

Renewable Energy Present Scenario and Rural Perspectives- Review

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Abstract-

Most of the power generation in India is carried out by conventional energy sources, coal and mineral oil-based power plants which contribute heavily to greenhouse gases emission. This focuses the solution of the energy crisis on judicious utilization of abundant renewable energy resources present scenario rural perspective. This paper reviews the renewable energy scenario of India. It begins by describing the importance of renewable energy and its advantages over fossil fuels. It gives an overview of the renewable energies in India while evaluating the current status and the deployment of each of these technologies to date in India. It also reviews the multi-criteria assessment of different renewable energy and draws out vital conclusions. It is based on the secondary information collected from various mass media including internet, various reports and other International Institutions.

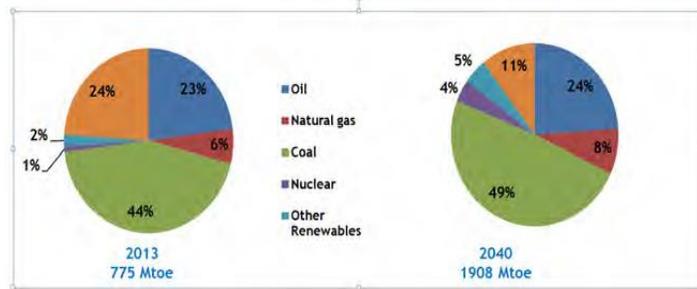
Index Terms—Conventional energy sources, renewable energy ,

1. Introduction

When India attained Independence, most of the country did not have sufficient electricity to light up its homes. The iconic lantern and the oil lamp were the only sources of light after dark. In most homes, all chores were completed by sunset and it was 'lights off' by 7.30 p.m, because very few could afford even a lantern, as kerosene was expensive and scarce. The oil lamp lit and placed at a window served as guide for travelers or those yet to return home. More than six decades after Independence, though one still gets to see the iconic figure of the little child studying under a street light, it is an exception rather than the rule. The situation has become much more 'brighter'. Electricity has reached most urban areas. According to Census 2011, there are 167.8 million households in rural areas out of which about 92,808,181 are electrified. This is thanks to the systematic planning by our policy makers, who have continuously worked to create energy sufficiency since Independence. Thermal and hydro power plants were set up in the first few decades after Independence adding capacity to our energy requirements. The situation was, however, not improving as much as necessary, as India was still dependent on imports for its petroleum and natural gas requirements. Petroleum pricing and availability was linked to West Asian politics and the massive fluctuations resulted in a heavy strain on India's balance of trade position. It is then that the policy makers began to think in terms of curtailing dependency on fossil fuels and replacing them by more renewable energy sources.

2. Energy Sector: The Challenge of Power for All

Energy use its availability and affordability, will continue to be crucial ingredients of development, growth, employment and poverty alleviation. Given its key role in households, farms, factories, offices, business places, transportation and construction it is not surprising that an intrinsically economic activity has found a prime place in the political agenda of democratically elected governments in developing countries. Human Poverty cohabits with energy poverty. Nearly two decades back we had a motivational slogan "Power for All". It has now graduated to 'Power for all 24X7', and will soon transform to Quality Power, and on to Green Power. The transportation system is almost entirely dependent on fossil fuels, essentially crude oil. We import nearly 75 per cent crude oil at present, and this figure is projected to reach 90 per cent by 2040. India is home to 18 per cent of the world's population, but uses only 6 per cent of the world's primary energy, inspite of being the third largest economy. Although energy use in India has almost doubled since 2000, it is still about one-third of the global average, and nearly 240 million remain without access to electricity. It is estimated that 840 million use primary fuels. Access to electricity is 81 per cent and clean cooking fuels 33 per cent. CO₂ emissions as a share of global emissions are 6 per cent, CO₂ emissions per capita are 30 per cent of the global average, and the share in fossil fuel consumption is 5 percent.



