

Chapter 2

Energy Service Company

Lee Yuen How

July 2020

This chapter should be cited as

Lee, Yuen How (2020), 'Energy Service Company', in Kimura, S., P. Han and S. M. Leong (eds.), *Energy Efficiency and Conservation Master Plan of Cambodia*. ERIA Research Project Report FY2020 no.07, Jakarta: ERIA, pp.7-18.

Chapter 2

Energy Service Company

Lee Yuen How

1. Introduction

1.1. What is an energy service company?

Energy prices in Cambodia, especially that of electricity, are marketed without counterproductive subsidies as far as energy efficiency is concerned. Accordingly, energy (electricity) cost seems to cost more than that of neighbouring countries, such as Thailand and Viet Nam. Thus, the application of economic efficiency policy to promote energy efficiency and conservation (EEC) is one of the options in Cambodia.

ESCO stands for energy service company. It operates a business by providing technologies with the necessary financing to energy users to replace or improve existing energy facilities to save energy. An ESCO will provide services as a one-stop solution for energy efficiency projects, which will ease project implementation as the client does not need to manage all the technical stages in project development, procurement, and commissioning. The ESCO retrieves the investment with the profit generated from the energy saved. On the other hand, it can be a consultancy company specialising in energy audits or energy monitoring services or equipment suppliers of energy-efficient equipment having competency in EEC.

According to the International Energy Agency (IEA) report, the value of the global ESCO market grew 8% to US\$28.6 billion in 2017, up from US\$26.8 billion in 2016. China continues to underpin the global ESCO market, growing at 11% to US\$16.8 billion in 2017. The market in the United States, where ESCOs have been operating for well over 30 years, grew to US\$7.6 billion in 2017. In Europe, the ESCO market remains somewhat underdeveloped compared to other major regions, representing 10% of the global total.

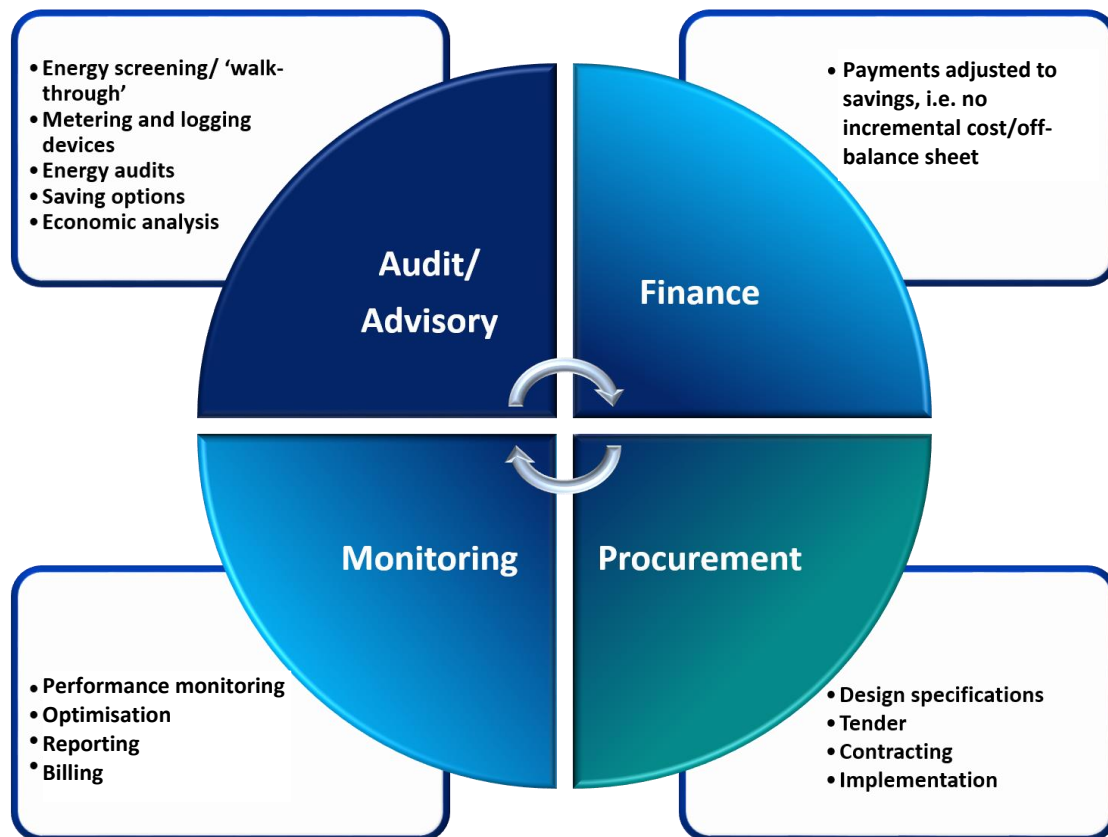
ESCOs have a huge potential role to play in reducing global energy consumption and, therefore, greenhouse gas (GHG) emissions. They could also play a key role in addressing energy shortages and price increases. ESCOs could be a particularly important force for change in developing countries and countries in transition for various reasons.

