

Energy Audits

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November 17, 2016





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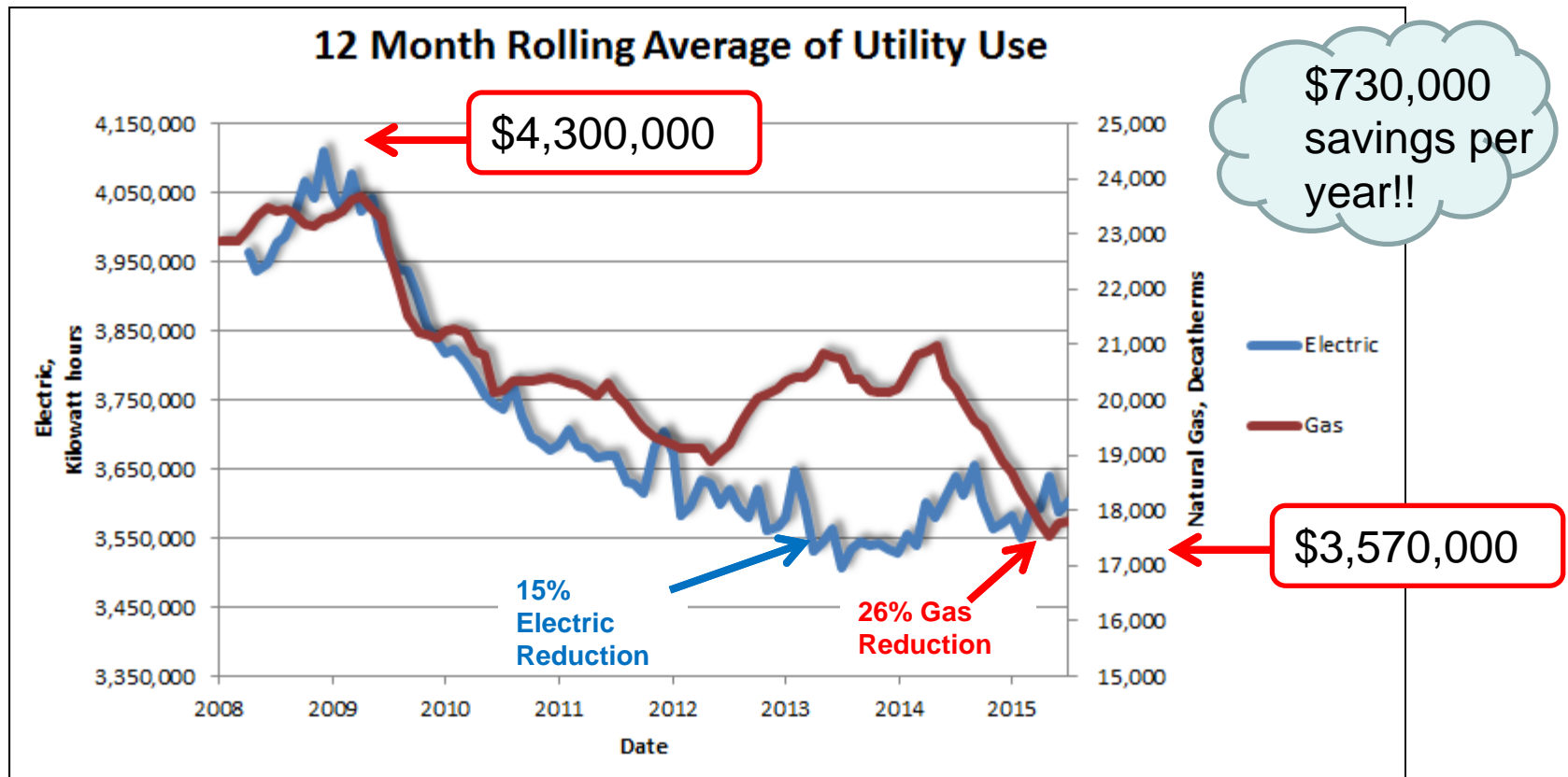
What we're going to cover:

- Energy Auditing 101
 - Why?
 - ASHRAE Level 1,2,3
 - What are the Barriers?
 - What are the Opportunities?
- The PowerShift Incentivized Audit Service

Why?

An energy audit is the first step
and
the method to define your next steps

for example:

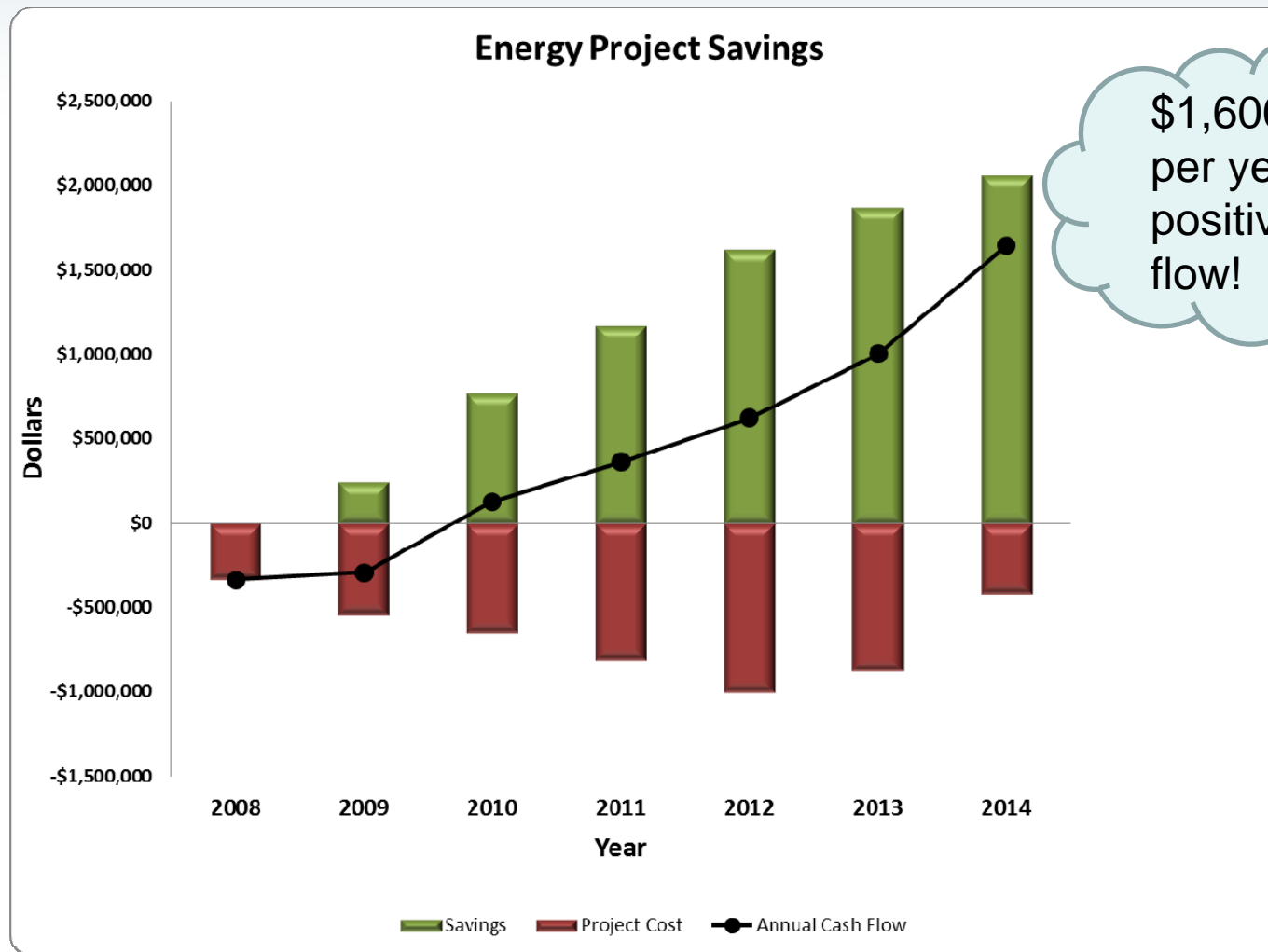


Why?

An energy audit is the first step
and
the method to define your next steps

Improve operational efficiency
and
save money!

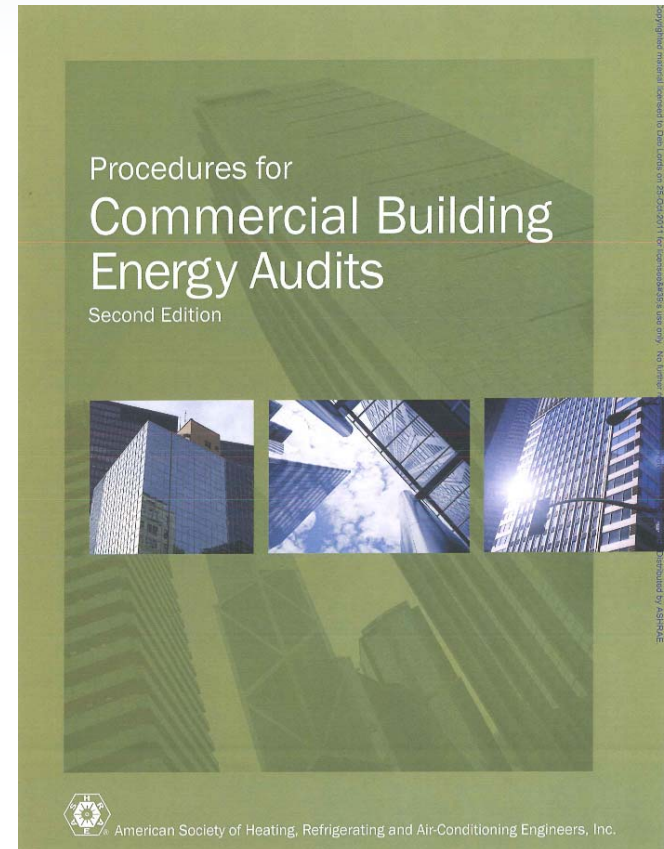
The Numbers...



