

Energy Insecurity in India: Exploration of Renewable Energy Resource

Sneh Gangwar

*Assistant Professor, Department of Geography,
Aditi Mahavidyalaya, University of Delhi.*

Abstract

India has a vast supply of renewable energy resources, and it has one of the largest programs in the world for deploying renewable energy products and systems. Indeed, it is the only country in the world to have an exclusive ministry for renewable energy development, the Ministry of Non-Conventional Energy Sources (MNES). Since its formation, the Ministry has launched one of the world's largest and most ambitious programs on renewable energy. Based on various promotional efforts put in place by MNES, significant progress is being made in power generation from renewable energy sources. In October, MNES was renamed the Ministry of New and Renewable Energy. This paper focus on major renewable energy resources and their potential in India, focusing on availability and energy security.

Keywords: India, Energy Resource, Insecurity, Renewable, Potential.

1. Introduction

In recent years, India has emerged as one of the leading destinations for investors from developed countries. This attraction is partially due to the lower cost of manpower and good quality production. The expansion of investments has brought benefits of employment, development, and growth in the quality of life, but only to the major cities. This sector only represents a small portion of the total population. The remaining population still lives in very poor conditions. India is now the eleventh largest economy in the world, fourth in terms of purchasing power. It is poised to make tremendous economic strides over the next ten years, with significant development already in the planning stages. This report gives an overview of the renewable energies

market in India. We look at the current status of renewable markets in India, the energy needs of the country, forecasts of consumption and production, and we assess whether India can power its growth and its society with renewable resources.

2. Concept of Renewable Energy

Renewable energy sources also called non-conventional energy, are sources that are continuously replenished by natural processes. For example, solar energy, wind energy, bio-energy (bio-fuels grown sustainably), hydropower etc., are some of the examples of renewable energy sources. A renewable energy system converts the energy found in sunlight, wind, falling-water, seawaves, geothermal heat, or biomass into a form, we can use such as heat or electricity. Most of the renewable energy comes either directly or indirectly from sun and wind and can never be exhausted, and therefore they are called renewable.

However, most of the world's energy sources are derived from conventional sources-fossil fuels such as coal, oil, and natural gases. These fuels are often termed **non-renewable** energy sources. Although, the available quantity of these fuels are extremely large, they are nevertheless finite and so will in principle 'run out' at some time in the future. Renewable energy sources are essentially *flows* of energy, whereas the fossil and nuclear fuels are, in essence, *stocks* of energy.

India's significant untapped renewable energy resources can be an important contributor to alleviating power shortages. They can also increase energy security, contribute to regional development, enhance access in remote (rural) areas, diversify fuel sources, and provide local and global environmental benefits. Recognizing these benefits, India's policymakers have given much attention to renewable energy, setting ambitious goals for the sector. Meeting these goals will require significant capital investments and concerted action to solve the many issues faced by the different renewable energy sectors.

3. Contribution to India's energy future

Persistent electricity shortages have been identified as a key bottleneck for sustaining India's growth rate. India's per capita consumption (of just 639 kWh) is one of the lowest in the world. According to the Ministry of Power, out of the total 593,732 villages in the country as per the 2001 census, 496,365 have been electrified as of Dec 31, 2009. In 2009–10 the national power shortage averaged 10.1 percent. Access to grid power remains low, with an electrification rate of just 55 percent, leaving almost 412 million people without electricity coverage. About 42 percent of rural households in India use kerosene-based lighting, paying 20–30 times more than they would for electricity-based lighting. Supply is not sufficient even in urban areas, where about 6 percent of households use kerosene for lighting.

The economic and opportunity costs of these shortages are very high. Substantial segments of Indian business and some household customers use expensive diesel

generators to cope with grid shortages. About 60 percent of Indian firms rely on captive or back-up generation (compared with just 21 percent in China). Grid-connected captive generation capacity is estimated to be about 20GW and growing at 30–40 percent a year. In the next 25 years, India's electricity demand is expected to grow at an average annual rate of 7.4 percent. Generation capacity will have to increase fivefold to keep pace with demand growth. India needs massive additions in generation capacity to meet the demands of its fast-growing economy. In 2008 India had 148GW of generation capacity, with annual electricity generation of about 724 Billion kWh. The Integrated Energy Policy Report, 2006, estimates that India will need to increase primary energy supply by three to four times and electricity generation by five to six times to meet the lifeline per capita consumption needs of its citizens and to sustain an eight percent growth rate.

Development of renewable energy sources, which are indigenous and distributed and have low marginal costs of generation, can increase energy security by diversifying supply, reducing import dependence, and mitigating fuel price volatility. India produces three-fourths of its electricity from coal and natural gas. At current usage, its coal reserves are projected to be depleted in 45 years. India already imports 10 percent of its coal for electricity generation; it is projected to import 16 percent by 2011. With the increase in demand for coal in Asia, global coal prices are projected to rise, exerting greater pressure on India's power sector. Natural gas also constitutes about 9 percent of India's current fuel mix and it is expected to go up to 20 percent in 2025, according to India's Hydrocarbon Vision, 2025. The International Energy Agency (IEA) estimates that nominal prices of coal will likely triple during the next two decades. Coal, gas, and oil prices have seen considerable volatility in recent years, and the trend will likely continue. At the same time, the cost of renewable energy is expected to fall significantly. Under the business-as-usual scenario of supply, energy diversification is expected to worsen because of the increasing share of coal generation. The energy diversification index measured as the sum of the squares of generation mix resources is expected to decline by 20 percent between 2009 and 2032, from 0.42 to 0.35. Accelerating the use of renewable energy is also indispensable for improving air quality and the local environment and for meeting India's commitments to reducing its carbon intensity. The power sector contributes nearly half of India's carbon emissions. On average, every 1GW of additional renewable energy capacity reduces 3.3 million tons of CO₂ a year. Reducing particulate concentrations is also estimated to save 334 lives for every million tons of carbon abated.

