http://ijopaar.com; 2016 Vol. 3(1); pp. 52-57

Renewable Energy Sources: A Solution of Power Crisis

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Date of revised paper submission: 24th July 2016; Date of acceptance: 31st July 2016
Date of publication: 14th August 2016; Impact Factor: 3.598; Quality Factor: 4.39
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Abstract

Crisis of power is one of the major problems in developing countries particularly in India. Day by day the gap between demand and production is increasing. Moreover, most of the power plants are fossil fuel based which will be phased out in future. Misuse and system loss in power sector are supposed to be the main issue regarding this crisis. It is possible to fulfill load demand by reducing transmission loss, by using compact fluorescent or LED lamps, transformation of holiday, proper load management and encouraging Independent Power Producers (IPP). Priority is given to control the misuse and mismanagement in power sector than to increase the generation of power. But proper utilization of renewable energy should be the up most choice for the solution of the power crisis. This is because it requires low cost and has lesser risk Initiative should be taken to develop new technology and skilled manpower required for the power sector considering renewable energy sources.

Keywords: Energy, Power.

1. INTRODUCTION

India is one among the fastest developing countries which is facing the critical problem of power crisis. There is acute shortage of electricity. This crisis consists in a peculiarly interlocked group of shortages, not only of electrical generating capacity but also of every major fuel supply. Behind these shortages lies a system of controls and interventions which not only have failed individually to achieve their intended purposes but have also worked at cross-purposes with one another. It is difficult to design a system that would succeed better than the current patchwork of interventions to wreak havoc in the field of power generation.

The ultimate source of power for both heating as well as for electricity is fuel. The four primary types of fuel currently in use are coal, oil, natural gas and uranium. Nuclear power plants provide less than 1% of the nation's total electricity at present.

The demand for electric power increases each second and there is an alarming and mounting power crisis throughout the globe. The efforts are being made to solve the existing crisis. There are several counter measures being planned such as generating power through diesel generators, solar,

wind and other green initiatives. However, they may incur huge costs and consume more time for actual implementation. In India renewable energy sector is said to be still in its infancy although Indian electricity sector is very active in renewable energy utilization, especially wind energy. India had an installed capacity of about 31.15 GW of non-conventional renewable technologies-based electricity, about 13.32% of its total.The major renewable energy sources are as following :

(a) **Solar energy:** Solar energy is the ultimate solution to power crisis. India has an ideal location for solar energy utilization. In a recent study conducted by Renewable Energy Research Centre, it is found that average solar radiation varies between 4 to 6.5 kWh per day and maximum amount of radiation are available in the month of March to April and minimum in December to January. Moreover, in the rural areas where there is no electricity connection, photovoltaic technology can be a blessing.

It is needed that newly built apartment buildings use solar panels along with the grid connection to get support during the load shedding period. But solar photovoltaic is lagging behind due to some hurdles. Although it can give service up to 20-25 years with proper maintenance, its installation cost is very high. Further, conventional batteries are very costly and have life span of around two to five years. These batteries are suitable for small scale power generation. The electricity generated by solar cells is therefore about five times to the conventional electricity. Unless the technology allows us to develop efficient storage devices which are cost effective too, solar photovoltaic is going to remain confined in limited domain. This is the reason that grid interactive solar energy is getting popular in European countries as it does not require a battery to store generated energy. Solar plates tap the solar power and provide it to grid where it gets stored. In the area where solar intensity is very high, solar thermal power plant can be installed. It is already well accepted in the country. Solar dryers, water heaters have directly contributed in conservation of electricity.

(b) **Nuclear Power**: In India, a total of 20 nuclear power plants are operational. Our history in nuclear power traces back to 1969 when Tarapur Atomic Power Station was setup. Foreseeing the ever growing power needs of the future generation and depleting natural resources, India has planned another 20 plants, while four are under construction.

Working of nuclear power plant is complex and each stage of energy production is closely monitored. A fission process of controlled nuclear reaction takes place where heavy nucleus splits into two or more lighter nuclei producing huge amount of power. Nuclear Power Plant works according to the international

safety standards set by AERB (Atomic Energy Regulatory Board).

Nuclear Power Plants in India are spread across the country in zones which are non earthquake prone. Most of the plants belong to the 3rd generation of plants, which have highly safety and security standards. It is notable that the operational plants like Kaiga Nuclear Power Plant, Madras Nuclear Power Plant, etc are standing example of optimal technological utilization. In addition, the planned and under construction nuclear power plants like Jaitpur Nuclear Power Project and Kudankulam Nuclear Power Plant are set to multiply nuclear energy generation potential of India.

(c) **Hydroelectric Power**: Hydroelectric and coal-fired power plants produce electricity in a similar way. In both cases a power source is used to turn a turbine, which then turns a metal shaft in an electric generator, this produces electricity. A coal-fired power plant uses steam to turn the turbine blades; whereas a hydroelectric plant uses falling water to turn the turbine.