1.2. Scope of services of ESCOs

ESCOs provide – either directly or through experienced subcontractors – all services identified by the organisation as needed to implement the energy efficiency retrofit. ESCOs present a comprehensive plan to maximise energy savings whilst meeting the customer's specific facility requirements. ESCOs normally design the project to include multiple conservation measures and to account for interfacing with existing installations.

The scope of ESCO services can be divided into four main categories: (i) energy audit/advisory, (ii) finance, (iii) monitoring, and (iv) procurement.

Figure 2.1: Scope of ESCO Services



ESCO = energy service company.
Source: Jensen (2017).

3. Fundamental operational features of ESCOs

ESCOs have four fundamental operational features. Firstly, an ESCO guarantees energy savings whilst getting the same level of services at a lower energy cost through the implementation of an energy efficiency project. This performance guarantee can revolve around the actual flow of energy savings from a project, stipulating that the energy savings will be sufficient to repay monthly debt service costs for an efficiency project or ensure the same level of energy service at a reduced cost.

Secondly, the compensation of ESCOs is directly tied to the energy savings achieved and, therefore, performance.

Thirdly, ESCOs typically directly finance, or assist in arranging financing, for the installation of the efficiency or energy project to be implemented by providing a savings guarantee.

Fourthly, ESCOs tend to retain an ongoing operational role in measuring and verifying the savings over the financing term. Broadly, the ESCO model can be especially attractive to those considering structural rehabilitation of existing buildings that also focus on energy efficiency retrofits. ESCOs can be an effective instrument in developing the skilled professional job market and stimulating the energy efficiency business in Cambodia.

2. Registration and Licensing

The objective of ESCO registration and licensing is to improve the professionalism and quality of services offered by ESCOs to clients. This will enhance confidence and trust in the energy services sector and promote the growth and development of the ESCO industry.

The ESCO registration has the following benefits:

- Developing professional and qualified ESCOs,
- Enhancing the standing and recognition of ESCOs,
- Preventing false claims amongst industry players,
- Regulating and monitoring the services of ESCOs to the public, and
- Arranging and assisting the promotion of ESCO services.

Potential registration and licensing criteria could include a range of services offered, the presence of qualified personnel like the energy manager, financing and project management capabilities, technological and project design capabilities, and measurement and verification capabilities.

With the registration and licensing in place, the government can monitor the quantity and quality of registered ESCOs per year, including the number of audits and implementation of energy performance contracts (EPCs) in the industry. With the information obtained, the government can report the reduction in carbon dioxide emissions and energy savings. All ESCO registration shall be valid for at least 1 year with a yearly renewal requirement. Due to changes of staff over time, yearly renewal should be required to ensure that an ESCO has a qualified person in the company. Continuous effort to conduct training and certification for individuals within the ESCO industry, such as continuous professional development (CPD) approach, could be considered.

3. Role of the General Department of Energy

The General Department Energy (GDE) has an important role in ensuring the development of ESCOs in Cambodia. One of its most important roles is to promote the EPCs in government and iconic buildings. This is to improve the energy use of buildings in the country and highlight the benefits of energy efficiency design in new and existing buildings. By taking a lead role such energy efficiency projects in government buildings will yield better results. The government can showcase successful EEC implementation and encourage more entities of the private sector to participate and create the demand for ESCO services.

