ISSN:2348-2079

Volume-7 Issue-2

International Journal of Intellectual Advancements and Research in Engineering Computations

An overall review on wind power generation as renewable source of energy leading towards sustainability

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ABSTRACT

Sustainable development is a defined as concept where the development meets the needs of the present without compromising the ability of future generations to meet their own needs. Implementing sustainability could be achieved by balanced environment, social and economic factors. In this estimate, renewable energy and its resources appears to be the one of the most prominent solutions. Solar, wind, hydro, geo-thermal, biomass are the various forms of renewable energy from which wind offers purest form renewable and sustainable energy. Here is an attempt to create a relation between sustainable development and renewable energy and how it act as sustainable energy.

Keywords: Sustainable Development, Environment, Renewable energy, Wind energy.

INTRODUCTION

The development is moving at reckless speed now a day, because of advancement in technology and the only major concern is that not everyone considers the drawback come along with this unbalanced growth. It is very much important to create equilibrium between the resource available and the demand for that resource. Over exploitation of resources was one of the prime cause for these unbalanced growth especially when there is need or demand for the resource is higher than their actual availability. In general natural resources are classified into renewable energy source and non-renewable energy source based on their renewability. Non-renewable energy resource is that source of energy which cannot be used again and again. These are conventional energy sources which are getting scarce because their supply cannot meet the demand. For instance coal and oil are major source of non-renewable energy which get depleted quickly and cannot replenish [1]. Energy generation and its use are connected to all factors of sustainable development particularly economy, society, and environment. The availability of alternative and renewable energy sources around the world are million times larger than those man produces by burning fossil fuels energy, the challenge here is how we can use these renewable resources in an environmentally friendly and acceptable way [2]. Renewable energy usage helps in the reduction of negative environmental impacts of conventional energy on the environment which can provide a long way to a sustainable development plan.

SUSTAINABLE DEVELOPMENT

In 1987, the Brundtland Commission published a report, Our Common Future, in an endeavor to link the problems of economic development and environmental stability. By doing so, this report gave the definition for sustainable development as development that meets the needs of the present without compromising the ability of

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future generations to meet their own needs. Brundtland argues in this report that environment and development cannot be treated as separate entities which are in relation with each other [3]. Dernbach emphasis that sustainable development is adopted as a conceptual framework in Agenda 21 and the Rio Declaration for achieving economic development that is socially equitable and environmentally safe base on which human activity depends. Sustainable development is a realistic and valid approach to deteriorating global conditions. Dernbach also spotlight the characteristics of sustainable development as economically efficient, more socially productive and more environmentally protective [4]. On focusing sustainable development many goals were set by United Nations from the year 2000. Millennium Development Goals (MDG) were proposed early in 2000 which consist of eight key goals [5]. After the success of MDGs, Sustainable Development Goals were proposed naming Transform our world, 2030 Agenda for sustainable development in Sustainable Development Summit 2015 [6]. Major dimensions of sustainable development are identified as society, economy and environment. These three dimensions of sustainability have paved the way to look forward [7]. Society, economy and environment are to be integrated for better development. The integrated sustainability implies the effective management of the inherent tensions between these three dimensions. Study. the evaluation of same. From the research reported by different researchers it can be concluded that ergonomics is an important criteria that must be included in any industry for achieve human comfort and satisfaction.

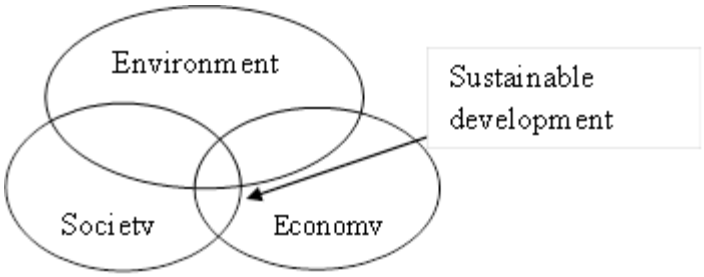

Fig.1. Factors of sustainable development

Non – renewable energy

Energy generation is linked to all the three dimensions of sustainable development. Non renewable energy resources are not sustainable and most of them are fossil fuels: coal, petroleum, and natural gas. Carbon is the main element in fossil fuels and when coal and oil are burned, they release particles which pollute the environment. According to Godfrey, Bob & Janet, 2003, the energy from the non- renewable sources has taken over the major supply of the world energy consumption and it had been estimated to be 80% of the total energy supply worldwide [8]. Because of this over usage of non renewable fossil fuels like coal, petroleum and natural gas cause climate change by emitting noxious gases such as CO_2 and methane resulting from the combustion process keep heat in their structure. The sun provides heat and radiation in atmosphere from sunrise to sunset. As per the natural cycle, this heat must be retransferred to the space but these toxic gases resulting from the fossil fuels cause keeping of some part of the heat in atmosphere. By this way, the world begins to heat and change the climate which cause ecological imbalance [9].

