

# Renewable energy – exploitable option for energy needs

*Uncontrolled industrialisation and over use of fossil fuel and air conditioner in large scale is resulting in change of climate, melting of glaciers, rising of sea level, volcanic eruption etc. All these indicate noticeable change in regular climate cycle. Continuous rise in pollution and drawbacks due to rise in temperature are even-accompanied with health problems that have become a new challenge. Global warming can create some new problems like people of country like Bangladesh, Maldives, and Tuvalu may face large problem of rehabilitations due to rising sea level and eventide, homelessness. It can raise a question to polar bear to search a new habitat for them. For our country too this is a complex problem. We are noticing sudden flood in Orissa, cyclone in Andhra Pradesh and unprecedented earthquake in Nepal, these are live examples in this context. So time has come to think and act positively for the use of renewable energy. It is time now for a detailed and deep discussion for this subject. We have to think about use of bio fuel instead of fossil fuel, minimise the use of traditional air conditioner, minimise the use of hazardous industry accompanied with carbon footprint. In information technology instead of use of computers and traditional machines in large scale use of robots can give a promise for a good future. When India is marching fast towards a challenging economy among advanced countries with its stake in information technology, energy option is an important issue to ponder with.*

## 1. Introduction

It is generally recognised 85% of global primary energy needs comes from fossil fuels. Fortunately, India's water wealth is enormous, with a potential of 84000 MW. In addition, there is a potential of 94000 MW in pumped storage and 15000 MW in small hydro sector. Wind energy is one option that can be exploited to meet energy demands in remote areas, away from the national grid. Solar energy has the advantage of supplying power throughout the year in almost all areas, albeit seasonal. The absence of moving parts, lower maintenance, and negligible running cost makes it beneficial to adopt it for traffic lights, government offices, etc.

Messrs. P. M. Abdul Rahiman, Scientist D, S. J. Ghule, Scientist B and Satish V. Kulkarni, Assistant Engineer, Central Water and Power Research Station, Khadakwasla, Pune 411 024, rah4uin@yahoo.co.in

There are other options like co-generation and power from municipal waste which otherwise is left unused, to keep the environment clean. Eco-friendly options are to be pursued rigorously to quench energy thirst of the country.

In automobile industry more use of renewable sources like solar energy should be encouraged. To discourage big group of car users, encouragement should be given to mono-rail, metro, bullet rail and these vehicles could be run by electrical energy that is under national debate. One more option is the use of bio-fuel. Pollution produced by automobile must have to be controlled. Public vehicle should be made attractive instead of private ones. Popularising public vehicles by giving them subsidy and let them run with bio-energy. If a person makes use of more than one car then he may be made to pay more tax. This is reasonable as in vogue in countries like Singapore.

## 2. Present scenario

Compared to last many decades the rise in temperature in last three decades is in alarming proportion. It is found that the rate of annual rise in temperature is increasing with more speed which is a big concern. Several sources has analysed the complexity of global warming. The study of its adverse impact on environment was done and remedial measures were categorised. Fig.1 shows the effect of global warming in a broad picture.

