

Module 12: Audit Quality Assurance

Learning Objectives

After completing this module, you will be able to:

- Describe the essential features of the DME Audit Guidelines;
- Summarize the prescribed process for preliminary and detailed audits;
- Ensure that the preliminary and detailed audits address all required assessment issues;
- Ensure that appropriate service providers for the audit and quality assurance are selected.

12.1 DME Audit Guidelines

DME Report 1.0 Auditing (Draft) under the Capacity Building in Energy Efficiency and Renewable Energy Program provides specifications for the energy auditing of buildings.

The Supervising Engineer needs to ensure compliance with these specifications when they are finalized. While the guidelines exist in draft at the time of preparation of this course, the structure provided in the document is summarized and highlighted in this Module.

12.1.1 Guideline Structure

The Guideline document provides:

- A process flow chart (see Figure 12.1)
- Definition of the preliminary audit
- Definition of the detailed audit
- Guidelines for quality assurance.

12.1.2 The Preliminary Audit

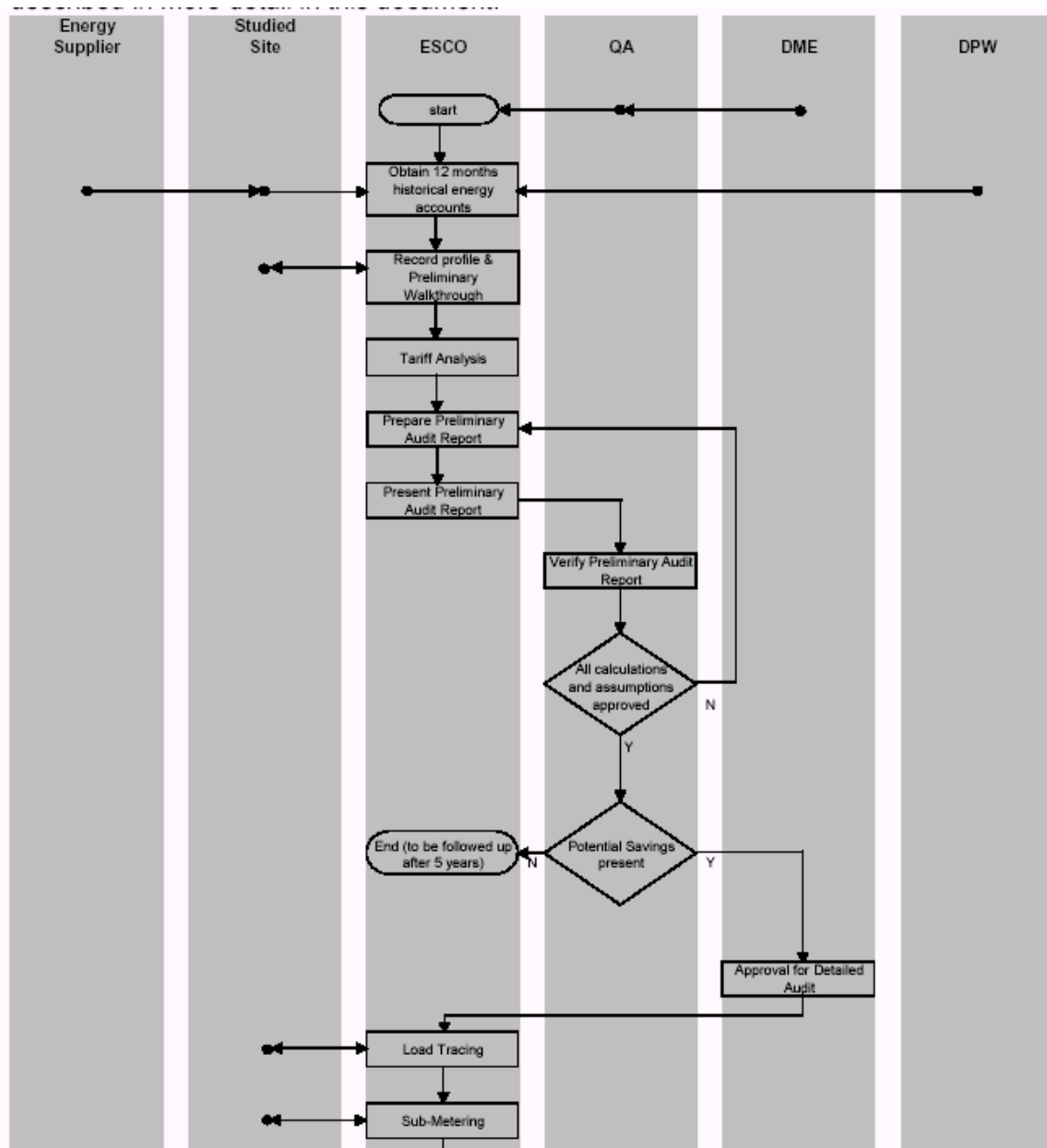
The purpose of the preliminary audit is to determine the potential for energy savings and so provide a basis for undertaking a detailed audit. The basis for the decision to proceed to a detailed audit is the building's performance indices; specifically,

