



Better Buildings Alliance Energy Management Information Systems (EMIS) for Retail, Food Service, and Grocery

December 9, 2014
2:00PM - 3:00PM EST
Call in: 1-866-952-8437
Access Code: 271-419-165

The Better Buildings Alliance

SECTOR TEAMS



**COMMERCIAL
REAL ESTATE
& HOSPITALITY**



HEALTHCARE



HIGHER EDUCATION



**RETAIL,
FOOD SERVICE
& GROCERY**

- The Better Buildings Alliance represents nearly 200 member organizations and approximately 10 billion commercial square feet across key market sectors.
- Members agree to: participate in at least one Alliance activity each year and share their successes with their peers.
- DOE commits to: connect members with technical resources and provide a platform for peer exchange.

Better Buildings members can join a team to help them meet their energy savings goals



Refrigeration



Laboratories



Energy Management
Information Systems



Renewables Integration



Lighting & Electrical



Space Conditioning



Plug & Process Loads



Food Service



Financing



Leasing & Split Incentive



Data Access



Workforce Development

Agenda

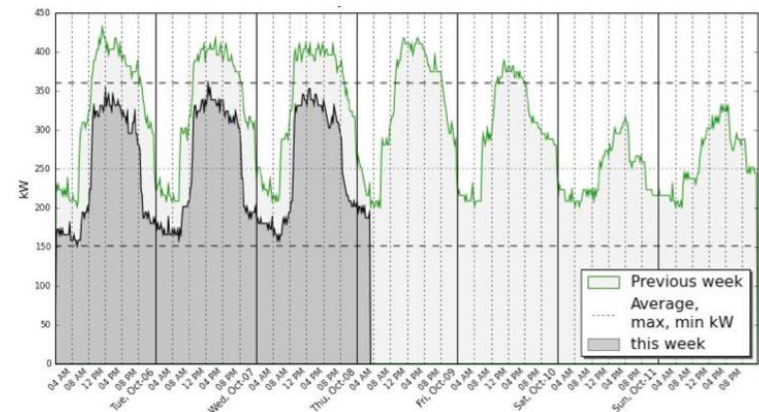
- Introduction to the EMIS Technology Team
- Success Stories from the Retail, Food Service, and Grocery Sector
 - Implementing Energy Information Systems
 - Implementing or expanding the use of Building Automation Systems
- Q&A

EMIS Technology Team Overview

- An introduction to EMIS technology team
- Resources highlights
- Areas of focus for the coming year

