

REPORT
ON ANCILLARY SERVICES AND BALANCING MARKET
IN BOSNIA AND HERZEGOVINA FOR 2024

Sarajevo, February 2025

Abbreviations:

SERC (DERK) – State Electricity Regulatory Commission

NOSBiH – Independent System Operator in Bosnia and Herzegovina

BSP – Balancing Service Provider

ASP – Ancillary Service Provider

BRP – Balance Responsible Party

ENTSO-E – European network of transmission system operators for electricity

EPBiH – The utility JP Elektroprivreda Bosne i Hercegovine d.d. Sarajevo

EPHZHB – The utility JP Elektroprivreda Hrvatske zajednice Herceg Bosne d.d. Mostar

ERS – Mixed Holding Elektroprivreda of Republika Srpska, parent company, stk. company Trebinje

EFT Stanari – EFT - Coal mine and Thermal Power Plant d.o.o. Stanari

EMS – Elektromreža Srbije

CGES – Electricity Transmission System of Montenegro

HOPS – Croatian Transmission System Operator

ELES – Elektro-Slovenija d.o.o. – Electricity Transmission System Operator in Slovenia

FSkar – Financial Settlement of KΔf, ACE and ramping period

FCP – frequency containment process

FCR – frequency restoration reserve

aFRR – frequency restoration reserve with automatic activation

mFRR – frequency restoration reserve with manual activation

Introduction

Balancing energy market is a part of the wholesale energy market, and it comes after the bilateral energy market. Unlike the bilateral energy market whose participants in purchase or sale transactions may be any licensed market participant, in the balancing energy market it is obligatory to have transmission system operator as one of the participants in the purchase/sale transaction.

Pursuant to the Law on Establishing Independent System Operator in BiH, NOSBiH is responsible for managing the balancing market in BiH which is defined as ‘the central market for electricity purchase and sale managed by NOSBiH with the purpose of maintaining a continuous balance of demand and supply in real time, as well as additional mechanisms performed by NOSBiH in order to ensure system services. In addition, one of NOSBiH’s operations is to provide ancillary services which are defined by the Law on Establishing Independent System Operator in BiH as ‘all services, with the exception of electricity generation and transmission, which are delivered to NOSBiH with the purpose of providing the system services including, among others, regulation of frequency and reserve, reactive power, voltage regulation and a power plant capability to start up without an external electricity supply’. Therefore, the balancing market and the mechanism of providing ancillary services are the ‘tools’ by which NOSBiH maintains the balance between generation, exchange, and consumption of electricity in real time, maintains the required level of reserve for ancillary services of secondary and tertiary regulation and enables safe operations of the electric power system. Participation in the balancing market is regulated by an agreement which NOSBiH concludes with a power market participant in line with the Market rules.

The main principles of balancing in 2024

In Bosnia and Herzegovina, the Market rules entered into force on 1st January 2016 thus establishing the market principles in the balancing processes and in allocation of the balancing costs of the power system in BiH. With the purpose of improving processes in the balancing energy market the Market rules¹ were amended at the end of 2021 and the changed Market rules started to apply as of 1st January 2022.

An organized balancing capacity and balancing energy market is established for frequency containment process (FCR) and frequency restoration process with automatic and manual activation– aFRR and mFRR.

The reserve capacity market was established for all processes and the right to participate belongs to those balancing service providers (BSPs) whose capacities satisfy the technical preconditions for providing the balancing services. The reserve capacity prices in 2024 were limited by relevant decisions made by the State Regulatory Electricity Commission (SERC). In case the required scope of reserve was not provided in the market, there was a possibility of a regulated procurement of missing quantities. If providers had failed to deliver reserve capacities, they would incur a penalty in an amount which was equal to 10% of the price cap for aFRR i.e. mFRR. The aFRR and mFRR reserve capacities were contracted monthly.

The reserved (contracted) capacity had to be offered at the balancing electricity market where energy power and price were also offered in case of activation. At the daily balancing energy market mFRR, the right to participate also belonged to the bids without reserved capacity i.e. voluntary bids.

The procurement of aFRR was done symmetrically for positive and negative range, and the procurement of mFRR was done separately for upward and downward regulation.

¹ Market rules were issued by NOSBiH, adopted by SERC by its Decision no 04-28-9-202-2/21 as of 13 October 2021

Through the market procedure 81% of the required FCR capacity was procured for 2024. The remaining FCR capacity was procured in a regulated manner. The procurement and service provision process are organized at the level of the calendar month. BSPs were obliged to provide the contracted FCR capacity, while the FCR energy is settled according to energy prices set by the FSkar process.

SERC's Decision on Determination of Coefficients and Price Caps for Ancillary Services as of 17 December 2021 and Decision on Amendments to the Decision as of 23 December 2022 determined hourly price caps² for control capacity and delivered balancing energy:

- The price for the balancing energy for upward mFRR is limited to 989.46 KM/MWh.
- The price for the balancing energy for downward mFRR is limited to -401.28 KM/MWh.
- The difference in prices of energy for upward and downward aFRR bids is limited to 40.00 KM/MWh.
- The price cap for aFRR amounts to 43.00 KM/MW/h.
- The price cap for mFRR upward capacity amounts to 9.00 KM/MW/h.
- The price cap for mFRR downward capacity amounts to 2.10 KM/MW/h.

