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Review of Renewable Energy Resources

M. Priyadharshini[1], R. Saravanan[2], S. Ramya[3]

IInd Year EEE, Dhirajlal Gandhi College of Technology, Salem, Tamilnadu, India[1, 3]

Assistant Professor, Dhirajlal Gandhi College of Technology, Salem, Tamilnadu, India[2]

Abstract: The electricity requirements of the world including India are increasing at alarming rate and the power demand has been running ahead of supply. Other conventional resources, presently being used for generation of electrical energy, may not be either sufficient or suitable to keep pace with ever increasing demand of the electrical energy of the world. Also generation of electrical power by cold based steam power plant or nuclear power plants causes pollution, which is likely to be more acute in future due to large generating capacity on one side and greater awareness of the people in this respect. The recent severe energy crisis has forced the world to develop new and alternative methods of power generation, which could not be adopted so far due to various reasons. The non-conventional methods of power generation may be such as solar energy, wind power, hydro-electric energy, biomass, hydrogen and fuel cells, geo-thermal power etc. This paper elucidates about different non-conventional energy sources like solar, wind, hydroelectric, biomass, geothermal etc,

Keywords: Ministry of New and Renewable Energy (MNRE), National Action Plan for Climate Change (NAPCC)

I. INTRODUCTION

Renewable energy in India comes under the purview of the Ministry of New and Renewable Energy. India was the first country in the world to set up a ministry of non-conventional energy resources, in early 1980s. India's cumulative grid interactive or grid tied renewable energy capacity (excluding large hydro) has reached 33.8 GW,[1] of which 66% comes from wind, while solar PV contributed nearly 4.59% along with biomass and small hydro power of the renewable energy installed capacity in India.

Renewable energy is considered to be an important driver for low carbon growth and India's sustainable solution to issues related to electrification in remote locations. India has around 150 GW of known renewable energy potential. This potential is likely to be even greater than 150 GW, if all the sources including tidal, wave, geothermal with significant generation capacity will be mapped. Even with such a vast potential, only ~22% of renewable energy potential (i.e. 33 GW1) is developed in the country.

The total installed capacity in India is around 2562 GW (as on October 2014) primarily dominated by thermal sources of energy. Thermal energy (comprising of oil, coal and natural gas) contributes around 69%3 of total installed capacity followed by hydro, renewable and nuclear energy. Renewable energy forms ~12.8%4 of total installed capacity.

This also shows that we are progressively moving towards the National Action Plan for Climate Change (NAPCC) target of renewable energy (i.e. 15% by 2020). India‟s commitment to reduce carbon emissions and fuel related concerns in conventional sector has increased in recent years; the Government has shifted focus towards development of renewable energy sources.

This step will help India in achieving energy security, reducing adverse environmental impact, lowering carbon intensity and realizing its aspirations for leadership in high-technology industries by contributing to a more balanced regional and global development.

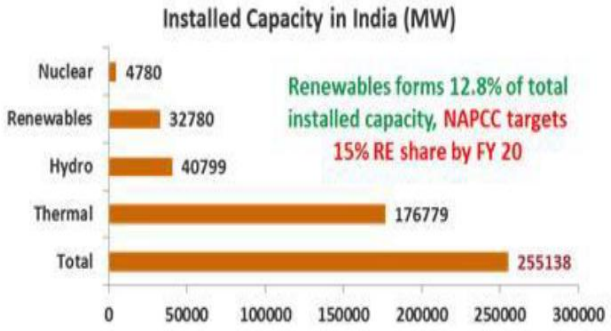

Fig -1: Installed capacity in India as on October 2014

However, in order to achieve the NAPCC targets as specified above, India needs a substantial increase in renewable energy capacity in the next five years. The targets specified in the 12th plan period aim at faster, sustainable and more inclusive growth as is also evident from ambitious targets indicated in working group report of Ministry of New and Renewable Energy (MNRE).

Even with potential for providing predictable and sustainable electricity generation with relatively lower visual impact; ocean power / geothermal constitutes a meager percentage of the 30 GW in the 12th.plan renewable energy targets for grid-connected renewable capacity addition. It has been learnt that marine power has traditionally suffered from relatively high cost and limited

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availability of sites with sufficient potential, thus constricting its total availability. However, following recent technological developments and improvements, both in design & turbine technology; it is expected that it will result in lowering of levelised costs for harnessing marine energy to competitive levels.

