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APEC Workshop on Public-Private Partnership for Solar Energy Development

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APEC WORKSHOP ON PUBLIC-PRIVATE PARTNERSHIP FOR SOLAR ENERGY DEVELOPMENT

01 – 02 August 2019

Ha Noi, Viet Nam

Summary Report

I. INTRODUCTION

On 01 and 02 August 2019, the APEC Workshop on Public-Private Partnership for Solar Energy Development, initiated by Viet Nam and co-sponsored by Canada; Chile; Hong Kong, China; Japan; and United States was held in Ha Noi, Viet Nam. 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 aims at the following objectives:

- Enhance understanding on the use of PPP to develop solar energy (PPP is a new form of solar energy development that are not popular. Participants, therefore, are expected to better understand about PPP, especially key success factors such as policy coordination, handling of land constraints, green incentives etc.);

- Provide the opportunities for solar energy experts from APEC member economies, solar energy producers and investors (business sector) to share information and best/ good practices on using PPP to remove the obstacles and facilitate the development of solar energy; and

- Explore potential cooperation opportunities among APEC member economies in developing solar energy (Experts from economies may work together in future events/ projects; Companies find new customers. This happened in previous energy projects in Viet Nam).

II. BACKGROUND

As a result of significant increase in industrial and population growth in recent decades, there has been a big increase in global demand for energy. Sources of nuclear energy, conventional energy such as oil, coal, natural gas, firewood, etc., have for long been a popular way to feed the world demand thanks to either its cheap price or easy usage, availability or all. However, energy crisis have been inevitably a part of modern world to as many economies and regions in the world, especially since 1970s due to the fact that these sources of energy are limited and fast depleted. Conventional energy, therefore, is increasingly no longer cheap, stable and sustainable as it used to be, which can adversely affect the global energy security and prosperity. Among those, renewable energy is on high agenda as a long – term, efficient alternative to the current situation.

In comparison to other kinds of energy, renewable energy, including solar energy is renewable, limitless, sustainable and environmental friendly. Though awareness on the importance and advantages of solar energy is raised, it is still difficult to develop the solar industry due to the fluctuations in solar panel prices and the barriers in solar installations and supply chain in APEC economies (namely high costs, standardization, changes in sub-component suppliers, etc.)

Public-private partnerships (PPP) are commonly accepted as one of the most effective ways to promote solar energy, through cooperation arrangements between the public sector and private businesses covering the joint planning, financing and implementation of solar energy projects/ programmes. These presuppose a long-term commitment on the part of the private business and compatible with the development-policy objectives of the government sector.

APEC is home to 21 member economies of diversified development levels but on fast growth in common. Reliable sources of energy remain important to all member economies for the sake of stability and prosperity. Through identifying to help remove the obstacles, and sharing experiences on PPP to facilitate the development of solar energy, as well as exploring further cooperation opportunities, this project is expected to contribute to the sustainable growth of renewable energy, in particular solar energy, across the APEC region.

In 2011, the APEC Leader clearly states to promote green growth: “We are committed to advancing our shared green growth objectives. We can and must

address both the region's economic and environmental challenges by speeding the transition toward a global low-carbon economy in a way that enhances energy security and creates new sources of economic growth and employment."

The APEC Leaders, once again, are committed to strengthening APEC Energy Security, clearly state in the 2012 Declaration: "Promote technology development and deployment of a low-emission energy supply including carbon capture, storage and use, and renewable energy sources such as bioenergy from sustainable biomass sources"

Through identifying to help remove the obstacles, and sharing experiences on PPP to facilitate the development of solar energy, as well as exploring further cooperation opportunities, the "APEC Workshop on Public Private Partnership for Solar Energy Development" would contribute directly to the commitments of APEC Leaders to "speed up the transition toward a low – carbon economy", and "promote development and deployment of a low – emission energy supply" that "enhance energy security and create new sources of economic growth and employment".

