Welcome! We’ll be starting shortly…
Berkeley Lab’s Smart Energy Analytics Campaign Team

Jessica Granderson
Staff Scientist, Deputy for Research Programs

Hannah Kramer
Technical Lead

Claire Curtin
Program Manager

Eliot Crowe
Technical Assistance Coordinator

Guanjing Lin
Senior Scientific Engineering Associate
Register for individual sessions, meet-ups, and workshops
Announcement: Upcoming Better Buildings Tech Team Calls

- Methods and Best Practices for Integrating DERs into Commercial Buildings
  - July 8th, 2020
  - 1:00 – 2:00 PM EST
  - Check the Better Buildings calendar to register

Have questions?
Claire Curtin: cmcurtin@lbl.gov
Smart Energy Analytics Campaign

- Launched in 2016
- Campaign goals:
  - Increase adoption of EMIS using a monitoring-based commissioning process
  - Broaden the base of early EMIS adopters
  - Help speed future market uptake
- Final Campaign numbers
  - 104 organizations
  - 6,100 buildings
  - 531M sq. ft.
  - 130+ supporting partners
Smart Energy Analytics Campaign Participants Recognized
(smart-energy-analytics.org/success-stories)
Better Buildings Alliance EMIS Technical Team

- Better Buildings Alliance EMIS Tech Team
  - Quarterly webinars and resources on EMIS and related areas (artificial intelligence, machine learning, and internet of things)
  - Resource for questions about EMIS and DERs
  - Share your work with peers
  - Suggest topics for BBA EMIS Tech Team meetings

- EMIS Tech Team webinars and other events open to public, please request your contact info be added to listserv

Contact Claire Curtin at cmcurtin@lbl.gov
Best Practices Using an EMIS: Commonwealth Partners
Jessica Loeper, Director of Sustainability, Austin Upton, Property Operations Manager for the Portfolio, Gary Walters, Chief Engineer for 560 Mission

Largest Portfolio Using on EIS: Stony Brook University
Thomas Lanzilotta, Campus Sustainability & Energy Manager

New Installation of FDD: University of Utah Health
Robert Armstrong, Energy and Sustainability Coordinator

Innovation Using EMIS: Pomona College
Dotty Hage, Energy Manager
Quick Facts

Building type: Office
Floor area with EMIS: 7.7 million sq. ft.
Total buildings with EMIS: 10
Energy savings: 8.5%
EIS Software: Aquicore

Key Success Factors

- Engineering team daily review for anomalies, peak demand
- Portfolio-level dashboards to prioritize and drill down
- Tracking projects on EIS platform and tying to energy trends
Portfolio-Wide Comparison Year over Year

- Compare previous year
- Show Temperatures
- Show Normalized Values
- Show Actual Values

- Actual Temperature
- Climate Normal Temperature
- Actual Consumption
- Normalized Consumption
- Previous Actual Consumption
- Previous Period Normalized Consumption
- Previous Period Temperature
Daily Check-Ins

Simple daily reports support troubleshooting and highlight potential issues.
FDD Monitoring and Troubleshooting

Being Tested Now

HVAC Analytics integrates into the building BMS, and utilizes artificial intelligence to provide improvement opportunities or highlight abnormalities.
Troubleshooting Through Trends
Portfolio-Wide Analysis during COVID-19

Weekly Consumption by Portfolio Region

Property-specific benchmarking
Largest Portfolio Using an EIS - Stony Brook University

Quick Facts

Building types: University

Floor area with EMIS: 12 million sq. ft.

Total Building with EMIS: 153 buildings

EIS Software: Custom built

Key Success Factors

- Created own dashboards, Annual Building Energy Report
- Alerts for high energy use and peak demand
- Focus on unoccupied hours
Introduction - University at a Glance

- **211 Total Buildings** (over 12 million GSF)
- **1,454 Acres**
- **26,254 Total Students**
- ~**19,000 Faculty/Staff/Affiliates**

- **6 dining facilities**
- **Over 1,100 Laboratories**
- **LI State Veterans Home**
- **Stony Brook Medicine**

- **University Hospital**
- **Health Sciences Center**
- **Research & Development Park**
- **Data Centers**
Campus Metering System

Dedicated Campus Wide Metering Data Collection Server

- 140 buildings submetered
- Over 240 electric sub-meters
- 75 HTHW metered points
- 35 CW metered points
- 30 domestic water metered points
- 91 asset level meters and sensors
- Data from meters is collected every 15 minutes and stored on a server
### Real-Time Building Level Data Monitoring

#### Energy Intensity Heatmap

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#### Energy Intensity Heatmap

- **07/08/19 (Mon)**
- **07/15/19 (Mon)**
- **07/22/19 (Mon)**
- **07/29/19 (Mon)**
Real-Time Building Level Data Monitoring

