



Final Report: Development of a roadmap towards a regional balancing cooperation (Task 5)

EKC and IMP

May 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 5:

DEVELOPMENT OF A ROADMAP TOWARDS A REGIONAL/EUROPEAN BALANCING COOPERATION/MARKET

Final Draft Report

December 2018

Final Report

May 2019



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1. INTRODUCTION

In the Report related to the Task 5 of this project, the analysis of possible balancing integration scenarios in order to identify an efficient plan for the balancing integration at regional and pan-European level, referring to the outcomes of the Tasks 1, 2, 3 and 4, and taking into account all cooperation models and requirements defined by EB GL and SO GL. Also, the contractual and governance arrangements are analysed, necessary to ensure an efficient implementation of cross-border balancing integration.

The report provides the plausible Roadmap for the efficient regional and pan-European balancing integration, including implementation project ranked according to their plausibility and priority.

Electricity Balancing Guidelines (EB GL) adopted 23rd November 2017 for EU member states, and related Implementation Framework documents, recognise the expected timelines for the implementation of EU-wide projects with the involvement of all TSOs. Three out of those four cooperation projects are under the scope of this Study.

- Imbalance Netting (IGCC project)
- mFRR (MARI project)
- RR (TERRE project)



Figure 1: EB GL - Implementation roadmap (source: ENTSO-E)



The timeline for EU TSOs is as follows:

For **Imbalance Netting**:

- Implementation Framework (IF) is drafted in June 2018, NRA approval is expected in summer 2019.
- **IGCC** common platform is to be fully prepared at early 2020
- Full participation of all TSOs is required until January 2022

For **RR**:

- Implementation Framework (IF) is drafted in June, NRA approval is approved in December 2018.
- **TERRE** common platform is to be fully prepared by January 2020
- Full participation of TSOs applying RR (and having common border) is required until January 2022

For **mFRR**:

- Implementation Framework (IF) is drafted December 2018, and NRA approval is expected during 2019.
- **MARI** common platform is to be fully prepared in the beginning of 2022
- Full participation of all TSOs is required until January 2024

According to the information from EnCS, the adoption of EB GL by the Contracting parties is expected during 2020. Comparing with the adoption of EB GL by EU countries (end 2017) and following the corresponding time sequence, it can be expected that the mandatory participation into relevant European projects, on the basis of EB GL adoption by EnC Contracting parties, will be delayed at least 2 years from the deadlines for EU TSOs. Nevertheless, as will be shown, the interest of WB6 TSOs could be to apply voluntary the relevant cooperation mechanisms before the formal deadline.

Task 5 – Integration Roadmap

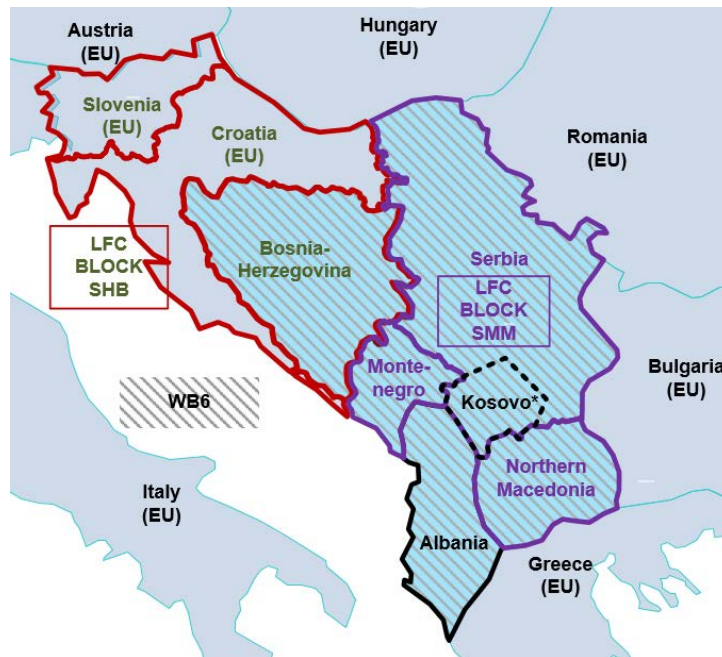


Figure 2: WB6 region



2. IMBALANCE NETTING

2.1 IN: Integration Roadmap

Based on the current state and gap analysis provided in Task 1 report, based on the potentials of LFC block as provided in Task 2, and finally based on Task 3 outcomes and findings related to Imbalance Netting model, this chapter provides the analysis of possible scenarios for Imbalance Netting implementation at regional and pan-European level. It takes into account the cooperation possibilities and requirements related to IN, as defined by EB GL and SO GL.

As it will be shown throughout this chapter: according to the Roadmap that is proposed, recognizing possibilities for the integration on the level of Imbalance Netting, WB6 parties:

- can and should exploit the existence of LFC block(s) and perform pre-netting within LFC block,
- possibly perform pre-netting among LFC blocks, and
- inevitably go towards the IN Target Model for cooperation, which is IGCC project

Definition of optimization regions, and requirements and possibilities for LFC blocks regarding Imbalance Netting cooperation are crucial for defining the roadmap for WB6 parties. Therefore, in the next chapter the possibilities for nested IN cooperation in forms of LFC blocks and optimization regions are summarized first.

2.1.1 Pre-netting on the level of LFC block

The possibilities of usage of LFC blocks regarding pre-netting have been described in the Task 2 Report. Here they are briefly repeated for the reasons of completeness of Task 5.

According to SO GL (Article 146, 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 INIF document (Article 11.2), each member TSO belonging to an LFC block shall have the right to perform imbalance netting with the other 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 an LFC block is not considered as an optimization region.



According to IGCC stakeholder document (4): “... In case TSOs perform a common dimensioning (LFC Block), pre-netting is necessary to favour 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”.

2.1.2 Pre-netting at optimization regions

Optimisation region means two or more neighbouring LFC Blocks (area smaller than the geographical area of all participating LFC blocks), applying either:

- imbalance netting, (explicit pre-netting) or
- exchange of balancing energy from aFRR¹ (and, by this, implicit netting between two or more LFC blocks participating in the IN-Platform).

Basically each IGCC Member has the right to pre-net its imbalance within an Optimization Region consisting of LFC Blocks which are part of the IGCC as well as in other co-operations consisting of non-IGCC LFC Blocks.

According to the “Stakeholder document” (4), to participate in the IGCC Optimization Region each IGCC Member has to fulfil the following rules:

- Implicit Imbalance Netting (e.g. a common merit order list for aFRR) between two or more LFC Blocks participating in IGCC, is considered as Imbalance Netting
- Each LFC Block participating in IGCC can have only one Imbalance Netting with other LFC Block(s) which are IGCC Members, preceding Imbalance Netting among all LFC Blocks of IGCC
- Each LFC Block participating in IGCC can participate in one other Imbalance Netting cooperation outside IGCC

Figure describes the netting layers in operation for IGCC:

¹ To remind on the “temporary nature” of explicit Imbalance Netting mechanism: It is foreseen that the aFRR-Platform (PICASSO project) implements an implicit imbalance netting. Hence, in case the geographical region of the IN-Platform is part of the geographical region of the aFRR-Platform, a separate algorithm for the IN-Platform will no longer be necessary.

