Deload Data:

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 0.21 seconds
Objective Function Value = 5830.40 $/hr

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| System Summary |
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How many?	How much?	P (MW)	Q (MVAr)
Buses	89	Total Gen Capacity	8789.2	-1582.5 to 4520.1
Generators	12	On-line Capacity	8789.2	-1582.5 to 4520.1
Committed Gens	12	Generation (actual)	5830.4	2852.0
Loads	36	Load	5727.9	1506.9
Fixed	36	Fixed	5727.9	1506.9
Dispatchable	0	Dispatchable	-0.0 of -0.0	-0.0
Shunts	44	Shunt (inj)	-5.7	567.6
Branches	210	Losses (I^2 * Z)	96.84	1912.77
Transformers	32	Branch Charging (inj)	-	0.0
Inter-ties	0	Total Inter-tie Flow	0.0	0.0
Areas	1			

	Minimum	Maximum
Voltage Magnitude	0.965 p.u. @ bus 7180	1.100 p.u. @ bus 2449
Voltage Angle	-9.81 deg @ bus 8964	25.23 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	-1.27 $/MWh @ bus 8581	1.05 $/MWh @ bus 3493
Lambda Q	-0.09 $/MWh @ bus 2449	0.43 $/MWh @ bus 8581

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| Bus Data |
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Bus #	Voltage Mag(pu)	Voltage Ang(deg)	Generation P (MW)	Generation Q (MVAr)	Load P (MW)	Load Q (MVAr)	Lambda($/MVA-hr) P	Lambda($/MVA-hr) Q
89	1.008	-1.770	-	-	-	-	1.021	0.002
228	1.064	-3.618	-	-	-23.43	57.40	1.003	-0.002
271	1.048	-5.872	-	-	96.70	26.80	1.021	0.004
317	1.057	3.467	-	-	-	-	1.000	-0.001
659	1.058	3.410	-	-	-	-	1.000	0.000

792	1.048	-3.364	-	-	295.30	41.90	1.005	0.001
913	1.032	0.000*	568.00	549.73	-	-	1.014	-
955	1.004	-7.676	-	-	244.20	152.70	1.035	0.023
1037	1.061	2.329	-	-	-	-	1.004	-0.001
1163	1.023	-0.406	-	-	-	-	1.011	0.002
1317	1.048	2.151	-	-	149.30	-2.00	1.004	0.000
1367	1.033	1.145	-	-	-	-	1.006	-
1445	1.048	-1.846	-	-	238.40	210.90	1.002	0.007
1531	1.038	-6.986	-	-	-	-	1.024	-0.002
1579	1.020	-1.615	-	-	-	-	1.019	-0.001
1611	1.058	-4.414	-	-	274.10	166.50	1.011	0.003
1616	1.014	-1.188	-	-	-	-	1.018	0.002
1676	1.022	-0.434	-	-	-	-	1.011	0.002
1815	1.067	-1.975	-	-	63.66	9.70	1.003	-0.001
1968	1.024	-7.907	-	-	118.40	137.00	1.035	0.021
2107	1.043	3.778	1500.00	661.89	-	-	1.004	0.001
2154	1.042	6.088	-	-	-357.45	33.05	1.002	0.001
2168	1.019	-9.782	-	-	8.60	-1.48	1.050	0.021
2267	1.052	7.939	166.67	228.16	-	-	0.989	0.024
2268	0.994	-2.066	-	-	-	-	1.024	0.009
2299	1.053	-6.590	-	-	402.10	110.20	1.020	-0.002
2441	0.989	-1.299	-	-	-	-	1.027	0.016
2449	1.100	-5.132	-	-	301.90	-103.20	0.999	-0.086
2520	1.009	-1.863	-	-	-	-	1.021	0.002
2870	1.061	2.329	-	-	-	-	1.004	-0.001
2908	1.027	-7.026	-	-	203.80	61.00	1.031	0.013
3097	1.056	1.728	-	-	361.91	3.66	1.005	0.000
3242	1.068	-4.132	-	-	296.10	82.30	1.007	0.000
3279	1.048	-3.333	-	-	-	-	1.005	0.001
3493	1.053	-5.865	-	-	226.30	61.10	1.053	0.002
3506	1.004	-7.642	-	-	-	-	1.035	0.023
3659	1.054	5.130	1143.65	573.22	-	-	1.000	-
4014	1.060	-4.921	-	-	-	-	1.013	-0.002
4423	1.053	-6.569	-	-	-	-	1.019	-0.002
4427	1.047	-7.074	-	-	296.80	77.70	1.031	0.003
4495	1.050	-7.137	-	-	336.30	104.40	1.036	-0.003
4586	1.061	-4.679	48.35	-29.81	-	-	1.000	-0.005
4665	1.051	-7.585	-	-	390.50	62.50	1.030	-0.005
4929	1.061	2.329	-	-	37.00	8.70	1.004	-0.001
5097	1.068	-4.133	21.23	8.85	-	-	1.007	0.000
5155	1.040	-7.021	-	-	411.30	168.00	1.030	0.006
5210	1.049	-1.537	-	-	347.61	74.37	1.000	0.010
5416	1.051	8.295	-	-	-	-	0.987	0.025
5509	1.012	-2.470	-	-	-	-	1.022	0.001
5587	1.053	-5.828	-	-	-	-	0.977	-0.010
5762	1.046	4.380	-	-	-	-	1.002	0.001
5776	1.084	-5.711	-	-	222.70	80.50	1.010	-0.000
5848	1.022	-1.271	-	-	-	-	1.018	-0.001

5996	1.046	4.380	-	-	-	-	1.002	0.001
6069	0.970	-2.819	-	-	-456.66	550.00	1.032	0.018
6233	1.057	3.509	704.10	-189.94	-	-	1.000	-0.000
6293	0.992	-0.902	-	-	-	-	1.025	0.015
6542	1.080	-4.378	-	-	355.98	-147.98	1.020	-0.009
6704	1.015	-0.808	-	-	-	-	1.012	0.001
6798	1.061	3.532	336.05	355.84	-	-	1.000	-
6826	1.085	-5.904	-	-	326.90	-82.30	1.010	-0.002
6833	0.985	-3.706	-	-	0.00	-550.00	1.036	0.014
7051	1.027	0.011	-	-	-	-	1.010	0.002
7180	0.965	-3.653	-	-	-	-	1.036	0.019
7279	1.060	-4.921	100.00	-6.64	-	-	1.013	-0.002
7526	1.028	-0.510	-	-	-179.73	-63.08	1.018	-0.001
7563	1.055	-7.678	-	-	531.70	-12.80	1.032	-0.002
7637	1.049	14.309	-	-	-	-	-1.122	0.414
7762	1.017	-0.739	-	-	-	-	1.017	0.003
7829	1.070	-2.961	-	-	-114.36	30.04	1.008	-0.000
7960	1.060	3.505	321.18	274.09	-	-	1.000	0.000
8103	1.017	-1.288	-	-	39.34	-10.70	1.012	0.002
8179	1.012	-1.764	-	-	-	-	1.020	0.002
8181	1.011	-1.596	-	-	-	-	1.020	0.003
8229	1.084	-5.711	-	-	-	-	1.010	-0.000
8329	1.053	2.910	-	-	-	-	1.002	0.002
8335	1.038	-7.005	-	-	637.92	139.57	1.024	-0.002
8420	1.058	-4.366	-	-	-	-	1.011	0.003
8574	1.014	-1.204	-	-	-	-	1.015	0.002
8581	1.053	25.227	-	-	-1299.13	-140.85	-1.275	0.426
8605	1.034	1.206	600.00	152.55	-	-	1.006	-
8847	1.025	-0.246	-	-	-	-	1.011	0.002
8921	1.018	-0.596	-	-	-	-	1.013	0.001
8964	1.019	-9.814	-	-	925.91	147.97	1.050	0.021
9024	1.067	-0.498	-	-	-	-	1.015	-0.005
9025	1.013	-1.416	-	-	-	-	1.020	0.003
9064	1.013	-1.196	-	-	-	-	1.017	0.002
9192	1.024	-7.667	-	-	17.92	23.30	1.034	0.021
9239	1.060	3.508	321.17	274.09	-	-	1.000	0.000
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		Total:	5830.40	2852.03	5727.89	1506.87		

Branch Data

Brnch #	From Bus	To Bus	From Bus Injection P (MW)	From Bus Injection Q (MVAr)	To Bus Injection P (MW)	To Bus Injection Q (MVAr)	Loss (I^2 * Z) P (MW)	Loss (I^2 * Z) Q (MVAr)
1	3097	659	-361.91	6.81	362.77	3.82	0.858	10.63

