Table 1. Parameters of buses in Test System 1

Bus	p_i^{d} (MW)	q_i^{d} (MW)	$V_i^{\min}$ (p.u.)	$V_i^{\max}$ (p.u.)
1	0	0	1.05	1.05
2	0.2205	0.1125	0.9	1.1
3	0.35	0.1785	0.9	1.1
4	0.7	0.357	0.9	1.1
5	0.2205	0.1125	0.9	1.1
6	0.7	0.357	0.9	1.1
7	0.7	0.357	0.9	1.1
8	0.35	0.1785	0.9	1.1
9	0.35	0.1785	0.9	1.1
10	0.2205	0.1125	0.9	1.1
11	0.7	0.357	0.9	1.1
12	0.35	0.1785	0.9	1.1
13	0.2205	0.1125	0.9	1.1
14	0.35	0.1785	0.9	1.1
15	0.7	0.357	0.9	1.1

Table 2. Parameters of branches in Test System 1

Index	From bus	To bus	Resistance (Ω)	Reactance (Ω)	Capacity (p.u.)
1	1	2	0.7766	0.7596	0.8
2	2	3	0.6716	0.6569	0.5
3	3	4	0.4827	0.4722	0.2
4	4	5	0.8744	0.5898	0.2
5	2	9	1.1554	0.7793	0.2
6	9	10	0.9680	0.6529	0.2
7	2	6	1.4677	0.9900	0.2
8	6	7	0.6245	0.4213	0.2
9	6	8	0.7182	0.4844	0.2
10	3	11	1.0305	0.6951	0.2
11	11	12	1.4052	0.9478	0.2
12	12	13	1.1554	0.7793	0.2
13	4	14	1.2803	0.8636	0.2
14	4	15	0.6870	0.4634	0.2

Table 3. Parameters of generators in Test System 1

Bus	$p_i^{g,min}$ (MW)	$p_i^{g,max}$ (MW)	$q_i^{g,min}$ (MVar)	$q_i^{g,max}$ (MVar)	c_i^a ($/MWh)	c_i^b ($/MWh)	Carbon emission factor (kg/kWh)
1	0	10	-10	10	0.04	28	0.85
8	0	2	0	0	0.06	42	0.45
10	0	2	0	0	0	12	0
13	0	2	0	0	0	10	0

Table 4. Parameters of O-D pairs in Test System 1

Index	Origin	Destination	Basic traffic demand (p.u.)
1	1	3	20

Table 5. Parameters of transportation system in Test System 1

Link	Origin	Destination	cap_a (p.u.)	t_a^0 (min)	l_a (km)
1	1	2	12	6	12
2	1	2	16	10	20
3	1	2	10	6.5	16
4	2	3	19.6	5	12
5	2	3	15.8	5.5	16