Based on the balancing energy prices of activated aFRR and mFRR bids imbalance prices were determined, which were used for the calculation of imbalance costs of balance responsible parties (BRPs) in BiH. Imbalance prices were determined for each 15-minute imbalance settlement period according to the most expensive bid activated, for realized electricity deficit and surplus respectively.

Balancing services in 2024

Table 1 presents specific values related to balancing capacities in 2024. Figure 1 graphically presents the share that BSPs have in providing specific balancing services as well as the share of undelivered capacity on an annual basis. Detailed monthly realization of capacity for different balancing services is shown in tables 2 - 6.

² Price cap is determined by SERC – Decision on determination of coefficients and price caps for ancillary services

Table 1: Balancing capacities in BiH for 2024

Reserved capacity and cost of capacity						
		FCR	aFRR Off-peak load (00.00 - 06.00 hrs)	aFRR Peak load (06.00 - 24.00 hrs)	mFRR Upward	mFRR Downward
Capacity needs	MW	13,00	27,58	45,90	196,00	68,00
Contracted capacity	MW	13,00	27,58	45,90	196,00	68,00
Capacity contracted at the market	MW	10,52	21,35	45,65	196,00	68,00
Price of contracted capacity	KM/MW/h	7,38	42,89	39,07	5,19	1,40
Contracted cost	KM	843.106	2.597.716	11.812.672	8.933.632	835.682
Delivered capacity	MW	13	10	24	149	55
Delivered capacity	%	100%	35%	51%	76%	81%
Capacity cost	KM	843.106	912.191	5.917.917	6.751.018	679.394
Undelivered service	MW	0	18	22	47	13
Penalty	KM	0	168.876	631.685	369.800	23.413

The table shows average capacity values presented in 1 hour resolution

BSP's share in delivered capacity						
EP BiH	MW	7	5	10	59	6
EP BiH	%	51%	50%	41%	40%	10%
ERS	MW	5	5	14	33	18
ERS	%	38%	50%	59%	22%	33%
EP HZHB	MW	1	0	0	57	12
EP HZHB	%	8%	0%	0%	38%	22%
EFT	MW	0			0	20
EFT	%	3%			0%	35%

The table shows average capacity values presented in 1 hour resolution

The balancing market in BiH in 2024 can be described as a stable one. Capacity prices were close to last year's prices. The price for upward balancing energy was higher, and the price for downward balancing energy was lower in comparison to last year. Insufficient availability of balancing capacities at night, especially for downward regulation, is also present in 2024.

Frequency Containment Process – FCP

From 2023, a market-based procedure for the procurement of frequency containment reserve (FCR) was introduced. BiH's obligation related to this reserve in 2024 is 13 MW and around 80% of the capacity was contracted completely through the market procedure.

Automatic frequency restoration reserve – aFRR

In 2024 NOSBiH had an average of 10 MW of aFRR capacity in off peak hours (from midnight until 6:00 am) which makes 35% of the required capacity which is less than last year. In peak load periods (from 6:00 am until midnight) there was an average amount of 24 MW of aFRR capacity available, which makes 51% of the capacity required. The cost of aFRR capacity in 2024 amounted to approximately 7 million KM. During the year three public power utilities with their balancing resources were registered as aFRR providers.

