

Title: Modeling and simulation of 1 generator and 9 bus using the Open IPSL

Name of the Contributor: Aritra Banerjee

Institution/Organization: Meghnad Saha Institute of Technology, Kolkata

Email: aritrabanerjee343@gmail.com

Abstract: The 1 generator 9 bus test system used to study the voltage stability at different buses. The simulation represents Open Circuit Fault Analysis of 9 bus system. The Open circuit fault simulated on standard 9 bus system. The power system model consists of 1 generator, 9 buses, 8 loads, 12 lines. The system is on a 100 MVA base. The model submitted is implemented in Modelica language using OpenIPSL package shown in Figure 1. a fault simulated at Bus 2 for the duration of 0.4 seconds (8 seconds to 8.4 seconds), the simulated voltage profiles of 9 bus system at various buses shown in Figure 2. For all analysis of this system, the lower voltage magnitude limits at all buses are 0.95 p.u, and upper limits are 1.05 p.u. Simulation obtained shows voltage profiles at various buses.

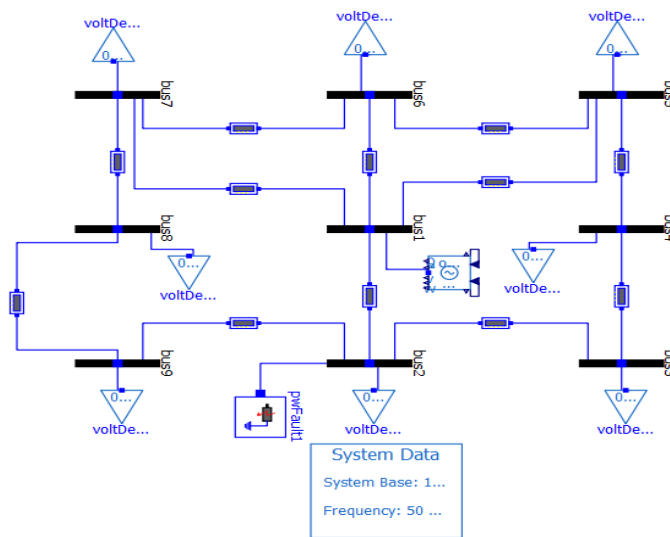


Figure 1: Implementation of 1 Generator 9 Bus System using Modelica and OpenIPSL

Explanation:

This model uses the following components:

Component Name	Class Path	Number
Generator (order 2)	OpenIPSL.Electrical.Machines.PSAT.Order2	1
Bus	OpenIPSL.Electrical.Buses.Bus	9
Transmission Line	OpenIPSL.Electrical.Branches.PwLine	12
Load	OpenIPSL.Electrical.Loads.PSAT.VoltDependant	8
System block	OpenIPSL.Electrical.SystemBase	1
Three phase fault	OpenIPSL.Electrical.Events.PwFault	1

Here the model represents 9 bus interconnected distribution system with a single generator. For all analysis of this system, the lower voltage magnitude limits at all buses are 0.95 p.u. and upper limits are 1.05 p.u. The type of generator used is a synchronous motor of order2. A fault is simulated, for the duration of 8 to 8.4 seconds at the 9th bus. During the fault, we can observe from the bus voltage profiles, that the voltage dip is more for the 2nd bus as it is the fault bus and the severity of the fault decreased as we move away from the fault bus. Simulation obtained shows profiles at various buses and waveforms obtained are observed. we can observe from the graph that is Transmission line or power line switching, it occurs between bus 1 and bus 2 where the opening time is 5 sec to 5.8 sec and it happens 3 times. in bus 2 Voltage drop is maximum and much affected but in other hand, voltage drop of bus 1 is minimum and bus 1 is less affected, and from figure 2 we can observe that in bus 2 fault has occurred which is not exactly 0 but it is nearly tends to 0.

