HYBRID RENEWABLE ENERGY MANAGEMENT INTELLIGENT SYSTEM

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ABSTRACT

Taking into contemplation of continuously cumulative feeding of the electricity and bother towards environmental subjects, renewable energy sources have been generally used for cohort of electricity. A Hybrid Energy System can be clarified as systems which contain of various energy causes such as wind, solar, fuel cell, diesel generator and storing systems such as batteries to store energy are unified and interrelated to satisfy the load energy demand. This paper gathers the cohort of electricity by operating the Hybrid Renewable Energy System (HRES).

Keywords - Hybrid Renewable Energy System, fuel cell ,wind, solar.

1. INTRODUCTION

The enormous increase in the electrical vigor demand over the world has elevated concerns over the many environmental influences such as release of gaseous and persistent substances unconfined from the fossil fuel burning, exhaustion of energy properties from fossil fuel and vigor supply shortage in the future [1-3]. The development of energy systems which are sustainable, non- polluting and substitute fuels are required for increasing energy demand in the future for various applications in the industries and other sectors [4]. The lack of electrical power supply which are reliable, the high operating cost of diesel generator or AC grid installation are some of the major challenges faced in the electrification in rural areas, leading a fair number of developing countries to focus into hybrid system configuration of alternative energies [5-7].

A Hybrid Renewable Energy System (HRES) can be clear as a system which is a combination two numerous technologies, that is, one or more non-renewable energy sources and at the smallest of one renewable energy source [8]. Many research and growth are currently absorbed in hybrid renewable energy systems in order to hybridize and enhance the generation of electricity. The scientific development has involved numerous storage systems and renewable energy sources and has understood electrical power system as a system that utilizes more than one energy source as HRES [9-10].

The goalmouth of a hybrid renewable energy system is to content the load demand by utilizing renewable sources, and if there is a lack it is rewarded with non-renewable sources, meanwhile plummeting the consumption of fuel. The reliability of the system is better when the makings from renewable energy are utilized together, which is most important improvement of hybrid systems. In adding to that, the storage system size can be further reduced moderately as there is less dependence on one independent energy

source [11]. The best sizing, selection of system mechanisms and control processes are important and exigent factors in the independent hybrid energy systems lifetime [12]. For sizing of mechanisms in hybrid system and cost optimization in relative to the load demand and the energy possessions accessible from the sites, various researches everything have been recognized and prosecuted using numerical methods. These practices engross more time and their complication level also increases proportionally with the number of energy sources taken into account in the structure of hybrid systems [13-14].

India is one amid the list of countries which has been fronting the same obstacle. We have huge energy demands but concurrently there are increasing challenges in reaching those demands by means of traditional methodologies of power generation [15].
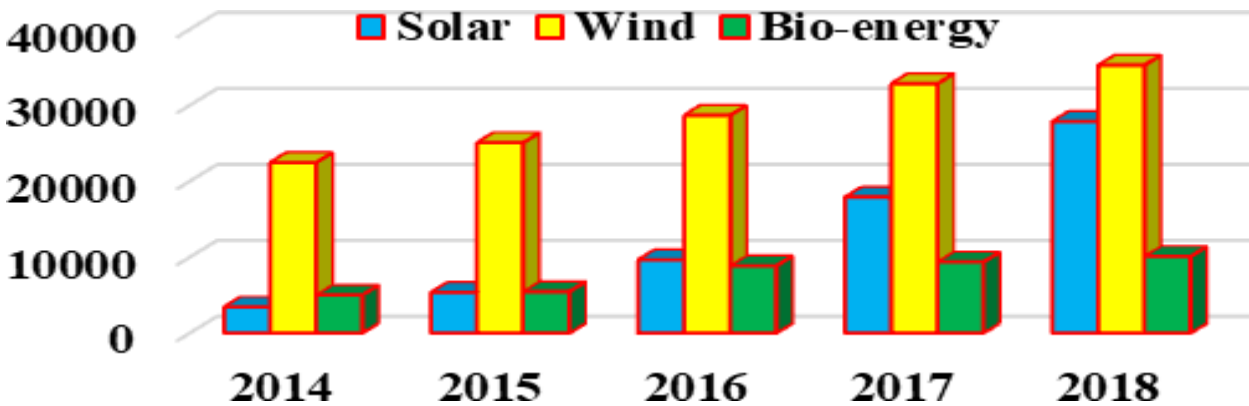

