

Chapter 3

Energy Managers

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Chapter 3

Energy Managers

Luk Chau Beng

1. Developing Certified Energy Managers

Implementing an energy efficiency and conservation (EEC) programme requires the commitment of all parties starting from the government to stakeholders and the public at large. The government shall promote awareness on policies, regulations, guidance, enforcement, and provide support to all stakeholders, including the public, through various forms of mass media and education campaigns. The stakeholders shall support and abide by the regulations collectively to achieve the goals and objectives of these initiatives. Cambodia, through the General Department of Energy (GDE), Ministry of Mines and Energy (MME), is believed to have plans of drafting and implementing new EEC regulations. Whilst waiting for the EEC regulations to be enforced, the GDE can kickstart its intention through awareness programmes and workshops with various stakeholders. This chapter addresses the needs, duties, and methodology of developing energy managers to support the implementation of such regulations.

In meeting these expectations and targets of the EEC programme, a responsible energy professional person called a 'certified energy manager' (CEM), who is well accepted in an energy-intensive organisation, will be appointed to promote and manage energy utilisation efficiently through a systematic energy management system. He will need to use his interpersonal skills to educate and increase awareness, motivate, and create behavioural change in the organisation to adapt to the new energy management concept. With these requirements, the CEM shall be a person proficient in management, information skills, and conversant with technical plant processes and other matters relating to energy management within the business entities.

1.1. Definition of certified energy managers

A CEM is a person who holds a national energy manager licence from the GDE, MME. Once the new EEC regulations are enforced, the owner of a designated building or factory (refer to Section 6.2) shall engage a CEM to ensure that use of energy in the energy-intensive premises are being managed efficiently. To achieve these goals, a CEM needs to set objectives, targets, and plans to achieve such planned targets, aside from reporting to the management of the premises and to the GDE.

The CEM needs to set up an in-house energy management committee with representation from all departments to collectively manage and reduce energy consumption. Hence, he or she should be technically competent and trained; possess interpersonal, execution, management and information knowledge and skills; and is familiar with EEC practices.

1.2. Skills and competence required of certified energy managers

A CEM clearly requires a mix of hands-on experience on technical plant process and EEC knowledge, and interpersonal, analytical, , and managerial skills, using appropriate tools and techniques to achieve the EEC goals. The five key components of a CEM competence (Oung, 2013) are:

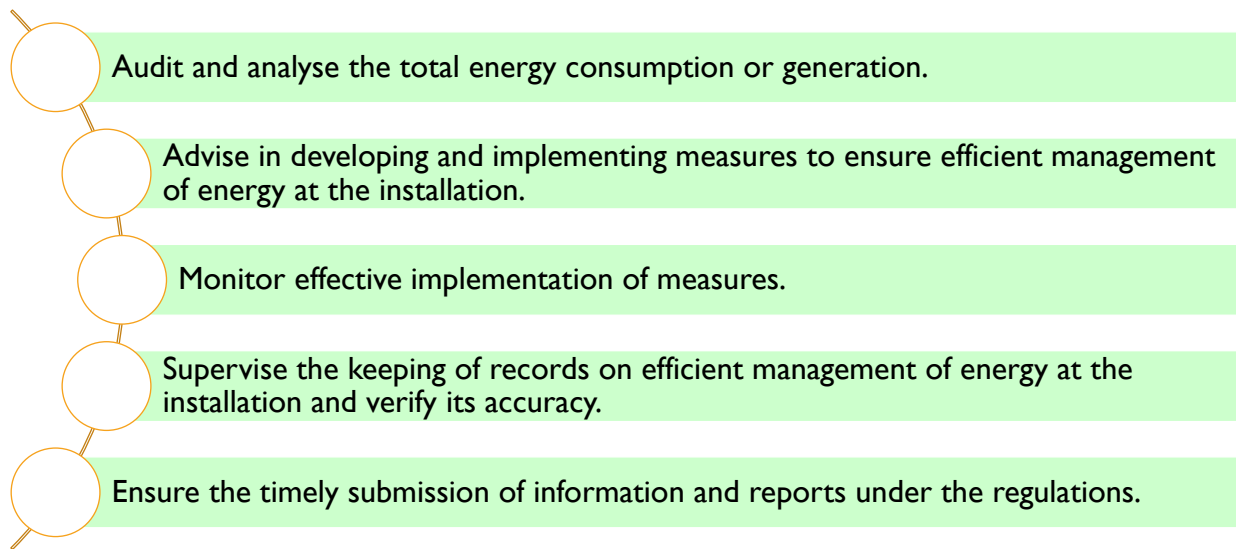
- 1) **Personal management** – managing oneself of EEC behaviour and conserving the use of energy through scheduling and prioritising actions.
- 2) **Interpersonal management** – dealing with the internal organisation and external parties (consultants and contractors), resolving conflicts, facilitating meetings, building an energy-efficient culture, organising resources, delegating tasks, setting business goals and evaluating performance, creating and managing networks, etc.
- 3) **Data information management** – observing, interviewing, measuring, monitoring, and other means of gathering energy consumption data, evaluating, modelling and processing the data, and disseminating energy consumption performance to the management and relevant departments for the success of the energy reduction programme.
- 4) **Execution** – planning and creating a vision for EEC, carrying out risk assessment, identifying opportunities, followed by mobilising tools and resources to reduce energy consumption.
- 5) **Technical competencies** – establishing and following a systematic energy management programme. This includes monitoring, measurement, documentation and reporting, plant process knowledge and energy use, energy audit, energy-saving measures and latest energy-efficient technology.