Previously Viet Nam held APEC events related to renewable energy such as SME 05 2016A - APEC Workshop on Renewable Energy Potentials for SMEs, APEC Workshop on Promoting the Development of Wind Energy, Phase 2 – Public Private Partnership for Wind Energy Development etc. However, previous projects touched on issues such as renewable energy for small and medium enterprises (with discussions on various forms of energy such as conventional power, biofuel, hydro etc. and suggestions on policies to assist SMEs to reap the benefits of renewable energy potentials), PPP for wind energy development. In addition, there have not been a specific topic on PPP for solar energy development in APEC.

Wind energy and solar energy are differed from each other and in developing economies, solar energy have becoming a popular trend (it is estimated that solar energy will develop by 33 per cent per year in Viet Nam) with higher and higher percentage of energy supply in economies as well as reasonable prices. However, reasons for the slower-than-expected development of solar energy are the high cost of initial installation, requirements for large land of installation etc. Therefore, it is crucial time to discuss the topic of PPP for more efficiency in

costs and land, as well as to discuss ways to remove the obstacles and facilitate the development of solar energy.

This project will contribute to the APEC Energy Security Initiative (ESI) as it is the principal mechanism through which the EWG addresses the short and long term energy security challenges in a sustainable manner. In ESI, Long-term measures include facilitating investment, trade and technology cooperation in energy infrastructure, natural gas (including LNG), energy efficiency, clean fossil energy (including carbon capture and geological sequestration), renewable energy and hydrogen and fuel cells[1]. Therefore, this project is one of the long-term measures as solar energy is a part of renewable energy. This project is also in line with EWG Strategic Plan during 2014-2018 as it contributes to EWG's pillars of strengthening energy security, promoting energy efficiency as well as developing cleaner energy sources.

III. OPENING REMARKS

In the opening remarks, **Ms Pham Quynh Mai (Viet Nam's Senior Official to APEC and Deputy Director General, Multilateral Trade Policy Department, Ministry of Industry and Trade, Viet Nam)** stressed that the aspirational goals of APEC in the energy sector are: to double the share of renewables in the APEC energy mix, including in power generation by 2030 and to reduce APEC's aggregate energy intensity by 45% from 2005 levels by 2035.

According to information from the International Energy Agency, while hydro power capacity in 2016 is almost 3.5 times larger than solar, future expansion is limited because of land area limitations and topographic requirements. Conversely, the scalability and declining costs for solar panels and solar thermal support rapid future growth. The speaker emphasized that at least two-thirds of APEC economies have more than 2,000 hours of sunshine annually, boasting rich solar resources that can be utilised by installing rooftop solar systems (statistics by World Meteorological Organization, 2010). In APEC Energy Outlook, 7th Edition, the Asia Pacific Energy Research Centre (APERC) calculates that solar rooftops in APEC had the potential to generate an estimated 2,000 Terawatt-hour of electricity using solar PV in 2016. This quantity is comparable with the total electricity that APEC generates from hydro power, which is currently the largest renewable generation source.

[1] http://www.ewg.apec.org/initiatives.html

However, in developing economies including Viet Nam, solar energy is new and accounts for a modest proportion of the total energy supply of the economy. Reasons for this situation are: most of the developing economies in the Asia-Pacific region encounter restricted financial resources, limitations of incompleted legal framework, lack of infrastructure, management science and technology, etc. This has posed many challenges to the developing APEC members in the planning of energy development. In the context of limited state budget, Public-Private Partnership (PPP) an inevitable trend. PPP is considered as one of the effective solutions to build infrastructure for solar energy development through exploitation and utilization of social resoruces and cooperation of the state. This is a form of cooperation to optimize investment efficiency to reduce the burden of the State budget.

This Workshop, therefore, is expected to further promote the advantages and potentials of attracting investment from the private sector for solar energy development.

