The Right Tool for the Right Job: The Past, Present and Future of GHG Management Tools

Kadri Jugandi
Account Executive
Lucid

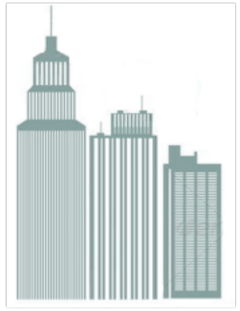
90%

2/3

lucid

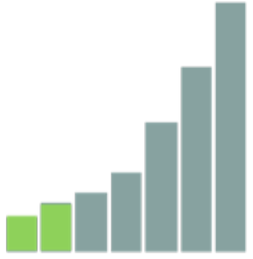
Smart buildings are a huge and growing opportunity

Proprietary & Confidential

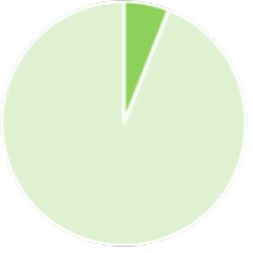


5M
commercial buildings in the U.S.

40%+
of energy is wasted



$35B
spent on commercial building automation in 2013



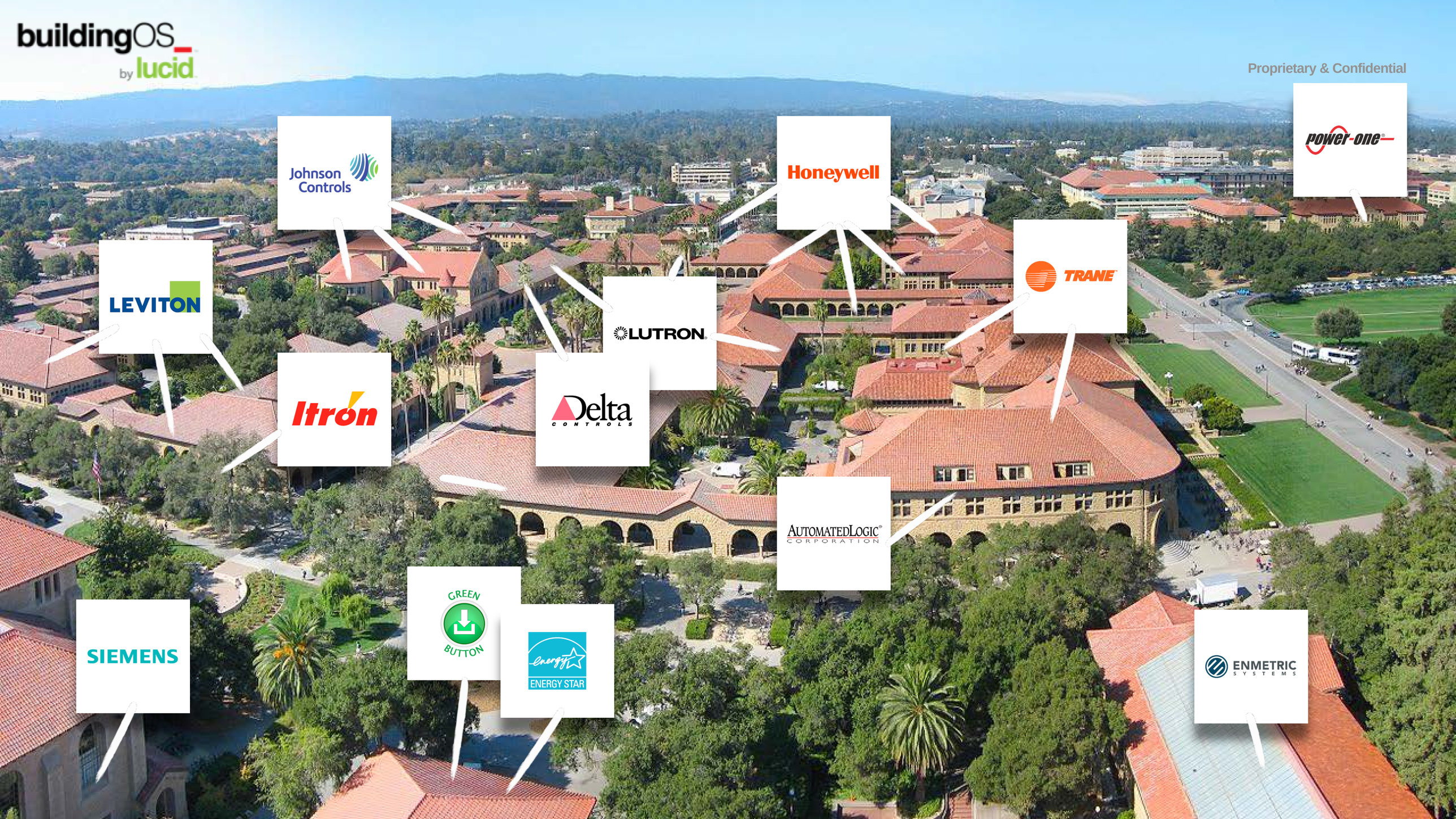
94%
of commercial buildings still don't have automation technologies

Proprietary & Confidential

Building technologies today are complex, fragmented, and disconnected from each other and from the Internet.

