

Policy Dialogue:

Renewable Energy Transition for Sustainable Growth

Purpose: Information

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Table of Contents

1	ENERGY TRANSITION	2
1.1	ROLE OF RENEWABLES.....	2
1.2	KEY AREAS FOR ACTIONS	2
2	ENERGY AND CLIMATE CHANGE GOALS	3
2.1	SUSTAINABLE DEVELOPMENT GOALS	3
2.2	APEC RENEWABLE ENERGY GOALS	3
2.3	PROGRESS TOWARD ENERGY AND CLIMATE GOALS	3
3	FACILITATE EFFECTIVE ENERGY TRANSITION	4
3.1	SUPPORT INNOVATION AND TECHNOLOGY DEVELOPMENT	4
3.2	SECTORAL RENEWABLE ENERGY PENETRATION	5
3.3	FISCAL AND FINANCIAL MEASURES	5
3.4	INTERNALISE EXTERNAL COSTS OF FOSSIL FUELS	5
3.5	GREEN/CLIMATE FINANCING.....	6
3.6	RENEWABLE GRID INTEGRATION	6
3.7	GRID INTERCONNECTION	6
3.8	REGIONAL COLLABORATION.....	7
4	ENERGY TRANSITION AND GROWTH.....	7
4.1	CONTRIBUTION TO GREEN ECONOMIC GROWTH	8
4.2	BARRIERS AND POLICY OPTIONS FOR GREEN GROWTH.....	8

1 ENERGY TRANSITION

The energy systems have faced the challenges to address energy security, economic efficiency and environment as well as urgently tackling key global issues, such as climate change, resource efficiency, sustainable consumption and production, environmental pollution, and energy access. These challenges are pressing and complexed, and there is a close nexus among energy security, economic growth, climate change, and environmental protection.

Energy transition and innovation toward sustainable and clean energy systems, which are represented by the processes of decarbonisation, decentralisation and digitalisation of entire energy systems, and re-electrification processes at end-user level, are the essential pathway to achieve sustainable development. Furthermore, energy transitions offer the opportunities of creating a circular economy, and generating new sources of growth, and shifting the economy from grey to green growth in APEC region.

1.1 Role of renewables

Renewable electricity is among the key drivers of clean energy transitions, which will be enabled by innovation and deployment of renewable energy technologies. Ambitions of renewable energy targets are consistently raised in many APEC economies. Renewable energy resources can play more important roles for effective energy transition, including in electricity supply, transportation, heating and cooling, and industrial processes. Depending on each economy's circumstance and condition, renewable energy progress can be accelerated beyond the power sector.

Over the past decade, the impressive progresses have been achieved with regard to the development and deployment of renewable energy, benefitting from innovation and significant cost reductions and competitiveness of renewable energy technologies. The rapid growth of renewable energy has been observed around APEC region which encouraged increased investment and financing in renewable energy utilisation.

1.2 Key areas for actions

To fully unleash the potential, it will require the governments to set out the right frameworks to cope with the growing share of renewables, formulate long-term plan in which the design of energy systems, including power grids and electricity markets, fully taking account of the shifting landscapes. Key areas for actions to facilitate renewable transition include:

- Economies would need to devise appropriate strategies and policies based on their resources availability, socio-economic conditions, and policy landscapes for other economic sectors' development;
- The effective energy transition will need to be built on technological innovation, economic viability, and efficient, and robust governance system;
- Promoting capacity building and best practices, and accelerating the development and deployment of renewable energy resources and technologies;
- Deployment of renewable energy and encouragement increased investment and financing in renewable energy production;
- Facilitate integration of renewables into power grid;
- Spurring innovation in the context of climate change. Call for Research and Development for clean energy technologies to promote international collaborative relationships;

- Reinforce and enhance regional, national and local initiatives involving multiple stakeholders, including governments, regulators, cities, communities, business and private sector;
- Access to finance and strengthened capacities need to be scaled up at a faster rate, particularly for less developed economies;
- Explore and develop the roadmaps to achieve the renewable energy development and energy transition goals.

Energy transitions that build on enabling energy policy frameworks designed by the governments can accelerate energy transitions and determine their directions and trajectories. Well-designed transition policies therefore consider each specific energy system's characteristics and encompass its energy supply and demand and social and economic background.

