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Non Conventional Energy's Overview Sources of India

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Abstract— The energy of a body is its capacity to do work. It is measured the total amount of work that the body can do. Everything what happens in the world is the expression of flow of energy in one of its forms. Today every country draws its energy needs from a variety of sources. We can broadly categorize these sources as conventional and nonconventional. The conventional sources include the fossil fuels (coal, oil and natural gas), types of nuclear power (Uranium), while the nonconventional sources such as sunlight, wind, rain, tides, and geothermal heat, which are renewable. The energy crisis which began in 1973 caused petroleum supplies to decrease and prices to rise exorbitantly. This crisis forced developing countries to reduce or postpone important development programs, so they could purchase petroleum to keep their economies operating. It created the urgent necessity to find and develop alternative energy sources, such as other fossil fuels (coal, gas), nuclear energy, and renewable energy resources. The consumption of energy is directly proportional to the progress of the mankind. With ever growing population, improvement in the living standard of the humankind, Industrialization of developing countries, the global demand for energy is expected to increase significantly in the near future. The primary source of energy is fissile fuel, however these fissile fuel sources are finite also with their fastly widespread use degradation of environment takes place, which causes global warming, urban air pollution and acid rain, It strongly suggest that the time is now come to harness and use the non-conventional and environment friendly energy sources is vital for steering the global energy supplies towards sustainable path. This paper describes in brief the non conventional energy sources and their usage in India.

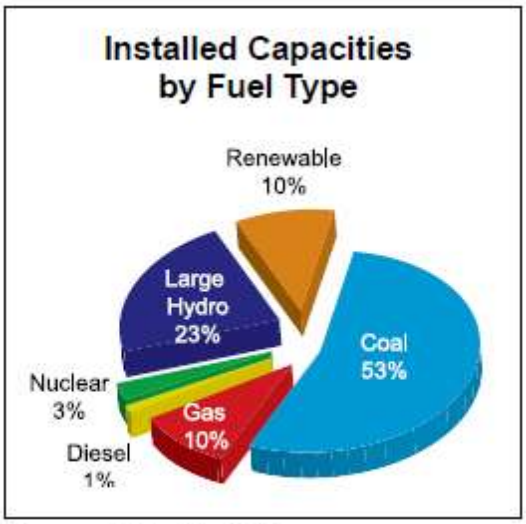
Keywords— NON CONVENTIONAL, Wind Energy, Hydro Energy, INDIAN POWER SCENARIO, Solar Energy, Biomass energy, Biofuel

1. Introduction

THE oil shocks of 1970s led to spiraling crude oil prices in the world market which prompted planners to view energy security as an issue of national strategic importance. Energy security has an important bearing on achieving national economic development goals and improving the quality of life of the people. India's dependence on crude oil will continue for most part of the 21st century. In addition, global warming, caused largely by greenhouse gas emissions from fossil fuel energy generating systems, is also a major concern. India needs to develop alternate fuels considering the aforesaid two concerns. India has a vast supply of renewable energy resources, and it has one of the largest programs in the world for deploying renewable energy products and systems. Indeed, it is the only country in the world to have an exclusive ministry for renewable energy development, Ministry of New & Renewable Energy Sources (MNRE) supports the implementation of a large broad- spectrum of programs covering the entire range of new and renewable energies. The program broadly seeks to, supplement conventional fossil fuel- based power; reach renewable energy, including electricity to remote rural areas for a variety of applications like water pumping for irrigation and drinking water purposes, drying farm produce, improved chulhas and biogas plants, energy recovery from the urban, municipal and industrial wastes. In addition, exploitation of hydrogen energy, geothermal energy, tidal energy and biofuels for power generation and automotive applications is also planned. Increasing the share of new and renewable energy in the fuel-mix is in the India's long-term interest. Although, the development process may warrant selection of least-cost energy options, strategic and environmental concerns may, on the other hand, demand a greater share for new and renewable energy even though this option might appear somewhat costlier in the medium-term.

