Protection of Power Network Using Limiting Reactors

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Abstract- *Contingency evaluation of any grid includes locating out the conduct of the capacity system as soon as applying to disturbance or any abnormalcy. This assignment includes the look at of ways to discover strength Swing on a line and verification of ways to locate electricity Swing supported rate of amendment in electric resistance. right here, package deal is needed for such evaluation due to in sensible instances networks area unit terribly hard and for an equivalent system, modeling the complete detail in step with real device helps less complicated technique to test an equivalent network while now not implementing it to practical situation. consequently to hold up device stability such contingency evaluation plays very essential function. a 3 space grid version is meant in SIMULINK package and simulated statistics is hired for evaluation at some stage in this paper. electric resistance visible by means of Distance Relay enters region this is about generally ninetieth of line electrical resistance internal one-cycle and it will likely be really strong at electric resistance good enough fault electrical resistance seen via relay. while simply in case of power Swing electrical resistance changes slowly and takes old to go into quarter settings. So, exploitation this technique, we're capable of locate Fault inner one -cycle. If electric resistance is ever-converting slowly, we're able to block relay from operation.*

Keywords- Contingency, Relay, Power Swing, Faults, Distance Relay.

I. INTRODUCTION

steady state electricity systems usually function close to their rated frequency. A balance among active and reactive electricity generated and ate up exists underneath stationary running situations, and the transmit and get hold of voltage variations are normally much less than five%. system frequency on a huge power device usually varies within +/- zero.02Hz on a 50Hz strength system. electricity system disasters, line switching, generator disconnection and failure. Loss or the utility of big blocks of load purpose sudden modifications in electric electricity, even as the mechanical electricity input to the generators remains surprisingly steady. those system disturbances purpose oscillations within the corners of the gadget rotor and might purpose large oscillations in the power drift.relying at the severity of the disturbance and the moves of the electric machine controls, the gadget may stay strong and return to a brand new nation of equilibrium by means of experiencing what's referred to as a strong energy swing. excessive gadget disturbances, alternatively, should reason huge separation of generator rotor angles, massive fluctuations in strength float, large fluctuations in voltages and currents, and loss of synchronism between generator corporations or between neighboring utility structures. large, stable, or risky strength fluctuations can purpose undesirable relay operations on networks at exclusive places, that can further exacerbate energy device disturbances and in the end result in cascading blackouts and blackouts. on this venture we can use the FCL unit with PSB and OST in order that we will restrict the fault present day.

II. CONCLUSION OF PREVIOUS WORK

Bellow simulation results Shows that the methods i.e. Change of positive sequence impedance is helpful for detection of power swing. But it have to protectequipment's which can response faster in order to response quickly to sense it. This analysis is helps to enable the power system blocking (PSB) setting of relays. Power swings both stable and unstable can precipitate wide spread outages to power systems with the result that cascade tripping of the power system elements occur. Protection of power systems against the effects of power swings both stable and unstable has been explained in this paper. The paper has given an overview of power swings, their causes and detection. Methods of detecting and protecting the power system against power swings have been discussed and elaborated. Detailed system studies both steady state and transient are required to determine the application of power swing protection. Extensive stability studies under different operating conditions must be performed to determine the rate of change of power swings. Protective relays use a number of methods to detect the presence of a power swing, the most common being the change of the positive sequence impedance. Other power System quantities have also been used for power-swing detection such as power and its rate of change, the phase angle difference across a transmission line or path and its rate of change.

III. OBJECTIVE OF THE WORK

1. The main objective of this system is to protect the transmission line from three phase fault.
2. It also helps to design OST circuit for prevent the circuit after fault.
3. Use of FCL unit to limit the fault current to lower value
4. Compare overall circuit with FCL and Without FCL.

IV. POWER SWING DETECTION METHOD

A. Continuous Impedance Calculation Method

This approach determines a power swing condition supported a continual electric powered resistance calculation as shown in fig three.1. continuous right here manner, as an example, that for every five ms step partner diploma impedance calculation is accomplished and compared with the impedance calculation of the previous 5 ms. As before lengthy as there is a deviation, an out-of-step situation is believed but now not tested but. subsequent impedance that during ternational journal of studies in technology, Engineering and generation (ijsrset.com) 108 have to be calculated 5 ms later is foretold based totally on the impedance difference of the preceding measured impedances.