Energy Auditing

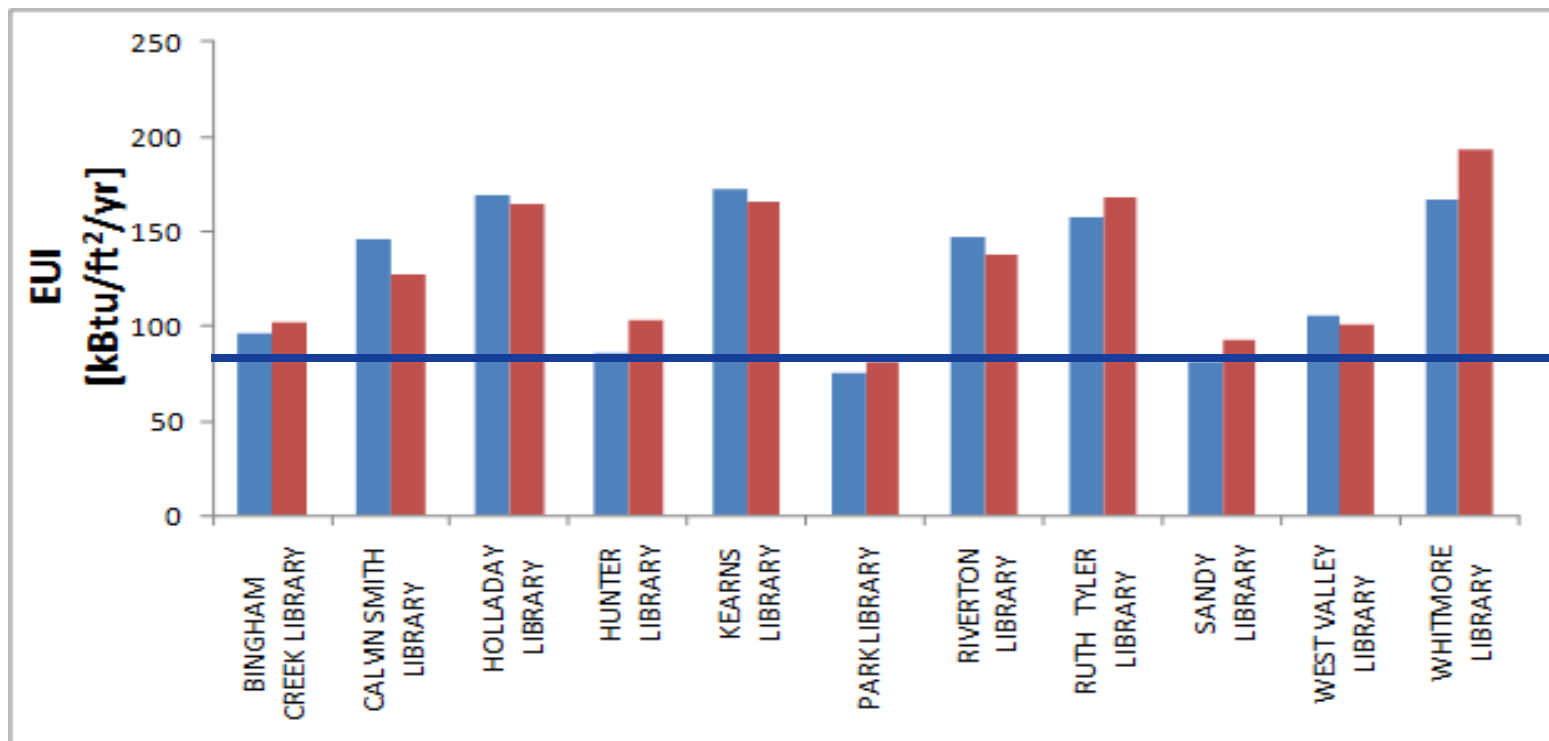
Preliminary
Energy-Use
Analysis

- Calculate kBtu/ft², \$/ft²
- Benchmarking
 - Compare to similar
 - Compare to historical



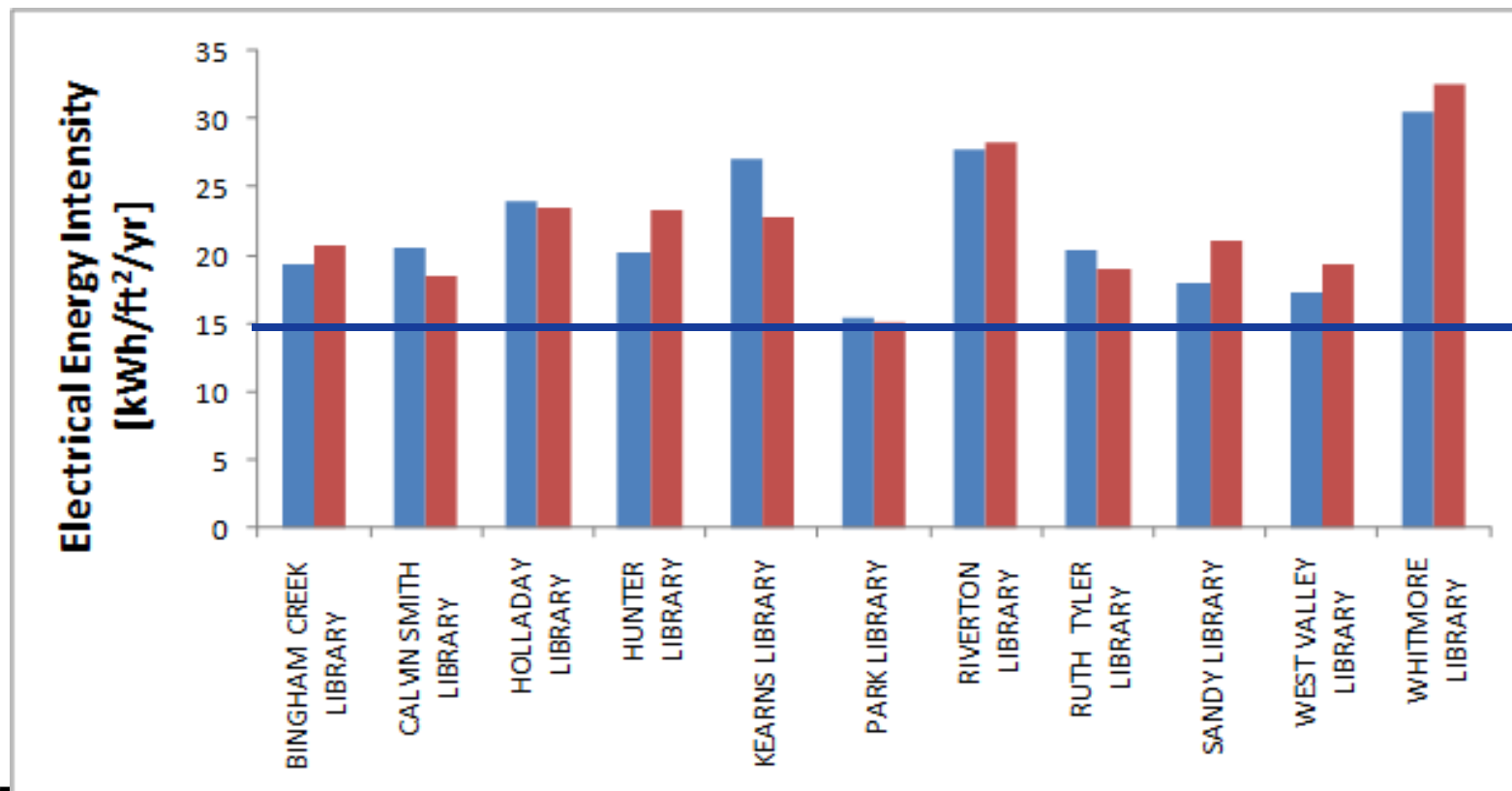
Preliminary Energy-Use Analysis

Total Energy Consumed per year (kBtu/yr)
Building Area (ft²)



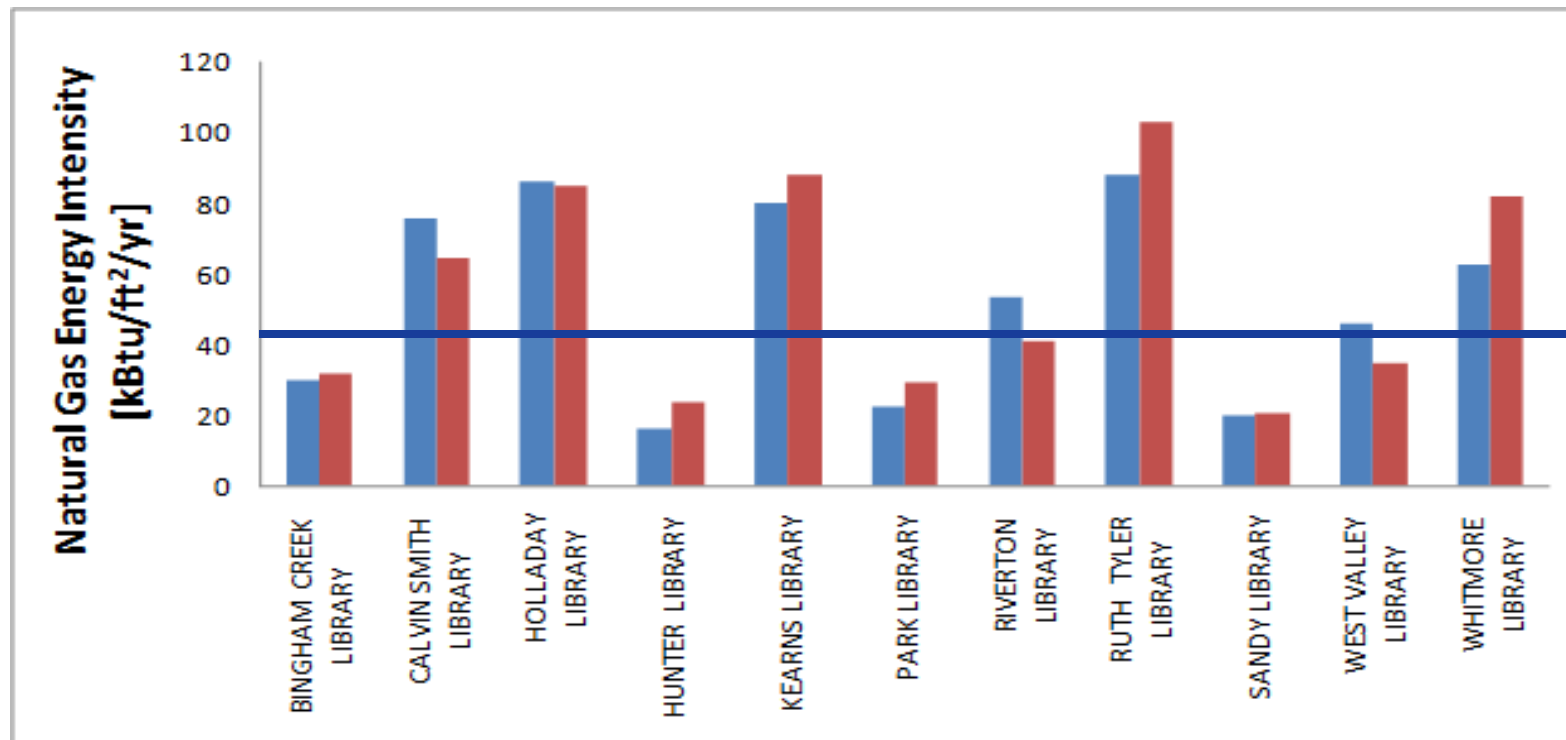
Preliminary Energy-Use Analysis

Electric Energy Consumed per year (kWh/yr)
Building Area (ft²)



