

RENEWABLE ENERGY RESOURCES AVAILABLE IN INDIA AS AN ALTERNATIVE FOR CONVENTIONAL ENERGY RESOURCES

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ABSTRACT:

In present paper, review regarding the the current status of the energy utilization and also the brief focused on the energy resources from the Water wind, Solar, biomass, biogas and coal. The cost effectiveness of energy production and effective utilization of the alternative resources has been reviewed.

Keywords: wind energy, solar energy, biogas, coal, utilization.

INTRODUCTION AND BACKGROUND

India has the fifth largest generation capacity in the world with an installed capacity of 152 GW as on 30 September 2009[1] , which is about 4 percent of global power generation. The top four countries, viz., US, Japan, China and Russia together consume about 49 percent of the total power generated globally. The average per capita consumption of electricity in India is estimated to be 704 kWh during 2008-09. However, this is fairly low when compared to that of some of the developed and emerging nations such US (~15,000 kWh) and China (~1,800 kWh). The world average stands at 2,300 kWh[2].

The Indian government has set ambitious goals in the 11th plan for power sector owing to which the power sector is poised for significant expansion. In order to provide availability of over 1000 units of per capita electricity by year 2012, it has been

estimated that need-based capacity addition of more than 100,000 MW would be required. This has resulted in massive addition plans being proposed in the sub-sectors of Generation Transmission and Distribution.

Transmission

The current installed transmission capacity is only 13 percent of the total installed generation capacity [3]. With focus on increasing generation capacity over the next 8-10years, the corresponding investments in the transmission sector is also expected to augment. The Ministry of Power plans to establish an integrated National Power Grid in the country by 2012 with close to 200,000 MW generation capacities and 37,700 MW of inter-regional power transfer capacity. Considering that the current inter-regional power

transfer capacity of 20,750 MW [4], this is indeed an ambitious objective for the country.

Need for Alternatives

- Fossil fuel reserves limited
- India - 17% of World population,
- 4% of primary energy
- Present pattern – predominantly fossil based (87% comm, 64% total)
- 52% of households unelectrified
- Linkage between energy services and quality of life

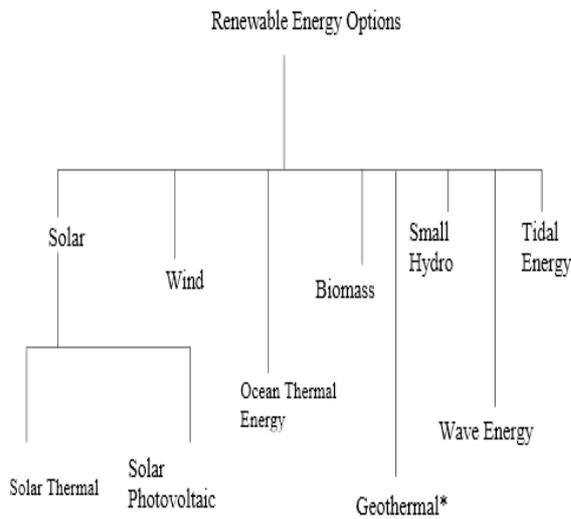


Fig.1-Alternative energy resources.[5]

Wind Power

Wind energy works out as the cheapest option in terms of total cost of ownership, and for most options even on year to year basis. However, costs of electricity generation of large scale thermal power stations using coal and natural gas as fuels are comparatively much lower than that of a wind farm. Government policy thrust for renewable energy, together with Renewable Power Purchase Obligations (RPOs) on utility companies and possible continuation of CDM beyond 2012 could expand tremendous scope for wind energy, leading to its sizable share in real terms in the total power scenario in India and globally.

Globally it has now been well recognized that wind energy is probably the most potential source of electricity among all renewable energy sources.



The concept of harnessing wind energy to generate electricity is gaining momentum around the world. The world-wide installed wind energy capacity was around 194.3 GW by the end of 2010 [6]. In India, the installed wind energy capacity is over 19 GW [7] and the country ranks fifth in the world. The cost of electricity produced from wind farms in India is at par with the cost of grid electricity. According to the Ministry of New and Renewable Energy guidelines [8], the buyback rate for electricity from wind farms is in the range Rs 3.39/kWh–Rs 5.31/kWh depending on each state, compared to Rs 3.90/kWh–Rs 5.90/kWh for grid electricity. More importantly, using wind to generate electricity emits much less harmful greenhouse gases than during the combustion of fossil fuels that are generously used to generate electricity. It is estimated that there is a saving of 300–500 tonnes of CO2 emission from a wind farm of 4 MWh electricity generation capacity in India[9].