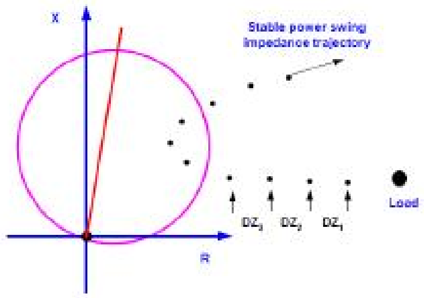

Figure 1. Power swing detection with continuous impedance calculation

B. Rate of Change of Impedance PSB and OST Methods

conventional power Swing blocking off schemes are relies upon on measuring the positive-sequence impedance at a relay. under normal operating conditions, the measured impedance is the load impedance, and its locus is away from the distance relay protection traits. while a fault take vicinity, the measured impedance movements rightaway from the burden impedance place to the region that display the fault at the impedance plane. below a device fault, the price of impedance change seen by means of the relay is defined with the aid of the quantity of sign filtering in the Relay. underneath a system swing, the measured impedance actions slowly on the impedance plane, and the fee of impedance exchange is described with the aid of the slip frequency of an equivalent -supply device. traditional power Swing blockading schemes use the difference between impedance rate of change for the duration of a fault and for the duration of a power swing to distinguish between a fault and a swing. to differentiate, one typically locations concentric impedance characteristics, separated by using impedance ΔZ, at the impedance plane and makes use of a time to time the period of the impedance locus because it travels among them. If the measured impedance pass the concentric traits before the timer expires, the relay pronounces the event a machine fault. in any other case, if the timer expires earlier than the impedance crosses each impedance traits; the relay classifies the event as a power swing.

V. NEED OF FCL UNIT

Power systems are very complex in nature due to the integration of several power electronic devices. Protection of this power systems and reliability as well as stability are depend on limiting the fault currents. Some fault current limiters (FCLs) have been applied in power systems as they provide rapid and efficient fault current limitation

VI. SIMULATION RESULT

The above is modeling of considered test system with two networks on sending end side and receiving end side with same rating sources.your paper.

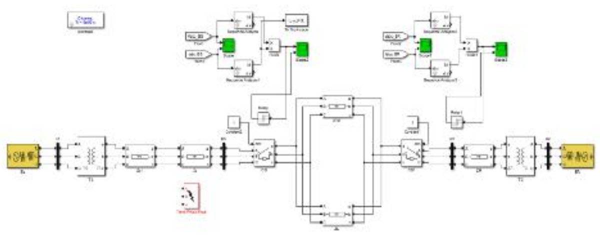

Figure2. Test system modeling with two networks

The simulation is run for 1sec with not fault or OST connected to the networks and the results are shown below.

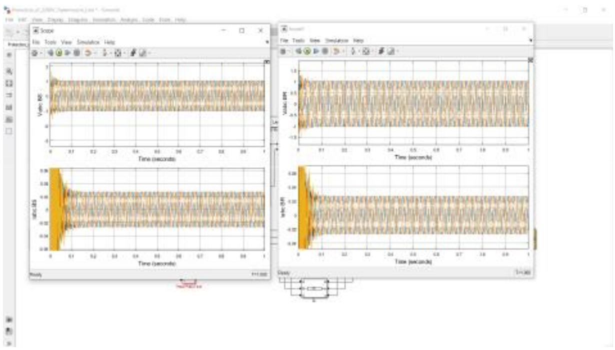

Figure 3. Three phase voltages and currents of two networks on sending end and receiving end

The above are the three phase voltages and currents of the two networks during no fault and no OST conditions. The below are the impedances of the two networks during no fault condition.

