

Adequate Battery Energy Storage System

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Abstract:

This paper explain a review on adequate battery energy storage system. A Competent BESS(Battery Energy storage system) for buffer system is studied for the reason that a gradual diminishing in the strength of unsteady input from wind mills. Design purpose of this system is to determination of the capacity of the BESS to ensure constant dispatch power to the connected grid and to obtained economic benefit from the cost of BESS .title “Adequate Battery Energy Storage system” (ABESS) is the new option which increases the efficiency of battery energy saving. System adopts efficient techniques to keep the battery level within min-max levels.

Keywords: Competent Energy Storage System, Energy buffer,unsteady power, wind Energy.

INTRODUCTION

Taking in to consideration to the different causes like rapid population growth, industrializations and many more reasons it is becoming more and more difficult to balance the demand and generation. Considering the dramatically changed scenario, it is must to believe on alternative power generation procedures. Although many traditional power generation plants are working concurrently to fulfill the demand side. But the contribution which is required in the form of raw material and the resources are at their least amount and getting less day by day.

This makes the researchers to turn their interest towards the alternate methods of power generation. These are renewable energy sources, which are naturally replenished on a time scale. Such as sunlight, wind, tides, waves and geothermal heat. Renewable energy sources are the future replacements for the distinct areas like Electricity Generation, Hot Water Heating, Vehicle Fuels and Off- Grid Energy Services. One of the common problems, with such renewable energy sources, are

they couldn't be a constant energy source. On the time scale i.e. from morning to evening the light energy varies, it is also affected by the climatic conditions, wind could not flow with constant pace, rain could not be streamlined rain, tides can not be constant and similarly waves and the geothermal heat. Each of this energy in-fact, renewable energy source could not be the constant source of the energy like all traditional methods. To come out of this drawback a nobel technique of Competent Battery Energy Storage System (ABESS) is proposed.

As, in the traditional methods of the battery energy saving the energy in converted into dc energy and is temporarily stored in the backup system as per the demand i.e. load later the stored energy is converted back in energy and transmitted towards load.

Some of the common drawbacks of the such traditional systems are they are not cost effective which means random battery cells were used to employ without any calculations with which sometimes less number of cells are used for storage which in terms provides less energy to the load, sometimes more number of cells employed which keeps storing excess energy without any reason.

Second drawback of the traditional method is excess charging and discharging of the cells. When battery cells charge after their max limit or discharges after min level its life cycle decreases.

The proposed Competent Battery Energy Storage System is designed by considering all the facts of the power electronics and the storage techniques. The ABESS is used to store the auxiliary or buffer storage for the wind farm. When storing of this buffer energy all the parameters must be taken in to consideration, like input power or mechanical power, buffer power, grid power etc.

Block Description

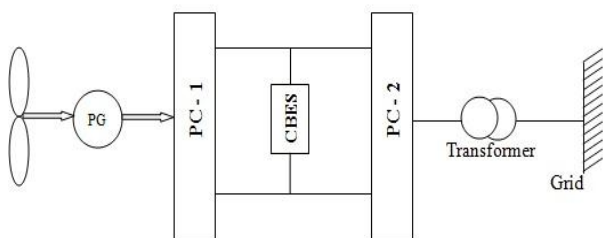


Fig.1: Competent Battery Energy Storage System

The logic blocks arranged in above format shows the possible method for implementing Competent Battery Energy Storage System. In this theme the energy generated from the wind power source is fed to the Power Generator Unit. Power generator, term used in general, being different techniques are available. But for better performance Permanent Magnet Synchronous Generator (PMSG) is Suggested. In this generator unit permanent magnet unit is used for field excitation. Further the rotor and the magnetic field rotates in the same field hence called synchronous. Magnetic field is generated through shaft mounted permanent magnet and current is induced into the stationery armature. Since, the permanent magnet is available at cheaper rates, and having lighter weight, hence becomes more economical and turbine rating increases. The energy source i.e. wind is providing random voltage levels and frequency, the Power Generator unit is responsible for converting the random nature energy

into fixed frequency energy. This is, input power, this input power is highly random in nature.

