

REPORT
ON ANCILLARY SERVICES AND BALANCING MARKET
OPERATIONS IN BOSNIA AND HERZEGOVINA FOR 2017

Sarajevo, February 2018

Abbreviations:

SERC – State Electricity Regulatory Commission

NOSBiH – Independent System Operator in Bosnia and Herzegovina

BSP – Balancing Service Provider

BRP – Balance Responsible Party

EPBiH - Public Enterprise Electric Utility of Bosnia and Herzegovina, d.d Sarajevo

EPHZHB - Public Enterprise Electric Utility of the Croatian Community Herzeg-Bosnia, d.d. Mostar

ERS - Mixed Holding Electric Utility of the Republic of Srpska - Parent Joint-stock Company, Trebinje

EAL-Aluminij d.d. Mostar

Energy Financing Team Stanari – EFT-Coal Mine and Stanari Thermal Power Plant, ltd.

Introduction

In accordance 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 to maintain continuous balance of demand and supply in real time, as well as additional mechanisms conducted 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 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 set out by an agreement which NOSBiH concludes with a power market participant in line with the Market rules.

The main principles of the balancing in 2017

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.

An organized market of capacity reserve and balance energy was established for secondary and tertiary regulation, while primary regulation was obligatory for the generation units connected to the transmission system, without compensations.

The control capacity market was established for secondary and tertiary regulation and the right to participate belonged to those ancillary service providers whose capacities satisfied the technical preconditions for providing mentioned ancillary services. The capacity prices in 2017 were limited in accordance with appropriate SERC's decisions. In case that the required scope of secondary and tertiary control capacity were not provided in the market, there was a possibility to procure the missing quantities. If the ancillary service providers had failed to deliver certain amount of secondary and tertiary control capacity, they would incur penalty in amount which was equal to 10% of the price cap for secondary i.e. tertiary control capacity.

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

The procurement of secondary control capacity was done symmetrically for positive and negative range of control, and the procurement of tertiary control capacity was done separately for upward and downward control.

SERC's Decision on determination of coefficients and price caps for ancillary services of 14 September 2017 (hereinafter the 'Decision') determined hourly price caps for control capacity instead of previous monthly price caps. In addition, the values of certain price caps were also changed.

Table 1: Ancillary services - review for the year 2017

Reserve capacity and capacity cost					
		Sec. reg. Off-peak load	Sec. reg. Peak load	Tert. reg. Upward	Tert. reg. Downward
Required capacity	<i>MW</i>	31,59	49,25	196,00	66,00
Contracted capacity	<i>MW</i>	31,50	49,68	196,00	66,00
Capacity contracted at the market	<i>MW</i>	22,31	49,34	196,00	66,00
Price of contracted capacity	<i>KM/ MW/h</i>	37,37	40,68	6,33	1,12
Contracted cost	<i>KM</i>	2.578.109	13.275.531	10.864.512	648.880
Delivered capacity	<i>MW</i>	4,13	35,78	179,05	45,41
Delivered capacity	<i>%</i>	12,25%	72,03%	91,35%	68,81%
Capacity cost	<i>KM</i>	364.489	9.582.204	9.887.113	442.966
Unprovided capacity	<i>MW</i>	27,37	13,90	16,95	20,59
Penalty for unprovided capacity	<i>KM</i>	-248.272	-376.339	-131.910	-37.016
Share of the BSP in delivered capacity					
EP BiH	<i>MW</i>	3,61	25,12	82,37	0,00
ERS	<i>MW</i>	0,29	5,48	24,31	32,25
EP HZHB	<i>MW</i>	0,23	5,19	72,37	0,00
EAL	<i>MW</i>			0,00	
EFT Stanari	<i>MW</i>			0,00	13,16

The table shows average capacity values presented in 1 hour.

These were the limitations at the balancing energy market in 2017¹:

- Price of energy for upward tertiary control was limited to 475.55 KM/MWh, that is 414.70 KM/MWh upon SERC's decision;
- Difference in prices of energy for upward and downward secondary control was limited to 40.00 KM/MWh in the bids for secondary control,
- The price cap for secondary control capacity amounted to 30 000 KM/MW/ for a month, that is 43.00 KM/MW/h upon the Decision,
- The price cap for upward tertiary control capacity amounted to 6 460 KM/MW/ for a month, that is 9.00 KM/MW/h upon the Decision,
- The price cap for downward tertiary control capacity amounted to 1 500 KM/MW/ for a month, that is 2.10 KM/MW/h upon the Decision,

Imbalance prices were defined according to the bids activated for balancing energy for secondary and tertiary control, and they were used in settlement of imbalance costs of balance responsible parties.

