

# MATPOWER Version 7.0, 20-Jun-2019 -- AC Optimal Power Flow

AC OPF formulation: polar voltages, power balance eqns

MATPOWER Interior Point Solver -- MIPS, Version 1.3.1, 20-Jun-2019

(using built-in linear solver)

Converged!

Converged in 0.19 seconds

Objective Function Value = 5839.35 \$/hr

## System Summary

How many?	How much?	P (MW)	Q (MVar)
Buses	89	Total Gen Capacity	9921.2 -1582.5 to 4520.1
Generators	12	On-line Capacity	9921.2 -1582.5 to 4520.1
Committed Gens	12	Generation (actual)	5839.4 3526.3
Loads	36	Load	5727.9 2106.9
Fixed	36	Fixed	5727.9 2106.9
Dispatchable	0	Dispatchable	-0.0 of -0.0 -0.0
Shunts	44	Shunt (inj)	-5.6 558.8
Branches	210	Losses ( $I^2 * Z$ )	105.91 1978.22
Transformers	32	Branch Charging (inj)	- 0.0
Inter-ties	0	Total Inter-tie Flow	0.0 0.0
Areas	1		

	Minimum	Maximum
Voltage Magnitude	0.900 p.u. @ bus 6833	1.100 p.u. @ bus 2449
Voltage Angle	-12.76 deg @ bus 8964	21.19 deg @ bus 8581
P Losses ( $I^2 * R$ )	-	14.29 MW @ line 5416-7637
Q Losses ( $I^2 * X$ )	-	238.47 MVar @ line 7637-8581
Lambda P	-1.91 \$/MWh @ bus 8581	1.06 \$/MWh @ bus 8964
Lambda Q	-0.11 \$/MWh @ bus 2449	0.54 \$/MWh @ bus 8581

## Bus Data

Bus #	Voltage Mag(pu)	Angle(deg)	Generation P (MW)	Generation Q (MVar)	Load P (MW)	Load Q (MVar)	Lambda(\$/MVA-hr) P	Lambda(\$/MVA-hr) Q
89	1.007	-3.691	-	-	-	-	1.013	0.004
228	1.063	-6.175	-	-	-23.43	57.40	1.000	-0.001
271	1.043	-8.065	-	-	96.70	26.80	1.012	0.006
317	1.056	-0.663	-	-	-	-	1.000	-0.001

