Better Buildings
U.S. DEPARTMENT OF ENERGY

Finding and Funding an Energy Management Information System (EMIS) That Is Right for Your Building Portfolio

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Better Buildings Summit, May 28, 2015

U.S. DEPARTMENT OF ENERGY

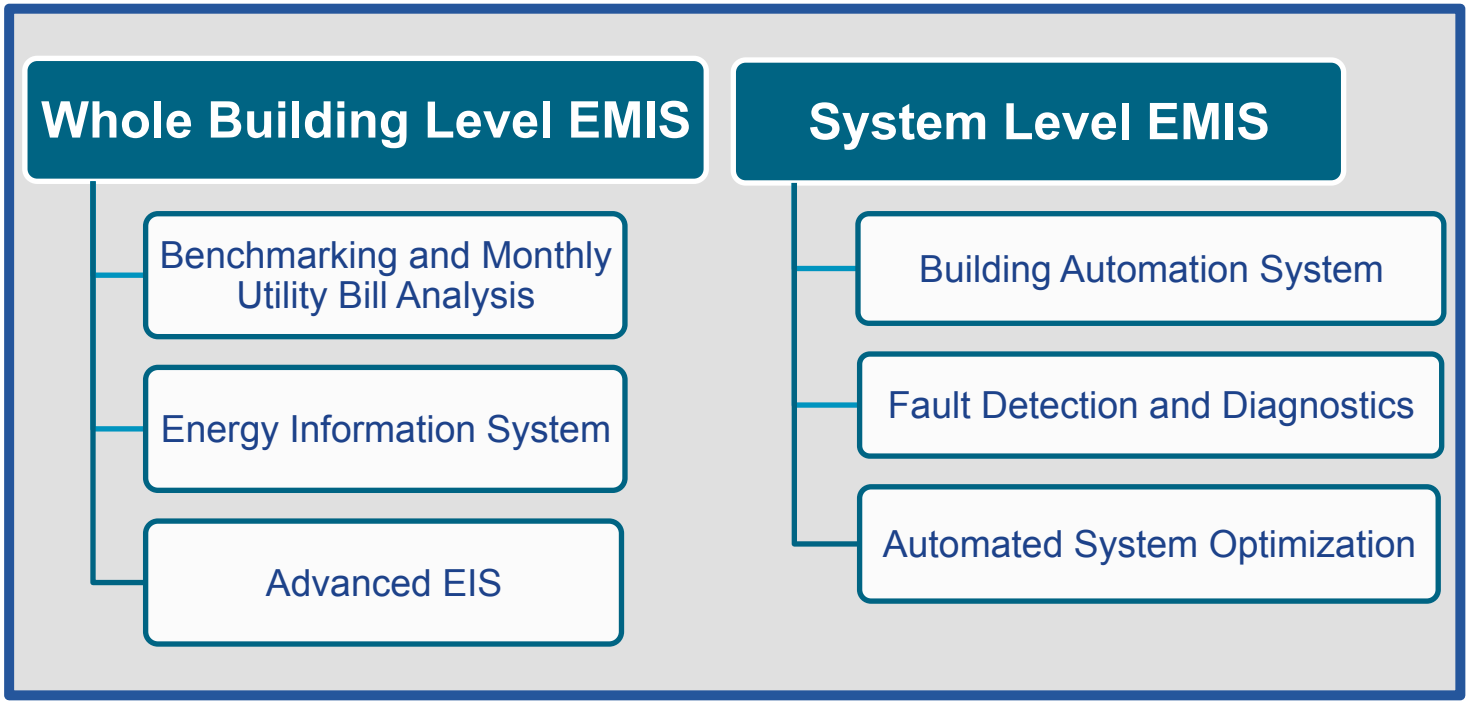
Outline

- Welcome and Introductions
- Introduction to EMIS
- Key Member Challenges and Associated Resources
- Member Experiences
- Discussion

Panelists Introductions

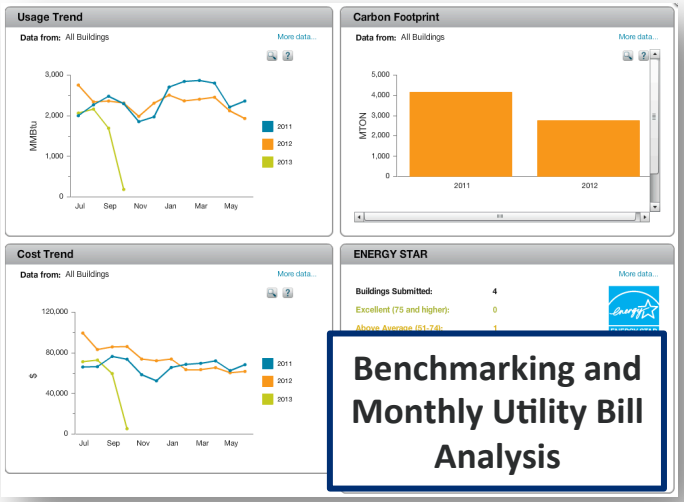
EMIS Definition

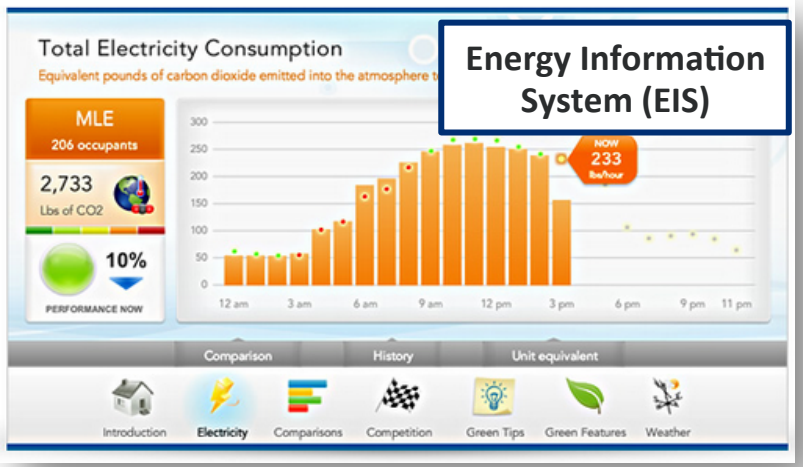
Energy Management and Information System (EMIS): broad family of tools and services used to manage building energy use

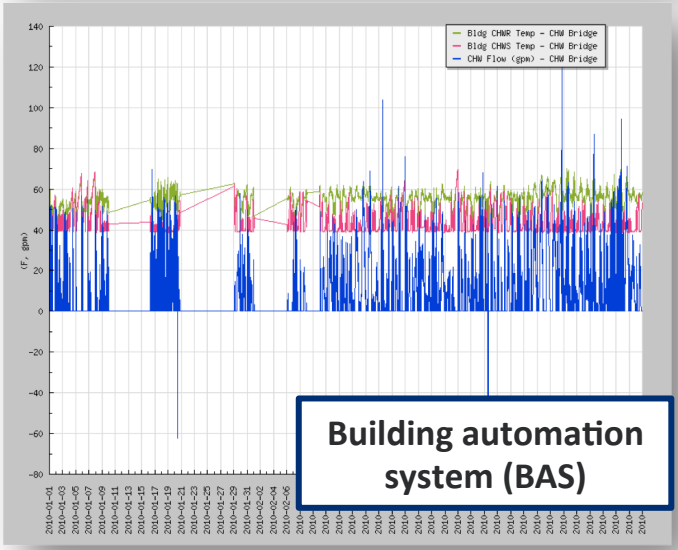


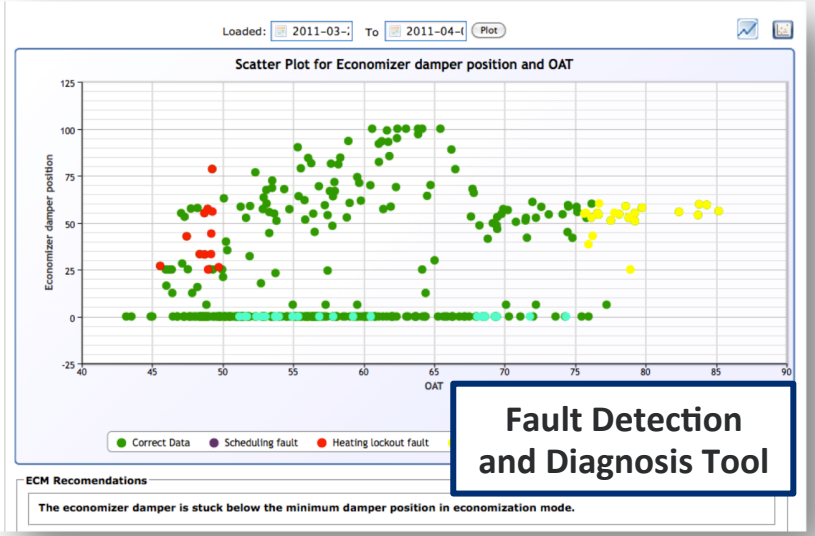
* The lines can be blurry and specific technologies may cross categories

