*Chapter-7*

# A Study on Load Frequency Control of BESS in Distribution Generation

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The object of a power system is to balance the electricity generated at the generator end with the power needed at the consumption end. However, consumer demand is always shifting as a result of advancement. Therefore, it is necessary to continuously check on and meet load demand. The system frequency will be impacted by any imbalance between power generation and demand. For load frequency regulation, an isolated power system is modelled in the current research. the asynchronous generation has also been modelled and integrated into the current model to see how it affects the features of the Power system Load frequency. Additionally, a battery energy storage system has been designed and integrated into other models. In this study, single area load frequency control (LFC) utilizing an integrated controller is initially taken into consideration. Second, Distributed generation is used to examine Single area LFC. Following that, the battery energy storage (BES) system is used to assess single area LFC. As per the study we can determine the proper gain for the PI controller, the impact of increasing DG penetration level and the impact of the BES system using MATLAB Simulink R2018A software.

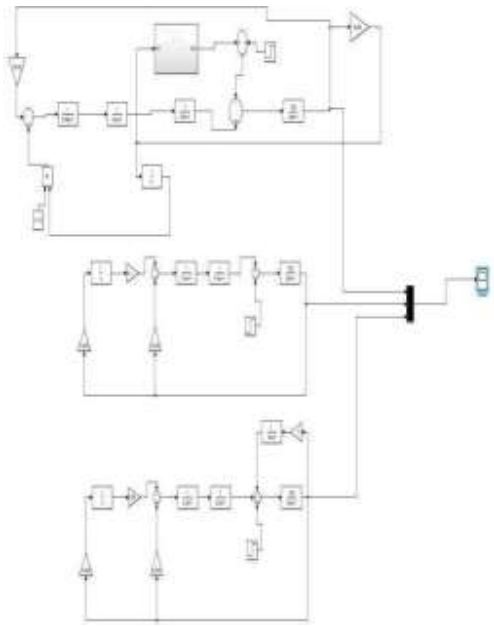

Fig.1: Simulation Diagram

The PI controllers are another name for an integral controller. It is a form of control created by fusing integral and proportional control action. It is called a "PI controller" as a result. Both proportional and integral controller control actions are used in the proportional-integral controller. When two distinct controllers are combined, a more effective controller is created, the drawbacks of each individual controller. In this instance, the control signal exhibits proportionality to both the error signal and its integral. The basic isolated power system, or LFC, is made up of the separate

block diagrams for the turbine, governor, generator, and load. Utilizing MATLAB Simulink, the transfer function model of an isolated power system is created.

LFC renewable energy resources/distributed generation are now incorporated in one location. The transfer function of first order depicts various RES or DG. The transfer function gain indicates the degree of Renewable penetration injected into the system. Renewable energy resources such as wind turbine systems, gas turbine systems, fuel cell and battery energy systems may all be represented by a transfer function of first order.

System Secondary control, also known as load frequency control, is a critical control function in the functioning of interconnected power systems, managing frequency and tie- line interchanges across different control zones. Many nations are currently transitioning from vertically integrated utilities that provide electricity at regulated prices to an economy that will include competitive enterprises selling unbundled power at cheaper costs. Load frequency management becomes critical in the power system structure to permit power exchanges and create better conditions for energy trading. One option for improving LFC performance is to install storage facilities during high demand periods, particularly a battery energy storage facility. Because BES can offer quick and active power compensation, it may also be utilized to improve load frequency control performance. BES also enhances supply dependability at high demand periods. Additional dynamic benefits of storage facilities include load levelling, factor adjustment, and black start capability.

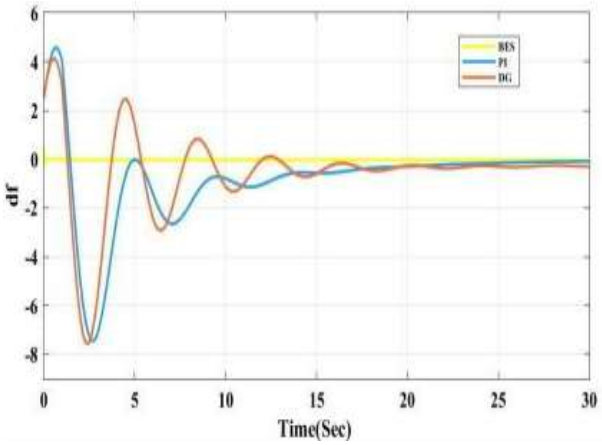


Fig 2: Response of PI, DG and BES for single area system LFC

It is observed in figure 2 that by using three controllers the BES is responded fast and obtained study state value with in one sec so, comparatively PI and DG by using BES system we can control the load frequency for single area control.

The use of BES in load frequency management for single area power systems has been demonstrated in this chapter. Through simulation research, it has been determined that BES Very Well substitutes PI controllers. When performance responses are compared, it becomes clear that BES has very good generalization capabilities, feasibility, reliability, and accuracy in load frequency control of single area power systems.

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