1.3. Duties of certified energy managers

1) Meeting the regulatory requirements

The CEM is responsible for compiling the in-house documentation to comply with the regulatory requirements of efficient energy management (EEM) of the designated premise. Figure 3.1 summarises what the regulator (GDE) expects from a CEM. The contents of a periodical report by a CEM is shown in section 3.2.4

Figure 3.1: Functions of Energy Managers under the Regulations



Source: Electricity Supply Act 1990, Malaysia.

2) Managing energy use in designated premises. This includes:

- Understanding how energy resources are being used and shares of energy use by various significant energy users;
- Determining how a change in production or process affects energy consumption; and
- Identifying the effect of future company plans and activities on energy demand and energy cost.

3) Acting as a centre for energy data information

- Providing data to the company's management for management reviews and approving organisation improvement plans;
- Providing information on actual energy consumption to all staff of the organisation. This will generate awareness of their effort and achievement and, hence, will motivate staff to monitor and track their targets.
- Installing appropriate online metering at significant energy-user locations to collect and trend such data.

4) Monitoring energy consumption pattern

- Assessing the key performance of each significant energy user, analysing the quantity of energy used, and identifying opportunities for improvement; and
- Communicating the energy input and deviations to the identified departments for immediate corrective action as well as planning for long-term improvement.

5) Energising and promoting engagement from all personnel

- The CEM needs to get the buy-in from the management and participation of the whole organisation in implementing culture change and creating a network of energy change teams to achieve the organisation's EEC goals.

- Educating the staff on business needs and means to reduce energy consumption.

6) Managing improvement projects, liaising with all parties to successfully implement and complete the project.

1.4. Example of focus areas for CEMs on high-impact EEC measures in designated premises

A CEM should focus and act to manage high-impact EEC measures at the designated premises to optimise energy use, recover waste heat, minimise energy losses, and improve operational efficiency.

- **Industries**

- Good combustion efficiency of fuel
- Optimisation of the usage of waste heat recovery
- Prevention of energy loss due to poor insulation, leakages, and poor heat transfer
- Use of energy-efficient equipment and proper operational control for varying demand
- Efficient use and conservation of electricity
- Substitution of energy

- **Buildings**

- Use of energy-efficient construction materials
- Shading of heat from sunlight into the building.
- Use of efficient heating, ventilation, and air conditioning (HVAC) equipment with proper control of room temperature
- Use of energy-efficient office equipment and fittings, such as lighting with proper operational control

2. Registration and Licensing of Certified Energy Managers

Cambodia is implementing EEC measures in designated premises through the new EEC regulations. The objectives of these regulations are to ensure that energy is efficiently and effectively used, the specific energy consumption and energy costs for designated premises are reduced, the competitiveness of the economy is increased, the dependence on imported fuel is decreased, and the natural environment of the country is protected.

