

APEC Green Energy Finance Capacity Building Program Report

I. Executive Summary

The “*APEC Green Energy Finance Capacity Building Program (EWG 04 2017A)*” was the second progress made by Chinese Taipei under the APEC Green Energy Finance Initiative recognized by 11th APEC Energy Ministerial Meeting, which focused on the difficulties of green energy finance faced by all member economies. The program aimed to provide important development information and make suggestions through research of related topics and dialogues between experts of the energy and financial sectors, in order to provide decision makers with policy recommendations within the APEC region, as well as to support APEC goals of doubling renewable energy share and reducing energy intensity. The program has made the following key findings and recommendations:

Key Finding 1: Green energy investment and finance have seen significant increase over the past decade, but funding level needed for developing green energy continues to face various challenges. In terms of energy efficiency, with higher upfront costs, energy efficiency projects usually have less attractive leverage ratio for business investment; also, lack of stable policy signals, complicated laws and regulations, and insufficient knowledge of potential stakeholders can be barriers for energy efficiency financing. In terms of renewable energy, with higher upfront costs and longer recovery periods compared to traditional energy sources, renewable energy projects are less competitive and less supported by necessary infrastructures.

Key Finding 2: APEC member economies face different challenges due to their own endowments, for example: some economies may not have sufficient resources for green energy development, and energy poverty

remains an issue in regions with low energy access; some economies are traditional energy producers, and their energy consumption are concentrated on fossil fuels; as for energy-related trade issues, many economies put emphasis on domestic green energy industries development, and are obligated to launch projects that facilitate local development.

Key Finding 3: A sustainable funding framework should be established in order to support green energy development. By means of domestic policies, regulatory instruments, financial measures and capacity building, member economies can send clear policy signals to provide market incentives and financial supports, and to establish information-sharing and capacity-building systems, effectively introducing funds to green energy projects.

Key Finding 4: In terms of general policy, all APEC member economies have submitted NDC under the “Paris Agreement,” and committed to green energy development goals set by international organizations, such as United Nations, IRENA, APEC, and ASEAN; domestically, all member economies have also formulate green energy development goals, establishing quantitative indicators to verify whether the goals are reached, which have legal binding force for the future development of green energy.

Key Finding 5: In terms of regulatory measures for energy efficiency, most APEC member economies have established energy efficiency standard and labeling/rating system; in addition to cross-sector energy efficiency policy and energy-saving requirements, different management standards have also been established targeting different sub-sectors to stimulate demands in the energy efficiency market and facilitate funding in related areas; as for regulatory instruments for renewable energy, most

APEC member economies now adopt the Feed-in-Tariff system as the incentive mechanism, while green procurement are also introduced to increase market demand. Furthermore, many member economies have gradually adopted market-based policy instruments to promote green energy development, where auction system is a common measure

Key Finding 6: In terms of financial instruments, most APEC member economies adopt financial instruments, such as taxation measures, direct subsidy, loan discount, and R&D supports, to encourage potential stakeholders to be involved in green energy development.

Key Finding 7: Regarding capacity building, APEC member economies are providing extensive capacity building programs through websites, events, or projects, for knowledge dissemination, and are also supporting related research projects and conducting trainings for professionals through public finance.

Recommendations—Conclusion of APEC Green Finance Capacity Building Program: This program focused on potential stakeholders from the energy and financial sectors in the APEC region, forging consensus for the facilitation of green finance and funding of renewable energy and energy efficiency projects in the future. The recommendations are summarized in the following four aspects:

1. Institutionalized Reform

- (1) For purpose of facilitating operational efficiency, promoting green energy policy integration, and decreasing the financial cost and risk from policy uncertainty, policy makers are first encouraged to form a sound, transparent and flexible investment-grade policy

framework that includes longer-term energy policy roadmap, regulatory framework and implementation measures.

- (2) In markets where risks to private sector development and the cost of capital remain elevated,
 - i. mobilize private capital by providing diverse financial tools such as guarantee, bond or cofinancing/investing to share the risks and lower the cost of capital;
 - ii. support green energy finance industry by streamlining technical and financial services.
- (3) It is encouraged to accelerate the deployment of green energy in infrastructure, especially in transportation, buildings, smart grids and etc., and to value the importance of holistic and integrated planning for low carbon development at communities and municipal levels.
- (4) It's also recommend Government can launch micro-finance targeted for green energy projects of disadvantaged groups to improve energy access and to alleviate energy poverty.