3. Renewable Energy Present Scenario and Rural Perspectives

There is now a growing awareness amongst the scientific community and the civil society on the need for a global energy future with distinct departure from past trends and patterns of energy usage. So far the predominant route of energy value chain comprises of generation of steam to rotate turbine, from burning of fossil or Nuclear fuels. The energy that is used for generation of power finds its application in various economic activities and house-hold uses. There is thus an undeniable relation between access to high quality energy services with human development and standard of living. Inadequate and unequally distributed energy services create Hindrance for employment generation and acts as a constraint to education and health services. India has the fifth-largest power generation portfolio worldwide. Around 60 per cent of India's current power generation capacity is coal based. The country has been rapidly adding capacity over the last few years with total installed power capacity growing to 272.5 GW. India has grown from being the world's seventh-largest energy consumer in 2000 to the fourth-largest one within a decade. Economic growth and increasing prosperity, coupled with factors such as growing rate of urbanization, rising per capita energy consumption and widening access to energy in the country are likely to further raise the energy demand in the country. The target of 40 GW roof top solar by 2022 (set by Govt of India) will result in abatement of about 6 crore tonnes of Carbon dioxide per year and will help fulfill the Indian commitment towards its contribution in mitigating the effect of the climate change.

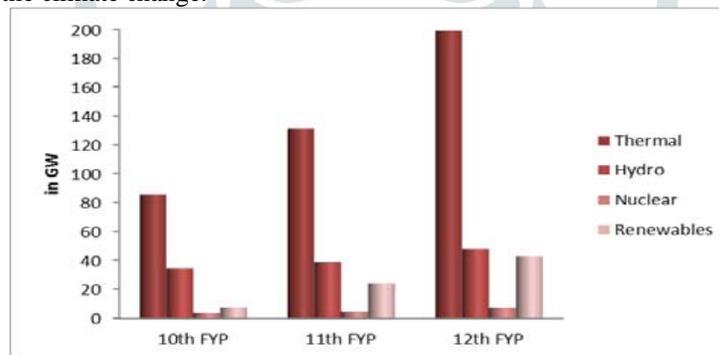


Figure 1 – Cumulative Installed Capacity (in GW)

3.1 Low Cost Solar Lanterns

Solar lanterns are increasingly finding applications in the rural areas for lighting purpose with key features such as LEDs, mobile charging, battery back-up etc. These lanterns are environment-friendly and can be immensely useful for children's study besides household and other economic activities. They have a huge potential to replace currently used kerosene lamps thus reducing the subsidy burden of kerosene.

3.2 Roof Top Solar – Off Grid

A large potential is available for generating solar power using unutilized space on rooftops in buildings and huts. Government is encouraging installations of solar power systems, particularly on rooftops, all over the country including on railway stations and airports. Solar power generated by each individual household, industrial, institutional, commercial or any other type of buildings, can be used to partly fulfill the requirement of the building occupants and surplus, if any, can be fed into the grid. So far, 26 states have notified their regulations to provide Net Metering /Gross Metering facilities to support solar rooftops installations. India will emerge as a major country utilizing the roof space for solar rooftop systems on a very large scale. The target of 40 GW roof top solar by 2022 (set by Govt of India) will result in abatement of about 6 crore tonnes of Carbon dioxide per year and will help fulfill the Indian commitment towards its contribution in mitigating the effect of the climate change.

3.3 Solar water pump

Solar water pump offer the solution. Due to division of land after every generation, 80 per cent of the farmers are small land holders nowadays. Getting new power connection for tube wells is really hard for them. Those who have tube wells, often face the threat of their power supply being disconnected by power distributing company for not being able to pay electricity bills on time. Solar water pump may be best suited to their needs. This combined with modern

techniques of irrigation such as drip irrigation, may really prove to be a boon for both – the farmer and fast receding ground water table.



3.4 Tractors equipped with solar panel

When we think of a farmer, the first image that emerges in our mind is that of a lean man with two bullocks. Though this image remains etched in the popular imagination, it is no longer true as tractors have vastly replaced bullocks. Farm mechanization has taken place at a rapid pace during last three decades. But these equipment's cost a lot and mainly big farmers are only able to afford them. Their operation costs are higher as tractors use petroleum fuel which keeps getting expensive every year, thus increasing the input costs of the agriculture. Tractors equipped with solar panel may be the solution to this problem. It is not only environment friendly but would also reduce diesel use and thus, our import bills. Due to small land holdings, expensive diesel and eight months of good sunlight, India is most suited place for these tractors. Small farmers will benefit immensely from this.