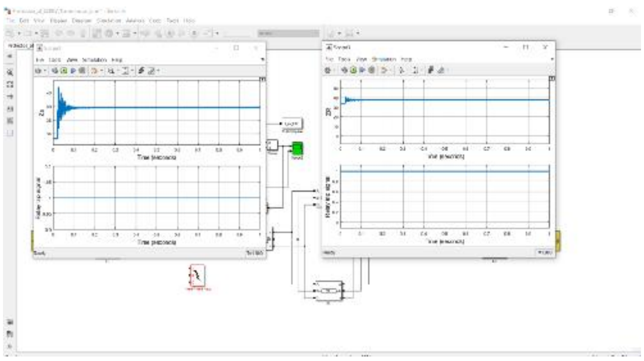

Figure 4. Impedance measurement of the two networks

The same network is connected with three phase to ground fault on the sending end side. The system is not connected with OST and the simulation results are shown below. The below are the three phase voltages and currents of the two networks during three phase to ground fault from 0.5-0.6sec with no OST module.

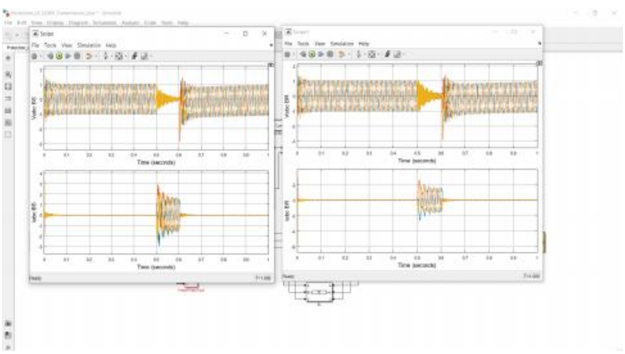

Figure 5. Three phase voltages and current during three phase to ground fault without OST

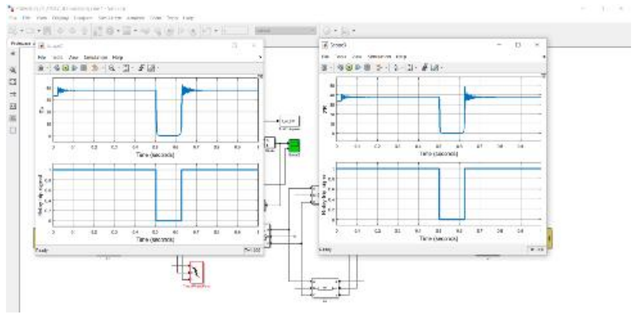

Figure 6. Impedance and relay tripping signal of two networks without OST

The same simulation model is updated with OST where the circuit breakers are operated with impedance relay on the sending end side and receiving end side. The three phase voltages and currents during three phase to ground fault are shown for the same with OST on both sides of the network.

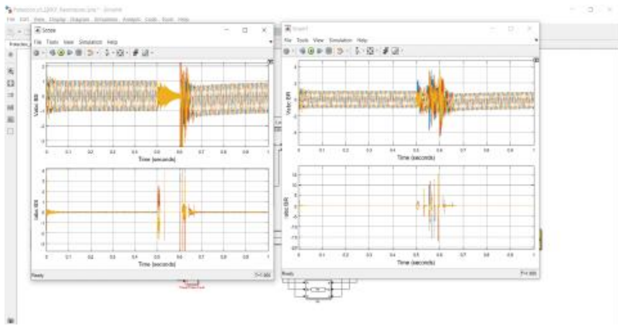

Figure 7. Three phase voltages and current during three phase to ground fault with OST

