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DMPPT Scheme to Extract Maximum Power during Partial Shading Condition: A Review

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Abstract

Importance of the energy is imperative in a society where the human lives in causing an exponentially increasing energy demand by degrees, while the fossil fuels are at verge of extermination. This indiscriminate tapping of fossil fuels resulting in many undesired consequences which predominantly incorporate ominous situations for the environment. Amongst numerous energy resources, solar energy is one of the best resources because of its availability at almost everywhere in the earth and direct conversion of solar energy into electrical energy. Since, it is envisaged toplay an indispensable role in future electricity mix of the world, so emphasize is given to the research and utilization of the solar energy around the world.

Keywords: Energy, Fossil Fuels, Bioenergy, Hydropower.

1 INTRODUCTION

Sun being the primary source of energy, manifests itself in almost all other forms of energy including chemical energy sources like fossil fuels. Energy consumption per capita is increasing day by day in developing countries which is a kind of indicator of living standard and growing economy. To counter global climate change, efficient and economic conversion of energy directly from solar to electrical to meet the growing energy demands replacing the conventional chemical sources seems to be an obvious way forward especially for developing countries [1][2].This technology evolves to the point where the tape can be formed and welded in a single passage in the welding furnace. The concept of butt welding was applied in 1931 in the Fretz-Moon process, created by J. Moon, an American and Fretz partner. The welding lines that use this process continue to work successfully to manufacture pipes with an outer diameter of approximately 114 mm.

In addition to hot welding technology, American E. Thomson also invented many other processes between 1886 and 1890, which allowed for electric welding. In 1898, Standard Tool Company, EE. UU., Granted a patent for the application of welding by electrical resistance to the manufacture of tubes and pipes. Welded pipes and electrical resistance pipes received a major boost in the United States, and much later in Germany, after the construction of a hot-rolling mill for large-volume materials for large-scale manufacturing. During the Second World War, arc welding was invented again in the United States, allowing the effective welding of magnesium in aircraft.

II. GLOBAL ENERGY CONSUMPTION SCENARIO

In past one and half decades unaccustomed change in use of energy has seen. Unanticipated use of energy in renewable share has changed scenario for the energy sector. Unaccustomed changes of energy consumption can be observed in figure 1.2 which was published in 'W.E.R. 2016' by 'W.E.C.' [4].

FINDING KEY

Solar Energy

Exponential growth of solar power electricity has been noticed. It has been reached 227 GWe. At the end of 2015; 406 GWth power was estimated by solar heating and cooling which was 1% of globally consumed energy.

E-Storage

146 GW power was estimated at global level in the end of 2015. bottom-up projections advise an international storage marketplace of 1.4 Gigawatts/year through 2020, with strong growth in electro-mechanical technologies specially.

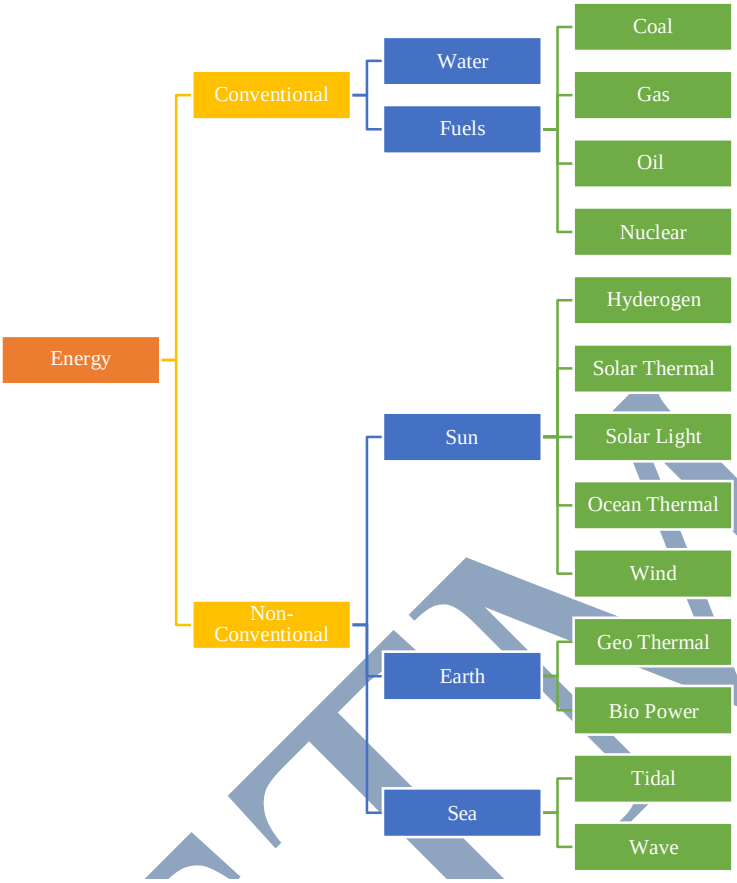

Figure 1: Classification of Energy Sources

Nuclear

There is rapid increase in the production of Uranium, 40% was reported between 2004 to 2013. Currently sixty-four new nuclear power plants are under construction in which forty-two nuclear plants are constructing in only three countries (China, Russia and India).