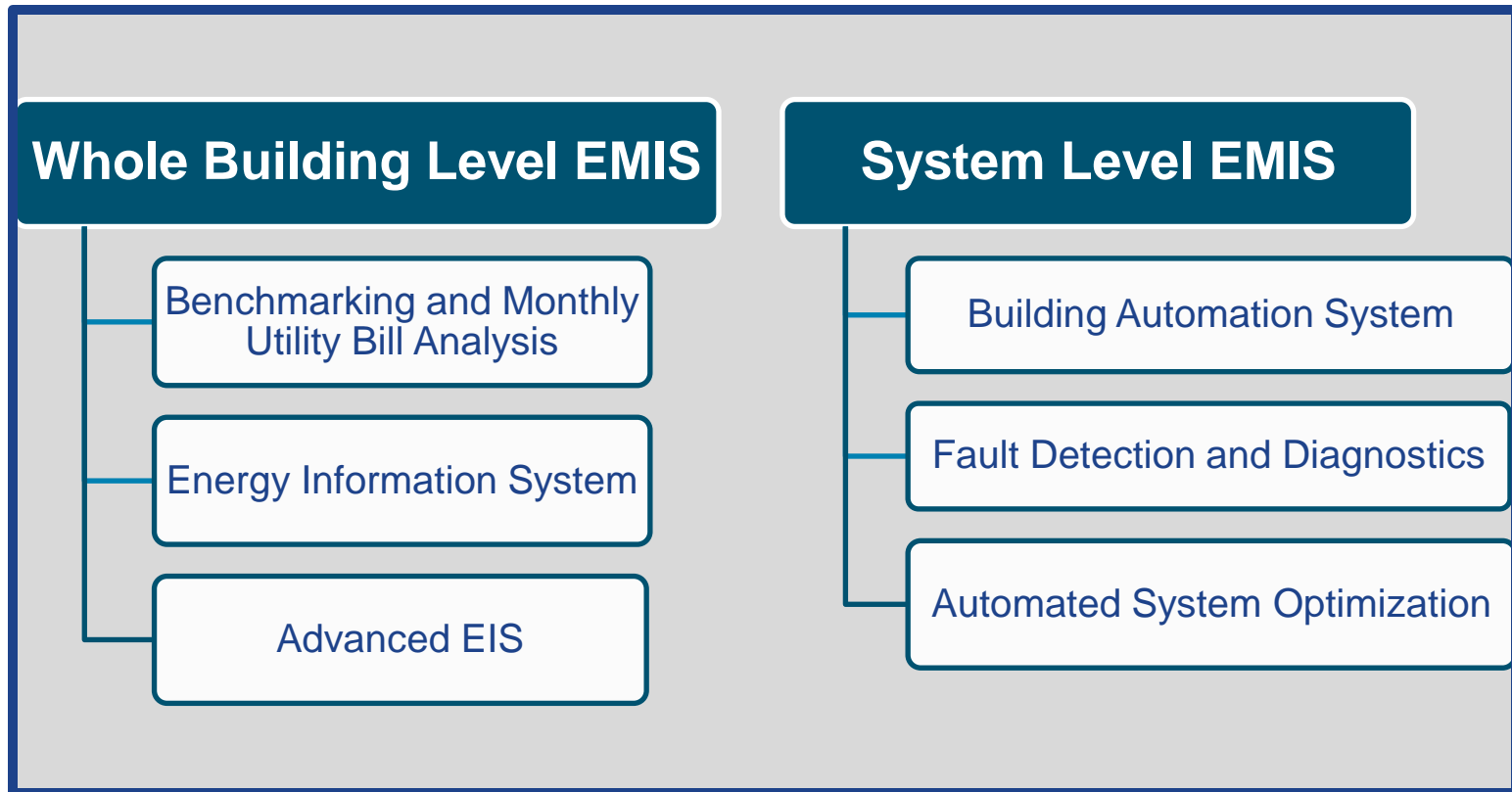
Motivation for EMIS work

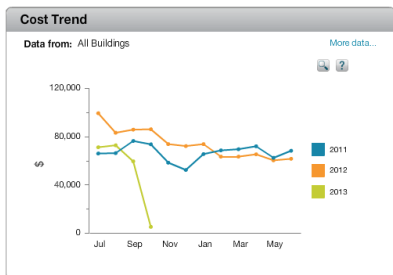
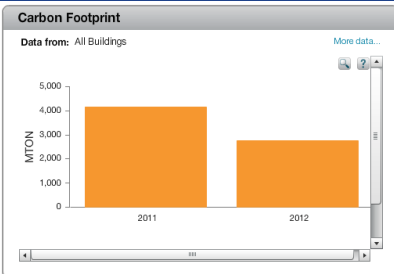
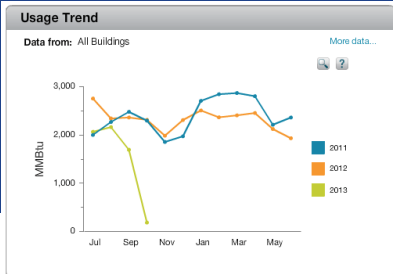
- Optimal performance requires higher granularity data, more timely analysis than monthly utility bills
- Energy Management and Information Systems (EMIS), broad family of tools that store, analyze, and display energy use or building systems data, enable up to 20% savings in operational efficiency



What are EMIS?

Energy Management and Information Systems (EMIS)





ENERGY STAR

Buildings Submitted: 4
 Excellent (75 and higher): 0
 Above Average (51-74): 1
 Below Average (50 and lower): 3

Useful Links:
 Become an ENERGY STAR Partner
 ENERGY STAR Resources for Buildings
 List of all ENERGY STAR Labeled Buildings
 EPA Greenhouse Gas Equivalencies
 Portfolio Manager login

Total Electricity Consumption

Equivalent pounds of carbon dioxide emitted into the atmosphere today

project green

MLE: 206 occupants
 2,733 Lbs of CO2

10% PERFORMANCE NOW

NOW 233 lbs/Year

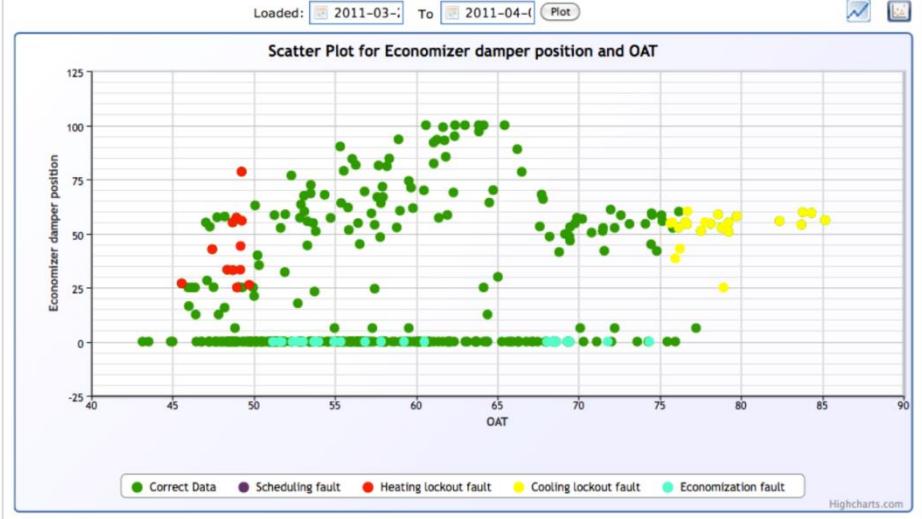
The dashboard includes a bar chart showing hourly electricity consumption and CO2 emissions from 12 am to 11 pm. A 'HIDE YESTERDAY' button is present. Navigation tabs for Comparison, History, and Unit equivalent are at the bottom.

Benchmarking and Monthly Utility Bill Analysis

Energy Information System (EIS)

Building automation system (BAS)

Fault Detection and Diagnosis Tool



ECM Recommendations

The economizer damper is stuck below the minimum damper position in economization mode.