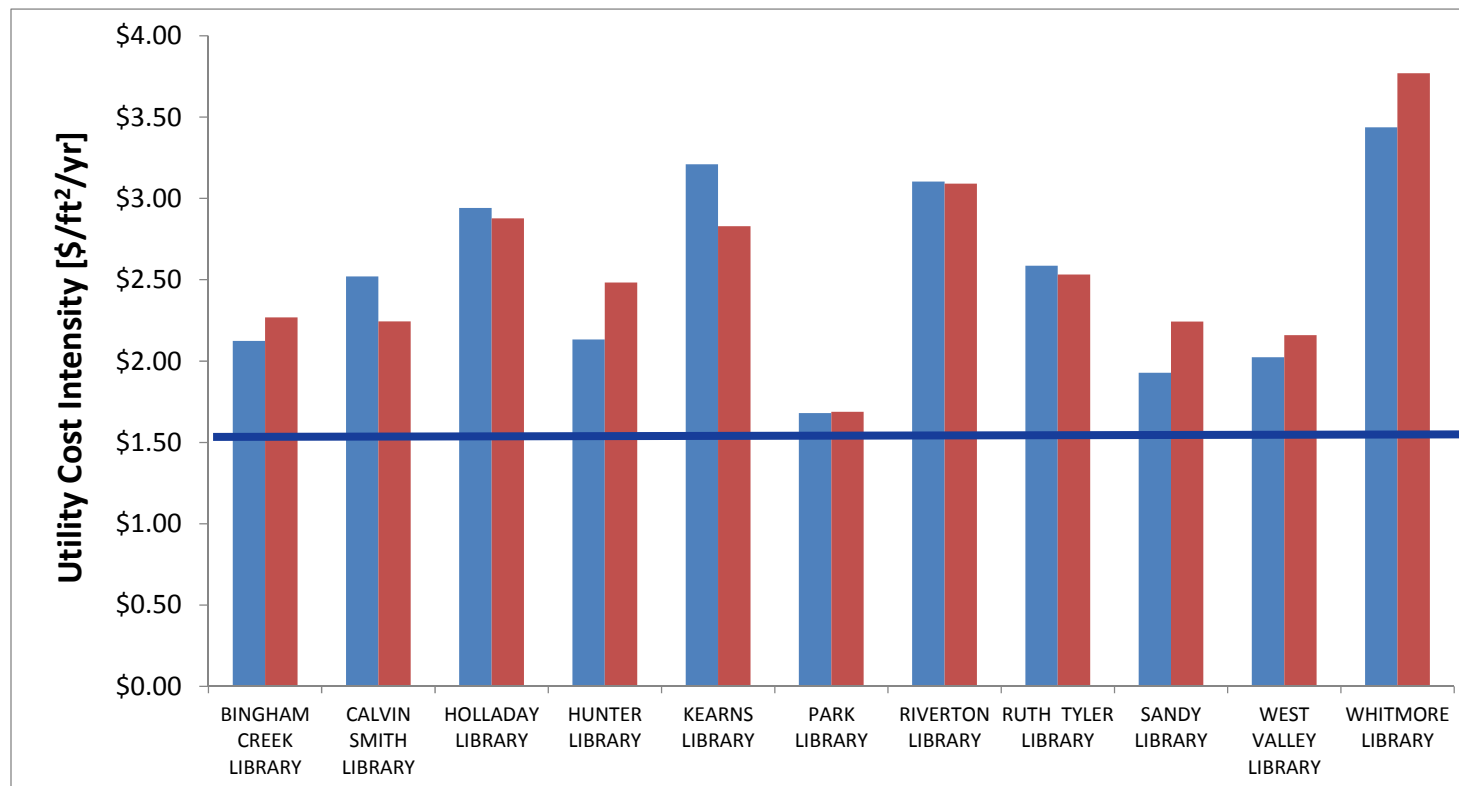
Preliminary Energy-Use Analysis

Natural Gas Consumed per year (kBtu/yr)
Building Area (ft²)

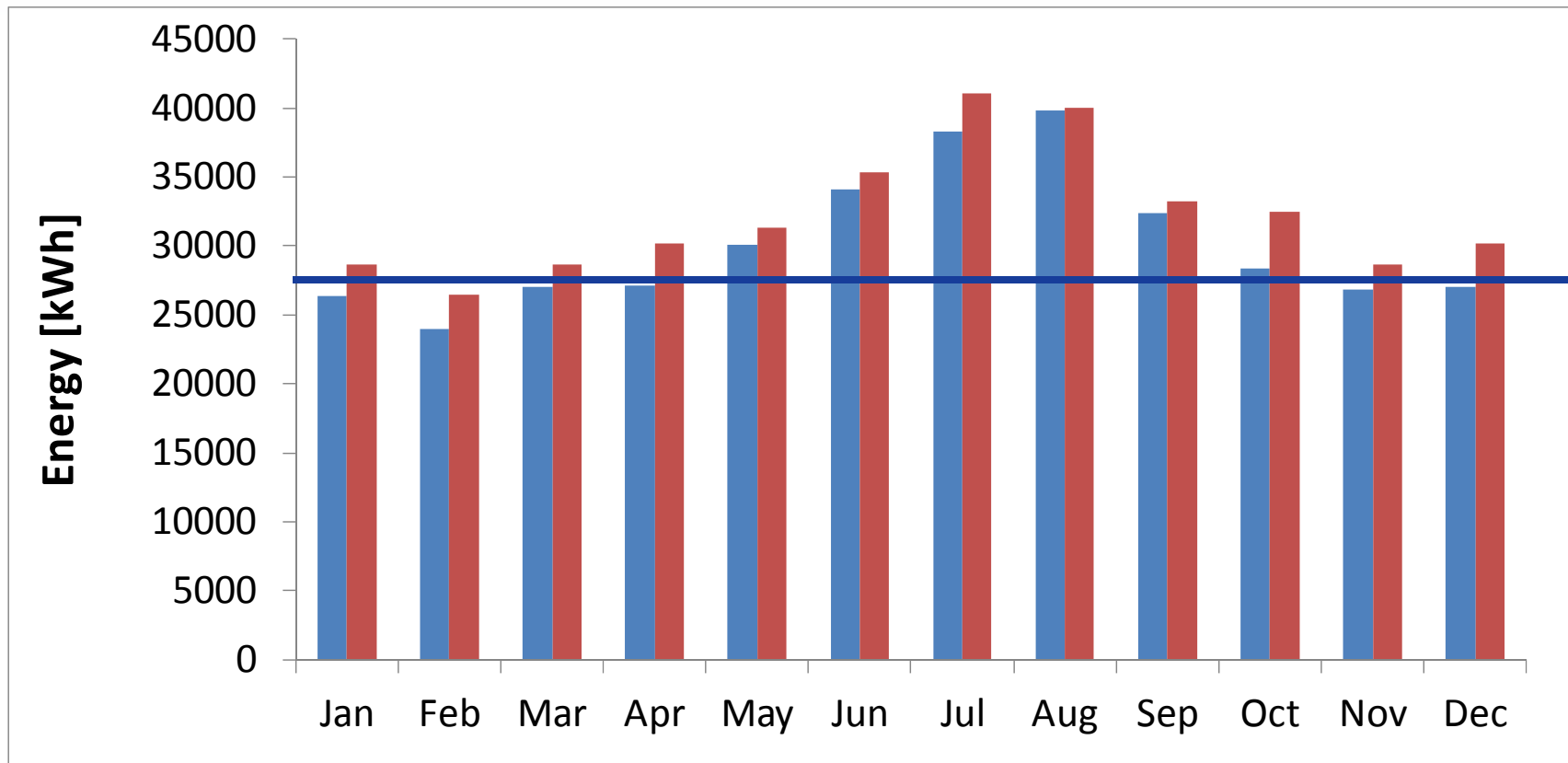


Preliminary Energy-Use Analysis

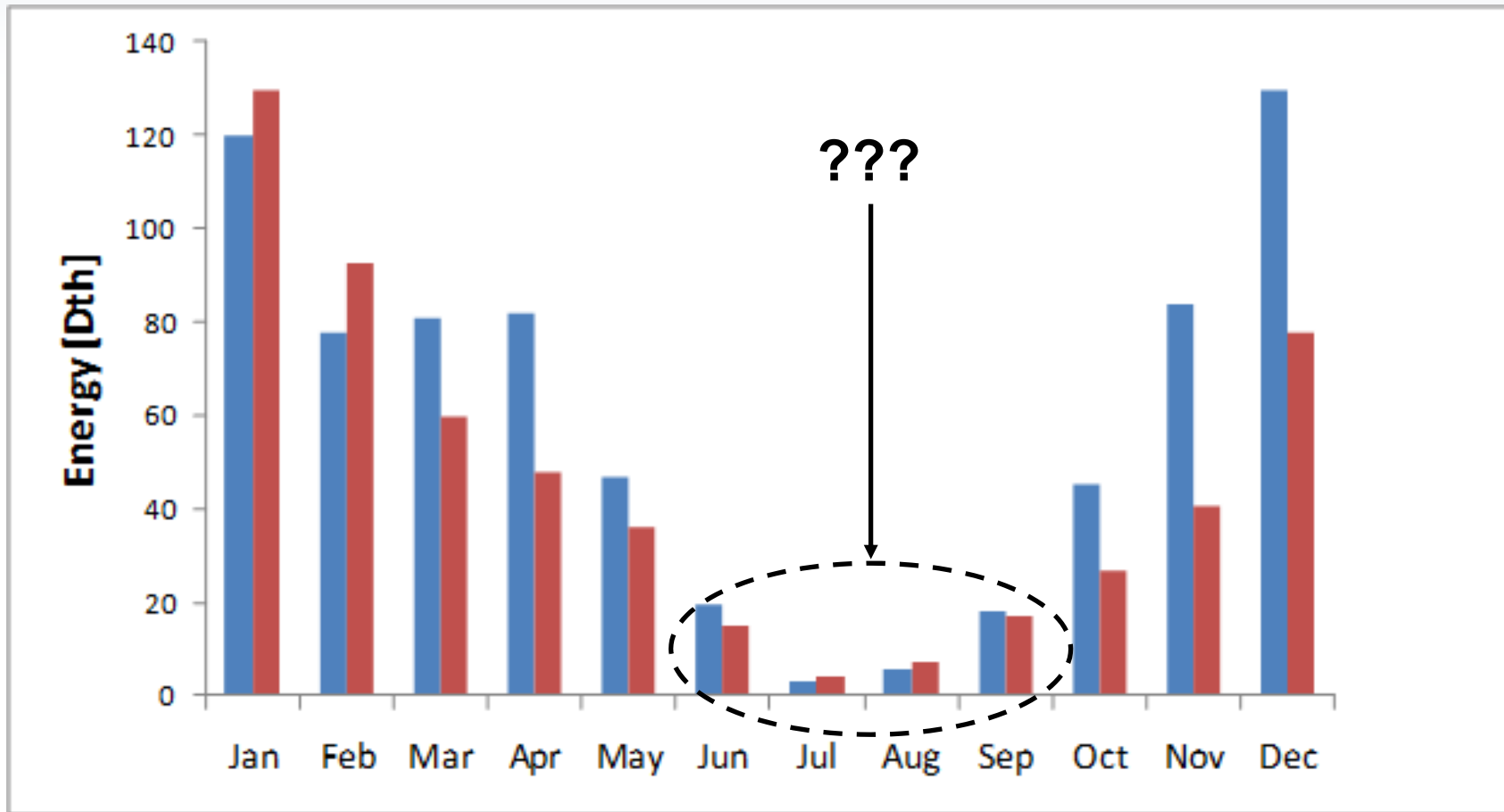
Utility Cost per year (\$/yr)
Building Area (ft²)



