

Repair time reduction and costs

Bus Out	Bus In	Repair Time Action 1 (Hours)	Repair Time Action 2 (Hours)	Repair Time Action 3 (Hours)	Repair Time Action 1 Cost (m.u.)	Repair Time Action 2 Cost (m.u.)	Repair Time Action 3 Cost (m.u.)
1	2	8.00	16.00	21.40	380000	570000	760000
1	18	7.50	15.10	20.10	32000	48000	64000
2	3	3.60	7.10	9.50	282000	423000	564000
2	22	2.90	5.70	7.60	90000	135000	180000
3	4	3.60	7.30	9.70	268000	402000	536000
4	5	7.70	15.30	20.50	262000	393000	524000
5	6	2.60	5.20	6.90	102000	153000	204000
5	25	3.50	7.00	9.40	188000	282000	376000
6	7	8.80	17.60	23.40	82000	123000	164000
7	8	2.90	5.80	7.70	62000	93000	124000
8	9	3.60	7.20	9.70	58000	87000	116000
9	10	2.70	5.50	7.30	54000	81000	108000
10	11	3.60	7.30	9.70	48000	72000	96000
11	12	3.00	6.10	8.10	40000	60000	80000
12	13	2.50	5.00	6.70	34000	51000	68000
13	14	4.10	8.30	11.00	18000	27000	36000
14	15	8.90	17.90	23.80	16000	24000	32000
15	16	2.70	5.30	7.10	12000	18000	24000
16	17	6.10	12.20	16.30	8000	12000	16000
18	19	3.60	7.20	9.60	24000	36000	48000
19	20	7.70	15.30	20.40	16000	24000	32000
20	21	7.50	15.00	20.00	8000	12000	16000
22	23	3.30	6.60	8.80	80000	120000	160000
23	24	2.80	5.60	7.50	40000	60000	80000
25	26	2.80	5.60	7.50	182000	273000	364000
26	27	2.80	5.60	7.50	178000	267000	356000
27	28	8.10	16.20	21.60	174000	261000	348000
28	29	6.20	12.40	16.50	162000	243000	324000
29	30	3.50	7.10	9.40	42000	63000	84000
30	31	2.90	5.70	7.60	28000	42000	56000
31	32	2.80	5.60	7.40	8000	12000	16000
33	1	9.10	18.10	24.20	424000	636000	848000

Failure rate reduction and costs

Bus Out	Bus In	Failure Rate Action 1 (Hours)	Failure Rate Action 2 (Hours)	Failure Rate Action 3 (Hours)	Failure Rate Action 1 Cost (m.u.)	Failure Rate Action 2 Cost (m.u.)	Failure Rate Action 3 Cost (m.u.)
1	2	0.44	0.66	0.94	570000	855000	1140000
1	18	0.36	0.54	0.77	48000	72000	96000
2	3	0.84	1.26	1.79	423000	634500	846000
2	22	0.84	1.26	1.79	135000	202500	270000
3	4	0.48	0.72	1.02	402000	603000	804000
4	5	0.56	0.84	1.19	393000	589500	786000
5	6	0.68	1.02	1.45	153000	229500	306000
5	25	0.84	1.26	1.79	282000	423000	564000
6	7	0.44	0.66	0.94	123000	184500	246000
7	8	1.16	1.74	2.47	93000	139500	186000
8	9	0.48	0.72	1.02	87000	130500	174000
9	10	1.04	1.56	2.21	81000	121500	162000
10	11	0.84	1.26	1.79	72000	108000	144000
11	12	0.48	0.72	1.02	60000	90000	120000
12	13	0.32	0.48	0.68	51000	76500	102000
13	14	0.32	0.48	0.68	27000	40500	54000
14	15	0.48	0.72	1.02	24000	36000	48000
15	16	1.20	1.80	2.55	18000	27000	36000
16	17	0.68	1.02	1.45	12000	18000	24000
18	19	0.60	0.90	1.28	36000	54000	72000
19	20	0.56	0.84	1.19	24000	36000	48000
20	21	0.44	0.66	0.94	12000	18000	24000
22	23	0.84	1.26	1.79	120000	180000	240000
23	24	0.68	1.02	1.45	60000	90000	120000
25	26	0.56	0.84	1.19	273000	409500	546000
26	27	0.64	0.96	1.36	267000	400500	534000
27	28	0.84	1.26	1.79	261000	391500	522000
28	29	1.00	1.50	2.13	243000	364500	486000
29	30	0.64	0.96	1.36	63000	94500	126000
30	31	1.04	1.56	2.21	42000	63000	84000
31	32	0.56	0.84	1.19	12000	18000	24000
33	1	0.12	0.18	0.26	636000	954000	1272000

