# From Numbers to Action: Using EMIS to Detect Problems and Fix Them

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Lawrence Berkeley National Laboratory

Better Buildings Summit May 10, 2016

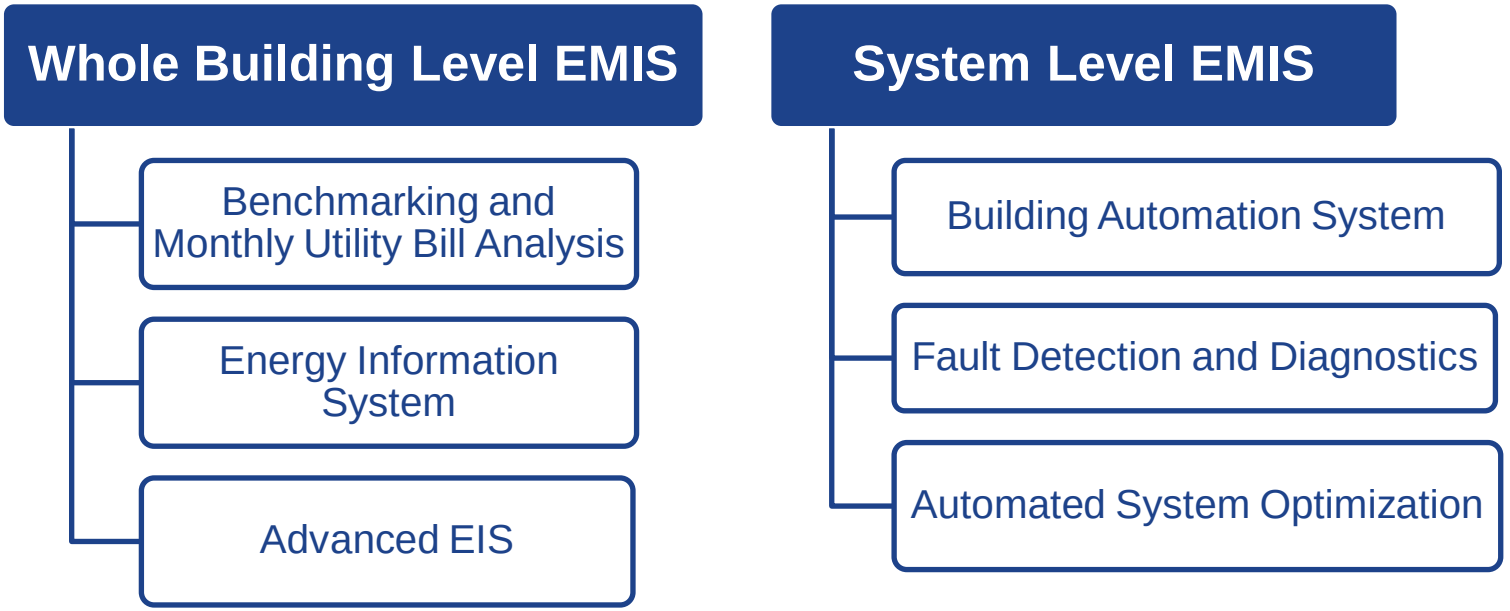
Supported by DOE Building Technologies Office, A. Mitchell

# Session Outline

- Welcome and Introductions
- EMIS Defined
- Overview of BBA EMIS Team
- Guest Presentations
- Q&A
- Wrap up

# Energy Management and Information Systems (EMIS)

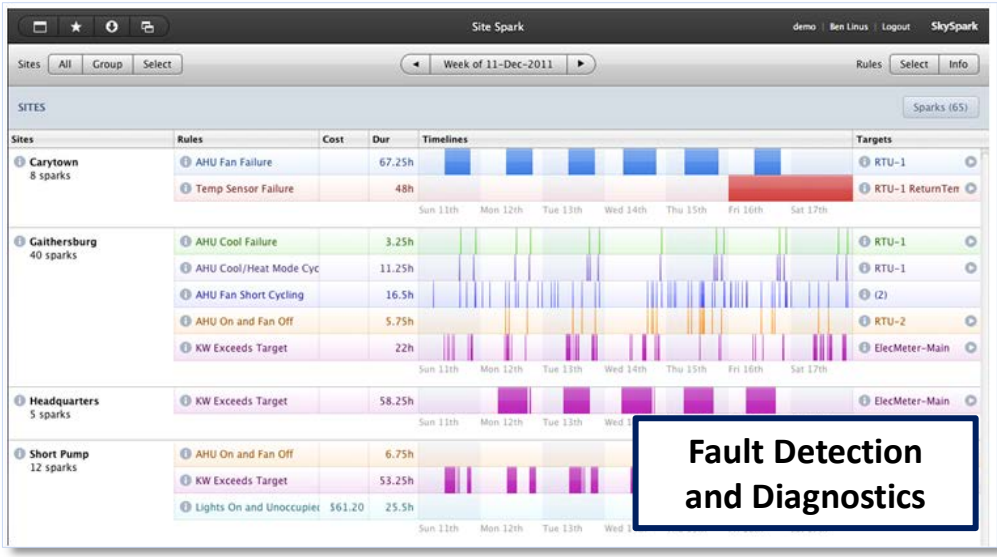
**EMIS are a broad family of tools to monitor, analyze, and control building energy use and system performance**



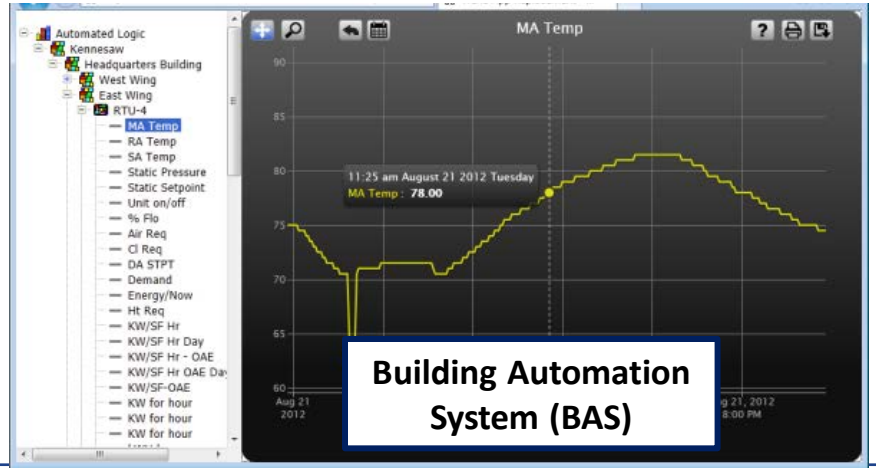

* The boundaries can be fuzzy; some tools cross categories, e.g., energy information systems with FDD and benchmarking capabilities

