

GUIDELINES ON SERVICES DELIVERY FOR REGISTERED ELECTRICAL ENERGY MANAGERS

Contact info

✉ mareem.my@gmail.com

by
MALAYSIAN ASSOCIATION OF
REGISTERED ELECTRICAL
ENERGY MANAGERS
(MAREEM)



CONTENTS

ABBREVIATIONS	2		
FOREWORD	3		
1.0 INTRODUCTION TO MAREEM	4		
2.0 THE PURPOSE OF THE GUIDELINE	6		
3.0 ENERGY MANAGER’S ROLES AND RESPONSIBILITIES	6		
4.0 SERVICES PROVIDED BY REGISTERED ELECTRICAL ENERGY MANAGERS	11		
4.1 General Requirements for Services Delivery	11		
4.2 Fees for Services Provided	12		
5.0 GUIDELINES ON EFFICIENT MANAGEMENT OF ENERGY PROGRAM THROUGH ENERGY MANAGEMENT SYSTEM DEVELOPMENT AND IMPLEMENTATION FOR REGISTERED ELECTRICAL ENERGY MANAGERS.	14		
5.1 Legal Requirements	14		
5.1.1 Safety Requirements	15		
5.2 General scopes	16		
5.3 Energy policy	16		
5.4 Installation roles, responsibilities, and authorities	18		
5.5 Energy Planning	18		
5.5.1 Energy Data Collection	20		
5.5.2 Comprehensive Energy review.....	21		
5.5.3 The establishment of energy performance indicators.....	23		
5.5.4 The establishment of energy baseline	23		
5.5.5 Opportunities for improving energy performance	24		
5.5.6 Setting the energy management objectives and targets	26		
5.5.7 Preparation of the energy management action plan	26		
5.6 The operation on energy management system	27		
5.6.1 Resources required for energy management system implementation	27		
5.6.2 Competence in energy management system implementation	28		
5.6.3 Awareness program on efficient management of energy	28		
5.6.4 Internal and external communications	29		
5.6.5 Energy efficient operational planning and control	29		
5.6.6 Energy Efficiency Design	30		
5.6.7 Procurement related to energy	30		
5.7 Performance evaluation on installation’s energy performance	31		
5.8 Management reviews on energy management progress and performance	32		
5.9 Continual improvement in energy management program and its activities	32		
5.10 Documentation of energy management activities	34		
6.0 REFERENCES	34		

ABBREVIATIONS

EMEER 2008	Efficient Management of Electrical Energy Regulations 2008
EMIS	Energy Management Information System
EnMS	Energy Management System
EnB	Energy Baseline
EnPI	Energy Performance Indicator
REEM	Registered Electrical Energy Manager
ESM	Energy Saving Measure

» FOREWORD

MAREEM PRESIDENT



MAREEM is a professional association with core objectives of developing, introducing, and promoting guidelines for best practices and code of ethics in providing services as Energy Managers in Malaysia and this region.

MAREEM also will promote and uplift the awareness and the responsibility as Energy Manager and the core roles in private sectors and government. We encourage its members to continually improve their skills and knowledge by participating in relevant programs.

Working together with related agencies in various sectors can further enhance the capability while exploring potential current opportunities and future.

MAREEM is committed in taking care of members welfare and is determined to promote healthy competition among members through professional services with high integrity.

Razali Abu Bakar
President

INTRODUCTION TO MAREEM

MAREEM was officially formed on 14 March 2016. The establishment of MAREEM was based on the need for a suitable and common platform for Registered Electrical Energy Managers (REEMs) to deal with concerns and issues raised by key stakeholders with regards to services provided to the market by REEMs.

This is due to the significant and responsible role that are held by REEMs under the law who are directly involved in ensuring the effective implementation of EMEER 2008. MAREEM is expected to function as a body to represent the collective voice of REEMs and to work closely with key stakeholders such as the regulator and other entities that are related to installations affected by the implementation of EMEER 2008 to resolve any issues and concerns raised for services offered and delivered by its members.



THE GOALS OF THE CONSTITUTION OF MAREEM

- I) To develop, introduce and promote guidelines for best practices and code of ethics in providing energy management services as a reference point in Malaysia and regional markets.
- II) To promote and raise awareness of the roles and responsibilities as Energy Managers that can be applied in the private and government sectors.
Promote the upgrading of skills and knowledge of its members through appropriate programs.
- III) To collaborate with relevant stakeholders in the various sectors to develop, expand and explore the potential for Energy Managers in the energy efficiency
- IV) industry at present and in the future.
- V) Keeping the welfare of its members and create healthy competition among members through professional services with integrity; and
- VI) To assist directly and indirectly in terms of professional inputs and feedback in the planning and implementation of policies related to energy, initiatives, and programs at the national level by the parties concerned for more sustainable of energy and environment management in the future.



VISION STATEMENT

Develop and promote the profession of Energy Managers towards professionalism, reliability and integrity of the highest order that are recognised both nationally and regionally.

2.0 THE PURPOSE OF THE GUIDELINE

This guideline is developed to serve as the reference of MAREEM members in performing their duties effectively when appointed as the REEM for any installation affected by the EMEER 2008 and by others who are involved in efficient management of energy activities in different stages and capacity in any installation.

3.0 ENERGY MANAGER'S ROLES AND RESPONSIBILITIES

Generally, an Energy Manager monitors and manages the energy efficiency of a facility or installation. They implement conservation measures, monitor energy consumption, assess business decisions for sustainability and seek out opportunities for increasing energy efficiency. An Energy Manager evaluates energy use and designs energy programs that increase efficiency and reduce

energy-related costs. They redesign processes, retrofit buildings and equipment, and plan energy-related systems for new projects.