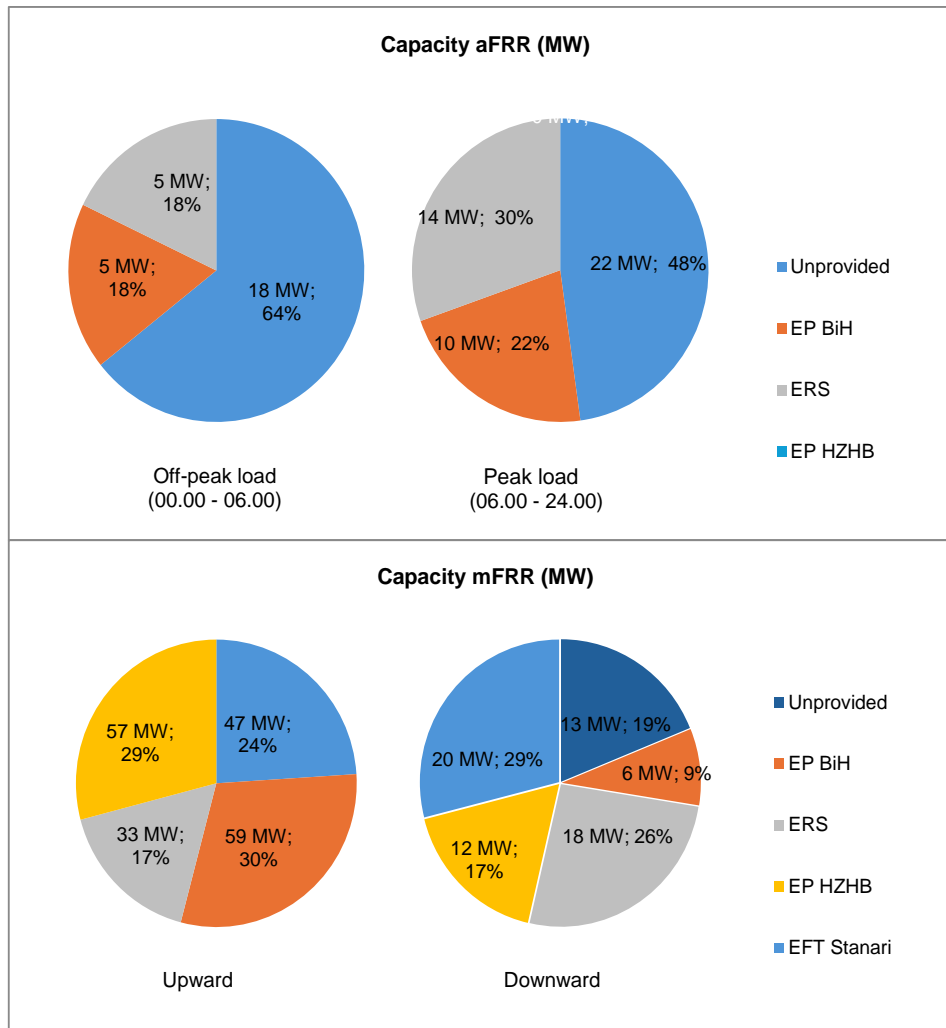


Figure 1: Share of BSPs in delivered balancing capacity in BiH in 2024

Manual frequency restoration reserve – mFRR

In 2024 NOSBiH had an average of 149 MW of upward mFRR which makes 76% of the required capacity. Average available capacity of downward mFRR amounted to 55 MW which makes around 81% of the required capacity. The cost for delivered capacity amounted to 6.8 million KM for upward mFRR and 0.7 million KM for downward mFRR. The availability of balancing capacity is worse compared to the previous year.

During the year 2024 four companies had their prequalified resources for providing mFRR balancing service.

Table 2: Report on balancing services in BiH for 2024
Frequency Containment Reserve - FCR

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23	
Required capacity	MW	13	13	13	13	13	13	13	13	13	13	13	13,00	93%	
Contracted capacity	MW	13	13	13	13	13	13	13	13	13	13	13	13,00	93%	
Capacity contracted at the market	MW	8	8	8	8	8	13	13	13	13	13	13	10,52	75%	
Price of contracted capacity	KM/MW	7,90	7,88	7,95	7,80	7,94	8,02	6,92	6,91	6,86	6,89	6,77	6,80	7,38	109%
Contracted cost	KM	76,453	71,270	76,811	72,965	76,811	75,038	66,886	66,796	64,238	66,707	63,374	65,755	843,106	101%
Delivered capacity	MW	13	13	13	13	13	13	13	13	13	13	13	13,00	93%	
Delivered capacity	%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100,00%	100%	
Capacity cost	KM	76,453	71,270	76,811	72,965	76,811	75,038	66,886	66,796	64,238	66,707	63,374	65,755	843,106	101%
Undelivered capacity	MW	0	0	0	0	0	0	0	0	0	0	0	0,00		
Penalty for undelivered capacity	KM	0	0	0	0	0	0	0	0	0	0	0	0		
The table shows average capacity values presented in 1 hour resolution															
BSP's share in delivered capacity															
EP BiH	MW	4	4	4	5	4	4	9	9	9	9	9	6,60	66%	
EP BiH	%	31%	31%	31%	38%	31%	31%	69%	69%	69%	69%	69%	51%		
ERS	MW	6	6	6	6	6	6	4	4	4	4	4	4,99	125%	
ERS	%	46%	46%	46%	46%	46%	46%	31%	31%	31%	31%	31%	38%		
EP HZHB	MW	2	2	2	2	2	2	0	0	0	0	0	0,99		
EP HZHB	%	15%	15%	15%	15%	15%	15%	0%	0%	0%	0%	0%	8%		
EFT Stanari	MW	1	1	1	0	1	1	0	0	0	0	0	0,41		
EFT Stanari	%	8%	8%	8%	0%	8%	8%	0%	0%	0%	0%	0%	3%		

The table shows average capacity values presented in 1 hour resolution

Table 3: Report on balancing services in BiH for 2024
aFRR - off-peak load (00.00 - 06.00)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23	
Required capacity	MW	32	31	28	28	24	23	26	26	25	27	29	32	27,58	95%
Contracted capacity	MW	32	31	28	28	24	23	26	26	25	27	29	32	27,58	95%
Capacity contracted at the market	MW	31	24	28	28	24	17	10	10	5	24	24	31	21,35	86%
Price of contracted capacity	KM/MW	42,93	42,92	42,89	42,89	42,90	42,83	42,88	42,88	42,89	42,91	42,88	42,91	42,89	101%
Contracted cost	KM	255,490	231,498	222,185	216,162	191,487	177,327	207,344	207,344	193,023	216,658	223,812	255,387	2,597,716	96%
Delivered capacity	MW	16	13	17	8	9	11	11	4	3	10	8	8	9,73	70%
Delivered capacity	%	50%	41%	60%	29%	39%	46%	43%	14%	11%	35%	28%	24%	35,29%	
Capacity cost	KM	126,865	94,460	133,777	63,307	74,993	80,742	88,997	28,914	21,252	76,718	63,330	60,181	913,537	71%
Undelivered capacity	MW	16	18	11	20	15	12	15	22	22	17	21	24	17,85	118%
Penalty for undelivered capacity	KM	12,877	13,715	8,876	16,055	11,663	9,671	11,842	17,895	17,225	14,023	16,076	19,545	169,464	119%