Screenshot Examples









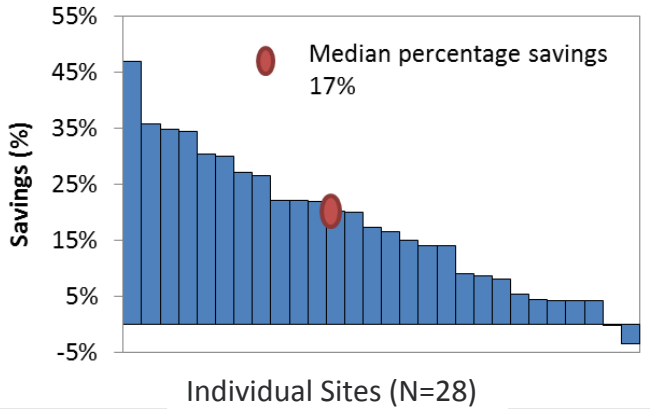
Graphic Source: Facility Dude (top left), Lucid (top right), Automated Logic (bottom left), Serious Energy (bottom right)

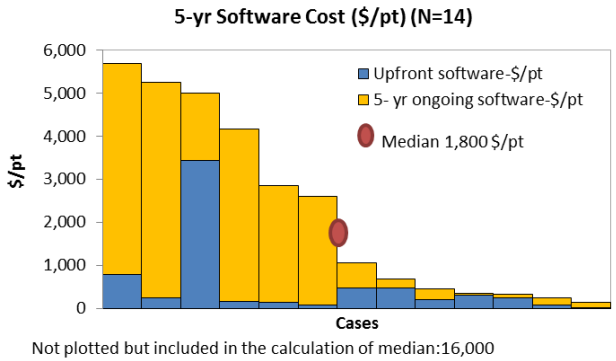
Key Member Challenges in Maximizing Benefits of EMIS, and Associated BBA Resources

1. Quantifying the Value Proposition for EMIS

EIS Cost and Benefits Study (2013)

- What is the cost, what have users saved, what are the best practices to maximize savings
- Median building and portfolio savings of 17% and 8% would not be possible without use of the EIS
  - Median building and portfolio utility savings of $56K per year, and $1.3M per year
- Median 5-yr cost of ownership = $150K, 1800$/pt, .06$/sf





26 participating organizations, 260M sf install base, 17 unique EIS

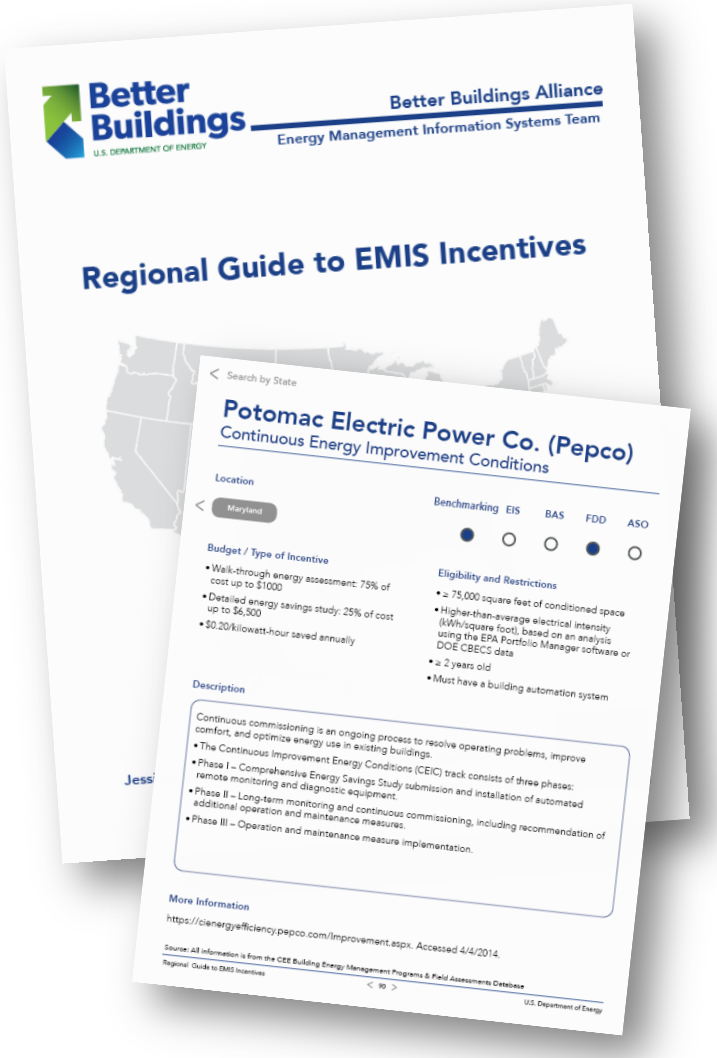
For more information http://eis.lbl.gov/pubs/lbnl-6476e.pdf

Making Best Use of EMIS

EIS Cost and Benefits Study (2013)

- Initial EUI, extent of efficiency projects, depth of metering, and total years of installation correlated with higher savings
  - EIS rarely if ever implemented as sole strategy
  - All but two participants reported savings could not have been achieved without the EIS
  - Those with less aggressive efficiency projects still saved 5%
- Best practices
  - Installation of sub metering, beyond whole-building level
  - Load profiling on a regular basis
  - Use of automated energy anomaly detection features
  - Monitoring peak load and managing demand charges

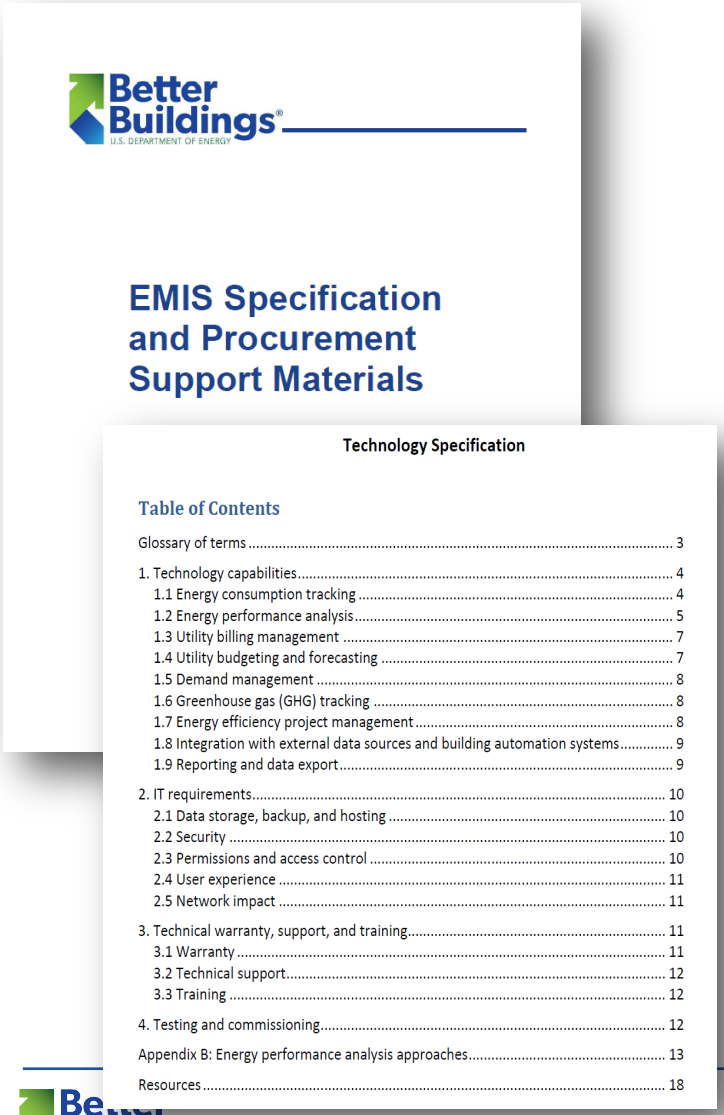
Offsetting the Costs of EMIS Implementation



Regional Guide to EMIS Incentives (2014)

- 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

2. Specifying and Selecting EMIS



EMIS Procurement Support Materials (2014)

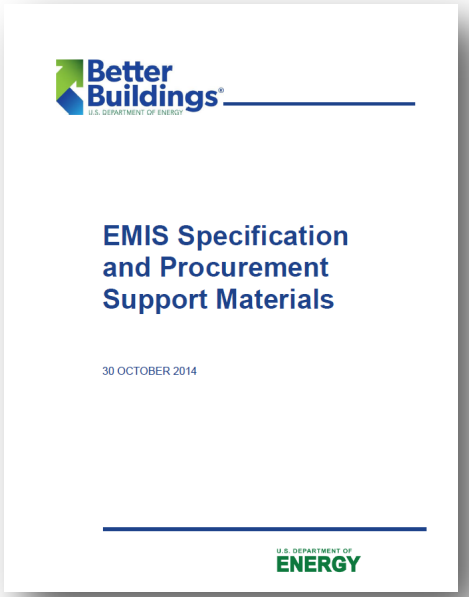
- Request for Proposal
  - Template to create a project-specific RFP for vendors
- Technology Specification:
  - Template of technology features that can be specified according to org. specific needs
- Evaluation Criteria
  - Several criteria to help choose between multiple competing proposals that satisfy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

2. Specifying and Selecting EMIS, Cont.

EMIS vendor demos and guest logins, Explore commercial EMIS offerings, (2014-15)

- LOBOS by Enerliance
- SENSEI by Cascade Energy
- WebCTRL by Automated Logic
- EnergyCAP by EnergyCAP
- Noesis PRO by Noesis Energy
- Panoptix by Johnson Control
- Building Analytics by Schneider Electric