Resources Highlight

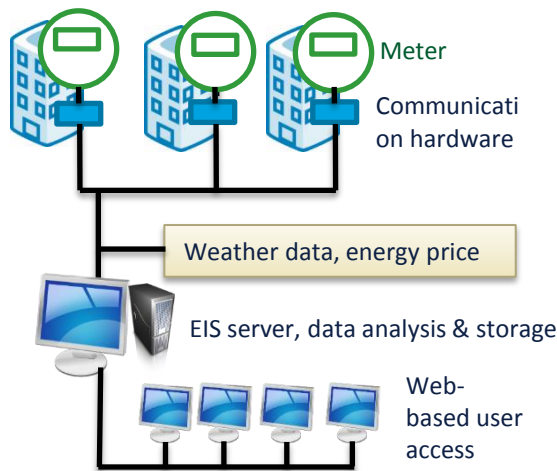
1. EMIS Technology Classification Framework

Technology attributes	Tools with a Whole-building Energy Focus			Tools with a System-level Focus		
	Benchmarking and Monthly Utility Bill Analysis	Energy Information Systems	Advanced Energy Information Systems	Building Automation Systems	Fault Detection and Diagnostic Systems	Automated System Optimization
Typical Data Scope	Whole-building	Whole building May include: submetering	Whole building May include: submetering and system-level monitoring	Systems, components, May include: system submetering	Systems, components, BAS trends May include: whole-building or system-level metering	
Typical Data Interval	Monthly	Hourly to 15-minute		15-minute and less		
Frequency of use	Monthly, annually	Daily, weekly, monthly			Weekly, monthly	
Primary Applications, Principal design intent	Utility bill reconciliation, energy use and cost tracking; peer-to-peer building comparisons of energy use.	Whole-building or portfolio energy tracking, and <i>data visualization</i> to identify opportunities to improve building operational efficiency.	Whole-building or portfolio energy tracking, and <i>automated interval data analysis</i> to identify opportunities to improve building operational efficiency.	Control of indoor temperature, light, and humidity setpoints based on building schedule; alarming of out-of-range operations.	Automated identification of faults, sometimes with associated causes, usually HVAC focused.	Automated modification of control parameters to optimize efficiency, energy use, and/or energy costs.

Resources Highlight –

2. EIS Technology Costs and Benefits

Hourly to 15-min interval meter data



- Synthesis of targeted case investigations
 - 26 participating organizations, 260M sf install base, 17 unique EIS
- Median building savings of 17% (\$56k) and portfolio savings of 8% (\$1.3M)
 - Would not be possible without use of the EIS
 - Median 5% savings in the cases with low extent of energy efficiency projects
- Key benefits
 - Operational efficiency, utility validation and payment, data for other analyses
- Median 5-yr cost of software ownership:
 - \$150K, 1800\$/pt, .06\$/sf over 5 year horizon



Resources Highlight –

3. EMIS Crash Course

- **Selecting a EMIS Tool**
- **Summary of EMIS Tools**

Set organizational goals

Establish roles & responsibilities

Understand organizational conditions

Define activities to meet goals

Identify required sensing, metering

Select a tool(s)

EMIS tools	Data scope	Key uses	Costs	Energy Savings
Benchmarking & utility bill analysis	Monthly utility bills	<ul style="list-style-type: none"> Peer-to peer comparison Utility bill analysis 	Free -\$	2.4% (median) (whole building, enabled savings)
EIS & Advanced EIS	Hourly or 15-min meter data	<ul style="list-style-type: none"> Energy dashboard/kiosk Benchmarking Energy anomalies alert Demand response Auto M&V 	\$\$-\$\$\$	8% (median), 0-33% (range) (whole building, enabled savings)
BAS	15-min or less interval sub-system data	<ul style="list-style-type: none"> Building system control Manually troubleshooting by investigating trends 	\$\$\$\$	10-15% (whole building)
FDD		<ul style="list-style-type: none"> Auto system or component fault notification Fault causes identification 	\$\$\$	2-11%(whole building, potential savings)
ASO		<ul style="list-style-type: none"> Optimal HVAC settings prediction 	\$\$\$	-

Resources Highlight –

4. Synthesis of EMIS Resources

- ‘Cliff’s Notes’ Synthesis of ~40 existing guides, handbooks, case studies, specifications

The collage features several key resources:

