

## GVFA Optimisation – Five IEEE-33 Microgrids

Generated on 2025-08-02 22:46 (Omar Yaseen Saeed)

### Consolidated Placement & Performance

MG	PV( bus, kW)	BESS (bus, kW)	HYDR O(bus ,kW)	CAP( bus,k VAr)	P_b ase( kW)	P_o pt( kW )	% $\Delta$ P	Vmi n_b ase	Vm in_ opt	WT( bus, kW)	EVCS (bus, kW)	BIOG AS(bu s,kW)	DG( bus, kW)
1	2,3449	6,1192	28,1388	33,1224	202.7	60.6	70.9	0.131	0.9647	nan	nan	nan	nan
2	2,200	2,619	nan	30,1500	202.7	96.0	52.6	0.9131	0.9566	33,2000	nan	nan	nan
3	2,1547	15,641	nan	33,150	202.7	77.0	62.0	0.9131	0.9664	nan	27,1899	nan	nan
4	2,3500	16,160	nan	33,801	202.7	60.1	70.3	0.9131	0.9589	nan	nan	6,1737	nan
5	10,200	15,150	nan	6,1500	202.7	64.1	68.3	0.9131	0.9611	nan	nan	nan	33,1220

### Microgrid Status (Islanded / Connected)

Microgrid	Net Exchange (kW)	Status
MG1	2314.3	Islanded
MG2	-896.2	Connected
MG3	371.9	Islanded

MG4	1681.7	Islanded
MG5	-2144.6	Connected

Omar Yaseen Saeed - UPV

## Branch Power Loss Tables

### MG1

Branch	Base (kW)	Optimised (kW)	%Δ
1	12.24	3.65	70.2
2	51.79	4.15	92.0
3	19.90	0.59	97.0
4	18.70	0.68	96.4
5	38.25	1.65	95.7
6	1.91	1.72	10.1
7	4.84	4.35	10.2
8	4.18	3.75	10.3
9	3.56	3.19	10.3
10	0.55	0.50	10.3
11	0.88	0.79	10.3
12	2.67	2.39	10.3
13	0.73	0.65	10.4
14	0.36	0.32	10.4
15	0.28	0.25	10.4
16	0.25	0.23	10.4
17	0.05	0.05	10.4
18	0.16	0.16	0.8
19	0.83	0.83	0.8
20	0.10	0.10	0.8
21	0.04	0.04	0.8
22	3.18	3.09	2.9
23	5.14	4.99	2.9

24	1.29	1.25	2.9
25	2.60	0.33	87.1
26	3.33	0.59	82.2
27	11.30	2.73	75.8
28	7.83	3.37	57.0
29	3.90	1.76	54.8
30	1.59	7.17	-349.8
31	0.21	2.36	-1008.1
32	0.01	2.92	-22070.1

## MG2

Branch	Base (kW)	Optimised (kW)	%Δ
1	12.24	1.27	89.6
2	51.79	6.96	86.6
3	19.90	0.29	98.6
4	18.70	0.10	99.4
5	38.25	0.10	99.7
6	1.91	1.75	8.6
7	4.84	4.42	8.7
8	4.18	3.81	8.7
9	3.56	3.25	8.8
10	0.55	0.51	8.8
11	0.88	0.80	8.8
12	2.67	2.43	8.8
13	0.73	0.66	8.8
14	0.36	0.33	8.9
15	0.28	0.26	8.9

16	0.25	0.23	8.9
17	0.05	0.05	8.9
18	0.16	0.16	0.4
19	0.83	0.83	0.4
20	0.10	0.10	0.4
21	0.04	0.04	0.4
22	3.18	3.11	2.2
23	5.14	5.03	2.2
24	1.29	1.26	2.2
25	2.60	1.66	36.2
26	3.33	2.60	22.0
27	11.30	10.75	4.9
28	7.83	8.98	-14.7
29	3.90	6.88	-76.7
30	1.59	14.43	-805.2
31	0.21	5.45	-2456.5
32	0.01	7.48	-56713.2

### MG3

Branch	Base (kW)	Optimised (kW)	%Δ
1	12.24	2.84	76.8
2	51.79	14.00	73.0
3	19.90	5.20	73.9
4	18.70	5.04	73.0
5	38.25	10.67	72.1
6	1.91	0.55	71.4
7	4.84	1.04	78.5

