

A Literature Review on Different Renewable Energy Resources

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Abstract—This paper presents a concise review of different renewable energy resources. The use of renewable energy resources is growing gradually and its requirement is also increasing as compared with the conventional energy sources from corner to corner of the world. The use of these energies can accomplish the added energy requirement and the research on this is in development. This paper provides a brief knowledge about different renewable energy resources. It thus, becomes a need to explore these sources more efficiently, so that we can maximize its use for different applications worldwide.

Keywords— Renewable Energy Resources, Solar Energy, Wind Energy, Hydrothermal Liquefaction

I. INTRODUCTION

As world’s population is increasing day by day, therefore the utilization of energy is increasing in a hurry. The employ of renewable energy resources seems to be a huge movement by which the extra energy can be generated as generation of energy becomes an important concern for the world [1]. Renewable energy resources can be a alternative option for conventional energy resources as it substitute conventional fuels in four basic different areas such as electricity generation, hot water/space heating, motor fuels and off grid energy examines etc [2]. Basically, the most important aspect for increasing renewable energies is to pilot a number of positive results like controlling the greenhouse effect and climate change [3] [4]. There are various renewable energy resources are available in nature mainly like solar, wind, geothermal, tidal, biomass etc. So, in this paper, a brief literature review is carried away to get an idea that how these renewable energy resources had been used so far and to have an idea about the evolution of these energy resources. So, after doing this review work, some of the important surveys are presented in Table 1, which is mentioned below.

TABLE 1. A BRIEF LITERATURE REVIEW ON DIFFERENT RENEWABLE ENERGY RESOURCES

Sl. No.	Method Used	Parameter Varied	Contribution of the Paper	References
1.			Case study of utilisation and prospective of RES Mexico.	
2	Power to gas (PtG) technology	Chemical Methanation	Worldwide development of Power to gas (PtG) technology.	
3			Clarity of flexibility in power system by initiating new technology for better energy penetration.	
4	Rural Electrification	1) 10-40GW [GigaWatt] (for wind) 2) 2.1-7.5GW (for bio mass) 3) 1-20GW (for solar)	Overview of Indian power market and India’s power strategy.	
5			CO ₂ emission reduction by some new technologies	
6			India aimed of generating 10% of the total power using renewable sources by 2012 which was 8% in 2010.	
7	Reduction in generation and transmission losses	Fuel saving for 4MW(Mega Watt) of conventional electricity generation	Malaysia aims at generating 5.5% of total electricity by renewable sources by 2015 and 5.9% by 2030.	
Sl. No.	Method Used	Parameter Varied	Contribution of the Paper	References
8	Reduction	Total	Development from	

	of the switch device count in Z - source inverter	harmonic distortion is reduced by 40%	Thyristorised grid side inverters to Z source inverters to improve the reliability of the system, which played a vital role in the development of the wind energy conversion system.	
9			This paper suggests to use renewable energy with a hybrid system.	
10			Presents a review of the technical aspects of offshore wind turbine installation.	
11			This article analyze the literature on the geopolitics of renewable energy resources.	
12	HTL(Hydro thermal Liquefaction)	1) Temperature 2) Pressure	Overview of HTL mechanism and it's future scope and it's advantages and disadvantages.	
13	Wind energy system		An overview on future emerging technologies in the field of wind power sector and its advantages and disadvantages on the perspective of Europe.	
14		1)Air pressure 2)Air temperature	Effect of climate change on the renewable energy systems.	
15			This paper explains the utility of renewable energy over the world and the performance of voltage controllers is also examined using MATLAB/Simulink.	
16			This review article talks about the advantages and disadvantages of renewable energy resources.	
17			This paper presents a survey of Photo Voltaic cell efficiency improvement and provides a evaluation on the solar concentration methods.	

So, from this above literature review, it can be clearly understandable that, renewable energy resources plays a very big role to meet the necessary extra power for our daily life. It can be also seen that, all foreign country and India also take very much interest on these energy resources as they are very much efficient and eco-friendly.

So, after this section, a brief idea about most of the renewable energy sources is discussed in section 2. After that, in Section 3 , two energy resources are described which are most commonly used i.e. solar energy and wind energy. In section 4, Conclusion part is included.

