



Final Report: Assessment of impact of existing Control Blocks on balancing market cooperation (Task 2)

EKC and IMP

March 2019

This report is a deliverable under the **Technical Assistance to Connectivity
in the Western Balkans, Component 2: Regional Energy Market.**

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Technical Assistance to the Implementation of Cross-border Electricity Balancing

Task 2: Assessment of impact of existing Control Blocks on balancing market cooperation

Final Report

March 2019

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Table of Contents

1. Current state of LFC blocks and cooperation in WB6	4
2. Potential of LFC blocks for further balancing cooperation	7
3. Requirements of SO GL and EB GL regarding LFC blocks	9
4. Gap analysis regarding LFC blocks.....	11
4.1 LFC Block - SMM (Serbia, Montenegro and Northern Macedonia)	13
4.2 LFC Block - SHB (Slovenia, Croatia and BiH)	17
4.3 TSO cooperation – Albania and Kosovo*	21
5. Findings and recommendations.....	25
6. References.....	27

1. CURRENT STATE OF LFC BLOCKS AND COOPERATION IN WB6

The assessment of existing Control Blocks in WB6 region regarding current practices, rules and procedures relevant for balancing cooperation is under the scope of this Task. The aim is to review the existing practice and recognize the gaps in relation to the requirements arising from SO GL and EB GL, as well as potential of using the existing Control Blocks and their current cooperation and infrastructure, to foster further regional balancing market cooperation. Currently there are two control blocks in WB6 area. Their organisation and current practices are given in table below.

LFC block	SMM	SHB
Members:	EMS, CGES, MEPSO	ELES, HOPS, NOS BiH
Block coordinator:	EMS	ELES
Contractual arrangements:	<ul style="list-style-type: none"> • Light operational agreement in force; • New operational agreement in accordance with SO GL, envisaged until mid 2020 	<ul style="list-style-type: none"> • Draft LFC block operational agreement prepared; under NRAs approval; expected in force until mid 2019
Products and settlement ¹ :	<ul style="list-style-type: none"> • aFRR control organisation (hierarchical mode) • Common dimensioning • Exchange of tertiary (mFRR/RR) energy (bilateral agreement EMS-CGES) • Settlement on hourly basis monthly accounting • IN under testing 	<ul style="list-style-type: none"> • aFRR control organisation (pluralistic mode) • Common dimensioning • Exchange of tertiary (mFRR/RR) energy (bilateral agreements) • Settlement on hourly basis, monthly accounting • ELES and HOPS were within Imbalance Netting Cooperation (INC) together with APG; INC is ended at the beginning of 2019, and since February 2019 ELES and HOPS are members of IGCC
Cross Zonal Capacity treatment	<ul style="list-style-type: none"> • EMS(&KOSTT), CGES and MEPSO are separate bidding zones • NTC/ATC based allocation • Remaining available ATC used for cross-border balancing 	<ul style="list-style-type: none"> • ELES, HOPS and NOS BiH are separate bidding zones • NTC/ATC based allocation • Remaining available ATC used for cross-border balancing

¹ Listed products are currently organized without firm contractual obligations, in accordance with LFC block operational agreement. Compliance towards SO GL and gaps are given in Chapter 4.

Data exchange	<ul style="list-style-type: none"> • Real time ACE (4 seconds) • Tie-line measurements • Control programs • CZC availability 	<ul style="list-style-type: none"> • Real time ACE (4 seconds) • Tie-line measurements • Control programs • CZC availability
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Projected level of cooperation between OST and KOSTT could result in forming LFC block; however relation of KOSTT towards SMM LFC block is still pending, and there is ongoing dispute among EMS and KOSTT.

Also, at the final project's meeting in ECS held on 21.12.2018, KOSTT clearly stated that formation of OST&KOSTT LFC block is not envisaged for the time being.