¹ Price caps adopted by SERC -Decision on determination of coefficients and price caps for ancillary services

Imbalance prices were determined for each hour according to the most expensive bid activated for realized shortage and surplus of electricity separately.

Ancillary Services in 2017

Table 1 presents specific values related to ancillary services capacity in 2017. Image 1 graphically presents the share that the BSP had in providing a specific ancillary service and the share of undelivered capacity on an annual basis. Detailed monthly realization of capacity for some ancillary services was shown in tables 2 - 5.

Low operational availability especially of secondary control capacity in off-peak load periods was caused by inconvenient hydrological circumstances during 2017. Despite this fact, during the year, there were no longer periods of large deviations of BiH Control Area towards the remaining part of the interconnection which would have caused larger disturbances or jeopardized the system's safety.

Secondary regulation

In 2017 NOSBiH had around 4 MW of secondary control capacity in off peak load periods (from midnight until 6:00 am), i.e. around 36 MW in peak load periods (from 6:00 am until midnight) which makes 12.25% and 72.03% of required secondary control capacity. The cost of delivered secondary control capacity in 2017 amounted to 9 946 693 KM. In 2017 three companies with their regulation resources were registered to provide ancillary service of secondary control.

Tertiary regulation

In 2017 NOSBiH had around 179 MW of upward tertiary control capacity and 45 MW of downward tertiary control capacity which makes 91.35% and 68.81% of required upward and downward tertiary control capacity. The cost of provided tertiary control capacity in 2017 amounted 9 887 113 KM for upward tertiary control and 442 966 KM for downward tertiary control. In 2017 5 companies were registered as providers of ancillary service of upward tertiary control, and 4 companies as providers of ancillary service of downward tertiary control.