Waste to Energy

The waste to energy capacity increased by 4 million metric tons per year between 2001 to 2007.

Currently Japan and China are the leaders in this field. Approximately 440 waste to energy plants have been installed in China only. With 40 million tons of thermal treatment of solid waste, Japan is a largest user.

Hydropower

Hydropower is a global leader in the field of renewable energy. In 2015, hydropower had share of 71% of all renewable electricity. More than 30% increment has been noticed in last decade.

Oil

Oil is a global leader in the field of energy consumption. In 2015, 32.94% energy consumption was only by oil. Energy substitution of oil cannot reach more than 5% for the next five years.

Natural gas

Natural gas is one of the leading energy source in power generation, representing more than 20% of generated power at global level and there is expected possible grow of the only fossil fuel's energy consumption.

Wind

International wind power era reached 430 GW in 2015, around 6.9% of overall global energy technology capacity (419 GW onshore, 11 GW offshore). A document of sixty-three Gigawatts was brought in 2015 and total funding inside the global wind zone become 110 billion US dollars in 2015.

Coal

Coal nevertheless gives around 39.5% of the sector's electricity but, counteract of weather alternate demands, passage to cleanser strength forms and elevated competition from other operatives are providing challenges for the sector.

Geo Thermal

Geothermal worldwide output is anticipated to be seventy-five Terawatt-hours for heat and seventy-five Terawatts-hours for power, but is targeting geologic plate obstacles.

Bio-Energy

Bioenergy is the biggest renewable energy supply with 13.95% out of 17.95% renewables in the electricity blend and substances 10.01% of global strength deliver.

