



## Smart Energy Analytics Campaign – Spring 2019 Recognition

Lawrence Berkeley National Laboratory  
June 6, 2019

Welcome! We'll be starting shortly...

# Welcome!



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Guanjing  
Lin  
Senior  
Scientific  
Engineering  
Associate



# 2019 Better Buildings and Better Plants Summit



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## 2019 SUMMIT

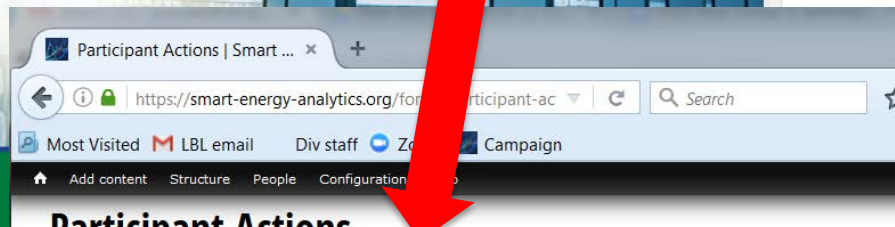
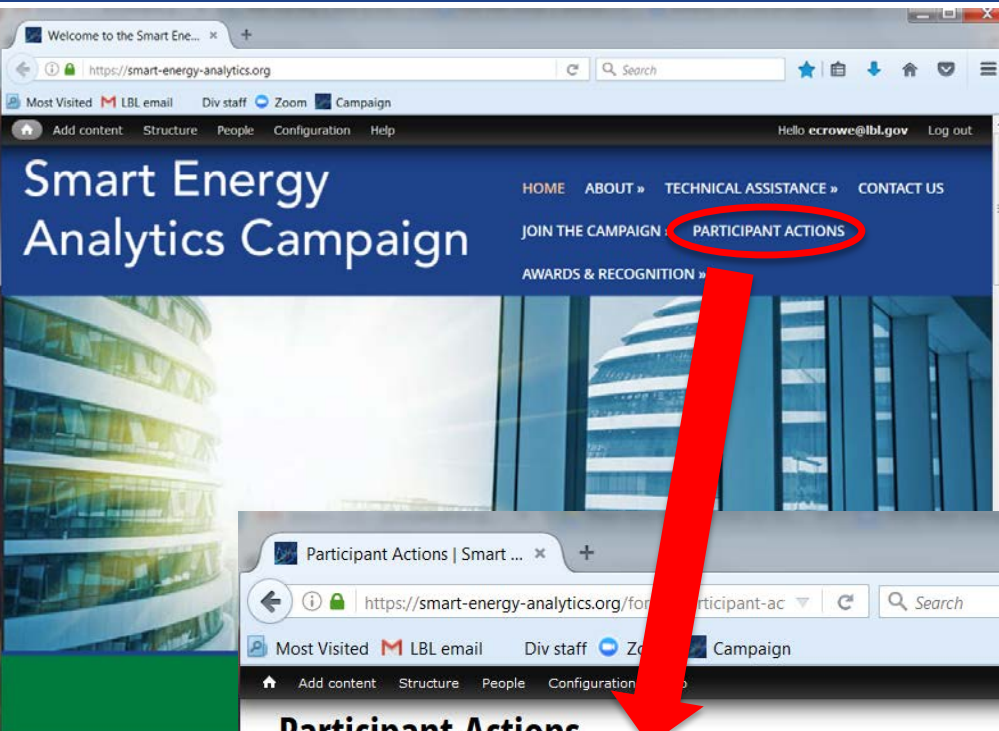
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**ENERGY**

# Participant Actions – update with 2018 data extended to June 14th



## Participant Actions

[View](#) [Edit](#) [Webform](#) [Results](#) [Revisions](#)

The Actions section helps the Campaign understand the results of using EMIS and energy management processes. Once you complete form, you will be recognized on the Smart Energy Analytics Campaign website.

The Actions submission is divided into three sections: EMIS installation, implementation, and annual energy use.

Facilities that installed a new EMIS and facilities utilizing an existing EMIS both qualify for participation.

### EMIS Installation

We installed a new EMIS, upgraded an existing EMIS, or used our existing EMIS as-is during the Campaign.  
Select the option that best describes your EMIS below.

