Utilization of Electrical Energy & its Recent Advancements

Bhagat Singh Tomar
Assistant Professor,
Electrical Engg. Department,
Laxmi Devi Institute Of Engg. & Technology,
Alwar,(Rajasthan),India,

Dwarka Prasad
Professor,
Electrical Engg. Department,
Laxmi Devi Institute Of Engg. & Technology,
Alwar,(Rajasthan),India

***Abstract*— This paper is presented to focus light on the utilization of electrical energy to enhanced its outcomes & solution to solve the upcoming problems in power sector.**

***Index Terms*— Electrical Energy , Bio Fuels, Solar Ponds, Renewable , Utilization, Generator, Piezoelectroic.**

1. INTRODUCTION

Energy plays a key role in achieving the desired economic growth. Efficient utilization of energy resource is not only conservational it also saves capital investment. Electric energy occupies the top grade in the energy hierarchy. It finds innumerable uses in home, industry, agriculture and in transport. Electric Energy demand has been rapidly increasing in India since 1947. The increase was very sharp in the seventies. This is attributed to greater industrialization and large scale use of electric energy for agricultural purpose. The per capita consumption in India is ridiculously low as compared to that in developed countries.

II. ELECTRIC ENERGY GROWTH IN INDIA

Table 1 shows the installed capacity and per capita consumption in India.

Year	Installed capacity	Per capita consumption(KWH)
1950	1.71	15.6
1961	4.65	37.9
1969	12.96	77.9
1979	26.68	130.9
1990	63.63	238.0
1997	85.79	334.3
2005	118.426	612.5

Table .1 Electric Energy growth in India

The electrical losses are very high in India and are about 4-5 times as compared to other developed countries. These losses are in transmission, distribution, transformation and energy theft.

Year	Percentage Losses
1950	15.2
1961	15.2
1969	17.0
1979	20.0
1990	23.3
2002	33.98
2005	31.25
2007	29.89

Table .2 Electrical Energy losses

III PLANNED DIRECT METHOD OF UTILIZATION

Solar energy can be used by man in a planned direct or indirect way. In the case of indirect utilization of solar energy we consider the use of renewable energies which are secondary effects of solar energy, i.e., wind energy, hydro energy, ocean energy, and secondary energy from photosynthetic process that is mostly connected with the use of biomass and biofuels. Using solar energy in the direct way we can apply two fundamental methods of energy conversion: photo thermal conversion of energy of solar radiation; photoelectric conversion of energy of solar radiation. Applying a photo thermal conversion of solar radiation energy we consider usually the following systems: Active low temperature solar water and air heating or cooling systems, which includes; – solar water heating systems with flat plate or vacuum solar collectors, – solar air heaters, including crop driers, – solar space cooling systems coupled with absorption refrigerator, – solar ponds, which are solar collectors and heat stores at the same time. They comprise several layers of salty water. With the increase of depth the salinity (density) increases, convection is suppressed, and the bottom layer is the hottest.

Solar radiation can cause photovoltaic generation of a power by separating positive and negative charge carriers in the absorbing material. In a presence of an electric field, the charge carriers can produce a current. Photoelectric devices are electrical current sources driven by a flux of solar radiation. However, solar cells are not the subject of this paper. When concerned with the effective use of solar energy and other renewable we consider the following characteristic features. Availability and power of a source, coherency between a source and an user, capacity of a source, low cost of energy extraction/conversion and transmission, steady and as high as possible performance of a source, energy use/extraction ought not to disturb natural energy balance of the source/environment, ecological issues.

The features mentioned above together with geographical location, climate, and local conditions are the most important factors that determine the possibilities of applying solar energy and other renewable and methods of energy conversion. Due to these factors some methods of energy conversion and some types of the system are preferable, and some are limited or even ineffective in the given conditions.

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In the case of solar energy, the use of high temperature systems with concentrators, electric power system with distributed concentrating collectors or centralized power tower systems, is restricted to special geographical regions characterized by high irradiation with high proportion of beam radiation, and high clearness sky index. Therefore in the high latitude countries it is not viable to apply these systems (even at the present state of a solar technology).

The paper analyses only these solar systems that utilize the photo thermal conversion of solar radiation and can operate in effective way in the high latitude countries. These systems are the typical and most popular option for modern low temperature heating systems and particularly they are the active solar water heating systems with flat plate solar collectors and passive solar space heating systems. Nowadays, the applied active and passive solar technologies are mature and start to compete with traditional water and space heating systems.