IV. KEY ISSUES

1. Overview on Solar Energy Development in APEC and Worldwide

- *Professor Terrence Surles (Senior Advisor, California Institute for Energy and Environment, USA)* presented on energy status of solar energy deployment, with a focus on the United States. In the first part, he talked briefly about the global renewable energy capacity, global investments for energy and the development of solar energy. Solar PV (photovoltaics – PV) capacity is considered growing faster than other renewable technologies. Japan, China and USA are the leaders in solar additions. In the second part, the speaker shared more information about the solar energy development in USA. He informed that solar installations have increased, note significant percentage of BTM (behind-the-meter) PV in Hawaii and smaller solar facilities are more likely to be developed. Future grid will require better telecommunication, monitoring, consumer involvement, and artificial intelligence. As costs decrease and new regulations are developed, storage deployment will increase. At the end of the

presentation, Professor Surles recommended solutions for solar energy development such as: State regulators – subject to legislative mandates; utility business models must change due to changes in technology and government policy; Everyone must work to ensure that utilities are profitable and electricity prices are reasonable.

2. The Necessity of Public-Private Partnership for Solar Energy Development

- *Mr Steivan Defilla (President Assistant of APEC Sustainable Energy Centre - APSEC, China)* talked about Elements of PPP favoring successful Solar Energy Development. He shared his perspective on PPP which is considered as way to match comparative advantages of the public and private sector, respectively. According to the speaker, PPPs are not a substitute for market reform and we can choose PPP models suitable for integrated electricity markets. PPPs are not the solution to all problems but the result of the best choice. The speaker shared some factors that make PPP successful which include: Project identification and preparatory work, Project development and due diligence, implementation arrangement, Procurement and project construction, Contract management, dispute resolution. At the end of the presentation, Mr Defilla concluded by giving some specific choices for solar PPP such as: Arouse interest of global solar investor community, prepare competitive international tendering; adhere to the upcoming global risk mitigation tool; make the right technological choices (CSP – concentrated solar power, PV, storage); manage the simultaneous grid extension.

- ***Profesor Dr. Joachim Monkelbaan, International University in Geneva, Independent Expert - Global Sustainability Advisor*** presented about the importance of having solar energy in the economy. The first reason is that the electricity generating from natural gas and renewable energy increase and the share of nuclear and coal generation decrease. The speaker mentioned about the governance for the sustainable development goal including PPP as a solution to extend the participation of the private sector. Through PPP, the private and public sectors can reach a mutually beneficial agreement: (i) the private sector can have the guarantees it needs

to face risks entailed in the time gap between the project's planning phase and its actual implementation; (ii) the public sector can obtain capital investment; budgetary certainty; innovation and new technologies; skills; risk transfer; and management expertise. On objectives of solar PPP, the speaker talked about PPP principles and key components of an enabling institutional framework for PPP. At the end of the presentation, he recommended: PPP should be implemented only in cases where they can be shown to provide value for money in its broadest sense; The implementation of PPP should be aligned with the Addis Principles; To ensure these conditions, it is necessary to set in place: At domestic level, an enabling institutional framework; At international/APEC level, common standards and guidelines.

3. Public-Private Partnership for Solar Energy Development – Perspectives from the Private Sector

- *Mr Eric Pyle (Director of Public Affairs and Policy, Solarcity, New Zealand)* he provided an overview of the New Zealand power system with focus on solar Zero Home – a technology platform which was designed in New Zealand by Solarcity and Panasonic that integrates solar management, energy storage and energy control and monitoring into a single device. He shared about three stages of power system development. Mr Pyle made a brief analysis about barrier to a smart, clean electricity system in a liberalized wholesale market. He also mentioned about challenges to the level of electricity distribution and the requirement for innovation. At the end of the presentation, Mr Pyle concluded some policies and rule for PPP for solar and batteries in a liberalized market.