2	9024	4929	-238.63	53.09	239.64	-41.03	1.009	12.06
3	1815	6542	72.59	-38.31	-71.74	41.80	0.847	3.49
4	6542	1445	-45.96	65.37	47.39	-61.45	1.429	3.93
5	6069	6833	277.87	-345.81	-276.75	355.54	1.130	9.73
6	6069	2268	-134.55	-193.63	135.30	200.27	0.745	6.64
7	6069	7180	265.01	71.94	-264.63	-67.71	0.385	4.22
8	6069	6293	-359.48	-187.99	360.91	204.40	1.434	16.41
9	1968	9192	-126.22	-9.40	126.26	9.94	0.043	0.54
10	1968	3493	-0.95	-0.50	0.96	0.55	0.008	0.05
11	1968	955	0.34	22.19	-0.25	-21.76	0.094	0.43
12	1968	228	-1.79	-0.49	1.82	0.64	0.028	0.16
13	1968	6826	-58.66	-52.57	60.20	57.87	1.539	5.30
14	1968	8964	288.23	-16.38	-286.14	25.83	2.092	9.46
15	1968	5776	-2.94	-2.02	3.03	2.26	0.088	0.24
16	9192	955	1.05	3.56	-1.03	-3.49	0.020	0.07
17	9192	6826	-8.28	-8.23	8.50	8.99	0.219	0.75
18	9192	8964	55.58	-6.15	-55.00	8.18	0.573	2.03
19	8574	1616	-7.95	-4.02	7.95	4.02	0.000	0.00
20	8574	1163	-132.75	-69.88	132.96	72.37	0.210	2.49
21	8574	9064	-3.94	3.65	3.94	-3.65	0.000	0.00
22	8574	8921	-331.14	-95.80	331.47	99.73	0.335	3.92
23	3493	2299	8.77	-1.08	-8.77	1.20	0.007	0.11
24	2299	4423	-183.06	-8.63	183.06	8.70	0.000	0.07
25	6826	2299	0.21	0.48	-0.21	-0.46	0.001	0.02
26	7563	2299	-1.82	0.61	1.83	-0.57	0.008	0.04
27	4427	2299	-5.63	-1.91	5.65	1.97	0.020	0.06
28	8335	2299	-0.30	-0.23	0.30	0.24	0.003	0.01
29	5155	2299	-0.85	-1.27	0.86	1.29	0.002	0.02
30	271	2299	13.37	-9.95	-13.31	10.17	0.057	0.22
31	2449	2299	0.97	0.71	-0.95	-0.66	0.024	0.05
32	4665	2299	-65.33	5.03	65.57	-3.90	0.240	1.13
33	4495	2299	-4.16	-1.11	4.16	1.15	0.005	0.04
34	3493	5587	-314.84	-51.15	314.84	51.35	-0.000	0.20
35	4586	3493	6.90	2.50	-6.89	-2.34	0.003	0.16
36	228	3493	44.15	1.74	-43.70	-0.01	0.448	1.73
37	6826	3493	0.30	4.08	-0.29	-3.95	0.012	0.12
38	7563	3493	-1.74	0.60	1.76	-0.54	0.014	0.06
39	4427	3493	-14.35	2.05	14.47	-1.76	0.119	0.29
40	8335	3493	-0.49	-0.06	0.50	0.08	0.006	0.01
41	5155	3493	-28.91	-8.64	29.08	9.34	0.171	0.69
42	271	3493	-0.03	-0.26	0.03	0.26	0.000	0.00
43	5776	3493	0.31	1.07	-0.30	-1.04	0.006	0.03
44	2449	3493	0.61	0.82	-0.59	-0.78	0.016	0.04
45	4665	3493	-3.76	1.00	3.79	-0.88	0.034	0.11
46	4495	3493	-80.55	9.56	80.97	-7.79	0.421	1.77
47	5587	4586	-114.33	-23.71	114.71	26.20	0.375	2.49
48	4423	4586	-183.06	-8.33	183.94	14.47	0.881	6.13
49	4929	2870	0.00	-0.70	0.00	0.70	0.000	0.00

50	4929	659	-191.49	40.42	191.79	-36.72	0.296	3.70
51	4929	1037	0.00	-0.62	0.00	0.62	0.000	0.00
52	4929	659	-223.68	52.51	224.12	-48.18	0.446	4.33
53	1815	5210	-0.17	0.78	0.17	-0.77	0.003	0.01
54	1815	1445	1.83	15.22	-1.77	-14.95	0.066	0.27
55	1616	7762	-261.98	-70.61	262.29	72.91	0.315	2.29
56	1616	2520	254.03	81.44	-253.71	-78.06	0.319	3.39
57	9064	7762	-240.74	-84.61	240.93	86.84	0.190	2.23
58	9064	89	236.80	103.94	-236.46	-100.98	0.332	2.96
59	1317	659	-336.35	-107.09	337.13	115.54	0.771	8.46
60	1317	8605	187.05	131.91	-186.61	-127.04	0.443	4.87
61	8605	1367	291.14	87.88	-291.11	-87.53	0.035	0.35
62	8605	8921	495.47	191.71	-493.41	-173.28	2.059	18.43
63	1163	1676	124.40	64.68	-124.39	-64.60	0.008	0.08
64	1163	7051	-257.36	-120.27	257.55	122.65	0.193	2.38
65	913	7762	275.46	269.94	-274.80	-262.43	0.656	7.51
66	2107	7762	1561.20	428.89	-1550.13	-296.94	11.076	131.95
67	2107	5996	-671.37	-88.39	672.05	95.68	0.674	7.29
68	2107	6293	610.17	321.40	-602.92	-257.13	7.252	64.26
69	913	7762	292.54	279.79	-291.75	-271.92	0.784	7.87
70	6704	8921	-161.87	-89.69	161.94	90.52	0.070	0.82
71	228	4586	96.07	-1.73	-95.71	3.49	0.358	1.77
72	2441	6293	-241.84	-83.90	242.00	85.84	0.161	1.94
73	955	3506	-277.25	-107.08	277.25	107.28	0.000	0.19
74	955	8964	34.33	-20.36	-34.05	21.95	0.283	1.59
75	3506	2908	-35.90	-50.76	36.15	52.29	0.248	1.53
76	228	6826	4.36	-2.63	-4.33	2.86	0.024	0.23
77	228	5776	1.12	-0.86	-1.10	0.92	0.012	0.06
78	8964	6826	-19.37	-3.52	20.33	5.15	0.960	1.63
79	5776	6826	29.40	-21.58	-29.37	21.71	0.031	0.13
80	659	8329	336.91	165.29	-336.48	-161.46	0.427	3.83
81	659	7051	535.72	226.94	-532.00	-189.02	3.717	37.92
82	659	9239	-321.07	-273.06	321.17	274.09	0.095	1.03
83	659	7960	-321.09	-273.09	321.18	274.09	0.095	1.00
84	659	6233	-320.64	292.78	320.74	-291.85	0.101	0.93
85	659	5416	-962.47	199.72	969.28	-116.23	6.814	83.50
86	659	6798	-335.91	-354.16	336.06	355.84	0.149	1.68
87	792	3279	-271.94	-30.68	271.94	30.83	0.000	0.15
88	7563	792	-0.99	0.41	1.01	-0.33	0.021	0.08
89	7279	792	-4.88	4.33	4.94	-4.15	0.058	0.18
90	8335	792	-55.86	-0.08	56.31	3.66	0.458	3.58
91	2449	792	-7.08	16.95	7.25	-15.94	0.162	1.01
92	4665	792	-3.28	1.30	3.36	-1.05	0.078	0.25
93	4495	792	-2.83	0.82	2.87	-0.63	0.044	0.19
94	5416	2267	313.85	-82.67	-313.62	84.70	0.229	2.03
95	5416	7637	-1283.13	226.66	1297.43	-90.82	14.291	135.84
96	8964	2168	-255.41	-43.30	255.41	43.44	0.000	0.14
97	3659	5996	740.92	373.97	-739.81	-361.33	1.115	12.64

98	5762	5996	0.00	2.44	0.00	-2.44	0.000	0.00
99	3242	5097	6.08	29.54	-6.08	-29.54	-0.000	0.00
100	7563	3242	-73.75	4.00	74.77	0.58	1.013	4.58
101	4427	3242	-0.80	-0.20	0.80	0.24	0.005	0.05
102	3242	7279	22.42	8.59	-22.38	-8.22	0.045	0.37
103	271	3242	-0.41	-0.24	0.41	0.26	0.000	0.02
104	3242	1611	1.24	1.81	-1.24	-1.78	0.003	0.02
105	5097	1611	27.31	38.39	-27.23	-37.88	0.082	0.51
106	8181	8179	92.27	-22.55	-92.24	22.83	0.027	0.28
107	8181	7762	-316.17	-85.39	316.62	90.61	0.451	5.22
108	9025	7762	-244.82	-66.71	245.08	69.90	0.264	3.19
109	7563	4427	-1.31	1.34	1.32	-1.32	0.004	0.02
110	7563	7279	-137.82	21.89	139.41	-15.31	1.595	6.58
111	7563	8335	-1.59	3.38	1.60	-3.31	0.012	0.08
112	7563	5155	-1.06	1.42	1.06	-1.39	0.001	0.03
113	7563	271	-3.78	0.98	3.78	-0.85	0.003	0.13
114	2449	7563	1.37	0.67	-1.34	-0.59	0.029	0.09
115	4665	7563	1.48	-7.45	-1.48	7.48	0.006	0.03
116	4495	7563	0.40	-0.46	-0.40	0.47	0.002	0.01
117	7563	1611	-60.32	12.48	61.07	-9.04	0.751	3.43
118	4427	7279	-1.64	-0.23	1.65	0.30	0.012	0.07
119	4427	8335	0.03	0.15	-0.03	-0.14	0.000	0.00
120	4427	5155	-0.11	15.13	0.13	-15.03	0.013	0.10
121	4427	271	-52.42	5.50	52.59	-4.41	0.168	1.10
122	2449	4427	0.79	0.57	-0.77	-0.52	0.020	0.05
123	4665	4427	-0.67	0.53	0.67	-0.52	0.002	0.01
124	4495	4427	-1.28	7.02	1.28	-7.00	0.004	0.02
125	4427	1611	-0.99	-0.06	0.99	0.11	0.006	0.05
126	5210	1445	34.20	-2.44	-34.18	2.62	0.029	0.18
127	8179	5509	180.22	-14.49	-179.98	16.71	0.236	2.22
128	8179	7762	-233.71	-44.28	234.08	48.70	0.376	4.42
129	7279	4014	0.00	0.00	0.00	0.00	0.000	0.00
130	8335	7279	-139.49	-51.59	140.57	57.88	1.077	6.29
131	5155	7279	-1.10	-0.45	1.10	0.50	0.004	0.05
132	271	7279	-0.74	-0.43	0.74	0.45	0.002	0.02
133	2449	7279	0.94	5.79	-0.88	-5.59	0.054	0.20
134	4665	7279	-2.14	0.64	2.19	-0.55	0.047	0.10
135	4495	7279	-0.98	0.08	0.99	-0.04	0.012	0.04
136	1611	7279	5.77	-2.71	-5.76	2.77	0.008	0.06
137	5509	1579	-178.94	-72.07	179.26	75.32	0.320	3.25
138	8335	1531	-167.60	-6.51	167.60	6.57	0.000	0.06
139	5155	8335	0.00	0.03	-0.00	-0.03	0.000	0.00
140	2449	8335	29.92	41.15	-29.47	-37.87	0.446	3.28
141	4665	8335	-1.11	2.40	1.12	-2.36	0.010	0.04
142	4495	8335	0.00	1.42	0.00	-1.40	0.003	0.02
143	7762	2268	325.05	276.08	-323.87	-262.42	1.178	13.66
144	5155	271	-36.08	-10.80	36.14	11.61	0.060	0.81
145	5155	2908	5.15	21.96	-5.08	-21.68	0.063	0.28