(i) Turbine Blades-

The dams are built on large rivers that have a large drop in elevation. The dam stores lot of water behind it in the reservoir. Near the bottom of the dam wall there is water intake. Gravity causes it to fall through the penstock inside the dam. At the end of the penstock there is a turbine propeller. A hydraulic turbine converts the energy of flowing water into mechanical energy. A hydroelectric generator converts this mechanical energy into electricity. In a large generator, electromagnets are made by circulating direct current through loops of wire wound around stacks of magnetic steel laminations. These field poles are mounted on the perimeter of the rotor. The rotor is attached to the turbine shaft, and rotates at a fixed speed. When the rotor turns, it causes the field poles (the electromagnets) to move past the conductors mounted in the stator. This, in turn, causes electricity to flow. Power lines are connected to the generator that carries electricity to consumers. The water continues past the propeller through the tailrace into the river past the dam.

(ii) Pumped storage: Reusing water for peak electricity demand

Demand for electricity is not constant and it goes up and down during the day, and overnight. Hydroelectric plants are more efficient at providing for peak power demands during short periods than are fossil-fuel and nuclear power plants, and one way of doing that is by using “pumped storage”, which reuses the same water more than once.

Pumped storage is a method of keeping water in reserve, for peak period power

demands by pumping water that has already flown through the turbines back up to a storage pool above the power plant at a time when the demand for energy is low, such as during the middle of the night. The water is then allowed to flow back through the turbine generators at times when demand is high and a heavy load is placed on the system.

The reservoir acts much as a battery, storing power in the form of water when demand is low and producing maximum power during daily and seasonal peak periods. An advantage of pumped storage is that hydroelectric generating units are able to start up quickly and make rapid adjustments in output. They operate efficiently when used for one hour or several hours. Because pumped storage reservoirs are relatively small, construction costs are generally low compared with conventional hydropower facilities.

(d) Ocean wave energy

Ocean wave energy is generated directly from the waves of the oceans. It is another special type of renewable energy which helps to decrease the harmful emissions of green house gases associated with the generation of power. India has the oceans surrounding the country. It can be potentially a significant source of electricity for our country. Though the main purpose of ocean wave energy is electricity generation, it can also be used for pumping of water, water desalination etc. The oscillation water column method is technically feasible and becoming economically attractive in this purpose. This type of wave energy harnessing device is being commissioned by several countries.

(e) Tidal energy

Tidal power or tidal energy is a form of hydropower that converts the energy of tides into electrical power. As tides are more predictable than wind and sunlight, tidal energy can easily be generated from the changing sea levels. The coastal area has a tidal rise fall of several meters.

(f) Biodiesel

Biodiesel is chemically trans esterified lipid. It is mono-alkyl ester and said to be hydrogenated alkane renewable diesel. This term refers to a vegetable oil- or animal fat based diesel fuel consisting of long- chain alkyl (methyl, ethyl, or propyl) esters. Biodiesel is typically made by chemically reacting lipids e.g., vegetable oil, animal fat or tallow with an alcohol producing fatty acid esters.

Biodiesel is meant to be used in standard diesel engines and is thus distinct from the vegetable and waste oils used to fuel converted diesel engines. Biodiesel can be used alone, or blended with petro diesel in any proportions. Biodiesel can also be used as a low carbon alternative to heating oil.

In recent years fossil fuel depletion and global warming issues are the point of concern around the world. To reduce carbon emissions and decreasing reserves of fossil fuels, biofuel can be an attractive source of energy. In comparison to fossil fuels, biofuel can reduce the emission of $C0_2$. Next generation biofuels can be a great solution to the global warming and the crying need of fossil fuels. The biodiesel can be used in the diesel generator to produce electricity. This will be cost efficient and also environmental friendly.

(g) Geothermal energy

The thermal energy which is generated and stored inside the earth surface is called geothermal energy. It is very much cost effective and environment friendly. With this technology, the steam and hot water produced inside the earth surface is used to generate electricity. Geothermal energy is generated about 4000 miles below the surface, in earth core. This energy is produced due to slow decay of radioactive particles in rocks. As aresult high temperature is produced inside the earth. About 10715 MW of geothermal energy is generated in 24 countries worldwide. The demand of electricity in urban as well as in the rural areas are increasing, but our production of electricity is not increasing. The rural demand for electricity can be covered by the production of electricity through geothermal energy. The electricity demand of urban can be met by this saved electricity which is supposed to be provided in the rural areas. Geothermal energy can balance the electricity consumption.

(h) Wind energy

The wind sector is progressing fast. There are many hilly and coastal areas in India which have huge potential for wind energy generation. Wind energy is a technique which converts the air flow into mechanical energy which is eventually converted into electricity without generating pollutants.

2. CONCLUSION

Power crisis can be solved by the use of renewable energy sources. Such sources are bio-diesel, biogas, solar energy, micro hydro, wind energy, ocean wave energy, ocean tidal power, geothermal energy etc. Some renewable energy resources like small hydro, micro hydro, wind, solar thermal, bio-mass based standalone power generation units have succeeded in India to some extent, whereas there is no serious study for tapping the potential of geothermal energy. Potential of wave and tidal energy remains untapped just without any satisfactory reason. Solar energy can also be a great source for solving power crisis in the country. But due to some technical limitations and cost solar photovoltaic has failed to gain necessary popularity.

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