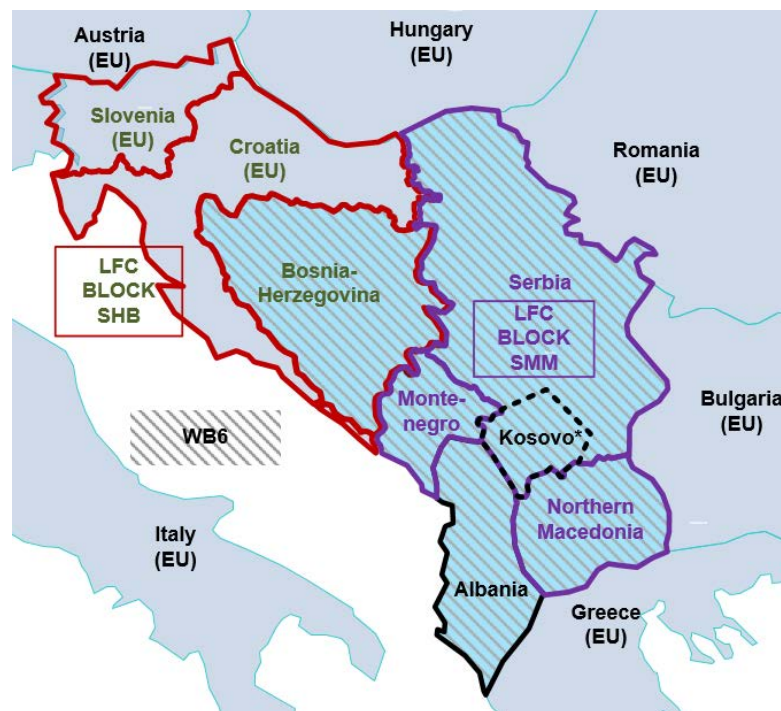


Figure 1: WB6: Existing control blocks

Besides cooperation on SMM and SHB block level, the following activities or initiatives are also ongoing within WB6 region:

- The mFRR balancing energy exchange between NOS BiH and EMS is signed and activated during 2017
- An agreement on the exchange of balancing energy between NOS BiH and CGES was approved and operational since March 2018

- OST and KOSTT developed a mechanism for exchange and sharing of secondary reserves but it is not yet operational;
- There is also a discussion about cross-border cooperation among OST, MEPSO, CGES and EMS for tertiary reserve

2. POTENTIAL OF LFC BLOCKS FOR FURTHER BALANCING COOPERATION

In this chapter the potential of using the existing LFC blocks to boost further balancing integrations was analysed.

The main potentials of LFC block existence are identified in the following areas:

Common dimensioning on the level of LFC block

Within the ENTSO-E CE synchronous area, control actions and reserve volumes are organized throughout decentralized structure of LFC Blocks and LFC Areas. In most cases in ENTSO-E CE, LFC Blocks consist of one LFC Area but there are also several LFC Blocks that consist of more than one LFC Area, including the two in WB6 region:

- LFC Block of Spain and Portugal (REN and REE)
- German LFC Block (50HzT, Amprion, TenneT Germany (including C.E. part of Energinet DK) and TransnetBW)
- SHB LFC Block (ELES, HOPS, NOS BIH)
- SMM LFC Block (EMS, CGES, MEPSO)

TSOs that are participating within LFC Blocks have the opportunity to significantly decrease the volume of balancing capacity by adopting the dimensioning concept on the level of LFC Block and allocate the responsibilities to member TSOs. This means that dimensioning incident, as the largest imbalance that might occur as a result of instantaneous change of active power in both directions, is determined for the whole LFC Block rather than individually by each participating TSO (LFC Area).

Total amount of balancing capacity, determined for the LFC Block, can be split among the participating TSOs with ratio agreed in their operational agreement.

Common dimensioning of balancing reserve is applied within both SMM and SHB block but currently in the form of non-obliged operational procedure. FRR and RR common dimensioning stays as the opportunity of lowering the required reserve on the level of LFC block, also according to System Operation Guidelines, as stated in the Part IV, Load-Frequency Control and Reserves (Articles 119, 157, 160).

Articles related to FRR and RR dimensioning also recognise that all TSOs of a LFC block shall determine the reserve, while "... recognising any possible geographical limitations for its

distributions with the LFC block". Knowing that SMM and SHB TSOs at the same time Bidding Zones (this is not so in e.g. German Control Block), at least the Cross Zonal Capacity among them required for the application of common reserve needs to be formally recognized and made available.

Sharing of reserve within LFC block

If common dimensioning is applied within LFC block, there would be no possibility to further decrease the level of balancing reserve within LFC block through reserve sharing.

Exchange of reserve on the level of LFC block

Annex VII to Article 167, defines limits for Exchange of FRR: " The TSOs of a LFC block shall ensure that at least 50 % of their total combined reserve capacity on FRR resulting from the FRR dimensioning rules in Article 157(1) and before any reduction due to the sharing of FRR in accordance with Article 157(2) remains located within their LFC block."