659	1.058	-0.682	-	-	-	-	1.000	0.000
792	1.048	-7.025	-	-	295.30	41.90	1.004	-
913	1.039	0.000*	1699.66	772.11	-	-	1.000	0.002
955	0.963	-10.358	-	-	244.20	152.70	1.034	0.043
1037	1.061	-1.748	-	-	-	-	1.004	-0.001
1163	1.022	-3.325	-	-	-	-	1.008	0.003
1317	1.050	-1.459	-	-	149.30	-2.00	1.002	0.000
1367	1.038	-1.789	-	-	-	-	1.003	0.000
1445	1.048	-5.698	-	-	238.40	210.90	1.001	0.007
1531	1.038	-9.420	-	-	-	-	1.016	-0.004
1579	1.019	-3.533	-	-	-	-	1.011	0.001
1611	1.060	-7.296	-	-	274.10	166.50	1.006	0.003
1616	1.013	-3.037	-	-	-	-	1.011	0.004
1676	1.022	-3.349	-	-	-	-	1.008	0.003
1815	1.067	-5.972	-	-	63.66	9.70	1.004	-0.001
1968	0.964	-10.646	-	-	118.40	137.00	1.036	0.050
2107	1.046	0.434	1221.12	661.90	-	-	1.000	0.004
2154	1.050	2.328	-	-	-357.45	33.05	0.999	0.002
2168	0.953	-12.729	-	-	8.60	-1.48	1.056	0.052
2267	1.052	3.915	166.67	228.16	-	-	0.988	0.028
2268	0.970	-3.885	-	-	-	-	1.017	0.020
2299	1.052	-8.896	-	-	402.10	110.20	1.014	-0.001
2441	0.953	-3.822	-	-	-	-	1.022	0.032
2449	1.100	-8.431	-	-	301.90	-103.20	0.993	-0.109
2520	1.008	-3.758	-	-	-	-	1.014	0.004
2870	1.061	-1.748	-	-	-	-	1.004	-0.001
2908	1.005	-9.271	-	-	203.80	61.00	1.025	0.025
3097	1.056	-2.365	-	-	361.91	3.66	1.005	0.000
3242	1.072	-7.194	-	-	296.10	82.30	1.004	-0.000
3279	1.048	-6.995	-	-	-	-	1.004	-
3493	1.051	-8.199	-	-	226.30	61.10	1.031	0.002
3506	0.963	-10.319	-	-	-	-	1.034	0.043
3659	1.068	0.901	666.67	940.15	-	-	0.998	-
4014	1.062	-7.335	-	-	-	-	1.006	-0.002
4423	1.052	-8.877	-	-	-	-	1.014	-0.001
4427	1.044	-9.209	-	-	296.80	77.70	1.020	0.004
4495	1.049	-9.413	-	-	336.30	104.40	1.023	-0.005
4586	1.060	-7.114	36.06	-29.81	-	-	1.000	-0.003
4665	1.050	-9.868	-	-	390.50	62.50	1.022	-0.006
4929	1.061	-1.748	-	-	37.00	8.70	1.004	-0.001
5097	1.072	-7.193	21.23	-4.10	-	-	1.004	-0.000
5155	1.035	-9.210	-	-	411.30	168.00	1.020	0.008
5210	1.049	-5.334	-	-	347.61	74.37	0.999	0.011
5416	1.051	4.260	-	-	-	-	0.986	0.030
5509	1.011	-4.388	-	-	-	-	1.015	0.002
5587	1.051	-8.162	-	-	-	-	0.988	-0.006
5762	1.054	0.646	-	-	-	-	0.999	0.002
5776	1.070	-8.875	-	-	222.70	80.50	1.007	-0.001

5848	1.022	-3.188	-	-	-	-	1.010	0.000
5996	1.053	0.647	-	-	-	-	0.999	0.002
6069	0.910	-4.939	-	-	-456.66	550.00	1.028	0.043
6233	1.057	-0.625	518.86	-189.96	-	-	1.000	-0.001
6293	0.957	-3.420	-	-	-	-	1.020	0.031
6542	1.079	-8.367	-	-	355.98	-147.98	1.020	-0.010
6704	1.017	-3.210	-	-	-	-	1.008	0.003
6798	1.061	-0.560	333.36	332.73	-	-	1.000	-
6826	1.069	-9.035	-	-	326.90	-82.30	1.007	-0.001
6833	0.900	-5.755	-	-	0.00	50.00	1.034	0.047
7051	1.026	-3.139	-	-	-	-	1.007	0.003
7180	0.905	-5.868	-	-	-	-	1.033	0.045
7279	1.062	-7.335	100.00	-6.64	-	-	1.006	-0.002
7526	1.028	-2.425	-	-	-179.73	-63.08	1.010	0.000
7563	1.056	-10.008	-	-	531.70	-12.80	1.024	-0.001
7637	1.049	10.273	-	-	-	-	-1.714	0.528
7762	1.017	-2.315	-	-	-	-	1.008	0.005
7829	1.054	-6.004	-	-	-114.36	30.04	1.004	0.000
7960	1.060	-0.614	237.87	274.17	-	-	1.000	0.000
8103	1.016	-4.438	-	-	39.34	-10.70	1.009	0.003
8179	1.011	-3.523	-	-	-	-	1.012	0.004
8181	1.011	-3.301	-	-	-	-	1.011	0.005
8229	1.070	-8.875	-	-	-	-	1.007	-0.001
8329	1.052	-1.158	-	-	-	-	1.002	0.002
8335	1.038	-9.442	-	-	637.92	139.57	1.016	-0.004
8420	1.060	-7.252	-	-	-	-	1.006	0.003
8574	1.014	-3.345	-	-	-	-	1.010	0.004
8581	1.053	21.191	-	-	-1299.13	-140.85	-1.908	0.543
8605	1.039	-1.729	600.00	273.47	-	-	1.003	-
8847	1.024	-3.392	-	-	-	-	1.008	0.003
8921	1.020	-2.997	-	-	-	-	1.008	0.003
8964	0.953	-12.764	-	-	925.91	147.97	1.056	0.052
9024	1.066	-4.538	-	-	-	-	1.015	-0.005
9025	1.012	-3.067	-	-	-	-	1.012	0.005
9064	1.013	-3.079	-	-	-	-	1.010	0.004
9192	0.964	-10.377	-	-	17.92	23.30	1.035	0.049
9239	1.060	-0.611	237.86	274.17	-	-	1.000	0.000

