



TECHNICAL DECISION

Technical limits on bidding and clearing prices
in the Balancing Market

Version 2.0
May 2022

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1 Introduction

In accordance with Commission Regulation (EU) 2019/943 on the internal market for electricity and, in particular, article 10, there shall be neither a maximum nor a minimum limit to the wholesale electricity price. This provision shall apply, inter alia, to bidding and clearing prices in all timeframes. It shall include Balancing Energy and imbalance prices, without prejudice to the technical price limits which may be applied in the balancing timeframe and in the Day-Ahead and Intraday timeframes.

In accordance with the same article, Nominated Electricity Market Operators (NEMOs) may apply harmonised limits on maximum and minimum clearing prices within the time frames of the Day-Ahead and Intraday Markets. The harmonised prices pursuant to articles 41(1) and 54(1) of Commission Regulation 2015/1222 (hereafter referred to as 'CACM'), must take into account the maximum value of lost load ('VoLL') so as not to restrict free formation of prices.

By virtue of its Decisions No 04/2017¹ and 05/2017², pursuant to articles 41 and 54 of CACM, and taking into account the main goals of Commission Regulation (EU) 2019/943 set out in article 3 thereof, and in particular the need to encourage free price formation and avoid actions that would impede price formation, ACER established harmonised maximum and minimum clearing prices for the Day-Ahead Market and the Intraday Market. The above decisions set the maximum and minimum prices to be applied in all Bidding Zones as follows:

- i. harmonised maximum clearing price for Day-Ahead Market Orders +3.000€/MWh and corresponding minimum price -500€/MWh, and
- ii. harmonised minimum clearing price for complementary and continuous trading on the Intraday Market +9.999€/MWh and corresponding minimum price -9.999€/MWh.

Commission Regulation (EU) 2017/2195 (hereafter referred to as "EBGL") establishes a guideline on electricity balancing. More specifically, Article 30 of the EBGL specifies that the pricing of Balancing Energy should, inter alia:

- i. be based on marginal pricing;
- ii. define how the activation of Balancing Energy bids activated for purposes other than balancing affects the Balancing Energy price;
- iii. establish at least one price of Balancing Energy, for each imbalance settlement period;
- iv. give correct price signals and incentives to market participants, and
- v. take into account the pricing method in the Day-Ahead and Intraday timeframes.

By virtue of decision No. 01/2020³ and paragraph 70 thereof, pursuant to article 30(1) of EBGL, ACER examined the legality of introducing technical limits in the Balancing Market under Commission Regulation (EU) 2019/943 and concluded that it is allowed. By virtue of this decision,

¹https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Individual%20decisions/ACER%20Decision%2004-2017%20on%20NEMOs%20HMMCP%20for%20single%20day-ahead%20coupling.pdf

²https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Individual%20decisions/ACER%20Decision%2005-2017%20on%20NEMOs%20HMMCP%20for%20single%20intraday%20coupling.pdf

³https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Individual%20decisions/ACER%20Decision%2001-2020%20on%20the%20Methodology%20for%20pricing%20balancing%20energy.pdf

a methodology⁴ was introduced (the 'Methodology for pricing balancing energy and cross-zonal capacity used for the exchange of balancing energy or operating the imbalance netting process'). In accordance with Article 3 of the methodology, the technical thresholds for bidding and clearing prices for all Balancing Energy products, both downward and upward Balancing Energy, are set as equal to:

- i. maximum limit +99.999 €/MWh, and
- ii. minimum limit -99.999 €/MWh.

The implementation of the above methodology and the technical limits specified therein shall commence with the entry into operation and participation of TSOs in the European platforms for the exchange of Balancing Energy from frequency restoration reserves with manual (MARI) and automatic activation (PICASSO). However, the determination of technical limits is needed for the operation of the market algorithms that arise out of the tests performed by the IPTO on the new platforms, but also following paragraph 69 of the above methodology.

Moreover, as specified in paragraph 71 of ACER's decision No. 01/2020, when proposing the value of these limits for the Balancing Market, the maximum and minimum prices for the Day-Ahead Market and the Intraday Market must be taken into account. More specifically, the price limits for Balancing Energy shall not be lower than the limits imposed in the Day-Ahead Market and the Intraday Market. In this way, the provision of adequate incentives for participation in markets which pre-date the Balancing Market is ensured. Consequently, the technical limits for Balancing Energy bidding and clearing prices should be consistent with those of the Day-Ahead Market and the Intra-Day Market and, by extension, consistent with the VoLL estimate, such that it is possible to increase prices to levels that final consumers will be ready to accept in order to avoid an outage. In other words, it should be possible for the real value of energy to reach the maximum level that the final consumers will be willing to pay for the electricity they consume.

On 25 February 2022, ACER amended Decision 01/2020 under its Decision No 03/2022⁵. This Decision established a transitional period in the application of the maximum and minimum price limits. From the deadline for the implementation of the European platforms for balancing energy exchange from frequency restoration reserves with manual (MARI) and automatic (PICASSO) activation, as defined in Articles 20 and 21 of the EBGL, and for a transitional period of 48 months, the balancing energy price limits shall be set equal to:

- i. maximum limit +15.000 €/MWh, and
- ii. minimum limit -15.000 €/MWh.

In the event that the harmonised Intraday Market clearing price limits for continuous trade, in accordance with ACER Decision Nos 04/2017 and 05/2017, pursuant to Articles 41 and 54 of the CACM, should increase (or decrease) beyond the limits of ± 9.999 €/MWh, then the balancing energy price limits as above shall be automatically increased (or decreased) by the same absolute value of the increase (or decrease).

⁴https://acer.europa.eu/Official_documents/Acts_of_the_Agency/Annexes%20to%20the%20DECISION%20OF%20THE%20AGENCY%20FOR%20THE%20C2/ACER%20Decision%20on%20the%20Methodology%20for%20pricing%20balancing%20energy%20-%20Annex%20I.pdf

⁵https://documents.acer.europa.eu/Official_documents/Acts_of_the_Agency/Individual%20decisions/ACER%20Decision%2003-2022%20on%20the%20Amendment%20to%20the%20Methodology%20for%20Pricing%20Balancing%20Energy.pdf

The VoLL price shall not necessarily be the same for all types of consumers. This differentiation shall allow the activation of optional management of demand response before the maximum VoLL price that consumers are willing to accept is reached. A relevant study⁶ carried out by ACER in order to estimate VoLL in Greece showed variable prices per consumer type (domestic or non-domestic). For non-domestic consumers, depending on their type of activity, prices ranged between 410 €/MWh and 2.380 €/MWh, whereas for domestic consumers, the study found a mean annual VoLL equal to 4.240 €/MWh.

