams to modify chillers' sequence of operation. At HMMB, the newest and most efficient chiller (CH-3) runs first before the two older chillers (CH-1 and CH-2). With this change, the same amount of cooling to the building will be delivered more efficiently. Also, less frequent downtime and reduced maintenance costs are expected because CH-3 is newer and easier to control.

Cost: \$1,073

Annual Savings: \$56,000

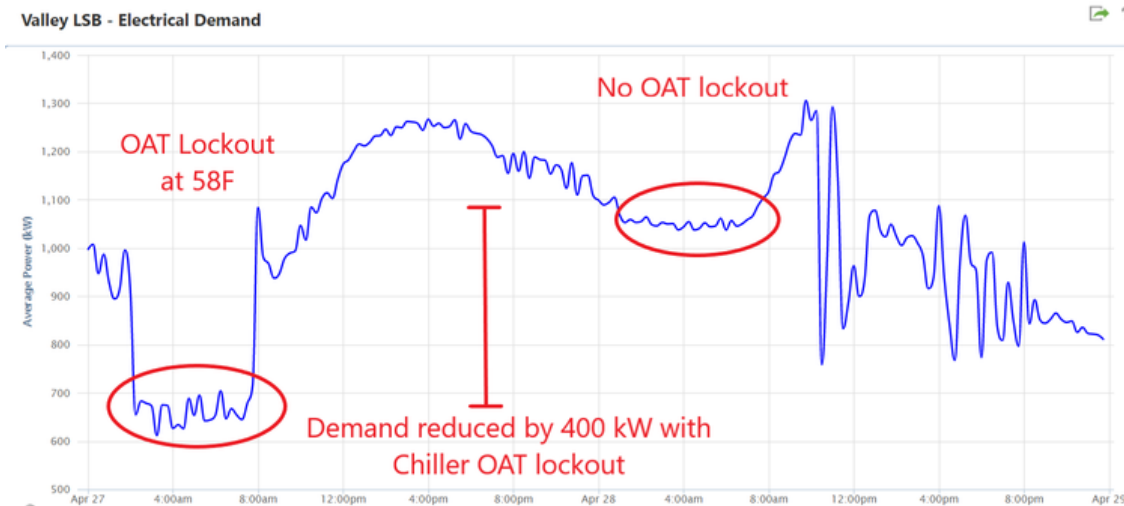


# VLSB Chiller In-House Commissioning

The EO initiated a commissioning (Cx) project for a recently installed chiller at VLSB that operates 24/7. The no-cost measures included a lockout temperature of 58F. In addition to energy savings, this lockout will give the chilled water system less run time, which results in less frequent downtime and reduced maintenance cost.

Cost: Minimal

Annual Savings: \$87,227



# Warren Hall - Datacenter RCx

The EO worked with Data Center Operations staff to reduce the need for humidification energy by reducing setpoints on Computer Room Air Conditioning (CRAC) units and to ensure ongoing monitoring of humidifier operation, relative humidity, and temperature of the servers.