-----

Total: 5839.35 3526.34 5727.89 2106.87

=====									
Branch Data									
=====									
Brnch	From	To	From Bus Injection		To Bus Injection		Loss (I^2 * Z)		
#	Bus	Bus	P (MW)	Q (MVAr)	P (MW)	Q (MVAr)	P (MW)	Q (MVAr)	
-----									
1	3097	659	-361.91	6.81	362.77	3.83	0.858	10.64	
2	9024	4929	-235.39	52.90	236.37	-41.15	0.983	11.75	

3	1815	6542	72.32	-38.21	-71.48	41.68	0.841	3.47
4	6542	1445	-49.46	66.12	50.99	-61.92	1.526	4.20
5	6069	6833	271.05	170.58	-270.38	-164.83	0.668	5.75
6	6069	2268	-195.81	-458.48	199.58	492.18	3.778	33.70
7	6069	7180	260.31	72.38	-259.89	-67.74	0.423	4.64
8	6069	6293	-282.73	-418.96	285.26	447.86	2.527	28.91
9	1968	9192	-124.78	-1.99	124.82	2.57	0.047	0.59
10	1968	3493	-1.24	-1.69	1.28	1.90	0.033	0.21
11	1968	955	-4.56	2.40	4.57	-2.37	0.006	0.03
12	1968	228	-1.95	-1.58	2.01	1.91	0.057	0.32
13	1968	6826	-60.14	-95.57	63.71	107.85	3.568	12.28
14	1968	8964	291.57	26.56	-289.14	-15.59	2.427	10.97
15	1968	5776	-3.15	-4.07	3.36	4.62	0.206	0.55
16	9192	955	0.03	0.30	-0.03	-0.30	0.000	0.00
17	9192	6826	-8.49	-14.91	9.03	16.75	0.534	1.84
18	9192	8964	56.39	0.87	-55.73	1.46	0.657	2.33
19	8574	1616	-140.84	23.26	140.92	-22.50	0.077	0.77
20	8574	1163	-9.35	-72.42	9.40	73.01	0.050	0.59
21	8574	9064	-143.35	30.03	143.43	-29.35	0.077	0.68
22	8574	8921	-198.62	-155.44	198.80	157.53	0.179	2.10
23	3493	2299	8.40	-1.34	-8.39	1.45	0.006	0.10
24	2299	4423	-170.87	-10.82	170.87	10.88	0.000	0.06
25	6826	2299	-0.03	0.25	0.03	-0.25	0.000	0.00
26	7563	2299	-1.82	0.82	1.82	-0.78	0.009	0.04
27	4427	2299	-4.23	-3.09	4.25	3.14	0.015	0.05
28	8335	2299	-0.33	-0.19	0.33	0.19	0.003	0.01
29	5155	2299	-0.67	-1.62	0.67	1.65	0.002	0.03
30	271	2299	14.59	-14.55	-14.51	14.89	0.088	0.34
31	2449	2299	0.61	0.89	-0.59	-0.85	0.019	0.04
32	4665	2299	-63.34	6.83	63.57	-5.77	0.227	1.06
33	4495	2299	-3.93	-1.12	3.94	1.15	0.004	0.04
34	3493	5587	-313.67	-57.85	313.67	58.05	-0.000	0.20
35	4586	3493	6.31	2.64	-6.30	-2.50	0.003	0.14
36	228	3493	39.87	2.41	-39.51	-0.99	0.367	1.42
37	6826	3493	-1.66	2.41	1.67	-2.35	0.006	0.07
38	7563	3493	-1.71	0.74	1.72	-0.68	0.014	0.06
39	4427	3493	-12.39	0.62	12.48	-0.40	0.088	0.22
40	8335	3493	-0.51	-0.02	0.52	0.03	0.006	0.01
41	5155	3493	-26.54	-13.15	26.70	13.83	0.166	0.67
42	271	3493	0.11	-0.46	-0.11	0.46	0.000	0.00
43	5776	3493	-0.30	0.74	0.31	-0.72	0.003	0.02
44	2449	3493	0.28	0.98	-0.26	-0.94	0.016	0.04
45	4665	3493	-3.60	1.08	3.64	-0.98	0.032	0.10
46	4495	3493	-76.47	10.17	76.85	-8.57	0.382	1.60
47	5587	4586	-105.01	-27.46	105.33	29.61	0.325	2.16
48	4423	4586	-170.87	-10.51	171.64	15.87	0.770	5.36
49	4929	2870	0.00	-0.70	-0.00	0.70	0.000	0.00
50	4929	659	-188.77	40.54	189.06	-36.94	0.288	3.60