Renewable energy has the potential to transform energy markets across the world. Globally, the clean technology industry is considered the next big high-tech industry (similar to the information technology and telecommunications sectors). Recognizing the sector's potential, China has made a strategic decision to lead the world in manufacturing solar, wind, and hydro equipment. As of 2008, it was the world's top producer of small hydropower equipment, solar water heaters, and solar photovoltaic panels, surpassing Japan. It has achieved a high level of domestic sourcing for most components for wind turbines and is expected to become the number one manufacturer

in 2010. India's early and aggressive incentives for the wind sector have led to the development of world-class players in the sector. The government's JNNSM has the potential to develop both domestic research and development (R&D) and manufacturing capability in the sector. Investing in renewable energy would facilitate the creation of globally competitive industries in wind, solar, and other technologies that can provide new opportunities for growth and leadership for corporate India.

Renewable energy development can also be an important tool for regional economic development within India. Many of the states endowed with rich renewable energy potential (Arunachal Pradesh, Himachal Pradesh, Orissa, Uttarakhand) lag in economic development. Developing renewable energy in these states can provide secure electricity supply to foster domestic industrial development, attract new investments, create employment, and generate additional state income by allowing the states to sell renewable energy trading certificates to other states. Investments to develop the attractive renewable energy potential of these states would thus give a huge boost to their economies. There are thus many good reasons for placing high priority on renewable energy development. Renewable energy should be developed, however, only if the economic benefits outweigh the costs. The economic rationale behind accelerating renewable energy growth must be made on a unified, nationwide, least-cost basis.

4. Overview: Renewable Energy in India

India's significant and sustained economic growth is placing enormous demand on its energy resources. However, there is a pervasive demand-supply imbalance that necessitates serious efforts by the government of India to augment energy supplies. The country imports about 80 percent of its oil. With the threat of a further increase in oil prices, serious problems with regard to energy security is anticipated. India also runs the substantial risk of lesser thermal capacity being installed. While dependence on imported coal is increasing, supply of indigenous coal is likely to decrease in the coming years because of production and logistic constraints. Significant accretion of gas reserves and production in recent years will probably mitigate power needs only to a small extent. Large hydro power projects fundamentally altered river ecosystems, often fragmenting channels and changing river flows. Natural lakes take hundreds of years to evolve from oligotrophic (low in nutrients) to eutrophic (rich in nutrients) status. But man-made reservoirs underwent this transition within a few years. It has degraded water quality, harmed fisheries, and brought siltation. Further, where reservoirs displaced people or suddenly changed resource availability or agricultural capacity, they brought major socio-economic problems. Difficulties of large hydro projects are increasing and nuclear power is also inundated with problems. The country thus faces potentially severe energy supply constraints.

Economic growth, increasing prosperity and urbanization, rise in per capita consumption, and spread of energy access are the key factors that would be responsible for substantially increasing the total demand for electricity. Thus there is an emerging

energy supply-demand imbalance. According to a Central Electricity Authority (CEA) report, the anticipated energy and peaking shortage in the country is estimated to be 10.3 percent and 12.9 percent, respectively, in 2011 and 2012. In view of electricity supply shortages, huge quantities of diesel and furnace oil are being used by all sectors – industrial, commercial, institutional and residential. Lack of rural lighting is leading to large-scale use of kerosene. This usage needs to be curtailed, as it is leading to enormous costs in form of subsidies, and increasing the country's import dependence. At the same time, a very large proportion of Indian citizens continue to live with no access to electricity and other forms of commercial energy. More than 50 percent of the population has little or no commercial energy access in their daily lives. Others with access often have to cope with poor and erratic availability and other fuels to complement the shortfall. With constraints in resource availability and in delivery mechanisms, traditional means of energy supplies are falling short. This is likely to be the case in the foreseeable future; energy access will continue to remain a problem.

5. Highlights of the Indian Renewable Energy Market

A number of facts and factors make the Indian renewable energy market exciting for entrepreneurs and investors. Here are some highlights:

1. India is the most developed renewable energy market in South Asia, with annual revenues of about USD 185 billion.
2. It is the third most attractive country to invest in renewable energy, according to Ernst & Young.
3. The overall demand-supply gap in the energy sector is expanding due to an increase in the population's standard of living. The demand-supply gap in power is currently at 10.3 percent and is one of the key drivers of renewable energy.
4. The utilization of renewable energy sources is still relatively low in India, thus presenting excellent business potential.
5. The Indian government expects the sector to grow to USD 19 billion, between 2008 and 2012, with renewable energy making up 20 percent of the 70,000 MW of total additional energy planned from 2008-2012.
6. India has been attracting over USD 3 billion investment every year in renewable sector
7. The country is emerging as one of the largest potential sources of Certified Emission Reduction (CER) and Renewable Energy Certificates (REC).

6. Conclusion

Developing renewable energy can help India increase its energy security, reduce adverse impacts on the local environment, lower its carbon intensity, contribute to a more balanced regional development, and realize its aspirations for leadership in high-technology industries. According to a KPMG report, India is the third most favoured

destination globally, for investments in the renewable energy sector. The report also says that the country will be a major source of new entrants into the sector, after the US and China. The Indian renewable energy market has become increasingly dynamic in recent years as a result of strong natural resources, greater accommodation to international investments and a variety of government incentives.