⁶https://www.acer.europa.eu/en/Electricity/Infrastructure_and_network%20development/Infrastructure/Documents/CEPA%20study%20on%20the%20Value%20of%20Lost%20Load%20in%20the%20electricity%20supply.pdf

2 Technical limits for Balancing Energy bidding and clearing prices

In summary, and taking into account that:

- i. Technical price limits are necessary for the operation of the Balancing Market;
- ii. Technical price limits for Balancing Energy must be less restrictive than the price limits for the Day-Ahead Market and the Intraday Market;
- iii. Technical price limits should take into account the value of lost load ('VoLL');
- iv. Technical price limits for Balancing Energy should permit free, efficient and fair price formation for all technologies able to participate in the Balancing Market demand response and storage, including RES;
- v. Where no market coupling is applied, a Local Intraday Market (LIDA) shall operate, in which maximum and minimum clearing limits shall coincide with those of the Day-Ahead Market, i.e. from -500€/MWh to 3.000€/MWh;
- vi. Where market coupling is in place, Complementary Regional Intraday Auctions (CRIDA) shall operate, the maximum and minimum limits of which shall be harmonised with ACER Decisions No 04/2017 and 05/2017, that is, +9.999€/MWh to -9.999€/MWh respectively;
- vii. With the participation in the European platforms for the exchange of Balancing Energy from frequency restoration reserves with manual (MARI) and automatic activation (PICASSO), maximum and minimum limits shall be harmonised with ACER Decision No 01/2020, that is, +9.999€/MWh to -9.999€/MWh respectively.
- viii. From the deadline for the implementation of the European platforms for balancing energy exchange from frequency restoration reserves with manual (MARI) and automatic (PICASSO) activation, as defined in Articles 20 and 21 of the EBGL, and for a transitional period of 48 months, the maximum and minimum price limits shall be harmonised with the provisions of ACER Decisions No 01/2020 and 03/2022 ACER decisions, i.e. +15.000€/MWh to -15.000€/MWh respectively. During the transitional period, the maximum and minimum price limits of +15.000€/MWh to -15.000€/MWh respectively, shall be automatically increased (or decreased) in the event that the harmonised Intraday Market clearing price limits for continuous transaction should increase (or decrease) beyond the limits of $\pm 9.999\text{€/MWh}$.
- ix. After the end of the transitional period, that is, 48 months after the deadline for the implementation of the European platforms for the exchange of energy balancing energy from frequency restoration reserves with manual (MARI) and automatic (PICASSO) activation, the maximum and minimum price limits shall be harmonised with the provisions of ACER Decisions No 01/2020 and 03/2022, i.e. +99.999€/MWh to -99.999€/MWh respectively.

In consequence of the above:

- i. During the first period of operation of the Markets, from their launch until the implementation of the Complementary Regional Intraday Intra-Day Transactions (CRIDAs), the maximum and minimum technical limits on bidding and clearing prices for balancing energy are respectively set at limits equivalent to the value of the loss of domestic load, that is, equal to +4.240€/MWh and -4.240€/MWh.
- ii. In the period between the implementation of Complementary Regional Intraday Auctions (CRIDAs), and until inclusion of the IPTO in one of the European platforms MARI or PICASSO, the maximum and minimum technical limits set for bidding prices and clearing prices for Balancing Energy should be equal to the Intraday Market limits, i.e. +9.999€/MWh and -9.999€/MWh.

- iii. As of the date of IPTO's integration in one of the European MARI or PICASSO platforms, and for 48 months from the deadline for the implementation of the European MARI and PICASSO platforms as defined in Articles 20 and 21 of the EBGL, the maximum and minimum technical limits on the Bidding and Clearing Balancing Energy prices are set equal to +15.000€/MWh and -15.000€/MWh respectively.
- iv. Lastly, 48 months from the deadline for the implementation of the European MARI and PICASSO platforms as set out in Articles 20 and 21 of the EBGL, the maximum and minimum technical thresholds on the bidding and clearing prices for balancing energy are set equal to +99.999€/MWh and -99.999€/MWh respectively.

The proposed technical limits will achieve a fair and smooth price formation in the process of transition to the new market model and will support the necessary familiarisation of participants in order to avoid disturbances in the wholesale market during the transition. At the same time, they ensure that Balancing Services shall be provided in a fair and objective manner, without discriminations in favour or against market participants, including demand response, RES and energy storage.

3 Technical Limits for bidding prices and clearing prices for Balancing Capacity

In accordance with the joint proposal⁷ from all EU TSOs for 'list of standard products for balancing capacity for frequency restoration reserves and replacement reserves' issued by the ENTSO-E, pursuant to implementation of the terms of Article 25(2) of the EBGL, the bidding prices for Balancing Capacity can take on positive or zero values. Consequently, the minimum limit for Bidding prices for Balancing Capacity shall be equal to zero.

As part of this Technical Decision and in order to investigate the implementation of a maximum limit for Balancing Capacity Bidding prices, the IPTO conducted a study on the influence that a maximum limit for Balancing Capacity Bidding prices would have upon the execution of the integrated scheduling process.

According to the findings, it is observed that in all the cases examined, the Balancing Capacity bidding price does not cause any significant changes to the ISP execution results, other than the expected increase in the Balancing Capacity compensation cost. The increase in the Balancing Capacity compensation cost has a minimal influence on the overall cost of securing Balancing Energy and the dispatch of Balancing Service Entities.

Given the minimal influence of the bidding price limit for Balancing Capacity on the remaining ISP results, the relevant limit is set as equal to the opportunity cost of the commitment of Balancing Capacity. If Balancing Capacity has been allocated to a Balancing Market Participant by the ISP, the submission of Balancing Capacity Offers may limit its participation in the Intraday Market by the quantity committed through the ISP results. Consequently, the opportunity cost to which a Participant that has been allocated Balancing Capacity is exposed shall be the inability to participate in the Intraday Market for the specific quantity.

The above restriction on participating in the Intraday Market due to commitment of Balancing Capacity as a result of the ISP shall apply to the period following the launch of Continuous Intra-Day Trading (XBID), whereas it shall not apply in the preceding period. Consequently, for the period following the launch of Continuous Intra-Day Trading (XBID), it is proposed that the maximum limit for Balancing Capacity bidding and clearing prices under the Integrated Scheduling Process (ISP) should be equal to the corresponding maximum allowed limit in the Intraday Market, i.e. +9.999€/MW-hour. For the period until the launch of the Continuous Intra-Day Trading (XBID), the Participants shall not be subject to any opportunity cost due to commitment of Balancing Capacity through the ISP. For the above reason and in order to ensure a smooth and gradual transition towards the limit of +9.999€/MW-hour, the maximum limit for Balancing Capacity bidding prices and clearing prices in the ISP shall fall within the range between the existing limit and the limit that shall apply after the launch of Continuous Intra-Day Trading (XBID).

In consequence of the above:

- i. In the initial period of operation of the new markets, from their launch until the implementation of Continuous Intra-Day Trading (XBID), the maximum limit set for

⁷ https://consultations.entsoe.eu/markets/ebgl_art25_spsc/

- Balancing Capacity bidding prices and clearing prices in the ISP is set as equal to the maximum allowed Energy Bidding price for the Intraday Market, i.e. +3.000€/MW-hour.
- ii. From the launch of the Continuous Intra-Day Trading (XBID) onwards, the maximum limit set for Balancing Capacity bidding prices and clearing prices in the ISP is set as equal to the maximum allowed limit for Energy Bidding in the Intraday Market, i.e. +9.999€/MW-hour. In the event that the harmonised Intraday Market clearing price limits for the continuous transaction are increased (or decreased) with respect to the 9.999€/MWh limit, the cap on bidding and clearing prices in the Balancing Capacity ISP shall be set equal to the average of the absolute values of the new harmonised Intraday Market clearing price limits for continuous transaction.

