



**Asia-Pacific
Economic Cooperation**

Project Summary Report

APEC Conference on Facilitating Solar Supply Chain

**Ha Noi, Viet Nam
31st July – 01st August 2014**

Energy Working Group

August 2014

APEC Conference on Facilitating the Solar Supply Chain

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Summary Report

I. Introduction

On July 31st and August 1st, 2014, the APEC Conference on Facilitating the Solar Supply Chain, initiated by Viet Nam and co-sponsored by China and the United States, was held in Ha Noi, Viet Nam. Speakers and participants came from eight APEC member economies (China, Indonesia, Malaysia, the Philippines, Chinese Taipei, Thailand, the United States, Viet Nam), the Organisation for Economic Co-operation and Development (OECD), the International Center for Trade and Sustainable Development (ICTSD), and FratiniVergano–European Lawyers. Most of the Conference participants were involved with energy-related policy making, or came from academic institutions or the private sector.

The Conference sought to update information on trends in the sourcing of inputs to solar-energy projects and possible changes that could affect supply chains in the future. It aimed also at creating a platform for APEC member economies to discuss current supply-chain management procedures and networks in the solar industry, as well as discussing opportunities and challenges in the solar equipment industry, with possible recommendations to tackle such challenges. Last but not least, the Conference was expected to explore potential cooperation opportunities among APEC member economies in facilitating the solar supply chain.

II. Background

This project is designed to implement the APEC Leaders' and Ministers' 2008 proclamation that "access to adequate, reliable, clean and affordable energy resources is vital to sustaining economic prosperity in the region." Furthermore, in 2011, the APEC Leaders clearly stated that they were "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."

At the 4th APEC Energy Ministerial Meeting in 2012, Ministers reiterated their endorsement of work to "develop renewable energy sources" to increase energy security, and to contribute to APEC's "economic development and reduce emissions of carbon dioxide and other pollutants into the atmosphere."

The APEC Leaders remain committed to strengthening APEC Energy Security, are clearly stated in their 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 bio-energy from sustainable biomass sources” and in their 2013 Declaration: “Invigorate work to develop clean and renewable energy through public-private partnership, as a promising approach to ensure sustainable investment and development of new technology, and to promote energy security and efficiency and lowering of greenhouse gas emissions”. They also set a goal “to reduce APEC’s aggregate energy intensity by 45 per cent by 2035”.

This project also directly supports the Action Plan in the APEC Leaders’ Growth Strategy (2010) with regard to renewable-energy development.

The APEC Conference on Facilitating the Solar Supply Chain would contribute directly to the commitments of APEC Leaders and Ministers to “speed up the transition toward a low-carbon economy”, and “promote development and deployment of a low-emission energy supply” that “enhance[s] energy security and create[s] new sources of economic growth and employment”.

Themes covered during the two-day event included: (i) *The Solar Market – Past, Present and Future*; (ii) *Entering the Solar Supply Chain – Clean Energy Manufacturing Tools and Services for Manufacturers*; (iii) *Solar Supply Chain, Challenges and Opportunities*; (iv) *Government Strategies and Policies to Facilitate Solar Supply Chain*; and (v) *Best Practices in Facilitating Solar Supply Chains in the APEC Member Economies*.

III. Discussion

Outcomes

The APEC Conference on Facilitating the Solar Supply Chain included two days for presentations and discussions on the state-of-play of solar supply chains, the need for improving supply-chain control and efficiencies, and facilitating solar supply chains. The last session (recommendations for future activities) provided an opportunity to share what participants can take away from the Conference as well as to suggest potential APEC activities related to facilitating solar supply chains in the APEC region and enhancing capacity-building activities to most benefit APEC member economies. Overall, the Conference achieved its main objectives as described in the project proposal. Moreover, all participants considered that it afforded many chances for valuable networking among representatives from the energy-policy community, academics and private-sector actors from within and outside the APEC region.

Key Issues Discussed

Opening remarks

In his opening remarks, **H.E. Mr. Nguyen Cam Tu, Vice Minister of Industry and Trade, Viet Nam**), stressed the importance of the Conference in view of the target that APEC Leaders set for themselves in 2012 to reduce the energy intensity of the region by 45% by 2035, as well as accelerating the transition of APEC member economies towards low-carbon growth. Renewable energy, including solar energy as a potential alternative energy resource, has contributed to ensuring a supply of energy. The advantages of solar energy over other traditional energy sources include: it is an available, abundant, and renewable energy supply; it produces zero emissions of carbon dioxide and pollutants.

