



Energy Management Centre - Kerala  
Thiruvananthapuram 695 017

### **Abstract**

Energy Management Centre – Detailed Energy Audit in Industries category –  
Deposit work - Orders issued - Reg

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No. EMC/227/2024-ETB-1 (EED)

Dated 08-10-2024

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Read: 1) G.O.(Rt) No. 2/2011/PD dated 01-01-2011

### **ORDER**

Government of Kerala as per order read as 1 has made energy audit mandatory for all HT/EHT consumers to regulate energy consumption. Energy Management Centre -Kerala is the nodal agency for implementing the audit scheme in the State. For conducting an energy audit, except for Designated Consumers, Energy Management Centre-Kerala had empanelled energy audit firms.

Energy Management Centre - Kerala (EMC) is releasing guidelines for conducting detailed energy audits of industries within the State. These audits are commissioned as deposit work, with fees determined by the contract demand mentioned in the electricity bill of the respective industry. The scope of the energy audit is predefined, outlined alongside the guidelines, and strictly adhered to by the auditing firm throughout the process, from field study to report preparation. Upon receiving the work order, EMC commits to completing the field study within 30 days. Subsequently, within 15 days of concluding the field study, EMC submits a draft report to the consumer. Consumers are encouraged to review the draft report and provide their feedback within 15 days of receiving it. Once the comments are received, EMC incorporates them into the final energy audit report. This final report, enriched with consumer input, is then promptly delivered to the consumer. The consumer has to remit 100% of the energy audit fee as advance for the conduct of the energy audit.

#### **Energy Audit in Industries (High Tension (HT) Consumer)**

The proposed fees for carrying out detailed energy audit at High Tension industries according to the contract demand (kVA) of the industry is as below.

Industries having Contract Demand up to 100 kVA	Rs. 45,000
Rate per kVA for the Contract Demand (kVA) exceeding 100 kVA and Maximum of 1500 kVA	Rs. 170 per kVA
GST @ 18% will be charged as extra.	

These rates are valid for industries having a contract demand up to 1500 kVA.

**Discount:**

Flat 10% discount on energy audit fee will be provided to Government Institutions/ Departments for carrying out energy audit at their facilities. This offer operates on a first-come, first-served basis and is available to a limited number of consumers.

**Certificate of Energy audit:** A certificate of energy audit will be provided to consumers who successfully conduct an energy audit under this scheme at no charge. Consumers who have conducted energy audits outside the scheme are also eligible to receive the certificate upon payment of Rs. 1000.00/- to the EMC bank account.

**EMC account details:**

Account Name: Energy Management Centre

Account Number: 32860100005883

Bank: Bank of Baroda, Ulloor Branch

IFSC Code: BARB0ULLOOR

GST No: 32AAATE1024A1ZU

Dr. R. Harikumar

Director

Copy to:

1. Joint Director
2. Registrar
3. Head, NMEEE & DSM Division
4. Accounts Officer
5. Secretary to Director / Stock File
6. Files

7. To all EMC Empanelled energy audit firms

### **SCOPE OF THE WORK**

#### **Detailed Energy Audit in Industries (HT Consumers)**

The scope of the work includes a detail study for energy conservation options of various energy sources like Electricity and Thermal Sources like HSD, LPG, Biogas etc. in the building and recommends actions for reducing the same. The Energy Auditor shall conduct 1 hour awareness training programme to the facility based on the findings of Energy Audit.

The broad scope of the study will be as per the following.

- A. Review of present electricity, thermal sources & estimation of energy consumption in various load centers like lighting, Air-Conditioning, Water Pumping, Office Equipment, Inverter / UPS etc.
- B. **Electrical Distribution System**
  - a. Review of present electrical distribution like Single Line Diagram (SLD), transformer loading, cable loading, normal & emergency loads, electricity distribution in various areas / floors etc.
  - b. Study of Reactive Power Management and option for power factor improvement.
  - c. Study of power quality issues like Harmonics, current unbalance, voltage unbalance etc,
  - d. Exploring the feasibility of Energy Conservation measures
  - e. Options (ENCON) in electrical power distribution system.
  - f. Study of Power Quality problems and correlation with Reactive power management, Energy losses etc.
- C. **Lighting System**
  - a. Review of present lighting system, lighting inventories etc.
  - b. Estimation of lighting load at various locations like different floors, outside (campus) light, pump house and other important locations.
  - c. Detail lux level survey at various locations and comparison with acceptable standards.

- d. Review Lighting arrangement.
- e. Study of present lighting control system and recommend for
- f. Improvement.
- g. Analysis of lighting performance indices like Lux/m, lux/watt, lux/watt/m and comparison with norms of high rise buildings.
- h. Exploring the Energy Conservation Options (ENCON) in lighting System.