Energy Managers often work in conjunction with engineers and consultants in the facilities. They work for and consult commercial businesses, industrial clients, and government agencies especially among large energy users.

However, the scope of works of Energy Managers often vary between installations depending on type of industry, energy uses, governing and installation structure, size, culture etc.

Below are some of the general descriptions of duties as an Energy Manager.

- i) Develop and implement energy saving strategies
To maximize energy efficiency benefits, Energy Managers create and oversee the implementation of short and long-term projects and strategies that increase energy efficiency, reduce greenhouse gas emissions, and minimize unnecessary consumption.

They also implement energy-related cost-saving measures. Throughout the development process, they calculate the budget, project energy savings, and identify the goals for each project. They work with the engineering team from the Client side to craft and implement these measures. They may also participate in the design and renovation of buildings to ensure their energy efficiency.

- ii) Perform Energy Assessment
Energy Managers assess various facilities from higher education, governmental, healthcare, commercial and industrial facilities for energy efficiency purposes. They will inspect buildings with existing energy laws in mind to ensure they adhere to all regulations.

The Energy Manager also monitors buildings to identify areas where energy is wasted, or energy efficiency needs improvement, analysing utility usage to identify and implement energy saving measures.

iii) Manage Utility Budget

Through energy assessment of energy audit and the development of energy saving strategies, the Energy Manager also is expected to prepare and monitor the utility budget.

This will include calculating current energy costs as well as the potential savings of upcoming projects for the installation. They prepare budget reports and cost estimates for the reporting to the management.

iv) Document and Present Energy Saving Projects

Energy Managers often must prepare formal proposals for all new projects, including projected costs and energy savings for each project. They also submit formal documentation and status updates for all current projects, regular utility consumption data reports and documentation of results for completed projects.

They then present this information to the top management for the approval for the implementation and supports for continual improvement.

For Peninsular Malaysia and Sabah where the Efficient Management of Electrical Energy Regulations 2008 (EMEER 2008) is applicable, the general functions and duties of a Registered Electrical Energy Manager (REEM) already prescribed in the Regulation 16 as shown in the Table 1 next page.

To assist REEMs in performing their duties upon appointed by any installation affected by EMEER 2008, potential key tasks that could be performed by REEMs to fulfil the requirements of Regulation 16 are also listed in the same Table 1 next page.

The provision in Regulation 16 of EMEER 2008.		Potential Key Tasks
a)	to audit and analyse the total electrical energy consumption or total net electrical energy generation at the installation, including the significant end use of electricity.	<ul style="list-style-type: none"> • Conducting energy review • Identification of significant energy uses (SEUs)
b)	to advise the private installation licensee or consumer in developing and implementing measures to ensure efficient management of electrical energy at the installation.	<ul style="list-style-type: none"> • The development and implementation of energy management system. • Development and introduction of energy policy and energy management team with defined roles and responsibilities. • Identification of energy saving measures. • Identification of key operating parameters of SEUs and establishment of operational controls measures.
c)	to monitor effective implementation of the measures.	<ul style="list-style-type: none"> • Establishment of energy baseline(s) and energy performance indicator(s). • Objective and target setting. • Reporting format and content of energy management activities. • Inputs for management reviews for continual improvement of energy performance.
d)	shall supervise the keeping of records on efficient management of electrical energy at the installation and verify its accuracy.	<ul style="list-style-type: none"> • Development and implementation of suitable documentation system and control of energy management related documents such as manual, procedures, working instructions, data collection sheets etc. • Checking and verification of data and information
e)	shall ensure that the private installation licensee or consumer submits the information and report within the periods as specified in Regulation 7.	<ul style="list-style-type: none"> • Reminders and advisory in preparation of data information to be updated in EMIS. • Checking and verification of data and information submitted through EMIS

Table 1: Provisions in regulation 16 and potential key tasks to be performed by REEMs

Further sections in this document provides some guidelines on more defined roles and responsibilities of Energy Managers in efficient management of energy in the installation while complying to the existing legal requirements as enforced by the Energy Commission through EMEER 2008.

To sustain and increase energy efficiency through efficient management of energy, an Energy Manager may have to perform more tasks and not limited to as listed below.

- Key resource person on energy management system development, implementation, performance monitoring and reporting.
- Assist the top management for implementation of an energy management system.
- Review effectiveness of existing energy management policies, practices, and initiatives.
- Develop new policies aimed at improving energy efficiency performance.
- Conduct energy planning and comprehensive review of energy consumption.
- Establish energy baseline(s) and energy performance indicator(s) for energy performance measurement and monitoring.
- Ensure the identification of energy saving opportunities evaluation and implementation through technical/energy auditing.
- Develop energy performance measurement and verification plan for proposed energy saving measures.
- Assess every energy efficiency project based on its return on investment if necessary or needed.
- Set energy management objectives and targets.
- Develop energy management action plan.
- Present a strong case for energy efficiency initiatives for implementation.
- Plan building/facilities automation control strategies.
- Monitor and evaluate energy use, analyze and track energy expenses.
- Maintain and improve operational and equipment efficiency.
- Identify competency and training requirements.
- Plan awareness and communication programs and activities.
- Evaluate the data needed for any recommendation for energy efficiency improvement.
- Prepare and present energy management reports for progress updates and

management review process.

- Initiate installation energy efficiency initiatives.
- Keep up with latest industry and technologies trends.
- Embrace social consciousness while making cost reduction a main priority.
- Complete requirements for certification and regulatory purposes as prescribed by the authority or other related entities.

4.0 SERVICES PROVIDED BY REGISTERED ELECTRICAL ENERGY MANAGERS

There are many types of services can be offered and delivered by REEMs to make their presence felt and effective in energy management activities for the installation which has engaged them. The following items in this document will provided some guides for REEMs in the whole process of initiation, development, implementation, and continual improvement process of adoption the energy management system for any installation into their energy management practices.