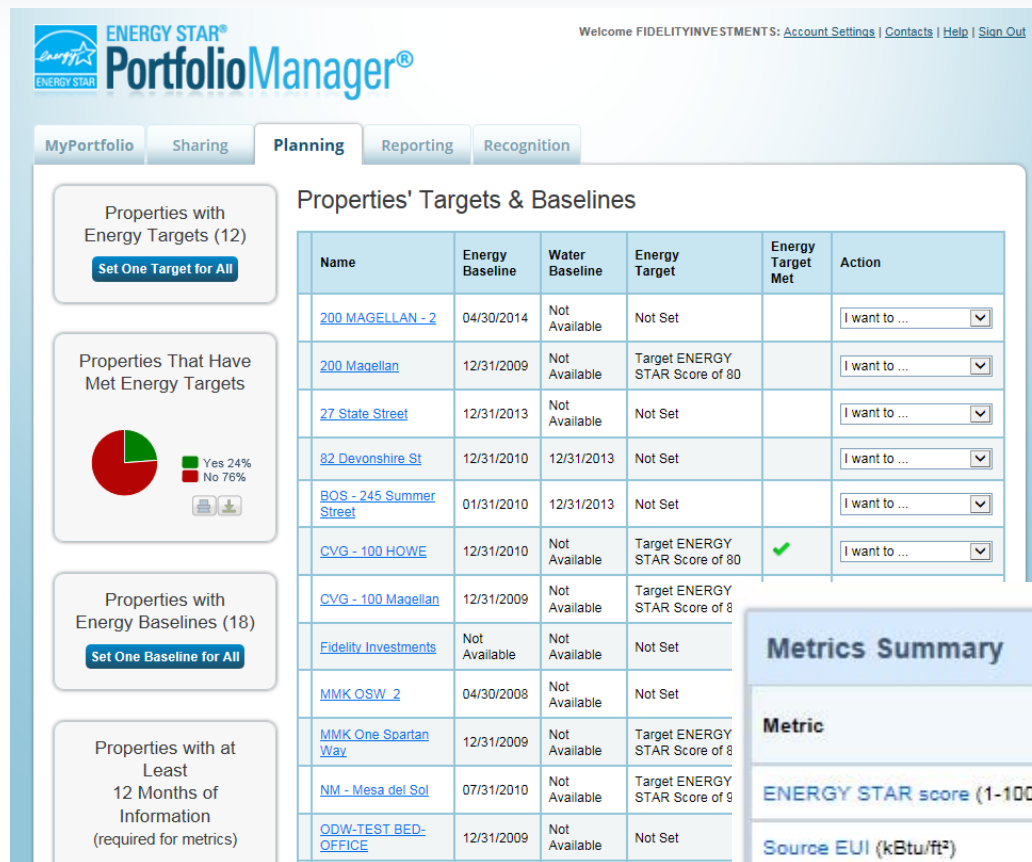
Preliminary Energy-Use Analysis



Preliminary Energy-Use Analysis

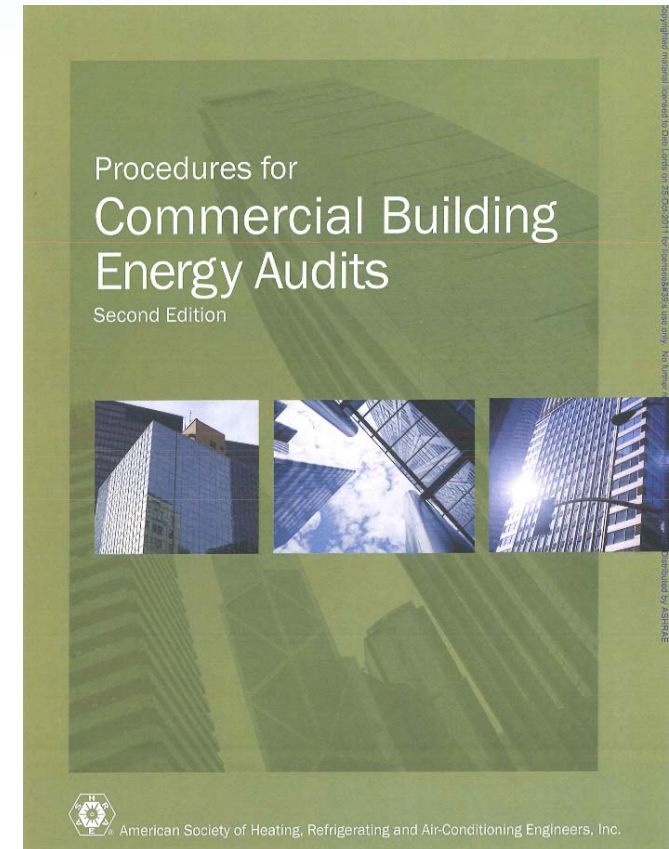
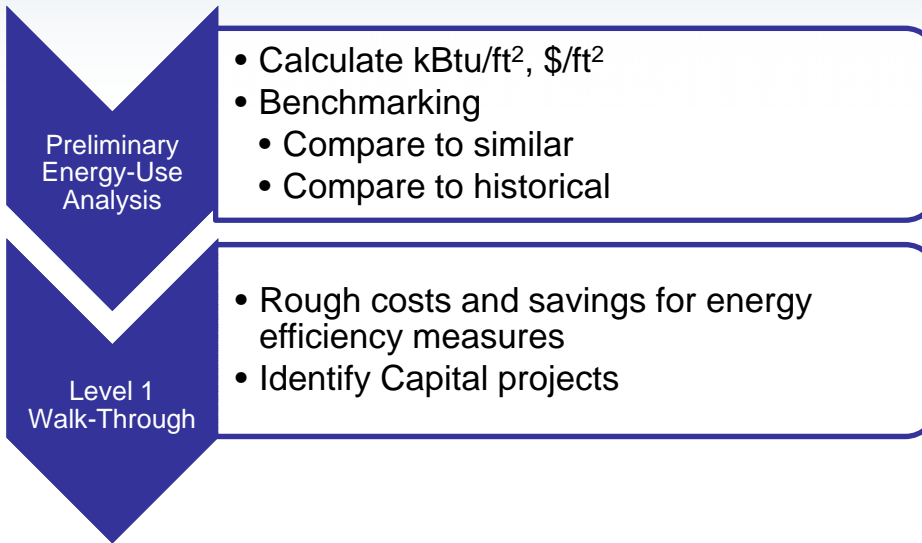


Preliminary Energy-Use Analysis

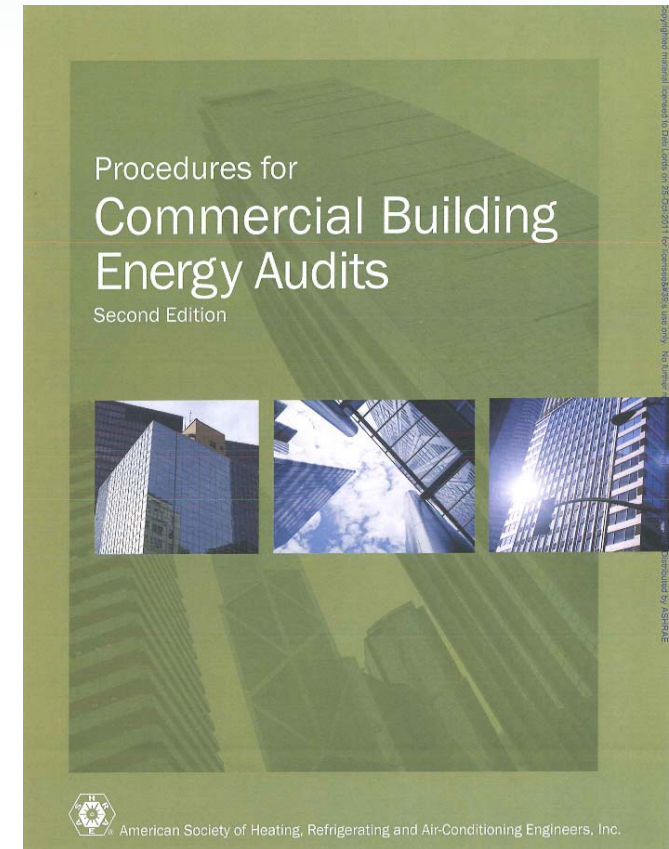
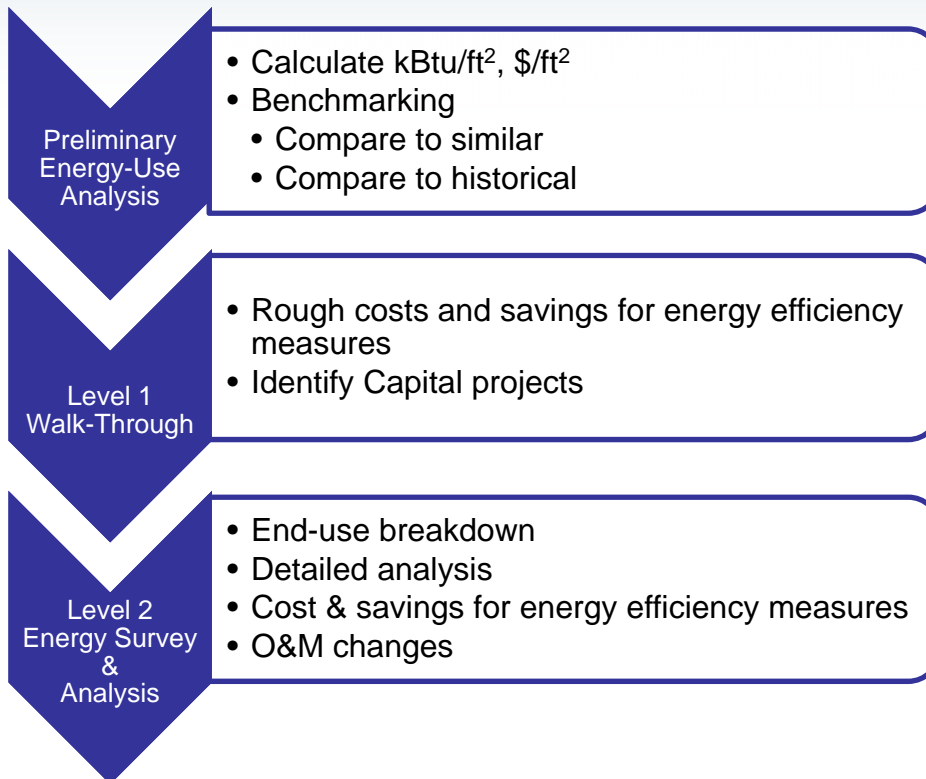