- Information Technology for Energy Managers**: A book cover with a blue and yellow design.
- Handbook of Web Based Energy Information and Control Systems**: A book cover with a colorful, abstract design.
- Web Based Enterprise Energy and Building Automation Systems**: A book cover with a blue and white design.
- The Building Performance Tracking Handbook**: A white cover with a blue line graph and a clock.
- California Commissioning Guide: Existing Buildings**: A white cover with a green building illustration.
- ENERGY INFORMATION HANDBOOK**: A blue cover with the text 'Applications for Energy-Efficient Building Operations'.
- Inventory of Commercial Energy Management and Information Systems (EMIS) for M&V Applications**: A white cover with the neea logo and the date 'October 9, 2013'.
- Technical Options Guidebook**: A blue cover with a building facade and the text 'Money & Energy Saving Resources from the ENHANCED CALIFORNIA ENERGY COMMISSION AUTOMATION'.
- Business Case**: A blue cover with a city skyline and the text 'Money & Energy Saving Resources from the ENHANCED CALIFORNIA ENERGY COMMISSION AUTOMATION'.
- FEDERAL ENERGY MANAGEMENT PROGRAM**: A green cover with the text 'Release 2.0 Metering Best Practices A Guide to Achieving Utility Resource Efficiency'.
- ENERGY STAR PortfolioManager™**: A blue cover with the text 'Benchmarking and'.
- Win the energy challenge with ISO 50001**: A white cover with a colorful light trail and the ISO 50001 logo.
- REAL-TIME ENERGY MANAGEMENT**: A white cover with the text 'A CASE STUDY OF THREE LARGE COMMERCIAL BUILDINGS IN WASHINGTON, D.C.' and three building photos.

California Commissioning Collaborative

Building Performance Tracking in Large Commercial Buildings: Tools and Strategies

Characterization of Fault Detection and Diagnostic (FDD) and Advanced Energy Information System (EIS) Tools
Commissioning

California Commissioning Collaborative

Building Performance Tracking in Large Commercial Buildings: Tools and Strategies

Subtask 4.4 Research Report: Characterization of Building Performance Metrics Tracking Methodologies
Commissioning

NRDC CASE STUDY

OCTOBER 2013
CS1307A

REAL-TIME ENERGY MANAGEMENT A CASE STUDY OF THREE LARGE COMMERCIAL BUILDINGS IN WASHINGTON, D.C.

AUTHORS
Philip Henderson
Meg Walner
Natural Resources Defense Council



Which buildings experienced the greatest savings?

Resources Highlight – 5. Regional Guide to EMIS Incentives

Regional Guide to EMIS Incentives

The screenshot displays the 'Regional Guide to EMIS Incentives' website. It features a search interface with a map of the United States and a list of programs. The search results for Maryland are shown, including details for the 'Potomac Electric Power Co. (Pepco) Continuous Energy Improvement Conditions' program. The program details include location, budget, eligibility, and a description of the continuous commissioning process.

Search by State

Incentive programs are organized by states
Starts on programs available / quotas / coverage
Spotlight programs / quotes / lessons learned
(Some highlighted programs / info with links to similar programs)
No programs in your area! Here are some resources to share with your local utility program manager

Maryland

Program Name	Benchmarking	EIS	BAS	FDD	ASO
Potomac Electric Power Co (Pepco) Continuous Energy Improvement Conditions	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potomac Electric Power Co (Pepco) Full Retro-Commissioning for Existing Buildings	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Potomac Electric Power Co. (Pepco)
Continuous Energy Improvement Conditions**

Location: Maryland

Budget / Type of Incentive

- Walk-through energy assessment: 75% of cost up to \$1000
- Detailed energy savings study: 25% of cost up to \$6,500
- \$0.20/kilowatt-hour saved annually

Eligibility and Restrictions

- ≥ 75,000 square feet of conditioned space
- Higher-than-average electrical intensity (With Square Foot), based on an analysis using the EPA Portfolio Manager software or DOE CBEC3 data
- ≥ 2 years old
- Must have a building automation system

Description

Continuous commissioning is an ongoing process to resolve operating problems, improve comfort, and optimize energy use in existing buildings.

- The Continuous Improvement Energy Conditions (CIEC) track consists of three phases:
 - Phase I – Comprehensive Energy Savings Study submission and installation of automated remote monitoring and diagnostic equipment.
 - Phase II – Long-term monitoring and continuous commissioning, including recommendation of additional operation and maintenance measures.
 - Phase III – Operation and maintenance measure implementation.

More Information

<https://energyefficiency.pepco.com/Improvement.aspx>. Accessed 3/14/2014.

Source: All information is from the CEE Building Energy Management Programs & Field Assessments Database.

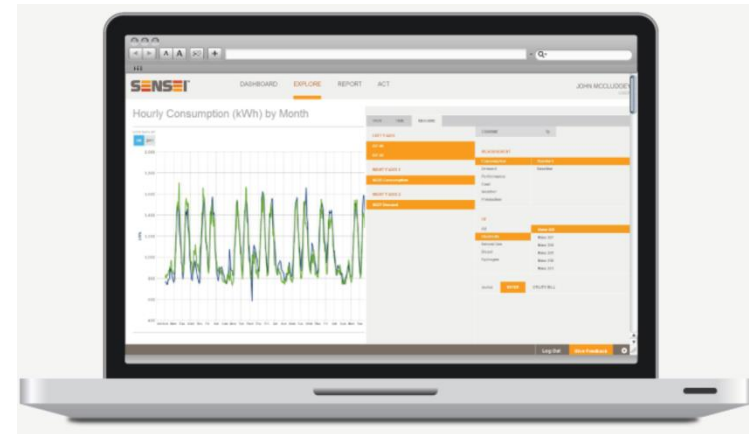
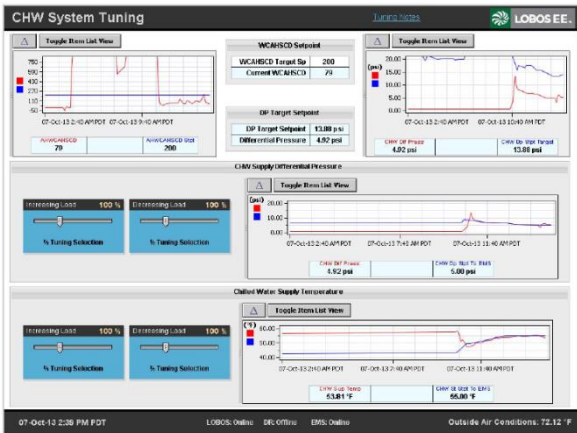
Regional Guide to EMIS Incentives | U.S. Department of Energy