* Vendors were selected based on interest indicated from EMIS project team members



3. Integrating EMIS into Institutional Energy Management

EMIS Crash Course (2014)

6 step process to plan EMIS

- Set organizational goals
- Establish roles & responsibilities
- Understand organizational conditions
- Define activities to meet goals
- Identify required sensing, metering
- Select a tool(s)

Summary of EMIS Tools

EMIS tools	Data scope	Key uses	Costs	Energy Savings
Benchmarking & utility bill analysis	Monthly utility bills	▪ Peer-to peer comparison ▪ Utility bill analysis	Free -$	2.4% (median) (whole building, enabled savings)
EIS & Advanced EIS	Hourly or 15-min meter data	▪ 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	▪ Building system control ▪ Manually troubleshooting by investigating trends	$$$$	10-15% (whole building)
FDD		▪ Auto system or component fault notification ▪ Fault causes identification	$$$	2-11%(whole building, potential savings)
ASO		▪ Optimal HVAC settings prediction	$$$	-

Member Experiences with Finding and Funding an EMIS

Member Experiences

- Eugenia Gregorio (Tower Companies)
- Pat Lydon (Legacy Health)
- Russell Subjinske (Wendy's)

- How was the EMIS selected and funded?
- What EMIS was selected, and why?
- When was the EMIS implemented?
- What benefits have the EMIS brought?

Our legacy is yours.

Finding and Funding an EMIS System

BBA Better Buildings Summit 2015

Pat Lydon

Legacy Health

Caring for patients… and the planet.

Legacy Health Background

Legacy Health, a nonprofit, locally owned organization based in Portland, Oregon, and serving Oregon and Southwest Washington.

- Five hospitals

- 4.3 million sq. ft. of owned space
  - > Excluding leased space

- Our mission statement:

  "Our legacy is good health for: Our people, our patients, our communities and our world."

- Environmentally sustainable business operations are key to our ability to achieve our mission.

Environmental Sustainability

Recognition:

- Practice Greenhealth honored Legacy Health with:
  - > System for Change Award; recognizes health systems that work cohesively to gather information, set goals, gauge their progress and encourage environmentally friendly practices.
  - > Environmental Leadership award, bestowed on all 5 Legacy hospitals. This award recognizes hospitals that find creative and innovative ways to achieve long-term sustainability.

Measuring Energy Consumption at Legacy

You can't manage what you don't measure.

- High level benchmarking:
  - > Energy Star Portfolio Manager
    - Simple and imperfect
    - Provides a good basis for discussion and investigation; not necessarily accurate measurement of performance
- Tracking patient census and adjusted discharges to see if correlation
- Site and building level energy measurement. We don't have a single EMIS… but we do need one.
  - > Current state - building control systems
    - Honeywell
    - Siemens
    - JCI
    - Alerton

Measurement Tools

- We are using third party EMIS tools at some sites
  - > Northwrite Energy Expert (since 2009) at two hospitals (electric and natural gas)
  - > Cascade Energy SENSEI on trial (2014) at one hospital (electric only)
- Northwrite Energy Expert was provided as a solution by electric utility serving several sites.
  - > Implementation funded by NEEA
  - > Some strengths… some weaknesses
  - > Measuring buildings; not submetered within buildings.
- Research uncovered Cascade Energy (SENSEI) as another option.
  - > Local, better price model
  - > Connected one meter so far (physical plant)
  - > More reliable user experience (so far)
- Not currently optimizing building controls systems as source of energy consumption data.

User Acceptance

- System must provide effective, reliable and consistent user experience.
  - > Unexpected challenges in implementation and ongoing use.
  - > Utility provided solution; represented as able to take inputs from any meter with a pulse output (electric, gas, water) … but installation brings additional challenges.
- Must be cost effective
  - > Some price models discourage connection of multiple meters
- Must provide useful information to allow conclusions
  - > Normalized views
  - > Modeled views - actual vs. predicted performance

Funding The System

- Some utilities may offer an EMIS as a service option; PGE offers Northwrite Energy Expert as an optional service for an additional monthly fee on the electric bill.

- Fee example:
  - Electric meter
    - Installation cost: $150 (per connected meter)
    - Monthly fee from PGE: $65 (per connected meter)
  - Natural gas meter
    - Installation cost: $100 - $800 (per connected meter dependent on type of meter)
    - Monthly fee from PGE: $65 (per connected meter)
    - Monthly fee from NW Natural: $8 (per connected meter)

Funding The System – Other Options

- To keep the implementation cost effective, find solution providers that don't charge based on number of connected data points. Alternatives might be:
  - > Charge by site
  - > Charge by building
- If no budget available then make the case to use savings to fund EMIS.
- Work with your utilities and efficiency organizations to see if they will provide incentives for EMIS; even if they don't currently, encourage them to consider.

Questions?

Finding and Funding an Energy Management Information System That Is Right for Your Building Portfolio

Wendy's Quality Supply Chain Coop, Inc.
Russell Subjinske P.E., C.E.M.
May 2015

Selection Process

Assumed needed:

- **Equipment**
  - Under $10K installed
  - Monitors on every circuit (184)
  - Non-invasive – wireless
  - Non Revenue Grade CT's
- **Software**
  - Charts and graphs
  - Looks are deceiving!

Really needed:

- **Equipment**
  - Reliable internet
  - One day service
  - Major equipment only (90-100)
  - Revenue grade (match utility bill)
- **Software**
  - Consistent data (no drops or nulls)
  - Fast exports (240,000,000 data lines)
  - Data analytics and visualization tool – no manufacturer can provide what you need!!!

Funding Process

- **Partner with someone who talks in pretty pictures and many colors**
  - Data and facts do not sell programs – personality and personability sells
  - Data and facts support the sale
  - Find the new guy still on his honeymoon
- **Start with a simple program that people can see and that can demonstrate a big win**
  - Corporate parking lot LED Conversion – Executive lot
  - Then restaurant parking lot lights
  - Then EC (brushless DC electric) Motors and interior LED's and ***then monitoring***
- ***Traction and credibility must be established before you can sell projects with potential return like Energy Management Information Systems***

Funding Process

- **EMIS is a tool that provides the opportunity for revelation and validates energy saving opportunities**
  - Much like Excel and Word
- **Difficult for financial people to grasp an estimated potential savings on what might be to fund a project like EMIS**
- **EMIS does not save money in itself like an LED light**
- **EMIS is a tool that gives you the opportunity to discover what you did not know and could not prove**
  - Someone must identify, fund and act on the opportunities discovered with the EMIS data
  - Opportunities have ROI's because of capital spent and savings generated but what was the idea discovered worth (data) and how is the ideas ROI calculated
  - If you claim the savings on the idea to generate ROI on the EMIS opportunity, how do you get ROI on the project capital for the actual project (cannot double dip on savings)?

Funding Process

- Get the low hanging fruit and gain creditability before you move toward the EMIS tool

- The EMIS tool leads you to the not so low hanging fruit and keeps you on the straight and narrow using the data it provides

- Once people see the data and results of the tools data there is no problem establishing it's worth but not necessarily it's ROI.

Who and Why

- **The right company is:**
  - Hungry
  - Flexible
  - Nimble
  - On the edge (has development money and staff)
  - Who needs you more than you need them
  - Fits your needs
- **I use Powerhouse Dynamics (Site Sage)**
  - They where right for me in 2013 and met my needs
  - If I knew then what I know now in 2015, I would not have used them
    - This will be true for most suppliers you find in a emerging technology

Benefits – Data Rules

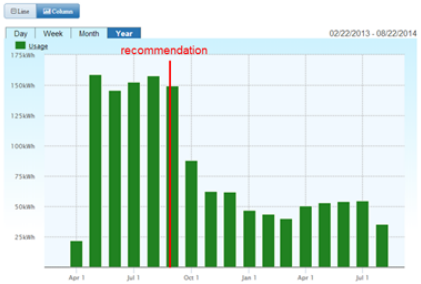
- **Behaviors - $3400/year savings (does not work in all locations)**

	Base Period - 6/6/13 to 9/4/2013		PMC Support Period - 9/5/13 to 6/30/14					
Equipment	Total kWh	Ave. kWh per Day	Total kWh	Ave. kWh per Day	Variance Ave. kWh Day	Annualized kWh Change	Annualized $$ Change @$.0985 kWh	Percent Change
Total Cooking Equipment	26,115	428.1	143,740	393.7	-34.4	-12,556	**-$1,237**	-8%
Total Interior Lights	4,666	79.2	21,523	58.9	-20.3	-7,410	**-$730**	-26%
Total Exterior Lights	6,072	87.2	26,992	73.9	-13.3	-4,855	**-$478**	-15%
Total Refrigeration Equipment	13,760	225.6	72,681	199.2	-26.4	-9,636	**-$949**	-12%
Total Ventilation Equipment	3,691	60.5	22,440	61.5	1.0	365	**$36**	2%
Totals	**54,304**	**880.6**	**287,376**	**787.2**	**-93.4**	**-34,091**	**-$3,358**	**-11%**

