A Study on Different Fault Vectors to analyze the Instability over PV Control System

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ABSTRACT

PV Control system stability is the major requirement of a system to provide the equalize generation and distribution of PV Control over the system. The paper has defined the functionality of the PV Control system stability along with different stability vector study. The paper has defined the fault classification for PV Control system along with fault impact analysis. The paper has defined different types of faults over the system along with fault classification and its impact analysis over the system. These faults include the balanced and unbalanced faults. The fault analysis is defined in different PV Control system components.

Keywords: Control System Stabilizer, Fault Analysis, Statcom.

1. INTRODUCTION

This A PV Control system is defined as an effective system that includes the effective exciter along with integrated AVR system that can provide high gain to the system. This integrated system is able to resolve the instability problem over the PV Control system. This kind of instability can be characterized by the low frequency oscillations under the defined period of time. The instability can results the insecurity over the system as well as restrict the PV Control distribution over the system. The most effective vectors that affects the instability are shown in figure 1.

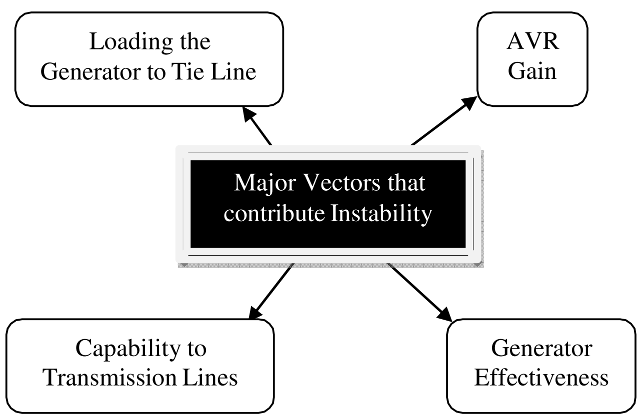

Figure 1: Factors to Control Instability

While identifying the efficient and the satisfactory solution, the oscillatory instability is been analyzed along with rotor oscillation adaption. This kind of analysis is done to achieve via PV Control system stabilizers (PSS) that are supplementary controller to the excitation system. The PV Control system stabilizer also provides the effective damping torque so that the synchronization to the system will be achieved. It also keep synchronizing the criticality of the oscillation frequencies. The requirement of the PSS is situational where the PV Control is transmitted over the long distances and provides the weak AC ties. Such kind of PV Control system stabilizers is not operated under the normal conditions but they also perform the satisfactory operation under unusual and abnormal condition specifications.

The PV Control system stabilizer functionality includes the inclusion of damping to the generator rotor so that the control over the PV Control system and its excitation system will be performed. This control also includes the control on auxiliary signal to attain the stabilizing. It also includes the component level of stabilization of electrical torque in phase along with rotor speed deviation control. The stabilizer also introduce the damping torque component along with the use of generator excitation control for speed deviation.

This control mechanism includes the basic structure definition, its modeling and the performance analysis of PV Control system under the excitation system control. This complete system is concerned with small signal performance analysis with limit specification on the stabilizer and the exciters. The work also includes the discussion on the basis of the PSS configuration and its consideration under the selection parameters. These parameters include the phase compensation with block phase specification and the characterization. This work includes the phase lag analysis under the input and the generator electrical torque specification. This analysis work includes the block wise specification under the phase compensation analysis. The second order block analysis with complex root specification.

This analysis under the frequency range specification along with phase analysis for the complete frequency range. The phase characteristic to the compensated change under the system conditions is defined. This compensation system is characterized under the compromised condition specification. It also includes the PSS based specification with significant increase to damping torque and the slight increase in the synchronizing torque will be obtained. The block signal analysis is also performed under the pass band fitleration and the time limit constraints. This association includes the oscillation count with pass change and terminal output specification. It also includes the speed control mechanism with view point specification and the wash out function. This consideration includes the signal stabilizing along with frequency interest analysis so that the generator voltage excusion will be obtained in system islanding conditions. The gain to the stabilizing is also obtained along with damping introduced to the PSS system. One of the effective component that improves the system stability and resolves the system impurities is Statcom. This component is described here under