#### **D. Heating, Ventilation & Air-Conditioning System (HVAC system)**

- a. Review of present HVAC system like Central Airconditioning system, VRF Airconditioning, window AC, split AC; package AC, Water Coolers, and Air Heaters etc.
- b. Performance assessment of VRF Systems, window AC, Split AC and Package AC systems.
- c. Performance Assessment of Chillers, Cooling Towers, Air Handling Units (AHUs) and cold insulation system of central AC.
- d. Analysis of HVAC Performance like estimation of Energy Efficiency Ratio (EER i.e. KW/TR), Specific Energy Consumption (SEC) of Chilled Water Pumps, Condenser Water Pumps, AHUs etc and comparison of the operating data with the design data.
- e. Analysis of Range and Approach of Cooling Towers
- f. Exploring the Energy Conservation Options (ENCON) in HVAC System.

#### **E. Diesel Generator (DG) Sets**

- a. Review of DG set operation schedules
- b. Performance Assessment of DG sets in terms of Specific Fuel Consumption (SFC i.e. KWh/Litres),
- c. Estimate the Energy Consumed in kCal.
- d. Exploring the Energy Conservation Options (ENCON) in DG
- e. Sets.

#### **F. Water Pumping System**

- a. Review of water pumping, storage and distribution systems.
- b. Performance assessment of all major water pumps i.e. power consumption vs. flow delivered, estimation of pump efficiency etc.
- c. Exploring the Energy Conservation Options (ENCON) in Water Pumping System.

#### **G . Thermal Energy Systems (Boilers, Heaters, Furnaces, Thermic Fluid Heaters etc.)**

### 1. **Performance assessment of thermal systems:**

- Evaluation of the efficiency of boilers, thermic fluid heaters, and furnaces.
- Measurement of parameters such as fuel consumption, combustion efficiency, and heat losses through flue gases and radiation.

### 2. **Energy conservation measures for thermal systems:**

- Identification of opportunities to improve the performance of thermal systems, such as improving insulation, recovering waste heat, and upgrading burners or controls.
- Recommendations for fuel switching or incorporating renewable thermal technologies like solar water heating systems.

## **H. Motor Load Survey**

- a. Conducting the motor load survey of all drives to estimate the percentage loading.
- b. Exploring the ENCON options in electric drive system.

## **I. Compressed Air System**

### 1. **System audit:**

- Detailed study of the compressed air system, including compressor operation, leakage identification, and air distribution network assessment.

### 2. **Energy conservation measures:**

- Recommendations for reducing energy consumption, such as fixing air leaks, optimizing compressor size, and installing energy-efficient compressors.
- Feasibility of heat recovery from compressed air systems.

## **J. Motor and Drive System**

### 1. **Motor load survey:**

- Conducting a motor load survey to assess the loading of major motors in the facility.
- Estimating the energy consumption of motors and analyzing operational efficiency.

### 2. **Energy conservation measures for motors:**

- Recommendations for optimizing motor operation, retrofitting with high-efficiency motors, and installing

variable frequency drives (VFDs) to reduce energy consumption.

## **K. Steam System**

### **1. Performance evaluation:**

- Analysis of steam generation, distribution, and end-use, including steam leaks, insulation losses, and steam trap performance.

### **2. Energy conservation opportunities:**

- Recommendations for optimizing the steam system, improving insulation, recovering condensate, and utilizing waste heat.
- Evaluation of opportunities for using alternative energy sources or waste heat recovery.

## **L. Waste Heat Recovery Systems**

### **1. Analysis of waste heat sources:**

- Review of the potential for recovering waste heat from exhaust gases, cooling systems, and other processes.

### **2. Recommendations for heat recovery systems:**

- Proposing solutions for waste heat recovery, such as the use of heat exchangers, cogeneration, or combined heat and power (CHP) systems.

## **M. Energy-Efficient Process Optimization**

### **1. Process optimization review:**

- Study of industrial processes to identify inefficiencies and energy wastage.

### **2. Energy conservation measures for processes:**

- Recommendations for optimizing process parameters, upgrading to energy-efficient technologies, and incorporating automation and control systems to reduce energy consumption.

## **N. Energy Monitoring & Accounting System**

- a. Detail review of present energy monitoring & accounting system in terms of metering, record keeping, data logging, periodic performance analysis etc.
- b. Recommend for effective energy monitoring & accounting system.

## **O. Others**

- a. Review of present maintenance practice, replacement policies and

building safety practices as applicable to high rising buildings and recommend for improvements.

- b. Cost-Benefit Analysis of each ENCON options indicating simple pay back period, return on investment (ROI), internal rate of return (IRR).
- c. Preparation of Detail Project Report and submission of the same to Building owner.
- a. **Renewable energy integration**  
Potential for Renewable energy applications, such as Solar thermal, Solar-PV, Biogas, Waste-to-energy, with cost-benefit analysis and savings on commercial energy
- l. **E- Mobility adaptation**  
Potential for E-Mobility adaptation, by switching over to Electric Cars, installing EV Charging stations etc.

## **DELIVERABLES IN THE DETAIL PROJECT REPORT (DPR)**

### **The DPR should contain the following information:**

- Methodology adopted for the study.
- Present energy scenario of the building.
- Detail analysis of the data obtained through field visits, trial measurements by portable gadgets, discussion with concerned personnel etc.
- Recommendations for energy saving options in all possible areas with cost-benefit analysis.
- Technical Specifications for any retrofit options,
- List of suppliers / manufacturers of energy efficient technologies.

