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Trainings in Renewable Energy Best-Practices: Procurement, Contracts, Lifecycle Cost Analyses, and Risk Mitigation to Mobilize Private Investment

Kuala Lumpur, Malaysia | 16-20 October 2017

APEC Energy Working Group

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A Joint APEC-ASEAN Workshop

ENERGY WORKING GROUP

SUMMARY REPORT

16-20 October 2017
Kuala Lumpur, Malaysia

The United States[1] hosted a joint APEC-ASEAN training on Renewable Energy Procurement, Contracts, Lifecycle Cost Analyses, and Risk Mitigation to Mobilize Private Investment (EWG 02 2017A, *Making the Case for Clean Energy Investments with Life-Cycle Impact Assessments*) in Kuala Lumpur, Malaysia from 16-20 October 2017. The 5-day workshop convened APEC and ASEAN officials from energy ministries, representatives from international organizations, NGOs, and academia to learn best practices and tools to help make the argument for, and support, renewable energy development. Participants also discussed how to procure renewable energy and attract investments for large-scale renewable energy installations. Representatives from APEC and ASEAN economies participated in the workshop, including attendees from Cambodia, Chile, Indonesia, Laos, Malaysia, Papua New Guinea, the Philippines, the United States, Thailand, Viet Nam, and the ASEAN Centre for Energy. They represented energy ministries, electricity utilities, energy regulators, research institutions, or multinational organizations, and most had responsibilities for the procurement of renewable energy.

[1] Hosted by the U.S. Department of Energy, U.S. Department of State and U.S. Department of Commerce with support from the US-APEC Technical Assistance to Advance Regional Integration (US-ATAARI) activity.

Background

The burning of coal, natural gas, and oil for electricity and heat is the largest single source of global greenhouse gas emissions, making up twenty-five percent of the world's emissions in 2010 according to the Intergovernmental Panel on Climate Change. The International Energy Agency estimates that electricity demand in Southeast Asian countries will increase by 80% between 2015 and 2040. Each decision within the APEC region to undertake a major retrofit or build a new electric power facility represents a long-term financial commitment with lasting implications to not only an economy's greenhouse gas emissions, environment and public health, but also that of the APEC region. The purpose of this joint workshop was twofold: 1) to provide decision-makers with the tools to assess environmental and health impacts as part of life-cycle costs when considering long-term energy investments, and 2) to build capacity for procuring large-scale renewable energy power plants and attracting investments to fund projects.

APEC Leaders continue to reiterate their aspirational goals to reduce aggregate energy intensity by 45 percent by 2035 and double the share of renewable energy in the regional energy mix by 2030 to achieve sustainable and resilient energy development within the Asia-Pacific. In 2015, APEC Energy Minsters reaffirmed the importance of low carbon development to achieve our individual and regional economic aspirations and goals. APEC Energy Ministers also welcomed the APEC Initiative for Enhancing the Quality of Electric Power Infrastructure taking into consideration not only resilience to extreme weather events but also lifecycle costs, environmental impact, responsiveness to changing market circumstances and business continuity. In addition, the Energy Working Group's Strategic Plan 2014-2018, aims to lower carbon intensity of the APEC energy supply:

Our mission is to build the capacity of APEC members to strengthen domestic and regional energy security and lower the carbon intensity of energy supply and use across the region, facilitated by information and data exchanges, joint research and development, and open trade and investment.

Finally, APEC has acknowledged the need to consider social concerns, such as environment and health impacts, when making power infrastructure decisions, as noted in the APEC Guideline for Quality Electric Power Infrastructure. This workshop builds upon this recommendation by providing capacity building on specific health and environmental impacts to consider across the life-cycle of an investment, available tools and datasets for estimating the extent and cost of such impacts, and strategies for applying impact assessments to drive cleaner energy decision making. Investments in cleaner energy will benefit the region by decreasing the environmental and health impacts associated with traditional power generation.

Key Findings

- The power purchase agreement (PPA) is the lifeblood of a renewable energy (RE) project, so its terms as well as the terms of other associated agreements should be developed in conjunction with the community of project developers, the off-taker/utility, lender(s), and any relevant ministries to ensure it is a mutually beneficial agreement.

- The regulator plays a critical role in both generating investor confidence and encouraging utilities to adopt and integrate RE.

- Competitive procurement, especially via auctions, has dramatically reduced the cost of RE to at or below grid parity in diverse economies worldwide; feed-in tariffs (FiTs) do not offer the same cost savings but may offer other advantages such as speed and ease of administration.

- Robust tools exist for calculating the value/expense of non-price costs (public health, environment) from different power generation lifecycles. Decision-makers can use these tools to forecast economic effects and externalities from changes to energy policies and technologies.

