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journal homepage: [www.elsevier.com/locate/rser](http://www.elsevier.com/locate/rser)

## Renewable energy: An overview on its contribution in current energy scenario of India

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## ARTICLE INFO

## Article history:

Received 31 December 2014

Received in revised form

6 December 2015

Accepted 13 January 2016

## Keywords:

Green house gas

Fossil fuels

Renewable energy

Energy

Electricity

## ABSTRACT

Energy is the major source for the economic development of any country. In case of the developing country like India, shortage of electricity work as a barrier for development. In recent years, India's energy consumption has been increasing at a relatively fast rate due to population growth and economic development. Rapid growth of the Indian economy places heavy demand of electric power. Presently most of the electric demand fulfilled by coal power plants and creates pressure on fossils fuel. Coal-based power generation is characterized by local and regional environmental degradation as well as greenhouse gas emissions, leading to climate change. Thus, there is need of enhance energy security along with reducing greenhouse gas emissions. Renewable energy is one of the environmentally friendly sources of energy. In present energy scenario harnessing of renewable potential in effective manner is becoming need of the era, which can provide sustainable power supply as well as mitigate the negative environmental impact due to fossil fuel.

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## 1. Introduction

India is the fourth largest energy consumer in the world after the United States, China, and Russia [1]. As of March 2013, the per capita total electricity consumption in India was 917.2 kWh [2]. Electricity consumption in India is expected to rise to around 2280 BkWh by 2021–22 and around 4500 BkWh by 2031–32 [3]. India's energy consumption has been increasing comparatively fast rate due to increase in population and living standard as well. Current centralized energy planning of India is mainly dependent on thermal power plant for energy need and its percentage share is near about 70% of total installed capacity of power plant [4]. This over dependency creates pressure on fossil fuel. The main concern arises on how to protect the fossil fuel for our coming generation with simultaneously utilizing the different resources of energy for high and sustained economic growth. Thermal Power Plant also affects surrounding environment very badly. It is also worth to note that very high amount of carbon dioxide (CO<sub>2</sub>) emission (0.9–0.95 kg/kwh) and SO<sub>x</sub>, NO<sub>x</sub> emission from thermal power plants contribute to global warming leading to climate change [5]. In the past century, research and literature have concluded that CO<sub>2</sub> concentration increased by 28% following the industrial revolution. The global average temperature has increased by 0.3 °C to 0.6 °C, and the sea level rose 10–15 cm in the past 100 years. Scientists predict that if greenhouse gas emissions continue and no effective protection policies for the environment are put into place, the global temperature will increase by 1–3.5 °C, and the sea level will increase by 15–95 cm [6]. Through electricity consumption industry contributes about 37% of the global green house gas emissions. Total energy-related emissions, which were 9.9 Gt CO<sub>2</sub> in 2004, have grown by 65% since 1971 [7,8]. Due to global warming people face natural disasters every year. In terms of per capita equity India is 145th in the world with a release of 1.25 t CO<sub>2</sub> per annum [9]. Pressure to increase its energy supplies and the consequent negative environmental impact of fossil fuels has led India to a conscious policy toward renewable sources [10].

Similarly after coming in the class of developing country each village of India has not been electrified. As of 31st March 2014 out of a total 5,93,732 inhabited villages, only 5,72,414 (96.4%) villages have got access to electricity. There are still 21,318 villages in India which have got no access to electricity for irrigation, education and lighting their houses. Development is only dream for people of these villages. The main reason for this situation is that these villages located at remote areas. Also a lot of investment is required in setting up transmission and distribution (T&D) mechanisms in the rural areas. Renewable energy become a very suitable candidate in these case as it is much more cost effective and less time consuming to set up in rural areas [11].

India's energy use efficiency for generating gross domestic product (GDP) in purchasing power parity (PPP) terms is better than the world average, but per capita power consumption is

among the lowest in the world. The country's per capita electricity consumption has reached 1010 kW-h (kWh) in 2014–15. In comparison, China has a per capita consumption of 4000 kWh, with developed nations averaging around 15,000 kWh per capita. India's CO<sub>2</sub> intensity is also one of the lowest at 0.22 kg of CO<sub>2</sub> per dollar of GDP PPP\_2000. This compares with 0.61 for China, 0.50 for US and 0.47 as global average. India's energy consumption needs to grow, as energy is a vital input for economic growth and for human development. Energy requirement itself depends on the policies pursued. Thus one needs to develop alternative scenarios that capture the impact of different policy options. An approach that facilitates such scenario construction is needed [12–14]. The government of India also try to balance the country's electricity demand with simultaneously environmental protection from the use of coal and other energy sources to produce electricity. Therefore there is need of new sources of energy. Renewable energy is the main option in these circumstances. Available potential of renewable energy can be explored and harnessed to meet the energy demand. There are different sources of renewable energy like Hydro, solar, wind and biomass energy present in our nature to overcome the crisis of energy. With large power potential, these renewable sources will short out the problem of electricity generation in future.

Therefore the main objectives of this paper are to explore the possible ways to provide electricity to each and everyone even in remote areas of the country, second to reduce pressure on fossils fuel and save it for next coming generation and third save the environment from global warming and ultimately from natural disasters.

## 2. Current energy scenario of India

India became the world's third largest producer of electricity in the year 2013 with 4.8% global share in electricity generation surpassing Japan and Russia but is still a power deficit country [15]. Despite tremendous growth in electricity generation, country continues to face both energy and peak deficit. During the year 2014–15, there would be energy shortage of 5.1% and peak shortage of 2.0% [16]. As the economy grows in coming years the electricity demand will further rise as there is strong correlation between rise in energy consumption and economic growth. India has been putting steady efforts at increasing its energy generation capacity. However, the demand for energy has been continuously outstripping supply. The table given below indicates the region wise installation capacity of different sources of electricity. State-owned and privately owned companies are significant players in India's electricity sector, with the private sector growing at a faster rate. India's central government and state governments jointly regulate electricity sector in India (Table 1).

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