146	4665	5155	-0.37	0.42	0.37	-0.42	0.000	0.01
147	4495	5155	-0.06	0.47	0.06	-0.46	0.000	0.00
148	5155	1611	-70.45	-15.89	70.84	19.41	0.393	3.51
149	271	2908	47.11	26.89	-46.67	-25.40	0.442	1.48
150	4665	271	-0.71	0.09	0.71	-0.06	0.000	0.02
151	4495	271	-0.61	0.19	0.61	-0.17	0.003	0.01
152	271	1611	-38.98	-8.79	39.10	9.87	0.116	1.08
153	1579	5848	-179.26	-58.10	179.40	59.34	0.137	1.24
154	7051	8847	274.45	88.71	-274.33	-87.32	0.118	1.40
155	5776	8229	0.00	0.00	0.00	0.00	0.000	0.00
156	317	6233	-383.34	-101.60	383.37	101.91	0.028	0.31
157	4665	2449	-32.56	-23.88	32.99	26.43	0.423	2.55
158	2449	4495	33.26	35.87	-32.91	-33.10	0.348	2.78
159	4665	4495	-24.76	10.25	24.81	-10.04	0.049	0.21
160	1611	8420	-423.41	-143.85	423.41	144.25	0.000	0.40
161	9024	6542	116.49	-8.26	-116.40	16.22	0.088	7.97
162	9024	6542	121.98	-16.11	-121.87	24.59	0.105	8.47
163	6069	9192	192.74	39.17	-192.53	-22.41	0.218	16.76
164	6069	1968	214.79	99.59	-214.50	-77.18	0.293	22.42
165	7829	1968	1.94	0.85	-1.92	-0.65	0.020	0.20
166	8574	2299	274.61	143.60	-274.17	-111.99	0.442	31.60
167	8574	5587	200.71	44.02	-200.51	-27.28	0.198	16.75
168	4929	1815	138.45	-2.00	-138.30	12.42	0.151	10.42
169	1815	792	0.39	0.19	-0.38	-0.18	0.002	0.01
170	6704	4586	161.65	90.38	-161.48	-76.47	0.166	13.91
171	2441	3506	241.60	85.02	-241.35	-55.92	0.254	29.10
172	1367	6826	290.92	85.92	-290.36	-48.09	0.555	37.83
173	1676	228	124.21	63.07	-124.09	-54.56	0.119	8.50
174	7829	6826	92.43	-24.14	-92.37	29.27	0.062	5.13
175	659	3279	272.55	63.97	-271.94	-30.83	0.607	33.15
176	5210	792	38.83	-2.56	-38.71	3.80	0.118	1.24
177	1445	792	60.08	-2.00	-60.01	3.59	0.073	1.59
178	7180	2168	264.41	71.64	-264.01	-41.96	0.400	29.68
179	6833	8964	276.51	199.16	-275.94	-157.12	0.562	42.04
180	3659	3242	402.73	199.25	-401.82	-123.32	0.907	75.93
181	8181	4427	223.69	114.72	-223.39	-88.77	0.295	25.94
182	9025	7563	244.60	69.87	-244.29	-41.66	0.316	28.20
183	2267	5210	480.29	143.46	-479.41	-60.19	0.885	83.28
184	5210	7279	5.12	-1.86	-5.06	2.18	0.062	0.32
185	5210	8335	39.47	2.89	-39.14	0.87	0.325	3.76
186	5210	2449	8.89	-8.03	-8.78	8.99	0.111	0.96
187	5210	4665	2.81	-0.98	-2.70	1.27	0.113	0.29
188	5210	4495	2.31	-0.45	-2.26	0.67	0.053	0.22
189	8179	7279	145.53	55.54	-145.38	-46.48	0.148	9.05
190	1445	7279	2.35	-1.01	-2.32	1.15	0.031	0.14
191	5509	8335	190.85	53.18	-190.64	-37.17	0.207	16.00
192	5509	1531	167.76	19.89	-167.60	-6.57	0.158	13.32
193	1445	8335	17.76	1.29	-17.62	0.31	0.138	1.60

194	7762	5155	281.21	176.23	-280.68	-135.64	0.531	40.58
195	7762	271	211.11	60.16	-210.86	-40.12	0.252	20.04
196	7829	5776	19.99	-6.75	-19.90	7.80	0.095	1.05
197	8329	1445	166.34	81.05	-166.10	-64.50	0.232	16.55
198	8329	1445	169.98	82.68	-169.73	-65.78	0.248	16.91
199	1445	2449	4.43	-4.70	-4.36	5.19	0.071	0.49
200	1445	4665	1.37	-0.43	-1.32	0.56	0.046	0.14
201	2268	2908	188.39	84.55	-188.20	-65.58	0.197	18.98
202	8847	5776	234.79	96.33	-234.44	-70.97	0.348	25.36
203	8847	8103	39.36	-9.94	-39.34	10.70	0.016	0.76
204	317	2449	383.29	99.56	-382.53	-39.95	0.753	59.61
205	7637	8581	-1297.75	97.62	1299.13	140.85	1.385	238.47
206	5848	7526	-179.70	-59.78	179.73	63.08	0.031	3.30
207	89	4495	236.26	105.58	-235.89	-79.90	0.374	25.68
208	2520	4665	253.65	81.93	-253.26	-54.66	0.395	27.27
209	5996	8420	424.61	221.60	-423.41	-144.25	1.198	77.35
210	2154	5996	357.14	-39.13	-357.03	50.90	0.107	11.77
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			Total:	96.843	1912.77			

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| Voltage Constraints |
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Bus #	Vmin mu	Vmin	|V|	Vmax	Vmax mu
2449	-	0.900	1.100	1.100	409.425

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=========
| Generation Constraints |
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Gen #	Bus #	Active Power Limits Pmin mu	Pmin	Pg	Pmax	Pmax mu
1	913	-	566.67	568.00	568.00	0.014
2	2107	-	500.00	1500.00	1500.00	0.004
3	2267	0.011	166.67	166.67	500.00	-
6	5097	-	7.08	21.23	21.23	0.007
9	7279	-	-908.93	100.00	100.00	0.013
11	8605	-	200.00	600.00	600.00	0.006

Gen #	Bus #	Reactive Power Limits Qmin mu	Qmin	Qg	Qmax	Qmax mu
2	2107	-	-257.62	661.89	661.90	0.001

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  3  2267      -      -78.83    228.16    228.16     0.024
  5  4586     0.005   -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      -      318.97    319.00    319.00     0.077  5587
  95   5416     2.083  1303.00   1303.00   1300.60      -     7637


Generator trip @2267:

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 0.24 seconds
Objective Function Value = 5837.31 $/hr
================================================================
|    System Summary                                            |
================================================================

How many?              How much?              P (MW)           Q (MVAr)
---------------------    -------------------  -------------  -----------------
Buses             89     Total Gen Capacity    8789.2       -1582.5 to 4520.1
Generators        12     On-line Capacity      8289.2       -1503.7 to 4291.9
Committed Gens    11     Generation (actual)   5837.3            2945.3
Loads             36     Load                  5727.9            1506.9
  Fixed           36       Fixed               5727.9            1506.9
  Dispatchable     0       Dispatchable          -0.0 of -0.0      -0.0
Shunts            44     Shunt (inj)            -5.5             557.9
Branches         210     Losses (I^2 * Z)       103.96           1996.37
Transformers      32     Branch Charging (inj)     -                0.0
Inter-ties        0      Total Inter-tie Flow      0.0              0.0
Areas             1

                     Minimum                      Maximum
                ------------------------  --------------------------------
Voltage Magnitude   0.934 p.u. @ bus 7180       1.100 p.u. @ bus 2449
Voltage Angle     -10.44 deg   @ bus 8964       24.53 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
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Lambda P -4.09 $/MWh @ bus 8581 1.05 $/MWh @ bus 8964
Lambda Q -0.15 $/MWh @ bus 2449 0.95 $/MWh @ bus 8581

Bus Data								
Bus #	Voltage Mag(pu)	Ang(deg)	Generation P (MW)	Q (MVAr)	Load P (MW)	Q (MVAr)	Lambda($/MVA-hr) P	Q
89	0.983	-1.907	-	-	-	-	1.021	0.000
228	1.045	-3.931	-	-	-23.43	57.40	1.003	-0.006
271	1.018	-6.245	-	-	96.70	26.80	1.021	0.002
317	1.078	3.448	-	-	-	-	1.000	-0.001
659	1.077	3.405	-	-	-	-	1.000	0.002
792	1.054	-3.490	-	-	295.30	41.90	1.006	-0.001
913	0.998	0.000*	567.99	337.61	-	-	1.015	-
955	0.970	-8.188	-	-	244.20	152.70	1.037	0.025
1037	1.079	2.339	-	-	-	-	1.004	0.001
1163	1.015	-0.463	-	-	-	-	1.012	0.001
1317	1.054	2.163	-	-	149.30	-2.00	1.004	0.001
1367	1.022	1.131	-	-	-	-	1.006	-
1445	1.057	-1.972	-	-	238.40	210.90	1.004	0.010
1531	1.017	-7.324	-	-	-	-	1.023	-0.009
1579	0.994	-1.737	-	-	-	-	1.019	-0.004
1611	1.024	-4.739	-	-	274.10	166.50	1.011	0.003
1616	0.988	-1.299	-	-	-	-	1.018	0.001
1676	1.015	-0.493	-	-	-	-	1.012	0.001
1815	1.082	-1.959	-	-	63.66	9.70	1.004	0.001
1968	0.991	-8.399	-	-	118.40	137.00	1.037	0.024
2107	1.012	3.901	1499.98	661.82	-	-	1.004	0.001
2154	1.009	6.341	-	-	-357.45	33.05	1.002	0.001
2168	0.985	-10.407	-	-	8.60	-1.48	1.053	0.023
2267	1.048	7.111	-	-	-	-	0.991	0.052
2268	0.964	-2.220	-	-	-	-	1.025	0.009
2299	1.029	-7.008	-	-	402.10	110.20	1.019	-0.007
2441	0.957	-1.431	-	-	-	-	1.028	0.017
2449	1.100	-5.300	-	-	301.90	-103.20	0.990	-0.148
2520	0.983	-2.010	-	-	-	-	1.021	-0.000
2870	1.079	2.339	-	-	-	-	1.004	0.001
2908	0.994	-7.479	-	-	203.80	61.00	1.032	0.014
3097	1.075	1.782	-	-	361.91	3.66	1.005	0.002
3242	1.034	-4.441	-	-	296.10	82.30	1.008	-0.000
3279	1.054	-3.457	-	-	-	-	1.006	-0.001
3493	1.029	-6.255	-	-	226.30	61.10	1.053	-0.002
3506	0.970	-8.151	-	-	-	-	1.037	0.025
3659	1.021	5.269	1092.23	489.62	-	-	1.000	-
4014	1.034	-5.196	-	-	-	-	1.013	-0.006
4423	1.029	-6.987	-	-	-	-	1.019	-0.007

