

# RENEWABLE ENERGY AND FOR SUSTAINABLE FUTURE

Ms. Ashwini G. Wankhede<sup>1</sup>, Prof. R.K.Verma<sup>2</sup>

1. Post Graduate Student, Department of EE, Padm. Dr. V.B.K.C.O.E., Malkapur, S.G.B.A. University,  
Maharashtra, India

2. Asst. professor, Department of EE, Padm. Dr. V.B.K.C.O.E., Malkapur, S.G.B.A. University,  
Maharashtra, India

<sup>1</sup>[aashuwankhede152@gmail.com](mailto:aashuwankhede152@gmail.com)

<sup>2</sup>[onerja24@gmail.com](mailto:onerja24@gmail.com)

## ABSTRACT

*In today's, India is a large consumer of fossil fuel such as crude oil, coal etc. The rapid increase in use of Non renewable energies such as fossil fuel, natural gas, oil has created problems of demand and supply for human. Because in which, the future of Non renewable energies is becoming uncertain. Also India has had a negative Energy Balance for decades, which has resulted in the need to procurement energy from outside the country to fulfill the needs of the entire country. India has a large amount of, supply of renewable energy resources & hence India has decided to organize a program for appropriate utilization of renewable energy resources. As a result of which, India is the only country in the world to have an exclusive ministry for renewable energy development, The Ministry of Non-Conventional Energy Sources (MNES) are available. The analysis of need of renewable energy sources, the policies of India through MNES, Permitted feature of the Government of India guided by renewable energy sources, sources of renewable energy available in India, Estimates of possible capacities of India from renewable energy sources is accessible in this paper.*

**Keywords:** Wind Energy, Solar Energy, Renewable Energy, Sustainable Energy

## 1. INTRODUCTION

The use of renewable energy increased greatly objective after the first large oil disaster in the late seventies. At that time, economic issues were the most important factors, hence interest in such processes reduced when oil prices demolish. The current resurgence of interest in the use of renewable energy is driven by the need to reduce the high environmental impact of fossil-based energy systems. Collecting energy on a large scale is undoubtedly one of the main challenges of our time. Future energy sustainability depends heavily on how the renewable energy problem is addressed in the next few decades. In most power-generating systems, the main source of energy (the fuel) can be manipulated, this is not true for solar and wind energies. The main problems with these energy sources are cost and obtain ability: wind and solar power are not always accessible where and when needed. Unlike conventional sources of electric power, these renewable sources are not “dispatch able” the power output cannot be organized. Daily and seasonal effects and limited predictability result in intermittent generation. Control is one of the key allowing technologies for the disposition of renewable energy systems. Solar and wind power require effective use of advanced control techniques. This section of the report will concentrate on two forms of renewable energy—wind and solar. Solar and wind power plants exhibit changing dynamics, nonlinearities, and uncertainties—challenges that want progressive control policies to solve effectively. The use of more efficient control strategies would not only increase the performance of these systems, but would increase the number of operating times of solar and wind plants and thus decrease the cost per kilowatt-hour (KWh) produced. Both wind and solar have tremendous potential for fulfilling the world's energy needs.

## 1.1 WIND ENERGY

In the case of wind, if predictable onshore wind turbines with 90-m towers were connected on 14% of the earth's surface, the projected wind power that could be commercially viable is 72 terawatt (TW). These amounts to almost four to five times the global power intake in all forms, which currently averages about 15 TW. With capacity that has tripled in the last five years, wind energy is the wild stressing energy source in the world.

Using larger wind turbines to convert kinetic energy into electricity has significantly increased the average power output of a wind turbine unit; most main producers have developed large turbines that produce 1.6 to 3.5 megawatts (MW) of electric power. Wind energy is a clean and renewable source of electric power are, many trials must be addressed. Wind turbines are complex machines, with large flexible structures working under turbulent and unpredictable environmental conditions, and are connected to a continually changing electrical grid with changing voltages, frequency, power flow, and the like. Wind turbines have to adapt to those variations, so their efficiency and reliability depend heavily on the control strategy applied.