However, difficulties still remain, such as: (i) *the high variability of power output from photovoltaic (PV) modules, due to fluctuations in solar incidence*; (ii) *the high investment costs of solar PV, and the need to train workers in how to maintain equipment with which they are not familiar*; (iii) *low consumer awareness the superiority and environmental friendliness of solar energy*. The Vice Minister expressed hope that Governments of APEC members could play an active role in identifying and implementing strategies, plans and policies that encourage the production and development of renewable energy in general, and solar energy in particular, to help resolve difficulties enterprises face when investing in solar energy. Moreover, programs to enhance the community's awareness of the benefits of using solar energy should be promoted. Last but not least, he encouraged the Conference participants to pay close attention to the speakers' presentations and to engage in active discussions, so as to facilitate a fruitful exchange of information on opportunities and challenges in the solar-equipment industry, leading to practical recommendations for tackling such challenges.

Conference's sessions

Experts provided presentations on the following topics:

1/ During Session 1, **Mr. Ronald Steenblik (Senior Economist, OECD Trade and Agriculture Directorate)** gave a comprehensive "Overview on the Solar Market – Past, Present and Future". First, Mr. Steenblik highlighted three main solar technologies: solar water heating, concentrated solar thermal power (CSP), and solar photovoltaic (PV) power. He reiterated that solar energy involves many activities, such as manufacturing, electric power generation, and associated services. According to Mr. Steenblik, policies play a crucial role in driving demand, and to some extent, supply. He gave examples of policies to limit emissions of air pollutants and greenhouse gases, electricity-company renewable-energy portfolio standards, feed-in tariffs, installation subsidies for homeowners to install roof-top solar panels, and R&D expenditure by governments on solar energy. Mr. Steenblik then provided detailed information on the current use and future potential for solar thermal heating and cooling, concentrated solar thermal power, solar PV power, especially within the APEC region. In his summing up, Mr. Steenblik

observed that: *(i) the world market for solar energy has been growing on average at double-digit rates of growth; (ii) prospects for continued demand growth for solar water heating and solar PV in the APEC region, and east and south-east Asia region in particular look good; (iii) over the medium-term, growth in concentrated solar thermal power will be more geographically limited; and that (iv) longer term prospects for solar energy are likely also to be good.*

2/ During Session 2 on “Entering the Solar Supply Chain – Clean Energy Manufacturing Tools and Services for Manufacturers”, **Dr. Terry Surles (Lead for Clean Energy Solutions, University of Hawaii, United States)** presented recent renewable-energy activities in the United States, with a focus on solar electricity. Dr. Surles insisted that while low carbon alternatives are more expensive than current fossil generation costs, there are many reasons to develop and deploy solar PV and solar thermal to reduce costs. Because the States can provide regulatory incentives for putting renewable energy systems on the grid, they are more effective than Federal Government in developing new energy policies and deploying new solar energy systems. The US has four decades of innovation in the solar industry, and there are new potentials for concentrated, multi-junction PV and for the decreased costs of installation for residential and commercial PV. On the other hand, PV industry is growing rapidly, but with an overcapacity. In addition, Dr. Surles was of the view that these new solar energy technologies, coupled with advances in Smart Grid systems must be utilized to increase flexibility for the installation of significant percentages of renewable energy systems. He concluded his presentation by giving interesting examples of smart grid solutions and collaboration that will serve to enhance the installation of solar energy systems.

3/ During Session 3 on “Solar Supply Chain, Challenges and Opportunities – Perspectives of International Organizations”, there were two speakers: **Mr. Ronald Steenblik and Mr. Mahesh Sugathan (Senior Research Fellow, ICTSD)**.

- **Mr. Ronald Steenblik** approached the issue from the perspective of the OECD. He emphasized that there are many risks and challenges to new entrants joining the upstream segment of the solar supply chain, such as policy uncertainty, current over-capacity in the industry, the market power of incumbents, and the rapid changes in the dominance of particular suppliers in recent years (“churn”), with Chinese manufacturers of PV cells and modules grabbing market share from those producing in other countries. Currently, the solar PV industry value chain is dominated by manufacturers domiciled in China, the United States, Europe and Japan. Mr. Steenblik predicted that the global market is likely to grow, especially over the long term, but could remain flat over the next five years, which would add to the difficulties faced by aspiring entrants. He suggested several ways that companies can join the global value chain for solar energy. Those are: *(i) concentrate on downstream activities related to installation; (ii) look for innovative ways to apply solar energy; and (iii) develop niches in services used in connection with solar projects.* Mr. Steenblik recommended that economies improve their participation in solar-power generation by: undertaking any needed

research on their solar resource; looking beyond average electricity prices to marginal costs of new electricity generation and understanding what it costs to serve different customers; streamlining unnecessary administrative barriers; reconsidering restrictions on foreign investment; and phasing out fossil-fuel subsidies. He concluded by observing that *(i) the solar-energy-technology manufacturing industry shares many features, with other modern, capital-intensive industries – constant innovation and economies of scale are all important; (ii) the scale and nature of government intervention adds another layer of uncertainty; (iii) attempting to enter mainstream production of polysilicon, wafers, cells or modules is risky at the moment; however, many niche products and services remain to be exploited; and (iv) encouraging investment in solar-based power means creating an enabling environment.*