Summary of Workshop Training in Renewable Energy Best Practices

Each economy first reported on its domestic renewable energy policies and plans, existing RE projects, and their project pipelines, providing insight into some of their challenges and successes in investment, construction, and operations of RE power plants.

For the first 3 days, a group of international clean energy attorneys presented sequential legal and financial concepts for consideration when attempting to procure renewable energy projects and shared and best practices through case studies.

Day 1: Presenters covered power as a privately developed public good; the differing priorities and financial timelines of lenders, developers, and off-takers/utilities; the role of the regulator in increasing investor confidence; standardization of project documents, including the vital power purchase agreement (PPA); challenges and solutions to accelerating RE development; and the first half of a case study on South Africa's two-year-long government shift to eventually stimulate over 6,500MW of RE investment, which featured a balanced and non-negotiable PPA, integrated resource planning (IRP), setting of RE development zones, and shift from a feed-in tariff to competitive procurement for all power projects, rapidly dropping solar and wind project costs to grid parity.

Day 2: Presenters covered the fundamental considerations for a bankable PPA; the difference between thermal and RE PPAs (the latter may include curtailment, reactive power, forecasting, etc.); handling of force majeure events; addressing risks related to the contract, construction, logistics, interconnection, power plant performance, disputes, currency, and ownership of a power project; and various procurement structures for RE projects, again with South Africa as a case study.

Day 3: Presenters dove into greater detail on topics, including the value of both benchmarking to similar economies and "market sounding" (via a Request for Information, RFI) to acquire stakeholder input and pricing data prior to decision-making; the two-envelope bidding process; removal of risks via contracts harmonization (PPA, Implementation Agreement, Direct Agreement, and Interconnection Agreement); currency exchange risk mitigation; obligated project revenue and payment prioritization from the revenue account; defaults and lender recourse under the Direct Agreement.

For the last 2 days, a selection of global researchers presented tools and methodologies for evaluating non-price costs (health, environment, and related externalities) of various power generation scenarios.

Day 4: Presenters emphasized competitive auctions as a major driver of cost reduction worldwide; challenges in forecasting and predictions in a dynamic market; six essential building blocks for RE development developed by the US Agency for International Development (USAID); lifecycle environmental impact assessments; least-cost analysis versus life-cycle assessment (LCA); the U.S. Environmental Protection Agency's BenMAP tool for evaluating cradle to grave, local and regional, short- and long-term human health impacts of power projects; and the Global Burden of Disease study.

Day 5: Presenters discussed the Long-range Energy Alternatives Planning (LEAP) system for evaluating climate change effects, other externalities, cost-benefit tradeoffs, and optimization of power sector planning and population dynamics, which can help modelers to inform policymakers; the use of actual economic data to estimate effects of policy and technology changes; integration of energy, economic, and environmental models; "cost of life" calculations; and group presentations of challenges in the energy sector and the use of tools to resolve them.

Recommendations for next steps

Attendees and presenters expressed interest in or support for:

- A discourse on USAID's 6 essential building blocks for RE development
- Hands-on trainings of the LEAP and BenMAP tools for economy-specific analyses
    - How to use these tools to influence and educate government ministries & accurately influence domestic policy and frameworks
    - APEC and ASEAN convening to share experiences with using these tools
    - Discussion of how governments can use modelled data to change policy
    - The inclusion of (local) financial/lending institutions in subsequent trainings
- Discussion of how to design RE auctions
- Sharing case studies among APEC and ASEAN economies on their experiences with PPAs, RE procurement and the energy planning process
- Collaboration among the U.S. National Association of Regulatory Utility Commissioners (NARUC) and other regional energy regulators on establishing regulations to guide stable RE growth
- Grid integration: Discussing key challenges to grid integration; best practices, technologies and systems for enhancing grid integration; and coping with grid integration costs
- Development of case studies around how modelling can successfully influence policy and project finance
- Regional integration: from regional power pools or even a tender process run by more than one government
- A deep-dive into select PPA terms e.g. force majeure using actual examples of clauses from PPAs

Appendix. Workshop Agenda

**Presentations can be accessed at www.tinyurl.com/CleanEnergy2017*

Agenda

Trainings in Renewable Energy Best-Practices: Procurement, Contracts, Life-Cycle Cost Analyses, and Risk Mitigation to Mobilize Private Investment