The Overall generation in the country has been increased from 967.150 BU during 2013-14 to 1048.673 BU during the year 2014-15. The Category wise generation

performance as follows:-
Thermal Increased by 10.83 %
Hydro Reduced by 4.16 %
Nuclear Increased by 5.47 %
Bhutan Import Reduced by 10.54 %
Overall Growth rate recorded by 8.43 %
The annual growth in power generation during recent years is as under:

Year	Growth in Achievement (%)
2008-09	2.7
2009-10	6.6
2010-11	5.56
2011-12	8.11
2012-13	4.01
2013-14	6.04
2014-15	8.43

Table.1 Annual growth in power generation

2. RENEWABLE ENERGY SOURCES

Source	Total Install Capacity (MW)
Wind Power	24,759.32
Solar Power (SPV)	4,684.74
Small Hydro Power	4,161.90
Biomass Power(Biomass & Gasification and Bagasse Cogeneration	4,550.55
Waste to Power	127.08
Total	38,283.59

Table.2 Total Renewable Energy Installed Capacity (31 Nov 2015)

3. SOLAR ENERGY

India is densely populated and has high solar insulation, an ideal combination for using solar power in India. Much of the country does not have an electrical grid, so one of the first applications of solar power has been for water pumping, to begin replacing India's four to five million diesel powered water pumps, each consuming about 3.5 kilowatts, and off-grid lighting. Some large projects have been proposed, and a 35,000 km² area of the Thar Desert has been set aside for solar power projects, sufficient to generate 700 to 2,100 gig watts.

The Indian Solar Loan Programme, supported by the United Nations Environment Programme has won the prestigious Globe World award for Sustainability for helping to establish a consumer financing program for solar home power systems.

Over the span of three years more than 16,000 solar home systems have been financed through 2,000 bank branches, particularly in rural areas of South India where the electricity grid does not yet extend.

Launched in 2003, the Indian Solar Loan Programme was a four-year partnership between UNEP, the UNEP Risoe Centre, and two of India's largest banks, the Canara Bank and Syndicate Bank.[19]

Announced in November 2009, the Government of India proposed to launch its Jawaharlal Nehru National Solar Mission under the National Action Plan on Climate Change with plans to generate 1,000 MW of power by 2013 and up to 20,000 MW grid-based solar power, 2,000 MW of off-grid solar power and cover 20 million sqmetres with collectors by the end of the final phase of the mission in 2020.

The Mission aims to achieve grid parity (electricity delivered at the same cost and quality as that delivered on the grid) by 2020. Achieving this target would establish India as a global leader in solar power generation.

3.1Solar manufacturing challenges

- Dependent on imported wafers for cell manufacturing.
- High cost of financing/capital.
- Competition from China & Taiwan.
- Low demand in India.
- Lack of technical knowledge especially in the upstream segment.

Beyond the above challenges, land is also a scant reserve in India and per capita land availability is low. Dedication of land area for exclusive installation of solar arrays might have to vie with other provisions that require land. The amount of land required for utilityscale solar power plants is currently approximately 1 km2 for every 20–60 MW (MW) generated.