A) Statcom

Statcom is introduced in 1999 as the SVC component that defines the voltage source convertor into the operation. The characteristic similarity analysis is here defined along with synchronous condenser so that the electronic device is defined with no inertia and the superior to the synchronous condenser in different ways. It also represent the system in an effective way so that the investment cost will be minimum as well as maintenance cost is also very low. A statcom is build with thyristors that has the capability like GTO and IGCT to turn off the system capabilities. The system is defined with static control lines to control the current and voltage specification and flow.

The main advantage of this system is the reactive PV Control provision under the voltage connection point analysis. This control includes the maximum current analysis with SVC based voltage comparison. It also includes the statcom capability analysis so that the effective voltage usage and distribution will be obtained. The statcom development is the combination of the energy storage on DC side that improves the PV Control quality and achieves the network operation stability.

In this paper, the PV Control system stability is been discussed along with different faults analysis in PV Control system. In this section, the basic working and components of PV Control system are been discussed. The section also includes the study of PSS along with statcom is defined. In section II, the work done by the earlier researchers to achieve the stability under different vectors. In section III, different faults associated with PV Control system are discussed. In section IV, the conclusion obtained from the work is discussed and presented.

2. EXISTING WORK

Marek Adamowicz et al.[6] has defined an application based work on the variable speed cascaded doubly fed induction generator. The work is defined for DG system. It also require the lower maintenance than single DFIG along with the absence of slip rings and brushes. A small DG system is defined with CDFIG system as well as back to back coverter. M.B Camara [7] has defined a behavior simulation along with micro PV Control system that includes the electric PV Control generation and its isolation to the equatorial region. The work includes the PV Control distribution to remote areas so that the good potential of the hydroelectric reactive to small community and activity will be explored. The river speed and flow variation in these areas is controlled under the original solution so that the variability will be compensated under the primary source in acceptable proportion so that the effective quality and good energy will be produced from the system.

Haisheng Sun [8] has defined a work on back-to back PWM converter that includes the effective use of excitation PV Control supply for the doubly fed induction generation in wind PV Control generation of the variable speed constant frequency change. Author has defined a mathematical model under the control strategy analysis and the converter to connect under the rotor and grid analysis. The DFID based output PV Control regulation is defined effectively so that the maximum energy wind energy capture is realized and effective generated over the system. Sundeep Sheri [9] has defined the modeling and controller for DFID system. Author defined the performance analysis under the disturbances so that effective system will be simulated. Author also defined a reduced order model to ease the calculation and to reduce the simulation time. Author defined the main assumption in the system under the stator transients and the saturation effect.

Hongmei Li [10] has defined a work to analyze the effect of electrical parameters on doubly fed induction generator on the transient voltage stability of a DFID. Author defined the work as a model to analyze the dynamic behavior of wind turbine system connected to a grid as well as performed a detailed examination over it. Author defined three phase fault under to analyze the instability over the system. B.Chitti Babu [11] defined complete modeling and simulation system for wind turbine under the doubly fed induction generator that feeds the AC PV Control to the utility grid. Author defined voltage source converters so that the connected back to back rotor terminal and utility grid to the DC link will be analyzed. Author defined a grid side converter under the PV Control flow analysis between the DC bus and AC side. Author also defined the sub-synchronous and super synchronous mode of operation. Duan Qichang [12] defined an open circuit fault diagnosis scheme so that the detection of the fault under the PV Control switches and back to back converter to the DFID wind PV Control generation system. A redundant topology based back to back converter is defined under the reconfiguration of the converter circuit under the faulty device.

