

Table S1: The system data of test system 1 (6-unit system)

Unit	a	b	c	P^{min}	P^{max}	P^0	UR	DR	POZ
1	240	7	0.007	100	500	440	80	120	[210, 240];[350, 380]
2	200	10	0.0095	50	200	170	50	90	[90, 110]; [140, 160]
3	220	8.5	0.009	80	300	200	65	100	[150, 170]; [210, 240]
4	200	11	0.009	50	150	150	50	90	[80, 90]; [110, 120]
5	220	10.5	0.008	50	200	190	50	90	[90, 110]; [140, 150]
6	190	12	0.0075	50	120	150	50	90	[75, 85]; [100, 105]

Table S2: The system data of test system 2 (15-unit system)

Unit	a	b	c	P^{min}	P^{max}	P^0	UR	DR	POZ
1	10.1	671	0.000299	150	455	400	80	120	[185 225];[305 335];[420 450]
2	10.2	574	0.000183	150	455	300	80	120	
3	8.8	374	0.001126	20	130	105	130	130	
4	8.8	374	0.001126	20	130	100	130	130	[180 200];[305 335];[390 420]
5	10.4	461	0.000205	150	470	90	80	120	
6	10.1	630	0.000301	135	460	400	80	120	
7	9.8	548	0.000364	135	465	350	80	120	[230 255];[365 395];[430 455]
8	11.2	227	0.000338	60	300	95	65	100	
9	11.2	173	0.000807	25	162	105	60	100	
10	10.7	175	0.001203	25	160	110	60	100	[30 40];[55 65]
11	10.2	186	0.003586	20	80	60	80	80	
12	9.9	230	0.005513	20	80	40	80	80	
13	13.1	225	0.000371	25	85	30	80	80	
14	12.1	309	0.001929	15	55	20	55	55	
15	12.4	323	0.004447	15	55	20	55	55	

Table S3: The system data of test system 3 (20-unit system)

Unit	a	b	c	P^{min}	P^{max}
1	1000	18.19	0.00068	150	600
2	970	19.26	0.00071	50	200
3	600	19.8	0.0065	50	200
4	700	19.1	0.005	50	200
5	420	18.1	0.00738	50	160
6	360	19.26	0.00612	20	100
7	490	17.14	0.0079	25	125
8	660	18.92	0.00813	50	150
9	765	18.27	0.00522	50	200
10	770	18.92	0.00573	30	150
11	800	16.69	0.0048	100	300
12	970	16.76	0.0031	150	500
13	900	17.36	0.0085	40	160
14	700	18.7	0.00511	20	130
15	450	18.7	0.00398	25	185
16	370	14.26	0.0712	20	80
17	480	19.14	0.0089	30	85
18	680	18.92	0.00713	30	120
19	700	18.47	0.00622	40	120
20	850	19.79	0.00773	30	100

Table S4: The system data of test system 4 (38-unit system)

Unit	a	b	c	P^{min}	P^{max}
1	64782	796.9	0.3133	220	550
2	64782	796.9	0.3133	220	550
3	64670	795.5	0.3127	200	500
4	64670	795.5	0.3127	200	500
5	64670	795.5	0.3127	200	500
6	64670	795.5	0.3127	200	500
7	64670	795.5	0.3127	200	500
8	64670	795.5	0.3127	200	500
9	172832	915.7	0.7075	114	500
10	172832	915.7	0.7075	114	500
11	176003	884.2	0.7515	114	500
12	173028	884.2	0.7083	114	500
13	91340	1250.1	0.4211	110	500
14	63440	1298.6	0.5145	90	365
15	65468	1298.6	0.5691	82	365
16	77282	1290.8	0.5691	120	325
17	190928	238.1	2.5881	65	315
18	285372	1149.5	3.8734	65	315
19	271676	1269.1	3.6842	65	315
20	39197	696.1	0.4921	120	272
21	45576	660.2	0.5728	120	272
22	28770	803.2	0.3572	110	260
23	36902	818.2	0.9415	80	190
24	105510	33.5	52.123	10	150
25	22233	805.4	1.1421	60	125
26	30953	707.1	2.0275	55	110
27	17044	833.6	3.0744	35	75
28	81079	2188.7	16.765	20	70
29	124767	1024.4	26.355	20	70
30	121915	837.1	30.575	20	70
31	120780	1305.2	25.098	20	70
32	104441	716.6	33.722	20	60
33	83224	1633.9	23.915	25	60
34	111281	969.6	32.562	18	60
35	64142	2625.8	18.362	8	60
36	103519	1633.9	23.915	25	60
37	13547	694.7	8.482	20	38
38	13518	655.9	9.693	20	38

Table S5: The system data of test system 5 (110-unit system)

