KATHMANDU UNIVERSITY

Dhulikhel, Kavre

Submitted By:

Satish Adhikari (41029)

Level: IV year / I semester

Group: EE(Power and Control)

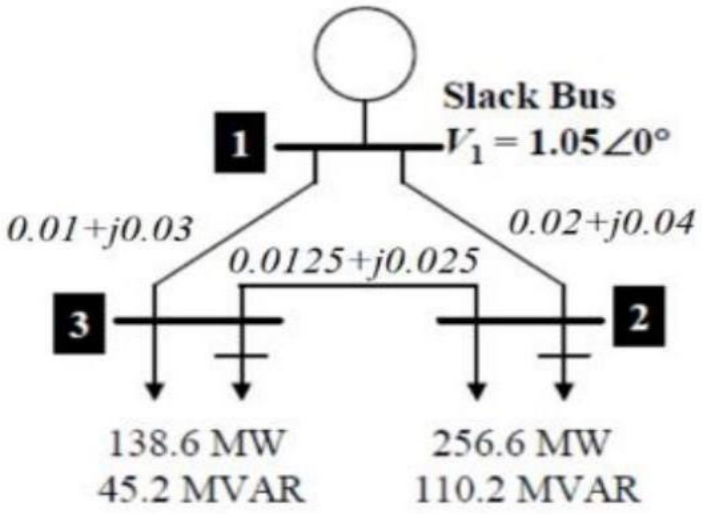
Submitted To:

Dr. Bishal Silwal

Assistant Professor

Department of Electrical and Electronics Engineering

3 Bus Systems



Modeling in Simulink

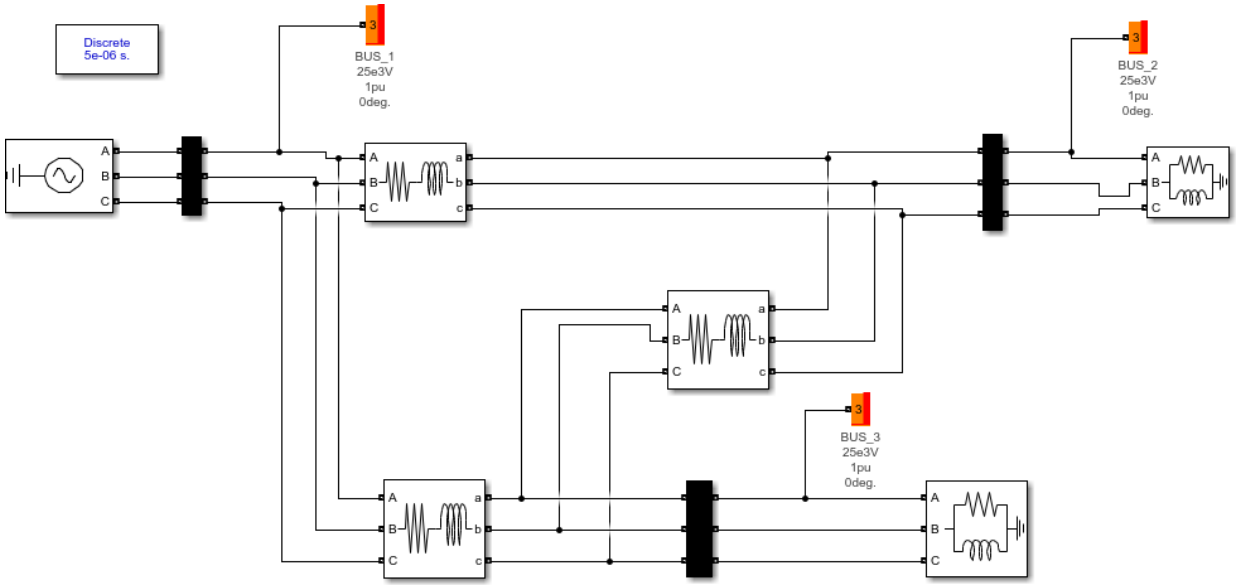
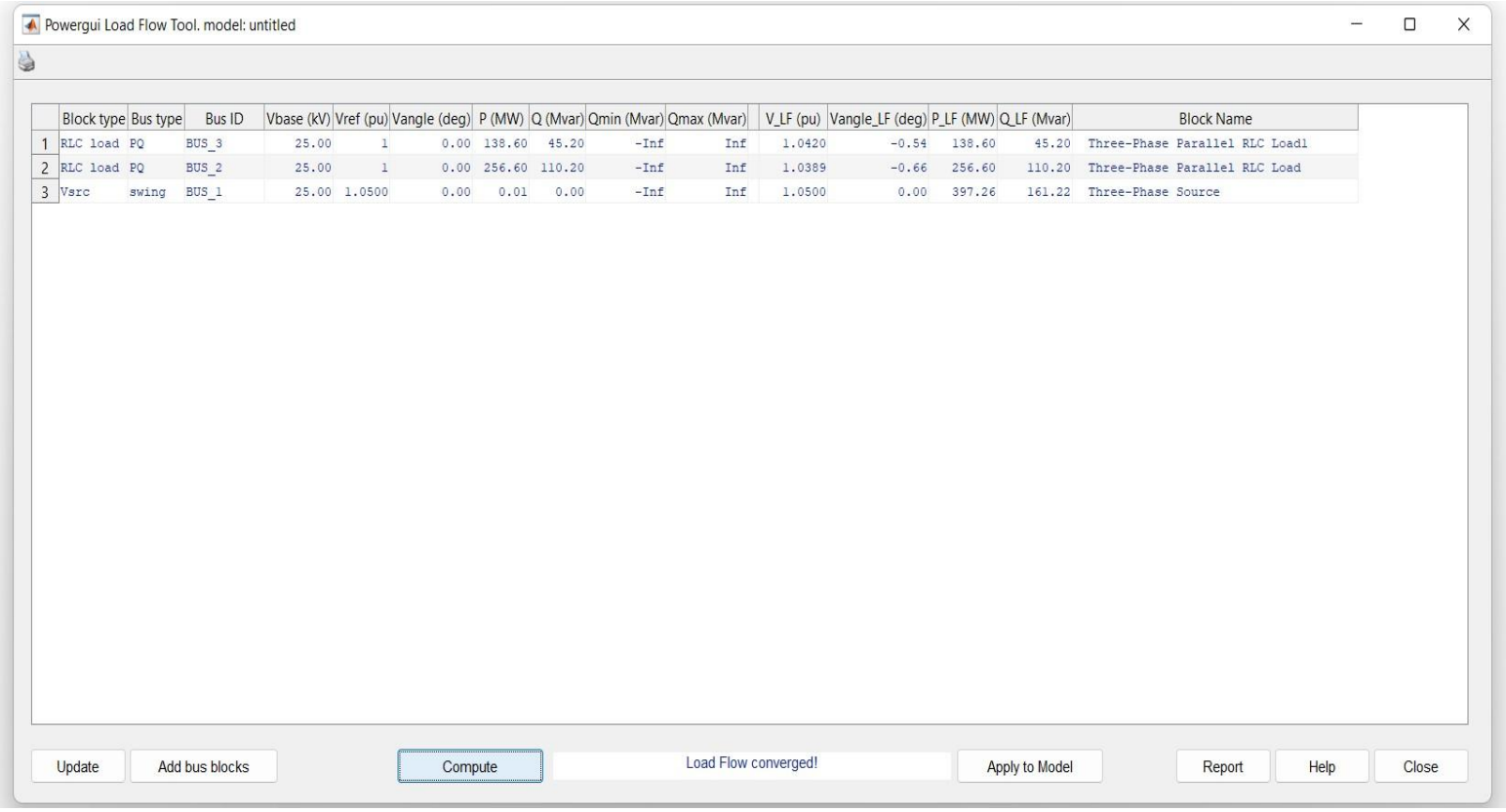


Figure 1 Simulink Model

The above is solved in MATLAB Simulink. Three buses are represented by the VI-measurement block which is represented as black block in above figure. One is source(slack bus) which is taken as reference bus having swing voltage of 1.05 $<0^0$. Three phase source is used in Simulink to supply given voltage level. The other two bus are load bus. Three phase parallel RLC load is used to represent the load bus in Simulink. The impedance between the buses are represented by Parallel RLC branch. The power flow between the buses and their voltage level is further calculated using powergui load flow tool.

