

Overview of Hybrid Renewable Power Generation

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ABSTRACT

Our India ranks 5th largest country in generation capacity & also it is 6th largest consumer of electricity in the world. To fulfil such a huge demand it is necessary to switch to alternative source of energy along with conventional sources. Such alternative sources can be solar energy, wind energy, tidal energy, and biogas, a fuel cell which are clean & natural sources of electricity generation. This paper entails a review of hybrid electric power generation systems standalone as well as interconnected to the electric utility grid. By using these renewables in conjunction with non-renewables estimated energy crisis can be reduced up to some extent.

Keywords: Renewables, Hybrid, Electricity, Standalone, Interconnection

I. INTRODUCTION

Today's era is known as 'Commercial Era'. Large commercialization of the whole world leads to improve the lifestyle of a human being and for such a developed world, a huge amount of energy need has become a thing of concern. Amongst all forms of energy, demand is high for electrical energy. So all the electrical utilities & consumers are in great concern about meeting required & growing energy demand. Around 75% of total world energy is derived from burning fossil fuels but, the use of fossil fuels in undoubtedly associated with air pollution causing lowering environmental quality. Also, one more thing in that whole world is in great fear of diminishing sources of fossil fuels. As fissile fuels are left in limited quantity, their cost also has increased & hence the cost of energy. To overcome all these problems, there is better option to switch towards the maximum use of renewable, which is natural, abundant in quantity & clean sources of energy, which do not cause harm to the environment. Renewable energy sources are – solar energy, wind energy, biogas energy, hydroelectric energy, tidal energy, fuel cell, OTEC plants. Since the past decade research is going on to develop economical & efficient models to derive

energy from renewable and hence, since 2013-14, investment in this sector has significantly increased. According to Bloomberg New Energy, finance is latest energy investment report, world's largest investor in renewable sector is China, while the US is of the second rank. Globally, solar & Wind power capacity grows from 74GW in 2013 to 100 GW in 2014. While record breaks renewable energy generation is undertaken by countries like Denmark, U.K., Germany, Scotland, Ireland.[1].

The organization of this document is as follows. In Section 2 (**Overview of Various Hybrid Renewables Technologies**), I'll give an overview of various existing research models designed by various researchers. In Section 3 (**Obstacles in Using Renewables**), explains challenges in bringing renewable power generation in easy practice, unlike conventional energy sources. 4 (Conclusion) conclusions will be out comings of an overall review of existing systems.

II. METHODS AND MATERIAL

1. Overview of Various Hybrid Renewables Technologies

The hybrid renewable system is that system in which more than one renewable source is involved. In present practice, there are many hybrid systems exists such as solar-wind hybrid system, wind-hydro hybrid system, solar –thermal hybrid system, etc. Again such hybrid systems are of two types- (a) Standalone hybrid systems (b) Grid-connected hybrid systems. Many researchers have developed different models to improve renewable generation systems, step by step.

Firstly , discussing the standalone system, there is one interesting technique has been developed by P.Madhu Prabhuraj and R.M. Sasiraja which uses resources like sunlight ,wind and most outstanding resource Biogas plant which is very readily available in remote side villages in abundant quantity. As the wind and the sun have intermittent nature, biogas is one who acts as base power generator which will work day-night for 24 hours. to switch power generation to the desired mode, the controller is designed. There are many times when excess power generation takes place in standalone systems which can be absorbed by dump load. Biogas can be also used for cooking purpose [2]. One more standalone model is introduced by R. Srinivasan., M. Yogaselvi and Dr. R. Arulmozhiyal which includes a battery to store generated power. There is also the provision of lamp bank as a dump load to prevent overcharging of the battery. Presented system can be used with any energy sources combination such as the wind, solar, fuel cell, or diesel engine generator or else biogas also.[3]above both or any standalone systems have the drawback that they need dump load to discharge excess generated electricity, which in other terms wastage of energy. Hence the second approach is developed i.e. grid interconnection. Presently grid interconnection of renewable is one of the hot topics. Such systems require very efficient inverter which can give quality output. Hence, Hang-Seok Choi, Y. J. Cho, J. D. Kim, and B.H. Cho have developed model which uses a zero current switching (ZCS) inverter which helps to reduce losses associated with switching as switching of IGBT switches of inverters is done at current zero. Such inverter can deliver more sinusoidal current to the grid.[4] Here, Mrs. Ramalakshmi, Mrs. Jerril Gilda presents the system with advanced power control technique, which uses dynamic voltage restorer to manage voltage sags and