The development and implementation of the new EEC regulations have been suggested to be under the purview of the Department of Energy Technique and Energy Business Policy (DoET&EBP), a department under the GDE. In the National Efficiency Policy, the Ministry of Industry, Mines and Energy (currently MME) declared its willingness to reduce energy demand by 20% and national carbon dioxide emission by 3 million tons by 2035 (MIME, 2013).

In the National Policy, Strategy and Action Plan on Energy Efficiency in Cambodia (MIME, 2013), an estimated saving potential in the industry sector of 20% (garment industry) up to 70% (brick factories) and in the commercial building sector of 20% to 30% is achievable. This can be achieved through (i) regular

training to create awareness and change in people's behaviour in the use of energy; (ii) awareness on the substantial amount of savings that can be achieved in energy and money in their premises; (iii) identifying operational and equipment inefficiency and carrying out regular maintenance, adjustment, or replacement of inefficient equipment; and (iv) use of energy-efficient building materials and passive design principles in buildings.

Amongst the major energy-consuming industries are the textile sector, followed by clay brick fabrication for building construction, rice mills for processing paddy into polished rice, rubber production, and the food sector with particular emphasis on the fabrication office for refrigeration. The energy-consuming entities of the commercial sector are offices, hotels, retail stores, education, industrial, and public buildings.

The new EEC regulations shall include a well-defined registration of designated premises based on energy usage threshold values over a consecutive period (e.g. over 2 consecutive years), qualifications for national certification of CEMs, mandatory training, role and responsibilities of CEMs, renewal process for CEMs, appointment of CEMs in the designated premises, systematic and progressive implementation of energy management at the designated premises, and reporting of CEMs to the GDE.

2.1. Establishment of a CEM advisory committee

In setting up the registration and licensing requirements for CEMs, a CEM advisory committee is first set up to formulate the requirements for the qualifications and registration of CEMs, examination syllabus, scheme of the examination, and registration and licensing of CEMs. The functions of the CEM advisory committee consist of the following:

- 1) Set up the mandatory qualifications for the application and registration of a candidate to the national level certification for energy managers.
- 2) Define the procedure and scheme of conduct of the examination.
- 3) Appoint the committee who will draft the national energy manager certification syllabus. The CEM advisory committee shall review said syllabus and endorse it before sending to the Board of Examinations for approval.
- 4) Review feedback from the industries, the candidates, and the public from time to time regarding the syllabus and procedure of the examination; and recommend measures for the endorsement by the Board of Examination.
- 5) Appoint the controller of examination and other approved officers such as invigilators and panel evaluators responsible for the conduct of the examination. Allow the controller of examination to deal directly with the approved panel of examiners for conducting the examination, and to supervise the secrecy and confidentiality of the printing and distribution of the questions.
- 6) Appoint the panel of examiners for paper setting, criteria of evaluation of papers, and moderation.
- 7) Appoint a vigilance officer to ensure that the examinations are conducted fairly and in a prescribed manner per the rules.
- 8) Approve the examination results and forward its recommendation for the announcement of the results.

- 9) Invite experts and other competent persons to advise the board on matters pertaining to the syllabus, conduct, and scheme of examination.

