Energy Auditing – ISO 50002

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

Monday, 9 December 2019 – Cairo, Egypt

Funded by the European Union

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 though 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 measure 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

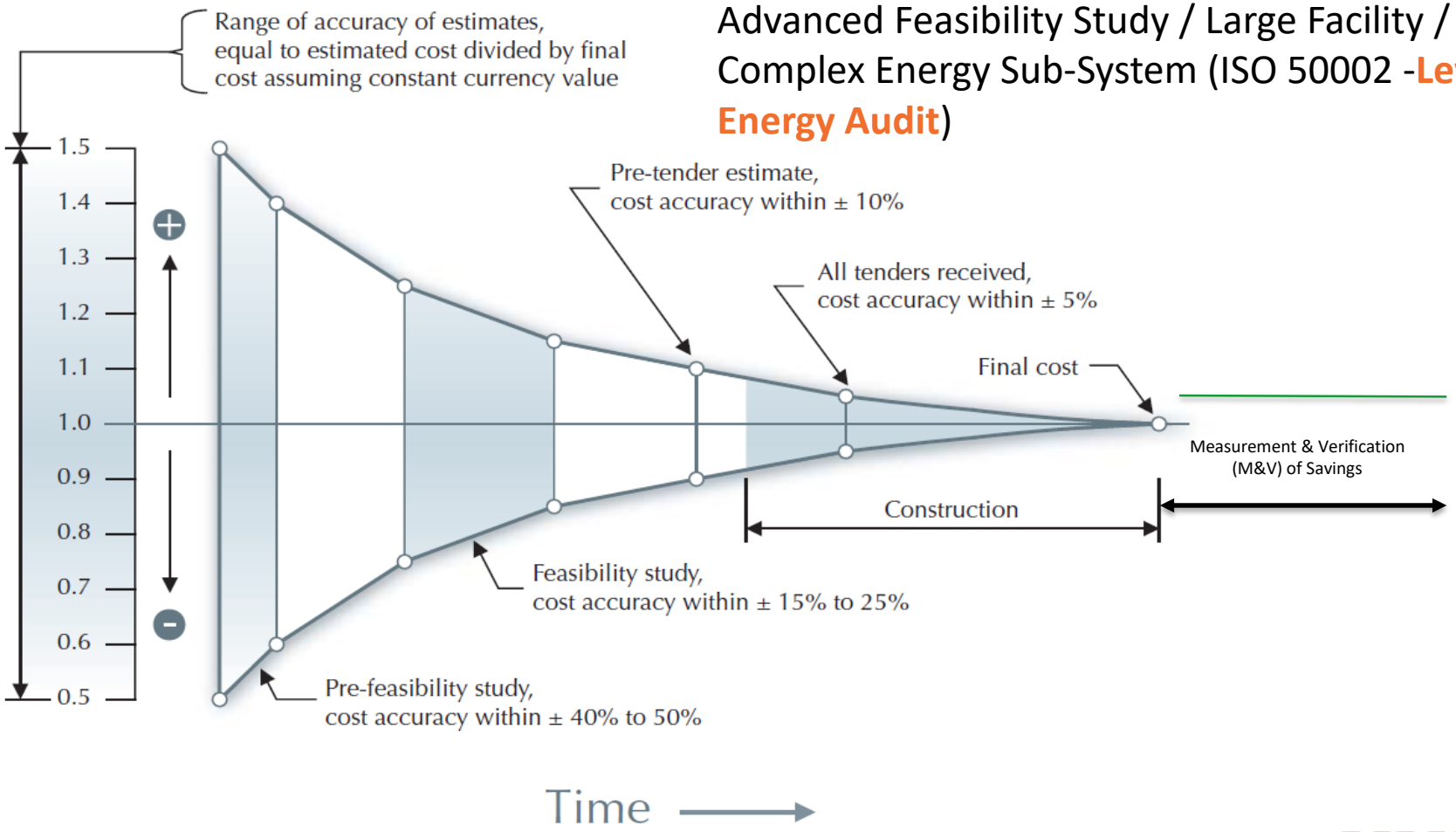
- and many, many more…

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

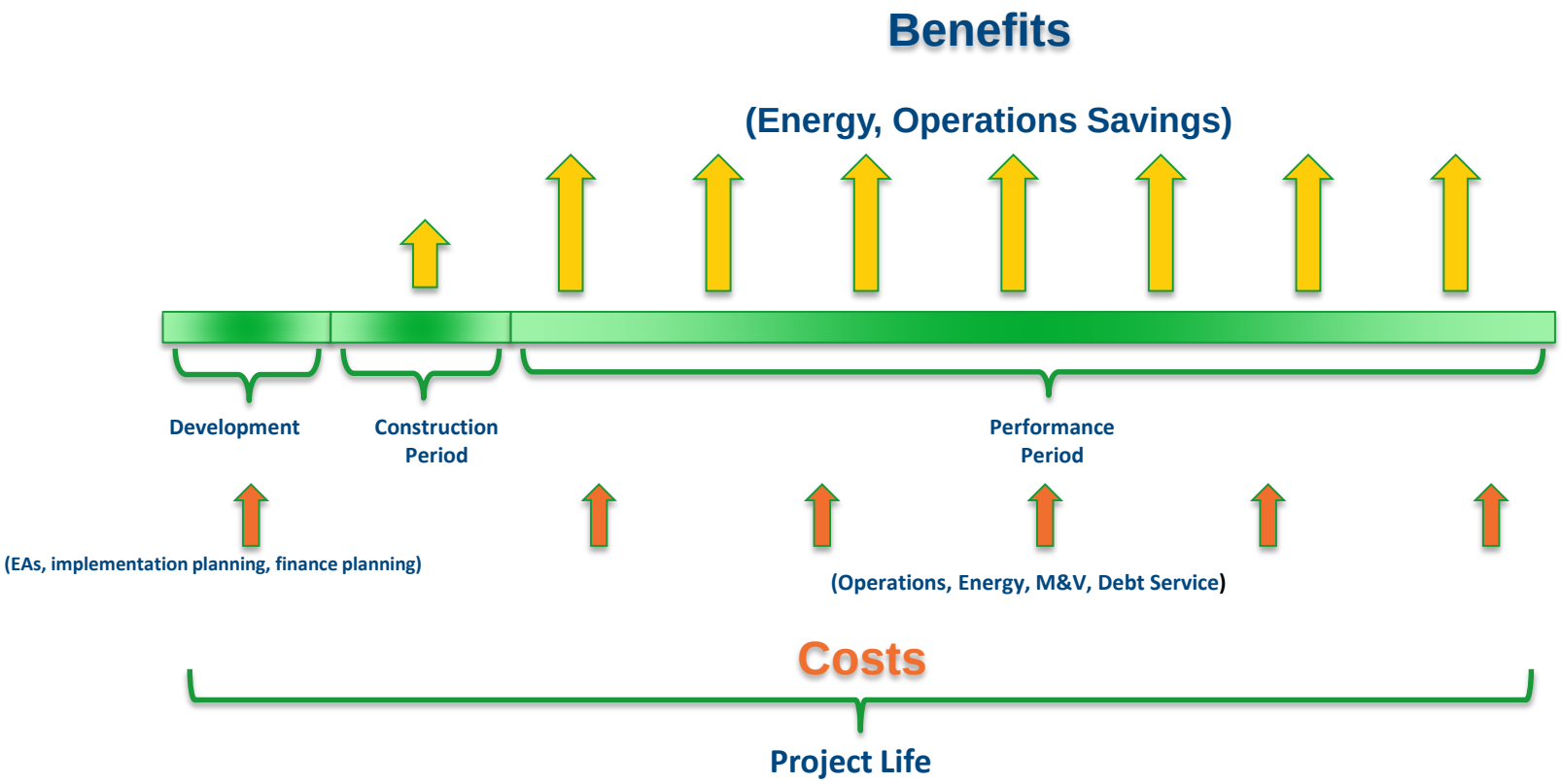
Uses