The GDE has the following roles to ensure ESCO establishment and growth in Cambodia:

- Capacity building, such as training to introduce best practices to local ESCOs to increase competency and knowledge;
- Formulating energy efficiency programmes and laws and regulations;
- Engaging with the private sector to participate in the EPCs and create a market for ESCOs;
- Promoting the development of a standardised contract and monitoring and verification protocols, such as the International Performance Measurement and Verification Protocol, to improve the credibility of ESCOs;
- Creating awareness by sharing success stories of public sector energy efficiency projects;
- Establishing a good registration and licensing process for ESCOs to ensure their competence and reliability;

- Encouraging joint ventures between foreign and local ESCOs to improve the latter’s knowledge and experience in implementing ESCO projects.

3.1. Sample ESCO application form

Figures 2.2 and 2.3 illustrates the form for ESCO registration and application. The details may be adjusted to suit Cambodian requirements.

Figure 2.2 Sample of ESCO Application Form (page 1)

**General Department of Energy (GDE)
Registration and Application for Energy Service Company (ESCO)**

Applicant’s Guide

Please submit the application to the GDE with the following supporting documents

No	Description	Submitted
Company Information		
1	Company Registration	
2	Copy of Office Tenancy Agreement or Sales and Purchase Agreement	
3	Company Profile with Organisational Chart, Track Record, and Expertise	
Competent Person		
4	Copy of Applicant’s Khmer Identity Card	
5	Copy of Competent Person’s (Energy Manager) Khmer Identity Card	
6	Certificate of Competent Person	
7	Copy of Competent Person’s Appointment Letter	

Section A: Applicant’s Information

Picture of Applicant	Applicant’s Name:
	Applicant’s Identity Number:
	Address:
	Position in Company:

Section B: Company Information

1	Company Name:	
2	Company Registration No:	
3	Company Address:	
4	Company Telephone Number:	
5	Company Email:	
6	Company Office (Rented/Owned)	

Figure 2.3 Sample of ESCO Application Form (page 2)

Company Directors and Shareholders			
No	Name and Identity Number	Address	Shareholding (%)
1			
2			
3			
4			

Section C: Information of Competent Person

1	Competent Person's Full Name:	
2	Certificate Registration Number:	
3	Khmer Identity Number:	

Section D: Monitoring and Measurement Equipment

No	Measurement Equipment	Brand	Model	Serial No.
1	Electrical Power and Energy Data Logger			
2	Thermal Energy Data Logger			
3	Flow Data Logger			
4	Others			

Section E: Declaration

I hereby certify that, to the best of my knowledge, all the information provided in this form is true and correct and the competent person listed in Section C is working full time in the company.

Applicant's Signature:	-----
Company Chop:	-----
Date:	-----

4. Financial Incentives

Financing support structures and funding mechanisms are vital to the success of the ESCO industry and the development of initial ESCO projects in the country. They assist in reducing the initial high costs and risks associated with the project. The governments of most developing countries may not be able to take on this task. However, the Cambodian government should invite international institutions like the World Bank, the Global Environmental Facility, and the Asian Development Bank to support ESCOs financially in the country during the early stages. However, this is only a short-term solution and should be considered as a kick-start before the domestic commercial banks become interested and willing to fund the local ESCOs. It is important to ensure that international organisations should not compete with domestic commercial banks for profitable ESCO projects once domestic banks are willing and able to participate in

ESCO financing. Once this occurs, international agencies and banks could play a secondary role in financing less profitable projects.

For the long-term success of ESCOs, domestic commercial banks must eventually play a role in financing ESCO projects. This requires institutional change and, therefore, a sustained effort over time. For example, domestic banks – as part of their environmental, social, and corporate governance – can introduce reduced interest rates in financial loans for energy efficiency projects. The banks can also introduce capacity building for their bank staff and other stakeholders to understand energy-efficiency financing through ESCOs.

Some other financial incentives can be through income tax exemption or reduction to encourage foreign ESCOs to partner with local ESCOs for knowledge transfer. The government can also exempt duties on imports of energy-efficient equipment for EEC projects.