16-20 October 2017

Sheraton Imperial Kuala Lumpur Hotel, Malaysia

DAY ONE	16 October 2017
8:30 – 9:00 am	**Registration and Arrival**
9:00 – 9:30 am	**Welcome and Overview of Trainings** **Mr Jamie Kern**, *Senior Fellow, Office of International Affairs, U.S. Department of Energy, United States* **Mr Nat Turner**, *Economic Counselor, United States Embassy Kuala Lumpur* **Mr Mohamed Badissy**, *Senior Attorney for Finance and Energy, U.S. Department of Commerce, Commercial Law Development Program, United States* **Dr Katie Purvis-Roberts**, *Professor of Chemistry and Environmental Science, Claremont McKenna College, United States*
9:30 – 10:00 am	**Participant Introductions**
10:00 – 10:30 am	**Coffee Break**

Session 1 10:30 – 11:30 am	**Country Representative Presentations** Each delegation will be asked to present for a maximum of 5 minutes on the following two questions: • How many utility-scale renewable energy projects have been developed or are proposed in your market? • What role is the private sector playing in the development of renewable energy projects?
Session 2 11:30 – 1:00 pm	**Fundamentals of Independent Power Producer Projects and Special Considerations for Private Renewable Energy Development** **Mr Mohamed Badissy**, *Senior Attorney for Finance and Energy, U.S. Department of Commerce, Commercial Law Development Program, United States*
1:00 – 2:00 pm	**Lunch**
Session 3 2:00 – 3:00 pm	**Current Trends in Private Investment in Renewable Energy IPP's** **Mr Ferdinand Calice**, *Partner, Hunton & Williams LLP, United Kingdom*
3:00 – 3:30 pm	**Coffee Break**
Session 4 3:30 – 4:30 pm	**The Role of Government in Establishing a Legal and Regulatory Environment for Renewable Energy Projects** **Ms Zahra Omar**, *Principal, Infinit Energy, South Africa*
4:30 – 5:00 pm	**Open Discussion / End of Day 1**
DAY TWO	**17 October 2017**
9:00 – 9:30 am	**Summary of Day 1**
Session 5 9:30 – 10:30 am	**Fundamental Elements of Renewable Energy PPAs** **Mr Ferdinand Calice**, *Partner, Hunton & Williams LLP, United Kingdom*
10:30 – 11:00 am	**Coffee Break**
Session 6 11:00 – 12:00 pm	**Unique Renewable Energy Project Risks: Transmission and Resource** **Mr Mohamed Badissy**, *Senior Attorney for Finance and Energy, U.S. Department of Commerce, Commercial Law Development Program, United States*
Session 7 12:00 – 1:00 pm	**Overview of Procurement Structures for Renewable Energy Projects** **Ms Zahra Omar**, *Principal, Infinit Energy, South Africa*
1:00 – 2:00 pm	**Lunch**

Session 8 2:00 – 3:00 pm	**Case Study: Transaction Timeline for a Renewable Energy Project** **TBD**
3:00 – 3:30 pm	**Coffee Break**
Session 9	**Regulating Grid-Independence: Mini-Grids and Distributed Generation**
3:30 – 4:30 pm	**TBD**
4:30 – 5:00 pm	**Open Discussion / End of Day 2**
DAY THREE	**18 October 2017**
9:00 – 9:30 am	**Summary of Day 2**
Session 10 9:30 – 10:30 am	**Case Study: South Africa's Renewable Energy Procurement Program** **Ms Zahra Omar**, *Principal, Infinit Energy, South Africa*
10:30 – 11:00 am	**Coffee Break**
Session 11 11:00 – 12:00 pm	**Structuring Tariffs for Renewable Energy Projects** **Mr Ferdinand Calice**, *Partner, Hunton & Williams LLP, United Kingdom*
12:00 – 1:00 pm	**Lunch**
1:00 – 2:30 pm	**Private Sector Roundtable in Partnership with the US-ASEAN Business Council**
2:30 – 3:00 pm	**Coffee Break**
Session 12 3:00 – 4:00 pm	**Integrating Renewable Energy into Domestic and Regional Markets** **Mr Mohamed Badissy**, *Senior Attorney for Finance and Energy, U.S. Department of Commerce, Commercial Law Development Program, United States*
4:00 – 4:30 pm	**ASEAN Workshop Evaluations and Roadmap for APEC Workshop**
4:30 – 5:00 pm	**Open Discussion / End of ASEAN Workshop**