Annex VIII to Article 169, defines limits for Exchange of RR: " The TSOs of the LFC areas constituting a LFC block shall ensure that at least 50 % of their total combined reserve capacity on RR resulting from the RR dimensioning rules according to Article 160(3) and before any reduction of reserve capacity on RR as a result of the sharing of RR according to Article 160(4) and Article 160(5) remains located within their LFC block."

So, TSOs within LFC block have no formal %limit to exchange the FRR or RR reserve, according to SO GL.

Pre-netting on the level of LFC block

Within the Imbalance Netting initiative, TSOs on the level of LFC block can impose priority of local pre-netting and corresponding Cross Zonal Capacity usage.

SO GL and "All TSOs' proposal for the implementation framework for a European platform for the imbalance netting process in accordance with Article 22 of GLEB...", (Jan'18) even fosters the application of "pre-netting" on the level of LFC blocks.

Implementation of the "pre-netting" process on LFC block level, is recognized as an important step in the Road Map for Imbalance Netting implementation in WB6, as presented in Task 5 (Roadmap).

According to SO GL (Article 146 (9), Imbalance netting process): Where a LFC block consists of more than one LFC area and the reserve capacity on FRR as well as the reserve capacity on RR is calculated based on the LFC block imbalances, all TSOs of the same LFC block shall implement an imbalance netting process and interchange the maximum amount of imbalance netting power defined in paragraph 6 with other LFC areas of the same LFC block.

According to "All TSOs' proposal for the implementation framework ..." (Article 11/3): Each member TSO belonging to a LFC block shall have the right to perform imbalance netting with the other member TSO(s) of the same LFC block prior the imbalance netting with other LFC blocks and by this have prior access to the transmission capacity within the LFC block. Imbalance netting within a LFC block is not considered as an "optimization region".

Here is important to note also: "optimization region" means two or more neighbouring LFC blocks performing imbalance netting process between each other before performing imbalance netting process with the other participating TSOs. According to Article 11/4, in optimization region pre-netting among control blocks is allowed, but only until aFRR exchange platform would be applied on EU level. Then the IN would be incorporated within aFRR platform; but since pre-netting on Control Block level is not considered as optimisation region, it seems that such form of pre-netting can remain as permanent solution.

According to IGCC stakeholder document (7): "... In case TSOs perform a common dimensioning (LFC Block), pre-netting is necessary to favor the access to the transmission capacities for aFRR activation. Without pre-netting within LFC Block the transmission capacity might be already used for imbalance netting between non-LFC Block members. Therefore, the pre-netting is considered mandatory in a LFC Block".

IT infrastructure

Existing aFRR IT infrastructure (data exchange channels and protocols, controllers, SCADA modules) are suitable for initial setup of Imbalance Netting and aFRR CMOL integration on the level of Control Blocks. Therefore switching from classical hierarchical/pluralistic control to e.g. Imbalance Netting can be seen as the upgrade of existing cooperation, with additional technical and market requirements, such as formal usage of remaining Cross Zonal Capacity and usage of opportunity costs for IN settlement.

3. REQUIREMENTS OF SO GL AND EB GL REGARDING LFC BLOCKS

The main requirements related to LFC Block operational agreements are given in Article 119 of SO GL. Based on the requirements given in this Article, in addition to Synchronous Area Operational Agreement on the level of CE synchronous area, TSOs of each LFC Block (where the LFC Block consists of more than one LFC area) are obliged to jointly develop a common proposal (LFC Block operational agreement) that will regulate the following operational aspects of Load-Frequency Control and Reserves applicable to WB6 region:

- Definition of FRCE target parameters for each LFC area in accordance with SO GL, Article 128(4). FRCE target parameters shall be specified on the level of synchronous area CE (Synchronous Area Operational Agreement) for each LFC Block at least annually
- Appointment of one TSO of LFC Block as LFC Block monitor. TSO, as LFC Block monitor, shall be responsible for collecting frequency quality evaluation data for that LFC Block
- Definition of ramping restrictions for active power output of HVDC interconnectors in the terms of ramping periods and/or maximum ramping rates as well as power generating units and demand facilities in the terms of their obligations on ramping periods and/or maximum ramping rates, individual ramping starting times and coordination of the ramping between power generating modules, demand units and active power consumption within the LFC block. These restrictions of active power outputs are required to limit their influence on FRCE target parameters of the LFC Block
- Allocation of responsibilities between TSOs in the LFC block for the implementation of the obligations to fulfil FRCE target parameters and comply with FRR and RR dimensioning principles
- Appointment of the TSO of LFC Block responsible for calculation and monitoring of FRCE for the whole LFC Block. In addition, this TSO could be responsible for calculation of the setpoint values for aFRR activation in addition to the FRCE of LFC area by taking into account the FRCE of the whole LFC Block
- Definition of requirements for the availability, reliability and redundancy of technical infrastructure for Load Frequency Control process activation structure in addition to requirements specified in the synchronous area operational agreement
- Definition of operational procedures in case of exhausted FRR or RR
- Allocation of responsibilities between TSOs in the LFC block to comply with FRR dimensioning rules
- Allocation of responsibilities between TSOs in the LFC block to comply with RR dimensioning rules
- Definition of escalation procedure in case of severe risk of insufficient reserve capacity on FRR and RR in the LFC block
- Definition of FRR and RR availability requirements and control quality requirements for all FRR and RR providing units and providing groups within LFC block
- Definition of any limits on the exchange of FCR and the exchange of FRR or RR with other LFC Blocks within the CE synchronous area

