

Supplementary Material: Conceptual Design of a Negative Emissions Polygeneration Plant for Multi-Period Operations Using P-Graph

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This document is the supplementary material for the paper titled: Conceptual design of a negative emissions polygeneration plant for multi-period operations using P-graph. The operating state of selected solutions is presented here for the different cases of GHG limitation described in the main text.

The software realization employed to generate the solutions by means of the P-graph solver controlled by VBA can be found in <http://p-graph.org/multiperiodic-processes/>.

The operating state of the units is presented as their working capacity for the different periods. Also their maximum capacity is presented in the first row as Cap. Such capacities are given according to their reference material. The subscripts of kW are employed to differentiate between the energy in the form of electricity (e), heat (h) and cooling (c). Information of period 25 presented for the storage units correspond to the amount of material stored at the end of period 24, i.e., at the end of the day.

Case 1: No limit on GHG emission

Table 1. Solution 1. Solution with best profit found for case 1. Profit = €853.644 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _c)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	0.0	1500.0	125.5	80.0	10.678	66.0	0.0
1.0	12000	0.0	0.0	125.5	80.0	4.3775	39.0	0.0
2.0	12000	0.0	0.0	125.5	80.0	4.3775	32.5	0.0
3.0	12000	0.0	0.0	125.5	80.0	4.3775	26.0	0.0
4.0	12000	0.0	0.0	125.5	80.0	4.3775	19.5	0.0
5.0	12000	0.0	0.0	125.5	80.0	6.3775	13.0	0.0
6.0	12000	0.0	0.0	125.5	80.0	6.3775	6.5	0.0
7.0	8000	0.0	0.0	125.5	80.0	6.3775	0.0	0.0
8.0	8000	0.0	0.0	125.5	80.0	8.3775	1.5	0.0
9.0	8000	0.0	1000.0	125.5	80.0	8.5775	3.0	0.0
10.0	4000	0.0	1000.0	125.5	80.0	10.578	4.5	0.0
11.0	4000	0.0	1500.0	125.5	80.0	10.678	14.0	0.0
12.0	4000	0.0	1500.0	125.5	80.0	10.678	23.5	0.0
13.0	4000	0.0	1500.0	125.5	80.0	10.678	33.0	0.0
14.0	4000	0.0	1500.0	125.5	80.0	8.6775	42.5	0.0
15.0	4000	0.0	1500.0	125.5	80.0	8.6775	52.0	0.0
16.0	8000	0.0	1500.0	125.5	80.0	8.6775	61.5	0.0
17.0	8000	0.0	1000.0	125.5	80.0	8.5775	63.0	0.0
18.0	8000	0.0	1000.0	125.5	80.0	8.5775	64.5	0.0
19.0	10000	0.0	500.0	125.5	80.0	10.477	66.0	0.0
20.0	10000	0.0	500.0	125.5	80.0	10.477	63.5	0.0
21.0	10000	0.0	0.0	125.5	80.0	10.377	61.0	0.0
22.0	12000	0.0	0.0	125.5	80.0	4.3775	58.5	0.0
23.0	12000	0.0	0.0	125.5	80.0	4.3775	52.0	0.0
24.0	12000	0.0	0.0	125.5	80.0	4.3775	45.5	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	39.0	0.0

Table 2. Solution 3. Solution with a water storage tank 12% smaller compared to solution 1. Profit = €853.381 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	0.0	1500.0	126.2	80.0	10.68	57.6	0.0
1.0	12000	0.0	0.0	126.2	80.0	4.3796	34.8	0.0
2.0	12000	0.0	0.0	126.2	80.0	4.3796	29.0	0.0
3.0	12000	0.0	0.0	126.2	80.0	4.3796	23.2	0.0
4.0	12000	0.0	0.0	126.2	80.0	4.3796	17.4	0.0
5.0	12000	0.0	0.0	126.2	80.0	6.3796	11.6	0.0
6.0	12000	0.0	0.0	126.2	80.0	6.3796	5.8	0.0
7.0	8000	0.0	0.0	126.2	80.0	6.3796	0.0	0.0
8.0	8000	0.0	0.0	126.2	80.0	8.3796	2.2	0.0
9.0	8000	0.0	1000.0	126.2	80.0	8.5796	4.4	0.0
10.0	4000	0.0	1000.0	109.4	80.0	10.529	6.6	0.0
11.0	4000	0.0	1500.0	126.2	80.0	10.68	0.0	0.0
12.0	4000	0.0	1500.0	126.2	80.0	10.68	10.2	0.0
13.0	4000	0.0	1500.0	126.2	80.0	10.68	20.4	0.0
14.0	4000	0.0	1500.0	126.2	80.0	8.6796	30.6	0.0
15.0	4000	0.0	1500.0	126.2	80.0	8.6796	40.8	0.0
16.0	8000	0.0	1500.0	126.2	80.0	8.6796	51.0	0.0
17.0	8000	0.0	1000.0	126.2	80.0	8.5796	53.2	0.0
18.0	8000	0.0	1000.0	126.2	80.0	8.5796	55.4	0.0
19.0	10000	0.0	500.0	126.2	80.0	10.48	57.6	0.0
20.0	10000	0.0	500.0	126.2	80.0	10.48	55.8	0.0
21.0	10000	0.0	0.0	126.2	80.0	10.38	54.0	0.0
22.0	12000	0.0	0.0	126.2	80.0	4.3796	52.2	0.0
23.0	12000	0.0	0.0	126.2	80.0	4.3796	46.4	0.0
24.0	12000	0.0	0.0	126.2	80.0	4.3796	40.6	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	34.8	0.0

Table 3. Solution 6. Solution with higher RO capacity and tank of storage 22% smaller. Profit = €853.179 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri-fied water (t)	Storage HCl (t)
Cap	12000	0.0	1500.0	126.74	80.0	10.681	51.158	0.0
1.0	12000	0.0	0.0	126.74	80.0	4.3812	31.579	0.0
2.0	12000	0.0	0.0	126.74	80.0	4.3812	26.316	0.0
3.0	12000	0.0	0.0	126.74	80.0	4.3812	21.053	0.0
4.0	12000	0.0	0.0	126.74	80.0	4.3812	15.79	0.0
5.0	12000	0.0	0.0	126.74	80.0	6.3812	10.526	0.0
6.0	12000	0.0	0.0	126.74	80.0	6.3812	5.2632	0.0
7.0	8000	0.0	0.0	126.74	80.0	6.3812	0.0	0.0
8.0	8000	0.0	0.0	126.74	80.0	8.3812	2.7368	0.0
9.0	8000	0.0	1000.0	126.74	80.0	8.5813	5.4737	0.0
10.0	4000	0.0	1000.0	107.79	80.0	10.524	8.2105	0.0
11.0	4000	0.0	1500.0	116.0	80.0	10.649	0.0	0.0
12.0	4000	0.0	1500.0	126.74	80.0	10.681	0.0	0.0
13.0	4000	0.0	1500.0	126.74	80.0	10.681	10.737	0.0
14.0	4000	0.0	1500.0	126.74	80.0	8.6813	21.474	0.0
15.0	4000	0.0	1500.0	126.74	80.0	8.6813	32.211	0.0
16.0	8000	0.0	1500.0	126.74	80.0	8.6813	42.947	0.0
17.0	8000	0.0	1000.0	126.74	80.0	8.5813	45.684	0.0
18.0	8000	0.0	1000.0	126.74	80.0	8.5813	48.421	0.0
19.0	10000	0.0	500.0	126.74	80.0	10.481	51.158	0.0
20.0	10000	0.0	500.0	126.74	80.0	10.481	49.895	0.0
21.0	10000	0.0	0.0	126.74	80.0	10.381	48.632	0.0
22.0	12000	0.0	0.0	126.74	80.0	4.3812	47.368	0.0
23.0	12000	0.0	0.0	126.74	80.0	4.3812	42.105	0.0
24.0	12000	0.0	0.0	126.74	80.0	4.3812	36.842	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	31.579	0.0

Table 4. Solution 51. Solution with the smallest tank for storage of water found in case 1. Profit = €853.179 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri-fied water (t)	Storage HCl (t)
Cap	12000	0.0	1500.0	130.46	80.0	10.649	13.846	0.0
1.0	12000	0.0	0.0	130.46	80.0	4.3924	9.2308	0.0
2.0	12000	0.0	0.0	130.46	80.0	4.3924	7.6923	0.0
3.0	12000	0.0	0.0	130.46	80.0	4.3924	6.1539	0.0
4.0	12000	0.0	0.0	130.46	80.0	4.3924	4.6154	0.0
5.0	12000	0.0	0.0	130.46	80.0	6.3924	3.0769	0.0
6.0	12000	0.0	0.0	130.46	80.0	6.3924	1.5385	0.0
7.0	8000	0.0	0.0	124.0	80.0	6.373	0.0	0.0
8.0	8000	0.0	0.0	130.46	80.0	8.3924	0.0	0.0
9.0	8000	0.0	1000.0	130.46	80.0	8.5924	6.4615	0.0
10.0	4000	0.0	1000.0	103.08	80.0	10.51	12.923	0.0
11.0	4000	0.0	1500.0	116.0	80.0	10.649	0.0	0.0
12.0	4000	0.0	1500.0	116.0	80.0	10.649	0.0	0.0
13.0	4000	0.0	1500.0	116.0	80.0	10.649	0.0	0.0
14.0	4000	0.0	1500.0	116.0	80.0	8.649	0.0	0.0
15.0	4000	0.0	1500.0	123.39	80.0	8.6712	0.0	0.0
16.0	8000	0.0	1500.0	130.46	80.0	8.6924	7.3846	0.0
17.0	8000	0.0	1000.0	110.15	80.0	8.5315	13.846	0.0
18.0	8000	0.0	1000.0	130.46	80.0	8.5924	0.0	0.0
19.0	10000	0.0	500.0	130.46	80.0	10.492	6.4615	0.0
20.0	10000	0.0	500.0	130.46	80.0	10.492	8.9231	0.0
21.0	10000	0.0	0.0	130.46	80.0	10.392	11.385	0.0
22.0	12000	0.0	0.0	130.46	80.0	4.3924	13.846	0.0
23.0	12000	0.0	0.0	130.46	80.0	4.3924	12.308	0.0
24.0	12000	0.0	0.0	130.46	80.0	4.3924	10.769	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	9.2308	0.0