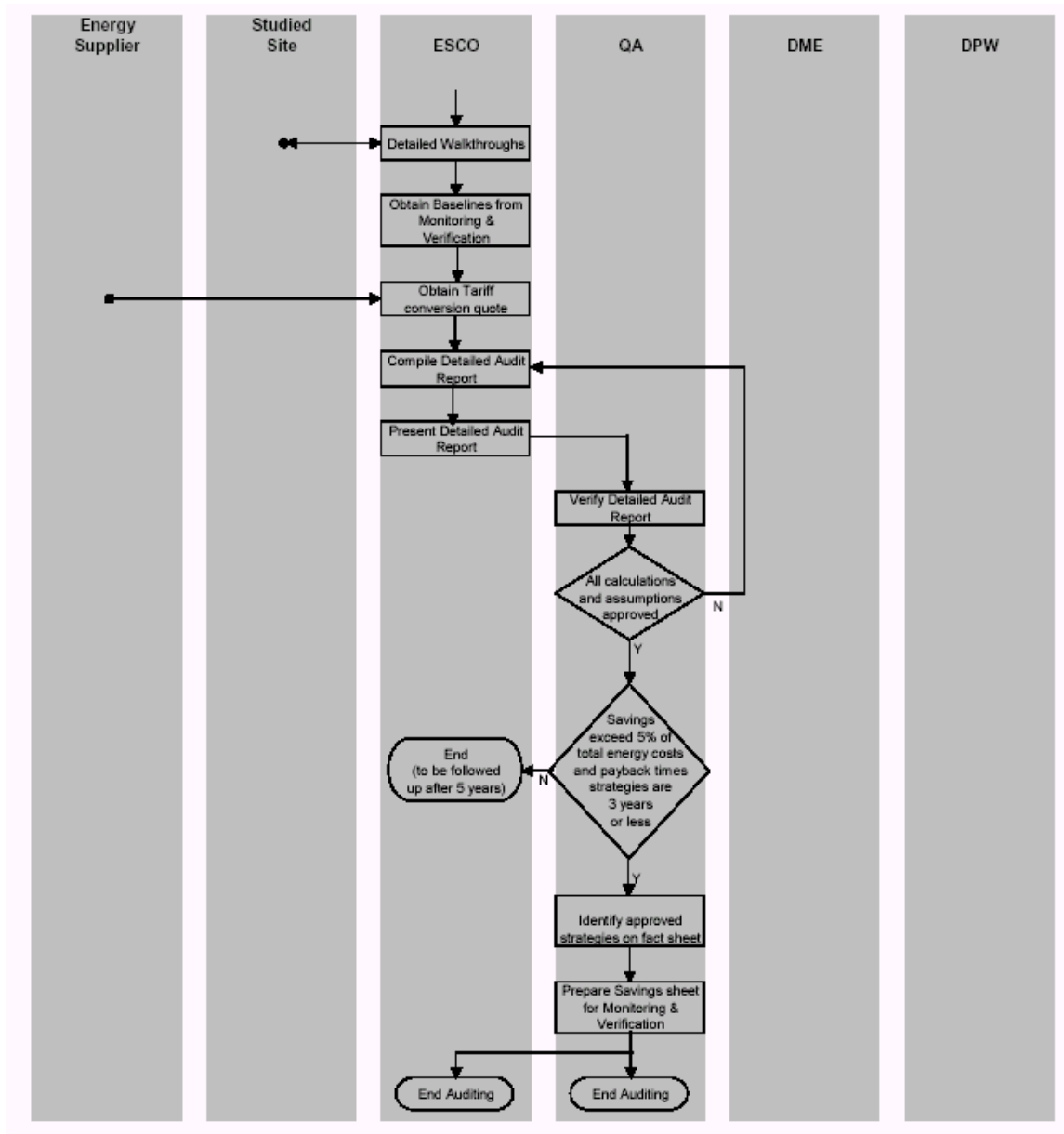
- The **consumption index** is the total energy consumption per year per unit of net floor area (i.e. occupied and conditioned floor area), measured in MJ/m²/year;
- The **demand index** is the average monthly maximum demand per unit of net floor area, measured in VA_{average}/m²/month.

The preliminary audit involves the following steps:

1. Collection of at least 12 months of historical energy consumption and billing data;
2. Collection of building operation information, including net floor area and occupancy schedules;
3. Determination of the demand profile for the facility, including measured kW, KVA and power factor;
4. A Walk-through inspection;
5. Tariff analysis.