- Definition of roles and responsibilities of the reserve connecting TSO, the reserve receiving TSO and of the affected TSO for the exchange of FRR and/or RR with TSOs of other LFC blocks
- Definition of roles and responsibilities of the control capability providing TSO, the control capability receiving TSO and of the affected TSO for the sharing of FRR and/or RR with TSOs of other LFC blocks within CE synchronous area
- Definition of coordinated actions within CE synchronous area aiming to reduce the FRCE in cases when FRCE cannot be sufficiently reduced for a longer period (more than 30 consecutive minutes) by using standard actions
- Definition of measures to reduce the FRCE by requiring changes in the active power production or consumption of power generating modules and demand units as a last resort measure

Before conclusion of an LFC Block operational agreement, TSOs are obliged to submit the following methodologies and conditions for approval by all the regulatory authorities of the concerned LFC Block:

- ramping restrictions for active power output;
- coordination actions within CE synchronous area aiming to reduce FRCE in cases when FRCE cannot be sufficiently reduced for a longer period (more than 30 consecutive minutes) by using standard actions;
- measures to reduce FRCE by requiring changes in the active power production or consumption of power generating modules and demand units;
- FRR and RR dimensioning rules;

In addition, requirements related to operation of LFC blocks given in EB GL include the following:

- All TSOs of the LFC block shall regularly and at least once a year review and define the reserve capacity requirements for the LFC block or scheduling areas of the LFC block pursuant to dimensioning rules as defined in SO GL.

4. GAP ANALYSIS REGARDING LFC BLOCKS

The gap analysis is carried out by comparing the current rules, operational agreements and practices of the existing LFC Blocks in WB6 region as well as cooperation initiatives between

TSOs against the above mentioned requirements of the System Operation and Electricity Balancing Guidelines.

4.1 LFC Block - SMM (Serbia, Montenegro and Northern Macedonia)

SO GL	Current operational practice / Operational agreements	Level of compliance	Proposed changes
LFC Operational Agreement	The existing operational agreement does not include all requirements listed in Chapter 3.2. It mainly covers only general terms and conditions for LFC Block arrangements.	Partially compliant	TSOs within SMM Block shall adopt a new operational agreement that will comprise all requirements listed in Chapter 3.2 in accordance with SO GL.
Article 119 (Paragraph 1a) - Definition of FRCE target parameters for each LFC area	FRCE target parameters are not defined for each LFC area within SMM block. FRCE target parameters are determined for SMM Block as a whole on the yearly level by authorized ENTSO-E working group.	Missing	Once FRCE target parameters are defined on the level of CE synchronous area within Synchronous Area Operational Agreement, SMM Block shall define individual FRCE parameters for each TSO
Article 119 (Paragraph 1b) - Appointment of one TSO of LFC Block as LFC Block monitor	The existing operational agreement appoints Serbian TSO (EMS) as LFC Block monitor	Compliant	Roles and responsibilities of LFC Block monitor TSO shall be clearly defined in accordance with SO GL
Article 119 (Paragraph 1c) - Definition of ramping restrictions for active power output	Ramping restrictions are not defined	Missing	Methodology shall be developed taking into account technical characteristics of generating units and demand facilities. This methodology shall be the basis for definition of ramping restrictions for active power output in LFC Block operational agreement between member TSOs.
Article 119 (Paragraph 1d) - Allocation of responsibilities between TSOs in the LFC block for the implementation of the obligations to fulfil FRCE target parameters and	The existing allocation of responsibilities between TSOs correspond to ENTSO-E Policy 1. In addition, there are ongoing activities to allocate these responsibilities between	Partially compliant	The existing allocation of responsibilities between TSOs shall be adapted to new FRCE target parameters and FRR and RR dimensioning principles given in SO GL and it

