DRAFT REGULATIONS

Manner and Interval of Time for Conduct of Energy Audit

In exercise of the powers conferred by clause (l) and (s) of Section 10 and Section 21(1) of the National Energy Efficiency and Conservation Act, 2016 (XXX of 2016), the Federal Government, in consultation with the National Energy Efficiency and Conservation Authority, hereby make the following regulations, namely:

1. Short title and commencement. - **(1)** These rules may be called the National Energy Efficiency and Conservation Authority (Manner and Interval of Time for Conduct of Energy Audit) Regulations, 2018.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. Definitions. - **(1)** In these rules unless the context otherwise requires,

(a) "Act" means the National Energy Efficiency and Conservation Act, 2016 (XXX of 2016)

(b) "energy audit report" means the report of energy audit submitted under regulation 3 and signed by the accredited energy auditor;

(c) "Form" means a form appended to these regulations.

(d) "specific energy consumption" means the average of energy consumed per unit of product or product-mix for the completed financial year.

(2) Words and expressions used herein and not defined but defined in the Act shall have the meanings respectively assigned to them in the Act.

3. Intervals of time for conduct of energy audit-(1) Every designated consumer shall have its first energy audit conducted, by an accredited energy auditor within 18 months of the notification issued by the Federal Government under clause (i) of section 10 of the Act.

(2) The interval of time for conduct and completion of subsequent energy audits shall be **three years** with effect from the date of submission of the previous energy audit report by the accredited energy auditor to the management of the designated consumer.

4. Manner of energy audit. - Every energy audit under the Act shall be conducted in the following manner: -

(1) Verification of data of energy use. - The accredited energy auditor shall

(a) verify the information submitted to the designated agency under the National Energy Efficiency and Conservation Authority (Form and Manner and Time for Furnishing Information with Regard to Energy Consumed and Action Taken on Recommendations of Accredited Energy Auditor) Rules, 2018 for the previous two years through examination of energy bills, production data, inspection of energy-using equipment, production-processes. and systems, spot measurements, discussion or interview with the officers and staff regarding operation of plants, energy management procedures, equipment maintenance problems, equipment reliability, projected equipment needs, improvements undertaken or planned, establish validated data on annual energy consumption and prepare a report in Form 1 for the year preceding to the year for which energy audit report shall be prepared and submitted;

(b) establish specific energy consumption for the year referred to in clause (a);

(c) disaggregate the energy consumption data and identify major energy using equipment, processes and systems.

(2) Scope of energy audit-The accredited energy auditor jointly with the energy manager of the designated consumer shall-

(a) develop a scope of work for the conduct of energy audit required under the Act with a view to ensuring adequate coverage in terms of the share of total energy use that is covered in the energy audit;

(b) select energy intensive equipment or processes for energy auditing;

(c) agree on best practice procedures on measuring the energy efficiency performance of selected equipment and on algorithm to estimate energy performance and energy savings;

(d) collect energy consumption, and production data for the equipment and processes covered within the scope of energy audit, operating data, and schedule of operation, non-proprietary process flow charts, production level disaggregated by product, if applicable, and such other historical data as may be considered essential by the accredited energy auditor for achieving the purpose of energy audit.

(3) Monitoring and analysis of use of energy data for energy audit. - The accredited energy auditor shall-

(a) verify the accuracy of the data collected in consultation with the energy manager, appointed or designated by the designated consumer in terms of the notification number xxxx, dated the xx-xx-xxxx, as per standard practice to assess the validity of the data collected;

(b) analyze and process the data with respect to-

(i) consistency of designated consumers' data monitoring compared to the collected data;

(ii) recommendations to reduce energy consumption and improve energy efficiency;

(iii) summary overview of energy consumption in plant or establishment by fuel type and by section;

(c) conduct equipment energy performance measurements with due diligence and caution.

(**4) Preparation of recommendations on energy saving measures, their cost benefit analysis**-The accredited energy auditor having regard to the overall efficiency of the production process, techno-economic viability of energy saving measures, site conditions and capacity of the designated consumer to invest for their implementation, shall prepare a list of recommendations to save energy and the list shall include-

(a) a brief description of each recommended measure;
(b) the estimated energy saving as well as energy cost reduction potential over a reasonable technical or economic life of the measure
(c) any known or expected technical risk associated with each measure
(d) a preliminary assessment of financial attractiveness of each measure or assessment of maximum investment feasible based on the estimated energy cost saving. potential over the life of the measure
(e) tabulated summary of recommendations listed as per their implementation schedule (short, medium and long term)
(f) where different alternatives for implementation of an energy efficiency measure are available, the accredited energy auditor shall examine and discuss Sum options and recommend the techno-financially better option.
(g) where the installation or implementation of any recommended energy saving measure after is procedures for operation and maintenance, staff deployment and the budget, the recommendation shall include discussion of such impacts including their solutions.

