



## RENEWABLE ENERGY – A SUSTAINABLE ALTERNATIVE ENERGY

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*Renewal Energy has become the only way of sustainable alternative energy. The significance of renewable energy increases of not only providing energy security but also environmental sustainability. The most disadvantaged group and remote communities can become the beneficiaries and finally renewable energy may become one of the biggest driver of inclusive growth. India is among the top five countries in the World in terms of renewal energy capacity. India has an installed base of over 15 DW which is around 9% of its total power generation capacity and contribute over 3% in its electricity mix. The opportunities in renewal power is immense. The greatest challenge before renewable energy is to reduce the per unit cost the renewal energy. Hence, there is a continuous need of research to innovate to reduce efficiency and being down costs. The Govt. is required to promote the private sector and lead to rapid development & deployment of renewable energy.*

**Keywords:** Energy, Sustainable development, investment, opportunity & inclusive growth.

### Introduction

The most significant development in the recent years is that renewable energy has become mainstream. People now recognize renewable as a possible revenue opportunity rather than just a corporate social responsibility (CSR) initiative. Hydro, wind and biomass based co-generation are already working well in many cases where they are economically viable apart from being environment friendly. Bio-fuels are doing wonders in Brazil and could do the same in other countries in due course. In bio-fuels, specially cellulosic fuels (i.e., fuels that come from non edible parts of certain crops, so that they don't have to compete with the world's food supply) are being given more emphasis. R & D are going to develop better variety as of Jatropa or other seeds specially for countries like India.

Renewable Energy has grabbed more than 50% share of the energy in some region of Europe. Even in India, the wind energy sector grew at over 40% during last fiscal year. Rabo bank looks at renewable and sustainable energy as a possible ultimate solution to many of the world's most serious problems – environmental damage, depletion of finite resources and high price of fossil fuel based energy which affects poor people and vulnerable economies the most. So both, countries and societies are becoming more and more conscious of the risk to the world's environment posed by the emissions from fossil fuel based energy, and the risks to the world's economy from the fact that prices of fossil fuels have been rising, which poor and developing countries can hardly afford and even developed countries hardly ignore. Technology improvement can help to reduce the cost of renewable energy.

### RE in World Scenario

There was record investment in new renewal energy capacity in 2005 in \$80 billion up from \$ 30 billion in 2004, according to the latest Global Status Report from REN 21, the

Renewable Energy Policy Network for the 21st century. The reports which captures the global action in renewable energy from mid 2005 to mid 2006 has some encouraging news for the sector.

According to the report, India crossed Japan in total renewable power capacity. Germany and China led the actions in the sector parting in about \$ 7 billion each followed by the U.S., Spain, Japan and India. Overall renewable power capacity expanded to 182 GW up from 160 GW in 2004 excluding large hydro power. The top six countries expanding capacity were China (42 GW) Germany (23 GW), the U.S. (23 GW) Spain (12 GW), India (7 GW) and Japan (4 GW).

Wind energy grid connected solar photovoltaic (PV) was the fastest growing power generation technology with a 55% increase in cumulative installed capacity to 3.1 GW up from 2.0 GW in 2004, More than half of the annual global increase occurred in Germany, which saw over 600 MW of PV installed in one year. Grid – connected solar PV increased by about 300 MW in Japan and 70 MW in the U.S. several milestone occurred in 2005 in this segment, such as commissioning of the world's largest PV power plant, 10 MW total in Germany and many large commercial installation of tens and hundreds of Kilowatts (KW) each. German cumulative PV capacity exceeded Japan for the first time. Including off grid application, total PV existing worldwide increased to 5.4 up from 4.0 GW in 2004.

**Table 1 : Indicators of Renewable Energy during 2004 & 2005**

<b>Selected Indications</b>	<b>2004</b>	<b>2005</b>	
Investment in New Renewable Capacity (Annual)	\$30	\$38	billion
Renewal power capacity (Existing Excl. Large Hydro)	160	182	GW
Renewal power capacity (Existing Incl.. Large Hydro)	895	930	GW
Wind Power Capacity (Existing)	-----	48	59 GW
Grid Connected solar PV capacity (Existing)	2	3.1	GW
Solar PV Production (Annual)	1150	1700	MW
Solar hot water capacity (Existing)	77	88	GWth
Ethanol production (Annual) litres	30.5	33	billion
Biodiesel production (Annual litres	2.1	3.9	billion
Countries with policy targets	45	49	-----
States/provinces/countries with feed in policies	37	41	-----
States/provinces countries with RPS policies	38	38	
State/provinces /Countries with biofuels mandates	22	38	

Source : Renewable Global Status Report 2008 update.