Table 5. Solution 66. First solution found that includes a tank for storage of HCl found in case 1. Profit = €853.179 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri- fied water (t)	Storage HCl (t)
Cap	12000	0.0	1500.0	125.5	82.826	10.678	62.609	6.5
1.0	12000	0.0	0.0	125.5	82.826	4.3776	33.913	5.087
2.0	12000	0.0	0.0	125.5	82.826	4.3776	27.13	5.3696
3.0	12000	0.0	0.0	125.5	82.826	4.3776	20.348	5.6522
4.0	12000	0.0	0.0	125.5	82.826	4.3776	13.565	5.9348
5.0	12000	0.0	0.0	125.5	82.826	6.3776	6.7826	6.2174
6.0	12000	0.0	0.0	125.5	15.0	6.3767	0.0	6.5
7.0	8000	0.0	0.0	125.5	82.826	6.3776	0.0	0.0
8.0	8000	0.0	0.0	125.5	82.826	8.3776	1.2174	0.28261
9.0	8000	0.0	1000.0	125.5	82.826	8.5776	2.4348	0.56522
10.0	4000	0.0	1000.0	125.5	82.826	10.578	3.6522	0.84783
11.0	4000	0.0	1500.0	125.5	82.826	10.678	12.87	1.1304
12.0	4000	0.0	1500.0	125.5	82.826	10.678	22.087	1.413
13.0	4000	0.0	1500.0	125.5	82.826	10.678	31.304	1.6957
14.0	4000	0.0	1500.0	125.5	82.826	8.6776	40.522	1.9783
15.0	4000	0.0	1500.0	125.5	82.826	8.6776	49.739	2.2609
16.0	8000	0.0	1500.0	125.5	82.826	8.6776	58.956	2.5435
17.0	8000	0.0	1000.0	125.5	82.826	8.5776	60.174	2.8261
18.0	8000	0.0	1000.0	125.5	82.826	8.5776	61.391	3.1087
19.0	10000	0.0	500.0	125.5	82.826	10.478	62.609	3.3913
20.0	10000	0.0	500.0	125.5	82.826	10.478	59.826	3.6739
21.0	10000	0.0	0.0	125.5	82.826	10.378	57.044	3.9565
22.0	12000	0.0	0.0	125.5	82.826	4.3776	54.261	4.2391
23.0	12000	0.0	0.0	125.5	82.826	4.3776	47.478	4.5217
24.0	12000	0.0	0.0	125.5	82.826	4.3776	40.696	4.8044
25.0	0	0.0	0.0	0.0	0.0	0.0	33.913	5.087

Table 6. Solution 104. Solution with a tank of for storage of HCl with larger capacity. Profit = €853.179 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri- fied water (t)	Storage HCl (t)
Cap	12000	0.0	1500.0	125.5	83.478	10.678	61.826	8.0
1.0	12000	0.0	0.0	125.5	83.478	4.3776	41.087	1.0435
2.0	12000	0.0	0.0	125.5	83.478	4.3776	34.239	1.3913
3.0	12000	0.0	0.0	125.5	83.478	4.3776	27.391	1.7391
4.0	12000	0.0	0.0	125.5	83.478	4.3776	20.544	2.087
5.0	12000	0.0	0.0	125.5	83.478	6.3776	13.696	2.4348
6.0	12000	0.0	0.0	125.5	83.478	6.3776	6.8478	2.7826
7.0	8000	0.0	0.0	125.5	83.478	6.3776	0.0	3.1304
8.0	8000	0.0	0.0	125.5	83.478	8.3776	1.1522	3.4783
9.0	8000	0.0	1000.0	125.5	83.478	8.5776	2.3043	3.8261
10.0	4000	0.0	1000.0	125.5	83.478	10.578	3.4565	4.1739
11.0	4000	0.0	1500.0	125.5	83.478	10.678	12.609	4.5217
12.0	4000	0.0	1500.0	125.5	83.478	10.678	21.761	4.8696
13.0	4000	0.0	1500.0	125.5	83.478	10.678	30.913	5.2174
14.0	4000	0.0	1500.0	125.5	83.478	8.6776	40.065	5.5652
15.0	4000	0.0	1500.0	125.5	83.478	8.6776	49.217	5.913
16.0	8000	0.0	1500.0	125.5	83.478	8.6776	58.37	6.2609
17.0	8000	0.0	1000.0	125.5	83.478	8.5776	59.522	6.6087
18.0	8000	0.0	1000.0	125.5	83.478	8.5776	60.674	6.9565
19.0	10000	0.0	500.0	125.5	83.478	10.478	61.826	7.3044
20.0	10000	0.0	500.0	125.5	83.478	10.478	58.978	7.6522
21.0	10000	0.0	0.0	125.5	0.0	10.377	56.13	8.0
22.0	12000	0.0	0.0	125.5	83.478	4.3776	61.63	0.0
23.0	12000	0.0	0.0	125.5	83.478	4.3776	54.783	0.34783
24.0	12000	0.0	0.0	125.5	83.478	4.3776	47.935	0.69565
25.0	0	0.0	0.0	0.0	0.0	0.0	41.087	1.0435

Table 7. Solution 198. Solution with the EGDA unit of highest capacity found in case 1. Profit = €853.179 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	0.0	1500.0	125.5	85.333	10.678	59.6	8.0
1.0	12000	0.0	0.0	125.5	85.333	4.3776	39.533	0.0
2.0	12000	0.0	0.0	125.5	85.333	4.3776	32.5	0.53333
3.0	12000	0.0	0.0	125.5	85.333	4.3776	25.467	1.0667
4.0	12000	0.0	0.0	125.5	85.333	4.3776	18.433	1.6
5.0	12000	0.0	0.0	125.5	58.667	6.3773	11.4	2.1333
6.0	12000	0.0	0.0	125.5	85.333	6.3776	7.0333	0.0
7.0	8000	0.0	0.0	125.5	85.333	6.3776	0.0	0.53333
8.0	8000	0.0	0.0	125.5	85.333	8.3776	0.96667	1.0667
9.0	8000	0.0	1000.0	125.5	85.333	8.5776	1.9333	1.6
10.0	4000	0.0	1000.0	125.5	85.333	10.578	2.9	2.1333
11.0	4000	0.0	1500.0	125.5	85.333	10.678	11.867	2.6667
12.0	4000	0.0	1500.0	125.5	85.333	10.678	20.833	3.2
13.0	4000	0.0	1500.0	125.5	85.333	10.678	29.8	3.7333
14.0	4000	0.0	1500.0	125.5	85.333	8.6776	38.767	4.2667
15.0	4000	0.0	1500.0	125.5	85.333	8.6776	47.733	4.8
16.0	8000	0.0	1500.0	125.5	85.333	8.6776	56.7	5.3333
17.0	8000	0.0	1000.0	125.5	85.333	8.5776	57.667	5.8667
18.0	8000	0.0	1000.0	125.5	85.333	8.5776	58.633	6.4
19.0	10000	0.0	500.0	125.5	85.333	10.478	59.6	6.9333
20.0	10000	0.0	500.0	125.5	85.333	10.478	56.567	7.4667
21.0	10000	0.0	0.0	125.5	0.0	10.377	53.533	8.0
22.0	12000	0.0	0.0	125.5	80.0	4.3775	59.033	0.0
23.0	12000	0.0	0.0	125.5	80.0	4.3775	52.533	0.0
24.0	12000	0.0	0.0	125.5	80.0	4.3775	46.033	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	39.533	0.0

Table 8. Solution 200. Last solution generated for case 1. Profit = €841.644 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	0.0	1500.0	125.5	84.0	10.678	61.2	8.0
1.0	12000	0.0	0.0	125.5	0.0	4.3765	31.8	8.0
2.0	12000	0.0	0.0	125.5	80.0	4.3775	33.3	0.0
3.0	12000	0.0	0.0	125.5	84.0	4.3776	26.8	0.0
4.0	12000	0.0	0.0	125.5	76.0	4.3775	19.9	0.4
5.0	12000	0.0	0.0	125.5	84.0	6.3776	13.8	0.0
6.0	12000	0.0	0.0	125.5	84.0	6.3776	6.9	0.4
7.0	8000	0.0	0.0	125.5	84.0	6.3776	0.0	0.8
8.0	8000	0.0	0.0	125.5	84.0	8.3776	1.1	1.2
9.0	8000	0.0	1000.0	125.5	84.0	8.5776	2.2	1.6
10.0	4000	0.0	1000.0	125.5	84.0	10.578	3.3	2.0
11.0	4000	0.0	1500.0	125.5	84.0	10.678	12.4	2.4
12.0	4000	0.0	1500.0	125.5	84.0	10.678	21.5	2.8
13.0	4000	0.0	1500.0	125.5	84.0	10.678	30.6	3.2
14.0	4000	0.0	1500.0	125.5	84.0	8.6776	39.7	3.6
15.0	4000	0.0	1500.0	125.5	84.0	8.6776	48.8	4.0
16.0	8000	0.0	1500.0	125.5	84.0	8.6776	57.9	4.4
17.0	8000	0.0	1000.0	125.5	84.0	8.5776	59.0	4.8
18.0	8000	0.0	1000.0	125.5	84.0	8.5776	60.1	5.2
19.0	10000	0.0	500.0	125.5	84.0	10.478	61.2	5.6
20.0	10000	0.0	500.0	125.5	84.0	10.478	58.3	6.0
21.0	10000	0.0	0.0	125.5	84.0	10.378	55.4	6.4
22.0	12000	0.0	0.0	125.5	84.0	4.3776	52.5	6.8
23.0	12000	0.0	0.0	125.5	84.0	4.3776	45.6	7.2
24.0	12000	0.0	0.0	125.5	84.0	4.3776	38.7	7.6
25.0	0	0.0	0.0	0.0	0.0	0.0	31.8	8.0