2.System Improvement

- (1) To improve market environment for green energy finance, it is encouraged to develop rating system, credit rating system, dispute settlement and risk management tools for green energy finance business among financial institutions.
- (2) In order to promote market transparency and data availability, it is encouraged to establish green energy finance project sharing mechanism to share information, such as project sources and scales, major technical contents, cost control, risk monitoring and

management, and project performance, in a standardized manner.

- (3) It is encouraged to formulate SOP to enhance finance practitioners' capabilities to take into account energy efficiency and other green energy aspects in mortgage and loan authorization, risk management and capital management in a systematic manner.
- (4) Promoting green energy demonstration projects can help explore innovative green energy business model, disseminate new financing tools and models, and facilitate the design of localized green energy finance framework.
- (5) The adoption of Environmental, Social and Corporate Governance(ESG) and Social Responsible Investment(SRI) should be disseminated and stronger binding principles should be pursued.
- (6) Large enterprises' can team up with the SMEs in their supply chains in terms of energy target setting and energy audit. As such they, as well as other actors (such as industry associations, utilities etc.) can serve as an effective platform to cluster SMEs together in a peer-to-peer business network.

3.Human Resource Development

- (1) It is encouraged to develop policy makers' capacity in understanding long-term green energy development trends.
- (2) It is encouraged to enhance policy makers' capabilities in financial analysis in order to design green energy policies that stimulate green energy investment.
- (3) It is recommended to develop financial institutions' capacity in understanding green energy and development of specialized products and services to scale up financing of green energy.

- (4) It is encouraged to reduce information asymmetry among stakeholders and to enhance their capacity in participating in green energy projects by providing targeted experience sharing and training sessions.

4. International cooperation

- (1) Many important international organizations, such as ASEAN, G20, IEA, IPEEC, and OECD endeavor on promoting green energy finance. Therefore, under the framework of APEC, it is encouraged to pursue cross fora cooperation with other international organizations to enhance synergy on green energy finance issues among all policy bodies of APEC to jointly achieve APEC's ambitious energy intensity reduction and renewable energy doubling goal.
- (2) It is encouraged to expedite best practice sharing to shorten the learning curves of facilitating green energy finance for each economy.

II. International and Regional Trends in Green Energy Finance

1. International Trends

Considering energy policy, economic growth, demographic trend, energy price, and costs of various energy technologies in different countries, IEA categorizes future energy development into three scenarios, and estimates corresponding demand for funds: 1) Current Policies—estimation made according to the situation of no changes in existing policies by each country; 2) New Policies—estimation made according to broad policy commitments and plans that have been announced by each

country; 3) IEA 450 Scenarios—to achieve Paris Agreement’s goal of limiting the global increase in temperature to 2°C by limiting concentration of greenhouse gases in the atmosphere to around 450 parts per million of CO₂.

Based on the Current Policies Scenario, IEA forecasts the future energy demand to reach 15,937 Mtoe by 2025 and to 19,636 Mtoe by 2040; in New Policies Scenarios, primary energy demand is forecasted to reach 15,340 Mtoe by 2025 and to 17,866 Mtoe by 2040. Both scenarios are quite far from the IEA 450 Scenario that is able to limit global temperature rise under 2 degrees Celsius.

According to IEA’s analysis, traditional energy security issues remain the key concerns of the world. Fossil fuels will be significant for the energy supply, but climate issues have already shown influences; especially after the implementation of Paris Agreement in November 2016, gradual changes have been observed in energy sector. From 2014 to 2016, global investment in upstream oil and gas development dropped significantly due to climate awareness and fall of oil price. Fossil fuel subsidies decreased from nearly 500 billion USD in 2015 to 325 billion USD, and, each year, about 1.8 trillion USD were invested in clean energy production worldwide.

Table 1 World Primary Energy Demand in 2025 and 2040

	2000	2014	Current Policies		New Policies		450 Scenario	
			2025	2040	2025	2040	2025	2040
Coal	2316	3926	4361	5327	3955	4140	3175	2000
Oil	3669	4266	4751	5402	4577	4775	4169	3326
Gas	2071	2893	3508	4718	3390	4313	3292	3301
Nuclear	676	662	865	1032	888	1181	960	1590
Hydro	225	335	414	515	420	536	429	593
Bioenergy	1026	1421	1619	1834	1633	1883	1733	2310
Other Renewables	60	181	420	809	478	1037	596	1759
Total	10042	13684	15937	19636	15340	17866	14355	14878
Fossil-fuel share	80%	81%	79%	79%	78%	74%	74%	58%
CO₂ emissions (Gt)	23	32.2	36	43.7	33.6	36.3	28.9	18.4