III. NATIONAL RESERVE ENERGY AND POTENTIAL SCENARIO

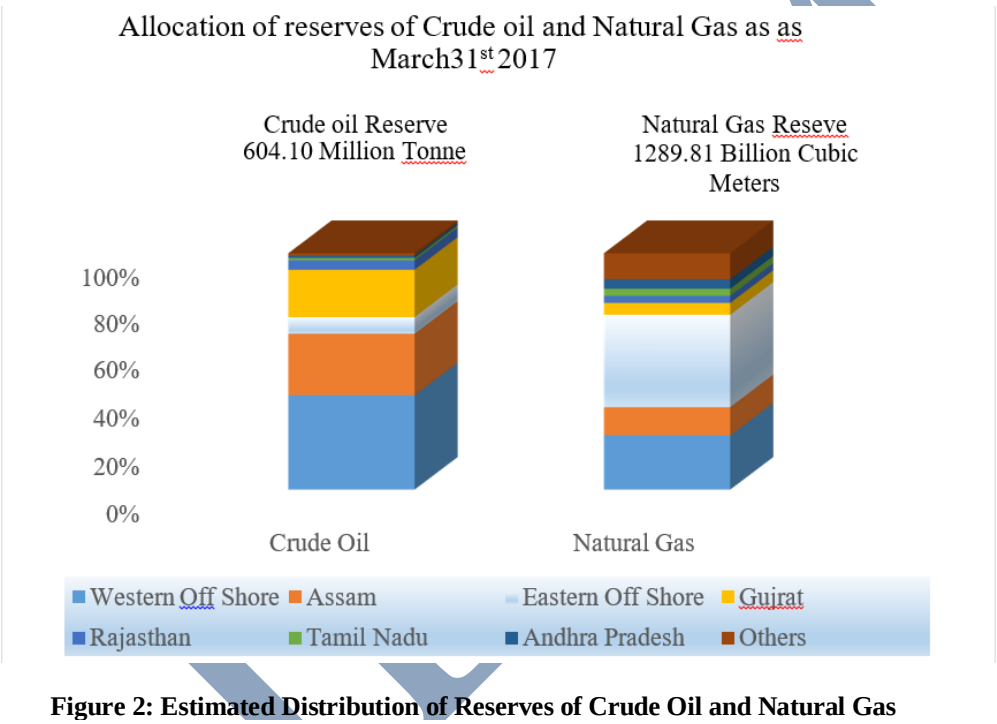

Figure 2: Estimated Distribution of Reserves of Crude Oil and Natural Gas

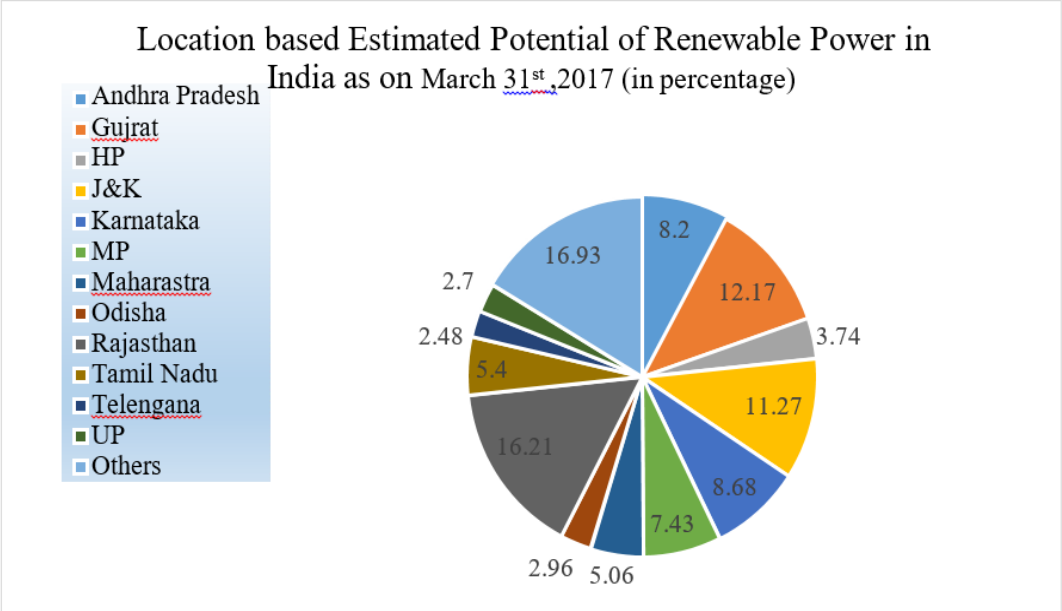

Figure 3: State wise Estimated Potential of Renewable Power in India

IV. LITERATURE SURVEY

Solar photovoltaic cells face the non-uniform conditions during their operation. That non-uniformity can be due to different irradiance, dynamic change in environmental condition and mismatching condition. These conditions can be cause of reduction in the power and overall efficiency. To maintain the stability of solar PV system during mentioned problems some techniques are developed. A survey has been done to know about that techniques, which is given below:

S. Silvestre et al. [6] have a new automated monitoring and fault detection approach primarily based on the electricity losses analysis. This technique consists of the extraction of parameters from bodily surroundings and same parameters calculated for predominant PV system from real time work

Juan David Bastidas Rodriguez et al. [7] did review about different types of architectures to find the maximum power point tracking during the mismatching conditions. This review includes static approach for mitigation the mismatching problems, centralised maximum power point tracking (CMPPT) architectures, distributed maximum power point tracking (DMPPT) architectures and reconfigurable maximum power point tracking (RMPPT) architectures

Boualem Bendib et al. [8] have analysed about conventional and advanced algorithm to know their advantages and disadvantages. They took their results during slow increase in radiation, rapid increase in radiation, slow increase in temperature and rapid increase in temperature.

Hossein Delavaripour et. al [11] have proposed a new DMPPT scheme using multi- winding forward-based converter, acts as a current balancing DPP converter. The converter is designed within the way that each converter harbour is associated in parallel with individual PV module to empower module-level most extreme control extraction. The proposed engineering works in two modes.: local MPPT and current balanced.

Jayanta Biswas et. al [12] have developed a digital controller based on a new architecture to control the D of each DPP DC-DC converter in real time. This controller consists of main bus controller (MBC) and submodule controller (SMC). The main bus controller co- ordinates the control operation of entire through communication protocol with submodule controller. They used PIC18F8520 and PIC18F452 microcontroller to developed a prototype model.

Guanying Chu et al. [9] have presented a new scheme which is based on BFC (bi- directional flyback converter) and isolated-port submodule DPP (differential power processing) optimizer. They took their results in Simulink and validate their results with the help of experimental setup. This scheme does not include any kind of MPPT algorithm. It also does not have any processor. It does not have any kind of communication link among the local converters so, voltage and current sensors are not required. During the mismatch condition, this scheme try to balance the voltage. The voltage equalization with open loop control is used to govern the submodule BFC Furthermore, each BFC matches the maximum output power of each submodule. It is very simple and easy to install and ideal for low cost solar PV installation.

V. CONCLUSION

To understand the circuit behaviour and basic features; results are taken under different conditions and compares with conventional scheme. At no partial shading condition performance of all type schemes is almost same. Whenever partial shading increases, the performance of conventional MPPT scheme gets poor. At very low irradiance and very high partial shading conventional scheme losses their control. Conventional MPPT schemes need a very good processor because all power is handled by only one converter and it has high work load. There are very high switching losses in practical conditions. Whenever any connection breaks, entire power will be lost.

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