2 ENERGY AND CLIMATE CHANGE GOALS

2.1 Sustainable Development Goals

The Sustainable Development Goals (SDGs), adopted by the United Nations General Assembly in 2015, provide a framework for international cooperation to achieve a sustainable future for the planet. The 17 SDGs and their 169 targets, at the heart of "the Agenda 2030", define a path to end extreme poverty, fight inequality and injustice, and protect the planet's environment.

Sustainable energy is central to the success of Agenda 2030. The global goal on energy, SDG 7, encompasses three key targets, namely ensuring affordable, reliable and universal access to modern energy services, increasing substantially the share of renewable energy in the global energy mix, and double the global rate of improvement in energy efficiency.

Climate change is a global challenge, which requires solutions being coordinated at the international level to help developing economies move toward low-carbon economies. The goal for climate change is SDG 13, "Take urgent action to combat climate change and its impacts".

To strengthen the global response to the threat of climate change, UN member economies adopted the Paris Agreement at the COP21 in Paris, which went into force in November of 2016. The Paris Agreement is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 °C above preindustrial levels and to pursue efforts to limit the temperature increase further to 1.5 °C.

2.2 APEC Renewable Energy Goals

Most APEC economies have set renewable energy development goals, and at the 2014 APEC Leaders' Meeting, Leaders endorsed a new aspirational goal to double the share of renewable energy in APEC's overall energy mix by 2030 comparing to the 2010 levels.

2.3 Progress toward energy and climate goals

Climate Change Goals

With the rising greenhouse gas emissions, climate change is occurring at rates much faster than anticipated and its effects are clearly felt worldwide. While there are positive steps in terms of the climate finance flows and the development of nationally determined contributions (NDC), far more ambitious plans and accelerated action are needed on both mitigation and adaptation.

"The climate emergency is a race we are losing, but it is race that we can win." UN Secretary-General Antonio Guterres concluded at Climate Action Summit on 23 September 2019. At the Summit, the UN estimates that the world would need to increase its efforts between three- and five-fold to contain climate change to the levels of 1.5 °C rise at most and avoid escalating climate damage already taking place around global. Mr Guterres indicated, "We need more concrete plan, more ambition from more economies and more business. We need all financial institutions, public and private, to choose, once for all, the green economy".

Therefore, if Sustainable Development Goals 7, 13 and other related Goals are to be met, much higher levels of ambition are required with regard to renewable energy, including transportation and heating. A energy transition is more urgently needed than ever before.

APEC Renewable Energy Goals

At the EWG57 in Manila, it was concluded that APEC is unable to achieve the Renewable Energy Doubling Goal on time according to current projection. Actions recommended to take include:

- Each economy faces different challenges on renewable energy development. therefore, inter-economy's activities should be among the focus;
- The activities of EGNRET will be on knowledge sharing, capacity building, and to identify key areas that APEC can work together;
- Research into the options filling the gap to reach the goal of doubling renewable energy in the APEC region.

3 FACILATE EFFECTIVE ENERGY TRANSITION

An important feature of the green energy transition is that, at least in the short term until more green technologies become cost-competitive with brown technologies, penetration of green and renewable energy technologies will depend on public policies and regulatory supports.

3.1 Support innovation and technology development

Successful transitions have been found technically possible by studies and demonstrated by experience in some economies both inside and outside of APEC region. It requires the rapid introduction of policies and fundamental political changes toward concerted and coordinated efforts to integrate global concerns, such as climate change, into local and national policy priorities, including energy security, pollution and energy access. Affordable, scalable solutions are now available to enable to leapfrog to cleaner, more resilient economies. Turning to renewable energy and a range of other measures will reduce emissions and increase adaptation efforts. Some key technologies and innovations are in the following areas:

- Green electricity generation: renewables, biofuels, energy storage and carbon capture and storage;
- Electricity transmission and distribution: flexible power system, smart grid, microgrid, and inter-grid connection;
- Low carbon transportation: fuel efficiency technologies, electric, hybrid and fuel cells vehicles;
- Energy efficiency: building, manufacturing processes;
- Adaptation to climate change.

Alongside the green and renewable energy technologies, a number of technologies that are not strictly speaking green but will be necessary to achieve the green energy transitions. These include in particular some digital and information technologies such as artificial intelligence, the internet of things and blockchain and others.