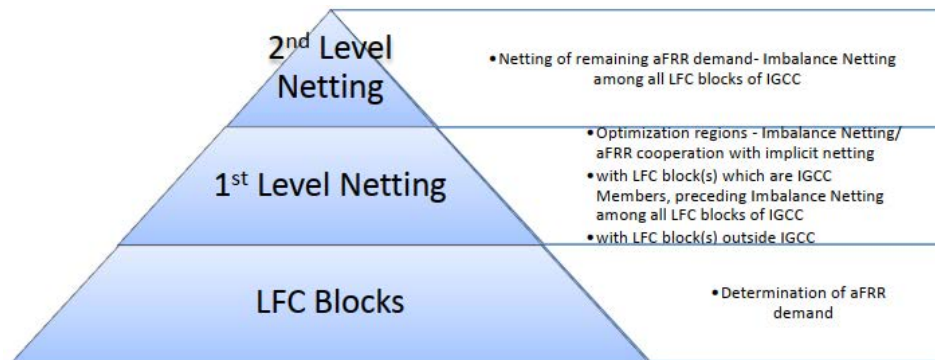


Figure 3: Imbalance netting – possible layers within IGCC

2.1.3 IGCC accession process

ENTSO-E's document "Guide how to become an IGCC member (1)" summarizes the main steps towards the membership and participation into IGCC. It defines the application steps and requirements in cooperation with participating TSOs and with hosting TSO (Transnet BW Germany).

To join IGCC, the acceding TSO will proceed in the following steps:

- 1) **Acceding TSO contacts** the convenor of IGCC EG via e-mail: igcc@entsoe.eu
- 2) Acceding TSO and all IGCC Members sign a **Non-Disclosure Agreement (NDA)** in order to make the IGCC MLA and other Confidential Information available to the Acceding TSO
- 3) Host TSO provides all technical and operational requirements to Acceding TSO for implementation (communication lines, virtual tie-line, etc.)
- 4) Acceding TSO **validates** with the Host TSO the technical feasibility of the implementation planning
- 5) Acceding TSO and the Host TSO jointly perform analyses resulting in insight of the impact of this accession on:
 - a) Imbalance Netting potential (volume and time) of the whole cooperation and per IGCC Member
 - b) Settlement results of the whole cooperation and per IGCC Member
- 6) Acceding TSO and IGCC Members inform their NRAs about joining IGCC, if it is required by their legislation
- 7) Acceding TSO in cooperation with the Host TSO submits the notification of joining IGCC via e-mail to the ENTSO-E Coordination of Secure Operation Sub Group ("CSO SG") convenor (3 weeks before the meeting), approximately 6 months before targeted initial testing
- 8) Acceding TSO **establishes** communication lines to the Host TSO
- 9) Acceding TSO and the Host TSO modify IT systems (e.g. SCADA, business system) and adapt the operational procedures accordingly



- 10) Acceding TSO in cooperation with the Host TSO registers the Virtual Tie Line² at the respective RGCE control centre
- 11) Host TSO confirms to the IGCC Expert Group (EG) that the Acceding TSO has implemented all necessary features
- 12) Acceding TSO and all IGCC Members sign the (Light) **Accession Agreement of the IGCC MLA**; necessary to be able to start the initial testing. Acceding TSO becomes a new party to the MLA, i.e. IGCC Member
- 13) Acceding TSO in cooperation with the Host TSO announces via e-mail the intention to start the initial testing (in accordance with the ENTSO-E Testbook) towards ENTSO-E CSO SG convenor and ENTSO-E Secretariat at least one week before the testing starts
- 14) **Initial tests** begin
- 15) Acceding TSO in cooperation with the Host TSO informs via e-mail after each test about the results to the IGCC EG and the ENTSO-E CSO SG convenor
- 16) Acceding TSO in cooperation with the Host TSO informs by e-mail the CSO SG convenor, the IGCC EG and the affected TSOs about start of the regular Trial test at least one week before its start
- 17) **One-year trial test** period begins
- 18) Acceding TSO in cooperation with the Host TSO prepares and sends via e-mail quarterly and final reports about trial-test results to the convenor of the CSO SG and the IGCC EG
- 19) In case the tests are successful, the CSO SG proposes to the RG CE Plenary a formal validation and closure of the trial period and recommends to agree on transition to **regular operation**

There is no entry fee charged to join this cooperation. Implementation costs are mainly related to the connection of the control systems, modification of control loops and the modification of business systems and should be borne by the Acceding TSO itself.

The IGCC will become the future IN-Platform. As described in Article 1 of the INIF document, all TSOs of the synchronous area Continental Europe (“CE”) performing the aFRR process are responsible for the implementation of the IN-Platform and have to use the IN-Platform one year after the approval of the INIF.

Out of 20 IGCC members, 11 are already connected to the IGCC project, as operating TSOs (from 8 countries). There are 9 TSOs as non-operating TSOs, who signed **Light Accession Agreement**, allowing them to participate in decision making already, although not operating yet. This group includes EMS-Serbia, which operational accession is expected during 2019.

² Operational Handbook P1/ BD6.2.

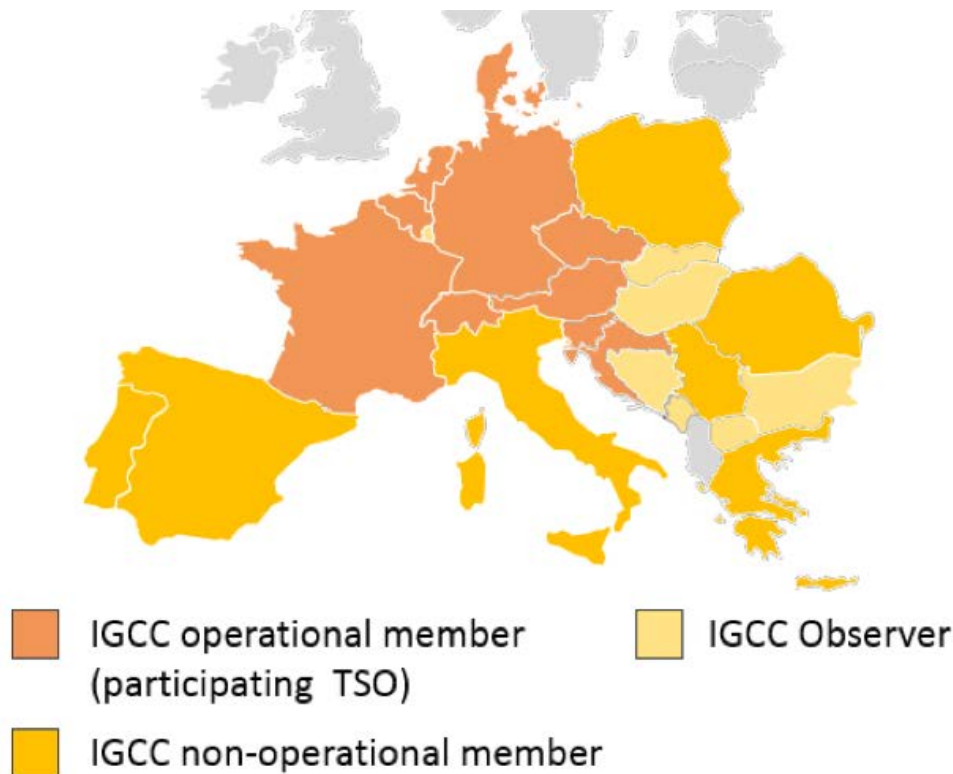


Figure 4: IGCC membership (https://www.entsoe.eu/network_codes/eb/imbalance-netting/)

During the course of this project, there is an ongoing rapid IGCC development and spreading of the membership, to the SEE TSOs as well, for which we believe that the project itself had the promoting and facilitating role. The latest membership status is shown on the *Figure 4*. During the project course, EMS became the non-operational member, and CGES, MEPSO and NOS BiH became the observers.

