EMIS Meets Lighting & Electrical

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BBA EMIS Project Team Meeting, January 15, 2016

Supported by DOE Building Technologies Office, A. Mitchell
Agenda

- Participant Introductions - Name, Organization
- EMIS Team Update
- Lighting & Electrical Team Update
- Presentation by LBNL and PNNL: EMIS Meets Lighting & Electrical
- Next Steps
EMIS Project Team Overview

- **Activity:** adopt or expand use of EMIS in your organization
  - EMIS Campaign planning and scoping – First Working Group meeting January 20th, still time to [join](#)!
  - Peer learning, guest presentations
    - GSA EMIS demo
    - EMIS meets lighting & electrical
    - BBA member implementation best practices and lessons learned

- [BBA-EMIS Team Site](#) for meeting materials and existing resources
  - Synthesis of existing EMIS resources, “Cliff’s Notes”
  - Hyperlinked regional guide to EMIS utility incentives
  - Vendor overviews and [guest login](#) access
  - EMIS procurement support materials – master spec and RFP, selection guidance
  - EMIS Primer
EMIS Project Team Update

- **EMIS Primer** is now available!

A holistic guide on planning, implementation and usage of EMIS technologies, including a synthesis of best practice insights

Please contact the LBNL Project Team with any questions
Lighting & Electrical Team Updates

- **LEEP Campaign**
  - Energy efficiency in parking facilities
  - Deadline for materials for awards due mid February

- **Interior Lighting Campaign**
  - Campaign to increase energy efficient troffers
  - Deadline for materials for awards due May 1

- **Next Generation Luminaires Competition**
  - Design competition for luminaires
  - Andy Thorsen on Kohl’s will be a judge

- **Lighting / controls decision process**
  - Summer 2016
EMIS Meets Lighting & Electrical
Energy Management and Information Systems (EMIS)

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

**Whole Building Level EMIS**
- Benchmarking and Monthly Utility Bill Analysis
- Energy Information System
- Advanced EIS

**System Level EMIS**
- Building Automation System
- Fault Detection and Diagnostics
- Automated System Optimization

* 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
- Energy Information Systems
- Building automation system (BAS)
Energy Management and Information Systems (EMIS)

- EMIS can enable savings of 5-20% from operational no-cost or low-cost measures
  - Commonly focus on portfolio, whole-building, and HVAC energy use and operations
  - Lighting control, operations, and data are not usually integrated

- Lighting is a key building load, and critical component of indoor environmental quality
Integration of Lighting into EMIS

- In advanced implementation cases, lighting data is integrated into EMIS in two primary ways
  - Sub-metered lighting loads integrated with energy information systems, i.e. meter analytics tools
  - Load and operational data from lighting automation/relay panels are integrated with building automation systems, usually via BACnet
BAS-Integrated Lighting: Data and Control

Image Source: RIT
EIS-Integrated Lighting Load Data (Cont.)
EIS-Integrated Lighting Load Data
Lighting Controls: Common Architectures

- Lighting automation/relay panels
  - Shut power on/off to an area or group of lighting loads served by the panel
  - Control based on time clocks, photosensors, occupancy sensors, or switches
  - May or may not be networked, spectrum of operator GUIs, data access

Image Source: Schneider Electric
Advanced lighting “control systems”

- Capable of *direct ballast/driver control* for advanced control
- Dashboards, reporting becoming more common
Graphical visualizations of
- Load and energy use – absolute and relative to other systems
- Time series trends, bar plots, floor plan overlays, etc
- Real-time operational status
- Schedules

Used to validate configuration, controls as well as for energy management
Verifying Correct Two-step Switching: Control Zone Level Lighting Data
Verifying Changes in Actuation: Whole Building Level Lighting Data

A. Low occupancy during the holiday results in a low value of 5% of installed load.
B. Standard occupancy resumes. Average daily peak is 80% of the installed load.
C. Lower occupancy rates on Fridays results in a peak of 75% of the installed load.
D. Weekend use is twice that of holidays, with a value of 10% of the installed load.
E. The average over this whole month period was 20% of the installed load.
Analysis of Efficiency Opportunities: Panel-level Lighting Data

1. Nighttime use is higher than it should be at 30% of the installed load.
2. Evening loads don't drop until very late, 10-11PM or later.

Improved scheduling and occupant controls should be considered to reduce after-hours and overnight loads.
Controls Commissioning: Zone Level Lighting Data

Occupancy controls are functioning properly.

The daylighting controls are not functioning properly, since there is no dimming during daylight hours.

The daylighting controls’ illuminance setpoint is adjusted. Lighting dims to between 40% and 70% of installed load during daytime hours.
Lighting Data Analytics

- Common useful lighting data analytics/things to look for in data
  - For daylighting – examine a number of days worth of data and ideally across many weeks or seasons when possible
  - Disaggregate data when possible – understand what is being measured and purpose of the different lights
  - Occupancy sensors – again multiple days are ideal to remove any potential anomalies
  - Multiple control strategies are not additive – you can have diminishing savings as more systems are layered into the space
Emerging Trends in Lighting Data Access and Integration

- Lighting Data access
  - Web-based interfaces are growing
  - Wireless and wired systems can integrate with EMIS
  - Power over Ethernet (more for new construction)

*Images Source: Lutron*
Emerging Trends in Lighting Data Access and Integration (Cont.)

- Standards / protocols
  - Open
  - Proprietary

- Industry in flux
  - No one integration winning out yet
Discussion
Next Steps

- Registration now open for BBA Summit
  - [http://betterbuildingsolutioncenter.energy.gov/summit](http://betterbuildingsolutioncenter.energy.gov/summit)
- EMIS Campaign planning – Working Group call January 20. Register to join:
  - [https://cc.readytalk.com/r/g8q8ugeqfhlt&eom](https://cc.readytalk.com/r/g8q8ugeqfhlt&eom)
- Next EMIS team meeting
  - Feb 12\(^{th}\) 2-3pm EST
  - Topic: Sector specific - Hospital EMIS
- Next Lighting & Electrical team meeting
  - April 14\(^{th}\) 2-3pm EST
  - Topic: TBD
THANK YOU

eere.energy.gov/betterbuildingsalliance/lighting

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BBA EMIS Team

THANK YOU

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