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APEC Workshop on Sharing Best Practices in Developing ESCO Models for Energy Efficiency

APEC Energy Working Group

March 2023

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SUMMARY REPORT

APEC Energy Working Group

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TABLE OF CONTENTS

APEC WORKSHOP ON SHARING BEST PRACTICES IN DEVELOPING ESCO MODELS FOR ENERGY EFFICIENCY

1 – 2 December 2022

(a hybrid event)

Summary Report

I. INTRODUCTION

On 1 and 2 December 2022, the APEC Workshop on Sharing Best Practices in Developing ESCO Models for Energy Efficiency, initiated by Viet Nam and co-sponsored by Hong Kong, China; Indonesia; Japan; Korea; Chinese Taipei; Thailand; USA, was held in a hybrid mode. Speakers and participants came from energy-related international organizations and research institutions and APEC member economies' relevant Ministries and government's agencies, companies and business associations.

The Workshop aimed at the following objective:

- to support APEC in moving closer to its aspirational energy efficiency targets by providing a platform for economies to share experiences and information about the ESCO model of energy efficiency and how it may be applied in APEC economies.

II. BACKGROUND

Energy, which is needed for every aspect of life, plays a key role in the development of economies. Economies need to use energy efficiently to be advantageous in global competition. Economies using energy efficiently succeed economically and have leading the field in the competition. Energy efficiency also has an important role in the sustainable development of economies. According to the research on "Role of energy efficiency on sustainable development" by Fortune Ganda, Collins C. Ngwakwe (2014), ***energy efficiency*** refer to different policies, technologies, and strategies that are aimed at solving issues related to energy use whether at residential, commercial, industrial and domestic capacities so as to minimize the emission of greenhouse gases which cause global warming together with reducing financial costs.

There are many methods to improve energy efficiency. One of those is the Energy Service Company (ESCO) model. ESCO model is a company that provides comprehensive energy solutions to customers such as designing and implementing energy saving projects, ensuring energy savings, leasing energy infrastructure, power generation and energy supply, risk management, etc. to help customers improve energy efficiency.

ESCO model has been widely applied in the world, especially in developed economies such as Japan, USA, Korea, etc [1]. ESCOs are widely implemented to improve energy efficiency in the public sector and industry. For example, in Viet Nam, the potential for energy saving/energy efficiency for ESCO investment in the industrial sector is more than 20%; construction, buildings, and transportation is 25-35%; living and service areas are 15-30%[2].

ESCO plays an important role in the process of implementing energy efficiency solutions. This business model, if well implemented, will bring great efficiency to promote energy saving, technological innovation, access to green growth solutions, and help businesses have conditions to participate in domestic and international projects on energy efficiency.

In Viet Nam, ESCO models are widely believed all aimed at promoting energy-saving activities in industry, supporting businesses to improve energy efficiency, reduce production costs, improve competitiveness, and meet requirements under the law[3]. This project aims to help these stakeholders share information and experiences on developing and applying ESCO Model to improve energy efficiency.

Over the recent years, with the objective to build the capacity of APEC members to improve domestic and regional energy efficiency, the APEC Energy Working Group has contributed to maximizing the energy sector's contribution to the APEC region's economic and social well-being. However, there has not been many activities focus on applying ESCO Model for energy efficiency. This

[1] https://www.sciencedirect.com/science/article/abs/pii/S0360544220307106
https://congthuong.vn/can-chinh-sach-cho-mo-hinh-tiet-kiem-nang-luong-esco-146272.html
https://www.sciencedirect.com/science/article/abs/pii/S0959652602001117
[2] https://congthuong.vn/can-chinh-sach-cho-mo-hinh-tiet-kiem-nang-luong-esco-146272.html
https://www.evn.com.vn/d6/news/ESCO-thuc-day-tiet-kiem-nang-luong-0-18-19724.aspx
[3] https://moit.gov.vn/tin-tuc/hoat-dong/chuong-trinh-thoa-thuan-tu-nguyen-thi-diem-ve-su-dung-nang-l2.html

project will also provide an opportunity for economies to share best practices in developing ESCO models for energy efficiency.