Case 2: GHG limit of 39000 kg eq./day

Table 9. Solution 1. Solution with best profit found for case 2. Profit = €712.882 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	529.18	1500.0	125.44	80.0	10.148	66.265	0.0
1.0	12000	0.0	0.0	125.44	80.0	4.3774	39.344	0.0
2.0	12000	0.0	0.0	125.44	80.0	4.3774	32.787	0.0
3.0	12000	0.0	0.0	125.44	80.0	4.3774	26.229	0.0
4.0	12000	0.0	0.0	125.44	80.0	4.3774	19.672	0.0
5.0	12000	0.0	0.0	125.44	80.0	6.3774	13.115	0.0
6.0	12000	0.0	0.0	125.44	80.0	6.3774	6.5573	0.0
7.0	7153	529.18	0.0	125.44	80.0	5.8482	0.0	0.0
8.0	7153	529.18	0.0	125.44	80.0	7.8482	1.5485	0.0
9.0	7153	529.18	1000.0	125.44	80.0	8.0482	3.097	0.0
10.0	3153	529.18	1000.0	125.44	80.0	10.048	4.6455	0.0
11.0	3153	529.18	1500.0	125.44	80.0	10.148	14.194	0.0
12.0	3153	529.18	1500.0	125.44	80.0	10.148	23.742	0.0
13.0	3153	529.18	1500.0	125.44	80.0	10.148	33.291	0.0
14.0	4000	0.0	1500.0	125.44	80.0	8.6774	42.84	0.0
15.0	4000	0.0	1500.0	125.44	80.0	8.6774	52.282	0.0
16.0	8000	0.0	1500.0	125.44	80.0	8.6774	61.725	0.0
17.0	7153	529.18	1000.0	125.44	80.0	8.0482	63.168	0.0
18.0	7153	529.18	1000.0	125.44	80.0	8.0482	64.716	0.0
19.0	9153	529.18	500.0	125.44	80.0	9.9482	66.265	0.0
20.0	9153	529.18	500.0	125.44	80.0	9.9482	63.813	0.0
21.0	9153	529.18	0.0	125.44	80.0	9.8482	61.362	0.0
22.0	11153	529.18	0.0	125.44	80.0	3.8482	58.91	0.0
23.0	12000	0.0	0.0	125.44	80.0	4.3774	52.459	0.0
24.0	12000	0.0	0.0	125.44	80.0	4.3774	45.901	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	39.344	0.0

Table 10. Solution 26. Solution in which CHP unit is turned off in period 18. Profit = €709.784 /day.

cPeriod	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	573.28	1500.0	125.44	80.0	10.104	66.229	0.0
1.0	12000	0.0	0.0	125.44	80.0	4.3774	39.344	0.0
2.0	12000	0.0	0.0	125.44	80.0	4.3774	32.787	0.0
3.0	12000	0.0	0.0	125.44	80.0	4.3774	26.229	0.0
4.0	12000	0.0	0.0	125.44	80.0	4.3774	19.672	0.0
5.0	12000	0.0	0.0	125.44	80.0	6.3774	13.115	0.0
6.0	12000	0.0	0.0	125.44	80.0	6.3774	6.5573	0.0
7.0	7082	573.28	0.0	125.44	80.0	5.8041	0.0	0.0
8.0	7082	573.28	0.0	125.44	80.0	7.8041	1.5573	0.0
9.0	7082	573.28	1000.0	125.44	80.0	8.0041	3.1147	0.0
10.0	3082	573.28	1000.0	125.44	80.0	10.004	4.672	0.0
11.0	3082	573.28	1500.0	125.44	80.0	10.104	14.229	0.0
12.0	3082	573.28	1500.0	125.44	80.0	10.104	23.787	0.0
13.0	3082	573.28	1500.0	125.44	80.0	10.104	33.344	0.0
14.0	4000	0.0	1500.0	125.44	80.0	8.6774	42.901	0.0
15.0	4000	0.0	1500.0	125.44	80.0	8.6774	52.344	0.0
16.0	8000	0.0	1500.0	125.44	80.0	8.6774	61.787	0.0
17.0	7082	573.28	1000.0	125.44	80.0	8.0041	63.229	0.0
18.0	8000	0.0	1000.0	125.44	80.0	8.5774	64.787	0.0
19.0	9082	573.28	500.0	125.44	80.0	9.9041	66.229	0.0
20.0	9082	573.28	500.0	125.44	80.0	9.9041	63.787	0.0
21.0	9082	573.28	0.0	125.44	80.0	9.8041	61.344	0.0
22.0	11082	573.28	0.0	125.44	80.0	3.8041	58.901	0.0
23.0	12000	0.0	0.0	125.44	80.0	4.3774	52.459	0.0
24.0	12000	0.0	0.0	125.44	80.0	4.3774	45.901	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	39.344	0.0

Table 11. Solution 30. Solution with the largest tank for water storage found in case 2.Profit = €709.779 /day

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri-fied water (t)	Storage HCl (t)
Cap	12000	573.28	1500.0	125.44	80.0	10.104	66.344	0.0
1.0	12000	0.0	0.0	125.44	80.0	4.3774	39.344	0.0
2.0	12000	0.0	0.0	125.44	80.0	4.3774	32.787	0.0
3.0	12000	0.0	0.0	125.44	80.0	4.3774	26.229	0.0
4.0	12000	0.0	0.0	125.44	80.0	4.3774	19.672	0.0
5.0	12000	0.0	0.0	125.44	80.0	6.3774	13.115	0.0
6.0	12000	0.0	0.0	125.44	80.0	6.3774	6.5573	0.0
7.0	7082	573.28	0.0	125.44	80.0	5.8041	0.0	0.0
8.0	7082	573.28	0.0	125.44	80.0	7.8041	1.5573	0.0
9.0	7082	573.28	1000.0	125.44	80.0	8.0041	3.1147	0.0
10.0	3082	573.28	1000.0	125.44	80.0	10.004	4.672	0.0
11.0	3082	573.28	1500.0	125.44	80.0	10.104	14.229	0.0
12.0	3082	573.28	1500.0	125.44	80.0	10.104	23.787	0.0
13.0	3082	573.28	1500.0	125.44	80.0	10.104	33.344	0.0
14.0	4000	0.0	1500.0	125.44	80.0	8.6774	42.901	0.0
15.0	4000	0.0	1500.0	125.44	80.0	8.6774	52.344	0.0
16.0	8000	0.0	1500.0	125.44	80.0	8.6774	61.787	0.0
17.0	7082	573.28	1000.0	125.44	80.0	8.0041	63.229	0.0
18.0	7082	573.28	1000.0	125.44	80.0	8.0041	64.787	0.0
19.0	9082	573.28	500.0	125.44	80.0	9.9041	66.344	0.0
20.0	9082	573.28	500.0	125.44	80.0	9.9041	63.901	0.0
21.0	9082	573.28	0.0	125.44	80.0	9.8041	61.459	0.0
22.0	12000	0.0	0.0	125.44	80.0	4.3774	59.016	0.0
23.0	12000	0.0	0.0	125.44	80.0	4.3774	52.459	0.0
24.0	12000	0.0	0.0	125.44	80.0	4.3774	45.901	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	39.344	0.0

Table 12. Solution 136. Solution with the smallest tank for water storage found in case 2. Profit = €707.722 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri-fied water (t)	Storage HCl (t)
Cap	12000	529.18	1500.0	128.71	80.0	10.12	29.501	0.0
1.0	12000	0.0	0.0	128.71	80.0	4.3872	19.738	0.0
2.0	12000	0.0	0.0	128.71	80.0	4.3872	16.448	0.0
3.0	12000	0.0	0.0	128.71	80.0	4.3872	13.159	0.0
4.0	12000	0.0	0.0	128.71	80.0	4.3872	9.8691	0.0
5.0	12000	0.0	0.0	128.71	80.0	6.3872	6.5794	0.0
6.0	12000	0.0	0.0	128.71	80.0	6.3872	3.2897	0.0
7.0	7153	529.18	0.0	128.71	80.0	5.858	0.0	0.0
8.0	7153	529.18	0.0	128.71	80.0	7.858	4.8162	0.0
9.0	7153	529.18	1000.0	128.71	80.0	8.058	9.6323	0.0
10.0	3153	529.18	1000.0	101.45	80.0	9.9762	14.448	0.0
11.0	3153	529.18	1500.0	115.89	80.0	10.12	0.0	0.0
12.0	3153	529.18	1500.0	115.89	80.0	10.12	0.0	0.0
13.0	3153	529.18	1500.0	115.89	80.0	10.12	0.0	0.0
14.0	4000	0.0	1500.0	116.0	80.0	8.649	0.0	0.0
15.0	4000	0.0	1500.0	128.71	80.0	8.6872	0.0	0.0
16.0	8000	0.0	1500.0	128.71	80.0	8.6872	12.71	0.0
17.0	7153	529.18	1000.0	128.71	80.0	8.058	17.421	0.0
18.0	7153	529.18	1000.0	128.71	80.0	8.058	22.237	0.0
19.0	9153	529.18	500.0	128.71	80.0	9.958	27.053	0.0
20.0	9153	529.18	500.0	128.71	80.0	9.958	27.869	0.0
21.0	9153	529.18	0.0	128.71	80.0	9.858	28.685	0.0
22.0	11153	529.18	0.0	128.71	80.0	3.858	29.501	0.0
23.0	12000	0.0	0.0	128.71	80.0	4.3872	26.317	0.0
24.0	12000	0.0	0.0	128.71	80.0	4.3872	23.028	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	19.738	0.0