Non-Dominated Solutions

Plan	Investment Cost (m.u.)	Non-Supplied Energy Cost (m.u.)	Loss Cost (m.u.)	Capacitor Cost (m.u.)
1	9559800	4051126	186670	9658
2	10025100	3949717	173444	15475
3	12565920	2677328	221396	3896
4	10885200	3221659	191163	8478
5	9776940	3837320	236487	3896
6	9415980	3928110	176365	17497
7	9399060	3933787	197850	15070
8	13440120	3306841	281647	0
9	9774120	3863238	220071	3896
10	9729000	3793020	209727	11744
11	9458280	4165438	194653	3896
12	9568260	3888129	220131	3896
13	18851700	1709874	222500	3896
14	10711770	3428851	189062	8594
15	9415980	3958135	175056	16310
16	21437640	1531938	184696	9624
17	9879870	3604682	176759	16256
18	15273120	2172810	193056	8478
19	13021350	2494032	183974	9591
20	12797160	3441435	281629	0
21	9458280	4151419	197233	3896
22	18851700	1691431	192211	3954
23	16195260	2151764	187296	8594
24	18851700	1669591	185126	8478
25	13420380	2444993	184866	8478
26	10349400	3528198	202410	8478
27	10422720	3966454	176853	13201
28	13710840	2518450	221227	3896
29	11172840	3216167	201038	8478
30	18496380	1672277	211884	8478
31	10152000	3788646	200938	3149
32	21209220	1495407	202907	8478
33	9774120	3863441	219757	3896
34	14596320	2323826	214714	8478
35	9540060	3886677	179126	14134
36	13208880	2553042	192883	5329
37	9525960	3883587	198177	5325
38	12940980	2550709	221390	3896
39	9596460	3967304	189961	3149
40	17550270	1820523	211832	8478
41	10766760	3144534	183090	16157
42	11048760	3254308	203626	3896
43	12092160	2790624	216666	8478

44	13208880	2588664	195106	3896
45	11787600	3750622	281621	0
46	9540060	3832970	191463	16157
47	21589920	1485402	183250	8478
48	21691440	1460725	196656	15104
49	21183840	1560063	211905	8478
50	9523140	3752758	197734	15223
51	9489300	3987406	219543	3896
52	9638760	3892151	190424	3149
53	9775530	3863377	210202	8478
54	9799500	3963659	175823	15475
55	9362400	4097147	219562	3896
56	9774120	3863266	219980	3896
57	10825980	3267476	208657	8478
58	9396240	4016257	203848	8478
59	9362400	4031015	191049	3954
60	9796680	3878799	193352	5042
61	13208880	2556391	221309	3896
62	10577820	3491902	215674	9624
63	12041400	3086583	192688	8478
64	18496380	1715872	198185	2521
65	11093880	3192208	214281	7259
66	12616680	2688052	204767	3896
67	9697980	3869606	210003	7045
68	9362400	4097148	219560	3896
69	10763940	3330411	186469	7815
70	13779930	2439556	185145	5785
71	10053300	3619653	194258	3896
72	10637040	3507541	219615	3896
73	9432900	3962462	177715	14479
74	9689520	3851399	197454	12832
75	21465840	1517911	192262	11744
76	21209220	1537272	218136	3896
77	14621700	2331108	191173	9933
78	9458280	4074293	220096	3896
79	10902120	4389058	281382	0
80	9415980	3927671	199821	12983
81	13208880	2488865	213394	8478
82	18851700	1668820	211889	8478
83	21589920	1509988	208560	5884
84	18496380	1674025	201959	8478
85	21691440	1520287	218375	3896
86	10267620	3584793	211004	10711
87	9796680	3945115	201581	2521
88	18851700	1709896	222346	3896
89	13902600	2428411	219896	8478

