

Implementation Guidelines

for Resolution No. (20) of 2024

Regarding Energy Audits in Large Industrial Facilities in Ras Al Khaimah

Version 1.0 – December 31, 2024

Revision History:

Date	Version	Type of Review	Completed By
07.11. 2024	1.0	Draft	Energy Efficiency and Renewables Sector of Ras Al Khaimah Municipality
20.11. 2024	1.0	Review	Energy Efficiency and Renewables Committee
31.12. 2024	1.0	Issuance	Chairman of the Energy Efficiency and Renewables Committee

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DIVISION ONE

Abbreviations & Glossary of Terms

101 Abbreviations

kWh	kilowatt-hour
GWh	Gigawatt-hour
BTU	British Thermal Unit
IG	Imperial Gallon
GHGs	Greenhouse gases
HVAC	Heating, ventilation, and air conditioning
AED	United Arab Emirates Dirham
Reem	The Energy Efficiency and Renewables Sector of Ras Al Khaimah Municipality
etc.	et cetera meaning “and so on”
e.g.	exempli gratia meaning “for example”

102 Glossary of Terms

Large Industrial Facility	Any establishment in Ras Al Khaimah practicing an industrial activity in accordance with the licensing authorities that meets the Energy Consumption Threshold established in these Implementation Guidelines.
Energy Consumption Threshold	The annual Energy consumption value in AED per annum or GWh per annum above which an industrial facility is considered a Large Industrial Facility.

Energy Audit	A comprehensive assessment and analysis of Energy and Water consumption as well as Emissions of a Large Industrial Facility, to identify Energy, Water, and Emissions savings opportunities.
Energy Auditor	A professional who performs an Energy Audit.
Energy Audit Report	A comprehensive report showing all the findings of an Energy Audit performed as per the scope and deliverables outlined in Appendix I.
Monitoring System	A system to continuously capture and store Energy and Water data to enable their analysis, identify areas of wastage, reduce consumption, predict system performance, and overall manage and optimise Energy and Water usage to improve efficiency as well as reduce costs and Emissions within a Large Industrial Facility.
Improvement Plan	A documented plan that sets targets, includes specific actions, timelines, expected savings, and investment requirements to improve the Energy and Water efficiency and reduce Emissions of a Large Industrial Facility.
Progress Report	A document summarizing the status of the activities and progress towards meeting the objectives of the Improvement Plan.
Energy	Refers to the net sum of all forms of final energy entering or leaving the boundary of a Large Industrial Facility that can be used for performing work, controlling, communicating, changing temperatures, properties, etc. of materials or equipment used within the Large Industrial Facility. Final energy should be expressed in GWh/year and in AED/year using the appropriated tariffs and it includes, but it is not limited to, electricity, thermal energy in the form of district cooling or heating, fuels in gas form, e.g. natural gas, liquid form, e.g. liquefied petroleum gas, petrol, diesel, or solid form, e.g. coal, refuse derived fuel, waste, as well as other forms of energy such as compressed air, etc.
Water	Refers to all forms of water entering or leaving the boundary of a Large Industrial Facility. Water should be expressed in IG/year and in AED/year using the appropriated tariffs and it includes, but it is not limited to, fresh water, treated sewage effluent, etc.
Greenhouse Gases	Gases that contribute to the greenhouse effect and that absorb and re-emit infrared radiation, the most important of which are: carbon dioxide (CO ₂), methane (CH ₄), nitrous oxide (N ₂ O), nitrogen trifluoride (NF ₃), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF ₆).
Emissions	Greenhouse gases released into the atmosphere as a result of human activities, altering the atmospheric chemical composition and contributing to air pollution and climate change.

DIVISION TWO

Objectives

201 Scope of Application

1. The Energy Consumption Threshold is defined as AED 2,000,000 (AED 2 million) in value per annum or 20 GWh in Energy units per annum.
2. The Resolution applies to industrial facilities with an average annual Energy consumption over the previous four (4) years, or since the start of their operation, whichever period is shorter, exceeding the Energy Consumption Threshold.

202 Energy Audits

1. Large Industrial Facilities that have not conducted an Energy Audit in the last four (4) years shall conduct an Energy Audit as per the scope of work and deliverables outlined in Appendix I within eighteen (18) months from the issuance of these Implementation Guidelines.
2. Large Industrial Facilities shall conduct an Energy Audit at least once every four (4) years to gather and analyse data on their Energy usage and Emissions.
3. Large Industrial Facilities may select an internal Energy Auditor or preferably an external and independent Energy Auditor to conduct the Energy Audit.
4. The Energy Auditor shall prepare an Energy Audit Report as per the scope and deliverables outlined in Appendix I.

203 Improvement Plans

1. Large Industrial Facilities shall develop and maintain an Improvement Plan which includes their projects and activities to optimise Energy and Water consumption and reduce Emissions.
2. The Improvement Plan shall have a time horizon of at least three (3) years and should be revised at least annually.
3. The Improvement Plan shall consider the outcome of the latest Energy Audit, if available.

