

## Electronic Supplementary Material

**Table S1** Historical operation data of distribution network 1 in Tianjin

Type	Indicator	Data 1	Data 2	Data 3	Data 4	Data 5	
Urban	A <sub>1</sub>	0.978	0.974	0.965	0.972	0.974	
	A <sub>2</sub>	1.3	1.4	1.3	1.4	1.4	
	A <sub>3</sub>	0.015	0.023	0.021	0.017	0.02	
	A <sub>4</sub>	0.001	0.002	0.0009	0.0011	0.001	
	A <sub>5</sub>	0.02	0.03	0.01	0.03	0.03	
	B <sub>1</sub>	1.2	1.3	1.4	1.2	1.3	
	B <sub>2</sub>	1.4	1.4	1.3	1.4	1.2	
	B <sub>3</sub>	0.0015	0.0014	0.0013	0.0011	0.0012	
	B <sub>4</sub>	0.09	0.08	0.08	0.08	0.07	
	B <sub>5</sub>	300	290	279	289	288	
	B <sub>6</sub>	0.02	0.03	0.02	0.04	0.01	
	B <sub>7</sub>	13	15	14	16	20	
	B <sub>8</sub>	0.00032	0.00041	0.00021	0.00012	0.00029	
	C <sub>1</sub>	10	12	12	11	13	
	C <sub>2</sub>	0.0032	0.0043	0.0021	0.0022	0.0023	
	C <sub>3</sub>	0.09	0.09	0.08	0.07	0.06	
	C <sub>4</sub>	0.6	0.5	0.6	0.5	0.6	
	C <sub>5</sub>	0.99	0.98	0.99	0.98	0.97	
	Suburban	A <sub>1</sub>	0.65	0.62	0.61	0.63	0.67
		A <sub>2</sub>	0.3	0.4	0.4	0.3	0.3
A <sub>3</sub>		0.003	0.004	0.003	0.004	0.002	
A <sub>4</sub>		0.998	0.999	0.997	0.992	0.998	
A <sub>5</sub>		0.1	0.2	0.3	0.1	0.3	
B <sub>1</sub>		0.7	0.8	0.7	0.8	0.9	
B <sub>2</sub>		0.9	0.8	0.8	0.9	0.7	
B <sub>3</sub>		0.03	0.02	0.03	0.02	0.02	
B <sub>4</sub>		0.1	0.2	0.3	0.2	0.3	
B <sub>5</sub>		500	498	470	450	490	
B <sub>6</sub>		0.12	0.13	0.12	0.12	0.13	
B <sub>7</sub>		30	34	35	31	32	
B <sub>8</sub>		0.0012	0.0014	0.0012	0.0012	0.0014	
C <sub>1</sub>		20	22	23	24	24	
C <sub>2</sub>		0.012	0.014	0.015	0.016	0.013	
C <sub>3</sub>		0.12	0.13	0.13	0.14	0.12	
C <sub>4</sub>		0.3	0.2	0.3	0.1	0.2	
C <sub>5</sub>		0.86	0.89	0.88	0.87	0.87	

**Table S2** Historical operation data of distribution network 2 in Tianjin

Type	Indicator	Data 6	Data 7	Data 8	Data 9	Data 10	Average
Urban	A <sub>1</sub>	0.981	0.973	0.982	0.976	0.978	0.9753
	A <sub>2</sub>	1.4	1.4	1.3	1.3	1.3	1.35
	A <sub>3</sub>	0.021	0.02	0.024	0.022	0.02	0.0203
	A <sub>4</sub>	0.0008	0.0004	0.009	0.0011	0.001	0.00183
	A <sub>5</sub>	0.02	0.02	0.02	0.01	0.01	0.02
	B <sub>1</sub>	1.3	1.2	1.3	1.2	1.3	1.27
	B <sub>2</sub>	1.2	1.2	1.3	1.4	1.5	1.33