III. OPENING REMARKS

In the opening remarks, **Mr Nguyen Van Vy (Deputy Chairman, Viet Nam's Energy Association)** stressed that the goal of the Workshop is to help APEC approach the goals of energy efficiency through sharing information and experiences on ESCO models on energy efficiency. and how to apply this model in APEC economies.

Mr Nguyen recalled that the overall goal of APEC cooperation in the energy sector is to aim to reduce energy intensity in the region by 45% by 2035 and double the share of renewables by 2030 as envisioned by the APEC Economic Leaders in Beijing 2014. The ESCO model is believed to promote energy-saving activities in industry, support businesses to improve energy efficiency, reduce production costs, improve competitiveness and meet regulations. on production and business. In addition, ESCO also creates standards for service providers, motivating them to improve themselves, improve competitiveness and bring more benefits to customers. However, the ESCO model is still quite new to developing economies in general and Viet Nam in particular. Currently, developing economies are gradually completing the legal basis in the field of economical and efficient use of energy, thereby creating favorable conditions for ESCO's development in the coming time.

In that sense, the Workshop is the contribution of Viet Nam as through sharing strategies, best practices and case studies among scholars, policy makers, representatives of businesses and organizations and associations inside and outside the Asia-Pacific region, APEC members can learn from each other's experiences on applying ESCO Model for energy efficiency.

IV. KEY ISSUES

1. THE IMPORTANCE OF DEVELOPING ESCO MODELS IN ENERGY EFFICIENCY

There were two speakers in the Session: Mr Peter Larsen, Staff

Scientist/Department Head, Electricity Markets & Policy Department, Lawrence Berkeley National Lab, USA; Mr Nguyen Hoai Nam, Senior Researcher, Deputy Director, Institute of Energy Science, Viet Nam Academy of Science & Technology.

- Mr Peter Larsen talked about the definition of ESCO and some on going researches at Berkeley Lab. After that he presented about the industry level trend with the key finding on industry size and growth. He said that after a period of little growth from 2011-2014, U.S. ESCO industry revenues increased to approximately $6 billion in 2018. These results represent an industry annual growth rate of about 3.4% between 2014 and 2018. He shared some information and figured about revenue trend by market segment by which public and institutional customers have consistently made up over 90% of industry revenue. More than half of ESCOs indicated that ratepayer-funded incentives are of medium or high importance for projects across all market segments. Non-energy benefits are increasingly important for projects; resilience and capital improvement needs are key drivers of ESCO Energy Savings Performance Contract (ESPC). In the last part, the speaker talked about the project level trend showing some ESCO project database and performance metrics. To summarized the presentation, Mr Peter Larsen said that projects are becoming larger (in terms of floor area and investment levels) and more comprehensive, are generating more savings, and installing more capital intensive measures, Reported project benefits are growing at a slower rate than the trend in project investment levels, significant amount of unreported non-energy benefits (e.g., avoided capital costs) that are an important component of the value proposition for customers and ESCOs.

- Dr. Nguyen Hoai Nam started his presentation by speaking about what is an ESCO and Energy Saving Performance Contracting (ESPC) Illustration. He then talked briefly about the ESCO market segments in Viet Nam including heat, steam, power and others. He listed some ESPC Benefits to partnered Facilities for examples: No Capital expenditures (CapEx) required for new energy-efficient retrofits; Paid from savings in current Energy/Operating costs; No risk for Energy Efficiency Project (EEP) Development, Implementation & Performance; Measured reductions in

energy and Green House Gas (GHG) emissions; At end of ESPC term, GCA owns EEP assets and receives 100% of Savings. About the case study, he introduced the project NAMI energy which is reliable rooftop usage for 15 – 20 years, electricity billing of more than VND 300,000,000/a month, rooftop area of more than 5,000 sqm. Dr Nam also mentioned briefly about Viet Thang Corporation Project, Sonadezi Corporation Project.

2. OPPORTUNITIES AND CHALLENGES IN DEVELOPING ESCO MODELS IN ENERGY EFFICIENCY

There were three speakers in the Session: Ms. Ming Zhao, Director, China Energy, and Environment Service Industry Alliance; Associate Professor Dr. Prapita Thanarak, School of Renewable Energy and Smart Grid Technology (SGtech), Naresuan University, Thailand; Ms. Devi Laksmi Zafilus, Deputy Director in the Directorate of Energy Conservation, Indonesia.