Table 13. Solution 172. Solution with improved autonomy thanks to the highest CHP unit capacity in case 2. Profit = €706.123 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	625.39	1500.0	125.44	80.0	10.052	66.188	0.0
1.0	12000	0.0	0.0	125.44	80.0	4.3774	39.344	0.0
2.0	12000	0.0	0.0	125.44	80.0	4.3774	32.787	0.0
3.0	12000	0.0	0.0	125.44	80.0	4.3774	26.229	0.0
4.0	12000	0.0	0.0	125.44	80.0	4.3774	19.672	0.0
5.0	12000	0.0	0.0	125.44	80.0	6.3774	13.115	0.0
6.0	12000	0.0	0.0	125.44	80.0	6.3774	6.5573	0.0
7.0	6999	625.39	0.0	125.44	80.0	5.752	0.0	0.0
8.0	6999	625.39	0.0	125.44	80.0	7.752	1.5677	0.0
9.0	6999	625.39	1000.0	125.44	80.0	7.952	3.1355	0.0
10.0	2999	625.39	1000.0	125.44	80.0	9.952	4.7032	0.0
11.0	2999	625.39	1500.0	125.44	80.0	10.052	14.271	0.0
12.0	2999	625.39	1500.0	125.44	80.0	10.052	23.839	0.0
13.0	2999	625.39	1500.0	125.44	80.0	10.052	33.407	0.0
14.0	4000	0.0	1500.0	125.44	80.0	8.6774	42.974	0.0
15.0	4000	0.0	1500.0	125.44	80.0	8.6774	52.417	0.0
16.0	8000	0.0	1500.0	125.44	80.0	8.6774	61.86	0.0
17.0	8000	0.0	1000.0	125.44	80.0	8.5774	63.302	0.0
18.0	8000	0.0	1000.0	125.44	80.0	8.5774	64.745	0.0
19.0	8999	625.39	500.0	125.44	80.0	9.852	66.188	0.0
20.0	8999	625.39	500.0	125.44	80.0	9.852	63.755	0.0
21.0	8999	625.39	0.0	125.44	80.0	9.752	61.323	0.0
22.0	10999	625.39	0.0	125.44	80.0	3.752	58.891	0.0
23.0	12000	0.0	0.0	125.44	80.0	4.3774	52.459	0.0
24.0	12000	0.0	0.0	125.44	80.0	4.3774	45.901	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	39.344	0.0

Table 14. Solution 200. Last solution generated for case 2. Profit = €705.896 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri-fied water (t)	Storage HCl (t)
Cap	12000	625.39	1500.0	125.51	80.0	10.052	65.495	0.0
1.0	12000	0.0	0.0	125.51	80.0	4.3776	38.935	0.0
2.0	12000	0.0	0.0	125.51	80.0	4.3776	32.446	0.0
3.0	12000	0.0	0.0	125.51	80.0	4.3776	25.957	0.0
4.0	12000	0.0	0.0	125.51	80.0	4.3776	19.468	0.0
5.0	12000	0.0	0.0	125.51	80.0	6.3776	12.978	0.0
6.0	12000	0.0	0.0	125.51	80.0	6.3776	6.4892	0.0
7.0	6999	625.39	0.0	123.88	80.0	5.7473	0.0	0.0
8.0	6999	625.39	0.0	125.51	80.0	7.7522	0.0	0.0
9.0	6999	625.39	1000.0	125.51	80.0	7.9522	1.6359	0.0
10.0	2999	625.39	1000.0	125.51	80.0	9.9522	3.2718	0.0
11.0	2999	625.39	1500.0	125.51	80.0	10.052	12.908	0.0
12.0	2999	625.39	1500.0	125.51	80.0	10.052	22.544	0.0
13.0	2999	625.39	1500.0	125.51	80.0	10.052	32.18	0.0
14.0	4000	0.0	1500.0	125.51	80.0	8.6776	41.816	0.0
15.0	4000	0.0	1500.0	125.51	80.0	8.6776	51.326	0.0
16.0	8000	0.0	1500.0	125.51	80.0	8.6776	60.837	0.0
17.0	8000	0.0	1000.0	125.51	80.0	8.5776	62.348	0.0
18.0	6999	625.39	1000.0	125.51	80.0	7.9522	63.859	0.0
19.0	8999	625.39	500.0	125.51	80.0	9.8522	65.495	0.0
20.0	8999	625.39	500.0	125.51	80.0	9.8522	63.131	0.0
21.0	8999	625.39	0.0	125.51	80.0	9.7522	60.767	0.0
22.0	12000	0.0	0.0	125.51	80.0	4.3776	58.403	0.0
23.0	12000	0.0	0.0	125.51	80.0	4.3776	51.913	0.0
24.0	12000	0.0	0.0	125.51	80.0	4.3776	45.424	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	38.935	0.0

Case 3: GHG limit of 30000 kg eq./day

Table 15. Solution 1. Solution with best profit found for case 3. Profit = €341.724 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	3582.7	1500.0	125.62	80.0	8.6779	61.004	0.0
1.0	12000	0.0	0.0	125.62	80.0	4.3779	38.293	0.0
2.0	12000	0.0	0.0	125.62	80.0	4.3779	31.911	0.0
3.0	12000	0.0	0.0	125.62	80.0	4.3779	25.529	0.0
4.0	12000	0.0	0.0	125.62	80.0	4.3779	19.147	0.0
5.0	12000	0.0	0.0	125.62	80.0	6.3779	12.764	0.0
6.0	12000	0.0	0.0	125.62	80.0	6.3779	6.3822	0.0
7.0	2267	3582.7	0.0	125.62	80.0	2.7952	0.0	0.0
8.0	2267	3582.7	0.0	125.62	80.0	4.7952	2.3344	0.0
9.0	2267	3582.7	1000.0	125.62	80.0	4.9952	4.6687	0.0
10.0	0	3582.7	1000.0	125.62	80.0	6.9952	7.0031	0.0
11.0	0	3582.7	1500.0	125.62	80.0	7.0952	13.873	0.0
12.0	0	3582.7	1500.0	125.62	80.0	7.0952	20.742	0.0
13.0	0	3582.7	1500.0	125.62	80.0	7.0952	27.612	0.0
14.0	0	2500.0	1500.0	125.62	80.0	6.1779	34.481	0.0
15.0	0	2500.0	1500.0	125.62	80.0	6.1779	44.599	0.0
16.0	8000	0.0	1500.0	125.62	80.0	8.6779	54.717	0.0
17.0	2267	3582.7	1000.0	125.62	80.0	4.9952	56.335	0.0
18.0	2267	3582.7	1000.0	125.62	80.0	4.9952	58.669	0.0
19.0	4267	3582.7	500.0	125.62	80.0	6.8952	61.004	0.0
20.0	4267	3582.7	500.0	125.62	80.0	6.8952	59.338	0.0
21.0	4267	3582.7	0.0	125.62	80.0	6.7952	57.672	0.0
22.0	6267	3582.7	0.0	125.62	80.0	0.79516	56.007	0.0
23.0	6267	3582.7	0.0	125.62	80.0	0.79516	50.341	0.0
24.0	12000	0.0	0.0	125.62	80.0	4.3779	44.675	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	38.293	0.0

Table 16. Solution 100. Solution with various periods of partial work in RO unit. This solution has the potential of generating more purified water. Profit = €336.23 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	3582.7	1500.0	128.41	80.0	8.6863	30.92	0.0
1.0	12000	0.0	0.0	128.41	80.0	4.3863	21.568	0.0
2.0	12000	0.0	0.0	128.41	80.0	4.3863	17.974	0.0
3.0	12000	0.0	0.0	128.41	80.0	4.3863	14.379	0.0
4.0	12000	0.0	0.0	128.41	80.0	4.3863	10.784	0.0
5.0	12000	0.0	0.0	128.41	80.0	6.3863	7.1895	0.0
6.0	12000	0.0	0.0	128.41	80.0	6.3863	3.5947	0.0
7.0	2267	3582.7	0.0	128.41	80.0	2.8035	0.0	0.0
8.0	2267	3582.7	0.0	128.41	80.0	4.8035	5.1218	0.0
9.0	2267	3582.7	1000.0	113.04	80.0	4.9574	10.244	0.0
10.0	0	3582.7	1000.0	118.75	80.0	6.9745	0.0	0.0
11.0	0	3582.7	1500.0	118.75	80.0	7.0746	0.0	0.0
12.0	0	3582.7	1500.0	118.75	80.0	7.0746	0.0	0.0
13.0	0	3582.7	1500.0	118.75	80.0	7.0746	0.0	0.0
14.0	0	2500.0	1500.0	115.5	80.0	6.1475	0.0	0.0
15.0	0	2500.0	1500.0	128.41	80.0	6.1863	0.0	0.0
16.0	8000	0.0	1500.0	128.41	80.0	8.6863	12.905	0.0
17.0	2267	3582.7	1000.0	128.41	80.0	5.0035	17.311	0.0
18.0	2267	3582.7	1000.0	128.41	80.0	5.0035	22.432	0.0
19.0	4267	3582.7	500.0	128.41	80.0	6.9035	27.554	0.0
20.0	4267	3582.7	500.0	128.41	80.0	6.9035	28.676	0.0
21.0	4267	3582.7	0.0	128.41	80.0	6.8035	29.798	0.0
22.0	6267	3582.7	0.0	128.41	80.0	0.80352	30.92	0.0
23.0	6267	3582.7	0.0	128.41	80.0	0.80352	28.041	0.0
24.0	12000	0.0	0.0	128.41	80.0	4.3863	25.163	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	21.568	0.0

