

Energy Audit Chapter-5. (1)

Energy Audit. It is an official systematic scientific study of energy consumption by an organisation Plant Sector. It is aimed at energy saving. measures for cost reduction and energy savings.

The use of energy has to be critically accounted. And any saving if possible, shall be achieved. This is possible, by Pre audit Testing, technical changes and introduction of new policies

It involves many engg. branches like Electrical, mechanical, Chemical etc. Energy Auditor. The person doing Energy Audit should have complete knowledge of the system which he is auditing.

① Defined as - "the verification monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption

Systematic Analysis of energy use, and energy consumption in order to identify the losses in order to improve energy performance.

Need of Energy Audit: In industry there are three expenses. Labour, material & Energy expenses. These costs to make the system economically can be must be reduced. Energy management can be easily done. In the area of cost reduction Energy Audit helps to understand how the energy

and fuels are used in industry.

Identify the area of waste.

And scope for improvement exists

It gives an idea about energy reduction

minimising losses and saving of energy.

It tells about preventive maintenance, Quality Control and about Production

helps to focus on ^{Variation} variations in energy cost.

Availability and reliability of supply of energy.

Identify energy conservation techniques.

And makes convert ideas of Energy conservation into reality.

bench mark for managing energy in an organisation provides basic for planning more effective use of energy..

Scope scope is potential savings

1. Electrical lamp efficiency enhancement.

2. Industrial and domestic sector, phase heating

generation

3. Domestic water efficiency

4. Process heat utilization in industry

5. Solar water heating technology.

6. Adaptions of green technologies

7. Implementation of clean technology.

* Explain different types of energy audit?

* Types of Energy Audit

1. Preliminary Audit with first standards

2. Mini Audit or General Audit Entire Audit

3. Detailed Audit comprehensive Audit

Preliminary Audit: called Simple Audit or Screening Audit. This Audit consists of walk through inspection

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of the facility to identify maintenance, operational or different equipment issues and also to identify areas that need further evaluation.

only major problem areas will be measured.

Covered during this Audit corrective measures.

Briefly described and quick estimates of implementation cost, potential operating cost savings and simple pay back periods.

and simple pay back periods.

Team includes few members. Consultant manager.

Plant engineer, energy supervisor. This team.

walks through the plant and observe the process

and note down observations

Audit is fast, simple, rapid survey. Quick implementation.

Mini Audit General Audit -

called complete site energy audit, expands.

Preliminary Audit by collecting more detailed information about facility operation, detailed evaluation

of energy conservation measures. Utility bills

are collected for 12 to 36 months. To allow the

Auditor, to evaluate the demand rate structures.

In depth interviews with the energy usage people. In depth interviews with

facility operating persons. are conducted to

provide best understanding of major energy

consuming systems. To gain short and long term.

consumption patterns. This audit enables energy consumption measures.

To identify all energy conservation measures.

Detailed financial analysis is performed for each measure based

on detailed implementation cost estimates. If the

specific operating cost savings. Subsequent detail is produced for project implementa-

Comprehensive Audit (Detailed Audit)

it is also called Technical analysis Audit or maximum Audit. It is a thorough and extensive energy audit that analysis and quantifies the amount of energy consumption in each and every subsystem of the plant. e.g.: lighting, heating, Ventilation, Boiler plant, Motors, etc. and compares it with target energy consumption.

Target for unit energy consumption is the optimum energy consumption per unit product.

Target is calculated from theoretical energy calculations and earlier experience.

Total energy for production divided by Total production

This Audit provides a detailed energy project.

Implementation plan for a facility because it evaluates all major energy using system.

This audit is more accurate of energy savings.

It is carried out in different Phase.

Phase 1. Pre audit phase Phase 2. Audit Phase.

Phase 3. Post Audit Phase.

Methodology for Energy Audit

A- Structured methodology is helpful in carrying out the energy audit in more efficient way

Any methodology can be adopted but it

Should fulfil the objective

Steps taken for finalizing methodology

1. Preparation of single line diagram of electrical system

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2. Collection of basic data related to energy consumption.
 3. Study of energy bills and consumption pattern.
 4. Identification of energy consumption per unit production.
 5. Schedule for dating all data's related to firm.
 6. Measurement of various electrical parameters.
 7. Analysis of energy loss or wastage.
 8. Analysing electrical tariff.
 9. Online recording of load pattern and evaluate their performance. Energy consumption.
 10. Suggestion to improve efficiency of equipment.
 11. Presentation of result obtained by analysis to top management.
 12. Training programme & General.
 13. Monitoring and reporting scheme by energy auditor and if necessary suggestions for improvement.
 14. Implementation of energy saving scheme.