4427	1.018	-7.492	-	-	296.80	77.70	1.032	-0.000
4495	1.025	-7.543	-	-	336.30	104.40	1.035	-0.012
4586	1.038	-5.070	28.67	-29.80	-	-	1.000	-0.009
4665	1.026	-8.008	-	-	390.50	62.50	1.030	-0.013
4929	1.079	2.339	-	-	37.00	8.70	1.004	0.001
5097	1.034	-4.442	21.22	-3.29	-	-	1.008	-0.000
5155	1.009	-7.462	-	-	411.30	168.00	1.031	0.005
5210	1.052	-1.837	-	-	347.61	74.37	1.004	0.018
5416	1.051	7.599	-	-	-	-	0.988	0.053
5509	0.986	-2.637	-	-	-	-	1.023	-0.003
5587	1.029	-6.217	-	-	-	-	0.976	-0.016
5762	1.013	4.511	-	-	-	-	1.002	0.001
5776	1.070	-6.002	-	-	222.70	80.50	1.010	-0.003
5848	0.997	-1.375	-	-	-	-	1.018	-0.004
5996	1.013	4.511	-	-	-	-	1.002	0.001
6069	0.939	-3.020	-	-	-456.66	550.00	1.033	0.020
6233	1.079	3.490	739.60	435.60	-	-	1.000	-
6293	0.960	-1.011	-	-	-	-	1.026	0.016
6542	1.094	-4.312	-	-	355.98	-147.98	1.019	-0.008
6704	0.996	-0.907	-	-	-	-	1.013	0.000
6798	1.081	3.538	379.12	429.55	-	-	1.000	0.002
6826	1.069	-6.211	-	-	326.90	-82.30	1.010	-0.004
6833	0.955	-3.962	-	-	0.00	-550.00	1.038	0.015
7051	1.024	-0.024	-	-	-	-	1.011	0.002
7180	0.934	-3.904	-	-	-	-	1.038	0.021
7279	1.034	-5.196	99.99	-6.62	-	-	1.013	-0.006
7526	1.003	-0.565	-	-	-179.73	-63.08	1.018	-0.005
7563	1.026	-8.133	-	-	531.70	-12.80	1.033	-0.005
7637	1.049	13.613	-	-	-	-	-3.749	0.927
7762	0.988	-0.817	-	-	-	-	1.018	0.002
7829	1.054	-3.175	-	-	-114.36	30.04	1.007	-0.002
7960	1.079	3.523	404.39	274.15	-	-	1.000	0.002
8103	1.014	-1.337	-	-	39.34	-10.70	1.012	0.002
8179	0.984	-1.896	-	-	-	-	1.020	-
8181	0.983	-1.720	-	-	-	-	1.020	0.001
8229	1.070	-6.002	-	-	-	-	1.010	-0.003
8329	1.070	2.902	-	-	-	-	1.002	0.004
8335	1.017	-7.345	-	-	637.92	139.57	1.023	-0.009
8420	1.025	-4.688	-	-	-	-	1.011	0.003
8574	0.992	-1.316	-	-	-	-	1.016	0.000
8581	1.053	24.530	-	-	-1299.13	-140.85	-4.088	0.953
8605	1.022	1.194	599.98	82.55	-	-	1.006	-
8847	1.022	-0.288	-	-	-	-	1.011	0.002
8921	0.999	-0.680	-	-	-	-	1.013	0.000
8964	0.985	-10.440	-	-	925.91	147.97	1.053	0.023
9024	1.083	-0.455	-	-	-	-	1.015	-0.003
9025	0.984	-1.532	-	-	-	-	1.021	0.002
9064	0.988	-1.302	-	-	-	-	1.018	0.001

9192	0.992	-8.145	-	-	17.92	23.30	1.036	0.024
9239	1.079	3.527	404.13	274.15	-	-	1.000	0.002
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		Total:	5837.31	2945.33	5727.89	1506.87		

Branch Data

Brnch #	From Bus	To Bus	From Bus Injection P (MW)	From Bus Injection Q (MVAr)	To Bus Injection P (MW)	To Bus Injection Q (MVAr)	Loss (I^2 * Z) P (MW)	Loss (I^2 * Z) Q (MVAr)
1	3097	659	-361.91	7.19	362.74	3.08	0.828	10.26
2	9024	4929	-244.29	47.39	245.30	-35.28	1.013	12.11
3	1815	6542	73.19	-38.08	-72.36	41.51	0.832	3.43
4	6542	1445	-39.69	72.10	41.17	-68.05	1.475	4.05
5	6069	6833	276.25	-349.84	-275.03	360.32	1.217	10.48
6	6069	2268	-134.38	-195.32	135.18	202.49	0.803	7.17
7	6069	7180	263.10	71.01	-262.70	-66.57	0.404	4.44
8	6069	6293	-352.27	-175.74	353.71	192.23	1.441	16.49
9	1968	9192	-124.86	-7.68	124.90	8.24	0.045	0.56
10	1968	3493	-0.97	-0.67	0.98	0.74	0.010	0.06
11	1968	955	1.11	22.73	-1.00	-22.25	0.106	0.48
12	1968	228	-1.82	-0.73	1.86	0.92	0.033	0.19
13	1968	6826	-64.58	-66.65	66.86	74.49	2.279	7.84
14	1968	8964	290.42	-9.53	-288.16	19.75	2.261	10.22
15	1968	5776	-3.29	-2.73	3.43	3.09	0.135	0.36
16	9192	955	1.17	3.63	-1.14	-3.55	0.023	0.08
17	9192	6826	-9.19	-10.42	9.52	11.56	0.331	1.14
18	9192	8964	55.93	-5.05	-55.32	7.24	0.616	2.19
19	8574	1616	2.06	95.79	-2.03	-95.43	0.036	0.36
20	8574	1163	-147.74	-190.38	148.30	197.09	0.567	6.72
21	8574	9064	4.64	107.62	-4.59	-107.23	0.044	0.38
22	8574	8921	-340.18	-182.04	340.62	187.17	0.439	5.13
23	3493	2299	8.72	-0.66	-8.72	0.77	0.007	0.11
24	2299	4423	-179.01	-18.50	179.01	18.57	-0.000	0.07
25	6826	2299	0.24	0.59	-0.24	-0.57	0.001	0.03
26	7563	2299	-1.88	0.20	1.89	-0.16	0.008	0.04
27	4427	2299	-6.03	-3.91	6.06	4.01	0.030	0.09
28	8335	2299	-0.23	-0.17	0.23	0.18	0.002	0.00
29	5155	2299	-0.89	-1.81	0.89	1.86	0.003	0.04
30	271	2299	11.93	-16.06	-11.84	16.40	0.088	0.33
31	2449	2299	1.28	1.18	-1.23	-1.07	0.050	0.11
32	4665	2299	-62.63	4.99	62.86	-3.90	0.231	1.08
33	4495	2299	-3.88	-1.01	3.88	1.05	0.004	0.04
34	3493	5587	-313.58	-58.36	313.58	58.57	0.000	0.21
35	4586	3493	6.61	2.88	-6.60	-2.72	0.003	0.16
36	228	3493	45.04	6.38	-44.54	-4.48	0.492	1.90
37	6826	3493	0.58	4.94	-0.56	-4.75	0.018	0.19

38	7563	3493	-1.78	0.33	1.79	-0.27	0.014	0.06
39	4427	3493	-15.05	-0.70	15.18	1.03	0.136	0.34
40	8335	3493	-0.43	-0.02	0.44	0.03	0.005	0.01
41	5155	3493	-30.51	-16.19	30.75	17.15	0.237	0.97
42	271	3493	-0.03	-0.62	0.03	0.62	0.000	0.01
43	5776	3493	0.43	1.38	-0.42	-1.33	0.011	0.05
44	2449	3493	0.86	1.26	-0.82	-1.16	0.036	0.10
45	4665	3493	-3.67	0.91	3.71	-0.80	0.034	0.11
46	4495	3493	-78.20	7.90	78.61	-6.16	0.414	1.74
47	5587	4586	-110.36	-30.37	110.74	32.87	0.377	2.50
48	4423	4586	-179.01	-18.22	179.90	24.41	0.890	6.20
49	4929	2870	0.00	-0.72	0.00	0.72	0.000	0.00
50	4929	659	-196.00	36.13	196.30	-32.42	0.297	3.71
51	4929	1037	0.00	-0.64	-0.00	0.64	0.000	0.00
52	4929	659	-229.08	47.60	229.53	-43.25	0.447	4.34
53	1815	5210	0.15	1.19	-0.14	-1.16	0.007	0.03
54	1815	1445	5.10	19.67	-4.98	-19.21	0.113	0.45
55	1616	7762	-251.42	35.71	251.71	-33.60	0.291	2.11
56	1616	2520	253.45	73.82	-253.12	-70.33	0.328	3.49
57	9064	7762	-232.16	26.23	232.33	-24.27	0.168	1.97
58	9064	89	236.75	95.90	-236.41	-92.87	0.341	3.03
59	1317	659	-356.23	-288.37	357.51	302.47	1.285	14.10
60	1317	8605	206.93	313.45	-205.75	-300.48	1.181	12.97
61	8605	1367	295.28	95.11	-295.24	-94.74	0.037	0.37
62	8605	8921	510.45	287.93	-507.89	-264.98	2.564	22.95
63	1163	1676	131.20	86.95	-131.20	-86.84	0.010	0.10
64	1163	7051	-279.51	-267.51	279.87	272.00	0.363	4.49
65	913	7762	276.10	166.44	-275.61	-160.83	0.490	5.61
66	2107	7762	1532.37	374.19	-1521.19	-241.04	11.177	133.15
67	2107	5996	-633.32	-25.17	633.95	31.96	0.628	6.79
68	2107	6293	600.93	312.80	-593.49	-246.88	7.440	65.93
69	913	7762	291.89	171.16	-291.31	-165.28	0.586	5.88
70	6704	8921	-167.19	-93.24	167.27	94.15	0.078	0.92
71	228	4586	102.20	13.62	-101.77	-11.51	0.427	2.11
72	2441	6293	-239.61	-83.65	239.78	85.68	0.169	2.03
73	955	3506	-275.86	-106.86	275.86	107.07	0.000	0.21
74	955	8964	33.81	-20.04	-33.52	21.69	0.294	1.65
75	3506	2908	-36.74	-52.34	37.02	54.07	0.281	1.74
76	228	6826	4.17	-2.87	-4.14	3.11	0.025	0.23
77	228	5776	1.03	-0.99	-1.02	1.05	0.013	0.06
78	8964	6826	-21.22	-5.77	22.50	7.95	1.281	2.17
79	5776	6826	35.61	-3.40	-35.57	3.53	0.031	0.13
80	659	8329	354.57	204.79	-354.08	-200.38	0.491	4.41
81	659	7051	566.52	415.80	-561.28	-362.38	5.235	53.42
82	659	9239	-404.01	-272.82	404.13	274.15	0.123	1.33
83	659	7960	-404.27	-272.86	404.39	274.15	0.123	1.29
84	659	6233	-340.88	-274.87	340.98	275.78	0.099	0.91
85	659	5416	-823.68	388.15	829.33	-318.98	5.645	69.17