51	4929	1037	0.00	-0.62	-0.00	0.62	0.000	0.00
52	4929	659	-220.48	52.59	220.91	-48.37	0.434	4.22
53	1815	5210	-0.31	0.79	0.32	-0.77	0.003	0.02
54	1815	1445	-0.31	15.39	0.38	-15.13	0.067	0.27
55	1616	7762	-411.87	-45.78	412.60	51.13	0.736	5.35
56	1616	2520	270.95	83.11	-270.59	-79.29	0.360	3.82
57	9064	7762	-395.50	-61.96	395.97	67.46	0.468	5.49
58	9064	89	252.07	106.98	-251.70	-103.67	0.372	3.32
59	1317	659	-209.98	-88.35	210.30	91.86	0.320	3.51
60	1317	8605	60.68	113.27	-60.54	-111.74	0.139	1.53
61	8605	1367	296.83	135.15	-296.79	-134.76	0.039	0.39
62	8605	8921	363.71	250.06	-362.30	-237.46	1.408	12.60
63	1163	1676	110.32	65.82	-110.31	-65.75	0.006	0.07
64	1163	7051	-119.72	-122.07	119.79	122.93	0.070	0.86
65	913	7762	826.93	381.87	-823.32	-340.56	3.609	41.31
66	2107	7762	972.74	497.96	-967.72	-438.14	5.021	59.81
67	2107	5996	-275.64	-428.49	276.02	432.60	0.380	4.10
68	2107	6293	524.01	592.44	-514.52	-508.33	9.492	84.11
69	913	7762	872.74	390.24	-868.42	-346.93	4.314	43.31
70	6704	8921	-163.43	-96.08	163.51	96.94	0.073	0.86
71	228	4586	84.46	-2.92	-84.18	4.29	0.278	1.37
72	2441	6293	-229.10	-89.34	229.26	91.26	0.160	1.92
73	955	3506	-287.57	-152.79	287.57	153.05	0.000	0.25
74	955	8964	38.84	2.77	-38.54	-1.13	0.293	1.64
75	3506	2908	-58.94	-91.02	59.76	96.09	0.819	5.07
76	228	6826	5.58	-1.17	-5.55	1.46	0.031	0.29
77	228	5776	1.54	-0.54	-1.52	0.62	0.017	0.08
78	8964	6826	-22.16	-11.79	23.94	14.82	1.783	3.02
79	5776	6826	28.10	0.64	-28.08	-0.56	0.019	0.08
80	659	8329	321.69	162.71	-321.30	-159.17	0.395	3.54
81	659	7051	394.40	240.27	-392.06	-216.36	2.343	23.91
82	659	9239	-237.79	-273.40	237.86	274.17	0.070	0.76
83	659	7960	-237.80	-273.43	237.87	274.17	0.070	0.74
84	659	6233	-172.27	286.85	172.33	-286.30	0.060	0.55
85	659	5416	-973.51	198.97	980.48	-113.62	6.966	85.36
86	659	6798	-333.22	-331.18	333.36	332.73	0.138	1.56
87	792	3279	-254.72	-32.32	254.72	32.46	0.000	0.13
88	7563	792	-0.68	0.32	0.69	-0.28	0.010	0.04
89	7279	792	-0.29	3.02	0.30	-2.98	0.013	0.04
90	8335	792	-37.52	-3.21	37.73	4.84	0.208	1.63
91	2449	792	-5.14	16.57	5.29	-15.66	0.144	0.90
92	4665	792	-2.21	0.86	2.25	-0.75	0.035	0.11
93	4495	792	-1.80	0.48	1.82	-0.40	0.018	0.08
94	5416	2267	302.66	-85.28	-302.44	87.18	0.215	1.91
95	5416	7637	-1283.13	226.66	1297.43	-90.82	14.291	135.84
96	8964	2168	-250.66	-39.93	250.66	40.09	0.000	0.16
97	3659	5996	308.08	720.16	-307.12	-709.18	0.969	10.98
98	5762	5996	0.00	2.48	0.00	-2.48	0.000	0.00

