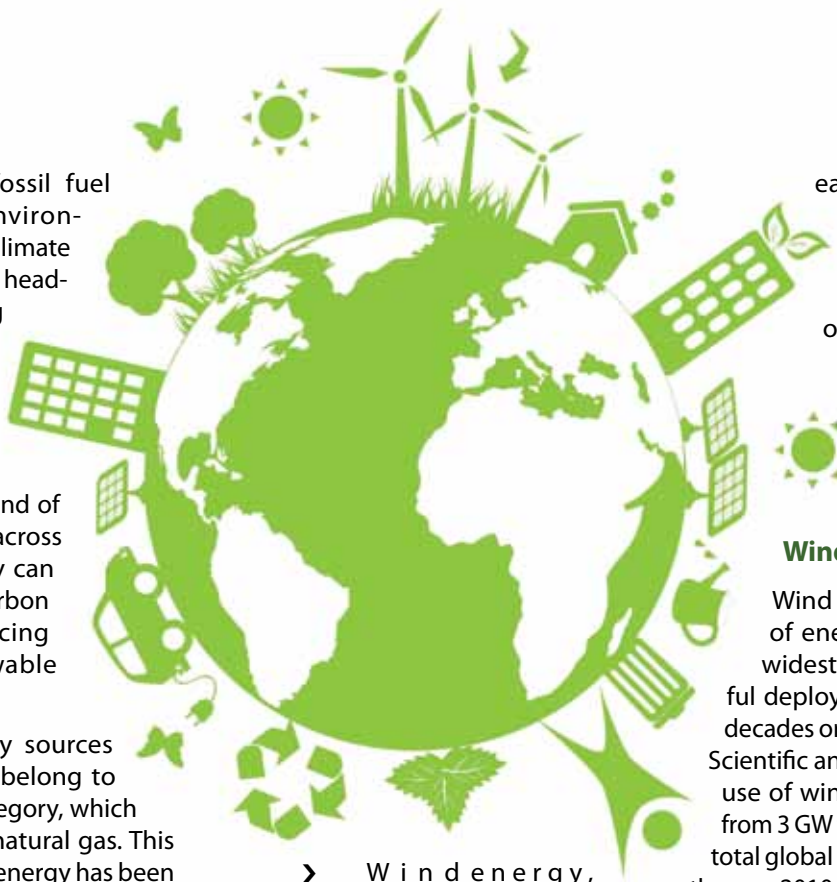
Renewable Energy

A Global View

Author - Manitam Biswas & Sambuddha Sengupta



With issues like fossil fuel exhaustion, environmental pollution and climate change dominating the headlines, there is a growing need to use alternative resources to ensure long-term security of the overall energy supply. The attempt is also to impose some kind of obligation on people across the world so that they can take steps to reduce carbon footprint while sourcing energy from renewable resources.

Most of the energy sources the world uses today belong to the non-renewable category, which includes coal, oil and natural gas. This means that when such energy has been consumed there is no chance of renewing or replacing that energy. For example, coal, a fossil fuel and one of the largest sources of energy worldwide, cannot be replaced once it is mined and burned to produce energy.

Therefore, the need to have an alternative and renewable source of energy is important as it allows the countries to exploit energies that can be renewed if and when it is needed.

The various types of renewable energy used across the world today are:

› Wind energy, which is probably the most widely used form of renewable energy worldwide

› Solar energy, which can be used in ways more than one

› Hydro-power, the energy of the falling water is used in various forms

› Biofuel, coming from different sources like plant or animal based organic matter

› Nuclear energy, which is gradually gaining importance

› Geothermal energy, tapping the earth's internal heat for variety of usage

Among these, the first three types of renewable energy are probably the most important and widely used ones.

Wind power generation

Wind as a renewable source of energy has witnessed the widest and the most successful deployment over the last two decades or so. According to the JRC Scientific and Technical Reports, the use of wind power has increased from 3 GW to 200 GW in terms of the total global accumulation. In Europe, the year 2010 saw five countries source more than 10 percent of the total electricity produced from wind. It is expected that wind will provide at least 12 percent of the total European electricity by the year 2020.