# EMIS Examples


**Benchmarking and Monthly Utility Bill Analysis**

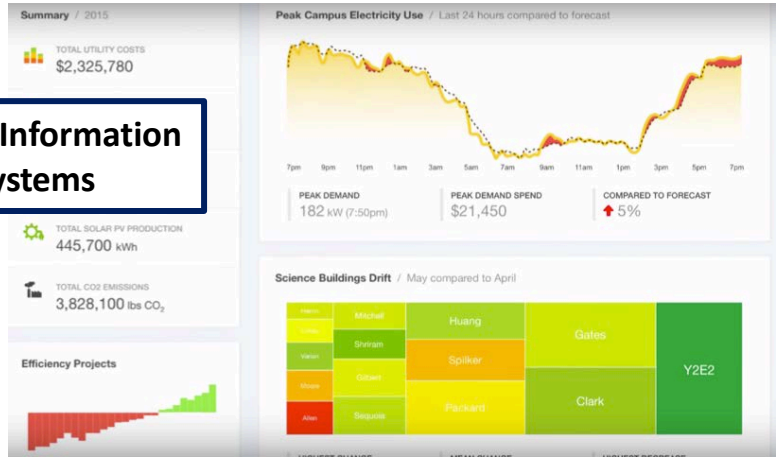



**Fault Detection and Diagnostics**




**Building Automation System (BAS)**

**Energy Information Systems**



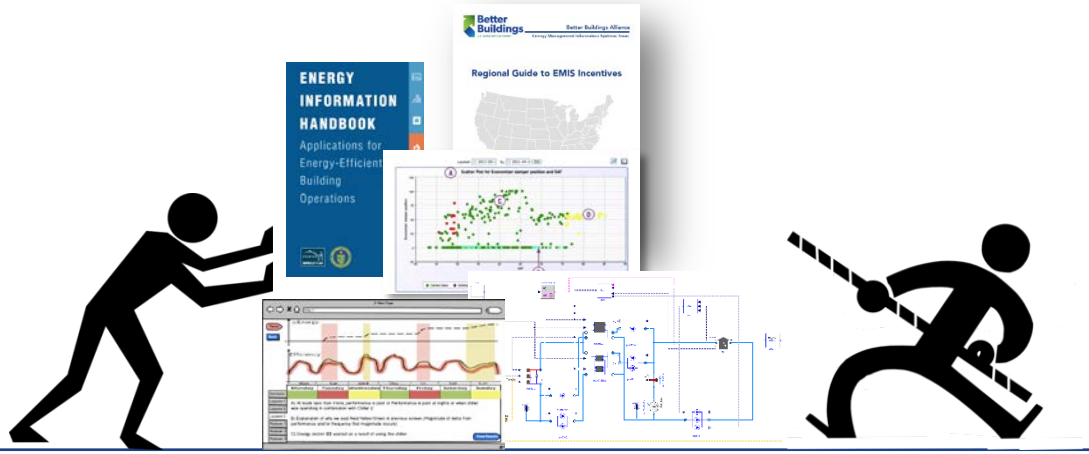

*Benchmarking: Performance Systems Development*
*BAS: Automated Logic*

*FDD: SkyFoundry*
*EIS: Lucid*

# EMIS Project Team Overview

## Support members in adopting or expanding use of EMIS

- Laboratory technical expertise and market intelligence connects utilities, owner/operator community, vendors of commercial tools
- Development of new analytical approaches, **identification of best-practice uses**
- **Knowledge and technology transfer** to **facilitate market push and market pull**

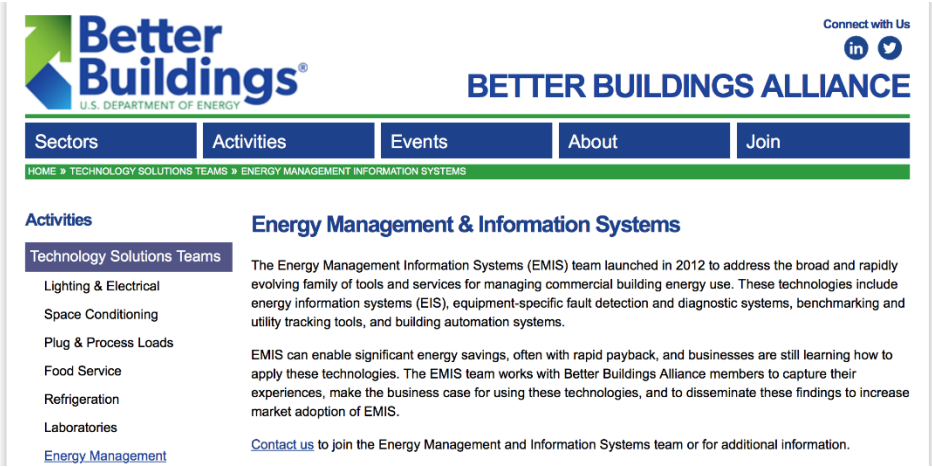



LBNL w/vendor community

LBNL w private and public sector, vendor community, utilities

# EMIS Resource Examples

- Synthesis of existing EMIS resources, “Cliff’s Notes”
- Hyperlinked regional guide to EMIS utility incentives
- Vendor overviews and guest login access
- Procurement support materials – spec, RFP, selection guidance
- Primer to organizational EMIS use
- Peer learning, guest presentations



# Questions and Open Discussion

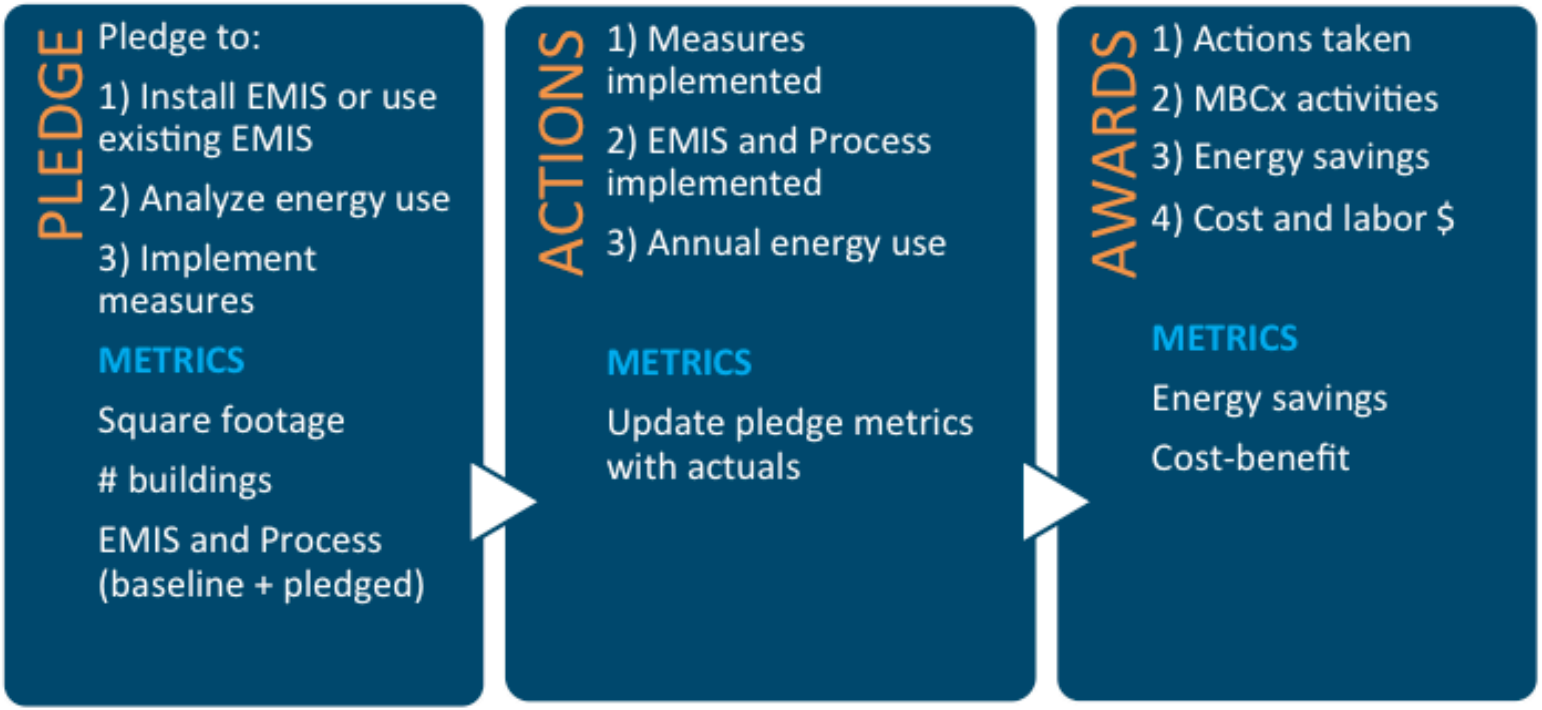
# Now Launching! Smart Energy Analytics Campaign

- Designed to increase adoption of EMIS technologies and processes
- Campaign activity planned for 2016-2018
  - Enroll Participants to use EMIS and monitoring-based commissioning to increase energy savings
  - Provide resources to support new and expanded EMIS projects
  - Convene early adopters to share successes
  - Award and recognize Participant's exemplary performance
  - Enlist Supporting Partners from industry to bring their members/customers into Campaign

# Smart Energy Analytics Campaign: Participant Process

## Who can participate?

- Commercial building owners, facility managers, energy managers and building operators of a single site, or a portfolio/campus of buildings
- Buildings can be located in any region of US



# Wrap Up

- Sign up to Participate in the Smart Energy Analytics Campaign
  - www. smart-energy-analytics.org
- Join the BBA EMIS team
  - Send email to cmcurtin@lbl.gov to be added to mailing list for upcoming webinars
- Visit Ask-an-Expert table
  - Jessica Granderson available for questions on