Analysis

Using Load Flow Analysis, following result is obtained:



	Block type	Bus type	Bus ID	Vbase (kV)	Vref (pu)	Vangle (deg)	P (MW)	Q (Mvar)	Qmin (Mvar)	Qmax (Mvar)	V_LF (pu)	Vangle_LF (deg)	P_LF (MW)	Q_LF (Mvar)	Block Name
1	RLC load	PQ	BUS_3	25.00	1	0.00	138.60	45.20	-Inf	Inf	1.0420	-0.54	138.60	45.20	Three-Phase Parallel RLC Load1
2	RLC load	PQ	BUS_2	25.00	1	0.00	256.60	110.20	-Inf	Inf	1.0389	-0.66	256.60	110.20	Three-Phase Parallel RLC Load
3	Vsrc	swing	BUS_1	25.00	1.0500	0.00	0.01	0.00	-Inf	Inf	1.0500	0.00	397.26	161.22	Three-Phase Source

Figure 2 Load Flow Analysis

In modeling base voltage is taken as 25KV. The slack bus voltage or reference voltage is 1.05<0 pu. The real and reactive power of load bus as rated is supplied there.

It is obtained that the voltage level at bus 2 is 1.038<-0.660. Similarly the voltage level at bus 3 is 1.04<-0.540. The total real power supplied is 397.26 MW and reactive power supplied is 161.22Mvar.

Moreover, the power obtained at bus 2 is 256.6 Mw and 110.20 Mvar. The real and reactive power at bus 3 is 138.6 Mw and 45.2 Mvar respectively.

In further detail, the data can be exported to matlab editor window through report option.