- Ms. Ming Zhao talked about 3 ESCO development phases: Development period, Promotion period, and Demonstrative period. To achieve success for ESCO Development, the speakers emphasized three main factors: Government leading, Market demanding, and Economy driving. Opportunities for ESCO development based on: Globally - Climate Change, Domestic-Environment problems, Practice solutions available, and Global network. It is necessary to have the technical and financial solution to develop ESCO, technically feasible for all sectors and economically reasonable with various business models. At the end of the presentation, the speaker listed some industry barriers and provided recommendations focusing on making a start – either from government pushing or market driving, long-term plan: make ESCO sustainable for a more extended period and closely linked with carbon reduction.

- Professor Dr. Prapita Thanarak started her presentation by giving an overview of past, present, and future global energy development. Afterward, she showed a matrix on the Public-Private cooperative model toward carbon neutrality. She emphasized that innovation will become the

driving force toward the energy industry's future. It is needed to promote the following issues: Strengthening energy policy & governance, Unlocking energy finance, Re-mapping energy geopolitics, Building energy system resilience, Designing the future of power systems, Accelerating energy access, Driving energy technology innovation, Navigating Future Energy Supply and Demand. At the end of the presentation, the speaker briefly introduced Thailand's government actions to develop the energy sector, which affects all areas, including the economy, society, technology, environment, legal, and policy.

- Ms. Devi Laksmi Zafilus briefly introduced the supporting regulation of the Indonesia Government to the energy industry. After that, she talked about investment opportunities. Investment Grade Energy Audit (IGA) recommendation has been implemented from 2015 to 2021 with a total investment cost of 144 Billion IDR. Energy savings obtained are 84 GWh per year, with energy cost saving equal to 40 Billion IDR per year and the remaining 244 Billion IDR investment potential. In the second part, she listed some existing ESCO and available banks and financial institutions in Indonesia. She shared some efforts to support ESCO development and also some challenges. To conclude the presentation, the speaker suggests focusing on harmonizing and strengthening policy to support ESCO; Increasing the enforceable of ESCO by bankability increment; Developing an Innovative financing scheme; Data evidence – by implementing a pilot project on several; Alternative financing model fit to ESCO; Support for International collaboration, and Capacity Building; Adaptation of ESCO to be adjusted in digital transformation and market demand.

3. CASE STUDIES/BEST PRACTICES OF DEVELOPING MODELS IN ENERGY EFFICIENCY

There were two speakers in the Session: Dr. Yeonji Kim, President of 1.5℃ Plan Institute, Korea; Mr Hsu Albert, Engineer, Green Productivity Foundation, Chinese Taipei.

- Mr Hsu Albert divided his presentation into 4 main parts: Development of ESCO Industry in Chinese Taipei; Roadmaps Developing ESCO Industry;

ESCO/Energy Efficiency Case Studies; Prospect of ESCO Models in Chinese Taipei. In the first part, he introduced briefly about Chinese Taipei Green Productivity Foundation and after that he shared some information about ESCO sales overview. He shared that the gross revenue reached to USD $540 Millions in 2022, which is 40 times since star-up in 2005 but it drops slightly by 7% due to COVID-19, nearly recovered by the end of 2022. He also talked about service providers structure and common technologies applied to energy efficiency. In the second part, the speaker showed some figures on market driven - ESPC incentives for domestic market. About the business protocols & regulations, he shared that mandatory minimum energy performance standard (MEPS) and voluntary energy efficient labeling system for manufacturers to phase out old inefficient equipment models while manufacturing new model. In the last part of the presentation, Mr Hsu Albert introduced some ESCO project in Chinese Taipei including: Comprehensive Retrofit at Taitung Hospital Chenggong Branch; Compressed Air Systematic Retrofit in Yi Hsin Textile Industrial and some Landmark ESPC Projects.

