

## **Title - Socio economic aspects of Hydrogen energy – Indian Perspective**

**\*Prof. Dileepkumar K. Nayak, \*\*Mrs. Usha Raghavan**

V.P.M.'s Polytechnic, 'Jnanadweepa', Chendani, Bunder Road, Thane – 400601, MS, India.

dknayak\_vpm@rediffmail.com, usha63mr@yahoo.com

### **Abstract**

India is a vast country with over 1 billion population and over one crore vehicles. Most of these vehicles use fuel energy from petroleum products. At present around 74% of Indian fuel requirement is taken care by import. Steep rise in crude oil prices is affecting the country's economy severely and it is in turn increasing the cost of living and transport.

Last five years have seen the doubling of crude oil prices. This has grossly affected the economic condition of farmers, as they are unable to ferry their crop products to markets, which fetch them better prices. Local sales fetch them nominal and uncertain returns. The cost of cultivation and farming is in the increasing side with uncertain revenue from the crops.

A sustainable and environment friendly Hydrogen fuel for vehicles can be a wonderful solution for the current situation.

Most part of India receives heavy rains during monsoon season. Rivers, lakes are also available in large number in India. Abundant water availability will be an advantage for Hydrogen Energy. The technology commercialization and sustainability will bring stability to fuel prices. Once the financially viable and continuous supply of fuel is ensured, it would be possible to increase the produce per given area and farmers can live with assured returns.

The paper will provide the statistics related to fuel status as of today, the corresponding trends and the future options.

### **Introduction**

Energy is the backbone of technology and economic development. Indian Energy requirements have increased in the years following the industrial developments. This rapid increase in use of energy has created mismatch in the demand and supply. The coal and petroleum fuel, import volume is in the increasing side. The crude oil price, which was around \$40 per barrel in the last year, has spiraled to \$56 per barrel. This has resulted in increase of petrol and diesel prices and in turn cost of transport. India being one of the moderate per capita income countries, the situation is worsening with increase in petroleum prices on a regular basis.

The more serious concern is the depletion of fossil resources, which are likely to last for another century when the demand is likely to reach multifold than the existing requirement.

