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Introduction

Economic growth of any nation is powered by energy. Since last decade India is achieving consistently high economic growth of more than 5%. Therefore, to sustain the present economic growth in future, India needs more energy resources such as coal, natural gas, petroleum products, power etc. However, to meet these demands, dependence on imported energy resources is increasing.

India's demand for petroleum products is expected to rise from 97.7 million MT in 2001-02 to 139.95 million MT. Against this the domestic crude production is likely to go up marginally from 32.03 million MT in 2001-02 to 33.97 million MT by 2006-07. Similarly, natural gas production in India will rise from 86.56 million standard cubic meters per day (MMSCMD) in 2002-03 to 103.08 MMSCMD in 2006-07, whereas the demand is likely to touch to more than 166 MMSCMD by then. To meet the demand of NG, some projects to import Liquefied natural gas (LNG) on West coast of India are under implementation. LNG will not be a cheap as compared to existing NG.

In this context efficient use of energy is of paramount importance to countries like India. Energy intensity is a measure of how well energy is being utilized. It is energy consumption per unit of GDP. India's energy intensity is reported to be 3.7 times that of Japan, 1.55 times that of USA, 1.47 times that of Asia and 1.50 times that of World average. High energy intensity indicates energy wastage in the economy and scope to improve the same through efficient use of energy by implementing energy conservation programmes.

Energy efficiency is often considered as a resource option to coal, oil or natural gas. It provides additional economic value by preserving the energy resource base and contributes in reducing pollution. Energy efficiency benefits to various players are summarized in **Table-1**.

Table-1

Energy Efficiency Benefits

Industry	Nation	World
➤ Reduced energy bills	➤ Reduced energy imports	➤ Reduced GHG and other emissions
➤ Increased competitiveness, opportunities for export	➤ Achieve higher economic growth,	➤ Maintain a eco friendly and sustainable environment
➤ Increased productivity	➤ Conservation of limited resources, less dependence on imports	
➤ Improved quality	➤ Improved energy security	
➤ Increased profits		

By recognizing high energy saving potential and its benefits which will also bridge the gap between demand and supply of energy resources and also reduce environmental emissions, the Government of India has enacted the Energy Conservation Act- 2001, which provides the legal framework and institutional arrangement for embarking on an energy efficiency drive.

Under this act, the government has notified 15 energy intensive industries and other establishments as designated consumers and the designated consumer has to get an energy audit conducted by an accredited energy auditor.

The success of this act in improving energy efficiency and achieving energy conservation cannot be guaranteed by law unless parties involved viz. designated consumers, their energy managers and energy auditors are sufficiently motivated to play their respective roles. It is observed that there are a number of barriers in conducting a successful energy audit in industries all over the world even in developed nations like USA. Some of the barriers are mentioned by energymanagertraining.com along with the statement of Issue #EE09. The paper discusses about what is involved in an “Energy Audit” and barriers faced and how to overcome them in order to achieve the objective of energy conservation through improvement in energy efficiency.

Energy Audit

Energy Audit performs a key role to formulate a systematic approach for decision-making in the area of energy management. The energy management programme in a plant is primarily oriented around optimizing the energy usages in the existing processes. This is accomplished in many ways, ranging from simple, inexpensive changes brought about by discussions to elaborate, detailed engineering studies and costly modifications resulting from what is known as “energy audits”

In Chapter-I- Definitions of The Energy Conservation Act, “energy audit” is 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”.

Another definition of “energy audit” is a study, analysis and evaluation of the energy consumption of a defined system by a team of competent and experienced engineers with the purpose of optimizing the efficiency of energy usage. Here, a system can range from a single operating unit e.g. distillation column including condensers, reboilers and associated pumps to all equipment of an entire plant consisting of a number of manufacturing units.

In brief, Energy Audit is the translation of energy conservation ideas into practice by arriving at techno-economic feasible solutions in an organization within a specified time limit.

Need for Energy Audit

In any company the need to carry out “Energy Audit” has to be fully understood. Unless the company management is not convinced about the need of an energy audit, it may prove to be futile exercise yielding no results. In any industry, energy - in any form constitutes a major portion of cost of production. With the existing environment of globalization and competition, the management of the industry searches for avenues for cost reduction. Energy management constitutes a strategic area of cost reduction. Energy Audit will help to understand about the ways of existing energy and fuel usage and identify the areas where waste occurs and where scope for improvements exists.

