

A Parallel Sectionalized Restoration Scheme for Resilient Smart Grid Systems - Data Set

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I. DATA OF NUMERICAL EXAMPLE FOR THE 6-BUS TEST SYSTEM

The post-disturbance transmission lines' data is shown in Table I. The black start (BS) units are illustrated in Table II. The hourly load data is presented in Table IV which follows load demand distribution profile as shown in Table III.

TABLE I
6-BUS TRANSMISSION LINE DATA

Line#	From bus	To bus	X (pu)	Capacity (MW)
1	1	2	0.170	200
2	2	3	0.037	100
3	1	4	0.258	100
4	2	4	0.197	100
5	4	5	0.037	100
6	5	6	0.140	100
7	3	6	0.018	100

TABLE II
6-BUS BLACK START UNITS

Unit#	Bus#	Min (MW)	Max (MW)	Ramp Up/ Down (MW/hr)	Marginal cost (\$/MWh)
1	1	100	220	55	13.5
2	2	10	100	50	40
3	6	10	70	20	17.7

TABLE III
6-BUS HOURLY LOAD DATA

Hour	Load (MW)	Hour	Load (MW)
1	179.2	13	277.2
2	168.0	14	280
3	162.4	15	280
4	156.8	16	271.6
5	156.8	17	268.8
6	162.4	18	268.8
7	179.2	19	260.4
8	212.8	20	257.6
9	243.6	21	257.6
10	266.0	22	260.4
11	277.2	23	243.6
12	280.0	24	201.6

II. DATA OF NUMERICAL EXAMPLE FOR THE 118-BUS TEST SYSTEM

The existing transmission lines data is shown in Table V. The black start (BS) units are illustrated in Table VI. The

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TABLE IV
6-BUS LOAD DEMAND DISTRIBUTION PROFILE

Bus#	Load (%)
1	20
2	40
3	40

average load data is presented in Table VII which is assumed to be distributed during 24 hours the same as 6-bus case study.

TABLE V
118-BUS TRANSMISSION LINE DATA

Line#	From bus	To bus	X (pu)	Capacity (MW)
1	1	2	0.0999	175
2	1	3	0.0424	175
3	4	5	0.00798	500
4	3	5	0.108	175
5	5	6	0.054	175
6	6	7	0.0208	175
7	8	9	0.0305	500
8	8	5	0.0267	500
9	9	10	0.0322	500
10	4	11	0.0688	175
11	5	11	0.0682	175
12	11	12	0.0196	175
13	2	12	0.0616	175
14	3	12	0.16	175
15	7	12	0.034	175
16	11	13	0.0731	175
17	12	14	0.0707	175
18	13	15	0.2444	175
19	14	15	0.195	175
20	12	16	0.0834	175
21	15	17	0.0437	500
22	16	17	0.1801	175
23	17	18	0.0505	175
24	18	19	0.0493	175
25	19	20	0.117	175
26	15	19	0.0394	175
27	20	21	0.0849	175
28	21	22	0.097	175
29	22	23	0.159	175
30	23	24	0.0492	175
31	23	25	0.08	500
32	26	25	0.0382	500
33	25	27	0.163	500

Line#	From bus	To bus	X (pu)	Capacity (MW)
34	27	28	0.0855	175
35	28	29	0.0943	175
36	30	17	0.0388	500
37	8	30	0.0504	175
38	26	30	0.086	500
39	17	31	0.1563	175
40	29	31	0.0331	175
41	23	32	0.1153	140
42	31	32	0.0985	175
43	27	32	0.0755	175
44	15	33	0.1244	175
45	19	34	0.247	175
46	35	36	0.0102	175
47	35	37	0.0497	175
48	33	37	0.142	175
49	34	36	0.0268	175
50	34	37	0.0094	500
51	38	37	0.0375	500
52	37	39	0.106	175
53	37	40	0.168	175
54	30	38	0.054	175
55	39	40	0.0605	175
56	40	41	0.0487	175
57	40	42	0.183	175
58	41	42	0.135	175
59	43	44	0.2454	175
60	34	43	0.1681	175
61	44	45	0.0901	175
62	45	46	0.1356	175
63	46	47	0.127	175
64	46	48	0.189	175
65	47	49	0.0625	175
66	42	49	0.323	175
67	42	49	0.323	175
68	45	49	0.186	175
69	48	49	0.0505	175
70	49	50	0.0752	175
71	49	51	0.137	175
72	51	52	0.0588	175
73	52	53	0.1635	175
74	53	54	0.122	175
75	49	54	0.289	175
76	49	54	0.291	175
77	54	55	0.0707	175
78	54	56	0.00955	175
79	55	56	0.0151	175
80	56	57	0.0966	175
81	50	57	0.134	175
82	56	58	0.0966	175
83	51	58	0.0719	175
84	54	59	0.2293	175
85	56	59	0.251	175
86	56	59	0.239	175
87	55	59	0.2158	175
88	59	60	0.145	175
89	59	61	0.15	175
90	60	61	0.0135	500
91	60	62	0.0561	175
92	61	62	0.0376	175
93	63	59	0.0386	500
94	63	64	0.02	500
95	64	61	0.0268	500
96	38	65	0.0986	500
97	64	65	0.0302	500
98	49	66	0.0919	500
99	49	66	0.0919	500
100	62	66	0.218	175
101	62	67	0.117	175
102	65	66	0.037	500
103	66	67	0.1015	175
104	65	68	0.016	500
105	47	69	0.2778	175
106	49	69	0.324	175