3.2 Sectoral renewable energy penetration

An integrated policy design will be necessary to identify cost-effective “win-win” solutions that can deliver on multiple objectives simultaneously in different sectors, which include:

- Power sector: The power sector has represented the bulk of renewable energy usage and will continue to be so in the future because of its technical and economic feasibility;
- Transport sector: Introducing electric vehicles provides an option for electrification of transport sectors. Where possible, liquid biofuel, e.g. bioethanol and biodiesel, could be promoted to replace or be blended with traditional petroleum fuel.
- Industrial sector: Iron and steel, chemicals and petrochemicals, and pulp-and-paper are the three major industries that represent the bulk of industrial energy use. The practice of using renewable energy in these industries such as heating processes for low-temperature applications can be explored.
- Commercial and residential sectors: distributed renewable energy generation, supported by microgrid technologies, can contribute significantly renewable energy penetration.

3.3 Fiscal and financial measures

Fiscal measures, such as reduced corporate income tax, corporate tax holiday, import duty exemption for eligible technologies and equipment, and exemption from value-added tax for clean energy technologies, can attract investors and small businesses to foster market stimulation.

Historically, the rationale for the introduction of fossil fuel subsidies has been the alleviation of energy poverty, boosting domestic supply, redistributing national resources wealth, and protecting employment. However, international experiences have indicated that the range and scale of the unintended outcomes of fossil fuel subsidies are significant. Phasing out fossil fuel subsidies will narrow the investment gap for renewable energy technologies.

3.4 Internalise external costs of fossil fuels

Failure to take environmental externalities into account, such as negative externalities from fossil fuel-based technologies, or positive externalities from low-emissions technologies, means that prices signal of energy produced under-incentivise the uptake of renewable and other low-emissions technologies.

The costs of environmental and social damage of fossil fuel-based power generation technologies are significant. Comparing the financial viability of renewable energy projects with fossil fuel-based projects, without considering these costs, leads to uneven competition in the marketplace. Internalizing externalities levels the playing field for renewable energy.

While the challenges to estimating externalities continue to exist, policymakers can take appropriate steps to design energy and environmental policies that correct for externalities. This may include putting in a pollution penalty, such as carbon levy on energy generated from fossil fuel, e.g. a carbon tax, to offset the costs of relevant damages. There have been a few carbon pricing initiatives in the region. Externalities in the transport sector, for example, can be introduced by imposing specific regulations,

such as higher fuel efficiency standards for passenger vehicles which in turn will make the EVs cost competitive.

3.5 Green/Climate Financing

With technological maturity, increase scale of deployment, and associated cost reduction, some renewable technologies now have competitive advantage over conventional fossil fuel-based technologies. Effective investment environment is required for the renewable energy projects development, which include:

- Provision of necessary project capital subsidy for renewable energy projects, and encouraging long-terms power purchase agreement;
- Enhancing communication between business and financial sectors to increase transparency and developing risk-mitigation measures to help mobilize private finance, while recognizing that public finance still plays an important role;
- Support efforts to mobilize finance and to improve the market and investment environment for clean energy options, innovative technologies and quality infrastructure that facilitate energy transitions;
- Contribution to relevant green and climate Funds, to assist developing economies in mitigation, adaptation and resilience practices to support energy transition and counter climate change impacts.

3.6 Renewable grid integration

Electricity grids and their operational, planning and market management mechanisms have mostly been designed many decades ago, based largely on the characteristics of incumbent fossil fuel technologies. They are facing challenges in coping with the increased renewable electricity generation. Power systems need to become more flexible and electric market designs must be adapted in order to avoid unintended impacts on electricity security and reliability.

This requires that the current system integration ideas need scaling up from successful pilots to clear legislative and regulatory programs that ensure effective uptake of renewable sources in line with renewable energy and climate change goals. More specifically,

- As renewable penetration increases, and without adequate planning and management, this could lead to forced curtailment of renewable penetration into the grid or prevention of capacity expansion of renewables;
- Formulation of long-term plan, in which the design of power grids and electricity markets fully takes account of the shifting landscape of power generation and increased energy storage;
- Coping with the integration challenges, which include localized grid congestion, frequency control and supply/demand imbalance that, if not managed well, can compromise system operation and reliability.

