

Bus	Type	V (pu)	Angle (°)	P <sub>G</sub> (MW)	Q <sub>G</sub> (MVar)	P <sub>L</sub> (MW)	Q <sub>L</sub> (MVar)	B <sub>sh</sub> (%)
1	2	1	0	0	0	374.9	98.7	0
2	0	1	0	0	0	0	0	0
3	0	1	0	0	0	0	0	0
4	0	1	0	0	0	0	0	0
5	0	1	0	0	0	0	0	0
6	0	1	0	16.7	4.9	0	0	0
7	0	1	0	13.5	0.4	0	0	0
8	0	1	0	20	8.5	0	0	0
9	0	1	0	11.5	3.2	0	0	0
10	0	1	0	0	0	0	0	0
11	0	1	0	13	11	0	0	0.24
12	1	1	0	0	0	348	20.5	0
13	0	1	0	0	0	0	0	0
14	0	1	0	60	18	0	0	0
15	0	1	0	0	0	0	0	0
16	1	1.02	0	50	11	12	0	0
17	0	1	0	10.2	4.5	0	0	0.072
18	0	1	0	22.5	6.7	0	0	0
19	0	1	0	17.1	8.1	0	0	0.168
20	0	1	0	24.5	12.8	0	0	0.3
21	0	1	0	21	12	0	0	0.072
22	0	1	0	15.7	6.6	0	0	0.048
23	0	1	0	8.1	2.8	0	0	0
24	0	1	0	15.9	9.6	0	0	0.048
25	0	1	0	11.4	4.3	0	0	0
26	0	1	0	4	2.7	0	0	0.024
27	0	1	0	12.5	4.3	0	0	0
28	0	1	0	16	0.87	0	0	0.048
29	0	1	0	6.5	2.4	0	0	0
30	0	1	0	0.1	0	0	0	0
31	0	1	0	15.2	6.3	0	0	0.096
32	0	1	0	6	0	0	0	0
33	0	1	0	10.6	3.6	0	0	0
34	0	1	0	4	1.2	0	0	0
35	0	1	0	17.1	5.1	0	0	0.12
36	0	1	0	21.1	11.1	0	0	0.048
37	0	1	0	11	3.2	0	0	0
38	0	1	0	18.4	6.2	0	0	0.192
39	0	1	0	5.6	2.3	0	0	0.096
40	0	1	0	4.3	2.1	0	0	0
41	0	1	0	28.1	13	0	0	0.096
42	0	1	0	20.5	11	0	0	0
43	0	1	0	11.4	4.7	0	0	0.048
44	0	1	0	12.7	5.8	0	0	0.072
45	0	1	0	6.2	0.3	0	0	0.048
46	0	1	0	4.8	1.8	0	0	0
47	0	1	0	10	3	0	0	0
48	0	1	0	24.2	15.3	0	0	0.024
49	0	1	0	6.2	2	0	0	0
50	0	1	0	10.5	3.4	0	0	0.048
51	0	1	0	5.3	2.4	0	0	0.024
52	0	1	0	94	27	0	0	0
53	0	1	0	10	3	0	0	0
54	1	1	0	0	1	20	20	0
55	0	1	0	10	0	0	0	0

Table 1: Bus Data - 55-bus test system

Bus	Type	V (pu)	Angle (°)	P <sub>G</sub> (MW)	Q <sub>G</sub> (MVar)	P <sub>L</sub> (MW)	Q <sub>L</sub> (MVar)	B <sub>sh</sub> (%)
56	0	1	0	1	0	0	0	0
57	2	1	0	0	0	0	0	0
58	0	1	0	10	0	0	0	0
59	0	1	0	0	0	0	0	0
60	0	1	0	0	0	0	0	0
61	0	1	0	0	0	0	0	0
62	0	1	0	0	0	0	0	0
63	0	1	0	5	0	0	0	0
64	0	1	0	0	0	0	0	0
65	0	1	0	0	0	0	0	0
66	0	1	0	5	0	0	0	0
67	0	1	0	0	0	0	0	0
68	0	1	0	0	0	0	0	0
69	0	1	0	5	0	0	0	0
70	0	1	0	0	0	0	0	0
71	1	1	0	0	0	20	0	0

Table 2: Substation Bus Data - 55-bus test system