4.1 General Requirements for Services Delivery



The most important thing in delivering services as an Energy Manager is to make it visible and effective in the eyes of key personnel and decision makers in any installation that has appointed the REEM to meet the legal requirements as the basis of the appointment at the start.

REEMs should be visible from the beginning during planning stage and then during implementation of activities in the services proposed and mutually agreed upon. Then REEMs should be more visible throughout the actual energy management activities performed and assistance provided to their clients.



The effectiveness of REEMs can be seen from actual deliverables reported as proposed in the services proposal especially on actual energy performance or energy savings achieved.

Below are the potential items to check in preparing or assessing services provided by REEMs:-

- Proposed scope of works.
- Proposed work plan activities throughout the service contract period.
- Services documents:
 - Services proposal contents
 - Service contract with service level agreement
 - Service delivery documents (Site visit form/report, monthly report format etc.)
- Expected Services outputs/deliverables.

4.2 Fees for Services Provided

Below are some factors that should be considered to determine or evaluate fees for services or scope of works to be performed by REEMs: -

- Fixed monthly fee based on the agreed service deliverables.
- Variable charges with type of services that are chargeable for expert advice and other value-added services such as energy audit, measurement and verification, training, awareness etc.
- Credentials such as relevant and recognized competencies, expertise, and experiences.
- Frequency of scheduled visits/meetings.
- Types of documents prepared-reports, minutes etc.
- Other services provided - Logistics - travelling and accommodation.
- Manhours and rates - presence at site, report preparation, data gathering and analyses.

Manhours shall be calculated based on the whole process and time spent by the REEM for each activity from the preparation, delivery to the end.

Below are some of the potentials activities in delivering services as REEMs: -

- Advisory of energy management development, implementation, and performance monitoring.
- Technical assessment/energy audit.

- Measurement and verification plan preparation and conducting measurement and verification works
- Reporting.
- Training requirements analysis and delivery.
- The use of specific equipment or tools.

5.0 GUIDELINES ON EFFICIENT MANAGEMENT OF ENERGY PROGRAM THROUGH ENERGY MANAGEMENT SYSTEM DEVELOPMENT AND IMPLEMENTATION FOR REGISTERED ELECTRICAL ENERGY MANAGERS.

5.1 Legal Requirements

The basic functions and duties of the appointed REEM at the installation is to evaluate, advise and to ensure the installation is complying with legal requirements under the EMEER 2008 upon the appointment by the installation.

Below are the legal requirements based on the Notification by the Energy Commission according to Regulation 6 and Regulation 7.

- i) to appoint or designate a REEM to carry out the functions and duties under Regulation 16 at the installation and to submit a written confirmation of such appointment or designation to the Energy Commission containing the name and of an electrical energy manager as well as the date of expiry of his registration as the electrical energy manager not later than three months from the date of the written notice.
- ii) to submit information regarding to:
 - the statement of policy for efficient electrical energy management of the installation.
 - the objectives of efficient electrical energy management; and
 - the accounts and documents pertaining to efficient electrical energy management.
 - to submit the report in Form A of the Second Schedule that has been duly signed; and
 - to submit any other information which the Commission may require not later than thirty days after the expiry of six consecutive months from the end of the period specified

In the same time, the installation is expected to retain documented information on the results of the evaluation of compliance and any actions taken.

5.1.1 Safety Requirements

It must be highlighted that the REEM is not a competent person under the Electricity Regulations 1994. Therefore, all energy management activities or works involving electrical installation and electrical equipment at the installation shall be carried out by or under the control of a competent person as stated in in Regulation 64, Electricity Regulations 1994.

Regulation 64. Competent person to connect switchboard, equipment, etc.

- I) No switchboard, switchgear or equipment, except any electrical appliance, fitting or apparatus designed to be connected to an electrical socket outlet by means of a plug, shall be connected to an installation for the purpose of receiving electricity unless the connection is carried out by or under the
 - II) control of a competent person.
- Notwithstanding sub-regulation (1), it shall not be unlawful for a person to replace any lamp in a domestic installation.”

Therefore, it is a must for the REEM to comply to all safety requirements by communicating and working closely with the competent persons on electrical safety at the installation.

5.2 General scopes

In the overall energy management system (EnMS) implementation, the REEM shall advise the installation to have a procedure to evaluate at planned intervals compliance with all other requirements related to its energy efficiency, energy use, energy consumption, and the EnMS itself.

Therefore, REEMs are expected to be knowledgeable and competent enough to advise and assist the installation in the development and implementation of sustainable energy management system beyond just following the minimum reporting requirements in the provisions in EMEER 2008 only.

The other general scope for the REEM to advise the installation is to determine the scope of the energy management system for the and define its boundaries and applicability for the development and implementation.

For EnMS development and implementation, the REEM shall advise the installation to ensure that it has the authority to advise in the control its energy efficiency, energy use, and energy consumption within the scope and boundaries.

The following sections in this document outlines key components and activities involved in the development and implementation of an effective EnMS for the installation.

5.3 Energy policy

The starting point to ensure the success of the implementation of energy management system is always from a commitment of the top management with the introduction of the organisation's energy management policy complete with the setting of energy management goals from the highest level of the business operation.

The introduction of energy policy often requires the understanding among the highest level of management personnel on its importance to ensure the success of energy management program at the organisation.

However, it is often an incredibly challenging task for anyone within the organization to convince the top management to introduce such policy without a strong business case proposal and value proposition or strategic reasons to make that policy decision.