    Tuesday May 10th, 4:30-5:30pm

# BBA EMIS Project Team Members 2015-2016

- Arlington County, Virginia
- CBRE
- CentraCare Health System
- City of Alexandria, VA
- City of Bellevue, WA
- City of Cincinnati, OH
- City of Cleveland, OH
- City of Newark, NJ
- Del Haize
- Emory University
- Food Lion
- Hospital Corporation of America
- Jamestown LP
- Jones Lange LaSalle
- Kauai County, HI
- King County, WA
- Legacy Health System
- Marriott
- Michigan State University (MSU)
- National Grid
- New York Power Authority
- NYC Buildings
- Oklahoma State U Med Center
- Retail Properties of America, Inc.
- Summa Health
- Texas Tech Health Center
- Ulta Beauty
- University of Maryland Medical Center
- University of Michigan Health System
- University of Wisconsin Medical Foundation
- Verizon
- WaWa
- Wendy's
- Whole Foods

# THANK YOU

eere.energy.gov/betterbuildingsalliance/EMIS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# "From Numbers to Action:
## Using Energy Management Information Systems (EMIS) to Detect Problems and Fix Them"

Aaron Daly

Global Energy Coordinator

# Start with the questions

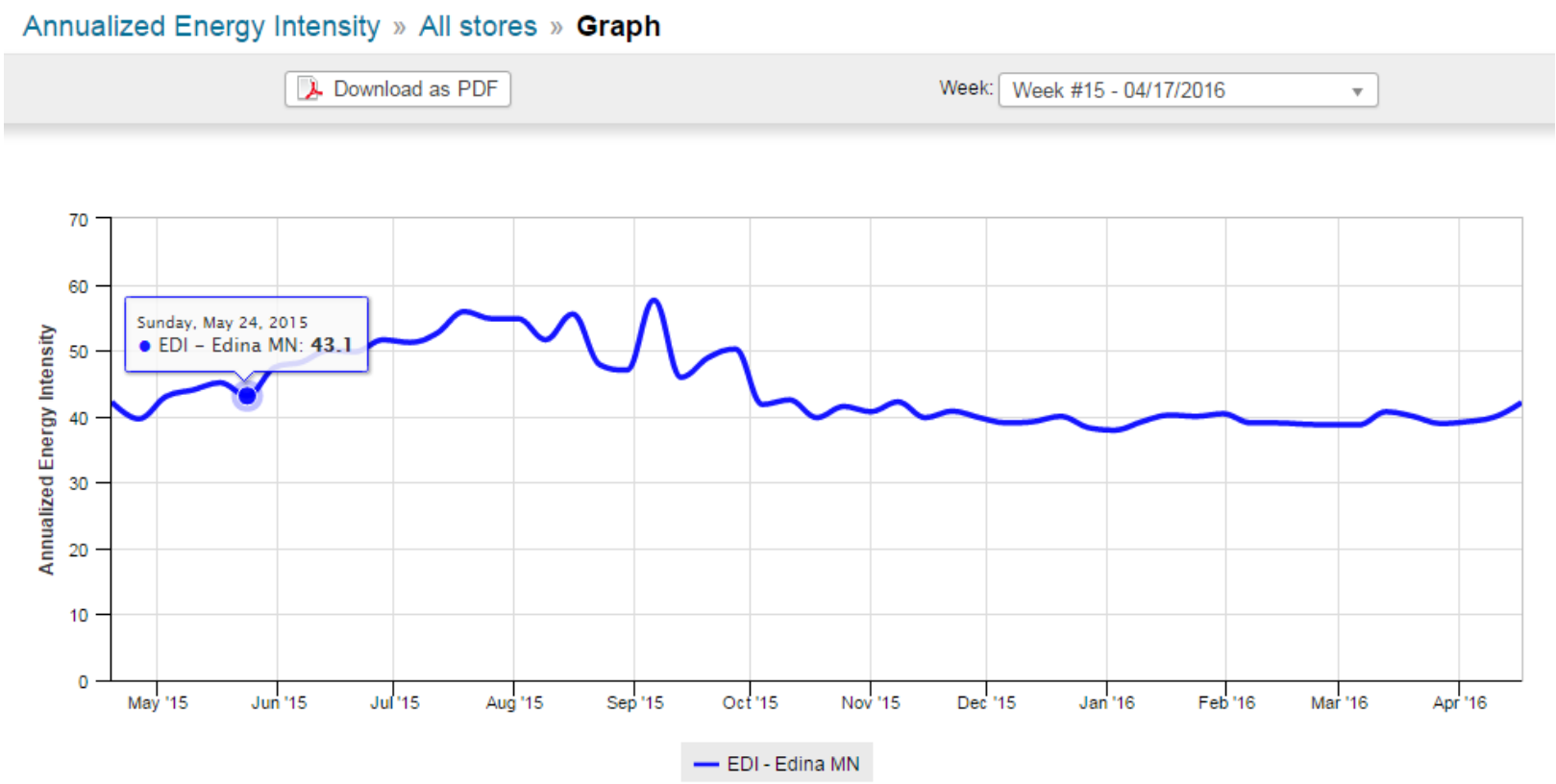
- What energy performance can we expect from our stores?
- What's broken?
- Where do we invest our capital?
- How well are our service contracts working?
- Are we paying the right amount for power?

# Virtual Quality Assurance Manager

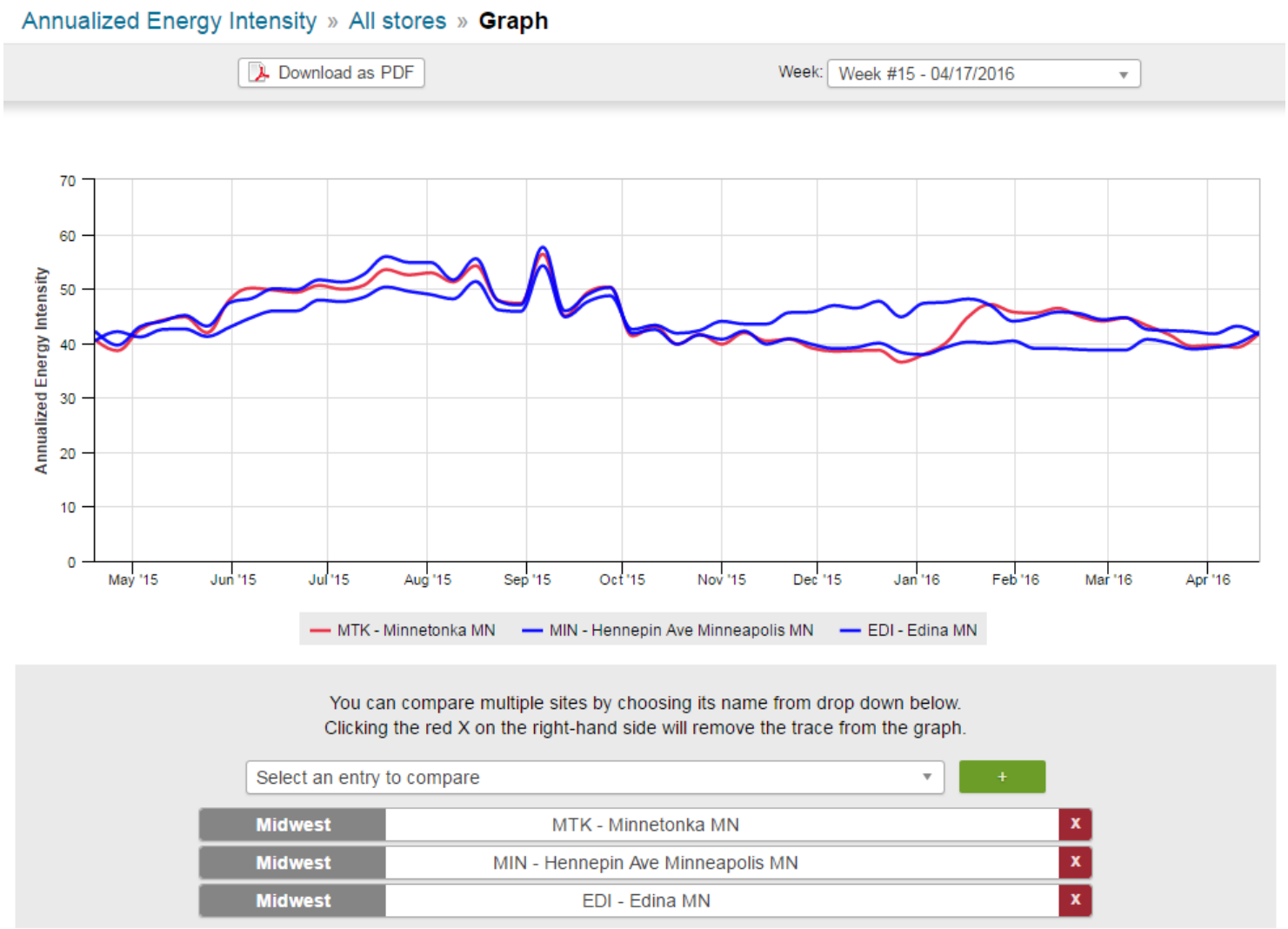
- What energy performance can we expect from our stores?
- What's broken?
- Where do we invest our capital?
- How well are our service contracts working?
- Are we paying the right amount for power?