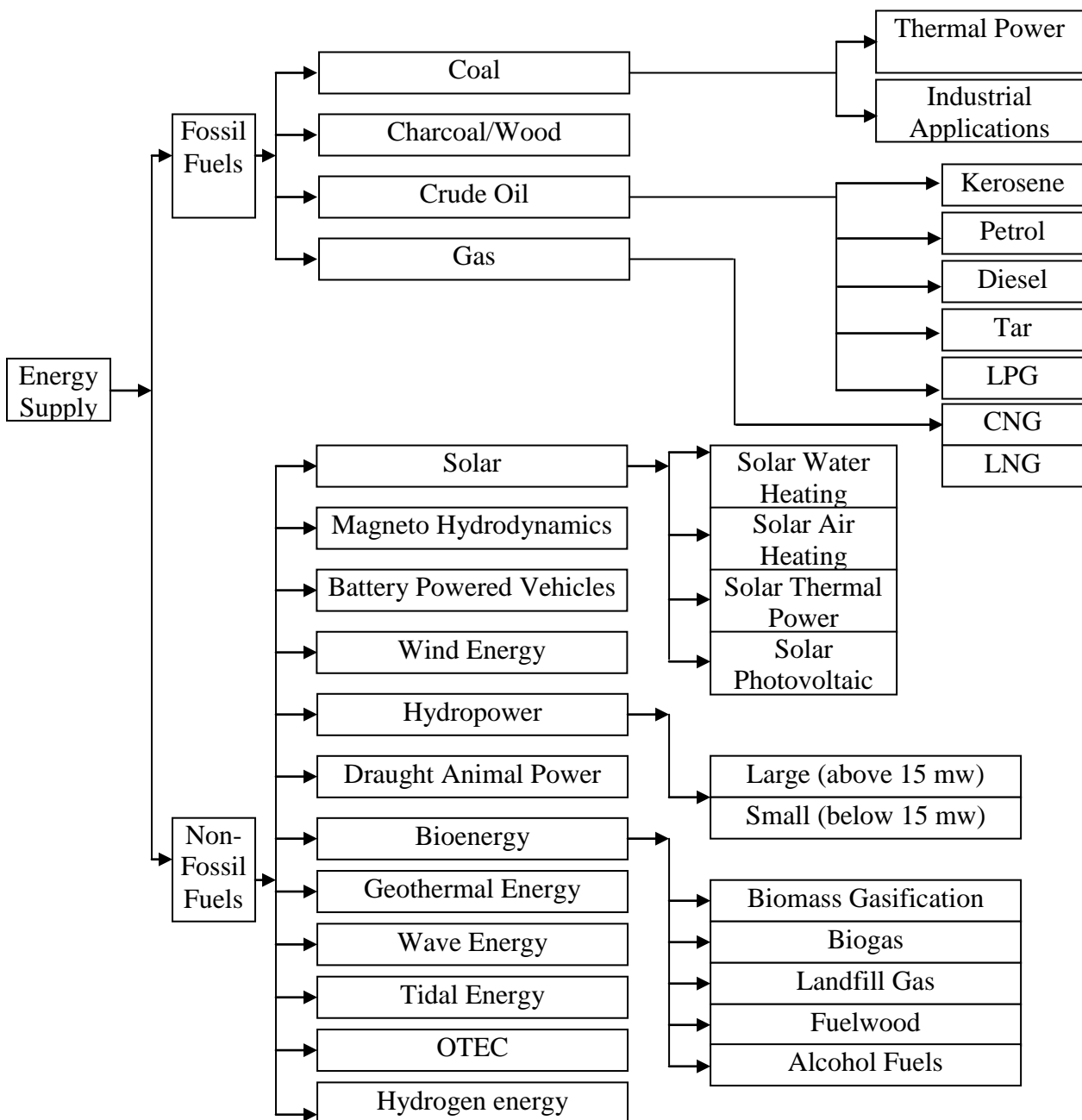
---

\* Principal, V.P.M.'s Polytechnic, Thane

\*\* The author is doing research in nanotechnology at National Chemical Laboratory, Pune with Dr. Murali Sastry as the Guide.

## **Present Energy Availability Options**

India is a vast country with different geographical conditions, which are conducive for variety of types of non-conventional energy generations. The power generation projects, which should take care of raising demands, are not being executed resulting in the widening gap between demand and supply. The energy conservation and energy savings and their significance is being discussed and implemented for this purpose so as to optimize the use of energy within every organization. In India the awareness is already created among the general public as well as industrialists as a result of which alternative to the fossil fuels are already being worked in the areas of solar, wind, biogas, biomass, biodiesel, tidal, nuclear and hydrogen energy. Different levels of research are in progress in all the areas with some matured technology in the areas of solar heating, cooking, rural electrification etc. However the attempts at present are inadequate to meet the raising demands of energy requirements.



**Conventional energy supply scenario:**

Although there is increasing interest in alternate energy sources such as solar, wind, biomass etc. a major of the energy comes from fossil fuel, oil and natural gas.

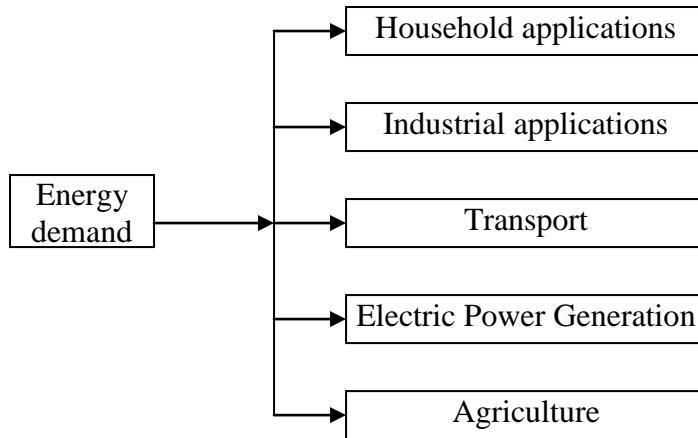
Following tables shows the demand and supply forecast for all the conventional energy sources mentioned above.

**Existing Electrical Energy generation status in India:**

Thermal	70%
Hydro Power	24%

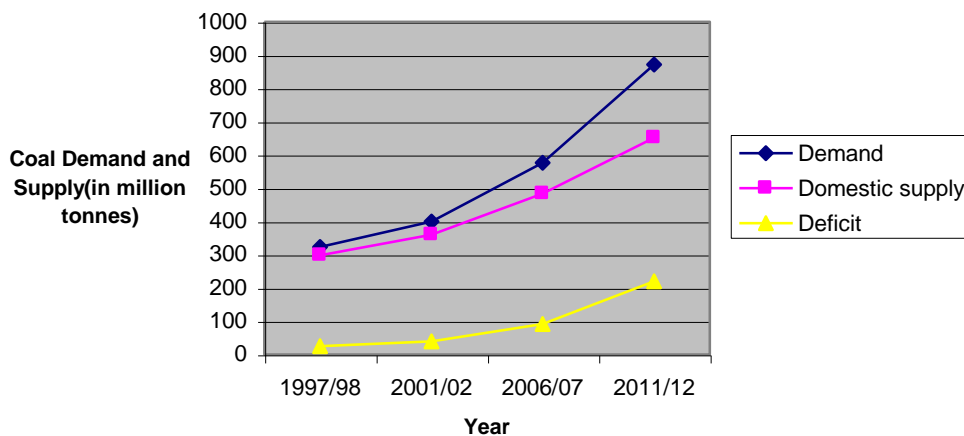
Nuclear	2.50%
Renewable Sources	3.50%

**Demand:**



**Table 1 : Coal demand and supply forecasts for India (million tonnes)**

	1997/98	2001/02	2006/07	2011/12
Demand	323	400	576	872
Domestic supply	298	360	484	652
Deficit	25	40	92	220