This is where whoever wanted to champion the introduction of an energy management system need to look beyond just the energy cost savings to convince the top management. This is due to sometime, unless the energy cost is a very significant portion of the total operating costs of the organisation or against the core business costs, energy costs savings alone would not be given much consideration in important business policies or strategic decisions.

The REEM shall advise the top management of the installation about establishing an energy policy that are appropriate and provides a framework for setting and reviewing objectives and energy targets.

The energy policy shall include a commitment to ensure the availability of information and necessary resources to achieve objectives and energy targets, a commitment to satisfy applicable legal requirements and other requirements related to energy efficiency, energy use, and energy consumption, a commitment to continual improvement of energy performance, supports the procurement of energy efficient products and services that impact energy performance and supports design activities that consider energy performance improvement.

The energy policy shall be available as documented information, communicated within the installation, available to interested parties, as appropriate and periodically reviewed and updated, as necessary.

The energy policy is not a stand-alone statement in a document and must be attached with clearly defined responsibilities of the management, resources needed and comprehensive energy planning to be executed to achieve the intended objectives and targets that have been set.

The introduction of energy policy comes with the dedicated responsibilities and authorities as discussed in the previous article. These responsibilities and authorities will be executed by the authorized representative with authorities to make some decisions for the overall implementation and through the scheduled management reviews by the top management group members in the organisation.

In the same time, the policy statement in the policy document of the organisation will serve as the main reference and guide for the internal energy management organisation to carry out the energy planning activities in the energy management system development stage. This will result in the main outputs which are energy management objectives and targets to be achieved.

5.4 Installation roles, responsibilities, and authorities

The REEM shall advise and give inputs to the top management of the installation to ensure that the responsibilities and authorities for relevant roles are assigned to the energy management team as follows:

- i) to ensure the EnMS is established, implemented, maintained, and continually improved
- ii) to implement action plans to continually improve energy performance.
- iii) to report the performance of the EnMS and improvement of energy
- iv) performance to top management at scheduled frequency.
To establish criteria and methods needed to ensure that the operation and control of the EnMS are effective.

The REEM shall advise and give inputs to define roles and responsibilities of members in the energy management team.

5.5 Energy Planning

The key goals to have a comprehensive planning is to ensure the EnMS can achieve energy performance improvement. It will come with actions to address risks and opportunities to achieve continual improvement and to prevent and reduce undesired effects in the same time.

What often being seen is the focus is always about the improvement measures to reduce energy cost through the identification of energy saving measures and then to implement them. The pre-requisites which the comprehensive planning to establish some key elements in the system is often being ignored which may lead to more risks to prove the actual improvement that have been achieved. It is because not all improvements in energy performance can be shown in the form reduction energy bills when there are other factors that affect the consumption energy.

The potential serious setback when the planning is not done properly that is the inability to demonstrate to the top management on real benefits in energy performance improvement from the energy management system that have been implemented. This may affect their future supports to keep allocating resources to sustain the system.

Therefore, the personnel who are assigned (often the energy manager) and other involved in the planning of energy management system for the organisation must have strong foundation of knowledge and know-how on how to conduct a comprehensive planning activity.

The tactical process flow of energy planning is summarized and illustrated in the Figure 1 below.



Figure 1 : Key main stages in energy planning starts with energy data collection and then followed by the energy review that will produce the planning outputs.

The REEM is expected to advise and guide the installation on how to conduct a comprehensive energy planning for the EnMS. Key elements in the energy planning consists of energy review, energy performance indicator, energy baseline, targets, and action plan.

For the energy planning, the REEM shall advise the installation on the planning for collection of energy data requirements where the installation needs to ensure that key characteristics of its operations affecting energy performance are identified, measured, monitored and analyzed at suitable intervals.

The REEM shall also advise the installation on how to define and implement an energy data collection plan appropriate to its size, complexity, resources and its measurement and monitoring equipment. The data collection plan shall specify the data necessary to monitor the key characteristics and state how and at what frequency the data shall be collected and retained.

Data to be collected, measurement or other suitable methods and retained documented information shall include the followings:-

- the relevant variables for SEUs.
- energy consumption related to SEUs and
- to the installation.
- operational criteria related to SEUs.
- static factors, if applicable.
- data specified in action plans.

5.5.1 Energy Data Collection

The energy data collection plan shall be reviewed at defined intervals and updated if needed and the equipment used for measurement of key characteristics provides data are accurate and repeatable. The documented information on measurement, monitoring and other means of establishing accuracy and repeatability also needs to be retained.

Challenges in data collection is often linked to the lack of detailed metered data which is the most ideal data to be obtained. Another big challenge is the lack of data and understanding about potential variables for energy consumption other the typical energy related data that have been collected regularly. Some data are also collected and



documented in incompatible data forms. For example, data collected at different frequency and for different purposes and then entered in the format that made it difficult to process and analyse using MS Excel to conduct the energy review.

The lack of data on specific energy uses may lead to the need to install sub-meters. However, it always highly recommended to have a very exhaustive exercise to check thoroughly and confirm on the relevancy of existing and available data have been collected before starting to collect new data especially types of data that may require measurements. This is the stage where the energy manager needs to guide the team to collect the suitable data for the purpose of the energy review process.

Data to be collected must be defined properly and the implementation of energy data collection plan that appropriate to size, complexity, resources, measurement, and monitoring equipment required and type of documentation to be used. Among the types of data to be collected and factors to be considered are potential variables for SEUs, energy consumption related to SEUs, operational criteria related to SEUs, static factor(if applicable), other data specified in data collection plan and accuracy and repeatability of measuring equipment.

The energy manager is supposed to be able to assist in confirming on how extensive the data to be collected that need to be analysed in the next step which is the energy review.