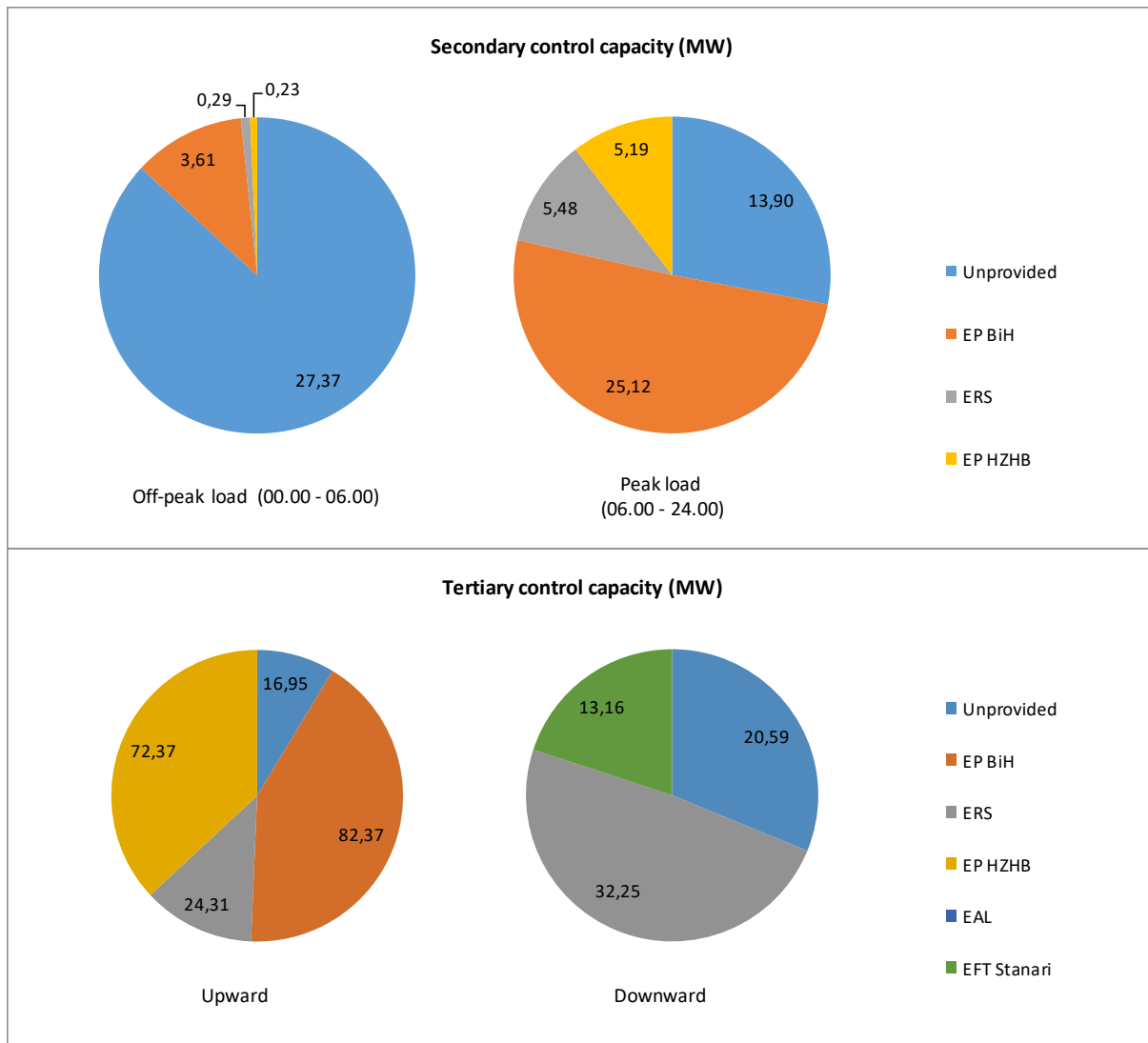


Image 1: Share of BSPs in delivered control capacity in BiH in 2017

Table 2: Report on ancillary services in BiH for the year 2017
Secondary regulation

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2017	2017/16	
Required capacity	MW	35	32	33	30	29	30	30	30	31	33	36	31,59	99,23%	
Contracted capacity	MW	34	32	33	30	28	31	30	30	31	33	36	31,50	100,80%	
Capacity contracted at the market	MW	34	32	33	30	22	31	0	16	21	21	29	22,31	209,15%	
Price of contracted capacity	KM/MW	32,42	33,30	32,24	32,41	40,32	32,71	40,32	41,67	40,27	42,15	40,84	37,37	104,46%	
Contracted cost	KM	205.000	179.000	196.803	175.000	210.000	182.500	225.000	225.000	230.940	250.380	273.486	2.578.109	104,89%	
Delivered capacity	MW	6	3	12	1	2	2	0	0	0	0	21	4,13	35,03%	
Delivered capacity	%	19%	8%	37%	4%	9%	7%	0%	3%	1%	0%	58%	12,25%		
Capacity cost	KM	48.589	17.542	87.866	8.333	18.105	17.250	0	7.258	1.500	0	1.500	156,546	39,02%	
Undelivered capacity	MW	28	29	21	29	26	29	30	30	31	33	15	27,37	140,67%	
Penalty for undelivered capacity	KM	-20.641	-22.121	-15.541	-21.667	-19.190	-21.525	-22.500	-21.774	-22.350	-23.344	-25.387	-12.234	-248,272	162,88%
The table shows average capacity values and prices presented in 1 hour.															
Share of the BSP in delivered capacity															
EP BiH	MW	6	3	11	1	1	2	0	0	0	0	0	3,61	32,54%	
EP BiH	%	100%	100%	94%	100%	32%	84%	0%	72%	100%	0%	67%	85%		
ERS	MW	0	0	1	0	0	0	0	0	0	0	0	0,29	41,47%	
ERS	%	0%	0%	5%	0%	0%	0%	0%	28%	0%	0%	0%	7%		
EP HZHB	MW	0	0	0	0	2	0	0	0	0	0	0	0,23		
EP HZHB	%	0%	0%	0%	0%	68%	16%	0%	0%	0%	0%	0%	33%	6%	

