Data for "Online Coordination of LNG Tube Trailer Dispatch and Resilience Restoration of Integrated Power-Gas Distribution Systems"

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There are some data for the paper of "Online Coordination of LNG Tube Trailer Dispatch and Resilience Restoration of Integrated Power-Gas Distribution Systems"

1. Parameters for the distribution system

The parameters of distribution nodes are listed in Table 1.

Table 1: Parameters of distribution lines

Node 1	Node 2	R_{ij}(ohm)	X_{ij}(ohm)	Node 1	Node 2	R_{ij}(ohm)	X_{ij}(ohm)
1	2	0.0922	0.0470	20	21	0.4095	0.4784
2	3	0.4930	0.2511	21	22	0.7089	0.9373
3	4	0.3660	0.1864	3	23	0.4512	0.3083
4	5	0.3811	0.1941	23	24	0.8980	0.7091
5	6	0.8190	0.7070	24	25	0.8960	0.7011
6	7	0.1872	0.6188	6	26	0.2030	0.1034
7	8	0.7114	0.2351	26	27	0.2842	0.1447
8	9	1.0300	0.7400	27	28	1.0590	0.9337
9	10	1.0440	0.7400	28	29	0.8042	0.7006
10	11	0.1966	0.0650	29	30	0.5075	0.2585
11	12	0.3744	0.1238	30	31	0.9744	0.9630
12	13	1.4680	1.1550	31	32	0.3105	0.3619
13	14	0.5416	0.7129	32	33	0.3410	2.0000
14	15	0.5910	0.5260	8	21	2.0000	2.0000
15	16	0.7463	0.5450	9	15	2.0000	2.0000
16	17	1.2890	1.7210	12	22	2.0000	2.0000
17	18	0.7320	0.5740	18	33	0.5000	0.5000
2	19	0.1640	0.1565	25	29	0.5000	0.5000
19	20	1.5042	1.3554				

The parameters of distribution nodes are listed in Table 2.

Table 2: Parameters of distribution nodes

Node ID	P_i^L (kW)	Q_i^L(kVar)	Value ($/kw)	Factor	$V_{\min}$	$V_{\max}$
1	0	0	9	0.9	0.9	1.1
2	100	60	2	0.9	0.9	1.1
3	90	40	2	0.9	0.9	1.1
4	120	80	8	0.9	0.9	1.1
5	60	30	7	0.9	0.9	1.1
6	60	20	5	0.9	0.9	1.1
7	200	100	3	0.9	0.9	1.1
8	200	100	2	0.9	0.9	1.1
9	60	20	2	0.9	0.9	1.1
10	60	20	4	0.9	0.9	1.1
11	45	30	10	0.9	0.9	1.1
12	60	35	3	0.9	0.9	1.1
13	60	35	5	0.9	0.9	1.1
14	120	80	6	0.9	0.9	1.1
15	60	10	9	0.9	0.9	1.1
16	60	20	9	0.9	0.9	1.1
17	60	20	2	0.9	0.9	1.1
18	90	40	8	0.9	0.9	1.1
19	90	40	3	0.9	0.9	1.1
20	90	40	4	0.9	0.9	1.1
21	90	40	7	0.9	0.9	1.1
22	90	40	8	0.9	0.9	1.1
23	90	50	2	0.9	0.9	1.1
24	420	200	5	0.9	0.9	1.1
25	420	200	5	0.9	0.9	1.1
26	60	25	2	0.9	0.9	1.1
27	60	25	8	0.9	0.9	1.1
28	60	20	4	0.9	0.9	1.1
29	120	70	6	0.9	0.9	1.1
30	200	600	6	0.9	0.9	1.1
31	150	70	6	0.9	0.9	1.1
32	210	100	9	0.9	0.9	1.1
33	60	40	7	0.9	0.9	1.1

The damaged distribution line and corresponding repair time is listed in Table 3.

Table 3: Parameters of damaged distribution lines and repaired time

Line	(23,24)	(19,20)	(9,15)	(6,7)	(6,26)	(9,10)	(12,13)	(29,30)
Repaired time (min)	240	300	360	420	480	540	600	660

2. Parameters for the gas network

The parameters of gas nodes, gas pipeline, compressor, generators, sources, storage and repair information are listed as follows.