5. Prioritization and preparation of action plan (1) The accredited energy auditors jointly with the energy manager shall select from the energy audit report such recommended measures as are included in sub-regulation (4) of regulation 4 which in the opinion of the designated consumer are technically viable, financially attractive and within its financial means, prioritize them and prepare plan of action for their implementation and this action plan shall include-

(a) preparation of detailed techno-economic analysis of selected measures;

(b) a monitoring and verification protocol to quantify on annual basis the impact of each measure with respect to energy conservation and cost reduction for reporting to Authority

(c) a time schedule agreed upon by the designated consumer of selected measures taking into consideration constraints such as availability of finance and availability of proposed equipment.

(2) The accredited energy auditor based on the activities undertaken under sub-regulation (4) of regulation 4 and regulation 5 shall submit a report in **Form 2** to the management of the designated consumer.

(3) The accredited energy auditor shall evaluate the implementation of each recommended energy saving measure in the previous audit report and submit a report in **Form 3** to the management of the designated consumer.

6. Structure of the energy audit report-(1) The energy audit report structure shall be jointly decided by the accredited energy auditor and designated consumer.

(2) The energy audit report shall highlight, details of specific energy consumption, list of recommendations to reduce energy consumption and costs, monitoring and evaluation of impact of selected measures and conclude with certification by accredited energy auditor stating that

(a) the data collection has been carried out diligently and truthfully;

(b) all data monitoring devices are in good working condition and have been calibrated or certified by approved or authorized agencies and no tempering of such devices have occurred

(c) all reasonable professional skill. care and diligence have been taken in preparing the energy audit report and the contents thereof are a true representation of the facts

(d) adequate training provided to personnel involved in daily operations after implementation of recommendations; and

(e) the energy audit has been carried out in accordance with these regulations, and the format for the preparation of energy audit report is given in **Form 4** for guidance.

(3) The accredited energy auditor shall highlight the strengths and weaknesses of the designated consumer in the management of energy and energy resources in the energy audit report and recommend necessary action to improve upon method of reporting data, energy management system in detail along with their underlying rationale, and improving energy efficiency and reducing energy consumption in the designated consumer.

(4) The accredited energy auditor shall sign the energy audit report under the seal of its firm giving all the accreditation details along with details of manpower employed in conducting the energy audit.

(5) The energy audit report shall include a work schedule sheet duly signed by accredited energy auditor and energy manager of the designated consumer.

FORM 1

Details of Validated data on Energy consumed and specific energy consumption per unit of production

[Regulation 4(1) (a) and (b)

1	Name of the Unit				
2	The Industrial Sector to which unit falls				
3 (a)	Complete address of Unit's location (including Chief Executive's name & designation) with mobile, telephone, fax nos. & e-mail.				
(b)	Year of Establishment				
4	Registered Office address with telephone, fax nos. & e-mail				
5	Name, designation, address, mobile, telephone, fax nos. & e-mail of contact person.				
6	**Production and capacity utilization details**				
Year	**Main Product**	**Units** (Please specify)	**Installed Capacity (a)**	**Actual Production (b)**	**% Capacity Utilization (b/a) x 100**
	Product 1 Product 2 etc				
Year 20xx – 20xx					
7.0	**Energy Consumption and cost**	**Year 20xx – 20xx**			
7.1	***Electricity Consumption and cost***				
(A)	***Purchased Electricity***				
(i)	Units (Million kWh/ year)				
(ii)	Total Cost (Rs. Million/ year)				
(iii)	Plant Connected Load (kW)				
(iv)	Contract demand (kVA) with utility				
(v)	Connected load (kW)				