Types of Energy Audit

The type of Energy Audit to be performed depends on

- a) The function and type of industry
- b) The depth to which the final audit is needed and
- c) The potential and magnitude of cost reduction desired.

Energy Audit can be thus classified into following two types:

- 1) Preliminary Audit
- 2) Detailed Audit

Preliminary audit is comparatively quick and less expensive exercise using existing or easily obtainable data to arrive at:

- Energy consumption in the organization
- Estimate the scope of energy saving
- Identification of the most likely areas of potential energy savings
- Plan for immediate improvements and savings with no/ low cost investment.
- Set a “reference point”
- Identification of areas for more in-depth detailed study

Detailed Energy Audit is a comprehensive audit to provide a detailed energy saving project implementation plan for a facility/ plant evaluating all major energy using systems. It offers the most accurate estimate of energy savings and investment cost along with financial cost / benefit analysis. In a comprehensive audit one of the key elements is establishing energy balance of all areas of facility.

Both preliminary and detailed Energy Audits can be carried out internally (by company’s technical people) or by external agency experienced the field.

Many industries have their own full-fledged energy management cells. On daily basis they collect information on use of energy and maintain record of their efficiencies. In a number of industries, Technical Services department maintain data and records of energy consumption plant wise. Such industries carry out energy audits internally regularly. They feel that their own technical people are more experienced and qualified to conduct the audit because they know the process better. However, some feel that it is better to bring outsider who does not have preconceived ideas.

Many may point out that energy auditors do not usually offer any ideas that a plant's own engineers could not come up with. However, one of the main considerations is that plant engineers cannot take out or devote required time from their regular duties to spend weeks or months on an energy audit. There are a number of experienced consultants specialized in the job of conducting energy audits and their services are more cost effective. They look at the whole system whereas most of company's engineers look at the area in which they are working. The external auditor brings in experience, an organized fresh approach in addition to talent and tools to do the audit job. Many critics of a plant audit admit that it does not necessarily provide innovations, it provides a useful second opinion on "things we consider that we already know" and it adds more substance to what you are thinking.

Normally plant personnel do not like that an external agency points out "good housekeeping" as an area of improvement. Therefore, some strongly believe that an external auditor should not be brought in until a company has done housekeeping jobs satisfactorily.

Let us consider the barriers normally experienced in conducting Energy Audit through an external agency and how to overcome them.

To carry out successful energy audit and generate and implement energy conservation projects, it is very essential to develop and maintain interest and enthusiasm. Some of the things that are helpful are:

1. Management's unequivocal and visible commitment to energy audit and energy conservation programme. The message must go from the top down that the management is keen and support the energy conservation programme of the company. Further, it is the middle management of the company that plays a key role in making or marring the energy audit and energy conservation programme a success. It is through middle management that accompany implements any programme. If the middle management develops a positive attitude towards energy audit and energy conservation projects as an outcome of the audit, a excellent fruitful audit can be conducted.
2. Publicity for energy audit and energy conservation: It is essential that all concerned engineers of the plant know what role they have to play in the audit at its various stages. The top management can spread the message in this regards through circulars, news bulletin and meetings with concerned engineers.

When the management decides to conduct an energy audit through an external agency, following steps need to taken:

- 1) The scope of the energy audit should be documented in detail. Many times, due to non-clarity in the scope, the audit does not go in right direction and the outcome of the audit is not as per expectations. Sometimes, utilities like power generation (for captive power generating plants)and distribution, steam generation and distribution are only included for audit purpose. The main plants are excluded. Sometimes all utilities like steam, power, compressed air (instrument air and service air), nitrogen, water supply and distribution are included along with main plants. The client should ask for the biodata of the audit team members, which the consultant is likely to deploy. Depending on the scope of energy audit, experienced energy auditor in the field can be selected for the intended job. It is felt that BEE can help those who are not familiar with making a Notice Inviting Tender (NIT) document by making available a model NIT document, which will highlight different aspects-technical and commercial, in conducting an Energy Audit through an external agency. It should guide the industry in overcoming different barriers, pitfalls and making the energy

audit a success. Through such document confidence about the “energy audit” can be built up between the auditor and client.

