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Contribution of Pakistan

to the CSTD 2017-18 priority theme on 'The role of science, technology and innovation to increase substantially the share of renewable energy by 2030'

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Recommendations by Pakistan in respect of the priority theme-I "the role of science, technology and innovation to increase substantially the share of renewable energy by 2030".

Renewables without Boarders

This year's theme is in line with "Increasing Access to Clean Energy to enhance Sustainable Development". The theme is a reflection of SDG 7 which is "Ensuring access to affordable, reliable, sustainable and clean energy for all". The International Renewable Energy Agency (IRENA) identifies the following six energy development goals that, either alone or in combination, commonly shape energy development pathways, namely, Energy Security, Energy Access, Energy Cost, International Competitiveness, Modernization and Green House Gas (GHG) emissions reduction, or mitigation of climate change. Accordingly, a modern energy supply follows the guiding objective of sustainable development. It combines security of supply, ability to compete and environmental compatibility. Renewable energy is particularly suited to fulfilling these criteria.

Apart from empowering nations for sustainable development, the priority theme-I also promises to directly mitigate climate change, which is one of the greatest challenges affecting the world today. As the world's climate changes and continues to change at rates unprecedented in recent human history, it is true that the impacts and risks related with these changes are real. This causes a great challenge for sustainability of life, ecosystems, livelihoods and indeed the development of the economy. Accordingly, there is need to adapt to the inevitable effects of climate change as well as to facilitate the development of techniques that can increase resilience to the climate change impacts.

Increment in Renewable Energy deployment is one such imperative that can alleviate the menace of climate change. It can only be realized through meaningful cooperation between nations of the world. There is need to disperse the RE deployment globally, especially across underdeveloped and developing world where most of the population resides, and where most of the sun shines--- to achieve the quantum necessary for achieving the 2030 deployment goal and thus illuminate the lives of millions residing off-grid.

"Like doctors without borders and banking without borders, we must have renewables without borders, encouraging knowledge and Technology exchanges across nations to spur R&D, innovation in and deployment of renewables across the globe to achieve the ambitious 25% share target by 2030"; a specially designed interactive and action oriented campaign aimed at equipping developing nations with skills, information, and knowledge in Renewable Energy, Energy Efficiency and Climate Change in a sustainable manner is need of the hour, bringing together & delivering effective clean energy & energy efficiency management solutions for governments, municipalities, building owners, industries & organizations that produce, deliver and/or consume energy.

Capacity building in human resource and infrastructure together with creating conducive environment for foreign investment can greatly improve the prospects of technology and capital transfer to third world countries, where access to capital is sparse. However the countries that are producing RE equipment have access to capital and financing at relatively good terms. Therefore, equipment financing for projects being deployed in third world countries can be offered at subsidized rates to ease implementation.

Challenges

Among the challenges, the insensitivity toward climate change, especially by the main polluters; is the primary concern, "there are commitments in the Koyoto Protocol and the Paris Agreement, however, the implementation is weak. In fact there is increment in the deployment of fossil fuel based power plants around the world, which is akin to the current practice of printing on a cigarette pack "smoking is injurious to health and the persons around", while selling the same brands with impunity. This challenge is exacerbated by the fact that renewables are up against odds. On the basis of the current global outlay, for renewables to compete, they require 35% increment in deployment compared to a corresponding increment of just 1% for the fossils.

Technical and Financial Innovation

Asia is home to over 4 billion people, and about 44 million people are being added to Asia’s urban population annually. According to an estimate by 2030, over 750 million people in Asia will be at climate change risks, energy consumption will rise by 54%, and over 80% of Asia’s population will experience water scarcity. These are some of the most pressing challenges that region will face in the next 15 to 20 years, however, with

adequate investments, green technologies for innovation can effectively address these challenges.

Technologies that can improve lives of people, particularly in the developing region, will be crucial to drive green innovation for sustainable growth in Asian countries. For instance, clean technology refers to investments in technologies and businesses which seek to improve performance, efficiency and productivity and minimize the negative impact of technological development on the environment.

