AGRICULTURE & FOOD: E-NEWSLETTER
WWW.AGRIFOODMAGAZINE.CO.IN
ISSN: 2581 - 8317

Renewable Energy Technologies and Opportunities for Rural Youth in India

Article ID: 32251

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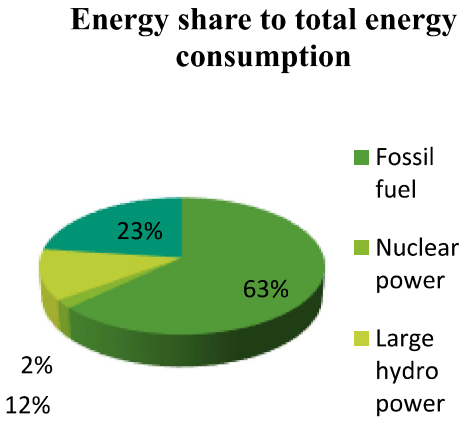
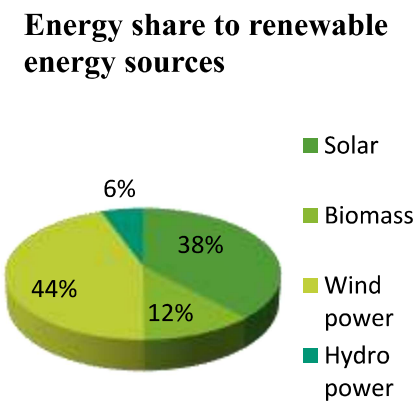
Abstract
An ever-growing population means an ever-growing requirement for energy. Sensibility to the undeniable fact that non-renewable sources are eventually depleting, the importance of renewable sources cannot be underestimated. To reach the requirement of energy, India requires 3–4 times more energy than the energy consumed every day, which paves a way towards exploitation of substitute sources of non-conventional energy sources and is inevitable. Today, renewable accounts for about 33% of India's primary energy consumptions. This article discloses about the major technical and commercial developments in renewable sector in our country and relevant government Policies and programmes on renewable energy which provides a platform for rural youth to adopt the present-day developing technologies which are feasible and energy efficient.

Introduction
Energy is the primary and most universal measure of all kinds of work by human beings and nature and being the indispensable input in all sectors of our country's economy. The energy requirement of any country is signified by per capita energy consumption, for India it is 150 kWh and it consumes only 1 % of total energy consumed in the world. (G. D. Rai, 2017).

These available sources of energy are grouped into three major types:
1. Primary energy sources: primary energy sources are the sources which furnish full supply of energy with high energy yield ratio. Even though these primary sources accelerate the growth but limited their supply.
2. Secondary energy sources: are these which produce no net energy.
3. Supplementary sources: are these which yield zero net energy but this consuming highest energy input for energy insulation. Coal natural gas, oil and nuclear energy are the primary sources of energy which yield net energy using breeder reactor. Solar energy, wind energy, water energy etc belong to Secondary sources.





Present day, each and every country withdraws its energy requisite from a variety of sources which are broadly categorized as commercial and non-commercial sources. The commercial sources include the fossil fuel (coal, oil and natural gas), hydroelectric power and nuclear power. While the non- commercial sources include wood,

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animal waste and agricultural waste. The exhaustion of natural resources and the accelerated demand of conventional energy have forced planners and policy makers to look for alternate sources.

Renewable energy supplies 22 % of the world's final energy consumption, counting traditional biomass, hydropower, and ''new'' renewable (wind, solar, geothermal, and bio fuels). The promising prospect for the future is adoptability of non-conventional energy resources is as a substitute to conventional energy. Hence, an attempt has been made through this paper to presents the information about the major technical and commercial developments in this sector in our country.

Renewable Energy in India

The population of India is more than 1028 million and is growing immensely at an annual rate of 1.58%. As fossil fuel energy becomes scarcer, it is inevitable to face energy shortages significantly due to increase in its cost and energy insecurity within the next few decades. India is determined to becoming one of the world's leading clean energy producers. The Government of India has already made various provisions, and entrenched many agencies that will help it to reach its goal. The country has an entrenched renewable energy potential of around 85,000 MW from commercially exploitable sources, i.e., wind, 45,000 MW; small hydro, 15,000 MW and biomass/bio energy, 25,000 MW. In addition, India has the potential to generate electricity using photovoltaic cells. (Ashwini et al, 2010)

1. Solar energy: it is the vital power source with the potential of 178 billion which is about 20,000 times the world's demand. The solar power where sun hits atmosphere is 1017 watts, whereas the solar power on earth is 1016 watts. The total world-wide power demand is 1013 watts. The sun provides us 1000 times more power than it is required. If we use only 5 % of this energy, it will be 50 times what the world is in need of. The energy radiated by the sun on a bright sunny day is approximately 1 kW/m2. As India lies in a temperature climate of the region of the world, where sun light in abundant for a major part of the year. It is necessitated to plan for proper utilization of solar energy.