swells generated due to intermittent nature of the wind and solar systems. This dynamic voltage restorer also can work as UPS when the grid fails to supply.[5] P. V. V. Rama Rao, B. Kali Prasanna, Y. T. R. Palleswari presents PV-Hydro hybrid system interconnected with electrical utility through constant frequency voltage inverter to which P-Q theory is applied. Filters are also used to reduce harmonics.[6]hence, we can observe that although in grid connected systems, generated energy is used without any wastage, such type of systems is more complicated to design than standalone.

2. Obstacles In Using Renewables

Renewable energy which is naturally available in earth's surrounding in abundance. Using such renewable sources will help to reduce greenhouse gases emissions, which are causing global temperature rise. Also, pollution problems will be eliminated which arises due to the burning of fossil fuels in conventional electricity generation approach and we can get clean electricity. So, such types of renewable projects will help to improve global environmental quality. Hybrid renewable power generation systems give a flexible approach to existing power system. When such hybrid systems are used in interconnection with the utility grid, load sharing takes place and hence utilities will be able to supply continuous and reliable power to consumers. Also, in the case of distributed systems using renewable when interconnected with the utility grid, the problem of poor quality of power supply due to intermittent nature of renewables can also be eliminated. Hence, such type of grid-interconnected systems is proven beneficial to utility companies also.

Last but not the least, consumers! By practically implementing such hybrid renewable system with grid interconnection consumers will be on safe side. They will be able to get uninterrupted, reliable and quality supply. If any problem arises with the utility grid, the power supplied by renewable will satisfy customers. If the government will be able to provoke public about benefits of the net metering facility, then customers can take advantage of self-generated power using renewable along with utility's power supply and

also will assist utility grid by introducing excess generated power in the grid. Hence, grid-connected renewable systems are proven beneficial to the customers also. Hence, we can say that this transition in electricity infrastructure is advantageous to each of the level in power system and also to the environment. Hence, this sector is the now-a-days centre of attraction for scientists, researchers, investors. As we know, renewable technology is developing one. A lot of research has been done in past few decades and lot is to be done. Researchers are developing various models to contribute green energy campaign. But there are still many practical barriers to bring these ideas in the practical world. One most important barrier is the expensive cost of such infrastructures. Due to this investors are thinking twice before investing in this sector. To enhance courage and confidence of investors government should give them monetary support. The second one is a lack of infrastructure and lack of skilled and knowledgeable people. Due to this , projects requires large installation time and problems in running such systems. Next one is legal complications and government rules to develop grid interconnected renewable systems. The government should release some complicated clauses so as to enhance consumers to use more and more renewable sources of electricity. So, likewise there are many practical and research limitations exists for such a systems and few years will require overcoming these limitations.

III. CONCLUSION

Although this hybrid power generation system can give flexibility to present utility grid based power system. Using renewables for electricity generation, we can reduce greenhouse gases emissions to a certain extent and can contribute to reducing global warming concern. Also, pollution levels in the atmosphere will come down. Such hybrid renewable systems will be advantageous to utilities for their load sharing and consumers will be satisfied due to the uninterrupted power supply. Renewable energy sources to generate electricity are like one blessing to the human race to save his future. The only need is to erect advanced infrastructure to overcome major barriers. in next

coming decades, with increased use of renewable, human will become free from fear of energy crisis.

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