86	659	6798	-378.92	-427.33	379.12	429.55	0.197	2.22
87	792	3279	-283.73	-58.21	283.73	58.38	0.000	0.17
88	7563	792	-1.16	-0.01	1.19	0.11	0.027	0.10
89	7279	792	-7.30	-1.79	7.38	2.05	0.081	0.25
90	8335	792	-60.94	-20.99	61.57	25.96	0.635	4.97
91	2449	792	-7.64	15.28	7.78	-14.41	0.140	0.88
92	4665	792	-3.86	0.08	3.95	0.23	0.098	0.31
93	4495	792	-3.27	-0.35	3.33	0.60	0.058	0.25
94	5416	2267	453.81	120.09	-453.33	-115.84	0.479	4.25
95	5416	7637	-1283.13	226.66	1297.43	-90.82	14.291	135.84
96	8964	2168	-253.47	-40.40	253.47	40.55	0.000	0.15
97	3659	5996	696.91	300.02	-695.91	-288.74	0.995	11.28
98	5762	5996	0.00	2.29	0.00	-2.29	0.000	0.00
99	3242	5097	4.98	36.38	-4.98	-36.38	0.000	0.00
100	7563	3242	-70.98	9.77	71.99	-5.22	1.008	4.55
101	4427	3242	-0.77	-0.11	0.77	0.16	0.005	0.04
102	3242	7279	18.96	-2.93	-18.93	3.18	0.030	0.25
103	271	3242	-0.40	-0.18	0.40	0.20	0.000	0.02
104	3242	1611	1.19	1.56	-1.19	-1.54	0.003	0.02
105	5097	1611	26.19	33.08	-26.12	-32.65	0.070	0.44
106	8181	8179	90.02	-37.17	-89.98	37.49	0.030	0.31
107	8181	7762	-312.97	-64.59	313.42	69.85	0.454	5.26
108	9025	7762	-243.70	-61.60	243.97	64.91	0.274	3.32
109	7563	4427	-1.33	1.28	1.33	-1.25	0.004	0.02
110	7563	7279	-140.79	15.77	142.52	-8.60	1.738	7.17
111	7563	8335	-2.07	2.00	2.08	-1.96	0.008	0.05
112	7563	5155	-1.02	1.55	1.02	-1.51	0.001	0.04
113	7563	271	-3.73	1.10	3.73	-0.97	0.003	0.13
114	2449	7563	1.67	1.29	-1.62	-1.12	0.055	0.16
115	4665	7563	3.53	-0.40	-3.53	0.41	0.001	0.01
116	4495	7563	0.51	-0.23	-0.50	0.24	0.002	0.01
117	7563	1611	-58.14	16.56	58.91	-13.06	0.765	3.50
118	4427	7279	-1.67	-0.31	1.69	0.38	0.013	0.07
119	4427	8335	-0.03	0.04	0.03	-0.04	0.000	0.00
120	4427	5155	1.40	19.09	-1.38	-18.92	0.023	0.17
121	4427	271	-50.84	9.10	51.01	-7.99	0.171	1.11
122	2449	4427	1.00	0.96	-0.96	-0.86	0.041	0.11
123	4665	4427	-0.56	0.84	0.56	-0.83	0.003	0.01
124	4495	4427	1.38	16.57	-1.36	-16.46	0.024	0.11
125	4427	1611	-0.95	0.03	0.96	0.02	0.006	0.05
126	5210	1445	10.30	-31.66	-10.28	31.83	0.027	0.17
127	8179	5509	176.63	-39.28	-176.38	41.62	0.250	2.35
128	8179	7762	-230.98	-25.50	231.36	29.96	0.379	4.46
129	7279	4014	0.00	0.00	0.00	0.00	0.000	0.00
130	8335	7279	-134.43	-33.38	135.40	39.06	0.973	5.69
131	5155	7279	-1.13	-0.55	1.14	0.61	0.005	0.06
132	271	7279	-0.79	-0.57	0.79	0.59	0.002	0.02
133	2449	7279	2.22	9.45	-2.07	-8.89	0.148	0.56

134	4665	7279	-2.11	0.73	2.16	-0.63	0.050	0.10
135	4495	7279	-0.97	0.13	0.98	-0.09	0.013	0.04
136	1611	7279	4.27	-6.98	-4.26	7.08	0.014	0.10
137	5509	1579	-178.93	-70.84	179.27	74.25	0.335	3.41
138	8335	1531	-165.93	5.70	165.93	-5.64	0.000	0.06
139	5155	8335	-0.05	-0.09	0.05	0.09	0.000	0.00
140	2449	8335	33.58	55.66	-32.85	-50.31	0.728	5.36
141	4665	8335	-1.40	1.87	1.41	-1.84	0.008	0.03
142	4495	8335	-0.20	1.03	0.20	-1.02	0.002	0.01
143	7762	2268	324.19	279.19	-322.94	-264.62	1.256	14.57
144	5155	271	-36.10	-11.30	36.16	12.17	0.064	0.87
145	5155	2908	5.90	23.81	-5.83	-23.46	0.080	0.35
146	4665	5155	-0.34	0.65	0.34	-0.63	0.000	0.01
147	4495	5155	-0.00	0.75	0.00	-0.74	0.001	0.01
148	5155	1611	-68.77	-11.82	69.16	15.31	0.390	3.48
149	271	2908	48.13	29.43	-47.62	-27.73	0.507	1.70
150	4665	271	-0.69	0.21	0.69	-0.19	0.000	0.02
151	4495	271	-0.56	0.34	0.56	-0.32	0.003	0.02
152	271	1611	-37.42	-4.35	37.53	5.37	0.109	1.02
153	1579	5848	-179.27	-57.89	179.41	59.19	0.144	1.30
154	7051	8847	281.41	112.61	-281.28	-111.05	0.131	1.55
155	5776	8229	0.00	0.00	0.00	0.00	0.000	0.00
156	317	6233	-398.59	-159.47	398.62	159.82	0.032	0.35
157	4665	2449	-36.95	-36.82	37.69	41.29	0.740	4.47
158	2449	4495	38.24	54.35	-37.60	-49.23	0.642	5.12
159	4665	4495	-24.68	9.64	24.73	-9.43	0.050	0.21
160	1611	8420	-417.61	-132.37	417.61	132.78	0.000	0.41
161	9024	6542	119.25	-4.91	-119.16	12.98	0.089	8.07
162	9024	6542	124.87	-12.84	-124.77	21.39	0.106	8.55
163	6069	9192	190.96	37.19	-190.73	-19.70	0.228	17.49
164	6069	1968	212.75	93.89	-212.45	-70.81	0.301	23.08
165	7829	1968	1.98	1.17	-1.96	-0.93	0.025	0.24
166	8574	2299	277.35	143.80	-276.88	-110.26	0.469	33.54
167	8574	5587	203.43	45.86	-203.22	-27.85	0.213	18.01
168	4929	1815	142.70	3.50	-142.55	7.21	0.155	10.70
169	1815	792	0.45	0.31	-0.45	-0.29	0.004	0.02
170	6704	4586	166.98	93.90	-166.80	-78.45	0.185	15.45
171	2441	3506	239.39	84.70	-239.12	-54.17	0.266	30.53
172	1367	6826	295.06	93.16	-294.47	-52.89	0.591	40.28
173	1676	228	131.02	85.34	-130.87	-74.46	0.152	10.88
174	7829	6826	92.48	-23.74	-92.41	29.02	0.064	5.28
175	659	3279	284.40	95.10	-283.73	-58.38	0.672	36.72
176	5210	792	35.21	-4.68	-35.12	5.70	0.097	1.02
177	1445	792	61.30	5.28	-61.22	-3.65	0.075	1.64
178	7180	2168	262.49	70.25	-262.07	-39.07	0.420	31.18
179	6833	8964	274.81	194.09	-274.23	-150.47	0.584	43.62
180	3659	3242	395.32	189.60	-394.40	-112.45	0.922	77.16
181	8181	4427	222.75	108.17	-222.45	-81.53	0.303	26.63