New disruptive technologies and innovations are unlocking clean technology markets, such as smart grids and smart industries. There is need to highlight technologies for green innovation and bring together experts, scientists and governments to create a shared understanding of the role of governments, academia and business to promote green innovation in Asia to achieve a sustainable future.

Green energy deployment in Pakistan has seen considerable growth in terms of Wind, Solar and Biomass based projects with a total outlay of ca. 4,000 MW, which translates to about 10% of the current overall energy outlay in the country. With the advent of renewable energy mapping under the World Bank ESMAP project, government planning and policy-making, site-scoping by commercial developer, and lowering of resource risk in project development has led to increase investment with the expected lower electricity prices for the intended power plants.

New Paradigms of R&D Systems

One of the key aspects for assuring long-term competitiveness is knowledge-based development, and this idea has led to the rapid increase of R&D investment in many countries. Asia takes a leading role in R&D, ten of them placing at the Top 40 R&D spending countries, however, the quality levels of development activities and performance still remain below that of major countries. In spite of limited resources, R&D systems must achieve enhanced productivity and improved effectiveness, such that they become a solid foundation to support the knowledge-based development. There are new demands on the systems to not only contribute on economic growth but also to address social issues, and new paradigms of the systems are shifting from technology-driven to demand-driven. Which direction should the new systems take? How should the evaluation within the new systems be conducted? What factors challenge the priority setting? How overlapping

funds should be avoided, and on what basis should basic and applied sciences be prioritized? These issues warrant new paradigms, share best practices and measures to improve the design, implementation and effectiveness of R&D system to maximize the impact on the society.

As opposed to common belief, Renewable Energy is not inexhaustible. The platforms utilizing RE are based on finite sources e.g. Silica, Lithium, etc; all the more reason to utilize these resources efficiently and judiciously.

A recent study at MIT concludes that even if all nations meet their Paris Agreement commitments, the world will exceed the 2 degrees maximum global temperature increase targeted for 2100 as early as 2050. With business as usual, renewables and nuclear energy may grow, but the world energy mix will continue to be dominated by fossil fuels (coal, oil and gas). To avoid this outcome, countries will need to muster innovative R&D to lower technology costs and increase both efficiency and deployment. Aggressive positive interventions will have to be undertaken to disrupt the fossil fuel domination in the present day energy mix.

Transition to a dramatically different global energy mix must be well underway with in the next decade to prevent an excessive temperature rise by 2100. It is recognized that such an undertaking will almost certainly require extraordinary political will along with sudden and unforeseen breakthrough in technology. Substantial R&D investment is needed to develop current technologies, explore and innovate new ones and increase the efficiency with which we use energy so less is required in the future. These measures will help countries move forward on climate change and support the transition onto a 2 degrees energy pathway as soon as possible.

Digital Grid, Energy Density and Efficiency

Specifically, for wind and solar to play a dominant role, the intermittency problem would have to be solved by inexpensive energy storage, or advances in grid operation. Otherwise the cost of both backup capacity, for example, gas turbines and battery electricity, makes the larger scale penetration of renewables economically infeasible. As enunciated in the Issues Paper on this theme, organization of Digital grid for increased stability and smart-grid for better management and efficiency becomes imperative.

Likewise, vast increment in current RE efficiency, energy density and storage systems cycle life is vital to compete with the fossil counterparts.

Apart from technical innovation, innovative financial models are required to promote the cause of renewables. To further the dissemination of decentralized renewable energy in order to address climate change and access to energy in developing countries, finance is needed. “Despite the steady growth of investment in the innovative development of alternative energy, international experience shows that, despite all the achievements in the field of alternative energy, the share of electricity from renewable sources in the total volume is still relatively small. But if we take into account the technological and financial barriers associated with the transition to renewable energy sources, as well as the steady growth in demand for energy, the problem of alternative energy gradually come to the fore. To solve this problem, it is necessary to create conditions for the comprehensive development of financing infrastructure of renewable energy, which depends on many factors and requires efficient allocation and recycling of capital investments. In any case, the problem of investments in various financial models developed in practice (at the state level or business), are associated with the extent of innovation and investment climate in the regions. Each investment project has its own distinctive risk profile, in which different factors have varying degrees of impact on the socio-economic and financial results of innovation in the field of renewable energy”.

