INCREASE THE GOOD ORGANIZATION OF WIND POWER GENERATION BY USING INTIGRATED CIRCUIT FOR WEAK POWER GRID

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Abstract: *The grid with battery and doubly- fed induction generator (DFIG) wind turbines once operative during a weak grid state of affairs with a coffee short circuit magnitude relation (SCR). The conception can analyze the performance of the grid with the battery connected DFIG each in steady state and transient state of affairs. The grid may be pictured as a venin equivalent circuit and is rated at twelve.5 kV. A battery system and a wind system are connected for the purpose of common coupling (PCC). The battery system being sculptural in PSCAD software system is rated at one MW/1 MHz and therefore the wind system model is rated at two MW. The grid has been characterized and analyzed supported 2 categories: sturdy grid and weak grid. A the grid is taken into account to be weak once the flow of active and reactive power within the network causes a major quantity of voltage fluctuation at the purpose of common coupling. A grid is taken into account to be sturdy once the grid is stable with allowable nominal deviations with voltage and frequency. The strength of the grid can be measured by taking the magnitude relation of grid's contact power with grid nominal power.*

Key Words: doubly- fed induction generator (DFIG), point of common coupling (PCC), Grid.

1. INTRODUCTION:

The technology has offered vital enhancements over the years in terms of modularity, flexibility and heterogeneous to satisfy numerous customer demands. The advancements in technology in BESS have given a reliable and economic resolution for many of the client requirements. The battery energy storage system (BESS) contains a tremendous growing technology and is been in business for quite a variety of years within the field of grid integration. Most of the benefits of such integration are: reduced output variability, improved power quality, smart transmission support, frequency regulation, peak demand regulation, curtailment of electricity from renewable energy sources and thereby offers a stable, reliable in operation grid. An in depth summary of the services provided by the energy storage is shown in Fig.1 [1]. The BESS application varies counting on the appliance and the client wants. Supported the applications, the BESS could be put in any place in generation, transmission and distribution areas during a given grid. Recently there has been the variety of further performance characteristics that must be thought of by the battery systems once they area unit supporting renewable readying. For frequency regulation and smoothing, quick reaction times are needed to resist short charge/discharge cycles. There are things where it's needed to produce an oversized quantity of power over a short amount of your time for a few frequency response things. Also just in case of offer shift, the battery energy storage should be suited for long charge/discharge cycles.

2. PREVIOUS STUDY:

The grid characteristics area unit expressed in terms of short circuit magnitude relation (SCR) as a robust or weak grid. Additionally delineated as inductive or resistive supported the network holmic resistance angle. A grid is mostly thought-about to be weak once the active power (P) and reactive power (Q) flows in and out of the grid network, wherever such flow of power affects the voltage amplitude at the purpose of common coupling. Such grid networks area unit thought-about to possess low SCR. The sturdy grid networks area unit those that have the potential to keep up steady voltage levels [2]. A number of the main problems connected to having a weak grid area unit as follows: the trip on the transient overvoltage, instability of turbine generator quick current control loops, reactive power swings and voltage instability, poorly damped frequency response. Hence, the weaker networks area unit needed to keep up a selected voltage deviation by adding synchronous condensers, electrical device banks and STATCOMs within the case of wind grid networks [4]. Steady state and transient analysis area unit did spot the impact of the battery connected power station system, with respect to the facility and voltage level of the grid in weak and strong grid conditions. Initially, the system is connected to the strong grid, so the voltage and power parameters area unit measured and analyzed. When the system is connected to the weak grid and analyzed for its effects on relevancy voltage and power. Connecting a power station with a weak grid causes voltage fluctuations. If this voltage fluctuation exceeds the given limit with relevancy the grid code, eventually it results in tripping off the power station.

The impact of the weak grid with a battery connected power station is analyzed, wherever active power, reactive power, voltage and current area unit measured in every condition [5].

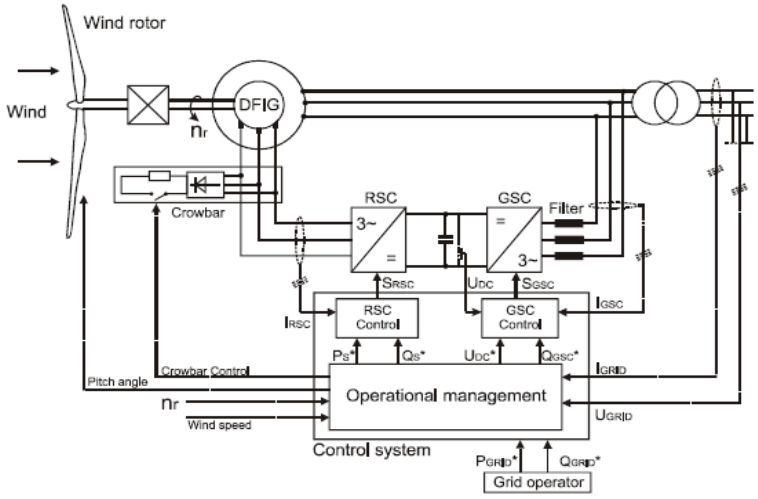

Fig.2.1. block diagram.