Net Cost: \$8,900

Annual Savings: \$37,000

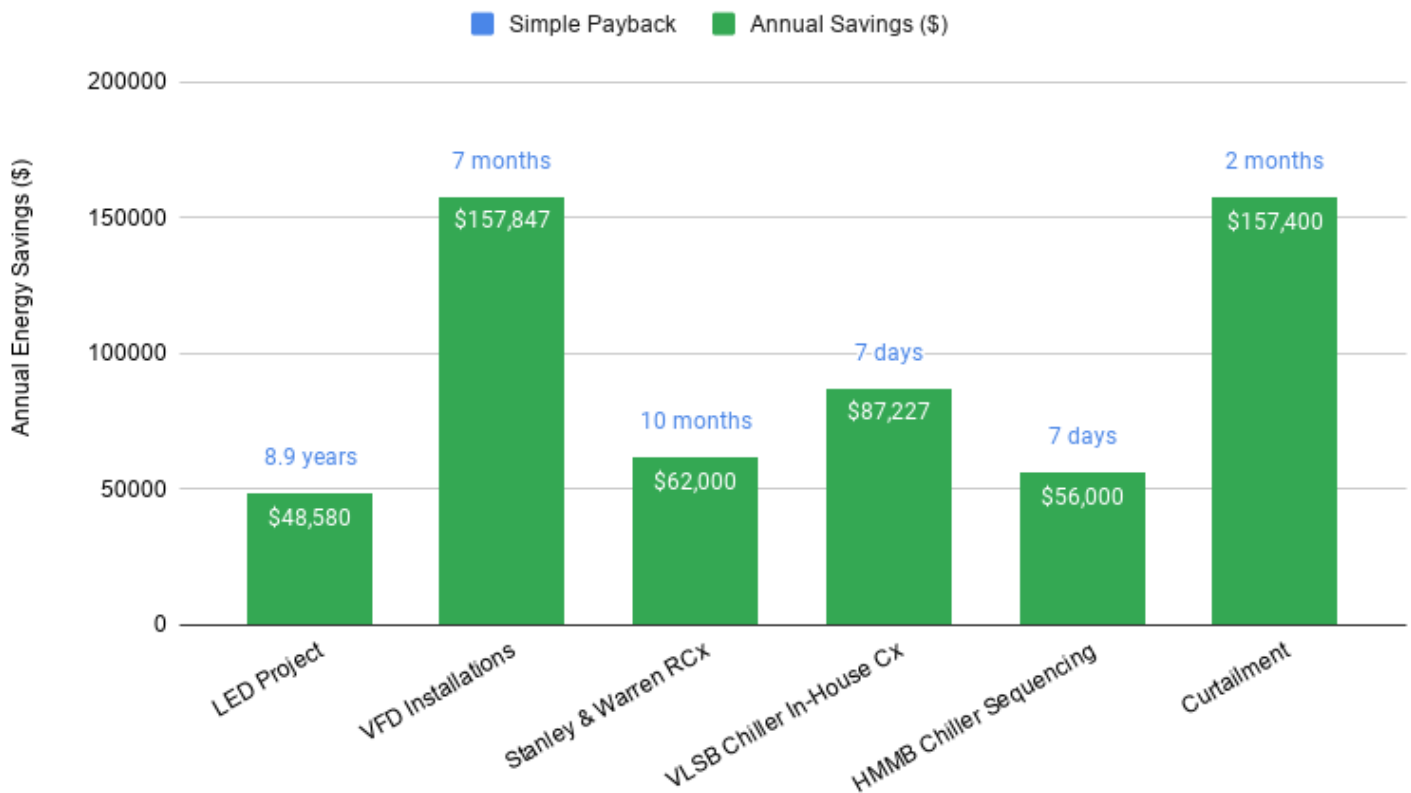
# Stanley Hall - Research

The EO worked with EMS, HVAC, and QB3 Facilities and Engineering staff to reduce unnecessary pumping by replacing bypass valves and adjusting balancing valves and control sequences. We also significantly reduced chilled water pump (CHWP) speed by reducing the chiller minimum flow setpoint and making adjustments to the Condenser Water Supply Temperature (CWST) and Chilled Water Supply Temperature (CHWST). The team also installed CO<sub>2</sub> sensors and Demand Control Ventilation (DCV) controls to reduce wasteful fan, cooling, and heating energy in unoccupied conference rooms.

