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Hybrid Biomass-Solar Power System with Establishment of Raw Material Procure

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ABSTRACT

The utilization of sustainable power sources is ending up exceptionally essential because of the restricted stores of non-renewable energy sources and worldwide ecological worries for the creation of electrical power age and usage. In remote regions, towns, it is anything but difficult to get more sum biomass. Subsequently by the utilization of crossover frameworks comprising of Biomass and PV for creation of electrical vitality in these remote regions can be more temperate. On the off chance that the advancement of a PC based approach for assessing, the general execution of independent half and half PV-Biomass creating frameworks are broke down ,at that point these outcomes are helpful for creating and introducing cross breed frameworks in remote regions This paper centers the practical thought of independent crossover frameworks having PV and Biomass for electrical generation in remote zones. Additionally in this paper a reproduction approach has been recommended for planning remain solitary network for remote regions. The normal sun powered radiation and amount of biomass required information are to anticipate the general execution of the creating framework. The batteries can likewise be utilized as a part of this framework to store the additional vitality which can additionally be utilized for reinforcement. Likewise the additional power is utilized to supply to the network. Here the reproduction is completed utilizing HOMER programming. The outcomes and investigation can used to enhance the improvement of the proposed demonstrate**.**

Keywords: *Biomass, Hybrid system, Homer software, Micro grid, PV array*

1. INTRODUCTION

In the beginning of the 21st century the world has encountered three major problems: (a) global warming and climate change caused by the green house effect due to the excessive release of carbon dioxide and other toxic gases in the atmosphere as a result of industrialization (b) Energy shortage in the sense that gas and oil prices have shot up due to the depletion of the minerals and (c) excessive shortage of fresh water in most parts of the world caused by deforestation in search of other alternatives of energy. The solutions that have been suggested to counter the aforesaid problems are: Introduction of energy efficient systems and energy saving; introduction of renewable energy sources; coal gasification and carbon dioxide sequestration and the introduction of the nuclear power [8]. The energy crisis that happened in 1970 brought to light the fact many countries need to depend on others for fossil fuels to replenish their energy resources. Renewable energy can provide an achievable solution to all these problems. Renewable energy sources do not diminish with time. These energy resources produce a clean and cheap form of indigenous energy. It's a mere fact that almost 80% of the energy used today comes from natural gas, coal and oil which are quickly running out with population and demand growth. Renewable energy is moreover, able to avoid pollution and environmental imbalance that leads to climate change and global warming.

These resources include, geothermal energy, hydro-electric power, solar energy, wind energy, biomass, tidal and wave power. Energy is a very important tool daily residential, industrial and economic activity. Affordable and reliable energy sources are the key objectives of any government to provide cheap energy to its people. This paper reports on the possible hybridization of the parabolic solar plant with a biogas plant.

2. PRESENT WORK

The site proposed for hybrid power generation is village situated in Punjab. The total population of the village is 3900. In the village, raw material for biomass power plant can be made available. The total number of cattle in the village is 2340. In the village has abundant quantity of human waste and animal dung, which can be used to generate electricity by installing biogas power plant. Average solar radiation at the village is 4.73kWh/m2/day, therefore the site has also a great potential to generate electricity through solar power plant. Three project models, one is of biomass power plant of 1000kW, second is of biogas power plant of 350kW capacity and the last is of solar power plant of 400 kW capacity are hence proposed.

3. METHODOLOGY

3.1 Photovoltaic system

Sizing a photovoltaic system is an important task in the system‟s design. In the sizing process one has to take into account three basic factors: i. The solar insolation of the site and generally the Metrological data ii. The daily power consumption (Wh) and types of the electric loads, and iii. The storage system to contribute to the system‟s energy independence for a certain period of time The PV generator is oversized it will have a big impact in the final cost and the price of the power produced and in the other hand, the PV-generator is undersized, problems might occur in meeting the power demand at any time. The sizing should be carefully planned, examining various possible PV system configurations and various models of components in order to get a cost effective and reliable system [3]. Theamount of solar radiation at a site at any time, either it is expressed as solar intensity (W/m2) or solar insolation or radiation in MJ or Wh, is primarily required to provide answer to the amount of power produced by the PV generator. The amount of electrical energy produced by a PV-array depends primarily on the insolation at a given location and time. Data on solar insolation are usually given in the form of global radiation that is beam, direct and diffuse radiation over a horizontal surface**.**

3.1.1 SYSTEM COMPONENTS

In this analysis, the major components are PV panels, biogas disaster, bio fuel generators, batteries, and converters. For economic analysis, the number of units to be used, capital cost, replacement and O&M costs and operating hours to be defined in HOMER in order to simulate the system.