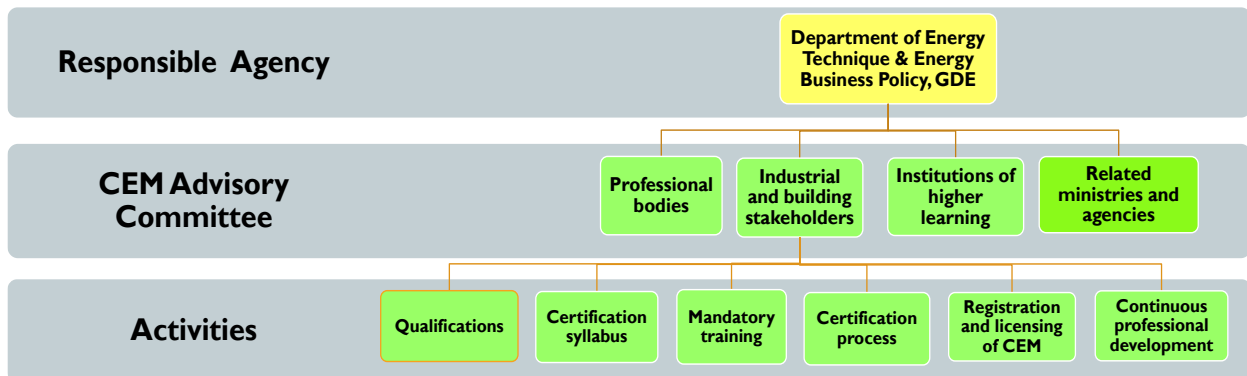
The CEM advisory committee is recommended to be set up under the Board of Examination. The committee consists of the

- Director General of the GDE, MME as the chair of the CEM advisory committee
- Director of the DoET&EBP, GDE as the Secretary
 - He submits a list of organisations, deemed to have influence on EEC activities, to the Board of Examinations for approval to be appointed as members of the committee.
 - Upon the approval by the Board, he then writes to and request each head of these organisations to nominate an EEC expert to be part of the committee.
 - Organisations may include:
 - Primary members consisting of ministries and governmental agencies such as the DoET&EBP under the DGE, Electricite du Cambodge (EDC), Electricity Authority of Cambodia, and other relevant ministries such as the Ministry of Urban Planning and Construction, the Ministry of Labour and Vocational Training, etc.;
 - Manufacturing associations (garment, breweries, rice millers, food industries, brick, chemicals, etc.);
 - Commercial stakeholders (hotels, malls, hospitals, and other commercial buildings);
 - Professional institutions (Board of Engineers Cambodia, etc.);
 - Institutions of higher learning (universities, technical college, and polytechnics).

2.2. National accredited qualification and certification for energy managers

Figure 3.2 shows the activities needed to be set up in developing and implementing the new national accredited qualification and certification process for energy managers.

Figure 3.2: Overview of Implementation of Energy Managers' Programme



CEM = certified energy manager, GDE = General Department of Energy.

Source: Author.

1) Minimum qualifications

- a) Minimum educational background (e.g. a first degree in engineering, science, and architecture or a higher vocational certificate in engineering)
- b) Minimum working experience in the field of energy management (e.g. 2 years). The experience may include the use of energy in operation and maintenance, planning, and energy auditing. The management of the designated premises must provide evidence of the applicant's experience in energy management.
- c) Completion of the mandatory energy manager training, as detailed in section 3.3.1, that is accredited by the DoET&EBP or the GDE.

2) Energy manager's certification syllabus

The suggested list of national certification syllabus for an energy manager covers three sections (Figure 3.3): section 1 covers the basic aspect of regulations, energy management, and energy audit; section 2 covers the fundamentals of electrical and thermal energy; and section 3, a specialisation field, covers energy management in equipment and system using large energy and its savings potential.

Figure 3.3: Sample Syllabus for Energy Manager Certification Course

<ul style="list-style-type: none"> • Section 1: General Aspect of Energy Management and Energy Audit <ul style="list-style-type: none"> • Energy scenario • Energy policy and legislation • Energy pricing • Efficient energy management • Energy audit • Energy reporting and presentation • Measurement and monitoring • Energy performance target • Section 2: Fundamentals of Electrical Thermal System <ul style="list-style-type: none"> • Electricity, heat, fluid, fuel, and combustion 	<ul style="list-style-type: none"> • Section 3: Energy Efficiency Potential <ul style="list-style-type: none"> • Electric motors, demand controls including variable speed control • Compressed air, fans and blower system • HVAC, refrigeration systems, and cooling tower • Electric heating system • Lighting systems • Boilers, furnaces, and heating systems • Heat exchangers and heat recovery equipment • Pumps and pumping system • Steam systems • Insulation and refractories • Cogeneration and waste heat recovery system • New energy-efficient solutions and technologies
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HVAC = heating, ventilation, and air conditioning.