Non-recourse Financing

Therefore, it is felt that “Financial institutions view the RE sector as higher risk, due to lack of technical capacity on the part of lenders to evaluate such projects and potential borrowers being unable to establish bankability of their projects.” However, a new wave of innovation is sweeping the energy transition sector, promising to accelerate deployment and cut the costs of energy-efficiency measures, as well as wind and solar generation. It isn't a technological improvement, like cutting hardware and labor costs. It isn't a policy mechanism like feed-in tariffs . It isn't even a new business model, like selling storage services . It's financial innovation.

In many countries where RE installed capacity has grown significantly, non-recourse project financing has played a decisive role in accelerating RE development. Unlike other financing options (such as corporate finance), with non-recourse financing, lenders assess

the cash flows expected to be generated from project activities, rather than the strength of the existing balance sheet of a project sponsor. Nonrecourse project finance is a common, proven investment structure in developed markets and an instrument of choice for financing large infrastructure projects. The same is increasingly true for project development in emerging markets. This model has seen good success in Turkey.

Leasing and Power Purchase

In the earlier days of the transition to renewable energy, the most significant stumbling block was cash: If you wanted to install solar on your building, or have your own electrical backup or storage capacity, you had to plunk down a hefty amount of cash. But thanks to financial innovation, those days are fading. Most people are aware that you don't need to pay out of pocket to put solar on your building anymore. A slew of companies will install a system for no money down, then lease it back to you over a period of several years. The system pays for itself over time, and you get lower bills with a locked-in price for electricity. This model is commonly known as power purchase, which is making steady ingress in countries around the world, especially from the stand point of distributed, or off-grid solar, which in Pakistan has seen phenomenal deployment rate, to the tune of some 500 MW/annum.

In so far as commercial solar is concerned, the availability of real-time data on the relevant renewable energy resource is crucial in this respect both for government plans and policy making, and for initial site scoping by commercial developers. The availability of accurate data also helps to lower the resource risk in project development, thereby leading to lower electricity prices for the intended installations.

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Recommendation by Pakistan

The Issues paper on priority theme-1: The role of science, technology and innovation to increase substantially the share of renewable energy by 2030, cites that:

> "Energy use in the household sector in developing countries is a major development issue. About 2.8 billion people worldwide currently do not have access to clean forms of cooking, a number which has not reduced since 2000. Of these, about 2.5 billion people – approximately a third of the world's population – are reliant on the traditional use of solid biomass, with 170 million cooking with kerosene and 170 million with coal. 1.9 billion of those without access to clean cooking are in developing Asia, with 850 million in sub-Saharan Africa (IEA, 2017)".

And that

> "Access to clean cooking is therefore an important development priority. It is also potentially one of the most cost effective, the IEA for example finding that the investment that would be required to deliver clean cooking for all is one tenth of that required to deliver universal electricity access (IEA, 2017)".

However, provision of clean cook stoves and/or, separate biogas units to each household as suggested in the paper may not be the most effective means and may be more costly and tedious compared to a central thermal Microgrid for the rural communities. Development of a 'thermal grid' by producing and distributing bio-methane from biodegradable waste and syngas from lignocellulosic biomass available locally will greatly contribute toward provision of clean cooking and heating to rural households at a much lower per capita investment outlay. We name it thermal grid because both the gases will be used for the safe cooking and heating in rural settings from a central platform. Biomass gasification is a proven and highly efficient technology, which can convert locally available biomass feedstock into clean burning gas. The char available as byproduct may be used as fertilizer for growing further feedstock. About 2.8 billion people worldwide currently who do not have access to clean forms of cooking stand benefitted from the proposed thermal micro-grid model.