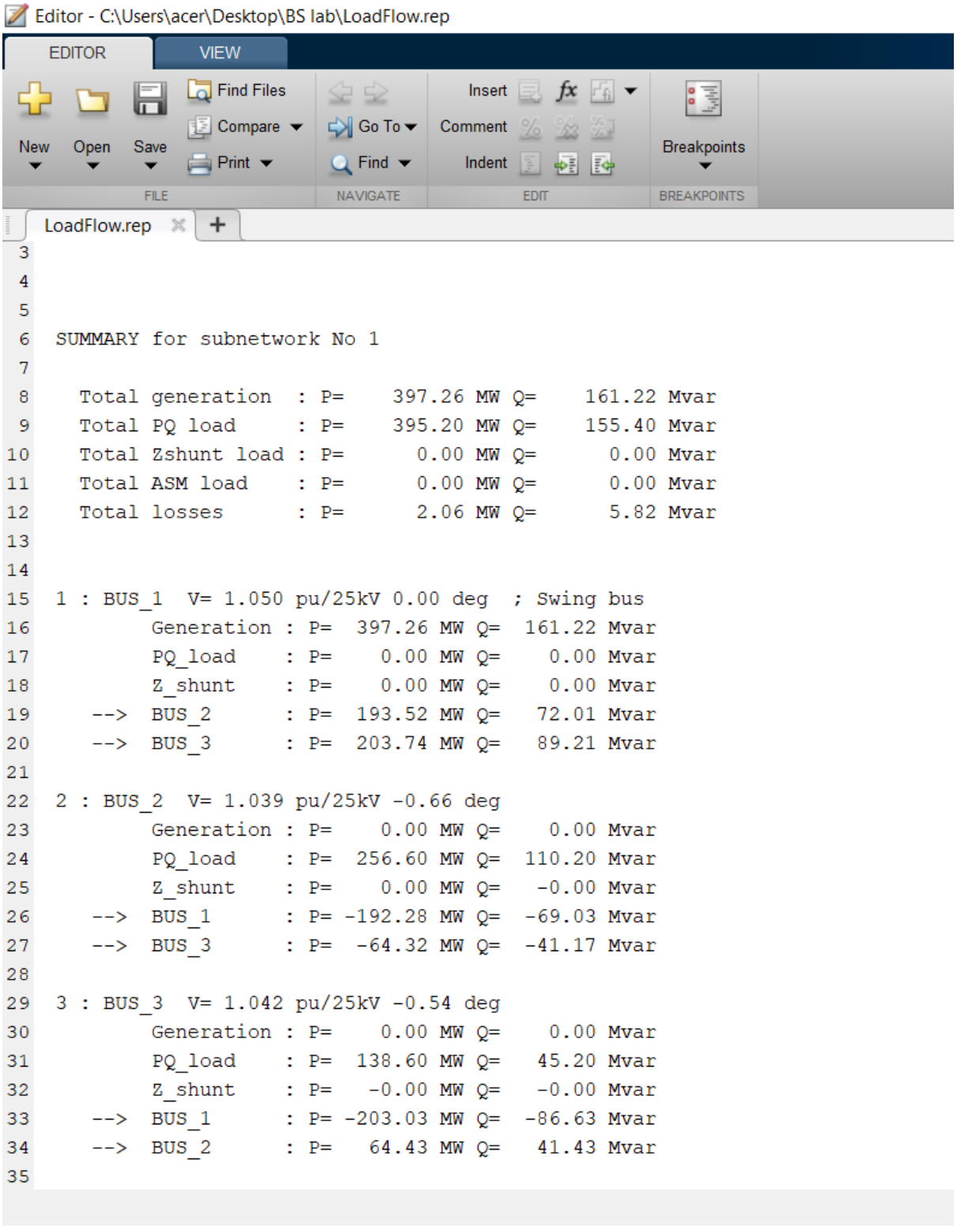
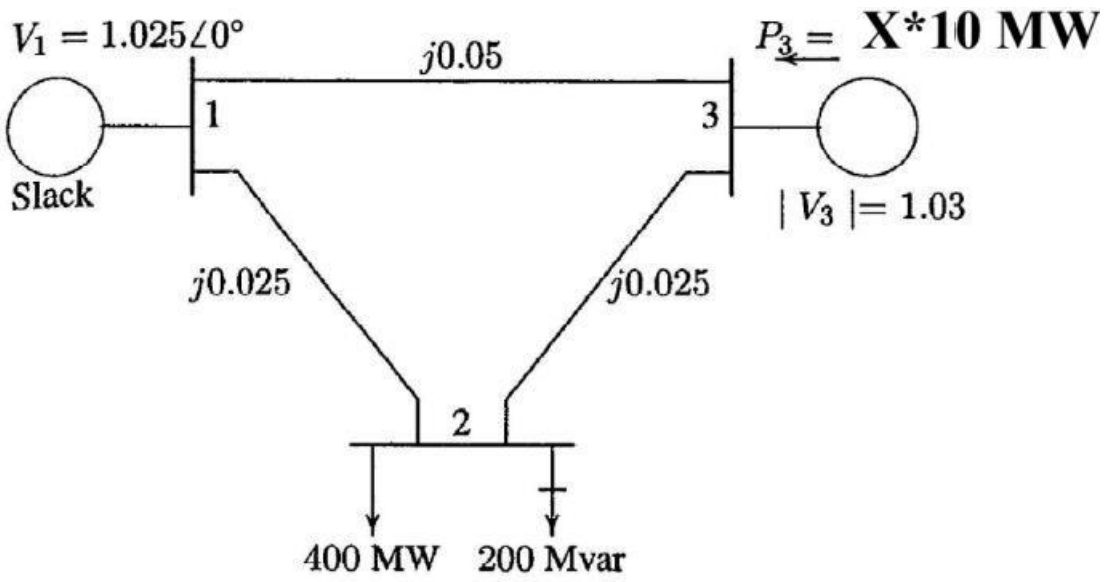


Figure 3 Reporting the data in editor window

Here, the total power generation is 397.26 Mw and 161.22 Mvar. Similarly, the total PQ load is 395.20 MW and 155.40 Mvar. So, the losses is 2.06 Mw and 5.82 Mvar. The power supplied by bus 1 to bus 2 is 193.52 Mw and 72.01 Mvar and to bus 3 is 203.74 Mw and 89.21 Mvar.

The power received by bus 2 through bus 1 is 192.28 Mw and 69.03 Mvar and power received by bus 2 through bus 3 is 64.32 Mw and 41.17 Mvar. Similarly, the power flow from bus 1 to bus 3 is 203.74Mw and 89.21 Mvar.

With Slack, PQ and PV Bus



Perform load flow on the network shown below using Matlab/Simulink. The real power injection at bus 3 is ten times your class roll number. From the results of the load flow solution, calculate the line flows and losses in the lines and the apparent power at the slack bus. Please note that the impedances are marked in pu on a 100 MVA base.