2.1.4 IGCC participation of WB6: risks and gaps

The necessary national technical and organisational requirements of IGCC accession steps by the individual TSOs can be implemented in parallel. To guarantee operational security, TSOs foresee a sequential testing and go-live of individual TSOs.

For the WB6 TSOs, the only blocking risk for the participation in the IGCC is the unresolved dispute between EMS and KOSTT. KOSTT recognition as control area/TSO is prerequisite for its individual participation in IGCC. Obviously, unresolved issue slows the EMS accession to IGCC as well, although foreseen in Q2 2019 (according to the accession timeline at https://www.entsoe.eu/network_codes/eb/imbalance-netting/).

Certain gaps for the balancing markets fully in line with EB GL are recognised in Task 1 report. Majority of them are not blockers for the IGCC participation, but can be resolved to enable the participation without workaround solutions, with full capacity and enabling full potential of IN. The risks and gaps are listed in the table, based on findings from Tasks 1, 2 and 3, with the assessment of its severity for the IGCC participation.

Table 1: IGCC cooperation: risks and gaps

Gaps: TSOs:	Technical, operational; Pdemand	Pricing; definition of IN opportunity prices; settlement	Cross Zonal Capacity	Organisational/legal	
EMS	/	Settlement period for calculation of settlement price in IGCC is 15 min. All WB6 parties are using 60 min as settlement period. IGCC participation manageable with 60 min as well, but needed to be harmonised in the long run.	Task 1 Report, page 20. Art 29-32: (“pay-as-bid” pricing for activation of balancing energy) Task 1 Report, page 21. Art 50: (TSO-TSO settlement rules for intended energy exch. aFRR/mFRR/RR) are missing. However, IGCC defines own settlement rules, so this is not considered as gap. Comment is valid for other TSOs as well.	There is no methodology for cross-zonal capacity calculation within the balancing timeframe for the exchange of balancing energy or for operating the imbalance netting process on CCR level (CCR Shadow 10). So, all TSOs should use CZC remaining after the intraday cross-zonal gate closure time.	Unresolved issues in balancing responsibilities with KOSTT slowing down the IGCC accession
KOSTT	Load frequency control loop readiness;		Task 1 Report, page 40. Art 29-31: (selection of balancing energy bids left up to TSO, no merit order list, pay as bid/regulated prices)		
OST	/		Task 1 Report, page 28. Art 29-32: (non-existence of balancing energy bids; price regulation based on HUPX DAM price)	Needed to insert such provision in corresponding regulations. In general: Task 1 Report, Art 37-39: (Explicit provisions on CZC missing)	/
CGES	/		Task 1 Report, page 20. Art 29-31: (“pay-as-bid”/regulated pricing for activation of balancing energy)		/
MEPSO	/		Task 1 Report, page 49. Art 29-31: (pay as bid pricing)		/
NOS BiH	/		Task 1 Report, page 71. Art 29-31: (“pay-as-bid” pricing for activation of balancing energy)		/

Severity level:

Red: blocker
Orange: important, but solvable, under resolution
White: related to EB GL; improves IN, but can work without it

Additional comments related to the listed gaps:

Pricing:

Since IN mechanism is such that main inputs cannot be controlled, such as Pdemand (and its correlation among TSOs) and ATC constraints, it is beneficial to introduce competitive national balancing markets which results in competitive opportunity prices which are then used in



Imbalance Netting process, for the determination of IN Settlement price, as described in Task 3 Report, chapter 2.2.2.

In order to correctly calculate IN settlement prices, for each participating TSOs opportunity price should be calculated. According to (3), prices of activated aFRR are considered as reliable proxies for opportunity prices. Document (3) describes three types of activated aFRR pricing:

- Pay as bid
- Marginal
- Administrative and day ahead price

Although these three pricing scheme are allowed regarding IN process, having in mind that for FRR processes marginal pricing is target model, usage of that pricing model is advised.

In any case, for successful calculation of opportunity prices, based on prices of activated aFRR, following is needed:

- Merit order list (except for administrative and day ahead price)
- Calculation of activated aFRR volume and price

Settlement period: Envisaged settlement period for calculation of settlement price in IGCC is 15 min. All WB6 parties are using 60 min as settlement period. IGCC participation manageable with 60 min as well, but needed to be harmonised in the long run.

CZC: EBGL envisages that all TSOs of a capacity calculation region shall develop a methodology for cross-zonal capacity calculation within the balancing timeframe for the exchange of balancing energy or for operating the imbalance netting process, but before the implementation of the capacity calculation methodology, TSOs shall use the cross-zonal capacity remaining after the intraday cross-zonal gate closure time.

2.1.5 Implementation roadmap, WB6

In defining the roadmap for the WB6 parties to approach to the Imbalance Netting cooperation, it is important first to summarize the following facts:

- IGCC project is the Continental European implementation project, to implement the targets set in EBGL for Imbalance Netting, mandatory for all EU TSOs. In line with the INIF and regional ongoing activities, IGCC accession is treated as high priority project, without alternatives in the field of Imbalance Netting.
- EB GL timeline foresees the full accession of EU TSOs to IGCC until January 2020 (with possible derogations, January 2022)



- In the process of adoption of EB GL to EnC CPs that requires time, the delay in transferring the related obligations (including IGCC accession) is estimated to minimally 2 years
- Nevertheless, early voluntary access to IGCC is beneficial, and already initiated among WB6 TSOs (EMS as IGCC non-operating member)
- There are two formal LFC blocks in WB6 (SMM and SHB)
- Pre-netting on the level of LFC block is considered as beneficial, and moreover mandatory
- Pre-netting among the LFC blocks is allowed only once, as described in chapter 2.1.2.

The above facts clearly stream the roadmap for Imbalance Netting within WB6 region. They are in general proposed in a form:

- Approach towards IGCC;
- In parallel, establish pre-netting within each LFC block, subordinated to IGCC;
- Optionally, perform pre-netting among LFC blocks

The proposed steps are as follows:

- (1) As a first step, it is proposed that all TSOs approach towards the IGCC, firstly as observers, and as soon as possible as members. As acceding TSOs, after signing NDA, they will be able to check the MLA and understand the whole methodological and organisational concept, all the rights and obligations, as well as the opportunities and limitations for pre-netting within IGCC; observer status within IGCC would serve also as a preparation for pre-netting within LFC block.
The accession process to IGCC is explained in Chapter 2.1.3, and can be performed in parallel with local Imbalance (Pre) netting activities
- (2) Formal formation of LFC blocks (SMM, SHB) under the propositions of SO GL, as described in Task 2 Report needs to be completed
- (3) ELES and HOPS approached to IGCC, and there is no longer INC cooperation with APG. NOS BiH should approach to IGCC as well. The cooperation on the level of SHB block will be initially achieved as pre-netting within SHB control block before global IGCC optimization, therefore such solution could stay as permanent pre-netting within IGCC with the following pre-netting sequence:
 - a. on SHB level firstly
 - b. finally, SHB with the rest of IGCC in the main IGCC optimization algorithm
- (4) In SMM block, EMS and CGES are ready to implement IN (existing gaps are not blockers, as given in chapter 2.1.4). They should initiate this mechanism as the nucleus of SMM pre-netting.