The table shows average capacity values presented in 1 hour

Table 3: Report on SR peak ancillary services in BiH for the year 2017
Secondary regulation - peak load (06:00 am until midnight)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	2017	2017/16	
Required capacity	MW	55	51	51	47	45	45	47	45	46	50	53	56	49,25	98,01%
Contracted capacity	MW	58	51	51	46	45	46	46	46	46	50	53	58	49,68	99,35%
Capacity contracted at the market	MW	58	51	51	46	41	46	46	46	46	50	53	58	49,34	120,33%
Price of contracted capacity	KM/MW	40,32	42,93	40,37	41,63	40,32	41,63	40,32	40,32	39,89	40,27	40,13	40,32	40,68	121,07%
Contracted cost	KM	1.305.000	1.103.460	1.148.739	1.034.000	1.012.500	1.034.000	1.035.000	1.035.000	990.960	1.123.490	1.148.383	1.305.000	13.275.531	119,97%
Delivered capacity	MW	44	42	45	37	31	35	34	34	35	18	27	47	35,78	100,32%
Delivered capacity	%	76%	82%	88%	81%	69%	76%	74%	75%	76%	37%	51%	82%	72%	
Capacity cost	KM	992.339	908.642	1.007.547	838.886	700.323	783.830	763.226	771.492	751.690	411.823	586.519	1.065.887	9.582.204	123,23%
Undelivered capacity	MW	14	9	6	9	14	11	12	12	11	32	26	11	13,90	96,95%
Penalty for undelivered capacity	KM	-31.266	-20.960	-14.132	-19.546	-31.218	-25.063	-27.177	-26.351	-24.863	-71.166	-59.099	-25.499	-376.339	113,10%
The table shows average capacity values and prices presented in 1 hour.															
Share of the BSP in delivered capacity															
EP BH	MW	28	32	34	31	25	19	19	19	27	15	18	34	25,12	90,86%
EP BH	%	64%	77%	76%	82%	80%	53%	57%	57%	77%	84%	68%	72%	70,19%	
ERS	MW	4	5	6	7	2	5	6	8	8	1	5	9	5,48	68,28%
ERS	%	10%	12%	13%	18%	7%	16%	17%	24%	23%	5%	17%	19%	15,31%	
EP HZHB	MW	12	4	5	0	4	11	9	7	0	2	4	4	5,19	
EP HZHB	%	26%	11%	11%	0%	13%	31%	26%	20%	0%	11%	15%	9%	14,49%	

The table shows average capacity values presented in 1 hour.

Table 4: Report on ancillary services in BiH for the year 2017
Tertiary upward regulation

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2017	2017/16	
Required capacity	MW	196	196	196	196	196	196	196	196	196	196	196	196,00	106,52%	
Contracted capacity	MW	196	196	196	196	196	196	196	196	196	196	196	196,00	107,94%	
Capacity contracted at the market	MW	196	196	196	196	196	196	196	196	196	196	196	196,00	130,81%	
Price of contracted capacity	KM/MW	5,90	6,54	5,34	5,34	5,17	6,87	7,59	7,59	6,40	6,43	6,49	6,28	6,33	71,80%
Contracted cost	KM	861.070	861.070	777.820	753.820	753.820	969.220	1.107.454	1.107.454	902.674	939.370	915.370	915.370	10.864.512	77,33%
Delivered capacity	MW	170	194	193	194	196	195	190	187	156	167	169	140	179,05	124,90%
Delivered capacity	%	87%	99%	99%	99%	100%	99%	97%	95%	80%	85%	86%	71%	91,4%	
Capacity cost	KM	746.030	849.532	767.478	746.381	753.820	962.627	1.072.415	1.058.155	714.508	782.012	780.617	653.538	9.887.113	88,97%
Undelivered capacity	MW	26	2	3	2	0	1	6	9	40	29	27	56	16,95	44,35%
Penalty for undelivered capacity	KM	-16.723	-1.591	-1.868	-982	0	-861	-4.115	-5.712	-25.802	-18.994	-17.592	-37.670	-131.910	
The table shows average capacity values and prices presented in 1 hour:															
Share of the BSP in delivered capacity															
EP BiH	MW	106	119	118	120	120	0	0	0	99	116	109	85	82,37	88,65%
EP BiH	%	62%	61%	61%	62%	61%	0%	0%	0%	64%	70%	65%	61%	46,00%	
ERS	MW	38	49	0	0	0	0	44	45	31	24	34	29	24,31	55,34%
ERS	%	23%	25%	0%	0%	0%	0%	23%	24%	20%	15%	20%	21%	13,58%	
EP HZHB	MW	26	26	76	75	76	195	146	142	26	26	26	26	72,37	43,42%
EP HZHB	%	15%	13%	39%	38%	39%	100%	77%	76%	17%	16%	15%	19%	40,42%	
EAL	MW	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0,00%
EAL	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0,00%	
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.