3.2 Advantages

1. Non polluting
2. Renewable sources
3. Lowmaintainance
4. Easy installation.

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3.3powerconsumption

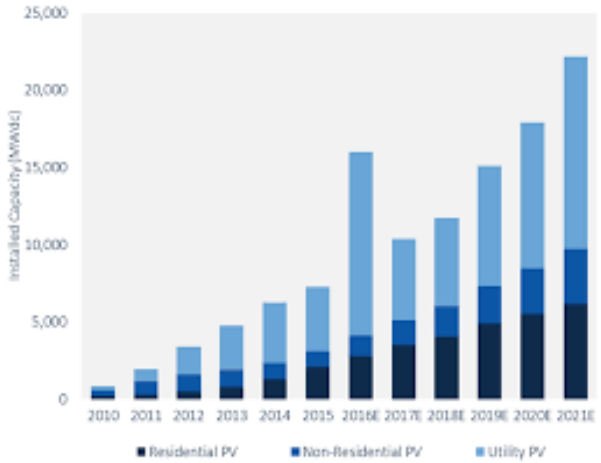

Fig -2: Installed capacity in India

3.4 Areas

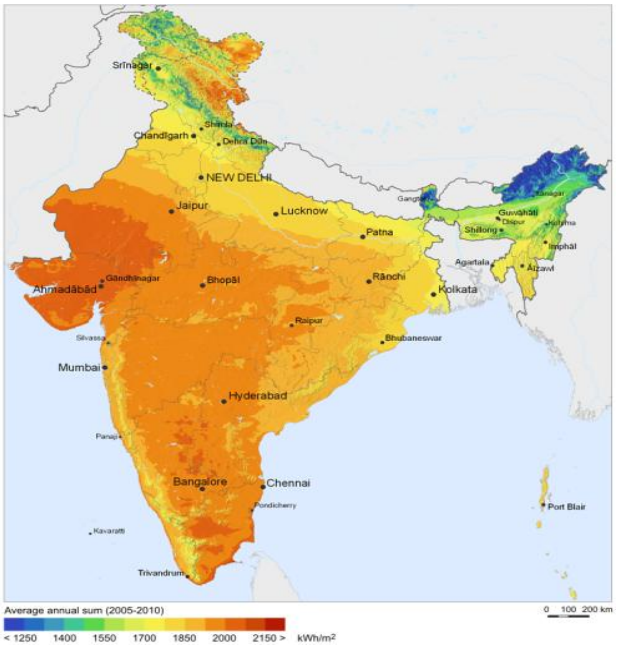

Fig3: Solar Energy in India

4. WIND POWER

India is surpassed only by Germany as one of the world's fastest growing markets for windenergy. By the mid 1990s, the subcontinent was installing more wind generating capacity thanNorth America, Denmark, Britain, and the Netherlands.

The ten machines near Okha in the province of Gujarat were some of the first wind turbinesinstalled in India. These 15-meter Vestas wind turbines overlook the Arabian Sea. Now, in2006, there is an installed capacity of 4,430 MW; however, ten times that potential, or 46,092 MW, exists.

4.1 Advantages of Wind Power:

- It is one of the most environment friendly, clean and safe energy resources.
- It has the lowest gestation period as compared to conventional energy.
- Equipment erection and commissioning involve only a few months.
- There is no fuel consumption, hence low operating costs.
- Maintenance costs are low.
- The capital cost is comparable with conventional power plants. For a wind farm,the capital cost ranges between 4.5 crores to 5.5 crores, depending on the site andthe wind electric generator (WEG) selected for installation.

4.2 Power consumption:

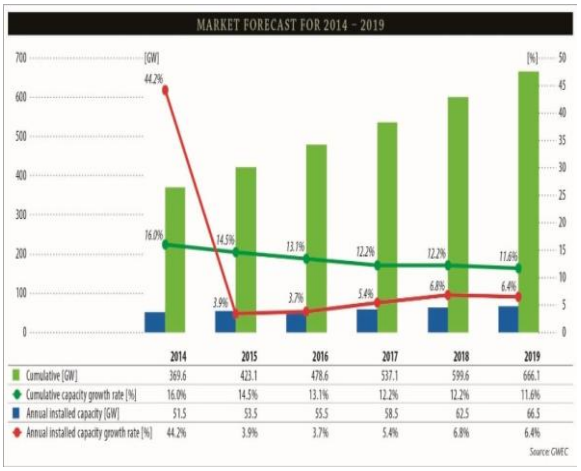

Fig -4: Installed capacity in India

4.3 Areas

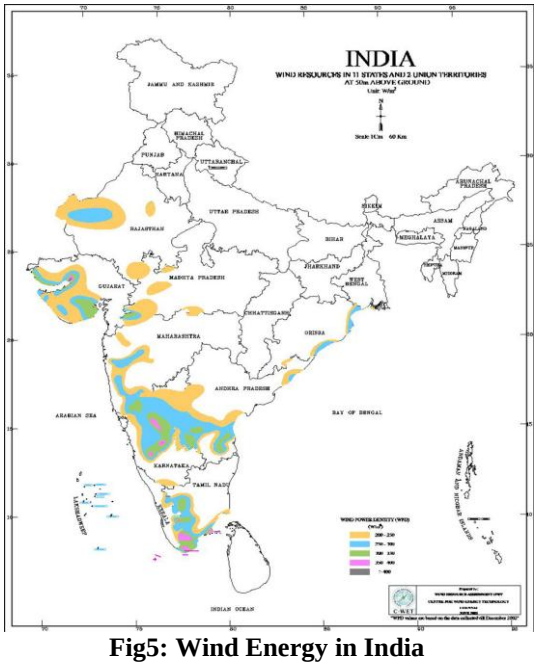

Fig5: Wind Energy in India

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5. BIOMASS

Is the term for energy from plants? Energy in this form is very commonly used throughout the world. Unfortunately the most popular is the burning of trees for cooking and warmth. This process releases copious amounts of carbon dioxide gases into the atmosphere and is a major contributor to unhealthy air in many areas.