- Includes 50+ incentive and financing programs
- Programs cover the US
- Primarily utility programs, some state/local, other
- Hyperlinked PDF for easy navigation on your PC

Resources Highlight –

6. EMIS Product Overviews, Guest Access

- Webinar demonstrations and guest logins from vendors identified as high interest by project team members
 - Enerliance, LOBOS
 - Cascade Energy, SENSEI
 - Automated Logic, WebCTRL
 - EnergyCAP
 - NOESIS
 - Johnson Control, Panoptix



Resources Highlight –

7. EMIS Procurement Support Materials



EMIS Specification and Procurement Support Materials

30 OCTOBER 2014

Technology Specification

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- Request for Proposal
 - A template to create a project-specific RFP for vendors
- Technology Specification
 - A template of technology features that can be specified according to org. specific needs
- Evaluation Criteria
 - Several criteria to help choose between multiple competing proposals that satisfy the spec.

Success Stories from the Retail, Food Service, and Grocery Sector

Success Stories: Managing Peak Demand with Building Automation Systems (BAS)

- Partnerships between utility companies and facility management for near instantaneous peak demand reduction



Success Stories: Staples

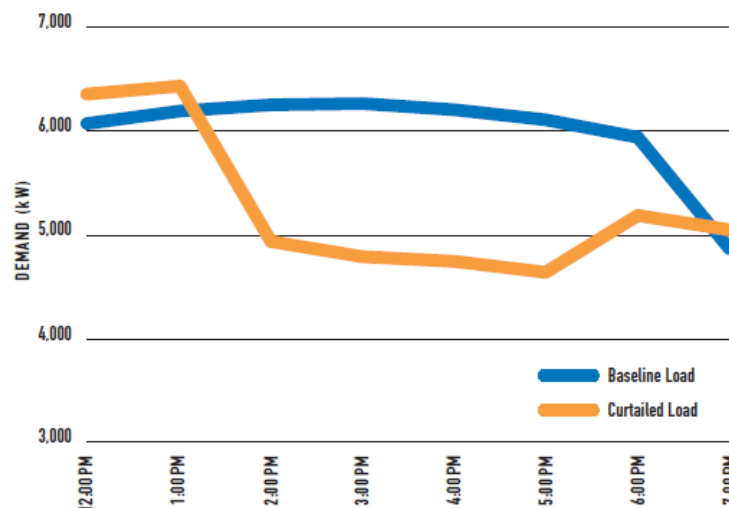
- Enhanced automation system allows Staples to shed 2.8 MW demand from anywhere

Building Type	Retail, multi-site
Site Size	119 stores
Cost	\$320,000
Incentives	\$300,000

Highlights:

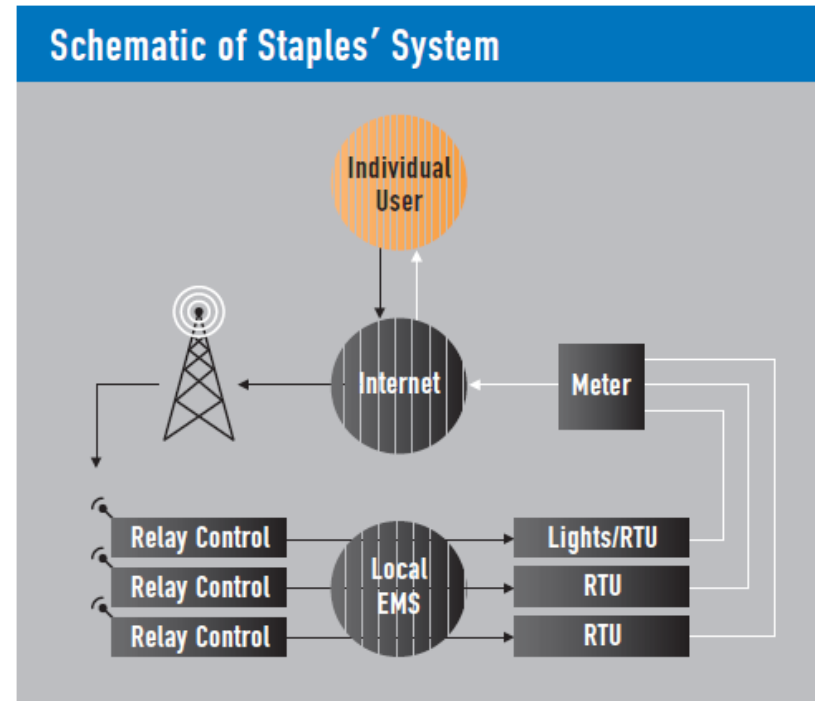
- For Staples: Ability to avoid high peak demand charges; sub-hourly energy data access and archiving
- For Utility: Increased grid reliability, avoided capacity increase