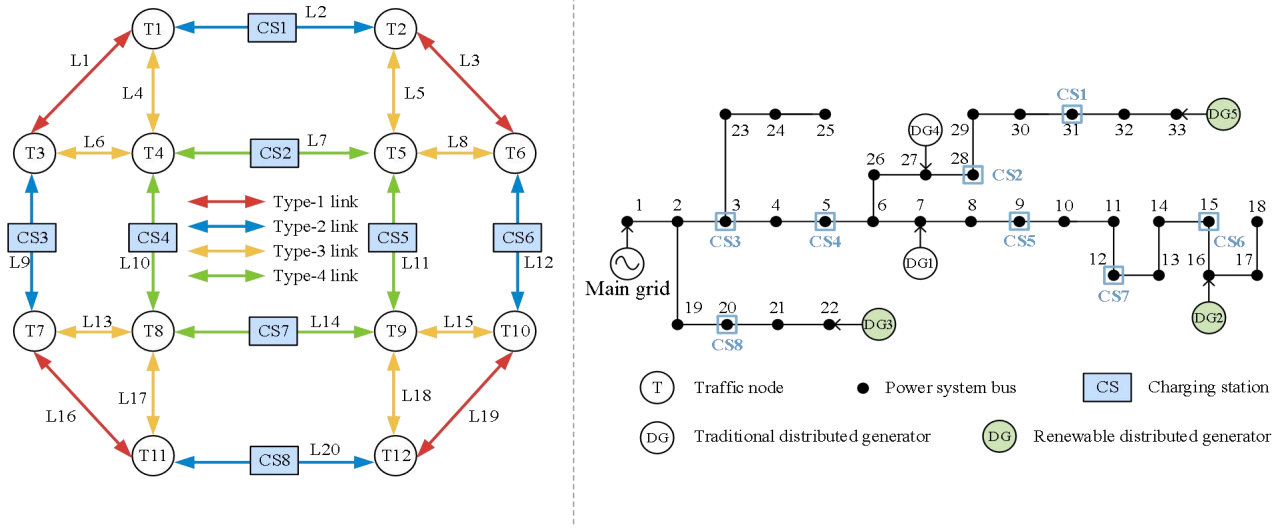

Fig 1. Configuration of Test System 2

Table 6. Parameters of buses in Test System 2

Bus	$P_{i,t}^{\mathrm{d}}$ (MW)	$Q_{i,t}^{\mathrm{d}}$ (MW)	$V_i^{\min}$ (p.u.)	$V_i^{\max}$ (p.u.)
1	0	0	1.04	1.04
2	0.6667	0.3	0.9	1.0488
3	0.6	0.2	0.9	1.0488
4	0.8	0.4	0.9	1.0488
5	0.4	0.15	0.9	1.0488
6	0.4	0.1	0.9	1.0488
7	1.3333	0.5	0.9	1.0488
8	1.3333	0.5	0.9	1.0488
9	0.4	0.1	0.9	1.0488
10	0.4	0.1	0.9	1.0488
11	0.3	0.15	0.9	1.0488
12	0.4	0.175	0.9	1.0488
13	0.4	0.175	0.9	1.0488
14	0.8	0.4	0.9	1.0488
15	0.4	0.05	0.9	1.0488
16	0.4	0.1	0.9	1.0488
17	0.4	0.1	0.9	1.0488
18	0.6	0.2	0.9	1.0488
19	0.6	0.2	0.9	1.0488
20	0.6	0.2	0.9	1.0488
21	0.6	0.2	0.9	1.0488
22	0.6	0.2	0.9	1.0488
23	0.6	0.25	0.9	1.0488
24	2.8	1	0.9	1.0488
25	2.8	1	0.9	1.0488
26	0.4	0.125	0.9	1.0488
27	0.4	0.125	0.9	1.0488
28	0.4	0.1	0.9	1.0488
29	0.8	0.35	0.9	1.0488
30	1.3333	3	0.9	1.0488
31	1	0.35	0.9	1.0488
32	1.4	0.5	0.9	1.0488
33	0.4	0.2	0.9	1.0488

Table 7. Parameters of branches in Test System 2

Index	From bus	To bus	Resistance (Ω)	Reactance (Ω)	Capacity (p.u.)
1	1	2	0.02305	0.01175	0.2
2	2	3	0.12325	0.062775	0.2
3	3	4	0.0915	0.0466	0.2
4	4	5	0.095275	0.048525	0.2
5	5	6	0.20475	0.17675	0.2
6	6	7	0.0468	0.1547	0.2
7	7	8	0.42785	0.3088	0.2
8	8	9	0.2575	0.185	0.2
9	9	10	0.26	0.185	0.2
10	10	11	0.04915	0.01625	0.2
11	11	12	0.0936	0.03095	0.2
12	12	13	0.367	0.28875	0.2
13	13	14	0.1354	0.178225	0.2
14	14	15	0.1478	0.1315	0.2
15	15	16	0.186575	0.13625	0.2
16	16	17	0.32225	0.43025	0.2
17	17	18	0.183	0.1435	0.2
18	2	19	0.041	0.039125	0.2
19	19	20	0.37605	0.33885	0.2
20	20	21	0.102375	0.1196	0.2
21	21	22	0.177225	0.234325	0.2
22	3	23	0.1128	0.077075	0.2
23	23	24	0.2245	0.177275	0.2
24	24	25	0.2240	0.175275	0.2
25	6	26	0.05075	0.02585	0.2
26	26	27	0.07105	0.036175	0.2
27	27	28	0.26475	0.233425	0.2
28	28	29	0.20105	0.17515	0.2
29	29	30	0.126875	0.064625	0.2
30	30	31	0.2436	0.2408	0.2
31	31	32	0.077625	0.090475	0.2
32	32	33	0.0853	0.13255	0.2

Table 8. Parameters of generators in Test System 2

Bus	$p_i^{\mathrm{g,min}}$ (MW)	$p_i^{\mathrm{g,max}}$ (MW)	$q_i^{\mathrm{g,min}}$ (MVar)	$q_i^{\mathrm{g,max}}$ (MVar)	c_i^a ($/MWh)	c_i^b ($/MWh)	Carbon emission factor (kg/kWh)
1	0	50	-50	50	0.04	28	0.85
7	0	6	0	0	0.06	42	0.45
16	0	3	0	0	0	12	0
22	0	3	0	0	0	12	0
27	0	6	0	0	0.06	42	0.45
33	0	3	0	0	0	12	0

Table 9. Parameters of O-D pairs in Test System 2

Index	Origin	Destination	Basic traffic demand (p.u.)
1	1	10	15
2	3	12	20
3	4	9	15
4	4	10	15
5	4	12	10

Table 10. Parameters of transportation system in Test System 2

Link	Origin	Destination	L_a^{road} (p.u.)	t_a^0 (min)
1	1	3	18	12
2	1	2	18	18
3	2	6	18	12
4	1	4	12	10
5	2	5	12	10
6	3	4	12	10
7	4	5	10	18
8	5	6	12	10
9	3	7	18	18
10	4	8	10	18
11	5	9	10	18
12	6	10	18	18
13	7	8	12	10
14	8	9	10	18
15	9	10	10	10
16	7	11	18	12
17	8	11	12	10
18	9	12	12	10
19	10	12	18	12
20	11	12	18	18