5. ESCO Business Model and Case Study

5.1. Energy performance contracting

One key element to promote and encourage investment in energy efficiency in buildings and industries is through energy performance contracting (EPC) undertaken by ESCOs. Under the EPC, ESCOs would design and install energy-efficient systems/equipment for clients in the public, industry, and commercial sectors. ESCOs' remuneration is based on the amount of energy savings obtained from the retrofitting of the energy-efficient systems. After the term of the contract, the subsequent value of the energy savings would entirely belong to the client. ESCOs have been successfully using this model that has been operated in many developed countries for years.

ESCO business models can be divided into two main financial models: shared savings contracts and guaranteed savings contract.

5.2. ESCO business model: Shared savings EPC

Figure 2.4 Shared Savings EPC Business Model



EPC = energy performance contract/contracting, ESCO = energy service company.

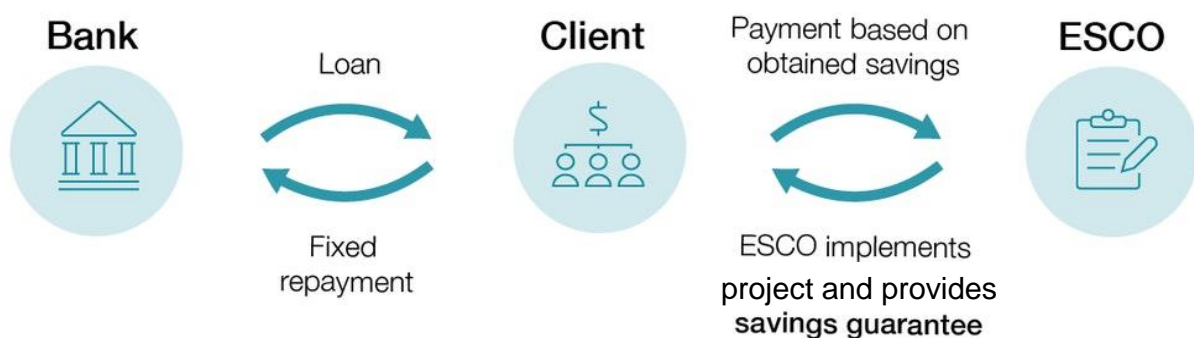
Source: International Energy Agency (IEA) website, <https://www.iea.org/>

With shared savings EPC, the ESCO finances the implementation of energy conservation measures at the customer’s facilities. Measured cost savings during the contract period are shared between the client who owns the facility and the ESCO. Usually, the contract specifies that a percentage of the obtained savings goes to the ESCO, which was previously defined by the client and the ESCO. This percentage is highly dependent on factors like the length of the project and project risks.

ESCOs often use a shared savings model, where they are paid a percentage of the costs they save for their client. Shared savings is a more attractive payment method because of its win-win nature. This is particularly relevant for energy efficiency projects. In shared savings projects, ESCOs finance the investment. In such a case, ESCOs take on the performance and credit risks. Through this business model, energy users, energy and technology services companies, financial institutions, and environmental protection workers together create a win-win situation.

5.3. ESCO business model: Guaranteed savings EPC

Figure 2.5 Guaranteed Savings EPC Business Model



EPC = energy performance contract/contracting, ESCO = energy service company.
 Source: International Energy Agency (IEA) website, <https://www.iea.org/>.

In guaranteed savings EPC, the ESCO assumes the risk of the project’s performance. The client obtains a bank loan or uses its equity to pay contractually determined fees to the ESCO and the bank and keeps the difference. The ESCO will guarantee a minimum energy savings level (percentage); if savings exceed the guaranteed level, the ESCO or the customer can absorb the savings, depending on the method of payment agreed. Fixed payment contracts mean that all savings belong to the customer whilst payment by a percentage of savings means that all savings beside the ones guaranteed to the client are paid to the ESCO.

Generally, the ESCO business model is for the energy users to improve energy efficiency, reduce energy costs, avoid incurring additional project costs, increase the company's turnover and profitability with the help of financial institutions to ease the financial burden, and contribute to environmental protection and sustainable development.