4 Technical limits in the Balancing Market

By this Technical Decision, the technical limits for bidding prices and clearing prices are determined as follows:

A. Technical Limits for bidding prices and clearing prices for Balancing Energy

Timeframe	Balancing Energy €/MWh	
	minimum	maximum
1 st Period	-4.240	+4.240
2 nd Period	-9.999	+9,999
3 rd Period:	-15.000	+15.000
4 th Period	-99.999	+99.999

- 1st Period: From the launch of the new markets until the introduction of Complementary Regional Intraday Auctions (CRIDAs).
- 2nd Period: From the implementation of Complementary Regional Intraday Auctions (CRIDAs) until inclusion of the IPTO in one of the European platforms, MARI or PICASSO.
- 3rd Period: From the date of the integration of the IPTO in one of the European platforms (MARI or PICASSO) and up to a maximum of 48 months from the deadline for the implementation of the European MARI and PICASSO platforms, as defined in Articles 20 and 21 of the EBGL.
- 4th Period: 48 months after the deadline for the implementation of the European MARI and PICASSO platforms.

B. Technical Limits for bidding prices and clearing prices for Balancing Capacity

Timeframe	Balancing Capacity €/MW - hour	
	minimum	maximum
1 st Period	0	+3,000
2 nd Period	0	+9,999

- 1st Period: From the launch of the new Markets until the implementation of Continuous Intra-Day Trading (XBID).
- 2nd Period: From the implementation of Continuous Intra-Day Trading (XBID) onwards.

5 ANNEX

Study of the impact of Balancing Capacity bid price caps on resolution of the Integrated Scheduling Process

5.1 Study Scenarios

In the framework of the Technical Decision for the application of technical limits on the Balancing Capacity Bid submission prices, the present study was carried out in order to examine the impact of the Balancing Capacity Bid cap on the resolution of the Integrated Scheduling Process.

To examine the effect, scenarios were formulated for four days where various Balancing Capacity Bid prices were used. The days selected are presented in the table below:

Days
01/04/2019
24/06/2019
14/09/2019
23/02/2020

The selection of days was based on the following criteria: 1 April 2019 was chosen because of the high rate of change in the system loads of the System that occurs within the day. 24 June 2019, 14 September 2019 and 23 February 2020 were chosen as typical days in summer, autumn, and winter respectively.

For the purposes of the study, the needs of the system in upward and downward automatic Frequency Restoration Reserves ('aFRR'), manual Frequency Restoration Reserves ('mFRR') and Frequency Containment Reserves ('FCR') were estimated as follows:

- **Upward/downward FRC:** 60 MW for each Dispatch Period of the Dispatch Day.
- **Downward aFRR:** 180 MW for each Dispatch Period of the Dispatch Day.
- **Upward aFRR:**

Dispatch Period	MW	Dispatch Period	MW
00:00	370	12:00	390
00:30	370	12:30	390
01:00	360	13:00	400
01:30	360	13:30	400
02:00	360	14:00	390
02:30	360	14:30	390
03:00	350	15:00	390
03:30	350	15:30	390
04:00	360	16:00	390
04:30	360	16:30	390
05:00	360	17:00	400

05:30	360	17:30	400
06:00	370	18:00	410
06:30	370	18:30	410
07:00	380	19:00	410
07:30	380	19:30	410
08:00	390	20:00	430
08:30	390	20:30	430
09:00	400	21:00	410
09:30	400	21:30	410
10:00	400	22:00	400
10:30	400	22:30	400
11:00	400	23:00	390
11:30	400	23:30	390

- **Downward mFRR:** 340 MW for each Dispatch Period of the Dispatch Day.
- **Upward mFRR:**

Dispatch Period	MW	Dispatch Period	MW
00:00	580	12:00	820
00:30	580	12:30	820
01:00	630	13:00	820
01:30	630	13:30	820
02:00	630	14:00	630
02:30	630	14:30	630
03:00	630	15:00	630
03:30	630	15:30	630
04:00	630	16:00	820
04:30	630	16:30	820
05:00	780	17:00	830
05:30	780	17:30	830
06:00	790	18:00	840
06:30	790	18:30	840
07:00	810	19:00	850
07:30	810	19:30	850
08:00	820	20:00	870
08:30	820	20:30	870
09:00	820	21:00	630
09:30	820	21:30	630
10:00	630	22:00	630
10:30	630	22:30	630
11:00	630	23:00	630
11:30	630	23:30	630

For each of the above days, five scenarios were created based on Balancing Capacity bid prices. In all scenarios, for each Balancing Service Entity, the bid prices for Automatic Frequency Restoration Reserves ('aFRR') are higher than the bid prices for Manual Frequency Restoration Reserves ('mFRR'), and the bid prices for the FCR are lower than those for mFRRs. The values for the Frequency Containment Reserve ('FCR'), in all scenarios, are in the range [0.01 - 45.01€/MW]. The prices of the bids for manual and automatic Frequency Restoration Reserves in each scenario were as follows:

Scenarios	Price range for mFRR and aFRR (€/MW)
Scenario 1	0.01-50
Scenario 2	100-150
Scenario 3	500-550
Scenario 4	1000-1050
Scenario 5	2950-3000

5.2 Results for 01/04/2019

Table 1 presents, for the five scenarios, the Balancing Energy costs, Balancing Capacity costs and Total Balancing costs.

Table 1: Balancing costs for the five scenarios

Scenarios	Balancing Energy Costs [€]	Balancing Capacity Costs [€]	Total Balancing Costs [€]
Scenario 1	798,194.26	409,987.37	1,208,181.62
Scenario 2	797,767.93	8,244,349.79	9,042,117.72
Scenario 3	798,352.73	39,579,590.08	40,377,942.80
Scenario 4	798,556.97	78,749,361.89	79,547,918.85
Scenario 5	799,795.84	231,511,468.48	232,311,264.32

Table 2 presents, for each scenario, the upward and downward Balancing Energy for each Dispatch Period of the Dispatch Day, the total upward and downward Balancing Energy, as well as the total number of counter activations for the entire Dispatch Day. No significant differences in the results appear between the scenarios.