5.5.2 Comprehensive Energy review

Energy review is the comprehensive analysis of energy efficiency level of the organisation from its energy consumption and energy use based on data and other information. This will lead to the understanding of trends of energy consumption, identification of Significant Energy Uses(SEUs) and energy variables, current energy performance with baselines and indicators and finally opportunities for energy performance improvement that can be used to establish the energy management target.

The REEM shall advise the installation on how to develop and conduct an energy review which will cover the followings:-

- i) To analyze energy use and consumption based on measurement and other data to identify current types of energy and to evaluate past and current energy use(s) and consumption.
- ii) To identify SEUs based on the analysis and then for each SEU to determine relevant variables that will affect energy consumption and the current energy performance.
- iii) To identify the person(s) doing work under its control that influence or affect the SEUs.
- iv) To determine and prioritize opportunities for improving energy performance; and
- v) To estimate future energy use(s) and energy consumption.

The process and key elements in the energy review is illustrated in the Figure 2 below.

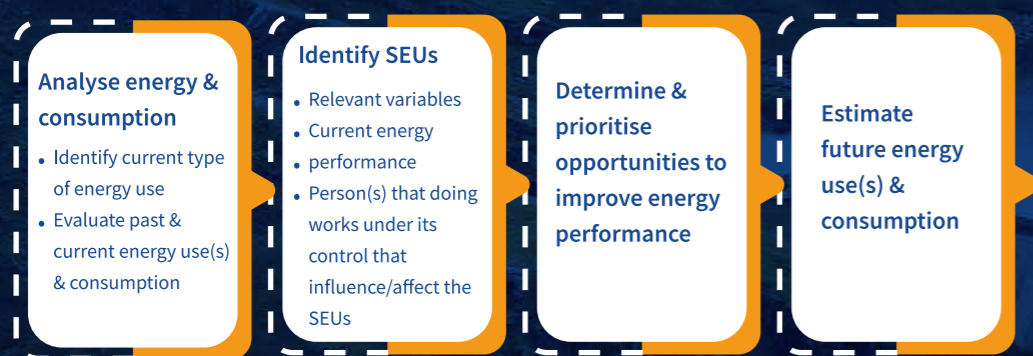


Figure 2: The comprehensive energy review process flow

The outputs from energy review is highly recommended to be presented in visual forms which is often in charts. These charts will illustrate the past and present trends of energy consumption that will help the energy manager to make the observations and interpretation from it. Below are expected outputs from the energy review process.

- i) Trends of energy monthly and yearly consumption and trends of energy monthly annualized consumption.
- ii) SEUs and energy variables.
- iii) Energy baselines (EnBs) and energy performance indicators (EnPIs).
- iv) Estimated/forecasted energy consumption.
- v) Difference between forecasted and actual energy consumption.
- vi) The use of Cumulative Sum(CUSUM) values to indicate actual energy performance improvement and its trends

The REEM shall also advise the installation that the energy review need to be updated at suitable intervals, as well as in response to major changes in facilities, equipment, systems, or energy-using processes.

5.5.3 The establishment of energy performance indicators

The EnPI is the measure of unit of energy performance as defined by the organization based on ISO50001:2018. It shall be appropriately established for energy performance measurement and verification purpose and to serve as the “ruler” used to compare energy performance before and after the implementation of action plans and other actions. Its value(s) shall be reviewed and compared to their respective EnB(s) that will enable the organisation to demonstrate energy performance improvement.

The REEM shall advise the installation on how to determine Energy performance indicator(s) that are appropriate for measuring and monitoring its energy performance and enable the installation to demonstrate its energy performance improvement.

5.5.4 The establishment of energy baseline

The REEM shall advise the installation on how to establish an energy baseline(s) using the information from the energy review, considering a suitable period. Where the installation has data indicating that relevant variables significantly affect energy performance, the installation shall carry out normalization of the energy performance indicator value(s) and corresponding energy baseline.

The REEM shall advise the installation on how to determine Energy performance indicator(s) that are appropriate for measuring and monitoring its energy performance and enable the installation to demonstrate its energy performance improvement.

The REEM shall also need to advise the installation that energy baseline(s) shall be revised in the case of one or more of the following:

- i) energy performance indicator no longer reflect the installation's energy performance.
- ii) there have been major changes to the static factors.
- iii) according to a pre-determined method.

The standard that can be referred by REEMs to establish energy performance indicators and energy baseline is ISO50006: Energy Management Systems – Measuring Energy Performance using Energy Baseline and Energy Performance Indicator.

5.5.5 Opportunities for improving energy performance

The REEM shall advise the installation on how to identify opportunities to improve energy performance to come up with potential energy saving measures (ESMs) and other activities to support the EnMS implementation.

This is the stage where technical audit or technical assessment will be needed to investigate and identify ESMs with the focus to the SEUs that has been confirmed from the energy review.

The type of technical audit and who can perform it is illustrated in the Figure 3 in the next page.

