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Scope of Solar Energy in Cold Arid Region of India at Leh Ladakh

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Abstract: Considering the fast depletion of fossil fuel, there is need for switching to renewable options for meeting the energy demands in future e.g. solar, wind, biomass etc. At present, 13% of the electricity production in our country is met through renewable sources, whereas globally it is about 22.8%. If we think about the availability of solar irradiation in India, it is abundantly available in cold arid regions at Leh-Ladakh. In spite of large availability of solar irradiation at Leh-Ladakh, e.g. 7-7.5 kWh m^{-2} day^{-1}, huge amount of diesel is still being used for meeting the daily energy demands of Leh-Ladakh. Solar energy has a great role to play for future energy security of Leh and Ladakh either through solar thermal or solar photovoltaic options. In this paper, different solar based technologies are discussed to use solar energy at domestic level, at farmers' field and even at industrial scale. Solar PV pumping system can easily be used for irrigation purpose and even to lift water against gravity at undulating terrains of Leh-Ladakh. Solar farming option can be utilized where both crop production and PV based electricity generation can be done on a single land use system. Solar air heating for buildings may provide congenial inside environment especially during winter months. Solar green house can be an effective way to produce vegetables even during harsh climatic conditions outside. Roof top PV system can share the electric energy consumptions in office buildings, hospitals, guest houses, hotels etc. Solar lanterns have the potential to replace conventionally used kerosene based lighting system. Other different solar technologies that have a potential in Leh-Ladakh are inclined solar dryer, solar PV winnower cum dryer, solar water heater etc. Utilization of above discussed solar based technologies may have improved the renewable energy scenario in Leh and Ladakh.

Key words: Renewable energy, Leh and Ladakh, solar thermal devices, solar PV technologies.

Considering the fast depletion of fossil fuel based energy, renewable energy is the most viable option for future energy security of world. At present, renewable energy share to world's global electricity production is about 22.8% (by the end of 2014), out of which 16.6% is contributed by hydropower, 3.1% by wind energy, 1.8% by biomass-power and 0.9% by solar PV (Renewable Energy Network for 21st Century, REN21). Cumulative renewable installed capacity in the world is 1712 GW including hydropower installation of 1055 GW. Annual growth rate of cumulative renewable energy installed capacity in 2014 was about 8%, whereas the annual capacity addition grew by 24% in 2014 as compared to 2013. India ranks 7th in the world in total renewable energy installed capacity while China tops the list followed by USA and Germany. In China, wind energy and hydropower installations are the major contributors to renewables whereas in USA, geothermal energy and in Germany, solar PV is the dominant contributor. India ranks 5th in the world in total wind energy installation after China, USA, Germany and Spain, whereas it is 10th in world among solar PV installation. Globally, 15% of the world population has no access of electricity. India today is home to one-sixth of the world's population, but accounts for only 6% of global energy use and one in five of the population-240 million people-still lacks access to electricity (World Energy Council, 2015). Therefore, much effort is needed in India to fulfill the future energy demand and specifically through renewable energy sources.

At present about 13% of energy generation in India is met through renewable sources e.g. wind, solar, biomass etc. whereas coal is till the main source contributing about 60% of total generation. During last few years, a great stride has been made to install solar PV plants, wind turbine, hydropower, biogas e.g. renewable installed cumulative capacity has been increased from 24914 MW in 2011-12 to 42752.21 by the end of 2015-16 with an

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