- *Mr Mai Van Trung (Business Development Director – SolarBK Company, Viet Nam)* provided some information about project of SolarBK Company in Viet Nam in Ninh Thuan and Binh Thuan. He then talked about transmission congestion, transmission network, and grid storage. About rooftop solar PPP, he shared that the Company has ~ 45 MWp installed economy-wide with 4,000 sites and it plans to 1,000 MWp up to 2025. The

speaker listed out some PPP projects of solar energy such as: public facility and solar street tights. At the end of the presentation, he mentioned about Solar Energy Transaction Center through which EVN (Viet Nam Electricity group) want to build a platform for solar prosumers to trade as a clearing center, allow big consumers to buy more renewable energy.

4. Government's Strategies and Policies on Public-Private Partnership for Solar Energy Development

- *Mr Nguyen Duc Cuong (former Director of Renewable Energy Center, Institute of Energy, Viet Nam)* presented about the development of Solar PV power through PPP in Viet Nam. In the general view, he said that Economic growth, Industrialization, and urbanization of Viet Nam has continued to push up the electricity demand and solar power is one of the keys to creation the green power sector in Viet Nam. He then introduced about a new Government Decree No. 63/2018/ND-CP dated 04 May 2018 on investment in the form of PPP promulgated, effective on 19 June 2018. This Decree prescribes the fields, conditions, order and procedures for investment in the form of public-private partnership (PPP). In the second part, he presented about overall on power sector in Viet Nam and the booming solar power development in Viet Nam. He shared that 82 solar plants with a total capacity of 4,460MW have been grid-connected. Mr Cuong also talked about the opportunities and challenges of PPP in solar power market. He came up with conclusion that it needs to: facilitate the stable development of solar energy, introduce strong enough policies, reduce administrative procedures for the investment process, provide good infrastructure (for example: transmission and distribution grids, project planning), create a equality playing field (rights, and opportunities), strengthen local contents: Participate in renewable energy business chains.

- *Mr Chih Wei Wu (Director, Electricity Division, Bureau of Energy, Ministry of Economic and Affair, Chinese Taipei)* said that Public-private partnership (PPP) may be considered a possible relationship among government and private sectors in the context of infrastructure and other services. A typical PPP structure involves contractual arrangements

between a numbers of parties, such as the government, project sponsor, project operator, financiers, suppliers, contractors, engineers and customers. After that, he shared his view about PPP for solar energy in which Feed-in tariff (FIT) is a core policy on PPP models to develop solar energy. FIT regime provides a fixed tariff in respect of solar power projects for a period of 20 years. FIT has been effective in the development of solar energy because that reasonable return provided by government can motivate the private sector to develop the solar energy. The speaker introduced the PPP model for governments' strategy to develop solar energy and the example of PPP on solar energy development. The speaker concluded that PPP can be regarded as a relationship among government and private sectors in the context of infrastructure and other services. In most cases PPP for solar energy is to develop PV solar energy and solar power. Solar PV 2-year Promotion Project, Green Energy Roofs Project, and FIT let the public and private sector increase more motivation to install the solar PV system.

5. Case Studies of Public-Private Partnership for Solar Energy Development in APEC Member Economies

- *Mr Terrence Surles (Senior Advisor, California Institute for Energy and Environment, USA)* presented about the State responses to Public Private Partnerships for renewable energy development and deployment. He introduced some state policies provide for incentives to drive development of renewable energy systems. Performance based regulation is new approach for better management of grid with falling sales due to efficiency improvements and generation and storage. The speaker then talked briefly about the renewable energy development in some big cities in the US such as: New York, Illinois, Massachusetts, California. He shared that the renewable goals: now at 60% by 2030 – 100% goal in 2045 will include large-head hydro. At the end of the presentation, Mr Surles concluded that private sector business models within an economy will be based on what their policies are; develop domestic training programs for enhancing intellectual capacity; overcome barriers related to best utilize resources – government should fund research and development; ability to address investment community concerns; regulatory consistency can lead to a

harmonized system for industry; collaborations between APEC economies create consistency.