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- (5) MEPSO should approach to EMS&CGES and complete pre-netting on the level of SMM LFC block; this should be done in parallel with IGCC accession process.
- (6) Having participation at IGCC as the target resolution, the optional step of pre-netting cooperation among LFC blocks could be OST with KOSTT, SHB with SMM; or SMM with OST or KOSTT, knowing that only one inter-LFC block pre-netting cooperation is allowed within IGCC. However, as analysed and mentioned also in (4), chapter 4.1: while LFC block pre-netting is considered mandatory, an additional pre-netting could lead to sub-optimal solution. Therefore, it is not encouraged.

The parallel processes of IGCC integration at EU level, IGCC integration within WB6 region, and IN integration on the level of LFC blocks in WB6, which would finally become pre-netting areas within IGCC is shown at *Figure 5*. It includes the steps and estimated timing of technical readiness, including IT development and testing, as well as parallel organisational and contractual steps.

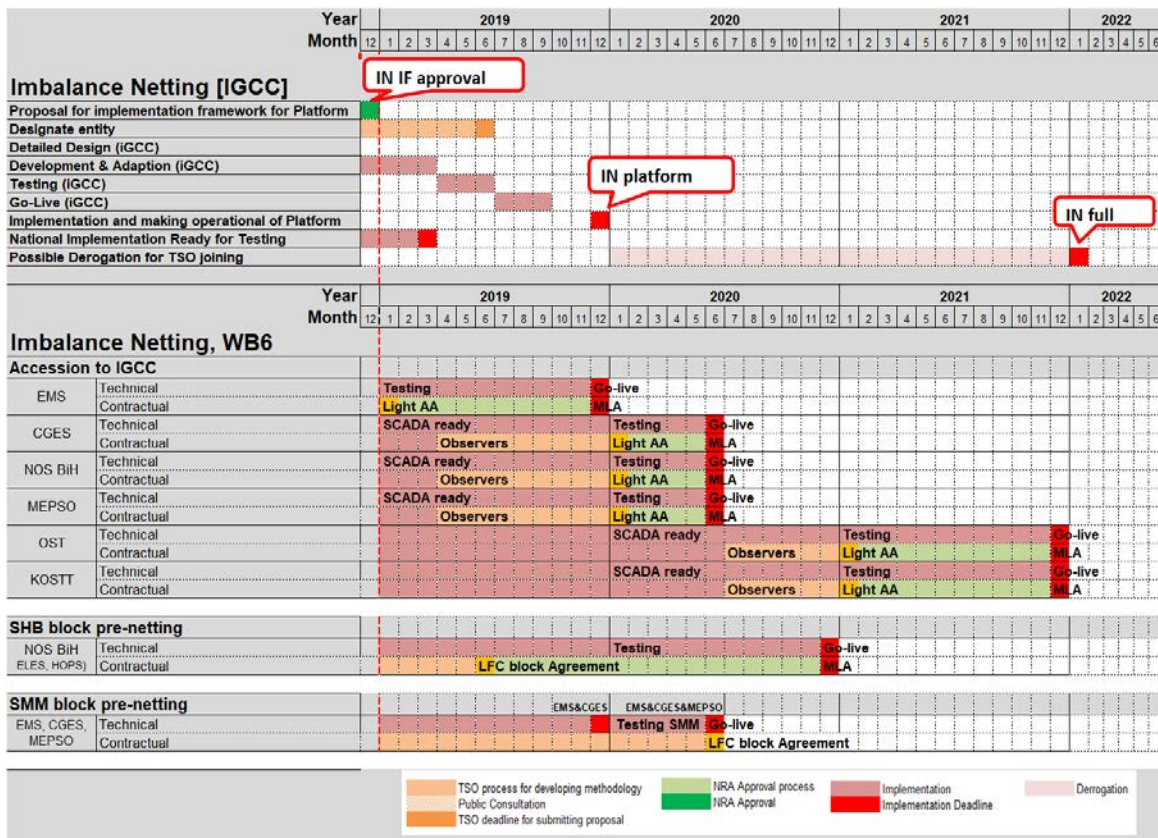


Figure 5: Imbalance netting – Implementation Roadmap, WB6³

³ Adjusted according to NOS BiH comments



2.2 Contractual arrangements

The proposal on contractual arrangements rely on the established structure within IGCC cooperation and the following documents:

- All TSOs' proposal for the implementation framework for a European platform for the imbalance netting process in line with Article 22 of EB GL ("INIF"), ENTSO-E (2)
- Related Explanatory Document (3)
- IGCC stakeholder's document for the principles of IGCC (4)
- IGCC stakeholder's document on Opportunity prices (5)

2.2.1 Non-disclosure Agreement

As reported in the accession steps, the first contractual obligation for acceding TSO is to sign the Non-Disclosure Agreement (NDA) with all IGCC TSOs. This enables the acceding TSO to have an insight to the IGCC Multilateral Agreement and to other confidential information.

2.2.2 Accession Agreement

After the preparation of all necessary features primarily in cooperation of acceding TSO and host TSO, the Acceding TSO signs the Accession Agreement of the IGCC MLA, with all IGCC TSOs. It is required for the start of initial testing and with this act, the acceding TSO becomes a new party to the MLA, i.e. IGCC Member.

The Accession Agreement:

- Recognises acceding TSO as IGCC member
- Confirms the compliance with technical requirements of IGCC process
- Transfers the propositions from MLA to acceding TSO

2.2.3 Multilateral Agreement

In any of the proposed forms of cooperation under Imbalance Netting, whether pre-netting on LFC block basis, cross-LFC block regional pre-netting, or joining IGCC as the target model, the Multilateral Agreement (MLA) among the participating TSOs is the key legal document.

MLA sets forth the mutual rights and obligations of the IN Members regarding their cooperation in respect of the design, implementation and operation of IN.

Integral MLA is not publicly available; it becomes available to the acceding TSOs upon signing NDA. On the basis the report for Task 3 of this project, and of listed available documents ((2), (3), (4), (5), (6), (8)), as well as the assessment of expected required articles, the main



propositions of the agreement that regulates participation in IGCC cooperation are given in the following table.

Form of MLA is generally equivalent for LFC IN cooperation (pre-netting) and for global IGCC cooperation; additionally local IN cooperation at LFC block level is expected to have additional propositions regarding the subordinated role of pre-netting process, towards global IGCC process.

