Role and Needs of Energy Managers

Energy Manager basics:

The role of an Energy Manager (EM) involves facilitating energy conservation by identifying and implementing various options for saving energy, leading awareness programs, and monitoring energy consumption. As such, EMs play a critical role in the successful implementation of energy conservation and demand management programs within the industry.

- ✔ Saving Energy
- ✔ Annual Savings Targets
- ✔ Reporting
- ✔ Quarterly Report Reviews
- ✔ Annual Reviews

Role and Needs of Energy Managers

Saving Energy:

EM duties revolve around the identification, reporting and implementation of energy savings opportunities. For quick reference, the responsibilities identified in the EM Agreement are summarized below:

- ✔ Electrical Energy Saving Project Implementation
- ✔ Energy Tracking & Monitoring
- ✔ Primary Assessment
- ✔ Maintenance and Operating Schedules
- ✔ Energy Savings Opportunities & Action Plan
- ✔ Measurement & Verification Strategy
- ✔ Energy Management Behaviour and Business Process Improvements
- ✔ Employee Awareness Programs
- ✔ Assistance to IESO Projects
- ✔ Reporting

Role and Needs of Energy Managers

Annual Savings Targets:

- EMs must meet two targets as laid out in the IAP Energy Manager Funding Agreement:
  - ✔ Minimum 2,000 MWh Annual Savings Target
  - ✔ Minimum 10% of Annual Savings Target attributed to Projects not financed by IESO incentives (non-incented)
- Understanding that it can be challenging to reach the targets in the first year of the agreement, if the EM does not meet the Annual Savings Target in the first twelve month period of the Agreement, the shortfall will be added to the Annual Savings Target for the second twelve month period. There is no adjustment in the maximum funding amount if some of the missed target in the first year is carried over to the second year. And the transfer of the target is only available in the first year.
- Performance will be assessed based on Quarterly Reports submitted by EMs.

Role and Needs of Energy Managers

Reporting:

- Energy management activities and conservation measures must be reported in Quarterly Reports. Quarterly Reports are submitted to the IESO for review and approval under the EM Funding Agreement.
- As part of the reporting requirements under the EM Funding Agreement, EMs are required to prepare the following reporting documents:
  - ✔ Quarterly Reports within 30 days of the end of each quarter.
  - ✔ EMs are encouraged to provide the Quarterly Reports as close to the end of each quarter as possible.
  - ✔ It is recommended that the Quarterly Report be maintained as a living document and used for project tracking purposes, such that it can be provided to the IESO at any time, without need of significant updates.
  - ✔ An Energy Management Plan (EMP) for each Facility occupied by the Participant, no later than six (6) months after the EM's employment start date, unless an EMP already exists.
  - ✔ An updated EMP is required for each subsequent twelve (12) month term.
  - ✔ It is highly recommended that Energy Managers make use of the Quarterly Report Template.

Role and Needs of Energy Managers

Quarterly Report Reviews:

- Each Quarterly Report will be reviewed by the IESO's Technical Reviewer so that the likelihood of targets being met can be assessed.
- Mid-term technical review of non-incented Measures can be valuable to IESO accounting.
- Quarterly Reports should include all Measures to date, including those in previous reports and those that have been reviewed.
- Quarterly Reports should also include Projects planned for the next term that show the potential to meet the next term's targets.

Annual Reviews:

- At the end of the fourth quarter of each EM term, an annual review will be performed by the IESO's Technical Reviewer to determine whether targets have been met.
- The annual review is based on the fourth Quarterly Report, which should identify all Projects that are complete and in-service such that they can be counted towards the current term's Annual Savings Target.

Role and Needs of Energy Managers

Technical Review of Non-Incented Savings:

Technical review of non-incented savings are conducted as the pre and post project information becomes available. This review may occur during a Quarterly Report review or the Annual Review.

- During the Quarterly & Annual Review process for EMs, the IESO's Technical Reviewer will perform a technical review of significant non-incented projects in order substantiate and verify the reported savings.
- For all other non-incented savings, the IESO's Technical Reviewer will still perform a high level check to ensure that the reported savings are reasonable and to assign a persistence value.
- In order to enable the review of non-incented projects, it is recommended that additional documentation be maintained, such as spillover forms, supporting calculations, operating conditions and technical specifications for pre and post project equipment.
- In addition, it is also recommended that pre and post project Measurement and Verification (M&V) be conducted for non-incented projects, where feasible, to provide support for the claimed energy savings.
  - ✔ The best support of any project is robust pre-project and post-project power consumption data as collected with power meters or similar instrumentation.
  - ✔ IPMVP-level M&V may not be warranted, but reasonable M&V should be performed for the benefit of internal project management, as well as IAP reporting.
  - ✔ An M&V strategy for ALL substantial projects is a characteristic of successful energy management and a proven strategy for gaining management buy-in.