comply with FRR and RR dimensioning principles	TSOs in the LFC Block in different manner. New allocation of FRR and RR within SMM Block takes into account system size as well as the largest possible incidents on the national level but it is developed as non-obligatory operational procedure mutually agreed between participating TSOs		should be part of a legally binding operational agreement between TSOs.
Article 119 (Paragraph 1e) - Appointment of the TSO of LFC Block responsible for calculation and monitoring of FRCE for the whole LFC Block	The existing operational agreement appoint Serbian TSO (EMS) as responsible for calculation and monitoring of FRCE for the whole LFC Block	Compliant	Roles and responsibilities of TSO responsible for calculation and monitoring of FRCE for the whole LFC Block shall be clearly defined in accordance with SO GL
Article 119 (Paragraph 1f) - Definition of requirements for the availability, reliability and redundancy of technical infrastructure for Load Frequency Control process	Currently there is no clear definition of requirements for the availability, reliability and redundancy of technical infrastructure for Load Frequency Control process.	Missing	Requirements for the availability, reliability and redundancy of technical infrastructure for Load Frequency Control process within SMM Block shall be clearly defined in addition to requirements given in Synchronous Area Operational Agreement
Article 119 (Paragraph 1g) - Definition of operational procedures in case of exhausted FRR or RR	Currently there is no definition of operational procedures in case of exhausted FRR or RR	Missing	Operational procedure in case of exhausted FRR and RR shall be clearly defined and adopted by all TSOs within SMM block
Article 119 (Paragraph 1h, j) - Allocation of responsibilities between TSOs in the LFC block to comply with FRR dimensioning rules	Currently, only deterministic approach is used to determine FRR within SMM block.	Partially compliant	Allocation of responsibilities and dimensioning rules shall be defined in accordance with SO GL requirements
Article 119 (Paragraph 1i, j) - Allocation of responsibilities between TSOs in the LFC block to comply with RR dimensioning rules	Currently, only deterministic approach is used to determine RR within SMM block.	Partially compliant	Allocation of responsibilities and dimensioning rules shall be defined in accordance with SO GL requirements
Article 119 (Paragraph 1k) - Definition of escalation procedure in case of severe risk of insufficient reserve	Not defined	Missing	The procedure in case of severe risk of insufficient reserve capacity shall be adopted

capacity on FRR and RR in the LFC block			
Article 119 (Paragraph 1l) - Definition of FRR and RR availability requirements and control quality requirements for all FRR and RR providing units and providing groups within LFC block	Not defined	Missing	The requirements shall be adopted as a part of LFC Block operational agreement
Article 119 (Paragraph 1m) - Definition of any limits on the exchange of FCR and the exchange of FRR or RR with other LFC Blocks within the CE synchronous area	Not defined	Missing	The possibilities of FCR and FRR/RR exchange shall be assessed and potential limits shall be identified.
Article 119 (Paragraph 1n) - Definition of roles and responsibilities of the reserve connecting TSO, the reserve receiving TSO and of the affected TSO for the exchange of FRR and/or RR with TSOs of other LFC blocks	Not defined	Missing	These definitions shall be adopted in new LFC Block operational agreement.
Article 119 (Paragraph 1o) - Definition of roles and responsibilities of the control capability providing TSO, the control capability receiving TSO and of the affected TSO for the sharing of FRR and/or RR with TSOs of other LFC blocks within CE synchronous area	Not defined	Missing	These definitions shall be adopted in new LFC Block operational agreement.
Article 119 (Paragraph 1q) - Definition of coordinated actions within CE synchronous area aiming to reduce the FRCE in cases when FRCE cannot be sufficiently reduced for a longer period (more than 30 consecutive minutes) by using standard actions	Not defined	Missing	These definitions shall be adopted in LFC Block operational agreement in accordance with synchronous area operational agreement.
Article 119 (Paragraph 1r) - Definition of measures to reduce the FRCE by requiring changes in the active power	Not defined	Missing	These definitions shall be adopted in LFC Block operational agreement in accordance with

production or consumption of power generating modules and demand units as a last resort measure			synchronous area operational agreement.
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EB GL	Current operational practice / Operational agreements	Level of compliance	Proposed changes
Article 32 (Paragraph 1) – Review and defining of the reserve capacity requirements for the LFC block at least once a year	Not defined	Missing	Regular annual review and definition of the reserve capacities shall be adopted in LFC Block operational agreement