- ☒ New EMIS
- ☐ Upgraded EMIS (add additional facilities, metering, or EMIS functionality)
- ☐ Existing EMIS

Provide the number of facilities with EMIS in use during the campaign and the total floor area associated with these facilities.





# Survey coming this summer

## For Campaign Participants and Supporting Partners:

Short survey to inform future planning for DOE Better Building's EMIS work with industry – we want your input

Campaign winding down in 2020 but your involvement continues through Better Buildings



# Smart Energy Analytics Campaign Participants Recognized ([smart-energy-analytics.org/success-stories](http://smart-energy-analytics.org/success-stories))



In Partnership with



MACALESTER COLLEGE



# Spring 2019 Smart Energy Analytics Campaign Recognition

**Best Practices in the Use of FDD in a Portfolio** – Hewlett Packard Enterprises in association with ISS Facility Services, Jeremy Macdonald, Global Energy and Sustainability Director

**Energy Performance Using EIS in a Portfolio** – Jamestown, Becca Rushin, VP Sustainability and Corporate Social Responsibility; Ed Bassford, Director of Operations at Jamestown Urban Management

**Energy Performance Using FDD in a Portfolio** – Kaiser Permanente, Gary Mullaney, Sr Energy Consultant

**Energy Performance Using EIS in a Single Site**– Benchmark Electronics, Steve Beck, Manufacturing Energy Manager

**Largest Portfolio Using EMIS** – Commonwealth of MA-DCAMM, Krista Lillis, Energy Program Manager

**Innovation Using EIS in a Portfolio**– Macalester College, Mike Pumroy, Energy Manager

**Innovation Using FDD in a Portfolio** – Amgen, Aditi Joshi, Sr Energy Engineer

# Best Practice in the Use of FDD

## Hewlett Packard Enterprises in partnership with ISS Facilities Services

### Quick Facts

**Building type:** Office, lab, data center

**Floor area with EMIS:** 2 million sq ft

**Total buildings with EMIS:** 15 buildings at 5 sites

**Energy savings:** 9% at one site

**MBCx Service provider:** ISS Facilities Services

**FDD Software:** KGS Clockworks



### Key Success Factors

- Central FDD expert on staff
- Obtain funding for resolving major faults and treating them as a project
- FDD calculates energy savings for water side economizer use



# Best Practice in the Use of FDD

## Hewlett Packard Enterprises in association with ISS Facilities Services

Home

Diagnostics

Analysis Builder

Performance Indicators

Commissioning Dashboard

Tasks

Projects

Reporting

Building Profiles

Equipment Profiles

### Diagnostics

The Diagnostics module provides a prioritized, searchable list of identified faults and energy saving opportunities across your portfolio.

Search Criteria

View By

Select Building Group: View All

Select Building: Chippewa Falls Bldg 1

Select Equipment Class: View All

Select Equipment Type: View All

Select Equipment: View All

Select Analysis: View All

Display Interval

☐ Half Day

☐ Daily

☐ Weekly

☒ Monthly

Date Range

\*Start Date: 4/1/2019

\*End Date: 4/30/2019

Filters

Notes Summary:

Tracking Code:

Results Only: ☐

Generate Data

[Download Current Diagnostics Page](#)

[Download Full Diagnostics Results](#)

178 data records found for 4/1/2019 to 4/30/2019 in monthly intervals.

Building	Equipment	Analysis	Start Date	Notes Summary	Tasks	Cost	E	C	M	Actions
Chippewa Falls Bldg 1	Chillers_1_4-Cooling P... (Cooling System)	Cooling Plant Energy	4/1/2019	Chiller on, free cooling available.	1	\$11,362	10	0	0	
Chippewa Falls Bldg 1	Chillers_5_6-Plant Rm 102 (Cooling System)	Cooling Plant Energy	4/1/2019	Chiller on, free cooling available.	1	\$9,674	10	0	0	
Chippewa Falls Bldg 1	Chillers_9_10_11-CHW Loop (Cooling System)	CHW Loop	4/1/2019	Minimal load across loop. Diff pressure higher than setpoint. Sensor error (flat, high, low).	1	\$8,004	10	0	6	
Chippewa Falls Bldg 1	Chillers_5_6-CHW Loop (Cooling System)	CHW Loop	4/1/2019	Low loop temp difference. Diff pressure lower than setpoint. Minimal load across loop.	1	\$6,973	10	0	6	
Chippewa Falls Bldg 1	RM_103 Liebert_04 (Zone Equipment)	Zone Unit	4/1/2019	Zone fan on while unoccupied. Compressor short cycling. Supply fan status data mismatch.	1	\$263	9	2	3	