Table 2: Contents of MLA for IGCC/IN cooperation

ARTICLE/CHAPTER	DESCRIPTION	REFERENCE
Signatories	List of signatory parties Defining member TSOs	
Preamble	Introductory points	Stakeholder document (4) INIF (2)
Definitions	Definitions of used terms and calculated values	EB GL (8) INIF (2) Stakeholder document (4)
Objectives and principles	General objectives, goals and principles of cooperation	Stakeholder document (4) INIF (2)
Governance structure	At IGCC, MLA establishes a two level governance structure and a decision making process: Steering Committee (SC) and Expert Group (EG); applicable to LFC block IN as well	Stakeholder document (4) INIF (2)
Decision making	Principles of decision making, representatives, voting rounds	Stakeholder document (4) INIF (2)
Cost sharing	Principles of cost sharing among TSOs	INIF (2) Stakeholder document (4)
Responsibilities	Definition of responsibilities of member TSOs and host TSO	Stakeholder document (4)



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ARTICLE/CHAPTER	DESCRIPTION	REFERENCE
Reduction or suspension of participation	Describing situation of reduction or suspension of participation, by the: <ol style="list-style-type: none">1. aFRR optimization system2. members3. affected TSO	Stakeholder document (4)
Optimization regions	Rights and obligations regarding pre-netting (at LFC block, implicit pre-netting within aFRR exchange, inter-block pre-netting); <i>As described in Chapter 2.1</i>	INIF (2) Stakeholder document (4)
Algorithm	Description of the IN optimization algorithm and integration in the local LFC loop <i>As described in Task 3 Report</i>	Stakeholder document (4)
Limitations	Principles of and applying the the transmission constraints: ATC limit, Profile limit, Flow-based limit	Stakeholder document (4)
Data exchange	Data exchanged in IGCC among participating TSOs and host TSOs: <ol style="list-style-type: none">1. Real time data (signals, status)2. Limitations3. Opportunity prices4. Settlement and accounting data <i>As described in Task 3 Report</i>	Stakeholder document (4) ENTSO-E Operational Handbook, Policy 1, Policy 2
Settlement	Settlement and accounting principles, incl. definition of opportunity prices for each TSO <i>As described in Task 3 Report</i>	Stakeholder document (4) Opportunity prices (5) ENTSOE guide on accounting and settlement (6)



ARTICLE/CHAPTER	DESCRIPTION	REFERENCE
Non-disclosure rules	Principles of protection of confidential information	General
Liabilities	Liabilities towards other members and towards third parties	General
Force majeure	Recognising Force majeure situations and related suspension of MLA obligations	General
Adaptations	Recognizing the needs for adaptation of main MLA documents and Annexes, mainly in relation to future expansion	Stakeholder document (4) Guide on how to become IGCC member 0
Termination	Principles of MLA termination by participating TSOs	General

2.2.4 LFC block operational agreement – contractual model for pre-netting

The Task 1 - ANNEX 1: PRE-NETTING AGREEMENT provides the contractual and governance framework of pre-netting at LFC block level, subordinated to IGCC, and it is envisaged as a part of LFC block Operational Agreement.



2.3 IT requirements and data exchange

Existing aFRR IT infrastructure (data exchange channels and protocols, controllers, SCADA modules) are suitable for initial setup of Imbalance Netting, both on the level of Control Blocks or wider among IGCC members. IT requirements related to implementation of IN platform includes:

- Determination of “host” TSO (TSO in which aFRR-Optimization system is installed)
- Application of current data exchange protocols and usage of existing IT structures
- Communication between “host” TSO and each participating TSO via two redundant communication lines that enables communication and exchange of messages, measurements and GI requests in both directions
- All data exchange (sent or received) with “host” TSO and aFRR-Optimization system must be transferred using ICCP (Inter-control Center Communication Protocol), that satisfies the requirements of IN cooperation in relation to IN cycle and time delay
- Continuous automatic exchange of signals via SCADA systems
- Handling of big data volumes
- Exchange of data in different time steps:
 - data ex-ante: ATC values and other Limits,
 - in real-time: P_{demand} , P_{corr} and
 - ex-post: Opportunity prices, Settlement prices, Settlement volumes, Benefits

Participating and “host” TSO exchange at least the following data:

From	To	Data
Participating TSO	Host TSO	Applicable Limits
Participating TSO	Host TSO	Participation Status Request
Participating TSO	Host TSO	aFRR-Demand (P_{demand})
Host TSO	Participating TSO	Correction (P_{corr})
Host TSO	Participating TSO	Participation Status
Host TSO	Participating TSO	Applicable Limits of other participating TSOs
Host TSO	Participating TSO	aFRR-Demand of other participating TSOs

3. MFRR/RR ENERGY EXCHANGE

Based on the current state and gap analysis provided in Task 1 report, as well as outcomes of Task 4 related to mFRR & RR energy exchange model, this chapter deals with the analysis of possible balancing integration scenarios at WB6 regional and pan-European level, taking into account all cooperation models and requirements defined by EB GL and SO GL.

As a result of balancing integration analysis, a WB6 Roadmap towards an efficient regional/European tertiary control (mFRR, RR) balancing integration is developed. This Roadmap defines priorities in balancing integration process, i.e. the projects/cooperation suitable for an early implementation and with potential to yield the highest benefits.

The developed mFRR & RR integration Roadmap is supported by proposing contract and governance framework to enable the efficient implementation of recognized cross-border balancing cooperation models.

3.1 Analysis of possible balancing integration scenarios

3.1.1 MARI project - European platform for mFRR energy exchange

Manually Activated Reserves Initiative (MARI) is the European implementation project for the creation of the European mFRR platform. MARI shall implement and make operational the European platform, where all standard mFRR balancing energy product bids shall be submitted and the exchange of balancing energy from mFRR shall be performed.



Figure 6: Current members and observers of MARI project

The TSOs proposal on Implementation Framework for a European platform for the exchange of balancing energy from frequency restoration reserves with manual activation (MFRRIF) is



submitted in early 2019. After the adoption of Implementation Framework, all TSOs shall implement and make operational the European platform in 30 months period according to EB GL Art.20. With possible 2 years derogation, full implementation of pan-European mFRR process should be completed not later than early 2024.

3.1.1.1 MARI project as mandatory

For assessing the needs and responsibilities for the accession to the MARI project in WB6 region, it is essential to point out the following aspects of EB GL and MFRRIF (currently in draft – to be approved June 2019):

EB GL, Article 20 states:

- (1) *“By one year after entry into force of this Regulation, all TSOs shall develop a proposal for the implementation framework for a European platform for the exchange of balancing energy from frequency restoration reserves with manual activation.”*
- (6) *By thirty months after the approval of the proposal for the implementation framework for a European platform for the exchange of balancing energy from frequency restoration reserves with manual activation, or where all TSOs submit a proposal for modification of the European platform pursuant to paragraph 5, by 12 months after the approval of the proposal for modification of the European platform, all TSOs shall implement and make operational the European platform for the exchange of balancing energy from frequency restoration reserves with manual activation and they shall use the European platform to:
 - (a) *submit all balancing energy bids from all standard products for frequency restoration reserves with manual activation;*
 - (b) *exchange all balancing energy bids from all standard products for frequency restoration reserves with manual activation, except for unavailable bids pursuant to Article 29(14);*
 - (c) *strive to fulfil all their needs for balancing energy from the frequency restoration reserves with manual activation.**

Draft mFRRIF document, Article 1, states:

“The mFRRIF is the common proposal of all TSOs in accordance with Article 20 of EBGL. The mFRR-Platform is mandatory for all TSOs.”

Accordingly, pan-European mFRR energy exchange process, and consequential MARI platform is considered mandatory for all TSOs.

3.1.2 TERRE project - European platform for RR energy exchange

Trans European Replacement Reserves Exchange (TERRE) is the European implementation project for exchanging replacement reserves in line with the Guideline on Electricity Balancing. The aim of TERRE is to build the RR Platform and set up the European RR balancing energy market in order to create harmonized playing fields for the Market Participants.

