

Title: Modeling of RBTS system along with Generation Expansion Planning

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Abstract:

RBTS system is a six-bus composite test system, in which generation expansion planning is developed. The main objective of this model is to expand the generating unit to meet the forecasted future demand. The model is implemented in Modelica language, presents the expansion of existing generating units to meet the forecasted load demand (120%), additional 20% load is to be met by the new feasible generating units. Balancing the generation and demand is simulated with the addition of new generating unit.

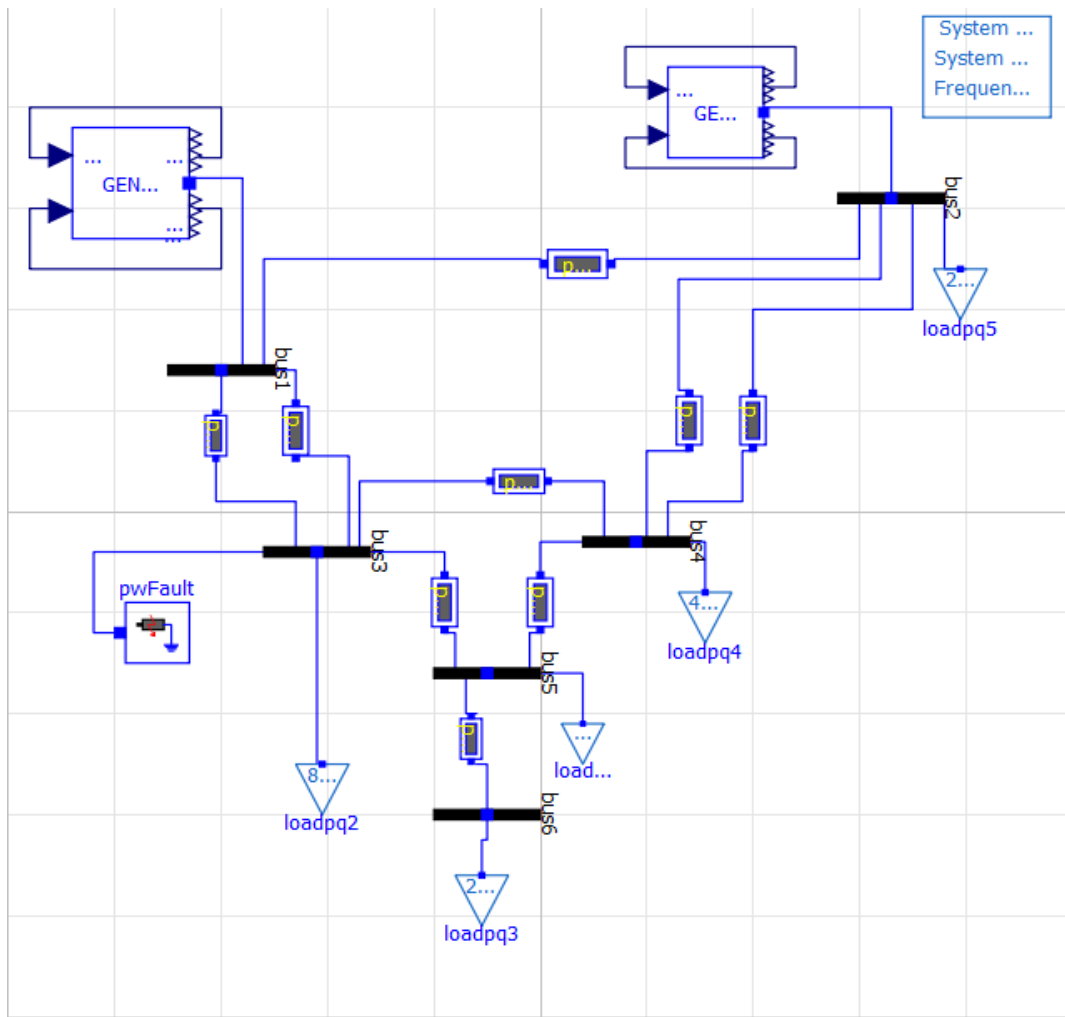


Figure 1. Implementation of RBTS System

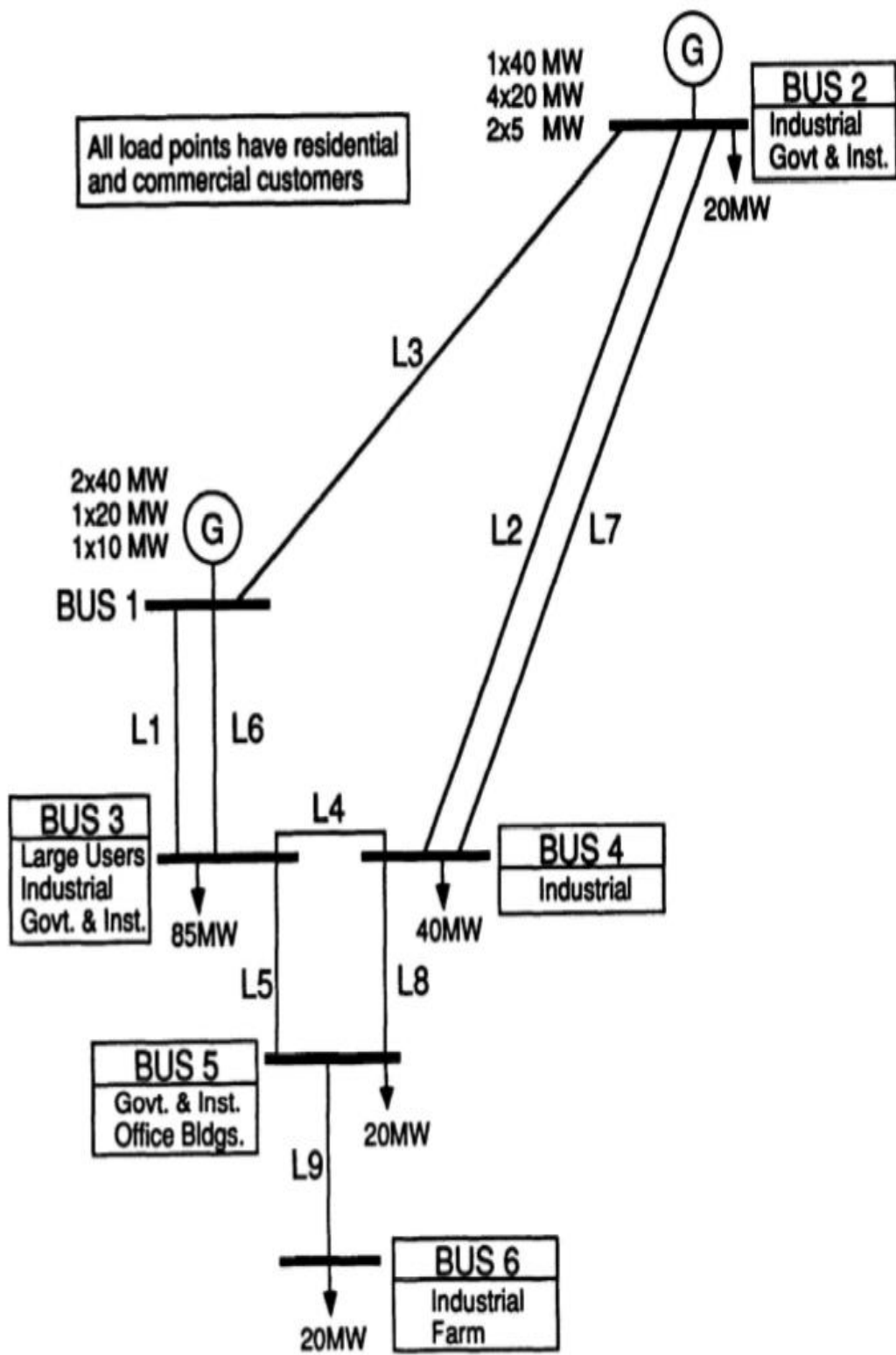


Figure 2. Single-line diagram of RBTS Network

Description of the simulation:

Table 1: Model components:

Componet Name	Path	Number
Buses	OpenIPSL.Electrical.Buses.Bus	6
Power Line	OpenIPSL.Electrical.Branches.PwLine	9
Generator	OpenIPSL.Electrical.Machines.PSE.GENROU	2
Constant PQ Load	OpenIPSL.Electrical.Loads.PSAT.LOADPQ	5
Three Phase Fault	OpenIPSL.Electrical.Events.PwFault	1
System Data Block	OpenIPSL.Electrical.SystemBase	1

The RBTS network model is implemented in OpenModelica language using OpenIPSL package is to study the voltage stability at different buses. The model is taken from “Assessment of Electric Power Systems Using Monte Carlo Methods by Billinton, W. Li” Page No 310. The system is on a 100 MVA base, the system voltage level is 230KV, and Load Demand is 185MW. A fault simulated for the duration of 2 to 2.4 seconds at the bus 3. During the fault the voltage profiles at different buses are observed.