HPE's FDD diagnostic dashboard helps filter and prioritize issues

# Energy Performance Using EIS in a Portfolio - Jamestown

## Quick Facts

**Building type:** Commercial real estate

**Floor area with EMIS:** 2.5 million sq ft

**Total buildings with EMIS:** 13

**Energy savings:** 4% first year

**EIS Software:** Aquicore and Enel X (formerly EnerNOC)

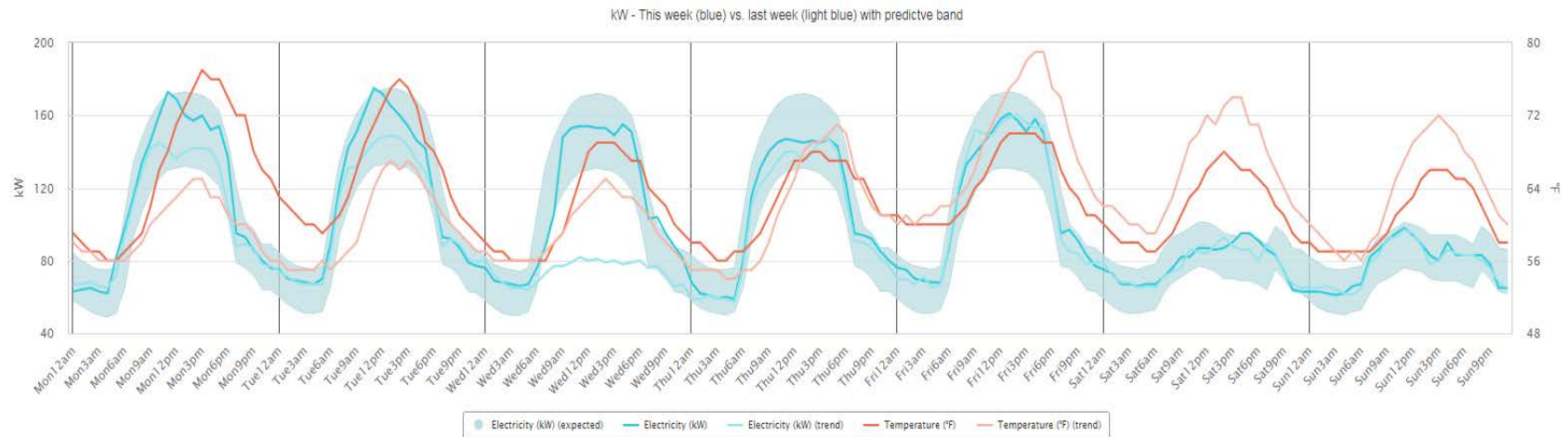


## Key Success Factors

- Training building engineers
- Redesigning EIS dashboards
- Encouraging weekly use of EIS

# Energy Performance Using EIS in a Portfolio - Jamestown

INTERVAL	CONSUMPTION (KWH)	CONSUMPTION (KWH) TREND	DEMAND (KW)	DEMAND (KW) TREND
Monday, Jul 9	2,748 kWh	▲ 9%	178 kW	▲ 21%
Tuesday, Jul 10	2,743 kWh	▲ 7%	180 kW	▲ 12%
Wednesday, Jul 11	2,652 kWh	▲ 49%	166 kW	▲ 94%
Thursday, Jul 12	2,570 kWh	▲ 5%	154 kW	▼ -2%



***This week's energy use (blue line); last week's energy use (light blue line); model-predicted energy use (light blue band); this week's outdoor air temperature (red line); last week's outdoor air temperature (orange line)***