3.5 Solar dryer

Other than this, solar energy can be used in ancillary activities like food processing and dairy. Solar dryer is one such application which can be used for drying perishable, semi-perishable and wet processed food material (such as potato chips, leafy vegetables) without contamination. Solar milking machines may help dairy sector.

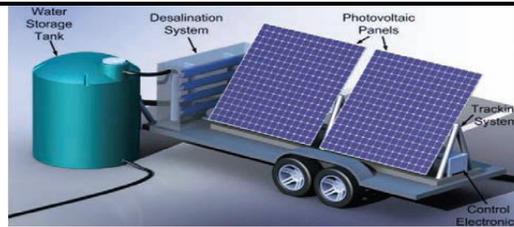


3.6 Solar electric fencing

Man-animal conflicts are often reported from all parts of the country. We often hear the herds of wild elephants straying into farmlands. They cause damage to crops and in return earn the wrath of the land owner, leading to conflict. Innumerable human and animal lives are lost in these conflicts. Though root cause of this problem lies in loss of habitat for wild animals and fragmentation of forest lands but Solar electric fencing of fields may solve this problem to a considerable extent, thus reducing the direct conflict.

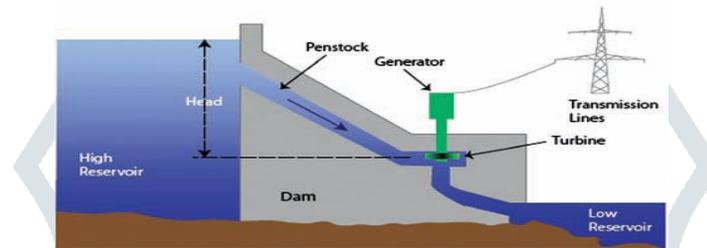
3.7 Solar desalination water plants

Pure water is matter of fortune, nowadays. Rapid industrialization and mindless exploitation of ground water has made this problem even more complicated. Several villages complain of ailments related to consumption of contaminated water. Purifying the water using modern techniques such as solar RO seems to be the only solution. Similarly India's 7600 km long coastal boundary line is facing the problem of saline water. Coastal villages are getting adversely affected. By using solar desalination water plants, drinking water crises may be overcome effectively.



4. Small Hydro-Power: Lighting Remote Villages

water is not just a liquid, essential for our survival but a good source of environment friendly, affordable and clean energy as well. The water flowing down a natural gradient can be used to turn turbines to generate electricity known as 'hydroelectric power'. With its abundant water resources, today India is the 7th largest producer of hydroelectric power, with an installed capacity of 42,783 MW. This is 14.35 per cent of total utility electricity generation in India. In addition 4,274 MW small hydro power units are installed as on 31 March 2016.



5. Biofuel

India has a tremendous biomass potential which could easily be relied upon to fulfil most of our energy needs. An estimated 5 crore metric tonnes of liquid fuels are consumed annually in India, but with the actual biomass potential and its full utilization, India is capable of generating almost double that amount per annum.

6. Biomass - One third contributor of energy to India is biomass with a potential of 22,536MW – [5] which comprises of solid biomass, which is an organic, non-fossil material of biological origins. Biogas which is principally methane and carbon dioxide is produced by anaerobic digestion of biomass and combusted to produce heat. Currently, India has 3697MW [6] installed capacity. Following is a list of some States with most potential for biomass reduction: Andhra Pradesh (200 MW), Bihar (200 MW), Gujarat (200 MW), Karnataka (300 MW), Maharashtra (1,000 MW), Punjab (150 MW), Tamil Nadu (350 MW), Uttar Pradesh (1,000 MW) [7].