Modeling the above question in Simulink

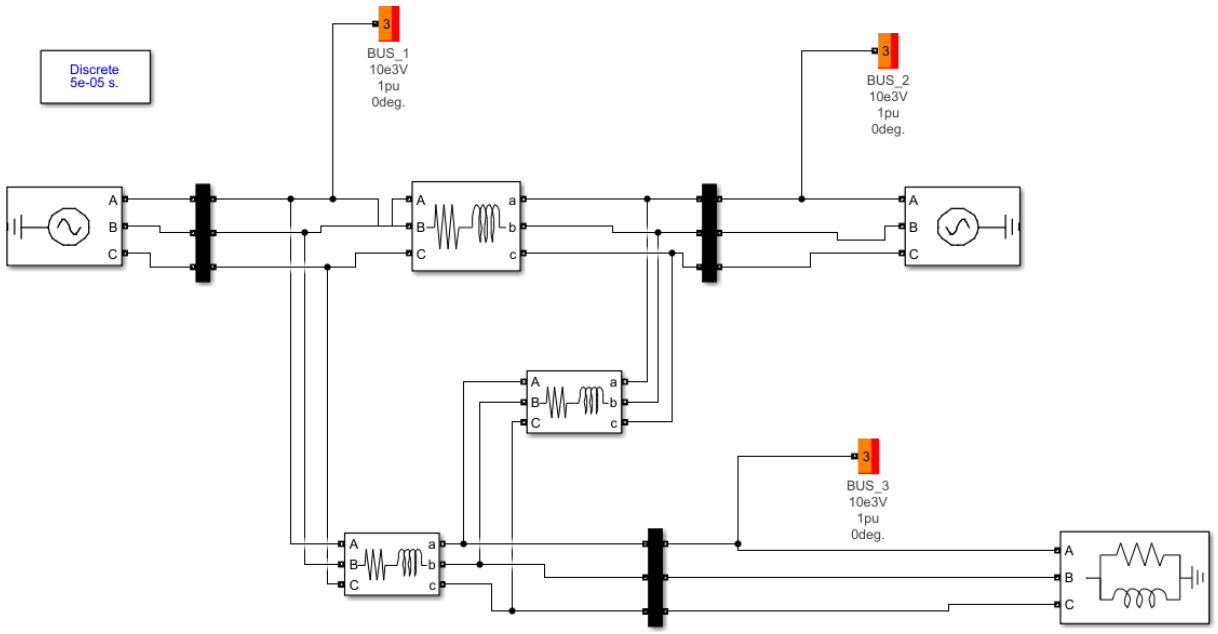
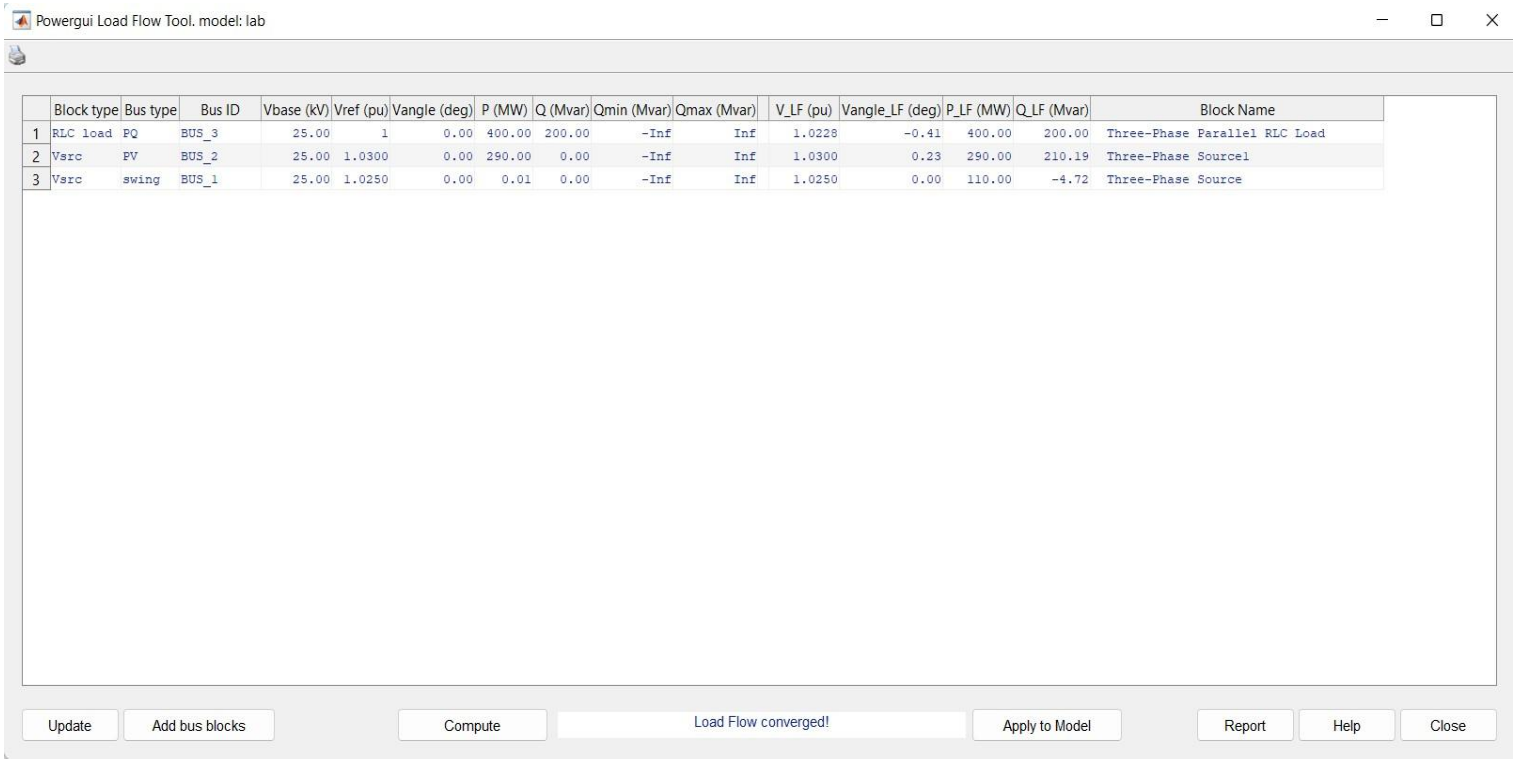