Metrics Summary Change Time Period			
Metric	Baseline (Jun 2008)	Current (Dec 2014)	Change
ENERGY STAR score (1-100)	Not Available	96	N/A
Source EUI (kBtu/ft²)	Not Available	181.9	N/A
Site EUI (kBtu/ft²)	Not Available	67.3	N/A
Energy Cost (\$)	366,980.01	Not Available	N/A
Total GHG Emissions (Metric Tons CO2e)	2,175.5	1,489.0	-686.5 (-31.6%)

Energy Auditing



Energy Auditing



End Use Breakdown

How Buildings Use Energy

Climate Zone 5

Internal Equipment
(computers, lamps, printers, coffee
pot, anything you plug into the wall)

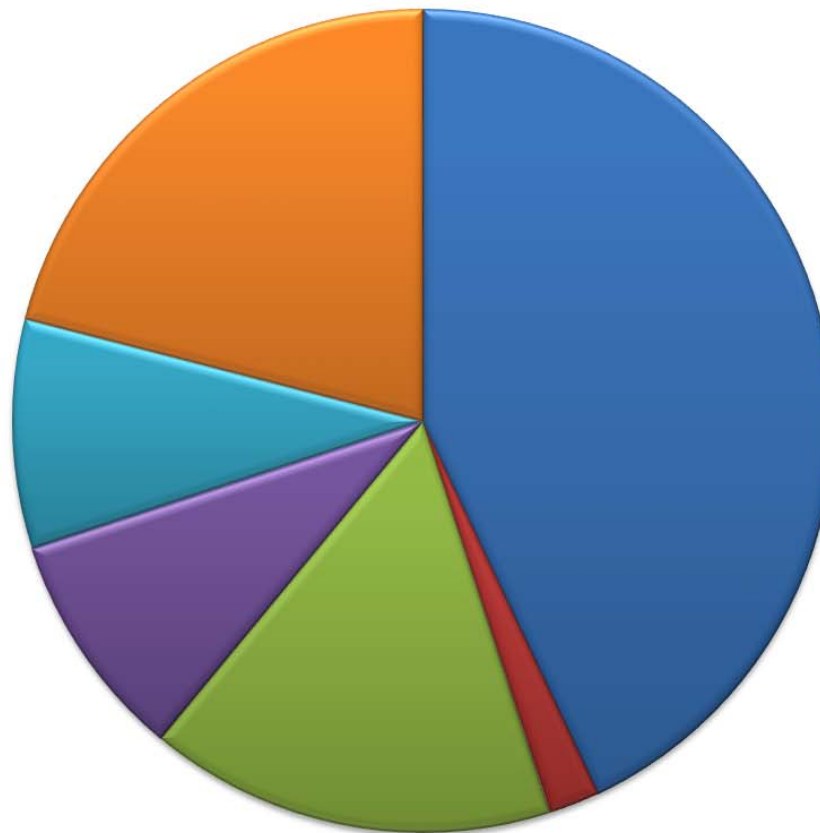
Space Cooling

Space Heating

Lights

Domestic Hot Water

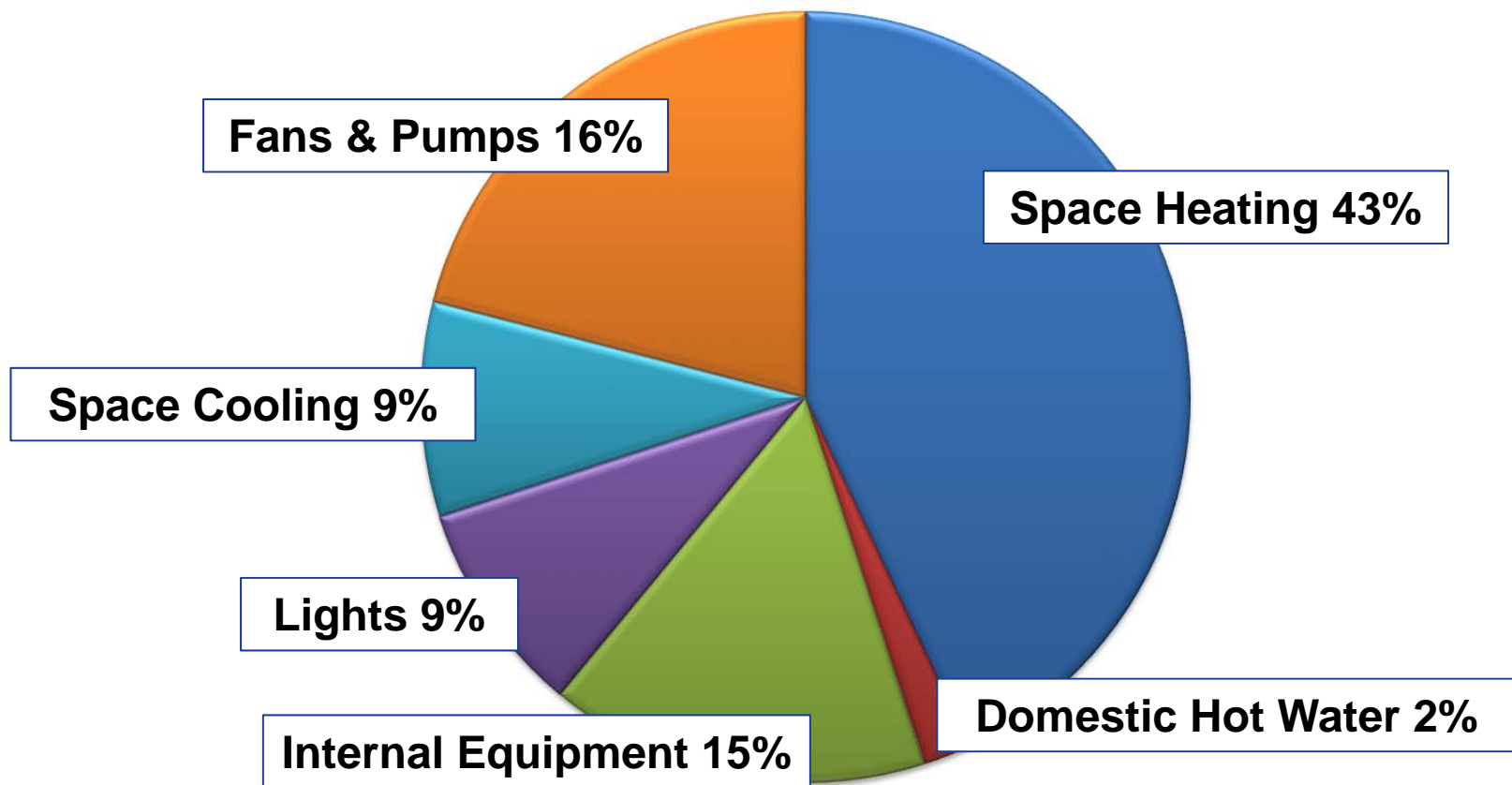
Fans & Pumps



End Use Breakdown

How Buildings Use Energy

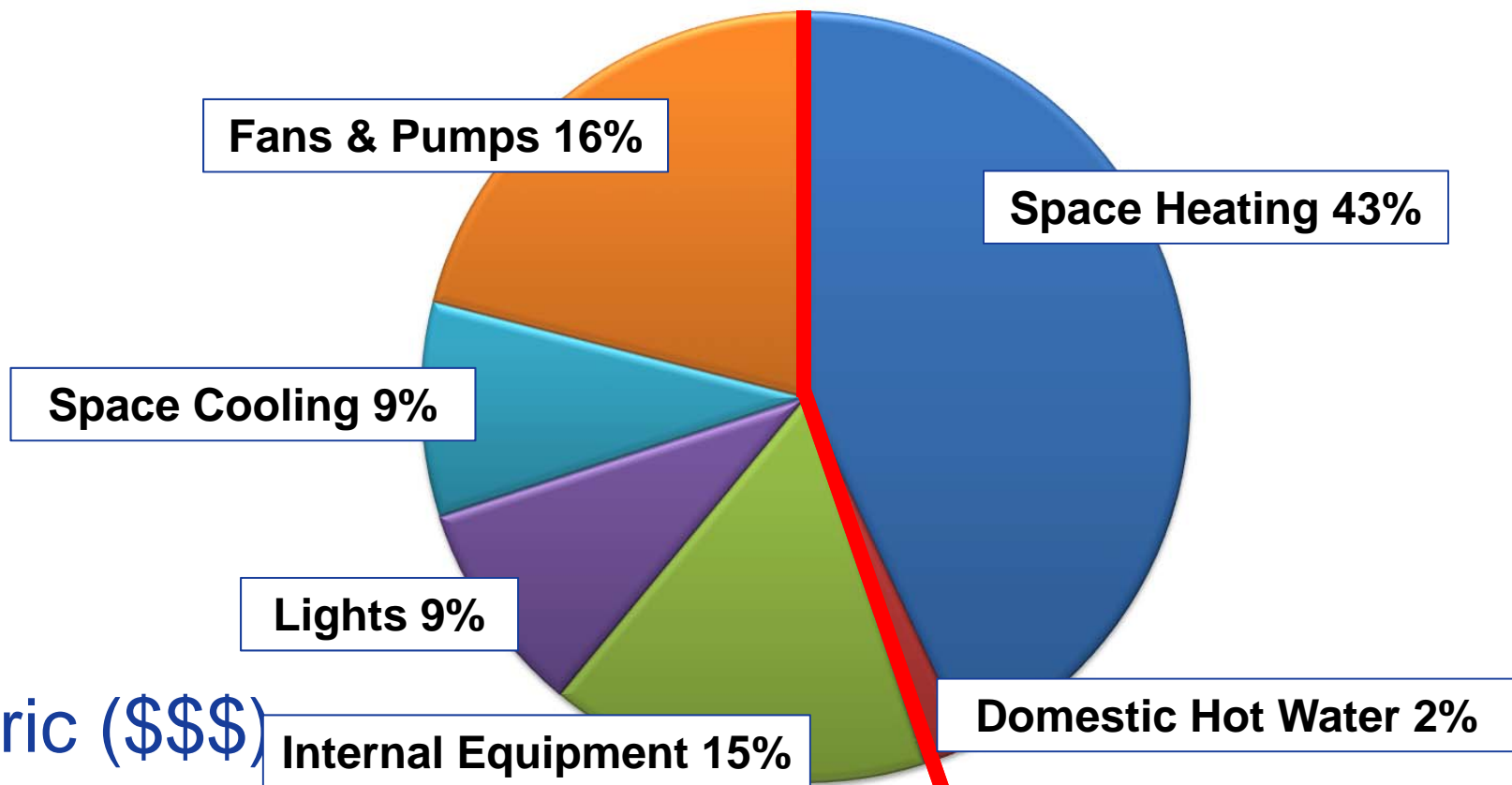
Climate Zone 5



End Use Breakdown

How Buildings Use Energy

Climate Zone 5

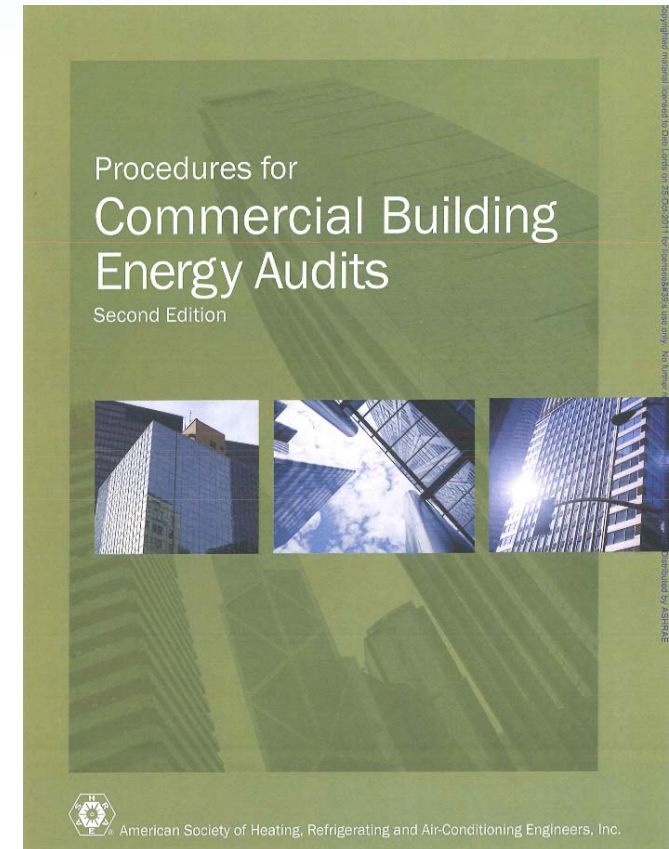
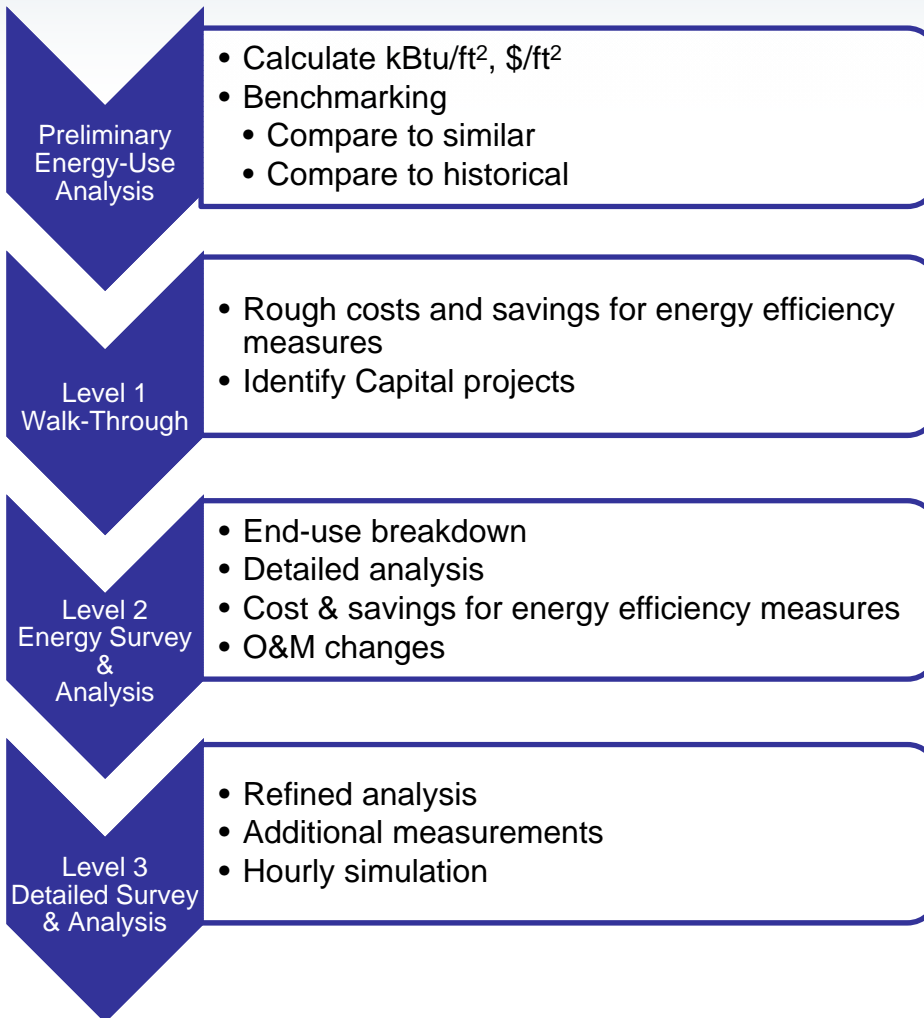


Electric (\$\$\$)



Natural Gas (\$)

Energy Auditing



From ASHRAE:

Table 1 — ENERGY AUDIT REQUIRED TASKS

Process	Level		
	1	2	3
Conduct PEA	•	•	•
Conduct walk-through survey	•	•	•
Identify low-cost/no-cost recommendations	•	•	•
Identify capital improvements	•	•	•