Table 2: Upward/downward Balancing Energy and counter activations for the five scenarios

Dispatch Period	Scenarios									
	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	BE Up	BE Dn								
0:00	50	25	50	25	50	25	50	25	50	25
0:30	40	159	38	157	42	161	42	161	40	159
1:00	211	143	212	143	211	143	211	143	211	143
1:30	211	154	211	154	211	154	211	154	211	154
2:00	202	162	202	162	202	162	202	162	202	162
2:30	239	201	239	201	239	201	239	201	239	201
3:00	337	293	337	293	337	293	337	293	337	293
3:30	337	298	337	298	337	298	337	298	337	298
4:00	375	258	375	258	375	258	375	258	375	258
4:30	384	250	384	250	384	250	384	250	384	250
5:00	349	248	349	248	349	248	349	248	344	243
5:30	428	210	428	210	428	210	428	210	428	210
6:00	276	154	282	160	282	160	282	160	272	150
6:30	295	11	295	11	295	11	295	11	295	11
7:00	251	92	251	92	251	92	251	92	238	79
7:30	322	200	322	200	322	200	322	200	251	128
8:00	325	153	325	153	325	153	325	153	325	153
8:30	317	136	317	135	317	135	317	135	325	144
9:00	394	120	394	120	394	120	394	120	394	120
9:30	368	130	368	130	368	130	368	130	368	130
10:00	425	33	422	30	446	55	440	49	442	50
10:30	348	5	348	5	348	5	348	5	398	55
11:00	457	13	457	13	457	13	457	13	495	50
11:30	421	0	421	0	421	0	421	0	440	19
12:00	475	0	475	0	475	0	475	0	475	0
12:30	462	0	462	0	462	0	462	0	462	0
13:00	483	0	483	0	483	0	483	0	483	0
13:30	467	0	467	0	467	0	467	0	467	0
14:00	481	0	481	0	481	0	481	0	481	0
14:30	412	15	412	15	417	20	417	20	417	20
15:00	417	102	417	102	417	102	417	102	417	102
15:30	417	62	417	62	417	62	417	62	417	62
16:00	410	116	410	116	410	116	410	116	410	116
16:30	410	0	410	0	410	0	410	0	410	0
17:00	308	11	308	11	308	11	308	11	308	11
17:30	403	0	403	0	417	14	425	22	425	22
18:00	251	0	251	0	251	0	251	0	251	0
18:30	564	0	564	0	564	0	564	0	564	0
19:00	357	0	357	0	357	0	357	0	357	0
19:30	521	0	521	0	521	0	521	0	521	0

20:00	287	0	287	0	287	0	287	0	287	0
20:30	274	0	274	0	274	0	274	0	274	0
21:00	274	0	274	0	274	0	274	0	274	0
21:30	228	84	228	0	228	84	228	84	228	84
22:00	265	29	242	6	237	1	237	1	237	1
22:30	205	177	205	177	167	140	167	140	167	140
23:00	197	66	197	66	197	66	197	66	198	67
23:30	170	134	185	149	185	149	189	153	170	134
Total BE	16,093	4,239	16,087	4,148	16,091	4,237	16,097	4,243	16,096	4,242
Counter Activations	33		32		34		35		35	

Figures 1 and 2 below show the number of dispatched units for the first (1-24) and the last 24 (25-48) Dispatch Periods of the Dispatch Day. As can be seen, the number of allocated units does not change significantly despite the change in Balancing Capacity offers.

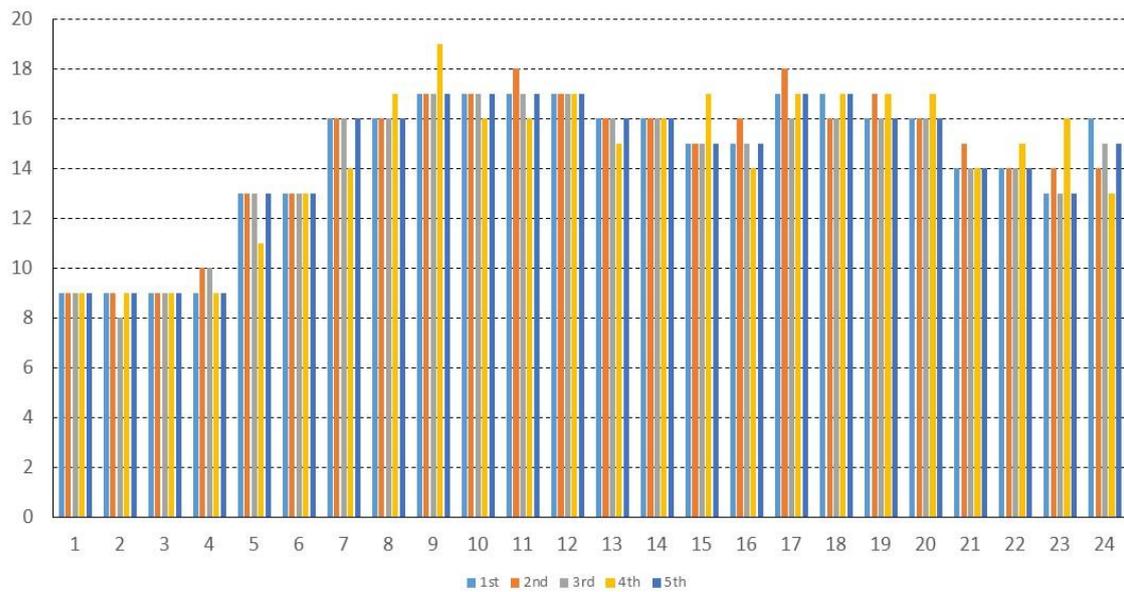


Figure 1: Number of Dispatched Units for the first 24 Dispatch Periods of the Dispatch Day for the five scenarios

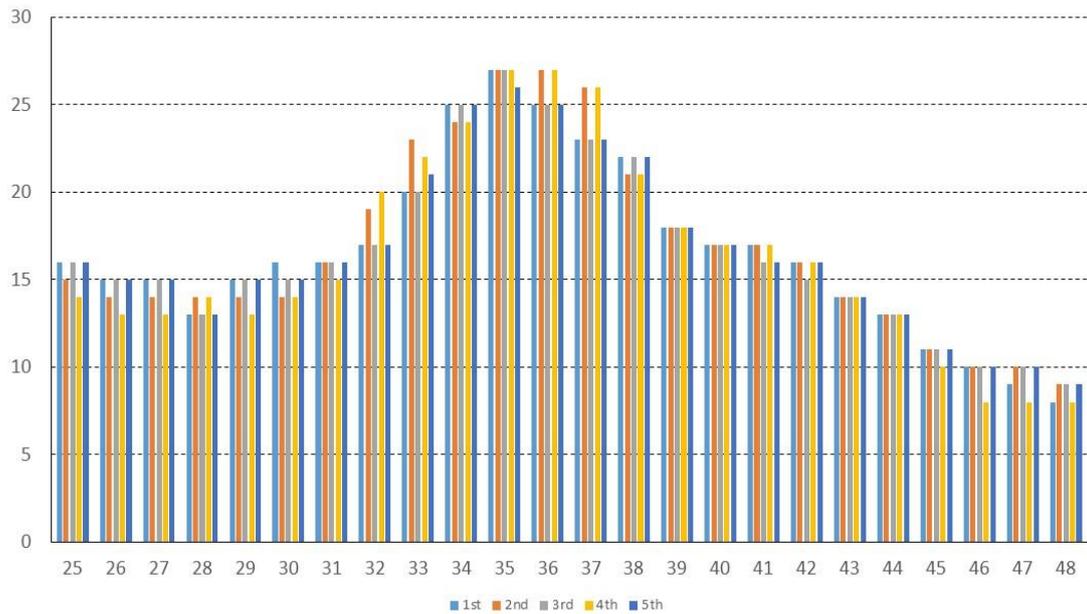


Figure 2: Number of Dispatched Units for the first 24 Dispatch Periods of the Dispatch Day for the five scenarios

5.3 Results for 24/06/2019

Table 3 presents, for the five scenarios, the Balancing Energy costs, Balancing Capacity costs and Total Balancing costs.