Solar hot water capacity increased by 14% to reach 88 gigawatts thermal (GWth), up from 77 GWth in 2004, excluding unglazed swimming pool heating. Accounting for retirements, 13 GWth of new capacity was added in 2005. China installed 80% of that new capacity (10.5 GWth) and remained the world leader with over 60% of the global installed

capacity. Solar hot water in Europe increased by more than 1.3 GWth. India and several other countries saw an acceleration of solar hot water installations. Construction began in the US and Spain on the world's first utility scale thermal power plants in 20 years. The report notes that biodiesel growth far outpaced that of ethanol. Global production of biodiesel reached 3.9 billion litres, up from 2.1 billion litres in 2004. Biodiesel production increased by 75% in the EU, led by increase in Germany, France, Italy, and Poland, and tripled in the US. Germany alone accounted for half of global biodiesel production in 2005. Nine EU countries began producing biodiesel for the first time in 2005, bringing to 20 the number of EU biodiesel producers.

Many new policies to support renewable energy adopted over the past year, and many more were extended, revised, or discussed. Not only were the EU and US active, but more than 16 developing countries including Brazil, China, Egypt, India, Mexico, Thailand, and Uganda came up with new getway.

China announced a revised target for 16% of primary energy from renewable by 2020, including large hydro, up from 17.5% actual share in 2005. India, in addition to its short term target of 10% of added power capacity by 2020, proposed long term targets by the 2032 in several categories, including 15% of power capacity, 10% of oil consumption substituted by biofuels, synthetic fuels, and hydrogen and 100 percent use of solar hot water in all possible applications (with full coverage of users like hotels and hospi – by 2022). New short term targets by 2020 include full use of co generation in the sugar and other biomass based industries. Among EU countries, Austria had one of the highest electricity share targets for renewable energy at 78% by 2020. Sweden came second at 60 percent.

Interestingly, a number of countries dramatically stepped up targets and mandates for biofuels-ethanol and biodiesel mixed with conventional fuels. The number of countries with “feed-in” policies for the purchase of power from renewable sources increased to 41, and the number of countries with future targets for the share of energy from renewable increases to at least 49. Initiatives for grid-tied solar power multiplied, including new initiatives in the EU, California and other US states, Australia, and China.

### **RE in Indian Context**

A few years ago, people would not have believed that renewal energy could one day be powering India ahead. But no longer it is an unimaginable scenario across the length and breadth of the country. Sun water, wind and plant sources are increasingly being used to produce energy to run homes, factories, office, farm and vehicles. At present around 6, 191 MW renewal energy sources are being produced which is around 5% of the total energy capacity installed in India (127, 423 MW).

The RE industry in India can be broadly categorized into solar, wind, biomass, urban wastes, small hydro sectors and biofuels.

**Solar Energy :** India receives solar energy equivalent to over 5000 trillion KW hr/year,

which is far more than the total energy consumption of the country. The daily average solar energy incident over India varies from 4-7 KW/hr m<sup>2</sup> depending upon the location. Only a fraction of the aggregate potential in solar energy is being currently used. Processed raw material for solar cells, large capacity SPV modules, film solar cells, SPV roof tiles, inverters, charge controllers etc. have good market potential in India.

**Biomass Energy :** India produces 540 million tons of crop and plantation residues every year, a large portion of which is either wasted, or used inefficiently. Conservative estimates indicate that even with the present utilization pattern of these residues and by using only the surplus biomass materials, estimated at about 10 million tons, about 17,000 MW of distributed power could be generated, which is almost 15% of existing installed power capacity.

**Hydro Project :** With numerous rivers and their tributaries in the country, the small and hydro sector presents an excellent energy opportunity with an estimated potential of 15,000 MW. About 10% of this has been exploited so far. The Indian government also provides concessions for existing hydro projects including financial support for renovation, modernization and capacity upgrading of aging small hydro power stations.

**Energy From Wastes :** The rising piles of garbage in urban and industrial areas represent another source of non-conventional energy. Good potential exists for generating approx, 15,000 MW of power from urban and municipal wastes and approx, 100 MW from industrial wastes in India.

**Biofuels :** The first large Jatropha plantations in India are expected to start bearing fruit from next year (though not at peak levels). It is estimated that at a 20 percent blending by the year 2012, biofuels could meet 16 million tones of diesel demand in the country, reducing petrodiesel consumption by 20 percent. India has 63 million hectares of wasteland alone, and about half of this can be used to plant Jatropha and other biofuel crops.

**Table 2 : Energy Generation Pattern in India**

Fuel	MW	% age
Total Thermal	83,982	66.0
Coal	89,198	54.4
Gas	13,582	10.7
Oil	1,202	0.09
Hydro	33,350	26.0
Nuclear	03,900	3.1
Renewable	6,191	4.9
Total	1,27,423	

Source : Ministry of Power March, 2006

**Table 3 : Renewable Energy Monitor**

Source	Units	Potential	Installation
Wind Power	MW	45,000	5,340
Small Hydro Power	MW	15,000	1,729
Biomass Power	MW	19,500	809
Urban & Industrial wastes	MW	1700	25.75
Solar PV	MW/sq.km	20	---
Solar Water Heating	Mn. Sq. m	140	0.70
Biogas Plants	Mn.	12	3,440
Improved cookstoves (Chulhas)	Mn	120	35.20

Source: MNES, In March 2006

### **The Rural Thrust**

India is a country where most of the people reside in rural areas. There are rural areas with no approach roads to reach, and where drinking water still remain a dream. Electrification in these villages is beyond imagination. This can be made possible through renewal energy. In a remote village called Karayadih in Silli block of Ranchi District there are roads and drinking water has been facilitated through deep boring. Still they lacked electric light and were bound to retire by 7 pm. Now every home in this village has at least two light bulbs. The biomass generator has brought light in their lives people now utilize evening and early night hours for productive activation. This use of energy has changed the life style of the said villagers.