Another Global Wind Energy Council (GWEC) report reveals that the wind industry supplied 6,810 MW of energy in the US in 2011. This marks a 30 percent increase from the 5,216 MW that it had contributed in 2010. The average annual growth in the last five years has been a robust 33 percent in the US..

The wind power projects in the US are typically Independent Power Producer (IPPs) owned projects and the country has also been looking to sign long-term power purchase agreements (PPA) with electric utilities. There was an increase in the direct ownership of wind projects by electric utilities in 2011.

As per the 2012 GWEC report, there is strong possibility that wind energy will be contributing to even more electricity production throughout Latin America. Under International Energy Agency's New Policies Scenario (NPS), wind power has been granted the permission to provide 36 TWh of electricity every year in countries like Brazil, Chile and Uruguay. This will also help to save 22 million tonnes of carbon dioxide emissions by the year 2030.

The People's Republic of China is another country that has been dominating the wind power market. In 2011, China led the global market by adding 17,630.9 MW of new wind capacity. The country has in fact cemented its place as the leaders in the wind market. A total of 62,364.2 MW wind power generation capacity was installed in the country by the end of the year.

The China also set up another 107.9 MW of offshore wind in the same year bringing the total to 258.4 MW, which is the third in the world after the UK and Denmark. With government deciding on new regulations to improve quality and solve all the transmission related bottlenecks, China's wind power generation scenario looks bright. It is expected that the installations will remain at about the current level for a few years, depending on the grid capacity to accommodate increasing quantities of wind. The government has set a target of 150 GW by the year 2020; given the current scenario, the target certainly looks achievable.

Any discussion on wind energy cannot be complete without mentioning about Germany. The country has strived to maintain its position as the European leader in wind energy with an installation capacity of 29,060 MW and 22,297 operational wind turbines. In 2011 alone, a total capacity of 2,085 MW was added including 238 MW in repowering and 108 MW offshore. Additionally, onshore turbines with installation capacity of 123 MW were also decommissioned in the same year. Adoption of plans like the Renewable Energy Sources Act (EEG) has contributed to the growth of the industry quite satisfactorily.

Solar Energy

Solar energy is another reliable renewable energy source gaining gradual importance over the last few years. Solar energy is originated from thermonuclear fusion reactions occurring in the sun. The entire electromagnetic radiation is represented by solar energy.

There are basically two main ways in which solar energy is used:

Solar photovoltaic (PV): Such a system directly converts solar energy into electricity using a PV cell made of a semiconductor material.

Concentrating solar power (CSP): Such

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a device concentrates energy from the sun ray to heat a receiver at high temperature. The heat received from the sun is first transformed into mechanical energy and then to electricity, which is then called solar thermal electricity (STE).

As far as PV electricity is concerned, the industry witnessed significant growth in 2011 even in the midst of financial and economic crisis. The European Photovoltaic Industry Association (EPIA) report findings for the year 2011 reveals:

› 29.7 GW of PV systems were connected to electric grids in 2011, up from 16.8 GW in 2010

› In Europe alone this figure was 21.9 GW, compared to 13.4 GW in 2010.

› Italy emerged to be the leaders of the market with 9.3 GW connected, followed by Germany

By 2011-end, more than 69 GW of solar cells were installed globally, having the ability to produce 85 TWh of electricity every year. Such an energy volume is sufficient to cover annual supply needs of more than 20 million households.

In a country like the US, the growth of solar industry has been notably seen. The third quarter of 2012 was in fact the largest on record for the US solar industry. According to the Solar Energy Industries Association, the total installation capacity through the three quarters was 1,992 megawatts (MW), which is slightly higher than the 2011 figure (1,885 MW).

In Q3, 684 MW of photovoltaic capacity was installed throughout the country, representing a 44 percent increase in deployment.