	$B_3$	0.0012	0.0013	0.0011	0.0012	0.0013	0.00126
	$B_4$	0.08	0.09	0.08	0.09	0.07	0.081
	$B_5$	286	286	289	291	298	289.6
	$B_6$	0.02	0.03	0.02	0.03	0.02	0.024
	$B_7$	12	15	17	18	15	15.5
	$B_8$	0.00027	0.00018	0.00017	0.00016	0.00015	0.000228
	$C_1$	11	12	13	12	11	11.7
	$C_2$	0.0018	0.0021	0.0019	0.0021	0.0022	0.00242
	$C_3$	0.05	0.07	0.05	0.06	0.06	0.068
	$C_4$	0.5	0.6	0.6	0.5	0.5	0.55
	$C_5$	0.99	0.98	0.97	0.98	0.96	0.979
Suburban	$A_1$	0.64	0.63	0.64	0.65	0.64	0.638
	$A_2$	0.4	0.3	0.4	0.3	0.3	0.34
	$A_3$	0.003	0.004	0.003	0.002	0.003	0.0031
	$A_4$	0.995	0.996	0.997	0.994	0.992	0.9958
	$A_5$	0.1	0.2	0.3	0.1	0.2	0.19
	$B_1$	0.7	0.8	0.9	0.8	0.8	0.79
	$B_2$	0.8	0.8	0.8	0.9	0.8	0.82
	$B_3$	0.03	0.03	0.02	0.02	0.02	0.024
	$B_4$	0.2	0.3	0.4	0.2	0.1	0.23
	$B_5$	487	489	468	489	459	480
	$B_6$	0.12	0.13	0.12	0.12	0.12	0.123
	$B_7$	32	33	34	34	36	33.1
	$B_8$	0.0015	0.0012	0.0012	0.0012	0.0012	0.00127
	$C_1$	24	25	23	23	23	23.1
	$C_2$	0.014	0.018	0.014	0.015	0.015	0.0146
$C_3$	0.14	0.15	0.16	0.16	0.14	0.139	
$C_4$	0.3	0.2	0.2	0.1	0.2	0.21	
$C_5$	0.86	0.87	0.88	0.84	0.87	0.869	

**Table S3** Criterion layer evaluation matrices of AHP and IIAHP methods

Method	Index	SA perception	SA comprehension	SA prediction
AHP	SA perception	1	2	2
	SA comprehension		1	2
	SA prediction			1
IIAHP	SA perception	[1, 0]	[2, 0.3]	[2, 0.4]
	SA comprehension		[1, 0]	[2, 0.2]
	SA prediction			[1, 0]

**Table S4** Index layer evaluation matrices  $A$  of AHP and IIAHP methods

Method	Index	$A_1$	$A_2$	$A_3$	$A_4$	$A_5$
AHP	$A_1$	1	4	4	6	5
	$A_2$		1	2	2	3
	$A_3$			1	3	1

	$A_4$				1	2
	$A_5$					1
IIAHP	$A_1$	[1, 0]	[4, 0.2]	[4, 0.5]	[6, 0.3]	[5, 0.3]
	$A_2$		[1, 0]	[2, 0.1]	[2, 0.4]	[3, 0.4]
	$A_3$			[1, 0]	[3, 0.2]	[1, 0.8]
	$A_4$				[1, 0]	[2, 0.4]
	$A_5$					[1, 0]

