

Renewable Energy Technologies - Present and Future Prospects in Indian Economy

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ABSTRACT

Energy is the most essential component for the economic development of any country. India's increase in population and economic development in recent years has put a pressure on Power sector. Energy plays an important role in economic Growth of a country so it is an important Issue when we think about economy of a country. At present coal based energy is posing threat to climate as well as health issues among living beings. Our attention towards Renewable Energy Technologies will help in reducing climate changes. In this Paper we are discussing about the renewable energy prospects in India and how they will be helpful in boosting the economy of our developing Nation.

Keywords: - Economy, Energy, Renewable, Solar, Wind

I. INTRODUCTION

Over the years, renewable energy sector technologies have emerged as a significant player in power generation in India. Power is one of the most important and crucial components for the economic development and welfare of any nation. The existence and development of adequate power sector is very important for the sustainable growth of the Indian economy. India's power sector is one of the most diversified in the world. Sources of power generation in India range from conventional sources such as natural gas, coal, oil, hydro and nuclear power to non-conventional sources such as wind, solar, biomass etc. With industrialization and urbanization, demand for electricity in India has increased rapidly and is expected to grow further in the coming years. In order to cope up with the ever increasing demand of electricity massive addition to the installed capacity is required. In the last five years there has been a visible impact of renewable energy technologies in the Indian economy. Renewable energy technologies in India have experienced tremendous changes in the policy framework during last few years.

India is the fourth largest energy consumer in the world after United States, China and Russia [1]. In our country the main contribution of energy is from thermal plants which accounts for about 60% of total energy. Developed nations promote renewable energy technologies as they are sensitive towards the environment and follow various international climate conventions like the United Nations Framework on Climate Change or UNFCCC [2]. While developing countries adopts renewable energy technologies for energy security, bridging the energy deficit, and enabling this energy to reach the masses in the form of basic lighting devices (Solar lights) and cooking systems (Bio gas plants).

Renewable Energy projects are normally of high capital and lower levels of energy generation due to limited availability of natural resources like wind velocity and solar radiation, which ultimately leads to higher cost of energy generation. Most of the projects are limited to not more than few hundred megawatts of capacity.

II. INDIA’S ENERGY SCENARIO

India became the world’s third largest producer of electricity in 2013 after China and United States, surpassing Japan and Russia but is still a power deficit country [1]. Despite this country still continues to face both energy and peak deficit. As ours is a growing economy, the demand for electricity is going to increase in the coming years. India has been putting steady efforts for increasing its energy generation capacity with installation of new power plants and new hydal projects.

Table 1 depicts the total installed power generation capacity with sector wise and type wise break up. Here we can see that main projects in case of renewable energy sector are taken up by private sector (except for hydro), while in case of nuclear energy 100% is taken up by central government.

Table 1: - The total installed utility power generation capacity as on 30 April 2017 with sector wise & type wise break up is as given below. [3]

| Sector | Thermal (MW) | | | | Nuclear (MW) | Renewable | | Total (MW) | % |
|-----------|--------------|----------|--------|-------------------|--------------|-----------|-----------------|------------|-----|
| | Coal | Gas | Diesel | Sub-Total Thermal | | Hydro | Other Renewable | | |
| Central | 55245.00 | 7490.83 | 0.00 | 62735.83 | 6780 | 11651.42 | 0.00 | 81167.25 | 25 |
| State | 65145.58 | 7257.95 | 363.93 | 72767.38 | 0.00 | 29703.00 | 1963.80 | 104447.28 | 32 |
| Private | 74012.38 | 10580.60 | 473.70 | 85066.68 | 0.00 | 3240.00 | 55283.33 | 143590.01 | 43 |
| All India | 194402.88 | 25329.38 | 837.63 | 220569.88 | 6780 | 44594.42 | 57260.23 | 329204.53 | 100 |

The Indian power sector has been continuously progressing in generation capacity, through conventional energy technologies like Coal, Gas, Hydro and nuclear power and non conventional sources like Wind, Solar, small hydro and biomass [4].

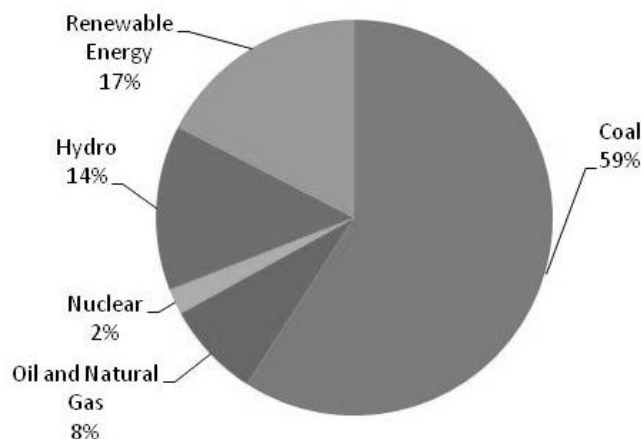


Fig 1 Sources of electricity in India

III. RENEWABLE SOURCES OF ENERGY

Renewable energy is that energy that is collected from renewable resources, which are naturally replenished on a human timescale, such as sun light, wind, rain, tides, waves and geothermal heat. We are lucky to be blessed with a variety of renewable energy sources such as biogas, sun, wind, geothermal and tidal. India's electricity energy sector is amongst the world's most active players in renewable energy utilization, especially wind energy. As of end of July 2017, India had an installed capacity of about 32.56 GW Wind Energy mainly spread across the South, West and North regions [5].