- Usage reporting & trending
- Metering/Sub-metering
- Asset availability
- Email alert system

# Usage Reporting & Trending



# Usage Reporting & Trending



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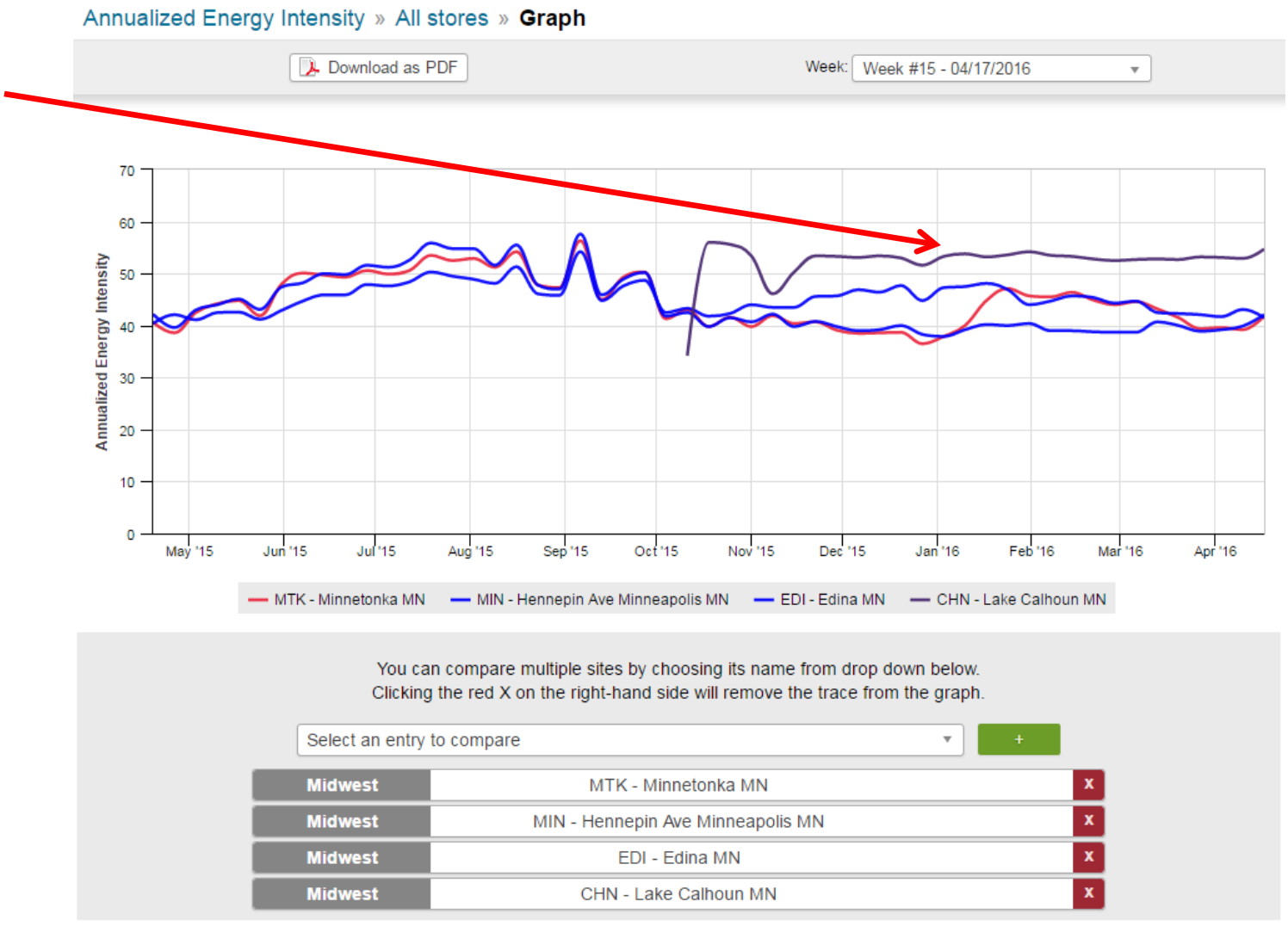
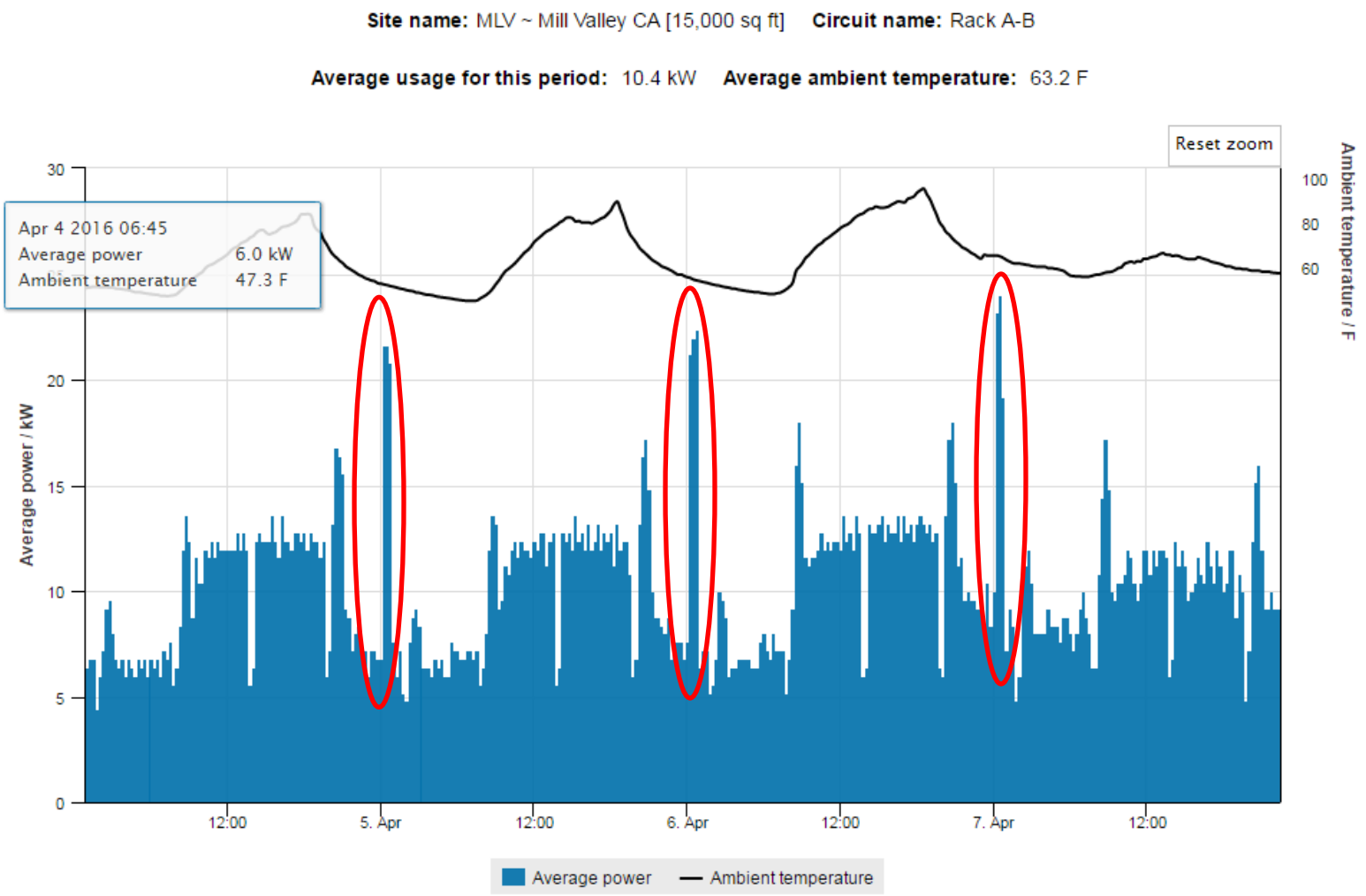