Source: Author.

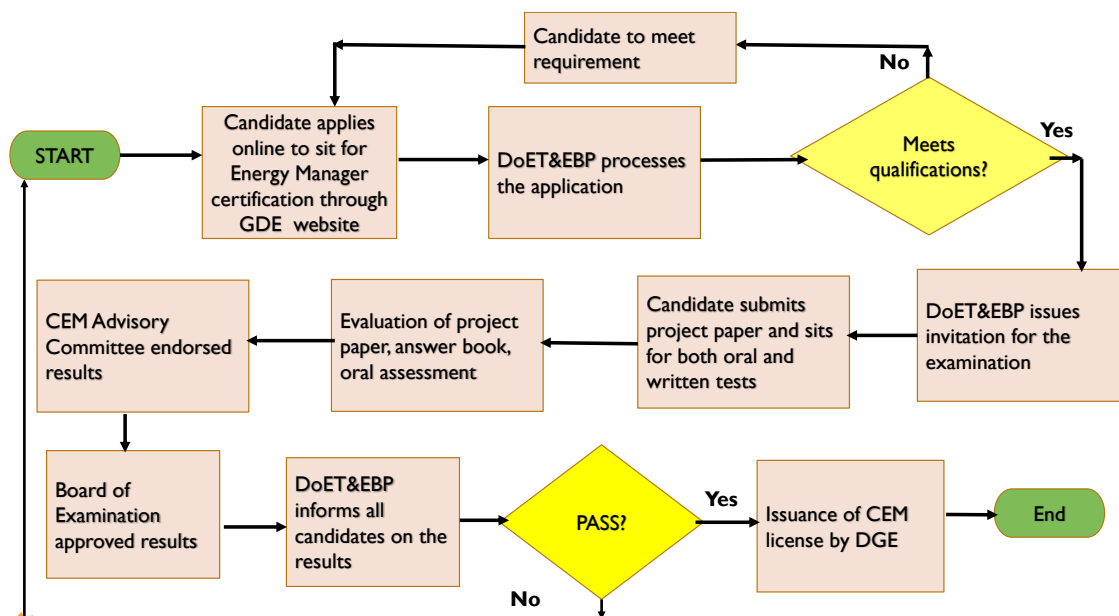
3) The certification process

Figure 3.4 shows the process for the application for CEM certification.

The examination will be conducted according to the approved Energy Manager Certification Syllabus as in section 3.2.2(2). The examination may include a written test with descriptive or numerical questions, an oral assessment, and a project based on EEC exercise carried out at the designated premises by the candidate himself. All candidates are required to achieve the minimum passing marks in all three parts.

The controller of examination manages the examination with the assistance of other officers such as invigilators, a panel of evaluators, and a vigilance officer. After the examination, he then compiles all the marks from the panel of evaluators and sends these to the CEM advisory committee for endorsement. The announcement of the results shall be carried out after the final approval by the Board of Examinations. A CEM licence shall then be issued by the GDE, duly signed by the Board of Examinations.

Figure 3.4: Process of Certification of Energy Managers



CEM = certified energy manager, DoET&EBP = Department of Energy Technique and Energy Business Policy, GDE = General Department of Energy.
Source: Author.

2.3. Licensing and renewal of certified energy managers

After the GDE announces the results, candidates who passed the examination shall apply for a CEM licence. The GDE shall then issue such licence, to be renewed yearly upon the CEM's submission of the application for renewal, payment of renewal fees, and continuous professional development (CPD) records as required by the regulation.

