MainMVO2023

Output:

```
MATPOWER Version 8.0, 17-May-2024
Power Flow -- AC-polar-power formulation
Newton's method converged in 3 iterations.
PF successful
Converged in 0.07 seconds
System Summary
====
                    How much?
How many?
                                     P (MW)
                                                    O (MVAr)
             33 Total Gen Capacity 3267.0 -3267.0 to
Buses
3267.0
Generators 33
                    On-line Capacity
                                      99.0
                                                 -99.0 to 99.0
Committed Gens 1
                    Generation (actual)
                                                     0.4
                                       3.8
Loads
             32
                   Load
                                       3.7
                                                      0.4
Fixed
            32
                   Fixed
                                       3.7
                                                     0.4
Dispatchable 0
                   Dispatchable
                                     -0.0 of -0.0
                                                    -0.0
Shunts
              0
                   Shunt (inj)
                                       -0.0
                                                      0.0
Branches
             32 Losses (I^2 * Z)
                                                     0.09
                                       0.13
                                       _
Transformers
             0
                    Branch Charging (inj)
                                                     0.0
Inter-ties
                   Total Inter-tie Flow 0.0
              0
                                                      0.0
Areas
              1
                    Minimum
                                           Maximum
Voltage Magnitude 0.937 p.u. @ bus 18 1.000 p.u. @ bus 1
Voltage Angle -2.39 deg @ bus 18
                                     0.00 deg @ bus 1
P Losses (I^2*R)
                                     0.02 MVAr @ line 5-6
Q Losses (I^2*X)
Bus Data
```

us	Vol	tage	Generat	ion	Loa	ad
		_	P (MW)	Q (MVAr)		
1	1.000	0.000*	3.85	0.44		
2	0.998	-0.050	_	_	0.10	0.06
3	0.987	-0.320	_	_	0.09	-0.41
4	0.981	-0.459	_	_	0.12	0.08
5	0.976	-0.608	_	_	0.06	0.03
6	0.965	-1.166	_	_	0.06	0.02
7	0.963	-1.421	_	_	0.20	0.10
8	0.959	-1.510	_	_	0.20	0.10
9	0.955	-1.761	_	_	0.06	0.02
10	0.952	- 2.006	_	_	0.06	0.02
11	0.951	- 2.034	-	-	0.04	0.03
12	0.950	- 2.090	-	-	0.06	-0.41
13	0.944	- 2.177	-	-	0.06	0.04
14	0.942	- 2.252	_	_	0.12	0.08
15	0.940	- 2.288	-	_	0.06	0.01
16	0.939	-2.310	-	-	0.06	0.02
17	0.937	-2.384	-	-	0.06	0.02
18	0.937	-2.393	-	-	0.09	0.04
19	0.997	-0.061	-	-	0.09	0.04
20	0.994	-0.128	-	-	0.09	0.04
21	0.993	-0.147	-	-	0.09	0.04
22	0.992	-0.168	-	-	0.09	0.04
23	0.983	-0.351	-	-	0.09	0.05
24	0.977	-0.439	-	-	0.42	0.20
25	0.973	-0.482	-	-	0.42	0.20
26	0.964	-1.210	-	-	0.06	0.03
27	0.962	-1.272	-	-	0.06	0.03
28	0.958	-1.623	-	_	0.06	0.02
29	0.954	-1.880	-	_	0.12	0.07
30	0.953	-1.990	-	-	0.20	-0.45
31	0.949	- 2.069	-	-	0.15	0.07
32	0.948	-2.091	_	_	0.21	0.10
33	0.948	-2.098	_	_	0.06	0.04
		Total:	3.85	0.44	3.72	0.35

Z)

# (MVAr)		Bus	P (MW)	Q (MVAr)	P (MW)	Q (MVAr)	P (MW)	Q
1	1	2	3.85	0.44	-3.84	-0.44	0.009	
0.00	2	3	3.38	0.21	-3.34	-0.20	0.035	
0.02	3	4	2.31	0.15	-2.30	-0.14	0.013	
0.01 4	4	5	2.18	0.06	-2.17	-0.06	0.012	
0.01 5	5	6	2.11	0.03	-2.09	-0.01	0.024	
0.02 6	6	7	1.09	0.07	-1.09	-0.07	0.002	
0.00 7	7	8	0.89	-0.03	-0.89	0.03	0.004	
0.00 8	8	9	0.69	-0.13	-0.68	0.13	0.003	
0.00 9	9	10	0.62	-0.15	-0.62	0.16	0.003	
0.00	10	11	0.56		-0.56			
0.00								
0.00	11	12	0.51			0.21		
12 0.00	12	13	0.45	0.21	-0.45	-0.21	0.003	
13 0.00	13	14	0.39	0.17	-0.39	-0.17	0.001	
14 0.00	14	15	0.27	0.09	-0.27	-0.09	0.000	
15 0.00	15	16	0.21	0.08	-0.21	-0.08	0.000	
16 0.00	16	17	0.15	0.06	-0.15	-0.06	0.000	
17 0.00	17	18	0.09	0.04	-0.09	-0.04	0.000	
18	2	19	0.36	0.16	-0.36	-0.16	0.000	
0.00	19	20	0.27	0.12	-0.27	-0.12	0.001	
0.00 20	20	21	0.18	0.08	-0.18	-0.08	0.000	
0.00 21	21	22	0.09	0.04	-0.09	-0.04	0.000	
0.00 22	3	23	0.94	0.46	-0.94	-0.46	0.003	
0.00 23	23	24	0.85	0.41	-0.84	-0.40	0.005	
0.00								