II. DIFFERENT RENEWABLE ENERGY RESOURCES

A. Solar Energy

Power generation through renewable energy sources is the need of the hour as we cannot be only dependent on the conventional energy sources to meet our needs. Solar energy is one of the most important renewable energy sources used all over the world [22]. Solar panels make use of the solar radiation reaching to the Earth and help in generating electric power with the help of solar radiation [23]. This power is utilized by us, in our households, industries, offices, schools, colleges, etc [24].

Solar panels are made up of solar modules connected in parallel; the solar modules are comprised of solar cells connected in series. Each solar cell is made up of a semiconductor like silicon, germanium, etc. Each solar cell acts as a PN junction and when the photon particles hit the surface of the solar panel then current flows due to the Photovoltaic effect. The output of the solar panels is dc in nature; hence the output can be connected to an inverter which converts DC to AC and then this AC power can be used to run the electrical appliances used in our house. The excess AC power can be provided to the grid [23].

B. Wind Energy

Wind energy is one of the purest forms of renewable energy source and many developed countries have made several energy policies to develop electrical power from wind energy to meet their needs. The mechanism of developing electric power using wind energy is also very simple but the only disadvantage is the Wind Energy Conversion System depends on the wind energy which is very uncertain and it is very difficult to get the desired output [12].

The wind turbine rotates due to the wind energy; the mechanical energy of the wind turbine is fed to the generator through a gear box. Gear box helps in maintaining same speed for the turbine and synchronous generator. The output of the generator is AC in nature; mainly Permanent Magnet Synchronous Generator is used. The output of the generator is fed to some power electronics converter which can be either multilevel converter or Matrix converter or Z source converter. The final output can be transmitted and distributed to domestic consumers, industrial and commercial consumers. Thus, wind energy can play a significant role in the meeting the energy needs [12].

C. Tidal Energy

By utilizing the natural phenomenon of movement of ocean water due to gravitational force known as tides, tidal energy can be harnessed twice a day. Tidal energy is a long-term resource and can be created by three technique namely,

- A) Tidal Barrages.
- B) Tidal Fences.

C) Tidal Turbines.

In all this case, electrical energy is to created by mechanical energy of turbine connected to generator [25].

Tidal power plant is easy to install and most importantly it is free from greenhouse gas emission. We can predict the tides since our past years, so tidal energy is the most predictable source.

Tidal power plant project are less compared to other renewable energy sources due to largely site requirement to construct dam. It need high capital investment and lot of R&D need for better turbine design to reduce capital cost [26].

D. Hydropower

By utilizing the gravitational force of falling water energy is harnessed by the rotation in turbines, electrical energy is produced. The production capacity of the energy is dependent on the water supply available. It is the most widely used form of renewable energy which is 3% of the world total energy.

Hydropower plant has low running cost while the average capital cost is high due to dams are expensive to build. The output can be controlled as per need it has a pumped storage to reserve water for high peak demand. This energy is free from greenhouse gas emission [27].

E. Geo-Thermal Energy

Geothermal energy is the thermal energy generated and stored in earth. This is the energy that determines the temperature of matter. It originates from the original formation of earth and through radioactive decay of the materials [28]. Water from hot springs is used since early times, but now it is used for electricity generation [29]. It is cost-effective, reliable, environmental friendly. But is limited only to areas near the tectonic plates [30].

There are three types of geothermal energy are there those are called: liquid-dominated plants, geothermal energy, enhanced geothermal energy. And as geo thermal energy do not need any fuel so there is no fuel cost. But capital costs are there [31]. Geothermal is also considered as a renewable sources because earth's heat content is much larger than the heat extracted, and is also considered as a sustainable [32] but extraction needs monitoring to avoid local depletion. Some of the examples are: hot-springs, lava, geysers, etc. [33].

F. Bio-Gas Energy

It is a mixture of gases produced by the breakdown of organic matter in the absence of oxygen primarily consists methane and carbon dioxide. It can be produced from raw materials like the agriculture waste, food wastes, green wastes etc. It is a renewable source of energy. It can be produced by anaerobic digestion with methanogen or anaerobic organisms which digest materials into a closed system [34]. It is mainly methane and carbon dioxide and produced by micro-organisms [35].

Bio gas mainly consists of :

1. CH₄: 50-75
2. CO₂: 25-30

3. N₂: 0-10

4. H₂: 0-1

5. H₂S: 0.1-0.5

6. O₂: 0-0.5 [36]

Also mainly depends on substrate composition, anaerobic reactor [37]. It can be used for electricity production in a CHP gas engine, where the waste heat is used for heating the digester. It can replace compressed natural gas used in vehicles [38].