2.4. Content of energy management report required of an appointed CEM²

The CEM shall monitor and report on the efficient energy management (EEM) semi-annually to the DoET&EBP. The report shall include the following:

- 1) Basic information on the business activities of the designated premises, EEM policies and objectives, and EEM committee organisation chart;
- 2) Types and description of energy-consuming system;
- 3) Baseline data for 6 consecutive months before the implementation of the EEM, presented in table and graphical format on the type, quantity, unit of measure of fuel or energy commodity used, and the quantity and unit of measures of each intended output/production, together with the calculated specific energy consumption;
- 4) Current trending similar to baseline data reporting for the next 6 consecutive months after EEM implementation. In addition, a report on energy consumption patterns and energy distribution breakdown shall be presented in line and pie charts, respectively. Finally, a comparison, with comments on the reasons, of the percentage decrease or increase in energy consumption and specific energy consumption of the designated premises.
- 5) List and status, in table form, of all EEM activities and projects being implemented or in progress, cancelled, or rejected in the designated premises; if the proposed activities are being cancelled or rejected, state the reason for rejection.
- 6) Summary of savings from EEM activities and projects in table form, along with the baseline measurement. Current consumption, percentage of savings (estimate and actual), and measuring tools. The current consumption savings achieved must be reported up to a maximum of 1 year to ensure that the designated premise keeps track of EEM performance.
- 7) New EEM activities and/or projects to be implemented with a brief description, estimated energy and cost savings, investment costs, and return benefits.

2.5. Role of the General Department of Energy

The successful implementation of the CEM programme lies in the effective development of CEM requirements in new EEC regulations, awareness and promotion, and implementation and enforcement of the regulations. The role of the GDE is summarised as follows:

- 1) Assign the DoET&EBP, under the GDE, to be responsible for setting up the new EEC regulations. The Economic Research Institute for ASEAN and East Asia (ERIA) shall be pleased to support the GDE in setting up the EEC regulations.
- 2) Appoint the CEM advisory committee to set up the various requirements for the registration and licensing of a CEM under the new EEC regulations. The requirements for CEM includes (i) minimum qualifications; (ii) certification syllabus; (iii) certification process; (iv) registration, licensing, and renewal; (v) penalty and appeal; and (vi) defined designated premises.
- 3) Submit the EEC regulations for the approval of the Minister of Mines and Energy.
- 4) To launch the CEM scheme, generate awareness to the occupants of the designated premises, industries and building associations, government agencies, local institutions of higher learning, and professional bodies.

² Electricity Supply Act 1990, Malaysia. Efficient Management of Electrical Energy Reg. 2008 [P.U. (A) 444].

- 5) Invite international organisations with EEC expertise, such as the Energy Conservation Center, Japan (ECCJ), ASEAN–Japan Energy Efficiency Partnership (AJEEP), Energy Management Action Network (EMAK), United Nations Industrial Development Organization (UNIDO), to assist in setting up the mandatory training for CEMs.
- 6) Invite local energy service providers and local institutions of higher learning to the CEM mandatory training to build their capacity as future local trainer providers.
- 7) Approve and accredit CEM training courses.
- 8) Enforce EEC regulations
 - Registration, licensing, and renewal of CEM; and
 - Registration of the designated premises.
- 9) Receive, review, comment, and communicate regarding the CEM periodical report.
- 10) Make information on EEC activities and achievements available to the public and the Royal Government of Cambodia.

3. Certified Training Courses

The main barriers towards realising the full potential of the EEC are lack of awareness by industry managers and policymakers as well as the lack of widespread education and training on energy management and conservation at all levels of the organisation. To successfully manage EEC at the designated premises, these barriers must first be overcome, together with a change in organisational behaviour towards energy conservation. This success will eventually result in sustainable energy development in Cambodia.

Effective training requires various flexible approaches, including project-based learning, case studies, interactive programmes, quizzes, etc. In many cases, teaching quality and learning experiences are observed to be higher when the trainer modifies and refines the training materials provided based on his or her experience on the subject. Well-experienced and specialised field experts on the technical, management, and commercial aspects are required. Hence, the DoET&EBP would benefit to use this opportunity to engage the assistance of international EEC experts from international organisations such as the ECCJ, AJEEP, EMAK, and UNIDO in identifying the potential gaps, and provide the necessary training and capacity building during this initial stage.

At this stage, the DoET&EBP should also identify and invite EEC professionals from local institutions of higher learning and professional bodies to be prepared as future local trainers under the guidance of these foreign EEC experts. Once they have successfully completed their course, they can set up their own company, develop their own course materials based on the GDE-approved syllabus, and apply to the DoET&EBP to be a licensed training provider.