IV RECENT ADVANCEMENT IN ENERGY

A ARTIFICIAL PHOTOSYNTHESIS

One of the crucial missing pieces in the portfolio of renewable energy sources is a clean liquid fuel that can replace gasoline and other transportation fuels. One of the most promising possibilities is artificial photosynthesis, mimicking nature's own method for converting sunlight, carbon dioxide, and water into fuels. A "bionic leaf" that could capture and convert 10 percent of the energy in sunlight, a big step forward for the field. It's also about 10 times better than the photosynthesis of your average plant.

A cobalt-phosphorous alloy to split the water into hydrogen and oxygen, and then set specially engineered bacteria to work gobbling up the carbon dioxide and hydrogen and converting them into liquid fuel.

B. SOLAR THERMOPHOTOVOLTAICS

A solar thermo photovoltaic device that could potentially push past the theoretical efficiency limits of the conventional photovoltaic’s used in solar panels. Those standard solar cells can only absorb energy from a fraction of sunlight's color spectrum, mainly the visual light from violet to red.

The nanotubes capture energy across the entire color spectrum, including in the invisible ultraviolet and infrared wavelengths, converting it all into heat energy. As the adjacent crystals heat up to high temperatures, around 1,000 °C, they reemit the energy as light, but only in the band that photovoltaic cells can capture and convert.

C. PEROVSKITE SOLAR CELLS

Perovskite solar cells are cheap, easy to produce, and very efficient at absorbing light. A thin film of the material, a class of hybrid organic and inorganic compounds with a particular type of crystal structure, can capture as much light as a relatively thick layer of the silicon used in standard photovoltaics.

One of the critical challenges, however, has been durability. The compounds that actually absorb solar energy tend to quickly degrade, particularly in wet and hot conditions.

D. CARBON STORAGE

Electricity generation is responsible for producing 30 percent of the nation's carbon dioxide, so capturing those emissions at the source is crucial to any reduction plan. This year saw advances for several emerging approaches to capturing carbon in power plants, including carbonate fuel cells, as well as at least some implementations of existing technology in the real world.
One method, however, appears more promising than initially believed: burying carbon dioxide and turning it into stone. Since 2012, Reykjavik Energy’s Carb Fix Project in Iceland has been injecting carbon dioxide and water deep underground, where they react with the volcanic basalt rocks that are abundant in the region.

E. CARBON DIOXIDE TO ETHANOL

Another promising option for captured carbon dioxide is, essentially, recycling it back into usable fuels. When voltage was applied, the device converted a solution of carbon dioxide into ethanol at a high level of efficiency. The materials were also relatively cheap and the process worked at room temperature, both critical advantages for any future commercialization.

V FUTURE TECHNOLOGY

In the future, civilization will be forced to research and develop alternative energy sources. Our current rate of fossil fuel usage will lead to an energy crisis this century. In order to survive the energy crisis many companies in the energy industry are inventing new ways to extract energy from renewable sources. While the rate of development is slow, mainstream awareness and government pressures are growing.

A. THE SPHERICAL SUN POWER GENERATOR

A spherical sun power generator prototype called the beta.ray. His technology will combine spherical geometry principles with a dual axis tracking system, allowing twice the yield of a conventional solar panel in a much smaller surface area. The futuristic design is fully rotational and is suitable for inclined surfaces, walls of buildings, and anywhere with access to the sky. It can even be used as an electric car charging station.

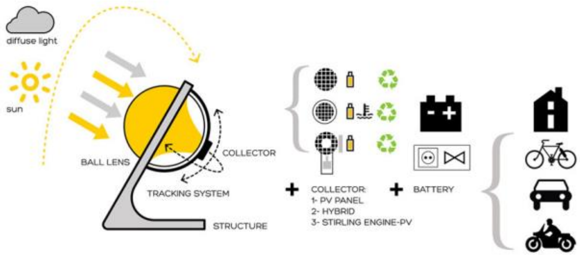

FIGURE 1 SPHERICAL SUN POWER GENERATOR

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B. 3D PRINTED SOLAR ENERGY TREES

The tree's leaves are actually flexible organic solar cells, printed using well established mass-production techniques. Each leaf has a separate power converter, creating a multi converter system that makes it possible to collect energy from a variety of sources like solar, wind and heat temperature. The more solar panels there are in a tree, the more energy it can harvest. The trunks are 3d printed using wood-based biocomposites. They are mass producible and can be infinitely replicated.

