Energy Efficiency, Energy Audits and ESCOs

Sherry Ann-Dial/Eugene Tiah
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Energy Efficiency

Energy Conservation and Energy Efficiency

Energy conservation means using less energy by changing habits, while **energy efficiency** means using special technology that requires less energy to do the same job.



Lower Operating Costs



Increased Productivity



Improved Operational Performance



Identify Energy Savings Opportunities



Long-Term Sustainability & Competitiveness

Barriers to Energy Efficiency

- Low energy costs
- Technical/commercial know how- identification and development of opportunities.
- High initial capital costs
- Access to capital

Benefit of Energy Efficiency

- Lower energy costs
- Higher energy security
- Lower greenhouse gas and other emissions- health and well being
- More competitive and sustainable businesses

Energy Audits

What is an Energy Audit?

An energy audit is a systematic, evidence-based analysis of **how a facility consumes energy**, where **energy is wasted**, and what **cost-effective measures** can be implemented to **reduce consumption and improve efficiency.**

Types of Energy Audit

Level 1: Walk-Through Audit (Preliminary)

The walk-through audit is the quickest and least expensive assessment. It provides a broad overview of energy use and identifies obvious inefficiencies:

1. Methodology: Visual inspection of the facility, review of utility bills (12+ months), and discussions with facility staff.

2. Duration: 1-2 days on-site, 1 week total including reporting.

3. Depth: Utility-level analysis (not equipment-level). Identifies major energy end-uses and obvious waste.

4. Outputs: Energy cost analysis, utility benchmarking, list of no-cost and low-cost savings opportunities, high-level estimates of potential savings.

5. Savings accuracy: Order-of-magnitude estimates (±30-40%).

6. Best for: Initial baseline, quick-win identification, deciding whether a deeper audit is warranted.

Types of Energy Audit

Level 2: Standard/Detailed Audit

The detailed audit is the most commonly conducted level. It provides equipment-level analysis with engineering calculations and credible savings estimates:

1. Methodology: Comprehensive data collection, equipment-level measurements (power logging, flow measurement, temperature profiling), engineering analysis, and benchmarking.

2. Duration: 3-7 days on-site, 3-4 weeks total including reporting.

3. Depth: Equipment-level energy accounting for all major consumers. Load profiles, efficiency assessments, and utilisation analysis.

4. Outputs: Detailed energy balance (where every BTU and kWh goes), equipment-wise consumption breakdown, comprehensive ECM list with engineering calculations, payback analysis for each recommendation, implementation priority matrix.

5. Savings accuracy: Engineering-grade estimates (±10-15%).

6. Best for: Most facilities seeking to implement a serious energy-efficiency programme and green audit integration.

Types of Energy Audit

Level 3: Investment-Grade Audit

The investment-grade audit provides the financial rigour needed to secure capital for major energy projects. It is essentially a Level 2 audit with enhanced financial modelling and monitoring-based commissioning:

1. Methodology: Extended monitoring (2-4 weeks of continuous data logging), detailed engineering analysis, financial modelling (NPV, IRR, life-cycle cost analysis), sensitivity analysis, and risk assessment.

2. Duration: 2-4 weeks on-site monitoring, 6-8 weeks total including analysis and reporting.

3. Depth: Sub-system and component-level analysis. Detailed operational profiles. Interaction effects between systems modelled.

4. Outputs: Bankable savings projections suitable for financing, detailed engineering specifications for recommended equipment, Monitoring & Verification (M&V) plans per IPMVP protocol, financial models with sensitivity scenarios, implementation project plans.

5. Savings accuracy: Bankable estimates (±5-10%) with M&V protocols.

6. Best for: Facilities pursuing major capital investments in energy efficiency (chiller replacement, cogeneration, solar PV), ESCO (Energy Service Company) contracts, or green financing

Energy Audit Standards

- **ISO 50002:2014 – Energy Audits – Requirements with guidance for use**
  - ISO 50002:2014 specifies the process requirements for carrying out an energy audit in relation to energy performance. It is applicable to all types of establishments and organizations, and all forms of energy and energy use.
- **ASHRAE Standard 211-2018**
  - Standard 211 establishes consistent practices for conducting and reporting energy audits for commercial buildings. The standard, which evolved from the best-selling Procedures for Commercial Building Energy Audits

Energy Service Companies (ESCOs)

ESCO Definition

Core Role: Develops, designs, builds, and may arrange financing for energy efficiency and renewable energy projects.