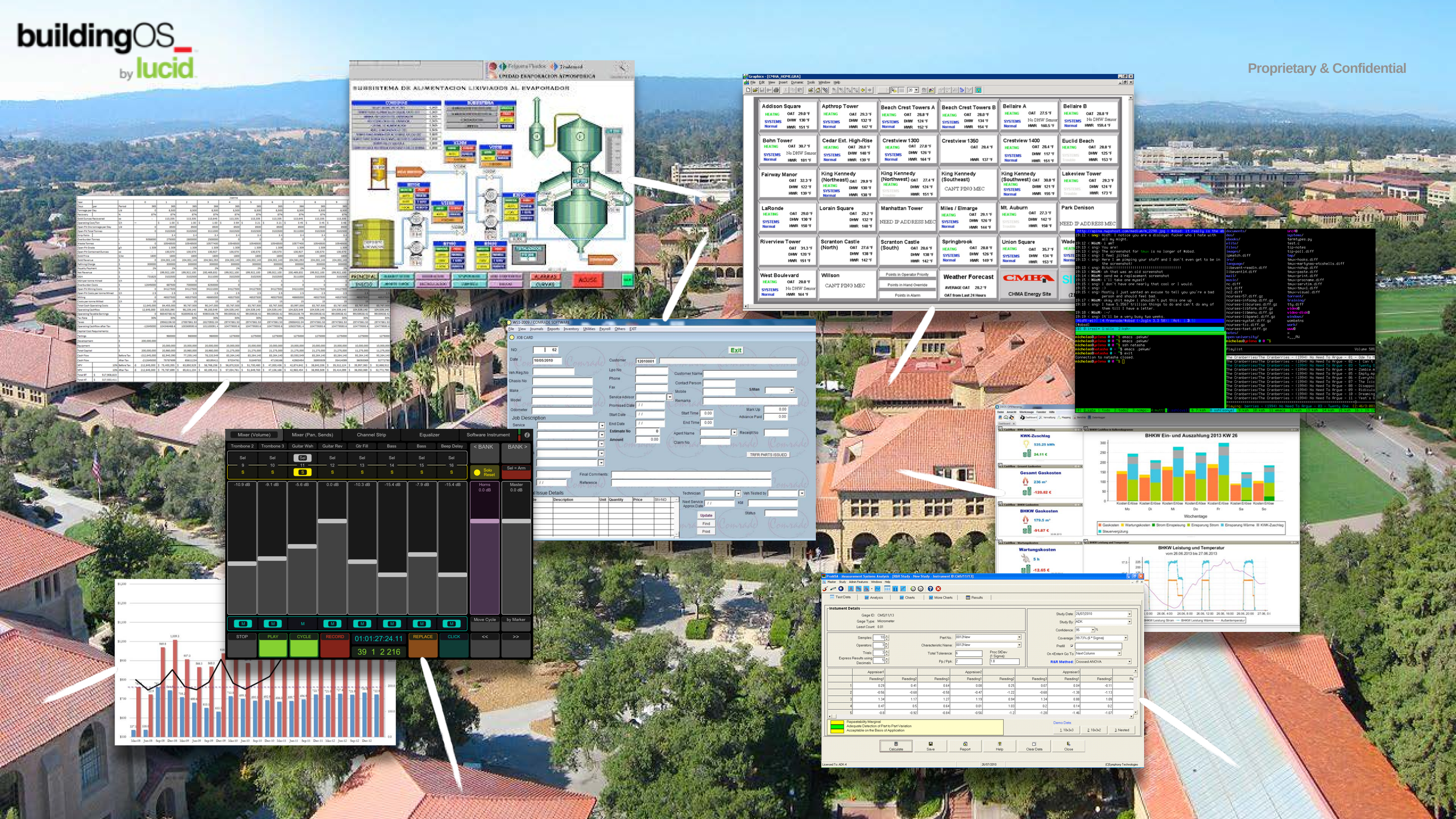
buildingOS by lucid

Proprietary & Confidential



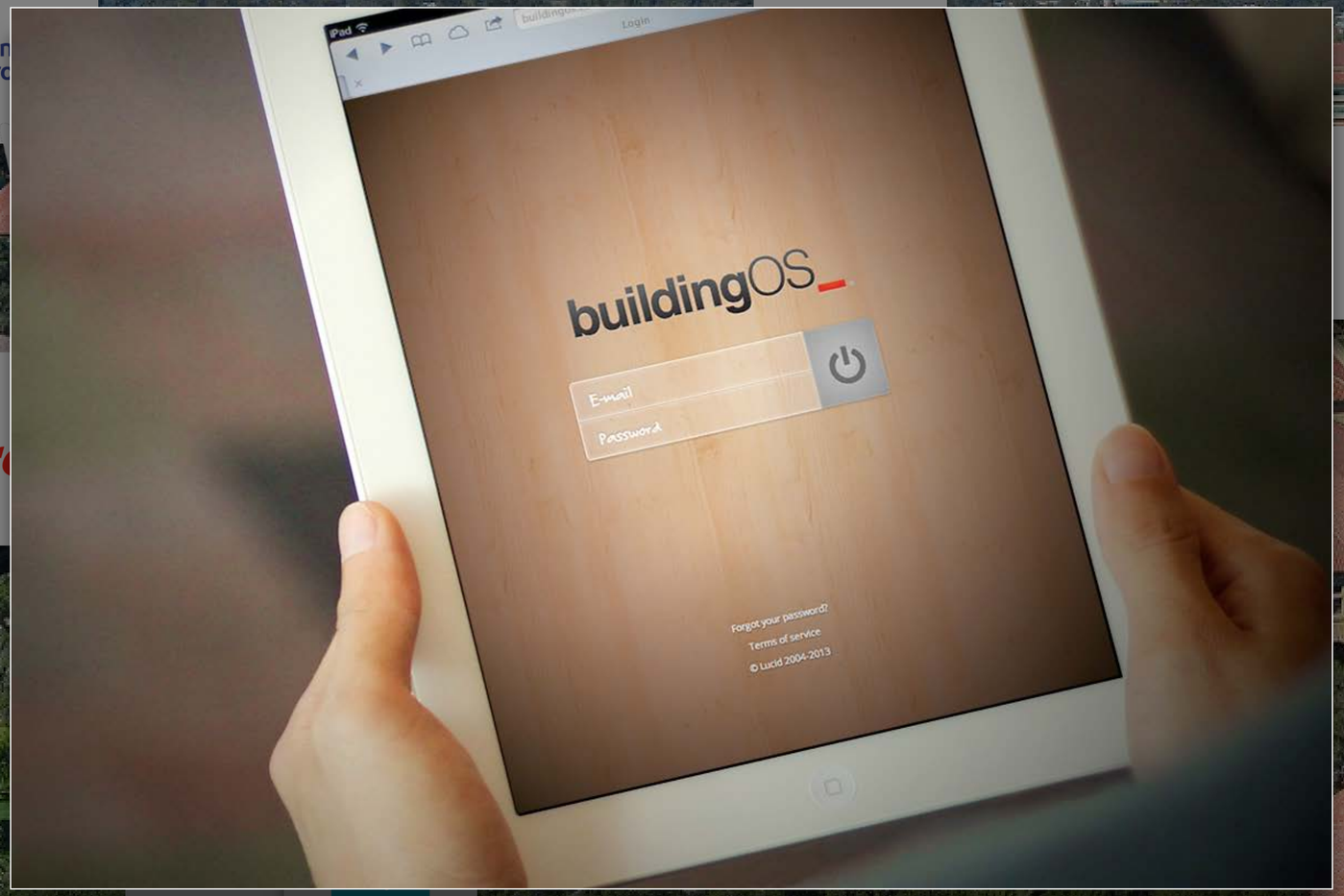
buildingOS by lucid

Proprietary & Confidential



buildingOS by lucid

Proprietary & Confidential



Enterprise

CRE

Higher Ed

K-12

Local Government

500+ customers

10,000 buildings

50,000 BIoT devices

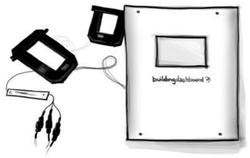
175 integrations

1B ft^2 under management

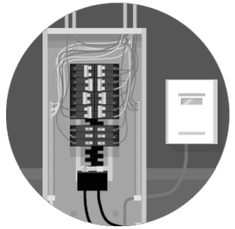
Building Sophistication

Bill Data

Smart Meter Data

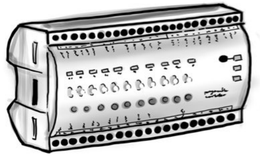


Building-level sub-meters



Circuit-level sub-metering

IoT Device Control



BMS Automation

Low → High

Sophistication

buildingOS by lucid

160+ Vendor & Device Integrations

Proprietary & Confidential

Compatibility with 95% of existing building systems technologies

buildingOS by lucid

Cloud-based building management

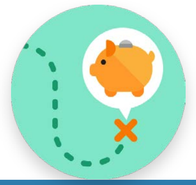
Proprietary & Confidential

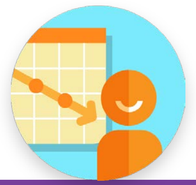
Finance & Planning | Sustainability | Energy Management | Tenant Management | Reporting

buildingOS by lucid

Cloud-based building management

Proprietary & Confidential





Finance & Planning	Sustainability	Energy Management	Tenant Management	Reporting
Budgets & Planning	Public Dashboards	Schedule Optimization	Tenant Billing	Automated EnergySTAR
Savings Verification	Energy Competitions	Peak Demand Mngmnt	Tenant Comfort	Customized Reporting
Utility Bill Verification	Compliance Reporting	Building Drift Analysis	Tenant Engagement	Workflow Automation

buildingOS®

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sarah@stanford.edu

****

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Stanford

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Help

229 buildings | **1,102** meters | **36** utility bills | **45** open tasks

Recently Viewed Buildings

Y2E2 Building

Dinkelspiel Auditorium

Sweet Hall

Branner Hall

Crothers Hall

James H. Clark Center

Sequoia Hall

Braun Music Center

Summary / 2015

TOTAL UTILITY COSTS
$2,325,780

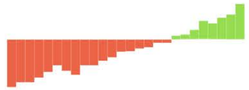
TOTAL ELECTRICITY USE
7,361,800 kWh

TOTAL WATER USE
20,267,300 gallons

TOTAL SOLAR PV PRODUCTION
445,700 kWh

TOTAL CO2 EMISSIONS
3,828,100 lbs CO_2

Efficiency Projects



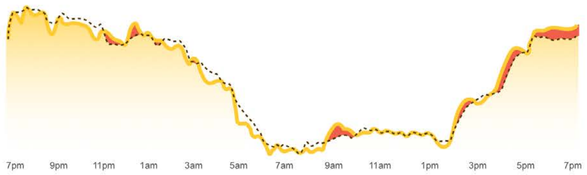
TOTAL IMPLEMENTATION COSTS
$5,387,000

TOTAL SAVINGS
$7,616,400

RETURN ON INVESTMENT
$2,229,400

Most Expensive Hourly Periods

Peak Campus Electricity Use / Last 24 hours compared to forecast

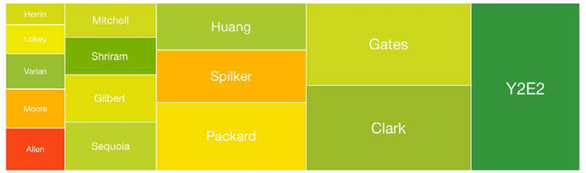


PEAK DEMAND
182 kW (7:50pm)

PEAK DEMAND SPEND
$21,450

COMPARED TO FORECAST
↑ 5%

Science Buildings Drift / May compared to April

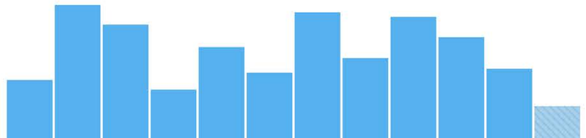


HIGHEST CHANGE
↑ 26% (Allen)

MEAN CHANGE
↓ 3.1%

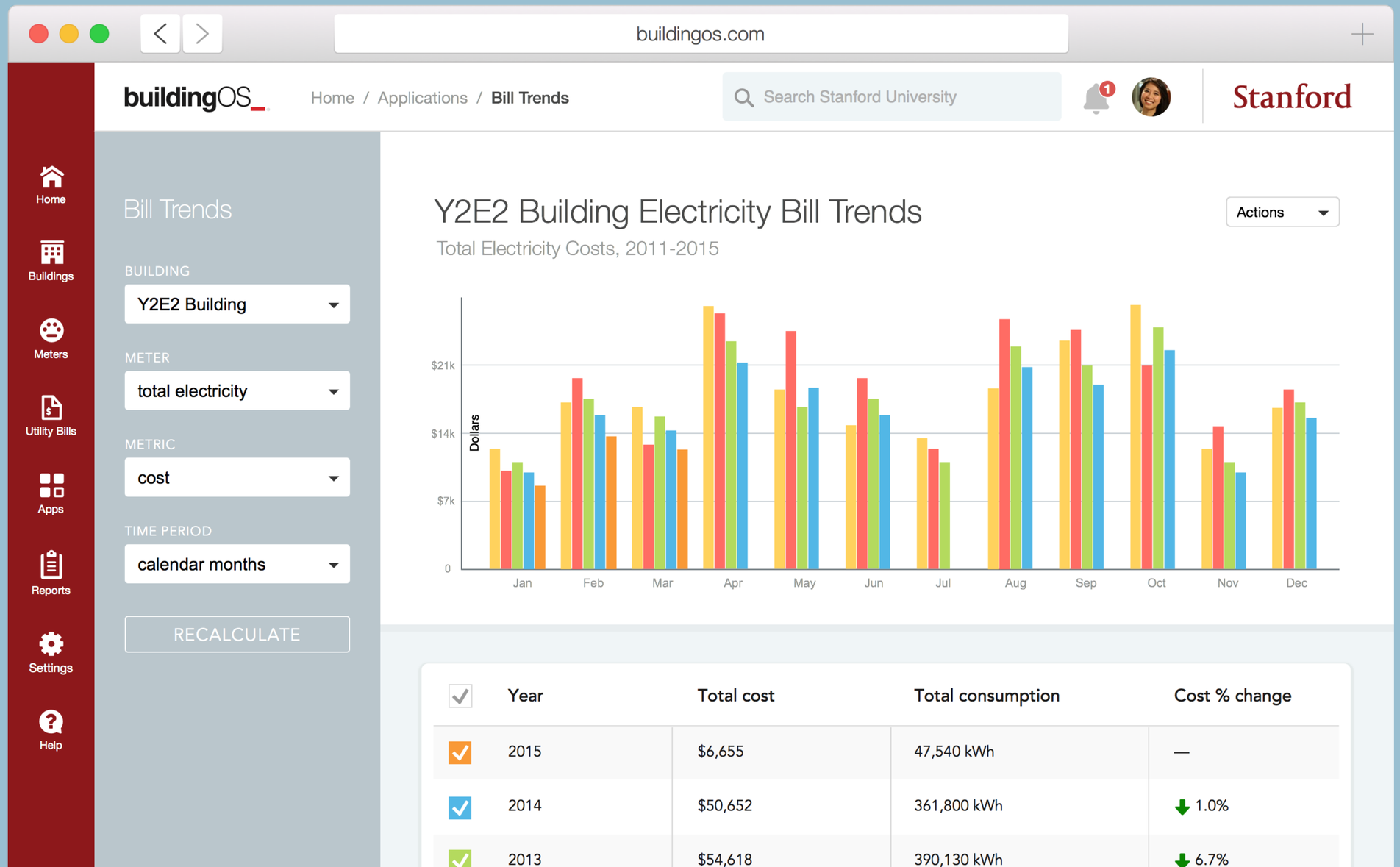
HIGHEST DECREASE
↓ 11% (Clark)