Figure 4 Simulink Model

The above is solved in MATLAB Simulink. Three buses are represented by the VI-measurement block which is represented as black block in above figure. One is source(slack bus) which is taken as reference bus having swing voltage of 1.025 <00. Another is PV bus having a voltage 1.03 <00. Three phase source is used in Simulink to supply given voltage level. The other bus is load bus. Three phase parallel RLC load is used to represent the load bus in Simulink. The impedance between the buses are represented by Parallel RLC branch. The power flow between the buses and their voltage level is further calculated using powergui load flow tool.

Analysis

The flowing result is obtained using load flow analysis



	Block type	Bus type	Bus ID	Vbase (kV)	Vref (pu)	Vangle (deg)	P (MW)	Q (Mvar)	Qmin (Mvar)	Qmax (Mvar)	V_LF (pu)	Vangle_LF (deg)	P_LF (MW)	Q_LF (Mvar)	Block Name
1	RLC load	PQ	BUS_3	25.00	1	0.00	400.00	200.00	-Inf	Inf	1.0228	-0.41	400.00	200.00	Three-Phase Parallel RLC Load
2	Vsrc	PV	BUS_2	25.00	1.0300	0.00	290.00	0.00	-Inf	Inf	1.0300	0.23	290.00	210.19	Three-Phase Source1
3	Vsrc	swing	BUS_1	25.00	1.0250	0.00	0.01	0.00	-Inf	Inf	1.0250	0.00	110.00	-4.72	Three-Phase Source

Figure 5 Load flow analysis

In modeling base voltage is taken as 25KV. The slack bus voltage or reference voltage is 1.025<0 pu. The another PV bus has voltage $1.03<0^0$. The voltage level obtained at PQ bus is $1.0228<-0.41^0$ .The real and reactive power of load bus as rated is supplied there.

In further detail, the data can be exported to matlab editor window through report option.