Rural electrification policies and programmes using renewable energy continue to emerge. China, Brazil, Bolivia and India has done a lot on this front. India's integrated Rural Electrification programme using renewable energy had served 300 districts and 2,200 villages by early 2006. More than 250 remote villages in seven stages were electrified under the programme in 2005. Additional projects are under implementation in over 800 villages and 700 hamlets in 13 states and union territories. India has also proposed to augment cooking, lighting and biomass power with renewable in 600,000 villages by 2032, starting with 20,000 remote unelectrified village by 2015, India has achieved 70 MW of small biomass gasification system for rural (off-grid) power generation.

In terms of rural electrification, China appeared the determined player. The China Township Electrification programme finished in 2005 after electrifying about 1.3 million rural people in 1,000 townships with solar PV, small hydro and a small amount of wind power. China has planned to electrify 20,000 villages and 3.5 million rural households with renewable by 2015.

The number of biogas users continues to increase in China, India, and Nepal, China reported 17 million existing biogas users in 2005, up from previous reports of 12 million.

From the report it is evident that biogas remains a priority in India with about 3.8 million

household scale biogas plants now reportedly installed, up from prior reports of 8.7 million, and 126000 new plants were expected to be installed from early April 2015 to April 2016. Nepal was providing 75 percent subsidies for family scale biogas plants.

### **Government Policies**

India is perhaps the only country in the world that has exclusive ministry that deals with renewable energy sources; but whether that has helped or not is a moot point – there are some who feel that two separate ministries for power should set-up conventional energy sources and up working at cross purposes.

Be that as it may, India has a policy framework in place to tap the potential for renewable energy. To promote investments in this sector, some of the policy measures taken by the Ministry of Non Conventional Energy Sources (MNES) include.

- 100 percent income tax exemption for any continuous block of 10 years in the first 15 years of operations.
- Providers of finance to projects are exempt from tax on any income by way of dividends, interest or long term capital gains from investment made in such projects on or after June 1, 1998 by way of shares of long term finance.
- Accelerate 100 percent depreciation on specified renewable energy based devices or projects.
- Accelerated depreciation of 80 percent in the first year of operations for wind energy.
- Interest rate subsidies to promote commercialization of new technology.
- Lower customs and excise duties for specified equipment
- Exemption or reduce of central and state taxes.

### **Investment Opportunities**

The total estimated investment in the renewal power section in the country is about Rs. 30,000 crores. Encouragingly about 90% of the investment has come from the private sector.

The market in India for RE business is estimated at \$ 1 billion every year and is growing at an annual rate of over 25 percent, with wind energy growing faster than this. The major areas of investment are : wind energy, small hydro projects, waste-to-energy, biomass, solar energy, and alternative fuel.

Of the estimated potential of 80,000 MW from RE, only about 6,191 MW has been exploited as of March 2006. The Central government has set a goal of meeting 20 percent of the country's power supply through RE by 2020.

To encourage renewable energy, the government provides various incentives, which could include central or state financial assistance, accelerated depreciation, relief in customs duty, excise duty and sales tax soft loans, and government policies covering wheeling, banking, buy back, and third party sale of power encourage the use of non-conventional energy sources and to offset the initial cost.

### **Sum Up**

For renewable energy to become mainstream in India, major institutional changes are required. Goals have to be specified. Fiscal incentives and disincentives are needed to promote this energy. Also, assured and dedicated funding for R & D in this sector is needed. There is an urgent need to set up specific institutions and organize very clear time lines. For instance, the technology for photovoltaic energy, while promising, is very costly currently. Now if the government assures to fund R & D on this for ten years with the assurance that after five years, the costs would be brought down and efficiency of conversion of energy will be increased then it would boost this sector.

Also, if certain policy measures come from the government like making it mandatory for all new buildings coming up to install solar water heaters, it would help create a market to make renewable energy products commercially viable. For instance, at the moment, due to the costs, people are unwilling to go in for photovoltaic generators. But, if it were made mandatory for all shopkeepers or housing societies to have PV generators instead of diesel generators it would escalate demand and bring down costs. Thus, a whole series of measures are needed and we also need to construct an energy roadmap to make it more mainstream. We have been experimenting with a lot of energy forms – from solar, hydro, biomass to wind.

In this country, we need biomass for rural areas, and solar photovoltaics in remote rural areas. A lot of the rural electrification comes from renewable energy sources like solar PV and biogas. Basically we have to see which works best where and use accordingly, Solar water heating has very good application in urban cities as well as in industries. On wind, we have already made rapid progress, though there are some issues with evacuation. The grids need to be strengthened.

So the target of 20% of renewable energy in total energy by 2020 can be achieved, it is possible to meet these targets only if we have policy measures to back these up.

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