# Metering/Sub-Metering

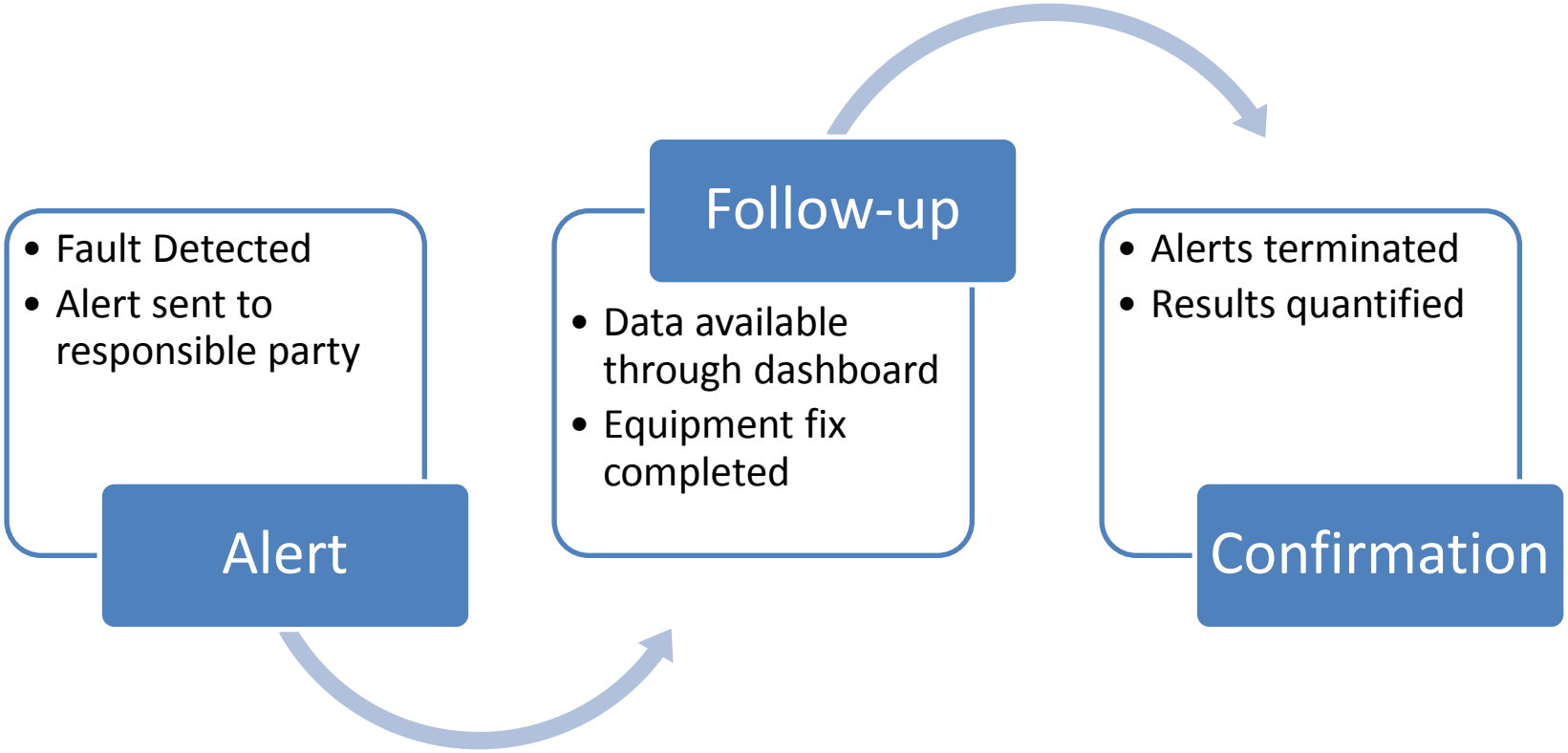


# Asset Availability

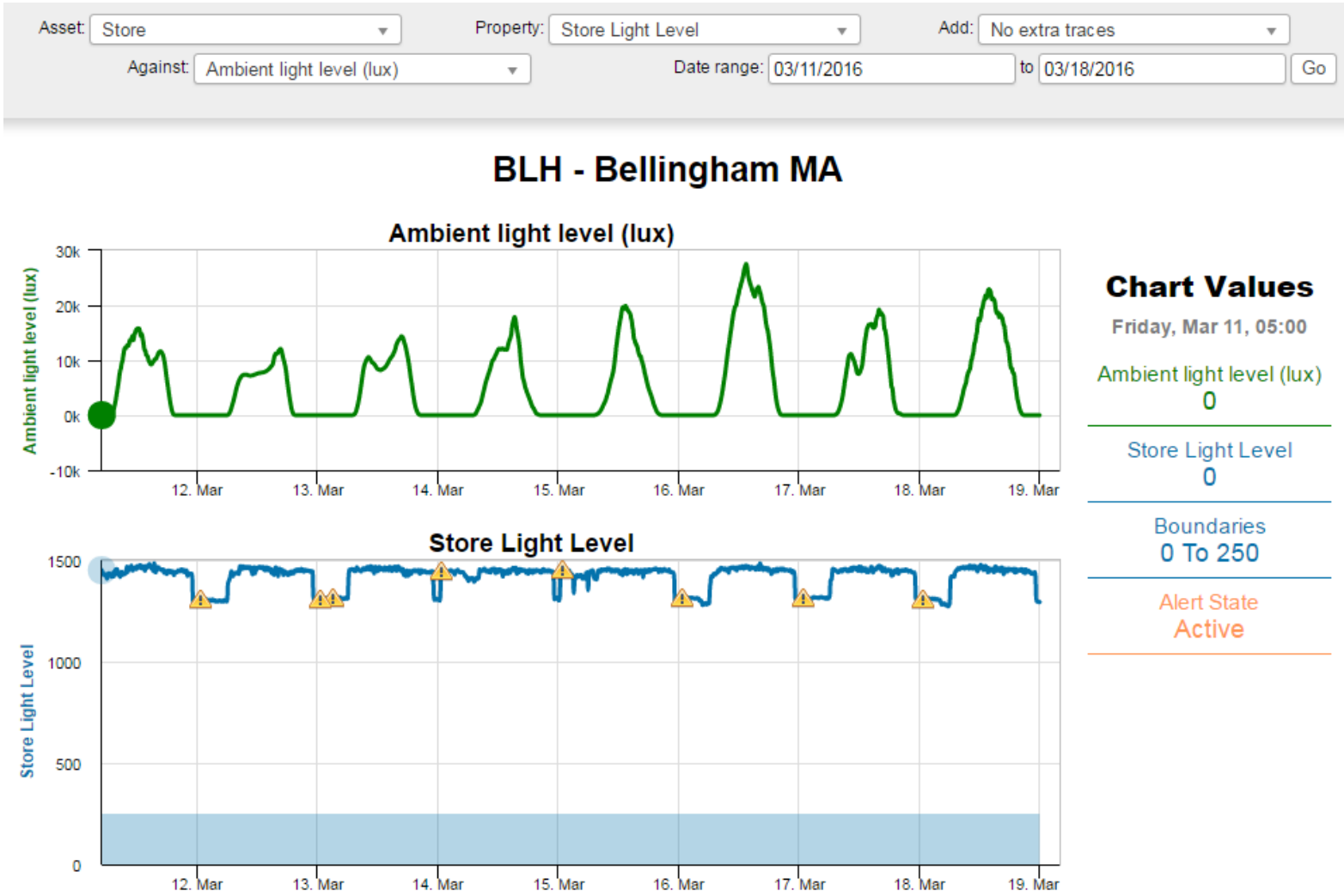
- Definition: the percent of time that an asset is within expected operating boundaries

- Operational performance parameters (temperature etc.)
- Energy consumption
- Maintenance implications
- Asset adequacy