3. WEAK/STRONG GRID:

The grid is taken into account to be weak as a result of the massive impedance characteristics it sees between the distributed generation sources and also the load upon long distance transmission lines. The literature contains a smart study of the control performance and stability drawback of the grid-connected inverter in a very weak grid system. The studies were regarding the interaction between power electronic devices and grid with attention on the management performance of a grid-connected inverter and its effects on harmonic resonance and system stability in a very weak grid condition [7]. During this paper, vector management is employed for grid current management and also the proportional integral (PI) controllers are shapely to stay the system stable in weak grid condition [8]. In a very weak grid the point of common coupling endure a lot of variations in voltage and contains the variety of harmonics. Once the converters are added to the grid, it causes effects on the grid current distortion and additionally results in system instability and poor quality of the grid current. Therefore filters are supplemental to attenuate such instability and create the grid stable.

4. SIMULATION RESULTS:

The battery and also the DFIG area unit tied to the grid system at 12.5 kilovolt operative at sixty cps. The battery and DFIG area unit independently management led victimization vector control methodology. The converter acts each as the electrical converter (dc to ac) and rectifier (AC to dc) to alter the bi-directional energy of between grid and battery [9]. The DFIG is additionally management-led victimization Vector control method. System analysis is finished once the Battery and also the DFIG is connected to a similar grid however controlled individually. Simulations are done in the steady state and transient conditions. The 3 part grid current and grid voltage severally. The grid RMS current is 141.42 A and also the grid RMS voltage is twelve.5 kilovolt from that the power is calculated to be three MW. Represents the 3 part turbine current and voltage severally. The turbine is operated at twelve m/s wind speed. The voltage at the low facet is 690 V RMS and turbine current is 1.76 kA. Therefore power is around a pair of MW. The dc battery current and voltage severally. From the simulation, it is seen battery dc current is 1100 A and battery dc voltage is 980 V. Battery has the facility of one MW.

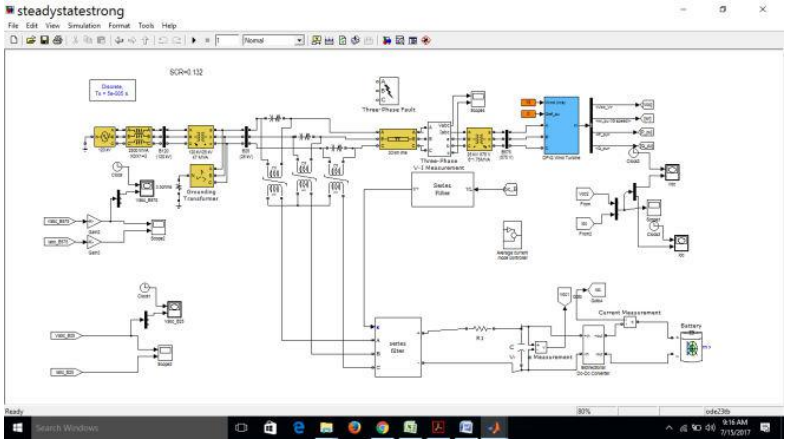

Fig.4.1.simulation circuit.

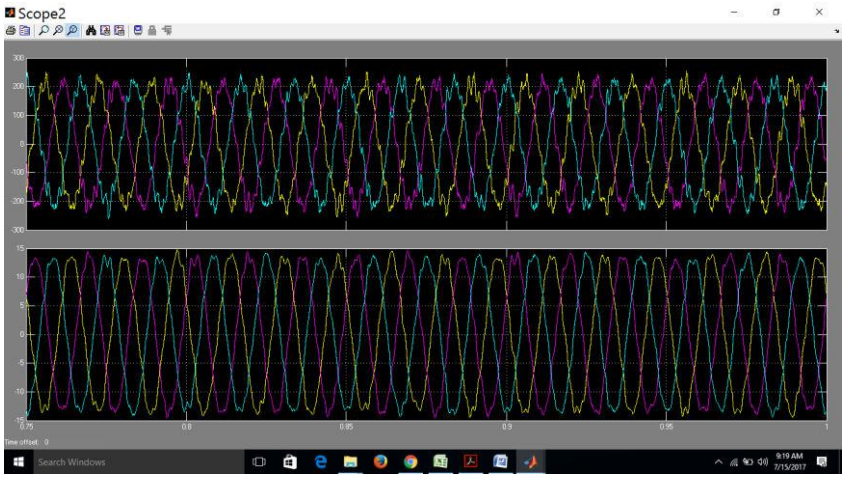

Fig.4.2.Current and voltage waveforms.

5. CONCLUSION:

The paper analyzes the performance of the grid once connected to a DFIG wind and battery system. Vector control is employed management to regulate to manage the voltage and current flow. The performance shows that the model works each in steady state condition and transient condition. The performance is additionally observed in weak grid situation. The simulation results show that the grid voltage is a smaller amount in weak grid condition wherever additional compensation is required to resolve this downside. The model additionally analyzed the performance of the grid with the battery connected DFIG wind system beneath transient situation. The system is ready to filter fault and become stable once more. Transients are analyzed in the weak grid to study grid scenario. It's determined that the sturdy grid stabilizes quicker than the weak grid. So as to form the system perform beneath less SCR, it needs compensation circuits to produce adequate reactive power to take care of the voltage.

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