2) The selection of the energy auditor and award of the audit job goes through following various phases:

- Some organizations like PSUs have to follow laid down procedure in selection and award of the job. First parties have to be pre-qualified for issuance of the bid. If the estimated value of the job is more than some prescribed limit, advertisement is published in reputed national dailies and asks for credentials of the interested parties in the given format. Based on information received from the parties, pre-qualification of parties is done. When the estimated value is not high, information about the suitable parties is collected through various channels. Suitable parties are short listed for issuance of tender documents.

BEE, being the apex organization in the field of energy management, can play an important role in maintaining information on suitable parties carrying out energy audit jobs in different fields. It is a fact that every auditor cannot conduct energy audits in all industries. Some have very good background of petrochemicals but not of cement industry. Similarly, some have good knowledge and experience of fertilizers but not of chloro-alkali industry. Also, some auditors can perform better audit of power generation, transmission and distribution but not of steam generation and distribution. So depending on the need of a client company, BEE can supply a list of parties suitable for the job. However, it is client’s responsibility to scrutinize the list further before issuance of tender documents.

- Tender submission process should be in two parts- viz. Unpriced and priced bid. Unpriced bid contains technical as well as commercial bid but without figures containing prices. It is normally noticed that bidders do not submit the bids exactly as per requirements. They do not agree to the scope of work in toto. They take some deviations to NIT terms and conditions. Therefore, to make all bidders “technically” at par with respect to services offered by them, clarifications form parties or discussions with them are required. Both the bidder and the client understand each others views and based on clarifications/ discussions whether the bidders are technically acceptable can be decided before priced bid opening. Contract negotiations and finalization of contract forms a contractual base to conduct an energy audit. Non-fulfillment of any term or condition can be considered as a breach in the eyes of law.

In the samples of barriers provided for the issue of this paper #EE09, there are five barriers under the category of “**Contract negotiation**”. These barriers can be grouped in two sub-categories as given below:

1. **Exploitation of expertise of reputed consultant by industries without compensation to arrive at a specific scope and further getting energy audit done through other agency.**

As mentioned earlier many industries- particularly in private sector, do not have adequate experience of preparation of scope of the audit. In such cases, the client requires engage a consultant for making scope and floating a tender. But normally consultant engaged for the job is himself interested in doing the audit. When the client requests for the budgetary proposal in order to get it approved from the top management, as a part of business

promotion, the consultant himself visits the client's plant and after discussing with plant people and visiting the site he makes a proposal to the client indicating the scope and methodology to be followed and the budgetary price the audit. If the budgetary price found to be higher than anticipated, the client contacts other consultants and get the job done through one of them at much lower price. However, this practice will not work always. In such process, the quality of the energy audit suffers. Therefore, any consultant should himself fix a limit of what he considers as business promotion expenses and what should be chargeable expenses for the service provided to prospective clients.

2. No standard payment terms or payment terms offered favour client (Likely loss due to impractical payment terms)

The terms of payment in an energy audit has an impact on the quality and timely completion of an audit. Generally payment terms should be linked to the progress of the job. It is difficult to measure the progress of the job on weekly or monthly basis. Therefore, the progress of the job is linked with the achievement of following milestones:

- a) Award of contract
- b) Visit of the consultant's team for collection of site data and discussion with plant personnel
- c) Preparation of the material and energy balance for the base case (existing operation)
- d) Preparation and submission of the draft report to the client for comments
- e) Preparation and submission of the final report.
- f) Implementation of the suggestions / schemes of energy savings.

The client prefers to get more work done than the payment made for. Contrary to this, the auditor requires some financial commitment from the client to go ahead with the job. Therefore, the auditor normally asks for 10 to 20% as an advance on award of the job. At the time of submission of proposal, the bidder/consultant must submit a time schedule for achieving each milestone and progress of the job. This will help in finalizing mutually agreed payments terms linked to milestones.

It is normally seen that on many occasions it takes very long time to get comments from client after submission of the draft report. Sometimes, the client deliberately avoids giving comments as already he received the details of the energy saving schemes/ suggestions. Therefore, some reputed energy auditors/ consultant include a clause related to the time for submission of comments by the client. For example, if comments on the draft report are not submitted within four weeks or 30 days, the auditor shall assume that there are no comments on the draft report from the client and on his own he will submit the final report to complete his contractual commitment.

Though clients prefer to include payment terms linked to implementation of schemes/ suggestions, it is experienced that the clients take very long time to take decision on implementation of schemes for various reasons such as financial constraints, likely changes in government policies on taxes and

duties, internal differences on the viability of schemes. Therefore, the consultant prefers to keep the implementation part outside the scope of the audit. He offers his services during implementation on chargeable basis. His fees for this portion may be on per diem basis or lump sum on the basis of schemes selected.