Total Water Use / Last 12 months



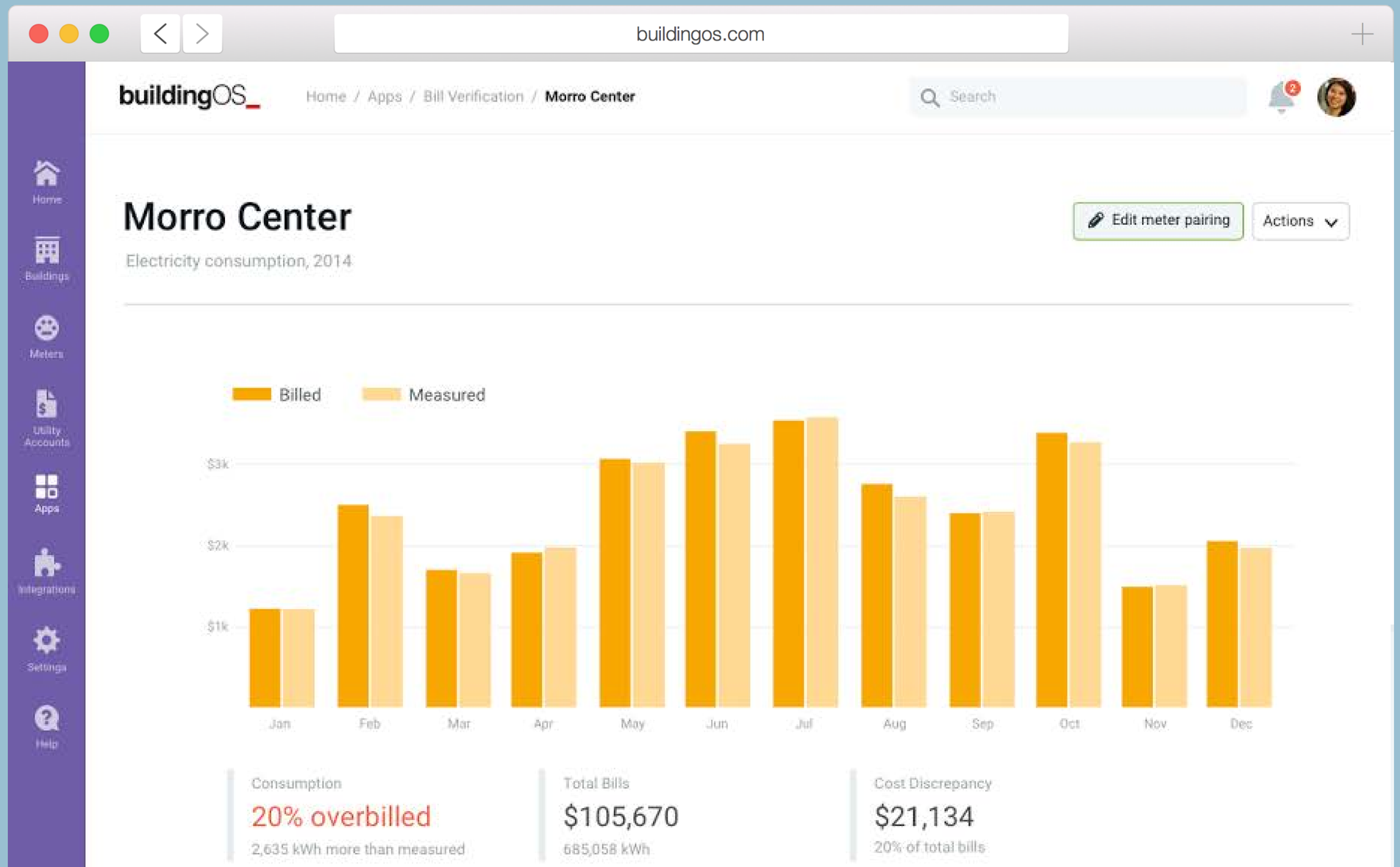
Analyze Bill Trends

Proprietary & Confidential



Verify Bill Accuracy

Proprietary & Confidential

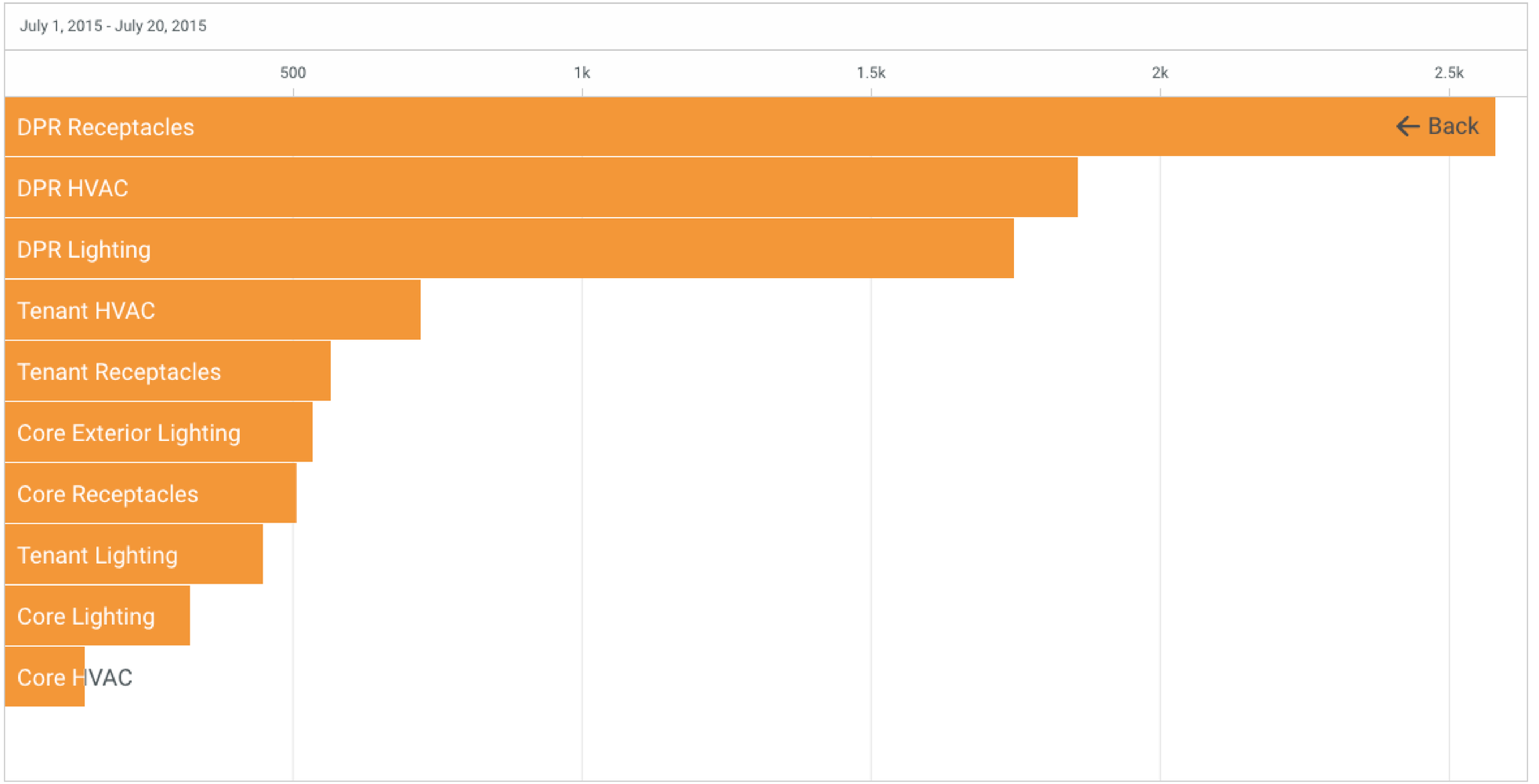


Home
Buildings
Meters
Utility Accounts
Apps
Integrations
Settings
Help

Comparisons at DPR Construction

Jump to

San Diego Office | electricity | over | this month | showing | total kWh | for | end use | compared to | none



Optimize Performance in Real-Time

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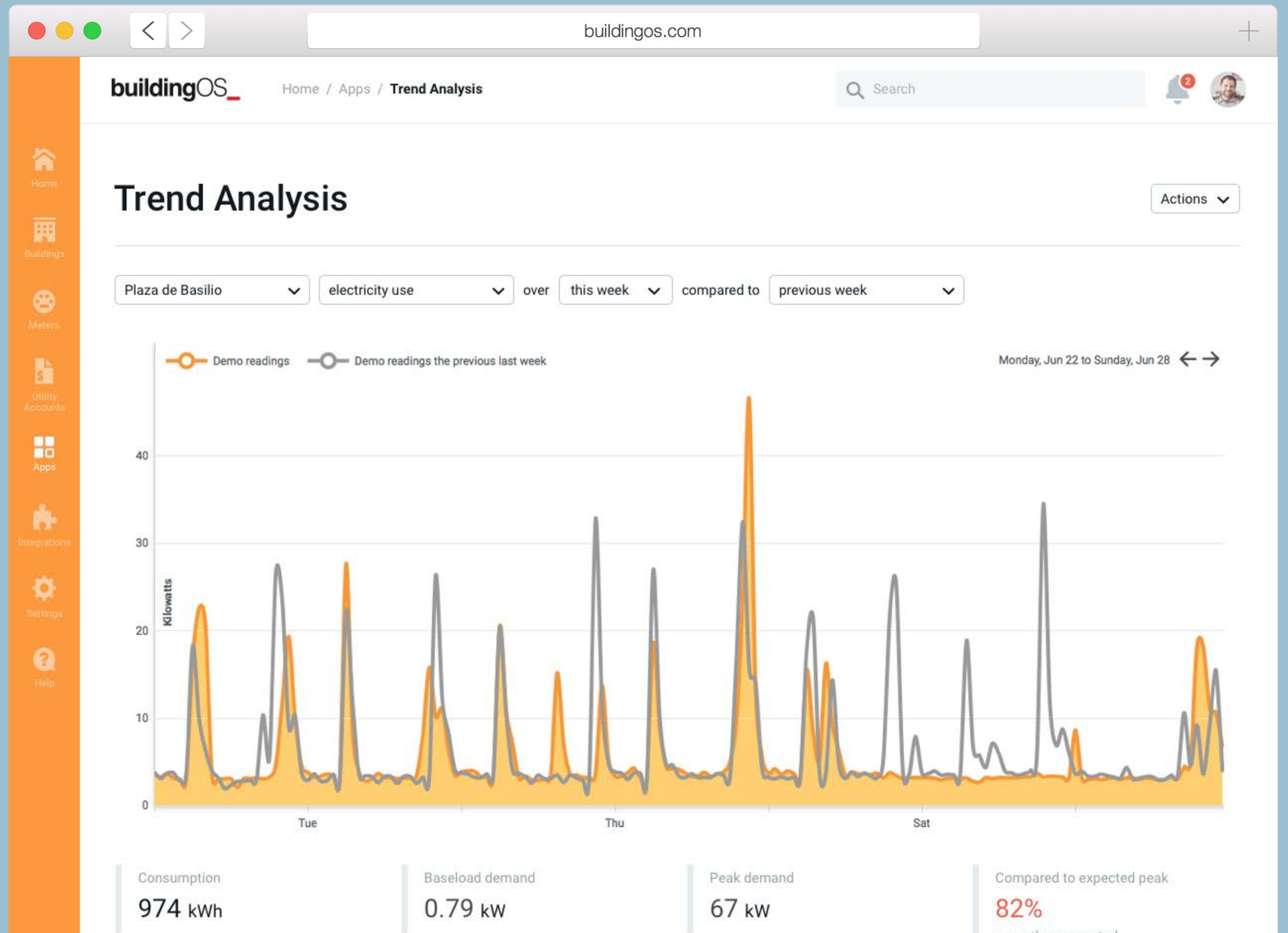