99	3242	5097	-6.16	49.60	6.16	-49.60	0.000	0.00
100	7563	3242	-60.14	-2.81	60.81	5.84	0.672	3.03
101	4427	3242	-0.56	-0.32	0.57	0.35	0.003	0.03
102	3242	7279	5.61	14.51	-5.60	-14.35	0.019	0.15
103	271	3242	-0.21	-0.35	0.21	0.37	0.000	0.01
104	3242	1611	0.67	2.13	-0.66	-2.11	0.004	0.02
105	5097	1611	15.07	45.49	-14.98	-44.97	0.084	0.52
106	8181	8179	122.06	-25.93	-122.01	26.41	0.047	0.48
107	8181	7762	-362.71	-86.88	363.30	93.66	0.585	6.78
108	9025	7762	-271.29	-65.87	271.61	69.74	0.319	3.86
109	7563	4427	-1.72	1.88	1.73	-1.84	0.006	0.05
110	7563	7279	-133.91	21.05	135.41	-14.86	1.502	6.19
111	7563	8335	-1.24	3.48	1.25	-3.41	0.012	0.07
112	7563	5155	-1.28	1.95	1.28	-1.89	0.001	0.06
113	7563	271	-4.04	1.66	4.04	-1.51	0.004	0.16
114	2449	7563	0.97	0.76	-0.95	-0.71	0.019	0.06
115	4665	7563	2.41	-10.21	-2.39	10.27	0.012	0.06
116	4495	7563	0.42	-0.59	-0.41	0.60	0.003	0.01
117	7563	1611	-50.73	8.44	51.25	-6.06	0.523	2.39
118	4427	7279	-1.46	-0.40	1.47	0.46	0.010	0.06
119	4427	8335	0.10	0.08	-0.10	-0.08	0.000	0.00
120	4427	5155	2.64	19.65	-2.62	-19.47	0.023	0.17
121	4427	271	-48.76	10.46	48.91	-9.48	0.151	0.98
122	2449	4427	0.50	0.71	-0.49	-0.67	0.016	0.04
123	4665	4427	-0.85	0.74	0.85	-0.73	0.004	0.01
124	4495	4427	-6.58	11.40	6.60	-11.33	0.014	0.07
125	4427	1611	-0.73	-0.20	0.74	0.23	0.004	0.03
126	5210	1445	40.34	-2.44	-40.31	2.69	0.040	0.26
127	8179	5509	220.87	-15.56	-220.51	18.89	0.355	3.33
128	8179	7762	-274.58	-43.68	275.10	49.72	0.514	6.05
129	7279	4014	0.00	0.00	0.00	0.00	0.000	0.00
130	8335	7279	-141.46	-53.91	142.58	60.42	1.115	6.52
131	5155	7279	-1.00	-0.61	1.00	0.66	0.004	0.05
132	271	7279	-0.60	-0.67	0.60	0.69	0.002	0.02
133	2449	7279	-1.44	6.28	1.50	-6.04	0.065	0.25
134	4665	7279	-2.07	0.53	2.12	-0.44	0.044	0.09
135	4495	7279	-0.94	0.01	0.95	0.02	0.011	0.03
136	1611	7279	0.33	-1.03	-0.33	1.04	0.000	0.00
137	5509	1579	-178.94	-72.03	179.26	75.29	0.320	3.26
138	8335	1531	-186.54	-2.33	186.54	2.40	0.000	0.07
139	5155	8335	0.05	-0.04	-0.05	0.04	0.000	0.00
140	2449	8335	18.87	42.15	-18.50	-39.44	0.367	2.70
141	4665	8335	-0.71	2.20	0.72	-2.17	0.008	0.03
142	4495	8335	0.30	1.21	-0.30	-1.20	0.002	0.01
143	7762	2268	398.15	583.44	-394.92	-545.94	3.233	37.50
144	5155	271	-35.67	-10.70	35.73	11.50	0.059	0.80
145	5155	2908	13.27	50.18	-12.93	-48.69	0.339	1.49
146	4665	5155	-0.43	0.58	0.43	-0.57	0.000	0.01