Net Cost: \$21,823

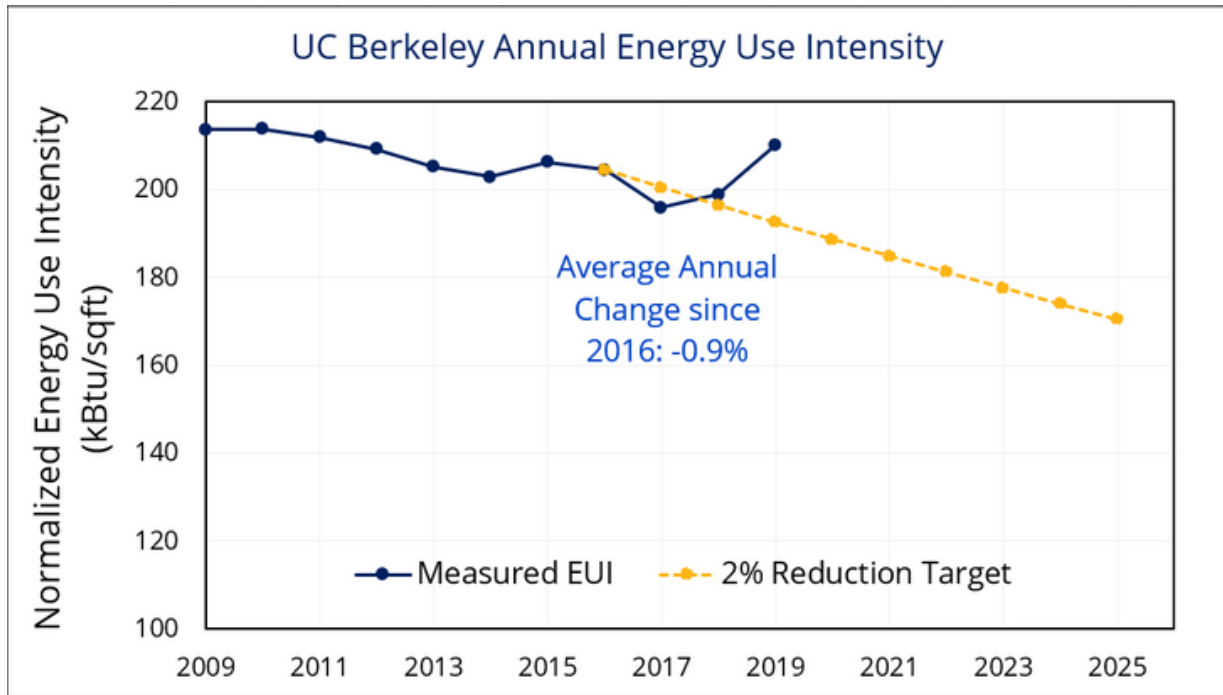
Annual Savings: \$25,000

## Snapshot Projects - Savings & Simple Payback



# Impacts Summary

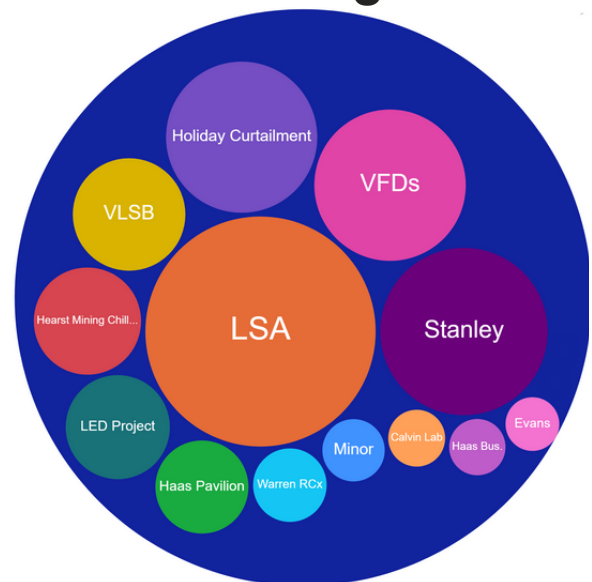
## Total Campus Energy Use Trend



## Energy Office 2019 Projects - Total Annual Utility Savings and Costs



## Energy Office 2019 Projects - Savings By Building





# 2020 Goals

In 2020, the Energy Office looks to focus efforts on:

- reducing steam use and developing projects to bend our energy use intensity (EUI) curve downward
- cost-effectively improving metering and energy information system (EIS) tools to better verify data and report on campus energy use
- conducting ongoing project monitoring, follow-up, and continuous commissioning (Cx) to ensure persistence of savings
- supporting efforts involved with the upgrade/replacement of the campus cogeneration plant
- building on our outreach and training efforts with staff, faculty and students.