※ The Unit: Mtoe

※ Includes the traditional use of solid biomass and modern use of bioenergy

Sources: IEA, “World Energy Outlook”, 2016

If climate and energy policies and plans currently proposed by each country could be implemented, based on the New Policies Scenario, at least 299 billion USD should be invested in renewable energy each year, 58 billion USD in other low-carbon measures annually, and an additional 919 billion USD in energy efficiency each year. To keep global temperature from rising by 2 degrees Celsius, green energy related investment will exceed 2 trillion USD annually from 2016 to 2040, reaching a total of over 50 trillion USD. In other words, even though the New Policies Scenario, which cannot meet Paris Agreement’s goal, if each country at the moment can thoroughly implement energy transition, green energy promotion policy, NDCs, and clean energy development programs, there remains a funding gap of 364 billion USD annually compared to the current situation, where investment in energy efficiency will take up a major share.

Table 2 Energy Supply Investment in 2025 and 2040

	Current Policies		New Policies		450 Scenario	
	Total	Annual	Total	Annual	Total	Annual
Fossil fuels	32849	1314	26626	1065	17263	691
Renewables	6130	245	7478	299	12582	503
Electricity networks	8860	354	8059	322	7204	288
Other low-carbon	1259	50	1446	58	2842	114
Total supply	49098	1964	43609	1744	39891	1596
Energy efficiency	15437	617	22980	919	35042	1402

※The Unit is USD \$2015 Billion)

※The methodology for energy efficiency investment derives from a baseline of efficiency levels in different end-use-sectors in 2014, the annual figure for energy efficiency in this column is the figure only for 2015.

※Includes nuclear and CCS.

Sources: IEA, “World Energy Outlook”, 2016

2.Green Finance Trends in the APEC Regional

According to the “*APEC Energy Demand and Supply Outlook 6th Edition*” released in May 2016 by Asia Pacific Energy Research Center (APEREC), APEC will need 17 to 35 trillion USD investment in energy sector between 2015 and 2040 based on current (BAU) energy development situation in APEC.

APEREC pointed out that current APEC renewable energy development trends will not satisfy the aspirational goals of reducing aggregate energy intensity and double the share of renewables in the APEC energy mix. Three scenarios—Improved Efficiency Scenario, High Renewable Scenario, and Alternative Power Mix Scenario are adopted to simulate possible course to achieve APEC’s aspirational energy goals. It is estimated that, under the Improved Efficiency Scenario, the target of energy intensity reduction can be achieved three years ahead of schedule, requiring approximately 5.6 trillion USD of green energy financing. In the High Renewable Scenario, the objective of doubling renewable energy

share can be achieved, requiring approximately 18 trillion USD of green energy financing, within which 8.6 trillion USD will be financed for increasing the shares of solar and wind power in total power generation.

III. APEC members’ promotional strategies of green energy finance

1. Economies’ Policy

(1) Global Participation—Paris Agreement

All APEC member economies have submitted NDC. Although NDC is not strictly binding, the international commitment proposed at the Economy level has already sent the policy signal. When governments could further formulate comprehensive carbon reduction strategy, and clarify the role of energy policy, establishing the direction of green energy development, they would be able to send a clearer policy signal, which helps to direct green energy funds to flow into related areas.

Table 3 NDCs/INDCs of APEC Economies

No	Economy	Base Year	Target	Time Frames
1	Australia	2005	26% - 28% below 2005 levels by 2030	2021-2030
2	Brunei	BAU	63% reduction in total energy consumption by 2035*	2035
3	Canada	2005	30% below 2005 levels by 2030	2030
4	Chile	2007	<ul style="list-style-type: none"> ▪ without the grant of international monetary funds: reduce CO2 emissions per GDP unit by 30% below 2007 levels by 2030; ▪ with the grant of international monetary funds: reduce CO2 emission per GDP unit by 2030 until it reaches a 35% to 45% reduction with respect to the 2007 levels 	2030
5	Indonesia	BAU	unconditional reduction target of 29%	2030