Figure 1

Walk In Cooler Lights

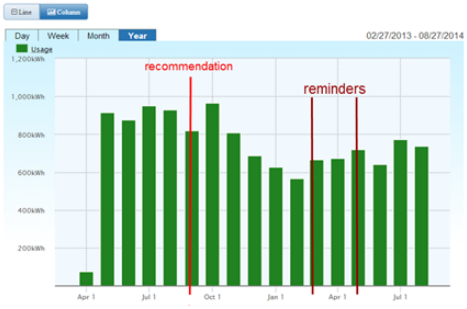
- **PMC Recommendation:** Lights were on 24 hours/day and recommended occupancy controls for the lights.
- **Action Taken:** Lighting controls were installed.
- **Results Achieved:** $8+/month savings



Month	Prior kWh	After kWh	Change
jul, 2013	152.5		
aug, 2013	157.9		
sep, 2013	149.3		
oct, 2013		88.1	
nov, 2013		62.5	
dec, 2013		61.9	
total	459.7	212.5	-247.2

Fryer #1

- **PMC Recommendation:** Fryer #1 turned on several hours longer per day than necessary and recommended new on/off schedule
- **Action Taken:** Staff followed on/off schedule more consistently
  Results Achieved: $8+/month savings



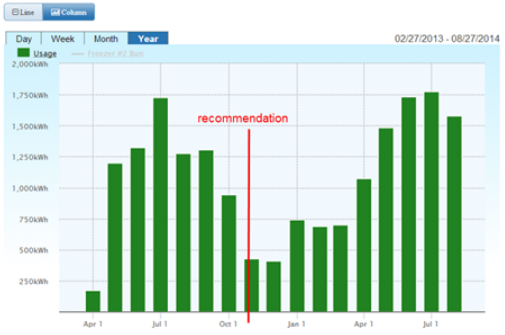
Month	Prior kWh	After kWh	Change
jul, 2013	951.4		
aug, 2013	931.1		
sep, 2013	820.1		
oct, 2013		964.2	
nov, 2013		807.6	
dec, 2013		686.1	
total	2702.6	2457.9	-244.7

Benefits – Data Rules

- **Maintenance - $1800/year savings** (not all organizations count cost avoidance)

Bun Freezer

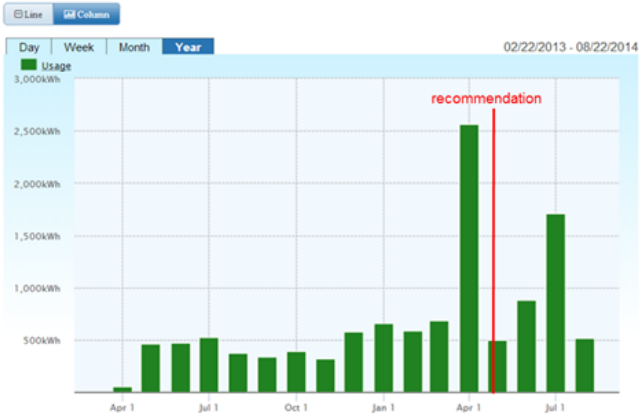
- **PMC Recommendation:** Bun Freezer temperatures were routinely 30 degrees and recommended technician to service the unit.
- **Action Taken:** Technician serviced the unit
- **Results Achieved:** $28/month savings



Month	Prior kWh	After kWh	Change
sep, 2013	1306.0		
oct, 2013			
nov, 2013			
dec, 2013			
jan, 2014			
feb, 2014			
total			

Ice Machine

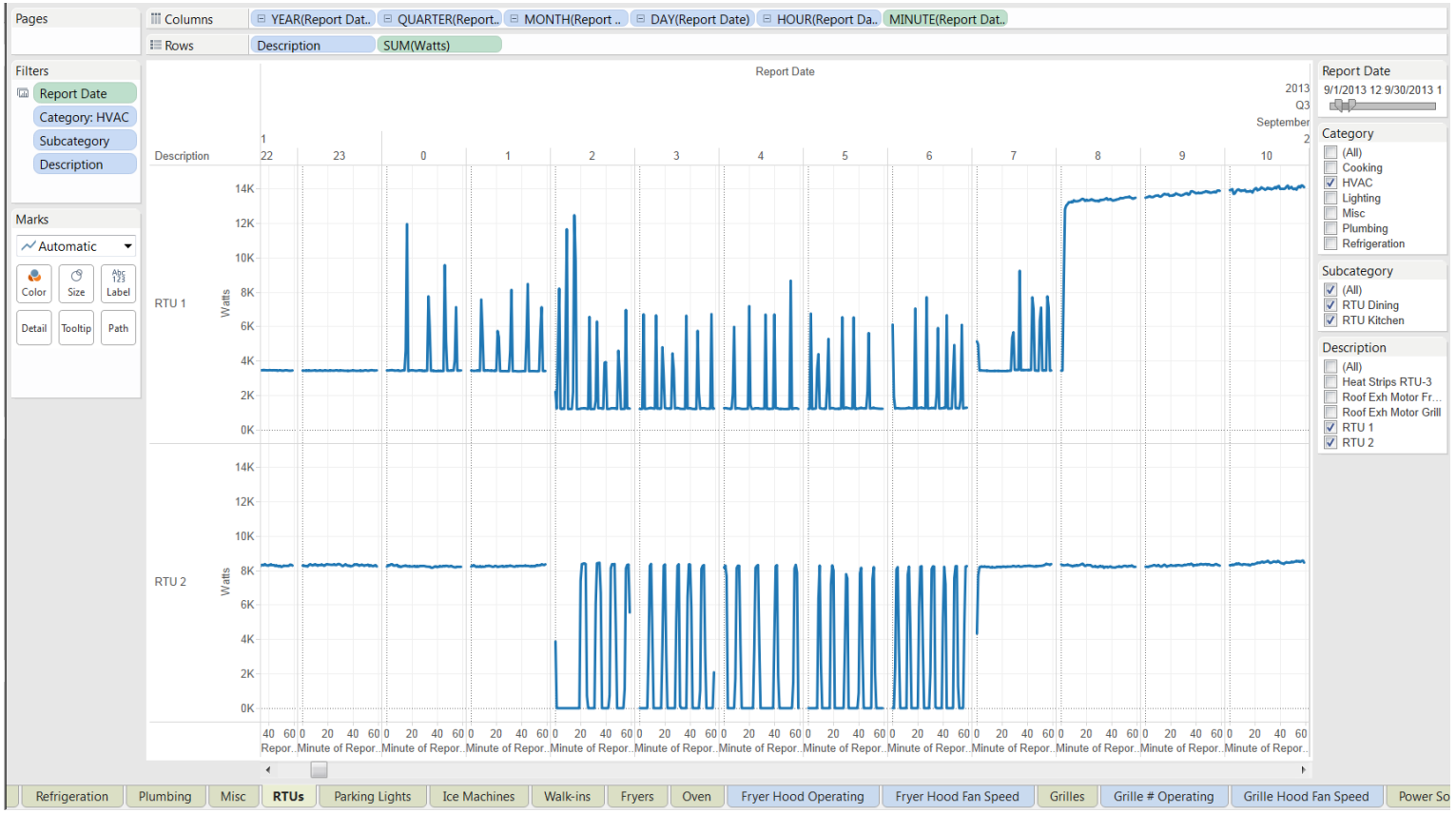
- **PMC Recommendation:** Ice Machine had a major spike in kWh usage and recommended a technician to service the unit.
- **Action Taken:** Technician serviced the unit
- **Results Achieved:** $18/month savings



Month	Prior kWh	After kWh	Change
mar, 2014	686.0		
apr, 2014	2564.0		
may, 2014	495.0		
jun, 2014		880.0	
jul, 2014		1705.0	
aug, 2014		615.0	
total	**3745.0**	**3200.0**	**-545**