Table 5: Report on ancillary services in BiH for the year 2017
Tertiary downward regulation

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2017	2017/16
Required capacity	MW	66	66	66	66	66	66	66	66	66	66	66	66,00	70,97%
Contracted capacity	MW	66	66	66	66	66	66	66	66	66	66	66	66,00	70,97%
Capacity contracted at the market	MW	66	66	66	66	66	66	66	66	66	66	66	66,00	70,97%
Price of contracted capacity	KW/MW	1,08	1,19	1,08	1,11	1,11	1,08	1,08	1,11	1,08	1,11	1,08	1,12	54,86%
Contracted cost	KM	52.940	52.940	52.940	52.940	66.540	52.940	52.940	52.940	52.940	52.940	52.940	648.880	51,68%
Delivered capacity	MW	45	53	51	50	43	38	44	51	49	19	43	45,41	65,65%
Delivered capacity	%	68%	80%	77%	75%	65%	58%	66%	77%	75%	29%	66%	68,8%	
Capacity cost	KM	37.448	40.937	40.759	41.845	43.108	31.875	35.938	40.380	37.718	13.181	31.833	47.945	47,44%
Undelivered capacity	MW	21	13	15	16	23	28	22	15	17	47	23	6	20,59
Penalty for undelivered capacity	KM	-3.163	-1.986	-2.285	-2.468	-3.486	-4.155	-3.364	-2.256	-2.489	-7.001	-3.432	-930	-37,016
The table shows average capacity values and prices presented in 1 hour.														
Share of the BSP in delivered capacity														
EP BiH	MW	0	0	0	0	0	0	0	0	0	0	0	0,00	
EP BiH	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0,00%	
ERS	MW	35	33	35	40	43	30	34	35	30	8	23	41	46,63%
ERS	%	77%	63%	70%	80%	100%	78%	77%	68%	60%	42%	54%	69%	
EP HZHB	MW	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%	0,00%	
EFT Stanari	MW	10	19	15	10	0	8	10	16	20	11	20	19	13,16
EFT Stanari	%	23%	37%	30%	20%	0%	22%	23%	32%	40%	58%	46%	31%	28,98%

The table shows average capacity values presented in 1 hour.

Balancing market

In 2017, for the needs of balancing the power system of BiH 49 431 MWh of upward balancing energy was engaged (injected electric energy) with average price of 157.42 KM/MWh.

In 2017, engaged downward balancing energy (takeover of electricity from the system) amounted to 34 117 MWh. Average price for this energy was 42.17 KM/MWh taking into account the energy with offered negative price also.

Imbalance

There were 9 balance responsible parties active in BiH in 2017, not counting so called 'trading BRPs' i.e. the BRPs with no imbalance realized within BiH. Average imbalance prices in 2017 were 119.06 KM/MWh for shortage and 44.97 KM/MWh for surplus of electric energy. However, these prices were moving in a wide range from -500.00 KM/MWh up to 475.55 KM/MWh, depending on the energy situation.

In comparison to the year 2016, it can be concluded that the year 2017 was characterized with larger shortage i.e. smaller surplus of electric energy appearing in the system and with an increased energy price in the balance market. Image 2 shows the deviations of the Control Area BiH in last four years.