Baseline versus Curtailed Load at 70 Staples Stores



Success Stories: Staples, Technical Details

- **Previous System**
 - EMS with direct digital control for lighting and HVAC systems
- **Upgrades to System**
 - Paging activated relay system
 - Web-enabled software
 - Web server
 - Utility-Grade interval meters
- **Curtailment Levels**
 - 1) Half of store lighting and 1 Roof Top Unit (RTU)
 - 2) Level 1 + 1 Additional RTU
 - 3) Level 1 + 2 Additional RTUs



Load curtailment for all 119 stores in California is online within a half hour of when the signal for initiation is sent from HQ in Boston

Success Stories: Albertsons Grocery

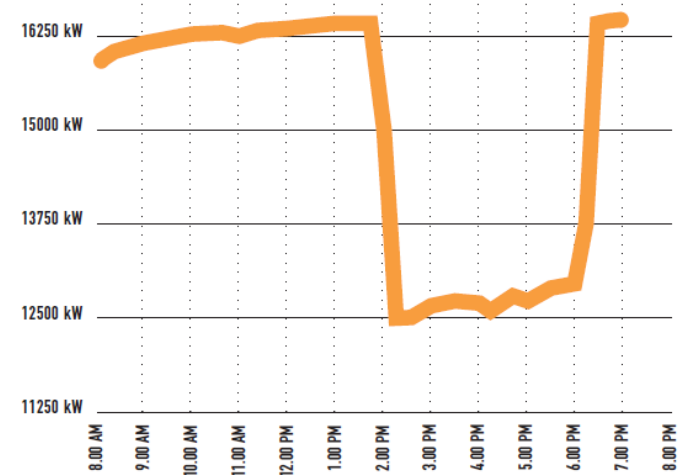
- Albertsons can shed 7.5 MW of peak demand through lighting, Anti-Sweat Heater (ASH) Controls and EIS

Building Type	Grocery, multi-site
Site Size	300 stores
Cost	\$3.8 Million
Incentives	\$1.8 Million
Payback Period	Immediate

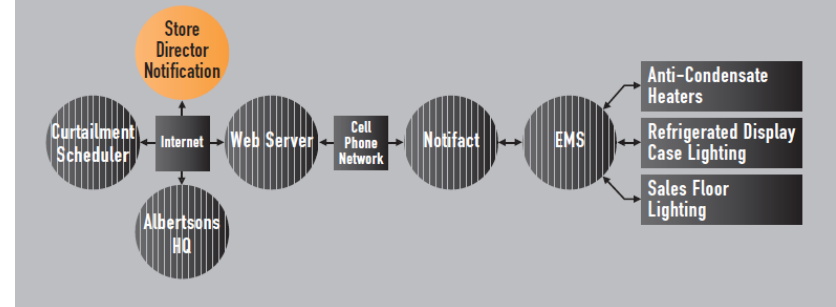
Highlights:

- Albertsons and Energy Service Company (ESCO) share Demand Response (DR) program revenue
- Additional Benefits: Energy Savings Measurement and Verification (M&V)

Demand Savings at Albertsons



Schematic of Albertsons Wireless Curtailment System



Success Stories: Integrating Information and Automation Systems

- More and more companies are offering integrated EMIS solutions, and facility managers are taking notice



Success Stories: Designer Shoe Warehouse (DSW)

- **Company-Wide EMIS System is anticipated to be cost effective in less than 2 years**

Building Type	Retail, multi-site
Site Size	311 stores (company wide)
Incentives	None
Payback Period	2 years



- Temperature & Schedule Control
- Energy Data Monitoring
- Key Performance Indicator Monitoring

Highlights:

- Customized dashboards allow for remote monitoring of energy consumption, as well as monitoring and control of lighting and HVAC Key Performance Indicators
- Automated exception reports alert key stakeholders of poorly performing stores
- Primary Uses: M&V, Fault Detection & Prevention, Remote BAS Control

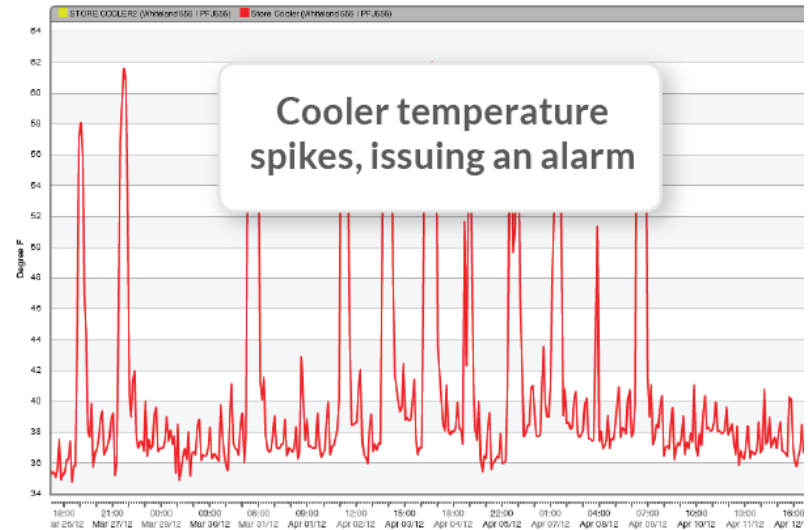
Success Stories: Wendy's

- **Immediately cost effective 12% energy savings for Wendy's Florida restaurants**