- Advanced Investment Feasibility Study – more detail for a larger, more complex facility
- External Funding Requests
- System Specific Detailed Feasibility Study

LOE generally the same as Level 2
- LOE determined by detail required and / or complexity of a sub system

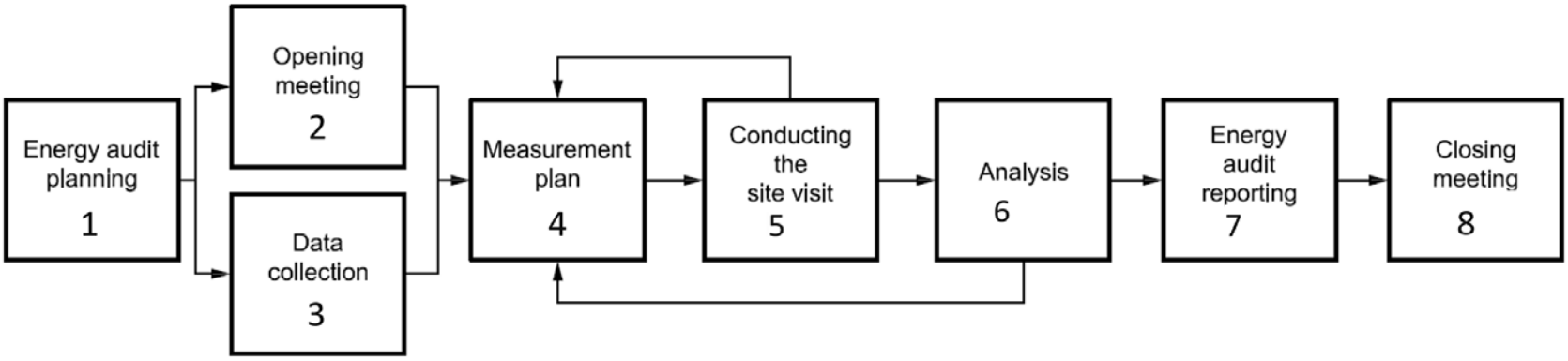
Audits Key Governances to Assign Audit Level

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

Energy Audit Cycle Costs



Energy Audit Steps



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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