		Year 20xx – 20xx	
(B)	***Own Generation***		
(a)	**Through DG sets**		
(i)	Annual generation (Million kWh/ year)		
(ii)	Total Cost (Rs. Million/ year)		
(iii)	Fuel used (HSD/ LDO/ LSHS/LSFO)		
(iv)	Gross calorific value (kCal/kg)		
(v)	Annual fuel consumption (tons)		
(vi)	Total annual fuel cost (Rs.Million)		
(b)	**Through Steam turbine/generator**		
(i)	Annual generation (Million kWh/ year)		
(ii)	Fuel used (state which type of fuel was used (C = coal, B = biomass, etc).		
(c)	**Through Gas turbine**		
(i)	Annual generation (Million kWh/ year)		
(ii)	Fuel used (state which type of fuel was used NG, PNG, CNG, Naphtha)		
(iii)	Gross calorific value (kCal/SCM)		
(v)	Annual fuel consumption (SCM)		
(vi)	Total annual fuel cost (Rs. Million)		
(C)	***Total generation of electricity (Million kWh/year) 7.1(B) {a(i)+b(i)+c(i)}***		
(D)	***Electricity supplied to the grid/others (specify) (Million kWh/year)***		
(E)	***Total cost of electricity consumed (Million kWh/year) 7.1 {A(i) + C-D}***		
7.2	**Fuel Consumption % Cost for process heating**		
(A)	**Coal**		
(i)	Gross calorific value (kCal/kg)		
(ii)	Quantity purchased (tons/ year)		
(iii)	Quantity used for power generation (tons/ year)		
(iv)	Quantity used as raw material, if any (tons/ year)		
(v)	Quantity used for process heating (tons/ year)		
(vi)	Total coal cost for process (Rs. Million/ year)		

		Year 20xx – 20xx	
(B)	**Lignite**		
(i)	Gross calorific value (kCal/kg)		
(ii)	Quantity purchased (tons/ year)		
(iii)	Quantity used for power generation (tons/ year)		
(iv)	Quantity used as raw material, if any (tons/ year)		
(v)	Quantity used for process heating (tons/ year)		
(vi)	Total lignite cost for process (Rs. Million/ year)		
(C)	***Bio mass Other purchased solid fuels (pl. specify) baggase, rice husk, etc.***		
(i)	Average moisture content as fired (%)		
(iii)	Average Gross calorific value as fired (kCal/kg)		
(iv)	Quantity purchased (tons/ year)		
(vi)	Quantity used as raw material, if any (tons/ year)		
(v)	Quantity used for process heating (tons/ year)		
(vi)	Total coal cost for process (Rs. Million/ year)		
7.3	**Liquid**		
(A)	***Furnace Oil***		
(i)	Gross calorific value (kCal/kg)		
(ii)	Quantity purchased (KL/ year)		
(iii)	Quantity used for power generation (KL/ year)		
(iv)	Quantity used as raw material, if any (KL/ year)		
(v)	Quantity used for process heating (KL/ year)		
(vi)	Total F. Oil Cost for process heating (Rs. Million/ year)		
(B)	**Low Sulphur Heavy Stock (LSHS)**		
(i)	Gross calorific value (kCal/kg)		
(ii)	Quantity purchased (tons/ year)		
(iii)	Quantity used for power generation (tons/ year)		
(iv)	Quantity used as raw material, if any (tons/ year)		
(v)	Quantity used for process heating (tons/ year)		
(vi)	Total LSHS Cost for process heating (Rs.Million/ year)		

		Year 20xx – 20xx
(C)	**High Sulphur Heavy Stock (HSHS)**	
(i)	Gross calorific value (kCal/kg)	
(ii)	Quantity purchased (tons/ year)	
(iii)	Quantity used for power generation (tons/ year)	
(iv)	Quantity used as raw material, if any (tons/ year)	
(v)	Quantity used for process heating (tons/ year)	
(vi)	Total HSHS Cost for process heating (Rs.Million/ year)	
(D)	***Diesel oil***	
(a)	***High Speed Diesel (HSD)***	
(i)	Gross calorific value (kCal/kg)	
(ii)	Quantity purchased (kL/ year)	
(iii)	Quantity used for power generation (tons/ year)	
(iv)	Quantity used as raw material, if any (tons/ year)	
(v)	Quantity used for process heating (tons/ year)	
(vi)	Total HSD Cost for process heating (Rs.Million/ year)	
(b)	***Light Diesel Oil (LDO)***	
(i)	Gross calorific value (kCal/kg)	
(ii)	Quantity purchased (kL/ year)	
(iii)	Quantity used for power generation (kL/ year)	
(iv)	Quantity used as raw material, if any (kL/ year)	
(v)	Quantity used for process heating (kL/ year)	
(vi)	Total LDO Cost for process heating (Rs.Million/ year)	
7.4	***Gas***	
(a)	***Compressed Natural Gas (CNG)***	
(i)	Gross calorific value (kCal/SCM)	
(ii)	Quantity purchased (million SCM/ year)	
(iii)	Quantity used for power generation (million SCM/ year)	
(iv)	Quantity used as raw material, if any (million SCM / year)	