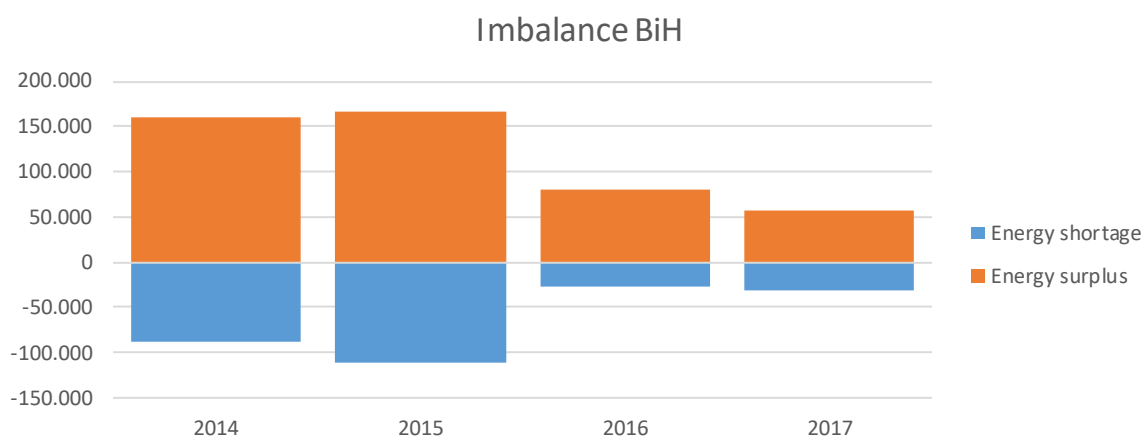


Image 2: Annual deviation of BiH Control Area

Table 6: Indicators of deviations of BiH in last four years

Imbalance BiH		Energy shortage				Energy surplus			
		2014	2015	2016	2017	2014	2015	2016	2017
Total	MWh	-87.222	-110.950	-28.159	-31.200	160.839	166.863	80.310	56.105
Max. hourly	MW	-225	-188	-313	-179	206	233	239	157

Table 7 presents engaged balancing energy values, energy prices and adequate expenses by taking into consideration cross-border engagements for the needs of BiH Control Area, exempting the energy engaged within BiH for the needs of other system operators.

Table 7: Report on ancillary services in BiH for the year 2017

Engaged energy	2017												2017	2017/16	
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC			
Energy for upward secondary control	MWh	3.861	2.991	5.162	3.180	2.092	3.901	4.537	4.046	3.982	1.485	2.245	2.272	39,754	138,53%
Energy for downward secondary control	MWh	4.244	2.978	2.057	1.723	1.736	1.655	1.907	1.897	1.687	1.628	1.823	9.505	32,839	52,12%
Energy for upward tertiary control	MWh	1.625	514	329	503	0	133	1.098	90	416	2.662	1.407	901	9,678	93,13%
Energy for downward tertiary control	MWh	233	110	10	25.5	109,999	83	0	64	30	487	23	104	1,278	80,23%
Balancing energy - upward	MWh	5.486	3.505	5.491	3.683	2.092	4.034	5.635	4.136	4.398	4.148	3.652	3.173	49,431	126,46%
Balancing energy - downward	MWh	4.477	3.087	2.067	1.748	1.846	1.738	1.907	1.961	1.717	2.115	1.846	9.609	34,117	52,81%
The cost of balancing and average prices															
Upward - cost	KM	1.024,219	432,416	559,813	500,344	223,025	445,954	916,588	546,246	611,279	1.197,445	801,352	522,762	7,781,442	161,84%
Upward - average price	KM/MWh	186,71	123,39	101,95	135,86	106,60	110,54	162,67	132,07	139,00	288,70	219,43	164,77	157,42	127,98%
Downward - cost (positive price)	KM	240,107	91,726	107,203	88,922	101,802	101,239	144,311	145,743	133,852	144,557	126,658	383,961	1,810,082	86,04%
Downward - cost (negative price)	KM	-55,090	-54,792	-5,000	-5,100	-27,500	-30,000	0	-32,084	-11,500	-126,292	-2,292	-21,700	-371,348	-155,23%
Downward - average price	KM/MWh	41,33	11,96	49,45	47,95	40,26	41,00	75,69	57,96	71,26	8,64	67,38	37,70	42,17	146,10%
Imbalance BiH															
Shortage - total	MWh	3.471	3.220	2.198	2.813	1.615	2.021	1.497	1.648	2.818	4.264	3.271	2.363	31,200	110,80%
Shortage - max hourly	MW	70	136	64	57	43	68	70	33	60	179	54	108	178,55	56,96%
Surplus - total	MWh	3.448	2.641	3.974	3.738	5.797	4.385	7.321	4.448	4.441	6.178	4.980	4.755	56,105	69,86%
Surplus - max hourly	MW	81	45	41	98	70	57	66	71	73	157	60	54	156,68	65,64%
Shortage - average price	KM/MWh	146,56	102,13	102,50	105,90	110,88	115,72	133,53	133,15	124,86	132,02	114,59	104,73	119,06	156,31%
Shortage - maximum price	KM/MWh	475,55	475,55	450,00	475,55	180,00	270,00	475,55	470,00	475,55	414,70	414,70	414,70	475,55	105,68%
Surplus - average price	KM/MWh	21,01	27,55	36,98	47,83	42,04	50,56	54,13	51,39	58,17	58,65	58,01	32,76	44,97	187,39%
Surplus - minimum price	KM/MWh	-500,00	-500,00	-500,00	-200,00	-250,00	-500,00	40,00	-500,00	-500,00	-500,00	-100,00	-450,00	-500,00	-66,67%