# Energy Performance Using FDD in a Portfolio - Kaiser Permanente

## Quick Facts

**Building type:** Healthcare

**Gross floor area:** 7 million sq ft

**Total buildings with EMIS:** 69

**Energy Savings:** 12% average savings at 7 locations

**MBCx Service provider:** KGS Buildings

**FDD Software:** KGS Clockworks

**EIS Software:** ENGIE Insight

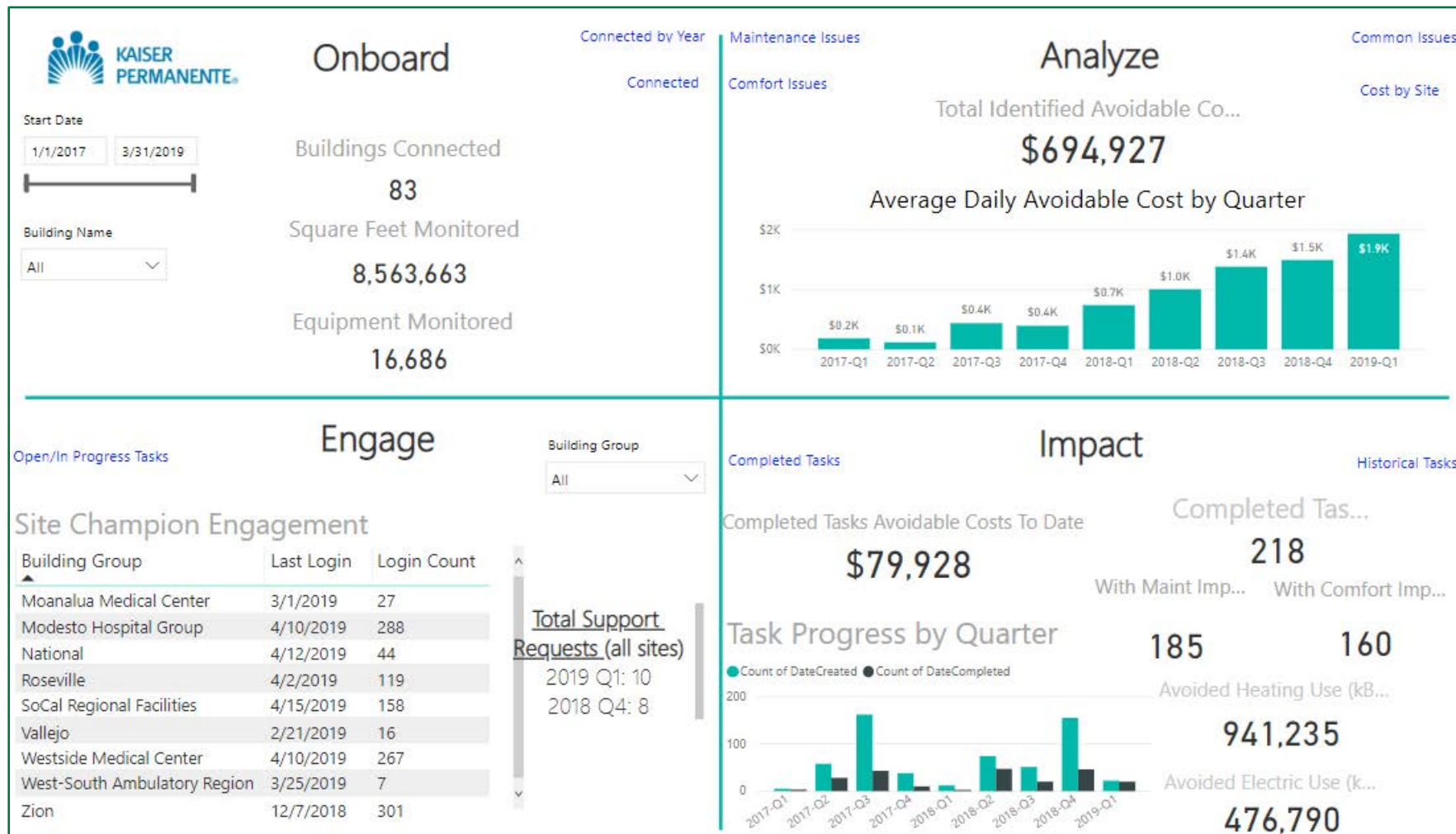


## Key Success Factors

- Corporate support and energy goals
- Distributed team of FDD champions supported by a small national team
- High quality reporting to management
- FDD for new construction



# Energy Performance Using FDD in a Portfolio - Kaiser Permanente



Kaiser Permanente's impact report summarizes results (developed in Microsoft Power BI utilizing FDD data)