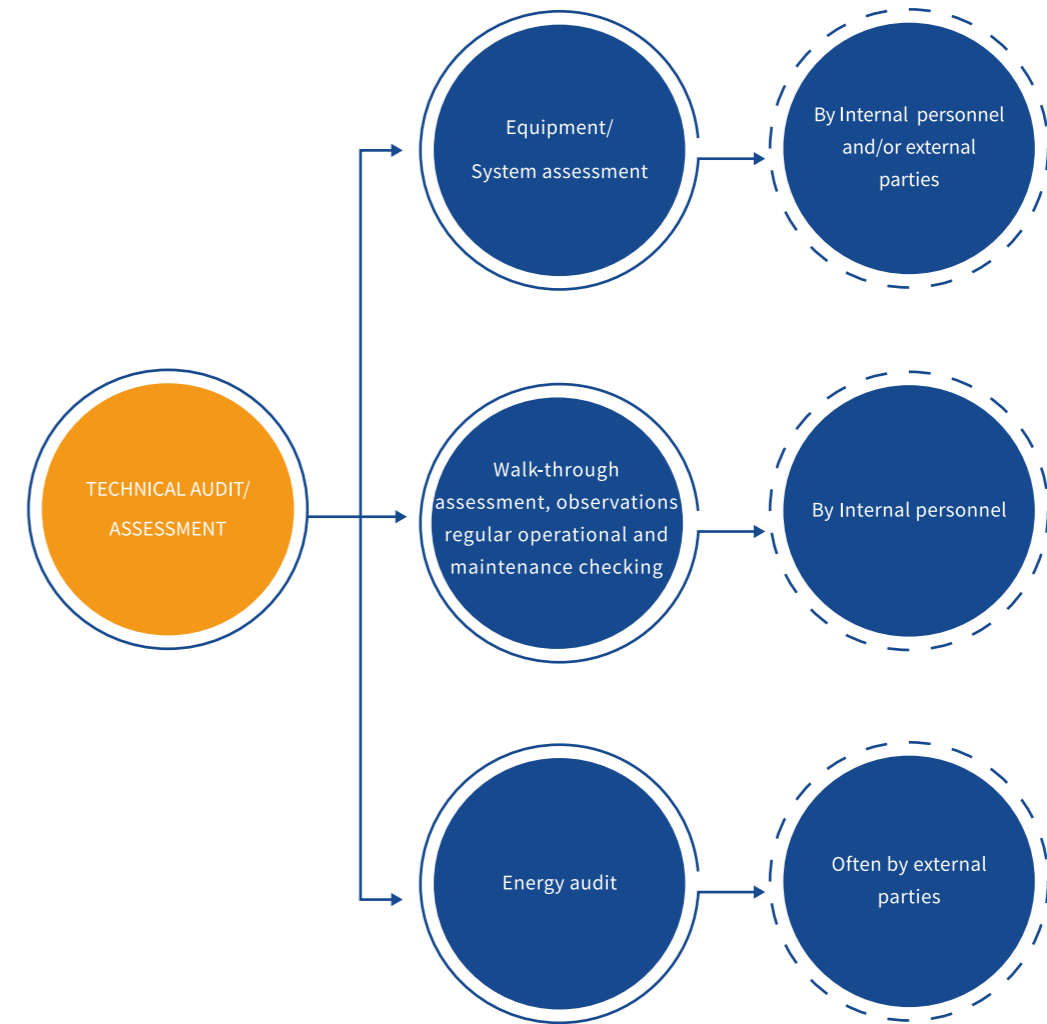


Figure 3: Types of technical audit/assessment to identify energy saving measures in EnMS.



It is also important to identify the economic benefits from implementing proposed ESMs and then convince the top management to approve the implementation to achieve the intended energy management objectives and targets.

From the estimated energy savings value from each ESM, the organisation can determine the percentage energy consumption that can be achieved against the baseline value that has been established. This value will be used to set the energy management target for agreed period and to be documented as the energy management objective and target.

The standard that can be referred by REEMs in conducting energy audit is ISO 50002 Energy Audits-Requirements with guidance for use.

5.5.6 Setting the energy management objectives and targets

The REEM shall advise and assist the installation to establish comprehensive energy management objectives and targets is consistent with the energy policy, applicable, measurable and consider SEUs.

The objectives and targets shall also consider opportunities to improve energy performance which require monitoring, communicated to all level of personnel and to be updated if necessary, with proper documentation.

Figure 4 below illustrates key elements in comprehensive energy management targets to achieve the objectives.

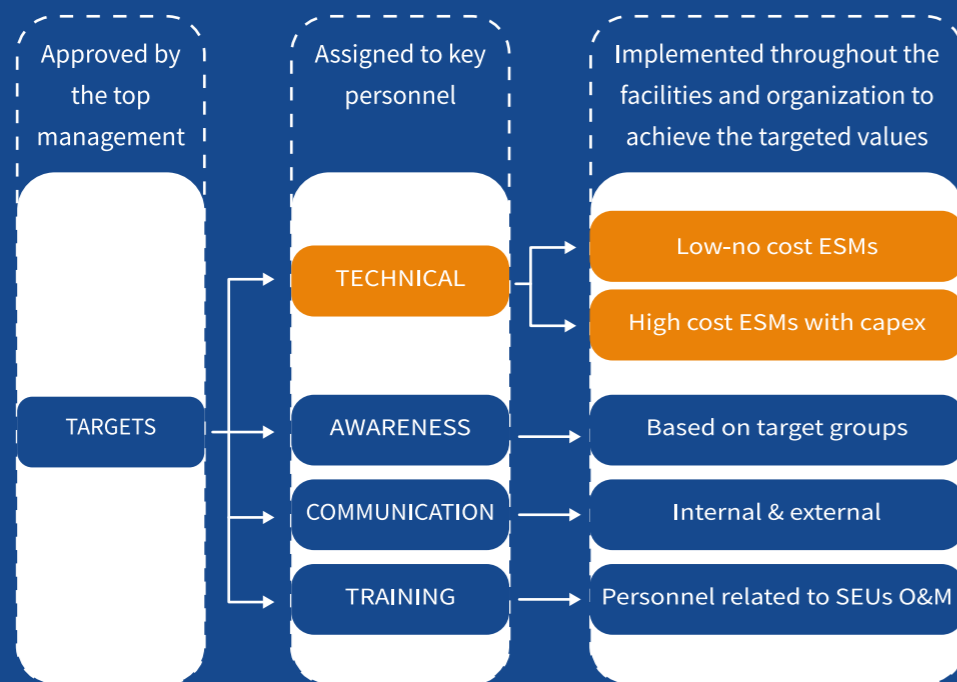


Figure 4: Key activities and target groups in a comprehensive energy management target.