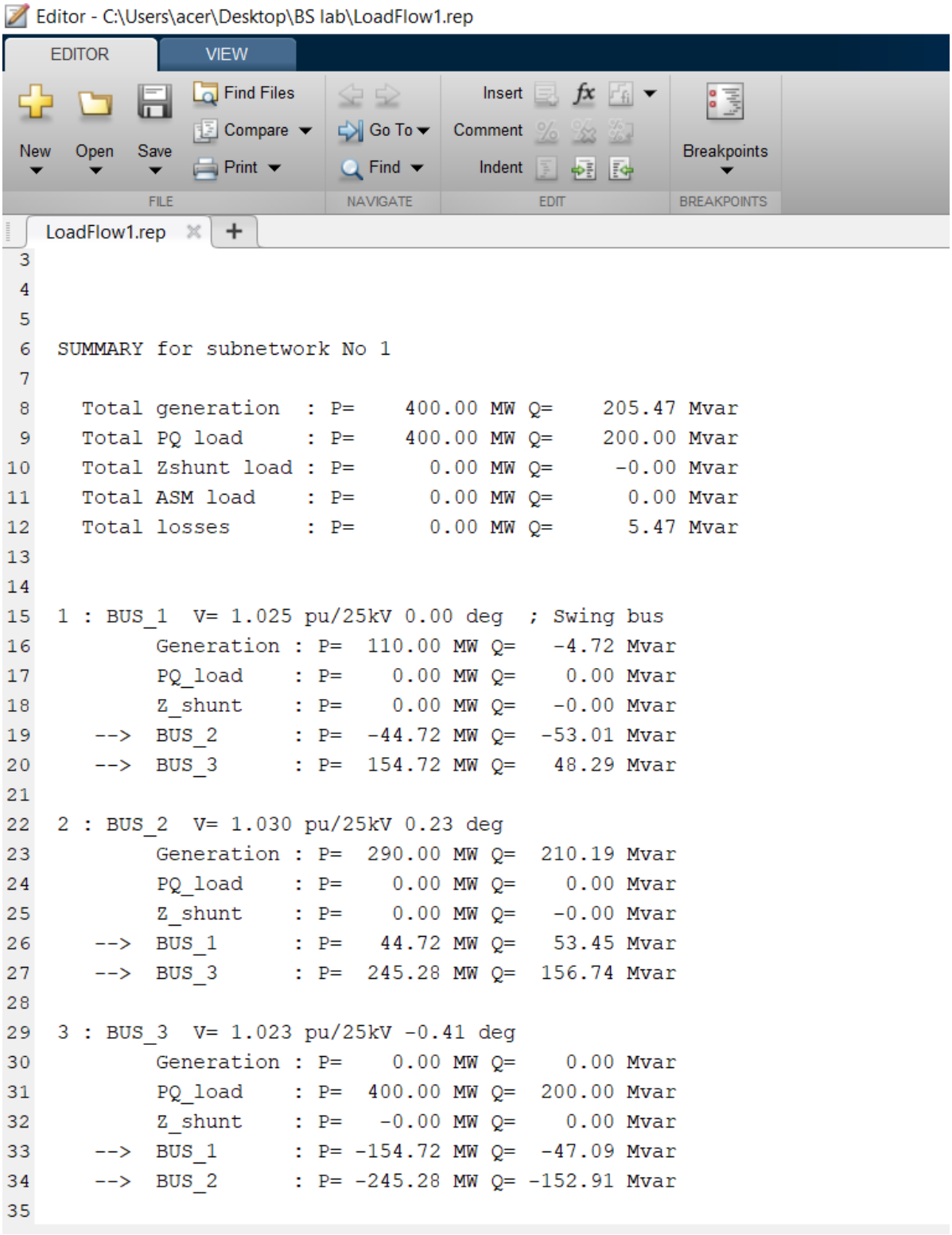


Figure 6 Reporting the data in editor window

Here,two buses are generating bus. The total generation capacity is 400 Mw and 205.47 Mvar. The total PQ load is 400 Mw and 200 Mvar. So, the losses is 5.47 Mvar.

Here, the power flow from bus 2 to bus 1 is 44.72 Mw and 53.01 Mvar. Similarly, from Bus 1 to Bus 3 is 154.72 Mw and 48.29 Mvar. Furthermore, the power flow from bus 2 to bus 3 is 245.28 Mw and 456.74 Mvar.