Table 3: Balancing costs for the five scenarios

Scenarios	Balancing Energy Costs [€]	Balancing Capacity Costs [€]	Total Balancing Costs [€]
Scenario 1	1,142,529.94	364,556.57	1,507,149.51
Scenario 2	1,145,215.89	8,200,315.21	9,345,531.10
Scenario 3	1,140,969.20	39,535,311.04	40,676,280.24
Scenario 4	1,140,993.58	78,711,690.97	79,846,009.36
Scenario 5	1,141,031.87	231,468,284.82	232,609,316.69

Table 4 presents, for each scenario, upward and downward Balancing Energy for each Dispatch Period of the Dispatch Day, total upward and downward Balancing Energy, as well as the number of counter activations for the entire Dispatch Day. No significant differences in the results appear between the scenarios.

Table 4: Upward/downward Balancing Energy and counter activations for the five scenarios

Dispatch Period	Scenarios									
	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	BE Dn	BE Up								
0:00	94	409	94	409	94	409	94	409	94	409
0:30	73	268	73	268	73	268	73	268	73	268
1:00	72	369	0	298	72	369	72	369	72	369
1:30	72	290	72	290	72	290	72	290	72	290
2:00	43	304	43	304	43	304	43	304	43	304
2:30	43	275	43	275	43	275	43	275	43	275
3:00	72	328	72	328	72	328	72	328	72	328
3:30	72	313	72	313	72	313	72	313	72	313
4:00	77	326	99	348	77	326	77	326	77	326
4:30	79	326	79	326	79	326	79	326	79	326
5:00	88	326	88	326	88	326	88	326	88	326
5:30	66	334	92	361	66	334	66	334	66	334
6:00	72	305	100	333	72	305	72	305	72	305
6:30	70	416	70	416	70	416	70	416	70	416
7:00	75	315	75	315	75	315	75	315	75	315
7:30	67	415	67	415	67	415	67	415	67	415
8:00	70	340	70	340	70	340	70	340	70	340
8:30	70	408	70	408	70	408	70	408	70	408
9:00	64	389	64	389	64	389	64	389	64	389
9:30	64	399	64	399	64	399	64	399	64	399
10:00	58	424	64	430	44	410	44	410	46	412
10:30	39	410	64	435	39	410	39	410	39	410
11:00	13	389	13	389	13	389	13	389	13	389
11:30	13	411	18	417	13	411	13	411	13	411
12:00	62	462	62	462	23	423	23	423	23	423
12:30	15	440	36	461	0	425	0	425	20	445
13:00	49	466	49	466	49	466	49	466	49	466
13:30	49	452	64	467	49	452	49	452	49	452
14:00	49	447	49	447	49	447	49	447	49	447
14:30	49	425	49	425	49	425	49	425	49	425
15:00	0	374	0	374	15	388	15	388	0	374
15:30	0	387	0	387	0	387	15	401	0	387
16:00	0	398	0	398	0	398	15	412	0	398
16:30	0	423	0	423	0	423	0	423	0	423
17:00	13	393	13	393	58	438	62	442	58	438
17:30	13	450	13	450	1	438	13	450	13	450
18:00	65	451	65	451	65	451	65	451	65	451
18:30	65	514	65	514	60	509	39	489	65	514
19:00	43	431	43	431	66	455	43	431	43	431
19:30	43	453	43	453	43	453	43	453	43	453

20:00	0	387	0	387	0	387	0	387	0	387
20:30	0	415	0	415	0	415	0	415	0	415
21:00	0	416	5	421	0	416	0	416	0	416
21:30	0	340	5	345	0	340	0	340	0	340
22:00	0	400	0	400	0	400	0	400	0	400
22:30	0	301	0	301	0	301	0	301	0	301
23:00	0	379	0	379	0	379	0	379	0	379
23:30	0	382	0	382	0	382	0	382	0	382
Total BE	2,032	18,476	2,118	18,562	2,039	18,473	2,041	18,473	2,032	18,476
Counter Activations	36		38		36		38		36	

Figures 3 and 4 below show the number of dispatched units for the first (1-24) and the last 24 (25-48) Dispatch Periods of the Dispatch Day. As can be seen, the number of dispatched units does not change significantly despite the change in Balancing Capacity offers.

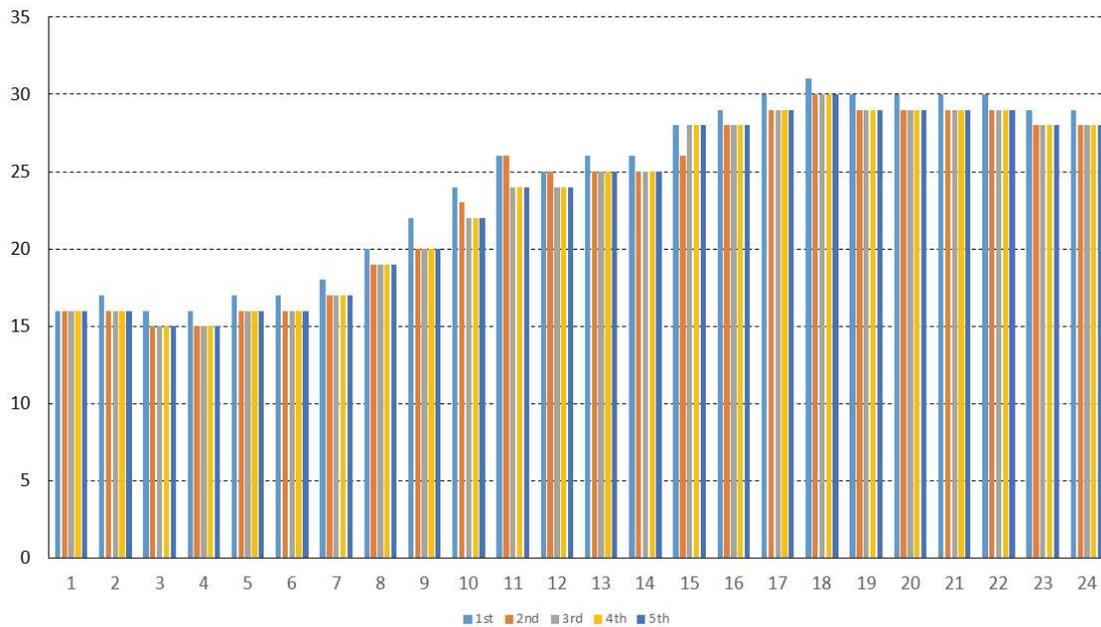


Figure 3: Number of Dispatched Units for the first 24 Dispatch Periods of the Dispatch Day for the five scenarios

