Delivering Cost Savings and Sustainable Solutions through Energy Management

Eaton energy solution Energy Audits

Whether driven by the economy, business conditions, corporate policies, regulatory requirements (such as EPACT or EISA) or an executive order...

Energy audits play a critical role in:

- 1. Reducing operating cost
- 2. Preparing for cap and trade
- 3. Reducing energy consumption

Additionally, energy audits are required on an ongoing basis to drive energy management and continuous improvement. Eaton's role as an energy solutions provider can help you succeed in sustainability initiatives through world-class energy engineering and technology, reducing energy consumption and costs.

Energy audits and the energy-management process



What is an energy audit?

An evaluation or study on how efficiently **natural resources** are being used in a business, facility or system.

This audit includes evaluating systems such as:

- Building envelope
- Lighting
- HVAC
- Water
- Steam
- Compressed air
- Process system(s)
- Operation, control and maintenance of all of the above

How are energy audits used?

- They identify Energy Conservation Opportunities (ECOs) that, when implemented, reduce energy consumption and cost
- Identify financially viable projects that 1) improve energy usage and/or efficiency, 2) improve application and utilization of alternative-energy sources or strategies and 3) reduce maintenance costs
- Provide knowledge that is used to allocate resources, make funding decisions, and drive energy-management strategies and planning
- Validate that energy management program initiatives and improvements are effective and sustainable



Steps in performing an energy audit

- 1. Historical energy usage data is collected and analyzed
- 2. The building and its operational characteristics are studied
- Potential modifications or operational changes are identified that will reduce the energy use or cost
- Engineering and economic analysis of potential modifications is performed
- Energy conservation opportunities are summarized along with their corresponding savings and cost, so that next steps, prioritization and allocation of resources can be accomplished
- A complete report is prepared that documents all the systems, analysis processes and results

Energy audit tips

- An energy audit will ideally address energy goals and objectives that have been set for a facility, plant, campus, organization or corporation
- Looking at an entire facility—across all energy systems, sources (electric, gas, propane, fuel oil, renewable sources, etc.) and operations—provides the greatest opportunity to maximize energy cost savings and create projects that are financially viable
- Energy audits have to be repeated to ensure savings are sustained, programs are being effective and new opportunities are identified

Eaton is careful to analyze all aspects of energy consumption and optimization, including:

Technology

- Review and application of equipment and components that reduce energy consumption cost
- People/Energy Culture
- Review of organizational readiness and buy-in for energy management plans and goals
- Level of awareness on how to support and improve energyconservation initiatives
- Can maximize no cost/ low–cost improvement opportunities

Operational & Maintenance

 Strategies – Review of sequencing strategies, capacity optimization, energy recovery solutions

Eaton's Guarantee

Commitment to quality if you are not completely satisfied with the quality of our work—specifically, the energy audit or cost savings methodology, cost savings, calculations, and support—you will not be charged. Eaton cannot predict the level or magnitude of the energy reductions or cost savings, but we guarantee the quality of the Eaton approach, analysis, objectivity and methodology.

Our vision

Achieve an industry-leading reputation as an Energy Solutions Provider by helping our customers succeed in business and sustainability pursuits via world-class energy engineering and technology solutions that reduce energy consumption and cost.

Eaton's standard energy audit levels

Level 1

Major Energy Conservation Opportunities will be identified, corrective measure briefly described and quick estimates of energy reductions and cost are provided. Level of detail is sufficient to prioritize energy-efficiency projects and to determine the need for a more detailed audit, study or design.

Level 2

Includes all the Level 1 benefits-plus goes into greater detail to identify all Energy Conservation Opportunities appropriate for a facility, given its operating parameters. The level of detail is sufficient to justify project implementation and to commit design funds.

Custom Audit Scopes are also available, and targeted audits can be performed on select systems.

Projects with opportunities to conserve energy and utilities were investigated as part of this audit. The mechanical, electrical, plumbing and control systems were analyzed to ascertain inefficiencies, saving potential and project implementation cost. The combination of field surveys of the existing systems, engineering calculations using industry standards practices, application of energy efficient technologies and adherence to the building design best practices resulted in the recommendation of the following Energy Conservation Opportunities.

Number of Recommended Opportunities				Estimated Implementation Cost				E	Estimated Annual Savings		Simple Payback		Estimated Return on Investment		
7 Without rebate 7 With rebate			\$1,684,673 \$1,624,673				\$354,204 \$354,204		4.60 YRS 4.58 YRS		19.33% 20.4%				
Energy Cost			t Before & After ECO					Energy Use BTU 10^6 Before & After ECO							
	\$2,299,870	\$258,750	\$258,750	\$17,048	\$15,090	682'2\$	\$2,001,396		82119	9238.4	621.88	1 537	149.8	121	71451
-	Annual Energy Cost-Now	Install DDC Controls	Escalator	Motor Upgrades	Point of Use HW Heater	fending Maching Energy Red	Annual Energy Cost-After ECO	- <i>-</i>	Annual Energy Cost-Now	Install DDC Controls	Escalator	Motor Upgrades	Point of Use HW Heater	fending Maching Energy Red	Annual Energy Cost-After ECO

The following table depicts the energy impact of implementing the recommended Energy Conservation Opportunities.

Annual Energy Cost	\$2,299,870	\$2,001,396	\$354,204	12.9%
Annual Cost\$ / Sq Ft	\$2.87	\$2.50	\$0	12.8%
Annual BTU consumption BTU 10^6	82,119	71,762	10,357	12.6%
BTU consumption / Sq Ft 10^6	.1026	.08971	.0129	12.6%

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		Level 1	Level 2
Report Items	No Cost / Low-Cost Opportunities Identified	Х	Х
	ECO Energy Saving (~% Accuracy)	+/- 20%	+/- 10%
	ECO Cost Estimated (~% Accuracy)	+/- 20%	+/- 10%
	Simple Payback Period (SPP)	Х	Х
	ROI \ NPV \ IRR Financial Metrics	Х	Х
	Lighting	Х	Х
	HVAC	Х	Х
	Compressed Air	Х	Х
be	Steam System	Х	Х
8	Building Envelope	Х	Х
×.	Water (Potable)	Х	Х
ŝ	Water (Process)		Х
dit Items / V	Analyze\Detailed View of HVAC Control System		Х
	Sequence of Operations		Х
	Measurement (Specific)		Х
	Onsite Interviews—General	Х	Х
Ā	Onsite Interviews—Maint. & Operations		Х
	Utility Bill Analysis (Elec., Gas, Water, etc.)	~12 Mo.	~12 - 36 Mo.
	Building Modeling		Х
	Lighting Photometric		X
	Delivery Time	6 - 8 days	3 - 4 wks

ECO: Energy Conservation Opportunities Custom audit scopes are available.

Typical energy conservation opportunities

Lighting

- Lamp/fixture technology
- Control, dimming and automation
- Daylight harvesting

HVAC

- · Control/commissioning
- Demand control ventilation

Gas driven absorption

Boiler Drain

· Toilet using gray water

Technology

- Reflective and/or "green" rooftops
- Variable Frequency Drives (VFDs)

Co-generation

Compressed Air • Demand Control

Air Leak Programs

energy sources

Operations

Steam line

• Alternative and renewable

· Capacity matches consumption-equipment that is main-

• Business operations and system control/alignment

Retro or continuous

commissioning

Insulation and gray

water integration

tained and operated efficiently



· Air Quality Optimization Supply

- Equipment maintenance

- Type of hot water system

- · Peak demand saving
 - · Effective use of exhaust heat
 - · CHP solutions