The table shows average capacity values presented in 1 hour resolution

BSP's share in delivered capacity															
EP BiH	MW	9	5	13	7	2	2	3	2	3	6	3	2	4,83	63%
EP BiH	%	58%	42%	80%	83%	26%	23%	23%	62%	99%	64%	32%	27%	50%	
ERS	MW	7	7	3	1	7	8	9	1	0	3	6	5	4,82	79%
ERS	%	42%	58%	20%	17%	74%	77%	38%	1%	36%	68%	73%	50%		
EP HZHB	MW	0	0	0	0	0	0	0	0	0	0	0	0	0,00	
EP HZHB	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	

The table shows average capacity values presented in 1 hour resolution

Table 4: Report on balancing services in BiH for 2024
aFRR - peak load (06:00 - 24.00 hrs)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23	
Required capacity	MMW	50	53	48	46	41	39	44	40	41	45	51	53	45,90	97%
Contracted capacity	MMW	50	53	48	46	41	39	44	40	41	45	51	53	45,90	97%
Capacity contracted at the market	MMW	50	53	48	46	41	39	44	40	38	45	51	53	45,65	97%
Price of contracted capacity	KM/MMW	38,78	38,97	38,55	38,51	38,10	39,09	39,47	39,34	40,96	38,65	39,18	39,40	39,07	103%
Contracted cost	KM	1.081.884	1.078.113	1.032.451	956.626	871.730	823.154	969.162	878.041	906.795	970.513	1.078.920	1.165.283	11.812.672	100%
Delivered capacity	MMW	38	34	31	25	22	22	23	17	8	24	20	19	23,60	85%
Delivered capacity	%	76%	64%	65%	54%	54%	56%	53%	43%	19%	53%	39%	36%	51,43%	
Capacity cost	KM	812.657	678.560	665.886	521.344	468.751	450.359	489.732	358.622	161.110	505.730	409.970	406.685	5.929.406	88%
Undelivered capacity	MMW	12	19	17	21	19	17	21	23	33	21	31	34	22,29	113%
Penalty for undelivered capacity	KM	28.669	42.720	39.936	51.017	44.902	39.429	50.100	55.186	77.306	50.561	72.335	81.770	633.931	114%

The table shows average capacity values presented in 1 hour resolution

BSP's share in delivered capacity																
EP BiH	MMW	20	16	18	13	7	6	5	4	5	10	8	6	9,73	77%	
EP BiH	%	52%	47%	57%	54%	29%	28%	22%	25%	60%	40%	38%	29%	41,20%		
ERS	MMW	18	18	14	12	16	16	18	13	3	14	12	13	13,88	92%	
ERS	%	48%	53%	43%	46%	71%	72%	78%	75%	40%	60%	62%	71%	58,80%		
EP HZHB	MMW	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0%	
EP HZHB	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0,00%		

The table shows average capacity values presented in 1 hour resolution

Table 5: Report on balancing services in BiH for 2024
Upward mFRR

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23	
Required capacity	MW	196	196	196	196	196	196	196	196	196	196	196	196,00	100%	
Contracted capacity	MW	196	196	196	196	196	196	196	196	196	196	196	196,00	100%	
Capacity contracted at the market	MW	196	196	196	196	196	196	196	196	196	196	196	196,00	100%	
Price of contracted capacity	KW/MW	4,01	4,03	4,07	4,10	4,36	7,15	7,12	7,10	7,25	5,00	4,03	4,04	5,19	101%
Contracted cost	KM	584,412	549,109	592,461	578,693	635,242	1,009,368	1,038,215	1,034,755	1,023,732	729,765	568,901	588,980	8,933,632	101%
Delivered capacity	MW	157	170	156	179	185	150	156	152	128	136	104	117	149,19	91%
Delivered capacity	%	80%	87%	80%	91%	94%	77%	80%	78%	65%	69%	53%	60%	76,12%	
Capacity cost	KM	455,649	467,292	459,290	521,077	595,742	790,577	833,785	802,057	679,579	506,862	293,183	345,926	6,751,018	91%
Undelivered capacity	MW	39	26	40	17	11	46	40	44	68	60	92	79	46,81	145%
Penalty for undelivered capacity	KM	25,856	16,466	26,753	11,292	7,475	29,603	26,751	29,357	43,859	40,139	59,572	52,677	369,800	146%
The table shows average capacity values presented in 1 hour resolution															
BSPs share in delivered capacity															
EP BiH	MW	63	74	79	90	70	45	48	47	45	38	52	63	59,41	110%
EP BiH	%	40%	44%	50%	50%	38%	30%	31%	31%	35%	28%	50%	54%	39,82%	
ERS	MW	44	46	28	39	49	37	42	46	21	11	17	15	32,91	113%
ERS	%	28%	27%	18%	22%	27%	25%	27%	30%	16%	8%	16%	13%	22,06%	
EP HZHB	MW	50	50	50	49	66	68	66	59	62	87,283221	36	39	56,88	70%
EP HZHB	%	32%	29%	32%	28%	36%	45%	42%	39%	49%	64%	34%	33%	38,13%	
EFT Stanari	MW	0	0	0	0	0	0	0	0	0	0	0	0	0,00	
EFT Stanari	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0,00%	