Figure 12.1: Audit Process Flow Chart





12.1.3 The Preliminary Audit Findings

The preliminary audit will generate the following information that can be used to determine whether or not a detailed audit is required:

- The building performance indices described above;
- Analysis of the demand profile, indicating any problems or potential savings opportunities;
- Potential savings opportunities identified in the Walk-through inspection;
- Application of the appropriate tariff to estimate the financial savings that are possible from identified savings or demand control measures;
- Confirmation that the appropriate tariff has been applied, or determination of the potential for financial savings related to the application of alternative tariffs.

12.1.4 The Detailed Audit

The purpose of the detailed audit is to identify specific measures for the reduction of consumption, reduction of peak demand, and/or reduction of energy costs. To meet this requirement, the auditor needs to carry out the following steps:

- Examine site drawings, including architectural and energy service line drawings in order to establish the basic analysis parameters;
- Develop an energy load inventory, with the application of sub-metering as required;
- Examine the electrical demand profile to determine opportunities for demand reduction and/or power factor correction; the electrical demand profile may also reveal opportunities related to unnecessary operation of specific loads (for example, during non-occupied hours);
- Assess all energy load areas, including:
 - **Lighting** – the opportunity for control through the use of timers, occupancy sensors, etc.; the use of efficient technologies such as LEDs, compact fluorescent fixtures, electronic ballasts, etc.; the lighting levels and their compliance with applicable standards; daylighting and dimming of fixtures where possible.
 - **HVAC** – the application of ventilation rates that comply with applicable standards (See Table 12.1); the application of humidity control when and where needed and utilizing efficient technologies such as desiccant dehumidification; efficiency of the air handling system, with particular attention to the use of dampers and the maintenance of filters; the use of efficient technologies such as variable speed drives in place of system dampers; system scheduling, and set point set-backs or set-ups; the efficiency of rooftop refrigeration units, chillers and cooling towers; opportunities for waste heat recovery; application or improvement of system insulation on air supply ducts, and both chilled water and hot water lines and storage tanks; avoidance of simultaneous heating and cooling.
 - **Domestic hot and cold water** – opportunities for flow reduction in faucets, shower heads, and other uses; application of insulation to storage tanks and distribution lines; possibility for reduction of water temperature and set-back during non-use periods; condition of and opportunities for speed control on supply pumps.
 - **Fuel switching opportunities** – for example, using fuel-fired boilers in place of electrically heated units.
 - **Steam Distribution System** – application of condensate return; condition of distribution lines and insulation; opportunities for steam trap repair/replacement.
 - **Compressed Air System** – efficiency opportunities through compressor maintenance, replacement, sizing; compressed air leakage as demonstrated by compressor operation during non-occupied periods; pre-cooling of intake air or relocation of compressor to cooler area.
 - **Building Envelope** – opportunities related to insulation, glazing and shading, control of infiltration.

Table 12.1: Required Fresh Air Quantities

Occupancy	Class	Design population	Minimum Ventilation Requirement
Entertainment and Public Assembly	A1	Number of fixed seats or 1 person /m ² if there are no fixed seats	3.5 l/s per person
Theatrical and Indoor Sport	A2	Number of fixed seats or 1 person /m ² if there are no fixed seats	3.5 l/s per person
Places of Instruction	A3	1 person / 5m ²	7.5 l/s per person
Worship	A4	Number of fixed seats or 1 person /m ² if there are no fixed seats	3.5 l/s per person
Exhibition Hall	C1	1 person / 10m ²	3.5 l/s per person
Museum	C2	1 person / 20m ²	3.5 l/s per person
Hospital	E2	1 person / 10m ²	5.0 l/s per person
Offices	G1	1 person / 15m ²	5.0 l/s per person

- Provide a baseline consumption indicator for the purpose of savings verification;
- Assess the opportunity for tariff change, including a quote from the utility for conversion.

12.2 Quality Assurance

Ensuring that the audit meets the requirements summarized above involves two issues:

- The selection of the ESCO or other service provider;
- The selection of a “Quality Assurer” to verify the audit findings.

12.2.1 Selection of the ESCO

The criteria that should be considered in the selection of the ESCO are:

- Education of employees, in particular additional specific Energy Management related certification or degrees.
- Expertise of company.
- Reference projects and other experience.
- Stability of company (assets / turnover).
- Professional indemnity and contractor's liability insurances.

12.2.2 Selection of the Quality Assurer

As indicated in Figure 12.1, the Quality Assurer in the DME Audit Process plays an independent, but parallel role as the preliminary and detailed audits are carried out. The criteria that should be applied to the selection of this party include:

- Education of employees, in particular the technical (electrical and mechanical facets) and financial in-house expertise.

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- Integrity of company.
- Reference projects and contracts.
- Stability of company (assets / turnover).