204 Reporting Process

1. Large Industrial Facilities that have conducted an Energy Audit in the last four (4) years shall share their Energy Audit Report with Reem within six (6) months of the issuance of these Implementation Guidelines and Large Industrial Facilities that have not conducted an Energy Audit in the last four (4) years shall share their first Energy Audit Report with Reem within twenty-four (24) months from the issuance of these Implementation Guidelines.
2. Large Industrial Facilities shall share all future Energy Audit Reports within three (3) months of their completion.
3. Large Industrial Facilities shall submit to Reem their first Progress Report within six (6) months from the issuance of these Implementation Guidelines and successive Progress Reports within the first month of every Gregorian calendar year thereafter.
4. In order to monitor and report on progress, Large Industrial Facilities are encouraged to use a Monitoring System to monitor their Energy and Water consumption and other performance metrics related to their Improvement Plan.

205 Support and Resources

1. Reem shall periodically empanel Energy Auditors with the required qualifications to perform an Energy Audit as per the scope and deliverables outlined in Appendix I and make the list of empaneled auditors available to Large Industrial Facilities.
2. Reem shall provide templates for the communication of the Progress Report, taking into consideration possible synergies with requirements from the Federal Energy Management Regulation in Industrial Facilities.
3. Reem shall assess the Energy Audit Reports and Progress Reports received from Large Industrial Facilities within three (3) months of receiving them and may provide recommendations for their review.
4. Reem shall identify commonalities across the received Energy Audit Reports and draw conclusions to inform future activities and create mechanisms for Large Industrial Facilities to share best practices through periodic meetings, workshops, conferences, and reports.
5. Reem shall provide conversion factors for Energy, Water, and Emissions to enable reporting in the units specified in these Implementation Guidelines.

APPENDIX I:

Scope and Deliverables of the Energy Audit

1. Scope of the Energy Audit

The Energy Auditor shall conduct a comprehensive assessment of Energy, Water and Emissions of the Large Industrial Facility after a site visit, which shall encompass, but not be limited to, the evaluation of the following components (where applicable):

Industrial processes	Assessment of process efficiency, alternative fuel sources, heat recovery mechanisms, water treatment/recovery systems, waste processing techniques, and the reutilization of industrial by-products for Energy, Water and other purposes, etc.
Operational practices	Examination of staff behaviors and operational practices relating to Energy and Water consumption and Emissions.
Heating and cooling systems	Review of HVAC systems and associated equipment, including water heaters, gas boilers, steam generators, etc.
Mechanical systems	Analysis of pumps, motors, compressors, and other related equipment.
Electrical systems	Evaluation of load demand, power factor, load balancing, etc.
Lighting systems	Inspection of fixtures, sensors, and other lighting components.
Water systems	Assessment of Water usage for fixtures and industrial processes.
Building envelope	Evaluation of the components related to the building envelope (when applicable).
Control systems	Examination of the Building Management System (BMS), Supervisory Control and Data Acquisition (SCADA) systems and/or other control systems.
Renewable energy generation	Assessment of any applicable renewable Energy generation systems.

2. Deliverables of the Energy Audit Report

The Energy Auditor shall provide some general information about the Large Industrial Facility, details on the state of the equipment installed, and current operational status (e.g. HVAC systems, lighting systems, BMS, and operating hours, etc.).

The Energy Auditor shall describe also the baseline Energy and Water consumption data and associated costs for each utility including breakups of technology/source and consumption.

The Energy Auditor shall identify potential saving opportunities in Energy and Water consumption and generation/treatment within the Energy Audit Report. The proposed Energy and Water saving opportunities must align with the operational needs of the Large Industrial Facility.

A preliminary cost benefit analysis must be conducted, detailing budgetary investments and payback periods for each identified opportunity, alongside a percentage savings analysis and rationale for each suggestion.

3. Structure of the Energy Audit Report

The Energy Audit Report must adhere to the following structure:

a) Executive summary

This section shall provide a brief overview of the Energy Audit findings, including a detailed table for each building/site/process evaluated, formatted as Table 1 below, along with a summary table for the entire Large Industrial Facility, formatted as Table 2.

b) Introduction

This section shall offer a brief project description, listing the buildings/sites/processes within the Large Industrial Facility, relevant locations, relevant personnel contacts from both the Energy Auditor and the Large Industrial Facility, details of site visit timings, and any other relevant information.

c) Facility description and baseline

This section shall include:

1. General information about the Large Industrial Facility, such as its size, usage, number of buildings/sites/processes, occupancy, operating hours, production, etc. It should also include details on the state of the equipment installed and their current operational status (e.g. HVAC systems, lighting systems, BMS, and operating hours, etc.).
2. Baseline Energy and Water consumption data (e.g. kWh, tons of coal, IG, etc.) and associated costs in AED for each utility including a breakup of the different utilities baseline by technology/source (e.g. imported electricity, solar, onsite coal thermal

generation, etc.) along with the total utility costs breakdown (in AED) and the breakup of how that Energy and Water is consumed by the main loads (process equipment, HVAC, lighting, etc.).