Building Type	Foodservice, multi-site
Site Size	12 stores
Cost	3,300/month for 3 years
Payback Period	2 years (w/o leasing) 0 years (with leasing)

Highlights:

- Inefficient cooler door operation identified with EMIS
- Primary Uses: Energy Savings through lighting control, HVAC and Refrigeration control; Opportunity Identification, M&V, Preventative Maintenance



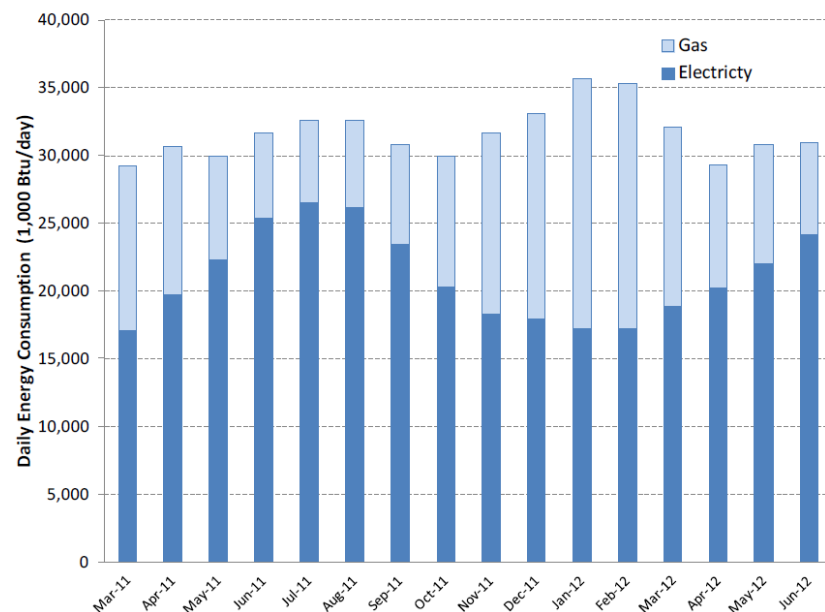
Success Stories: Whole Foods

- Energy Information Systems (EIS) and modeling help to investigate savings in new building prototype

Building Type	Grocery, Single Site
Site Size	40,000 ft ²
Payback Period	Less than 5 years

Highlights:

- Energy Savings: 32% better than ASHRAE -2004 Baseline
- The majority of this savings was achieved through upgrades to refrigeration equipment and interior lighting, such as LED lighting in refrigerated display cases
- Sub-metering & energy modeling revealed an additional 6% energy savings through improvements to defrost, ASHs, and condenser fans



Success Stories: Walmart

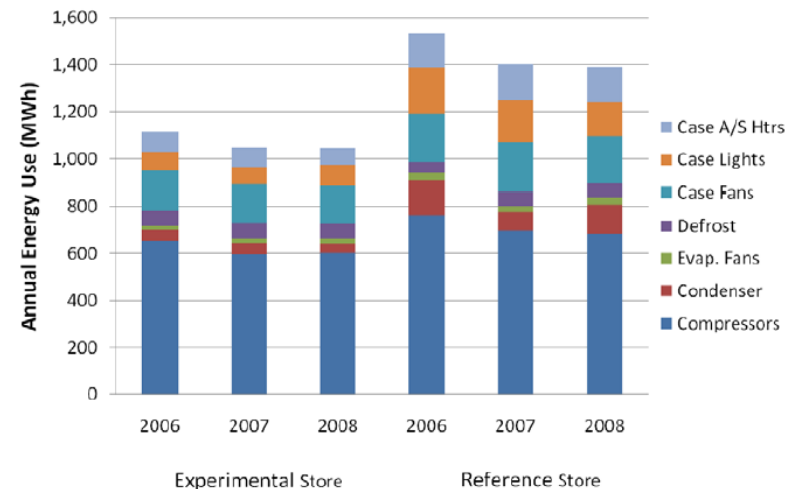
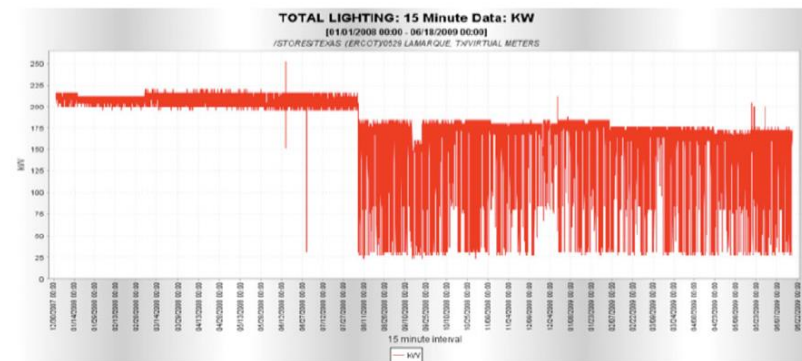
- **EIS is leveraged by Walmart to save between \$20 and \$40 Million on utility bills each year**