4.2 LFC Block - SHB (Slovenia, Croatia and BiH)

SO GL	Current operational practice / Operational agreements	Level of compliance	Proposed changes
LFC Operational Agreement	Currently valid operational agreement within SHB Block deals only with general terms and conditions. SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory Authorities for approval)	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.
Article 119 (Paragraph 1a) - Definition of FRCE target parameters for each LFC area	FRCE target parameters are not defined for each LFC area within SHB block. FRCE target parameters are determined for SHB Block as a whole on the yearly level by authorized ENTSO-E working group.	Missing	Once FRCE target parameters are defined on the level of CE synchronous area within Synchronous Area Operational Agreement, SHB Block shall define individual FRCE parameters for each TSO
Article 119 (Paragraph 1b) - Appointment of one TSO of LFC Block as LFC Block monitor	The existing operational agreement appoints Slovenian TSO (ELES) as LFC Block monitor	Compliant	Roles and responsibilities of LFC Block monitor TSO shall be clearly defined in accordance with SO GL
Article 119 (Paragraph 1c) - Definition of ramping restrictions for active power output	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory Authorities for approval)	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.
Article 119 (Paragraph 1d) - Allocation of responsibilities between TSOs in the LFC block for the implementation of the obligations to fulfil FRCE target parameters and comply with FRR and RR dimensioning principles	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.

		Authorities for approval)	
Article 119 (Paragraph 1e) - Appointment of the TSO of LFC Block responsible for calculation and monitoring of FRCE for the whole LFC Block	The existing operational agreement appoints Slovenian TSO (ELES) as responsible for calculation and monitoring of FRCE for the whole LFC Block	Compliant	Roles and responsibilities of TSO responsible for calculation and monitoring of FRCE for the whole LFC Block shall be clearly defined in accordance with SO GL
Article 119 (Paragraph 1f) - Definition of requirements for the availability, reliability and redundancy of technical infrastructure for Load Frequency Control process	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory Authorities for approval)	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.
Article 119 (Paragraph 1g) - Definition of operational procedures in case of exhausted FRR or RR	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory Authorities for approval)	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.
Article 119 (Paragraph 1h, j) - Allocation of responsibilities between TSOs in the LFC block to comply with FRR dimensioning rules	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory Authorities for approval)	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.
Article 119 (Paragraph 1i, j) - Allocation of responsibilities between TSOs in the LFC block to comply with RR dimensioning rules	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.

		Authorities for approval)	
Article 119 (Paragraph 1k) - Definition of escalation procedure in case of severe risk of insufficient reserve capacity on FRR and RR in the LFC block	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory Authorities for approval)	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.
Article 119 (Paragraph 1l) - Definition of FRR and RR availability requirements and control quality requirements for all FRR and RR providing units and providing groups within LFC block	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory Authorities for approval)	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.
Article 119 (Paragraph 1m) - Definition of any limits on the exchange of FCR and the exchange of FRR or RR with other LFC Blocks within the CE synchronous area	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory Authorities for approval)	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.
Article 119 (Paragraph 1n) - Definition of roles and responsibilities of the reserve connecting TSO, the reserve receiving TSO and of the affected TSO for the exchange of FRR and/or RR with TSOs of other LFC blocks	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory Authorities for approval)	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.
Article 119 (Paragraph 1o) - Definition of roles and responsibilities of the control capability providing TSO, the control capability receiving	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.

TSO and of the affected TSO for the sharing of FRR and/or RR with TSOs of other LFC blocks within CE synchronous area		submitted to national Regulatory Authorities for approval)	
Article 119 (Paragraph 1q) - Definition of coordinated actions within CE synchronous area aiming to reduce the FRCE in cases when FRCE cannot be sufficiently reduced for a longer period (more than 30 consecutive minutes) by using standard actions	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory Authorities for approval)	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRAs.
Article 119 (Paragraph 1r) - Definition of measures to reduce the FRCE by requiring changes in the active power production or consumption of power generating modules and demand units as a last resort measure	SHB Block is currently in the process of adopting new operational agreement in accordance with SO GL, Article 119.	Partially compliant (LFC Block Operational Agreement is submitted to national Regulatory Authorities for approval)	LFC Block operational agreement shall be signed after approval of methodologies and conditions by NRA.