**Conduct of Energy Audit – Compliance with safety, health, hazards, accidents, damage, loss prevention and environmental standards, rules, regulations, accepted practices and similar statutes.**

#### v. **Energy Audit Firm:**

It is the sole responsibility of the energy audit firm (who has been awarded the assignment of conducting energy audit) to ensure compliance, in its entirety, with the concerned and applicable standards, rules, regulations and accepted practices pertaining to the Occupational Safety and Health Hazard, accidents, damages, loss prevention, Environmental aspects, and other similar statutes. This shall cover its own personnel, employees, properties,

instruments, tools and equipment, systems and all those associated with the energy audit activities within the plant/factory/building/facility/and-or any such premises, as applicable.

v. **The energy audit facility:**

It is the sole responsibility of the client company (whose facility is energy audited) to ensure that competent/qualified/certified personnel of the client company shall only extend the coordination and support to the energy audit team for the smooth conduct of energy audit, issue access permits, provide adequate office and storage space, ensure safe working place and conditions, provide data and drawings, extend field assistance and guidance to conduct instrumented trails and measurements and any or all such and similar needs and necessities to accomplish the energy audit.

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**Contents of Energy Audit Report**

- i. **Acknowledgement**
- ii. **Contents**
- iii. **Certification**
- iv. **Executive Summary** – The Executive Summary shall include tabulation of all the Energy conserving recommendations in abstract including specifications, capital investment, annual energy savings, annual return on monetary savings, simple pay-back period.
- v. **Introduction** – This chapter shall include Introduction about EMC and only basic details of the building, its purpose of use, building plan, number of occupants, built up area, type of business, Annual Energy consumption, Annual Energy cost, Energy cost as a percentage of annual expenses, preferably in tabular format, Energy share in pie-chart format etc.
- vi. **Energy & Utility Description** – This chapter shall include the details of Electricity supply, provider, tariff category and slab, sanctioned connected load, measured connected load, 24 Hours Load Curve, maximum demand, etc. preferably in tabulated form, details of Electrical Panels and Distribution Boards / Single Line Diagram approved latest by Kerala State Electrical Inspectorate, details of highest capacity loads,



Load Matrix mapping distribution of various loads area wise arriving total quantity, load and energy consumption, Breakup / Piechart of different Electrical loads – both areawise and categorywise, Breakup / Pie chart of different Energy consumption – both areawise and categorywise

- vii. **Energy Performance** – This chapter shall include the tabulation of Measured Annual Energy consumption – Electrical, Thermal, Total, Annual Energy Cost, Measured Specific Energy Consumption (kWh/production), Measured Energy Performance Index (kWh/sqm), Measured Breakup of Energy – Thermal & Electrical, source wise etc.
- viii. **Climate Impact** – This chapter shall include the tabulation of annual energy carbon footprint – source wise, carbon offsets from any source available etc., graphs etc.
- ix. **Energy Performance Assessment of Major Equipments** – This Chapter shall include Energy Efficiency and Loading assessment of highest rated and key equipments in the facility
- x. **Power Quality Assessment** – This Chapter shall include a tabulation of major power quality issues analyzed including the order of voltage and current harmonics upto 15<sup>th</sup> in case of normal buildings and 25<sup>th</sup> in case of hospitals, Voltage THD, Current THD, Voltage Flicker, Voltage Dips and Swells, Over and Under Voltage, Frequency deviation, Distortion PF, Transformer derating factor, standard graphs etc.
- xi. **Thermal Imaging Study** – This chapter shall include the thermal imaging study of loose contacts and overloading of Electrical Busbars and switchgear, Motors, Capacitors, Heat infiltration through roof, leakages etc.
- xii. **Recommendations for Energy Conservation** – This chapter shall include detailed Energy savings calculations of items mentioned in Executive Summary clearly showing pre and post fitted – watts, numbers, working hours, energy consumed, daily energy savings, annual energy savings, annual monetary savings, annual investment, annual carbon offset, simple payback period. The recommendations must be classified as Energy Efficiency measures, Renewable Energy integration, E-Mobility adaptation and behaviour Change initiatives.
- xiii. **Energy Policy** – This chapter shall include draft energy policy that the management shall follow to work towards ISO 50001.
- xiv. **Annexure I - Load Matrix** mapping distribution of various loads area wise arriving total quantity, load and energy consumption

- xv. **Annexure II – Electricity Bills** ( Latest Detailed Bill downloaded from utility website )
- xvi. **Annexure III** – Data obtained from instruments including plots
- xvii. **Annexure IV – Standard Data** – shall include the value of standard watts of fittings, cost of fittings recommended, conversion of physical quantities etc.
- xviii. **Annexure V** – Name plate details of major energy consuming equipments
- xix. **Annexure VI – Vendor details** - Details of multiple vendors and contact details who can supply the equipment mentioned in Recommendations for Energy Conservation.

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