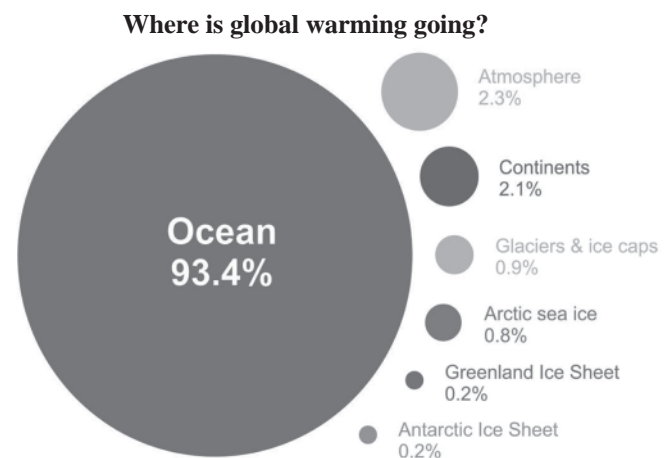


Fig.1 Effect of global warming

Since the time of industrial revolution human activities increased the amount of greenhouse gases in the environment. The concentrations of CO<sub>2</sub> and methane have increased by 36% and 148% respectively since 1750. These levels are much higher than at any time during the last 800,000 years, the period for which reliable data has been extracted from ice cores. According to Estimation made in the year 2011 global emissions of carbon dioxide which is due to burning of fossil fuel and includes cement production was 34.8 million tonnes. Global warming has been observed in the scale of the century. Since the year 1971 of the average earth temperature, 90% of the increased energy is dissolved in the sea which resulted in 0.8 degree centigrade temperature rise in it since year 1980. In the year 1990 there was a increase in this emissions by more than 54%. In the total emissions the contribution of coal is 43.5%, of oil is 34%, of gas is 18%, and of cement is 4.9%. Gas emission by all sectors is shown in Fig.2. However, there is a declining use of coal for power generation, due to very good thrust given by various countries with accelerated use of wind and other renewable sources, as being executed in India. From the final three decades of last century, per capita income (GDP) and population growth are the main causes in increasing greenhouse gas emission. It is very important, especially in the perspective of India's rapid industrial growth, the urge to march forward with faster advancement and industrial growth, it is reasonable to achieve as the world's most prosperous developed country, provided we keep carbon footprint under control.

### Annual Greenhouse Gas Emissions by Sector

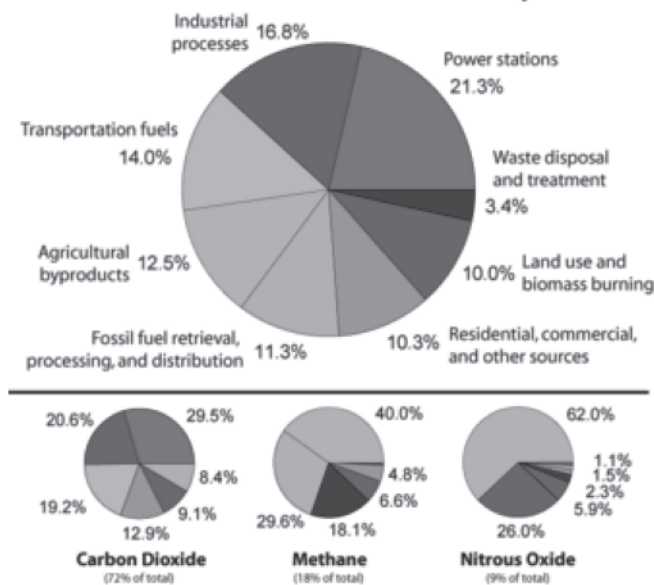


Fig.2 Description of carbon emission sector wise

### 3. Promising features of renewable sources

It is the need of the hour to extensively use renewable resources, available as a gift of nature such as solar, ocean, wind energy for better environment and conservation. By changing energy policies and taking concrete measures at the national

level, it would pave way to move towards prosperity and development. The rough estimate of renewable potential is shown in the Table 1.

TABLE 1: POTENTIAL OF NON-CONVENTIONAL SOURCES

Sources	Potential (approx.)
1 Small hydro	15000 MW
2 Wind energy	45, 000 MW
3 Solar energy	5 x 10 <sup>9</sup> kWh/year
4 Bio-mass	19, 500 MW

### 3.1 HYDROPOWER

Major source of renewable energy is hydro. According to energy information agency's report, (International Energy Outlook, 2000), total primary energy consumption worldwide is going to be increased by 60% between 1997 and 2020 and by three fold by the middle of the century. Today, 85% of the primary energy consumption is from fossil fuel (coal, oil and gas) with large scale emission of gases like carbon dioxide and methane. It is well recognized that this is affecting eco-system. Studies have shown that development of even half of the world's economically feasible hydropower potential could reduce gas emissions by 13% and associated reduction in sulphur dioxide emission that cause acid rain and nitrous oxide emissions. The magnitude of the impact of particulate emissions could be imagined by the fast growth of respiratory diseases. Thus, eco-friendly options must be adopted to avoid degradation of environment.

Small hydro is easily implementable in north eastern states due to geographical reasons. Arunachal Pradesh and Himachal Pradesh are marching fast in this front. Tripura is another important state readying to export electricity generated by hydro to neighbouring countries like Bangladesh.

### 3.2 BIO-FUEL

Oil seeds of some plants can be used for liquid fuel. Bio-fuel development in India centres mainly around the cultivation and processing of jatropha plant seeds which are rich in oil content (40%). The drivers for this are historic, functional, economic, environmental, moral and political. Jatropha oil has been used in India for several decades as bio-diesel for the diesel fuel requirements of remote rural and forest communities; jatropha oil can be used directly after extraction (i.e. without refining) in diesel generators and engines. Jatropha has the potential to provide economic benefits at the local level since under suitable management it has the potential to grow in dry marginal non-agricultural lands, thereby allowing villagers and farmers to leverage non-farm land for income generation. Since jatropha oil is carbon-neutral, large-scale production will improve the country's carbon emissions profile. Finally, since no food producing farmland is required for producing this bio-fuel (unlike corn or sugar cane ethanol, or palm oil diesel), it is considered the most acceptable choice among India's current bio-fuel options; it has no known negative impact on the production of the massive amount of grains and other vital

agriculture goods India produces to meet the food requirements of its massive population.