The table shows average capacity values presented in 1 hour resolution

Table 6: Report on balancing services in BiH for 2024
Downward mFRR

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23
Required capacity	MW	68	68	68	68	68	68	68	68	68	68	68	68,00	100%
Contracted capacity	MW	68	68	68	68	68	68	68	68	68	68	68	68,00	100%
Capacity contracted at the market	MW	68	68	68	68	68	68	68	68	68	68	68	68,00	100%
Price of contracted capacity	KM/MW	1,42	1,42	1,36	1,36	1,43	1,42	1,42	1,39	1,39	1,39	1,39	1,40	87%
Contracted cost	KM	71.670	67.046	68.675	66.550	72.533	69.343	71.655	71.655	67.889	70.246	68.062	835.682	87%
Delivered capacity	MW	66	53	58	34	55	58	61	57	47	55	56	55,34	96%
Delivered capacity	%	96%	78%	85%	50%	82%	85%	90%	84%	69%	80%	83%	81,38%	
Capacity cost	KM	69,041	52,401	58,225	32,888	59,239	58,599	63,986	59,997	46,664	56,445	56,329	679,394	84%
Undelivered capacity	MW	2	15	10	34	13	10	7	11	21	13	12	12,66	122%
Penalty for undelivered capacity	KM	374	2,225	1,606	5,187	1,954	1,563	1,090	1,675	3,229	2,080	1,751	23,413	123%
The table shows average capacity values presented in 1 hour resolution														
BSP's share in delivered capacity														
EP BiH	MW	9	9	0	0	5	5	5	6	7	7	7	5,58	59%
EP BiH	%	14%	18%	0%	0%	9%	9%	8%	11%	15%	13%	12%	10,09%	
ERS	MW	16	17	26	20	20	20	21	16	6	18	17	18,00	85%
ERS	%	25%	32%	45%	59%	35%	35%	35%	28%	13%	33%	29%	32,52%	
EP HZHB	MW	15	15	15	14	10	10	10	10	9	10	14	12,04	96%
EP HZHB	%	23%	28%	25%	41%	17%	17%	16%	18%	19%	18%	25%	21,75%	
EFT Stanari	MW	25	12	17	0	19	22	25	25	25	19	19	19,50	133%
EFT Stanari	%	38%	22%	29%	0%	33%	39%	41%	44%	54%	35%	34%	35,24%	

The table shows average capacity values presented in 1 hour resolution

Balancing energy market

In 2024, for the purpose of BiH power system balancing 68 102 MWh of upward balancing energy was activated (energy injection) with an average price of 307.61 KM/MWh. The total cost of this energy is significantly higher compared to the year 2023 due to large quantities and higher price of balance energy.

In 2024, activated downward balancing energy (energy takeover) amounted to 51 886 MWh. Average price for this energy was 88.87 KM/MWh considering the energy with offered negative price as well. Downward balance energy prices are also lower compared to 2023 prices.

Imbalance

There were 9 balance responsible parties (BRPs) active in BiH in 2024, not counting the so called 'trading BRPs', i.e., the BRPs with no imbalance realized within BiH. Average imbalance prices in 2024 were 193.78 KM/MWh for shortage and 73.20 KM/MWh for surplus of energy. These prices are 5% lower compared to last year's imbalance price. Imbalance prices ranged from -400.00 KM/MWh up to 1643.00 KM/MWh, depending on the energy situation, considering the activated cross-border balancing energy for the needs of the LFC area of BiH. In 2024 there were negative imbalance prices for realized surplus in 552 calculation periods (15 minutes) which makes 1.57% of the time in 2024.

Figure 2 and Table 7 show the deviations of the Control Area BiH over the past few years.

Table 7: Deviation of the BH LFC area for the last five years

Imbalance BiH		Energy shortage						Energy surplus					
		2019	2020	2021	2022	2023	2024	2019	2020	2021	2022	2023	2024
Total	MWh	-42.010	-29.318	-80.435	-86.765	-46.142	-88.806	38.864	52.587	35.417	33.014	45.672	41.387
Max. Hourly	MW	-186	-149	-742	-270	-163	-901	171	218	118	216	143	193

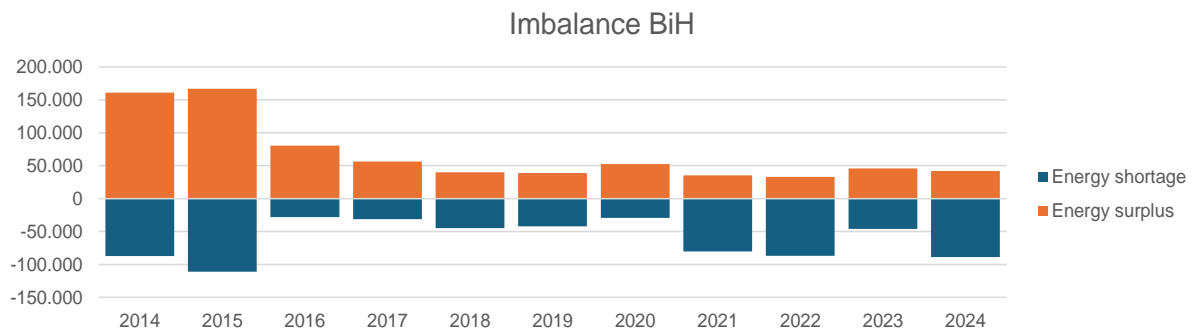


Figure 2: Annual deviations of BiH Control Area

Table 8 presents values of activated balancing energy, energy prices and relevant costs by taking into consideration cross-border activations for the needs of LFC BiH Control Area, exempting the energy activated within BiH for the needs of other system operators.