**Load**

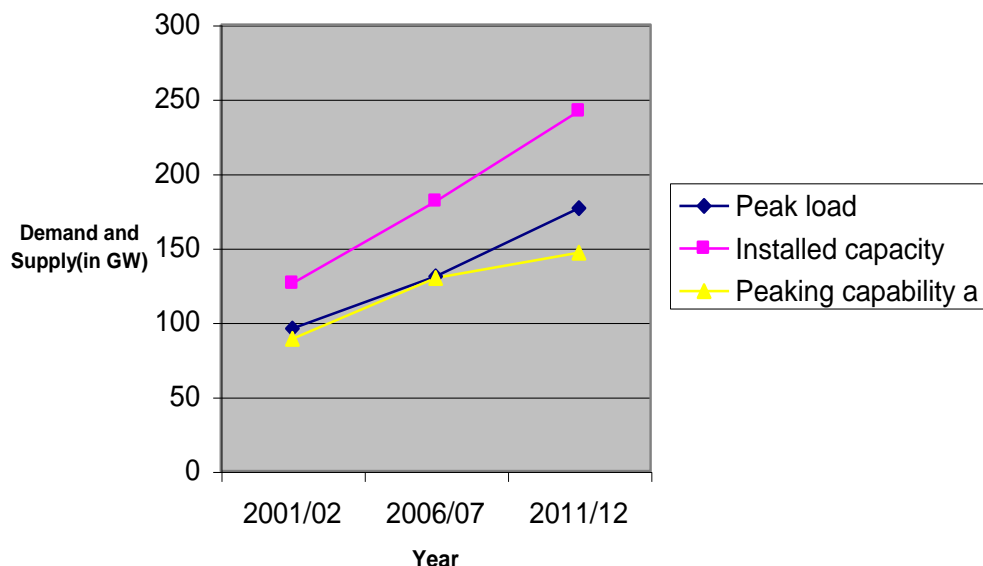
**Shedding Technique used to overcome Electric supply deficit in India**

Present Electric Energy Supply since last two decades has affected all the states of the country. Urban and rural areas are subjected Load shedding to overcome this deficit. The Load shedding normally continues for 4 to 6 Hrs/ Day depending on the situation. This resulted in the use of available alternative at such areas to avoid the inconvenience. The Metro cities which are the industrial hubs and major consumers of electricity were earlier spared from these power cuts. However since last year the situation has further worsened with no new power generating units getting added to the supply side, even the metro cities have starting facing load shedding of 1-2 hrs/day. This is bound to affect the production at industries. This may also result in the negative growth in the economy. Hence to improve

this situation many steps are being undertaken by the Energy Ministry of the government of India as well as the Ministry of Non-Conventional Energy Sources.

**Table 2 : Demand and supply forecasts for power in India (GW)**

	2001/02	2006/07	2011/12
Peak load	95.76	130.94	176.65
Installed capacity	126.04	181.10	242.00
Peaking capability a	88.92	129.82	146.67

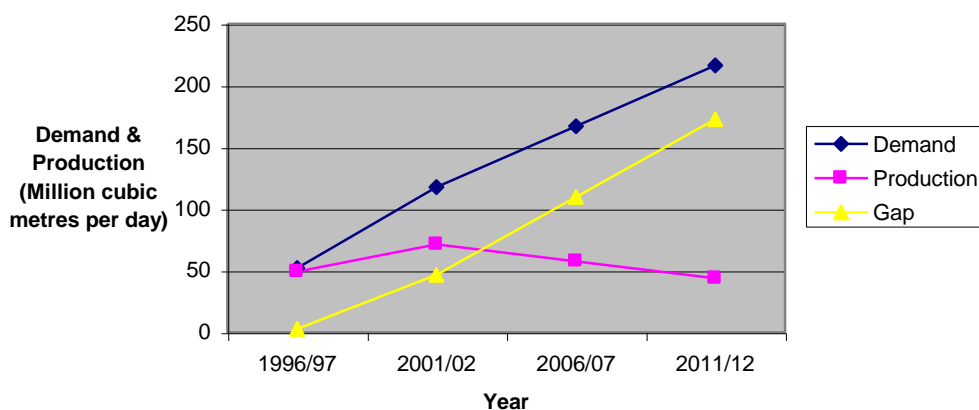


### The Fuel Situation

This is another area, which will face difficulty in future. The cost of fuel is increasing on one side and the vehicles on the road are also increasing. The cost of transport fuel has increased by around 20% in the last couple of years, which is a huge rise. As this is likely to become major concern, it is essential to find alternative to petroleum fuels. The use of Biodiesel has provided some useful results, however as on date this is still a non-viable option & still in the research stage. The present vehicle fuels apart from being expensive they increase the pollution level to a great extent resulting in the health hazards for the populations. In this connection matured hydrogen technology, as a fuel in future can be an excellent alternative.