Schedule Optimization

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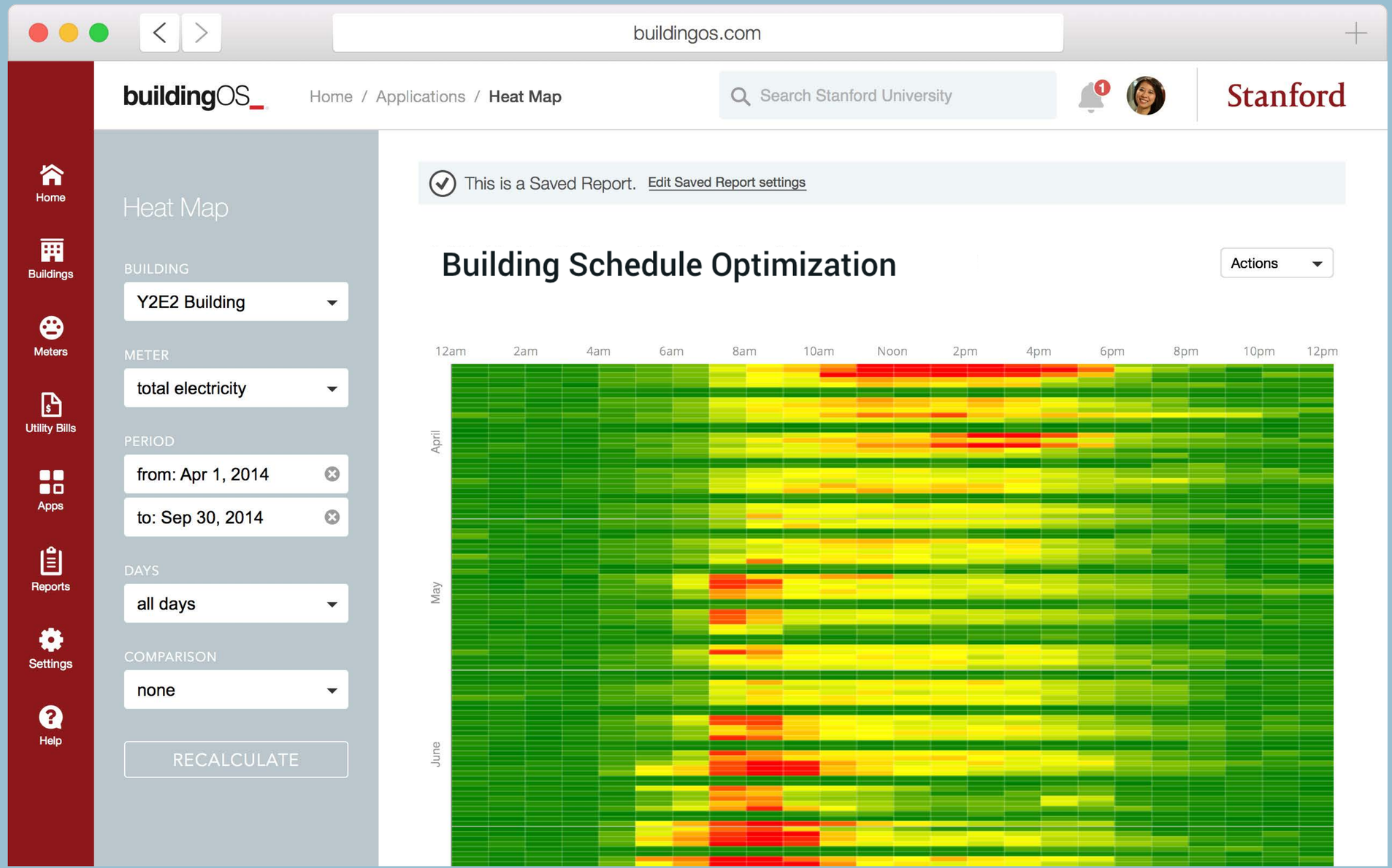
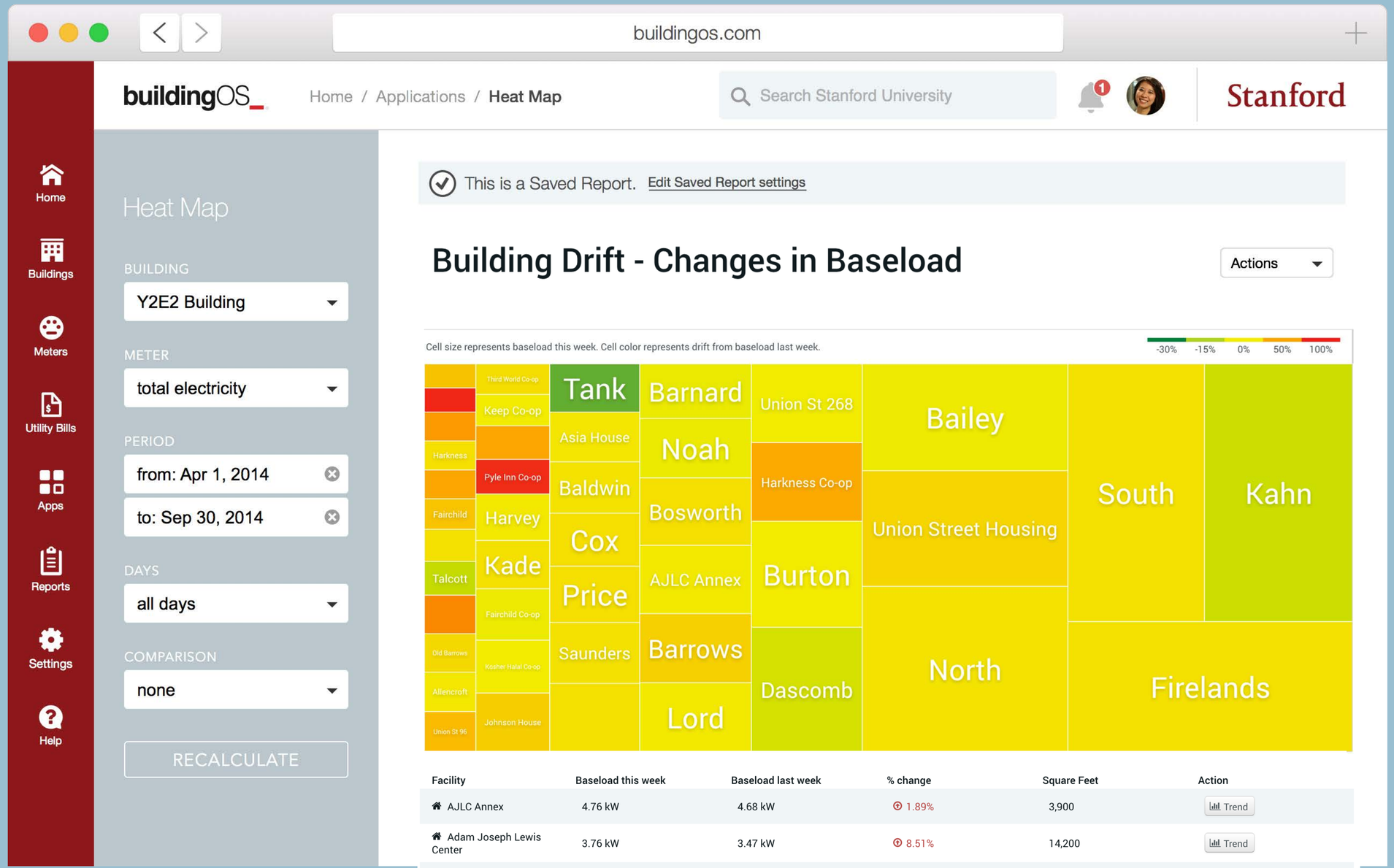


Detecting Building Drift

Proprietary & Confidential



Home
Buildings
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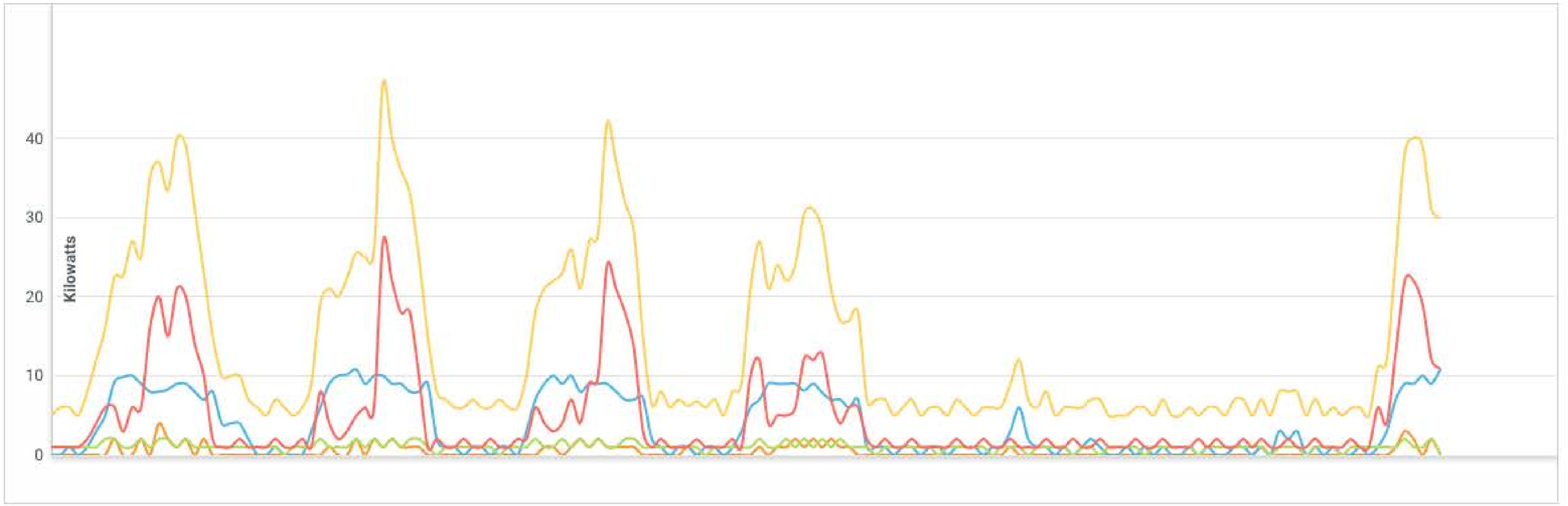
Help

All Meters at DPR Construction

+ Add meter

The last 7 days



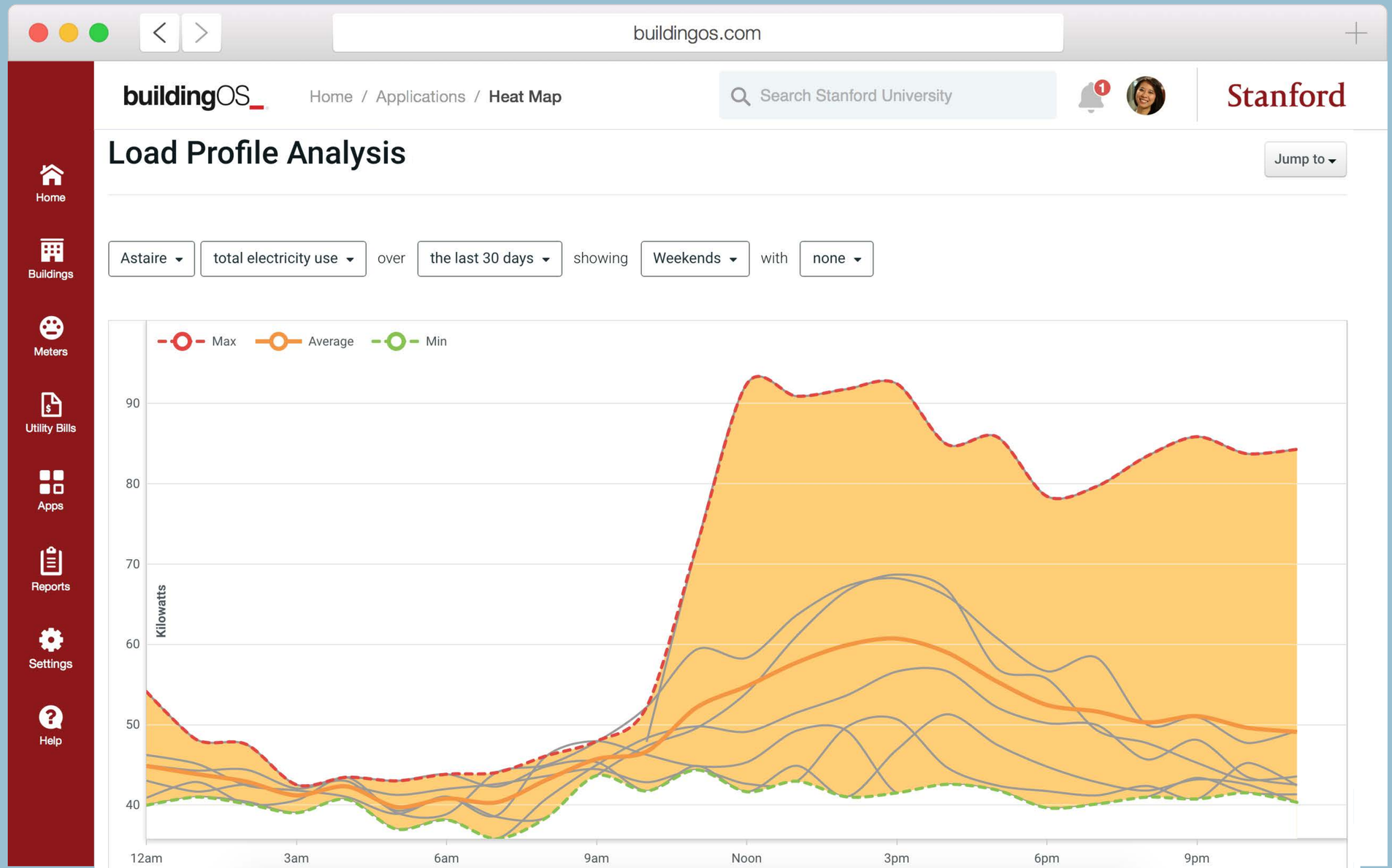
Search | Filter | Actions | Graph

Type: Electricity x

Building	Meter	Scope	Integration	Reading	Status
Newport Beach Office	Electricity_679031S204BLP2AM9	Other	Tridium	12 minutes ago	Online
Newport Beach Office	Electricity_679031S205BLP1HM1	Other	Tridium	12 minutes ago	Online
Phoenix Office	Total Electricity Use	Whole building	Calculated Meter	9 minutes ago	Calculated