Review mechanical and electrical (M&E) design and condition and O&M practices		•	•
Measure key parameters		•	•
Analyze capital measures (savings and costs, including interactions)		•	•
Meet with owner/operators to review recommendations		•	•
Conduct additional testing/monitoring			•
Perform detailed system modeling			•
Provide schematic layouts for recommendations			•
Report	Level		
	1	2	3
Estimate savings from utility rate change	•	•	•
Compare EUI to EUIs of similar sites	•	•	•
Summarize utility data	•	•	•
Estimate savings if EUI were to meet target	•	•	•
Estimate low-cost/no-cost savings		•	•
Calculate detailed end-use breakdown		•	•
Estimate capital project costs and savings		•	•
Complete building description and equipment inventory		•	•
Document general description of considered measures		•	•
Recommend measurement and verification (M&V) method		•	•
Perform financial analysis of recommended EEMs		•	•
Write detailed description of recommended measures			•
Compile detailed EEM cost estimates			•



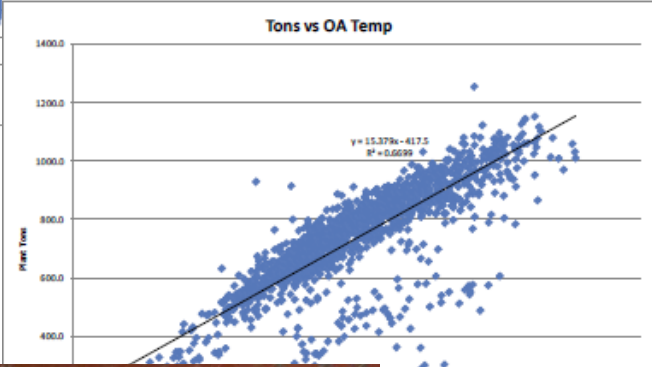
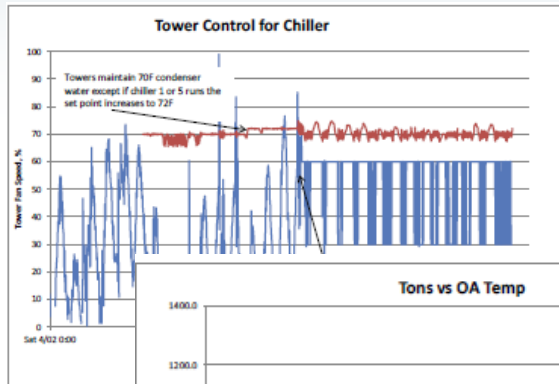
BSR/ASHRAE/ACCA Standard 211P

Public Review Draft

Standard for Commercial Building Energy Audits

First Public Review (August 2016)
(Draft Shows Complete Proposed New Standard)