Training under this section refers to the mandatory training for energy managers as part of the requirements for registration and the mandatory CPD training for renewal of their licence.

3.1. Mandatory energy manager training

The mandatory energy manager course is an approved course based on the approved syllabus (see para 3.2.2 [2]) and conducted by a training provider approved by the GDE. This course will provide the knowledge and skills required by the CEM to execute his duties competently and effectively.

This mandatory training aims to:

- Introduce the principles of energy management with fundamental and specialised knowledge in EEC.
- Improve measurement, verification, and analytical skills.
- Promote investments in energy savings through energy efficiency measures and technologies.
- Lead to reduction in specific energy consumption.

At the end of the mandatory course, participants will be assessed and required to pass all three modes of assessment: (i) a written examination; (ii) submission of an energy audit carried out by the participant at his site covering the assessment, analysis, and recommendation on energy-saving measures and investment appraisal; and (c) an oral interview before a certificate of achievement is issued. Candidates can use this certificate of achievement to apply for their registration as CEM.

3.2. Mandatory continuous professional development

Continuous professional development (CPD) refers to the accumulated hours of training and other EEC activities, which are a prerequisite for the renewal of the CEM licence. The CPD provides CEMs an opportunity to continuously update their skills and knowledge on the current EEC methodology, best practices, efficient technologies, and specialised EEC equipment and system optimisation.

Other activities that form part of the CPD include participating in drafting EEC codes and standards and best practice guidelines, making presentations to share knowledge and experience, and attending EEC-related postgraduate studies.

CPD programmes can be conducted through courses, forums, workshops, and seminars. All CPD courses must be approved with accredited hours by the DoET&EBP. The approved reference code must also be stated on the training providers' advertisement flyers and certificates.

Examples of training organisers are the GDE, energy manager associations, engineering professional bodies, energy service companies (ESCOs), industry and building associations, and other training providers approved by the GDE.

4. Setting Up the Association of Energy Managers

The Association of Energy Managers is a non-governmental and non-profit organisation set up amongst CEMs working in designated premises and ESCOs.

An example of the vision of such association is to develop the professionalism, trustworthiness, and high integrity of CEMs to be recognised nationally and regionally. Its mission shall play an important role in the effective execution of government EEC policies and programmes to achieve a progressive and sustainable Cambodia.

The Government of Cambodia should motivate, encourage, and assist the energy managers' group in setting up such association. Members may comprise CEMs, trainee energy managers, and other stakeholders of local institutions of higher learning and owners of designated premises.

4.1. Objectives of the Association of Energy Managers

The Association of Energy Managers aims to provide CEMs a platform to network, share experiences amongst its members, create a strong working relationship between government regulators and the owners of designated premises, and help the government achieve its EEC goals. Other objectives include

- ensuring the welfare of its members;
- promoting a healthy competition amongst members of the association through professional services, ethics, and integrity;
- providing professional input and feedback to the regulator about the national planning and execution of government EEC policies, initiatives, and programmes;
- improving the competency, skills, and best EEC practices of its members to develop their business and career path potentials as well as to increase their competitiveness;
- providing awareness on campaigns, financial incentives, or grants to implement energy-efficient solutions and energy auditing through association portals and emails;
- guiding and assisting members deal with the regulators and relevant government agencies.

4.2. Activities of the Association of Energy Managers

- Collaboration, cooperation, and networking with the DoET&EBP by
 - obtaining and sharing the latest information on any new policies, guidelines, initiatives, activities, and other information to members;
 - jointly organising EEC events such as town halls, forums, and conferences to provide members an opportunity to dialogue and network with the regulator to clarify matters and gain a better understanding of government initiatives and expectations;
 - assisting the government achieve the national EEC goals by disseminating important EEC-related information and motivating owners of designated premises; and
 - bringing up matters faced by the members and discussing with the regulator to ensure smooth implementation of EEC activities and protection of members' welfare.
- Organising activities that enhance the competency, skills, knowledge, and competitiveness of energy managers such as
 - training, talks, conferences, and knowledge sharing;
 - awareness on latest best practices and efficient technology;
 - standard writing, study tours, and visits relating to EEC;
 - working groups amongst association members in carrying out knowledge exchanges, advising members in dealing with authorities; and
 - CPD training programmes for CEMs to renew their licence.