Unit	a	b	c	P^{min}	P^{max}	Unit	a	b	c	P^{min}	P^{max}
1	24.389	25.547	0.0253	12	2.4	56	82.136	14.327	0.0098	96	25.2
2	24.411	25.675	0.0265	12	2.4	57	82.298	14.354	0.0099	96	25.2
3	24.638	25.803	0.028	12	2.4	58	82.464	14.38	0.0092	100	35
4	24.76	25.932	0.0284	12	2.4	59	82.626	14.407	0.0094	100	35
5	24.888	26.061	0.0286	12	2.4	60	218.895	19	0.0072	120	45
6	117.755	37.551	0.012	20	4	61	219.335	19.1	0.0071	120	45
7	118.108	37.664	0.0126	20	4	62	219.775	19.2	0.007	120	45
8	118.458	37.777	0.0136	20	4	63	143.735	11.694	0.0066	185	54.3
9	118.821	37.89	0.0143	20	4	64	144.029	11.715	0.0057	185	54.3
10	81.136	13.327	0.0088	76	15.2	65	144.318	11.737	0.0058	185	54.3
11	81.298	13.354	0.0089	76	15.2	66	144.597	11.758	0.0059	185	54.3
12	81.464	13.8	0.0091	76	15.2	67	269.131	24	0.0036	197	70
13	81.626	13.407	0.0093	76	15.2	68	269.649	24.1	0.0036	197	70
14	217.895	18	0.0062	100	25	69	270.176	24.2	0.0036	197	70
15	218.335	18.1	0.0061	100	25	70	187.057	11.862	0.0025	360	150
16	218.775	18.2	0.006	100	25	71	320.002	8.492	0.0029	400	160
17	142.735	10.694	0.0046	155	54.3	72	321.91	8.503	0.003	400	160
18	143.029	10.715	0.0047	155	54.3	73	52.136	13.327	0.0054	300	60
19	143.318	10.737	0.0048	155	54.3	74	42.298	12.354	0.0055	250	50
20	143.597	10.758	0.0049	155	54.3	75	32.464	11.38	0.0099	90	30
21	259.131	23	0.0026	197	68.9	76	23.626	9.407	0.0031	50	12
22	259.649	23.1	0.0026	197	68.9	77	220	14	0.0024	450	160
23	260.176	23.2	0.0026	197	68.9	78	190	13.1	0.0023	600	150
24	177.057	10.862	0.0015	350	140	79	250	13.2	0.0036	200	50
25	210.002	7.492	0.0019	400	100	80	230	13.5	0.0049	120	20
26	211.91	7.503	0.0019	400	100	81	70	24	0.0061	55	10
27	210	12	0.0014	500	140	82	60	14.5	0.007	40	12
28	180	12.1	0.0013	500	140	83	210	14.2	0.0088	80	20
29	240	12.2	0.0026	200	50	84	150	13.4	0.0022	200	50
30	220	12.5	0.0039	100	25	85	130	11.3	0.0048	325	80
31	60	23	0.0051	50	10	86	80	8.9	0.0053	440	120
32	50	13.5	0.005	20	5	87	90	14.4	0.0021	35	10
33	200	13.2	0.0078	80	20	88	80	14.3	0.0033	55	20
34	140	12.4	0.0012	250	75	89	125	13.9	0.0034	100	20
35	120	10.3	0.0038	360	110	90	160	13.8	0.0037	220	40
36	90	9.9	0.0043	400	130	91	50	13.7	0.0066	140	30
37	80	13.4	0.0011	40	10	92	400	13.6	0.0043	100	40
38	70	13.3	0.0023	70	20	93	260	8.4	0.0022	440	100
39	115	12.9	0.0034	100	25	94	110	7.6	0.0055	500	100
40	150	12.8	0.0067	120	20	95	170	7.5	0.0032	600	100
41	40	12.7	0.0056	180	40	96	140	7.2	0.0077	700	200
42	300	12.6	0.0023	220	50	97	26.389	26.547	0.0353	15	3.6
43	250	7.4	0.0012	440	120	98	25.411	26.675	0.0365	15	3.6
44	100	6.6	0.0045	560	160	99	25.638	26.803	0.038	22	4.4
45	160	6.5	0.0022	660	150	100	25.76	26.932	0.0384	22	4.4
46	130	6.2	0.0067	700	200	101	65	15.3	0.021	60	10
47	34.389	26.547	0.0353	32	5.4	102	82	16	0.023	80	10
48	34.411	26.675	0.0365	32	5.4	103	86	20.2	0.024	100	20
49	34.638	26.803	0.038	52	8.4	104	84	20.2	0.035	120	20
50	34.761	26.932	0.0384	52	8.4	105	75	25.6	0.034	150	40
51	34.888	17.061	0.0386	52	8.4	106	56	30.5	0.037	280	40
52	127.755	38.551	0.032	60	12	107	67	32.5	0.039	520	50
53	128.108	36.664	0.0326	60	12	108	68	26	0.035	150	30
54	128.458	38.777	0.0236	60	12	109	69	25.8	0.028	320	40
55	128.821	38.89	0.0243	60	12	110	72	27	0.026	200	20