**Table 3 : Natural gas demand and supply in India (million cubic metres per day)**

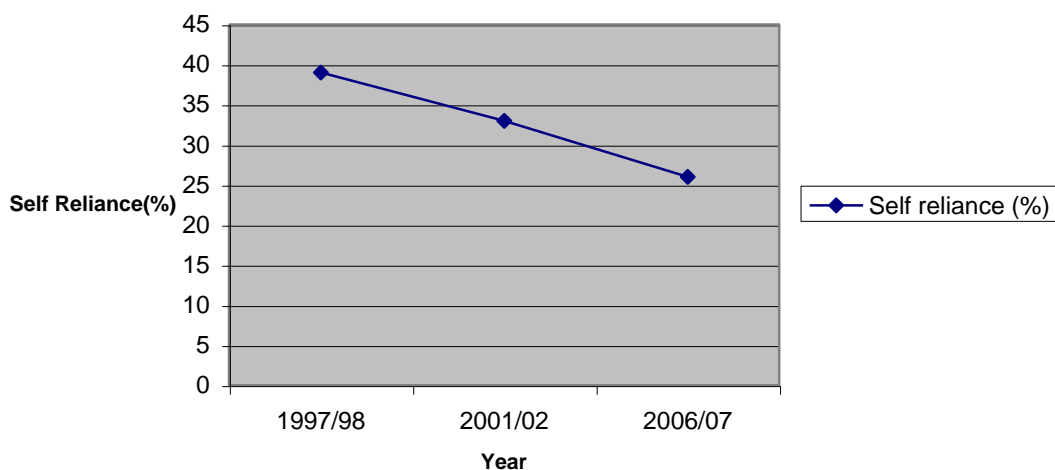
	1996/97	2001/02	2006/07	2011/12
Demand	52.1	117.8	167.1	216.4
Production	49.3	71.2	57.5	43.8
Gap	2.8	46.6	109.6	172.6



**Table**

**4 : Oil demand and supply in India (million barrels per day)**

Year	Crude production	Crude imports	Petroleum products demand	Self reliance (%)
1997/98	0.69	0.62	1.68	39
2001/02	0.74	1.57	2.10	33
2006/07	0.80	2.20	2.89	26
2011/12	0.90	3.31	4.06	21



### Non Conventional Energy Options

Taking the overview of these forecasts it is observed that in each and every area demand is more and the supply is less. If this situation persists no conventional source will remain to supply energy.

The draft renewable energy policy of the Govt. of India sets the following targets to be achieved.

- 30 million more households to have improved cookstoves
- 3 million more family-size biogas plants to be set up
- 5 million solar lanterns
- Decentralized electricity, including village grid tail-end injection systems, to be provided to one-quarter of these villages in the following manner, through power plants with an average installed capacity of 100 kWp per plant:
  - 1500 solar photovoltaics plants
  - 2000 biomass gasifier-based power plants
  - 1000 small hydro power plants
  - 2 million solar home systems
  - 5 million square metres of collector area for low-temperature solar water-heating systems, comprising (1) domestic systems for 1 million households, each with a capacity of 100 litres per day and (2) 2.5 million square metres of collector area for industrial applications.
- In addition, it is targeted to install 1000 medium-temperature, solar-concentrator-based solar process heating systems, each equivalent to a steam generation capacity of 10 tonnes per day
- 1000 MW to be installed through thermal applications
- Renewable sources of energy to contribute 10%, or about 12 000 MW, to the capacity addition of 120 000 MW

### **Inference**

Hydrogen Energy will be a promising option at least as transport fuel. The leading world companies are promising hydrogen economy by 2010, it will be a welcome news. This will help in reducing the depletion of fossil resources and at the same time provide supplementary energy through alternatives. The use of hydrogen for Electricity generation can help in reducing the coal import for the new projects. Most importantly the new alternatives are basically non exhaustible and hence it will aid the growth of economy and reduce pollution and global warning.

### **References**

- Publication of National Seminar on Alternative Energy Sources, V.P.M.'s Polytechnic, Thane