24	24	25	0.42	0.20	-0.42	-0.20	0.001	
0.00 25	6	26	0.93	-0.09	-0.93	0.09	0.001	
9.00	O	20	0.93	-0.09	-0.93	0.09	0.001	
26	26	27	0.87	-0.11	-0.87	0.12	0.001	
0.00								
27	27	28	0.81	-0.14	-0.81	0.14	0.005	
.00								
28	28	29	0.75	-0.16	-0.74	0.17	0.003	
0.00 29	29	30	0.62	-0.24	-0.62	0.24	0.002	
0.00	29	30	0.02	0.24	0.02	0.24	0.002	
30	30	31	0.42	0.21	-0.42	-0.21	0.001	
0.00								
31	31	32	0.27	0.14	-0.27	-0.14	0.000	
.00								
32	32	33	0.06	0.04	-0.06	-0.04	0.000	
.00								
_								
						Total:	0.134	
.09								
-0.45 -0.41 MATPOW Power	00000006 ER Vers Flow 's methodes	nod conve	r-power	2024 formulation 3 iterations	5.			
==== : - -=====	System	Summary	======			======	=======	
	•			1.0		(M) (3)		CARL (A
low ma	ny?		HOW I	າາuch? 	P 	(MW) 	Q ((MVAr)
 Buses		33	Tota ¹	l Gen Capaci	ity 32	67.0	-3267.0 t	: 0
3267.0		22						
Genera	cors	33	un-t:	ine Capacity	/	77. 0	-99.0 t	20 99.0

```
Generation (actual)
Committed Gens 1
                                                              0.4
                                           3.8
Loads
                32
                       Load
                                             3.7
                                                              0.4
               32
Fixed
                       Fixed
                                             3.7
                                                             0.4
Dispatchable
               0
                       Dispatchable
                                            -0.0 of -0.0
                                                            -0.0
                      Shunt (inj)
Shunts
                0
                                            -0.0
                                                             0.0
                      Losses (I<sup>2</sup> * Z)
Branches
                32
                                                             0.09
                                              0.13
Transformers
               0
                                             _
                                                              0.0
                       Branch Charging (inj)
Inter-ties
                0
                       Total Inter-tie Flow
                                              0.0
                                                              0.0
Areas
                 1
                       Minimum
                                                 Maximum
Voltage Magnitude 0.937 p.u. @ bus 18
                                           1.000 p.u. @ bus 1
Voltage Angle -2.39 deg @ bus 18
                                          0.00 deg
                                                      0 bus 1
P Losses (I^2*R)
                                           0.04 MW
                                                      @ line 2-3
Q Losses (I^2*X)
                                            0.02 MVAr @ line 5-6
====
     Bus Data
====
Bus Voltage
                       Generation
                                             Load
 # Mag(pu) Ang(deg)
                      P (MW) O (MVAr)
                                        P (MW) Q (MVAr)
  1 1.000 0.000*
                        3.85
                                 0.44
  2 0.998
           -0.050
                                          0.10
                                                   0.06
  3 0.987 -0.320
                                                  -0.41
                                          0.09
  4 0.981
           -0.459
                                          0.12
                                                  0.08
  5 0.976
           -0.608
                                          0.06
                                                   0.03
  6 0.965
                                          0.06
                                                   0.02
           -1.166
  7 0.963
           -1.421
                                          0.20
                                                   0.10
  8 0.959
                                          0.20
                                                   0.10
           -1.510
  9 0.955
           -1.761
                                          0.06
                                                   0.02
 10 0.952
           -2.006
                                          0.06
                                                   0.02
 11 0.951
           -2.034
                                          0.04
                                                   0.03
 12 0.950
            -2.090
                                          0.06
                                                  -0.41
 13 0.944
           -2.177
                                          0.06
                                                   0.04
 14 0.942
            -2.252
                                          0.12
                                                   0.08
 15 0.940
                                          0.06
            -2.288
                                                   0.01
 16 0.939
            -2.310
                                          0.06
                                                   0.02
 17 0.937
            -2.384
                                          0.06
                                                   0.02
 18 0.937
           -2.393
                                          0.09
                                                   0.04
 19 0.997
            -0.061
                                          0.09
                                                   0.04
 20 0.994
           -0.128
                                          0.09
                                                   0.04
 21 0.993
           -0.147
                                          0.09
                                                   0.04
 22 0.992
            -0.168
                                          0.09
                                                   0.04
 23 0.983
           -0.351
                                          0.09
                                                   0.05
 24 0.977 -0.439
                                          0.42
                                                   0.20
```