Small Hydro Power

India has a huge hydro power potential, out of which around 20% has been realized so far. New hydro projects are facing serious resistance from

environmentalists. Resettlement of the displaced people with their lands becomes major issue.



BIOMASS Power

The government of India strongly encourages the utilization of biomass energy. All renewable energy matter is under jurisdiction of Ministry of Non-Conventional Energy Source (MNES). MNES estimated the biomass power potential in the entire country as 19,500 MW. To obtain the maximum utilization of such high potential energy source, MNES has been conducting various researches such as technologies, resource assessment and system modelling on biomass energy sector. As the results, India now becomes one of the leading countries of biomass energy utilization. [10]

Biogas

Energy is a complex system; hence, energy-production and energy-conversion require systemic thinking, for which firstly a change of aspect is necessary. The primary view-point is to satisfy the energy demands with the lowest possible stress on the environment. Furthermore, ecological thinking should prevail increasingly during the planning and operating of the different kinds of technical equipment and facilities [11].

Hydrogen and Fuel Cells

In both Hydrogen and Fuel Cells electricity is produced through an Electro-chemical reaction between hydrogen and oxygen gases. The fuel cells are efficient, compact and reliable for

automotive applications. Hydrogen gas is the primary fuel for fuel cells also. Hydrogen can be produced from the electrolysis of water using solar energy. It can also be extracted from sewage gas, natural gas, naphtha or biogas. Fuel cells can be very widely used once they become commercially viable.

Solar power

Sun is the primary source of energy. The earth receives 1.6×10^{18} units of energy from the Sun annually, which is 20,000 times the requirement of mankind on the earth. Some of the solar energy causes evaporation of water, leading to rains and creation of rivers etc.



Biogas is generated from organic materials under anaerobic conditions. Feedstocks for biogas generation include cow dung, poultry droppings, pig manure, kitchen waste, grass faecal matter and algae. Countries where agriculture sector is an important component to the growth of economy, have found biogas as a useful replacement for woodfuel and dung as fuel for cooking, and heat-ing. Given increasing oil prices, high health risk associated with unsustainable woodfuel usage and its impact on the environment it is crucial for the government to consider other alternatives which are sustainable and affordable[12]

Several designs and capacities of Solar Water Heating System (SWHS) are available to suit the users' needs. The Government of Tamilnadu provided a subsidy of Rs.2000/-to Rs.3000/-for domestic Water Heating System from 1993 to 1998. The Government also sanctioned the full cost of SWHS in 12 Government buildings,

mostly hostels and hospitals, in addition to which during the Ninth Plan, 1370 domestic and 58 Industrial Water Heaters were installed in Tamil Nadu. Solar Photovoltaic pump is a system which produces electricity from sunlight and operates the pump to lift water from wells. A 900 watts pump can deliver about 50,000 litres of water per day over a total head of 30 feet. It can irrigate one to two acres. [13]

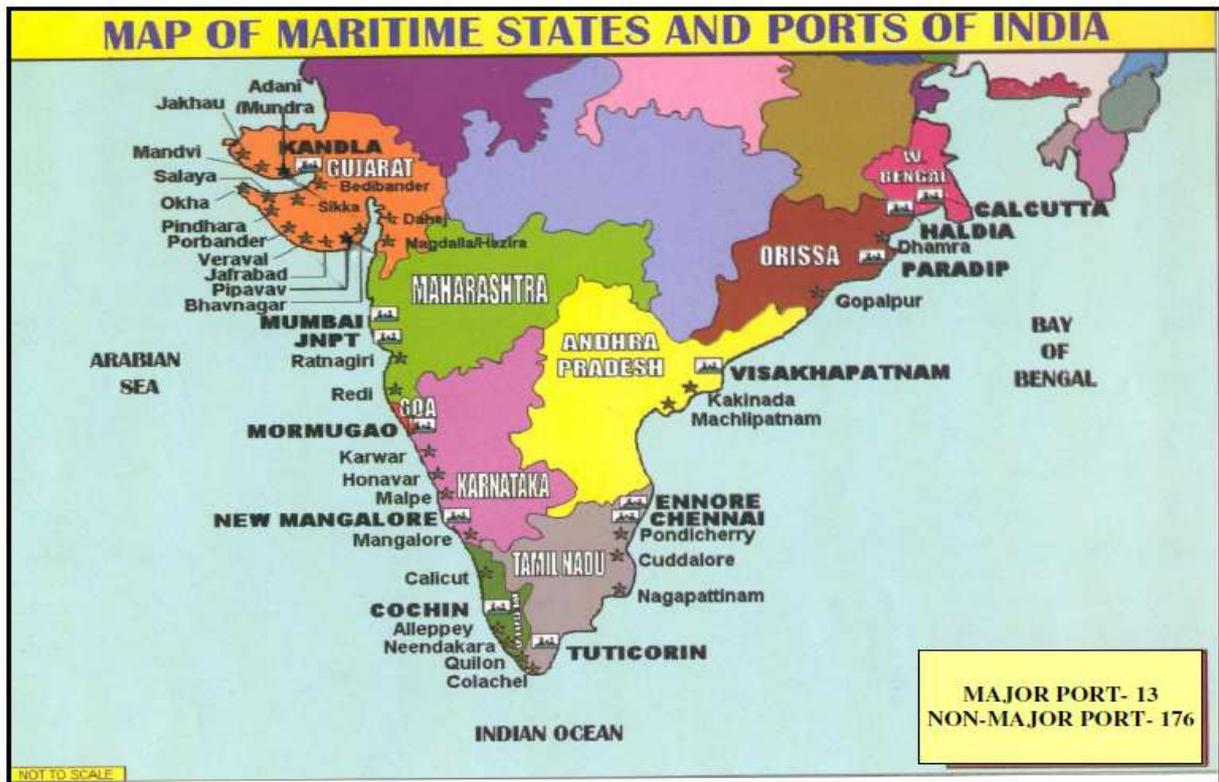
Out of the 11 maritime states and union territories the state of Gujarat has the longest coast line of about 1600 kms with 40 non major ports handling 70% of the total traffic of non major ports.