- The presentation of Dr. Yeonji Kim focused on ESCO trend in Korea. Firstly, she talked about soft loan investment trend for e-saving facilities with low interest loan and tax incentive. The target group would be SME, middle market enterprises, NPOs, ESCOs. After that, she show the line chart growing trend of successful ESCO register companies by year. Four companies registered in 1992 the number of registered companies increased significantly due to the easing of registration standards in 2015 and now about 300 companies are registered. In the second part, the speaker talked about Energy Efficiency Resources Standards (EERS) that require state-run energy companies to help their customers improve efficiency in line with their assigned targets. She shared some information of Seoul Authority regulation in GHG emission, building profit program, and Seoul Climate Action plan to 2050 (SCA), SMG’s Green building plan policy. At the end of the presentation, Dr. Yeonji Kim talked about experiences Gyeonggi Province in GHG emissions and Carbon Neutral Fund.

4. DISCUSSIONS

- A speaker commented that the US government tried to facilitate the development of the ESCO market, recognizing the usefulness of the ESCO model in the economy. One effort of the government was to introduce an accreditation program for ESCO companies. The program would provide financial records, project information, and customer references to the Accreditation Committee. Application and submission to this program may cost only a few thousand US dollars per year. Later on during the Q&A part the U.S. speaker reiterated that the ESCO accreditation program gave ESCO companies multiple benefits related to setting up the financial scheme for ESCO projects.

- Accreditation is mandatory for ESCO companies in the U.S. It helps build trust if a company attempts to apply for funding or money from the government to carry out ESCO projects.

- Providing incentives is the preferred approach in the US. Tax incentives are offered to ESCO companies. The government takes money from the electricity bills and puts into energy efficiency programs to provide funding for the ESCO market.

- In addition, there are savings models where the costs of retrofit are recovered from customer's savings. The ESCO companies in the US are paid by the banks to install the equipment. Then the customers would pay back over time from the savings and then keep the savings beyond the guarantee. This model seems to work very well in the United States.

- Some large power companies in the United States have divisions to carry out ESCO works. They have funds and implement the ESCO projects by themselves. Specific information about such companies and their projects are made readily accessible on the internet.

- Another speaker continued by explaining the financial model of ESCO in Viet Nam. He highlighted that the fit-in tariff (FIT) for the rooftop solar system was introduced in Viet Nam just a few years ago as an incentive from the Vietnamese government. The giant state-owned power corporation, Electricity of Viet Nam (EVN), was the only buyer. The rooftop solar system benefited significantly from the FIT. Interviews and discussions with ESCO companies revealed that they would charge for

electricity consumption in the facility at a concessional rate as compared to the electricity being bought from the regular electricity network. Those ESCO companies that can export electricity to the grid could make a profit in most cases, thanks to the scale of investment and the FIT.

- However, from the mid of 2021 until now, the FIT was no longer valuable for ESCO companies. The price for the rooftop and the financing mechanism from the ESCO could only help to make some savings and thus provide concessional offers for the fee charged to the facility owner.

- A speaker highlighted two success factors for discussion and negotiation in finalization of the ESCO contracts:

  - Firstly, having transparent discussions among ESCO companies, the engineers, the facility owners, the facility managers, the accountants, and the banks that may fund the project to clarify what key issues should be taken into account to make that particular the project successful; and

  - Secondly, putting in place a very solid plan and protocols in terms of measuring and verifying savings for multiple years, especially after COVID-19 pandemic.

- Another speaker added that a barrier and challenge for ESCO models in Viet Nam was the M&E work. Monitoring and validating the savings was rather new not only for the facility owners, but also for the ESCO companies. It was important to define the baseline. This was usually key to contract negotiation and mutual agreement between the two parties.

- Length of the ESCO contracts varies a lot between economies. In the U.S. the ESCO contract often lasts for 8-9 years or even goes up to 12-13 years. However, most of the facilities in Viet Nam will not be able to afford that term. Therefore, the ESCO companies in Viet Nam have to find ways to significantly shorten the payback period to 4-6 years. The trend is taking place quite dramatically now.

- There are lots of uncertainties in terms of productions, risk management, financial management for energy efficiency and energy savings. Sometimes energy benefits are not the first motivation to implement an ESCO project in Viet Nam. On top of that, the mechanisms for ESCO project implementation should be set up in the next few years in Viet Nam.

