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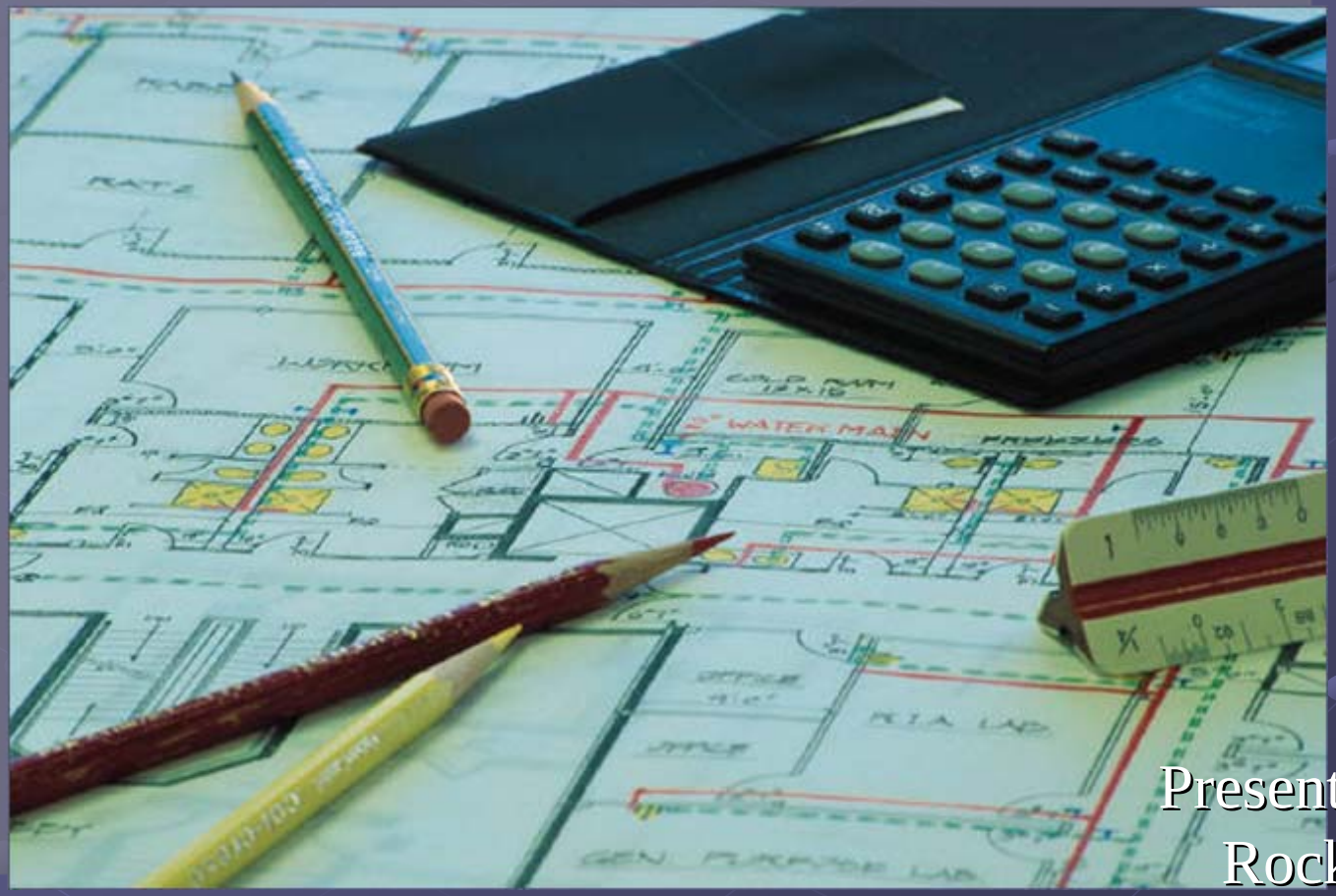
How To Conduct an Energy Audit



Presented by:
Rocky Harmstead

Agenda

- Preliminary Audit
- Auditor’s Tools

What is an audit?

- An evaluation of energy consumption to conserve energy “$”

Why Do an Audit?

- Save Money
- Improve Efficiency
- Conservation
- Improve Building Performance
- Address Comfort Problems
- Pursue Utility Incentives

Who’s Doing the Audit?

- What are their goals?
- Motive varies depending upon auditor

	Local Utility	Vendor	Maintenance contractor	Energy Efficiency Service Provider	Hired auditor
Goal	Quantify savings Promote rebates	Sell equipment, use rebate programs	Sell services, reduce bills, solve operating problems	Lower overall energy bill, use rebates	Investigate specific problems
Strengths- from customer viewpoint	Free service, realistic savings	Free service, realistic savings , applies for rebates	Familiarity with building systems and equipment	Packaged energy services	Specific problems uncovered and analyzed, (systems approach)
Weakness	Preliminary audit only	Building Specific operation	Focused, on their systems	Building Specific operation	Expensive-

The Preliminary Audit What's Done?