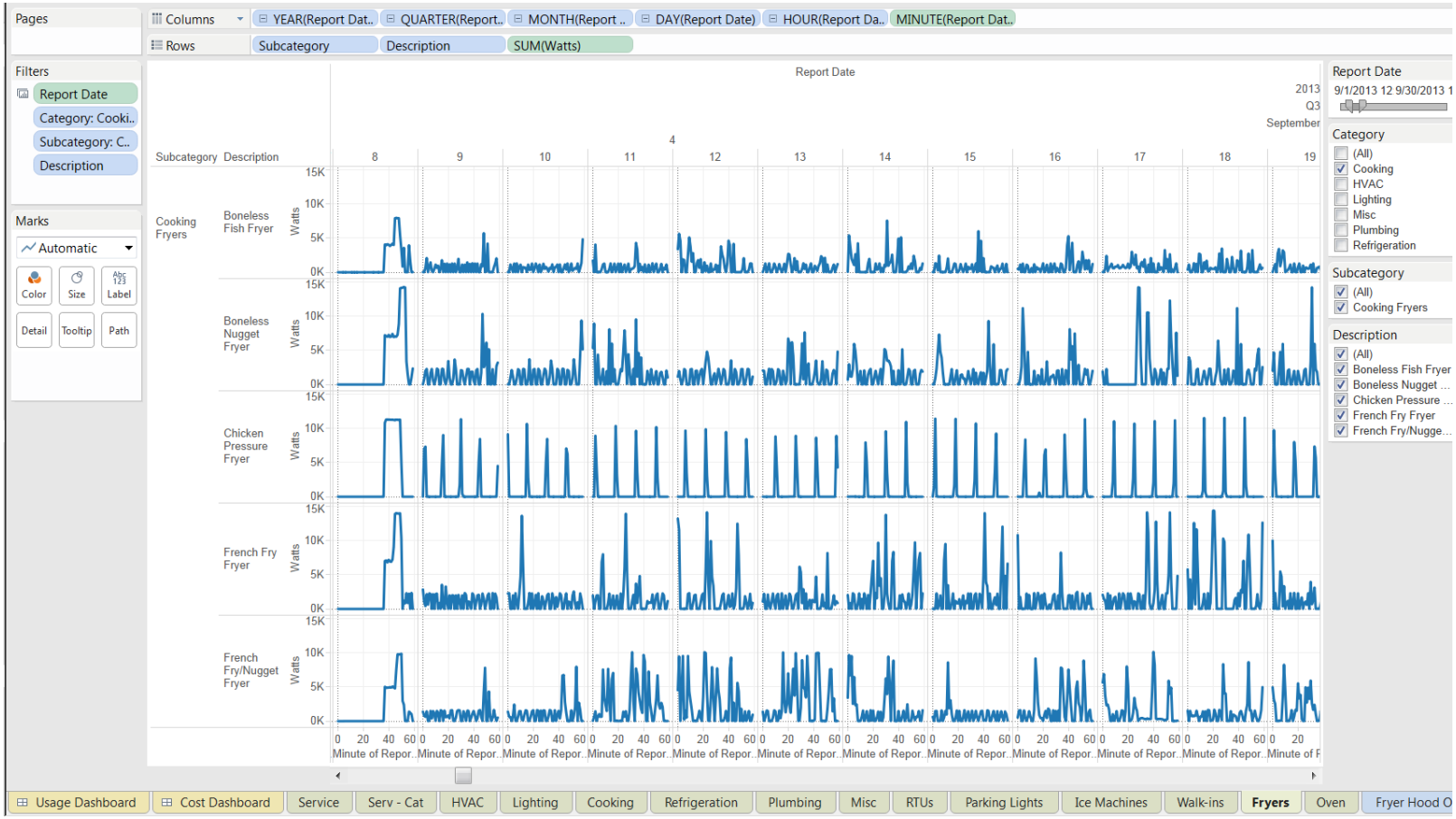
Benefits – Data Rules

- **Equipment Sizing – Reduced equipment sizing by 5 ton or 17%**
  - Engineer calculated equipment heat load at 7.5 tons on design day in September 2014



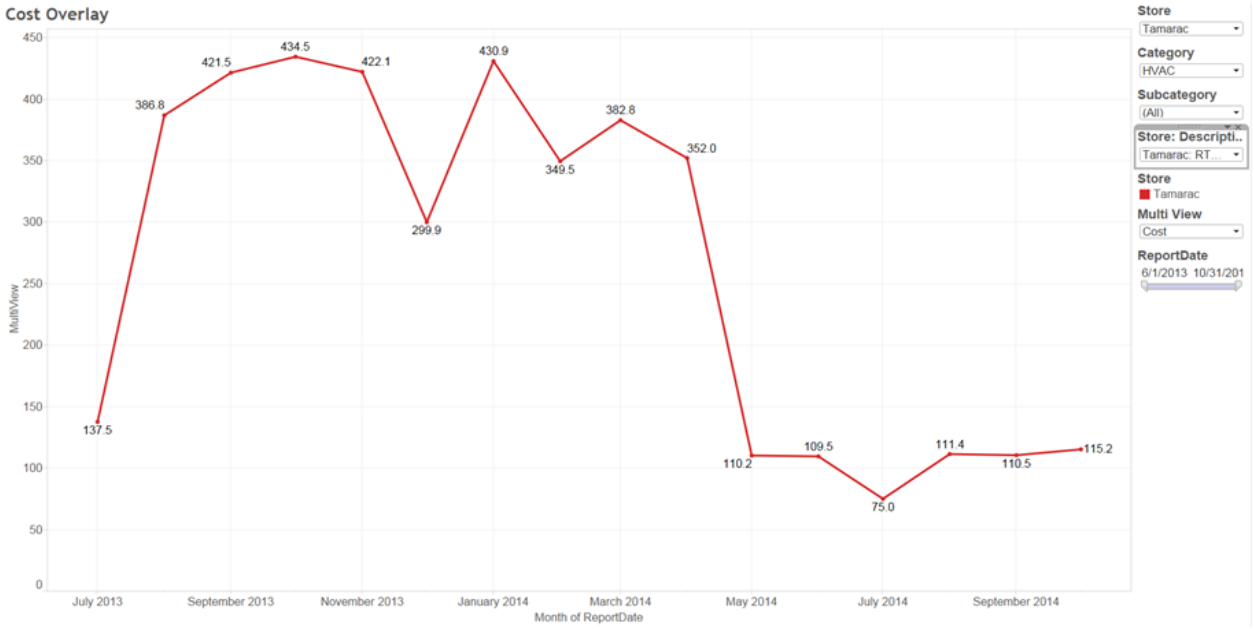
Benefits – Data Rules

- **Equipment usage – Can equipment be eliminated – Savings $5000 capital and $816/ year**