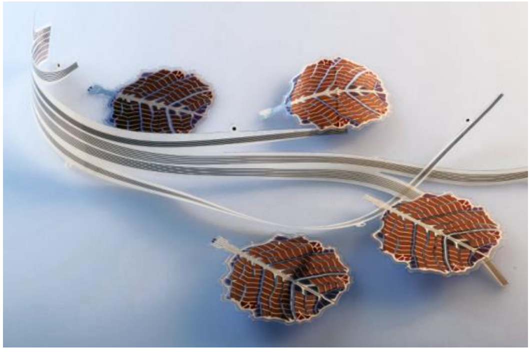

FIGURE 2 SOLAR ENERGY TREES

C. FLYING WIND FARMS: FUTURE POWER HARVESTERS.

A pair of balloons at 2,600 feet. The open sails move antagonistically so while one moves downwind the other moves upwind. This movement spins a turbine to generate power. The option of offshore flying wind turbines is also being explored to solve the airspace competition issue. At higher altitudes, wind has more power and velocity and is more consistently predictable. As power generated goes up because of higher wind resistance proportional to the cube of relative velocity, more power can be generated. That works out to be some 8 – 27 times the power produced at ground level. The tethers can haul in the kites/balloons housing the turbines during storms or for general maintenance work. less pollution is an advantage, as well as the fact that it will not take up much precious ground space for installation. This plan certainly presents plenty of challenges for air traffic and other unmanned aircraft by its need of a minimum 2-mile no-fly zone. The offshore option also has the extra effort of transporting the energy from sea to land-based power plants.

FIGURE 3 FLYING WIND FARMS

D. SOLAR WIND POWER: GENERATING POWER IN THE FUTURE

Energy generated from Sun, which is better known as solar power and energy generated from wind called the wind power are being considered as a means of generating power. now combined **solar power** and **wind power** to produce enormous energy called the solar wind power, which will satisfy all energy requirements of human kind.

The satellite launched to tap solar wind power, instead of working like a wind mill, where a blade attached to the turbine is physically rotated to generate electricity, would use charged copper wire for capturing electrons zooming away from the sun at several hundred kilometers per second.

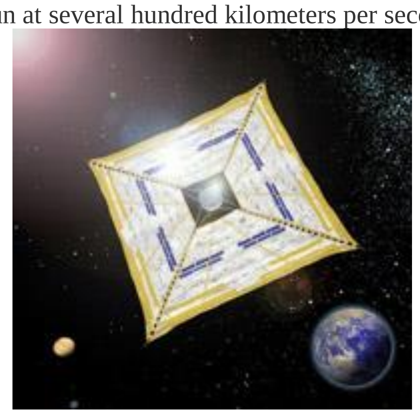

FIGURE 4 SOLAR WIND POWER

E. ENERGY HARVESTING 'PIEZO-TREE' CONCEPT

The flapping leaves developed in the laboratory generate energy which can be utilized by us. They are christened as the "Piezo-tree." The synthetic leaves of the "Piezo-tree" are connected to a piezoelectric stem. The movement of leaves is responsible for generating energy. They convert wind energy into electrical energy. The flapping motion of the leaves causes the instability of the aero-elastic system. The main constituent of the "Piezo-tree" is of Polyvinylidene Fluoride (PVDF) which is a flexible piezoelectric material.

The prototype behaves as a tree facing breeze. The Piezo-tree's flexible plate and film oscillate just as a flag or leaf might flap in the wind. The flapping motion is generated due to instability of the aero-elastic system. Because the flexible

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piezoelectric material Polyvinylidene Fluoride (PVDF) can endure unpredictable wind strength. They have attached one edge of PVDF element to a cylinder bluff body and left the other edge free. When the breeze blows and touches this bluff body, it leads to a vortex-shedding. Then the periodic pressure difference forces the piezo-leaf to synchronously bend in the downstream of the air wake. The AC signal is gleaned from the flapping piezo-leaf that is working on a periodic bending model, and the electrical energy is then stored in a capacitor after rectifying it with a full-wave bridge.

p

FIGURE 5 PIEZO TREE

VI. CONCLUSION

Energy is an essential basic need for not only human beings, but also for national economic and social development. However, production of energy is found to exhibit both local and global environmental impacts, if not appropriate technology and management.

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