

Dataset of “Weekly Frequency-Constrained Scheduling for Electricity-Heat Coupled Systems Against Wind Droughts”

I. Configurations of Test System I

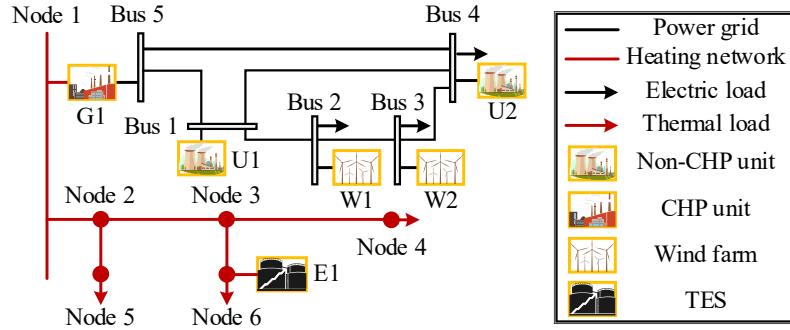


Fig. 1 Topology of Test System I

TABLE I INTEGRATION CAPACITY

Name	Capacity	Others
W1	120 MW	—
W2	100 MW	—
U1	200 MW	—
U2	150 MW	—
G1	80 MW (electricity), 50 MW (heat)	—
E1	15 MWh	$L^E=10 \text{ m}$, $A^{E,s}=250 \text{ m}^2$, $m=30 \text{ kg/s}$

TABLE II NODE DATA OF THE 5-BUS POWER GRID

Bus No.	Active power (MW)
1	0
2	154
3	154
4	77
5	0
Total	385

TABLE III BRANCH DATA OF THE 5-BUS POWER GRID

Branch No.	From bus	To bus	Resistance (p.u.)
1	1	2	0.00281
2	1	4	0.00304
3	1	5	0.00064
4	2	3	0.00108
5	3	4	0.00297
6	4	5	0.00297

TABLE IV NODE DATA OF THE 6-NODE THERMAL NETWORK

Bus No.	Heat power (MW)
1	0
2	0
3	0
4	10
5	10
6	11
Total	31

TABLE V PIPELINE DATA OF THE 6-NODE THERMAL NETWORK

Branch No.	From bus	To bus	Length (m)	Diameter (m)	Conductivity (W/(m°C))	Mass flow rate (kg/s)
1	1	2	10500.00	0.50	0.25	400.00
2	2	3	6500.00	0.30	0.25	260.00
3	3	4	6500.00	0.10	0.25	140.00
4	2	5	5500.00	0.25	0.25	140.00
5	3	6	5500.00	0.10	0.25	120.00