2 INDIAN POWER SCENARIO

With high economic growth rates and over 15 percent of the world's population, India is a significant consumer of energy resources. In 2009, India was the fourth largest oil consumer in the world, after the United States, China, and Japan. Despite the global financial crisis, India's energy demand continues to rise. In terms of end-use, energy demand in the transport sector is expected to be particularly high, as vehicle ownership, particularly of four-wheel vehicles, is forecast to increase rapidly in the years ahead India currently has 15,789 MW of installed renewable energy sources out of 1, 57,229 MW total installed capacities with distribution shown below

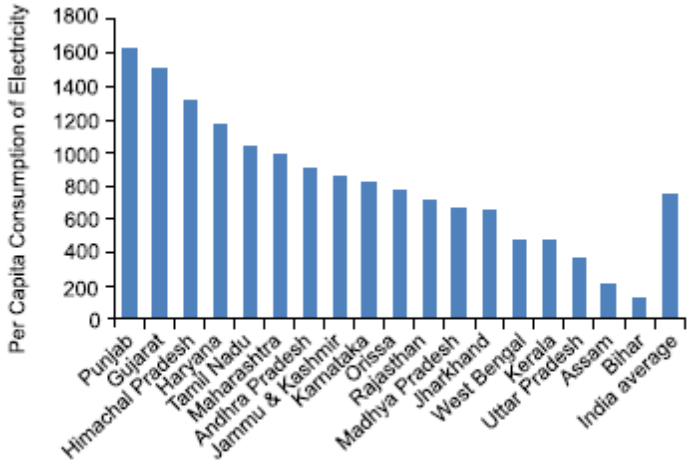


Source: CEA, July 2010

1. Thermal power - 64.6 per cent of the total installed capacity, producing 1,00,598 MW.
2. Hydel power plants come next with 24.7 per cent of the total an installed capacity of 36,863 MW.
3. Renewable energy sources contribute around 10% to the total power generation in the country producing 15,789 MW (as on 31.1.2010).

• Gross Generation: 640 BUs

• Per Capita Consumption: 632 kwh/ ANNUM



Source: Indiastat.com (http://www.indiastat.com)

Among 16 major states, per capita electricity consumption of Punjab, Gujarat, Haryana, Tamil Nadu, and Maharashtra exceeded 1,000 kWh in 2007-08. On the other hand, for underdeveloped states such as Bihar the figure was as low as 10 kWh.

• Energy Shortage about : 12%

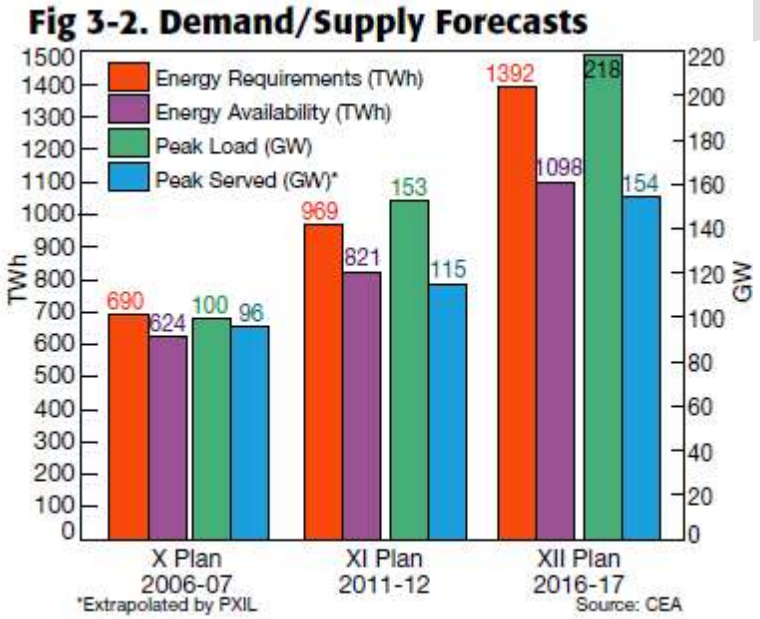
• Peaking Shortage about: 13-15 %

• Electricity demand growing @ 8% annually

• Capacity addition of about 92,000 MW required in the next 10 years

• Challenge is to meet the energy needs in a sustainable manner

However India's demand/supply gap is 12% on average and the progressive states see a gap in access of 15%. Being one of the fastest growing economies, the average energy usage per capita is expected to increase from 632kWh per annum today to 1000kWh by the beginning of 2013.