182	9025	7563	243.50	64.58	-243.17	-35.27	0.328	29.31
183	2267	5210	453.33	115.84	-452.55	-42.67	0.778	73.17
184	5210	7279	5.46	0.70	-5.40	-0.37	0.063	0.33
185	5210	8335	39.94	12.68	-39.58	-8.49	0.362	4.19
186	5210	2449	8.62	-7.50	-8.52	8.37	0.101	0.87
187	5210	4665	3.09	-0.26	-2.97	0.58	0.122	0.32
188	5210	4495	2.45	0.18	-2.40	0.06	0.057	0.24
189	8179	7279	144.15	45.84	-144.00	-36.81	0.148	9.02
190	1445	7279	2.77	0.51	-2.73	-0.34	0.037	0.16
191	5509	8335	188.92	38.07	-188.71	-22.12	0.206	15.95
192	5509	1531	166.09	7.95	-165.93	5.64	0.161	13.59
193	1445	8335	18.77	7.01	-18.60	-5.02	0.171	1.99
194	7762	5155	280.29	170.25	-279.74	-128.25	0.550	42.00
195	7762	271	210.53	58.16	-210.27	-37.14	0.264	21.02
196	7829	5776	19.90	-7.47	-19.80	8.57	0.099	1.10
197	8329	1445	175.03	100.34	-174.76	-81.31	0.266	19.03
198	8329	1445	178.88	102.39	-178.59	-82.95	0.285	19.44
199	1445	2449	4.64	-4.01	-4.58	4.45	0.063	0.44
200	1445	4665	1.57	0.00	-1.52	0.16	0.054	0.16
201	2268	2908	187.58	83.21	-187.38	-63.29	0.207	19.92
202	8847	5776	241.74	120.07	-241.34	-91.19	0.397	28.88
203	8847	8103	39.36	-9.93	-39.34	10.70	0.016	0.77
204	317	2449	398.54	157.35	-397.69	-90.33	0.847	67.02
205	7637	8581	-1297.75	97.62	1299.13	140.85	1.385	238.47
206	5848	7526	-179.70	-59.61	179.73	63.08	0.032	3.47
207	89	4495	236.22	97.24	-235.84	-70.93	0.383	26.31
208	2520	4665	253.07	74.01	-252.66	-45.93	0.406	28.08
209	5996	8420	418.83	211.91	-417.61	-132.78	1.226	79.13
210	2154	5996	357.15	-38.76	-357.04	51.30	0.114	12.54
						--------	--------	
					Total:	103.962	1996.37	

==
| Voltage Constraints |
==

Bus #	Vmin mu	Vmin	|V|	Vmax	Vmax mu
2449	-	0.900	1.100	1.100	706.932

==
| Generation Constraints |
==

Gen #	Bus #	Active Power Limits Pmin mu	Pmin	Pg	Pmax	Pmax mu
1	913	-	566.67	567.99	568.00	0.015
2	2107	-	500.00	1499.98	1500.00	0.004
6	5097	-	7.08	21.22	21.23	0.008

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  9  7279      -     -908.93     99.99    100.00     0.013
 11  8605      -      200.00    599.98    600.00     0.006

 Gen   Bus                Reactive Power Limits
  #     #     Qmin mu     Qmin       Qg       Qmax    Qmax mu
----  -----   -------   --------  --------  --------  -------
  2  2107      -     -257.62    661.82    661.90     0.001
  5  4586     0.009   -29.81    -29.80     92.96      -
  8  6798      -     -183.48    429.55    429.61     0.002
  9  7279     0.006    -6.64     -6.62     14.78      -
 10  7960      -      -93.22    274.15    274.20     0.002
 12  9239      -      -93.22    274.15    274.20     0.002

================================================================
|    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     0.078  5587
  95   5416     4.707  1303.00   1303.00   1300.60      -     7637


Reactive LAA@7180 by 220MVAr:

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 = 5843.26 $/hr
================================================================
|    System Summary                                            |
================================================================

How many?              How much?             P (MW)          Q (MVAr)
---------------------    -------------------  -------------  -----------------
Buses             89     Total Gen Capacity    8789.2       -1582.5 to 4520.1
Generators        12     On-line Capacity      8289.2       -1503.7 to 4291.9
Committed Gens    11     Generation (actual)   5843.3            3226.2
Loads             37     Load                  5727.9            1726.9
  Fixed           37       Fixed               5727.9            1726.9
  Dispatchable     0       Dispatchable          -0.0 of -0.0      -0.0
Shunts            44     Shunt (inj)             -5.4             554.7
Branches         210     Losses (I^2 * Z)       109.95           2054.00
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 7180	1.100 p.u. @ bus 2449
Voltage Angle	-10.63 deg @ bus 8964	24.60 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	-5.13 $/MWh @ bus 8581	1.06 $/MWh @ bus 8964
Lambda Q	-0.18 $/MWh @ bus 2449	1.15 $/MWh @ bus 8581

Bus Data								
Bus #	Voltage Mag(pu)	Ang(deg)	Generation P (MW)	Q (MVAr)	Load P (MW)	Q (MVAr)	Lambda($/MVA-hr) P	Q
89	0.983	-1.893	-	-	-	-	1.021	-
228	1.044	-3.939	-	-	-23.43	57.40	1.003	-0.008
271	1.016	-6.256	-	-	96.70	26.80	1.021	0.002
317	1.078	3.512	-	-	-	-	1.000	-0.001
659	1.077	3.474	-	-	-	-	1.000	0.003
792	1.054	-3.432	-	-	295.30	41.90	1.006	-0.003
913	1.001	0.000*	568.00	430.00	-	-	1.015	-
955	0.954	-8.274	-	-	244.20	152.70	1.040	0.036
1037	1.079	2.408	-	-	-	-	1.004	0.001
1163	1.015	-0.436	-	-	-	-	1.012	0.002
1317	1.055	2.211	-	-	149.30	-2.00	1.004	0.001
1367	1.023	1.148	-	-	-	-	1.006	-
1445	1.057	-1.909	-	-	238.40	210.90	1.004	0.010
1531	1.017	-7.295	-	-	-	-	1.022	-0.013
1579	0.994	-1.719	-	-	-	-	1.019	-0.005
1611	1.026	-4.729	-	-	274.10	166.50	1.011	0.002
1616	0.988	-1.284	-	-	-	-	1.018	0.001
1676	1.014	-0.466	-	-	-	-	1.012	0.002
1815	1.082	-1.892	-	-	63.66	9.70	1.004	0.001
1968	0.968	-8.496	-	-	118.40	137.00	1.042	0.038
2107	1.014	3.904	1500.00	661.90	-	-	1.004	0.002
2154	1.014	6.306	-	-	-357.45	33.05	1.002	0.002
2168	0.960	-10.595	-	-	8.60	-1.48	1.061	0.040
2267	1.048	7.178	-	-	-	-	0.991	0.060
2268	0.955	-2.168	-	-	-	-	1.026	0.015
2299	1.029	-7.015	-	-	402.10	110.20	1.019	-0.009
2441	0.944	-1.335	-	-	-	-	1.029	0.026
2449	1.100	-5.258	-	-	301.90	-103.20	0.985	-0.183
2520	0.983	-1.995	-	-	-	-	1.021	-0.001
2870	1.079	2.408	-	-	-	-	1.004	0.001

2908	0.986	-7.498	-	-	203.80	61.00	1.034	0.019
3097	1.075	1.850	-	-	361.91	3.66	1.005	0.003
3242	1.037	-4.430	-	-	296.10	82.30	1.007	-0.002
3279	1.054	-3.399	-	-	-	-	1.006	-0.003
3493	1.028	-6.264	-	-	226.30	61.10	1.053	-0.004
3506	0.955	-8.235	-	-	-	-	1.040	0.035
3659	1.028	5.224	1090.23	646.49	-	-	1.000	-
4014	1.035	-5.175	-	-	-	-	1.013	-0.009
4423	1.029	-6.994	-	-	-	-	1.019	-0.009
4427	1.017	-7.495	-	-	296.80	77.70	1.032	-0.001
4495	1.025	-7.540	-	-	336.30	104.40	1.034	-0.016
4586	1.038	-5.093	23.29	-29.81	-	-	1.000	-0.011
4665	1.026	-8.002	-	-	390.50	62.50	1.029	-0.017
4929	1.079	2.408	-	-	37.00	8.70	1.004	0.001
5097	1.037	-4.431	21.23	-4.11	-	-	1.007	-0.002
5155	1.008	-7.474	-	-	411.30	168.00	1.031	0.005
5210	1.053	-1.776	-	-	347.61	74.37	1.005	0.020
5416	1.051	7.666	-	-	-	-	0.988	0.062
5509	0.986	-2.619	-	-	-	-	1.022	-0.004
5587	1.028	-6.226	-	-	-	-	0.976	-0.018
5762	1.018	4.493	-	-	-	-	1.002	0.002
5776	1.064	-6.081	-	-	222.70	80.50	1.010	-0.002
5848	0.997	-1.357	-	-	-	-	1.018	-0.006
5996	1.018	4.493	-	-	-	-	1.002	0.002
6069	0.917	-2.899	-	-	-456.66	550.00	1.035	0.033
6233	1.079	3.554	725.39	434.58	-	-	1.000	-
6293	0.947	-0.905	-	-	-	-	1.027	0.025
6542	1.094	-4.246	-	-	355.98	-147.98	1.020	-0.008
6704	0.997	-0.894	-	-	-	-	1.013	-
6798	1.081	3.601	366.00	429.61	-	-	1.000	0.002
6826	1.063	-6.299	-	-	326.90	-82.30	1.010	-0.002
6833	0.933	-3.880	-	-	0.00	-550.00	1.041	0.028
7051	1.023	0.008	-	-	-	-	1.011	0.002
7180	0.900	-3.761	-	-	0.00	220.00	1.041	0.040
7279	1.035	-5.175	100.00	-6.64	-	-	1.013	-0.009
7526	1.003	-0.547	-	-	-179.73	-63.08	1.018	-0.006
7563	1.027	-8.112	-	-	531.70	-12.80	1.032	-0.007
7637	1.049	13.680	-	-	-	-	-4.722	1.116
7762	0.988	-0.802	-	-	-	-	1.018	0.002
7829	1.047	-3.224	-	-	-114.36	30.04	1.007	-0.001
7960	1.079	3.598	424.72	274.20	-	-	1.000	0.002
8103	1.013	-1.309	-	-	39.34	-10.70	1.012	0.002
8179	0.984	-1.880	-	-	-	-	1.020	-0.000
8181	0.983	-1.705	-	-	-	-	1.020	0.001
8229	1.064	-6.081	-	-	-	-	1.010	-0.002
8329	1.070	2.970	-	-	-	-	1.002	0.004
8335	1.017	-7.316	-	-	637.92	139.57	1.022	-0.013
8420	1.026	-4.679	-	-	-	-	1.011	0.002