# Energy Performance Using EIS in a Site Benchmark Electronics

## Quick Facts

**Building type:** Office and manufacturing

**Gross floor area:** 80,000 sq ft

**Energy savings:** 15% electric

**EIS software:** The Energy Detective



## Key Success Factors

- Energy team's integration of EIS into working practices
- Persistence in use over three years
- Data supports utility program-funded efforts

# Energy Performance Using EIS in a Site Benchmark Electronics



Benchmark's EIS provides color-coded visualization of daily energy consumption

# Largest Portfolio Using an EMIS Commonwealth of MA - DCAMM

## Quick Facts

**Building types:** Various state owned buildings

**Floor area with EMIS:** 25 million sq ft

**Total Building with EMIS:** 420 buildings

**Energy Savings:** 23 buildings with 14% average energy savings

**EIS Software:** Enel X (formerly EnerNOC)

**MBCx Service provider:** in house with 3<sup>rd</sup> party assistance from B2Q



## Key Success Factors

- Use of data: energy, demand, equipment sizing, M&V
- EIS automated opportunity reporting: delayed start, earlier shutdown, reduced holiday/weekend operation, and baseload reductions



# Commonwealth Building Energy Intelligence (CBEI)

## Problem:

**Decentralized energy and building data across different facilities and agencies. Energy Team (DCAMM) requires the data. Our work revolves around it to ensure we fix it right the first time.**

## Solution:

**Centralized metering and centralized bill collection in 1 platform.** Tracks & records data for electricity, natural gas, steam, hot and chilled water, and oil usage.



## Program Basics:

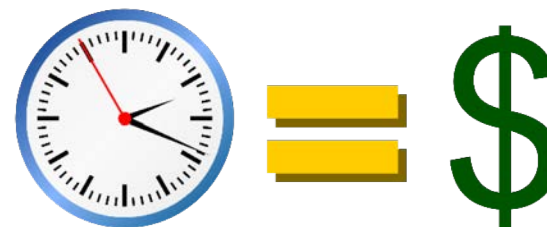
- Tracks and records 5 minute interval data for electricity, natural gas, steam, hot and chilled water, and oil usage
- Covers 25 million square feet, 420 buildings out of a total of 934 buildings are metered (approximately 24% of Commonwealth buildings over 20k sqft).
- Tracking utility bills for 482 accounts across 42 sites
- Includes state hospitals, prisons, universities, community colleges, trial courts, office buildings.
- Managed by DCAMM, funding contribution and support from DOER.



# Commonwealth Building Energy Intelligence (CBEI)

## Benefits

1. Utility billing
  - Load shedding
  - Peak demand rates
  - Savings from identifying utility charges
  - Utility Incentives
2. Programmatic “cost avoided” (\$50,000-\$200,000 per project)
  - Baselineing
  - Utility bill collection
3. Identifying project savings
  - M&V for projects
4. Equipment and maintenance insight
5. Identify utility cost savings to save jobs



Commonwealth Energy Intelligence (CEI)

# Innovation in the Use of EIS in a Portfolio

## Macalester College

### Quick Facts

**Building type:** University campus

**Floor area:** 1.3 million sq ft

**Total buildings with EMIS:** 26

**Energy Savings:** 5% electric savings

**EIS Software:** in house developed EIS using web-based submeters by MAMAC Systems, Inc.



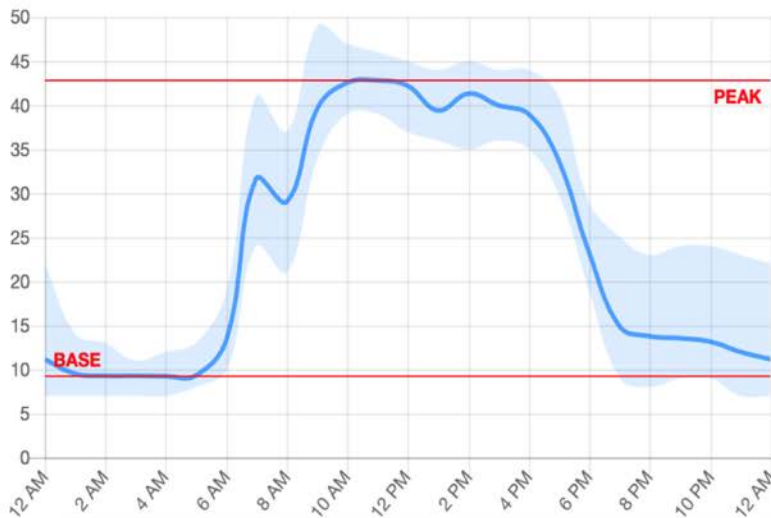
### Key Success Factors

- Partnership between Sustainability Office, Facilities Services, IT staff and students
- Determined visualizations they would use, then developed them
- Unique analytics: correlation between HDD and steam condensate to identify problems