The key drivers for renewable energy are the following:

· The demand-supply gap, especially as population increases

· A large untapped potential

· Concern for the environment

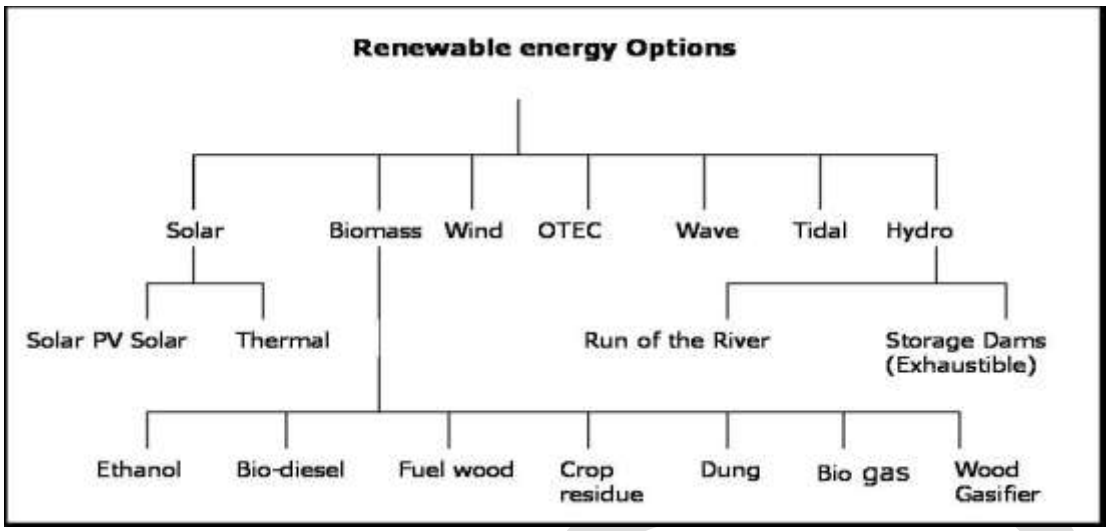
· The need to strengthen India's energy security

· Pressure on high-emission industry sectors from their shareholders

· A viable solution for rural electrification

3 POWER FROM NON CONVENTIONAL ENERGY

India is one of the fastest growing countries in terms of energy consumption. Currently, it is the fifth largest consumer of energy in the world, and will be the third largest by 2030. At the same time; the country is heavily dependent on fossil sources of energy for most of its demand. This has necessitated the country to start aggressively pursuing alternative energy sources - solar, wind, biofuels, small hydro and more.