- Interview the facility manager and facility engineer
- Walk through the facility

Questions for Facility Manager $$

- Ownership?
- Future plans?
- Audit goals?
- Available budget?
- **Drivers** –process? energy cost?

Facility Engineer-Documented Information

- Types of process systems?
- Facility age?
- Operating schedules?
- Types of lighting and HVAC systems?
- Any equipment operation that could be improved with energy conservation measures?

The Facility Walk-Through What to Look for and document

- Process
- Controls
- Mechanical
- Lighting
- Plug Loads
- Building Shell

Process Changes-examples

- Ultrafine bubble diffusers
- Dissolved oxygen automatic control
- Selector to reduce solids from the primary treatment
- Disinfection system changes

Controls

- Dissolved Oxygen control
- Improved blower sequencing
- Blower controls- suction throttling, VFDs
- Pump VFDs

Mechanical

- Pumps
- Mixers
- HVAC upgrades/ economizers
- Heating Systems
- Premium Efficiency Motors

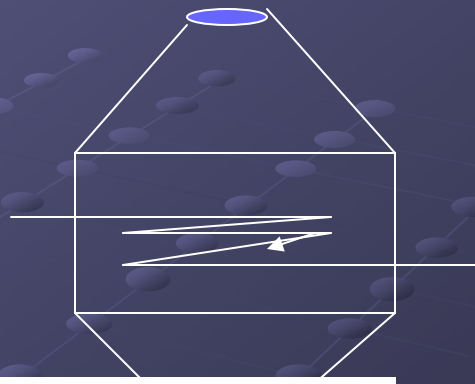
Heating Systems- Air-conditioning

Is natural gas available to replace inefficient electric resistance heating?

Occupancy sensor T-stat?

Heating Systems- Boilers

- Boiler Tune-ups
- Economizers
- Blowdown Conductivity control maintenance



Heating Systems-

- Thermal Insulation
- Steam Traps

Maintenance

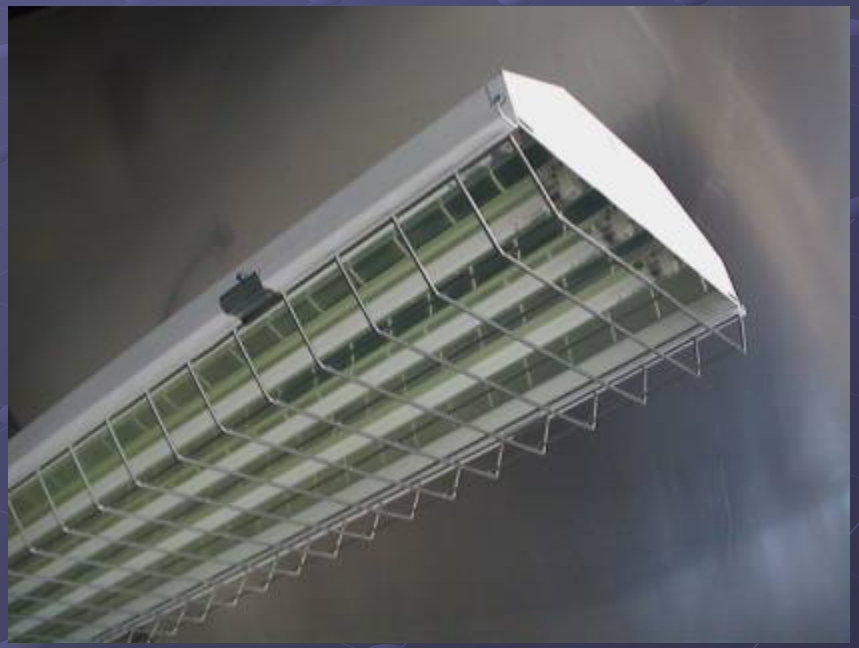
- Motors:
  replace with high efficiency motors on burnout
- Improved Maintenance:
  clean filters, belts, clean heat exchangers

Lighting Opportunities

- Fluorescent relamp and delamp
- Metal halide to fluorescent
- Sky-lighting and day lighting with dimmable ballasts

Delamp and Add Reflectors

Metal Halide to Fluorescent



Sky Lighting and Dimmable Ballasts

Automated Controls

- For lighting:
  photo sensors w/dimmable ballasts, time-clocks, occupancy sensors

Automated Controls- Night Visit

- Identify equipment that is in operation
  - Night ventilation
- Identify areas that are in use
- Identify potential phantom loads
- Observe/interview custodial crew
- Observe/test controls
  - Sweeps
  - Occupancy sensors
  - Air side economizer