5.5.7 Preparation of the energy management action plan

The REEM shall advise the installation on how to develop the action plan to achieve its objectives and energy targets when the plan need to be established and maintained

The energy management action plan should include the following:

- i) Measures to be implemented which will consist of technical and non-technical measures.
- ii) Resources required to implement each measure.
- iii) Responsible/assigned personnel.
- iv) Targeted period/deadline to be completed.
- v) Performance evaluation and verification method.
- vi) Records and documents needed on the progress of the action plan.

The REEM shall advise the installation to consider how the actions to achieve its objectives and energy targets can be integrated into the installation’s business processes to reduce energy cost based on the action plan with key elements as illustrated in Figure 5 below.

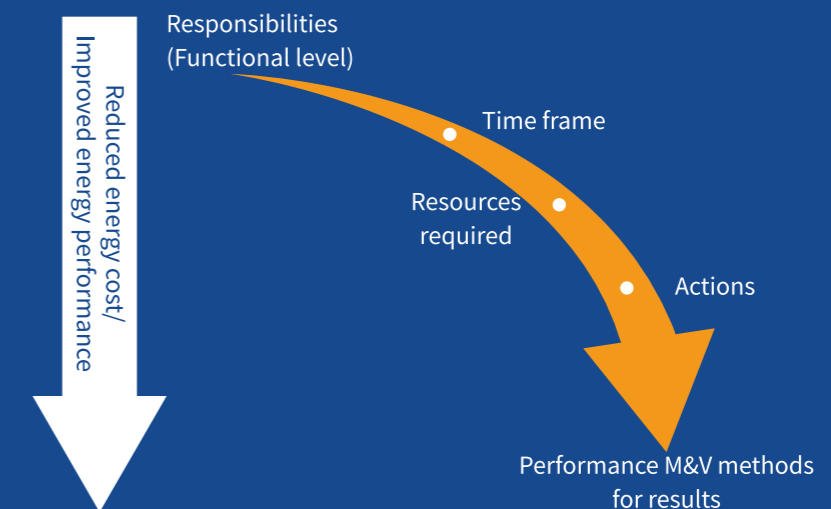


Figure 5: Key elements in the action plan to reduce energy cost.

5.6 The operation on energy management system

5.6.1 Resources required for energy management system implementation

The REEM shall advise the installation about to determine and provide the resources needed for the establishment, implementation, maintenance, and continual improvement of energy performance and the EnMS as illustrated in the Figure 6 in the next page.

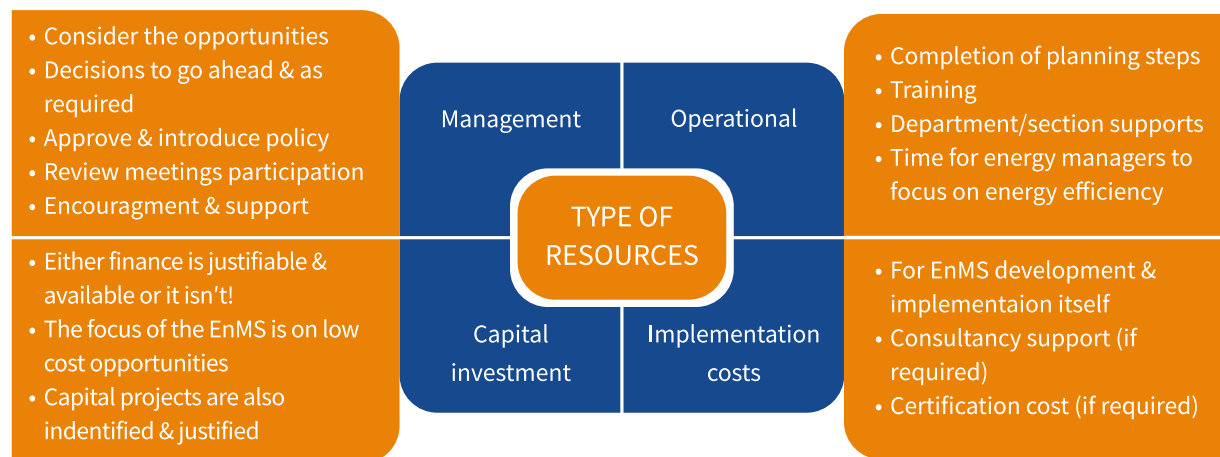


Figure 6: The summary of resources needed in the implementation of EnMS.

5.6.2 Competence in energy management system implementation

The competency of personnel involved on operating and maintaining energy using systems and equipment is very importance to ensure its energy performance to be at the desired level. Therefore, the REEM shall advise the installation about the followings:

- i) to determine the necessary competence of person(s) doing work under its control that affects its energy performance and EnMS.
- ii) to ensure that these persons are competent based on appropriate education, training, skills, or experience.
- iii) to take actions to acquire the necessary competence and evaluate the effectiveness of the actions taken if necessary and suitable means.
- iv) to retain appropriate documented information as evidence of competence.

5.6.3 Awareness program on efficient management of energy

The REEM shall advise the installation the importance to ensure that persons doing work under the installation's control shall be aware of the energy policy, their contribution to the effectiveness of the EnMS and the impact of their activities or behaviour with respect to energy performance as well as the implications of non-compliance with the EnMS requirements.

The target groups for the awareness programmes and activities should be customized for in-house personnel at all levels and external parties who

performed works in the installation and those who have interests in the operation of the installation for different purposes such as service providers, suppliers, customers, regulators and etc.