25	0.973	-0.482	_	_	0.4	42 0.20		
26	0.964	-1.210	_	_	0.0	0.0 3		
27	0.962	-1.272	_	_	0.0	96 0.03		
28	0.958	-1.623	_	_	0.0	96 0.02		
	0.954	-1.880		_	0.3			
30	0.953	-1.990		_	0.3	20 -0.45		
	0.949	-2.069		_	0.3			
	0.948	-2.091	_	_	0.3			
	0.948	-2.098	_	_	0.0			
	01710	2.070					_	
		Total:	3.8	5 0.44	3.'	72 0.35		
===== ==== 	Branch	Data	======	======	======		======	=====
===== ==== Brnch Z)	From	To	From Bus	Injection	To Bus	Injection	Loss	(I^2 *
#	Bus	Bus	P (MW)	Q (MVAr)	P (MW)	Q (MVAr)	P (MW)	Q
(MVAr)	١							
1	1	2	3.85	0.44	-3.84	-0.44	0.009	
9.00								
2	2	3	3.38	0.21	-3.34	-0.20	0.035	
9.02								
3	3	4	2.31	0.15	-2.30	-0.14	0.013	
9.01								
4	4	5	2.18	0.06	- 2.17	-0.06	0.012	
0.01								
5	5	6	2.11	0.03	-2.09	-0.01	0.024	
9.02								
6	6	7	1.09	0.07	-1.09	-0.07	0.002	
9.00								
7	7	8	0.89	- 0.03	-0.89	0.03	0.004	
9.00								
8	8	9	0.69	-0.13	-0.68	0.13	0.003	
9.00								
9	9	10	0.62	-0.15	-0.62	0.16	0.003	
9.00			3.32	3.20		0.20	2.303	
10	10	11	0.56	-0.18	-0.56	0.18	0.000	
9.00	10		3.00	5.10	3.30	0.10	5.000	
11	11	12	0.51	-0.21	-0 51	0.21	0.001	
9.00	11	12	0.51	0.21	0.31	0.21	0.001	
12	12	12	Q //E	0.21	- 0 //E	-0 21	0 002	
	12	13	0.43	0.21	-0.45	-0.21	0.003	
0.00	12	1.0	0.20	0.10	-0.30	- 0 10	0.001	
13	13	14	U.39	0.17	-0.39	-0.17	0.001	
9.00								

14 0.00	14	15	0.27	0.09	-0.27	-0.09	0.000	
15	15	16	0.21	0.08	-0.21	-0.08	0.000	
0.00 16	16	17	0.15	0.06	-0.15	-0.06	0.000	
0.00	10	1,	0.10	0.00	0.10	0.00	0.000	
17 0.00	17	18	0.09	0.04	-0.09	-0.04	0.000	
18	2	19	0.36	0.16	-0.36	-0.16	0.000	
0.00								
19	19	20	0.27	0.12	-0.27	-0.12	0.001	
0.00		0.4	0.10		0.40			
20	20	21	0.18	0.08	-0.18	-0.08	0.000	
0.00								
21 0.00	21	22	0.09	0.04	-0.09	-0.04	0.000	
22	3	23	0.94	0.46	-0.94	-0.46	0.003	
0.00								
23	23	24	0.85	0.41	-0.84	-0.40	0.005	
0.00								
24	24	25	0.42	0.20	-0.42	-0.20	0.001	
0.00								
25	6	26	0.93	-0.09	-0.93	0.09	0.001	
0.00								
26	26	27	0.87	-0.11	-0.87	0.12	0.001	
0.00	20	20	0.01	0.14	0.01	0.14	0.005	
27	27	28	0.81	-0.14	-0.81	0.14	0.005	
0.00 28	28	29	0.75	-0.16	-0.74	0.17	0.003	
0.00	20	2)	0.70	0.10	0.74	0.17	0.005	
29	29	30	0.62	-0.24	-0.62	0.24	0.002	
0.00								
30	30	31	0.42	0.21	-0.42	-0.21	0.001	
0.00								
31	31	32	0.27	0.14	-0.27	-0.14	0.000	
0.00								
32	32	33	0.06	0.04	-0.06	-0.04	0.000	
0.00								
						Total:	0.134	
0.09								

idx =

11

idx =

28 idx =2 idx =11 idx = 28 idx = 2 idx = 11 idx =28 idx = 2 idx =11 idx =28 idx =

2

idx =

11

idx =

28

idx =

2

idx =

11

idx =

28

idx =

2

idx =

11

idx =

28

idx =

2

idx =

```
11
idx =
  28
idx =
  2
idx =
  11
idx =
  28
idx =
   2
Real_Power_Losses =
   1.339910859700731e+02
Best_universe_Inflation_rate =
   1.339910859700731e+02
Optimum_bus =
  12 30 3
sizes =
 0.4500000000000 1.050000000000 0.4500000000000
Elapsed time is 52.231430 seconds.
```