3.1.2 Solar Photovoltaic;-

Sun rays are available with prosperity in Barisal, Bangladesh. Lots of solar home system has been installed. But, there is no set up yet established for off grid networking. In this research, solar photovoltaic is used with biogas generation for the establishment of a hybrid system. Solar system cost consists of cost with cables and charge controllers. It’s known to me by analysing present market; cost of PV panel with set up cost Tk. 75000 for 1 kW generation. Various costs are represented in Table 1 and cost is considered in BDT. Life time has been taken 25 years.

3.1.3 Generator

In this research, two set of 10 kW biomass generators are considered to find out the most cost effective system. The main reason of using to fulfil the energy demand in peak hour both for winter and summer season and also meet the terms of backup requirements. As biomass resource is available in prosperity, fuel cost is considered zero. The main cost is considered for biogas generation procedure and biogas power generator. . To produce 1KW electricity from biomass, $1200 is required including plant cost and generator cost, i.e. about BDT 9600000 is required in this purpose. Digester lifetime is considered for 8 years and fuel curve slope and intercept are taken as 0.05 and 0.33 respectively.

3.1.4 Battery

Batteries are used to store the solar photovoltaic output. In rural area like our proposed are, where most of the power is used after day time. So, main target of our system is to store energy at day time and discharge the stored energy after evening. So, batteries are used following through charge controller. Also, a dump load is used for the purpose of removing excess charge and preventing system damage. In this

system, the Surrette 4KS25P storage batteries are utilized. The specifications and different costs of batteries.

3.1.5 Converter

Converter converts the dc power to ac power. As, most of the home appliances are operated in ac, dc generation from the PV array is converted to ac following through a controller. In this .proposed system, 25 kW converters are considered for optimum solution. The details of converter cost assumption and different parameters.

3.2 Biomass power

Biomass power: Biomass is the amount of living matter in a given habitat, expressed either as the weight of organisms per unit area. Biogas is a mixture of gases, generally carbon dioxide and methane. It is produced by microorganisms, especially in the absence of oxygen. This process is called anaerobic process. Biogas also can develop at the bottom of lakes where decaying organic matter builds up under wet and anaerobic conditions. And a biodiesel is made from vegetable oils and animal fats. The main factor of choosing this type of hybrid system consist of biomass is that in remote area villages it is easily and economically available in the form of dung of cow, buffalo, goat etc. During the cloudy day, the total electricity production can depend on the biomass. The most perspective was the building of biogas plant in a remote area and care has to be taken that, as there was located large dairy farm. Rest of the needed feedstock for this cogeneration plant is provided by plant biomass, e.g. cereals, perennial grasses, maize, other energy crops or biomass from unused agricultural areas. It is recommended to include in feedstock, a part of manure, the different local biomass, e.g. maize, perennial grasses and legumes, straw, reed, waste biomass from food industry, biodegradable part of municipal wastes, aiming to increase economical viability for potential biogas projects and to provide stable round year running of biogas cogeneration plants.

4. COMBINED BIOMASS BIOGAS AND SOLAR PV SYSTEM

A PV – Biomass power system, which is a combination of a photovoltaic array integrated with a biomass generator, is a better option for a remote area which is not connected to the grid and is a best solution to electrification of remote areas, where extension of national grid is not a cost effective option. The system which is analyzing consists of a PV array, a battery bank, a biomass generator, a charge controller and a DC/AC converter. In the design and sizing of the system; the system should be considered as an autonomous system. Such a constraint leads to an infinite number of possible system configurations In the first step we will collect the data regarding location of area, the total land area, area under crops, crop production, energy consumption, agri-residue output, raw material available, average radiation per square meter, sunshine hours per year etc and second step calculate load of the selected village. The next step will be proper selection of equipments (Engines, generators, turbines, boilers, types of engines, effect of temperature, digester design, height of digester, batteries, inverter, PV collectors, cables etc.) [3]. Next step Cost estimations (Subsidies by government and private bodies, generation cost etc). At last step we will calculate of payback period. Finally the whole area will be supplied power with the help of Micro Hybrid biomass, biogas and solar combined power plant.