EB GL	Current operational practice / Operational agreements	Level of compliance	Proposed changes
Article 32 (Paragraph 1) – Review and defining of the reserve capacity requirements for the LFC block at least once a year	Not defined	Missing	Regular annual review and definition of the reserve capacities shall be adopted in LFC Block operational agreement

4.3 TSO cooperation – Albania and Kosovo*

The analysis below is done before the final project’s meeting, and gives a gap analysis versus SO GL and EB GL, if OST and KOSTT would actually create a formal LFC block. At the final project’s meeting in EnCS 21.12.2018, KOSTT clearly stated that formation of OST&KOSTT LFC block is not envisaged for the time being.

SO GL	Current operational practice / Operational agreements	Level of compliance	Proposed changes
LFC Operational Agreement	LFC Block between Albania and Kosovo* is not established. TSOs are negotiating about LFC procedures for cross-border procurement of balancing services and waiting for NRA approvals. These procedures shall be part of bilateral operational agreement between TSOs.	Missing	Possible decision about establishing LFC Block between Albania and Kosovo* shall be made on the ENTSO-E level. In such case, valid LFC Block operational agreement shall be signed.
Article 119 (Paragraph 1a) - Definition of FRCE target parameters for each LFC area	FRCE target parameters are not defined for KOSTT and Albania. FRCE target parameters are determined for Albania as a whole on the yearly level by authorized ENTSO-E working group.	Missing	Once FRCE target parameters are defined on the level of CE synchronous area within Synchronous Area Operational Agreement, KOSTT and OST shall define individual FRCE parameters for each TSO
Article 119 (Paragraph 1b) - Appointment of one TSO of LFC Block as LFC Block monitor	LFC Block between Albania and Kosovo* is not established. TSOs can agree about monitoring party within bilateral TSO agreement.	Missing	In case of cross-border procurement of balancing services between Kosovo* and Albania, they shall appoint one TSO to be in charge for LFC monitoring.
Article 119 (Paragraph 1c) - Definition of ramping restrictions for active power output	Ramping restrictions are not defined	Missing	Methodology shall be developed taking into account technical characteristics of generating units and demand facilities.
Article 119 (Paragraph 1d) - Allocation of responsibilities between TSOs in the LFC block for the implementation of the obligations to fulfil FRCE target parameters and	The dimensioning principles for FRR and RR are in accordance with ENTSO-E Policy 1 for Albania.	Partially compliant	The dimensioning principles and fulfilment of FRCE target parameters shall be adopted to principles given in SO GL and synchronous area operational agreement.

comply with FRR and RR dimensioning principles	KOSTT has no balancing reserve dimensioning applied.		
Article 119 (Paragraph 1e) - Appointment of the TSO of LFC Block responsible for calculation and monitoring of FRCE for the whole LFC Block	LFC Block between Albania and Kosovo* is not established. TSOs can agree about monitoring party within bilateral TSO agreement.	Missing	In case of cross-border procurement of balancing services between Kosovo* and Albania, they shall appoint one TSO to be in charge for LFC monitoring.
Article 119 (Paragraph 1f) - Definition of requirements for the availability, reliability and redundancy of technical infrastructure for Load Frequency Control process	Currently there is no clear definition of requirements for the availability, reliability and redundancy of technical infrastructure for Load Frequency Control process.	Missing	Requirements for the availability, reliability and redundancy of technical infrastructure for Load Frequency Control process shall be clearly defined in addition to requirements given in Synchronous Area Operational Agreement
Article 119 (Paragraph 1g) - Definition of operational procedures in case of exhausted FRR or RR	Currently there is no definition of operational procedures in case of exhausted FRR or RR	Missing	Operational procedure in case of exhausted FRR and RR shall be clearly defined and adopted
Article 119 (Paragraph 1h, j) - Allocation of responsibilities between TSOs in the LFC block to comply with FRR dimensioning rules	Currently, only deterministic approach is used to determine FRR in Albania. KOSTT has no balancing reserve dimensioning applied.	Partially compliant	Allocation of responsibilities and dimensioning rules shall be defined in accordance with SO GL requirements.
Article 119 (Paragraph 1i, j) - Allocation of responsibilities between TSOs in the LFC block to comply with RR dimensioning rules	Currently, only deterministic approach is used to determine FRR in Albania. KOSTT has no balancing reserve dimensioning applied.	Partially compliant	Allocation of responsibilities and dimensioning rules shall be defined in accordance with SO GL requirements.
Article 119 (Paragraph 1k) - Definition of escalation procedure in case of severe risk of insufficient reserve capacity on FRR and RR in the LFC block	Not defined	Missing	The procedure in case of severe risk of insufficient reserve capacity shall be adopted.
Article 119 (Paragraph 1l) - Definition of FRR and RR availability requirements and control quality requirements for all FRR and RR providing	Not defined	Missing	The requirements shall be adopted