In the proposed system a set of power converters are used, to have connection between generator and the grid. PC-1 is the power converter unit 1 which converts the random ac energy into dc form, so that it can be stored into the battery cells. Between these two power converters a capacitor or bank of capacitors can be included. In first case, it can be used as harmonics filter for smoothing purpose and in second case it can be used storage media. But for the second case, energy stored could be very small. Competent Battery Energy Saver system is incorporated between PC-1 and PC-2 unit. PC-1 Unit and CBES system together constitutes the power buffer system. The buffer system executes corrective actions for smoothing the randomness in the input power: to achieve the target output power Converter Unit 1 is controlled to adjust the intermediate dc output voltage so that, at the, output power supplied will be the net output power. Power Converter Unit 2 will take care of converting the dc input power into ac power at the grid frequency.

Successful implementation of the proposed system depends on the factors like: geographical place where the wind power is to be generated, precise determination of CBES Cells, output power to be generated and etc.

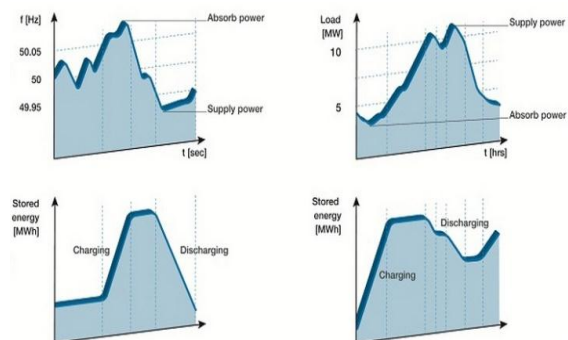


Fig.2: Power Smoothing

Competent Battery Energy Storage:-

Capacity of the battery cells are determined in terms of Energy and the Power. Energy capacity specifies the amount of energy that can be stored in the battery. Whereas power rating indicates the amount

of power that can be supplied by the battery during charging/discharging hours.

From fig.1 it is quite predictable that:

Battery Power = Input Power – Output Power.

Here output power is expected to be constant power source, which makes battery power to vary according to the input power. The total power generated, out of, 70 % is fed to the grid and the remaining 30% power is diverted towards to the CBES system.

For proper distribution of the energy requirement a base power value in MW is considered. Which means the power generated at any condition will be at least base value or least value under any condition. This value will be maintained within the window of 20% to 100 % of the grid power. But for the worst case possibilities of different conditions less KWh power will be generated.

To maintain the base value, PMSG is responsible. At any condition things will not happen like 0 energy is generated. That means wind can not be steady. If the Energy generated drops after 20% of the grid energy then Permanent Magnet Synchronous Generator (PMSG) will rotate the aero turbines at least at minimum RPM possible. For obtaining the benefit cost or the number of cells required for the ABESS system the following parameters must be considered.

$$C = k1Pin - k2Pcell - k3Ecell(max.)$$

Where,

C is the net profit obtained by the wind mills.

K1 is unit price of wind energy INR per kilowatt.

Pin is the input power of wind farm.

Pcell is power diverted to the buffer or battery storage system.

K2 and K3 are capital cost and expenditure cost related

to buffer storage system.

Ecell is the battery energy in MJ.

While getting economic benefit from the ABESS all the parameters must be proper determined so that we can easily find out the total benefit cost related to the competent battery energy storage system. Exact amount of cell required for the buffer system is calculated from the above mentioned calculations and proper benefit cost and the power which is fed to the grid is been calculated by this system so it is much more competent in the era of battery storage system.

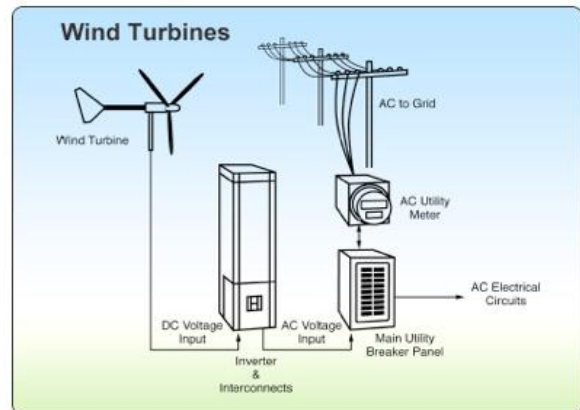


Fig3: Competent battery energy storage system

Conclusion:-

In the proposed paper the Competent battery energy storage system is determined for not only keeping the constant power fed to the grid but also to obtain the benefit cost of the buffer energy storage system. The constant dispatch level is sure by proposing this technique.

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