Detailed Energy Audit (DEA)/ Investment Energy Audit (IGEA) Report Format

REEEP-GREEN

(Exhibit 01)

Rastriya Banijya Bank Limited

Nov 2024

Background:

Towards ensuring desirable quality requirements and also as a consistent template for energy audit reports and to enhance their utility for monitoring and evaluation, an energy audit report structure along the following lines is recommended for adoption.

While the report structure compliance in entirety is desirable from programmatic perspective, flexibility needs to be accommodated, as, the extent of detailing; customization and client centric information may vary as per specific situations, warranting simplified presentation on the one hand or far more elaborate detailing on the other. In presentation part, a good balance between quantitative and qualitative detailing and text and visual content is desirable, for the purpose of readability, understandability, and utility from client perspective. An illustrative energy audit report format for adoption is presented as under.

Title Sheet of the report to indicate:

- Nature of audit namely: Detailed Energy Audit/Investment Grade Energy Audit/Target Audit.
- Name of the industry/audited entity
- Name of the auditing entity
- Duration/Timeframe of audit
- Sponsors, stakeholders as applicable

Opening page:

Opening page of report may contain table of contents of energy audit report with page number in a chronological sequence.

Acknowledgements:

The acknowledgements page may acknowledge contributions of key stakeholders associated in audit activity from client side as well as sponsors, signed by team leader of audit with date.

Study Team:

On this page, the list of study team members with designations may be presented, for future follow up references.

Abbreviations/Nomenclature used in report:

In this page, the report may list the abbreviations, nomenclature used in report, for ease of understanding purposes.

List of instruments used:

In this page, the list of instruments used in energy audit need to be mentioned

Executive summary:

In this section, the report may present the synopsis of study findings, which would at-least, include:

- Baseline details of the audited entity.
- EE Option summary listing in a table, covering all EE opportunities identified: option wise annual energy savings potential, cost savings potential per annum, Investment needs and simple payback period and CO_2 savings.
- Prioritized options listing as short term (less than one year simple payback period);medium term (one to three year simple payback period);long term (over three year simple payback period)

Headers and footers:

The report may have consistent headers and footers as per relevance for easy accessibility.

Chapter 1: INTRODUCTION:

1.1 Background of the Study:

1.2 Scope of energy audit:

In order to ensure that the energy auditing process covers all aspects of energy use/consumption, it is recommended that the consultant/consulting organization follow the 'Energy Audit Guidelines for Industrial Sectors 2077' and 'Energy Audit Guidelines for Commercial Sectors 2077', published by Water and Energy Commission Secretariat, Government of Nepal. Accordingly, the energy auditor should perform the tasks but not limited to as mentioned below:

I. Pre-audit phase

- Prepare a checklist/action plan for an energy audit of the facilities based on preliminary discussion with the management.
- Form an energy audit project team within an organization incorporating relevant departments such as engineering, production, finance, procurement, etc.
- Coordinate and ensure the communication with the project team, and the relevant stakeholders about the objectives and scope of the energy audit.

- Conduct walkthrough survey of the facility to have complete understanding of the organization, process, utilities, etc.
- Review and collect historical energy related data and information, technologies, reports, etc. of the organization.
- Identify the Significant Energy Consumption (SEC) areas of special interest to be surveyed during the audit in consultation with the project team.

II. Audit phase

- Perform the energy survey and monitoring to establish, and investigate, energy/material balances for specific plant, departments or process equipment.
- Collect/establish following information.
    - Energy consumption by type of energy, by department, by process equipment/facilities, by end-use
    - Energy cost and tariff data
    - Process and material flow diagrams
    - Generation and distribution of utility services (e.g., compressed air, steam)
    - Sources of energy supply (e.g., electricity from the grid or self-generation)
    - Potential for fuel substitution, process modifications, and the use of co-generation systems (combined heat and power generation)
    - Energy consumption pattern, production cost per product unit.
    - Energy management procedures and energy awareness training programs within the organization, etc.
    - Immediate plan of the industry/ enterprise for system/equipment replacement, renovations, up-scaling in near future, if any, etc.
- Collect/establish following baseline data:
    - Capacity utilization
    - Quantity & type of input materials used
    - Water consumption
    - Fuel consumption
    - Electrical energy consumption
    - Steam consumption
    - Other inputs such as compressed air, cooling water etc.
    - Quantity & type of wastes generated
    - Percentage rejection / reprocessing

- Analyse the data and information for identifying potential energy efficiency measures, technology enhancement, system improvement, operations and maintenance, etc. from the energy saving perspective along with the cost of such measures.
- Prepare and recommend the appropriate energy efficiency opportunities with their economic feasibility (including detail analysis of EE measure, supporting calculations for energy saving as well as the cost benefit analysis with simple payback period method). Any assumptions made for such analysis/calculation should be clearly mentioned with acceptable reasoning.

III. Reporting phase

- Prepare a structured and concise energy audit report as per the scope of work.
- Report should contain at least but not limited to following information covering the following distinct subjects:
    - Executive summary
    - Background of the study
    - Plant energy use features (electrical and thermal)
    - Baseline details of the audited entity
    - Energy efficiency improvements opportunities/measures with cost benefits in the appropriate areas but not limited to;
        - Electrical load and demand management, and power factor improvement.
        - Motors, pumps, and variable frequency drive (VFD)
        - Air compressors, fans, blowers, and cooling towers application
        - Heating, ventilation, air conditioning & refrigeration systems (HVAC) application
        - Cogeneration application
        - Boiler & steam system
        - Waste heat recovery system
        - Furnaces & ovens application
        - Lighting system
        - Insulation & refractories system
        - House-keeping measures
    - Cost-benefit analysis with simple payback period.
    - Relevant vendor information: product literature should be included to the extent possible.