However, in order to sustain such growth, countries need to diversify the business across several economies to relieve the pressure on countries like Germany. The cost of producing energy through CSP technology is presently higher than any conventional fossil fuel technology. There are huge opportunities of reducing cost with large scale deployment and technology improvements.

Hydro-power

Hydroelectricity is considered to be one of the major contributors to the world's overall electricity. The cost of such power production is comparatively lower than other renewable energy sources. The levelised cost of electricity (LCOE) for hydro-power refurbishments and upgrades can be as low as USD 0.01/ KWh.

The primary reasons for using hydro-power plants are:

› A significant amount of hydro-power still remains unexploited. The technical potential is even greater than what we have today in the sector

› Hydro-power provides more stability to electrical systems by providing flexibility and grid services. It can also provide grid stability as spinning turbines can be ramped up to produce electricity.

› The annual operations and maintenance costs along with the average investment is far lower than any other standard renewable energy source.

As far as production size in terms of countries is concerned, China and South America are the market leaders, housing most of the world's biggest hydro-electricity plants. In fact, China is by far the largest hydro-power producers. The Three Gorges dam in China has an ability of 22.5 GW, which is more than 50 percent larger than the second biggest power station of the world.

North America also has some of the largest hydro-power plants in the world. Other major producers include Canada, the US, Brazil and India. Hydro-electricity contributes to almost 23 percent of global electricity production, according to data released during World Hydro Power Innovation Summit 2012.

The Indian scenario

The renewable energy sector in India is still at a nascent stage. Even though it was the first country in the world to set up a ministry dedicated to the non-conventional energy resources, the sector is yet to achieve the kind of success it was expected to. According to industry reports, the share of renewable energy in the overall electricity production is around 10-12 percent, which when compared to developed countries is quite low.

The Ministry of New and Renewable Energy (MNRE) in India has been engaged in improving the state of renewable energy in the country. The latest initiative by the ministry includes the adoption of Research, Design, Development and Demonstration in order to develop new and renewable energy technologies, processes, materials and

components, products, subsystems and services.

The concentration on solar power to manufacture renewable energy has been quite evident in India. According to a recent report published by the Council on Energy, Environment and Water Natural Resources Defense Council, solar power has the ability to play a significant role in securing and diversifying India's energy future, as the country aspires to become a hub for solar projects. The CSP, in particular, has a much brighter potential to grow.

In April 2012, the Council for Energy, Environment and Water (CEEW) in collaboration with the Natural Defense Council (NRDC) published an internal report titled: Laying the Foundation for a Bright Future: Assessing Progress under Phase 1 of India's National Solar Mission. The purpose of the report was to highlight the progress of CSP projects under Phase 1 of the mission while also identifying the challenges in order to address them.

As far as the growth of wind energy is concerned, it has been one of the fastest growing industries so far, but with the withdrawal of schemes like Generation Based Incentive Scheme (GBI) and Accelerated Depreciation Scheme (AD), the market has currently slowed down. With a cumulative installation capacity of 18 GW (by 2012 end), wind power currently accounts for almost 70 percent of the total installed capacity in the renewable energy sector.

As far as government support for the growth of the renewable energy sector is concerned, initiatives and incentives haven't been scarce. In 2011, INR 482.45 billion has been invested in the Indian renewable energy sector, out of which 44.6 percent accounted to wind. Government bodies like MNRE, Indian Renewable Energy Development Agency and Centre for Wind Energy Technology have been dedicatedly working on improving the quality of renewable energy resources.

Hydro-power and biofuels are the other major contributors with market shares of 14 percent and 13 percent, respectively. Projects like Tehri Dam, Srisailam Dam and Nagarjunasagar are dedicated to hydro-power production.

While India's position in the renewable energy space with respect to other countries may be improving, a lot still needs to be done. Focus on all the key aspects of growth is crucial for the overall development of the sector as well as for prevention and protection against environmental pollution and climate change ■

Sambuddha Sengupta specialises in content development & planning and Works with Netscribes.

Manitam Biswas is a Research Analyst and works with Netscribes