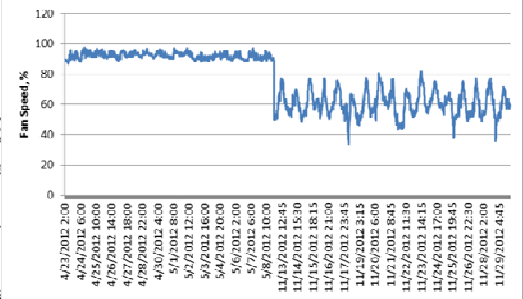
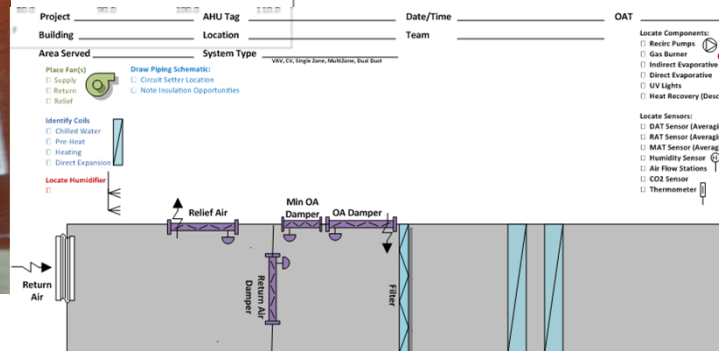
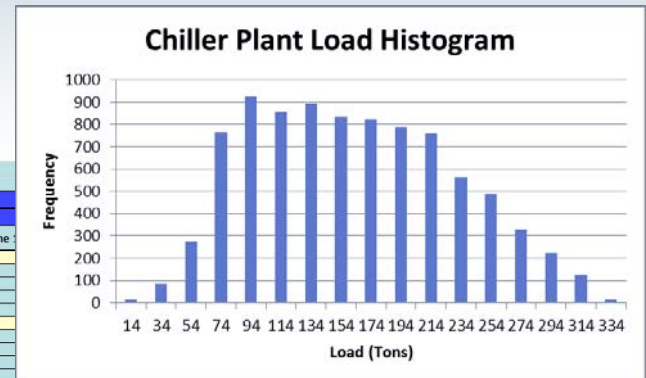
Lots of information



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ETCGroup

System	Unit	Example	Name
Service / Application		Building A	
Manufacturer		Carrier	
Serial Number			
Model		23XRV	
VFD	Yes/No	Yes	
Type		Screw	
Refrigerant Type		R-134a	
Cooler Fluid Type		Fresh Water	
% by weight (Cooler)		0%	
Condenser Fluid Type		Fresh Water	
% by weight (Condenser)		0%	
Economizer	Yes/No	No	
Heat Rejection Type		Air-Cooled	
Annual Operating Hours	hours	4300	
Primary Control Variable / Criteria		Pressure	
Age	Years		
Current Chiller Conditions			
Chiller Rated Capacity	tons	240	
Input kW	kW	102	
Evaporator Conditions			
Entering Temperature	deg. F	53	
Leaving Temperature	deg. F	44	
Flow Rate - Full Flow	GPM	639	
Pressure Drop @ Full Flow	FT WC	20	
Fouling Factor, qualitative		Good	
Condenser Conditions			
Entering Temperature	deg. F	80	
Leaving Temperature	deg. F	73	
Flow Rate - Full Flow	GPM	88	



Results

- What numbers matter to you?
- What do you need to take this to the next step?

Results

Measure Number	Measure Description	Annual Energy and Cost Savings				Payback with Incentive						
		Peak Demand Savings (kW)	Electricity Savings (kWh)	Gas/Fuel Savings (therms)	Total Cost Savings	Measure Cost	Potential Utility Incentive	Measure Life (years)	Net Measure Cost	IRR (over Life of Measure)	NPV*	Simple Payback (yr)
EEM-1	Replace Incandescent Lamps with CFLs	7.6	15,245	-	\$ 1,906	\$ 1,875	\$ 545	3	\$ 1,330	132%	\$ 3,958	0.7
EEM-2	Reduce Pressure Setting on Pneumatic Compressor	-	2,312	-	\$ 206	\$ -	\$ -	3	\$ -	N/A	\$ 571	-
EEM-3	Install VFD on Tenant Condenser Loop Pump to Reduce Flow	19.0	163,872	-	\$ 25,188	\$ 17,386	\$ 13,110	10	\$ 4,276	589%	\$ 200,021	0.2
EEM-4	Install VFD and Implement Demand-Controlled Ventilation for AHU-1	-	12,448	423	\$ 2,290	\$ 11,136	\$ 1,418	10	\$ 9,718	20%	\$ 8,855	4.2
EEM-5	Install CO Sensors and VFD to Control Garage Exhaust Fan	18.8	48,948	-	\$ 8,811	\$ 25,616	\$ 3,916	10	\$ 21,700	39%	\$ 49,762	2.5
EEM-6	Add Hot-Water Resets Control and Install Condensing Boiler	-	44,838	17,203	\$ 25,274	\$ 102,511	\$ 20,790	20	\$ 81,721	31%	\$ 261,758	3.2
EEM-7	Replace Garage HPS Fixtures with LED Fixtures with Integrated Motion Sensor	6.8	29,854	-	\$ 4,114	\$ 29,598	\$ 2,174	15	\$ 27,423	12%	\$ 18,316	6.7
EEM-8	Repair Economizers on All Air Handlers	5.0	22,342	-	\$ 2,904	\$ 12,864	\$ 2,511	5	\$ 10,354	12%	\$ 2,577	3.6

Measure #	Measure Description	Electric Savings			Project Cost	Electric Payback	Incentives	Natural Gas Savings			Cost After Incentives	Total Savings	Payback after Incentive	Financials	
		kWh/yr	kW/mo*	\$/yr	\$	Years	\$	dth/yr	Other	\$/yr	\$	\$/yr	Years	NPV	IRR
1	Controls Upgrades	823,200	162	\$69,884	\$269,475	3.9	\$41,560	0	0.0	\$0	\$227,915	\$69,884	3.3	\$ 339,455	32%
2	Variable Primary Flow Pumping	216,800	39	\$19,066	\$78,125	4.1	\$14,060	0	0.0	\$0	\$64,065	\$19,066	3.4	\$ 195,494	33%
3	VFD Chiller Retrofit (1st Chiller)	780,800	125	\$64,488	\$395,000	6.1	\$50,640	0	0.0	\$0	\$344,360	\$64,488	5.3	\$ 533,562	22%
4	VFD Chiller Retrofit (2nd Chiller)	775,700	153	\$65,812	\$380,000	5.8	\$50,310	0	0.0	\$0	\$329,690	\$65,812	5.0	\$ 566,256	23%
Project Totals		2,596,500	479	\$219,250	\$1,122,600	5.1	\$156,570	0	0	\$0	\$966,030	\$219,250	4.4	\$ 2,018,779	26%

Real Numbers: Hospital



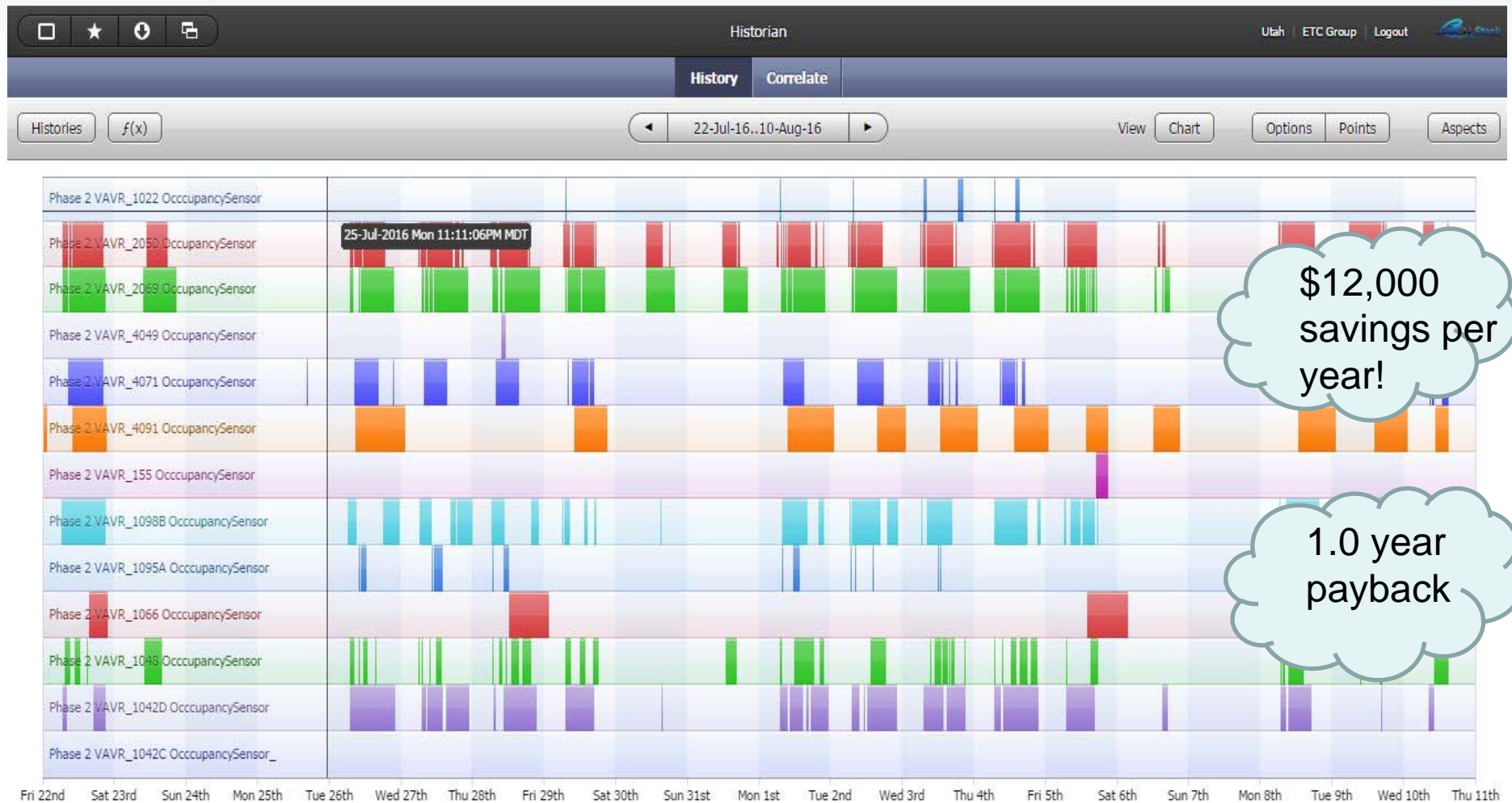
\$210,000
savings per
year!