8	4.18	0.66	84.2
9	3.56	0.58	83.7
10	0.55	0.10	81.3
11	0.88	0.18	79.3
12	2.67	0.75	71.9
13	0.73	0.32	55.8
14	0.36	0.56	-55.8
15	0.28	0.24	13.0
16	0.25	0.22	13.0
17	0.05	0.05	13.0
18	0.16	0.16	0.5
19	0.83	0.83	0.5
20	0.10	0.10	0.5
21	0.04	0.04	0.5
22	3.18	3.11	2.3
23	5.14	5.03	2.3
24	1.29	1.26	2.3
25	2.60	2.05	21.1
26	3.33	3.01	9.5
27	11.30	8.46	25.1
28	7.83	5.78	26.2
29	3.90	2.77	28.9
30	1.59	1.17	26.5
31	0.21	0.15	29.0
32	0.01	0.04	-171.5

**MG4**

Branch	Base (kW)	Optimised (kW)	%Δ
1	12.24	2.89	76.4
2	51.79	11.52	77.8
3	19.90	1.87	90.6
4	18.70	1.47	92.1
5	38.25	2.80	92.7
6	1.91	1.36	29.1
7	4.84	3.21	33.6
8	4.18	2.49	40.4
9	3.56	2.04	42.7
10	0.55	0.30	45.3
11	0.88	0.45	48.4
12	2.67	1.25	53.1
13	0.73	0.30	58.9
14	0.36	0.08	77.2
15	0.28	0.05	83.9
16	0.25	0.23	9.3
17	0.05	0.05	9.3
18	0.16	0.16	0.7
19	0.83	0.83	0.7
20	0.10	0.10	0.7
21	0.04	0.04	0.7
22	3.18	3.11	2.3
23	5.14	5.03	2.3
24	1.29	1.26	2.3

25	2.60	1.18	54.7
26	3.33	1.44	56.8
27	11.30	4.62	59.1
28	7.83	3.00	61.8
29	3.90	1.32	66.2
30	1.59	3.37	-111.3
31	0.21	1.04	-386.8
32	0.01	1.30	-9782.4

#### MG5

Branch	Base (kW)	Optimised (kW)	%Δ
1	12.24	3.22	73.7
2	51.79	10.60	79.5
3	19.90	1.19	94.0
4	18.70	0.83	95.6
5	38.25	1.43	96.3
6	1.91	0.97	49.4
7	4.84	2.09	56.8
8	4.18	1.39	66.7
9	3.56	1.08	69.6
10	0.55	0.31	43.7
11	0.88	0.47	46.7
12	2.67	1.30	51.2
13	0.73	0.32	56.8
14	0.36	0.09	74.8
15	0.28	0.25	9.7
16	0.25	0.23	9.7



17	0.05	0.05	9.7
18	0.16	0.16	0.3
19	0.83	0.83	0.3
20	0.10	0.10	0.3
21	0.04	0.04	0.3
22	3.18	3.12	1.9
23	5.14	5.05	1.9
24	1.29	1.26	1.9
25	2.60	1.33	48.7
26	3.33	1.85	44.5
27	11.30	6.86	39.3
28	7.83	5.29	32.4
29	3.90	3.36	13.7
30	1.59	4.26	-167.2
31	0.21	1.83	-757.1
32	0.01	2.93	-22158.9

## Bus Voltage Tables

### MG1

Bus	Base (p.u.)	Optimised (p.u.)	%Δ
1	1.0000	1.0000	0.00
2	0.9970	1.0010	0.39
3	0.9829	0.9973	1.46
4	0.9755	0.9975	2.26
5	0.9681	0.9981	3.11
6	0.9497	0.9993	5.23
7	0.9462	0.9960	5.27
8	0.9413	0.9914	5.32
9	0.9351	0.9855	5.39
10	0.9292	0.9800	5.46
11	0.9284	0.9792	5.47
12	0.9269	0.9778	5.49
13	0.9208	0.9720	5.56
14	0.9185	0.9698	5.59
15	0.9171	0.9685	5.60
16	0.9157	0.9672	5.62
17	0.9137	0.9653	5.64
18	0.9131	0.9647	5.65
19	0.9965	1.0004	0.40
20	0.9929	0.9969	0.40
21	0.9922	0.9962	0.40
22	0.9916	0.9955	0.40
23	0.9794	0.9938	1.47