The simulation result of the Bus voltages of RBTS network shown below:

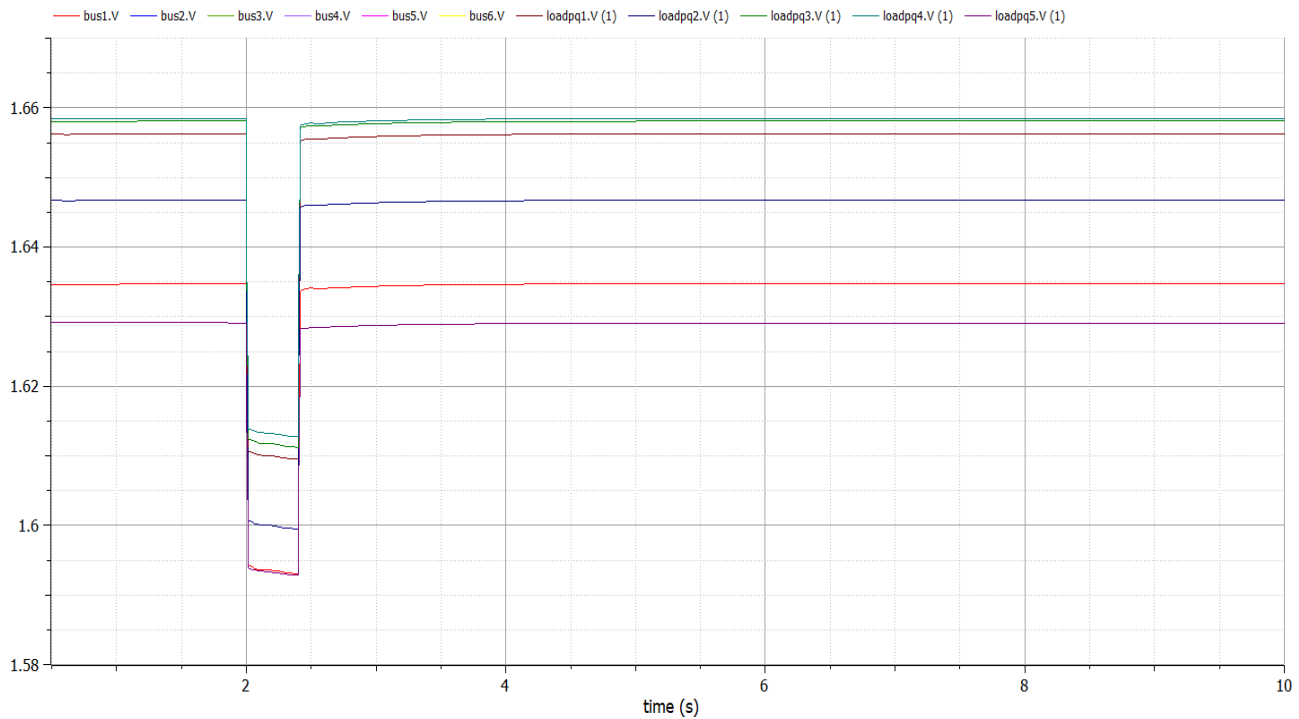


Figure 3. Voltage profiles of buses of radial RBTS network

Table 2: Bus voltage magnitude (p.u.) of all buses obtained are tabulated below.

Bus No	Bus Voltage Magnitude (p.u)
1	1.05
2	1.05
3	1.027439
4	1.028740
5	1.026217
6	1.025328

Conclusion:

The implemented RBTS network in OpenModelica represents the system behaviour before and after the fault occurs at bus 3. Bus voltage magnitude (p.u.) of all buses are obtained. Due to the fault that occurred at Bus 3, we can observe voltage disturbances occurs from 2 to 2.4 sec on every Bus. The voltage profiles after the some disturbance occur then voltage becomes constant clearing remain constant.