A.A. Sattar [13] describes the design of a Doubly Fed Induction Generator (DFIG) connected to the grid through back to- back converters in the rotor circuit. A vector control oriented with the stator voltage is applied for the grid side converter that is responsible for maintaining the DC link voltage constant regardless of the PV Control flow between the rotor and the grid. A field orientation control with the d-axis aligned with the stator flux is applied for the rotor side converter. Tan Luong Van [14] has proposed a function model of back-to-back PWM converters, based on the switching function, is developed for simplified simulation of PV Control electronic application systems. For the function model, the PWM PV Control switches are represented by dependent PV Control sources. By using the proposed function model, the computer memory and the run time required for the simulation of PV Control circuits can be significantly reduced. Seifeddine Belfedhal [15] has illustrated the control of a variable speed wind generator system based on a doubly fed induction generator connected to the network associated to a flywheel energy storage system is considered. Firstly, the doubly fed induction generator is modeled and simulated. A.Babaie Lajimi[16] has demonstrated a complete mathematical DFIG model is proposed. The rotor is considered fed by a voltage source converter whereas the stator is connected to the grid directly. Output PV Control and electromagnetic torque are controlled using field-oriented control (FOC). Simulation results show the efficiency of the controller in exploiting the maximum PV Control of wind.

3. FAULTS IN PV CONTROL SYSTEM

One of the important aspects of PV Control system stability is the fault analysis. Fault is the major affecting component so that the bus voltage and line current analysis under different type of faults. The faults in such system are divided into three-phase balanced faults and unbalanced faults. The unbalanced fault includes the line to ground fault, line-to-line fault and line to ground fault. The information gained to the system and fault studies includes the phase relay analysis and line-ground fault information analysis. The fault studies are used to obtain rating of the protective switchgear.

The fault analysis and fault effect depends on multiple parameters such as impedance of generator and the intervening circuit. The reactance of the generator under short circuit condition is not constant. The fault analysis includes the generator behavior is divided into three periods such as sub-transient period, transient period and the steady state period.

Faults in PV Control system occur because of plant failure. The PV Control system failure includes the switching surge or the light stroke analysis includes the conductor and insulator problems. The probability of different kind of faults over the PV Control system is shown here under

Table 1 : Probability of Type of Faults

Type of Fault	Probability Ratio
Single Phase to Ground Faults	10%
Phase to Phase Fault	15%
Two Phase to Ground Fault	10%
Three Phase Faults	5%

These faults occur because of heavy current called short circuit over the current flow over the PV Control system. The fault determination over the system includes the selection of the circuit breaker and the proactive relays so that the associated apprature or the connection problem. Single phase to ground faults are most common with three phase fault.

These faults include the calculation under the symmetrical conditions. Different kind of faults in PV Control system are explored here under

A) Balanced Three Phase Fault

This type of fault is defined under short circuit under three phases. These faults occur infrequently but it is most sever fault type. This fault occur in a balanced network because of its phase wise distribution. If the phase is single phase, the other phase can share the problem and balance the network. The reactance of the generator under circuit condition affects the quality and the reactance over the system is required for effective stability requirement over the system. This kind of fault occurs as the sub-transient reactance of the system under few cycles of short circuit current and transient reactance upto 30 cycles. This kind of fault analysis depends on the time of operation of the protective system. This kind of system also includes the interrupting capacity of the circuit breakers.

B) Unbalanced Fault

Different types of unbalanced faults are the single-line-ground fault, line-to-line fault, and double line-to-ground fault. The online diagram simplifies the solution of the balanced three phase problems; the method of symmetrical components that resolve the solution of unbalanced circuit into a solution of a number of balanced circuits used.

C) Faults in Generator

The disturbance over the PV Control system occurred because of high current or the voltage. This disturbance causes the fault in the generator and stresses because of the design limit and the temperature unbalancing, amplification and the distortion in torque gaps and the unbalanced flux densities. The generator are subjected to the high current and it significantly contribute to the reduction of machine operating life. The plants are connected to high voltage transmission lines so that effective disturbance control in such system is achieved.

CONCLUSION

In this paper, The PV Control system stability is been discussed along with instability vector analysis. The paper has discussed different reasons of fault occurrence over the system. The paper has defined different kind of faults and its impact over the PV Control system.

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