Instruments for Energy auditing

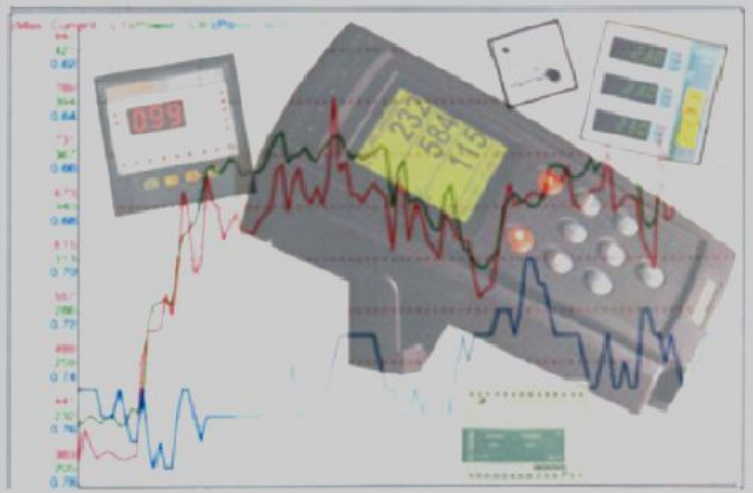
The requirement for an energy audit is to identify and quantify where energy is being used necessitates measurements. These measurements require the use of instruments. The basic instruments used in energy audit work are listed below. These instruments are portable, durable, easy to operate and relatively inexpensive.

Key Performance Parameters for Energy Audit

Basic Electrical Parameters in AC & DC systems – Voltage (V), Current (I), Power factor, Active power (kW), Maximum demand (kVA), Reactive power (kVAr), Energy consumption (kWh), Frequency (Hz), Harmonics, etc.

Parameters of importance other than electrical such as Temperature and Heat Flow, Radiation , Air and Gas Flow, Liquid Flow, RPM , Air Velocity, Noise and Vibration, Dust Concentration, TDS, PH, Moisture Content, Relative Humidity, Flue Gas Analysis – CO_2, O_2, CO, SO_x, NO_x, Combustion Efficiency etc.

Instruments for Energy auditing



Electrical Measuring Instruments:

These are instruments for measuring major electrical parameters such as KVA, KW, PF, Hertz, KVAr, Amps and Volts. In addition some of these instruments also measure harmonics.

These instruments are applied on-line i.e. on running motors without any need to stop the motor. Instant measurements can be taken with hand-held meters, while more advanced ones facilitates cumulative readings with print outs at specified intervals.

Some precautions and safety measures:

To avoid short circuits and potentially life-threatening hazards, never attach the clamp to a circuit that operates at more than the maximum rated voltage, or over bare conductors.

While using the instrument, use rubber hand gloves, boots, and a safety helmet, to avoid electrical shocks, and do not use the instrument when hands are wet.

Instruments for Energy auditing

Fyrite:

In this, a hand bellow pump draws the flue gas sample into the solution inside the fyrite. Thereafter, a chemical reaction changes the liquid volume that reveals the amount of gas percentage. Oxygen or CO_2 can be read from the scale. The FYRITE employs the well-known "Orsat method of volumetric analysis" using chemical absorption of a sample gas such as carbon dioxide or oxygen. The reagent used to absorb carbon dioxide (CO_2) is potassium hydroxide (dyed red), and chromous chloride (blue) is the absorbent for oxygen (O_2). The unique feature of the FYRITE is that the absorbing fluid is also used as the indicating fluid so that one vessel takes the place of both measuring burette and absorption pipette.

Fuel Efficiency Monitor:

This measures Oxygen and temperature of the flue gas. Calorific values of common fuels are fed into the microprocessor which calculates the combustion efficiency.

Instruments for Energy auditing

Combustion Gas Analyzer:

This instrument has in-built chemical cells which measure various gases such as CO_2, CO, NO_X, SO_X etc.

Gas analyzers are flexible in what must be measured depending on the requirements of the customer/user.

They have specific sensors sealed inside the equipment that can be changed to measure the different components in the gas. But because a maximum of two sensors can be connected, only two or three parameters can be measured at one time.

It is light and easier to handle compared to the fuel efficiency monitor.

Instruments for Energy auditing

Manometer with Pitot Tube:

Digital flexible membrane manometer is used for measuring pressures in air ducts carrying exhaust flue gases (boiler, furnaces), or air from fans and blowers.