8574	0.992	-1.301	-	-	-	-	1.016	-	
8581	1.053	24.598	-	-	-1299.13	-140.85	-5.130	1.146	
8605	1.023	1.211	600.00	115.73	-	-	1.006	-	
8847	1.021	-0.258	-	-	-	-	1.011	0.002	
8921	0.999	-0.665	-	-	-	-	1.013	0.000	
8964	0.960	-10.630	-	-	925.91	147.97	1.061	0.040	
9024	1.083	-0.388	-	-	-	-	1.015	-0.003	
9025	0.984	-1.517	-	-	-	-	1.021	0.002	
9064	0.988	-1.287	-	-	-	-	1.018	0.001	
9192	0.969	-8.232	-	-	17.92	23.30	1.041	0.038	
9239	1.079	3.602	424.40	274.20	-	-	1.000	0.002	
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		Total:	5843.26	3226.15	5727.89	1726.87			

Branch Data

Brnch #	From Bus	To Bus	From Bus Injection P (MW)	From Bus Injection Q (MVAr)	To Bus Injection P (MW)	To Bus Injection Q (MVAr)	Loss (I^2 * Z) P (MW)	Loss (I^2 * Z) Q (MVAr)
1	3097	659	-361.91	7.19	362.74	3.08	0.828	10.26
2	9024	4929	-244.36	47.44	245.38	-35.32	1.013	12.12
3	1815	6542	73.20	-38.09	-72.36	41.52	0.832	3.43
4	6542	1445	-39.61	72.04	41.09	-67.99	1.471	4.05
5	6069	6833	274.13	-350.83	-272.85	361.80	1.274	10.97
6	6069	2268	-133.08	-299.60	134.69	313.98	1.611	14.38
7	6069	7180	259.74	268.26	-258.95	-259.52	0.796	8.74
8	6069	6293	-344.88	-261.39	346.70	282.29	1.827	20.90
9	1968	9192	-123.72	-5.48	123.76	6.05	0.046	0.57
10	1968	3493	-1.05	-1.13	1.07	1.24	0.018	0.11
11	1968	955	-0.64	14.90	0.69	-14.68	0.048	0.22
12	1968	228	-1.89	-1.15	1.93	1.39	0.044	0.25
13	1968	6826	-67.74	-81.44	70.85	92.15	3.111	10.71
14	1968	8964	292.84	7.08	-290.43	3.80	2.407	10.88
15	1968	5776	-3.50	-3.42	3.69	3.91	0.185	0.50
16	9192	955	0.80	2.35	-0.78	-2.31	0.010	0.04
17	9192	6826	-9.68	-12.72	10.14	14.29	0.459	1.58
18	9192	8964	56.42	-2.31	-55.77	4.63	0.653	2.32
19	8574	1616	2.09	95.36	-2.05	-95.01	0.036	0.36
20	8574	1163	-149.00	-184.71	149.55	191.22	0.550	6.51
21	8574	9064	4.75	107.42	-4.71	-107.04	0.043	0.38
22	8574	8921	-340.98	-189.84	341.43	195.08	0.449	5.25
23	3493	2299	8.68	-0.77	-8.67	0.88	0.007	0.11
24	2299	4423	-177.36	-18.31	177.36	18.38	-0.000	0.07
25	6826	2299	0.21	0.50	-0.21	-0.48	0.001	0.02
26	7563	2299	-1.81	0.29	1.82	-0.25	0.008	0.03
27	4427	2299	-6.05	-4.10	6.08	4.20	0.031	0.10
28	8335	2299	-0.21	-0.17	0.21	0.17	0.001	0.00

29	5155	2299	-0.90	-1.92	0.91	1.96	0.003	0.05
30	271	2299	11.49	-17.25	-11.39	17.61	0.094	0.36
31	2449	2299	1.30	1.18	-1.25	-1.07	0.051	0.11
32	4665	2299	-61.59	5.76	61.81	-4.71	0.224	1.05
33	4495	2299	-3.81	-0.99	3.81	1.03	0.004	0.04
34	3493	5587	-313.22	-60.21	313.22	60.43	0.000	0.21
35	4586	3493	6.52	2.90	-6.52	-2.74	0.003	0.16
36	228	3493	44.97	6.27	-44.48	-4.37	0.491	1.90
37	6826	3493	0.33	4.21	-0.32	-4.07	0.013	0.14
38	7563	3493	-1.74	0.39	1.75	-0.33	0.013	0.06
39	4427	3493	-15.01	-0.83	15.15	1.16	0.136	0.33
40	8335	3493	-0.41	-0.02	0.42	0.02	0.004	0.01
41	5155	3493	-30.77	-17.23	31.01	18.24	0.248	1.01
42	271	3493	-0.03	-0.67	0.04	0.68	0.000	0.01
43	5776	3493	0.35	1.21	-0.34	-1.17	0.008	0.04
44	2449	3493	0.88	1.26	-0.84	-1.16	0.037	0.10
45	4665	3493	-3.62	0.95	3.66	-0.84	0.033	0.11
46	4495	3493	-77.24	8.47	77.65	-6.77	0.405	1.70
47	5587	4586	-109.08	-30.97	109.45	33.42	0.371	2.46
48	4423	4586	-177.36	-18.03	178.23	24.11	0.874	6.09
49	4929	2870	0.00	-0.72	-0.00	0.72	0.000	0.00
50	4929	659	-196.06	36.16	196.36	-32.45	0.297	3.71
51	4929	1037	0.00	-0.64	0.00	0.64	0.000	0.00
52	4929	659	-229.16	47.64	229.60	-43.29	0.447	4.35
53	1815	5210	0.15	1.19	-0.14	-1.16	0.007	0.03
54	1815	1445	5.15	19.64	-5.03	-19.18	0.113	0.45
55	1616	7762	-251.72	34.90	252.01	-32.79	0.291	2.12
56	1616	2520	253.77	74.21	-253.44	-70.71	0.329	3.50
57	9064	7762	-232.46	25.20	232.63	-23.23	0.168	1.97
58	9064	89	237.17	96.75	-236.82	-93.70	0.343	3.05
59	1317	659	-361.43	-281.86	362.71	295.95	1.284	14.09
60	1317	8605	212.13	306.96	-210.96	-294.17	1.164	12.79
61	8605	1367	298.20	111.73	-298.16	-111.34	0.039	0.39
62	8605	8921	512.76	298.17	-510.14	-274.71	2.622	23.46
63	1163	1676	132.38	87.06	-132.37	-86.95	0.010	0.10
64	1163	7051	-281.92	-261.76	282.28	266.21	0.359	4.44
65	913	7762	275.82	211.52	-275.26	-205.03	0.567	6.49
66	2107	7762	1533.98	406.90	-1522.71	-272.61	11.272	134.29
67	2107	5996	-628.14	-160.83	628.79	167.91	0.654	7.08
68	2107	6293	594.15	415.83	-585.66	-340.56	8.494	75.27
69	913	7762	292.18	218.48	-291.50	-211.67	0.678	6.80
70	6704	8921	-168.64	-95.04	168.71	95.98	0.079	0.94
71	228	4586	103.11	12.48	-102.68	-10.33	0.434	2.14
72	2441	6293	-238.78	-86.37	238.95	88.46	0.174	2.09
73	955	3506	-279.62	-124.65	279.62	124.87	-0.000	0.23
74	955	8964	35.52	-11.06	-35.25	12.59	0.272	1.53
75	3506	2908	-41.33	-68.36	41.79	71.16	0.452	2.80
76	228	6826	4.36	-2.28	-4.33	2.50	0.024	0.22

77	228	5776	1.10	-0.85	-1.09	0.91	0.012	0.06
78	8964	6826	-22.69	-8.50	24.33	11.28	1.637	2.78
79	5776	6826	38.64	4.43	-38.60	-4.28	0.037	0.15
80	659	8329	354.97	204.65	-354.48	-200.24	0.492	4.41
81	659	7051	572.28	421.79	-566.92	-367.12	5.358	54.67
82	659	9239	-424.27	-272.77	424.40	274.20	0.132	1.43
83	659	7960	-424.59	-272.82	424.72	274.20	0.132	1.38
84	659	6233	-325.67	-273.81	325.76	274.67	0.094	0.86
85	659	5416	-823.38	388.03	829.02	-318.90	5.641	69.13
86	659	6798	-365.81	-427.45	366.00	429.61	0.191	2.16
87	792	3279	-284.18	-57.95	284.18	58.12	0.000	0.17
88	7563	792	-1.17	-0.00	1.20	0.10	0.027	0.10
89	7279	792	-7.39	-1.61	7.48	1.87	0.082	0.26
90	8335	792	-61.36	-20.69	62.00	25.70	0.641	5.01
91	2449	792	-7.73	15.27	7.87	-14.39	0.140	0.88
92	4665	792	-3.90	0.09	4.00	0.23	0.100	0.32
93	4495	792	-3.31	-0.36	3.37	0.61	0.059	0.25
94	5416	2267	454.11	120.01	-453.63	-115.75	0.479	4.25
95	5416	7637	-1283.13	226.66	1297.43	-90.82	14.291	135.84
96	8964	2168	-249.74	-13.00	249.74	13.15	0.000	0.15
97	3659	5996	693.24	445.22	-692.09	-432.11	1.157	13.11
98	5762	5996	-0.00	2.31	0.00	-2.31	0.000	0.00
99	3242	5097	5.84	41.28	-5.84	-41.28	0.000	0.00
100	7563	3242	-71.54	7.56	72.55	-2.98	1.014	4.58
101	4427	3242	-0.78	-0.16	0.78	0.21	0.005	0.05
102	3242	7279	19.14	0.01	-19.11	0.24	0.030	0.25
103	271	3242	-0.41	-0.24	0.41	0.25	0.000	0.02
104	3242	1611	1.23	1.75	-1.23	-1.73	0.004	0.02
105	5097	1611	27.07	37.17	-26.98	-36.66	0.083	0.52
106	8181	8179	89.48	-38.84	-89.45	39.15	0.030	0.31
107	8181	7762	-313.03	-64.79	313.49	70.06	0.454	5.26
108	9025	7762	-243.70	-60.41	243.97	63.72	0.273	3.31
109	7563	4427	-1.24	1.46	1.25	-1.43	0.004	0.03
110	7563	7279	-141.01	15.74	142.75	-8.56	1.741	7.18
111	7563	8335	-2.08	2.08	2.09	-2.03	0.008	0.05
112	7563	5155	-0.96	1.74	0.97	-1.70	0.001	0.04
113	7563	271	-3.66	1.35	3.66	-1.22	0.003	0.13
114	2449	7563	1.68	1.27	-1.62	-1.10	0.054	0.16
115	4665	7563	2.90	-1.65	-2.90	1.66	0.001	0.01
116	4495	7563	0.47	-0.28	-0.47	0.28	0.002	0.01
117	7563	1611	-58.32	15.51	59.08	-12.03	0.761	3.48
118	4427	7279	-1.70	-0.36	1.71	0.43	0.013	0.08
119	4427	8335	-0.04	0.02	0.04	-0.02	0.000	0.00
120	4427	5155	1.92	20.60	-1.89	-20.40	0.026	0.20
121	4427	271	-50.13	10.78	50.29	-9.68	0.168	1.10
122	2449	4427	1.01	0.97	-0.97	-0.86	0.042	0.11
123	4665	4427	-0.53	0.89	0.54	-0.88	0.003	0.01
124	4495	4427	1.84	17.47	-1.81	-17.34	0.027	0.13