Table 8: Balancing market in BiH in 2024

Activated balancing energy															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23	
FCR upward	MWh	252	228	233	220	258	257	314	217	213	279	271	246	2.988	88%
FCR downward	MWh	307	277	332	384	313	234	257	244	292	209	205	181	3.235	79%
aFRR upward	MWh	3.369	2.108	4.448	2.705	2.632	4.220	6.156	4.763	1.846	4.536	4.931	6.205	47.920	127%
aFRR downward	MWh	8.082	7.123	5.305	4.665	5.814	3.609	2.556	1.332	1.255	3.168	2.198	1.573	46.681	63%
mFRR upward	MWh	102	76	566	358	141	2.483	401	1.652	3.361	249	2.856	4.949	17.193	454%
mFRR downward	MWh	188	372	133	121	71	96	0	3	606	236	115	30	1.970	434%
Balancing energy upward	MWh	3.723	2.412	5.248	3.283	3.031	6.960	6.871	6.631	5.420	5.065	8.059	11.400	68.102	151%
Balancing energy downward	MWh	8.577	7.772	5.770	5.171	6.197	3.939	2.812	1.579	2.153	3.614	2.518	1.784	51.886	66%
Cross-border balancing energy for the needs of CA BiH taken into account															
Balancing energy cost and prices															
Upward - cost	KM	869.908	358.675	1.094.593	557.561	466.517	2.166.507	1.260.444	2.145.069	2.915.082	906.565	3.098.872	5.109.268	20.949.061	190%
Upward - average price	KM/MWh	233,68	148,72	208,57	169,83	153,90	311,28	183,44	323,47	537,88	179,00	384,53	448,18	307,61	126%
Downward - cost	KM/MWh	811.434,29	630.449,79	526.109,99	427.331,12	543.197,38	368.491,33	322.898,07	197.636,30	35.765,83	327.977,75	230.052,05	189.696,77	4611040,67	51%
Downward - average price	KM/MWh	94,61	81,11	91,19	82,64	87,65	93,56	114,81	125,19	16,61	90,76	91,36	106,32	88,87	77%
Imbalances of BiH LFC area															
Shortage - total	MWh	3.400	3.269	6.415	4.107	3.881	11.511	6.367	9.229	9.139	5.825	11.090	14.590	88.821	192%
Shortage - max hourly	MWh	59	73	66	126	66	901	75	131	112	97	197	99	900,72	554%
Surplus - total	MWh	3.280	4.500	1.735	3.982	5.429	3.942	2.473	2.468	6.065	3.578	2.624	1.638	41.714	91%
Surplus - max hourly	MWh	66	54	41	51	102	193	45	44	95	72	88	47	192,77	135%
Price shortage - average	KM/MWh	193,91	145,76	168,46	155,47	154,61	172,81	163,65	211,54	242,52	165,33	235,20	314,00	193,78	94%
Price shortage - maximum	KM/MWh	700,00	800,00	950,00	680,00	630,00	899,00	850,00	900,00	980,00	980,00	1.643,13	1.419,38	1.643,13	166%
Price surplus - average	KM/MWh	70,76	66,11	72,09	63,67	67,15	71,18	85,38	78,25	65,03	83,22	71,74	82,72	73,20	94%
Price surplus - minimum	KM/MWh	-400,00	-400,00	-60,00	-300,00	-400,00	-400,00	0,00	-20,00	-400,00	-400,00	-400,00	-100,00	-400,00	100%

Transmission losses and FSkar process

In 2024 energy to cover transmission losses was procured through regulated procedure in first two months, and in the remaining part of the year transmission losses were covered through the market procedure. The total cost of this service in 2024 was 60. 959 382 KM, which is over 50% higher in comparison to last year.

The process of financial settlement of deviations between LFC Areas of Continental Europe – FSkar process includes unintended exchange, energy from the frequency containment process (FCR) and ramping period. Because of the FSkar process, NOSBiH is due to pay 12.5 million KM for the year 2024, which is significantly higher than in the previous year.

Cross-border balancing energy exchange

Based on the agreement on the joint balancing reserve in the Slovenia-Croatia-Bosnia and Herzegovina LFC block, the capacity of mFRR which was to be provided in 2024 within the BiH LFC area was 196 MW for upward regulation, and 68 MW for downward regulation. In 2017 Agreement on cross-border exchange of balancing energy was also signed with Serbian Transmission System Operator – EMS, and in 2018 the same Agreement was signed with the Transmission System Operator in Montenegro – CGES

Table 9 shows the values of exchanged cross-border balancing energy in 2024 with the expenses included. Figure 3 shows the share of neighboring TSOs in total cross-border exchange of balancing energy with BiH.