Table 2 Renewable energy in India as on 31 March 2017 [3]

| S.No | Renewable Sources of Energy | Capacity (MW) | % Share |
|------|-----------------------------|---------------|---------|
| 1 | Wind | 32279 | 56.5 |
| 2 | Solar | 12288 | 21.5 |
| 3 | Small Hydro Power | 4379 | 7.7 |
| 4 | Biomass | 8182 | 14.3 |
| 5 | Total | 57128 | 100 |

Renewable energy is very important in reducing global carbon emissions. It's now a well known fact that climate is changing and fossil fuel emissions are contributing greatly to this change. By contrast the emissions from wind turbines and solar panels are almost zero. By recent Greenpeace estimates, the world could save \$180 billion a year by switching 70% of the planet's electricity production and converting to renewable options [6].

3.1 Wind Energy

In India Wind power installed capacity has increased from 9587MW in 2007 to 32279 MW in 2017 [5]. According to economic survey 2016-17 India ranks 4th globally in terms of installed wind energy capacity after China, U.S. and Germany. Today India is an important player for wind energy in the international market. In India major wind energy projects had been installed in the coastal line in the States of Tamil Nadu, Maharashtra, Karnataka, Gujarat and Rajasthan. The National Institute for Wind Energy (NIWE) latest estimate for India's wind power potential is 302 GW at 100 meters [7]. In order to exploit the vast coastline for offshore wind energy in the Indian Exclusive Economic Zone, the National Offshore Wind Energy Policy has been released.

3.2 Solar Energy

Among the various renewable energy resources, the solar energy potential is highest in the country. Most parts of India Solar capacity in India is expected to touch 18.7GW by the end of 2017 overtaking Japan [9]. Most of the parts in India receive 4-7 kWh of solar radiation per square meter per day in a year [8]. The country has set a target of 20 GW of solar energy by 2020.

3.3 Small Hydro Energy

Ministry of New and Renewable Energy has been vested with the responsibility of developing Small Hydro Power (SHP) projects which are up to 25 MW capacities [10]. The estimated potential for power generation in the country from such plants is about 20,000 MW. Most of the projects are in Himalayan States as river-based projects and in other States on canals used for irrigation. The SHP programme is now essentially private

investment driven. Projects are normally economically viable and private sector is showing lot of interest in investing in SHP projects. The viability of these projects improves with increase in the project capacity. The Ministry's aims that in next 10 years at least 50% of the potential in the country is harnessed. The main drawback of these projects is that they are dependent on continuous flow of water which is not possible during draught and dry seasons.

3.4 Bio Mass Energy

Biomass is organic material that includes wood, sawdust, animal dung, plant leaves, crop residue and animal waste, and is a renewable source of energy contributing about 14% of the total renewable energy [11]. Biomass contains stored energy from the sun. Plants absorb the sun's energy in a process called photosynthesis. When biomass is burned, the chemical energy of biomass is released as heat which is used to produce electricity. In India mainly bagasse is used as biomass for production of electricity. This electricity produced is mainly distributed in remotes and rural areas. The Indian Institute of Science, Bengaluru has developed Biomass Atlas of India.

IV. ECONOMIC VIABILITY AND FUTURE OF RENEWABLE ENERGY TECHNOLOGIES

It is a well known fact that initial cost of installation for most of the renewable energy technologies is higher but at the same time its running and maintenance cost is less, which makes it more attractive. With increase in coal, diesel and petrol prices, in the coming days energy from renewable sources is going to be more attractive and cheaper. History was created on May 2017 when tariff of Rs. 2.44 per unit was disclosed in the auction carried out by Solar Energy Corporation of India Limited (SECI) for 500 MW capacity in Bhadla Phase-III Solar Park, Rajasthan.

Also the wind tariff in India touched lowest level of Rs.2.64 per kWh in the second wind auction conducted by the Solar Energy Corporation of India (SECI) on behalf of Ministry of New & Renewable Energy, Government of India in the month of October 2017. With improving technology and reducing tariffs Ministry is not only confident of achieving the target of 175 GW by 2022 but exceeding it.

India with increase in population, global warming and diminishing coal and petrol resources, needs to maintain its momentum in the field of renewable resource energy. Solar capacity has been increased from 2.6 to 12.2GW in last three years. A record of 5.5 GW wind capacity was added in last financial year 2016-17.

The government has taken many steps to promote the installation of renewable energy technologies. Solar pumping systems are being promoted for irrigation facilities to be adopted by farmers. A huge amount of subsidy is also being provided for such systems through Centre and State Government schemes.

A number of institutions have also been established and are working for the promotion of renewable energy technologies. To name few these are National Institute of Solar Energy (NISE), National Institute of Wind Energy (NIWE), Sardar Swaran Singh National Institute of Bio-Energy (SSS-NIBE), Indian Renewable Energy Development Agency (IREDA), Solar Energy Corporation of India (SECI), Sardar Patel Renewable Energy Research Institute (SPRERI).

V. CONCLUSIONS

We as a developing country, have to set targets for Renewable Energy Technologies to boost our growing economy in coming future. We have a major role in reducing the green houses gases by adopting these technologies at a faster pace in the years to come. By adopting renewable technologies we have to invest less on pollution control measures. It has been established fact that India has a great potential for renewable energy. Only right technology at right place need to be established with a positive attitude so that these technologies are adopted both at rural and urban areas. Thus adopting renewable energy technologies are surely going to boost up Indian economy in the near future.

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