The simulation result of all 11 Bus voltages shown below:

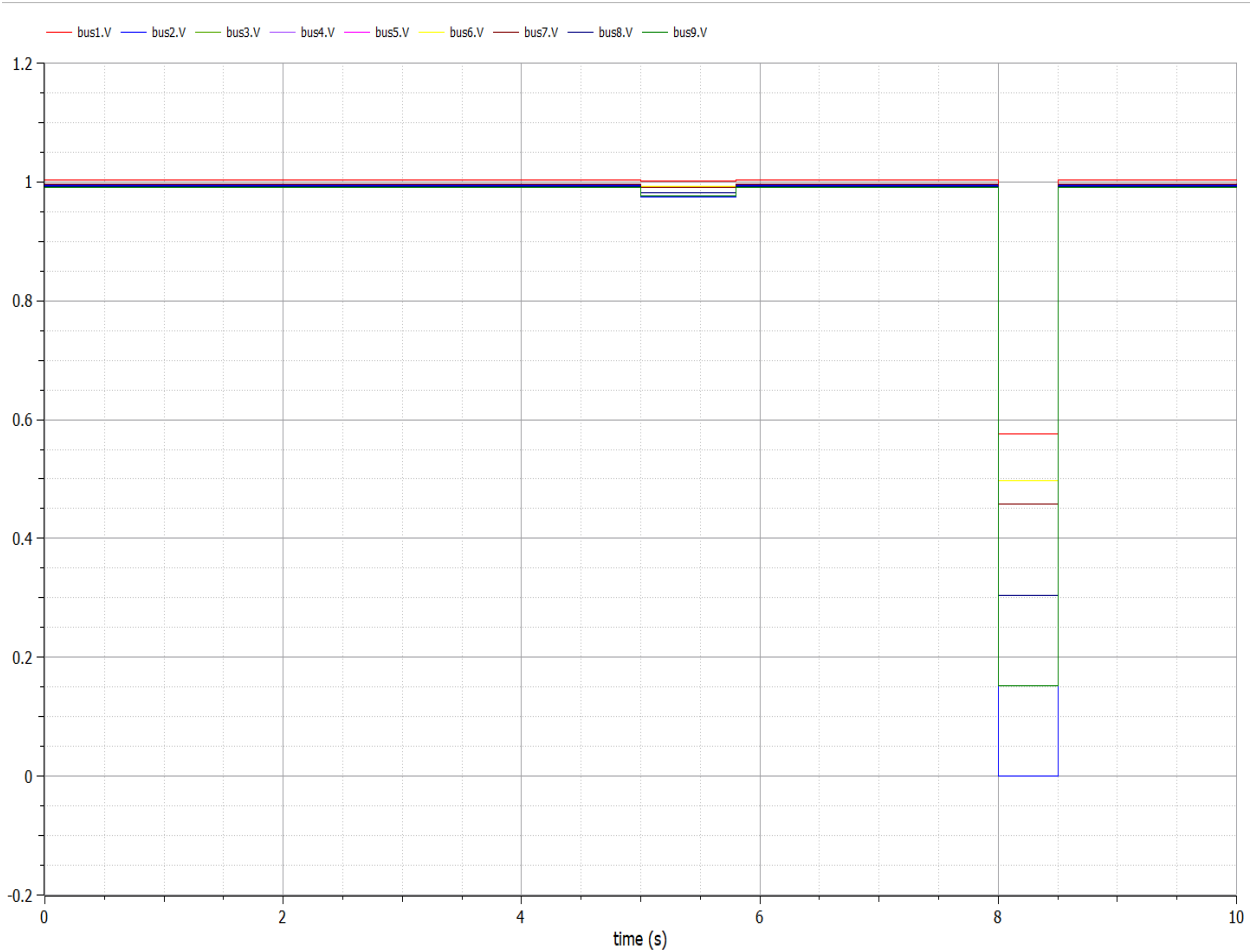


Figure 2: The voltage profiles of simulated 9 bus

BUS NUMBER	BUS VOLTAGE MAGNITUDE (p.u)
1	1.000000
2	0.990832
3	0.988817
4	0.989400
5	0.992598
6	0.993416
7	0.992598
8	0.989400
9	0.988817

Conclusion: The implemented 9 bus model in Modelica represents the system behaviour before and after the fault occurs at the 2nd bus. Bus voltage magnitude (p.u.) of all 9 buses obtained are found to be between 0.95 p.u and 1.05 p.u. The relation between line impedance and fault severity observed. In this 9 bus system any fault occurs system will be open circuited.