3. Calculation of the Large Industrial Facility Emissions considering all the Energy and Water consumption as well as any other Emissions, e.g. from processes, etc.
4. Summary of the measurements taken on-site.
5. Any discrepancies between the measurements, observed bills of quantities, operation hours, conditions, etc. versus the provided/expected data.
6. Summary of key areas of inefficiency and opportunity.

d) Energy saving opportunities

This section shall detail each proposed Energy or Water saving opportunity, including the rationale for its selection, its main technical, economic, and environmental benefits, including the associated Emissions reductions and any potential risks or restrictions.

This section shall also explore opportunities for onsite Energy generation (e.g. solar, waste heat recovery), and/or Water treatment.

For each opportunity, this section shall specify the recommended monitoring and verification approach, along with relevant parameters for measurement.

e) Business case

This section shall present a cost benefit analysis for the proposed Energy and Water saving opportunities, detailing savings in Energy and Water (kWh, IG, BTU, etc.) and monetary terms (in AED). The costs shall include both capital and operational expenses, organized in the standard format of Table 1 for each building/site/process.

Table 1 will categorize proposed Energy and Water saving opportunities based on payback periods: less than 2 years, less than 5 years, and optional opportunities with longer payback periods or limited applicability. Additionally, a consolidated overview of the business case for the entire facility must be provided in the standard format of Table 2.

f) Recommended next steps

This section shall outline the recommended approaches for the Large Industrial Facility to pursue the identified Energy and Water saving opportunities, which may include detailed design work for specific opportunities, use of specialized providers and/or contractors, additional studies for in-depth evaluation, use of energy performance contracting, recommended outsourcing model, etc.

This section shall also propose a preliminary roadmap of activities to transition the identified Energy and Water saving opportunities into actionable projects that will achieve the anticipated savings.

Table 1: Summary of Energy and Water saving opportunities (to be provided for each building / site / process in a large industrial facility)

#	Saving opportunity	Building / site / process name where it is applied	Annual elec. baseline. (kWh/year)	Annual water baseline. (lG/year)	Other Energy baseline. (BTU or Other /year)	Savings (kWh, lG, BTU/ year)	Savings on ¹ system (%)	Energy and Water ² savings (%)	CO ₂ savings (tons of CO _{2eq} / year)	Total baseline (AED/year)	Utility Savings (AED/year) (A)	Other Savings ³ (AED/year) (B)	Total Savings (AED/year) (C=A+B)	Additional design ⁴ . cost (AED) (D)	Equip. cost (AED) (E)	Install. cost (AED) (F)	Other capex ⁵ (AED) (G)	Total capex. (AED) (H=D+E+F+G)	Simple Payback (Years) (H/C)	O&M ⁷ Costs (AED/year) (I)	M&V ⁸ costs (AED/year) (J)	Total opex (AED/year) (K=I+J)	Proposed EPC contract (Years) (L)	Payback (Years) ((H+K*L)/C)
1																								
2																								
m																								
Total																								

Table 2: Overall saving summary (for the whole large industrial facility)

#	Building / site / process name	Annual elec. baseline. (kWh/year)	Annual Water baseline. (lG/year)	Other Energy baseline. (BTU or Other /year)	Elec. savings (kWh/year)	Water savings (lG/year)	Other Energy savings (BTU or Other /year)	Energy and Water ⁶ savings (%)	CO ₂ savings (tons of CO _{2eq} / year)	Total baseline (AED/year)	Total savings (AED/year) (A)	Total capex (AED) (B)	Simple payback (Years) (B/A)	O&M ⁷ Costs (AED/ year) (C)	M&V ⁸ costs (AED/ year) (D)	Total Opex (AED/year) (E=C+D)	Proposed EPC contract (Years) (F)	Payback (Years) ((B+E*F)/A)
1																		
2																		
m																		
Total																		

¹ Saving on system (%) refers to the expected reduction of Energy or Water consumption by implementing this saving opportunity on that particular system's consumption (chiller, motor, process, etc.).

² Energy or Water saving (%) refers to the expected reduction of Energy or Water consumption by implementing this saving opportunity, expressed as a share of the total utility bill of the Large Industrial Facility.

³ Any savings in maintenance, etc. and others directly attributable to the proposed saving opportunity.

⁴ Any additional design cost required to confirm/finalize the design of the proposed saving opportunity so that it can be implemented.

⁵ Any cost related to the installation of the measurement equipment necessary for verifying the savings of the proposed saving opportunity, or any other additional cost not covered in the previous columns and that shall be clearly identified.

⁶ Energy or Water saving (%) refers to the expected reduction of Energy and Water consumption by implementing all saving opportunities identified for the specific building/site/premise, expressed as a share of the total utility bill of the Large Industrial Facility.

⁷ Operation and maintenance.

⁸ Monitoring and verification.