Table 17. Solution 150. Solution with CHP unit of highest capacity found in case 3. Profit = €334.282 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri- fied water (t)	Storage HCl (t)
Cap	12000	4073.7	1500.0	125.88	80.0	8.6787	58.215	0.0
1.0	12000	0.0	0.0	125.88	80.0	4.3787	36.737	0.0
2.0	12000	0.0	0.0	125.88	80.0	4.3787	30.614	0.0
3.0	12000	0.0	0.0	125.88	80.0	4.3787	24.491	0.0
4.0	12000	0.0	0.0	125.88	80.0	4.3787	18.369	0.0
5.0	12000	0.0	0.0	125.88	80.0	6.3787	12.246	0.0
6.0	12000	0.0	0.0	125.88	80.0	6.3787	6.1229	0.0
7.0	1482	4073.7	0.0	125.88	80.0	2.305	0.0	0.0
8.0	1482	4073.7	0.0	125.88	80.0	4.305	2.6919	0.0
9.0	1482	4073.7	1000.0	125.88	80.0	4.505	5.3837	0.0
10.0	0	4073.7	1000.0	125.88	80.0	6.505	8.0756	0.0
11.0	0	4073.7	1500.0	125.88	80.0	6.605	13.732	0.0
12.0	0	4073.7	1500.0	125.88	80.0	6.605	19.388	0.0
13.0	0	4073.7	1500.0	125.88	80.0	6.605	25.044	0.0
14.0	4000	0.0	1500.0	125.88	80.0	8.6787	30.7	0.0
15.0	0	2500.0	1500.0	125.88	80.0	6.1787	40.577	0.0
16.0	8000	0.0	1500.0	125.88	80.0	8.6787	50.955	0.0
17.0	1482	4073.7	1000.0	125.88	80.0	4.505	52.832	0.0
18.0	1482	4073.7	1000.0	125.88	80.0	4.505	55.523	0.0
19.0	3482	4073.7	500.0	125.88	80.0	6.405	58.215	0.0
20.0	3482	4073.7	500.0	125.88	80.0	6.405	56.907	0.0
21.0	3482	4073.7	0.0	125.88	80.0	6.305	55.599	0.0
22.0	5482	4073.7	0.0	125.88	80.0	0.30501	54.291	0.0
23.0	12000	0.0	0.0	125.88	80.0	4.3787	48.983	0.0
24.0	12000	0.0	0.0	125.88	80.0	4.3787	42.86	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	36.737	0.0

Table 18. Solution 199. Solution with the smallest tank for water storage found in case 3. Profit = €333.027 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	3582.7	1500.0	129.64	80.0	8.673	19.791	0.0
1.0	12000	0.0	0.0	129.64	80.0	4.39	14.15	0.0
2.0	12000	0.0	0.0	129.64	80.0	4.39	11.791	0.0
3.0	12000	0.0	0.0	129.64	80.0	4.39	9.4331	0.0
4.0	12000	0.0	0.0	129.64	80.0	4.39	7.0748	0.0
5.0	12000	0.0	0.0	129.64	80.0	6.39	4.7165	0.0
6.0	12000	0.0	0.0	129.64	80.0	6.39	2.3583	0.0
7.0	2267	3582.7	0.0	129.64	80.0	2.8072	0.0	0.0
8.0	2267	3582.7	0.0	129.64	80.0	4.8072	6.3583	0.0
9.0	2267	3582.7	1000.0	129.64	80.0	5.0072	12.716	0.0
10.0	0	3582.7	1000.0	99.673	80.0	6.9173	19.075	0.0
11.0	0	3582.7	1500.0	118.75	80.0	7.0746	0.0	0.0
12.0	0	3582.7	1500.0	118.75	80.0	7.0746	0.0	0.0
13.0	0	3582.7	1500.0	118.75	80.0	7.0746	0.0	0.0
14.0	0	2500.0	1500.0	115.5	80.0	6.1475	0.0	0.0
15.0	0	2500.0	1500.0	115.5	80.0	6.1475	0.0	0.0
16.0	8000	0.0	1500.0	124.0	80.0	8.673	0.0	0.0
17.0	2267	3582.7	1000.0	129.64	80.0	5.0072	0.0	0.0
18.0	2267	3582.7	1000.0	129.64	80.0	5.0072	6.3583	0.0
19.0	4267	3582.7	500.0	129.64	80.0	6.9072	12.716	0.0
20.0	4267	3582.7	500.0	129.64	80.0	6.9072	15.075	0.0
21.0	4267	3582.7	0.0	129.64	80.0	6.8072	17.433	0.0
22.0	6267	3582.7	0.0	129.64	80.0	0.80723	19.791	0.0
23.0	6267	3582.7	0.0	129.64	80.0	0.80723	18.15	0.0
24.0	12000	0.0	0.0	129.64	80.0	4.39	16.508	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	14.15	0.0

Table 19. Solution 200. Last solution generated for case 3. Profit = €333.01 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri-fied water (t)	Storage HCl (t)
Cap	12000	4073.7	1500.0	126.56	80.0	8.6807	49.976	0.0
1.0	12000	0.0	0.0	126.56	80.0	4.3807	32.618	0.0
2.0	12000	0.0	0.0	126.56	80.0	4.3807	27.181	0.0
3.0	12000	0.0	0.0	126.56	80.0	4.3807	21.745	0.0
4.0	12000	0.0	0.0	126.56	80.0	4.3807	16.309	0.0
5.0	12000	0.0	0.0	126.56	80.0	6.3807	10.873	0.0
6.0	12000	0.0	0.0	126.56	80.0	6.3807	5.4363	0.0
7.0	1482	4073.7	0.0	123.19	80.0	2.2969	0.0	0.0
8.0	1482	4073.7	0.0	123.19	80.0	4.2969	0.0	0.0
9.0	1482	4073.7	1000.0	123.19	80.0	4.4969	0.0	0.0
10.0	0	4073.7	1000.0	120.22	80.0	6.4881	0.0	0.0
11.0	0	4073.7	1500.0	126.56	80.0	6.6071	0.0	0.0
12.0	0	4073.7	1500.0	126.56	80.0	6.6071	6.3427	0.0
13.0	0	4073.7	1500.0	126.56	80.0	6.6071	12.685	0.0
14.0	0	2500.0	1500.0	126.56	80.0	6.1807	19.028	0.0
15.0	4000	0.0	1500.0	126.56	80.0	8.6807	30.092	0.0
16.0	8000	0.0	1500.0	126.56	80.0	8.6807	40.656	0.0
17.0	1482	4073.7	1000.0	126.56	80.0	4.5071	43.219	0.0
18.0	1482	4073.7	1000.0	126.56	80.0	4.5071	46.598	0.0
19.0	3482	4073.7	500.0	126.56	80.0	6.4071	49.976	0.0
20.0	3482	4073.7	500.0	126.56	80.0	6.4071	49.355	0.0
21.0	3482	4073.7	0.0	126.56	80.0	6.3071	48.733	0.0
22.0	5482	4073.7	0.0	126.56	80.0	0.30707	48.112	0.0
23.0	12000	0.0	0.0	126.56	80.0	4.3807	43.49	0.0
24.0	12000	0.0	0.0	126.56	80.0	4.3807	38.054	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	32.618	0.0

Case 4: GHG limit of 25340 kg eq./day

Table 20. Solution 1. Solution with highest profit found in case 4. Profit = €0.257 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	5000.0	1500.0	126.16	80.0	6.3795	52.44	0.0
1.0	12000	0.0	0.0	126.16	80.0	4.3795	35.034	0.0
2.0	12000	0.0	0.0	126.16	80.0	4.3795	29.195	0.0
3.0	12000	0.0	0.0	126.16	80.0	4.3795	23.356	0.0
4.0	12000	0.0	0.0	126.16	80.0	4.3795	17.517	0.0
5.0	12000	0.0	0.0	126.16	80.0	6.3795	11.678	0.0
6.0	12000	0.0	0.0	126.16	80.0	6.3795	5.839	0.0
7.0	0	5000.0	0.0	126.16	80.0	1.3795	0.0	0.0
8.0	0	5000.0	0.0	126.16	80.0	3.3795	3.161	0.0
9.0	0	5000.0	1000.0	126.16	80.0	3.5795	6.322	0.0
10.0	0	5000.0	1000.0	126.16	80.0	5.5795	9.483	0.0
11.0	0	5000.0	1500.0	126.16	80.0	5.6795	12.644	0.0
12.0	0	5000.0	1500.0	126.16	80.0	5.6795	15.805	0.0
13.0	0	5000.0	1500.0	126.16	80.0	5.6795	18.966	0.0
14.0	0	2500.0	1500.0	126.16	80.0	6.1795	22.127	0.0
15.0	0	2500.0	1500.0	126.16	80.0	6.1795	32.788	0.0
16.0	3936	2539.7	1500.0	126.16	80.0	6.1398	43.449	0.0
17.0	0	5000.0	1000.0	126.16	80.0	3.5795	46.118	0.0
18.0	0	5000.0	1000.0	126.16	80.0	3.5795	49.279	0.0
19.0	2000	5000.0	500.0	126.16	80.0	5.4795	52.44	0.0
20.0	2000	5000.0	500.0	126.16	80.0	5.4795	51.601	0.0
21.0	2000	5000.0	0.0	126.16	80.0	5.3795	50.762	0.0
22.0	4992	4379.5	0.0	126.16	80.0	0.0	49.923	0.0
23.0	4992	4379.5	0.0	126.16	80.0	0.0	44.96	0.0
24.0	4992	4379.5	0.0	126.16	80.0	0.0	39.997	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	35.034	0.0

