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IMPLEMENTATION OF CONTROL APPROACH MEANT FOR SYNCHRONOUS COMPENSATORS

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ABSTRACT:

As an exciting substitute to renewable energy sources as well as constant power loads, static synchronous compensators are regarded as fast voltage–ampere source. The technology of Static synchronous compensators were been studied in literature extensively in earlier works. Most of the studies make a spotlight on Static synchronous compensators operation as well as performance under unusual network conditions. Our work will introduce a reactive power control system for static synchronous compensators that is capable to support ac network voltage in uneven voltage sags. The control scheme that is proposed for synchronous compensators functioning in unusual network conditions will introduce a new reactive current reference generator. It contains the important aspect such as the ability to provide the necessary reactive current still when there is a drop of voltage in amplitude during voltage sag. Hence the safe system process is effortlessly assured by means of fixing limit that is required current to highest rated current.

Keywords: Renewable energy sources, Static synchronous compensators, Reactive current reference generator, Network voltage, Power loads.

1. INTRODUCTION:

Examination of novel power circuit topologies that get better performance of traditional configurations was reported. Static synchronous compensators were generally utilized for provision of network

services, which comprise regulation of voltage, balancing of networks, and improving of stability [1]. Various studies of these compensators were conducted to get better ac network process throughout unstable voltage sags. Static synchronous compensators are moreover regarded as speedy voltage ampere sources and actually these are grid-associated voltage source converters that are dedicated towards reactive power injection. Active power is consumed within the static synchronous compensators during the process of system start up. In the stable state, absorption of active power is extremely minute, and it is only employed to balance for power losses as a result, the voltage–ampere rating of static synchronous compensators is usually committed to exchange of reactive power. Exchange of reactive power with ac network is one of ancillary services that are provided by distributed sources of renewable energy. This service is employed to a great extent will enhance margin to voltage collapse and, as a result, to get better the constancy of electrical network. Reactive power is additionally utilized for regulation of voltage, balancing of network, as well as supporting of voltage throughout temporary abnormal conditions. Our work will present a control scheme that is proposed for synchronous compensators functioning in unusual network conditions [2][3]. Our work suggests a reactive power control system for static synchronous compensators that is capable to support ac network voltage in uneven voltage sags. Our proposed control scheme will introduce a new reactive current reference generator which contains the important aspect such as the ability to provide the necessary reactive current still when there is a drop of voltage in amplitude during voltage sag. The current generator will limit the maximum amplitude towards predefined value devoid of distorting current waveforms. The safe system procedure is effortlessly assured by means of fixing limit that is required current to highest rated current.

2. METHODOLOGY:

Distributed sources of renewable energy by means of low rated power conventionally make use of reactive power control to manage power factor of installation directly. During the increase of generation capacity, voltage control is selected choice as capacity of high power sources to control terminal voltage will enhance in this case. Capability of reactive power compensation by means of

renewable energy sources is restricted and these sources that are interfaced by power inverters are mostly considered to export the entire available active power; as a result, power rating of the inverters is effortlessly achieved. Exchange of reactive power with ac network is one of secondary services that are provided by distributed sources of renewable energy. Reactive power is in addition utilized for regulation of voltage, balancing of network, as well as supporting of voltage throughout temporary abnormal conditions. Besides energy sources, stable power loads will supply reactive power towards electrical network. Static synchronous compensators speedy voltage ampere sources and actually these are grid-associated voltage source converters that are dedicated towards reactive power injection. Voltage sags normally have a tendency to get worse the performance of power converters as well as electrical machines that are associated towards ac network. The intention of our work is to suggest a reactive power control system for static synchronous compensators that is capable to support ac network voltage in uneven voltage sags. Our work will introduce a new reactive current reference generator which contains the important aspect such as the ability to provide the necessary reactive current still when there is a drop of voltage in amplitude during voltage sag [4]. Since active power is only utilized to recompense for power losses, active current is insignificant compared with reactive current. The control algorithm of current generator is easy, specified that online calculation of maximum reactive power that is conveyed to ac network is not necessary. New reactive current reference generator will employ a current set point in place of usual reactive power set point. Hence the safe system process is effortlessly assured by means of fixing limit that is required current to highest rated current.