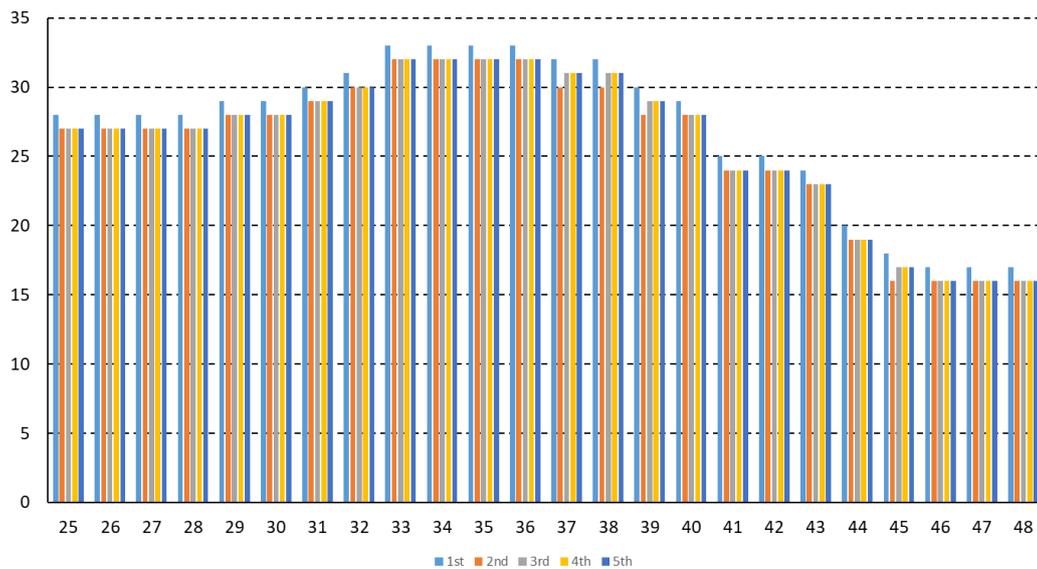


Figure 4: Number of Dispatched Units for the first 24 Dispatch Periods of the Dispatch Day for the five scenarios

5.4 Results for 14/09/2019

Table 5 presents, for the five scenarios, the Balancing Energy costs, Balancing Capacity costs and Total Balancing costs.

Table 5: Balancing costs for the five scenarios

Scenarios	Balancing Energy Costs [€]	Balancing Capacity Costs [€]	Total Balancing Costs [€]
Scenario 1	168,734.65	487,109.60	655,844.25
Scenario 2	165,684.17	8,325,740.47	8,491,424.64
Scenario 3	159,984.34	47,503,494.39	47,663,478.73
Scenario 4	167,588.63	78,829,684.59	78,997,273.22
Scenario 5	166,196.02	231,593,042.34	231,759,238.37

Table 6 presents, for each scenario, upward and downward Balancing Energy for each Dispatch Period of the Dispatch Day, total upward and downward Balancing Energy, as well as the number of counter activations for the entire Dispatch Day. No significant differences in the results appear between the scenarios.

Table 6: Upward/downward Balancing Energy and counter activations for the five scenarios

Dispatch Period	Scenarios									
	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	BE Dn	BE Up								
0:00	456	455	456	455	456	455	456	455	456	455
0:30	453	362	453	362	453	362	453	362	398	307
1:00	367	396	367	396	367	396	367	396	367	396
1:30	357	329	357	329	357	329	357	329	357	329
2:00	297	306	297	306	297	306	297	306	297	306
2:30	294	282	294	282	277	265	294	282	294	282
3:00	278	282	278	282	267	271	278	282	278	282
3:30	278	282	278	282	267	270	278	282	278	282
4:00	277	282	277	282	267	271	277	282	267	271
4:30	273	282	273	282	243	252	273	282	273	282
5:00	284	269	284	269	284	269	284	269	284	269
5:30	239	269	236	266	236	266	236	266	236	266
6:00	268	269	256	258	246	247	268	269	256	258
6:30	234	269	223	258	223	258	234	269	223	258
7:00	285	269	285	269	285	269	285	269	285	269
7:30	259	269	259	269	259	269	259	269	259	269
8:00	173	154	173	154	173	154	173	154	173	154
8:30	173	164	173	164	173	164	173	164	173	164
9:00	253	235	253	235	253	235	253	235	253	235
9:30	281	235	273	228	273	228	273	228	273	228
10:00	319	307	311	298	311	298	311	298	311	298
10:30	348	307	333	291	311	269	333	291	333	291
11:00	326	296	326	296	326	296	326	296	326	296
11:30	326	299	326	299	326	299	326	299	326	299
12:00	310	295	308	293	308	293	308	293	308	293
12:30	311	295	308	292	308	292	308	292	308	292
13:00	288	282	288	282	288	282	288	282	288	282
13:30	308	274	308	274	308	274	308	274	308	274
14:00	288	296	288	296	288	296	288	296	288	296
14:30	288	280	288	280	288	280	288	280	288	280
15:00	288	275	295	282	288	275	288	275	288	275
15:30	268	309	268	309	268	309	268	309	268	309
16:00	259	271	259	271	259	271	259	271	259	271
16:30	158	277	173	292	158	277	173	292	173	292
17:00	263	260	249	245	228	224	249	245	249	245
17:30	98	251	158	312	98	251	158	312	158	312
18:00	98	91	153	146	98	91	153	146	153	146
18:30	98	248	98	248	98	248	98	248	98	248
19:00	113	101	113	101	113	101	113	101	113	101
19:30	113	203	113	203	113	203	113	203	113	203

20:00	105	75	105	75	105	75	105	75	105	75
20:30	118	8	118	8	118	8	118	8	118	8
21:00	98	66	98	66	98	66	98	66	98	66
21:30	123	0	123	0	123	0	123	0	123	0
22:00	98	67	98	67	98	67	98	67	98	67
22:30	139	27	139	27	139	27	139	27	139	27
23:00	176	148	176	148	176	148	176	148	176	148
23:30	176	150	176	150	176	150	176	150	176	150
Total BE	11,673	11,413	11,733	11,474	11,464	11,204	11,749	11,490	11,661	11,402
Counter Activations	47									

Figures 5 and 6 below show the number of dispatched units for the first (1-24) and the last 24 (25-48) Dispatch Periods of the Dispatch Day. As can be seen, the number of allocated units does not change significantly despite the change in Balancing Capacity offers.