# Fault Detection & Repair Process



# Email Alert System



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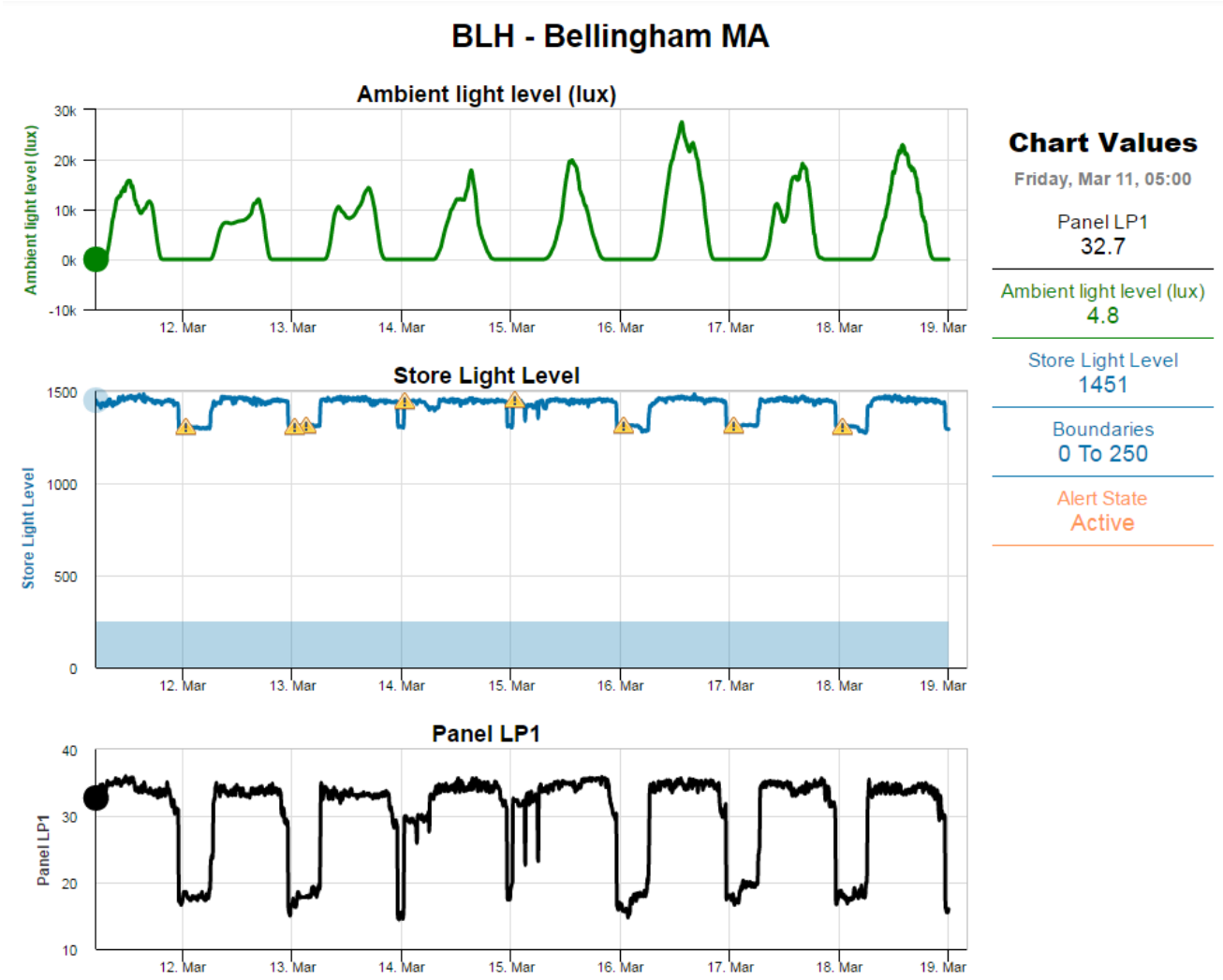

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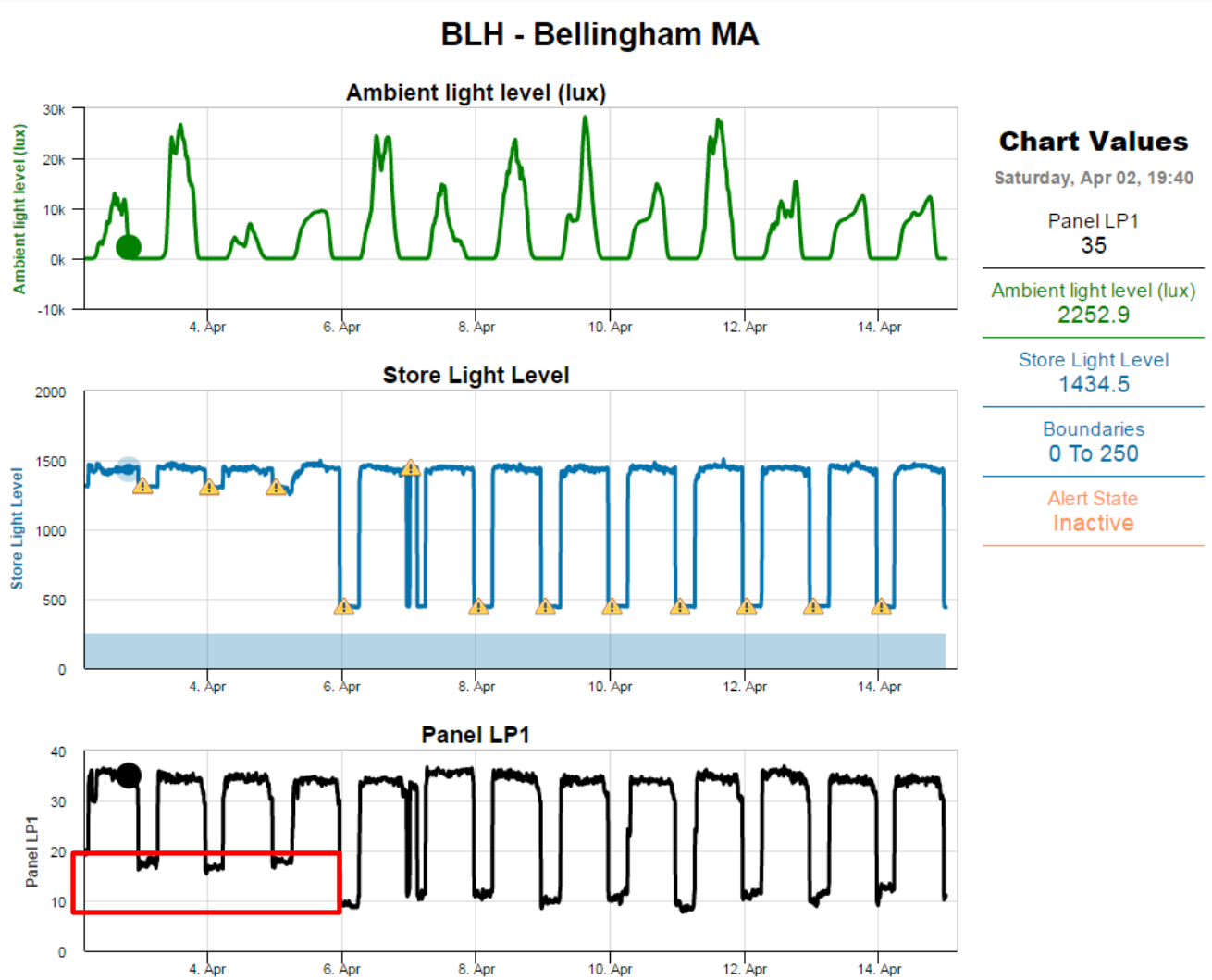

