Promoting Renewable Energy in India

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Introduction

Energy 2000 scenario emphasises the use of the (1) enormous potential of energy efficiency and (2) renewable resources, more due to the fact that nuclear alternatives are not clearly favoured by many nations and have imposed moratorium. Moreover in many developing countries as well as in countries with economies in transition, electricity is not available to the people in rural and remote areas to speed up their economic growth for poverty alleviation and sustainable development. For example, in a country like India, out of the total population of 1000 million, more than 70% lives in rural and remote areas and need electricity for their development. Similar situation exists in most of the developing countries and countries with economies in transition. To provide sustainable livelihoods to such a large number of world population as well as to gradually shift the world economic development path from carbon to non-carbon, promotion of renewable energy technologies and maximising their use in world's economic development efforts are considered to be the most desirable alternatives, globally.

Energy Scenario in India

Economic development all over the world is associated with a massive increase in energy requirement. The installed capacity of the country has considerably increased from a mere 1362 MW in the early fifties to 76,000 MW in 1994, of which 54,340 MW is thermal, 20,360 MW is hydro and 2,000 MW is nuclear power. Notwithstanding this substantial capacity enhancement, the country continues to face upto 20% power shortage in many regions.

During the last fifty years, there has been an expansion in the total energy use in the country with a shift from non-commercial to commercial sources. The use of commercial energy has increased ten fold over this period and growth in future requires a large increase in commercial energy. This calls for optimisation of capacity to expand domestic production of commercial energy and the inability to do so will be a crucial constraint upon future growth. Even with the best efforts in this area India will remain energy deficient and import of energy in the form of crude oil and petroleum products and also coal will continue.

Though fossil fuels will continue to be India's major energy source and will continue to play a critical role in our country, a major challenge for us is to develop programmes and policies that will reduce our dependence on fossil fuels in order to achieve sustainable economic growth and environmental stability. Decentralised energy can make a significant impact on the generation of electricity in view of rapid technological development and improving cost effectiveness.

Decentralised Energy Sector in India

A large potential of non-conventional sources exists in the country. These include bio-gas, solar PV, solar thermal, bio-gas gasified, wind power, small hydro power, co-generation. These sources are available throughout the country and thus generation may be possible near the load centres which takes care of the problems associated with distribution. Besides, these sources are also low carbon-dioxide emitters. In view of the issues linked to climate change, the decentralized energy sources seem to be a better alternative for sustainable development of the country.

In continuation of the concerted efforts for the promotion of renewables, the government aims for the gradual commercialization of non-conventional energy and to exploit the large co-generation potential. Appropriate legislative framework and related measures are being undertaken to enable power producers to sell it to the grid at a remunerative price.

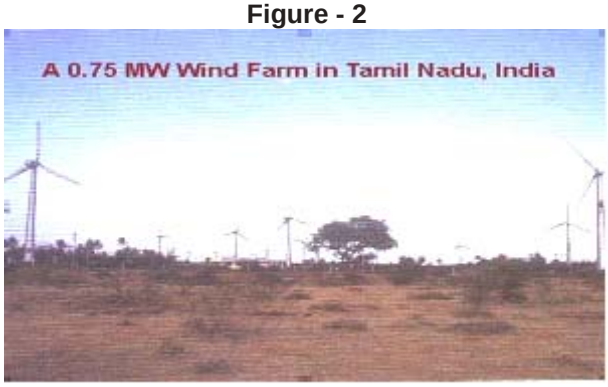
Considerable progress has been made in India over a wide range of programmes particularly in the production of electricity from renewable energy resources. Among renewable technologies, wind farms appear to be a feasible and cost effective option for supplementing the conventional means of power generation on a large scale. The total installed wind power capacity of India is nearly 600 MW which has placed India among the top three countries in the world in harnessing the wind resources. This capacity is expected to reach upto 2000 MW by the turn of the century. Figure 1 shows the wind power development in India during the last decades.

Since 1985, the Ministry of Non-Conventional Energy Sources (MNES) has carried out an extensive wind monitoring and mapping programme to identify better sites and assess the resource potential. A number of wind mapping and monitoring stations were set up and a number of wind farm sites were identified in Tamil Nadu, Gujarat, Andhra

Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra states and Lakshsdweep (island) in India. Under the ***India - Renewable Resource Management Programme*** of the Global Environment Facility, efforts have been made to install wind farms in Tamilnadu District of India and connect them to the grid of Tamil Nadu Electricity Board. In fgure 2, a 0.75 MW wind farm in the state of Tamilnadu is shown. The total power generated so far in Tamilnadu from wind energy has led to conservation of 2,52,216 metric tonnes of coal and 7,90,300 litres of furnace oil, and has helped avoid emissions of green house gases into the atmosphere.

Another priority area is small hydro-power development. However, only a small portion of the total potential available is realised so far. Advanced bagasse co-generation is another ambitious programme launched to harness the 3500 MW potential available in the sugar industry. In the area of solar photovoltaics, India has achieved a leading position in the world in the development and use of technology. India is the second largest manufacturer of crystalline silicon modules in the world. Industrial production has reached a level of 7 MW / year. This programme also received a boost from the Global Environment Facility and the Indian Renewable Energy Development Agency. The main emphasis of this programme is to provide solar lantern and solar pumps. Other uses are solar thermal water heating system for commercial and industrial establishments.

Figure - 2



The technology for biomass based gasification has been known for quite some time and was extensively used in Germany, UK and even in India during the second world war when oil and gas became scarce. The gas produced by the biomass gasifier is fed into an internal combustion engine which can then drive an electrical generator to produce electricity and conserve diesel oil, thus avoiding GHGs emission. Such a technology can be used in climate change mitigation projects particularly in the decentralised sector visibly in rural India.