Karnataka:

The maritime state of Karnataka has a coast line of about 300 kms studded by ten non major ports handling 4% of the total traffic.

Kerala:

The maritime state of Kerala has a coast line of



State -wise scenario of port development in non major ports

Maharashtra:

Maharashtra has a coast line of 720 kms with 53 non major ports handling about 10% of the total traffic handled by all non major ports.

Goa :

The maritime state of Goa has a coast line of 105 kms and has five non major ports handling 15 million tones, accounts for 8% of the total traffic

Gujarat:

about 590 kms. There are seventeen non major ports.

TamilNadu:

The maritime state of Tamil Nadu has a long coast line of about 1000 kms with fourteen non major ports. Traffic handled by all the fourteen non major ports is less than one million tonnes.

Pondicherry:

The maritime territory of Pondicherry has a small coast line of about 45 kms with two non major ports at Pondicherry and Karaikkal.

Andhra Pradesh:

The maritime state of Andhra Pradesh with a coast line of about 1000 Kms has twelve non major ports handling 20 million tonnes of cargo next only to Gujarat.[14]

Table-1.Major ports – trend in cargo mix

| | (In Percentage) | | | | |
|----------------------|-----------------|---------|---------|---------|---------|
| COMMODITY | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 |
| POL Crude + Product | 33.55 | 33.28 | 32.00 | 33.00 | 31.00 |
| Iron Ore | 18.69 | 17.37 | 18.00 | 18.00 | 18.00 |
| Fert Fin. & Fert Raw | 2.88 | 3.05 | 3.00 | 3.00 | 3.00 |
| Thermal Coal | 8.89 | 8.04 | 8.00 | 8.00 | 8.00 |
| Coking Coal | 4.98 | 4.89 | 5.00 | 5.00 | 5.00 |
| Container | 14.63 | 15.84 | 18.00 | 18.00 | 18.00 |
| Others | 16.38 | 17.53 | 16.00 | 15.00 | 17.00 |
| TOTAL | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

Table-2.Coal handling in major ports –traffic growth (in million tonnes)

| Year | Total Cargo Traffic | Thermal Coal | Coking Coal & Other Coal | Total Coal Traffic | % against Total Traffic |
|---------|---------------------|--------------|--------------------------|--------------------|-------------------------|
| 2005-06 | 423.57 | 37.66 | 21.10 | 58.76 | 13.87% |
| 2006-07 | 463.78 | 37.31 | 22.67 | 59.98 | 12.93% |
| 2007-08 | 519.31 | 39.60 | 25.33 | 64.93 | 12.50% |
| 2008-09 | 530.53 | 43.30 | 38.43 | 81.74 | 13.02% |
| 2009-10 | 561.09 | 43.37 | 43.65 | 87.02 | 15.50% |

CONCLUSION:

The utilization of alternative energy resources will lead the nation in all directions. Current status of the energy utilization and also the brief focused on the energy resources from the Water wind, Solar, biomass, biogas and coal. The cost effectiveness of energy production and effective utilization of the alternative resources has been reviewed.

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