Benefits – Data Rules

- **Energy Saving Device Validation – Refrigerant Additive**



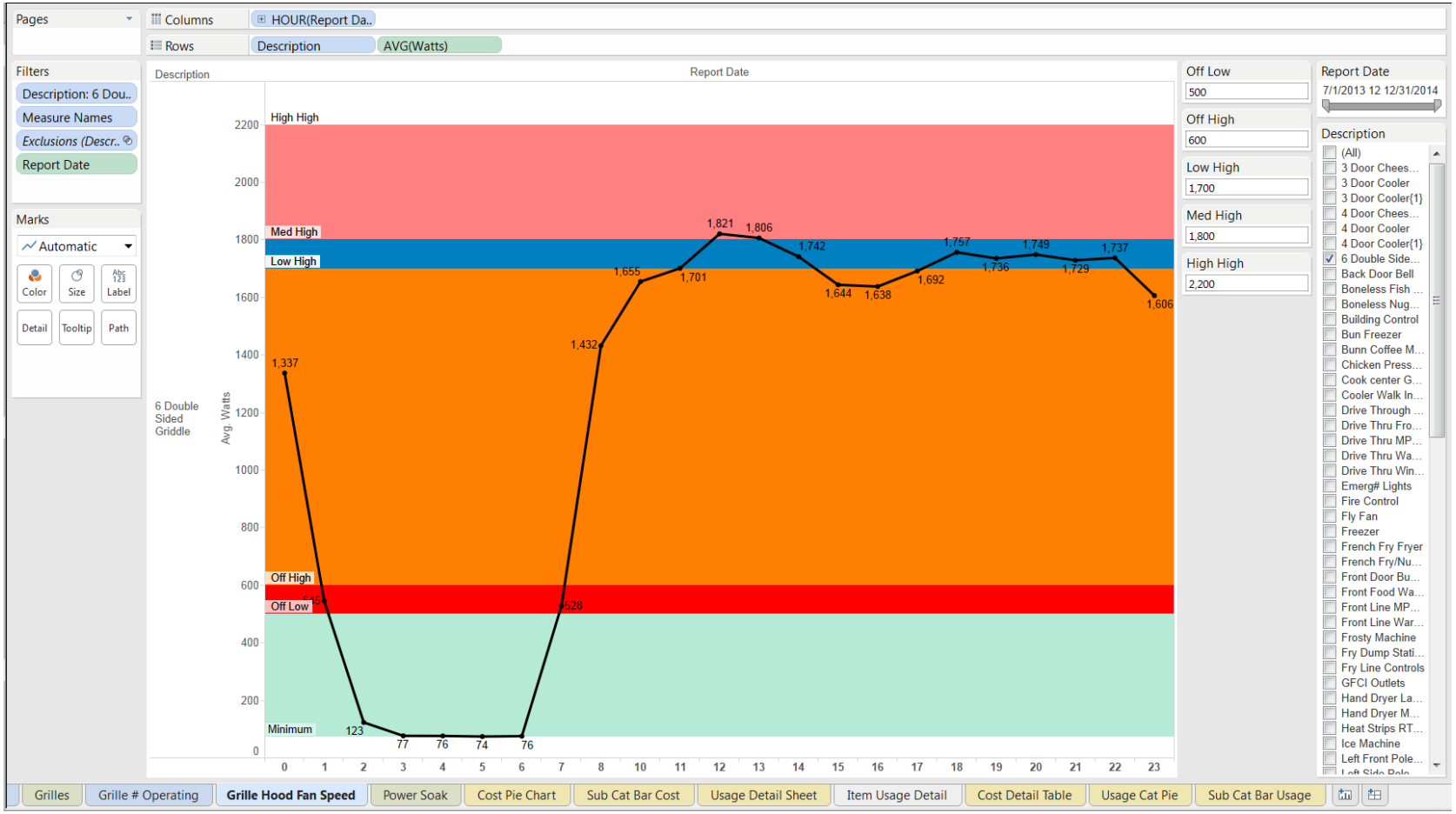
Sensor Breakdown for Tamarac

Categ..	Subc..	Store: D..		ReportDate 2013 July	August	Septemb..	October	November	December	2014 January	February	March	April	May	June	July	August	Septemb..	October	Grand Total
HVAC	RTU Make-Up	Tamarac: RTU3 - Makeup Air	Cost	$137.53	$386.77	$421.51	$434.45	$422.12	$299.92	$430.91	$349.48	$382.82	$352.02	$110.20	$109.51	$74.97	$111.36	$110.45	$115.21	$4,249.24
			KWH	1,563	4,395	4,790	4,937	4,797	3,408	4,897	3,971	4,350	4,000	1,252	1,244	852	1,266	1,255	1,309	48,287
			Run Time (Hours)	743	741	716	740	717	523	740	671	742	695	720	719	484	732	718	743	11,144
			% of Total KWH al..	3.24%	9.10%	9.92%	10.22%	9.93%	7.06%	10.14%	8.22%	9.01%	8.28%	2.59%	2.58%	1.76%	2.62%	2.60%	2.71%	100.00%
			% Difference in K..	0.00%	40.84%	34.54%	14.90%	-0.76%	-24.46%	-1.58%	-37.37%	-7.68%	0.09%	-28.73%	16.03%	41.73%	46.09%	14.83%	-27.46%	0.00%
			% Difference in Ru..	0.00%	-0.18%	-3.44%	-0.28%	-3.36%	-13.88%	37.30%	-9.68%	40.94%	40.29%	44.47%	44.69%	32.43%	49.27%	44.70%	49.88%	0.00%
Grand Total			Cost	$137.53	$386.77	$421.51	$434.45	$422.12	$299.92	$430.91	$349.48	$382.82	$352.02	$110.20	$109.51	$74.97	$111.36	$110.45	$115.21	$4,249.24
			KWH	1,563	4,395	4,790	4,937	4,797	3,408	4,897	3,971	4,350	4,000	1,252	1,244	852	1,266	1,255	1,309	48,287
			Run Time (Hours)	743	741	716	740	717	523	740	671	742	695	720	719	484	732	718	743	11,144
			% of Total KWH al..	3.24%	9.10%	9.92%	10.22%	9.93%	7.06%	10.14%	8.22%	9.01%	8.28%	2.59%	2.58%	1.76%	2.62%	2.60%	2.71%	100.00%
			% Difference in K..	0.00%	40.84%	34.54%	14.90%	-0.76%	-24.46%	-1.58%	-37.37%	-7.68%	0.09%	-28.73%	16.03%	41.73%	46.09%	14.83%	-27.46%	0.00%
			% Difference in Ru..	0.00%	-0.18%	-3.44%	-0.28%	-3.36%	-13.88%	37.30%	-9.68%	40.94%	40.29%	44.47%	44.69%	32.43%	49.27%	44.70%	49.88%	0.00%

- **August to October 2013 = $1242.73 (14,122 kwh)**
  - CDD = 1521 (FT Lauderdale Station)
- **August to October 2014 = $337.02 (3,830 kwh)**
  - CDD = 1492 (FT Lauderdale Station)
- ***Savings for 3 months $905.71 (10,292 kwh)***

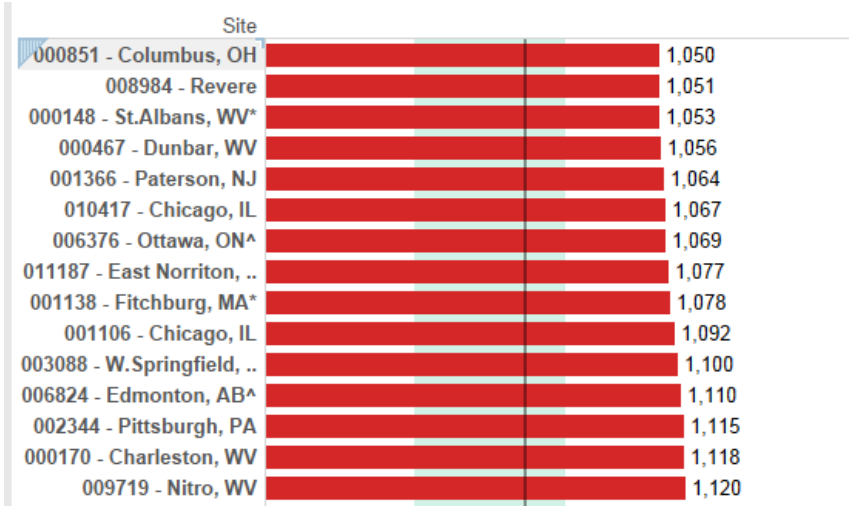
Benefits – Data Rules

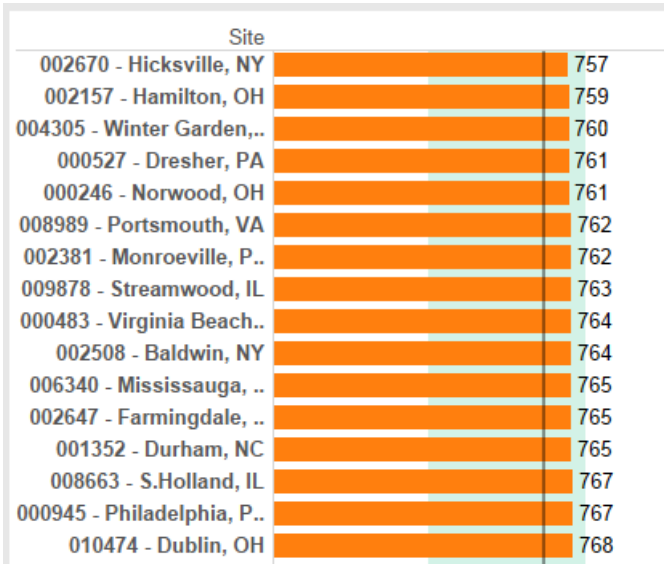
- **New Program Support - Demand Control Ventilation Schedule – Savings of $8000/ year with 5 month payback on new restaurant**

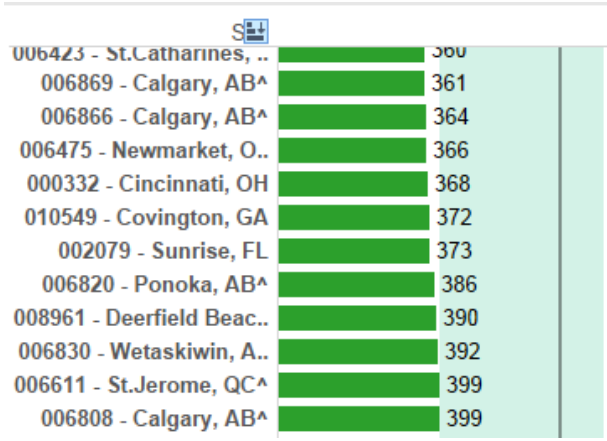


Benefits – Data Rules

- **Energy Use Analysis for Restaurant Operations – Top, average and lowest energy users**



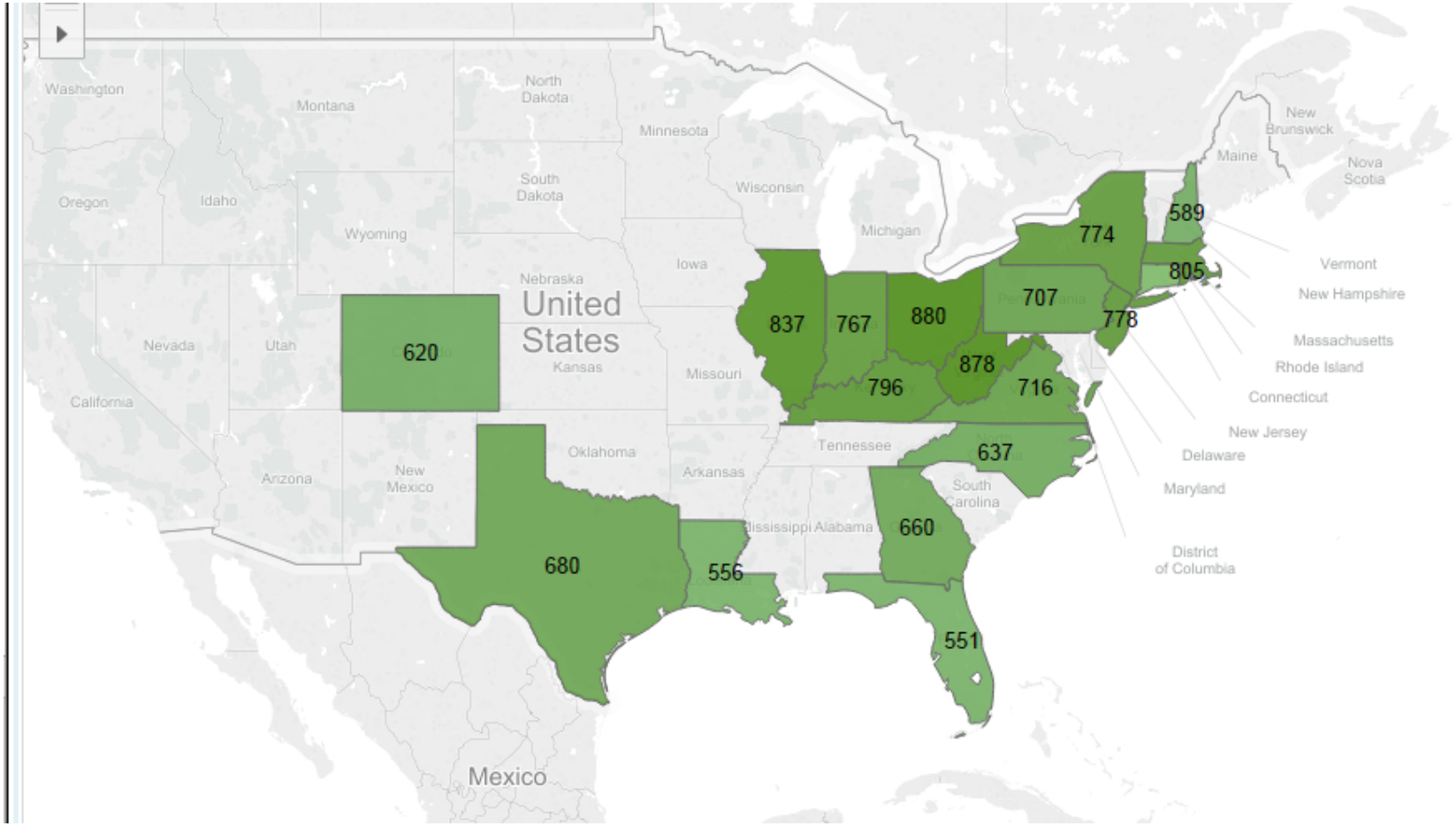




Reports to division executives each month for their area. They can research various restaurants to determine best practices in energy optimization.