(v)	Quantity used for process heating (million SCM / year)	
(vi)	Total cost of natural gas for process heating (Rs. Million/ year)	

		Year 20xx – 20xx
(b)	***Liquefied Petroleum Gas (LPG)***	
(i)	Gross calorific value (kCal/SCM)	
(ii)	Quantity purchased (million SCM / year)	
(iii)	Quantity used for power generation (million SCM / year)	
(iv)	Quantity used as raw material, if any (million SCM / year)	
(v)	Quantity used for process heating (million SCM / year)	
(vi)	Total cost of LPG for process heating (Rs.Million/ year)	
(c)	***Gas generated as by product/ waste in the plant and used as fuel***	
(i)	Name	
(ii)	Gross calorific value (kCal/SCM)	
(iii)	Quantity used for process heating (million SCM / year)	
(iv)	Total cost of byproduct gas for process heating (Rs.Million/ year)	
7.5	***Solid Waste***	
	Solid waste generated in the plant and used as fuel	
(i)	Name	
(ii)	Gross calorific value (kCal/Kg)	
(iii)	Quantity used for process heating (tons/ year)	
(iv)	Total cost of solid waste for process heating (Rs.Million/ year)	
7.6	**Liquid Waste**	
	Liquid effluent/ waste generated in the plant and used as fuel	
(i)	Name	
(ii)	Gross calorific value (kCal/kg)	

(iii)	Quantity used for process heating (tons/ year)	
(iv)	Total cost of liquid effluent for process heating (Rs.Million/ year)	
7.7	**Others**	
(i)	Name	
(ii)	Average gross calorific value (kCal/kg)	
(iii)	Quantity used for power generation (tons/ year)	
(iv)	Quantity used for process heat (tons/year)	
(v)	Annual cost of the others source	

Signature
Name of Energy Manager
Name of Company
Full Address
Contact Person
Email Address
Telephone/ Fax Numbers
Seal

Signature
Name of Accredited Energy Auditor
Accreditation Details
Seal

Form 2
Details of energy saving measures recommended in the energy audit report (year)
[See Regulation 5(2)]

S. No	Energy Efficiency Improvement Measures	Investment in Million Rs	Reasons for not implementing measure	Date of completion/likely completion of measure	Annual Energy Savings				
					Oil	Gas	Coal	Electricity	Others

Signature
Name of Energy Manager
Name of Company
Full Address
Contact Person
Email Address
Telephone/ Fax Numbers
Unit's Address

Signature
Name of Accredited Energy Auditor
Accreditation Details
Seal

Form 3

Details of energy efficiency and conservation measure implemented, investment made and savings in energy achieved and progress made in the implementation of other recommendations

[See Regulation 5(3)]

A. Implemented

S. No	Description of energy efficiency improvement measure	Category**	Investment (Rs)	Verified Monetary Savings (Rs)	Verified Energy Savings	Units	Fuel	Remarks

B. Under Implementation

S. No	Description of energy efficiency improvement measure	Category**	Investment (Rs) Estimated	Verified Monetary Savings (Rs)	Verified Energy Savings	Units	Fuel	Remarks

Signature
Name of Energy Manager
Name of Company
Full Address
Contact Person
Email Address
Telephone/ Fax Numbers
Unit's Address

Signature
Name of Accredited Energy Auditor
Accreditation Details
Seal

***** See Annexure 1***

Annexure 1

Suggested categories of areas of energy efficiency improvement for obtaining details of energy savings