- **Mr. Mahesh Sugathan** made an in-depth presentation on “Solar Supply Chains: Trade-Related Issues and Considerations”. First, Mr. Sugathan introduced the APEC 54 Environmental Goods (EG) list and the reflection of the solar PV sector in the APEC EG list. Second, he highlighted the trade barriers along the solar supply chain. Those are: (i) tariffs and non-tariff barriers, (ii) local-content requirements, and (iii) trade remedies. To him, there are issues and challenges in solar PV standards such as diversity in geographical conditions, the need for clearer instructions in installation manuals and for service standards for installers and for emerging technologies that are not covered by standards. In addition HS issues may need to be clarified for certain solar products and components where identification may not always be easy and solar product could be classified with other products under the same tariff line at the HS-6 digit level. Governments often had to balance sometimes competing interests such as renewable power expansion, environmental protection and promoting local manufacturing. An important consideration was which part of the supply-chains could green jobs be created and research suggests that most jobs were created in the downstream segments associated with services such as installation and maintenance. Thus promotion of upstream manufacturing segments through trade-related protection could cost downstream jobs. Mr. Sugathan finally raised a number of issues and questions for further discussion including the role of APEC initiatives (including various APEC working groups) in addressing challenges faced by solar supply chain in the region.

4/ Two speakers presented in Session 4 on “Solar Supply Chain, Challenges and Opportunities – Perspectives of the Private Sector”: **Mr. Lin Wan (Managing Director, Beijing Energy Innovation Ltd, China) and Ms. Eugenia Laurenza (Associate, FratiniVergano, European Lawyers).**

- The presentation of **Mr. Lin Wan** was divided into four parts: *(i) the solar supply chain, (ii) solar development in China, (iii) challenges and opportunities, and (iv) suggestions for cooperation.* First, Mr. Wan put forward a definition of “solar energy” and its three stages: solar PV-panel fabrication, solar power-station installation, and the generation of electricity from solar energy. To him, the solar

supply chain encompasses not only manufacturing, but also other value-adding activities, such as services. In terms of renewable energy development in China, renewable energy contributed 10.6% of China's total energy consumption in 2013, and renewable-energy-based power plants accounted for 20% of its electricity production. According to Mr. Wan, opportunities to develop of solar supply chains are strongly affected by costs, the local energy structure, access to the Internet, and the quality of the local solar resource. However, there are also technological, economic and social challenges. Mr. Wan concluded by giving some suggestions in the areas of project pool, project evaluation schemes and financing and investment.

- The presentation of Ms. Eugenia Laurenza focused on the solar-panel industry. Ms. Laurenza pointed out that the solar-panel industry, which includes ancillary service industries, is in a period of transition. One symptom of this is the high degree of variability in the durability and performance of panels on the market. She reiterated that optimizing the supply chain is key to cutting costs and improving quality. Ms. Laurenza pointed out three challenges facing the solar-panel industry: (i) high costs relative to the market value of the finished products; (ii) the need for standardization; and (iii) barriers to providers of solar-industry services. In her conclusion, Mr Laurenza recommended that companies make effective use of existing supply chains to reach export markets, to take advantage of standardization, and tariff-reduction initiatives (such as the APEC initiative on environmental goods) and to pay close attention to barriers thrown up by trade-defense measures.

5/ During Session 5 on “Solar Supply Chain, Challenges and Opportunities – Perspectives of the Public Sector”, there were two speakers: **Dr. Howard Lu (Senior Researcher, Industrial Technology Research Institute, Chinese Taipei) and Mr. Nguyen Duc Cuong (Director, Institute of Energy, Viet Nam).**