Fig-1: Wind Energy

## 1.2 SOLAR ENERGY

Solar energy is a radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaics, solar thermal energy, molten salt power plants, solar architecture and artificial photosynthesis. It is an important source of renewable energy and its technologies are broadly characterized as either passive solar or active solar depending on how they are capturing and allocate solar energy or convert it into solar power. Active solar techniques include the use of concentrated solar power, photovoltaic systems and solar water heating to bind the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and scheming, places that naturally circulate the air. The large magnitude of solar energy available makes it a highly appealing source of electricity. Sustainable source of energy is the sun. In which one of the greatest technical and scientific opportunities we look is developing efficient ways to collect, store, convert, and utilize solar energy at an affordable cost[15]. The solar power is reaching the earth's surface is near 85,000 TW. Covering 0.22% of our planet with solar collectors with an efficiency of 8% would be enough to satisfy the current global power consumption. Sakri solar plant is the biggest solar power plant in the state with 125 MW capacity. The Shri Sai Baba Sansthan Trust has the world's largest solar steam system. It was constructed at the Shirdi shrine at a valued cost of 1.33 crore (US\$200,000), 58.4 lakh (US\$87,000) which was paid as a subsidy by the renewable energy ministry. The system is used to cook 50000 meals per day for travellers visiting the shrine, resulting in annual savings of 100 000 kg of cooking gas and has been designed to generate steam for cooking even in the absenteeism of electricity to run the feed water pump for circulating water in the system. The project to install and commission the system was completed in 7 months and the system has a design life of 25 years. The Osmanabad region in Maharashtra has been sanctified with an abundance of sunlight and is ranked the third best region in India in terms of solar isolation. A 10 MW solar power plant is available in

Osmanabad, in Maharashtra by Relyon Solar, generates approximately 18 lakh units per MW which is the highest generation in Maharashtra of any solar power plant. Solar plant was commissioned in 2013 and the records of one complete year are available. Solar-sourced electricity can be generated either directly using photovoltaic (PV) cells or indirectly by gathering and focused the solar power to generate the steam, which is then used to drive a turbine to provide the electric power (CSP). The heat transfer liquid is pumped through the receiver pipe and picks up the heat transferred through the receiver tube walls. Higher concentration can be obtained, and the mirrors are cheaper than parabolic mirrors, but a more composite tracking mechanism is needed. The main control problems with solar plants are related to sun following and control of the thermal variables. Although control of the sun-tracking devices is typically done in an open-loop mode, control of the thermal variables is mainly complete in closed loop. The uncertainty and intermittency of wind and solar generation are major complications that must be addressed before the full potential of these renewable can be reached.



Fig-2: Solar Energy

## 2. SUCCESSFUL APPLICATION OF CONTROL

There two methods can be used name of the following:

1. Wind energy
2. Solar Energy

### 2.1 Wind Energy

The Wind power generation capacity in our India has significantly improved in the last few years and as of 31 January 2017 the installed capacity of wind power was 28,871.59 MW, mainly spread across the North, West and North regions. <sup>[1]</sup>By year end 2015 India had been the fourth largest installed wind power capacity in the world. The development of wind power in India created in 1986 year with the first wind farms being set up in our coastal areas of Maharashtra (Ratnagiri), Gujarat (Okha) and Tamil Nadu (Tirunelveli) with 55 kW Vestas wind turbines.[2] The potential for wind farms in the country was first evaluated by the Dr. Jami Hossain using they are the GIS platform to be more than 2,000 GW in 2011. This was subsequently re-validated by Lawrence Berkley National Laboratory, US (LBNL) in an independent study in 2012.

- **Tamil Nadu**

In Tamil Nadu's wind power capacity is approximately around 28% of India's total capacity.[2] The Government of Tamil Nadu realized the importance and need for renewable energy, and set up a separated Agency, as recorded society, called the Tamil Nadu Energy Development Agency (TEDA) as early as 1985. Now at these stage Tamil Nadu has become a leader in Wind Power in India. In Muppandal wind farm the total capacity is 1500 MW, the largest wind power plant in India. The total wind installed capacity in Tamil Nadu is 7633 MW. <sup>[13]</sup>During the economic year 2014-15, the electricity generation is 9.611 GWh, with about a 16% capacity utilization factor.