No	Economy	Base Year	Target	Time Frames
			and conditional reduction target up to 41 % of the business as usual scenario by 2030	
6	Japan	2013 2005	26.0% by 2030 compared to 2013 (25.4% reduction compared to 2005)	2030
7	Korea	BAU	emission reduction by 37% from the BAU level by 2030	2030
8	Malaysia	2005	emissions intensity of GDP by 35% on unconditional basis and by 45% on conditional basis by 2030	2030
9	Mexico	BAU	25% of Greenhouse Gases and Short Lived Climate Pollutants emissions on unconditional basis and by 40% on conditional basis by 2030	2030
10	New Zealand	2005	emissions will be reduced to 30% below 2005 levels by 2030	2030
11	Peru	BAU	20% emissions reduction on unconditional basis and 30% on conditional basis by 2030	2030
12	Papua New Guinea	100% renewable energy by 2030		2030
13	China and HKC	2005	<ul style="list-style-type: none"> ● the peaking of carbon dioxide emissions around 2030; ● lower carbon dioxide emissions per unit of GDP by 60% to 65% from the 2005 level; ● increase the share of non-fossil fuels in primary energy consumption to around 20%; ● increase the forest stock volume by around 4.5 billion cubic meters on the 2005 level 	2030
14	Philippine	BAU	emissions reduction of about 70% by 2030*	2030
15	Russia	1990	limiting anthropogenic greenhouse gases to 70-75% of 1990 levels by the year	2030

No	Economy	Base Year	Target	Time Frames
			2030*	
16	Singapore	2005	reduce emissions intensity by 36% from 2005 levels by 2030, and stabilise emissions with the aim of peaking around 2030	2030
17	Thailand	2005	reduce emissions by 20% from 2005 level on unconditional basis and 25% on conditional basis by 2030	2030
18	Chinese Taipei**	2005	emission reduction by 50% from the 2005 level by 2030	2030
19	United States	2005	emissions reduction by 26%-28% below 2005 level in 2025	2025
20	Viet Nam	BAU	reduce emissions by 8% on unconditional basis and 25% on conditional basis by 2030	2030

* INDC Under Ratification

** Chinese Taipei announced Intended Nationally Determined Contributions target voluntarily in 2015, *see*

[https://enews.epa.gov.tw/enews/enews_ftp/104/1117/174044/Submission%20by%20Republic%20of%20China%20\(Taiwan\)Intended%20Nationally%20Determined%20Contribution.pdf](https://enews.epa.gov.tw/enews/enews_ftp/104/1117/174044/Submission%20by%20Republic%20of%20China%20(Taiwan)Intended%20Nationally%20Determined%20Contribution.pdf), last visited: Dec 30th 2017

Sources: UN NDC Registry, *see* <http://www4.unfccc.int/ndcregistry/Pages/All.aspx>, last visited: Dec 30th 2017

(2) Economies' Domestic Green Energy Development Goals

All APEC member economies have considered domestic energy situation, evaluated various international commitments and own development needs to formulate policy goals at the economy level, and have established clear quantitative indicators. In terms of energy efficiency goals, most of indicators are the energy intensity, energy productivity, and reduction of energy consumption quantity; as for renewable energy goals, most of indicators are the installed capacity or generation output of renewables. Regarding power generation output, many economies are now

differentiating the shares of renewable energy and traditional fossil fuels in total output.

Also, some economies have not established their own goals of domestic green energy development; instead, they have handed over policy-making and implementation of promotion programs to local governments as part of their efforts to realize carbon-reduction targets (mostly focused on NDC, as well as related polities). Currently, almost all APEC members have established domestic green energy development goals to send clearer policy signals, which will enhance stakeholders' confidence in participating in green financing.

Table 4 Green Energy Targets of APEC Economies

No	Economy	Energy Efficiency	Renewable Energy
1	Australia	improve Australia's energy productivity by 40% between 2015 and 2030	large-scale generation of 33,000 GWh in 2020 (about 23.5% electricity generation in 2020 from renewable sources)
2	Brunei	reduce total energy consumption by 63% and energy intensity to 45% by 2035 compared to a BAU scenario	954 GWh by 2025
3	Canada	Reduce petroleum-generated electrical energy consumption by 50% at deployed camps by 2030	100% of electricity used in buildings and operations will be from renewable energy sources by 2025
4	Chile	reducing energy consumption by 20 percent by 2025	70% of national electricity generation from renewable sources by 2050
5	Indonesia	reduce energy elasticity to less than 1 by 2025 and to reduce the intensity of final energy by 1% per annum until 2025.	46,307 MW by 2025
6	Japan	reduce final energy consumption	22% to 24% renewable energy of

