

STATCOM Based Power Quality Improvement Of Hybrid System

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Abstract : This paper substantiate the conventional energy depleting very fast and the power demand increasing every passing day, it has become absolute necessary to focus on renewable energy. Lots and lots of project are being undertaken which are capable to make use of power from the renewable energy resources like, wind, sun, water etc. The synthesis of these systems (hydro energy, wind energy, solar power etc.) discover different kinds of problems in the grid like system stability problems or power quality issues which needs to be resolved. The most prevailing passive filters were used but at the present time active filters such as Static Synchronous Compensator (STATCOM) and Dynamic Voltage Restorer (DVR) are select for the task. Static synchronous compensator is a device that regulates the voltage level or the reactive power in the system. It is predominantly used to maintain voltage stability, enlargement of critical clearing time. Dynamic Voltage Restorer (DVR) is a voltage restorer that can solve the voltage power quality issues. The purpose of this work to integrate the STATCOM and the DVR for voltage control and harmonics filtering. The simulation will be carried in MATLAB/SIMULINK and results will be presented to validate the claim.

Keywords - STATCOM, DVR (Dynamic Voltage Restorer), WTIG (Wind Turbine Induction Generator)

I. INTRODUCTION

Electrical energy is the most efficient and saleable form of energy and the modern society is heavily dependent on the electric supply. The human existence cannot be imagined without the supply of electricity. At the same time the quality of the electric power supplied is also very important for the efficient functioning of the end user equipment and use of renewable energy has increased through time and integration of renewable energy such as wind, photovoltaic, fuel cell, and tidal to the grid solved many and replenished the exceeding and ascending need for electrical energy. Synthesis of the renewable energy with the grid has lead to a more complex electrical network or "Grid". This enlargement and enrichment in equipment has caused problems such as stability, reliability and power quality and . The issue of power quality is of great importance to the to the wind turbine and there's a need to find solutions to these problems, using different technologies such as smart meters, monitoring system, controllers, remote ability. The synthesis of wind energy into a weak system is a challenge; voltage fluctuation, voltage dips, swells and swags are created due to the uncontrollable resource and the nature of the Distributed Wind Induction Generator (DWIG) on the already weak system. This causes reliability ,stability issues and power quality issues which need to be solved .

The issues are

- 1) Power Quality
- 2) Voltage Variation
- 3) Harmonics

Consequently the power quality issues damage equipment such as Microprocessors, Programmable Logic Controllers (PLC's), Variable Speed Drives (VSD's) and delicate control systems. It may cause the tripping of Contactors and protection devices. It can lead to stopping sensitive equipment such as PC's, and it may stop the process of plant an power quality . The integration of Non conventional energy into a weak system is a challenge; voltage fluctuation, voltage dips, swells and swags are created due to the uncontrollable resource and the nature of the Distributed Wind Induction Generators (DWIG) on the already weak system. This causes reliability, stability issues, and power quality issues which need to be solved.

II. THEORETICAL FRAMEWORK

RENEWABLE ENERGY

Classically passive filters were used but nowadays active filters such as Static Synchronous Compensator (STATCOM) and Dynamic Voltage Restorer (DVR) are chosen for the task. STATCOM is a device that regulates the voltage level and reactive power in the system. It is used to maintain voltage stability, enlargement of critical clearing time. DVR is a voltage restorer that can solve the voltage power quality issues. This objective in this work is to integrate the STATCOM and the DVR for voltage control and harmonics filtering. The simulation will be done in MATLAB/SIMULINK and the combined work of the STATCOM and the DVR in improving the power quality will be shown. The objective of this paper is to define a system at the grid which will help to have an idea of the system at grid level. In this work WTIG along with a non-linear load for harmonics generation is intended to be used. The DVR and STATCOM are used for Active filtering. They cancel the effect of voltage sags and voltage swells by injecting a voltage into the system, and remove the harmonics in the system by injecting a current into the system.

III. LITERATURE SURVEY

[1] M. El- Habrouk, M. Darwish, and P. Mehta, "Active power filters: a review," *IEE Proceedings-Electric Power Applications*, vol. 147, pp. 403-413, 2000.