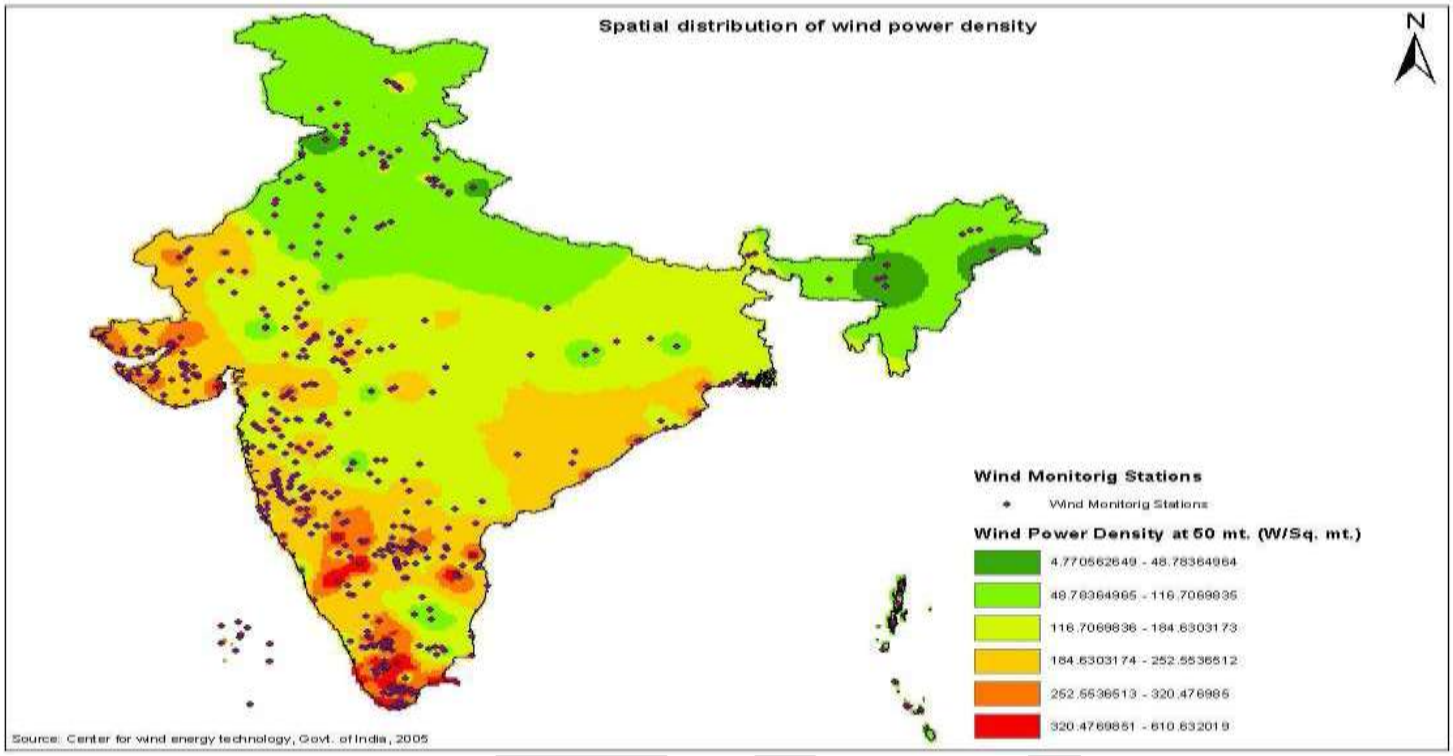
The country has an estimated renewable energy potential of around 85,000 MW from commercially exploitable sources: Wind, 45,000 MW; small hydro, 15,000 MW and biomass/bioenergy, 25,000 MW. In addition, India has the potential to generate 35 MW per square km using solar photovoltaic and solar thermal energy. It has proposed an addition of 15,000 MW of Renewable Energy generation capacities during the period. Wind Power projects form 70 percent (10,500 MW) of the proposed capacity addition, while Small Hydro Projects (SHP) accounts for 9.3 per cent (1,400 MW).

A) Wind Energy

India's wind power potential has been assessed at 48500 MW. The current technical potential is estimated at about 13 000 MW, assuming 20% grid penetration, which would increase with the augmentation of grid capacity in potential states. The state-wise gross and technical potentials are given below

India is implementing the world's largest wind resource assessment program comprising wind monitoring, wind mapping and complex terrain projects.

State	Gross potential (MW)	Technical potential (MW)
Andhra Pradesh	8275	2110
Gujarat	9675	1900
Karnataka	6620	1310
Kerala	875	610
Madhya Pradesh	5500	1050
Maharashtra	3650	3060
Orissa	1700	1085
Rajasthan	5400	1050
Tamil Nadu	3050	2150
West Bengal	450	450
Total	45195	14775



This program covers 800 stations in 24 states with around 200 wind monitoring stations in operation at present. Wind Electric Generators are being manufactured in the country by a dozen manufacturers through

(i)joint ventures or under licensed production

(ii)subsidiaries of foreign companies under licensed production and

(iii) Indian companies with their own technology. The current annual production capacity of domestic wind turbine is about 3,000 MW.