No	Economy	Energy Efficiency	Renewable Energy
		around 13% by 2030 compare to BAU; reduce electricity consumption around 17% by 2030 compare to BAU.	the power mix by2030
7	Korea	13% reduction in energy demand and 15% reduction in electricity demand by 2035	58.5GW of renewables by 2030
8	Malaysia	reduce the electricity consumption by 10% in the year 2020 compared to a BAU scenario	21,370 MW by 2050
9	Mexico	--	35% of electricity system will operate with clean energy by 2024 and 50% by 2050
10	New Zealand	improving energy intensity (GJ per NZ\$103) of 1.3% per annum	90% Renewable Energy By 2025
11	Peru	--	60% of national consumption to be met by renewable energy sources by 2025
12	Papua New Guinea	--	--
13	China and HKC	energy consumption decline by 15% per unit of GDP by 2020	1900 TWh, or 27% renewable energy of total power generation.
14	Philippine	24% energy savings by 2040; 3% Economy-wide improvement in energy intensity by 2040	350 MWp by 2020
15	Russia	56% energy intensity reduction target for 2030	4.5% of all electricity generation (more or less corresponding with the current global average), to be reached by 2020
16	Singapore	energy intensity improvement of 35% by 2030	15,306 MW by 2030
17	Thailand	reduce energy intensity by 25% in 2030	19,684 MW by 2036
18	Chinese Taipei	annually increase more than 2% of energy efficiency; make energy intensity decrease by 50%	20% renewable energy of all electricity generation by 2025

No	Economy	Energy Efficiency	Renewable Energy
		or above in 2025	
19	United States	<ul style="list-style-type: none"> ● 100 MW reduction in peak-load electricity consumption by 2020 ● 30% reduction in electricity and natural gas consumption ● 20% reduction in heating fuel consumption ● Weatherization of 100% of homes and 50% of businesses by 2030 ● Capturing all cost-effective efficiency resources available for utility customers 	20% renewable energy generation target by 2020
20	Viet Nam	national energy conservation target is set for 2006-2010 as 3%-5%, and for 2010-2015 as 5%-8%	45,800 MW by 2030

Sources: this report

3.Regulatory Instruments

(1) Energy Efficiency

As for regulatory measures for energy efficiency, most APEC member economies have now established own energy efficiency standard and labeling/rating system; in addition to cross-sector energy efficiency policy and energy-saving requirements, different management standards have also been established targeting different sub-sectors, including industry, transportation, buildings, houses, and appliances, which are either regulatory or voluntary. Economies are also conducting energy efficiency data collection, auditing, and monitoring, in order to assess policy outcomes. Through raising requirements for energy efficiency, the power sector and end users are given the responsibility to save energy, which will stimulate demands in the energy efficiency market, facilitating greater

investments in related areas.

Table 5 Energy Efficiency Instruments of APEC Economies

No	Economy	Standard/ Labeling					Energy Saving Management		
		Industry	Transport /Vehicles	Buildings	Houses	Appliances	Regulatory	Voluntary	Monitoring
1	Australia	✓	✓	✓	✓	✓	✓		✓
2	Brunei		✓	✓				✓	
3	Canada	✓	✓	✓	✓	✓	✓	✓	✓
4	Chile	✓	✓	✓		✓	✓		✓
5	Indonesia	✓	✓	✓		✓	✓	✓	✓
6	Japan	✓	✓	✓	✓	✓	✓	✓	✓
7	Korea	✓	✓	✓		✓	✓		✓
8	Malaysia	✓	✓	✓		✓	✓		✓
9	Mexico	✓	✓	✓		✓	✓		✓
10	New Zealand	✓	✓	✓	✓	✓	✓		
11	Peru	✓	✓	✓	✓	✓	✓		✓
12	Papua New Guinea	✓	✓	✓		✓	✓		
13	China and HKC	✓	✓	✓		✓	✓	✓	✓
14	Philippine	✓	✓	✓		✓	✓	✓	✓
15	Russia	✓	✓	✓		✓	✓		✓
16	Singapore	✓	✓	✓	✓	✓	✓	✓	✓
17	Thailand	✓	✓	✓		✓	✓	✓	✓
18	Chinese Taipei	✓	✓	✓		✓	✓	✓	✓
19	United States	✓	✓	✓	✓	✓	✓	✓	✓
20	Viet Nam	✓	✓	✓		✓	✓		✓

Sources: this report

(2) Renewable Energy

In terms of regulatory instruments for renewable energy, most APEC member economies now adopt the FIT system as the incentive mechanism. The FIT system manages prices, and it protects profit and investment conditions while also ensuring pioneer or yet-to-be-commercialized renewable energy technologies sufficient funds for early development; however, the design of the guaranteed payment will result in negative outcomes such as increase in overall policy cost, or increase in administrative costs for achieving the most efficient rate. Also, government agencies of member economies adopt green procurement as project demonstrations or means to increase market demand, for example: installing solar PV modules on rooftops of public buildings, encouraging public utilities to install renewable energy generation facilities or green energy infrastructures, or promoting distributed renewable energy solutions in form of public finance to regions with insufficient grid infrastructures, inability to afford grid-connection costs, and smaller regional scale.