1.2 year
payback

Higher Ed



Some Interesting Details: Higher Ed



Luxury Condominium



Government

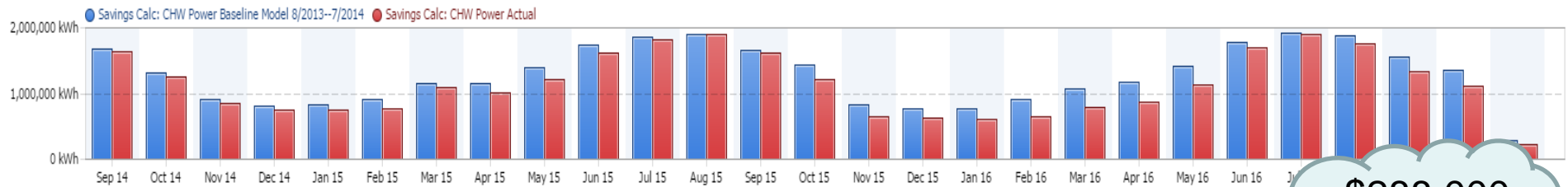


Medical Manufacturing

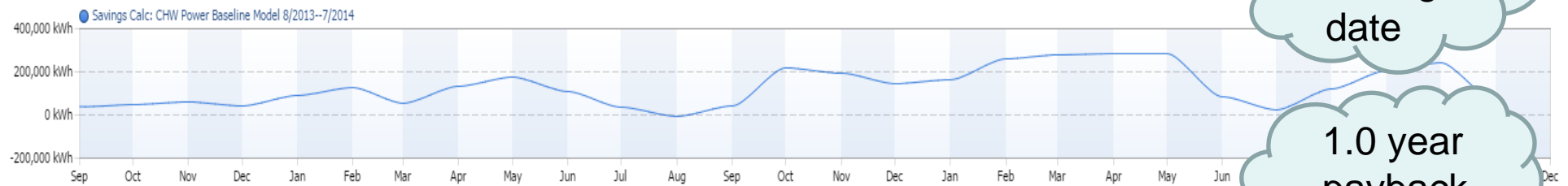


Casino

Baseline vs Actual Energy Use



Energy Savings



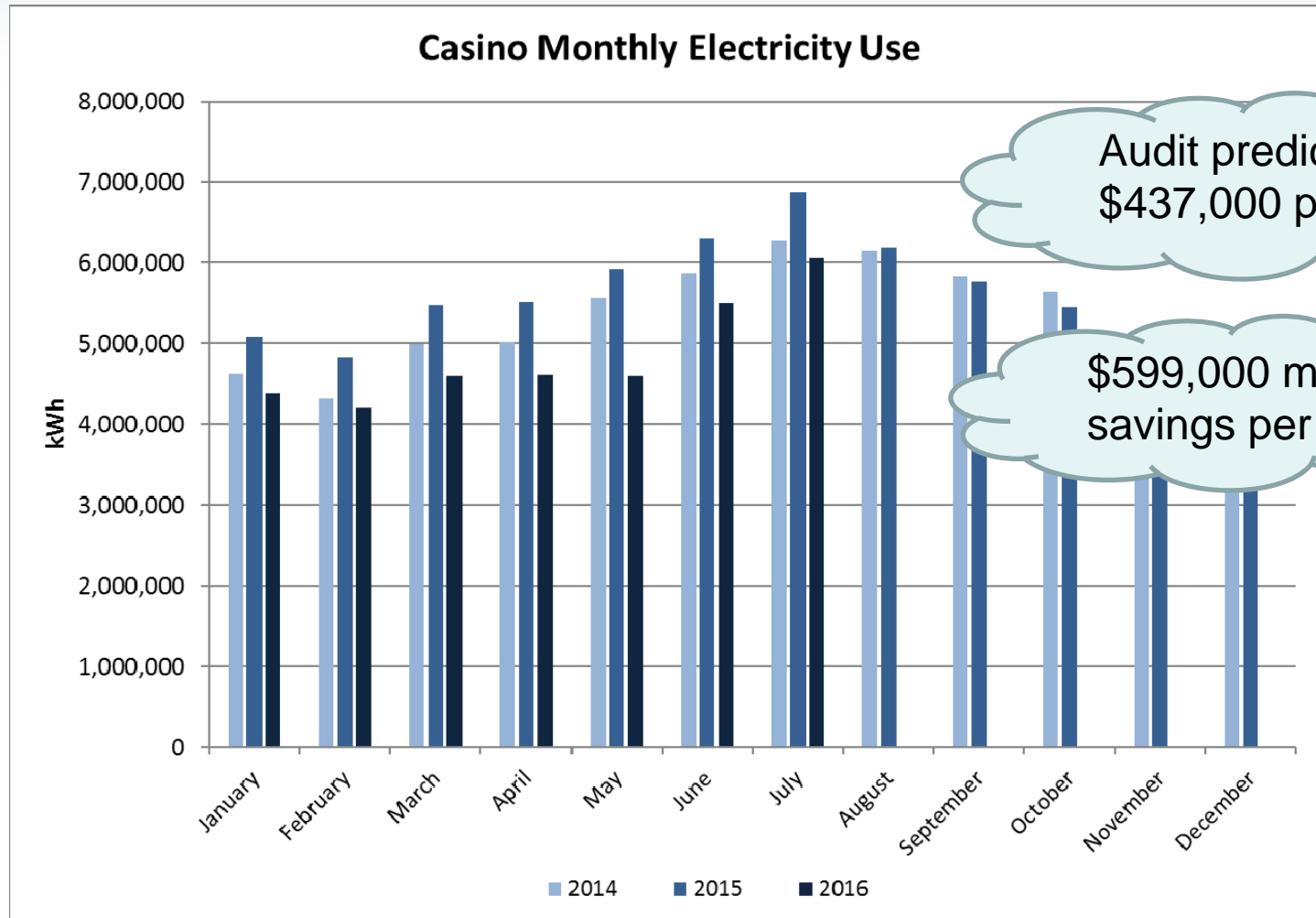
\$288,000
savings to
date

1.0 year
payback

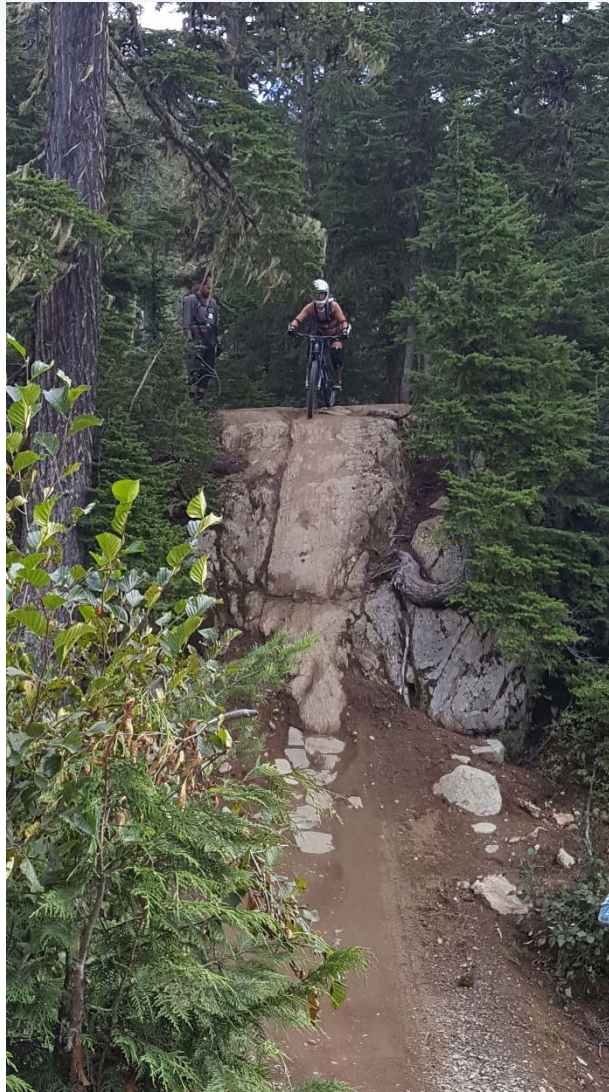
Cumulative Energy Savings Since June 2014



Casino #2



Let's Get Started!!!



Barriers

- Competition for Money
- Attention
- Risk
- Trust
- Financials
- Split Budgets

How can they be overcome?

- Dedicated Energy Efficiency Budget
- Internal Champions
- Culture
 - Build EE into existing capital or maintenance projects through added budget or adding performance goals
- Risk
 - Start small and prove it
 - Education

What are the opportunities?

- Building Envelope
- Lighting
 - Upgrades and Control
- HVAC
 - Equipment Repair and Upgrade
 - Part Load Operation (CV to VAV, VFDs, etc)
 - Systems Approach
- Controls – Upgrades and Optimization

Resources

- ASHRAE EEMs to Consider
 - www.ashrae.org/PCBEA
- International Energy Agency
 - Holistic Assessment Toolkit
 - <http://www.ecbcs.org/annexes/annex46.htm>
- Washington State University Energy Auditor Checklist
- DOE Better Buildings



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Financing or pa <input type="text"/>	--Choose-- <input type="text"/>	Commercial (8) <input type="text"/>	--Choose-- <input type="text"/>

[Clear All Filters](#)

Implementation Model (24)

[Building Upgrade Value Calculator](#) Implementation Model

Partner: USAA Real Estate Company

USAA developed a calculator to convert the results of energy efficiency upgrades into metrics that are meaningful for financial decision makers.

[Capital Set Aside and Relaxed Payback Requirements](#) Implementation Model

Partner: Nissan North America, Inc.

Nissan worked with industry peers to benchmark funding practices for energy efficiency projects to determine whether its investment criteria for these projects was restrictive relative to industry norms. Following the benchmarking analysis, Nissan...

[Capital Set Aside Fund](#) Implementation Model

Partner: 3M

3M's goal was to ensure funding for worthwhile energy efficiency projects that were being overlooked through the normal budgeting process. 3M created a special pool of capital to fund cost-saving energy efficiency projects that provided positive...

[Centralized Energy Management And Capital Set-Aside Fund](#) Implementation Model

Partner: University of Pittsburgh Medical Center

Current search

24 results

[Financing or paying for a project](#)



NV Energy can help:

- The PowerShift Incentivized energy audit program
 - Discover and document opportunities - give you the numbers you need.
 - NV Energy may pay for 50% of the cost up to \$15,000.
 - Measures eligible for higher cost cap

Casino





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