Line#	From bus	To bus	X (pu)	Capacity (MW)
107	68	69	0.037	500
108	69	70	0.127	500
109	24	70	0.4115	175
110	70	71	0.0355	175
111	24	72	0.196	175
112	71	72	0.18	175
113	71	73	0.0454	175
114	70	74	0.1323	175
115	70	75	0.141	175
116	69	75	0.122	500
117	74	75	0.0406	175
118	76	77	0.148	175
119	69	77	0.101	175
120	75	77	0.1999	175
121	77	78	0.0124	175
122	78	79	0.0244	175
123	77	80	0.0485	500
124	77	80	0.105	500
125	79	80	0.0704	175
126	68	81	0.0202	500
127	81	80	0.037	500
128	77	82	0.0853	200
129	82	83	0.03665	200
130	83	84	0.132	175
131	83	85	0.148	175
132	84	85	0.0641	175
133	85	86	0.123	500
134	86	87	0.2074	500
135	85	88	0.102	175
136	85	89	0.173	175
137	88	89	0.0712	500
138	89	90	0.188	500
139	89	90	0.0997	500
140	90	91	0.0836	175
141	89	92	0.0505	500
142	89	92	0.1581	500
143	91	92	0.1272	175
144	92	93	0.0848	175
145	92	94	0.158	175
146	93	94	0.0732	175
147	94	95	0.0434	175
148	80	96	0.182	175
149	82	96	0.053	175
150	94	96	0.0869	175
151	80	97	0.0934	175
152	80	98	0.108	175
153	80	99	0.206	200
154	92	100	0.295	175
155	94	100	0.058	175
156	95	96	0.0547	175
157	96	97	0.0885	175
158	98	100	0.179	175
159	99	100	0.0813	175
160	100	101	0.1262	175
161	92	102	0.0559	175
162	101	102	0.112	175
163	100	103	0.0525	500
164	100	104	0.204	175
165	103	104	0.1584	175
166	103	105	0.1625	175
167	100	106	0.229	175
168	104	105	0.0378	175
169	105	106	0.0547	175
170	105	107	0.183	175
171	105	108	0.0703	175
172	106	107	0.183	175
173	108	109	0.0288	175
174	103	110	0.1813	175
175	109	110	0.0762	175
176	110	111	0.0755	175
177	110	112	0.064	175
178	17	113	0.0301	175
179	32	113	0.203	500

Line#	From bus	To bus	X (pu)	Capacity (MW)
180	32	114	0.0612	175
181	27	115	0.0741	175
182	114	115	0.0104	175
183	68	116	0.00405	500
184	12	117	0.14	175
185	75	118	0.0481	175
186	76	118	0.0544	175

TABLE VI
118-BUS BLACK START UNITS

Unit#	Bus#	Min (MW)	Max (MW)	Ramp Up/ Down (MW/hr)	Marginal cost (\$/MWh)
1	10	150	2000	1300	12.89
2	25	100	2000	2000	12.89
3	49	10	2225	800	26.24
4	59	25	2000	1000	17.82
5	69	5	2025	1300	26.24
6	80	5	2000	600	26.24
7	89	100	2675	1000	12.89
8	100	100	2000	1300	10.76

TABLE VII
118-BUS AVERAGE LOAD DATA

Load#	Bus#	Load (MW)	Load#	Bus#	Load (MW)
1	1	54.14	47	57	12
2	2	21.23	48	58	12
3	3	41.4	49	59	277
4	4	31.85	50	60	78
5	6	55.2	51	62	77
6	7	20.17	52	66	39
7	11	74.31	53	67	28
8	12	49.89	54	70	66
9	13	36.09	55	74	68
10	14	14.86	56	75	47
11	15	95.54	57	76	68
12	16	26.54	58	77	61
13	17	11.68	59	78	71
14	18	63.69	60	79	39
15	19	47.77	61	80	130
16	20	19.11	62	82	54
17	21	14.86	63	83	20
18	22	10.62	64	84	11
19	23	7.43	65	85	24
20	27	65.82	66	86	21
21	28	18.05	67	88	48
22	29	25.48	68	90	78
23	31	45.65	69	92	65
24	32	62.63	70	93	12
25	33	24.42	71	94	30
26	34	62.63	72	95	42
27	35	35.03	73	96	38
28	36	32.91	74	97	15
29	39	27	75	98	34
30	40	20	76	100	37
31	41	37	77	101	22
32	42	37	78	102	5
33	43	18	79	103	23
34	44	16	80	104	38
35	45	53	81	105	31
36	46	28	82	106	43
37	47	34	83	107	28
38	48	20	84	108	2
39	49	87	85	109	8
40	50	17	86	110	39
41	51	17	87	112	25
42	52	18	88	114	8.49
43	53	23	89	115	23.35
44	54	113	90	117	21.23
45	55	63	91	118	33
46	56	84			