Table 21. Solution 7. First solution with negative profit found in this work. Profit = €-0.179 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	5000.0	1500.0	126.3	80.0	6.3799	50.791	0.0
1.0	12000	0.0	0.0	126.3	80.0	4.3799	34.209	0.0
2.0	12000	0.0	0.0	126.3	80.0	4.3799	28.508	0.0
3.0	12000	0.0	0.0	126.3	80.0	4.3799	22.806	0.0
4.0	12000	0.0	0.0	126.3	80.0	4.3799	17.105	0.0
5.0	12000	0.0	0.0	126.3	80.0	6.3799	11.403	0.0
6.0	12000	0.0	0.0	126.3	80.0	6.3799	5.7016	0.0
7.0	0	5000.0	0.0	123.0	80.0	1.37	0.0	0.0
8.0	0	5000.0	0.0	126.3	80.0	3.3799	0.0	0.0
9.0	0	5000.0	1000.0	126.3	80.0	3.5799	3.2984	0.0
10.0	0	5000.0	1000.0	126.3	80.0	5.5799	6.5969	0.0
11.0	0	5000.0	1500.0	126.3	80.0	5.6799	9.8954	0.0
12.0	0	5000.0	1500.0	126.3	80.0	5.6799	13.194	0.0
13.0	0	5000.0	1500.0	126.3	80.0	5.6799	16.492	0.0
14.0	0	2500.0	1500.0	126.3	80.0	6.1799	19.791	0.0
15.0	0	2500.0	1500.0	126.3	80.0	6.1799	30.589	0.0
16.0	3938	2538.5	1500.0	126.3	80.0	6.1415	41.388	0.0
17.0	0	5000.0	1000.0	126.3	80.0	3.5799	44.194	0.0
18.0	0	5000.0	1000.0	126.3	80.0	3.5799	47.492	0.0
19.0	2000	5000.0	500.0	126.3	80.0	5.4799	50.791	0.0
20.0	2000	5000.0	500.0	126.3	80.0	5.4799	50.089	0.0
21.0	2000	5000.0	0.0	126.3	80.0	5.3799	49.388	0.0
22.0	4992	4379.9	0.0	126.3	80.0	0.0	48.686	0.0
23.0	4992	4379.9	0.0	126.3	80.0	0.0	43.86	0.0
24.0	4992	4379.9	0.0	126.3	80.0	0.0	39.035	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	34.209	0.0

Table 22. Solution 105. Solution with RO unit of highest capacity found in case 4. Profit = €-3.517 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _c)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	5179.8	1500.0	127.54	80.0	6.3837	38.367	0.0
1.0	12000	0.0	0.0	127.54	80.0	4.3837	26.747	0.0
2.0	12000	0.0	0.0	127.54	80.0	4.3837	22.289	0.0
3.0	12000	0.0	0.0	127.54	80.0	4.3837	17.831	0.0
4.0	12000	0.0	0.0	127.54	80.0	4.3837	13.373	0.0
5.0	12000	0.0	0.0	127.54	80.0	6.3837	8.9156	0.0
6.0	12000	0.0	0.0	127.54	80.0	6.3837	4.4578	0.0
7.0	0	5179.8	0.0	127.54	80.0	1.2039	0.0	0.0
8.0	0	5179.8	0.0	127.54	80.0	3.2039	4.0028	0.0
9.0	0	5179.8	1000.0	115.53	80.0	3.3678	8.0056	0.0
10.0	0	5179.8	1000.0	123.54	80.0	5.3919	0.0	0.0
11.0	0	5179.8	1500.0	123.54	80.0	5.4919	0.0	0.0
12.0	0	5179.8	1500.0	123.54	80.0	5.4919	0.0	0.0
13.0	0	5179.8	1500.0	123.54	80.0	5.4919	0.0	0.0
14.0	0	2500.0	1500.0	127.54	80.0	6.1837	0.0	0.0
15.0	0	2500.0	1500.0	127.54	80.0	6.1837	12.042	0.0
16.0	0	5000.0	1500.0	127.54	80.0	3.6837	24.084	0.0
17.0	0	5179.8	1000.0	127.54	80.0	3.4039	28.627	0.0
18.0	0	5179.8	1000.0	127.54	80.0	3.4039	32.629	0.0
19.0	1712	5179.8	500.0	127.54	80.0	5.3039	36.632	0.0
20.0	1712	5179.8	500.0	127.54	80.0	5.3039	37.21	0.0
21.0	1712	5179.8	0.0	127.54	80.0	5.2039	37.789	0.0
22.0	4986	4383.7	0.0	127.54	80.0	0.0	38.367	0.0
23.0	4986	4383.7	0.0	127.54	80.0	0.0	34.786	0.0
24.0	12000	0.0	0.0	127.54	80.0	4.3837	31.205	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	26.747	0.0

Table 23. Solution 159. Solution with the CHP unit of highest capacity found in case 4. Profit = €-7.781 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri-fied water (t)	Storage HCl (t)
Cap	12000	5650.6	1500.0	126.93	80.0	8.6818	43.839	0.0
1.0	12000	0.0	0.0	126.93	80.0	4.3818	30.395	0.0
2.0	12000	0.0	0.0	126.93	80.0	4.3818	25.329	0.0
3.0	12000	0.0	0.0	126.93	80.0	4.3818	20.263	0.0
4.0	12000	0.0	0.0	126.93	80.0	4.3818	15.197	0.0
5.0	12000	0.0	0.0	126.93	80.0	6.3818	10.132	0.0
6.0	12000	0.0	0.0	126.93	80.0	6.3818	5.0657	0.0
7.0	0	5650.6	0.0	126.93	80.0	0.73128	0.0	0.0
8.0	0	5650.6	0.0	126.93	80.0	2.7313	1.9826	0.0
9.0	0	5650.6	1000.0	126.93	80.0	2.9313	3.9651	0.0
10.0	0	5650.6	1000.0	126.93	80.0	4.9313	5.9477	0.0
11.0	0	5650.6	1500.0	126.93	80.0	5.0313	7.9303	0.0
12.0	0	5650.6	1500.0	126.93	80.0	5.0313	9.9128	0.0
13.0	0	5650.6	1500.0	126.93	80.0	5.0313	11.895	0.0
14.0	0	2500.0	1500.0	126.93	80.0	6.1818	13.878	0.0
15.0	0	2500.0	1500.0	126.93	80.0	6.1818	25.312	0.0
16.0	8000	0.0	1500.0	126.93	80.0	8.6818	36.746	0.0
17.0	0	5650.6	1000.0	126.93	80.0	2.9313	39.681	0.0
18.0	0	5650.6	1000.0	126.93	80.0	2.9313	41.663	0.0
19.0	959	5650.6	500.0	126.93	80.0	4.8313	43.646	0.0
20.0	959	5650.6	500.0	126.93	80.0	4.8313	43.71	0.0
21.0	959	5650.6	0.0	126.93	80.0	4.7313	43.775	0.0
22.0	4989	4381.8	0.0	126.93	80.0	0.0	43.839	0.0
23.0	4989	4381.8	0.0	126.93	80.0	0.0	39.65	0.0
24.0	12000	0.0	0.0	126.93	80.0	4.3818	35.46	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	30.395	0.0

Table 24. Solution 191. Solution with the tank for water storage of highest capacity found in case 4.Profit = €-8.663 /day

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri- fied water (t)	Storage HCl (t)
Cap	12000	5000.0	1500.0	131.76	80.0	6.3963	58.813	0.0
1.0	12000	0.0	0.0	131.76	80.0	4.3963	1.4238	0.0
2.0	12000	0.0	0.0	131.76	80.0	4.3963	1.1865	0.0
3.0	12000	0.0	0.0	131.76	80.0	4.3963	0.94918	0.0
4.0	12000	0.0	0.0	131.76	80.0	4.3963	0.71188	0.0
5.0	12000	0.0	0.0	131.76	80.0	6.3963	0.47459	0.0
6.0	12000	0.0	0.0	131.76	80.0	6.3963	0.23729	0.0
7.0	0	5000.0	0.0	131.76	80.0	1.3963	0.0	0.0
8.0	0	5000.0	0.0	131.76	80.0	3.3963	8.7627	0.0
9.0	0	5000.0	1000.0	131.76	80.0	3.5963	17.525	0.0
10.0	0	5000.0	1000.0	96.712	80.0	5.4912	26.288	0.0
11.0	0	5000.0	1500.0	123.0	80.0	5.67	0.0	0.0
12.0	0	5000.0	1500.0	123.0	80.0	5.67	0.0	0.0
13.0	0	5000.0	1500.0	123.0	80.0	5.67	0.0	0.0
14.0	0	2500.0	1500.0	131.76	80.0	6.1963	0.0	0.0
15.0	0	2500.0	1500.0	131.76	80.0	6.1963	16.263	0.0
16.0	0	5000.0	1500.0	131.76	80.0	3.6963	32.525	0.0
17.0	0	5000.0	1000.0	131.76	80.0	3.5963	41.288	0.0
18.0	0	5000.0	1000.0	131.76	80.0	3.5963	50.051	0.0
19.0	2000	5000.0	500.0	127.0	80.0	5.482	58.813	0.0
20.0	2000	5000.0	500.0	115.19	80.0	5.4466	58.813	0.0
21.0	2000	5000.0	0.0	80.0	80.0	5.241	47.0	0.0
22.0	4965	4396.3	0.0	131.76	80.0	0.0	0.0	0.0
23.0	4965	4396.3	0.0	131.76	80.0	0.0	0.64197	0.0
24.0	8983	1885.6	0.0	131.76	80.0	2.5107	1.2839	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	1.4238	0.0