- Presentation of energy audit report: submit the draft report to the respective industry, district chambers, and project for comment/feedback and submit the final report after incorporation of the comments.

1.3 About the unit/facility:

(Coverage may present location, year of establishment, facilities, capacity, current capacity, shifts/day and days/year normal operation, electrical and thermal energy consumption and cost per annum).

Chapter 2: PROCESS DESCRIPTION

(EA report to present Process overview with relevant flow diagrams especially briefing energy linkages/energy using equipment)

Chapter 3: PLANT ENERGY SYSTEMS

3.1 Electrical Energy Use features:

Coverage to present plant/facility features relating to electrical energy and load management practices, grid, diesel generation, co-gen costs, power factor, time of use tariffs, maximum demand trends, specific electrical energy consumption, major equipment (like drives, refrigeration, pumping, compressors,) consuming power, breakup and factors affecting consumption.

3.2 Thermal Energy Use features:

Coverage to present plant/facility features relating to thermal energy use, specific thermal energy consumption, layout, operational features and specifications of major utilities such as furnace, boilers, WHR systems etc.

Chapter 4: STRATEGIC ENERGY MANAGEMENT PROGRAM

(May cover rationale of a strategic energy management program at the unit, voluntary policy statement desirable as a measure of management commitment to energy efficiency, desirable features of a MIS system and any desirable upgrades in plant automation as relevant)

Chapter 5: ENERGY EFFICIENCY OPPORTUNITIES

IGEA/DEA report to cover Energy efficiency opportunities in this chapter in a clear manner, presenting for each opportunity the following aspects:

1. Title of measure (EE opportunity)

2. Present situation

3. Recommendation

4. Cost benefits:

Cost benefits should at least present:

- Present energy consumption
- Energy consumption after improvement (implementation of EE measure)
- Annual energy savings
- Annual cost savings
- Annual CO_2 savings
- Simple payback period in months or years

Chapter 6- EXHIBITS

Each energy audit report may include exhibits to support the report findings, as deemed necessary, for clarity, better understanding, and may include information like:

- ✓ Line diagrams,
- ✓ Historical energy data
- ✓ Technical Specifications
- ✓ Design data
- ✓ Detailed calculations like heat balance
- ✓ Details of motor load survey, lighting survey, steam trap survey, insulation survey etc.
- ✓ Vendor information and product literature
- ✓ Generic tips, Housekeeping measures, maintenance guidelines etc.

Exhibits may also address any incentive schemes available from Government, Ministries, NEA, or Financial Institutions or International institutions, that are prevalent and applicable, to enhance the viability of the EE proposals.

The Detailed Energy Audit (DEA) or Investment Grade Energy Audit (IGEA) Report should follow the Energy Audit Guidelines for Industrial Sectors 2077 and Energy Audit Guidelines for Commercial Sectors 2077 published by Water and Energy Commission Secretariat, Government of Nepal*.

[**Energy Audit Guidelines for Industrial Sectors 2077 published by Water and Energy Commission Secretariat, Government of Nepal. Available at http://www.wecs.gov.np/pages/reports-and-publications?lan=en&id=115*

Energy Audit Guidelines for Commercial Sectors 2077 published by Water and Energy Commission Secretariat, Government of Nepal. Available at http://wecs.gov.np/source/Energy%20Audit%20Guideline%20for%20Commercial%20Sectors%20(English).pdf]

Detailed Energy Audit (DEA)/Investment Grade Energy Audit (IGEA) Sample

CONFIDENTIAL

YEAR

Energy Audit Report of ……

Full Address

Conducted By:

1 INTRODUCTION

1.1 Background of the study
1.2 Objective of the Study
1.3 Scope of the energy audit
1.4 About the Industry
1.5 Process Description
1.6 Methodology Applied for Audit

2 ENERGY SYSTEMS FEATURES AND INVENTORIES

2.1 Energy use inventories
2.1.1 Energy Intensive Facilities and Equipment
2.1.2 Energy Resources
2.2 Electrical Energy and Load Management Practices
2.2.1 Electricity Resources Features
2.2.2 Electricity Use Trend
2.2.3 Month-wise Power Demand Trend
2.2.4 Other Electricity Sources and Backup System Use
2.2.5 Specific Electrical Energy Consumption (SEC)
2.3 Thermal Energy Systems
2.3.1 Thermal Energy Resources Features
2.3.2 Thermal Energy Use Trend 20
2.3.3 Specific Energy Consumption (SEC)

3 FIELD MEASUREMENT, OBSERVATION AND ANALYSIS

3.1 Electrical and Thermal System Survey
3.2 Analysis and Performance Assessment Electrical and Thermal System
3.2.2 Specific Energy Consumption (SEC)

4 STRATEGIC ENERGY MANAGEMENT

(May cover rationale of a strategic energy management program at the unit, voluntary policy statement desirable as a measure of management commitment to energy efficiency, desirable features of a MIS system and any desirable upgrades in plant automation as relevant)

5 ENERGY EFFICIENCY OPPORTUNITIES

Energy audit report to cover Energy efficiency opportunities in this chapter in a clear manner, presenting for each opportunity the following aspects:
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- Annual energy savings
- Annual cost savings
- Annual CO_2 savings
- Simple payback period in months or years

6 ANNEXURE

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- ✓ Details of motor load survey, lighting survey, steam trap survey, insulation survey etc.
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- ✓ Generic tips, Housekeeping measures, maintenance guidelines etc.

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