Financial Risk: Accepts financial risk linked directly to whether the project actually achieves the guaranteed energy savings.

Payment Model: Compensation is performance-based, paid back over time using the money saved on utility bills.

ESCO Business Model – The Integrated Services

Integrated Energy Services

- Development
- Energy conservation measure (ECM) identification
- Engineering design
- Financing*
- Procurement
- Construction and on-site supervision
- Commissioning
- Capacity-building
- Performance guarantee
- Operations and maintenance*
- M&V of savings



Contractors

Equipment Manufacturers





Governments

Financial Institutions





Energy Suppliers

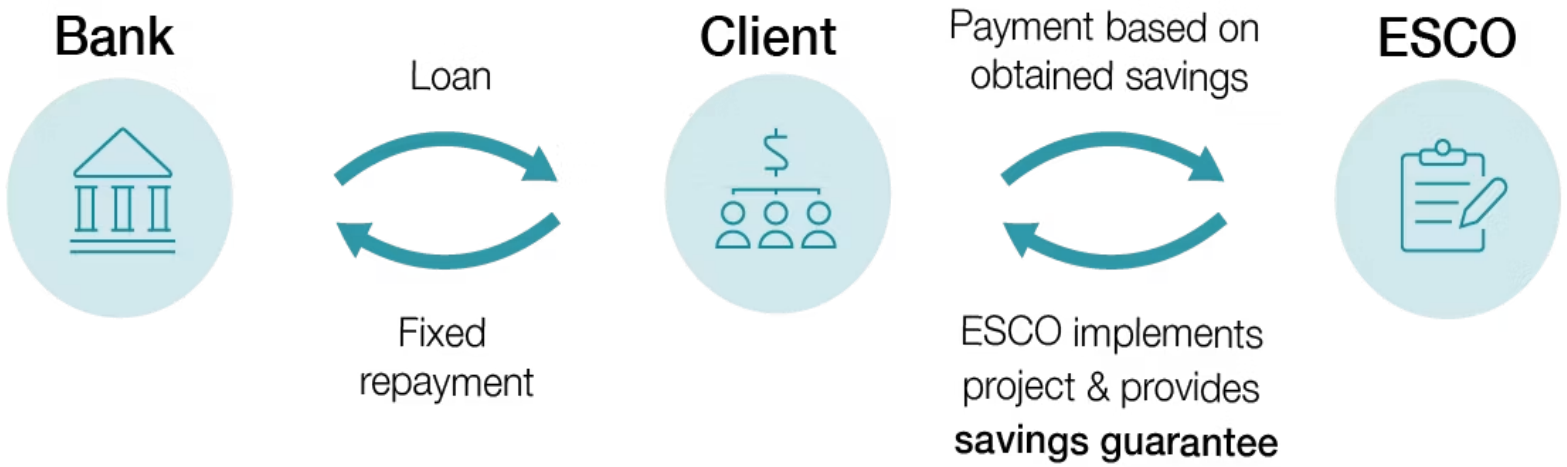
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ESCO Contract Types

Guaranteed Savings(EPC GS)

Energy Performance Contract Guaranteed Savings model (EPC GS): the ESCO guarantees a certain savings on the client's energy bill. **The ESCO takes on the technical risk.** The client obtains a bank loan, or uses their own equity, to pay contractually determined fees to the ESCO and the bank, and keeps the difference.



https://www.iea.org/reports/energy-service-companies-escos-2/esco-contracts

ESCO Contract Types

Shared Savings(EPC SS)

Energy Performance Contract Shared Savings model (EPC SS): the ESCO can provide financing, as well as project development and implementation costs, with the energy savings shared between the ESCO and the client over the contract period. In this situation, the ESCO is assuming both the **technical and the credit risk (of the client)**, which can be of value to the client as it avoids the need for upfront capital costs, with ongoing payments to the ESCO based on the savings obtained. The project would therefore be off-balance sheet.



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Thank You