Manage Peak Demand

Proprietary & Confidential



Total Electricity Consumption

Kilowatt-hours of electricity consumed today

CAL POLY
SAN LUIS OBISPO

Fremont Hall
243 occupants

267
Kilowatt-hours

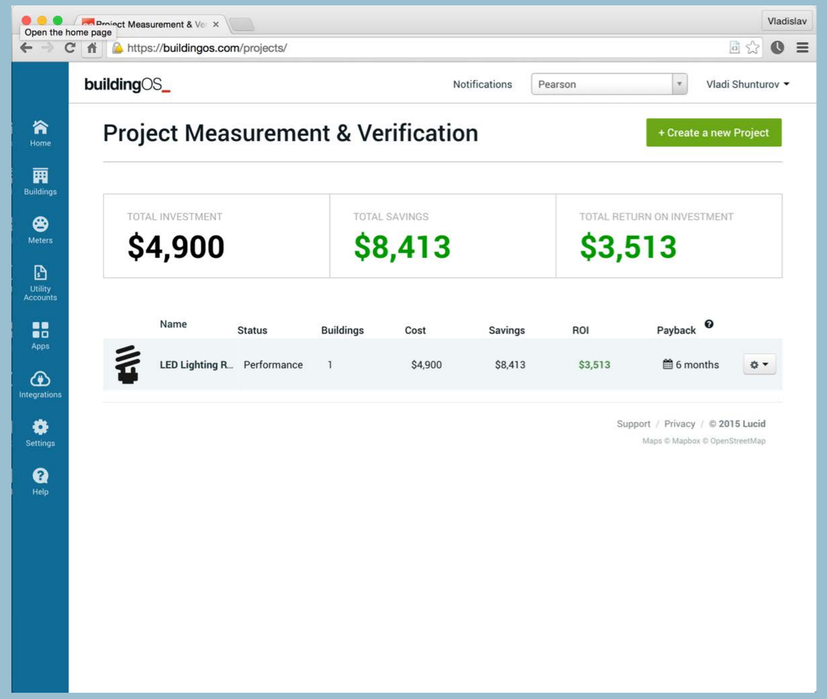
Select a Hall | Select a Timescale | Select a Unit Equivalent

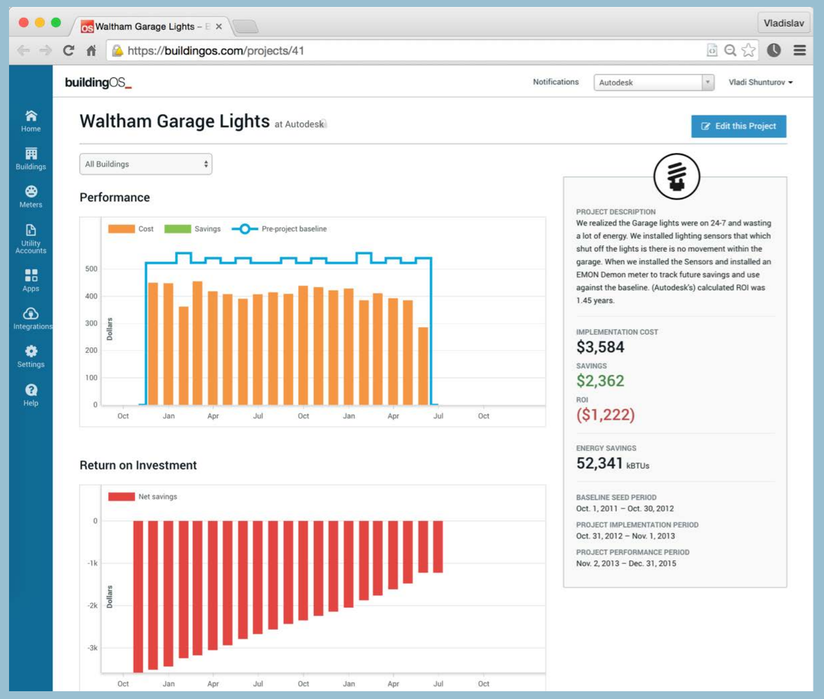
Introduction | Electricity | Water | Hot Water | Comparisons | Green Tips | Weather

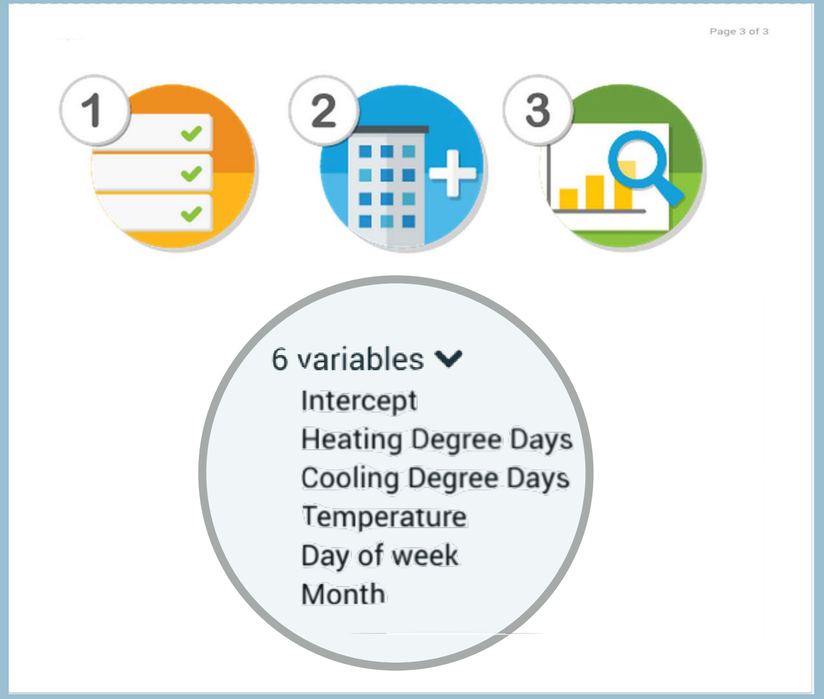
buildingdashboard

Savings Measurement + Verification

Proprietary & Confidential







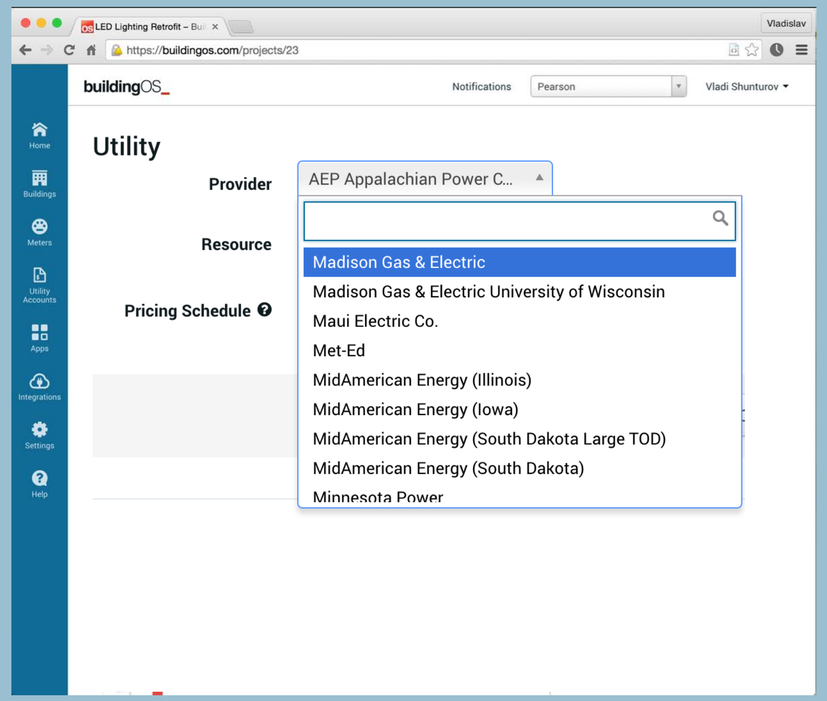
Document each efficiency project and expected ROI

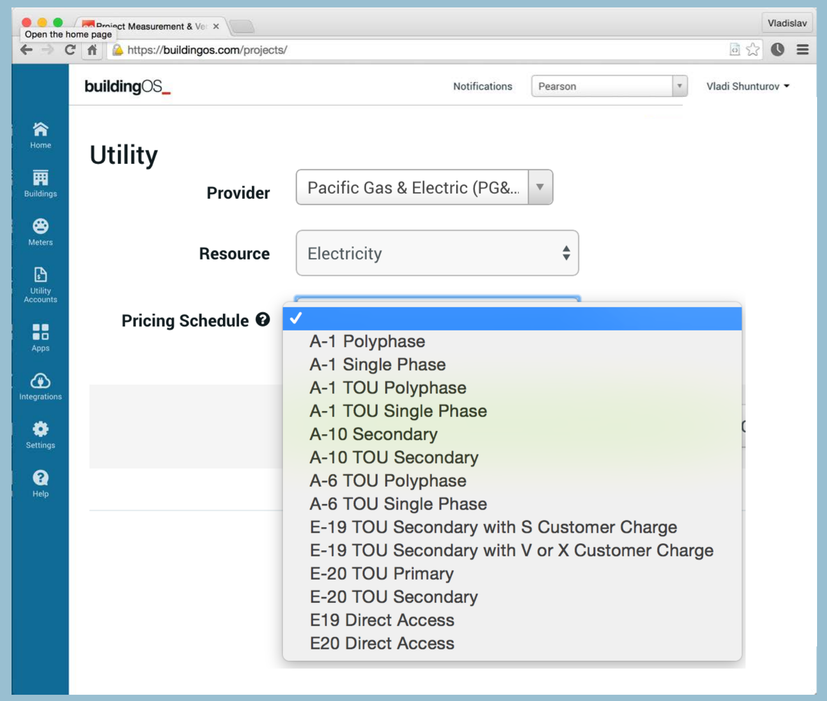
Automate reporting of savings across entire portfolio