Plug Load conservation

- Plug Load Controllers
  - for refrigerated beverage dispensers
  - for computer monitors

Energy Manager Software

- Remote control of power features of networked PCs

Building Shell

- Window film or awnings: (Except North)
- Leaks: doors and windows
- Insulation: roof and walls
  - Cool Roofs
- Passive: trees

Lighting Audit Form

Project Name National University
Project Site Name Spectrum - 9393 Lightwave
Project Sponsor
Date 03/08/2006

For Administrator Use Only

Project # _____

Administrator Receipt Date: _____

LIGHTING EQUIPMENT SURVEY (LE1)

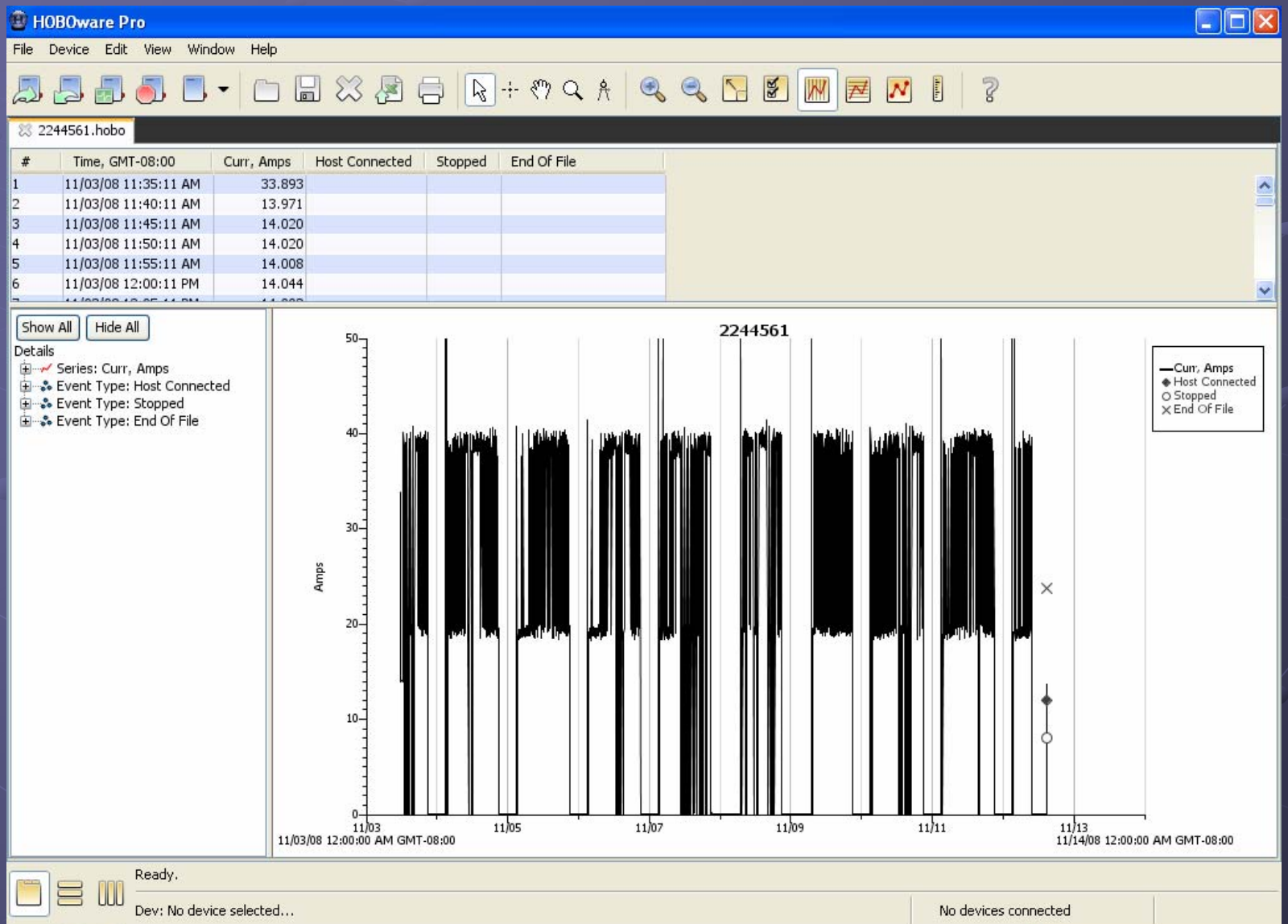
GENERAL INFORMATION					PRE INSTALLATION						POST INSTALLATION						SAVINGS		
Line Item	Building	Flr	Area Description/ Location	Use Type	Pre Fixt Number	Pre Fixt. Code	Pre kW/Fixt.	Pre kW/Space	Pre Operating hours	Exist Cont	Post Fixt Number	Post Fixt Code	Post kW/Fixt	Post kW/Space	Post Operating hours	Prop Cont	kW Saved	Efficiency kWh Saved	Controls kWh Saved
1	National	1	halls- no sensor	hall	100	FU2EE	0.072	7.200	3900	none	100	F22ILL	0.033	3.300	3900	none	3.900	15210	0
2	National	1	halls- w/ sensor	hall	100	FU2EE	0.072	7.200	3900	sensor	100	F22ILL	0.033	3.300	3900	sensor	3.900	15210	0
3	National	1	classroms	class	100	F44EE	0.144	14.400	3900	sensor	100	F43ILL	0.089	8.900	3900	sensor	5.500	21450	0
4	National	1	parking lot	outdoor	30	MH150/1	0.190	5.700	3900	photo	30	HPS100/1	0.138	4.140	3900	photo	1.560	6084	0
5	National	1	building floods	outdoor	20	I150/1	0.150	3.000	4150	photo	20	MH70/1	0.095	1.900	4150	photo	1.100	4565	0
6	National	1	break room	break	10	FU2EE	0.072	0.720	3900	switch	10	F22ILL	0.033	0.330	3900	switch	0.390	1521	0
7	National	1	lobby chandelie	lobby	8	CF21/2D	0.026	0.208	3900	timer	8	CF21/2D	0.026	0.208	3900	timer	0.000	0	0
					368.0			38.4			368.0			22.1			16.4	64,040.0	0.0