5. Road Map for Developing Energy Managers (2020–2025)

Cambodia has yet to draft EEC regulations. Hence, the GDE needs to exert more effort, commit, provide leadership, and deploy resources particularly for the new EEC regulations, which include CEM registration and licensing. Accordingly, the execution of the road map is planned in three phases.

Phase 1 (2020–2021): Setting up the regulations for registration and licensing of energy managers

- The GDE to appoint the DoET&EBP to be responsible for setting up, implementing, and enforcing the new EEC regulations (2020)
- Government to launch and make public the intents of EEC initiatives (2020)
- Form the CEM advisory committee to develop mandatory criteria, such as the minimum qualifications for registration, certification, and licensing processes; functions and responsibilities of a CEM; requirements for designated premises; reporting and efficient energy management planning; penalties and appeal to be inserted into the EEC regulations (2020)
- Appoint a working committee to draft the examination syllabus (2020)
- Appoint a working committee to draft the EEC regulations (2020)
- The GDE to approve the certification examination syllabus for CEMs (early 2021)
- The minister to approve the EEC regulations (mid-2022).

Phase 2 (2021–2023): Awareness training, mandatory energy managers’ training, and developing examination questions

- Start developing the mandatory energy managers’ training with assistance from international EEC organisation experts (e.g. ECCJ, AJEEP, UNIDO, EMAK, etc.) (mid 2021)
- Conduct the first mandatory energy managers’ training with assistance from international EEC organisation experts (e.g. ECCJ, AJEEP, UNIDO, EMAK etc.) (end 2021)
- CEM advisory committee to appoint the panel of examiners and start preparing questions (2022)
- Establish examination procedures (2022)
- The GDE to approve local trainers to conduct the mandatory energy managers’ training (2023)

Phase 3 (2024–2025): Registration and licensing

- The CEM advisory committee to appoint the controller of examination and vigilance officer to organise and conduct the energy managers’ examination (2024)
- Controller of examination to appoint invigilator and support staff to conduct the examination (2024)
- Registration of energy managers (2024)
- Conduct of first energy managers’ examination (2024)
- Licensing of first CEMs (2024)
- Conduct of first CPD training courses (2025)

Table 3.1 shows the project milestones with leading and responsible organisations.

Table 3.1: Road Map Milestone for Energy Managers with Leading and Responsible Organisations

	Milestone Activities	Leading Organisation	Involved Organisations	Schedule
Phase 1	<ul style="list-style-type: none"> ✓ Government to launch EEC initiatives; Form a task force (including Examination Advisory Committee) to draft Act, regulations, and examination syllabus ✓ EEC Act and energy managers' regulations ✓ Establish syllabus for energy managers ✓ Enactment of EEC Act and its regulations 	- GDE	<ul style="list-style-type: none"> - Professional institutions - Industrial and building associations - Institutions of higher learning and ministries 	Start 3 years 1 year 1 year
Phase 2	<ul style="list-style-type: none"> ✓ Start training of energy managers with international energy efficiency organisations ✓ Appoint panel of examiners and prepare examination questions ✓ Establish examination procedures ✓ Approve local trainers for mandatory courses for energy managers 	- GDE	<ul style="list-style-type: none"> - International organisations with expertise in energy efficiency, experts, and stakeholders - Appointed panel - Task force - Local experts on energy efficiency 	1–3 years 1–2 years 1–2 years 1–2 years
Phase 3	<ul style="list-style-type: none"> ✓ Set up new EEC regulatory department to manage all EEC matters ✓ Appoint controller of examination who then appoints invigilators and support staff ✓ First examination for energy managers ✓ Registration of energy managers ✓ Continuous professional development 	- GDE	<ul style="list-style-type: none"> - GDE - Examination Advisory Committee - EEC regulator department - Training organisers 	1 year ½ year ½ year ½ year

EEC = energy efficiency and conservation, DoET&EBP = Department of Energy Technique and Energy Business Policy, GDE = General Department of Energy.

Source: Author.

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