- **Maharashtra**

Maharashtra is one of the prominent conditions that fitted wind power projects second to Tamil Nadu in our India [2]. As of end of March 2016, installed wind power capacity is 4655.25 MW. As of now there are 40 developers registered with state nodal agency "Maharashtra energy Development Agency" for development of wind power projects. All the major manufacturers of wind turbines including Suzlon, Vestas , Gamesa , Regen, Leitner Shriram have presence in Maharashtra.



Fig-3: Muppandal wind farm in Tamil Nadu

## 2.2 Solar Energy

The Solar System is the gravitationally bound system containing the Sun and the objects that orbit it, either directly or indirectly. Of those objects that orbit the Sun directly, in world the largest eight of the planets, with the remainder being significantly smaller objects, such as dwarf planets and small Solar System bodies. Of the objects that orbit the Sun indirectly, the moons, two are larger than the smallest planet, Mercury. The sun supplies the majority of the energy available on the Earth; wind power, hydropower, biomass and all fossil fuels can trace their energy source back to the sun. These indirect routes for growing solar energy have certain advantages: storage of energy in the case of fossil fuels and hydropower, and transportation of energy in the case of wind.

However, the challenges involved in attaching solar energy directly and on a large scale are such that it remains an elusive but still fundamentally attractive one of the best way of justifying climate change. This paper describes the present status of solar energy worldwide, and outlines the competing technologies, the magnitude of energy they could produce, and the extent to which they could be used. Human are uses of solar energy distances for natural lighting and agriculture, from simple technologies such as the outdoor clothesline through to centralized electrical power plants armed with storage. It is almost impossible to enumerate this characteristic use, as most uses of solar energy, such as passive heating, active heating is not superior than the passive, are classed as energy efficiency measures. While these simple solar system methods are important, this paper is primarily concerned with active solar power conversion that can relocate conventional power generation and contribute towards a truly sustainable energy supply. Sunlight provides the one of the energy source that powers the Earth's climate and ecology. Attaching the solar energy for hot water and electrical power could provide a renewable, low carbon energy source, and presents an attractive way of modifying climate change. In developing countries, solar technologies are already in use to enhance the standard of living [13,14]. They are a natural choice where solar in flux is high and grid services are unavailable or limited. In developed countries, solar energy can appear less attractive than conventional sources due to its intermittent nature, but with the right technology it can have considerable benefits in terms of reduced carbon emissions and improved energy security. In developed countries, most forms of solar energy are currently more expensive than conventional alternatives. At this pre-inexpensive stage, incentives are needed to encourage their uptake [14]. We can use solar energy either to provide heat or to generate electricity. Solar hot water systems is used to supply up to 70% of household hot water in the UK; in sunnier climates, virtually all domestic hot water could be provided for. The main cost for solar warm water systems is the installation itself, although they can be incorporated into new buildings with minimal overhead cost. The largest installed capacity is found in China, where solar hot water collectors are a cost-effective means for easing the rising demand placed upon conventional energy generation. The use of solar system in heat in commercial and industrial environments is also feasible but much less widespread. Solar electricity can be generated directly using photovoltaic (PV) panels. These panels are suitable for use on roofs and are now manufactured in sufficient quantity that the electricity generated in some favorable locations has almost reached grid parity (the point where the cost of photovoltaic electricity matches the residential grid price)[13,15].

### **3. RENEWABLE ENERGY FOR SUSTAINABLE FUTURE**

Sustainable energy is the energy that is expended at irrelevant rates compared to its supply and with sustainable future manageable security effects, particularly or specially environmental effects. Also another common definition of sustainable energy is an energy system that serves the needs of the present without compromising the ability of future generations to meet their needs [13]. The organizing main principle for sustainability is sustainable development, which includes the three interconnected domains: economics, politics and culture. These are the Sustainability science is the study of sustainable development or growth and environmental science. These technologies promote sustainable energy including renewable energy sources, such as hydroelectricity, wind energy, solar energy, tidal power, wave power, geothermal energy and also technologies designed to improve energy efficiency. These Costs have dropped dramatically in the past recent years, and continue to fall [16]. Most of these above technologies are either economically good or close to being so. Increasingly, most effective government policies support investor confidence and these markets are expanding. Considerable development is being made in the energy transition from fossil fuels to ecologically sustainable systems, to the point where many studies support 100% renewable energy.