Table 8: Report on losses and compensations for 2017

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2017	2017/2016	
Compensations	MWh	-744	-1.704	484	2.740	2.844	3.219	3.894	4.672	1.191	2.408	2.024	1.350	22.378	57,98%
Losses	MWh	36.591	27.621	26.271	25.472	23.755	26.506	28.957	28.832	26.607	26.863	28.481	33.355	339.309	101,63%
Reference price	KM/MWh	87,97	87,97	77,01	76,23	76,19	82,96	86,75	81,65	76,92	87,09	84,85	87,09	82,72	87,02%
Cost	KM	3.284.329	2.579.688	1.985.883	1.732.836	1.593.175	1.931.871	2.174.208	1.972.686	1.954.998	2.129.746	2.244.865	2.787.331	26.371.616	97,65%

Compensations: '-', 'direction - reception', '+', 'direction - gwing'

Table 9: Report on cross-border exchange (XB) of balancing energy for 2017

Energy engaged in BiH for other TSOs' needs		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2017	2017/2016
XB Exchange - Import		MWh				99								99	
Import average price		KM /MWh				-200,00								-200,00	
Import cost		KM				-19.800								-19.800	
XB Exchange - export		MWh				56								56	
Export average price		KM /MWh				475,55								475,54	
Export cost		KM				26.630								26.630	
Engaged cross-border energy for the needs of BiH															
XB Exchange - Import		MWh									415	120	127	662	
Import average price		KM /MWh									207,84	273,82	115,17	202,02	
Import cost		KM									86.254	32.858	14.626	133.738	
XB Exchange - Export		MWh											15	195	210
Export average price		KM /MWh											44,98	7,92	10,57
Export cost		KM											675	1.545	2.220

Transmission losses and compensations

In 2017 electric energy to cover transmission system losses was purchased through public procurement procedures. Total cost of this service in 2017 was 26 371 616 KM. The energy prices obtained in the procurement procedure were in average by around 13% lower than the prices in 2016 (Table 8).

Exchange of cross border balancing energy

On the basis of the Agreement on the provision of a joint reserve in the Slovenia-Croatia-Bosnia and Herzegovina control block, the capacity of tertiary regulation which was to be provided in 2017 within the BiH control area was 196 MW for upward regulation and 66 MW for downward regulation. In 2017 Agreement on cross-border exchange of balancing energy was signed with Serbian transmission system operator – Elektromreža Srbije.

Table 9 shows the values of exchanged cross-border balancing energy in 2017 with the expenses included. Out of the total amount of 1 027 MWh of cross-border balancing energy, the amount of 155 MWh was exchanged with Slovenia, 645 MWh with Croatia and 227 MWh with Serbia.

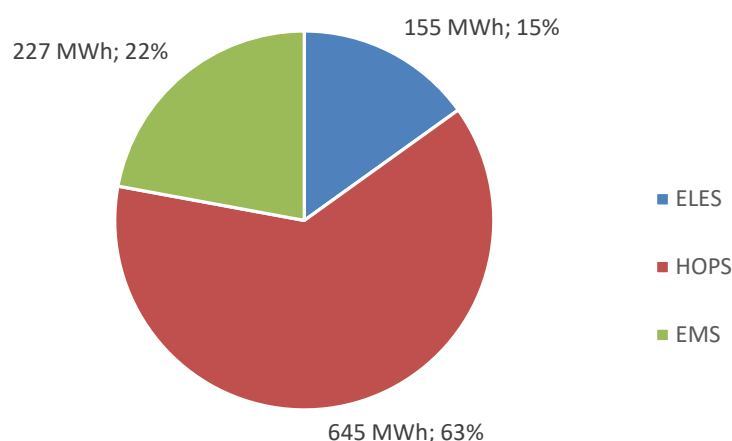


Image 3: Exchange of cross border balancing energy

Conclusion

Unlike in 2016, all required capacities of ancillary services in 2017 were procured in an annual procurement procedure except a part of secondary control capacity (off-peak load).

In comparison to the year 2016 it can also be concluded that the capacity price in 2017 was smaller than the price caps, and that the energy prices in the balancing market were generally raised.