Fig. 1.Installed capacity of various renewable sources

2. HYBRID SYSTEMS

The electrical power made by the renewable energy sources can be distinguished depending on its erraticism. The key is to form a hybrid system by connection the sources of energy supply. Several arrangements have been proposed by taking reflection of well-defined parameters. Fig. 2 demonstrates the classification of hybrid system depending upon certain criteria.
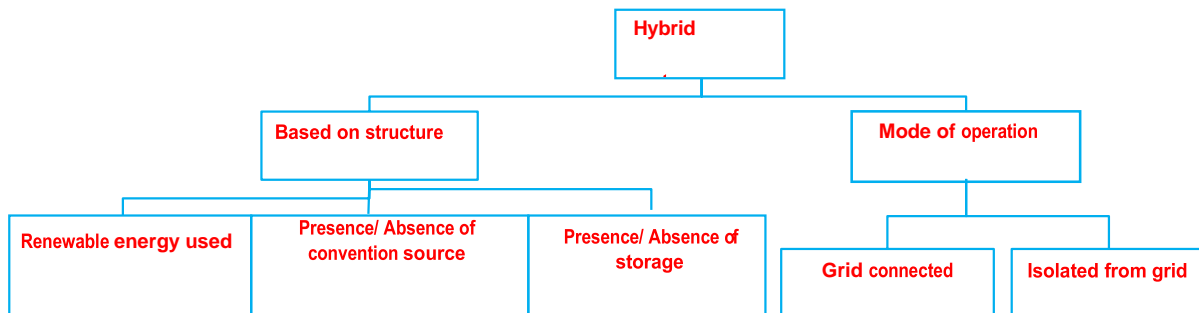

Fig. 2. Classification of hybrid system

While seeing the mode operation, hybrid system can be additional classified into two groups. The first group represents grid connected hybrid systems. The operation of grid connected system occurs in parallel with network. The grid connected systems are always linked to the network. In the second group, the hybrid systems are isolated from the grid. This type of systems does not have links with the networks.

The architecture of the hybrid energy systems can be grouped into three types as given below:

- **Renewable source of energy used:**

  It is obligatory to have renewable source of energy such as a wind generator or PV system or combination of PV and wind generator, in a hybrid renewable energy system. For excellent of an energy source, the currently obtainable of an energy potential is very necessary.

  - **Photovoltaic system:** This type of schemes can be connected in locations where the climate is very hot or where the sunshine is more.

- **Wind systems:**

  This type of systems can be connected in the locations with tall wind speed. Storage systems such as batteries and fuel cells are obligatory if the hybrid system operates under the stand-alone mode.

  - **Hybrid photovoltaic, wind, diesel system:** These systems are lengthily connected and used in the locations where the solar potential and the amount of wind speed is suitable. The crucial objective of this system is to diminish the amount of fuel ingesting from the system. A hybrid system which does not consist of conventional energy source can be classified as following:

- **PV system with energy storage:**

  In order to content the load demand, the PV system should contain of another energy source during the nonappearance of sunshine. For installing independent photovoltaic systems, the energy storage bulk is very important to feedstuff the load during the broken condition of energy source.

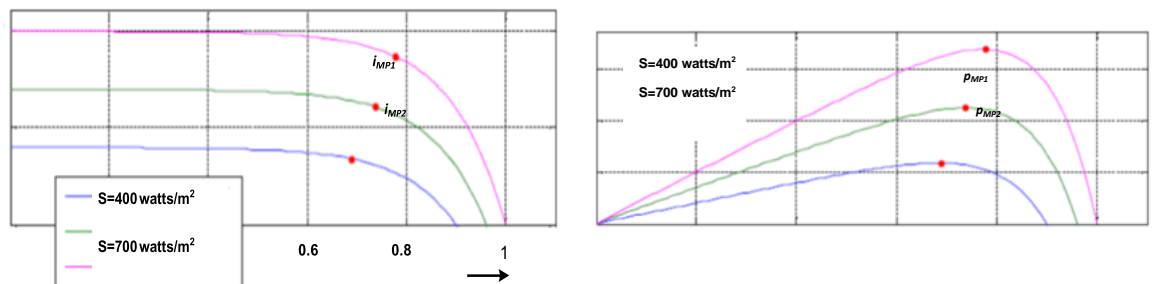## 3. MODELLING OF HYBRID SYSTEM

A. Solar PV system

Fig. 4. (a)I-V Curves of PV Array with different Radiation levels (b) P-V Curves of PV Array with different radiation levels