# Innovation in the Use of EIS in a Portfolio

## Macalester College

**Average Day Pattern** Weyerhaeuser Hall



BASE-PEAK CONSUMPTION RATIO:

0.2155

BASE CONSUMPTION:

9 kWh

PEAK CONSUMPTION:

43 kWh

MIN. CONSUMPTION TIME:

3 AM – 4 AM

MAX. CONSUMPTION TIME:

10 AM – 11 AM

Base to peak consumption ratio is benchmarked across buildings to identify high off-hours operation.



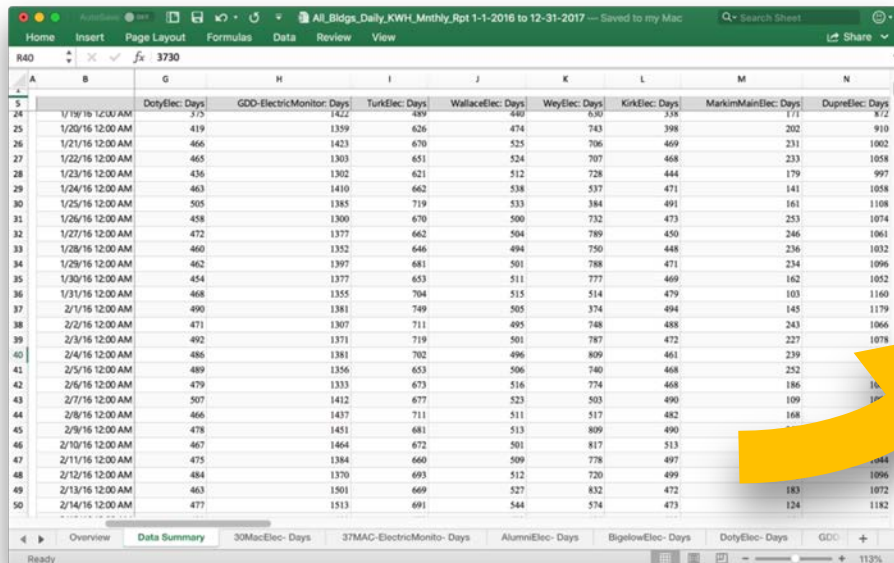
# EMIS at Macalester College

- Starting 2013: installing inexpensive meters for monitoring electricity & gas consumption, water usage, and steam condensate return
- Need for energy data analytics tool that would automatically collect the sensor data
- Most commercial EMIS's: proprietary & expensive
- Involving a student with computer science background, developed a dashboard