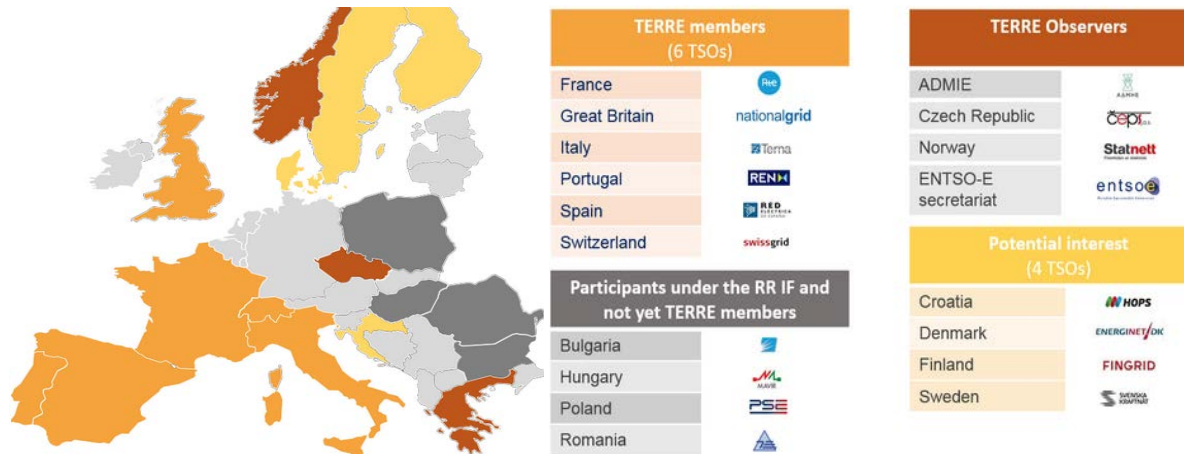


Figure 7: Current members and observers of TERRE project

The TSOs proposal on Implementation Framework for a European platform for the exchange of balancing energy from restoration reserves (RRIF) is submitted in June 2018. Full implementation of RR process should be completed in January 2022.

3.1.2.1 TERRE project as optional

For assessing the needs and responsibilities for the accession to the TERRE project in WB6 region, it is essential to point out the following aspects of EB GL and draft RRIF:

EB GL, Article 19 states:

- (1) *“By six months after entry into force of this Regulation, all TSOs performing the reserve replacement process pursuant to Part IV of Regulation (EU) 2017/1485 shall develop a proposal for the implementation framework for a European platform for the exchange of balancing energy from replacement reserves.”*
- (6) *By one year after the approval of the proposal for the implementation framework for a European platform for the exchange of balancing energy from replacement reserves, all TSOs performing the reserve replacement process pursuant to Part IV of Regulation (EU) 2017/1485 and that have at least one interconnected neighbouring TSO performing the replacement reserves process shall implement and make operational the European platform for the exchange of balancing energy from replacement reserves. They shall use the European platform to:*



- (a) submit all balancing energy bids from all standard products for replacement reserves;
- (b) exchange all balancing energy bids from all standard products for replacement reserves, except for unavailable bids pursuant to Article 29(14);
- (c) strive to fulfil all their needs for balancing energy from replacement reserves.

Article 31 of EB GL states:

- (10) TSOs that do not use the reserve replacement process to balance their LFC area shall strive to use all balancing energy bids from relevant common merit order lists for frequency restoration reserves to balance the system in the most efficient way, taking into account operational security.

RRIF, Article 1, states:

“The RR-Platform as determined in this RRIF in accordance with Article 19 of the GL EB is the common proposal of the RR TSOs as listed in the explanatory document.”

Accordingly, process related RR energy exchange, and consequential TERRE platform is considered optional for the TSOs. Participation depends if TSO applies RR at all, and if it has at least one border with neighbouring TSO applying RR as well.

3.1.3 Current state assessment in WB6 region

On the basis of the assessment of current state of balancing markets in WB6 region, as well as gap analysis for each country, inspired and in line with MARI and TERRE projects, the selection of pragmatic and applicable cooperation on the regional level is elaborated below⁴:

- (Task 1 and Task 2 analysis) Allocation of responsibilities among TSOs in each Control Block to comply with FRR and RR (if necessary) dimensioning principles - Synchronous Area Framework Agreement (SAFA) and Synchronous Area Operational Agreement (SAOA) and LFC Block operational agreement
 - SHB LFC Block is currently in the process of adopting new operational agreement in accordance with SO GL, which aim to regulate allocation of responsibilities within SHB Block for complying with FRR dimensioning principle requirements. It is expected that this agreement will become effective during 2019.
 - SMM LFC Block recently initiated discussion among participating TSOs to start working on new LFC block operational agreement that will take into account

⁴ With clear reference to the findings of previous tasks (mainly Task 1, Task 4)



requirements from SO GL. Firstly, it is expected that during 2019, SMM Block should develop methodology for allocation of responsibilities within the Block and submit it to NRAs in each country. Beside this issue, SMM Block Working Group initiated discussion regarding new balancing settlement rules within the Block, therefore it is expected that new SMM Block operational agreement will be completed and signed during 2020.

- OST is compliant with ENTSO-E Policy 1 requirements, while currently KOSTT has no balancing reserve on the national level. In the past period, there were several attempts to establish cooperation between OST and KOSTT regarding cross-border balancing services, but no agreement is operational yet due to ongoing dispute among EMS and KOSTT. Considering this, it is expected that compliance with SO GL standards regarding FRR dimensioning jointly for OST and KOSTT cannot be fulfilled prior to 2021.
- (Task 1 analysis) In most of the WB6 TSOs, mFRR reserve is procured on the yearly level through bilateral contracts with BSPs.
- (Task 4 analysis) It is shown that the participation in mFRR exchange and MARI project is mandatory, while the participation in RR exchange and TERRE project is optional
- (Task 4&5 analysis) Both MARI and TERRE project are not mature as IGCC project for Imbalance Netting, which is already operational, and which surely evolves towards the pan-European Imbalance Netting target model, with defined algorithm, members' obligations and which has defined contractual framework.
- (Task 4 analysis) mFRR process with two products (Scheduled and Direct Activation) and RR with Scheduled Activation product, to large extent share the same/similar timeframe and triggering events, therefore the application of all three "tertiary control" models in parallel seems complex and not justified at this stage.
- (Task 4 analysis) Nowadays, the TSOs of WB6 region mainly procure and activate mFRR for tertiary control purpose. The strategy for mFRR activation is different among TSOs in WB6 region. For instance, OST and NOSBIH rarely activate mFRR, practically only in the cases when almost complete aFRR band is activated, while EMS rely more on mFRR trying to keep required band for aFRR. There is no clear distinction between balancing energy prices between aFRR and mFRR due to the fact that both reserves are often procured on hydro power plants (fast responsiveness) hence there is no significant space for economic optimisation between aFRR and mFRR activation.
- (Task 4 analysis) RR is rarely used in the product format which is recognized within EB GL. It is usually treated as an "emergency" balancing reserve in WB6 region which is necessary only in the cases of largest outages in the system and it is usually activated



throughout bilateral TSO agreements for tertiary control energy exchange or emergency energy exchange.