Solar photovoltaic system produces electrical energy by subsequent the principle of photovoltaic consequence. The electrical energy is produced in the solar panel when the solar radioactivity is incident on it. A solar panel contain of a set of solar cells which are related either in series or in parallel grouping in order to supply the required amount of output voltage and current.

B.Wind Energy System

Wind energy system entails of turbine changes the kinetic energy produced due to the wind into rotational energy. When the wind turbine and producer coupled, due to the rotating energy in turbine, electrical energy is generated in generator. The output power of the arrangement is dependent on velocity of wind, density of air, power coefficient and area swept by blades

The output power of wind turbine is allied with wind speed in a cubic ratio. The first order moment of inertia a abrasion based dynamic model for the wind turbine rotor and also a first order model for the Permanent Magnet Generator is used. The dynamics of the wind turbine owing to its rotor inertia and generator are added slightly under-damped system by seeing the wind turbine response as a second order.

C. Fuel Cell

The procedure of a fuel cell is to generate electrical energy from chemical energy. Generally, analytical and observed modeling approaches are utilized widely. The analytical model of fuel cell is associated to the electrochemical equation analysis which pronounces the working of fuel cell. This type of modeling approach dictates large multiplication and vast evidence regarding geometrical and electrochemical stipulations like internal moistness level, substance layer thickness and transmission coefficients. The correctness in this type of methods completely trusts upon approximation and supposition made in the analysis. In the nonappearance of geometrical and chemical variables, empirical approach of modeling is extensively followed. This type of method is based on data fitting and black box approach. The correctness in the empirical type modeling relies on various factors. These factors touch the accuracy at each phase of modeling process. The generator which contains of hydrogen as its protuberant fuel is used for modeling of fuel cell.

4. IMPORTANCE OF ENERGY STORAGE SYSTEMS

Energy storage is secondhand to store excess electrical energy in order to exploit it when there is no additional power source. It is also secondhand as an alternative source of energy. To guarantee the stability in the power system, batteries and super capacitors are used in hybrid energy storage system. Battery-Super capacitor is used hybrid storage system in order to growth the life of battery bank. This can be accomplished by dropping the stress level and size of the battery. This system also diminishes the overall capital cost of system.
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Hybrid stand-alone systems extensively use lead acid batteries as energy storage system. Lead acid batteries are favored because of high efficiency, lower capital and installation cost. Lead acid batteries have effectiveness about eighty-five to ninety percent, whereas the Li-ion battery has an competence of up to ninety percent. Li-ion batteries are used very minus in stand-alone hybrid systems, even though they have high energy density, long operating life and low self-discharge rate.

5. FUTURE CHALLENGES IN ENERGY MANAGEMENT SYSTEM

Under stable irradiance, few extreme power point tracking approaches sustain an optimum presentation. In difference to that, under swift variation of irradiance, the routine is dissatisfying. KF (Kalman Filter) comprises two steps, that is, estimate and correction. The expectation involves the expecting of the state. The correction encompasses rectifying of the estimate with respect to measured value. Thus, it can be employed for estimating the maximum power point voltage, then improvement of this estimate value dependent upon the error generated between estimation and measured voltage of PV. The next step involves controlling of the converter to obtain the rectified value. The recurrence of this process is complete till the error value is close to zero. This indicates that maximum power point is reached.

CONCLUSION

This paper discusses the present status of Hybrid Renewable Energy System(HRES) and its part in enhancing the generation of electrical energy. This paper examines modeling of various renewable energy sources and predictable sources like diesel generator. It highpoints the various energy storage devices which uplifts the efficiency of the system.

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