- A speaker gave additional information about ESCO projects. Most ESCO work being performed in the US were public facilities. Private sectors accounted for about 10 - 20% of the total number of projects; they financed the projects by themselves. ESCO projects of the private sector were processed and completed very quickly. They often had very short payback time in the contracts.

- The ESCO industry in the U.S. had a tough time penetrating the industrial sector because big industries did not want to the involvement of other companies in their business' operation and manufacturing plans.

- In the U.S. greenhouse gas (GHG) emission popped up as a controversial subject for a number of sectors. Energy efficiency and carbon pollution reduction was incentivized in both ESCO companies and other business entities.

- In terms of the ESCO projects in the transportation sector, particularly for high speed railway transportation, a speaker informed that the ESCO model was applied in high-based lighting features in railway station buildings. The maintenance work provided by the service provider was quite new in this regard. They were finding the right time to replace old features and parts when needed.

- Building energy consumption accounted for 70% of the GHS emissions. Transportation made up 19.2% of the total emission. The proportions of industrial manufacturing and waste were 3.3% and 6.1% up respectively and the rest was from other sectors.

- The composition of GHG emission in the Republic of Korea varied from region to region, as shared by the speaker from Korea. While in Seoul emission mainly came from buildings, in Gyeonggi province industrial proportion was the highest with 38%; transportation accounted for 19%, the percentages of residential buildings and commercial/ public buildings were 18% and 17% up respectively, and others made up 8%. The speaker also commented on for BRP (Building Retrofit Program) loan. He noted that the advantages of this program were energy saving and subsidy for certification for applicants. The government implemented a subsidy policy for old residential buildings for green building transformation. A target of

1,000 homes for the BRP loan program application was set by the government of the Republic of Korea.

V. RECOMMENDATIONS

During the final session, there were 2 panelists in this Session: Dr. Edward Vine, Affiliate at Lawrence Berkeley National Laboratory (LBNL), USA; Mr Ma Khai Hien, Director, Senior Energy Efficiency Specialist, Energy Conservation Research and Development Center, Viet Nam.

- Dr Edward Vine talked briefly about the current context of climate change (highlighting flash floods, drought, dust storms, and heat waves in 2022) and the United States government's effort in reducing emissions via promoting energy efficiency. He compared an analysis of ESCO activity in the past with current ESCO activity and presented a list of barriers to the development of an ESCO market. He classified the barriers into three types: (1) barriers to ESCOs, (2) barriers to end use consumers, and (3) barriers to regulatory bodies. He recommended three types of Government actions for promoting the ESCO market: (1) create a large and stable demand for energy services projects in the public sector, (2) remove barriers to the public procurement of energy efficiency services, and (3) facilitate adequate and affordable financing of ESCO projects. He provided suggestions to each of these actions. Specifically, for creating demand for energy services, it was important to: (1) promote information, education, and training; (2) create demonstration projects for energy performance contracting; (3) standardize contracts and proposals, including measurement and verification; and (4) create an ESCO association and partnerships, for developing an accreditation and certification service – hopefully, joining the Global ESCO Network. Specifically, for facilitating the financing of ESCO projects, it was important to develop funding sources for ESCO projects and, possibly, a Super ESCO. Near the end of his presentation, he shared some information on US activities, in particular, the Federal Energy Management Program (FEMP) and other actions being conducted in the US for promoting the ESCO market. He concluded his talk by encouraging all member economies to conduct evaluations of their

ESCO activities and their ESCO market, in order to determine whether the ESCO market was operating as designed and how improvements could be made.

- Mr Ma Khai Hien started his presentation by introducing about ENERTEAM, who is an independent sustainability consulting firm with more than 20 year of experience in promoting energy conservation, resource efficiency and renewable energy in Viet Nam and in ASEAN region. After that, we talked about the legal framework for ESCO services focusing on some key legislation of Viet Nam. In the second part, Mr Hien talked about sharing ESCO business in Viet Nam with guaranteed saving contract, shared saving contract, guaranteed rebate. He also listed out some challenges and barriers to ESCO in Viet Nam including regulation, technical and financial. To conclude the presentation, the speaker provided some recommendation for developing ESCO activities as follow: strengthen capacity building, improve the institution and legal corridor, allow private sector implementation and financing of GEEP under the PPP, develop sustainable financial mechanism, establish a model of financial linkage between ESCO enterprises and institutions, grant fiscal autonomy for local energy efficiency consulting firms/services providers.