II. Configuration of Test System II

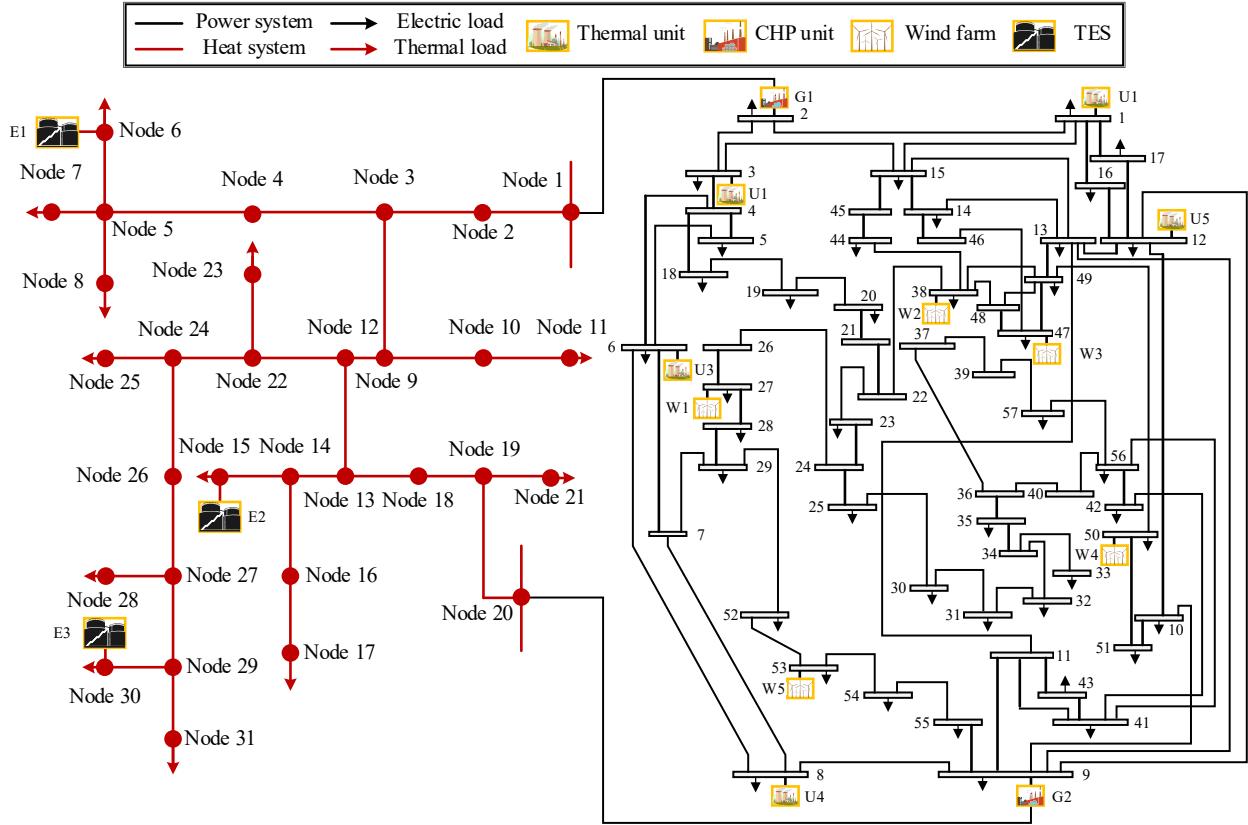


Fig. 2 Topology of Test System II

TABLE VI INTEGRATION CAPACITY

Name	Capacity	Others
W1	150 MW	—
W2	150 MW	—
W3	150 MW	—
W4	150 MW	—
W5	150 MW	—
U1	575.88 MW	—
U2	140 MW	—
U3	100 MW	—
U4	550 MW	—
U5	410 MW	—
G1	80 MW (electricity), 70 MW (heat)	—

Name	Capacity	Others
G2	80 MW (electricity), 70 MW (heat)	—
E1	15 MWh	$L^E=10 \text{ m}$, $A^{E,s}=250 \text{ m}^2$, $m=30 \text{ kg/s}$
E2	15 MWh	$L^E=10 \text{ m}$, $A^{E,s}=250 \text{ m}^2$, $m=30 \text{ kg/s}$
E3	15 MWh	$L^E=10 \text{ m}$, $A^{E,s}=250 \text{ m}^2$, $m=30 \text{ kg/s}$

TABLE VII NODE DATA OF THE 57-BUS POWER GRID

Bus No.	Active power (MW)	Bus No.	Active power (MW)
1	55	19	3.3
2	3	20	2.3
3	41	21	0
4	0	22	0
5	13	23	6.3
6	75	24	0
7	0	25	6.3
8	150	26	0
9	121	27	9.3
10	5	28	4.6
11	0	29	17
12	377	30	3.6
13	18	31	5.8
14	10.5	32	1.6
15	22	33	3.8
16	43	34	0
17	42	35	6
18	27.2	36	0
37	0	48	0
38	14	49	18
39	0	50	21
40	0	51	18
41	6.3	52	4.9
42	7.1	53	20
43	2	54	4.1
44	12	55	6.8
45	0	56	7.6
46	0	57	6.7
47	29.7	Total	1250.8

TABLE VIII BRANCH DATA OF THE 57-BUS POWER GRID

Branch No.	From bus	To bus	Resistance (p.u.)
1	1	2	0.0083
2	2	3	0.0298
3	3	4	0.0112
4	4	5	0.0625
5	4	6	0.043
6	6	7	0.02
7	6	8	0.0339
8	8	9	0.0099
9	9	10	0.0369
10	9	11	0.0258
11	9	12	0.0648
12	9	13	0.0481
13	13	14	0.0132
14	13	15	0.0269
15	1	15	0.0178
16	1	16	0.0454
17	1	17	0.0238
18	3	15	0.0162
19	4	18	0.0162
20	4	18	0.0162
21	5	6	0.0302
22	7	8	0.0139
23	10	12	0.0277
24	11	13	0.0223
25	12	13	0.0178
26	12	16	0.018
27	12	17	0.0397
28	14	15	0.0171
29	18	19	0.461
30	19	20	0.283
31	21	20	0.283
32	21	22	0.0736