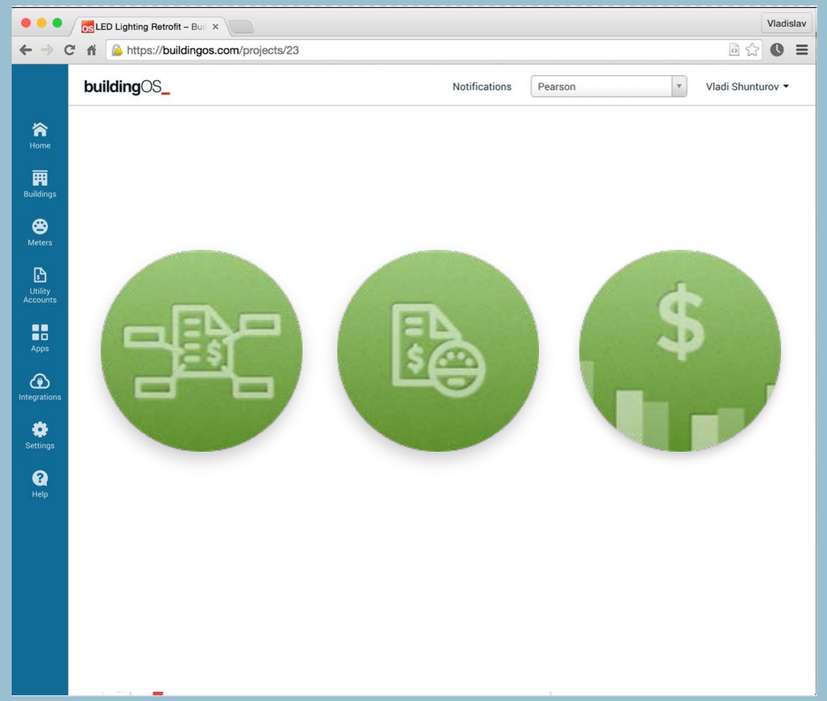
Award-winning algorithm guarantees accuracy

Utility Rate & Tariff Engine

Proprietary & Confidential







Extensive coverage across US utilities and growing quickly

Support for different rate types (TOU, Peak Demand, Tiered)

Accurate cost calculations across all BuildingOS apps

Home
Buildings
Meters
Utility Bills
Apps
Reports
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Help

229 buildings | **1,102** meters | **36** utility bills | **45** open tasks

Recently Viewed Buildings

Y2E2 Building

Dinkelspiel Auditorium

Sweet Hall

Branner Hall

Crothers Hall

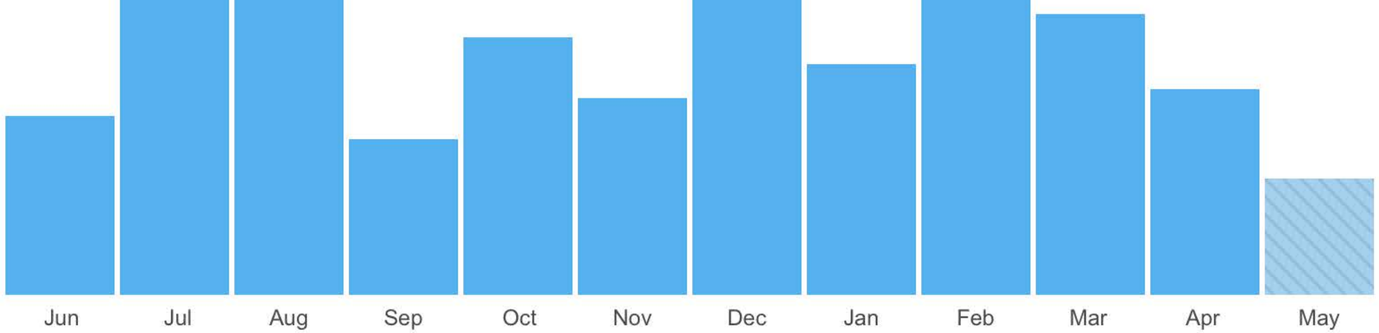
James H. Clark Center

Sequoia Hall

Braun Music Center

Summary / 2015

Peak Campus Electricity Use / Last 24 hours compared to forecast

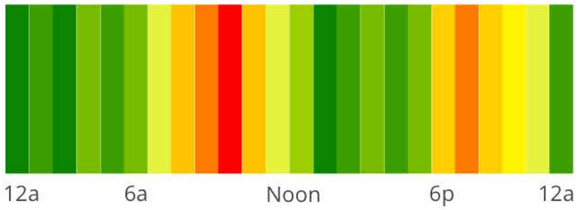


HIGH
2,152,000 gal (Jul)

MEDIAN
1,278,000 gal (Jan)

LOW
983,000 gal (Sep)

Most Expensive Hourly Periods

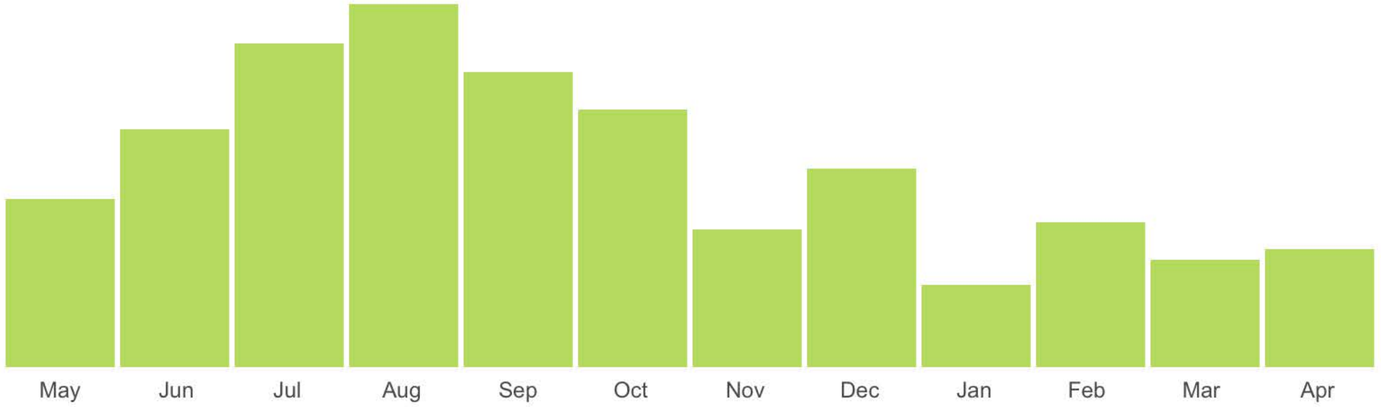


9:00-10:00am
$15,670

8:00-9:00am
$12,040

7:00-8:00pm
$10,330

Total Electricity Bills / Last 12 months



HIGHEST
$876,810 (Aug)

2ND HIGHEST
$874,920 (Jul)

3RD HIGHEST
$873,680 (Sep)

Meter Status

1,060 online

32 offline

10 flatlines

Home
Buildings
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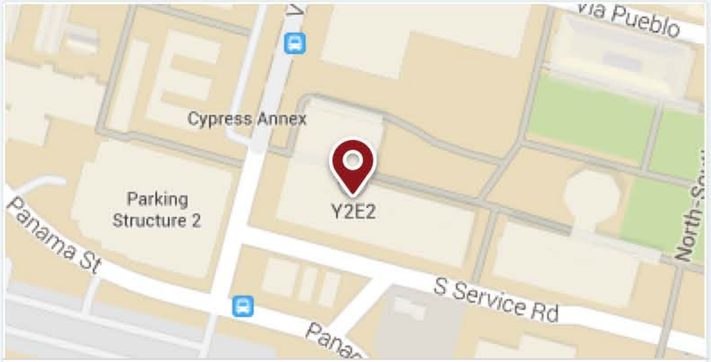
Y2E2 Building