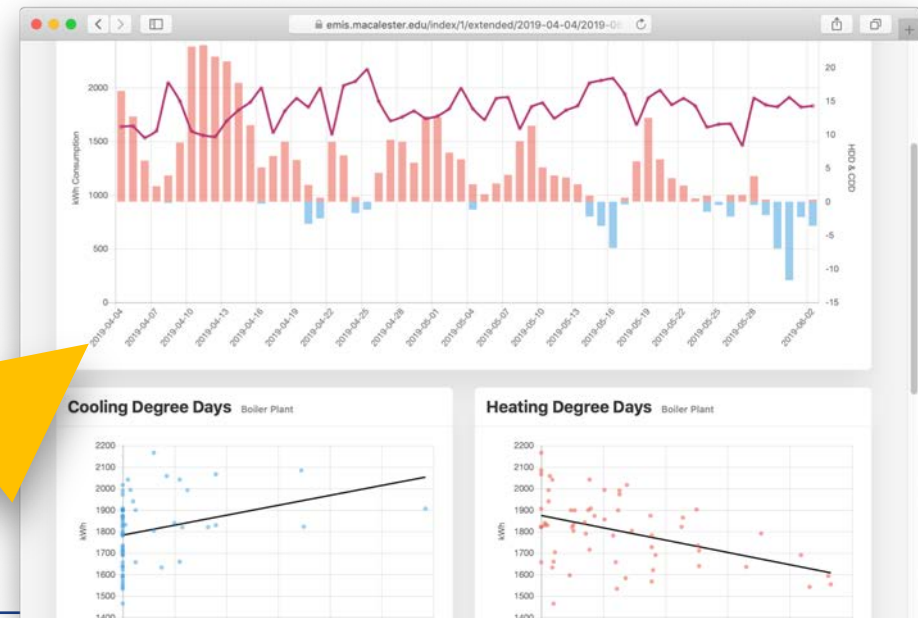
<http://emis.macalester.edu>

# EMIS at Macalester College

- Easy-to-use web-based application
- Automatically collects data from sensors
- Professional visualizations & user interface
- Cost-effective and non-proprietary software



	A	B	G	H	I	J	K	L	M	N
5			DutyElec: Days	GDD-ElectricMonitor: Days	TurkElec: Days	WallaceElec: Days	WeyElec: Days	KirkElec: Days	MarkimMainElec: Days	DupreElec: Days
24	1/19/16 12:00 AM	375	1422	489	440	630	338	171	872	
25	1/20/16 12:00 AM	419	1359	626	474	743	398	202	910	
26	1/21/16 12:00 AM	466	1423	670	525	706	469	231	1002	
27	1/22/16 12:00 AM	465	1303	651	524	707	468	233	1058	
28	1/23/16 12:00 AM	436	1302	621	512	728	444	179	997	
29	1/24/16 12:00 AM	463	1410	662	538	537	471	141	1058	
30	1/25/16 12:00 AM	505	1385	719	533	384	491	161	1108	
31	1/26/16 12:00 AM	458	1300	670	500	732	473	253	1074	
32	1/27/16 12:00 AM	472	1377	662	504	789	450	246	1061	
33	1/28/16 12:00 AM	460	1352	646	494	750	448	236	1032	
34	1/29/16 12:00 AM	462	1397	681	501	788	471	234	1096	
35	1/30/16 12:00 AM	454	1377	653	511	777	469	162	1052	
36	1/31/16 12:00 AM	468	1355	704	515	514	479	103	1160	
37	2/1/16 12:00 AM	490	1381	749	505	374	494	145	1179	
38	2/2/16 12:00 AM	471	1307	711	495	748	488	243	1066	
39	2/3/16 12:00 AM	492	1371	719	501	787	472	227	1078	
40	2/4/16 12:00 AM	486	1381	702	496	809	461	239		
41	2/5/16 12:00 AM	489	1356	653	506	740	468	252		
42	2/6/16 12:00 AM	479	1333	673	516	774	468	186		
43	2/7/16 12:00 AM	507	1412	677	523	503	490	109		
44	2/8/16 12:00 AM	466	1437	711	511	517	482	168		
45	2/9/16 12:00 AM	478	1451	681	513	809	490			
46	2/10/16 12:00 AM	467	1464	672	501	817	513			
47	2/11/16 12:00 AM	475	1384	660	509	778	497			
48	2/12/16 12:00 AM	484	1370	693	512	720	499			
49	2/13/16 12:00 AM	463	1501	669	527	832	472	183	1072	
50	2/14/16 12:00 AM	477	1513	691	544	574	473	124	1182	