DAY FOUR	October 19, 2017
8:30 – 9:00 am	**Registration and Arrival**
9:00 – 9:15 am	**Welcome and Overview of Workshop Days 4 and 5** **Dr Katie Purvis-Roberts**, *Professor of Chemistry and Environmental Science, Claremont McKenna College* **Workshop Objectives** • Discuss least cost energy options for society and industry, reliability of energy syste and energy security • Introduce life-cycle impact assessments and available tools and datasets to enable members to better: - Formulate the business cases for investments; and - Evaluate new clean energy technologies for health and environmental impacts • Allow members to share best practices for clean energy assessment, discuss strategi for successfully communicating assessment findings, and gauge the need for further training of the available toolsets
Session 1 9:15 – 10:15 am	**Setting the Stage: Elements for Consideration in Choosing Energy Generation Capacity** This session will provide an overview of least cost energy options, reliability of the energy supply, and energy security, which must be weighed when considering options for energy projects. **Dr Allen Eisendrath**, *Global Climate Change Office Director, Economic Growth, Education and Environment (E3) Bureau, U.S. Agency for International Development, United States* *Open Discussion and Questions and Answers*
10:15 – 10:30 am	**Coffee Break**
Session 2 10:30 – 12:30 pm	**Overview of Life-Cycle Impact Assessments** This session will provide members with information about Life-Cycle Impacts Assessments when making energy choices. The discussion will focus on the environmental and health consequences of energy choices and how to include these additional factors into making long-term energy plans. **Moderator: Dr Allen Eisendrath**, *Global Climate Change Office Director, Economic Growth, Education and Environment (E3) Bureau, U.S. Agency for International Development, United States* • **Dr Mili-Ann M. Tamayao**, *Assistant Professor, Department of Industrial Engineering and Operations Research, University of the Philippines*

	• **Dr Thapat Silalertruksa**, *Researcher, Life Cycle Sustainability Assessment Lab, the Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi* • **Dr Norasikin Ahmad Ludin**, *Senior Lecturer/Head of Quality, Solar Energy Research Institute, Universiti Kebangsaan Malaysia* *Open Discussion and Questions and Answers*
12:30 – 1:30 pm	**Lunch**
Session 3 1:30 – 3:30 pm	**Benefits Mapping and Analysis Program (BenMAP-CE) Overview** This session will give an overview of the BenMAP program and its application. **Ms Amanda Curry Brown**, *Environmental Protection Agency, United States* *Open Discussion and Questions and Answers*
3:30 – 3:45 pm	**Coffee Break**
Session 4 3:45 – 4:30 pm	**Key Takeaways from Connecting Life-Cycle Analysis and BenMAP Modeling** **Dr Katie Purvis-Roberts**, *Professor of Chemistry and Environmental Science, Claremont McKenna College*
DAY FIVE	**October 20, 2017**
Session 5 9:00 – 10:00 am	**LEAP: The Long-range Energy Alternatives Planning System** LEAP, the Long-range Energy Alternatives Planning System, is a widely used software tool for energy policy analysis and climate change mitigation assessment developed at the Stockholm Environment Institute. This session will give an overview of the LEAP program and its potential application to integrated resource planning and low-emission development strategies. **Dr Charlie Heaps**, *Stockholm Environment Institute* *Open Discussion and Questions and Answers*
10:00 – 10:30 am	**Coffee Break**
Session 6 10:30 – 12:00 pm	**Panel: Energy Planning using BenMAP and LEAP and the Importance of Life-Cycle Analysis** This session will allow members to share their experiences implementing the Life-Cycle Analysis and tools to calculate the cost of health and environmental impacts, including successes; challenges; lessons learned; etc. **Moderator: Ms Elena Thomas-Kerr**, *U.S. Department of Energy, United States*

	• **Pn. Azah Ahmad**, *Director of Renewable Energy Technology, Sustainable Energy Development Authority of Malaysia* • **Mr Wongpun Limpaseni**, *Associate Professor, Institute of Metropolitan Development, Navamindradhiraj University* • **Dr Han-Pang Su**, *Director, Third Research Division, TRI, Chinese Taipei* *Open Discussion and Questions and Answers*
12:00 – 1:30 pm	**Lunch**
Session 7 1:30 – 3:00 pm	**Breakout Groups: Initial Thoughts on How to Apply Life-Cycle Analysis to Energy Planning** This session will include a chance for participants to discuss which tools they think are most beneficial for incorporating clean energy choices into their respective economies. **Facilitator: Mr Jamie Kern**, *U.S. Department of Energy, United States* ***Group or Breakout Sessions with Rapporteurs to Report Out*** *Open Discussion and Questions and Answers*
3:00 – 3:30 pm	**Coffee Break**
Session 8 3:30 – 4:15 pm	**Question and Answer/General Discussion**
Session 9 4:15 – 4:45 pm	**Day 2 Wrap-Up and APEC Workshop Evaluations** **Dr Katie Purvis-Roberts**, *Professor of Chemistry and Environmental Science, Claremont McKenna College*