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Renewable Energy Potential in India

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Abstract

For assessment of renewable energy potentiality, it is essential to understand the role of private investment, value of liberalization in the Power Sector and its effects, policy prescriptions for different scale of operations, smart and resilient transmission and distribution infrastructure, cooperation in R&D for current, new and innovative technologies; grid integration of renewable energy (RE), political framework and stakeholder landscape. The resilience of the energy sector against all odds showcases that renewable energy is indeed the future and will play a major role in providing a clean, secure and sustainable energy economy. The potential is unquestionably large and the rapidly growing economies are determined to transform the economic crisis into an opportunity for greener growth. India has tremendous energy needs and increasing difficulty in meeting those needs through traditional means of power generation. To acquire a deeper understanding of policy efforts to encourage and enable renewable scale up, mobilizing finance for renewable energy innovation and deployment, benefits of collaboration, synergies, and knowledge sharing at the international level to scale up renewable energy (RE) are some essential components that can play vital role in exploring renewable energy in future.

Keywords: Reneawble energy; power; policy; management.

1. Introduction

Renewable energy is energy that comes from resources which are continually replenished such as sunlight, wind, rain, tides, wave sand geothermal heat. About 16%

of global final energy consumption comes from renewable resources, with 10%] of all energy from traditional biomass, mainly used for heating, and 3.4% from hydroelectricity. New renewable (small hydro, modern biomass, wind, solar, geothermal, and bio-fuels) accounted for another 3% and are growing very rapidly [1-2]. The share of renewable in electricity generation is around 19%, with 16% of electricity coming from hydroelectricity and 3% from new renewable [2]. Climate change and global warming concerns, coupled with high oil prices, peak oil, and increasing government support, are driving increasing renewable energy legislation, incentives and commercialization [3]. New government spending, regulation and policies helped the industry weather the global financial crisis better than many other sectors [4]. According to a 2011 projection by the International Energy Agency, solar power generators may produce most of the world's electricity within 50 years, dramatically reducing the emissions of greenhouse gases that harm the environment [5]. Renewable energy sources, that derive their energy from the sun, either directly or indirectly, such as Hydro and wind, are expected to be capable of supplying humanity energy for almost another 1 billion years, at which point the predicted increase in heat from the sun is expected to make the surface of the Earth too hot for liquid water to exist [6-7].

Rapid deployment of renewable energy and energy efficiency, and technological diversification of energy sources, would result in significant energy security and economic benefits [8]. Renewable energy replaces conventional fuels in four distinct areas: electricity generation, hot water/space heating, motor fuels, and rural (off-grid) energy services [9]. Some countries have much higher long-term policy targets of up to 100% renewable. Outside Europe, a diverse group of 20 or more other countries target renewable energy shares in the 2020–2030 time frame that range from 10% to 50% [10]. In international public opinion surveys there is strong support for promoting renewable sources such as solar power and wind power, requiring utilities to use more renewable energy (even if this increases the cost), and providing tax incentives to encourage the development and use of such technologies. There is substantial optimism that renewable energy investments will pay off economically in the long term [11].

India is aiming to expand its power generation capacity by 44 percent over the next five years, but recent problems demonstrate the scale of the challenge. Even before the blackout in June of 2012, the country's power generation fell short by 5.8 percent when confronted with a peak-hour demand of 128GW, according to government data [12-14]. Per capita consumption of electricity in India is low. Around half the country's population does not have access to electricity. As is well known, most villages that are un-electrified are also home to people who are poverty stricken and multi-dimensionally deprived. According to Planning Commission estimates, around 57 percent of the rural households and 12 percent of the urban households in India did not have electricity in 2000. Power outages and voltage fluctuations of grid based electricity in rural areas need rectification even in villages that are electrified. India's economy faces increasing challenges because energy supply is struggling to keep pace

with demand and there are energy shortages (as much as 15 percent daily) almost everywhere in the country. Such chronic lack of energy and unreliable supplies threaten India's economic growth.