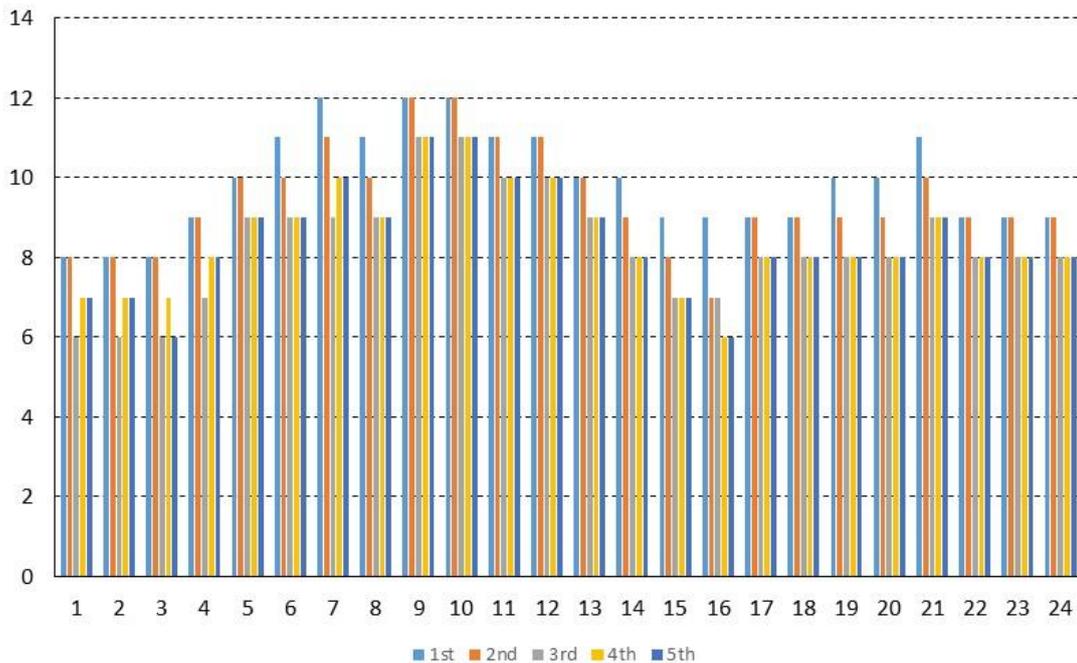


Figure 5: Number of Dispatched Units for the first 24 Dispatch Periods of the Dispatch Day for the five scenarios

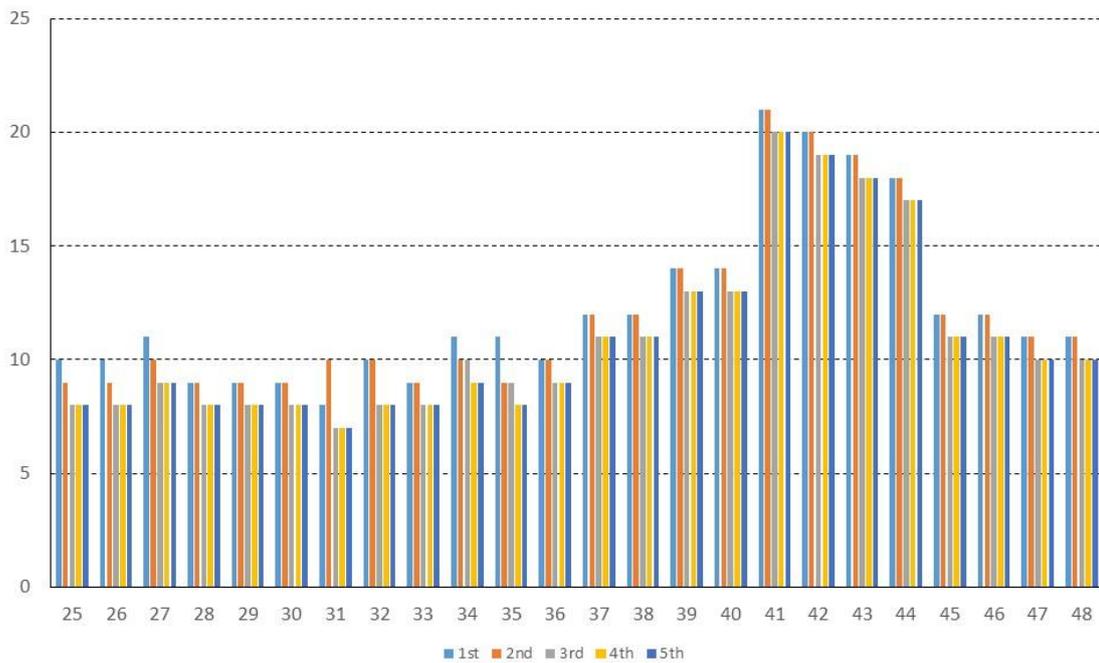


Figure 6: Number of Dispatched Units for the first 24 Dispatch Periods of the Dispatch Day for the five scenarios

5.5 Results for 23/02/2020

Table 7 presents, for the five scenarios, the Balancing Energy costs, Balancing Capacity costs and Total Balancing costs.

Table 7: Balancing costs for the five scenarios

Scenarios	Balancing Energy Costs [€]	Balancing Capacity Costs [€]	Total Balancing Costs [€]
Scenario 1	361,189.38	516,497.15	877,686.53
Scenario 2	363,430.58	8,347,635.16	8,711,065.75
Scenario 3	363,546.93	39,683,596.65	40,047,143.59
Scenario 4	362,407.46	78,854,675.16	79,217,082.63
Scenario 5	363,430.58	231,616,635.16	231,980,065.75

Table 8 presents, for each scenario, upward and downward Balancing Energy for each Dispatch Period of the Dispatch Day, total upward and downward Balancing Energy, as well as the number of counter activations for the entire Dispatch Day. No significant differences in the results appear between the scenarios.

Table 8: Upward/downward Balancing Energy and counter activations for the five scenarios

Dispatch Period	Scenarios									
	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	BE Dn	BE Up								
0:00	319	302	319	302	327	309	319	302	319	302
0:30	314	198	314	198	314	198	314	198	314	198
1:00	328	295	328	295	328	295	328	295	328	295
1:30	342	295	342	295	342	295	342	295	342	295
2:00	321	295	321	295	321	295	321	295	321	295
2:30	367	295	367	295	368	296	367	295	367	295
3:00	328	295	328	295	328	296	328	295	328	295
3:30	359	308	359	308	367	315	347	296	359	308
4:00	338	296	350	308	363	321	350	308	350	308
4:30	354	308	342	296	354	308	354	308	354	308
5:00	328	296	340	308	340	308	328	296	328	296
5:30	292	308	292	308	292	308	292	308	292	308
6:00	330	283	330	283	330	283	330	283	330	283
6:30	284	283	284	283	284	283	284	283	284	283
7:00	323	295	323	295	323	295	323	295	323	295
7:30	325	295	325	295	325	295	325	295	325	295
8:00	358	333	358	333	358	333	358	333	358	333
8:30	360	333	360	333	360	333	360	333	360	333
9:00	330	333	330	333	330	333	330	333	330	333
9:30	353	333	353	333	353	333	353	333	353	333
10:00	306	333	306	333	306	333	306	333	306	333
10:30	290	333	290	333	290	333	290	333	290	333
11:00	287	321	287	321	287	321	287	321	287	321
11:30	288	321	288	321	288	321	288	321	288	321
12:00	271	321	271	321	271	321	271	321	271	321
12:30	288	321	288	321	288	321	288	321	288	321
13:00	262	291	262	291	262	291	262	291	262	291
13:30	318	291	318	291	318	291	318	291	318	291
14:00	294	295	294	295	294	295	294	295	294	295
14:30	194	312	177	295	194	312	177	295	177	295
15:00	292	286	307	301	292	286	307	301	307	301
15:30	179	301	184	306	173	295	184	306	184	306
16:00	237	211	224	199	237	211	224	199	224	199
16:30	125	226	98	199	125	226	98	199	98	199
17:00	101	74	123	97	106	79	123	97	123	97
17:30	25	263	25	263	30	268	25	263	25	263
18:00	116	105	96	85	143	132	96	85	96	85
18:30	25	164	25	164	25	164	25	164	25	164
19:00	183	179	183	179	183	179	183	179	183	179
19:30	183	215	183	215	183	215	183	215	183	215
20:00	163	175	163	175	163	175	163	175	163	175