Considering all aspects regarding payment terms, it is recommended that standard payment terms may be as follows:

- 10 % advance payment after award of contract but before starting of the work.
- 20% on completion of site visit for collection of required data and discussions with energy management group/ plant personnel.
- 20% on submission of base case comprising of material and energy balance of existing operations.
- 30% after submission of the draft report for comments.
- 20% after presentation and submission of the final report.

Some fine variations can be done from case to case basis. However, if payment terms are simpler and linked to major milestones, it shall help both parties in completing the audit job smoothly..

After the award of the contract of energy audit, the auditor has to mobilize his team for the job by selecting a team leader (Project manager) and his deputies of different disciplines such as production, mechanical, electrical and instrumentation. If the audit is limited to a limited area, engineers of all disciplines mentioned above may not be required. The best beginning to start on the audit job is to have a meeting of both sides about methodology to be employed for the audit. The auditor prepares a questionnaire about the documents/data required and information to be collected from the client. To conduct a thorough audit, history and information on plant operation and maintenance of plant equipment is essential. Information submitted by filling the questionnaire gives the audit team an idea about different facilities to be seen during the site visit and to concentrate on areas where their attention to study energy saving methods is required.

The most important part about getting information of operation of utilities and main plants is the site visit. A thorough meaningful interaction with plant personnel and the audit team needs to take place during the visit of the team. From client's side, one coordinator is required to be appointed during the period of the audit job. Energy Manager or the head of Technical Services department is normally entrusted with the job. During the visit the audit team visits each plant area and get data on actual operating parameters maintained and carry out checks on some of the important parameters with their own portable instruments. The client's on-line instruments used for collection of data should be calibrated in order to avoid erroneous data. After visit to plant and discussions, a joint "Minutes of Meetings" (MoM) must be signed indicating the data collected by the auditing team, documents handed over, further data and/ or documents required by the auditing team. The coordinator from client's side must see that cooperation from all plant personnel is given to the audit team by supplying required information/ data.

In the list of barriers related to energy audit work in the field there are three cases. These barriers are:

- **Very little cooperation from plant operating personnel in getting details.**
- **Audit teams focus on the cause and not the effect during the plant study.**
- **Non-availability of process parameters for evaluating the efficiency.**

For overcoming the first barrier in the category, as pointed out earlier, the top management's visible commitment for the audit is necessary and the message must go down all the levels of the plant. Before, the audit teams visit the plant personnel must do their "good housekeeping jobs" themselves in order to avoid embarrassment of pointing out by the audit team. The data collected and observations by the audit team should be discussed with the plant personnel in positive manner before leaving the site.

Second barrier listed above in the category is due to lack of expertise of the auditor in the field of the industry. Some firm may be a new entrant in the field without proper resources including manpower, instruments to carry out the audit. Such barrier can easily overcome by selecting the party by following procedure of scrutinizing the energy audit firms for their capabilities, credentials, reference list of the jobs carried out by them and checking the satisfaction level of their customers. Since, BEE is now engaged in educating those who are interested in energy audit activities and accredit the agencies to carry out energy audit in different specialized areas, it should guide the clients interested in energy audit by supplying the required information on accredited energy audit agencies. Also, BEE can get feedback from customers about their satisfaction level about the audit conducted. It could help in evaluating the performance of all BEE accredited agencies and those agencies fall short in customers satisfaction may be guided to improve their performance or face the cancellation of accreditation. BEE can even consider giving a rating to each agency based on its performance during last three years.

It should be understood that assessing the performance of existing equipment and machineries, proper instrumentation is required. Instruments are eyes of the plant. Through them you operate the plant efficiently and safely. Good metering of fuel, steam, air, cooling water along with their pressure and temperature conditions will aid in making material and energy balance of different areas of the plant. In designing of a plant such instrumentation is normally provided by the designer. However, over a period of operation, some of these instruments start failing due to negligence in maintenance. Portable instrument normally brought by the audit team with them have limitations. If the data collected for constructing mass and energy balance is insufficient due to lack of instrumentation, analysis of the performance of the plant and equipment cannot be made accurately. Therefore, before site visit the audit team should submit a list of instruments to be made available with proper calibration by the client at the time of visit. Some instruments maybe installed temporarily.