For economic as well as environmental reasons, India needs to shift to non-polluting renewable sources of energy to meet future demand for electricity. Renewable energy is the most attractive investment because it will provide long-term economic growth for India. A favorable renewable energy policy could create millions of new jobs and an economic stimulus of at least US$1 trillion, and perhaps much more if all indirect economic (ripple) effects are included. Renewable energy also has the advantage of allowing decentralized distribution of energy – particularly for meeting rural energy needs, and thereby empowering people at the grassroots level. Solar electricity could also shift about 90 percent of daily trip mileage from petroleum to electricity by encouraging increased use of plug-in hybrid cars. The present business model needs to be changed from a centralized to a decentralized structure that allows all stakeholders, including capital investment coming from state-owned investors, pension funds, and foreign countries. This new business model should include the development of all forms of "distributed" (i.e. non-grid) energy such as solar, wind, hydro, biomass, biogas, and geothermal. Distributed energy not only reduces the huge amount of energy lost in grid distribution, it also helps lighten the load on the grid. Distributed energy is a critical part of the real energy revolution in achieving a cost-effective smart grid solution. All forms of distributed power, micro-generation and micro-grids should be incorporated into the electrical supply system to make the system more reliable. India is in a unique position to introduce clean energy solutions on an enormous scale to provide affordable energy for everyone especially the poor [14].

2. Posibilities for Renewable Energy in India

India has lot of potential for renewable energy. Solar is the prime free source of inexhaustible energy available to all. And, India is one of the sun's most favored nations, blessed with about 5,000 TWh of solar isolation every year. Even if a tenth of this potential was utilized, it could mark the end of India's power problems by using the country's deserts and farmland to construct solar plants. Renewable energy has the potential to re-energize India's economy by creating millions of new jobs, allowing the country to achieve energy independence, reduce its trade deficits and propel it forward as a "Green Nation." India should take full advantage of this golden opportunity because renewable energy has particular relevance in remote and rural areas where there are around 289 million people who don't have access to reliable sources of energy. Solar energy is the most cost-effective option for India to reduce energy poverty without having to extend national grid services to provide power for individual homes and buildings.

India's present generation capacity is about 200,000 MW. The country could potentially increase grid-connected solar power generation capacity to over 200,000

MW and wind energy to over 100,000 MW by 2030 if the right resources (and more importantly, energy policies) were developed. India can develop massive commercial wind farms to harness the strong onshore coastal area and offshore wind to boost the country's supply of clean renewable energy. But, to tap this vast resource, India must develop and implement smart business models and favorable policies as quickly as possible. Another opportunity for sparking investment in solar, is the U.S.-India Energy partnership program called SERIIUS (the Solar Energy Research Institute for India and the United States). This collaboration could lay the foundation for an energy independent future – one in which the Indian government takes advantage of the vast amounts of energy available from the Rajasthan Desert sun (instead of oil from the Arab nations) to power its future energy needs. In addition, renewable energy would not only create millions of jobs, but also sustain India's positive economic growth, help lift its massive population out of poverty, and combat climate change.

3. Action Needed

The Indian government is taking many measurable steps toward improving infrastructure and power reliability, including the development of renewable energy from solar and wind. But clearly, more needs to be done, and fast. One step in the right direction was the establishment of the Jawaharlal Nehru National Solar Mission (JNNSM) in late 2009. However, the present JNNSM target of producing 10 percent of its energy from solar – 20 GW – by 2022 is totally inadequate. JNNSM needs to take bold steps with the help of central and state governments in order to play a greater role in realizing India's solar energy potential. One step toward achieving this goal would be to start a nationwide solar initiative to facilitate large scale deployment of 100 million solar roofs and large utility-scale generation installations within the next 20 years. India could become a major player and international leader in the solar energy space.

4. Renewable Energy Exploration

There are many strategies for exploration of renewable energy in India and some of them are [14] as under: (a) aggressively expand large-scale deployment of both centralized and distributed renewable energy including solar, wind, hydro, biomass, and geothermal to ease the strain on the present transmission and distribution system – and reach more off-grid populations. Facilitate growth in large-scale deployment by installing 100 million solar roofs and large utility-scale solar generation, through both centralized and distributed energy within the next 20 years; (b) enact a National Renewable Energy Standard/Policy of 20 percent by 2020 – to create demand, new industries and innovation, and a new wave of green jobs; (c) develop favorable government policies to ease the project permitting process, and to provide startup capital to promote the exponential growth of renewable energy. Create and fund a national smart infrastructure bank for renewable energy; (d) accelerate local demand