It is remarkable that many economies have gradually adopted market-based policy instruments to promote green energy. Especially in terms of renewable energy, over the past decade, auction system has seen rapid growth globally. Objective factors, such as the progress of renewable energy technologies (especially solar PV and wind power) and developers' familiarity with renewable energy projects, have facilitated the competitive environment in the market. To decision-makers, the auction system not only minimizes policy costs and relieves public financial burdens, it also offers flexibility in design to suit projects of different scales and different energy mixes, allows intervention both of amount and price, and can be combined with various policy elements in projects. Therefore, the auction

system has been widely adopted. Many of the APEC member economies runs renewable energy projects with the auction system, and in 2016, solar PV capacity installed via the auction system exceeded 4800 MW, whereas wind power capacity exceeded 8000 MW.

Table 6 Auction Projects among APEC region in 2016

Economies	Solar PV/USD		Wind Power/USD	
	Capacity	Price	Capacity	Price
Canada	140MW	120/MWh	1499.5MW	66/MWh ^a
Chile	580MW	29.1/MWh	4400GWh	45.2/MWh
Mexico	2953MW	38.4/MWh	1658 MW	38.4/MWh
Peru	184.5MW	48/MWh	162MW	37/MWh
China and HKC	1000MW	78/MWh	--	--
Russia	--	--	610MW	--
United States	26MW	26.7/MWh	--	--

Sources : IRENA, Renewable Energy Auctions, 2017

However, the auction system does have its share of shortcomings. According to IRENA’s report in 2017, although renewable energy auction system helped to achieve the most optimal prices, sometimes over-aggressive bidding of projects would delay the schedule or lead to failed bids; furthermore, the auction system is more favorable to larger enterprises, and crowds out smaller companies, as the latter often participate in distributed solutions under such system, especially rooftop solar PV and heat supply.

Table 7 Renewable Energy Regulation Scheme of APEC Economies

No	Economy	Incentives	Auction
1	Australia	Quotas, FIT	Solar, Wind
2	Brunei	FIT	Solar
3	Canada	RPS, FIT	Solar, Wind
4	Chile	FIT	Solar, Wind
5	Indonesia	FIT, RPS	Solar, Wind, Geothermal
6	Japan	FIT	Solar, Wind
7	Korea	RPS (post-2012)	Solar
8	Malaysia	FIT, RPS	Solar
9	Mexico	FIT	Solar, Wind
10	New Zealand	FIT	--
11	Peru	FIT	Solar, Wind
12	Papua New Guinea	FIT, RPS	--
13	China and HKC	FIT	Solar
14	Philippine	FIT, RPS, Net Meter	Solar
15	Russia	FIT	Wind
16	Singapore	Net Meter	Solar
17	Thailand	FIT	--
18	Chinese Taipei	FIT	Solar, Wind
19	United States	RPS, FIT	Solar
20	Viet Nam	Quotas	Solar

Sources: this report

(3) Policy Inspiration—Market-Based Instruments

In recent years, global green energy promotion policy trend has shifted from command- and-control legislation to market-based instruments. In general, market-based instruments set a policy specifying outcome to be delivered by market actors without prescribing the delivery mechanisms, create incentives through prices, markets, or other economic

variables, introducing market-based instruments in addition to the existing command-and-control legislation could bring greater policy benefits. As for green energy development, the recent market-based instruments at the moment are the auction system and certificates.

The auction system for renewable energy projects has been widely adopted. As for energy efficiency, combining energy-saving obligation requirements for the power sector will push the industry to search for solutions in the market with optimized costs. In the APEC region, economies such as Australia, Canada, China, Korea, and the United States, have all demanded the power sector to fulfill energy-saving obligations. The first to combine such requirements with the auction system was the United States, allowing power sector to bid with energy efficiency (amount of energy saved) against the electricity liberalization market, in pursuit of energy-saving goals through minimum costs. Some areas, such as Hawaii, also determine the usage of energy efficiency public funds through auction or competitions, attracting many solutions in 2014, and achieving great results.

Moreover, certificates are recognized as another market-based instrument for the creation of new market, and was first utilized to support the development of renewable energy. Through the trading system of Renewable Energy Certificates (RECs), compulsory or voluntary renewable energy consumption goals can be achieved, increasing the opportunities to implement renewable energy projects, and enabling funds to flow into the renewable energy market. The mechanism includes the establishment of a verification and certification system for renewable energy power generation, to verify that all project contents comply with regulatory requirements, and conduct unitization on project performance (ex: the unit of renewable energy power generation is 1MWh); through bundled and unbundled sales of electricity and certificates, a trading system

is formed.