Building Type	Combined Retail & Grocery
Site Size	67 Million ft ² (All US stores)

Highlights:

- Each month, a benchmarking analyst identifies the 20 poorest performing sites
- Regression-based predictions provided by the EIS software allow for week ahead energy and demand predictions that are accurate to within 1% for hourly data.
- In addition to benchmarking regular stores, data is used to benchmark experimental store energy consumption

At one site, poor store performance was traced back to a failed dimming control module



Success Stories: Michaels Craft Store

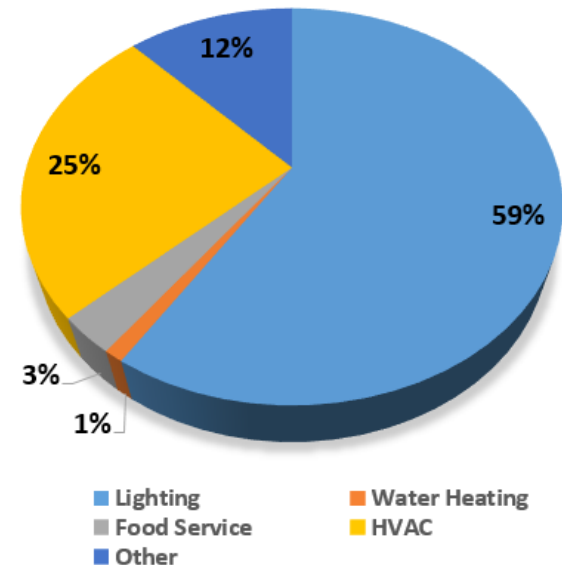
- **Michaels EMIS system brings “Intensive care unit” monitoring philosophy to buildings**

Building Type	Retail, multi-site
Site Size	1000+ stores

Highlights:

- The EMIS system reports prioritized issues to higher-ups in Michaels every 4 hours
- CO² sensors monitor building occupancy, and the EMIS system adjust lighting and HVAC control accordingly
- The EMIS system also allows for integrated demand management with automated adjustments for real-time pricing fluctuations
- Michaels has already recorded 25% energy savings
- Primary Uses: M&V, Fault Detection & Prevention, Remote BAS Control

Breakdown of Michaels average annual energy consumption



Success Stories: Case Study Resources

- **Albertsons Grocery**
 - *Albertsons Can Shed 7.5 MW of Peak Demand Through Enhanced Lighting Controls*
 - <http://www.energy.ca.gov/2005publications/CEC-400-2005-059/CEC-400-2005-059-FS.PDF>
- **BestBuy**
 - *Showcase Project: Skylights & Dimmable Fluorescent Lighting with Enterprise Energy Management System*
 - <http://www4.eere.energy.gov/challenge/showcase/lasvegas/best-buy>
- **DSW**
 - *Money-Saving Lessons in Energy Management*
 - http://www.us.sbt.siemens.com/marketplaces/rcs_docs_camp/whitepapers/DSWRetailerArticle.pdf
- **IKEA**
 - *PG&E and IKEA – Assembling Cost-Effective Energy Management*
 - http://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/cs_ikea.pdf
- **Michaels Craft Store**
 - *RCS Starving the Energy Monster*
 - [Shortened URL for Siemens Case Study, Michael's Craft Store](#)
- **Safeway**
 - *PG&E and Safeway – An Alliance in Energy Conservation*
 - http://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/retail/ctm-0609-0016_safeway.pdf

Success Stories: Case Study Resources

■ Staples

- *Enhanced Automation Allows Staples to Shed 2.8 MW Across 119 Stores from a Single Location*



Staples Case Study

■ Walmart

- *Building Energy Information Systems: User Case Studies*
 - <http://eis.lbl.gov/pubs/beis-case-studies.pdf>
- *Wal-Mart Experimental Store Performance Stories*
 - <http://www.nrel.gov/buildings/pdfs/48295.pdf>

■ Wendy's

- *Wendy's Chain Realizes Significant Cost Savings*
 - <http://www.gridpoint.com/case-study-wendys-restaurant-fast-food-franchise>

■ Whole Foods

- *Whole Building Efficiency for Whole Foods*
 - <http://www.nrel.gov/docs/fy13osti/56331.pdf>
- *Whole Foods Market Improves Energy Efficiency in New Construction*
 - http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/whole_foods_improves_energy_efficiency.pdf

Discussion

Discussion

- Discussion of EMIS applications in the sector
 - What type of EMIS are in use or being considered for use in your organization?
 - What are the key uses or activities in the last year?
 - What motivated your EMIS implementation?
 - What have been key lessons learned in your use of EMIS?
 - What are critical challenges you are facing in deploying EMIS?
 - How can we deliver value as a project team? What new knowledge is needed?
- Q &A with EMIS project team leads

Ready to join the EMIS team?

- If you already a member of the Better Buildings Alliance, email Guanjing Lin (gjlin@lbl.gov) or Samuel Fernandes (sgfernandes@lbl.gov) to join the EMIS team.
- If you are not yet a member of the Better Buildings Alliance, we hope that you will join us. Complete the sign up form at eere.energy.gov/betterbuildingsalliance/join

Thank You

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