3.7 Grid interconnection

Widening the balancing area of grid networks through the interconnection of national or sub-national grids can reduce the relative variability of both load and generation. Connecting geographically distant wind power and solar power plants can smooth out the variability of these variable renewable energy resources. Larger balancing areas can also lead to cost savings on spinning reserve as this service can be pooled over the entire area.

An interconnected grid offers an even wider range of benefits, including enabling cross-border power trade and improving energy security of the entire energy system. Relevant issues to be addressed include:

- Grid codes harmonisation;
- Coordinated operation of the power grids;
- Development of connection agreements;
- Electricity market integration.

3.8 Regional collaboration

It has become ever more important to engage in cross-border cooperation and share and discuss best practices with other economies in the region with increased renewable applications. The areas of regional cooperation could include:

- Knowledge sharing: collaboration and information exchange with other relevant international organisations such as IEA and IRENA; sharing the experience from the economies with effective and successful renewable energy policies and development programs such as China, some States in the US;
- Capacity building: work with multilateral institutions, and also with relevant international initiatives such as One Belt and One Road (OBOR) Initiative, building up the capacity for renewable energy development across the APEC region;
- Energy connectivity/interconnected grid: energy connectivity, relying on both technical and financial viability and political trust, could build upon the existing regional economic cooperation frameworks, such as ASEAN;
- Formulation of energy transition roadmaps: the selection of energy technologies, technical pathways and energy transition trajectories will be subject to the status of social and economic development, resources availability, and the existing energy infrastructure of each member economy;
- Effectively monitoring, measuring and assessment of the progress of energy transition in member economy and across the APEC region.

4 ENERGY TRANSITION AND GROWTH

A virtuous cycle of environment and economies growth is important, which is driven by breakthrough innovation and deployment clean energy technologies, with effective regulation and policy from the governments, active role of business and corporations under the enabling environment created, and effective participation of broad communities.

Energy transitions offers a path of high-quality growth and low carbon development, turning the economy growth from grey to green¹.

¹ "Green Economy" defined as products and services in renewable and alternative energy, energy efficiency, water, and waste and pollution

4.1 Contribution to green economic growth

It has been evidenced for the policies that encourage the development of new low-carbon and renewable technologies can have economy-wide benefits through increased innovation spill-overs and contribute to green economic growth.

Energy transition is able to create opportunities for businesses and economy. The companies that supply cutting-edge clean technologies are expected to grow, as these technologies are expected to diffuse over the next decades. Opportunities will arise along the value chain, from technology providers to investors and to the developers of the energy projects. It has been envisaged that the green economy proportion of the market capitalization will be growing, while the fossil fuel sector is shrinking. There will also be significant opportunities for financial institutions, which will direct investment towards sustainable and renewable energy projects.

Alongside the direct benefits to greening economic sectors, there will be indirect benefits as well, such as from technological and non-technological knowledge spill-overs and productivity improvement from better health due to low air pollution with the progress of energy transition. In addition, new technology fields offer potentially high marginal private returns to first movers and will generate larger knowledge spill-overs.

4.2 Barriers and policy options for green growth

Some main barriers and policy options for green economic growth include:

- **Skills shortage:** New technologies require new skills to enable the technologies to be developed and diffused, and new infrastructure to be deployed. Thus, a successful energy transition is likely to entail, for example, upgrading skill sets in industries experiencing with adjustments, gearing up educational institutions and firms to provide the new skills for new occupations and sectors that will emerge from the green economy;
- **Innovation capacity:** not only the training of researchers, but also to develop a well-functioning innovation ecosystem;
- **Financing:** investors lack the knowledge necessary to accurately evaluate the risk-return profile of new technologies. Lack of adequate financing along the entire clean and renewable energy chain is one of the obstacles in the commercialisation of science;
- **Dynamic business environment:** Lack of business dynamism, for example lack of market entry and exit, means that low-emissions innovations may not overtake fossil fuel-based incumbents and secure their place in mainstream markets, even if they are more efficient. To realised energy transition and shape the green economic growth, it is important improving business environments and promoting business activities, including organising knowledge sharing and necessary capacity development programs, fostering public-private partnerships for dissemination of innovative technologies, and development of infrastructure projects, products, and services.