5.6.4 Internal and external communications

The REEM shall advise the installation on how to determine the internal and external communications relevant to the EnMS, including:

- i) on what it will communicate.
- ii) when to communicate.
- iii) with whom to communicate.
- iv) how to communicate.
- v) who will communicate.

When establishing its communication process, the REEM shall advise the installation to ensure that information communicated is consistent with information generated within the EnMS and is dependable.

The REEM shall also advise the installation to establish and implement a process by which any person doing work under the installation's control can make comments or suggest improvements to the EnMS and to energy performance.

5.6.5 Energy efficient operational planning and control

The REEM shall advise the installation to plan, implement and control the processes, related to its SEUs, needed to meet requirements, and to implement the measures in the action plan by:

- i) establishing criteria for the processes, including the effective operation and maintenance of facilities, equipment, systems, and energy-using processes where their absence can lead to a significant deviation from intended energy performance.
- ii) communicating the criteria to relevant person(s) doing work under the control of the installation.

- iii) implementing control of the processes in accordance with the criteria, including operating and maintaining facilities, equipment, systems, and energy-using processes in accordance with established criteria; and
- iv) keeping documented information to the extent necessary to have confidence that the processes have been carried out as planned.

The REEM shall also advise the installation shall control planned changes and review the consequences of unintended changes, acting to mitigate any adverse effects, as necessary. In the same time to ensure that outsourced SEUs or processes related to its SEUs are controlled.

5.6.6 Energy Efficiency Design

The REEM shall advise the installation to consider energy performance improvement opportunities and operational control in the design of new, modified and renovated facilities, equipment, systems and energy-using processes that can have a significant impact on its energy performance over the planned or expected operating lifetime.

It is recommended to establish the energy efficiency evaluation criteria for any design and projects that will affect energy consumption especially related to SEUs.

Where applicable, the results of the energy performance consideration shall be incorporated into specification, design, and procurement activities. In Malaysia, among the standard can be referred for energy efficiency design is MS1525:Energy efficiency and the use of renewable energy guidelines for non-residential buildings.

5.6.7 Procurement related to energy

The REEM shall advise the installation about to establish and implement criteria for evaluating energy performance over the planned or expected operating lifetime when procuring energy using products, equipment and services which are expected to have a significant impact on the installation's energy performance.

When procuring energy using products, equipment, and services that have, or can have, an impact on SEUs the installation shall inform suppliers that energy performance is one of the evaluation criteria for procurement. The criteria established can be integrated with the criteria in the energy efficiency design above as well.

Where applicable, The REEM shall advise the installation to define and communicate specifications for ensuring the energy performance of procured equipment and services and the purchase of energy.

5.7 Performance evaluation on installation's energy performance

The REEM shall advise the installation about monitoring, measurement, analysis, and evaluation of energy performance and the EnMS that has been implemented that should cover the followings to determine the energy performance and the progress of EnMS:

- i) what needs to be monitored and measured including at a minimum, the following key characteristics.
- ii) the effectiveness of the action plans in achieving objectives and energy targets.
- iii) EnPI(s).
- iv) operation of SEUs.
- v) actual versus expected energy consumption.
- vi) the methods for monitoring, measurement, analysis, and evaluation, as applicable, to ensure valid results.
- vii) when the monitoring and measuring shall be performed.
- viii) when the results from monitoring and measurement shall be analyzed and evaluated.

The REEM shall also advise the installation to investigate and respond to significant deviations in energy performance and to retain documented information on the results of the investigation and response and energy performance monitoring and measurement.

The standard that can be referred by REEMs in energy performance measurement of the installation is ISO50015:Energy Management Systems – Measurement and Verification of energy performance of organizations.

5.8 Management reviews on energy management progress and performance

The REEM shall advise the top management of the installation to review the installation's EnMS implementation, at suitable intervals, to ensure its continuing suitability, adequacy, effectiveness, and alignment with the strategic direction of the installation.

The management review shall consider the followings:

- i) the status of actions from previous management reviews.
- ii) changes in external and internal issues and associated risks and opportunities that are relevant to the EnMS.
- iii) information on the EnMS performance, including trends in deviations and actions taken.
- iv) monitoring and measurement results.
- v) performance evaluation audit results.
- vi) results of the evaluation of compliance with legal requirements and other requirements.
- vii) opportunities for continual improvement, including those for competence.
energy policy review if necessary, which need to consider on the extent to which objectives and energy targets have been met, energy performance improvement results and status of the action plans.

The outputs of the management review shall include decisions related to continual improvement opportunities and any need for changes to the EnMS with regards to all the above item i to viii for opportunities to improve energy performance and integration with business process, the allocation of resources and of awareness and communication.

5.9 Continual improvement in energy management program and its activities

When any deviation from the EnMS is identified, the REEM shall advise the installation

- i) to respond to the deviation and act to control and correct it and then to manage its impact(s).
- ii) to assess the need for action to eliminate the causes for prevention or occurring elsewhere.
- iii) to implement any action needed and to review the effectiveness of any action taken.
- iv) to review and make changes to the EnMS, if needed.

The REEM shall continue to advise the installation to continually improve the suitability, adequacy, and effectiveness of the EnMS and to demonstrate continual energy performance improvement through on-going monitoring, targeting, and reporting on energy management activities and progress of the installation.

5.10 Documentation of energy management activities

The REEM shall advise the installation about the suitable EnMS documentation structure, process and control that shall include documented information on energy management activities and key data and information to demonstrate and records the effectiveness of the EnMS and energy performance improvement achieved.

6.0 REFERENCES

- i) ISO50001:2018 Energy Management Systems-Requirements with guidance for use
- ii) Efficient Management of Electrical Energy Regulations 2008.