units and providing groups within LFC block			
Article 119 (Paragraph 1m) - Definition of any limits on the exchange of FCR and the exchange of FRR or RR with other LFC Blocks within the CE synchronous area	Not defined	Missing	The possibilities of FCR and FRR/RR exchange shall be assessed and potential limits shall be identified.
Article 119 (Paragraph 1n) - Definition of roles and responsibilities of the reserve connecting TSO, the reserve receiving TSO and of the affected TSO for the exchange of FRR and/or RR with TSOs of other LFC blocks	Not defined	Missing	These definitions shall be adopted
Article 119 (Paragraph 1o) - Definition of roles and responsibilities of the control capability providing TSO, the control capability receiving TSO and of the affected TSO for the sharing of FRR and/or RR with TSOs of other LFC blocks within CE synchronous area	Not defined	Missing	These definitions shall be adopted
Article 119 (Paragraph 1q) - Definition of coordinated actions within CE synchronous area aiming to reduce the FRCE in cases when FRCE cannot be sufficiently reduced for a longer period (more than 30 consecutive minutes) by using standard actions	Not defined	Missing	These definitions shall be adopted in accordance with synchronous area operational agreement.
Article 119 (Paragraph 1r) - Definition of measures to reduce the FRCE by requiring changes in the active power production or consumption of power generating modules and demand units as a last resort measure	Not defined	Missing	These definitions shall be adopted in accordance with synchronous area operational agreement.

EB GL	Current operational practice / Operational agreements	Level of compliance	Proposed changes
<p>Article 32 (Paragraph 1) – Review and defining of the reserve capacity requirements for the LFC block at least once a year</p>	<p>Not defined</p>	<p>Missing</p>	<p>Regular annual review and definition of the reserve capacities shall be adopted in LFC Block operational agreement</p>

5. FINDINGS AND RECOMMENDATIONS

The main recommendations regarding the changes of the LFC block organisation and functioning are listed here.

- Both existing LFC blocks (SMM, SHB) can provide the additional opportunities to participating TSOs for improved cooperation regarding balancing and operation; their LFC block cooperation agreements have to be aligned with the requirements of SO GL and EB GL, as listed in detail in dedicated gap analyses (Chapter 4).
- TSOs within LFC Blocks have the opportunity to significantly decrease the volume of balancing capacity by adopting the common dimensioning concept on the level of LFC Block and allocate the responsibilities to member TSOs. This means that dimensioning incident, as the largest imbalance that might occur as a result of instantaneous change of active power in both directions, is determined for the whole LFC Block rather than individually by each participating TSO (LFC Area). Total amount of balancing capacity, determined for the LFC Block, can be split among the participating TSOs with ratio agreed in their operational agreement.
- Common dimensioning of balancing reserve is applied within both SMM and SHB block but currently in the form of non-obliged operational procedure. FRR and RR common dimensioning stays as the opportunity of lowering the required reserve on the level of LFC block, also according to System Operation Guidelines, as stated in the Part IV, Load-Frequency Control and Reserves (Articles 119, 157, 160).
- If common dimensioning is applied within LFC block, there would be no possibility to further decrease the level of balancing reserve within LFC block through reserve sharing. However, TSOs within LFC block have no formal limit to exchange the FRR or RR reserve, according to SO GL and the opportunity of exchange of reserve can be used within the existing LFC blocks.
- Within the Imbalance Netting initiative i.e. IGCC as mandatory target mechanism, TSOs on the level of LFC block can and should impose priority of local pre-netting and corresponding Cross Zonal Capacity usage. SO GL and INIF documents even foster the application of “pre-netting” on the level of LFC blocks. Implementation of the “pre-netting” process on LFC block level, is recognized as an important step in the Roadmap for Imbalance Netting implementation in WB6, as presented in Task 5 (Roadmap).
- Existing aFRR IT infrastructure (data exchange channels and protocols, controllers, SCADA modules) are suitable for initial setup of Imbalance Netting and aFRR CMOL integration on the level of Control Blocks. Therefore switching from classical

hierarchical/pluralistic control to Imbalance Netting can be seen as the upgrade of existing cooperation, with additional technical and market requirements, such as formal usage of remaining Cross Zonal Capacity and usage of opportunity costs for IN settlement.

- According to SO GL, TSOs with LFC should define requirements for availability, reliability and redundancy of technical infrastructure used for LFC process.

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