Participants also shared overall views and recommendations on what APEC should do in term of policies and actions to support the development of ESCO in APEC member economies as follows:

- At the beginning of this session a participant commented on how to improve the benefits of ESCO model application. He highlighted that ESCO companies provided comprehensive energy solutions with a wide variety of services, including planning, construction, installation, operation and maintenance (O&M), optimization, financing and commercial risk taking during the entire service life.
- Therefore, application of ESCO models could bring multiple benefits, including:

- First, customers did not have to pay investment costs for installation and operation of the system. Instead, the monthly energy savings would be calculated and shared by the investment entities;

- Second, businesses could save on fuel costs compared to using electricity;

- Third, applying the ESCO model brings environmental and social benefits on top of economic efficiency. Such benefits include reducing GHG emissions, raising awareness of businesses and the community in greenhouse gasses and their usage, and creating jobs.

- A number of recommendations were made to the governments of APEC member economies to promote ESCO models for energy efficiency and to develop a healthy ESCO market. The main recommendations are summarized below:

  - To issue more specific enabling policies and to improve the legal framework for the ESCO market development;

  - To role model with a few government projects;

  - To pilot some project-based financing schemes/ models for ESCO projects with the major banks and financial institutions.

- The participants and speakers also recommended a number of activities that APEC should do in the next 1-2 years to help promote the development of ESCO model in the APEC region as follows:

  - To organize workshops, training courses and capacity building activities on best practices on financing ESCO projects in APEC member economies;

  - To create and facilitate a regular forum/ network and dialogues for government officers, banks and financial institutions and ESCO companies to discuss challenges and solutions for development of the ESCO market.

VI. CONCLUSIONS

In her closing remarks, Ms Pham Quynh Mai (Viet Nam's Senior Official to APEC) recognized productive sessions were held on a number of important issues such as identifying importance of ESCO model, opportunities and challenges in developing the ESCO model, sharing case studies and best practices as well as making recommendations to governments to promote the ESCO model for the sake of energy efficiency. From the presentations and discussions, The Senior Official also noted that the ESCO develops, installs and arranges financing for projects designed to improve the energy efficiency and maintainance costs for facilities. What is more, it enables business to promote green solutions, invest in new equipments and technology while still efficiently and effectively managing investment costs, reducing production costs, improving competitiveness, meeting legal requirements as well as achieving energy efficiency. In practice, the ESCO model has been widely applied in the world, especially in developed economies such as Japan, Korea, USA, etc. On the other hand, limitation of capitals, lack of experiences in consulting and implementing ESCO model projects might impede the model from being widely adopted in many other economies, developing ones in particular.

Through the sharing of information and lessons learnt, Ms Pham highlighted though challenges might remain in terms of regulation, technologies and finance, a number of recommendations have been suggested to APEC in general and its member economies in particular to best use of this model. In that sense, it would significantly contribute to fulfilling aspirational goals of APEC Leaders in 2016 to reduce the aggregate energy intensity by 45% by 2035 and APEC Leaders' commitments to a new type of urbanization featuring green energy-efficientand and people-oriented development.

Through the information sharing, Ms Pham suggested that each and every member economy's participants could have a more in-depth knowledge of implementing the ESCO model, hence choose their own strategies and goals to promote the model, subject to their specific domestic circumstances and their long-term development policies.

By hosting this Workshop, Viet Nam wishes to join and strongly support APEC's common efforts to green, sustainable and inclusive growth and development.

