

Trends of renewable energy generation in Indian Context for meeting sustainability

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Abstract

Sustainable energy generation and effective utilization is the most sought concern in the 21st century. Rapid population growth, urbanization and industrialization have dramatically increased the global energy demand leading towards the faster depletion of fossil fuels. According to International Energy Agency (IEA), world primary energy demand is projected to be increase by 38.33% (approx.) between 2017 and 2040 and fossil fuel share to meet this demand is projected to be about 78% by the year 2040. Such escalating energy demand and increased consumption of fossil fuels are believed to be the main factor behind emission of greenhouse gases (GHGs) resulting global warming. Such rising problem of global warming has shifted the global interest to look for sustainable energy sources. Conference of Parties (CoP) 21, 2015 strictly warned and asked the nations to reduce their greenhouse gas emission level with the agenda to achieve the goal of limiting the rise in global temperature to well below 2 °C. With Sustainable Development Goal (SDG) 7, universal access to energy, a higher share of renewable energy and massive improvements in energy efficiency are now part of the top global priorities for sustainable development in the years to come. India is projected to be a significant contributor to the rise in global energy demand, around one-quarter of the total. Most of the country's energy demand is met largely by imported fossil-based coal, oil and gas reserves. About 61.7% of electricity is generated from conventional (coal, lignite, diesel and gas) thermal-based power plants. Any ambiguity in the energy imports due to price hike and energy insecurity may cause severe energy

scarcities that will consecutively hamper the industrial growth and economic progress. India is committed to achieve SDG 7 and the associated targets, which comprehensively ensure access to clean, affordable, reliable and modern energy services. Fortunately, India is blessed with a variety of renewable energy resources with favorable geology and geography with huge customer base and widening gap between demand and supply. Indian renewable energy sector is the fourth most attractive renewable energy market in the world. India is ranked fourth in wind power, fifth in solar power and fifth in renewable power installed capacity as of 2018. Currently, renewable energy contributes 24.3% of total installed capacity of 374.199 GW in the country. Installed renewable power generation capacity has gained pace over the past few years, posting a CAGR of 17.33% between FY16-20. With the increased support of Government and improved economics, the sector has become attractive from investors perspective. The Indian government is aiming to achieve 225 GW of renewable energy capacity (including 114 GW of solar capacity addition and 67 GW of wind power capacity) by 2022, more than its 175 GW target as per the Paris Agreement. The government plans to establish renewable energy capacity of 500 GW by 2030. Moreover, EVs are expected to play a major role in attaining sustainable development goals and adoption of EV is likely to grow significantly with the increasing demand for clean energy technologies. However, there are certain constraints that hinder the development of some of the renewable energy systems throughout the country such as wind energy due to its intermittency and variation of wind speed. Furthermore, grid integration of renewable energy projects is essential for bringing about an increase in the renewable share in regional and national energy mix. Grid instability and inertia are the issues need to be resolved. Research, development, production and demonstration have been carried out enthusiastically in India in search of feasible solution to the persistent problem of power shortage for the past three decades. In order to accelerate the adoption of RE technologies effectively, government supports (suitable regulatory policies, tax rebates) and R&D interventions (efficiency and technological improvement) are essential. In line with the SDG 7, Centre for Energy, IIT Guwahati is involved in pursuing emerging research in the fields of efficiency enhancement of solar PV and thermal collectors, decentralized power generation through integrated RE (bioenergy and solar) technologies, hydrogen technology, thermal and electrical energy storage (LI-ion and solid state battery), fluidized bed technologies for biomass/coal combustion, and energy efficiency of systems.

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