Edit this Building | Actions

Overview | 20 Meters | 4 Utility Accounts | Files | Audit Trail



473 Via Ortega
Stanford, CA 94305

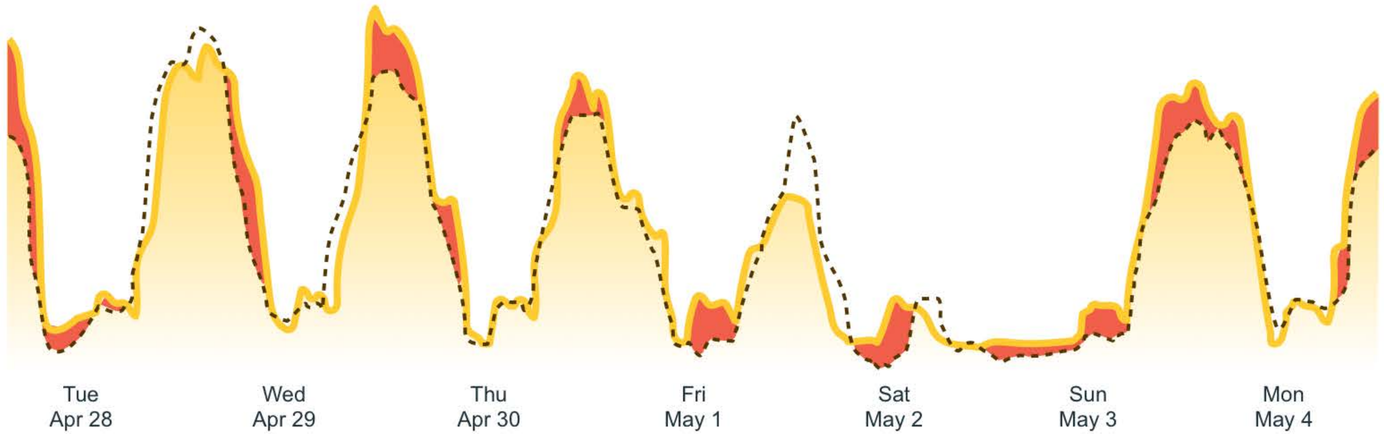
Offices, Labs

166,560 ft²

4 floors

400 occupants

Total Electricity Use / Last 7 days compared to forecast



TOTAL USE	TOTAL SPEND	COMPARED TO EXPECTED
960 kWh	$12,270	↑ 8%

166,560 ft²

4 floors

400 occupants

TOTAL USE	TOTAL SPEND	COMPARED TO EXPECTED
960 kWh	$12,270	↑ 8%

ENERGY STAR

90

out of 100

Summary / 2015

TOTAL UTILITY COSTS
$125,780

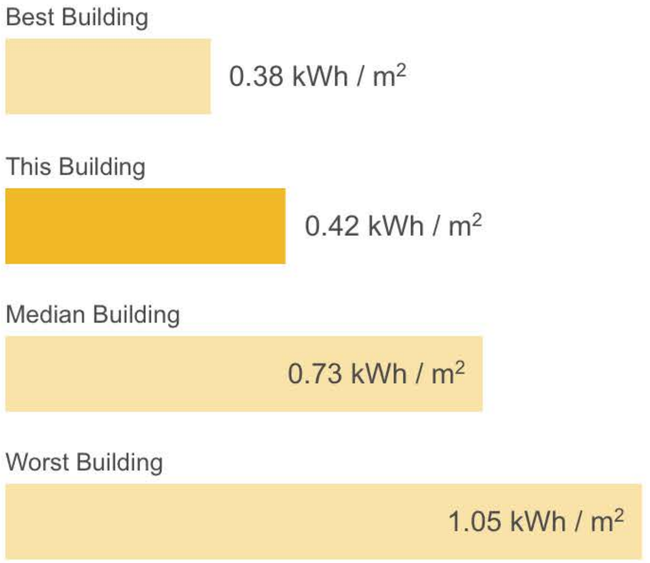
TOTAL ELECTRICITY USE
361,800 kWh

TOTAL WATER USE
267,350 gallons

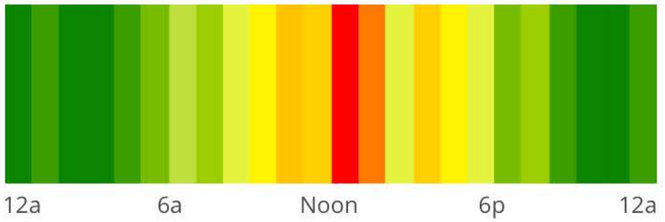
TOTAL SOLAR PV PRODUCTION
35,710 kWh

Community Comparison

Science Buildings, Last 24 hours



Most Expensive Hourly Periods



12:00-1:00pm
$335

1:00-2:00pm
$290

10:00-11:00am
$264

Total Water Use / Last month

0.73 kWh / m^2

Worst Building

1.05 kWh / m^2

$290

10:00-11:00am

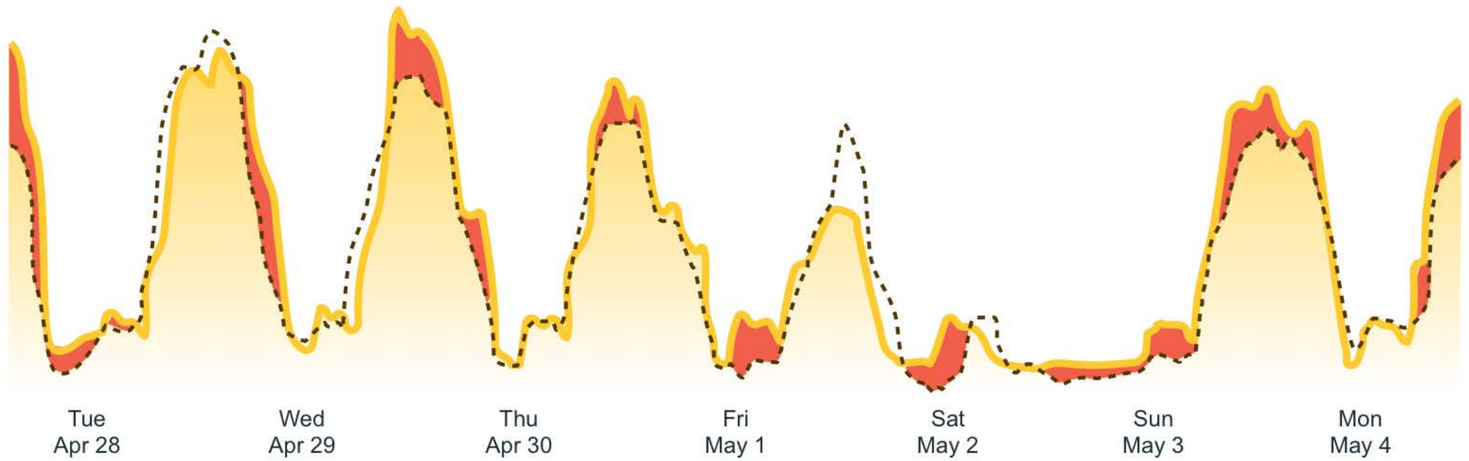
$264

ENERGY STAR

90

out of 100

Total Electricity Use / Last 7 days compared to forecast



TOTAL USE	TOTAL SPEND	COMPARED TO EXPECTED
960 kWh	$12,270	↑ 8%

Meter Status

18 online

0 offline

2 flatlines

0 spikes

Total Water Use / Last month

Summary / 2015

TOTAL UTILITY COSTS

$125,780

TOTAL ELECTRICITY USE

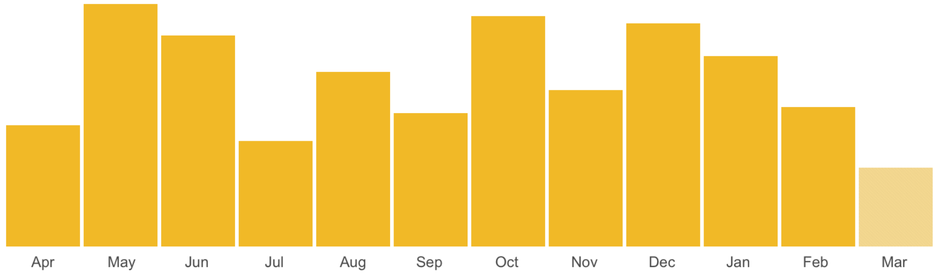
361,800 kWh

buildingOS by lucid

Embed in any website

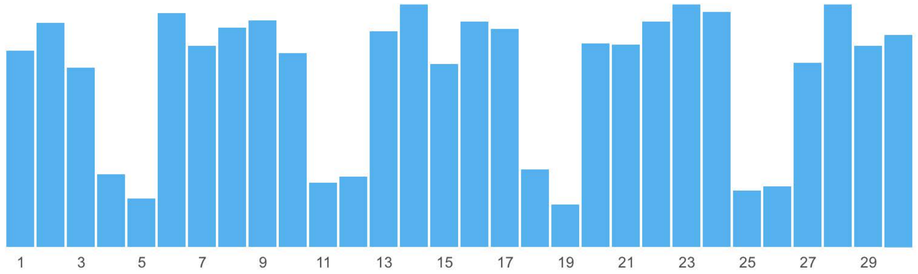
Proprietary & Confidential

Total Electricity Use / Last 12 Months



HIGH	MEDIAN	LOW
56,890 kWh (May)	34,590 kWh (Nov)	16,720 kWh (Jul)

Total Water Use / Last month



TOTAL USE	TOTAL SPEND	COMPARED TO EXPECTED
66,830 gal	$3,550	↓ 2%

Summary / 2015

TOTAL UTILITY COSTS
$125,780

TOTAL ELECTRICITY USE
361,800 kWh

TOTAL WATER USE
267,350 gallons

TOTAL SOLAR PV PRODUCTION
35,710 kWh

TOTAL CO2 EMISSIONS
160,140 lbs CO_2

Automated PDF generation and email delivery

Proprietary & Confidential

Connected Cities™ by lucid

A Clinton Global Initiative Commitment to Action

Connected Cities

Connected Cities is a technology-driven program from Lucid to enable cities to **maximize resource efficiency** for a stronger and more resilient building stock

- Connected Cities is a **Clinton Global Initiative Commitment to Action**
  Commitments to Action are new, unique and measurable solutions to the world's most pressing challenges
- **Complementary** to existing systems and commitments
  Connected Cities unlocks the data for your city & county buildings no matter what systems you have in place

Proprietary & Confidential

What Connected Cities Receive

Centralize historical energy and water data for all buildings

Automate Energy Star benchmarking and disclosure for all buildings

Automate utility bill data capture for key buildings

Demonstrate results using real-time electricity data for key buildings

Access experts in resource efficiency and BuildingOS through your Connected Cities Success Manager

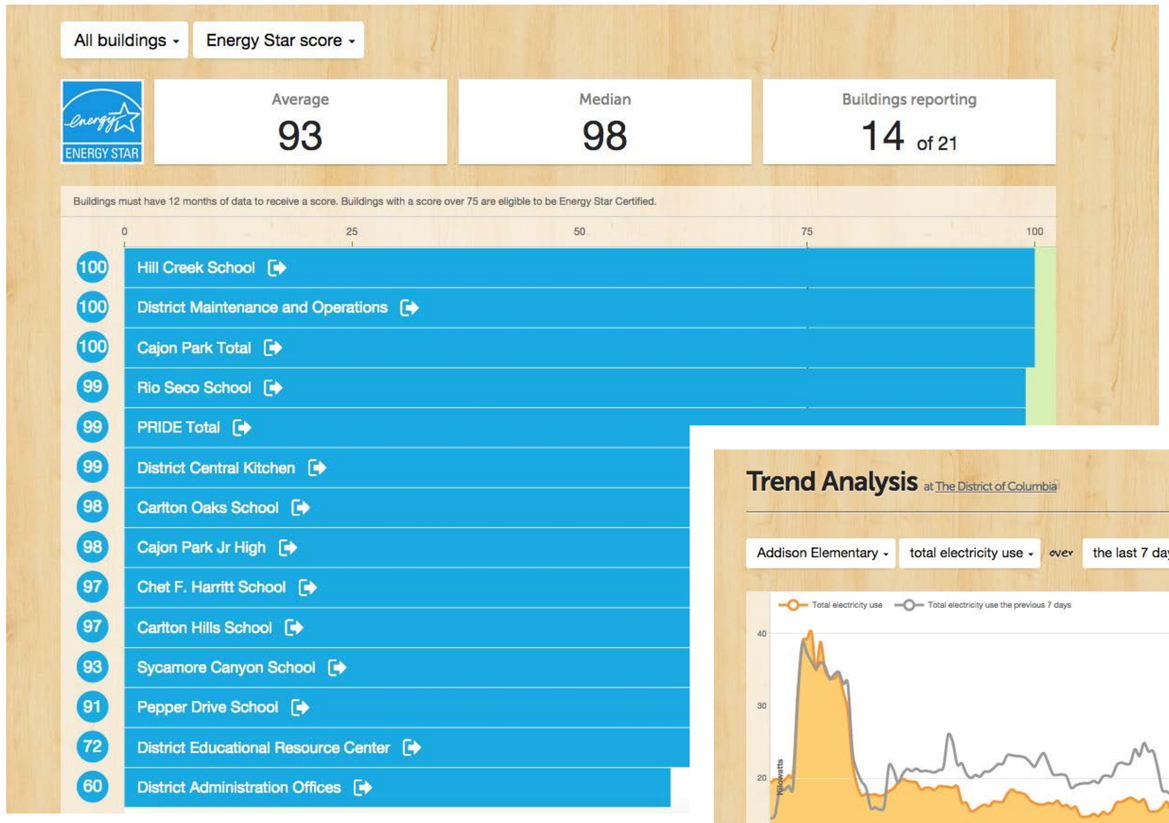
Promote results to key stakeholders with tools and templates for clear reporting and communications

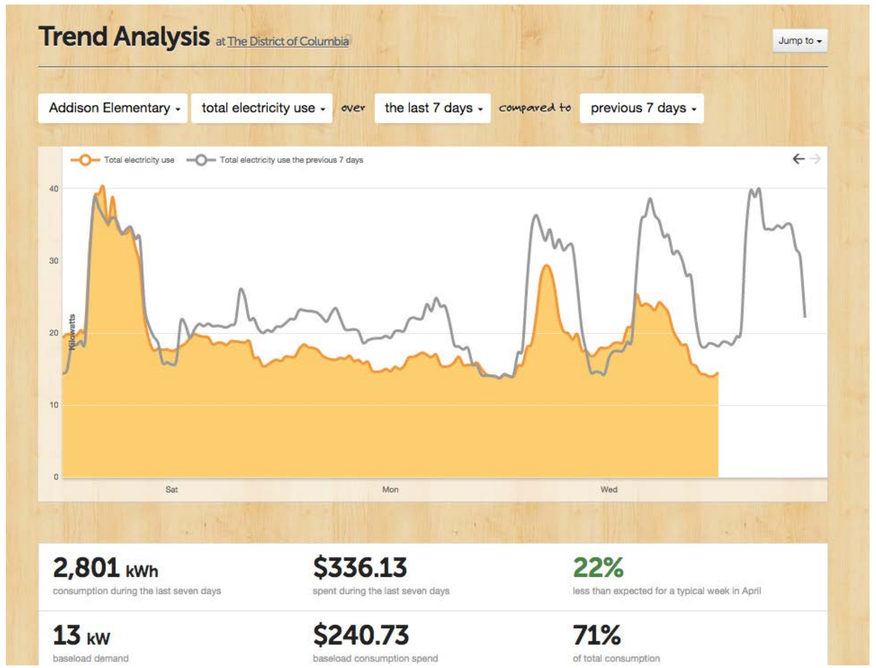
Learn and share with other cities through the Connected Cities Exchange

Get recognized as a leader through awards and media

Proprietary & Confidential

Automated Energy Star, Comparisons & Efficiency ROI Tracking





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POLICY PROCUREMENT MONITORING CONSERVATION ON-SITE ENERGY GRID BUILDING SYSTEMS

Orlando, Santa Cruz First to Sign Up for Lucid's Connected Cities

June 10, 2015 By Linda Hardesty

Lucid launched Connected Cities, a program that Lucid says will connect 100 US cities to BuildingOS over the next three years. The program, born out of Lucid's commitment to action to the Clinton Global Initiative, is being anchored by the City of Orlando, Florida, and the City of Santa Cruz, California.