- *Mr Martin Brown Santirso (Independent Advisor on Sustainable Energy Governance)* presented about case study of Peru Renewable Energy Auctions. At first, he talked briefly about energy policy in Peru and the current development of the economy. In Peru, electricity generation historically dominated by hydro given the large potentials afforded by its geography. With projected demand increases of over 5% per annum, a combination of gas and hydro would meet this new demand. He then mentioned about challenges and the Domestic Energy Plan of Peru from 2010 to 2040. According to a survey by the Ministry of Energy and Mines (MINEM), Peru's untapped renewable energy potential but it is not really well developed. Mr Brown shared experience of Peru in PPP renewable energy auctions and he came up with lesson learn such as: Auctions are an effective mechanism to engage private sector for the delivery of RE; Achieving project uptake and optimum prices; However, it is important to set a system that appropriately rewards time behavior and strong performance.

- *Profesor Dr. Joachim Monkelbaan (International University in Geneva, Independent Expert - Global Sustainability Advisor)* provided some figures about renewable energy in California. California solar energy develops rapidly because of high insolation, community support, declining solar costs renewable portfolio standard which requires that 33% of California's electricity come from renewable resources by 2020, and 50% by 2030. He then shared information of some project such as Ivanpah – CSP Project, Desert Sunlight, California Valley Solar Ranch. The speakers also talked about experience of implementing the projects with keys to succeed from financing, purchase agreement, risk allocation, private consortium and transparency.

6. Discussions

- Coal industry experienced various transitional periods in the west of the US. Coal industry seemed uneconomic and too expensive to spend on coal technology. Wind/ solar energy is cheaper than coal. A speaker commented workers should be trained to change their jobs from coal to solar and other renewable energy sources.
- Experiences in public – private partnership: in California, USA, companies provide technologies while Hawaii does not have PPP.
- A speaker commented that a new grid scale system (10 megawatt of solar plus storage) is really cheap.
- On the role of Government: (i) to provide federal tax credit, for example, in Hawaii this figure is 30 per cent; (ii) in some States, penalties will be imposed if goals of the Renewable Portfolio Standards are not achieved.
- How economies with less progresses can benefit from PPP? It is a learning process. Whether to choose PPP is up to decision of the Government. PPP is normally feasible for oversized projects; but many economies have PPP in small projects at school/ community level. It is essential to build capacity for Governments especially on risks and rewards of PPP, develop PPP templates, more transparent in PPP etc.
- If there is a 100 MW solar energy project, PPP or tender – which one is better? Depending on modality, estimated results and assessment of the whole process; a reminder that if tender is selected, then it should be international tender to assure efficiency.
- Governments should move away from financing to guarantee, however, for economies with low State budget, is there an alternative option? In Thailand, there is a green fund to support projects; in Germany, feed-in-tariffs is available for small plants. It should be revenue neutral for Governments. Governments need to choose policies to develop solar PV, how to regulate, learn from other economies, understand that economies want/ what people need/ how to support etc. (sometimes there was mistake, such as California, USA wanted to have electric vehicle by 2010 but failed). There should be a comprehensive analysis before deciding on an incentive.
- PPP is in the early stage of development. In PPP, the role of the public sector is a partner, not a supervisor. However, since Governments' role is to provide a stable regulatory system, sometimes there are conflicts of

interests. One speaker is quite skeptical on PPP and highlighted that it should be better governance of PPP. Another speaker emphasized that PPP will be effective if the private sector provides capital, the public sector supports in pricing and policies. There is a risk in resilience of PPP if a partner wants to pull out.

- Factors affecting on capacity of solar energy projects:

  + Land scope: in Viet Nam each MW of a solar energy project would take 1.8 – 2.3 ha (forbidden to use land from natural, high conservation value forests) while in Chinese Taipei each MW of a solar energy project would take 1 ha;

  + Capability in transmission and distribution grids;

  + Categories of solar panel (mono, poly, flexible);

  + In some economies the Governments will build specific schemes to develop solar energy.

