A REVIEW OF STATCOM FOR STABILITY IMPROVEMENT OF FSIG BASED GRID CONNECTED WIND FARM

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ABSTRACT

Wind Farms are one of the favorable solutions for delivering clean energy in near future. Use of wind energy into existing power system presents a technical challenges and that requires consideration of voltage regulation, stability, power quality problems. The purpose of this paper is to analyze and study stability of a wind farm based on conventional fixed speed Induction generator when it has been integrated with a weak grid by comparing various techniques. A analysis of the stability improvement of a FSIG wind plant has been done, when it is supported with FACTS like STATCOM. There are so many difficulties in ensuring good quality power into the grid, as demanded by the more and more stringent grid codes. These problems could be solved by using Flexible Alternate Current Transmission Systems (FACTS) devices in the system and particularly the Static synchronous condenser (STATCOM) which uses the principle of reactive power control (injection or absorption). One of the main causes of disconnection of wind network is the variation of voltage (drop voltage or over voltage) at the bus bar connection. The use of STATCOM, allows regulating the voltage and maintaining the grid connection with wind even under certain severe conditions of disturbance such as faults. In this paper, we propose a study of the importance of STATCOM when it installed in a wind farm and the effect of injecting reactive power by STATCOM under various conditions in order to maintain the voltage at the nominal value

KEYWORDS: Fixed Speed Induction Generator (FSIG), Power System Stability, STATCOM.

INTRODUCTION

Increasing demand of electric power resources has led to the substantial improvements in the usage of renewable energy systems such as wind power and solar power especially among the developing countries. Nowadays wind power is widely used as non-pollutant energy and promising renewable energy resources in the world for electrical power generation. Fixed speed induction Generator (FSIG) is mostly used for getting electrical power from wind turbines.
The main objective is to minimize reactive power exchange between wind power plant and distribution network, dynamic compensation of reactive power can be employed which would help in preventing the voltage collapse at the terminals of wind farms and lead to improve the stability of the wind farm.

One of the major issues concerning fixed speed induction generator interconnected to the power grid is voltage instability problem. It occurs in a power system when the reactive power demand by FSIG during grid faults and heavy loading conditions is not met by the capacitor banks installed near to the FISG. When the FSIG is tripped from the grid, the situation will still become worse resulting in a very low voltage in the grid. Hence power system operators need the wind turbines not to get disconnected from the grid during grid faults. Voltage source static VAR compensator such as STATCOM can be used with directly connected asynchronous wind generators.

**LITERATURE SURVEY:**

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PROPOSED METHODOLOGY:

The proposed methodology uses the Static Synchronous Compensator (STATCOM) to improve stability of wind farm that is connected to a grid and load. The wind farm model based on FSIG, equipped with STATCOM, Connected to a power system network has been developed by MATLAB/SIMULINK. The impacts of STATCOM on power system during and after the occurrence of the fault are investigated.

EXPECTED RESULTS:

In this system p.u. active, p.u. reactive, p.u. voltage & speed will be analyzed & shows the performance simulations results. This will smoothen & provide regulating voltage as well as the desired parameter during the faulty conditions. The test system is studied at steady state condition and fault state conditions. At the fault state, the voltage, active power and reactive power are monitored at the main bus. The studied wind farm operates at the nominal wind speed of 11 m/s, so the wind turbines operate at nominal values. During fault period, it can be assumed that the wind speed does not change. All faults are created near grid at t=3.5 sec. and the fault is cleared at 3.7 sec. The effect of a 3 MVAR STATCOM on the behavior of the wind farm will study for all cases.

FUTURE WORK:

- Performance analysis of wind farm distribution system using SVC.
- Designing of a protection system for wind farm distribution network for different types of fault

CONCLUSION

The proposed method will show better wind farm stability performance of STATCOM compensation during fault occurrence. System p.u. active, p.u. reactive, p.u. voltage & speed will be analyzed & shows the performance simulations results & better operating conditions. This will smoothen the desired parameter during the faulty conditions. In fault case system with STATCOM gives more voltage, large active power, low value of reactive power supplied by grid to wind farms. Thus, the large amount of wind power can be penetrated in to the grid without affecting the machine stability by controlling reactive power flow in the grid using STATCOM of suitable rating.

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REFERENCES