### 3.3 SOLAR ENERGY

In the race for achieving larger goal, the rapid industrialization scene and changed production of food, finally the county is on the verge of excessive use of fossil fuels, excessive pollution, depletion in ozone layer, changing climate. Solar energy is available in abundance in India that too from morning 9 am to 5 pm throughout India, and fortunately this is the time of all government offices and peak hours of traffic. So, a new policy to use solar energy is need of the hour. One more dangerous fact is that in a country like ours a major source of greenhouse emissions is kerosene oil based lanterns, which can be easily converted for use with solar energy; such lanterns are widely available now in variety with LED lights. It is heartening to note Maharashtra has integrated solar plants to the grid (Dhule plant) in a big way.

### 3.4 WIND POWER

Wind power is one option with a potential of 45,000 MW. But only limited states like Tamil Nadu, Gujarat and Maharashtra have ventured to tap the huge potential of wind energy. India has developed only about 22,562 MW, a 5% share of potential. Rs.10,000 crores have been invested in windmills in the Nellai, Kattabomman and Nagercoil, Kanya Kumari district in last decade which speaks about relevance of this energy option. Most of the windmills are manufactured with foreign collaboration and a national testing agency to ascertain field performance is the immediate necessity.

Initially, 50-250 kW with diameter of 15-30 m and tower height about 30m was generally in use, now wind turbines with diameters of up to 40m rated at 500 kW are in operation. Global wind power capacity has crossed 2,00,000 MW, of which nearly 22,562 MW is now in India. Making the country the fifth largest in wind generation. Though the wind power is costlier as compared to hydroelectric and thermal power, the cost difference is narrowing down day by day, with mass implementation.

TABLE 2: GLOBAL WIND POWER CAPABILITY

Rank	Country name	Capacity (MW)
1.	China	114,364
2.	USA	65,628
3.	Germany	39,963
4.	Spain	22,578
5.	India	22,562
6.	U K.	12,597
7.	Canada	9,694
8.	France	9,563
9.	Italy	8,831
10.	Brazil	5,294

## Result and discussions

Increasing global warming and carbon emission is raising demand for more use of renewable energy and low-polluting energy sources. To stop the uncontrolled use of fossil fuels, new guidelines are needed in government policy. Sources of energy such as solar, wind and geothermal should be promoted in new ways, to keep our environment less polluted. For this purpose the use of solar and wind driven motor will be a new attraction in the rural areas and will be in effect soon. Finally we see that the dangerous rise in temperature in the last three decades is lethal compared to past several decades. Policies are being made about alternative measures such as new energy options and methods of environmental protection.

## Conclusions

At the present juncture daunting challenge of meeting power demands of the country should adopt a policy to add peak load capacity and small hydro schemes and uprating of old ones. The option of other renewables like wind, solar, biomass, would supplement the major renewable for sustained development by balancing disparity in energy demand between urban and rural populace. Co-generation is one option that the country can economically exploit with production of sugar along with generation of power supply to neighbouring village during of seasons. India should adopt a strategy, which would not only meet the demand of power for economic growth but also maintain eco-friendly environment.

## Acknowledgements

The authors are deeply indebted to Dr. Mukesh Kumar Sinha, Director, CWPRS, Pune for his valuable guidance and constant encouragement. The authors place on record the grateful acknowledgement for his kind permission to publish the paper in this journal. The authors express sincere gratitude for his immense advice and continuous guidance to enhance quality of this paper. The authors also express sincere gratitude to Mr. M. D. Kudale, Additional Director, CWPRS, Pune for his continuous guidance to enhance quality of this paper.

## References

1. Rahiman, P. M. Abdul, Chavan, A. R. and Bhambure, S. R. and Kashid, M. B. (2004): "Eco friendly strategy for power needs", All India Seminar on Energy and environment – issues and challenges, at Deharadun, February 28-29 2004.
2. Rahiman, P. M. Abdul, Kulkarni, S. V. and Goel, P. K. (2015): "Global Warming A power point presentation", – National Hindi Scientific Seminar 2015, 28-29 Sept 2015, at Indian National Centre for Ocean Information Services (INCOIS), Hyderabad.
3. Naidu, B. S. K.: "India Hydro Vision 2025" Water and Energy International (P 38-41).
4. Prasad, Yogendra (1999): "Hydropower Development in India: Impediments & solution". *Indian JI. of Power and River Valley Development*, 1999 (P 112-117).