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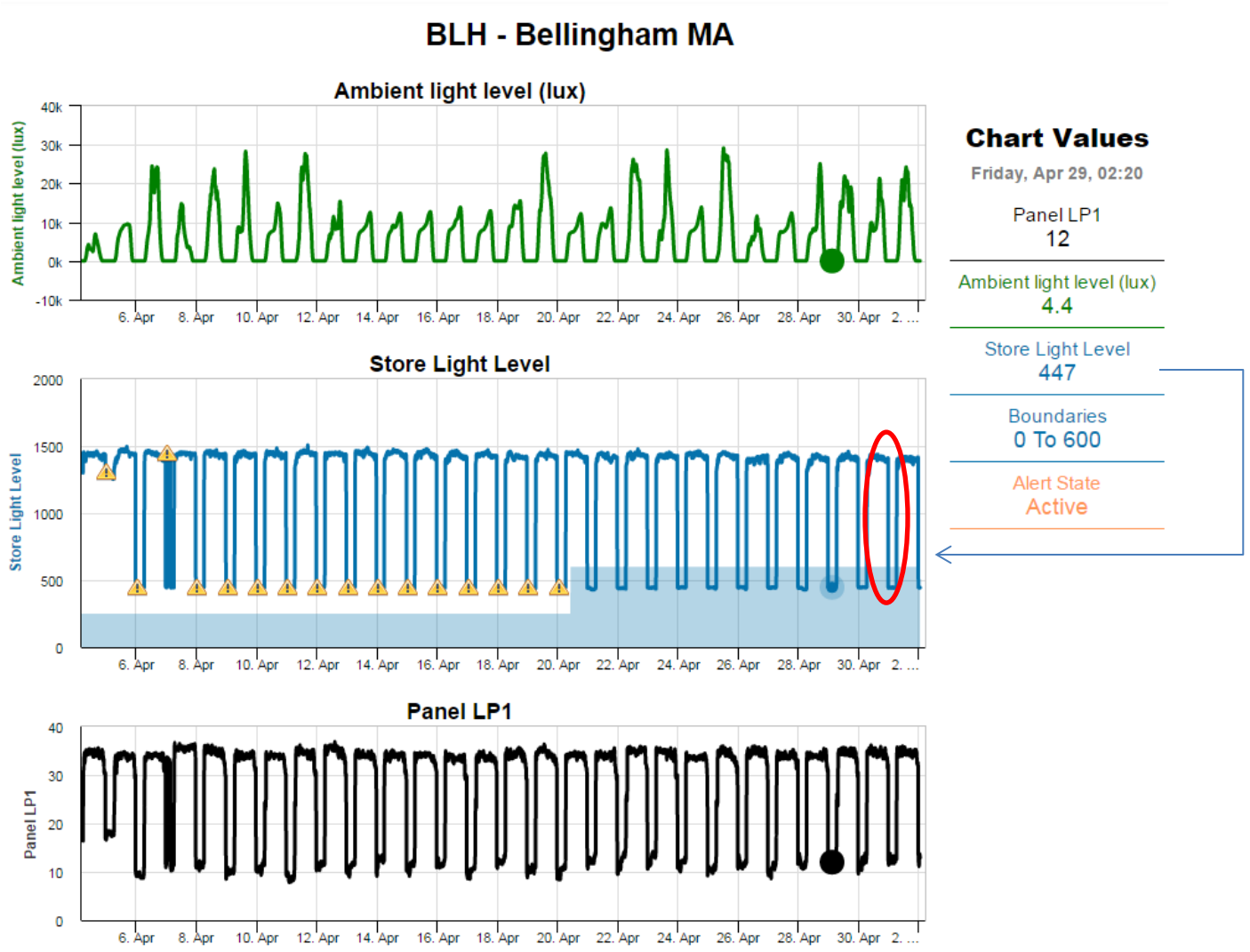

# Considerations for deployment


- Start with the end in mind
- Know what problems you plan to solve
- Think about the people and how they will interact with the system
- Consider how the system will grow and evolve with your teams needs

## Thank You!

Aaron Daly, CEM
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# Energy Management Information System

UNIVERSITY OF MIAMI

Jose M. Varona

Better Building Summit
May 2016

# Overview

UNIVERSITY OF MIAMI

Located in Miami, FL.

Climate Zone 1A (i.e. Very Hot – Humid)

Founded 1925; classes began October 1926

16,848 students (Fall 2015) – 4,012 on-campus

240 acres – Main campus

18 acres – Marine & Atmospheric Sciences

153 acres – Medical School

# Main Campus Profile

UNIVERSITY OF MIAMI

6 Million GSF building space

Building Age: 1925 - 2015

$10 million annual utility

75% electricity (Florida Power & Light)

District CHW Loops (3)

Energy Use Index Range (annual)

21 – 628 kBTU/sq-ft

10% increase in campus GSF since 2012

Campus EMIS Needs:

Allow campus SME to contribute to projects & goals

Limit need for new resources (e.g. FTE, software, & servers)

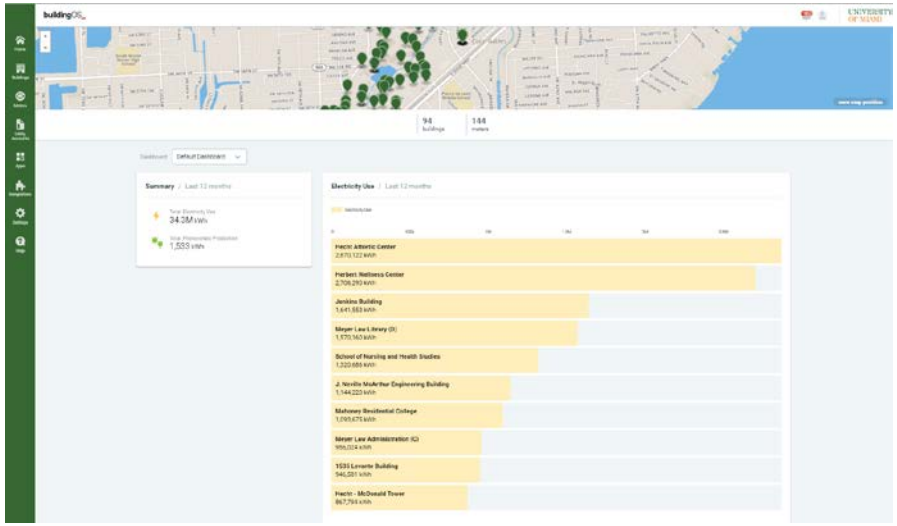
# Campus EMIS – Web-Based Tools


## Benchmarking & Utility Bill Analysis

- Ecova platform – Resource Performance
- Benchmark (Data Analyst)
- 10 yr. historical data available in platform
- Monthly reports provide variance analysis
- Weather normalization
- EUI Opportunity list

## Energy Information Systems

- Lucid Design Group – BuildingOS
- Verification of utility bill data
- Allows open access to building energy usage
- Several analytical tools available

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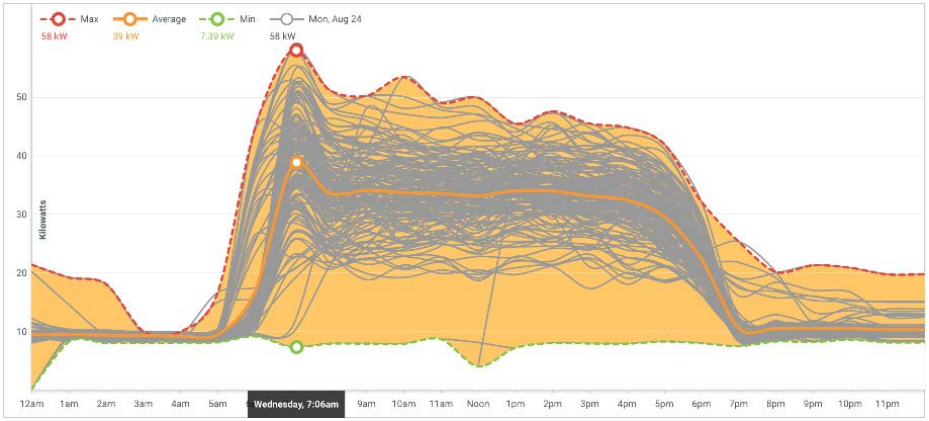
# Energy Information System – BuildingOS

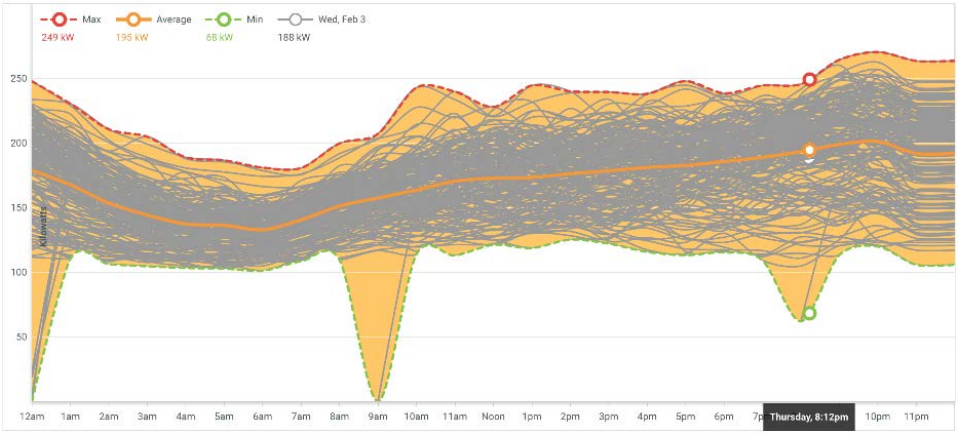
## BuildingOS Tools

- Analysis
- Alarming
- Reporting
- M&V – Energy Projects
- EnergyStar




## Profile Analysis

- Is behavior predictable?
- What's the Building profile?
- Where are the opportunities for setbacks?