The applications of solar energy as follows:

a. Heating and cooling of residential building
b. Solar water heater
c. Solar drying of agricultural and animal products
d. Solar distillation on a small community scale
e. Salt production by evaporation of seawater or inland brines
f. Solar cookers
g. Solar furnaces
h. Solar photovoltaic cells etc.

2.Wind energy: it is used for power generation and pumping of the water. About 0.7 million wind pumps are in operation in different countries. A minimum wind speed of 3m/s is needed. Potential in India is estimated between 20,000 and 25,000 MW. The maximum power generated from any single unit is about 1MW. The energy available in the winds over the earth's surface is estimated to be 1.6 × 107 MW which is of the same order of magnitude as the present energy consumption on the earth. Wind energy which is the indirect source of solar energy conversion can be utilized to run wind mill, which in turn drives a generator to produce mechanical power, such as for water pumping. In India generally wind speeds obtainable are in the lower ranges. The developments are being mainly concentrated on water pumping wind mills suitable for operation in the wind speed of 8 to 36 km per hour.

3. Biomass energy: The potential for application of biomass as alternative sources of energy in India is very great. We have plenty of agricultural and forest resources for production of biomass. Biomass is produced in nature through photosynthesis achieved by solar energy conservation. The biomass is used directly by burning or is further processed to produce more convenient liquid and gaseous fuels.

Biomass resources fall into three categories:

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a. Biomass in its traditional solid mass (wood and agricultural residue)
b. Biomass in its non-traditional form converted into liquid forms.
c. Ferment the biomass anaerobically to obtain a gaseous fuel called biogas.

The production of biogas is of particular significant for India because of its large cattle production as the main source of biogas production is wet dung. The total cattle production the country is about 250 million. Some other sources of biogas are sewage, crop residue, vegetable waste, water hyacinth, poultry droppings, pig manure, algae and ocean kelp. In rural sector biogas finds great applications in cooking, lighting, mechanical power and generation of small electricity. Biogas can be used solely or with diesel engine in I.C. engines, for production of power. During seventh plan period more than 7.3 lakh families based on biogas plants were installed.

Future of Renewable Energy in India

India, faced with twin challenges on energy and environmental front, has no option but to work towards increasing the role of renewable in the future energy systems. Renewable energy technologies vary widely in their technological maturity and commercial status. In India, renewable energy is at the take-off stage and businesses, industry, government and customers have a several issues to address before these technologies could make a real penetration. India bearing with massive renewable energy resources (solar PV, wind, solar heating, small hydro and biomass) is to set to have large-scale development and deployment of renewable energy projects. India would also have to look for international cooperation in renewable energy through well defined R&D projects with proper division of labour and responsibilities for specific tasks with equitable financial burden and credit sharing arrangements. Renewable energy development is considered in India to be of great importance from the point of view of long-term energy supply security, environmental benefit sand climate change mitigation. A number of government and private organizations such as MNRE, Centre for Wind Energy Technology, Universities, IITs, NITs, Indian Oil Corporation Ltd. (IOCL) and The Energy Resource Institute (TERI) are involved in R&D of renewable energy sources.

Conclusion

Energy security, economic growth and environment protection are the national energy policy drivers of any country of the world. The increased prices of crude oil boosted up the efforts for further evolution and advancement of renewable energy sources. A censorious part of the solution to the problem lies in encouraging renewable energy technologies as a response to concern about security of energy, economic growth against rising energy prices, competitiveness, health costs and environmental degradation. The focus has to be increased towards the deployment of renewable power which accounts for around 5% in the electricity-mix by 2032. Finally, renewable energy provides enormous benefits and can contribute significantly in the national energy mix at least economic, environmental and social costs and it is expected that the share of renewable energy in the total generation capacity will increase in future.

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