#### **3.1 Renewable energy technologies**

Renewable energy these technologies are essential contributors to sustainable energy as they generally contribute to world energy security, reducing the dependence on fossil fuel resources, and providing opportunities for modifying greenhouse gases and shows result[17]. The International Energy Agency are state that: Conceptually, one can define three generations of renewable technologies, reaching back more than 100 years.

##### **A. First-generation technologies**

First-generation technologies emerged from the industrial revolution at the end of the 19<sup>th</sup> century; include hydropower, heat, biomass combustion and geothermal power. Some of these technologies are still in extensive use. First-generation technologies are most competitive in locations with plentiful resources. First generation future use depends on the exploration of the available resource potential, particularly in developing countries, and on overcoming challenges related to the environment and social acceptance.

##### **B. Second-generation technologies**

Second generation technologies include solar heating and cooling, modern forms of bioenergy, wind power and solar photovoltaic [15]. These technologies are now just entering markets as a result of research, development and demonstration (RD&D) are in investments since the 1980s. The first investment was promoted by energy security concerns linked to crises (1973 and 1979) of the 1970s but the continuing application of these renewable is due, at least in part, to environmental benefits. Many of the technologies reproduce significant advancement in materials.

##### **C. Third-generation technologies**

Third generations technologies still under development and include advanced biomass gasification, bio-refinery technologies, concentrating solar thermal power, hot dry rock geothermal energy and ocean energy. Advances in nanotechnology may also play a major role[16]. They are on the horizon and may have potential comparable to other renewable energy technologies, but still depend on attracting sufficient attention and RD&D funding. These newest technologies include advanced biomass gasification, bio-refinery technologies, solar thermal power stations, hot dry rock geothermal energy and also ocean energy.

### **4. ENABLING TECHNOLOGIES FOR RENEWABLE ENERGY**

There are Heat pumps and Thermal energy storage are classes of technologies that can be enable the utilization of renewable energy sources that would otherwise be inaccessible due to atmospheric condition and a temperature that is too low for utilization or a time lag between when the energy is available and when it is needed[15,16]. While enhancing the temperature of available renewable thermal energy, heat pumps have the additional property of leveraging electrical power (or in some cases mechanical power or thermal power) by using it to extract additional energy from a low quality source (such as seawater, lake water, the ground, the air, or waste heat from a process). Thermal storage technologies allow heat or cold to be stored for periods of time ranging from hours or overnight to interpersonal, and can involve storage of sensible energy (i.e. by changing the temperature of a medium) or latent energy (i.e. through phase changes of a medium, such between water

and slush or ice). Short-term thermal storages can be used for peak-shaving in area heating or electrical distribution systems. There are kinds of renewable or alternative energy sources that can be enabled include natural energy (e.g. collected via solar-thermal collectors, or dry cooling towers used to collect winter's cold), waste energy (e.g. from HVAC equipment, industrial processes or power plants), or surplus energy (e.g. as seasonally from hydropower projects or intermittently from wind farms). The Drake Landing Solar Community (Alberta, Canada) is demonstrative. Latent heat is typically stored in ice tanks or what are called phase-change materials (PCMs) [15].

## CONCLUSIONS

Now a days clean energy and most of the need in our generation. Most national energy policies worldwide aim at ensuring an energy portfolio that supports a cleaner environment and stronger economy and that supports national security by providing a stable, varied, domestic energy supply. Clean energy is a global and urgent imperative. Renewable generation, especially from wind and solar and sustainable future are the concepts are main in these technologies needed to address global warming and related issues. The key challenge is to reduce the cost of renewable energies to affordable levels.

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