B) Hydro Energy

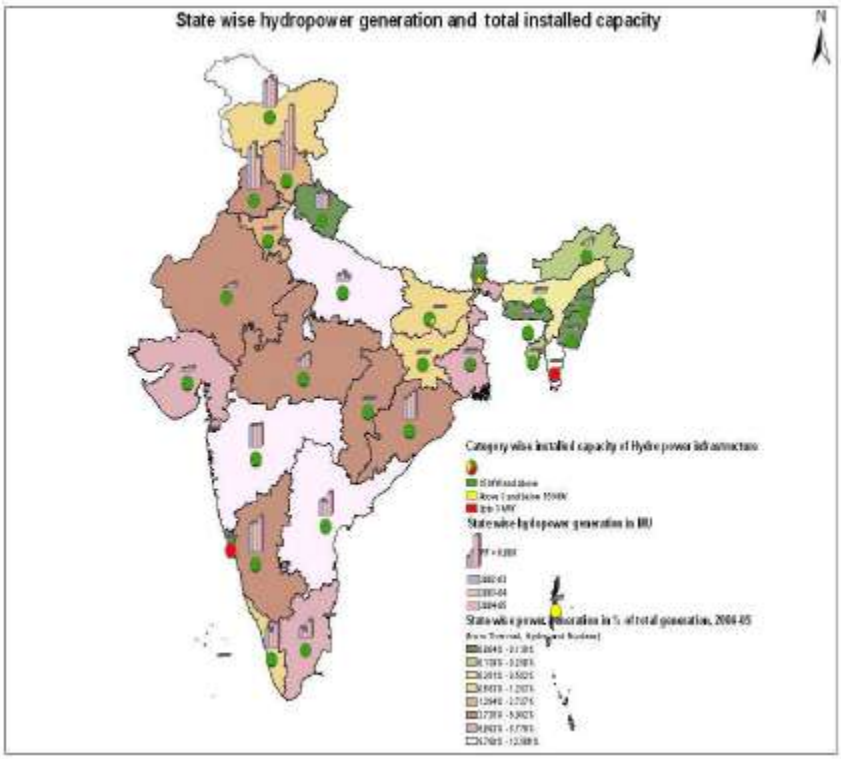
Hydro power is the largest renewable energy resource being used for the generation of electricity. The 50,000 MW hydro initiatives have been already launched and are being vigorously pursued with DPRs for projects of 33,000 MW capacity already under preparation. Harnessing hydro potential speedily will also facilitate economic development of States, particularly North-Eastern States, Sikkim, Uttaranchal, Himachal Pradesh and J&K, since a large proportion of our hydro power potential islocated in these States. In India, hydro power projects with a station capacity of up to 25 megawatt (MW) each fall under the category of small hydro power (SHP).

Type	Station Capacity
Micro	Upto 100 KW
Mini	101 KW to 2000 KW
Small	2001 KW to 25000 KW

With numerous rivers and their tributaries in India, small hydro RE presents an excellent opportunity with an estimated potential of 15,000 MW with only 17 percent of this sector exploited so far. Over 674 projects aggregating to about 2558.92 MW generating capacity have been set up in the country as on 31.12.2009. Of the estimated potential of 15,000 MW of small hydro power in the country, 5415 potential sites with an aggregate capacity of 14,292 MW have been identified. Most of the potential is in Himalayan States as river based projects and in other States on irrigation canals.

Hydel projects call for comparatively larger capital investment. Therefore, debt financing of longer tenure would need to be made available for hydro projects. Central Government is committed to policies that ensure financing of viable hydro projects.

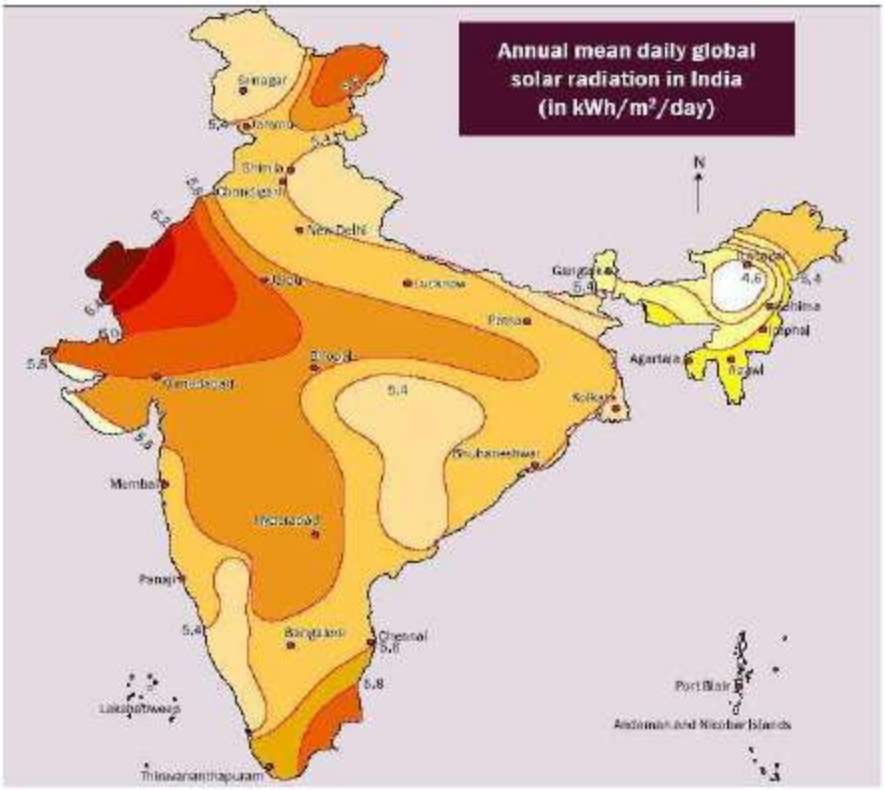
State Governments need to review procedures for land acquisition, and other approvals/clearances for speedy implementation of hydroelectric projects.