Most of the renewable sources have small generation capacity. The renewables tend to be competitive vis-à-vis fossil fuel sources in remote sparsely populated locations (typically rural locations) where it is not economical to extend the grid. Renewables thus have large potential in meeting the development needs of small rural communities.

The Asia Least-cost Greenhouse Gas Abatement Strategy study by Asian Development Bank has estimated the cost of various mitigation options. The study shows that the renewables have the highest GHG emission reduction potential. The cost per tonne of CO_2 saved is also low for renewables as is the absolute amount of investment. These renewable projects can hence meet the development needs of the country and at the same time help in reducing carbon-dioxide emissions and addressing climate change.

Table 1 : The estimated potential and the current status of exploitation of renewables in India

Source / Technology	Potential / Availability	Potential Exploited
Biogas Plants	12 million	2.7 million
Biomass based Power	17,000 MW	69.5 MW
Efficient Woodstoves	120 million	20 million
Solar Energy	5 x 10^{15} Wh/Year	25 MW
Small Hydro	10,000 MW	250 MW
Wind Energy	20,000 MW	1,000 MW
Ocean Thermal	50,000 MW	
Sea Wave Power	20,000 MW	
Tidal Power	9,000 MW	

(Source : Ninth Five-Year Plan)

Climate Change Mitigation Strategies in India

As per the Asia Least-cost Greenhouse gas Abatement Strategy (ALGAS) study conducted by Asian Development Bank (ADB), the main source of GHGs in India (as for other countries as well) is the energy sector. In India 70-72% of commercial energy is generated by using fossil fuels, and this scenario is expected to continue in the coming decades. This poses environmental problems at the local, national and global levels.

The general abatement strategy and goals as suggested by the ALGAS study include : efficient use of resources, promotion of renewables and enhancement of sinks. On the one hand, it is necessary to enforce mandatory standards, for limiting emissions of greenhouse gases, adopting new and clean technologies and measures like bringing down T&D losses while on the other hand, measures are required for energy conservation and efficiency improvement.

In the short and medium term, the country would focus on efficient use of resources and the promotion of renewables. The Kyoto commitments shall mean that there would be finance available to direct decisions away from fossil fuel energy sources to these sources. These financial sources need to be tapped for promotion of these distributed renewable projects.

In order to overcome the resource constraint and meet the requirements of additional capacity in the energy sector, India has recently opened up this sector for private investment. As per the new policy and the amended legislation, 100% foreign-owned private companies can set up power projects of any size in India. A five year tax holiday has been allowed in respect of profits from these investments. This new policy of the Government of India has attracted foreign investors including non resident Indians.

Climate Change Centre at Development Alternatives - Attempts to Encourage Renewable Sources of Energy

Development Alternatives, a not for profit organisation with its head quarters at New Delhi, India, has set up a Climate Change Centre. The Centre acts as a knowledge base on issues related to climate change and its mitigation. As there is not much awareness about climate change issue in India the first and foremost task becomes to raise awareness among the Indian industries, the government and other stakeholders, the Centre organises workshops and seminars on issues related to climate change, its impacts and climate change mitigation mechanisms like Joint Implementation (JI), Activities Implemented Jointly (AIJ) and Clean Development Mechanism (CDM).

The activities of the Climate Change Centre are backed by strong research work. Sustainable Development in the host country being an integral part of CDM, the Centre carried out a research study on "Measuring Progress Towards Sustainable Development in Indian Climate Change Mitigation Projects". It also prepared a policy recommendation paper for Government of India on "Climate Change Mitigation Projects : Incorporating Sustainable Development Concerns". The Centre has also developed training modules on "Incorporating Sustainable Development Concerns in Climate Change Mitigation Projects in India" and gives training to Indian business sector and other stakeholders, in order to build their capacity on this issue.

The most important function of the Centre is to provide advisory services to the stakeholders and facilitate the business sector in taking up initiatives in such fields where the potential for carbon emission reduction lies. These projects, besides being low carbon emitters shall also help assist in sustainable development of the host countries the Centre provides services in developing projects which contribute to these objectives. The Centre over the last one year has organised a few project identification workshops in different parts of India and has solicited a number of renewable energy projects. The projects are mainly in the wind energy sector, solar photo voltaic lamps and pumps, small hydro power plants, biomass combustion / gasification and bagasse cogeneration etc. These projects are very useful in meeting the rural energy requirements, besides contributing to reductions of GHG emissions. These projects were put forward at different windows domestically as well as globally for funding. A few of these projects are very close to financial closure, other projects are at an advanced stage of the pipeline. If the Indian business sector as well as the foreign investors keep on working with the same level of enthusiasm, this will lead to large scale expansion of the renewable sources of energy in the country.

Conclusion

The developed countries have appropriated a significant amount of natural resources in the past, subsequently leading to global warming and climate change. Despite the claim that countries like India are emerging as major energy consumers, this is not entirely true. For example, in the case of per capita coal consumption, the OECD average is 1058 koe, which is much larger than the world average of 394. In comparison, India has a very low per capita consumption of 132 koe. There is scope for developing countries to develop and in the process increase their GDP, without necessarily having commensurate increase in their GHG emission in view of present level of high emissions per unit GDP.

The need of the hour is joint efforts between the Annex-I and developing countries and transfer of technology from the Annex-I countries so that developing countries may reduce the GHG emissions per unit of their GDP i.e. without compromising with their developmental priorities. It shall be noted here that climate change is not a priority area for the developing countries but developing countries may undertake measures to address climate change which are within their respective capabilities.