## Automated Meter Infrastructure

- FPL Meters (130)
- Interval data pushed to Building OS
- UM QC meter values through on-site M&V

UNIVERSITY
OF MIAMI

# Use Case #1 – QC Cx Activities

## Is that Time-of-Day (TOD) Point working?

Location: McKnight Building (EUI: 40.2 kBTU/sq-ft annual)

Project: 2nd Phase Interior Renovation and VAV addition

Issue: Equipment short cycling profile. Cx activities indicated all TOD points active, and all Energy/HVAC system under control.

Finding: Air-cooled chiller TOD state change inoperable due to programming gap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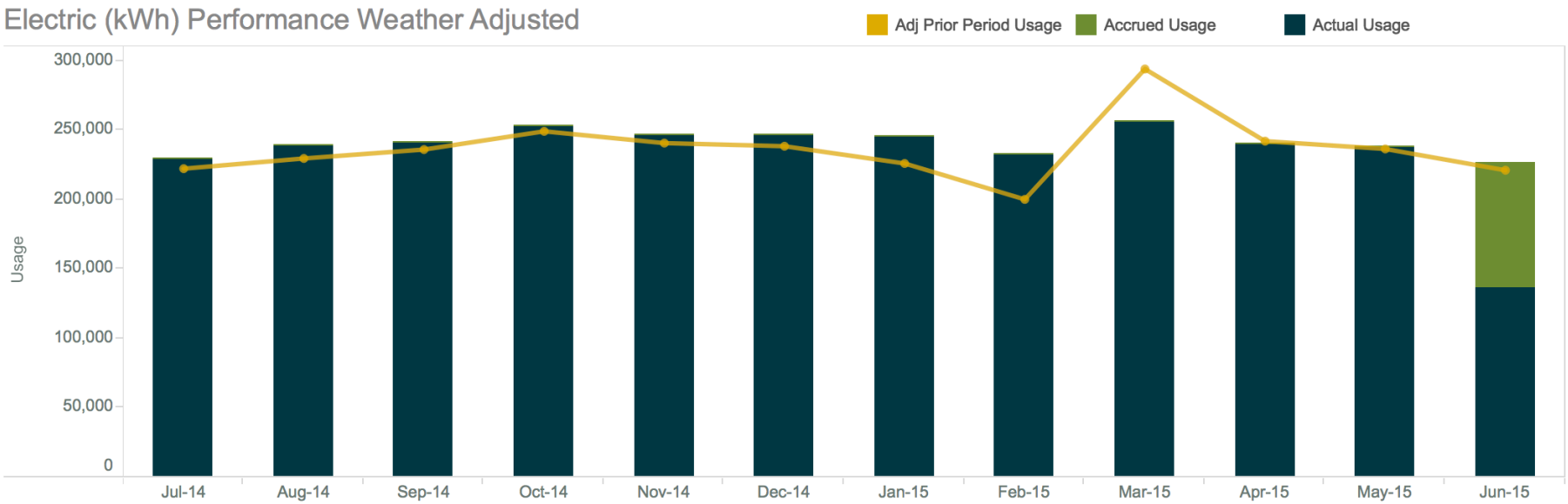
# Use Case #2 – Retrofit M&V

## What's the True energy savings from a Retrofit?

- Location: Wellness Center (Main Campus gym) – 150 kBTU/sq-ft annual
- Building Profile: Flat /"all-nighter"
- Good candidate for lighting retrofit
- Initiative: In-house retrofit project; utilize the Campus EIS platforms to track energy projects

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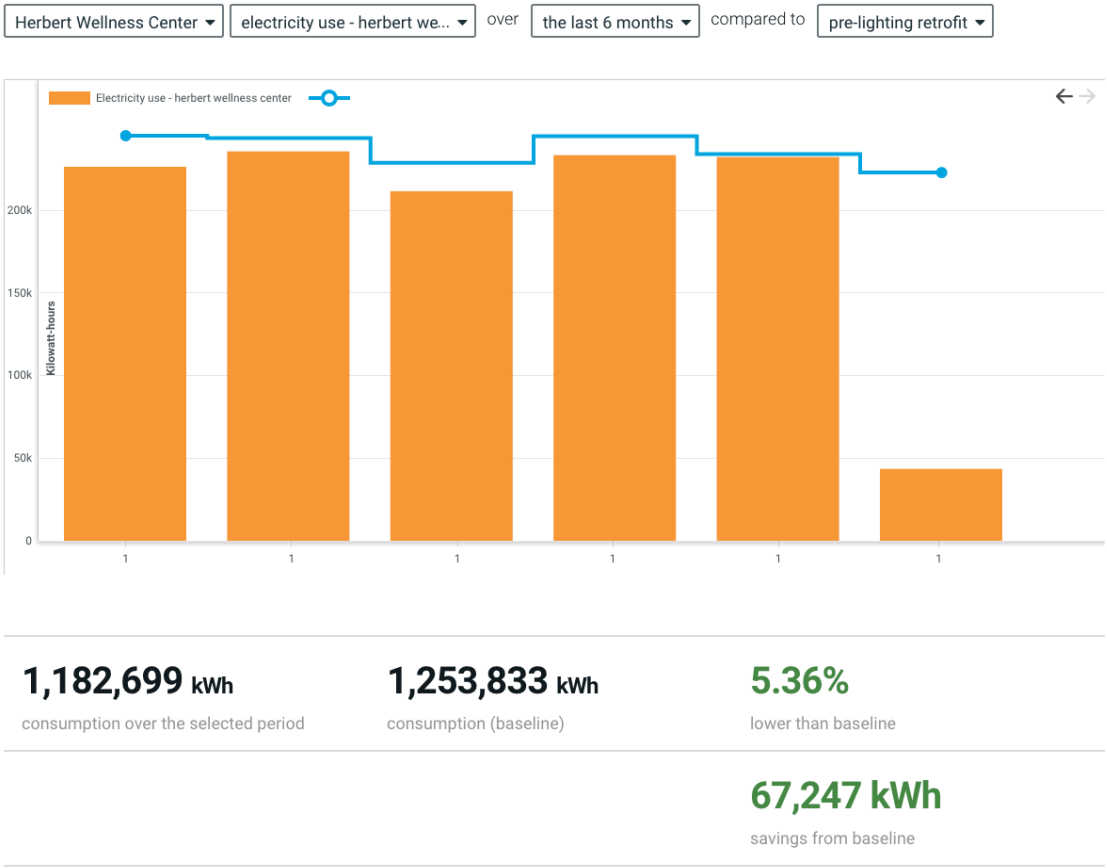
# Use Case #2 – Retrofit M&V (cont.)

## Will the profile impact be constant as well?

- Location: Wellness Center (Main Campus gym)
- Project: LED Lighting Retrofit on Main gym Basketball court
- Initiative: In-house retrofit project; utilize the Campus EIS platforms to track the savings

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# Systems EMIS – O&M

## Continuous Commissioning (Web-based)

- KGS Buildings - Clockworks
- Daily alarming & reporting
- Weather normalization
- Fault categorization (energy, comfort, maintenance)


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# Next-Phase of EMIS

| Initiative | Scope |
|---|---|
| BuildingOS (Phase II) | Expand data availability through dashboard for PV systems, water meters (through local WASA initiative), & Chilled Water |
| BuildingIQ | Application of optimization scheme to LEED silver building (student facility). Can it:<br>1. Reduce CHW & electricity consumption<br>2. Improve occupant comfort<br>3. Improve O&M costs |
| Continuous Cx + Building Level Control Services | Integrate Continuous Cx algorithms with building management platform (scorecard for all equipment) |
| Chilled Water Plant & building Optimization (R&D) – Loop wide | Utilize Modelica® models, and BMS data, to improve chilled water operation & distribution (collaboration with College of Engineering) |



# Biggest Obstacles

Capital Dollars for Energy Projects

- Green Revolving Fund/Reserve Initiative

Getting vendors to “play nice” (commitment to open data protocols/platform)

Software/algorithms/Technology evolution

Staff Levels & training (solution: Faculty/Student collaboration)

Expansion to other Resource Conservation Efforts (Water tracking)

# Thank You

Q&A