Merits and demerits

Some basic merits of using non renewable energy resources are cheaper than other source and easy to use.Ibrahim emphasis that the ill-effects to environment are largely associated with consumption of non renewable energy resources. The serious problem lies in it are air pollution, acid rain, ozone depletion, green house effect and so on which creates remark on human lifestyle. The sustainable utilization of renewable energy is the potential solution [10]. Non renewable energy not

only effect environment but also other factors of sustainable development. Increased exploitation has increased the price for the energy resource especially when there is demand for the resource is high but the quantity available is limited, then there will be obvious increase of cost [11].

Energy security and sustainable development are of high importance in the global agenda due to the impact of volatile energy prices, high demand for energy security, and concerns over environmental sustainability and the global climate change. New and renewable energy technologies are viable options to meet the challenge of achieving sustainable development while conserving natural resources [12]. All these reasons had created a great urge to look up for alternative energy which will perform as sustainable energy in effective manner to achieve sustainable development.

RENEWABLE ENERGY

Renewable Energy sources does not depleted, and it is distributed over all geographical area, these resources are quickly renewable through natural process. It won't create any environmental pollution and the main advantage of using renewable resource is it is available throughout the year. Renewable energy projects are sustainable replacement to carbon emitting techniques and solution for environmental, social and economic factors of energy practices. Stakeholders view on rural sustainable development is comparatively lower than urban areas. This creates need for small scale energy projects to improve the living standards of rural community [13].

Julia considers that sustainable and affordable energy are the key factor for poverty reduction and development. As like, macro scale energy production, small scale sustainable energy production projects are helpful in national development by contributing to local economy, employment creation, income [14]. Income level of people is of important concern for environment pollution. Energy policies are to be made stronger for effective renewable energy usage. Sustainable development and renewable energy are energy efficient, adversely affects the environmental pollution. Environmental quality increases with sustainable products by stakeholders [15].

Alrikabi addresses, renewable energies are affordable, eco-friendly and abundant in nature with various forms like solar, wind, biomass, tidal or hydro and geothermal [16]. The above renewable energy technologies may not be equivalent with conventional energies in terms of production cost, but they could be much better if we consider their environmental and social effects. Transmission of energy and distribution costs, do not differ much among the conventional and renewable energies [17].

Forms of renewable energy

The following are the various forms of renewable energy [18]

Solar energy

It is in which sunlight is used both directly or indirectly to light the house, generate electricity and so on. Solar Energy can be classified as two types such as passive solar and active solar.

Wind energy

Sun heats the atmosphere, which produces wind. Wind can be harnessed to produce electricity with the help of wind mills.

Biomass energy

Biomass is all organic matter produced by photosynthesis, existing on the earth's surface. It can be converted to electricity by variety of conversion processes like direct combustion, gasification, pyrolysis and more [19].

Geothermal energy

Energy drawn from the earth crust is known as geothermal energy. Low temperature and high temperature resources are the two forms of geothermal renewable energy. Electricity can be generated from the heat produced inside the earth crust [20].

Hydro energy

Hydroelectricity is the electricity generated by conversion of energy from flowing water. Hydro

power can be generated with the help of hydro power plants [21].

Above forms are used one or other countries to produce considerable amount of cleaner energy, this paper mainly discusses on wind energy.

Wind energy

Wind is a clean resource and eco – friendly energy has a history of more than 3000 years. The average annual growth rate of wind power generation is 30% up to the year 2012. China, The U.S, Germany, Spain and India are regarded as top five contributors of wind energy. Wind power is produced in on shore as well as in off shore, both the methods create impact on environment to certain extent [22]. Wind energy is produced through windmills which work both in horizontal axis and vertical axis. The basic mechanics of the two systems are similar in which wind passing over the blades is converted in to mechanical power and fed through transmission to an electrical generator.

Dursan states that the wind power generation will reduce CO_2 emission in environment, which is due to large consumption of electricity in household level. Domestic level wind energy production can be adapted with different types of wind turbines [23]. wind power can provide us a long-term positive impact on biodiversity by minimizing the threat of climate change - the greatest threat to biodiversity. As well as, the construction and operation of both onshore and offshore wind turbines can cause potential negative environmental impacts on birds and cetaceans, landscapes, sustainable land use, and the marine environment [24].

The factors that limit the installation of micro wind turbines are low wind speed, high turbulence intensity and high aero dynamic noise. The study is done on three types of roof, among in which flat roof has greater intensity of power generation [25]. Wind energy will be great replacement to conventional energy, proper study and knowledge will be helpful to increase percentage of installation.

CONCLUSION

Energy generation and their source are major problem in achieving sustainable development. The renewable sources are cost effective, user-friendly, so that they can easily beat the non renewable resources. By promoting renewable energy sources we can avoid environmental degradation. Sustainable Energy Strategies typically helpful in integrating all the three dimensions (society, environment, economy) of sustainability. Wind power generation is best form of renewable energy and can be produced in micro and macro level.

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