The certification system must build a regulatory scheme, with strict standards and requirements and thorough execution by certification agencies, for it to be fully effective. Recognitions of key information, including renewable technologies, quantity, and sources, during issuance of certificates can also serve as a type of market monitoring data. Furthermore, when designing the system, situations such as repeated certification, excessively long period, and inappropriate transfer, should be taken into consideration, and market infrastructures should be enhanced to facilitate liquidity. Unbundled sales may increase liquidity, but it is criticized as liable entities may not be the actual users of renewable energy, or the renewable electricity generated may not be used in the region of the certificates. As for RECs, currently within the APEC region, Australia, Canada, Chile, Japan, Korea, Mexico, New Zealand, China, Chinese Taipei, and the United States have adopted the system, whereas Singapore has launched related demonstrative project in 2016.

There is a similar design for energy efficiency, which combines energy-saving obligations of fossil fuels power sector and certification system, which a concept similar to carbon trading. Referred to as “White Certificates” in Europe, the largest markets are Italy and France. Implementing the system not only introduces funds to energy-saving projects but also benefits the development of energy-saving industry (such as ESCO Company) by bringing in more funds. Among APEC member economies, only the United States are now adopting the white certificates system at the local government such as Connecticut, New York, Pennsylvania, and Nevada, which have energy efficiency requirements for the power sector, and allow the power sector to fulfill its obligations through reduction of end consumption or purchase of certificates; some of the certificates are used to satisfy voluntary energy-saving needs.

Financial Instruments

Current Developments in Member Economies

Most APEC member economies adopt financial instruments, such as taxation measures, direct subsidy, loan discount, and R&D supports, to encourage potential stakeholders to be involved in green energy development. In terms of taxation measures, common practices are tax reduction or exemption, such as business tax, consumption tax, or other taxes (for example: surcharge from ratepayers). However, there are also added taxes for carbon emissions or energy consumption; direct subsidy may be conducted through public procurement, facility subsidy, or grants; furthermore, there are plenty of public financial supports provided for the R&D of energy-saving or renewable energy technologies.

**Table 8 Financial Instruments of Green Energy Development
among APEC Region**

Economy	Energy Efficiency					Renewable Energy				
	Taxation	Direct Subsidy	Loan	Risk Mitigation	R&D	Taxation	Direct Subsidy	Loan	Risk Mitigation	R&D
Australia	✓	✓			✓	✓	✓	✓		✓
Brunei						✓	✓			✓
Canada		✓			✓	✓	✓	✓		✓
Chile	✓				✓	✓	✓			✓
Indonesia	✓	✓			✓	✓	✓	✓		✓
Japan	✓	✓	✓		✓	✓	✓	✓		✓
Korea	✓	✓	✓		✓	✓	✓			✓
Malaysia	✓	✓	✓	✓	✓	✓	✓			✓
Mexico	✓	✓	✓	✓	✓	✓	✓			✓
New Zealand	✓	✓	✓		✓	✓	✓	✓		✓
Peru	✓	✓				✓	✓			✓
Papua New Guinea	✓	✓				✓	✓			✓
China and HKC	✓	✓	✓	✓	✓	✓	✓	✓		✓
Philippine	✓	✓	✓		✓	✓	✓	✓		✓
Russia	✓	✓	✓		✓	✓	✓			✓
Singapore	✓	✓	✓		✓	✓	✓	✓		✓
Thailand	✓	✓	✓	✓	✓	✓	✓	✓		✓
Chinese Taipei	✓	✓	✓		✓		✓			✓
United States	✓	✓	✓	✓	✓	✓	✓	✓		✓
Viet Nam	✓	✓	✓		✓	✓	✓	✓		✓

Sources: this report

(4) Policy Inspiration

i. Policy Oriented Institution / Green Bank

Unlike commercial financial institutions may not afford green energy projects due to considerations of flow of funds, duration of project, risk assessment, information gap, and maximization of profit, policy oriented institutions founded, invested, and guaranteed, by public finance or regional funds could carry out policy-oriented financing for green energy, which would help to attract more funds to green energy projects and showcase best practices of projects. For example, the United States, Japan, Malaysia, and Australia, all have established such financial institutions; participation in green energy projects is not limited to project financing, as these institutions may also provide loans or guarantees. Also, the government may directly invest in the projects or provide direct funding through sovereign wealth fund, pension fund, or issuance of bond.