Benefits – Data Rules

- **Better Building Challenge Data – EUI analysis**



Finding and Funding an Energy Management Information System that is Right for Your Portfolio

Better Buildings Summit %
Thursday May 28, 2015 %

Eugenia Gregorio
Director of Corporate Responsibility
The Tower Companies

Company Overview

- Family-Owned, Privately-Held Real Estate Development & PM Firm
- Locally-Focused
- Develops, Owns & Manages
- Over 5 million SF of commercial office, multi-family residential, and retail centers
- Leader in Green Building Industry .

Sustainability Leadership %

Lead by example on environmental responsibility, by developing and managing high performance properties, being a global voice on environmental stewardship, and sharing our sustainable and innovative practices.

U.S. GREEN BUILDING COUNCIL LEED USGBC

ENERGY STAR

The Climate Registry

2014 GREEN LEASE LEADER

Goal: 20% by 2020 &

TOWER COMPANIES

Energy and Water Performance

ENERGY PERFORMANCE

Cumulative (vs. Baseline)	**10%**
Annual (2013)	**3%**

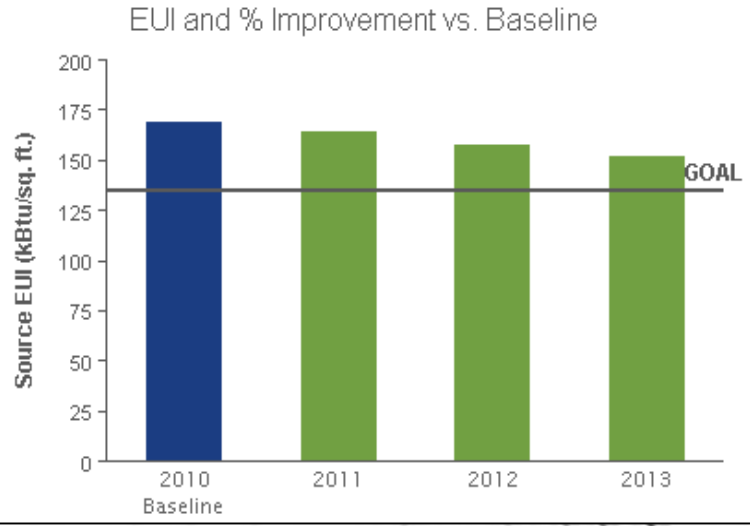
WATER PERFORMANCE

Cumulative (vs. Baseline)	**14%**
Annual (2013)	**4%**

THE TOWER COMPANIES

PORTFOLIO ENERGY PERFORMANCE

Better Buildings Challenge Partners strive to decrease portfolio-wide source energy use intensity (EUI) and to increase the percent improvement compared to a set baseline. Tower has committed 10 buildings that they both own and manage, which make up 3 million square feet of multi-tenant commercial office and multi-family high-rise residential properties. Compared to a 2010 baseline, Tower has improved energy performance by 10% due in large part to implementing a Real-Time Energy Management Program focused on low-cost ECMs and sustainable operations, LED lighting retrofits, BMS control upgrades, and equipment upgrades. There are other properties that The Tower Companies owns but that are not managed directly and therefore, aren't being included in this program.



https://www4.eere.energy.gov/challenge/partners/better-buildings/the-tower-companies

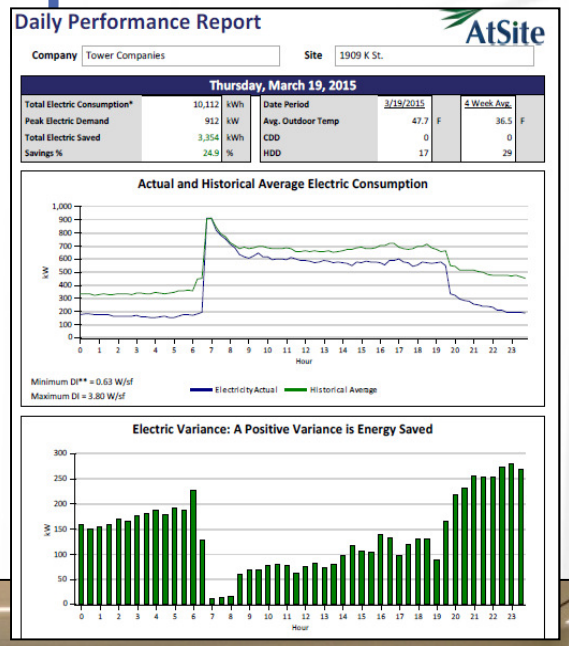
Moving Beyond Benchmarking %

- Over $8 million on Utilities every year; 20% of budget %
- Get information faster than every 30-45 days
- Gain visibility and transparency into building operations
- Develop actionable low to no-cost ECMs
- Set Goals, Measure Progress, 3rd Party Validation
- Tighten Operations & Train Staff

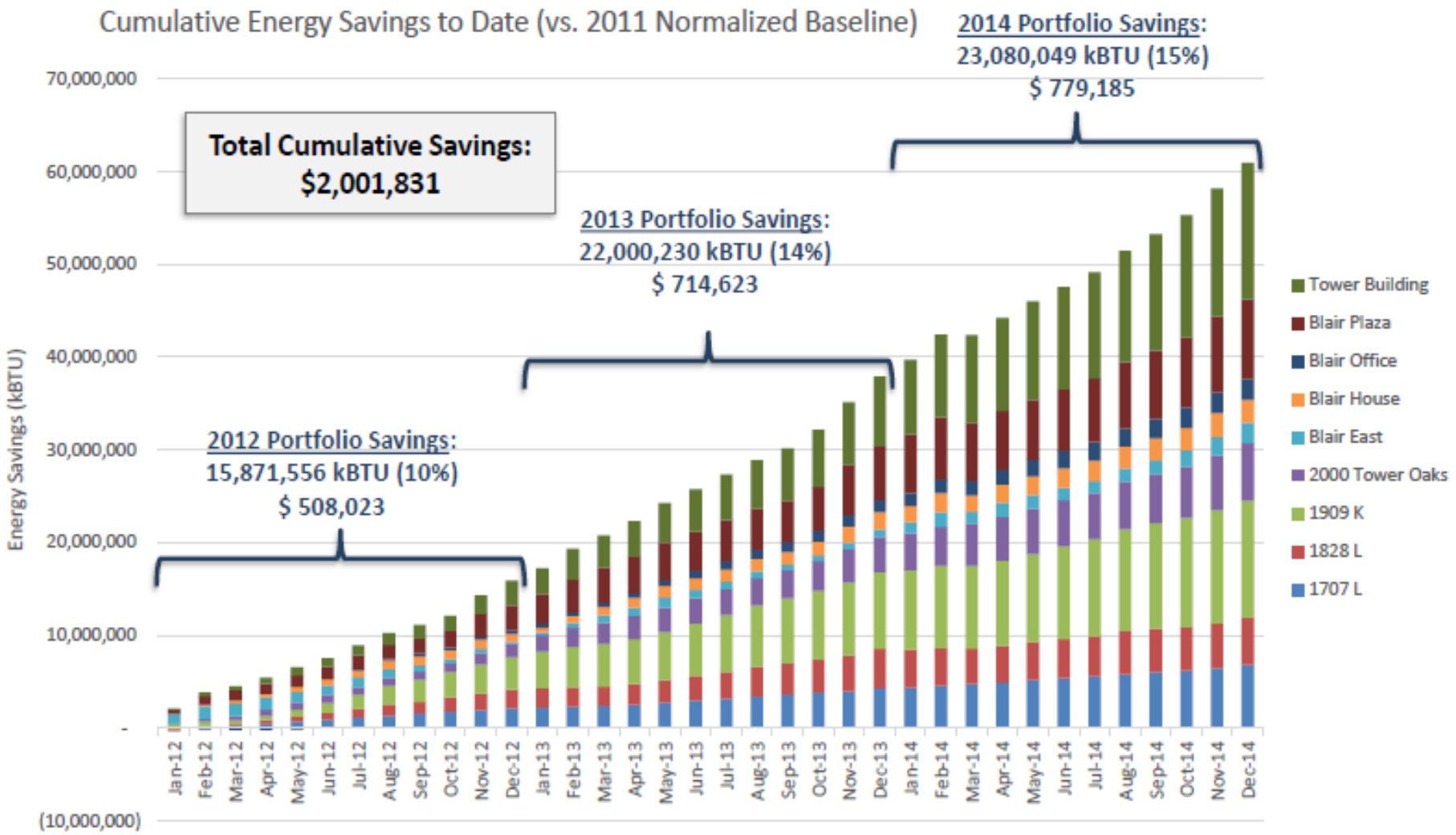
What was our approach?)