3. AN OVERVIEW OF PROPOSED SYSTEM:

By means of minute transmission as well as distribution distances, losses of power are undoubtedly reduced. The decreases of network congestion, enhancement of local power quality, as well as provision of ancillary services are noteworthy improvements of distributed situations of power generation. Our work will put forward a control scheme that is proposed for synchronous compensators functioning

in unusual network conditions. Static synchronous compensators were used for provision of network services, which comprise regulation of voltage, balancing of networks, and improving of stability. Various studies of compensators were conducted to get better ac network process throughout unstable voltage sags. A new reactive current reference generator was proposed which contains the important aspect such as the ability to provide the necessary reactive current still when there is a drop of voltage in amplitude during voltage sag. Thus the safe system process is effortlessly assured by means of fixing limit that is required current to highest rated current. The expressions of reference signals that repair highest amplitude of phase currents towards a predefined value are deduced [5]. This intention has to be reached when phase currents are unstable. The method of reactive power injection of proposed current reference generator is made known through analysis of positive as well as negative sequence reactive power. The control algorithm of current generator is easy, particular that online calculation of maximum reactive power that is conveyed to ac network is not necessary. New reactive current reference generator will employ a current set point in place of usual reactive power set point. The injected current might be simply restricted to constant highest amplitude by means of using a criterion reactive power control in cascade by means of a current limiting block. On the other hand, in this situation, injected current is clipped throughout an over current situation, ensuing in undesirable entire harmonic distortion. The projected current generator will limit the maximum amplitude towards predefined value devoid of distorting current waveforms [6]. As active power is only utilized to recompense for power losses, active current is insignificant compared with reactive current as a result, only the reference of reactive current is considered.

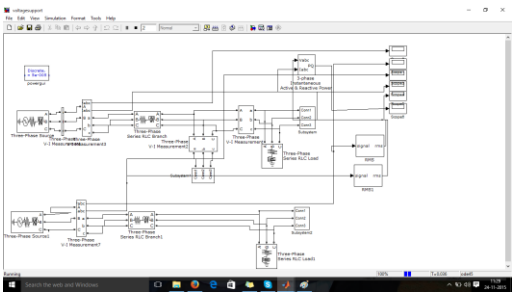

Fig 1: Circuit with and without statcom

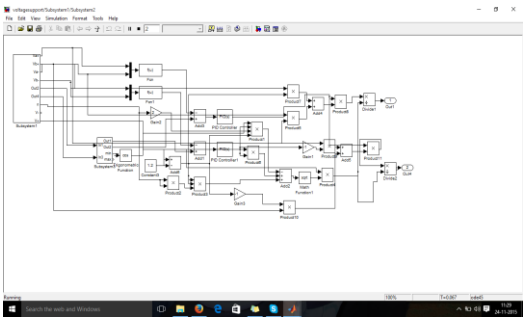

Fig 2: Controller of STATCOM

Fig 3: active and reactive powers of load

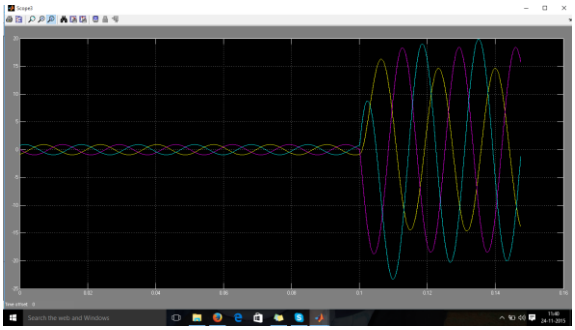

Fig 4: statcom injuctios

Fig 5: rms voltages under sag

Fig 6: unabalanced sag of system

Fig 7: voltage after removing the unbalanced voltage sag

4. CONCLUSION:

More penetration of the renewable energy sources that are positioned close to point of

power utilization is noticed in modern times. The objective of our work is to put forward a reactive power control system for static synchronous compensators that is capable to support ac network voltage in uneven voltage sags. The control scheme proposed for synchronous compensators functioning in unusual network conditions will set up a new reactive current reference generator which contains the important aspect such as the ability to provide the necessary reactive current still when there is a drop of voltage in amplitude during voltage sag. Novel reactive current reference generator will employ a current set point in place of usual reactive power set point hence the safe system process is effortlessly assured by means of fixing limit that is required current to highest rated current. The control algorithm of current generator is easy, specified that online calculation of maximum reactive power that is conveyed to ac network is not necessary. The proposed current generator will limit maximum amplitude towards predefined value devoid of distorting current waveforms.

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