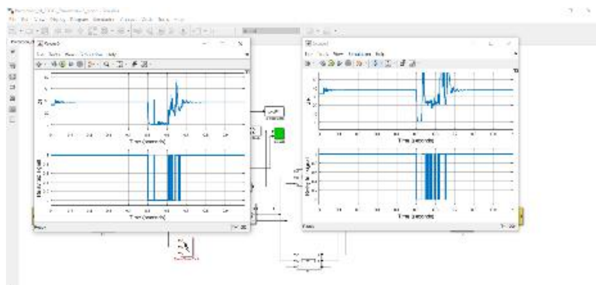

Figure 8. Impedance and relay tripping signal of two networks with OST

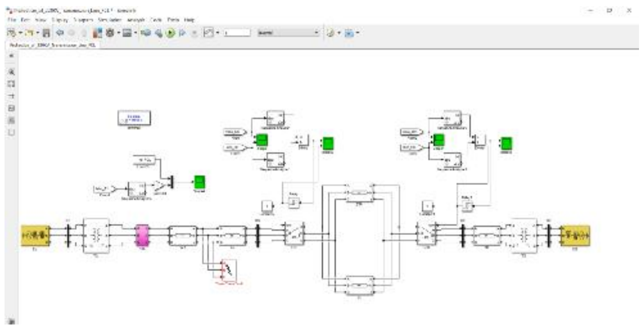

Figure 9. Test system with FCL connected on the fault side network

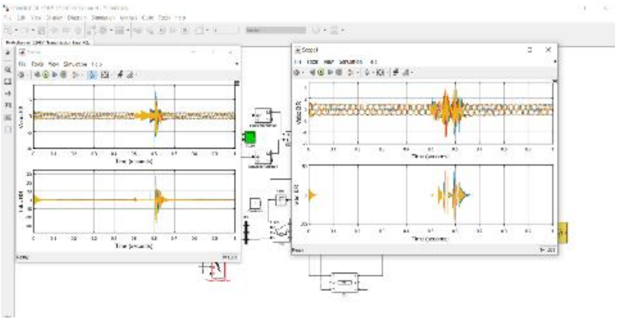

Figure 10. Three phase voltages and current during three phase to ground fault with OST and FCL

The above are the three phase voltages and currents when the test system is run with FCL unit on the sending end side. And below are the impedances of the two networks with FCL unit during three phase to ground fault condition.

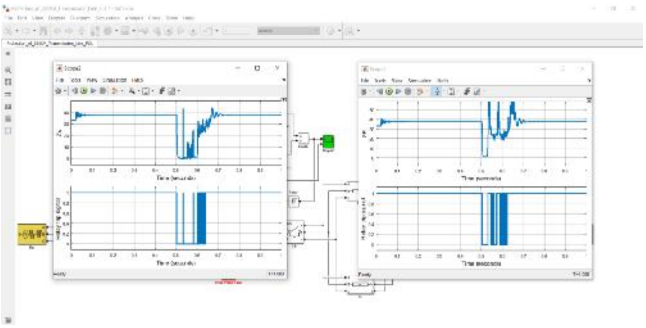

Figure 11. Impedance and relay tripping signal of two networks with OST and FCL

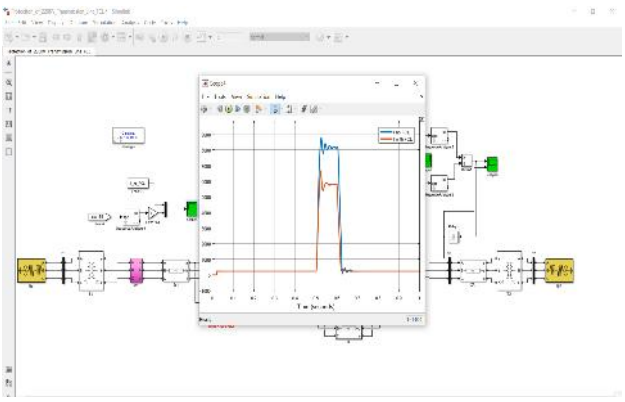

Figure 12. Comparison of fault current during fault with and without FCL on the sending end network

The above is the fault current comparison on sending side network with and without FCL unit connected in series to the network. As compared the current with FCL unit is less as compared to no FCL unit.

VII. CONCLUSION

Protection of transmission line done using OST and FCL unit overall system done with total four part

1. Simulate and observed the system with PSB and no fault condition.
2. Simulate and observed the system with PSB and fault condition.
3. Simulate and observed the system with PSB, OST and fault condition.
4. Simulate and observed the system with PSB, OST, FCL and fault condition

- It is observed that using OST phenomenon the protection of transmission line on occurrence of fault can be done also
- Also comparative of with and without FCL done using FCL fault current limit to lower value observed.

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