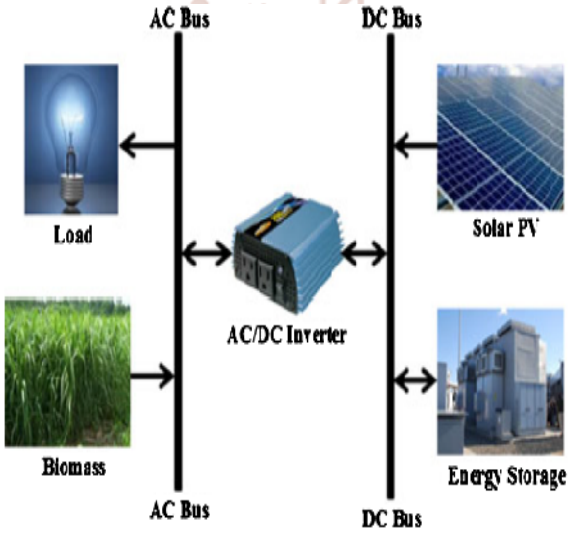

Figure 1 Block diagram of Hybrid Power Plant

5. PROJECT MANAGEMENT

Project management is applying knowledge, skills, tools and techniques into project activities to meet project requirements. It is accomplished through rational use and integration of 42 project management processes. According to their logic theories, the process can be categorized into five process groups: initiating, planning, implementing, monitoring and

ending. This article will identify the five process groups respectively.

5.1 Initiating Process

The main task of this phase is to determine the project charter. To reduce the uncertainty in project implementation, project charter should include the following areas: clear objectives, initial scope, preliminary budget, project manager power distribution, major project stakeholders.

5.2 Planning Process

In the planning process, it is essential to make a detailed plan on the schedule, cost and risk and communication, scope quality in the process of establishment of the raw material purchasing system, which are finally summarized into concrete implementing scheme and project documents.

5.3 Implementing Process

The main task of this phase is to perform all kinds of tasks and goals at the planning stage so as to ensure the implementation of purchasing task. At this stage, we should pay attention to the following questions: The pretreatment of the raw material. Biomass raw materials is essentially characteristic of low energy destiny and bulk mass. In order to reduce the cost of material transportation, the materials need to be preprocessed.

6. RESULT AND DISCUSSION

The assumptions made on the conversion equivalents of biomass are as follows; Biogas contains 65% methane, which when burnt produces 35% electrical power,50%heat and 15% goes to losses.For the calculation of the amount of electricity and heat obtained per day it is assumed that 1 tonne= 300m3 of biogas . Table II shows the demand of electricity expressed in terms of equivalent heat versus the electricity generation from the CSP plant. Assuming electrical conversion efficiency of 35%, for every 1m3 of biogas we obtain 2.14kWh (electricity), 3.96kWh of thermal heat. For the month of January the daily average of electricity and heat was calculated to be: Electricity per hour in one day in January from biogas was 3940.8 kWh, thermal heat in one day in January from biogas (H3) is calculated as 5629 kWh.

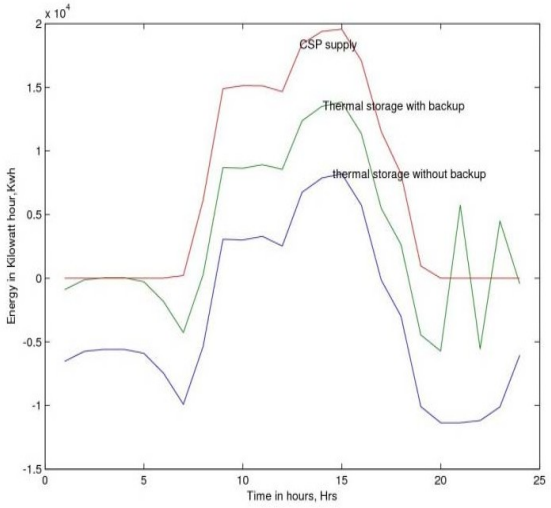

Fig 2: Graph of electricity generation and storage in a day

7. CONCLUSION

In many spots of the world the sun isn't there for 24 hrs henceforth to take care of the expanding demand at any given time we have to supplement the illustrative trough stockpiling with some warmth prepared for dispatch in overcast days or around evening time. The utilization of anaerobic absorption brings down the discharge of the Green house gases fundamentally. Age of power utilizing the waste warmth as a reinforcement radiator for the warm stockpiling of the allegorical plant expands the measure of vitality stockpiling for sometime later and subsequently it upgrades dependability of the plant. This arrangement gives a higher electric power generation and a noteworthy solidness of the warm framework and in addition making a higher inexhaustible yield of the plant. Hybridization of a CSP plant with biomass plant can be an answer for the debilitated vitality emergency in numerous African people group who still depends on kindling for their day by day vitality in cooking and lighting. Innovative work ought to be done to think of a warmth exchange liquid that will have the capacity to store the warm vitality from the sun for constant age after nightfall. Concentrating sun oriented warm power can is an inexhaustible type of power age. It doesn't radiate the green house gases which is one of its prime points of interest.

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