* 9 Explain Demand Side Management & Benefits

Demand side management is a mechanism to influence customers capability and willingness to reduce electricity consumption. DSM is an utility program aiming to fine-tune consumers energy consumption pattern.

It consists of the planning, implementing and monitoring activities of electric utility that are designed to encourage consumers to modify their

level. and pattern of usage.

Demand Side Response.

Demand side management is called Demand Side Response. It is the modification of user consumer demand for energy through various methods such as financial incentives and behavioural change. Through education

Programmes designed by end users to reduction in energy demand. Alternate source also can be used to displace load from electricity power grid.

Benefits of DSM:-

1. Financial Savings on electricity bill
2. Reduced use of energy so energy conservation
3. Promotes more efficient lighting systems. Technology
4. Promotes energy awareness.
5. Encourages consumer to use less energy during peak hours.
6. Reduced energy cost.
7. Better use of supply. (Power Quality)
8. Improved service for customer.
9. Reduce pollution
10. Less generation and transmission capacity required
11. Low maintenance.

Steps Involved in Energy Audit

1. Data collection
2. Efficiency evaluation
3. Loss Quantification
4. Operation improvement measures.

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5. Techno economic evaluation of Projects
 6. Designing energy data report system.
 7. Action Plan for implementation
 8. Review setting up of Target.

Benefit from Energy Audit

1. Usage of energy is calculated.
2. Analysis and identification of losses in all systems can be done.
3. Developing energy monitoring system.
4. Conservation of energy and reduction of energy will.
5. Optimization of energy cost.
6. Control of pollution
7. Use of improved efficiency equipment.

Energy Audit report.

Important report. Should be well structured.
and should cover all aspects.

It should contain

1. Executive Summary.
2. General aspects of energy auditing
3. Energy Tracking System.
4. Utilities Infrastructure
5. Assessments and recommendations
6. Operation and maintenance.

Energy Audit Team

To make energy audit successful a multi-disciplinary team is required covering all technical, safety, accountancy and management aspects.

∴ The Team consists of:-

Technical manpower.

Supervisor. and Floor manager.

Energy manager. as Team Leader. Who is having lot of general technical knowledge. and managerial skill

Energy manager.

Technical
manpower.

Floor manager.

Supervisor.

Draughtsman

From all Dept.

Audit

Personel.

Offic.

Accountant

Staff.

DSM Planning and Implementation

DSM. Programme are utility and customer Specific. the various steps of implementation are.

Step 1 (load Research. assess the customer base) tariff load profile on an hourly basis and well identify the sectors contributing the load shape

Step 2 (Define load shape objectives)

DSM engineers. will define load shape objectives for current situation

Various load shape objectives are.

i) Peak clipping. Reduction in peak demand.

Valley filling increased demand at off peaks.

load shifting demand shifting to off peak period

load Building increased demand.

Conservation Reduction in load.

Step 3 (will identify the end use applications and design a program for energy conservation)

Step 5. Monitoring and Evaluation (5)

This step will track the program design and implementation and will compare and get end results. (Solving).

DSM. Implementation Strategy?

Key challenge in successfully achieving DSM objectives is making the DSM programme design work successfully in the field customer acceptance. depending on how well the programme is carried out.

A. Poor design may be difficult to implement. Where as good design is easy to implement and has good results.

Good programme also needs some adjustment when implemented.

A variety of delivery mechanisms are often available. to assist in the implementation of utility programme. They include.

1. in house staff.
2. Staff hired on a temporary basis to perform programme tasks.
3. Market intermediaries
4. Community groups
5. outside consultants
6. Government agencies

Key to successful implementation

1. Start with good programme design.
2. Respond to early information in the market place.
3. Be flexible with details of programme, delivery
4. Learn from the experience. in the region learn

Block diagram of DSM implementation model at utility

Electric utility