for renewable energy by providing preferential Feed-in-Tariffs (FIT) and other incentives such as accelerated depreciation; tax holidays; renewable energy funds; initiatives for international partnerships/collaboration incentives for new technologies; human resources development; zero import duty on capital equipment and raw materials; excise duty exemption; and low interest rate loans; (e) establish R&D facilities within academia, research institutions, industry, government and civil society to guide technology development (f) accelerate the development and implementation of solar and wind farms; utility-scale solar and wind generation nationwide; (g) initiate a move to electrify automotive transportation or develop electric vehicles and/or plug-in hybrids – such as the Nissan Leaf or Chevy Volt, etc.

Develop and implement time-of-day pricing to encourage charging of electric vehicles at night. Adopt nationwide charging of electric cars from solar panels on roofs, and solar-powered electric vehicle charging stations around the country. Thousands of these solar-powered recharging stations could spread across India just like the present public call offices (PCO), giving birth to the "Green Revolution." These recharging connections could be deployed in highly-concentrated areas, including shopping malls, motels, restaurants, and public places where cars are typically parked for long periods; (h) aggressively invest in a smart, two-way grid (and micro-grid). Invest in smart meters, as well as reliable networks that can accommodate the two-way flow of electrons. Such networks need to be resilient enough to avoid blackouts and accommodate the advanced power generation technologies of the future; (i) develop large-scale solar manufacturing in India (transforming India into a global solar manufacturing hub); (j) work towards a Hydrogen Economy development plan. Hydrogen can be fed into fuel cells for generating heat and electricity – as well as for powering fuel cell vehicles. Produce hydrogen using renewable energy with solar and wind power. If done successfully, hydrogen and electricity will eventually become society's primary energy carriers of the twenty-first century. If India made the massive switch from coal, oil, natural gas and nuclear power plants to renewable energy, it is possible that 70 percent of India's electricity and 35 percent of its total energy could be powered by renewable resources by 2030.

A renewable, energy-powered future is already here, not decades away. Newly built solar plants are already considerably cheaper than new nuclear plants per kilowatt hour of electricity produced, and solar energy will compete head on with conventional energy generation. In places such as California and Italy it has already reached so-called "grid parity." India can ramp up its efforts to develop and implement large utility-scale solar and wind energy farms to meet the country's economic development goals, while creating energy independence and realizing potentially enormous environmental benefits. Both issues have a direct influence on national security and the health of the Indian economy.

5. Conclusion

Best-practice policies at state & local level to promote renewable, city & spatial planning, role of micro-finance and consumer credit for promoting renewable, capacity-building to develop local skills to produce, market, install, operate and maintain sustainable energy technologies are essential components to harass renewable energy. Current global trends in energy supply and consumption are patently unsustainable – environmentally, economically and socially. It also went on to add that the situation can be changed if the supply of reliable and affordable energy is secured and a rapid transformation is made to a low-carbon, efficient and environmentally benign system of energy supply. Availability of energy, its source and cost have become key points of debate in development over the last couple of decades. Whichever be the sector - agriculture, telecom & ICT, construction, services or manufacturing - availability of energy is a prerequisite for its growth, while on the other hand, certain sources of energy could so seriously damage the environment that the very business that it supports may become unsustainable over a period of time. Such a situation has necessitated the move by various stakeholders to rely more on renewable energy. Green Energy is essential to limiting global warming and protecting ecosystems by reducing CO2 emissions through energy efficiency and renewable Energy. Climate change comes at a cost to both our economy and our environment. Growing telecommunications infrastructure requires increasing amount of electricity to power it. Part of the electricity comes from the power grid and remaining through burning of fossil fuel like diesel. Both of these sources contribute to emission of green house gases (GHG) with the attendant negative environmental effects. Current global trends in energy supply and consumption are patently unsustainable – environmentally, economically and socially. It also went on to add that the situation can be changed if the supply of reliable and affordable energy is secured and a rapid transformation is made to a low-carbon, efficient and environmentally benign system of energy supply. There is need for further research and policy framework.

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