Branch No.	From bus	To bus	Resistance (p.u.)
33	22	23	0.0099
34	23	24	0.166
35	24	25	0.166
36	24	25	0.166
37	24	26	0.166
38	26	27	0.165
39	27	28	0.0618
40	28	29	0.0418
41	7	29	0.0418
42	25	30	0.135
43	30	31	0.326
44	31	32	0.507
45	32	33	0.0392
46	34	32	0.0392
47	34	35	0.052
48	35	36	0.043
49	36	37	0.029
50	37	38	0.0651
51	37	39	0.0239
52	36	40	0.03
53	22	38	0.0192
54	11	41	0.0192
55	41	42	0.207
56	41	43	0.207
57	38	44	0.0289
58	15	45	0.0171
59	14	46	0.0171
60	46	47	0.023
61	47	48	0.0182
62	48	49	0.0834
63	49	50	0.0801
64	50	51	0.1386
65	10	51	0.0277

Branch No.	From bus	To bus	Resistance (p.u.)
66	13	49	0.0178
67	29	52	0.1442
68	52	53	0.0762
69	53	54	0.1878
70	54	55	0.1732
71	11	43	0.0258
72	44	45	0.0624
73	40	56	0.03
74	56	41	0.553
75	56	42	0.2125
76	39	57	0.0239
77	57	56	0.174
78	38	49	0.115
79	38	48	0.0312
80	9	55	0.0481

TABLE IX NODE DATA OF THE 31-NODE THERMAL NETWORK

Bus No.	Heat power (MW)
1	0
2	0
3	0
4	0
5	0
6	13.9368
7	4.8078
8	6.6444
9	0
10	0
11	7.7112
12	0
13	0
14	0
15	9.7188
16	0
17	5.3430
18	0
19	0
20	0
21	6.6168
22	0
23	8.4078
24	0
25	6.8352
26	0
27	0
28	6.4524
29	0
30	8.0094
31	7.5438
Total	92.0274

TABLE X PIPELINE DATA OF THE 31-NODE THERMAL NETWORK

Branch No.	From bus	To bus	Length (m)	Diameter (m)	Conductivity (W/(m°C))	Mass flow rate (kg/s)
1	1	2	700.00	0.500	0.480	1044.00
2	2	3	5910.00	0.500	0.480	1044.00
3	3	4	2350.00	0.313	0.480	396.00
4	4	5	8310.00	0.313	0.426	396.00
5	5	6	950.00	0.107	0.426	180.00
6	5	7	3830.00	0.107	0.285	108.00
7	5	8	5830.00	0.107	0.426	108.00
8	3	9	6070.00	0.500	0.480	648.00
9	9	10	1540.00	0.107	0.480	108.00
10	10	11	820.00	0.107	0.432	108.00
11	9	12	400.00	0.313	0.413	540.00
12	12	13	2310.00	0.313	0.413	0
13	13	14	510.00	0.210	0.432	216.00
14	14	15	180.00	0.107	0.426	108.00
15	14	16	3180.00	0.107	0.426	108.00
16	16	17	4340.00	0.107	0.272	108.00
17	18	13	3200.00	0.132	0.329	216.00
18	19	18	1550.00	0.132	0.285	216.00
19	20	19	3310.00	0.313	0.257	324.00
20	19	21	720.00	0.107	0.285	108.00
21	12	22	1380.00	0.313	0.426	540.00
22	22	23	1300.00	0.107	0.285	108.00
23	22	24	1540.00	0.313	0.389	432.00
24	24	25	400.00	0.107	0.285	108.00
25	24	26	1360.00	0.313	0.329	324.00
26	26	27	910.00	0.313	0.329	324.00
27	27	28	250.00	0.107	0.285	108.00
28	27	29	300.00	0.132	0.285	216.00
29	29	30	730.00	0.107	0.257	108.00
30	29	31	2150.00	0.107	0.285	108.00

III. Parameters

TABLE XI PARAMETERS IN SIMULATION

Symbol	Value	Symbol	Value
π	0.06	ρ^w	1000 kg/m ³
$\sigma^{s,\min}, \sigma^{s,\max}$	70 °C, 85 °C	c^w	4200 J/(kg·°C)
$\sigma^{r,\min}, \sigma^{r,\max}$	55 °C, 65 °C	$RoCoF^{\max}$	0.2 Hz/s
$T^{U,\text{on}}, T^{U,\text{off}}$	3 h, 1 h	D	0.01
$\Delta f_{\text{qss}}^{\max}$	0.2 Hz	Δf^{\max}	0.5 Hz
f_0	50 Hz	ε^w	0.05
M^G, M^U	5 s, 6 s	Δt	1 h
$N_t, \mathcal{N} $	24, 20	Δf_{DB}	0.5 s
RU^G, RD^G	0.9, 0.9	T_D	10 s
c^a	1.5 kJ/(kg·K)	R^a	8.314 J/(K·mol)
ψ	1/2.89, 1/2.89	ϕ	2.89, 2.89
μ	1.4	η^c	0.85, 0.85
η^T	0.82, 0.82	V^s	224000 m ³