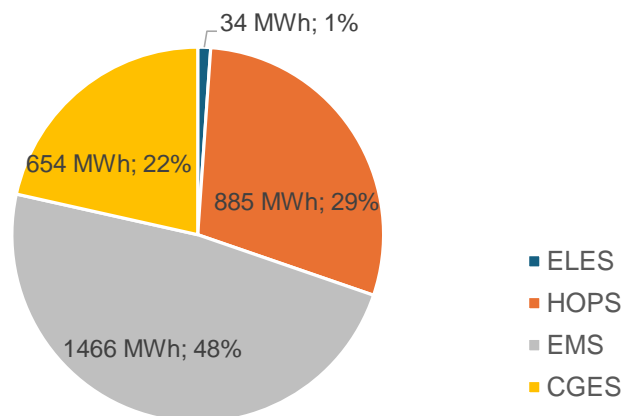


Image 3: Cross-border exchange of balancing energy

Table 9: Report on transmission losses and cross-border settlement (FSkar) for 2024

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23	
Losses	MWh	32,955	27,236	28,569	24,254	21,759	23,550	31,275	27,639	23,295	25,893	30,276	35,838	332,540	99%
Reference price	KM/MWh	109,94	109,94	199,80	199,80	188,46	199,90	199,90	199,90	200,00	200,00	200,00	183,96	167%	
Cost	KM	3.502.139	3.259.721	5.708.139	4.845.988	4.100.771	4.707.570	6.251.792	5.525.000	4.656.608	5.178.692	6.055.284	7.167.680	60.959.382	153%
Cost of FSKar	KM	208.179	-114.441	660.882	191.401	-115.447	2.411.518	560.331	1.258.794	1.246.594	436.634	2.505.697	3.328.917	12.579.061	727%

Table 10: Report on cross-border balancing energy exchange for 2024

XB energy - Connecting TSO NOSBiH														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2024	2024/23
XB Exchange - Import	MWh	40	125	115		190	203	34	117				823,667	308%
Average Price	KM /MWh	-86,88	-228,92	-400,01		-400,01	-400,01	-400,01	-211,67				-332,13	123%
Cost	KM	-3.475	-28.500	-46.001		-75.968	-81.201	-13.600	-24.818				-273.564	378%
XB Exchange - Export	MWh		55			90	115				20	80	360	68%
Average Price	KM /MWh		876,37			683,33	866,67				878,33	878,13	825,51	104%
Cost	KM		48.200			61.500	99.667				17.567	70.250	297.184	70%
XB energy - Requesting TSO NOSBiH														
XB Exchange - Import	MWh					980	50				495	330	1855	
Average Price	KM /MWh					542,76	384,16				805,87	733,56	642,64	
Cost	KM					531.900	19.208				398.906	242.074	1.192.088	
XB Exchange - Export	MWh													
Average Price	KM /MWh													
Cost	KM													
Export	KM													

Conclusions

All required balancing capacities for 2024, apart from a part of FCR capacities and aFRR capacity in off peak load periods, were procured in public procurement procedures, mostly in the annual tender.

In relation to the year 2023, similar prices of balancing capacities were realized for aFRR and for mFRR. The realized prices of balancing capacities are significantly below the regulated price-caps, except for the price of aFRR capacity in the off-peak period.

The worst availability of balancing capacities, as in previous years, was achieved for the aFRR service at night. In 2024, around 35% of the required capacity was delivered. A slightly better availability was achieved for the aFRR reserve in periods of peak load, and it amounted to 51%, while the availability of the mFRR reserve up and down is 76% and 85% respectively. The dominant providers of balancing services are three public utilities with their own balancing capacities.

In contrast to balance capacities, the prices of upward balancing energy in 2024 are higher compared to 2023, and the price for downward balancing energy was lower in comparison to 2023. In 2024, 1900 MWh of cross-border balancing energy was activated for the needs of the LFC area of BiH. Half of this energy amount was activated after the blackout which happened in June. At the same time, NOSBiH, in line with its possibilities, delivered balancing energy to the neighboring system operators.

Imbalance prices were in line with balancing energy prices and on average amounted to 193.78 KM/MWh for a realized energy shortage, i.e., 73.20 KM/MWh for realized energy surplus. The prices are lower than last year's imbalance prices.

The cost of energy to cover transmission losses is 50% higher than in 2023. The main reason for this in price increase of this energy which in 10 months of 2024 was procured through market procurement procedure. Considering the regulated prices for the first two months of 2024, the average price of energy to cover losses in 2024 amounted to 186.96 KM/MWh unlike the year 2023 when the whole year was covered by a regulated procurement cost of 109.94 KM/MWh.

Bad hydrological situation and problems in delivery of electricity from most thermal power plants marked the year 2024. There was a significant deficit of energy in the amount of 88 GWh and surplus of energy of 42 GWh. As for the settlement between transmission system operators – Fskar process, the cost was seven times higher than in last year.

Considering the actual tariff for system services, based on ancillary services and the balancing market the amount of 4 million KM of expense was realized in 2024.

