Mitigation Enabling Energy Transition in the MEDiterranean region

Energy Auditing – ISO 50002

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Energy Audits in Industrial Small Medium Enterprises (SMES) - Training Course

Monday, 9 December 2019 – Cairo, Egypt
Why Energy Auditing?

• The audit needs to focus on developing a full understanding on what affects energy use in the organisation

• Understanding will lead to recognition of opportunities

• Then we can identify the potential of the savings

• Then we make the recommendations to our clients
Energy Audit Objectives

- The main objectives in auditing is to assign the opportunities for energy savings and the associated investment requirements.
- The opportunities can be classified as:
  - **Near Term Low Cost / No Cost measures**
    - Often associated with changing behaviors or purchasing practices
    - Measures require minimal investment and are low risk to implement
    - Typically identified and implemented through an in-house managed EnM program
  - **Medium Term / Moderate Investment Measures**
    - Associated with retrofit of an energy system
    - Require significant investment that must meet internal return financial performance expectations
    - Higher risk for implementation and most often require outside specialist technical services firm to implement
  - **Long Term / Capital Investment Measures**
    - These are typically measures that have paybacks that exceed financial performance criteria for stand alone investments
    - Best implemented as a bundled part of a larger capital upgrade program
    - Can be made more attractive if outside incentives can be found or through packaging with an innovative finance approach (energy supply contract, outsourced facility management, O&M contracts, operating lease, etc.)
Energy Audit Process

• Guidance and Tools for Energy Audits
  – Why reinvent the wheel?
  – Excellent tools and guides available
  – Easy to use, easy to read, reliable, well researched
  – Most are free
Energy Audits Guides

- **ASHRAE**
  - Procedures for Commercial and Building Energy Audits

- **Association of Energy Engineers (AEE)**
  - Certified Energy Auditor Body of Knowledge
  - Energy Management Handbook, Dr. Wayne C. Turner

- and many, many more…
Energy Audit Standards

- ISO 50002
- AS/NZS 3598
- BS EN 16247-1:2012
- Many others

- Which one is best? Answer: None of them. They are all similar and promote the same basic steps!
- Do we need a reference framework for energy audits? **YES**
- Do all energy audits need to have exactly the same approach, details, etc.? **NO** – All energy audits are different! Different objectives, different budgets, different systems, etc.
Types of Energy Audits

Advanced Feasibility Study / Large Facility / Complex Energy Sub-System (ISO 50002 - Level 3 Energy Audit)
Types of Energy Audits

**Level 1**
- **Accuracy**
  - -30% to -50% Savings
  - +30% to + 50% Costs
- **Uses**
  - Monitoring
  - Scoping
  - Qualification
  - Key feasibility study for small facilities or simple energy systems
- **LOE (Typical)**
  - Small-Medium Building
    - 1 days on site
    - 1 week office report writing
  - Large Building
    - 2 days on site
    - 2 weeks office report writing

**Level 2**
- **Accuracy**
  - -15% to -25% Savings
  - +15% to + 25% Costs
- **Uses**
  - Detailed feasibility
  - Firm internal funding requests
- **LOE (Typical)**
  - Small-Medium Building
    - 1 week on site
    - 2 weeks office report writing
  - Large Building
    - 2 Weeks on site
    - 4 weeks office report writing

**Level 3**
- **Accuracy**
  - -5% to -10% Savings
  - +5% to + 10% Costs
- **Uses**
  - Advanced Investment Feasibility Study – more detail for a larger, more complex facility
  - External Funding Requests
  - System Specific Detailed Feasibility Study
- **LOE generally the same as Level 2**
  - LOE determined by detail required and / or complexity of a sub system
Audits Key Governances to Assign Audit Level

- Facility Size.
- Objectives of the Facility.
- Efforts needed.
- Measurement Level.
- Data Collection and its Availability.
- Methodology and Analysis.
Energy Audit Cycle Costs

Benefits

(Energy, Operations Savings)

Costs

Project Life

(EAs, implementation planning, finance planning)

(Operations, Energy, M&V, Debt Service)
Energy Audit Steps

1. Energy audit planning
2. Opening meeting
3. Data collection
4. Measurement plan
5. Conducting the site visit
6. Analysis
7. Energy audit reporting
8. Closing meeting
Energy Audit Steps

**Planning**
- Hold meeting with key organizational stakeholders
- Determining the energy audit objectives
  - Roles, responsibilities, data requirements, resources
- Investment criteria
- Determining the scope, timeframe
- Selecting audit type/detail, reporting format, approval process
- Reviewing management systems
  - (EnvMS, EnMS, etc.)
- Reviewing organizational, regulatory or other constraints
- Consulting with the initial facility stakeholders

**Strategy for Planning**
- How is energy use related to:
  - General business operations
  - Market positioning
  - Technology pressures
  - Work environment
  - Productivity
  - Quality
  - Energy and resource security
  - Etc.
Energy Audit Steps

• Meetings and Data Collection
  – Data required and when
  – Access to facilities
  – Timeframes for data collection on site
  – Organize copying, retrieving documents, etc.
  – Key personnel on site to access specific areas
  – Security clearances?
  – Site inductions for safety
  – Special clothing / personal protective equipment
  – Liability releases / insurance for site work
  – Measurement equipment safety inspection requirement
Energy Audit Steps

• Measurements Planning:
  - Utility bills (Do not go to site without first reviewing!)
  - Review of drawings and specifications
    - Single-line electrical drawings
    - High-level process schematics (e.g. energy and mass flow diagrams)
    - HVAC plans
    - Architectural layouts with lighting fixture placements
    - Site plan
    - Alternatives / Substitutes: Emergency exit plan, google maps
  - Review of specific operational issues / delayed maintenance items
Energy Audit Steps

• Conducting Site Visit:
  – Do we need to measure everything? **NO**
  – We need to measure enough data to **estimate** energy use and savings appropriate for the required level of accuracy
  – Factors include:
    • Project development stage
    • Available resources
    • Acceptable level of risk
  – It is impossible within most audits to measure all parameters.
  – The energy auditor must be an expert at making estimates based on incomplete data.
Energy Audit Steps

• Post Site Visit Analysis:
  – Preliminary / Rough Analysis (Level 1 Audits / Non-Core Measures):
    • Developing target scope for a more detailed study
    • Time and resources are limited
    • The project values are low
    • The facility / energy system and operating profile is simple
  – Detailed Analysis (Level 2 Audits / Core Measures):
    • Projects with internal funding available
    • Firm budget commitments for project implementation have been made
    • Moderate complexity systems and operating profiles
  – Advanced Analysis (Level 3 Audit / High Value / High Risk Projects):
    • Projects that require solicitation of external funding
    • Moderate complexity systems and operating profiles
    • Where project modifications have significant financial, health and human safety, or environmental risks (e.g. modifications to process, critical environments, etc.)
Energy Audit Steps

• Audit Findings and Reporting:
  – Baseline data of assessing the Energy Conservation Measures (ECMs).
  – Audit Methodology Approach.
  – Audit Data Analysis related to the facility energy performance indicators.
  – Audit Findings for the EE/RE opportunities.
  – ECMs outlines and the financial feasibility.
  – Conclusions and Remarks.
Contact us!

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