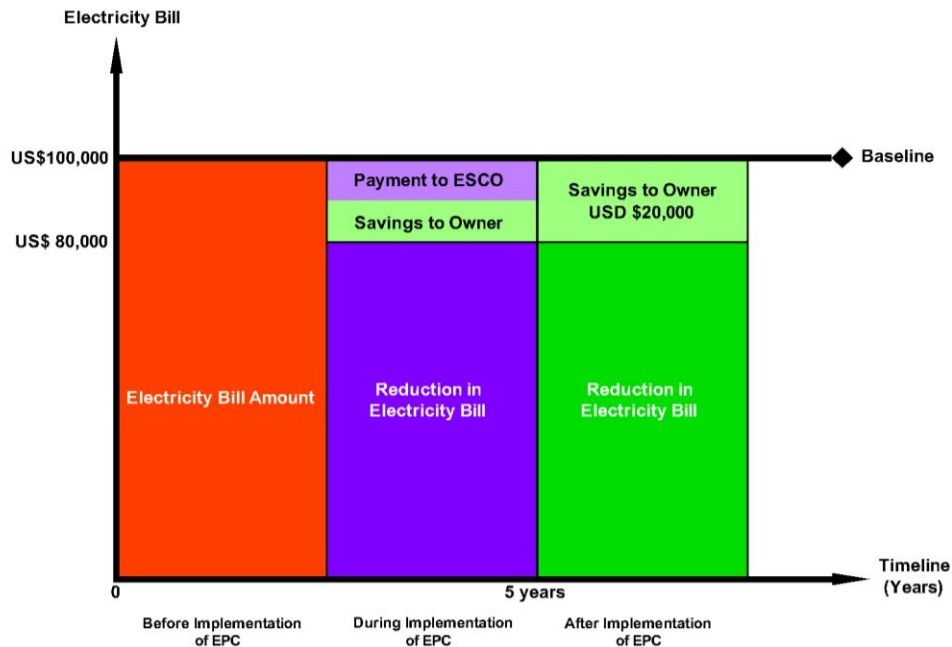
Demonstration programmes in the public and the private sectors increase awareness of energy efficiency and the role of ESCOs. They also increase ESCO capacity and are key to market creation. Government

demonstration programmes have been central to ESCO success in developed countries. Government buildings are one of the biggest users of electricity in the world. To promote ESCOs, governments should undertake demonstration projects in public buildings but should not limit these to the public sector. Demonstration projects in various industry sectors and utilities would be very helpful in promoting ESCO success. The government could play a key role in identifying industrial customers or groups of customers. It goes through some of the first steps in terms of getting the client’s commitment, defining their contracting and financing terms, getting basic information on their energy cost and consumption and use characteristics, and then delivering to the ESCO community a qualified and decision-ready customer.

5.4. How to implement EPC in government buildings

- 1) Request for proposals, shortlist, and engage the services of an ESCO for an energy efficiency improvement project in a government building.
- 2) Perform an energy audit at a facility to evaluate the level of savings that can be accomplished.
- 3) The ESCO will offer to implement and finance the project.
- 4) Guarantee the savings over an agreed term
- 5) The actual amount to be paid will be based on the agreed sharing value between the ESCO and the owner of the government facility.
- 6) After the agreement ends, the ownership of all the equipment and system installed at the facility will be transferred to the government.
- 7) The government will register and license the ESCO.

Figure 2.6 ESCO EPC Business Model



EPC = energy performance contract, ESCO = energy service company.

Source: Umar (2014).

5.5. Case study: Shared savings EPC hospital project

5.5.1 Project information

The EPC case study involved a hospital with 548 beds using the shared savings business model. The hospital was built in 1987 with a gross floor area of 44,800 m². The average electricity tariff is US\$0.108/kWh. The EPC project scope includes the retrofit and upgrade of the chiller plant system and the LED (light-emitting diodes) lighting. The project was completed within 30 weeks with an EPC contract of 8 years where the savings are split – 80% to the ESCO and 20% to the client. After the contract period, the asset would be transferred to the client without any cost, and the total 100% savings would be enjoyed by the client. The total EPC project cost was about US\$850,000.00, consisting of engineering, consultancy, measurement and verification, procurement of the equipment, and project management and supervision.