The Central Government will support the State Governments for expeditious development of their hydroelectric projects by offering services of Central Public Sector Undertakings like National Hydroelectric Power Corporation (NHPC). Land acquisition, resettlement and rehabilitation issues have caused significant delays in hydro projects.

C) Solar Energy

India is a solar rich country. India is a country near the equator – which means that given its geographical location, it is subject to a large amount of solar radiation throughout the year. India is also, according to area, the 7th largest country in the world.



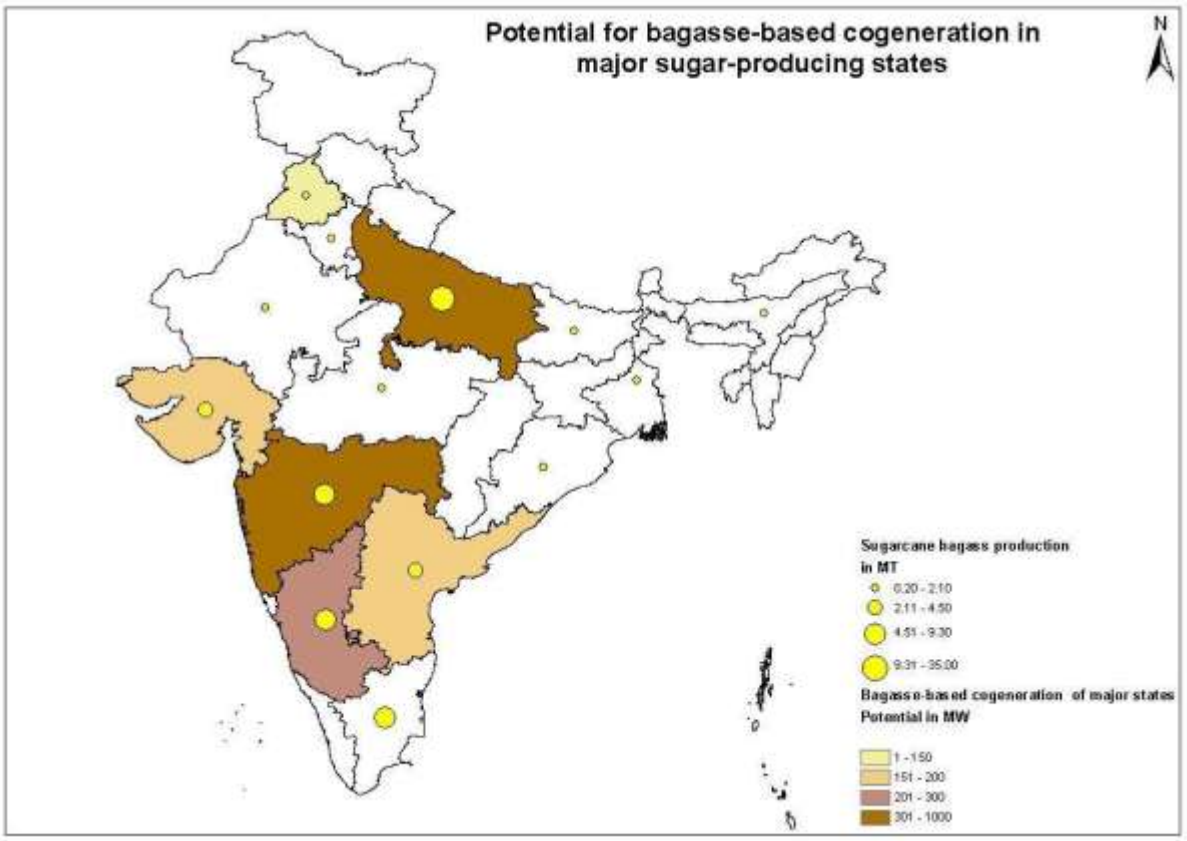
The average solar radiation received by most parts of India range from about 4 to 7 kilowatt hours per meter square per day, with about 250-300 sunny days in a year. As can be seen from the solar radiation map above, the highest annual solar radiation is received by Rajasthan (desert area) and the lowest by the North eastern states of India. India has one of the world's largest programmes in solar energy which include R&D, demonstration and utilization, testing & standardization, industrial and promotional activities. Processed raw material for solar cells, large capacity SPV modules, SPV roof tiles, inverters, charge controllers all have good market potential in India as do advanced solar water heaters, roof integrated solar air heaters; and solar concentrators for power generation (above 100KW).