- (Task 4 analysis) Markets are generally moving closer to real time, which includes more active intra-day commercial trade. Consequently, the need for RR activation is gradually decreasing, since restoring of imbalance in longer term can be achieved by altering the positions of parties at imbalance, over intra-day changes of schedules.
- (Task 4 analysis) The generation fleet in WB6 is such that there are not much units typically usable in RR-manner (such as gas units that can be rather easily cold-started). Having in mind the above, logical direction for WB6 cooperation would be the application of mFRR (DA and SA) exchange in a form of standard product described in Task 4, firstly at regional level, with gradual extension within the region, and as well moving towards the full participation in MARI project. Optionally, inclusion of RR remains as the additional possibility for those TSOs who apply such mode of control (for releasing of aFRR and mFRR reserve). Activation of RR is primarily seen at national level, without much incentive to perform regional or pan-European cooperation (knowing the optionality of TERRE project).

3.2 mFRR/RR: Integration Roadmap

Although mFRR/RR energy exchange models are elaborated within the scope of this Project, it is of utmost importance for WB6 region to comply with FRR dimensioning principle requirements given in SO GL regarding balancing reserve before implementation of any balancing energy related cooperation model, as it is elaborated in Task 1 and Task 2 (compliance with dimensioning rules and compliance with requirements of SO GL regarding LFC Blocks and allocation of responsibilities between TSOs in the LFC Block to comply with FRR and RR dimensioning principles). The reserve-related compliance process contributes to proper setup of national and regional balancing markets and facilitates more liquid balancing energy market.

In this course it is suggested, in the first phase of the integration roadmap, to harmonize existing allocation of responsibilities among TSOs, where applicable, to comply with SO GL requirements and ensure that all TSOs from WB6 region keep the required volume of balancing reserve within their systems.

3.2.1 Reserve-related tasks and steps



- (1) Reserve sharing among LFC Blocks and TSOs cooperation
 - In parallel with allocation of responsibilities for FRR dimensioning within SMM and SHB LFC Blocks as well as within OST&KOSTT cooperation (elaborated in subchapter 3.1.3 - Current state assessment in WB6 region), it is suggested to perform detailed assessment of possible mutual provision of FRR capacity among SMM Block, SHB Block and OST&KOSTT cooperation with the goal to lower amounts of procured FRR capacity, taking into account available cross zonal capacity. Detailed assessment should take into account possibilities for reserve sharing between LFC Blocks taking into account probabilistic approach of FRR dimensioning, proving that the balancing reserves needs based on historic system imbalances are less than dimensioning incident in 99% of time. It is well known from the operational practice that all TSOs in WB6 region struggle to procure required volume of FRR and ensure its availability for 8760 hours throughout the year.
 - Reserve exchange is available mechanism which could be applied e.g. among OST and KOSTT, who have complementary generation fleet and through which they can fulfil its reserve requirements. In general, it is applicable and useful to be applied among any other TSOs with the lack of possibilities to procure required volume of reserve (TSOs with large ratio between largest generating unit capacity and total installed generating capacity) even after the allocation of responsibilities within LFC Block or TSO's cooperation regarding compliance with FRR dimensioning principles.

- (2) Shorter procurement period for FRR
 - Once having regional cooperation for mFRR energy, for all TSOs in WB6 region, it is recommended to set shorter procurement periods and procurement of FRR closer to real-time. This will reduce availability risk for BSP on the short-term basis and reduce the price for reserve on the long-term basis. In addition, TSOs should adopt more stringent rules for penalties in case of non-availability of balancing reserve.

3.2.2 Energy-related tasks and steps

- (1) **Initial step:** Harmonisation of standard product for SA and DA mFRR in accordance with description given in Task 4 ("MARI like")
 - In the initial stage, it is recommended that all TSOs of WB6 region launch the process of harmonisation of the standard product in accordance with technical and organisational requirements given in Task 4.

- (2) **Regional 1:** RS, ME, BA at single platform and CMOL (1 year from now - at least)
 - Taking into account that EMS, CGES and NOSBIH already signed bilateral operational agreements for cross-border exchange of mFRR energy between them,



it is envisaged that signing of multilateral (i.e. trilateral) agreement between these TSOs should be an initial step in WB6 regional integration regarding balancing energy. Within this agreement, TSOs should harmonize the main organisational and technical issues to launch activation of mFRR balancing energy bids from a common merit order list without margins and usage of single Activation Optimisation Function (AOF). Besides, having a common merit order for mFRR balancing energy in place opens additional possibilities for cross-border cooperation for mFRR reserve such as common dimensioning, additional balancing energy bids for procurement of mFRR reserve as well as exchange of reserve.

- Harmonization of organisational and technical issues between EMS, NOSBIH and CGES, should be in line with criteria described in Task 4: Models of regional cooperation for balancing energy - It should be emphasized that in this period, TSOs will continue to work with Imbalance Settlement Period of 1 hour and correspondingly the minimum duration of delivery period for schedule-activated mFRR should be 50 minutes, as given in Task 4.

(3) **Regional 2:** Transformation of Regional 1 platform (EMS, NOSBIH and CGES) into WB6 platform (3 years from now - at least)

- In the second (intermediate) stage, it is envisaged that OST, MEPSO and KOSTT should join multilateral cooperation between EMS, NOSBIH and CGES once they are ready from the organisational and technical point of view, thus forming regional cooperation. The implementation of regional cooperation on WB6 level could be beneficial for both technical and economic reasons compared to national balancing market operation only. This would accommodate transformation of current practice with bilateral agreements for “tertiary energy” exchange into multilateral regional balancing cooperation, which would boost the efficiency of balancing energy deployment, as well as overall balancing market welfare. In addition, this interim solution would provide smother transition and harmonization with EB GL.

(4) **European:** Full integration of WB6 region with MARI

- MARI project is implemented in accordance with agreed time-schedule on the EU level. It is envisaged that it will take 3 years from now for mFRR platform to Go-Live and taking into account the possible derogations, the full implementation is scheduled for end of 2023 (five years from now)
- After transformation of trilateral initiative for balancing energy exchange with CMO and single platform into WB6 regional platform, all TSOs should start the compliance procedure with MARI requirements. Beside organisational and legal



issues, TSOs should start to harmonize their ISPs to 15 minutes. This requires large technical infrastructure updates in SCADA/EMS systems and on-site measurement procedures.

- The main target is that all WB6 TSOs should join MARI project and transition from regional cooperation to Pan-European should be preferably grouped together or individually, TSO by TSO, in accordance with the level of compliance

The *Figure 8* shows the parallel processes of MARI integration at EU level, MARI accession by WB6 parties, and mFRR integration within WB6 region. It shows the steps and estimated timing of technical readiness, including IT development and testing.