24	0.9727	0.9872	1.49
25	0.9694	0.9839	1.50
26	0.9477	1.0001	5.52
27	0.9452	1.0012	5.93
28	0.9337	1.0067	7.82
29	0.9255	1.0044	8.52
30	0.9220	1.0030	8.79
31	0.9178	1.0064	9.66
32	0.9169	1.0083	9.97
33	0.9166	1.0121	10.42

#### MG2

Bus	Base (p.u.)	Optimised (p.u.)	%Δ
1	1.0000	1.0000	0.00
2	0.9970	0.9991	0.20
3	0.9829	0.9939	1.11
4	0.9755	0.9930	1.79
5	0.9681	0.9924	2.51
6	0.9497	0.9915	4.40
7	0.9462	0.9882	4.44
8	0.9413	0.9835	4.48
9	0.9351	0.9775	4.54
10	0.9292	0.9720	4.60
11	0.9284	0.9712	4.61
12	0.9269	0.9697	4.62
13	0.9208	0.9639	4.68
14	0.9185	0.9617	4.71

15	0.9171	0.9604	4.72
16	0.9157	0.9591	4.73
17	0.9137	0.9571	4.75
18	0.9131	0.9566	4.76
19	0.9965	0.9985	0.20
20	0.9929	0.9950	0.20
21	0.9922	0.9943	0.20
22	0.9916	0.9936	0.21
23	0.9794	0.9903	1.12
24	0.9727	0.9837	1.14
25	0.9694	0.9804	1.14
26	0.9477	0.9931	4.79
27	0.9452	0.9955	5.33
28	0.9337	1.0063	7.78
29	0.9255	1.0149	9.66
30	0.9220	1.0201	10.65
31	0.9178	1.0280	12.01
32	0.9169	1.0309	12.44
33	0.9166	1.0348	12.89

### MG3

Bus	Base (p.u.)	Optimised (p.u.)	%Δ
1	1.0000	1.0000	0.00
2	0.9970	0.9995	0.25
3	0.9829	0.9940	1.13
4	0.9755	0.9929	1.79
5	0.9681	0.9921	2.48

6	0.9497	0.9884	4.08
7	0.9462	0.9858	4.19
8	0.9413	0.9842	4.55
9	0.9351	0.9824	5.07
10	0.9292	0.9812	5.59
11	0.9284	0.9812	5.69
12	0.9269	0.9813	5.87
13	0.9208	0.9816	6.60
14	0.9185	0.9817	6.88
15	0.9171	0.9828	7.16
16	0.9157	0.9815	7.18
17	0.9137	0.9796	7.21
18	0.9131	0.9790	7.22
19	0.9965	0.9990	0.25
20	0.9929	0.9954	0.25
21	0.9922	0.9947	0.25
22	0.9916	0.9941	0.25
23	0.9794	0.9905	1.13
24	0.9727	0.9839	1.15
25	0.9694	0.9806	1.16
26	0.9477	0.9891	4.36
27	0.9452	0.9902	4.76
28	0.9337	0.9802	4.98
29	0.9255	0.9731	5.14
30	0.9220	0.9699	5.21
31	0.9178	0.9669	5.35

32	0.9169	0.9664	5.40
33	0.9166	0.9667	5.46

#### MG4

Bus	Base (p.u.)	Optimised (p.u.)	%Δ
1	1.0000	1.0000	0.00
2	0.9970	1.0005	0.35
3	0.9829	0.9941	1.13
4	0.9755	0.9922	1.72
5	0.9681	0.9907	2.34
6	0.9497	0.9866	3.89
7	0.9462	0.9835	3.94
8	0.9413	0.9796	4.06
9	0.9351	0.9747	4.24
10	0.9292	0.9702	4.41
11	0.9284	0.9696	4.44
12	0.9269	0.9686	4.50
13	0.9208	0.9643	4.72
14	0.9185	0.9627	4.81
15	0.9171	0.9619	4.89
16	0.9157	0.9614	4.99
17	0.9137	0.9595	5.01
18	0.9131	0.9589	5.02
19	0.9965	1.0000	0.35
20	0.9929	0.9964	0.35
21	0.9922	0.9957	0.35
22	0.9916	0.9951	0.35