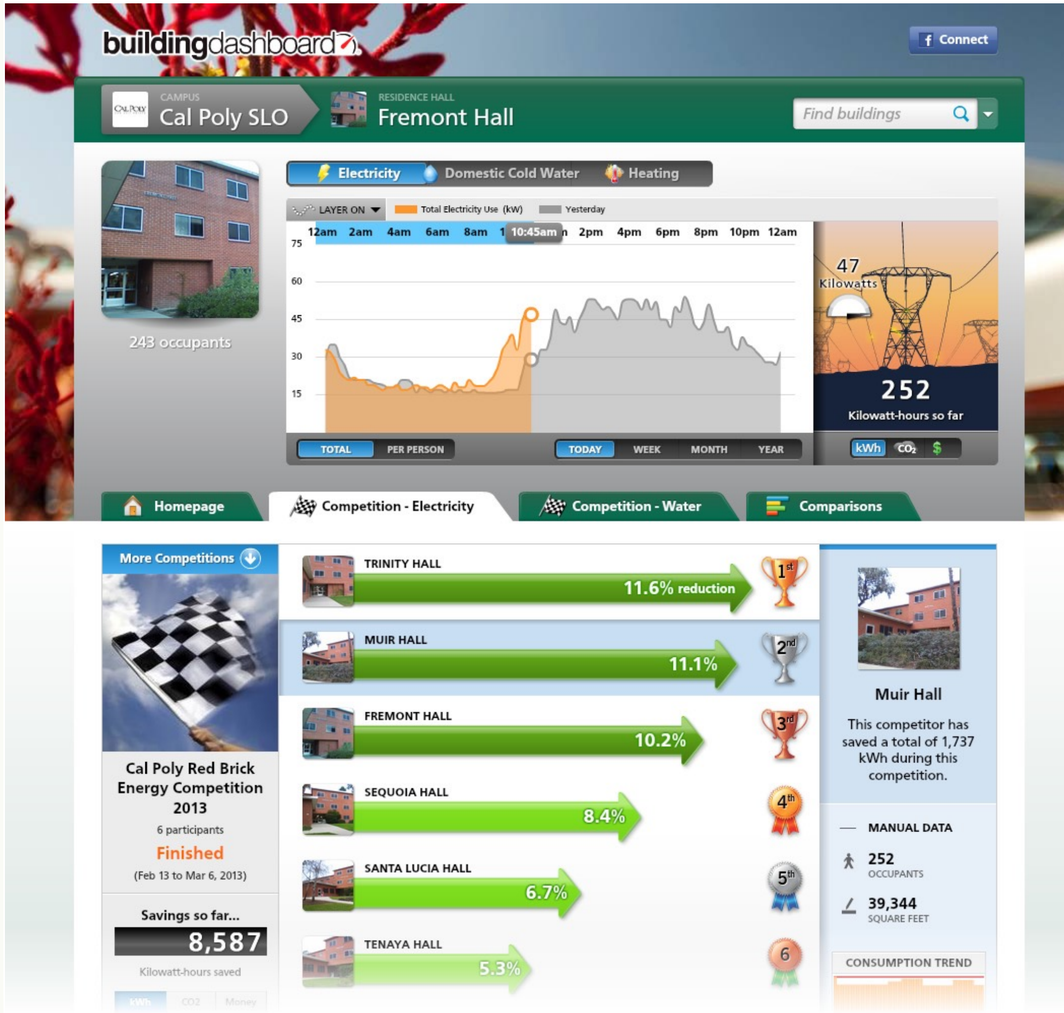
Lucid has partnered with Dell to provide Internet of Things to facilitate implementation processes.

Participating cities will receive access to Lucid's BuildingOS building management platform to centralize energy and water data for all city buildings. Cities will also receive access to Lucid's new ENERGY STAR application for BuildingOS, which automates ENERGY STAR benchmarking and disclosure for all buildings, as well as Bill Trends, an application that automatically collects and analyzes all utility bill data.

Bolstering the Connected Cities offering is the Connected Cities Network of experts in city resource efficiency. The network fosters collaboration between cities to share scalable tactics and creates network effect for all city stakeholders to collectively yield significant energy savings.

Cal Poly leverages Building Dashboard to engage students in achieving campus-wide energy reduction goals and reinvigorate discussion about sustainability

Lucid's Building Dashboard provides facilities staff and the student housing community with the visualization and communication tools they need to foster a sweeping new dialogue about campus sustainability through friendly competitions and social media.



Case Study - City of Santa Cruz

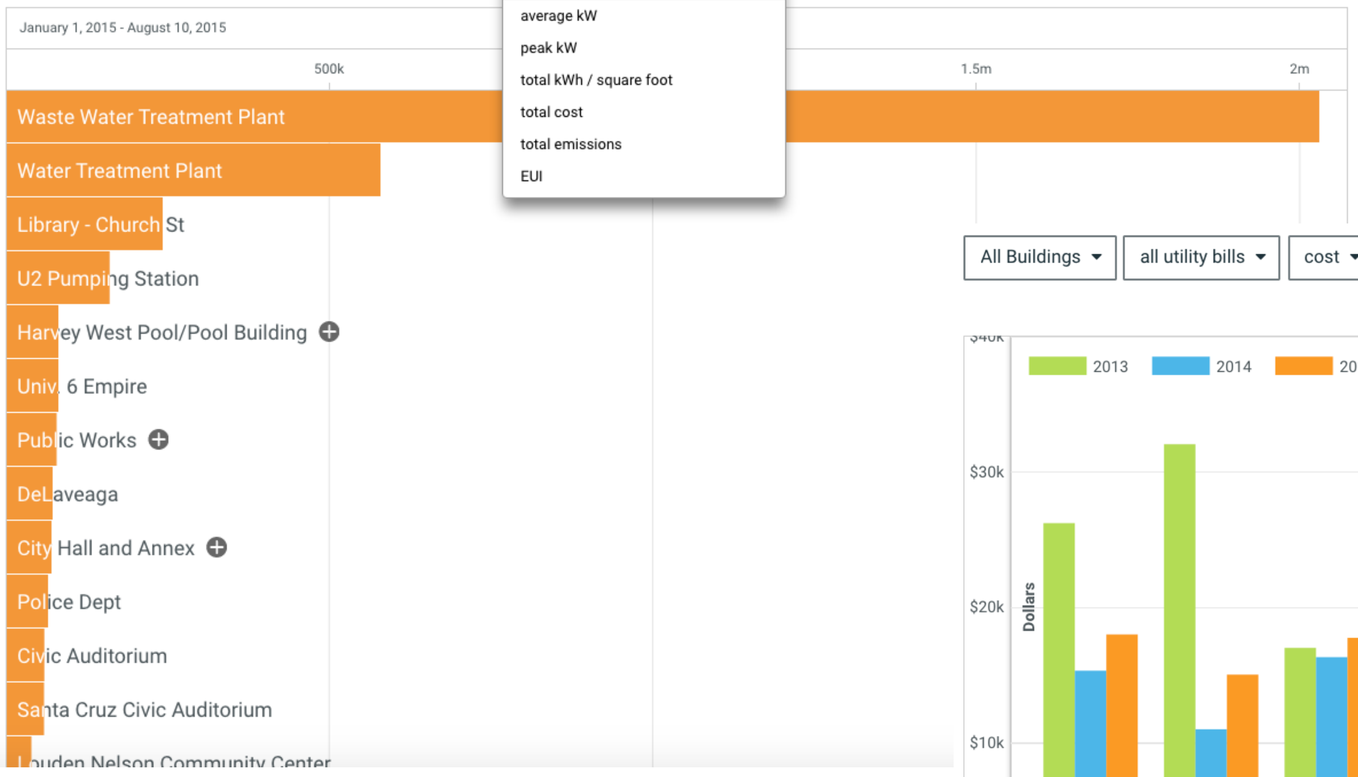
Comparisons at City of Santa Cruz

Jump to

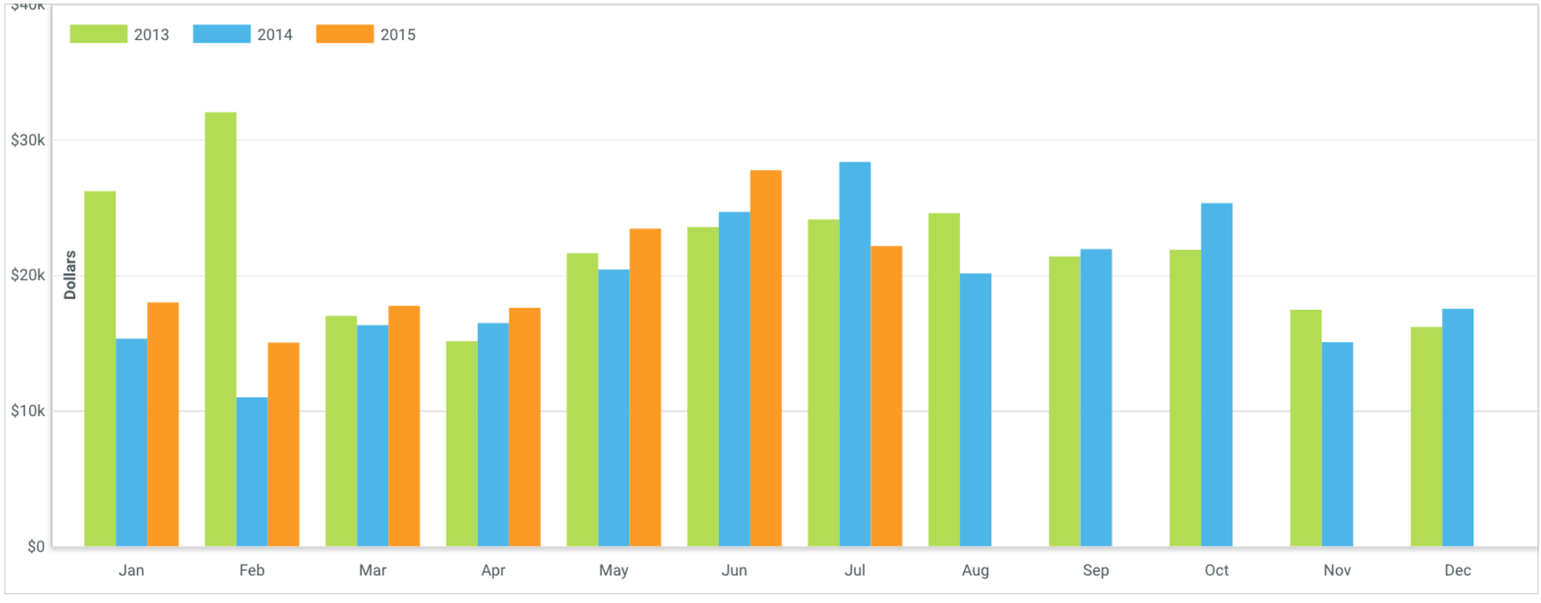
All Buildings | electricity | over | this year | showing | total kWh | compared to | none

- total kWh
- average kW
- peak kW
- total kWh / square foot
- total cost
- total emissions
- EUI

January 1, 2015 - August 10, 2015



All Buildings | all utility bills | cost | across | billing cycle end dates



	Year	Total Cost	% change	Electricity	Natural Gas	Water
✔	2015	$141,926	6.90%	$132,144	$9,781	-
✔	2014	$232,883	11%	$217,051	$15,833	-
✔	2013	$261,567	33%	$243,018	$18,549	-

lucid™

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