Table 4: Parameters of gas nodes

Node ID	Load (kcf/h)	Min-Pressure (Psig)	Max-Pressure (Psig)	Node	Load (kcf/h)	Min-Pressure (Psig)	Max-Pressure (Psig)
1	0	105	170	11	36.2	105	170
2	49.4	105	170	12	32.2	105	170
3	54.6	105	170	13	43.7	105	170
4	24.1	105	170	14	29.3	105	170
5	0	105	170	15	33.3	105	170
6	39.1	105	170	16	45.4	105	170
7	32.8	105	170	17	41.9	105	170
8	0	105	170	18	0	105	170
9	0	105	170	19	32.8	105	170
10	56.3	105	170	20	23.6	105	170

Table 5: Parameters of gas pipeline

Pipeline	From node	To node	ϕ_{mn} (kcf/Psig)	Pipeline	From node	To node	ϕ_{mn} (kcf/Psig)
1	1	2	163	10	11	12	164
2	2	3	144	11	12	13	163
3	3	4	183	12	13	14	144
4	4	5	151	13	14	15	183
5	5	6	164	14	15	16	151
6	6	7	163	15	11	17	164
7	8	9	144	16	18	19	163
8	9	10	183	17	19	20	144
9	10	11	151				

Table 6: Parameters of gas compressor

Pipeline	From node	To node	Compression ratio
1	9	5	1.1
2	17	18	1.1s

Table 7: Parameters of gas sources

Source ID	Gas Node	Upper (kcf/h)	Lower (kcf/h)
1	1	6000	0
2	8	6000	0

Table 8: Parameters of gas-fired generators

Generator ID	Max-Active Power (kW)	Max-Reactive Power (kVar)	Distribution node	Gas node
1	3000	3000	13	9
2	3000	3000	21	3
3	3000	3000	31	11

Table 9: Parameters of gas storage

Storage ID	Storage #1	Storage #2	Storage #3
Distribution node	13	21	31
Gas node	3	9	11
Transportation node	4	7	12
$\overline{\overline{Cap_m}}$	3	3	3
$\overline{cg_{m,t}^{RP}}$(kg/h)	15000	15000	15000
$\underline{cg_{m,t}^{RP}}$(kg/h)	0	0	0
$\overline{\overline{dg_{m,t}^{RP}}}$(kg/h)	150000	150000	150000
$\underline{dg_{m,t}^{RP}}$(kg/h)	0	0	0
$\overline{\overline{cg_{m,t}^{RV}}}$(kg/h)	300000	300000	300000
$\underline{cg_{m,t}^{RV}}$(kg/h)	0	0	0
$\overline{\overline{S_m^G}}$(kg)	22500	22500	22500
$\underline{S_m^G}$(kg)	0	0	0
η_m^P /$\overline{\eta_m^V}$/ η_m^S	0.999	0.999	0.999

Table 10: Parameters of damaged gas pipeline lines and repaired time

Pipeline	(19,20)	(14,15)	(2,3)	(8,9)	(1,2)
Repaired time (min)	300	420	480	540	660

Table 11: Parameters of damaged gas compressors and repaired time

Compressor	(17,18)
Repaired time (min)	360

Table 12: Parameters of damaged gas source and repaired time

Gas source node	1	8
Repaired time (min)	660	700

3. Parameters for the transportation network

The parameters for the transportation networks are listed as follows.

Table 13: Parameters of the transportation network

Edge ID	Node 1	Node 2	Travel time (min)
1	1	2	10
2	2	6	10
3	6	10	10
4	10	12	10
5	11	12	10
6	7	11	10
7	3	7	10
8	1	3	10
9	1	4	20
10	2	5	10
11	5	6	20
12	9	10	20
13	9	12	10
14	8	11	10
15	7	8	10
16	3	4	20
17	4	5	10
18	5	9	10
19	8	9	10
20	4	8	10

4. Parameters for trailers

We use for trailers in this work. The four trailers share the same parameters, which are listed as follows.

- LNG capacity: 15 tons.
- Maximum charging/discharging rate $cg_{v,t}^{V}/dg_{v,t}^{V}$: 30 tons/h
- Charge/discharge efficiency η_v^C/η_v^D: 0.9999

Besides, at the beginning of the restoration, the trailers' initial locations are node #1,#1,#6,#6 in the transportation network.