

Table A.1. self-evaluation efficiency values of various plants in 2010

Plant	s^{1-}	s^{2-}	s^{3-}	s^{4-}	s^{5-}	s^{1+}	s^{2+}	s^{3+}	θ
Plant1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Plant2	0.0000	0.0000	0.0000	1.5357	0.0000	0.0000	572.9005	276.2802	0.9840
Plant3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Plant4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Plant5	0.0000	1.8579	0.0000	1.6525	0.8271	0.0000	0.0000	0.0000	0.8961
Plant6	0.0000	8.4581	0.0000	2.0240	0.7285	0.0000	0.0000	486.9865	0.8643
Plant7	0.0000	3.7310	0.0000	1.2040	0.4988	0.0000	0.0000	349.1099	0.9980
Plant8	0.0000	0.0000	6.0523	2.7594	1.1645	0.0000	612.2247	0.0000	0.8764
Plant9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Plant10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Plant11	22931.1757	0.9455	0.0000	0.2594	0.0000	176.3845	0.1326	43.8610	1.0850
Plant12	31852.1794	3.2248	0.0048	0.2816	0.0000	0.0000	221.0728	277.9909	1.1330
Plant13	4798.7161	0.0975	0.0000	0.0000	0.0068	11.9507	0.0000	5.9686	1.0131
Plant14	0.0000	0.0000	1.7394	0.5233	0.0780	3183.8105	0.0000	875.7957	0.9930
Plant15	0.0000	9.6089	0.0000	0.9491	1.0541	0.0000	0.0000	0.0000	0.9947
Plant16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Plant17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Plant18	0.0000	2.5595	2.2473	1.3275	0.0000	0.0000	183.4813	43.6588	0.9572
Plant19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000

Note: the unit of $s^{1-}, s^{1+}, s^{2+}, s^{3+}$ is Ton, and the unit of $s^{2-}, s^{3-}, s^{4-}, s^{5-}$ is GJ/ton ethylene. θ

denotes the efficiency value for the ethylene plant.

Table A.2. Main input-output data of ethylene production plants 6、8、11、13 in 2009

time	2008	2008	2008	2008
Plant	Plant6	Plant8	Plant11	Plant13
Crude/Ton	38754.70	57025.87	257110.42	260173.49
fuel/GJ/ton ethylene	20.73	16.89	20.72	21.31
steam/GJ/ton ethylene	7.04	10.20	0.86	-1.16
water/GJ/ton ethylene	3.64	3.88	3.68	1.05
electricity/GJ/ton ethylene	1.48	2.56	0.75	1.43
ethylene/Ton	10953.10	18614.33	79568.00	77887.23
propylene/Ton	5581.74	7344.75	39854.25	39567.20
cfour/Ton	3510.00	5318.75	24021.92	26192.07