- Forecast of capacity/ demand of solar energy sector? Depending on approach of each economy and attractions from FIT.

- Experiences in dealing with numerous partners in a project:

  + Governments should have long-term policies;

  + Right interpretation from all sides;

- Potentials of rooftop solar PV (schools, hospitals, buildings etc.):

  + In Chinese Taipei: 20 GW by 2025;

  + In Viet Nam, according to World Bank, 15 GW with 5 MW solar energy was installed from Da Nang to southern provinces. A program on rooftop solar PV development in Viet Nam was launched in July 2019 aimed to install 100,000 new rooftop solar systems across the economy by 2025. This program targeted solar power capacity of about 1,000 megawatt peak by 2025.

- In New Zealand: (i) solar energy projects will be supported in reuse of battery; (ii) Electricity price gradually decreased which is consequence of market power; (iii) in natural disasters, such as earthquakes, batteries can

help improve household resilience (iv) batteries can support an electrically-weak power system, by providing fast acting reserves.

- In Peru: solar energy price has decreased in the past 5 years due to transparency in market pricing and tender and increasing roles of market operators. Peru put priorities in developing solar and wind energy
- A speaker commented that Viet Nam still relied on fossil fuel at least until 2030 with several thermal power plants were under construction. There are micro-grid projects in some islands in Viet Nam.

V. RECOMMENDATIONS AND CONCLUSIONS

During the final Session, participants shared what they learned from the Workshop and discuss the way forward for this project.

1. Take-away from the Workshop

- Understanding of PPP concept, mechanisms and its uses;

- Different experiences of other economies regarding PPP;
- How quickly solar energy is developing;
- Battery storage;
- Potential of battery and behind-the-meter solar PV.

2. Recommendations to APEC/ individual economy

2.1. Actionable policies (at APEC and economy level)

- A stable and transparent environment for business;
- Rationalize policies;
- Bring information to public; more case studies (technologies, FIT..)
- More efficient bidding and workshops to attract investors;
- Stable purchase electricity prices;
- Long-term contracts;
- A system approach and consider what make the most for your economy;
- A regional program to make in-economy decisions;
- Be flexible in PPP and technologies applied.

2.2. Further activities or initiatives that APEC should have to develop solar energy

- Cooperate among different agencies;
- Energy storage;
- Make this as an agenda item at Ministerial/ Senior official level;
- Make sustainable cities to develop solar energy;
- Share best practices among economies;
- Create PPP template/ toolkit for economies to formulate their own mechanism;
- Share experiences among Governments on how to regulate FIT;
- Enhance awareness of households on benefits of solar energy especially rooftop;
- Impacts of batteries on environment;
- Political act;
- Transmission lines;
- Salient provisions of particular PPP agreements;
- PPP for ancilliary services.

VI. ANNEX 1: FINAL AGENDA OF THE WORKSHOP

Time	Content
01 August 2019	
08.30 – 09.00	Registration
09.00 – 09.10	Opening Speech *Ms Pham Quynh Mai, Deputy Director General, Multilateral Trade Policy Department, Ministry of Industry and Trade, and Viet Nam's Senior Official to APEC*
09.10 – 09.20	**Photo Session**
09.20 – 09.50	**Session 1: Overview on Solar Energy Development in APEC and Worldwide** During this Session, speaker(s) will share information on background, current state-of-play, development and trends of solar energy development. Presentations may also introduce advantages and disadvantages in developing solar energy; development levels in the APEC region, achievements, etc. Moderator: - *Mr Eric Pyle, Director of Public Affairs and Policy, Solarcity, New Zealand.* Speaker: - *Professor Terrence Surles, Senior Advisor, California Institute for Energy and Environment, USA.*
09.50 – 10.20	Discussion (Questions and Answers)
10.20 – 10.50	Tea Break
10.50 – 11.45	**Session 2: The Necessity of Public-Private Partnership for Solar Energy Development** This session will explore the rationale and necessity of utilizing public – private partnership (PPP) to develop solar energy as well as its economic impact regionally and globally from different perspectives.