# Innovation in the Use of FDD in a Portfolio

## Amgen

### Quick Facts

**Building type:** Office, lab, manufacturing

**Floor area:** 6.5 million Sq Ft

**Total buildings with EMIS:** 6 campuses

**Energy savings:** 5% whole facility energy savings (based on 3 locations reporting)

**FDD Software:** KGS Clockworks

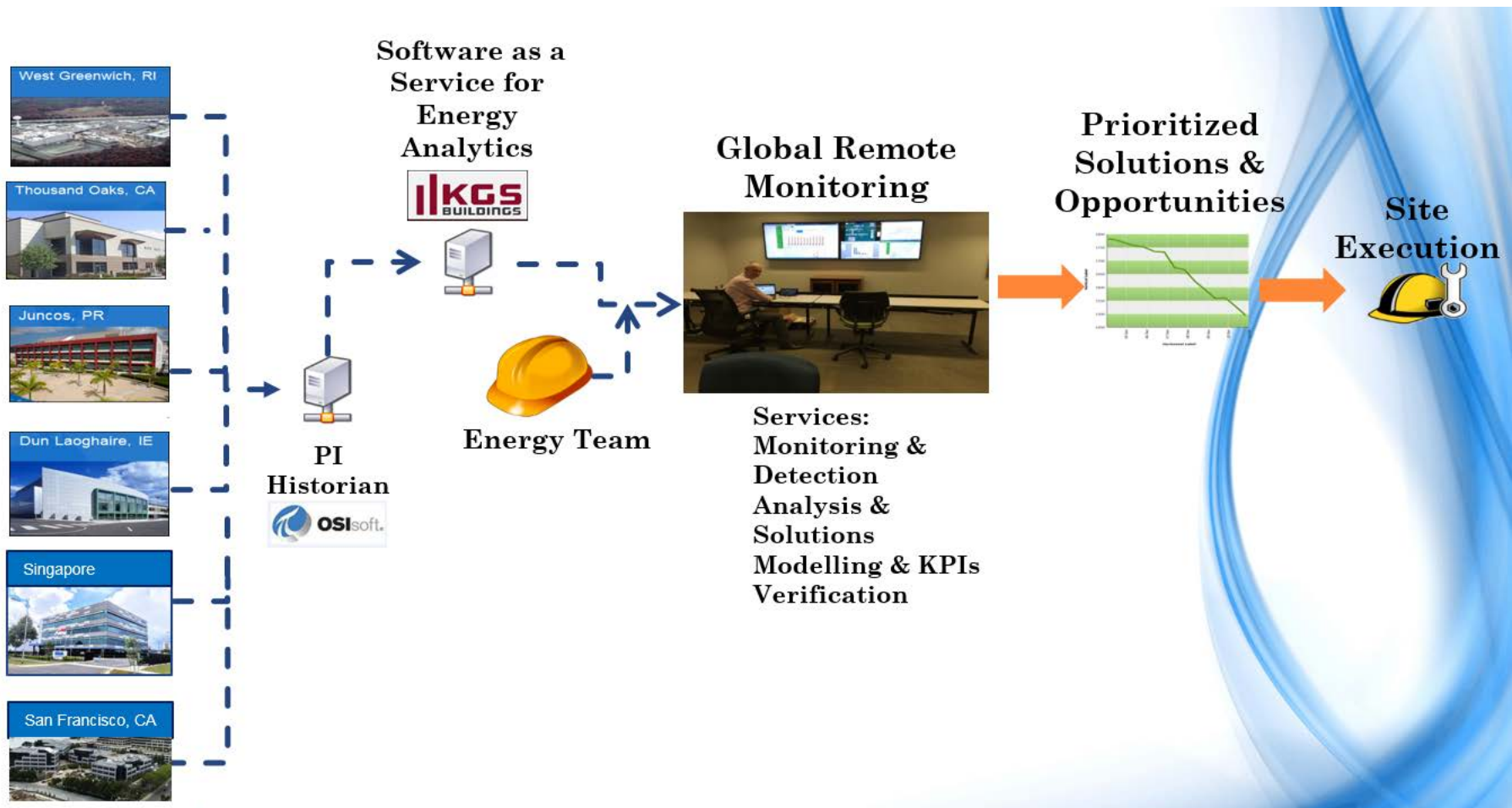


### Key Success Factors

- Remote monitoring center with two full time engineers
- Weekly FDD meetings and reports to track progress resolving faults

# Innovation in the Use of FDD in a Portfolio

## Amgen





# Q&A

Please submit your questions for the award recipients using the chat box



# Spring 2019 Smart Energy Analytics Campaign Recognition

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**Innovation Using FDD in a Portfolio** – Amgen, Aditi Joshi, Sr Energy Engineer

# Thank you

## Next Steps:

- Join the Campaign or make a referral – new participants accepted until Jan 1, 2020.
- Submit Participant Actions webforms by Friday, June 14

Questions, please contact:

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Hannah Kramer [hkramer@lbl.gov](mailto:hkramer@lbl.gov)

[smart-energy-analytics.org](http://smart-energy-analytics.org)