90	9758610	3735002	180879	8749
91	14207160	2438730	215528	6418
92	9540060	3862089	200480	15070
93	15158910	2222107	210010	9624
94	9523140	4367779	182140	9965
95	13208880	3362495	281644	0
96	13254000	2486789	209736	8594
97	9867180	4076516	197783	2521
98	9830520	3859469	205416	8594
99	12030120	2862745	213401	8478
100	9774120	3831145	213673	6072
101	11223600	3255894	194885	3896
102	10587690	3745357	174263	17497
103	9596460	3977762	189495	3149
104	9537240	4018465	199328	3896
105	9774120	3863290	219932	3896
106	10541160	3546383	217265	3896
107	13731990	2417037	178317	11171
108	9362400	4097207	219414	3896
109	9393420	4204167	194947	3896
110	9551340	3823286	198379	15123
111	13779930	2429910	215933	8228
112	13208880	2583907	195696	3896
113	21465840	1658001	199271	3896
114	21691440	1520341	218157	3896
115	10772400	3533481	180028	10711
116	18851700	1669288	207713	8478
117	9596460	3965766	190104	3149
118	10157640	3936834	182138	8251
119	15044700	2248534	231976	7045
120	10772400	3366470	220153	3896
121	10349400	3528179	202837	8478
122	9537240	4004496	202584	3896
123	9578130	3844252	184674	15070
124	9492120	4078219	188926	12832
125	11485860	3236873	195460	3896
126	19178820	1683180	222014	3896
127	9537240	4039536	194986	3896
128	10556670	3496588	210954	8478
129	14596320	2326111	191244	3954
130	10541160	3476570	219702	3896
131	10579230	3531912	199001	7045
132	13254000	2523973	191861	3149
133	13242720	2555842	208755	3896
134	13276560	2474880	209777	8478
135	9836160	3926155	184562	7942

136	12269820	3565616	281638	0
137	13710840	2469155	180639	10083
138	9592230	4119624	177298	15223
139	10381830	3511882	208768	10963
140	9774120	3863246	220037	3896
141	21209220	1510492	193752	8478
142	9669780	4028235	178716	12983
143	13440120	2456324	187159	6130
144	9714900	4004572	176442	11116
145	12250080	3149768	255154	3896
146	21691440	1520287	218402	3896
147	11223600	3142895	208679	8478
148	18851700	1669593	185119	8478
149	19178820	1637942	184111	8478
150	21209220	1542155	211807	3896
151	9644400	3811880	184389	15223
152	9370860	4082142	208424	3149
153	18851700	1709872	222533	3896
154	14404560	2326969	200393	8478
155	10194300	3938627	178822	9777
156	9729000	3755267	199079	15070
157	9596460	3972355	189666	3149
158	10243650	3535122	184796	18279
159	10840080	3285648	177664	8902
160	9796680	3788457	205999	5670
161	9525960	3985002	220098	3896
162	14387640	2418275	203756	3896
163	14404560	2392603	213941	3896
164	10087140	3705712	185280	7907
165	18496380	1696046	191056	5670
166	12959310	2663980	212459	3896
167	12919830	2519575	178623	11958
168	13428840	2432365	186405	8478
169	21209220	1537208	218389	3896
170	10885200	3321935	219985	3896
171	10637040	3507543	219583	3896
172	17664480	1943020	200311	3896
173	21691440	1520288	218369	3896
174	12092160	2839762	180968	9677
175	21465840	1534844	179679	11958
176	9540060	3865053	182004	17497
177	18851700	1709911	222286	3896
178	9537240	4031903	196488	3896
179	9813600	3704936	181776	16410
180	9736050	3843724	220985	7045
181	9740280	3813172	174978	16410

182	9551340	3953827	197040	3149
183	9571080	3894302	190294	3149
184	21437640	1524761	218397	3896
185	13462680	2474973	189306	5670
186	9452640	3953689	190123	7562
187	10783680	3301214	185635	8478
188	9551340	3817604	174409	16157
189	9463920	4044035	190947	3149
190	9424440	3975540	196938	15070
191	21589920	1598136	199342	3896
192	21589920	1532139	203230	4452
193	9774120	3863979	219443	3896
194	10442460	3595556	190672	3149
195	9841800	3861848	220002	3896
196	10047660	3726163	214987	8478
197	9531600	3902159	219605	3896
198	14342520	2415023	202040	14036
199	9551340	3950780	207903	3149
200	10783680	3301214	185633	8478
201	12565920	2673200	218703	8478