	Moderator: *- Mr Chih Wei Wu, Director, Electricity Division, Bureau of Energy, Ministry of Economic and Affair, Chinese Taipei.* Speakers: *- Mr Steivan Defilla, President Assistant of APEC Sustainable Energy Centre, China;* *- Profesor Dr. Joachim Monkelbaan, International University in Geneva, Independent Expert - Global Sustainability Advisor.*
11.45 – 12.15	Discussion (Questions and Answers)
12.15 – 14.00	Lunch
14.00 – 15.00	**Session 3: Public-Private Partnership for Solar Energy Development – Perspectives from the Private Sector and International Organizations** This Session will provide participants with a wide range of experience and information from the private sector and international organizations regarding PPP for solar energy development in the APEC region. Presentations are encouraged to include information on the challenges to PPP. Speakers are also encouraged to suggest recommendations to the Government on appropriate measures to better and more effective PPP mechanism to develop solar energy. Moderator: *- Mr Martin Brown Santirso, Independent Advisor on Sustainable Energy Governance.* Speakers: *- Mr Eric Pyle, Director of Public Affairs and Policy, Solarcity, New Zealand;* *- Mr Mai Van Trung, Business Development Director – SolarBK Company, Viet Nam.*
15.00 – 15.30	Discussion (Questions and Answers)
15.30 – 16.00	Tea Break
16.00 – 17.00	**Session 4: Government's Strategies and Policies on Public-Private Partnership for Solar Energy Development**

	During this Session, speakers will share relevant Government's strategies and policies on public – private partnership (PPP) to develop solar energy in the APEC region. Presentations may explore regulatory barriers that impede the development of solar energy through PPP in the APEC region. Moderator: - *Profesor Dr. Joachim Monkelbaan, International University in Geneva, Independent Expert - Global Sustainability Advisor.* Speakers: - *Mr Nguyen Duc Cuong, former Director of Renewable Energy Center, Institute of Energy, Viet Nam;* - *Mr Chih Wei Wu, Director, Electricity Division, Bureau of Energy, Ministry of Economic and Affair, Chinese Taipei.*
17.00 – 17.30	Discussion (Questions and Answers)
End of Day 1	

02 August 2019	
09.00 – 10.15	**Session 5: Case Studies of Public-Private Partnership for Solar Energy Development in APEC Member Economies** This session will be dedicated to hearing various case studies and detailed examination in developing solar energy through PPP in APEC member economies. Moderator: - *Mr Steivan Defilla, President Assistant of APEC Sustainable Energy Centre, China.* Speakers: - *Mr Terrence Surles, Senior Advisor, California Institute for Energy and Environment, USA;* - *Mr Martin Brown Santirso, Independent Advisor on Sustainable Energy Governance;*

	- *Profesor Dr. Joachim Monkelbaan, International University in Geneva, Independent Expert - Global Sustainability Advisor.*
10.15 – 10.30	Discussion
10.30 – 11.00	Tea break
11.00 – 11.45	**Session 6: The Way Forward** During this Session, Workshop participants will brainstorm, explore possible ways and suggest recommendations to APEC on (i) how to facilitate the development of solar energy through PPP; and (ii) enhance capacity building activities to most benefit APEC member economies. Moderator: *Ms Nguyen Huong Tra, Viet Nam*
11.45 – 12.00	Wrap – up and Conclusion: *Ms Pham Quynh Mai, Deputy Director General, Multilateral Trade Policy Department, Ministry of Industry and Trade, and Viet Nam's Senior Official to APEC*
12.00 – 14.00	Lunch
THE END	