Table 25. Solution 197. Solution with various periods of partial operation of RO unit. This solution has the potential of generating more purified water. Profit = €-8.765 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri- fied water (t)	Storage HCl (t)
Cap	12000	5000.0	1500.0	129.46	80.0	6.3894	20.274	0.0
1.0	12000	0.0	0.0	129.46	80.0	4.3894	15.272	0.0
2.0	12000	0.0	0.0	129.46	80.0	4.3894	12.726	0.0
3.0	12000	0.0	0.0	129.46	80.0	4.3894	10.181	0.0
4.0	12000	0.0	0.0	129.46	80.0	4.3894	7.6358	0.0
5.0	12000	0.0	0.0	129.46	80.0	6.3894	5.0905	0.0
6.0	12000	0.0	0.0	129.46	80.0	6.3894	2.5453	0.0
7.0	0	5000.0	0.0	123.0	80.0	1.37	0.0	0.0
8.0	0	5000.0	0.0	129.46	80.0	3.3894	0.0	0.0
9.0	0	5000.0	1000.0	116.55	80.0	3.5507	6.4547	0.0
10.0	0	5000.0	1000.0	123.0	80.0	5.57	0.0	0.0
11.0	0	5000.0	1500.0	123.0	80.0	5.67	0.0	0.0
12.0	0	5000.0	1500.0	123.0	80.0	5.67	0.0	0.0
13.0	0	5000.0	1500.0	123.0	80.0	5.67	0.0	0.0
14.0	0	2500.0	1500.0	115.5	80.0	6.1475	0.0	0.0
15.0	0	2500.0	1500.0	115.5	80.0	6.1475	0.0	0.0
16.0	3983	2510.1	1500.0	123.5	80.0	6.1615	0.0	0.0
17.0	0	5000.0	1000.0	129.46	80.0	3.5894	0.0	0.0
18.0	0	5000.0	1000.0	129.46	80.0	3.5894	6.4547	0.0
19.0	2000	5000.0	500.0	129.46	80.0	5.4894	12.909	0.0
20.0	2000	5000.0	500.0	129.46	80.0	5.4894	15.364	0.0
21.0	2000	5000.0	0.0	129.46	80.0	5.3894	17.819	0.0
22.0	4976	4389.4	0.0	129.46	80.0	0.0	20.274	0.0
23.0	4976	4389.4	0.0	129.46	80.0	0.0	18.606	0.0
24.0	4976	4389.4	0.0	129.46	80.0	0.0	16.939	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	15.272	0.0

Table 26. Solution 200. Last solution generated for case 4. Profit = €-8.841 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri-fied water (t)	Storage HCl (t)
Cap	12000	5650.2	1500.0	127.59	80.0	8.6838	37.892	0.0
1.0	12000	0.0	0.0	127.59	80.0	4.3838	26.431	0.0
2.0	12000	0.0	0.0	127.59	80.0	4.3838	22.026	0.0
3.0	12000	0.0	0.0	127.59	80.0	4.3838	17.62	0.0
4.0	12000	0.0	0.0	127.59	80.0	4.3838	13.215	0.0
5.0	12000	0.0	0.0	127.59	80.0	6.3838	8.8102	0.0
6.0	12000	0.0	0.0	127.59	80.0	6.3838	4.4051	0.0
7.0	0	5650.2	0.0	124.95	80.0	0.7257	0.0	0.0
8.0	0	5650.2	0.0	127.59	80.0	2.7336	0.0	0.0
9.0	0	5650.2	1000.0	122.31	80.0	2.9178	2.6443	0.0
10.0	0	5650.2	1000.0	124.95	80.0	4.9257	0.0	0.0
11.0	0	5650.2	1500.0	124.95	80.0	5.0257	0.0	0.0
12.0	0	5650.2	1500.0	124.95	80.0	5.0257	0.0	0.0
13.0	0	5650.2	1500.0	127.59	80.0	5.0336	0.0	0.0
14.0	0	2500.0	1500.0	127.59	80.0	6.1838	2.6443	0.0
15.0	0	2500.0	1500.0	127.59	80.0	6.1838	14.739	0.0
16.0	8000	0.0	1500.0	127.59	80.0	8.6838	26.834	0.0
17.0	0	5650.2	1000.0	127.59	80.0	2.9336	30.429	0.0
18.0	0	5650.2	1000.0	127.59	80.0	2.9336	33.073	0.0
19.0	959	5650.2	500.0	127.59	80.0	4.8336	35.718	0.0
20.0	959	5650.2	500.0	127.59	80.0	4.8336	36.443	0.0
21.0	959	5650.2	0.0	127.59	80.0	4.7336	37.167	0.0
22.0	4985	4383.8	0.0	127.59	80.0	0.0	37.892	0.0
23.0	4985	4383.8	0.0	127.59	80.0	0.0	34.364	0.0
24.0	12000	0.0	0.0	127.59	80.0	4.3838	30.836	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	26.431	0.0

Case 5: GHG limit of 20000 kg eq./day

Table 27. Solution 1. Solution with lowest cost found in case 5. Profit = €-668.189 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri-fied water (t)	Storage HCl (t)
Cap	9031	6383.9	1500.0	127.62	80.0	6.1839	34.532	0.0
1.0	9031	1855.5	0.0	127.62	80.0	2.5285	24.032	0.0
2.0	9031	1855.5	0.0	127.62	80.0	2.5285	20.027	0.0
3.0	9031	1855.5	0.0	127.62	80.0	2.5285	16.022	0.0
4.0	9031	1855.5	0.0	127.62	80.0	2.5285	12.016	0.0
5.0	9031	1855.5	0.0	127.62	80.0	4.5285	8.0108	0.0
6.0	9031	1855.5	0.0	127.62	80.0	4.5285	4.0054	0.0
7.0	0	6383.9	0.0	127.62	80.0	0.0	0.0	0.0
8.0	0	6383.9	0.0	127.62	80.0	2.0	0.47176	0.0
9.0	0	6383.9	1000.0	127.62	80.0	2.2	0.94353	0.0
10.0	0	6383.9	1000.0	127.62	80.0	4.2	1.4153	0.0
11.0	0	6383.9	1500.0	127.62	80.0	4.3	1.8871	0.0
12.0	0	6383.9	1500.0	127.62	80.0	4.3	2.3588	0.0
13.0	0	6383.9	1500.0	127.62	80.0	4.3	2.8306	0.0
14.0	0	2500.0	1500.0	127.62	80.0	6.1839	3.3024	0.0
15.0	0	2500.0	1500.0	127.62	80.0	6.1839	15.426	0.0
16.0	0	5000.0	1500.0	127.62	80.0	3.6839	27.549	0.0
17.0	0	6383.9	1000.0	127.62	80.0	2.2	32.173	0.0
18.0	0	6383.9	1000.0	127.62	80.0	2.2	32.645	0.0
19.0	0	6383.9	500.0	127.62	80.0	4.1	33.116	0.0
20.0	0	6383.9	500.0	127.62	80.0	4.1	33.588	0.0
21.0	0	6383.9	0.0	127.62	80.0	4.0	34.06	0.0
22.0	4985	4383.9	0.0	127.62	80.0	0.0	34.532	0.0
23.0	4985	4383.9	0.0	127.62	80.0	0.0	31.032	0.0
24.0	4985	4383.9	0.0	127.62	80.0	0.0	27.532	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	24.032	0.0

Table 28. Solution 2. Solution with the boiler of lowest capacity and tank of water storage with higher capacity found in case 5. Profit = €-668.218 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri- fied water (t)	Storage HCl (t)
Cap	8667	6250.0	1500.0	127.41	80.0	6.1833	36.169	0.0
1.0	8667	2082.8	0.0	127.41	80.0	2.3005	25.033	0.0
2.0	8667	2082.8	0.0	127.41	80.0	2.3005	20.861	0.0
3.0	8667	2082.8	0.0	127.41	80.0	2.3005	16.689	0.0
4.0	8667	2082.8	0.0	127.41	80.0	2.3005	12.517	0.0
5.0	8667	2082.8	0.0	127.41	80.0	4.3005	8.3443	0.0
6.0	8667	2082.8	0.0	127.41	80.0	4.3005	4.1722	0.0
7.0	0	6250.0	0.0	127.41	80.0	0.13327	0.0	0.0
8.0	0	6250.0	0.0	127.41	80.0	2.1333	0.66128	0.0
9.0	0	6250.0	1000.0	127.41	80.0	2.3333	1.3226	0.0
10.0	0	6250.0	1000.0	127.41	80.0	4.3333	1.9838	0.0
11.0	0	6250.0	1500.0	127.41	80.0	4.4333	2.6451	0.0
12.0	0	6250.0	1500.0	127.41	80.0	4.4333	3.3064	0.0
13.0	0	6250.0	1500.0	127.41	80.0	4.4333	3.9677	0.0
14.0	0	2500.0	1500.0	127.41	80.0	6.1833	4.6289	0.0
15.0	0	2500.0	1500.0	127.41	80.0	6.1833	16.54	0.0
16.0	0	5000.0	1500.0	127.41	80.0	3.6833	28.451	0.0
17.0	0	6250.0	1000.0	127.41	80.0	2.3333	32.863	0.0
18.0	0	6250.0	1000.0	127.41	80.0	2.3333	33.524	0.0
19.0	0	6250.0	500.0	127.41	80.0	4.2333	34.185	0.0
20.0	0	6250.0	500.0	127.41	80.0	4.2333	34.847	0.0
21.0	0	6250.0	0.0	127.41	80.0	4.1333	35.508	0.0
22.0	4986	4383.3	0.0	127.41	80.0	0.0	36.169	0.0
23.0	4986	4383.3	0.0	127.41	80.0	0.0	32.457	0.0
24.0	4986	4383.3	0.0	127.41	80.0	0.0	28.745	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	25.033	0.0