Appendix: Financial overview

Table 11: Financial balance - ancillary services and balancing energy in 2024

Balancing capacity

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23
FCR - capacity	-76.453	-71.270	-76.811	-72.965	-76.811	-75.038	-66.886	-66.796	-64.238	-66.707	-63.374	-65.755	-843.106	
FCR - capacity - penalty	0	0	0	0	0	0	0	0	0	0	0	0	0	
aFRR - capacity <i>KM</i>	-939.523	-773.020	-799.663	-584.651	-543.744	-531.101	-578.729	-387.536	-182.363	-582.448	-473.300	-466.866	-6.842.944	85,58%
aFRR - capacity - penalty <i>KM</i>	41.546	56.435	48.813	67.072	56.566	49.100	61.942	73.081	94.530	64.584	88.411	101.315	803.394	115,06%
mFRR upward - capacity <i>KM</i>	-455.649	-467.292	-459.290	-521.077	-595.742	-790.577	-833.785	-802.057	-679.579	-506.862	-293.183	-345.926	-6.751.018	90,71%
mFRR upward - capacity - penalty <i>KM</i>	25.856	16.466	26.753	11.292	7.475	29.603	26.751	29.357	43.859	40.139	59.572	52.677	369.800	145,97%
mFRR downward - capacity <i>KM</i>	-69.041	-52.401	-58.225	-32.888	-59.239	-58.599	-63.986	-59.997	-46.664	-56.445	-56.329	-65.579	-679.394	84,32%
mFRR upward - capacity - penalty <i>KM</i>	374	2.225	1.606	5.187	1.954	1.563	1.090	1.675	3.229	2.080	1.751	680	23.413	123,07%
Total <i>KM</i>	-1.472.890	-1.288.858	-1.316.818	-1.128.029	-1.209.540	-1.375.050	-1.453.604	-1.212.274	-831.226	-1.105.660	-736.452	-789.454	-13.919.855	91,14%

Positive values are invoiced by NOSBIH and paid by BSP, negative values are paid by NOSBIH and invoiced by BSP

Balancing energy

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23
Upward <i>KM</i>	-869.908	-358.675	-1.094.593	-557.561	-466.517	-2.166.507	-1.260.444	-2.145.069	-2.915.082	-906.565	-3.098.872	-5.109.268	-20.949.061	190,00%
Downward <i>KM</i>	811.434	630.450	526.110	427.331	543.197	368.491	322.898	197.636	35.766	327.978	230.052	189.697	4.611.041	50,97%
Total <i>KM</i>	-58.474	271.774	-568.483	-130.229	76.680	-1.798.016	-937.546	-1.947.432	-2.879.316	-578.587	-2.868.820	-4.919.571	-16.338.020	825,73%

Positive values are invoiced by NOSBIH and paid by BSP, negative values are paid by NOSBIH and invoiced by BSP

Imbalances

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23
Surplus <i>KM</i>	-405.033	-347.901	-198.911	-299.525	-477.008	-244.664	-225.893	-100.657	-229.884	-319.465	-135.284	-80.815	-3.065.040	79,83%
Shortage <i>KM</i>	1.844.680	878.537	2.607.076	1.824.640	1.594.051	4.774.157	2.845.310	5.260.365	7.229.596	2.372.797	7.666.489	11.656.567	50.554.264	171,53%
Total <i>KM</i>	1.439.647	530.636	2.408.165	1.525.115	1.117.043	4.529.493	2.619.417	5.159.708	6.999.712	2.053.333	7.531.205	11.575.751	47.489.225	185,26%

Positive values are invoiced by NOSBIH and paid by BSP, negative values are paid by NOSBIH and invoiced by BSP

Losses and FSkar

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23
Losses <i>KM</i>	-3.502.139	-3.259.721	-5.708.139	-4.845.988	-4.100.771	-4.707.570	-6.251.792	-5.525.000	-4.656.608	-5.178.692	-6.055.284	-7.167.680	-60.959.382	152,54%
FSkar <i>KM</i>	-208.179	114.441	-660.882	-191.401	115.447	-2.411.518	-560.331	-1.258.794	-1.246.594	-436.634	-2.505.697	-3.328.917	-12.579.061	726,81%
Total <i>KM</i>	-3.710.318	-3.145.280	-6.369.021	-5.037.389	-3.985.325	-7.119.088	-6.812.123	-6.783.794	-5.903.202	-5.615.326	-8.560.981	-10.496.597	-73.538.443	176,38%

Positive values are invoiced by NOSBIH and paid by BSP, negative values are paid by NOSBIH and invoiced by BSP

System tariff

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23
Total <i>KM</i>	5.157.796	4.497.353	4.450.711	3.954.396	3.703.821	3.726.452	4.282.274	4.166.266	3.768.627	4.196.583	4.971.825	5.609.183	52.485.287	104,63%

Positive values are invoiced by NOSBIH and paid by market participants

Financial balance

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2024	2024/23
Total <i>KM</i>	1.355.762	865.626	-1.395.446	-816.136	-297.321	-2.036.208	-2.301.582	-617.525	1.154.593	-1.049.657	336.777	979.312	-3.821.807	-22,68%

Positive value - NOSBIH account credited