125	4427	1611	-0.96	-0.02	0.97	0.07	0.006	0.05
126	5210	1445	10.15	-31.59	-10.13	31.76	0.027	0.17
127	8179	5509	176.04	-39.98	-175.79	42.32	0.249	2.33
128	8179	7762	-230.83	-24.96	231.20	29.41	0.378	4.45
129	7279	4014	0.00	0.00	0.00	0.00	0.000	0.00
130	8335	7279	-134.33	-34.82	135.31	40.52	0.976	5.70
131	5155	7279	-1.15	-0.60	1.16	0.67	0.006	0.06
132	271	7279	-0.82	-0.65	0.82	0.68	0.002	0.03
133	2449	7279	2.24	9.32	-2.10	-8.77	0.145	0.55
134	4665	7279	-2.14	0.70	2.19	-0.60	0.051	0.10
135	4495	7279	-0.98	0.11	1.00	-0.07	0.013	0.04
136	1611	7279	4.24	-6.33	-4.23	6.42	0.012	0.09
137	5509	1579	-178.93	-70.85	179.27	74.26	0.335	3.41
138	8335	1531	-165.65	5.97	165.65	-5.91	0.000	0.06
139	5155	8335	-0.06	-0.11	0.06	0.11	0.000	0.00
140	2449	8335	33.71	55.39	-32.99	-50.06	0.724	5.33
141	4665	8335	-1.47	1.82	1.48	-1.79	0.008	0.03
142	4495	8335	-0.27	0.97	0.27	-0.96	0.002	0.01
143	7762	2268	323.46	393.57	-321.68	-372.92	1.781	20.65
144	5155	271	-36.00	-11.26	36.06	12.13	0.064	0.87
145	5155	2908	8.52	34.36	-8.36	-33.63	0.166	0.73
146	4665	5155	-0.32	0.70	0.32	-0.68	0.000	0.02
147	4495	5155	0.02	0.80	-0.02	-0.79	0.001	0.01
148	5155	1611	-69.80	-16.21	70.21	19.89	0.412	3.68
149	271	2908	51.30	40.48	-50.61	-38.19	0.682	2.29
150	4665	271	-0.68	0.24	0.68	-0.22	0.000	0.02
151	4495	271	-0.54	0.37	0.55	-0.35	0.003	0.02
152	271	1611	-38.42	-8.75	38.53	9.87	0.119	1.11
153	1579	5848	-179.27	-57.89	179.41	59.19	0.144	1.30
154	7051	8847	284.64	123.10	-284.50	-121.48	0.138	1.63
155	5776	8229	0.00	0.00	0.00	0.00	0.000	0.00
156	317	6233	-399.60	-159.55	399.63	159.90	0.032	0.35
157	4665	2449	-37.34	-36.78	38.09	41.29	0.747	4.51
158	2449	4495	38.80	54.54	-38.15	-49.34	0.651	5.20
159	4665	4495	-24.30	10.27	24.35	-10.06	0.050	0.21
160	1611	8420	-418.93	-138.99	418.93	139.40	0.000	0.41
161	9024	6542	119.29	-4.94	-119.20	13.01	0.089	8.07
162	9024	6542	124.91	-12.87	-124.80	21.42	0.106	8.55
163	6069	9192	189.46	34.66	-189.22	-16.68	0.234	17.99
164	6069	1968	211.05	88.61	-210.75	-65.15	0.306	23.46
165	7829	1968	1.98	1.50	-1.95	-1.21	0.029	0.29
166	8574	2299	278.33	145.08	-277.86	-111.23	0.473	33.85
167	8574	5587	204.36	47.34	-204.14	-29.11	0.216	18.22
168	4929	1815	142.76	3.47	-142.61	7.25	0.155	10.71
169	1815	792	0.45	0.31	-0.45	-0.29	0.004	0.02
170	6704	4586	168.43	95.71	-168.24	-79.92	0.189	15.79
171	2441	3506	238.56	87.39	-238.29	-55.97	0.274	31.42
172	1367	6826	297.98	109.77	-297.36	-67.42	0.622	42.34

173	1676	228	132.19	85.45	-132.04	-74.41	0.154	11.03
174	7829	6826	92.53	-23.72	-92.46	29.07	0.065	5.35
175	659	3279	284.85	94.93	-284.18	-58.12	0.674	36.81
176	5210	792	35.28	-4.73	-35.18	5.76	0.098	1.03
177	1445	792	61.48	5.18	-61.41	-3.53	0.076	1.65
178	7180	2168	258.76	42.94	-258.34	-11.67	0.421	31.27
179	6833	8964	272.64	192.42	-272.04	-147.48	0.601	44.94
180	3659	3242	396.99	201.27	-396.05	-122.83	0.937	78.44
181	8181	4427	223.35	110.04	-223.04	-83.12	0.306	26.92
182	9025	7563	243.50	63.39	-243.17	-34.16	0.328	29.23
183	2267	5210	453.63	115.75	-452.85	-42.50	0.779	73.26
184	5210	7279	5.51	0.63	-5.45	-0.29	0.064	0.33
185	5210	8335	40.17	12.56	-39.80	-8.33	0.365	4.23
186	5210	2449	8.68	-7.49	-8.58	8.37	0.101	0.87
187	5210	4665	3.11	-0.27	-2.99	0.59	0.124	0.32
188	5210	4495	2.48	0.19	-2.42	0.06	0.059	0.25
189	8179	7279	144.05	44.34	-143.90	-35.39	0.147	8.96
190	1445	7279	2.80	0.47	-2.76	-0.30	0.037	0.17
191	5509	8335	188.60	37.72	-188.40	-21.84	0.205	15.88
192	5509	1531	165.81	7.63	-165.65	5.91	0.160	13.54
193	1445	8335	18.88	6.95	-18.71	-4.94	0.173	2.01
194	7762	5155	281.09	174.16	-280.53	-131.47	0.559	42.69
195	7762	271	211.32	61.73	-211.05	-40.38	0.268	21.36
196	7829	5776	19.85	-7.82	-19.75	8.94	0.101	1.12
197	8329	1445	175.23	100.27	-174.96	-81.21	0.267	19.06
198	8329	1445	179.08	102.31	-178.79	-82.85	0.286	19.47
199	1445	2449	4.68	-4.01	-4.61	4.45	0.064	0.44
200	1445	4665	1.59	-0.00	-1.53	0.16	0.055	0.16
201	2268	2908	186.82	79.64	-186.61	-59.76	0.206	19.88
202	8847	5776	244.96	130.49	-244.54	-99.90	0.420	30.59
203	8847	8103	39.36	-9.93	-39.34	10.70	0.016	0.77
204	317	2449	399.54	157.44	-398.69	-90.11	0.851	67.33
205	7637	8581	-1297.75	97.62	1299.13	140.85	1.385	238.47
206	5848	7526	-179.70	-59.61	179.73	63.08	0.032	3.47
207	89	4495	236.63	98.07	-236.25	-71.62	0.385	26.46
208	2520	4665	253.38	74.39	-252.98	-46.23	0.407	28.16
209	5996	8420	420.17	219.44	-418.93	-139.40	1.240	80.04
210	2154	5996	357.15	-38.80	-357.04	51.24	0.113	12.44
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					Total:	109.952	2054.00	

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| Voltage Constraints |

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Bus #	Vmin mu	Vmin	|V|	Vmax	Vmax mu
2449	-	0.900	1.100	1.100	877.630
7180	40.494	0.900	0.900	1.100	-

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| Generation Constraints |
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Gen #	Bus #	Active Power Limits Pmin mu	Pmin	Pg	Pmax	Pmax mu
1	913	-	566.67	568.00	568.00	0.015
2	2107	-	500.00	1500.00	1500.00	0.004
6	5097	-	7.08	21.23	21.23	0.007
9	7279	-	-908.93	100.00	100.00	0.013
11	8605	-	200.00	600.00	600.00	0.006

Gen #	Bus #	Reactive Power Limits Qmin mu	Qmin	Qg	Qmax	Qmax mu
2	2107	-	-257.62	661.90	661.90	0.002
5	4586	0.011	-29.81	-29.81	92.96	-
6	5097	0.002	-4.11	-4.11	8.91	-
8	6798	-	-183.48	429.61	429.61	0.002
9	7279	0.009	-6.64	-6.64	14.78	-
10	7960	-	-93.22	274.20	274.20	0.002
12	9239	-	-93.22	274.20	274.20	0.002

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| Branch Flow Constraints (S in MVA) |
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Brnch #	From Bus	"From" End |Sf| mu	|Sf|	Limit |Smax|	"To" End |St|	|St| mu	To Bus
34	3493	-	318.96	319.00	319.00	0.079	5587
95	5416	5.679	1303.00	1303.00	1300.60	-	7637