- To measure pressure in air pipes, manometers must be used in combination with a pitot tube
- Attach flexible rubber tubes to the inlet and outlet probes of the manometer. Tighten these to ensure that there is no leakage of air.
- Attach these two tubes to the ends of the pitot tube
- Make a 6-cm monitoring hole in the duct or pipeline
- Insert the pitot tube into the monitoring hole

Instruments for Energy auditing

	**Contact Thermometer:** These are thermocouples which measures for example flue gas, hot air, hot water temperatures by insertion of probe into the stream. For surface temperature a leaf type probe is used with the same instrument.
	**Non Contact Infrared Thermometer**: Infrared thermometers calculate the amount of thermal radiation (infrared radiation) emitted from the object. By knowing the emissivity of the object and the amount of infrared energy emitted by the object, the object's temperature can be determined. With the help of infrared thermometers, temperatures of the objects placed in hazardous or hard-to-reach places or other situations can be determined. The most common design of a IR thermometer consists of a lens to focus the infrared energy on to a detector. The detector changes the energy to an electrical signal that can be shown in units of temperature after being corrected for ambient temperature variation.

Instruments for Energy auditing

Ultrasonic Flow Meter:

This is one of the popular means of non-contact flow measurement. There are two main types of ultrasonic flow meters: Transit time and Doppler. Transit time ultrasonic meters have both a sender and a receiver. They send two ultrasonic signals across a pipe: one traveling with the flow and one traveling against the flow.

The ultrasonic signal traveling with the flow travels faster than a signal traveling against the flow. The ultrasonic flow meter measures the transit time of both signals. The difference between these two timings is proportional to flow rate.

Transit time ultrasonic flow meters usually monitor clean liquids. Doppler ultrasonic flow meters measure dirty liquids. They compute flow rate based on a frequency shift that occurs when their ultrasonic signals reflect off particles in the flow stream.

Instruments for Energy auditing

Tachometer

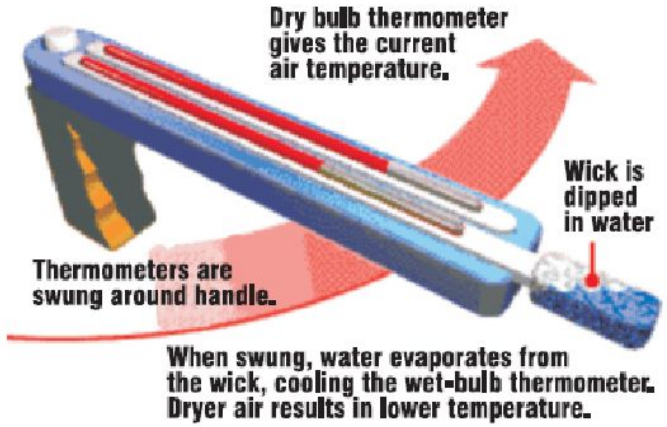
Stroboscope

Speed Measurements:

In any audit exercise speed measurements are critical as they may change with factors such as frequency, belt slip, loading, etc. A simple tachometer is a contact type instrument, which can be used where direct access is possible.

More sophisticated and safer ones are non contact instruments such as stroboscopes. A stroboscopic light source provides high-intensity flashes of light, which can be caused to occur at a precise frequency. When this light source is made to fall on an object with periodic motion it appears that the motion is slowed down, or stopped when both the frequencies bear a definite relationship. A stroboscope uses this principle for measurement of RPM.

Instruments for Energy auditing



Psychrometer:

A sling psychrometer - consists of two thermometers mounted together with a handle. One thermometer is ordinary and measures the dry bulb temperature. The other has a wet cloth wick, over its bulb and is called a wet-bulb thermometer. When a reading is to be taken the psychrometer is whirled around. The water evaporates from the wick, cooling the wet-bulb thermometer. Then the temperatures of both thermometers are read. If the surrounding air is dry, more moisture evaporates from the wick, cooling the wet-bulb thermometer more, so there is a greater difference between the temperatures of the two thermometers. By using these temperatures the humidity is computed.

Instruments for Energy auditing

Lux Meters:

A light sensitive cell measures the incident light (all light in the visible spectrum is measured) and evaluates that against the human daylight sensitivity curve. The resulting value is the measurement result in lux. This works well but it requires a different correction factor for every light spectrum.

The much more expensive lux meters with one cell are optimized and tuned with optical filters and lenses such that the sensitivity of this set of lenses and the cell itself directly matches the eye's light sensitivity curve (so only one correction value needed for light of any spectral content).

Instruments for Energy auditing

Smart Energy Meters

The term smart meter usually refers to electric meters which keep detailed statistics on usage, but it can be used for fuels or water applications as well performing the same job. The primary purpose of smart meters is to provide information on how end users use their electricity on a real-time basis. The smart energy meters use a wireless communication to help track the electricity consumption and thus save both electricity and money. It can be easily installed and gives an accurate reading of electricity consumption which can also be monitored / controlled through mobile or internet.

Instruments for Energy auditing

Thermography

Infra-red thermal monitoring and imaging (non-contact type) measures thermal energy radiation from hot/cold surfaces of an object and provides input for assessing health of equipment and predictive maintenance.

The thermal camera unit converts electromagnetic thermal energy (IR) radiated from an object into electronic video signals. These signals are amplified and transmitted via interconnected cable to a display monitor where the resulting image is analysed and interpreted for hot/cold spots.