Once the site visit is over and all the information/ data is made available by the client, the energy audit scrutinizes data and construct a material and energy balance of the plant. The audit team may take of offline simulation software like Aspen Plus (for chemical industry) to check the performance of the plant and equipment. Such software can be used for data validation and error smoothening. A material and energy balance made for each plant and section, based on the material and energy data collected, is called a "Base case" and it forms the basis of comparison of improved energy consumption with different energy saving schemes proposed by the auditor. The result of the "Base case" for each section/ plant should be submitted to the client for their comments and get his agreement with the result. This will avoid disagreement with the conclusions of the draft/ final report.

After material and energy balance for the "Base case" is made, different energy saving schemes can be suitably incorporated for the different cases to arrive at new material and energy balances. Some the schemes may be independent i.e. it is possible to implement them individually and get the projected energy savings e.g. steam trap replacement, steam leakages, optimizing operating parameters, downsizing of impellers of oversized pumps etc.. Some schemes may be interdependent i.e. in order to get the projected energy savings a total package of schemes is required to be implemented. Such schemes are needed substantial investments and have to be looked into carefully for their viability. Energy savings schemes once technically feasible,

financial criteria is then applied to select the most attractive schemes. The auditor should take care in selecting schemes for revamping measures, which involve high investment and revamping scheme should be tailor made as per requirement. Many times revamping scheme implemented successfully in one plant can fail due to different conditions of the plant. Long term schemes should be given with their likely time schedule for implementation.

There are following two barriers listed under the category of “Energy Audit Methodology”:

- **Due to wrong methodology used, the potential savings were shown more than the present actual power consumption in lighting.**
- **Air leakages accounted as 60% of the air flow, which was not palatable to plant operating personnel.**

Methodology used in the energy audit should be discussed with the client’s coordinator and should be practical and acceptable. Therefore preparation of the “Base case” based on actual operating data collected during site visit is very important. Once the “Base case” is accepted by the client, the projected incremental savings can be justified and the client will not have much hesitation in acceptance of the same.

After selecting short-term and long-term schemes, the auditor normally prepares a draft report and submit to the client for his comments. The team of engineers of the client studies the report and gives comments. The auditor may explain to the team of client about different schemes presented in the report and benefits thereof. For a comparatively audit of a large size plants involving a number of utilities such as steam and power generation, cooling water supply, inert gas generation, the client may require about a month’s time to scrutinize the draft report and submit his comments. However, some time the client delays submission for no reason. Minor delay by the client on account of raising queries about some missing information in the report can be justified. If the delay is intentional, the contractual clause related to submission of the final report considering the draft report is acceptable to the client since no comments were submitted to the auditor within one month should be used. This will entitle the auditor to claim the payment due against the milestone and protect interests of the auditor.

There are following eight barriers listed under the category of “presentation of results to client”:

- **Findings of the audit were not acceptable to the plant personnel as they felt that the auditor was pointing out their mistakes in operation.**
- **The audit firms draw conclusions on the basis of thumb rules, short cut methods, assumptions and approximations.**
- **The audit firm’s observations regarding housekeeping not acceptable to plant personnel.**
- **Non-involvement of plant personnel or poor inter-departmental coordination result into poor acceptance of the report.**
- **The approach of the auditor is too theoretical; plant personnel were not able to grasp the measures suggested.**
- **Long term and investment related measures are justified on the basis of payback period without detailed financial analysis.**
- **The report was not presented in organized and comprehensive manner, which gave a wrong impression about the quality of the audit.**
- **Lack of user friendly energy audit and simulation software for detailed analysis of energy losses and suggested improvement measures.**

If there is a proper coordination and involvement of plant personnel of the client at various stages of audit particularly during the audit team's site visit, preparation of the "Base case" and comments on the draft report, the plant people would will not show reluctance in accepting the measures and recommendations of the final report. The report should not use direct language in pointing out energy losses in existing operation due to fault of plant personnel. The language used in the report should be motivating to plant personnel. In some areas, where plant personnel have done some good jobs in improving energy efficiency, they should be appreciated and mentioned in the report.