147	4495	5155	-0.12	0.64	0.12	-0.63	0.001	0.01
148	5155	1611	-53.51	-28.42	53.79	30.92	0.279	2.49
149	271	2908	56.65	56.39	-55.68	-53.14	0.968	3.25
150	4665	271	-0.74	0.18	0.74	-0.16	0.000	0.02
151	4495	271	-0.62	0.29	0.63	-0.28	0.004	0.02
152	271	1611	-22.26	-20.86	22.33	21.49	0.068	0.63
153	1579	5848	-179.26	-58.09	179.40	59.33	0.137	1.24
154	7051	8847	272.26	115.74	-272.14	-114.26	0.125	1.47
155	5776	8229	0.00	0.00	0.00	0.00	0.000	0.00
156	317	6233	-346.50	-96.08	346.53	96.34	0.023	0.25
157	4665	2449	-21.13	-26.38	21.43	28.17	0.296	1.79
158	2449	4495	18.84	38.02	-18.58	-35.93	0.262	2.09
159	4665	4495	-24.71	12.14	24.76	-11.92	0.052	0.22
160	1611	8420	-386.89	-164.34	386.89	164.69	0.000	0.35
161	9024	6542	114.91	-8.17	-114.82	15.92	0.086	7.76
162	9024	6542	120.32	-16.02	-120.22	24.26	0.102	8.25
163	6069	9192	190.91	30.51	-190.67	-12.14	0.239	18.37
164	6069	1968	212.69	83.29	-212.38	-59.61	0.309	23.68
165	7829	1968	1.79	1.74	-1.76	-1.45	0.029	0.29
166	8574	2299	282.82	147.69	-282.35	-114.21	0.468	33.48
167	8574	5587	208.88	48.45	-208.66	-30.23	0.216	18.23
168	4929	1815	135.80	-2.09	-135.65	12.12	0.145	10.03
169	1815	792	0.30	0.20	-0.30	-0.19	0.002	0.01
170	6704	4586	163.21	96.78	-163.04	-82.22	0.174	14.56
171	2441	3506	228.88	90.37	-228.63	-61.48	0.252	28.90
172	1367	6826	296.60	133.13	-295.97	-90.07	0.632	43.06
173	1676	228	110.13	64.22	-110.03	-57.09	0.100	7.13
174	7829	6826	92.36	-24.11	-92.29	29.39	0.064	5.28
175	659	3279	255.26	61.63	-254.72	-32.46	0.534	29.18
176	5210	792	35.97	-2.04	-35.87	3.10	0.101	1.06
177	1445	792	52.53	-1.54	-52.48	2.75	0.056	1.22
178	7180	2168	259.70	71.20	-259.26	-38.61	0.439	32.59
179	6833	8964	270.18	118.75	-269.68	-81.00	0.505	37.75
180	3659	3242	358.59	219.99	-357.81	-155.10	0.776	64.90
181	8181	4427	240.44	119.57	-240.10	-89.93	0.337	29.64
182	9025	7563	271.08	69.03	-270.70	-34.89	0.383	34.13
183	2267	5210	469.11	140.98	-468.27	-61.46	0.845	79.51
184	5210	7279	2.94	-1.61	-2.91	1.73	0.024	0.12
185	5210	8335	29.76	2.94	-29.57	-0.79	0.186	2.15
186	5210	2449	7.55	-7.90	-7.45	8.70	0.093	0.80
187	5210	4665	2.10	-0.76	-2.04	0.92	0.064	0.17
188	5210	4495	1.68	-0.32	-1.65	0.44	0.028	0.12
189	8179	7279	175.53	52.41	-175.33	-39.87	0.205	12.54
190	1445	7279	1.18	-0.84	-1.17	0.89	0.010	0.04
191	5509	8335	212.39	51.94	-212.14	-32.42	0.252	19.52
192	5509	1531	186.74	18.87	-186.54	-2.40	0.195	16.47
193	1445	8335	12.93	1.31	-12.86	-0.46	0.073	0.85
194	7762	5155	307.07	189.01	-306.44	-141.06	0.628	47.94