1. Better housekeeping measures
2. Installation of improved process monitoring and control instrumentation, or software
3. Fuel Handling System
4. Steam Generation System
5. Steam Distribution System
6. Electricity Generation System
7. Hot Water System
8. Compressed Air System
9. Raw/ Process Water System
10. Cooling Water System
11. Process Cooling/ Refrigeration System
12. Heating, Ventilation and Air Conditioning System
13. Electrical System
14. Lighting System
15. Melting/ Heating/ Drying Equipment (e.g. Furnaces, Heaters, Kilns, Ovens, Dryers, Evaporators, etc.)
16. Heat Exchangers
17. Pumps, Compressors, Fans, Blowers, Piping, Ducting
18. Process Equipment (e.g.) Reactors, Separation Equipment, Material, Handling Equipment, etc.)
19. Transformers
20. Electric Motors and Drives
21. Process Technology
22. Process Integration
23. Process Control and Automation
24. Other Non-Equipment Measures (e.g. Plant Operation/ Scheduling, Tariff Schedule, etc.)
25. Recovery of waste heat for process heat or power generation
26. Retrofitting, modification or sizing of fans, blowers, pumps, including duct systems
27. Other

Form 4

FORMAT

[See regulation 6 (2)]

Guidelines for preparation of Energy Audit Report

Each energy audit report shall include

(1) Title page

- Report title
- Client name
- Location of the plant/establishment
- Date of report
- Name of the accredited energy auditors

(2) Table of contents

(3) Acknowledgement

(4) Executive summary

- Company's profile
- Goals and objectives of the energy management programme
    - Major challenge and goals for the upcoming year.
    - Major activities to meet challenges and goal
- Summary and classification of energy
- Conservation measures - should be in Form 2.

1.0 Introduction about the plant/establishment

1.1 General plant/establishment details and descriptions

1.2 Energy audit team

1.3 Component of production cost (raw materials, energy, chemicals, manpower, overhead, others)

1.4 Major energy use areas

2.0 Production process description

21 Brief description of manufacturing process

2 2 Process flow diagram and major unit operations

23 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 Electricity
- 3.2.2 Steam
- 3.2.3 Water
- 3.2.4 Compressed air
- 3.2.5 Chilled water
- 3.2.6 Cooling water
- 3.2.7 Others

4.0 Detailed process flow diagram and energy and material balance

4.1 Flow chart showing flow rate. temperature, pressures of all input-output streams

4.2 Water balance for entire industry

4.3 Energy balance of the designated consumer in the tabular form

5.0 Performance evaluation of major utilities and process equipment/systems

5.1 List of equipment's and process where performance testing was done

5.2 Results of performance testing

6.0 Energy efficiency in utility and process system

6.1 Specific energy consumption

6.2 Boiler efficiency assessment

6.3 Thermic fluid heater performance assessment

64 Furnace efficiency analysis

6.5 Cooling water system performance assessment

6.6 Diesel Generator set performance assessment

67 Refrigerator system performance

6.8 Compressed air system performance

6.9 Electric motor load analysis

610 Lighting system

6.11 Others.

7.0 Evaluation of energy management system

7.1 Energy management policy

7.2 Energy management monitoring system

7.3 Bench marking

7.4 Development and establishment of procedures. include energy efficiency possibilities

7.5 Training to staff responsible for operational and associated processes

7.6 General audit review

7.7 Conform to Act. rules and regulations framed there under

7.8 Strength and weaknesses of the designated consumer.

8.0 Energy conservation measures and recommendations

8.1 The report shall provide existing energy profile of the designated consumer with percentage share of major equipment / processes, utilities etc., so that it becomes a basic document for future monitoring.

8.2 Details of energy saving measures recommended in Form 2

8.3 Cost benefit analysis of each recommended energy saving measures as per standard practice.

8.4. The investment proposals shall be backed with technical and economic viability and prioritization of energy conservation measures based on financial analysis of various Options taking into account the capacity of the designated consumer to make investment in such measures.

8.5. The energy auditor may also consider the substitution of existing energy use by any other form of techno -commercially viable form of energy.

8.6. Details of energy saving measures implemented, investment made and saving in energy achieved together with progress made in the implementation of the remaining energy saving measures in Form 3.

9.0 Certification

This part shall indicate certification by accredited energy auditor stating that-

(i) the data collection has been carried out diligently and truthfully;

(ii) all data monitoring devices are in good working condition and have been calibrated or certified by approved agencies authorized and no tempering of such devices has occurred;

(iii) all reasonable professional skill, care and diligence had been taken in preparing the energy audit report and the contents thereof are a true representation of the facts;

(iv) adequate training provided to personnel involved in daily operations after implementation of recommendations; and

(v) the energy audit has been carried out in accordance with the National Energy Efficiency and Conservation Authority (Manner and Interval of Time for Conduct of Energy Audit) Regulations, 2018

Signature

Name of the accredited energy auditor

Accreditation details

Seal