Energy Calendar View

Class Schedule View
Real-Time Building Level Automated Email Notifications

Meter Alert: Possible BMS Override Alerts for 5-15-2020

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<th>Rate Exceeded</th>
<th>Time Frame</th>
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<td>Challenger Hall</td>
<td>34.9 kW exceeded rate of 30 kW</td>
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Meter Alert: Peak kW - Computer Science

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Project Tracking Using Data for M&V

Monthly Electric Data (kWh)

- Sep: 10.5%
- Oct: 3%
- Nov: 21.4%
- Dec: 10.6%
- Jan: 2.4%
- Feb: 7.4%
- Mar: 3.1%
- Apr: -1.2%
- May: -3.9%
- Jun: 5.4%
- Jul: -22.1%
- Aug: 3.5%

Comparison between 2018 and 2019.
Looking Forward Fault Detection, Diagnostics, and Analytics

- BMS
- EMS
- Class Schedules
- Building Occupancy
- Weather Data

Central Server ➔ Fault Detection, Diagnostics, and Analytics
New Installation of FDD – University of Utah Health

Quick Facts

Building type: Healthcare
Floor area: 172,000 sq. ft. in pilot
Total buildings with EMIS: 3
Energy savings: 9.7% (pilot first year)
FDD Software: Skyspark

Key Success Factors

- Initial pilot to hone processes
- Remote monitoring center with two full time engineers
- Weekly FDD meetings and reports to track progress resolving faults
FDD AT UNIVERSITY OF UTAH HEALTH

- 924,912 sq. ft. connected hospital buildings.
- Added 355,122 sq. ft. in January with new acute care hospital.
- Adding 172,530 sq. ft. currently with new rehabilitation hospital.
- Plans to add neuropsychiatric hospital along with 10 community clinics to central FDD program in coming years.
LESSONS LEARNED

• Start with the meters
• Pilot before largescale deployment
• Consider JACE & BAS upgrades before deployment
• Meet often – weekly energy meetings with controls shop
• Include key personnel in meetings (controls contractor, engineer)
LOOKING AHEAD

- Meter maintenance program
- EMIS
- Energy dashboards
- FDD Rules – prioritization of “sparks”
- Deployment in community clinics
Quick Facts

Building type: University campus

Floor area: 828,000 sq. ft.

Total buildings with EMIS: 18

Energy Savings: 19%*

EIS Software: Melrok

Key Success Factors

- EMIS acts as cloud-based control system
- Exploring the use of wi-fi load as a proxy for occupancy
- Use of EMIS for M&V of energy projects and retrocommissioning
Automated Cloud-Based Continuously Optimizing Building Energy Management Systems (ACCO BEMS):
Bottom Line

- Buildings ‘drift’ from the moment they are commissioned
- Buildings become less efficient and the bottom line is that energy efficiency losses often exceed 20%

Usual Suspects:
- No one is even looking at the data and how the Building Energy Management System (BEMS) is operating campus buildings
- Bad configuration of BEMS
- Poor installation of BEMS
- Faulty sensors & actuators
- Poor sequence of operation
- Lack of Commissioning

Requirement for Energy Efficiency & Optimization:
- Actively & in real-time manage & optimize Building Energy Management Systems (BEMS). This is ACCO BEMS
Data Management Chasms

- Energy / Building Management Systems
  - Facility Equipment
  - Utility and Energy Meters
  - Environmental Sensors
  - Process Sensors

- Data Storage
- Data Analytics
- KPI Dashboards & Alerts

Increasing Value

Data Chasm

Control Chasm

Data Acquisition

Analytics

Action
ACCO BEMS Infrastructure
Out of the Box Exploratory Data Analysis
## Sensor Anomaly: Faulty Sensors & Actuators

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<td>03/06/2020 14:59:00</td>
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## System Anomaly: Faulty Equipment (i.e. SOO)

<table>
<thead>
<tr>
<th>Account</th>
<th>Equipment Description</th>
<th>Issue Description</th>
<th>Date</th>
<th>Most Recent State</th>
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<td>Pomona College</td>
<td>AH1 - Alexander Hall</td>
<td>Temperature Inconsistency Across Heating Coil</td>
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Cloud Controls

![Graph showing ACCO BEMS and Pres ACCO BEMS data over time. The graph illustrates the changes in supply air sensor static pressure and demand over a period from April 7 to April 8.]
Customization:
Python Sand Box
Building Design Intent = O&M
Please submit your questions for the award recipients using the chat function (Send chat to Eliot Crowe)
Thank you

**Next Steps:**

**Register** for the Virtual Better Buildings Summit

For Campaign participants, contact Claire Curtin to become part of Better Buildings EMIS Tech Team

Claire Curtin cmcurtin@lbl.gov
Hannah Kramer hkraker@lbl.gov