Some of the more modern forms of biomass energy are methane generation and production of alcohol for automobile fuel and fueling electric power plants.

5.1 Advantages of biomass:

- Reducing methane levels
- Improved Air Quality
- Preventing Forest Fires
- Reliability
- Recycling

5.2 Power consumption:

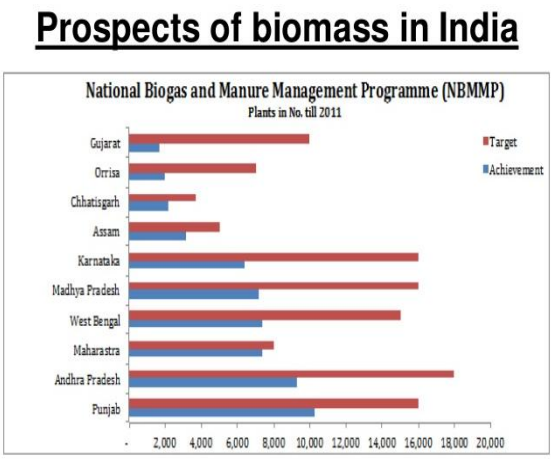

Fig6: Biomass in India

5.3 Areas

Fig7: Biomass in India

6. HYDRO POWER

This form uses the gravitational potential of elevated water that was lifted from the oceans by sunlight. It is not strictly speaking renewable since all reservoirs eventually fill up and require very expensive excavation to become useful again. At this time, most of the available locations for hydroelectric dams are already used.

6.1 Advantage:

- No Fuel Cost
- Low Operating Costs and little Maintenance
- No Greenhouse Gas Emissions/Air Pollution
- High Load Factor.

6.2 Power consumption:

HYDRO POWER

Country	Annual hydroelectric production (TWh)	Installed capacity (GW)	Capacity factor	% of total capacity
China	585.2	197	0.37	22.25
Canada	369.5	89	0.59	61.12
Brazil	363.8	69	0.56	85.56
USA	250.6	80	0.42	5.74
Russia	167.0	45	0.42	17.64
Norway	140.5	28	0.49	98.25
India	115.6	34	0.43	15.80
Venezuela	86.8			67.17
Japan	69.2	27	0.37	7.21
Sweden	65.5	16	0.46	44.34

Fig8: Hydro power in India

6.3 Areas:

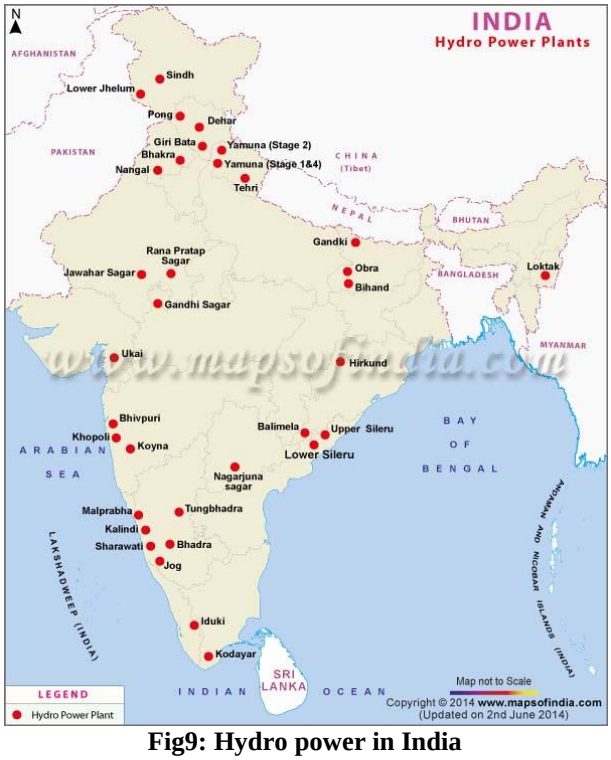

Fig9: Hydro power in India

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7. COMPARISON BETWEEN ENERGIES