VII. ANNEX 1: RESULTS OF THE PRE-WORKSHOP SURVEY

	Does your economy apply Energy Service Company (ESCO) Model? If your answer is "Yes", please answer the next questions.	**Please share some policies and regulations your economy is applying on ESCO Model.**	**If possible, what is the implication(s) of those policies and regulations on developing and promoting ESCO Model?**	**Can you share case study (ies) and best practice(s) relevant to ESCO Model in your economy?**
New Zealand	N/A	N/A	N/A	N/A
Korea	Yes	The ESCO program was introduced to Korea in order to extend energy conservation polices and measures led by the government to the private sector. Major project areas of ESCOs include energy-efficient facility investment, maintenance services and energy management monitoring for such facilities. ESCOs focus mainly on high efficiency lighting, waste heat recovery, heating and cooling systems, and process improvement. Combining the advantages of the Shared Savings Model with those of the Guaranteed	N/A	N/A

		Savings Model is New Shared Savings Model. It was introduced as a new contract model in February 2011. Thanks to vigorous support from the government, annual investment has been increasing since 1998. In 1998, investment reached KRW 29,571 million over 139 cases. By 2011, the investment had risen to KRW 285,390 million for 202 cases. Investment of ESCOs had been limited to Combined Heat and Power (CHP) facilities and high efficiency lighting systems until 1997, but from 1998 it diversified to include such areas as waste heat recovery facilities; cooling and heating systems; and process improvement.		
Indonesia	Yes	Presidential Regulation No. 77 Of 2018 on Environmental Fund Management and the derivative regulation-Finance Ministerial Regulation No. 137/PMK.01/2019 on Organization and Working Procedure of Environmental Fund Management Agency	This mandatory opens opportunities for ESCOs to run energy efficiency business	N/A
Viet Nam	Yes	N/A	N/A	Rooftop solar power at ICD Tan Cang, Ho Chi Minh city

VIII. ANNEX 2: FINAL AGENDA OF THE WORKSHOP

1 December 2022	
08:30–09:00	Registration and Test Run
09:00–09:10	**<u>Opening Ceremony</u>** Welcoming Speech by Mr Nguyen Van Vy, Deputy Chairman, Renewable Energy Association of Viet Nam
09:10–10.00	**Session 1: THE IMPORTANCE OF DEVELOPING ESCO MODELS IN ENERGY EFFICIENCY** **Moderator:** - Ms Nguyen Huong Tra, Hanoi National University, Viet Nam **Speakers:** - Mr Peter Larsen, Staff Scientist/Department Head, Electricity Markets & Policy Department, Lawrence Berkeley National Lab, USA. - Mr Nguyen Hoai Nam, Senior Researcher, Deputy Director, Institute of Energy Science, Viet Nam Academy of Science & Technology.
10:00–10:20	**Discussions (Q&A)**
10:20–10:30	Coffee Break
10:30–11:10	**Session 2: OPPORTUNITIES AND CHALLENGES IN DEVELOPING ESCO MODELS IN ENERGY EFFICIENCY** **Moderator:** - Dr. Cao Thi Hong Vinh, Lecturer, Foreign Trade University, Viet Nam. **Speakers:** - Ms Ming Zhao, Director, China Energy and Environment Service Industry Alliance. - Associate Professor Dr. Prapita Thanarak, School of Renewable Energy and Smart Grid Technology (SGtech), Naresuan University, Thailand.

	- Ms. Devi Laksmi Zafilus, Deputy Director in the Directorate of Energy Conservation, Indonesia.
11:00–11:30	**Discussions (Q&A)**

2 December 2022	
08:30–09:00	Registration and Test Run
09:00–09:50	**Session 3: CASE STUDIES/ BEST PRACTICES OF DEVELOPING ESCO MODELS IN ENERGY EFFICIENCY** **Moderator:** - Vu Minh Nguyet, Nathan Associate Inc. **Speakers:** - Dr. Yeong Ji Kim, President of 1.5℃ Plan Institute, Korea. - Mr Hsu Albert, Engineer, Green Productivity Foundation, Chinese Taipei.
09:50 – 10:10	**Discussions (Q&A)**
10:10 – 10:20	Coffee Break
10:20 – 11:20	**Session 4: RECOMMENDATIONS FOR GOVERNMENTS TO DEVELOP ESCO MODELS** **Moderator:** - Ms Nguyen Huong Tra, Hanoi National University, Viet Nam **Speakers:** - Mr Edward Vine, Affiliate at Lawrence Berkeley National Laboratory (LBNL), USA. - Mr Ma Khai Hien, Director, Senior Energy Efficiency Specialist, Energy Conservation Research and Development Center, Viet Nam.
11:20 – 11:30	**Closing Remarks** - Ms Pham Quynh Mai, Viet Nam's Senior Official to APEC