**Table S5** Index layer Judgment matrices  $B$  of AHP and IIAHP methods

Method	Index	$B_1$	$B_2$	$B_3$	$B_4$	$B_5$	$B_6$	$B_7$	$B_8$
AHP	$B_1$	1	2			2	2	3	3
	$B_2$		1					3	3
	$B_3$	4	4	1	2	3	3	3	5
	$B_4$	2	4		1	3	3	4	4
	$B_5$		5			1	2	5	4
	$B_6$		3				1	4	4
	$B_7$							1	3
	$B_8$								1
IIAHP	$B_1$	[1, 0]	[2, 0.3]			[2, 0.3]	[2, 0.1]	[3, 0.1]	[3, 0.3]
	$B_2$		[1, 0]					[3, 0.3]	[3, 0.3]
	$B_3$	[4, 0.3]	[4, 0.3]	[1, 0]	[2, 0.2]	[3, 0.1]	[3, 0.2]	[3, 0.5]	[5, 0.1]
	$B_4$	[2, 0.2]	[4, 0.1]		[1, 0]	[3, 0.1]	[3, 0.3]	[4, 0.2]	[4, 0.3]
	$B_5$		[5, 0.2]			[1, 0]	[2, 0.4]	[5, 0.1]	[4, 0.3]
	$B_6$		[3, 0.2]				[1, 0]	[4, 0.4]	[4, 0.1]
	$B_7$							[1, 0]	[3, 0.2]
	$B_8$								[1, 0]

**Table S6** Index layer Judgment matrices  $C$  of AHP and IIAHP methods

Method	Index	$C_1$	$C_2$	$C_3$	$C_4$	$C_5$
AHP	$C_1$	1				
	$C_2$	5	1	4		
	$C_3$	4		1		
	$C_4$	6	3	5	1	
	$C_5$	8	4	5	2	1
IIAHP	$C_1$	[1, 0]				
	$C_2$	[5, 0.1]	[1, 0]	[4, 0.3]		
	$C_3$	[4, 0.3]		[1, 0]		
	$C_4$	[6, 0.4]	[3, 0.1]	[5, 0.1]	[1, 0]	
	$C_5$	[8, 0.2]	[4, 0.5]	[5, 0.3]	[2, 0.4]	[1, 0]

**Table S7** Detailed calculation process of comprehensive evaluation model

Area	Indicators value	Comprehensive weighted results	Objective weighted result	Subjective weighted result	
Urban	0.982	0.124	0.2009	0.047	Subjective score
	0.9545	0.0682	0.0785	0.058	0.8655
	0.8318	0.0555	0.0515	0.0595	
	0.9986	0.033	0.0459	0.0202	Objective score
	0.9655	0.0515	0.0443	0.0587	0.92
	0.8143	0.0486	0.0329	0.0643	
	0.7875	0.0364	0.0187	0.0542	Comprehensive score
	0.9945	0.0639	0.0795	0.0483	0.8928
	0.9667	0.0631	0.0616	0.0646	
	0.952	0.0512	0.044	0.0584	
	0.8833	0.0411	0.0321	0.0501	
	0.8542	0.0308	0.0162	0.0454	
	0.9217	0.0271	0.0126	0.0417	
	0.8867	0.0355	0.01	0.0611	
	0.9617	0.0339	0.0389	0.029	
	0.1636	0.0063	0.0036	0.0089	
	Suburban	0.9	0.0584	0.062	0.0547
0.9267		0.0641	0.087	0.0413	
0.0101		0.0154	0.0047	0.0047	Subjective score
0.0028		0.003	0.0026	0.0026	0.1888
0.0032		0.0031	0.0032	0.0032	
0.0002		0.0001	0.0002	0.0002	Objective score
0.0187		0.0174	0.0201	0.0201	0.1691
0.0068		0.0052	0.0083	0.0083	
0.0053		0.0036	0.0071	0.0071	Comprehensive score
0.0132		0.0166	0.0098	0.0098	0.179
0.0295		0.0328	0.0262	0.0262	
0.0053		0.0042	0.0064	0.0064	
0.0021		0.0021	0.0021	0.0021	
0.0048		0.0023	0.0073	0.0073	
0.0034		0.0023	0.0046	0.0046	
0.0053		0.0014	0.0092	0.0092	
0.0096		0.0085	0.0107	0.0107	
0.0315	0.0179	0.0452	0.0452		
0.0134	0.0152	0.0116	0.0116		
0.0138	0.0181	0.0095	0.0095		