The efficiency of the existing chiller plant system was about 1.86 kW/RT (kilowatt per refrigeration ton). However, with the upgrade, improved efficiency of 0.83 kW/RT was achieved whilst the same comfort level, relative humidity, and temperature requirements by the client were maintained. The overall savings obtained in a year was about 2,144,362 kWh equivalent to US\$231,434.00.

The hospital lighting uses the conventional ballast T8 40W 4 feet tube and T8 2 feet tube. There were about 7,000 units of lighting for both sizes. For the lighting retrofit, the existing lighting was replaced with a new LED lighting with a lower power rating of 10.5W for the 4 feet tube and 9W for the 2 feet tube. The total energy savings achieved in a year was about 936,211 kWh, equivalent to a cost savings of US\$101,042.00.

Below is the summary of the EPC project:

- 1) Total electricity savings from chiller plant system annually: 2,144,362 kWh/year
- 2) Total electricity savings from LED lighting annually: 936,211 kWh/year
- 3) Total electricity savings from chiller plant system and LED lighting annually:
 $2,144,362 \text{ kWh} + 936,211 \text{ kWh} = 3,080,573 \text{ kWh/year}$
- 4) Total electricity cost savings:
 $3,080,573 \text{ kWh/year} \times \text{US}\$0.108/\text{kWh} = \text{US}\$332,702.00$
- 5) 80% savings goes to ESCO: $80\% \times \text{US}\$332,702 = \text{US}\$266,161.50$
- 6) Total investment cost by ESCO: US\$850,000.00
- 7) Simple payback period: $\frac{850,000.00}{266,161.50} = 3.19 \text{ years}$
- 8) Internal rate of return (IRR) = 26.56%

6. Road Map for Establishing the ESCO Market in Cambodia (2020–2025)

ESCOs have been promoted in developing countries through various programmes and mechanisms. The support of international development agencies and financial institutions, as well as developing country governments, has been particularly critical to ESCO success. However, other programmes and

mechanisms, including domestic financial institutions, ESCO associations, utilities, and joint ventures with multinational ESCOs, have also played a key role in some countries.

ESCO development has not started in Cambodia yet. Most of the energy efficiency projects are conducted by in-house or general engineering contractors. To kick-start the establishment of ESCOs, a road map is structured in three phases in the GDE guidelines for the planning of establishing ESCOs in the country.

During phase one (2020–2021), promotion and creating awareness of ESCOs are important to develop the industry together, with stakeholders' engagement with agencies such as the GDE, energy efficiency equipment suppliers, Cambodia Constructors Association, Board of Engineers of Cambodia, and factory owners. Although the major impact from energy efficiency is envisaged to be from the private sector, the role of government institutions and government-linked companies are crucial for the successful introduction of energy efficiency initiatives and the EPC project. The government can implement a demonstration project and, through circulars, direct its institutions and ministries to practise energy efficiency in its operations. With the ESCO industry in its infancy, the partnership of foreign and local ESCOs is needed to provide experience and knowledge transfer to the local ESCOs. In addition, registration and licensing requirements for ESCOs would improve trust and regulate the market.

In phase two (2022–2023), with a successful completion of a demonstration project, the government can actively promote the benefits of energy efficiency projects implemented by ESCOs to the public and the private sectors that can increase the take-up rate. The government can share the electricity savings data obtained from the demonstration project with the local financial institution regarding the benefits of financing EPC projects, which can be part of their portfolios soon. Lastly, in phase two, the formation of an ESCO association can play an important role in promoting energy efficiency investments in collaboration with government agencies, banks, and utilities companies. The ESCO association could participate in public outreach programmes, explore the creation of new partnerships, and provide training and capacity building for their members. They can also promote working relationships amongst members, allowing them to collaborate on projects and to take on larger projects that require a combination of various skill sets and financial strength. International partnerships and collaboration amongst ESCOs and ESCO associations are also critical for information exchange and capacity building. ESCOs in developed countries could play an advisory role in countries where they do not wish to fully operate but may engage on a joint venture basis.