III. WORKING OF SOLAR AND WIND ENERGY

A. Working of Solar Energy

Here, in this section, we can understand the working of solar energy from the below mentioned Figure 1, which means how, solar energy is produced. The figure is given below [19]-

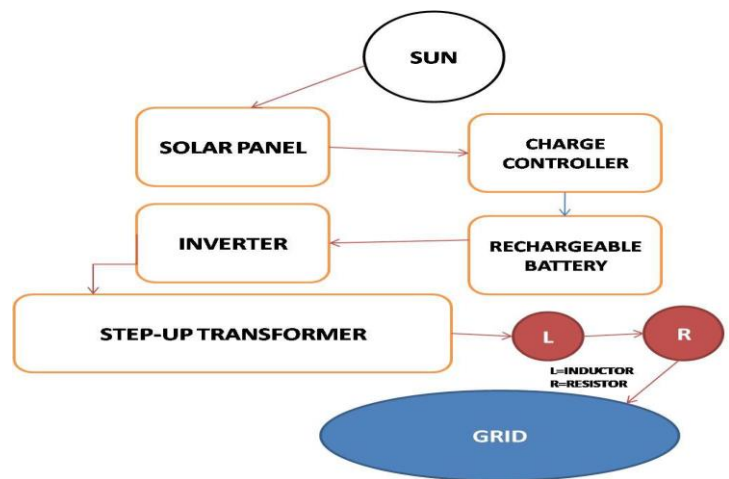


FIGURE 1. WORKING OF SOLAR ENERGY

So, from the above mentioned figure, it is clearly visible that, the main producer of this energy is solar irradiation which comes from sun. Solar irradiation falls to the solar panel, which are used to charge a battery through charge controller. Then this battery is used to power up any electrical equipment off grid. When it comes to on grid operation, then this energy flows to a step-up transformer through inverter. After that, this stepped up current goes to the main grid through Inductor and resistor.

B. Working of Wind Energy

So, in this section, we will find out how wind energy is produced from the below mentioned Figure 2 [19].-

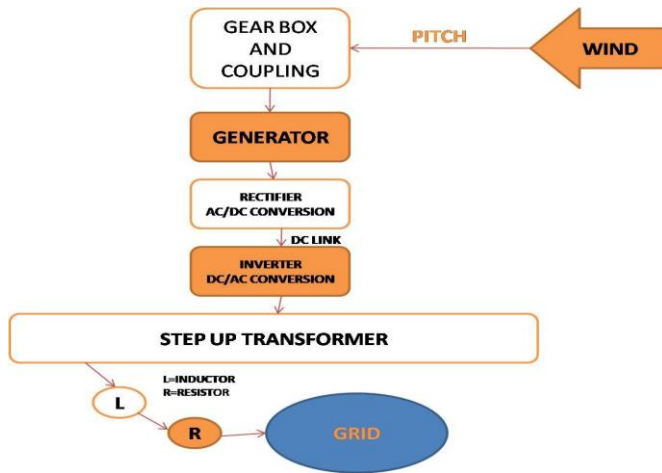


FIGURE 2. WORKING OF WIND ENERGY

Basically, wind energy can be produced in a hilly area, where enough wind is available and it can be produced with the help of a turbine. After blowing wind by turbine, this high speed wind pass through a gear box to a generator, where voltage and current is produced. Then, this voltage and current pass through a pair of rectifier and inverter to a step-up transformer. At last it is fetched out to on grid through inductor and resistor.

So, after doing all these reviews, it can be clearly visible that, renewable energy is the future of our world and for us too. So, for this reason, we have to-

- 1) Explore more efficient techniques to extract the maximum from these energies.
- 2) Review other renewable sources like, tidal , geo-thermal, bio-mass energies more effectively.

IV. CONCLUSIONS

This paper presents a detailed survey on different renewable energy resources to explore the development of these sources from past few years. From this paper, it is clearly visible that, renewable energy resources are the future for us, as it will be a key source to meet our required power for a advanced and healthy lifestyle. This paper also presents the overview of these sources and a detailed working of solar and wind energy sources. This paper also represents that , except solar and wind, other energy sources needs to be also explored.

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