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 many?                How much?              P (MW)            Q (MVAr)
---------------------    --------------------  -------------  ----------------
Buses                33     Total Gen Capacity    3267.0       -3267.0 to
3267.0
Generators           33     On-line Capacity        99.0          -99.0 to 99.0
Committed Gens        1     Generation (actual)      3.8                0.4
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)         0.13               0.09
Transformers          0     Branch Charging (inj)     -                 0.0
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   @ 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)   Q (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       -         -        0.09     -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

================================================================================
====
|     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	1	2	3.85	0.44	-3.84	-0.44	0.009	0.00
2	2	3	3.38	0.21	-3.34	-0.20	0.035	0.02
3	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	10	11	0.56	-0.18	-0.56	0.18	0.000	0.00
11	11	12	0.51	-0.21	-0.51	0.21	0.001	0.00
12	12	13	0.45	0.21	-0.45	-0.21	0.003	0.00
13	13	14	0.39	0.17	-0.39	-0.17	0.001	0.00
14	14	15	0.27	0.09	-0.27	-0.09	0.000	0.00
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
17	17	18	0.09	0.04	-0.09	-0.04	0.000	0.00
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
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
0.00
 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
0.00
 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
 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

compensated =

 -0.415000000000000
 -0.450000000000000
 -0.410000000000000


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 many?                How much?              P (MW)            Q (MVAr)
---------------------    -------------------  -------------  ----------------
--
Buses             33     Total Gen Capacity    3267.0       -3267.0 to
3267.0
Generators        33     On-line Capacity        99.0         -99.0 to 99.0
```

Committed Gens	1	Generation (actual)	3.8		0.4
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)	0.13		0.09
Transformers	0	Branch Charging (inj)	-		0.0
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 @ 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 Mag(pu)	Voltage Ang(deg)	Generation P (MW)	Generation Q (MVAr)	Load P (MW)	Load 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	

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	1	2	3.85	0.44	-3.84	-0.44	0.009	0.00
2	2	3	3.38	0.21	-3.34	-0.20	0.035	0.02
3	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	10	11	0.56	-0.18	-0.56	0.18	0.000	0.00
11	11	12	0.51	-0.21	-0.51	0.21	0.001	0.00
12	12	13	0.45	0.21	-0.45	-0.21	0.003	0.00
13	13	14	0.39	0.17	-0.39	-0.17	0.001	0.00

```
 14     14     15       0.27       0.09      -0.27      -0.09      0.000
0.00
 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
 17     17     18       0.09       0.04      -0.09      -0.04      0.000
0.00
 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
 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
0.00
 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
0.00
 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
 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 =

  0.450000000000000   1.050000000000000   0.450000000000000

Elapsed time is 52.231430 seconds.
```