20:30	163	132	163	132	163	132	163	132	163	132
21:00	100	120	100	120	100	120	100	120	100	120
21:30	196	112	196	112	196	112	196	112	196	112
22:00	100	116	100	116	100	116	100	116	100	116
22:30	189	111	188	110	188	110	188	110	188	110
23:00	183	217	183	217	173	207	183	217	183	217
23:30	185	209	190	215	185	209	190	215	190	215
Total BE	12,194	12,325	12,176	12,308	12,267	12,399	12,164	12,296	12,176	12,308
Counter Activations	48									

Figures 7 and 8 below show the number of dispatched units for the first (1-24) and the last 24 (25-48) Dispatch Periods of the Dispatch Day. As can be seen, the number of allocated units does not change significantly despite the change in Balancing Capacity offers.

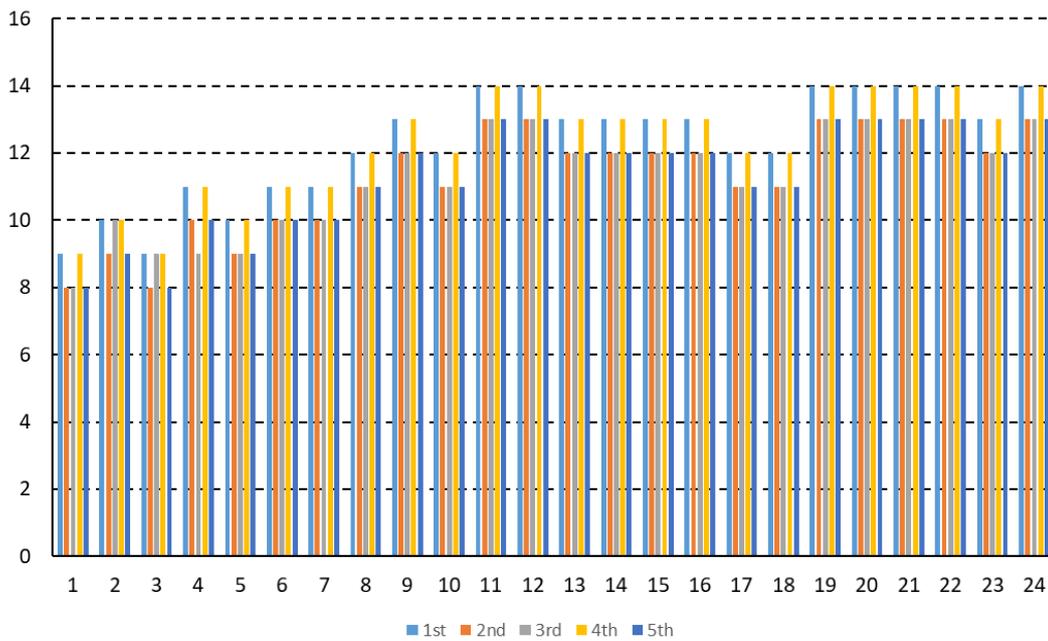


Figure 7: Number of Dispatched Units for the first 24 Dispatch Periods of the Dispatch Day for the five scenarios

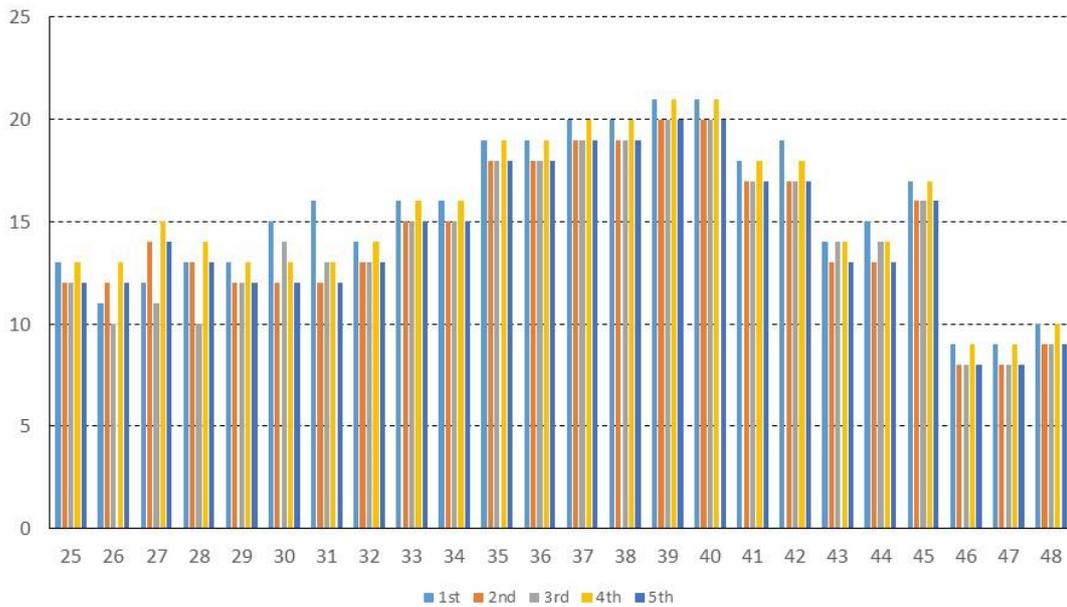


Figure 8: Number of Dispatched Units for the first 24 Dispatch Periods of the Dispatch Day for the five scenarios

5.6 Conclusions

It is observed that, in all the scenarios examined, the increase in the price of Balancing Capacity bids does not cause a significant unanticipated change in the results of the ISP, other than the expected increase in the cost of Balancing Capacity. Balancing Energy costs do not show significant variations between the five scenarios on all four days considered and therefore remain unaffected by Balancing Capacity supply caps. Lastly, in none of the scenarios is there a significant change in dispatched units, nor in counter activations, i.e. activations of upward or downward Balancing Energy within the same Dispatch Period.