Table 29. Solution 81. Solution with CHP unit and boiler of largest capacities found in case 5. Profit = €-675.434 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	12000	7575.8	1500.0	129.36	80.0	6.3891	34.067	0.0
1.0	12000	0.0	0.0	129.36	80.0	4.3891	21.909	0.0
2.0	12000	0.0	0.0	129.36	80.0	4.3891	19.264	0.0
3.0	12000	0.0	0.0	129.36	80.0	4.3891	16.62	0.0
4.0	12000	0.0	0.0	129.36	80.0	4.3891	13.975	0.0
5.0	12000	0.0	0.0	129.36	80.0	6.3891	11.331	0.0
6.0	12000	0.0	0.0	129.36	80.0	6.3891	8.6865	0.0
7.0	0	6389.1	0.0	129.36	80.0	0.0	6.0421	0.0
8.0	0	7575.8	0.0	129.36	80.0	0.81333	8.2304	0.0
9.0	0	7575.8	1000.0	129.36	80.0	1.0133	6.8586	0.0
10.0	0	7575.8	1000.0	129.36	80.0	3.0133	5.4869	0.0
11.0	0	7575.8	1500.0	129.36	80.0	3.1133	4.1152	0.0
12.0	0	7575.8	1500.0	129.36	80.0	3.1133	2.7435	0.0
13.0	0	7575.8	1500.0	129.36	80.0	3.1133	1.3717	0.0
14.0	0	2500.0	1500.0	129.36	80.0	6.1891	0.0	0.0
15.0	0	2500.0	1500.0	129.36	80.0	6.1891	13.856	0.0
16.0	0	5000.0	1500.0	129.36	80.0	3.6891	27.711	0.0
17.0	0	7575.8	1000.0	129.36	80.0	1.0133	34.067	0.0
18.0	0	7575.8	1000.0	129.36	80.0	1.0133	32.695	0.0
19.0	0	7575.8	500.0	129.36	80.0	2.9133	31.323	0.0
20.0	0	7575.8	500.0	129.36	80.0	2.9133	29.952	0.0
21.0	0	7575.8	0.0	129.36	80.0	2.8133	28.58	0.0
22.0	4977	4389.1	0.0	129.36	80.0	0.0	27.208	0.0
23.0	4977	4389.1	0.0	129.36	80.0	0.0	25.442	0.0
24.0	4977	4389.1	0.0	129.36	80.0	0.0	23.675	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	21.909	0.0

Table 30. Solution 93. Solution with the tank for water storage of highest capacity found in case 5.Profit = €-675.584 /day

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri- fied water (t)	Storage HCl (t)
Cap	9035	6382.5	1500.0	131.63	80.0	6.1959	49.852	0.0
1.0	9035	1852.6	0.0	131.63	80.0	2.5433	0.0	0.0
2.0	9035	1852.6	0.0	131.63	80.0	2.5433	0.0	0.0
3.0	9035	1852.6	0.0	131.63	80.0	2.5433	0.0	0.0
4.0	9035	1852.6	0.0	131.63	80.0	2.5433	0.0	0.0
5.0	9035	1852.6	0.0	131.63	80.0	4.5433	0.0	0.0
6.0	9035	1852.6	0.0	131.63	80.0	4.5433	0.0	0.0
7.0	0	6382.5	0.0	127.15	80.0	0.0	0.0	0.0
8.0	0	6382.5	0.0	131.63	80.0	2.0135	0.0	0.0
9.0	0	6382.5	1000.0	131.63	80.0	2.2134	4.482	0.0
10.0	0	6382.5	1000.0	118.18	80.0	4.1731	8.9641	0.0
11.0	0	6382.5	1500.0	127.15	80.0	4.3	0.0	0.0
12.0	0	6382.5	1500.0	127.15	80.0	4.3	0.0	0.0
13.0	0	6382.5	1500.0	127.15	80.0	4.3	0.0	0.0
14.0	0	2500.0	1500.0	131.63	80.0	6.1959	0.0	0.0
15.0	0	2500.0	1500.0	131.63	80.0	6.1959	16.13	0.0
16.0	0	5000.0	1500.0	131.63	80.0	3.6959	32.259	0.0
17.0	0	6382.5	1000.0	131.63	80.0	2.2134	40.888	0.0
18.0	0	6382.5	1000.0	131.63	80.0	2.2134	45.37	0.0
19.0	0	6382.5	500.0	127.15	80.0	4.1	49.852	0.0
20.0	0	6382.5	500.0	124.44	80.0	4.0919	49.852	0.0
21.0	0	6382.5	0.0	80.0	80.0	3.8586	47.147	0.0
22.0	4968	4394.4	0.0	131.12	80.0	0.0	0.0	0.0
23.0	4968	4394.4	0.0	131.12	80.0	0.0	0.0	0.0
24.0	4968	4394.4	0.0	131.12	80.0	0.0	0.0	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 31. Solution 104. Solution with the smallest tank for water storage found in case 5.Profit = €-675.677 /day

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Puri- fied water (t)	Storage HCl (t)
Cap	9060	6392.2	1500.0	130.39	80.0	6.1543	9.6426	0.0
1.0	9060	1837.2	0.0	130.39	80.0	2.555	7.4504	0.0
2.0	9060	1837.2	0.0	130.39	80.0	2.555	6.2086	0.0
3.0	9060	1837.2	0.0	130.39	80.0	2.555	4.9669	0.0
4.0	9060	1837.2	0.0	130.39	80.0	2.555	3.7252	0.0
5.0	9060	1837.2	0.0	130.39	80.0	4.555	2.4835	0.0
6.0	9060	1837.2	0.0	130.39	80.0	4.555	1.2417	0.0
7.0	0	6392.2	0.0	130.39	80.0	0.0	0.0	0.0
8.0	0	6392.2	0.0	130.39	80.0	2.0	3.2142	0.0
9.0	0	6392.2	1000.0	130.39	80.0	2.2	6.4284	0.0
10.0	0	6392.2	1000.0	117.53	80.0	4.1614	9.6426	0.0
11.0	0	6392.2	1500.0	127.18	80.0	4.2904	0.0	0.0
12.0	0	6392.2	1500.0	127.18	80.0	4.2904	0.0	0.0
13.0	0	6392.2	1500.0	127.18	80.0	4.2904	0.0	0.0
14.0	0	2500.0	1500.0	115.5	80.0	6.1475	0.0	0.0
15.0	0	2500.0	1500.0	117.75	80.0	6.1543	0.0	0.0
16.0	0	5000.0	1500.0	130.39	80.0	3.6922	2.2517	0.0
17.0	0	6392.2	1000.0	117.53	80.0	2.1614	9.6426	0.0
18.0	0	6392.2	1000.0	127.18	80.0	2.1904	0.0	0.0
19.0	0	6392.2	500.0	130.39	80.0	4.1	0.0	0.0
20.0	0	6392.2	500.0	130.39	80.0	4.1	3.2142	0.0
21.0	0	6392.2	0.0	130.39	80.0	4.0	6.4284	0.0
22.0	4972	4392.2	0.0	130.39	80.0	0.0	9.6426	0.0
23.0	4972	4392.2	0.0	130.39	80.0	0.0	8.9118	0.0
24.0	4972	4392.2	0.0	130.39	80.0	0.0	8.1811	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	7.4504	0.0

Table 32. Solution 200. Last solution generated for the case 5. Profit = €-676.369 /day.

Period	Boiler (kW _h)	CHP Unit (kW _e)	Chiller (kW _e)	RO Unit (t/h)	EGDA (t/h)	Importer (MW _e)	Storage Purified water (t)	Storage HCl (t)
Cap	9404	6250.0	1500.0	127.68	80.0	6.1841	33.719	0.0
1.0	4985	4384.1	0.0	127.68	80.0	0.0	23.4	0.0
2.0	9404	1622.0	0.0	127.68	80.0	2.7621	19.96	0.0
3.0	9404	1622.0	0.0	127.68	80.0	2.7621	15.968	0.0
4.0	9404	1622.0	0.0	127.68	80.0	2.7621	11.976	0.0
5.0	9404	1622.0	0.0	127.68	80.0	4.7621	7.984	0.0
6.0	9404	1622.0	0.0	127.68	80.0	4.7621	3.992	0.0
7.0	0	6250.0	0.0	126.75	80.0	0.13129	0.000	0.0
8.0	0	6250.0	0.0	127.68	80.0	2.1341	0.0	0.0
9.0	0	6250.0	1000.0	125.82	80.0	2.3285	0.93357	0.0
10.0	0	6250.0	1000.0	126.75	80.0	4.3313	0.0	0.0
11.0	0	6250.0	1500.0	126.75	80.0	4.4313	0.0	0.0
12.0	0	6250.0	1500.0	126.75	80.0	4.4313	0.0	0.0
13.0	0	6250.0	1500.0	126.75	80.0	4.4313	0.000	0.0
14.0	0	2500.0	1500.0	127.68	80.0	6.1841	0.000	0.0
15.0	0	2500.0	1500.0	127.68	80.0	6.1841	12.184	0.0
16.0	0	5000.0	1500.0	127.68	80.0	3.6841	24.367	0.0
17.0	0	6250.0	1000.0	127.68	80.0	2.3341	29.051	0.0
18.0	0	6250.0	1000.0	127.68	80.0	2.3341	29.984	0.0
19.0	0	6250.0	500.0	127.68	80.0	4.2341	30.918	0.0
20.0	0	6250.0	500.0	127.68	80.0	4.2341	31.851	0.0
21.0	0	6250.0	0.0	127.68	80.0	4.1341	32.785	0.0
22.0	4985	4384.1	0.0	127.68	80.0	0.0	33.719	0.0
23.0	4985	4384.1	0.0	127.68	80.0	0.0	30.279	0.0
24.0	4985	4384.1	0.0	127.68	80.0	0.0	26.839	0.0
25.0	0	0.0	0.0	0.0	0.0	0.0	23.4	0.0