Equipment Audit Form

HVAC SURVEY RECOMMENDATIONS												
Name:	**Spectrum Academy Center- National**			ABBREVIATION=DESCRIPTION						Survey by:		
Address:	**9388 Lightwave Ave**			HP = Heat Pump		SPCU = Split Cooling Unit				Date:		
City, State, ZIP	**San Diego, CA. 92123**			RTPKG = Rooftop gas package		WP- Wall Package Unit on trailer				Site Contact Name:		
				SPHP = Split Heat Pump		t-stat= manual thermostat				Site Contact Phone:		
SF of Bldg.	**63,000**			AHU = Air Handling Unit		bpt = by-pass timer						
						prog t-stat= programmable thermostat						
Tag	**Manuf.**	**Model #**	**Serial #**	**Type of unit**	**Estimated Capacity**	**Age (Years)**	**Area Served**	**Type of Control**	**Econ**	**Annual Hrs.of Operation**	**Cond. Coil Condition**	**Comments**
1	**Trane**	**SXHG-C75**	**N/A**	**RTPKG VAV AHU**	**75 tons**	**5.5**	**classrooms/hall**	**EMS**	**Yes**	**4056**	**good**	**Bldg EMS Control 8.8 EER**
				SA Fan	**40 hp**			**ASD**				
				RA Fan	**15 hp**			**ASD**				
2	**Trane**	**SXHG-C75**	**N/A**	**Pkg VAV**	**75 tons**	**5.5**	**classrooms/hall**	**EMS**	**Yes**	**4056**	**good**	**Bldg EMS Control 8.8 EER**
				SA Fan	**40 hp**			**ASD**				
				RA Fan	**15 hp**			**ASD**				
3	**Trane**	**SXHG-C60**	**N/A**	**Pkg VAV**	**60 tons**	**5.5**	**classrooms/hall**	**EMS**	**Yes**	**4056**	**good**	**Bldg EMS Control 9.2 EER**
				SA Fan	**40 hp**			**ASD**				
				RA Fan	**15 hp**			**ASD**				
4	**Ray Pak**			**hot water boiler**	**1,200,000 Btuh**	**5.5**	**classrooms/hall**	**hi/lo fire**	**N/A**		**N/A**	**81 % efficiency**
5				**Exhaust Fan**	**1/2 hp**	**5.5**	**restrooms**	**EMS**		**4056**		**(total quantity- 6)**

Auditor’s Tools-

Hobo Logger


HOBOware Pro
File Device Edit View Window Help
2244561.hobo
Time, GMT-08:00 Curr, Amps Host Connected Stopped End Of File
1 11/03/08 11:35:11 AM 33.893
2 11/03/08 11:40:11 AM 13.971
3 11/03/08 11:45:11 AM 14.020
4 11/03/08 11:50:11 AM 14.020
5 11/03/08 11:55:11 AM 14.008
6 11/03/08 12:00:11 PM 14.044
Show All
Hide All
Details
Series: Curr, Amps
Event Type: Host Connected
Event Type: Stopped
Event Type: End Of File
2244561
Amps
50
40
30
20
10
0
11/03
11/05
11/07
11/09
11/11
11/13
11/03/08 12:00:00 AM GMT-08:00
11/14/08 12:00:00 AM GMT-08:00
Curr, Amps
Host Connected
Stopped
End Of File
Ready.
Dev: No device selected...
No devices connected