The future is bright for continued PV technology dissemination around the world. PV technology fills a significant need in supplying electricity, creating local jobs and promoting economic development in rural areas, while also having the positive benefits of avoiding the external environmental costs associated with traditional electrical generation technologies. People who choose to pursue a renewable and sustainable energy future now, are the ones showing the way for the future.

D) Biomass energy

Globally, India is in the fourth position in generating power through biomass and with a huge potential, is poised to become a world leader in the utilization of biomass. Biomass power projects with an aggregate capacity of 773.3 MW through over 100 projects have been installed in the country. For the last 15 years, biomass power has become an industry attracting annual investment of over Rs. 1,000 billion, generating more than 09 billion unit of electricity per year.

More than 540 million tons of crop and plantation residues are produced every year in India and a large portion is either wasted, or used inefficiently.



By using these surplus agricultural residues, by conservative estimates more than 16,000 MW of grid quality power could be generated through Biomass. In addition, about 5,000 MW if power can be produced, if all 550 sugar mills in the country switch over to modern techniques of cogeneration.

Thus the estimated biomass power potential is about 21,000 MW.

However, in India, though the energy scenario in India today indicates a growing dependence on the conventional forms of energy, about 32% of the total primary energy use is still using biomass and more than 70% of the country's population depends upon it for its energy needs.

E) Energy from Wastes:

The rising piles of garbage in urban areas caused by rapid urbanization and industrialization throughout India represent another source of nonconventional energy. An estimated 50 million tones of solid waste and approximately 6,000 million cubic meters of liquid waste are generated annually in the urban areas of India. Good potential exists for generating approximately 2,600 MW of power from urban and municipal wastes and approximately 1,300 MW from industrial wastes in India. A total of 48 projects with aggregate capacity of about 69.62 MWeq have been installed in the country thereby utilising only 1.8% of the potential that exists.

F) Biofuels:

The GOI recently mandated the blending of 10 percent fuel ethanol in 90 percent gasoline. This mandate as created an approximately 3.6 billionliter demand for fuel ethanol in blend mandate to the entire country. This significant demand growth creates a tremendous manufacturing opportunity for the fuel ethanol industry seeking to expand its investments internationally.

Conclusion: It is not an exaggeration to state that 'Humanity is facing a choice between a peaceful decision on its common energy future or wars for resources in the near future. The world Population is set to grow by 0.9% per year on average, from an estimated 6.7

billion in 2008 to 8.5 billion in 2035 (UNDP, 2009). There is a need of trapping and using non conventional energy sources in India for the survival of future generation. However it is clear that grid extension in rural areas is often not cost effective, so decentralized electricity generation with non conventional energy sources such as small wind, hydro, solar, biomass, biofuels and energy from waste are best suited to provide the much needed options.

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