23	0.9794	0.9905	1.14
24	0.9727	0.9839	1.16
25	0.9694	0.9806	1.16
26	0.9477	0.9853	3.96
27	0.9452	0.9836	4.07
28	0.9337	0.9775	4.68
29	0.9255	0.9732	5.16
30	0.9220	0.9712	5.34
31	0.9178	0.9721	5.92
32	0.9169	0.9731	6.13
33	0.9166	0.9756	6.43

#### MG5

Bus	Base (p.u.)	Optimised (p.u.)	%Δ
1	1.0000	1.0000	0.00
2	0.9970	0.9985	0.15
3	0.9829	0.9921	0.93
4	0.9755	0.9904	1.53
5	0.9681	0.9889	2.15
6	0.9497	0.9861	3.84
7	0.9462	0.9832	3.92
8	0.9413	0.9802	4.13
9	0.9351	0.9766	4.44
10	0.9292	0.9734	4.75
11	0.9284	0.9728	4.78
12	0.9269	0.9717	4.84
13	0.9208	0.9673	5.06

14	0.9185	0.9657	5.14
15	0.9171	0.9649	5.22
16	0.9157	0.9636	5.23
17	0.9137	0.9617	5.25
18	0.9131	0.9611	5.26
19	0.9965	0.9980	0.15
20	0.9929	0.9944	0.15
21	0.9922	0.9937	0.15
22	0.9916	0.9930	0.15
23	0.9794	0.9886	0.94
24	0.9727	0.9820	0.95
25	0.9694	0.9787	0.96
26	0.9477	0.9859	4.02
27	0.9452	0.9856	4.28
28	0.9337	0.9828	5.26
29	0.9255	0.9812	6.02
30	0.9220	0.9818	6.49
31	0.9178	0.9853	7.36
32	0.9169	0.9869	7.63
33	0.9166	0.9892	7.92



### Interconnected 165-Bus Voltage (Snapshot)

Bus	Base (p.u.)	Optimised (p.u.)	%Δ
1	1.0000	1.0000	0.00
2	0.9970	1.0010	0.39
3	0.9829	0.9973	1.46
4	0.9755	0.9975	2.26
5	0.9681	0.9981	3.11
6	0.9497	0.9993	5.23
7	0.9462	0.9960	5.27
8	0.9413	0.9914	5.32
9	0.9351	0.9855	5.39
10	0.9292	0.9800	5.46
11	0.9284	0.9792	5.47
12	0.9269	0.9778	5.49
13	0.9208	0.9720	5.56
14	0.9185	0.9698	5.59
15	0.9171	0.9685	5.60
16	0.9157	0.9672	5.62
17	0.9137	0.9653	5.64
18	0.9131	0.9647	5.65
19	0.9965	1.0004	0.40
20	0.9929	0.9969	0.40
21	0.9922	0.9962	0.40
22	0.9916	0.9955	0.40
23	0.9794	0.9938	1.47
24	0.9727	0.9872	1.49

25	0.9694	0.9839	1.50
26	0.9477	1.0001	5.52
27	0.9452	1.0012	5.93
28	0.9337	1.0067	7.82
29	0.9255	1.0044	8.52
30	0.9220	1.0030	8.79
31	0.9178	1.0064	9.66
32	0.9169	1.0083	9.97
33	0.9166	1.0121	10.42
34	1.0000	1.0000	0.00
35	0.9970	0.9991	0.20
36	0.9829	0.9939	1.11
37	0.9755	0.9930	1.79
38	0.9681	0.9924	2.51
39	0.9497	0.9915	4.40
40	0.9462	0.9882	4.44
41	0.9413	0.9835	4.48
42	0.9351	0.9775	4.54
43	0.9292	0.9720	4.60
44	0.9284	0.9712	4.61
45	0.9269	0.9697	4.62
46	0.9208	0.9639	4.68
47	0.9185	0.9617	4.71
48	0.9171	0.9604	4.72
49	0.9157	0.9591	4.73
50	0.9137	0.9571	4.75

