Appendix A

A.1 Load Curves

The numerical data of the load curves, presented in Table A1, are time series representing the electric energy demand throughout the day.

Table A1 Load Curve. Source: Adapted from [43].

Hour (h)	Residential Load Factor (pu)	Industrial Load Factor (pu)
1	0.59	0.15
2	0.48	0.19
3	0.44	0.22
4	0.41	0.25
5	0.55	0.41
6	0.85	0.65
7	1.01	1.01
8	0.80	1.25
9	0.89	1.55
10	0.91	1.65
11	1.07	1.73
12	1.12	1.55
13	1.18	1.21
14	1.05	1.62
15	0.93	1.65
16	0.92	1.57
17	1.02	1.35
18	1.16	1.15
19	1.31	0.65
20	1.39	0.55
21	1.55	0.35
22	1.30	0.25
23	1.09	0.21
24	0.69	0.15

A.2 Photovoltaic Units

The numerical data shown in Figure A1 and detailed in Tables A2, A3, and A4 are used to compute the power generated by the $PVsystem$ element as a function of its daily irradiation, temperature, and inverter efficiency.

Table A2 Correction factor of panel power for different temperatures. Source: Adapted from [49].

Temperature (°C)	PMP Correction Factor (pu)
0	1.2
25	1.0
75	0.8
100	0.6

The photovoltaic units installed in the IEEE 123 and 34-bus systems are shown in Tables A5, A6, and A7.

Fig. A1 Characteristic curves of the *PVsystem* model in OpenDSS. Source: Adapted from [49].
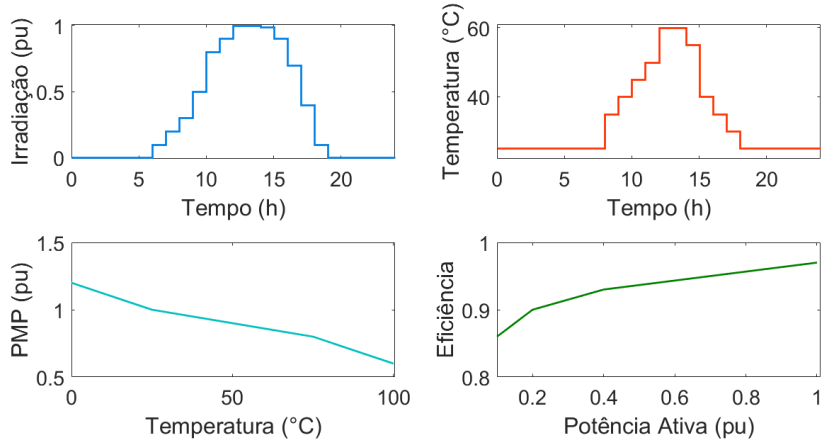

Table A3 Inverter efficiency curve. Source: Adapted from [49].

Irradiance (pu)	Efficiency (%)
0.1	86
0.2	90
0.4	93
1.0	97

Table A4 Irradiance and temperature curve of the *PVsystem* panel. Source: Adapted from [43].

Hour (h)	Irradiance (pu)	Temperature (°C)	Hour (h)	Irradiance (pu)	Temperature (°C)
1	0	25	13	1	60
2	0	25	14	1	60
3	0	25	15	0.99	55
4	0	25	16	0.9	40
5	0	25	17	0.7	35
6	0	25	18	0.4	30
7	0.1	25	19	0.1	25
8	0.2	25	20	0	25
9	0.3	35	21	0	25
10	0.5	40	22	0	25
11	0.8	45	23	0	25
12	0.9	50	24	0	25

Table A5 Photovoltaic units installed in the IEEE 123-bus system. Source: Author.

Bus	No. of Phases	Phases	Pmpp (kW)
3	1	C	6.2
5	1	C	30
7	3	A, B, C	12.4
8	3	A, B, C	15.5
9	1	A	6.2
12	1	B	30
13	3	A, B, C	6.2
14	1	A	8.25
15	1	C	8.25
16	3	A, B, C	100
21	3	A, B, C	100
22	1	B	10.3
24	1	C	30
25	3	A, B, C	8.25
26	2	A, C	6.2
28	3	A, B, C	100
29	3	A, B, C	12.4
30	3	A, B, C	30
31	1	C	10.3
32	1	C	6.2
33	1	A	10.3
36	2	A, B	100
38	1	B	12.4
41	1	C	8.25
42	3	A, B, C	1.8
45	1	A	10.3
46	1	A	8.25
48	3	A, B, C	1.8
49	3	A, B, C	15.5
37	1	A	10.3
50	3	A, B, C	60

Table A6 Photovoltaic units installed in the IEEE 123-bus system (continued). Source: Author.

Bus	No. of Phases	Phases	Pmpp (kW)
51	3	A, B, C	60
55	3	A, B, C	15.5
56	3	A, B, C	8.25
57	3	A, B, C	100
58	1	B	12.4
59	1	B	1.8
65	3	A, B, C	12.4
68	1	A	1.8
69	1	A	12.4
70	1	A	6.2
71	1	A	10.3
72	3	A, B, C	1.8
73	1	C	6.2
74	1	C	60
75	1	C	12.4
76	3	A, B, C	15.5
77	3	A, B, C	8.25
78	3	A, B, C	10.3
79	3	A, B, C	12.4
81	3	A, B, C	6.2
82	3	A, B, C	30
84	1	C	15.5
85	1	C	30
86	3	A, B, C	8.25
88	1	A	12.4
90	1	B	60
91	3	A, B, C	15.5
92	1	C	60
95	3	A, B, C	1.8
96	1	B	10.3
98	3	A, B, C	1.8
99	3	A, B, C	10.3
100	3	A, B, C	15.5
101	3	A, B, C	100
103	1	C	30
106	1	B	60
107	1	B	15.5
109	1	A	8.25
111	1	A	6.2
110	1	A	10.3
112	1	A	6.2
113	1	A	12.4
135	3	A, B, C	1.8
152	3	A, B, C	6.2
160	3	A, B, C	30
197	3	A, B, C	1.8
450	3	A, B, C	100

Table A7 Photovoltaic units installed in the IEEE 34-bus system. Source: Author.

Bus	No. of Phases	Phases	Pmpp (kW)
802	3	A, B, C	6.2
806	3	A, B, C	6.2
808	3	A, B, C	8.25
810	1	B	10.3
812	3	A, B, C	12.4
814	3	A, B, C	6.2
850	3	A, B, C	10.3
816	3	A, B, C	30
818	1	A	1.8
820	1	A	30
822	1	A	15.5
824	3	A, B, C	1.8
826	1	B	10.3
828	3	A, B, C	60
830	3	A, B, C	30
854	3	A, B, C	60
856	1	B	10.3
852	3	A, B, C	60
832	3	A, B, C	1.8
888	3	A, B, C	30
890	3	A, B, C	40
858	3	A, B, C	60
864	1	A	60
834	3	A, B, C	16.5
842	3	A, B, C	60
844	3	A, B, C	12.9
846	3	A, B, C	30
848	3	A, B, C	60
860	3	A, B, C	10.3
836	3	A, B, C	16.5
840	3	A, B, C	15.5
862	3	A, B, C	30
838	1	B	60