- Understand Resources, Needs & Goals)
- Research Industry Peers
- Evaluate Market Solutions
- Form Team, Develop) Program Scope, Set Goals, Measure Progress)

Tip: Start small and try a pilot building first! %



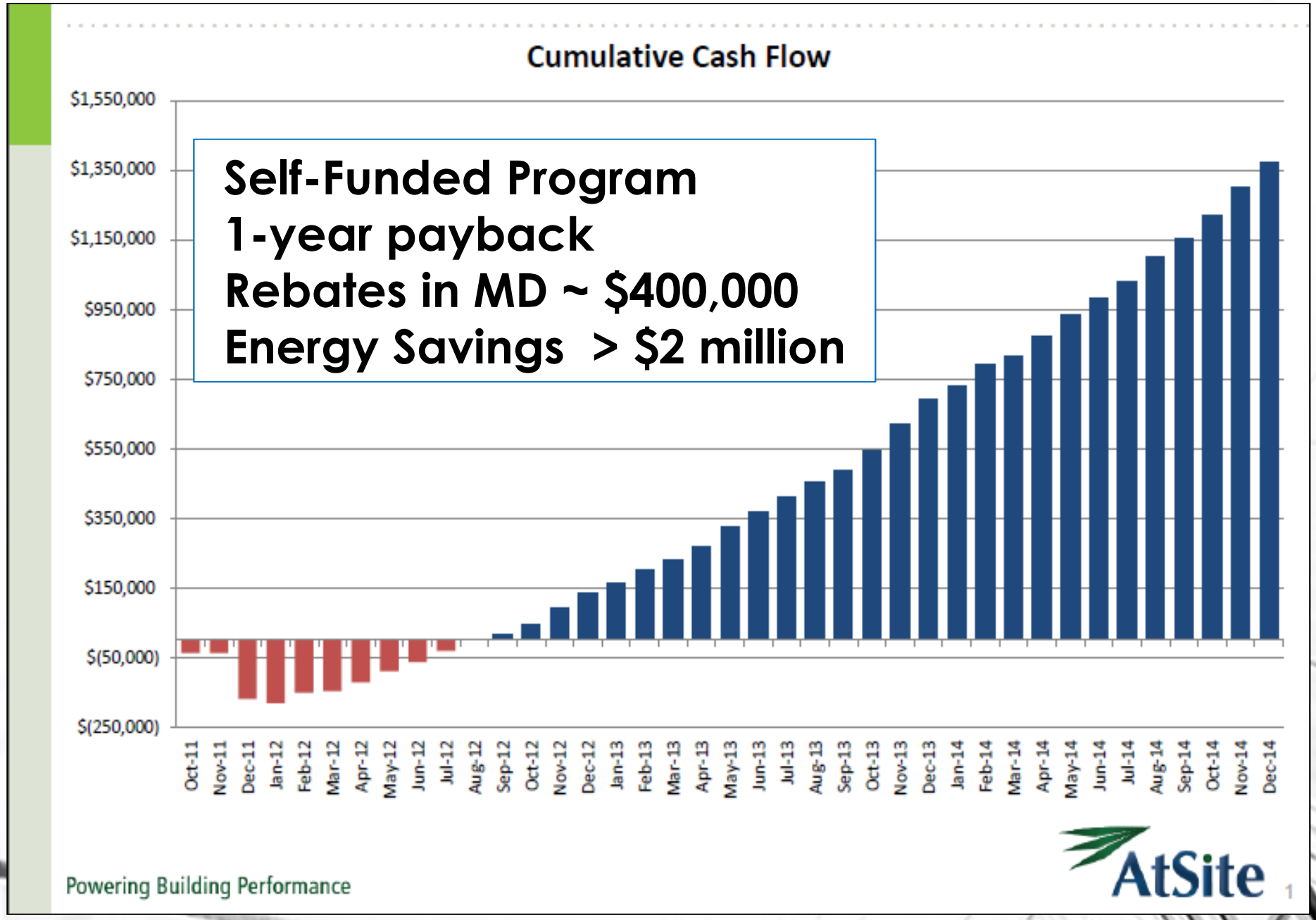
Portfolio Progress Over Time (



*Savings calculated against a 2011 baseline that has been normalized to the listed month's weather and building and occupancy conditions

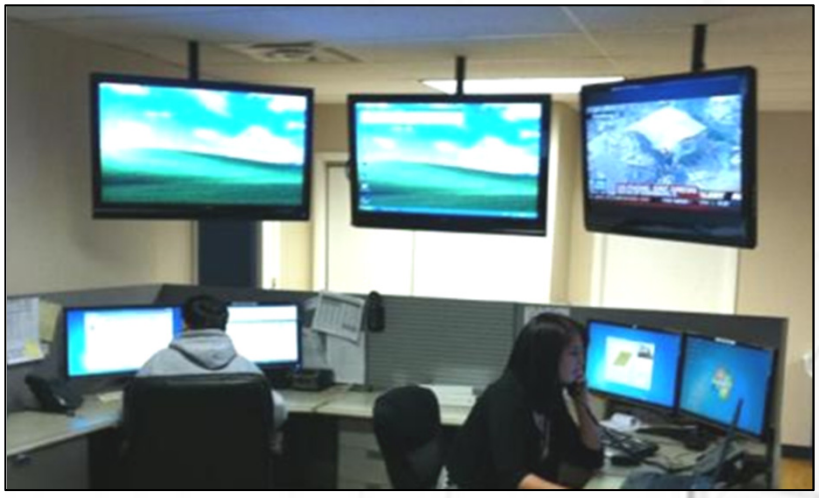
**Cost savings calculated using $0.125/kWh and $0.0097/CF, based solely on electric and gas consumption. These savings estimates do not incorporate program or ECM costs.

Let's Talk Money &



Energy Conservation Measure Best Practices

- ✓ Real-Time Energy Management
- ✓ Align Building Operations with Lease Hours
- ✓ Night Audits
- ✓ LED Lighting
- ✓ Green Lease Guidelines
- ✓ High Efficiency Gas Boilers
- ✓ BMS Upgrades
- ✓ Set-point modifications
- ✓ Green Teams & Engagement
- ✓ PV Solar Systems



Showcase Project

THE TOWER COMPANIES

Showcase Project: The Millennium Building

LOCATION
Washington, DC

PROJECT SIZE
240,000 square feet

FINANCIAL OVERVIEW
Project Cost $300,000

Annual Energy Use

Baseline (2011)	229 kBtu/sq. ft.
Actual (2013)	182 kBtu/sq. ft.

Energy Savings: **20%**

Annual Energy Cost

Baseline (2011)	$752,000
Actual (2013)	$551,000

Cost Savings: **$201,000**

- **Project: Real-Time Energy Management, New Building Automation System (BAS/BMS), LED Lighting in Stairwells**
- **Time Period: 18 months (Jan '12 – June '13)**

NRDC Case Study

Are claims of 10% to 20% energy savings realistic in commercial bldgs?

	Square Feet	2012 Occupancy	2011 kWh	2012 kWh	kWh Savings	$ Savings	Percent of kWh Savings
1707 L Street	109,926	302	1,965,135	1,516,274	448,861	$58,352	23%
1828 L Street	332,928	928	5,590,937	5,227,183	363,754	$47,288	7%
1909 K Street	239,128	462	5,197,305	4,327,589	869,716	$113,063	17%
Total for three buildings combined			12,753,377	11,071,046	1,682,331	$218,703	13.2% Average

Reference:
http://www.nrdc.org/business/casestudies/tower-companies.asp

THANK YOU!

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THE TOWER COMPANIES

Discussion

THANK YOU

eere.energy.gov/betterbuildingsalliance/EMIS

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BBA EMIS Project Team Members

- Arlington County, Virginia
- Best Buy
- Boston Market
- CentraCare Health System
- City of Boston
- City of Cleveland, Ohio
- City of Milwaukee, Wisconsin
- City of West Palm Beach, Florida
- CBRE
- Food Lion
- Glenborough
- U.S. General Services Administration
- Hospital Corporation of America
- Legacy Health System
- Kauai County, Hawaii
- MC Realty
- New York-Presbyterian Hospital
- PetSmart
- PeaceHealth
- Prudential Real Estate Investors
- Publix Super Markets
- Retail Properties of America, Inc.
- Saunders Hotel Group
- Spokane county, Washington
- Staples
- Summa Health System
- Target
- Tishman Speyer Properties
- Tulane University
- Ulta
- University of Maryland
- University of Maryland Medical Center
- University of Pittsburgh Medical Center
- Verizon
- Wawa
- Wendy's Quality Supply Chain Co-op
- Whole Foods Market
- Yum! Brands

Industry Partners at the Summit