51	0.9131	0.9566	4.76
52	0.9965	0.9985	0.20
53	0.9929	0.9950	0.20
54	0.9922	0.9943	0.20
55	0.9916	0.9936	0.21
56	0.9794	0.9903	1.12
57	0.9727	0.9837	1.14
58	0.9694	0.9804	1.14
59	0.9477	0.9931	4.79
60	0.9452	0.9955	5.33
61	0.9337	1.0063	7.78
62	0.9255	1.0149	9.66
63	0.9220	1.0201	10.65
64	0.9178	1.0280	12.01
65	0.9169	1.0309	12.44
66	0.9166	1.0348	12.89
67	1.0000	1.0000	0.00
68	0.9970	0.9995	0.25
69	0.9829	0.9940	1.13
70	0.9755	0.9929	1.79
71	0.9681	0.9921	2.48
72	0.9497	0.9884	4.08
73	0.9462	0.9858	4.19
74	0.9413	0.9842	4.55
75	0.9351	0.9824	5.07
76	0.9292	0.9812	5.59

77	0.9284	0.9812	5.69
78	0.9269	0.9813	5.87
79	0.9208	0.9816	6.60
80	0.9185	0.9817	6.88
81	0.9171	0.9828	7.16
82	0.9157	0.9815	7.18
83	0.9137	0.9796	7.21
84	0.9131	0.9790	7.22
85	0.9965	0.9990	0.25
86	0.9929	0.9954	0.25
87	0.9922	0.9947	0.25
88	0.9916	0.9941	0.25
89	0.9794	0.9905	1.13
90	0.9727	0.9839	1.15
91	0.9694	0.9806	1.16
92	0.9477	0.9891	4.36
93	0.9452	0.9902	4.76
94	0.9337	0.9802	4.98
95	0.9255	0.9731	5.14
96	0.9220	0.9699	5.21
97	0.9178	0.9669	5.35
98	0.9169	0.9664	5.40
99	0.9166	0.9667	5.46
100	1.0000	1.0000	0.00
101	0.9970	1.0005	0.35
102	0.9829	0.9941	1.13

103	0.9755	0.9922	1.72
104	0.9681	0.9907	2.34
105	0.9497	0.9866	3.89
106	0.9462	0.9835	3.94
107	0.9413	0.9796	4.06
108	0.9351	0.9747	4.24
109	0.9292	0.9702	4.41
110	0.9284	0.9696	4.44
111	0.9269	0.9686	4.50
112	0.9208	0.9643	4.72
113	0.9185	0.9627	4.81
114	0.9171	0.9619	4.89
115	0.9157	0.9614	4.99
116	0.9137	0.9595	5.01
117	0.9131	0.9589	5.02
118	0.9965	1.0000	0.35
119	0.9929	0.9964	0.35
120	0.9922	0.9957	0.35
121	0.9916	0.9951	0.35
122	0.9794	0.9905	1.14
123	0.9727	0.9839	1.16
124	0.9694	0.9806	1.16
125	0.9477	0.9853	3.96
126	0.9452	0.9836	4.07
127	0.9337	0.9775	4.68
128	0.9255	0.9732	5.16

129	0.9220	0.9712	5.34
130	0.9178	0.9721	5.92
131	0.9169	0.9731	6.13
132	0.9166	0.9756	6.43
133	1.0000	1.0000	0.00
134	0.9970	0.9985	0.15
135	0.9829	0.9921	0.93
136	0.9755	0.9904	1.53
137	0.9681	0.9889	2.15
138	0.9497	0.9861	3.84
139	0.9462	0.9832	3.92
140	0.9413	0.9802	4.13
141	0.9351	0.9766	4.44
142	0.9292	0.9734	4.75
143	0.9284	0.9728	4.78
144	0.9269	0.9717	4.84
145	0.9208	0.9673	5.06
146	0.9185	0.9657	5.14
147	0.9171	0.9649	5.22
148	0.9157	0.9636	5.23
149	0.9137	0.9617	5.25
150	0.9131	0.9611	5.26
151	0.9965	0.9980	0.15
152	0.9929	0.9944	0.15
153	0.9922	0.9937	0.15
154	0.9916	0.9930	0.15

155	0.9794	0.9886	0.94
156	0.9727	0.9820	0.95
157	0.9694	0.9787	0.96
158	0.9477	0.9859	4.02
159	0.9452	0.9856	4.28
160	0.9337	0.9828	5.26
161	0.9255	0.9812	6.02
162	0.9220	0.9818	6.49
163	0.9178	0.9853	7.36
164	0.9169	0.9869	7.63
165	0.9166	0.9892	7.92