195	7762	271	235.35	71.58	-235.04	-46.39	0.316	25.18
196	7829	5776	20.22	-7.66	-20.11	8.80	0.103	1.14
197	8329	1445	158.82	79.91	-158.61	-64.63	0.214	15.28
198	8329	1445	162.31	81.53	-162.08	-65.92	0.229	15.61
199	1445	2449	3.59	-4.61	-3.53	5.01	0.058	0.40
200	1445	4665	0.99	-0.33	-0.97	0.40	0.024	0.07
201	2268	2908	195.16	75.10	-194.95	-54.65	0.212	20.44
202	8847	5776	232.59	123.28	-232.22	-95.91	0.376	27.37
203	8847	8103	39.36	-9.94	-39.34	10.70	0.016	0.76
204	317	2449	346.45	94.05	-345.83	-45.04	0.619	49.01
205	7637	8581	-1297.75	97.62	1299.13	140.85	1.385	238.47
206	5848	7526	-179.70	-59.77	179.73	63.08	0.031	3.31
207	89	4495	251.50	108.26	-251.08	-79.49	0.419	28.77
208	2520	4665	270.53	83.16	-270.09	-52.39	0.445	30.77
209	5996	8420	387.94	232.70	-386.89	-164.69	1.053	68.02
210	2154	5996	357.13	-39.22	-357.03	50.82	0.105	11.60

-----

Total: 105.907 1978.22

=====

| Voltage Constraints |

=====

Bus #	Vmin mu	Vmin	V	Vmax	Vmax mu
-------	---------	------	---	------	---------

2449	-	0.900	1.100	1.100	522.094
------	---	-------	-------	-------	---------

=====

| Generation Constraints |

=====

Gen #	Bus #	Pmin mu	Pmin	Pg	Pmax	Pmax mu
-------	-------	---------	------	----	------	---------

3	2267	0.012	166.67	166.67	500.00	-
4	3659	0.002	666.67	666.67	2000.00	-
6	5097	-	7.08	21.23	21.23	0.004
9	7279	-	-908.93	100.00	100.00	0.006
11	8605	-	200.00	600.00	600.00	0.003

Gen #	Bus #	Qmin mu	Qmin	Qg	Qmax	Qmax mu
-------	-------	---------	------	----	------	---------

1	913	-	-269.94	772.11	772.11	0.002
2	2107	-	-257.62	661.90	661.90	0.004
3	2267	-	-78.83	228.16	228.16	0.028
5	4586	0.003	-29.81	-29.81	92.96	-
9	7279	0.002	-6.64	-6.64	14.78	-

=====



Branch Flow Constraints (S in MVA)								
=====								
Brnch	From	"From" End		Limit		"To" End		To
#	Bus	Sf  mu	Sf	Smax	St	St  mu	Bus	
-----								
34	3493	-	318.96	319.00	319.00	0.043	5587	
95	5416	2.674	1303.00	1303.00	1300.60	-	7637	