7. Wind - Electrical energy and mechanical energy can also be produced by wind energy. India has 19051 MW of installed capacity and ranks 5th and has a potential of utilization up to 102772MW. Some of the major wind energy plants are located in Tamil Nadu (7160MW), Gujarat (3093MW) and Maharashtra (2976MW).

8. Geothermal - One energy sources that has not been exploited at all, is the geothermal energy, which is an enormous, underused heat and power resource that is clean, reliable and home grown. [8]With growing dependence on coal and with increasing environmental problems, India will soon have to start exploiting this source of energy which has a potential of about 10000 MW [9].

9. Nuclear - Nuclear power stands fourth in electricity generation in India after thermal, hydro and wind. India stands ninth in the world in terms of number of operational nuclear power reactors and has 20 nuclear reactors in operation in six nuclear power plants, generating 5,780 MW, also seven nuclear reactors are under construction. India's electricity generation is expected to reach 20,000 MW by 2020. The Biggest Nuclear plant in India is located in Tarapur, Maharashtra, 1400MW, followed by Rawatbhata in Kota Rajasthan, 1180 MW and KaigaKarnataka, 880 MW. Kudankulam, Tamil Nadu of 2000MW, India's biggest power plant is under construction.

10. Ocean - There is a huge potential of tidal and marine energy in India which can be produced from ocean. For the tidal energy potential- locations are the Gulf of Cambay and the Gulf of Kachchh on the west coast with max tidal range- 8m to 11m and average range- 5m to 7m .The Ganges Delta, Sunder bans West Bengal too has good locations for small scale tidal power development. The tidal power potential in India is 8000-9000 MW- 7000 MW [10] in the Gulf of Cambay, 1200 MW in the Gulf of Kachchh and less than 100 MW in Sunder bans. And for the marine energy potential- along the 6000 Km of coast is about 40,000 MW. A British tidal energy company, Atlantis Resources, is expected to set up a tidal power plant with the capacity to generate over 50 MW in the Gulf of Kutch with construction already started in early 2012.

11. why are renewable sources better than oil resources?

A broad comparison between renewable sources of energy and oil resources based on some factors is given below, see Table I. It indicates that renewable resources are the future for the country in the energy sector and there is a need to completely unleash the potential of these resources.

TABLE I: DIFFERENCE BETWEEN RENEWABLE ENERGY AND OIL RESOURCES

	Renewable sources of energy	Oil Reserves
1. Availability	They are abundant in nature	Oil reserves are limited in nature
2. Regeneration	Can be Regenerated; Inexhaustible resource	Ore is drained , can't be regenerated
3. Emission	Zero emission	releases greenhouse gases
4. Environmental effect of use	There is no adverse effect on Environment. The whole system is pollution free and environment friendly.	Harmful to the environment
5. Transportation	Used where it is available or transported where needed	Has to be transported from its source site for further processing, exposing the environment to pollution from accidents
6. Distribution	Evenly distributed in world.	Uneven distribution which leads to flow gap And price fluctuations.
7. Development	Leads to more sustainable development. i.e. more jobs opportunities	Lesser sustainable development
8. Storage	Need storage between Production and consumption.	Portable form of energy. Easy to store
9. Climate Change	Depends on alteration of climate	Do not depend on weather modifications
10. Area	Large amount of land is required	Not large geographical area is required
11. Geo- political implications	Reduces our reliance on oil, Safe guarding national security. Allows for self- sufficiency	Over-reliance on oil as a resource can undermine a country's energy security.
12. Cost	High Capital and Maintenance cost.[4]	Cost of producing is low since they are naturally available. Furthermore they are cheap to transform from one form of energy to another.
13. Energy Supply	Once generated, they produce high amount of energy.	limited supply only

Conclusion

Looking at the present scenario, a sustainable energy system in country like India is essential, the need of the hour for sustainable development. Because of the Inequality in energy distribution, renewable energy has the possibility of becoming the foundation for the country's future energy requirements. An analysis on the demand for new renewable technologies clearly shows a shift in preference towards these technologies as a source of energy- wind, biomass, and geothermal, tidal and marine, hydropower, solar photovoltaic. In Future many small project and initiative can be taken to use renewable energy for the industry and social welfare.

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