ii. International Cooperation

Developing economies, in addition to launching green energy projects through domestic public financial resources, are recommended to combine various sources from multilateral or bilateral institutions, as well as private financing to launch energy efficiency projects. In the Asia-Pacific region, APEC, Asian Development Bank, and World Bank, have proactively participated in comprehensive projects of renewable energy and energy efficiency technologies, as well as energy infrastructures construction or capacity building, in recent years, in response to issues of energy conservation and carbon reduction, and energy access, and these are all financial resources that can be utilized.

iii. Promote Voluntary Participation Framework—CSR and Equator Principles

The Equator Principles (EPs) is an initiative launched by private

financial institutions including Citigroup, ANB AMRO Bank, Barclays Bank, and Westdeutsche Landesbank, which is a voluntary risk management framework based on World Bank Group Environmental Health, and Safety Guidelines and International Finance Corporation Performance Standards on social and environmental sustainability. The principles are adopted for project financing assessment or credit contraction for projects relating to environmental, social, and governance issues. The principles are applicable to project financing advisory services, project finance, project-related corporate loans, and bridge loans, so that financial institutions, on the basis of responsible lending, can be friendlier to green energy projects, facilitating investment. This voluntary framework currently is adopted by 92 financial institutions in 37 countries. Financial institutions in APEC member economies, including Australia, Canada, China, Japan, Korea, Mexico, Peru, Chinese Taipei, and the United States, have adopted the framework. On this foundation, with the increase of number of green energy projects and related data, internal policies of financial institutions targeting risk-sensitive industries may be formulated in the future.

iv. Encourage Developing Synergies of Energy Efficiency and Renewable Energy

Considering that renewable energy has a wide range of use in power generation, fuel, and heat supply, and many renewable energy technologies are ideal for distributed applications that can reduce wasting of transmission and distribution through deployments closer to end users, and that the focus of energy efficiency has gradually shifted onto developing solutions for sub-sectors of power services, building, and transportation, it is possible that synergies between the two be created. IRENA's study targeting China, Denmark, France, Germany, India, Italy, the United

Kingdom, and the United States, under the framework of SEforALL Initiative, also believes that, compared to just renewable energy power sector, or energy efficiency improvement, combining renewable energy deployment and energy-saving improvement can better showcase the results of comprehensive projects—such as: building energy-saving improvement and electricity costs reduced through limiting industrial power consumption; it not only enhances the outcomes of the projects but also serves as reference to project financing assessment.

4.Capacity Building

(1) Current Developments in Member Economies

Capacity building programs adopted by APEC member economies focus on a broad scope of capacities, targeting related policies, background knowledge, statistics, and best practices of renewable energy and energy efficiency, and conduct promotion through websites, events, or projects; as for green energy technology and application, member economies support domestic research projects through public finance; in terms of professional training, some member economies will target different professional stakeholders, such as policy makers, financial professionals, business people, and organize regular training. Some member economies increase the number of professionals in correspondence with domestic energy policies; for example: Australia employs and trains more energy efficiency inspectors in response to domestic industry energy conservation and management policy.

(2) Policy Inspiration—Facilitate Use of Open Data

Regard to APEC member economies' implementation of capacity building programs, it is evident that almost all APEC member economies have utilized the Internet for knowledge sharing and dissemination. Considering that the main barriers of green energy finance may be

alleviated through transparent data of green supporting measures and project performance, APEC member economies perhaps can carry out integration of related information in the future, establishing an open database on the economy level or regional level, which may include: 1) general information that can be used for decision-making, such as government policies, main price signals, and technical information, and so on; 2) various financial resources or measures needed to launch projects; 3) performances and comparison of green energy projects; and 4) advisory services and information for producers and consumers, such as certification measures, or simplified procedures for collaboration between different supply chains.

As for existing international databases, IEA and IRENA have cooperated to establish a database of policies and measures, which includes information on overall policies and supporting instruments, as well as cross-sectorial and sub-sectorial data of renewable energy and energy efficiency. An annual publication is provided as reference material for all users.

Among APEC member economies, the United States has established a series of databases, including overall policies, background knowledge, supporting measures, and publications. The one directly related to green finance is Database of State Incentives for Renewables & Efficiency (DSIRE®), which was founded in 1995 by U.S. Department of Energy in collaboration with N.C. State University. The database includes all current green energy incentives in all levels of government in the United States, which are listed according to region (local government), category, type of policy, implementation time, and so on. The webpage of each incentive also features detailed information, including project introduction, content of incentive, amount of fund, application qualifications, other information, and contact information. This may serve as a reference for all member

economies for future improvement of own database.