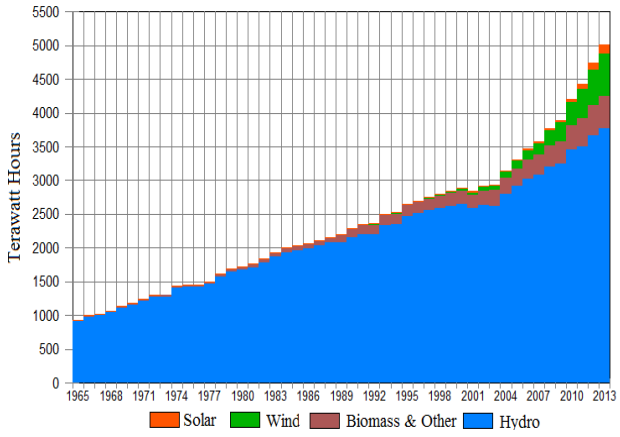

Fig10: Comparison between energies

7.1 Projected energy consumption of India for 2030

Currently, 45 percent of households in India do not have access to electricity. Newlegislation has set a target of electrifying all households by 2010. As in the past, the ongoingchallenge in providing electricity is the ability of the poor to pay.

India announced plans inMarch, 2005, to continue subsidizing electricity consumption for rural and poor households thatuse less than 30 kilowatt hours per month.

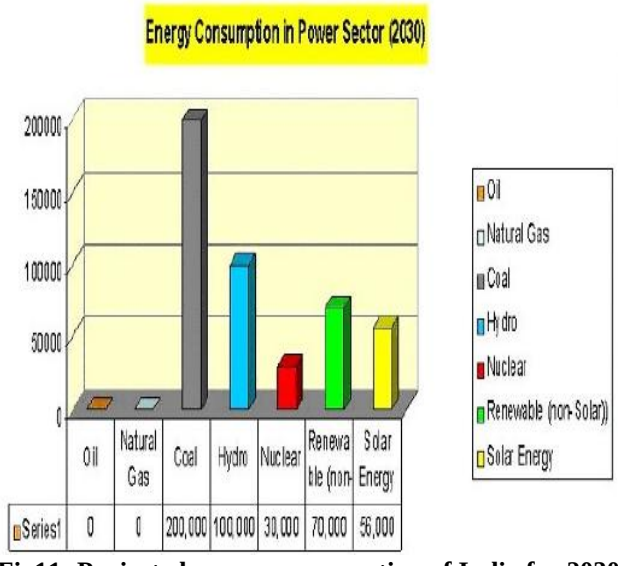

Fig11: Projected energy consumption of India for 2030

8. CONCLUSION

This paper presents the Renewable Energy capacity in India and installation of Renewable Energy Generation.The renewable sources is cost effective, user-friendly, so that they can easily beat the fossil fuels by promoting renewable energy sources we can avoid, Air pollution, soil pollution and water pollution Country's Economy will increase.

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BIOGRAPHIES

M. Priyadharshini she is pursuing UG degree in Electrical and Electronics Engineering at Dhirajlal Gandhi College of Technology, Salem. He has received awards/prizes for innovative projects and circuit debugging event etc., His research interest involves in electronics, electrical machines and renewable energy resources.

R. Saravanan he is received the Diploma in Electrical and Electronics Engineering in 2001 from K.S.R Institute Technology, Tiruchengode. He is received her undergraduate degree in Electrical & Electronics Engineering from Government College of Engineering, Salem in 2009 and postgraduate degree in Power Electronics and Drives from Sona College of Technology, Salem in 2012. He is working as Assistant Professor in Department of Electrical & Electronics Engineering at Dhirajlal Gandhi College of Technology, Salem and has been teaching for more than 4 years. He has published 8 papers in National and International Journals/Conferences and has supervised undergraduate projects. Her research interests include power Electronics, harmonics, power system and renewable energy.

S. Ramya she is pursuing UG degree in Electrical and Electronics Engineering at Dhirajlal Gandhi College of Technology, Salem. He has received awards/prizes for innovative projects and circuit debugging event etc., His research interest involves in electronics, electrical machines and renewable energy resources.