- **Dr. Howard Lu** gave a presentation on “Chinese Taipei’s Strategies and Policies to Facilitate Solar Supply Chain.” He divided his presentation into four parts: (i) *the global PV market and its supply chains*, (ii) *Chinese Taipei’s PV supply chain*, (iii) *Chinese Taipei’s infrastructure resulting in the Chinese Taipei’s PV strength*, and (iv) *Chinese Taipei’s strategies and policies to facilitate solar supply chains*. With regards to the PV industry supply chain in Chinese Taipei, Dr. Lu highlighted a complete and robust supply chain, from the production of polysilicon, monocrystalline ingots, and wafers to cell processing and module production. Chinese Taipei used to import all its main module materials, but now it can make them all. The strengths of Chinese Taipei’s solar PV arise from its strong, high-tech industrial base, its complete supply chain, its attention to quality, the high performance yet low cost of its PV modules, and its well-developed experience in solar PV system applications and services. Dr. Lu concluded his presentation by explaining the PV-promotion policy of Chinese Taipei. Those include the Million Rooftop PVs Promotion Program, programs to

spur innovation in the solar PV industry, and the economy's PV foreign market expansion plan.

- The presentation of **Mr. Nguyen Duc Cuong** was divided into six parts: *(i) an overview on power and renewable energy, (ii) Viet Nam's main renewable power resources, (iii) the Government's strategies and policies to facilitate the solar supply chain, (iv) its renewable-energy master plan, (v) FIT and other incentive policies, and (vi) summary and conclusions.* Mr Nguyen noted that more than 20 supply companies are now producing solar water heaters commercially in Viet Nam today, but there is only one assembler of solar PV modules, with production capacity of 13 MW per year. The Government of Viet Nam is considering establishing a renewable-energy development fund, he said. Currently it provides a USD 50 grant for each of solar water heating system installed. In his conclusion, Mr. Nguyen reiterated that the Government of Viet Nam has an interest in developing solar energy in the country due to its rapidly increasing power demand, and has demonstrated this commitment through several incentives. However, these incentives are not attractive enough for investors. Accordingly, new incentives and support mechanisms for solar PV, such as a FIT, are under preparation.

6/ During Session 6 on “Best Practices in Facilitating Solar Supply Chain in the APEC Member Economies”, there were two speakers: **Dr–Ing Jiratkwinn Rakwichian (Director, Institute for Development of Economy and Community Power, Thailand) and Dr. Huynh Thi Minh Thu (Director of Research and Development, Bach Khoa Investment and Development of Solar Energy Corporation, Viet Nam).**

- Dr. Rakwichian's presentation focused on “Renewable-Energy Business Development and Project Development in the Thailand Market”. He gave examples on some Thai corporate “Go-for-Green” and CSR initiatives using power from solar and wind resources. He then discussed Thailand's medium-term plan for renewable-energy development plan, which aims to support the new renewable-energy technology prototypes, encourage the development of new technologies for bio-fuel production, develop sustainable cities and enhance local energy production. As an example he described a community smart grid that has been installed at CET in Chiang Mai, Thailand. He concluded his presentation by highlighting solar business opportunities and channel.
- Dr. Huynh Thi Minh Thu approached the issue from the perspective of the private sector. Her presentation provided a brief overview of the commercial activities of Solar BK, described the company's supply chain, and offered suggestions as to how to increase solar-energy production in Viet Nam. Regarding the supply chain, products such as solar glass, EVA film, PV cells, and multi-layer films are distributed through Solar BK to customers on Viet Nam islands, in Viet Nam's cities, and abroad. She shared two key recommendations: *(i) There should be more incentive programs for solar PV deployment in Viet Nam to reach more Vietnamese in urban and rural areas, and it is essential to promote technology necessary for the solar-PV industry.*

IV/ Conclusions and Recommendations

1/ The consensus view of the conference's speakers, moderators and participants agreed that the project achieved its intended objectives. They considered the Conference to have evaluated to be good for APEC to continue to identify best policy practices for facilitating the development of solar supply chains in APEC member economies. In addition, participants recognized that sharing experiences and the best practices of governments and the private sector were useful. Participants were also impressed by the degree to which APEC members and companies have adapted solar energy to local conditions and to meet local needs.

Participants also said that the Conference had provided a great opportunity for networking with PV experts from within and outside APEC region.

2/ The Conference's participants also shared their intentions to apply the project's content and knowledge they gained from the Conference in future work. For example, they intended to: *(i) suggest new policy priorities and work plans within home economies on solar energy; (ii) develop and organize capacity building and training for solar-PV players; (iii) take into account the information gathered during the Conference when designing future training courses, work plans and methods for drafting regulations, etc.*

3/ The Conference concluded with two break-out sessions, which discussed: *(i) how to facilitate APEC solar supply chain, (ii) how to enhance capacity building activities to most benefit APEC member economies, and (iii) consistent utilization of standards across the APEC region for PV deployment allows for more access to venture capital and financing.* The outcomes of these discussions are attached with this Summary Report.

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