For phase three (2024–2025), the government or the agency in charge of ESCOs can prepare the standardised guidelines and mechanism of energy performance and measurement and verification contracts to facilitate the clients' and financial institutions' understanding of ESCOs and other concerns. Tax incentives and import duty exemption for ESCOs and energy efficiency technology within a certain period will spur the growth of the industry. With the incentives provided by the government, the participation of local ESCOs in the industry will increase, and the government can call for EPC proposals for government buildings to further reduce the cost of energy use.

Table 2.1: Road Map Milestone for ESCOs with Leading and Responsible Organisations

Phase	Milestone Activities	Target Groups	Organisations Involved	Time Schedule
Phase 1A	Initiation of stakeholders' engagement Promotion and awareness Demonstration project	GDE	Engineering institutions and associations Cambodia hotels, factories, and malls	2 years
Phase 1B	ESCO registration and licensing requirements	GDE and Ministry of Commerce	GDE and Ministry of Commerce	2 years
Phase 1C	Foreign and local ESCO partnership	GDE	Foreign ESCO and engineering institutions and associations	1 year
Phase 2A	Financing mechanism and engagement with local financial institutions	GDE and Ministry of Economy and Finance	Local banks and financial institutions	2 years
Phase 2B	Formation of ESCO Association Cambodia	GDE and Ministry of Commerce	Engineering institutions and associations	1 year
Phase 2C	Promotion of successful pilot project	GDE	Engineering institutions and associations Cambodia hotels, factories, and malls	1 year
Phase 3A	Government tax incentives	GDE and Ministry of Economy and Finance	GDE and Ministry of Economy and Finance	2 years
Phase 3B	EPC standardised guidelines	GDE	*ESCO Association of Cambodia	1 year
Phase 3C	Request for proposal for EPC in government buildings	GDE and Ministry of Public Works and Transport	*ESCO Association of Cambodia	1 year

* To be established.

EPC = energy performance contract/contracting, ESCO = energy service company, GDE = General Department of Energy.

Source: Author.

References

ASEAN Centre for Energy (ACE) (2017), *ASEAN ESCO Report*. Jakarta: ACE. <https://aseanenergy.org/esco-report/>

Boza-Kiss, B., P. Bertoldi, and M. Economidou (2017), 'Energy Service Companies in the EU: Status Review and Recommendations for Further Market Development with a Focus on Energy Performance Contracting', *JRC Science for Policy Report*, Luxembourg: European Commission, <https://publications.jrc.ec.europa.eu/repository/bitstream/JRC106624/kjna28716enn.pdf>.

- Ellis, J. (2010), *Energy Service Companies (ESCOs) in Developing Countries*. Winnipeg, Canada: International Institute for Sustainable Development, Canada. https://www.iisd.org/pdf/2009/bali_2_copenhagen_escos.pdf,
- Hor, K. (2014), 'EPC Development/Suitability for the Government Sector and How It Should Be Implemented,' Building Sector Energy Efficiency Project (BSEEP), https://www.st.gov.my/en/contents/presentations/EPC_2014/How%20EPC%20is%20suitable%20to%20be%20implemented.pdf.
- International Energy Agency (IEA) (2018), 'Report on Energy Services Companies (ESCOs): At the Heart of Innovative Financing Models for Efficiency,' <https://www.iea.org/reports/energy-service-companies-escos-2/esco-contracts>.
- Jensen, H.R. (2017), *Energy Performance Contracting Guidebook*, Building Sector Energy Efficiency Project, Malaysia: Public Works Department.
- Umar, Z. (2014), *Demand Side Management (DSM)*, Malaysia: Energy Commission, https://www.st.gov.my/en/contents/presentations/EPC_2014/Demand%20Side%20Management.pdf.
- World Bank Energy and Extractives Global Practice ECA Region (2019), *Roadmap for the Implementation of Energy Efficiency in Public Buildings of the Kyrgyz Republic*, Washington, DC: The International Bank for Reconstruction and Development/The World Bank Group. <http://documents.worldbank.org/curated/en/491271560400148398/pdf/Roadmap-for-the-Implementation-of-Energy-Efficiency-in-Public-Buildings-of-the-Kyrgyz-Republic.pdf>.