USE OF BESS TECHNOLOGY FOR RUNNING AN ISOLATED HYDRO POWER GENERATING SYSTEM ALONG WITH CONTROLLING VOLTAGE AND FREQUENCY AND IMPROVING QUALITY OF POWER IN POWER SYSTEM.

B.A JAN
bjan768@gmail.com

Abstract: Every field of the present day modern life is dependent on power. Sometimes it is not possible to run a hydro / diesel / wind generating system in isolation because of variation of frequency voltage and all other parameters. This paper deals with running an hydro generating system in isolation ,the main aim with these isolated power systems is to reduce system operating costs and environmental impact. The proposed voltage and frequency controller is having bi directional capabilities of active and reactive power flow by which it controls voltage and frequency with variation of consumer loads and has harmonic elimination and load balancing thus improving quality of power.

Keywords: Battery energy storage system ,voltage and frequency controller ,active and reactive power ,hydro generating system.

I INTRODUCTION

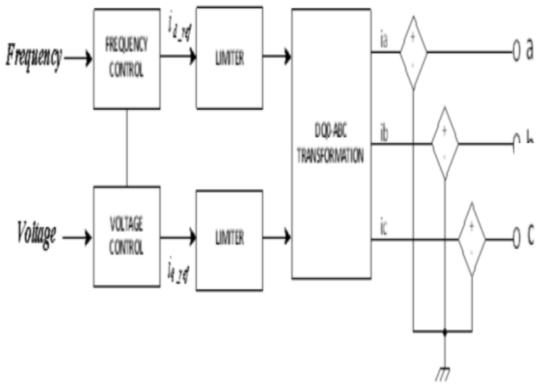
It is very difficult for some areas to access the main power grid especially remote areas /hilly areas .so it is necessary in these areas to have a system with the power provider which can be run in isolation with quality power. This paper deals with running a power system successfully in isolation and providing power with good voltage and frequency. the viability of isolated systems using hydro generating system or any other environment friendly /cost efficient power system depends on regulation and other stimulation techniques

II BESS SYSTEM

Battery energy storage system consists of converters harmonic and DC filter circuits battery strings. BESS can change active and re active power in both directions providing control in four quadrants. BESS can satisfy the technical requirements for primary frequency regulation by absorbing power from the grid for high frequency periods and can supply to the grid during low frequency periods. BESS has a very fast dynamic response compared to typical generators or other storage devices. BESS can cover wide range of applications ranging from short term power quality to long term energy management. A battery bases controller is proposed for control of voltage and frequency in isolated system. The viability of isolated systems using renewable energy sources depends largely on regulation and stimulation techniques.

Bess consists of rectifier / inverter , battery cells and the energy storage system. The rectifier / inverter is normally based on a voltage source converter and a pulse width modulation. It acts as the interface between BC and AC sides if the converter losses, internal dynamics of battery cells and battery capacity are ignored, the battery can be regarded as the controlled current source for 3 phases. The EMS messages the active and re-active power exchange. There are different control objectives for EMS. Here the tasks are stabilizing the grid frequency and voltage of the connected bus. Therefore, the frequency and voltage are taken as the inputs to determine the active and reactive power references which equate d and q components of the control signals for the current sources.

To assess the working of proposed coordinated control scheme the frequency and voltage rfesponse is conducted with storage with an option of coordinated control on and off environment after switching to isolated operation as the first case of reference. The simulation with and without BESS regulation where the generator is in question



III. SYSTEM INVESTIGATED

For the purpose of investigating a small isolated power system, an LFC dynamic simulator is implemented with Mat lab/Simulink environment according to the structure of each generating unit is modeled with its speed-governing system and corresponding turbine. Respective shafts are included within the sum of the inertia constants of all rotating machines, namely all generators' contributions in the power system are added to obtain the single machine Equivalent over the network. The difference with the total load is then used in the basic swing equation. The grid frequency is readily obtained from the rotor dynamic equation given in the Following:

$$= - \sum_i P_{L_i})$$

$$\frac{df}{dt} \frac{f_o}{2\sum_i H_i} (\sum_i P_{M_i} \text{.........} (1)$$

Furthermore, the isolated power system shall consider the power rating of an island of small to medium scale power generation (100–500 MW). Consequently, the installed power generation Available is chosen to be about 450 MW. Moreover, isolated power systems often use renewable energy from the wind, and Therefore 90MWof wind power (20% wind penetration) will be included in the power system under study. The remaining 360 MWcome from both hydraulic units and fossil-fired steam units in equal proportions. References give the different dynamic models necessary for the speed-governing systems and turbines. The steam unit models a fossil-fuelled single reheat tandem compound turbine along with its electro hydraulic control (EHC) speed-governing system. The hydro turbine and speed-governing system are also obtained, and the variable-speed wind turbine units with its speed-governing Systems are given. The speed-governing system is composed of a pitch controller and a tracking characteristic controller. The corresponding different sets of parameters are shown in the Appendix. The resulting LFC isolated power system simulator is shown in Fig. 3. Additionally, to obtain the wind input profile, auto correlated distributed time series are derived from awe bull distribution having a mean wind speed of 7 m/s with scale (*n)* and shape (β) parameters of 8 and 2, respectively. The load profile prevision is obtained from a typical load profile scaled to the size of the current power system considered, namely 360 MW peak power (total installed power is 450 MW). A random generator output is added on top of the load profile with a variance of $\pm 5MW$ to integrate stochastic part of the demand. The reader should be aware that other techniques or models are readily available for wind and load profile definition, such as taking historical measurements for instance. Nevertheless, the methodology developed and presented in this paper is not dependent upon the input profile chosen and is seen as a general method independent of the inputs. Next, an evaluation of the effect of the BESS on the dynamic stability of the power system is performed by comparing simulations with and without the BESS device.

IV. EFFECT OF BESS ON FREQUENCY REGULATION

Due to the property of providing fast active power BESS can decrease the frequency and by providing reactive power it can compensate the frequency increase by supplying the reactive power .Small isolated power systems cannot rely on generator inertia in interconnected grids. Between up and downward trend of frequency that is 50mhz primary power is activated.

V CONCLUSION

The stability of isolated power system is achieved by using BESS technology because it has the property of active and reactive power compensation with low grid inertia .There is a great scope of profitability for the power supplier by using BESS . and great scope for frequency regulation of an isolated system using BESS . The BESS offers active power compensation which improves stability of an isolated power system

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