Presentation of the final report should be well organized in different chapters. An "executive summary" should be presented in the beginning giving highlights of the reports including measures and recommendations for energy savings. General arrangement of the report should be made in the following format:

- i) Acknowledgement**
- ii) Executive Summary**

1.0 Introduction of the plant

- 1.1 Plant Description
- 1.2 Objective and scope of Energy Audit
- 1.3 Energy Audit Team
- 1.4 Existing Components of Production Cost
- 1.5 Areas of Energy Use

2.0 Process Description of Main plants and Utilities

- 2.1 Brief Description of Production Process
- 2.2 Major Unit Operations
- 2.3 Major Raw Material inputs - quantity and costs

3.0 Energy and Utility System Description

- 3.1 List of Utilities
- 3.2 Brief Description of each Utility
 - 3.2.1 Power
 - 3.2.2 Steam
 - 3.2.3 Water
 - 3.2.4 Compressed air
 - 3.2.5 Cooling water
 - 3.2.6 Chilled water

4.0 Material and Energy balance of existing operations

- 4.1 Methodology used in arriving at "Base Case"
- 4.2 Details of Material and Energy Balance for each section

5.0 Energy Efficiency in Utility and Process Systems

- 5.1 Specific Energy consumption
- 5.2 Boiler efficiency assessment
- 5.3 Furnace efficiency analysis
- 5.4 Cooling water system performance assessment
- 5.5 Power supply and distribution

- 5.6 Electric motor load analysis
- 5.7 Compressed air system performance
- 5.8 Lighting system

6.0 Energy Conservation options for different systems

- 6.1 Short term measures
- 6.2 Long term measures with Implementation Time Schedule.
- 6.3 Projected improvements in efficiencies
- 6.4 Projected savings

Annexures

- A-1 Process flow diagram of main plants
- A-2 Flow diagram for utilities
- A-3 Material and Energy balance Block diagram
- A-4 Worksheets for calculations of specific energy consumption, efficiencies, performance
- A-5 Brief specifications of energy saving equipment/ package
- A-6 Worksheets for financial savings projections
- A-6 List of instruments used
- A-7 List of software used.
- A-8 List of Vendors for equipment/ packages recommended.

The report should be easily readable and should be without complicated language jargons. It should clearly spell out recommendation on measures to be taken for energy savings and their benefits to the organization.

Implementation

All the efforts of energy audit ultimately has to culminate in implementation of recommended schemes/ measures for improving energy efficiency and achieving the goal of energy conservation. The plant should make an action plan to implement short term and long term measures. Short term measures requires the least investment, time and results are visible immediately after implementation. For long-term measures/ schemes, further detailing of the scheme may be required with the help of audit firm or some other agency experienced in designing of the proposed scheme.

There are **ten barriers listed under the category of “On the fly adjustment of technologies and equipment” and “implementation assistance**. While implementing a scheme, a thorough technical knowledge about the impact of the scheme is needed. Limited or only theoretical knowledge will not yield desired results. Normally, any company will invest in a long-term energy saving measures after in-depth technical and economic analysis. If it is not sure of the results, it will avoid investment. If the company invests on the basis of audit report and the recommended scheme fails due to improper implementation without involvement of the audit firm, the blame of failure goes to the audit firm. For long term measures involving high costs, a simple financial analysis like payback period, ROI may not be sufficient. In such cases financial analysis over the life cycle should be carried out to guide investment decision-making. Therefore, careful assessment with the help of technology supplier/ vendor is desirable.

The audit firm should remain in contact with the client and render all assistance required on chargeable basis. He should carry out post-implementation audit to evaluate the performance of

energy saving schemes implemented by the client. His involvement up to last stage of implementation will boost his own confidence in carrying out a successful energy audit and he will also get the credit for the job done from the client.

Conclusion

- The success of the energy audit depends on commitment of both parties involved viz. the company and the audit firm.
- The top management of the company should have a total visible commitment and support for the energy audit and the message should be passed to down level.
- Scope of the audit job should be clearly defined in order to avoid confusion.
- Payment terms should be based on achievement of important milestones.
- Plant personnel of the company should cooperate with the audit in providing required information / documents about the plant.
- The audit team must explain to plant personnel about the methodology followed in conducting energy audit.
- An agreement on the “Base case” prepared by the audit team should be reached before proceeding ahead with energy savings schemes to be proposed.
- Recommendations on energy saving schemes should consist of two parts: short- term and long-term measures.
- The report presentation should be simple but comprehensive. A time schedule for long-term measures may be included.
- Energy savings projected should be practical and achievable.
- BEE can play an important role in accreditation of energy audit firms and feedback about their performance. The audit firm for their own interest should get involved in implementation of recommended measures. It will improve their image.