Technical Assistance to the Implementation of Cross-border Electricity Balancing



Task 5 – Integration Roadmap

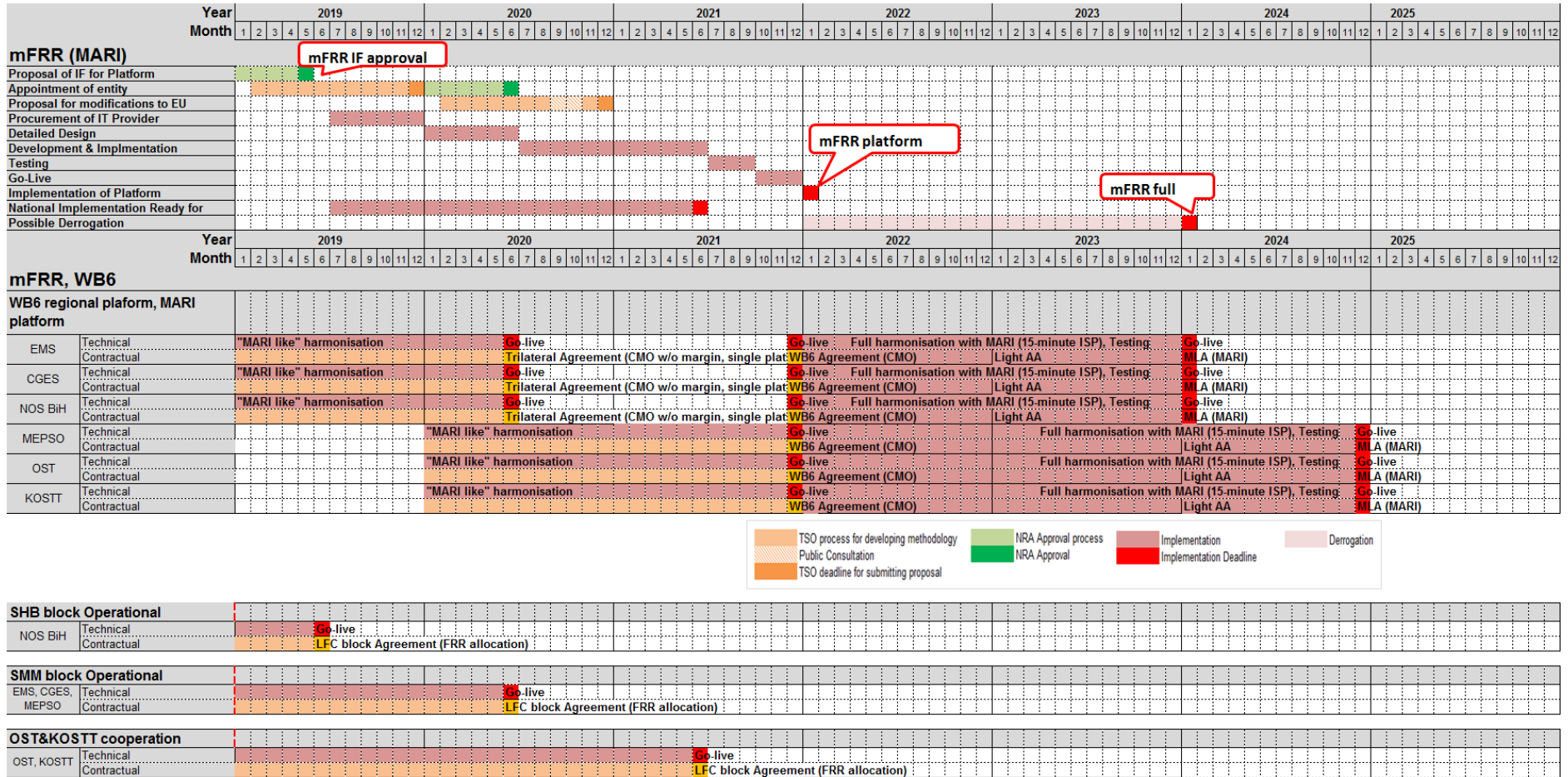


Figure 8: mFRR – Implementation Roadmap, WB6



3.2.3 Risks and gaps

The risks and gaps are listed in the table, based on findings from Tasks 1, 2 and 4, with the assessment of its severity for the participation in mFRR & RR cooperation.

Table 3: Regional mFRR & RR cooperation: risks and gaps

Gaps: TSOs:	Definition of standard product	CMOL	GCT	Pricing and Settlement	Cross Zonal Capacity	Organisational/ legal
EMS	<p>Task 1 Report, page 18 Art 18: (Terms and conditions for BSP don't cover bid characteristics as it is envisaged in IF)</p> <p>Task 1 Report, page 19 Art 25: (definition of standard product is missing.)</p>	<p>Task 1 Report, page 18 Art 2: (MOL is defined but not fully in line with EBGL)</p> <p>Task 1 Report, page 19 Art 29: (Ensure that CMOL is used in existing agreements concluded among EMS and the CGES and NOSBiH)</p>	<p>Task 1 Report, page 19 Art 24: (BSP to TSO GCT is 60 minutes, which is not in line with IF and transitional solution envisaged in Task 4)</p>	<p>Task 1 Report, page 18 Art 30: (pricing is defined as "pay as bid which is not in line with (17) and transitional solution envisaged in Task 4", also limitation in the price difference of the activated energy in both directions should be eliminated)</p> <p>Ensure that methodologies for common pricing and common settlement rules , are used in existing agreements concluded among EMS and the CGES and NOSBiH, and that are in line with at least transitional solutions envisaged in Task 4)</p>	<p>There is no methodology for cross-zonal capacity calculation within the balancing timeframe for the exchange of balancing energy or for operating the imbalance netting process on CCR level,</p> <p>So all TSOs should use CZC remaining after the intraday cross-zonal gate closure time.</p> <p>Insert such provision in corresponding national regulations.</p>	
KOSTT	<p>Task 1 Report, page 39 Art 18: (Terms and conditions for BSP don't cover bid characteristics as it is envisaged in IF)</p> <p>Task 1 Report, page 40 Art 25: (definition of standard product is missing)</p>	<p>Task 1 Report, page 37 Art 2: (MOL is only mentioned)</p> <p>Task 1 Report, page 40 Art 29: (Activation of balancing energy is left up to TSO's discretion)</p>	<p>Task 1 Report, page 39 Art 24: (BSP to TSO GCT is 60 minutes, which is not in line with IF and transitional solution envisaged in Task 4)</p>	<p>Task 1 Report, page 40 Art 30: (envisaged "pay as bid" or regulated prices of balancing energy are not compliant with (17) and with transitional solution as explained in Task 4)</p>		<p>Unresolved issues in balancing responsibilities with EMS prevents the individual participation in regional mFRR & RR cooperation.</p>
OST	<p>Task 1 Report, page 27 Art 18: (Terms and conditions for BSP don't cover bid characteristics as it is envisaged in IF)</p> <p>Task 1 Report, page 28 Art 25: (definition of standard product is missing)</p>	<p>Task 1 Report, page 23 Art 2: (definition of MOL is missing)</p> <p>Task 1 Report, page 28 Art 29: (Because there is no bidding process there is no MOL at all)</p>	<p>Task 1 Report, page 28 Art 24: (There is no BSP to TSO GCT, because there is no bidding process at all)</p>	<p>Task 1 Report, page 28 Art 30: (in absence of balancing bids, pricing is based on day ahead HUPX prices, which is not compliant with (17) and transitional solution set in Task 4)</p>		/



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<p>CGES</p>	<p>Task 1 Report, page 59 Art 18: (Terms and conditions for BSP don't cover bid characteristics as it is envisaged in IF)</p> <p>Task 1 Report, page 59 Art 25: (definition of standard product is not fully compliant with definition envisaged by EBGL and IF)</p>	<p>Task 1 Report, page 57 Art 2: (MOL is poorly defined)</p> <p>Task 1 Report, page 60 Art 29: (Ensure that CMOL is used in existing agreements concluded among CGES and the EMS and NOSBiH)</p>	<p>Task 1 Report, page 59 Art 24: (BSP to TSO GCT is 30 minutes, which is no fully in line with IF and transitional solution envisaged in Task 4)</p>	<p>Task 1 Report, page 60 Art 30: (envisaged "pay as bid"/ contracted prices of balancing energy are not compliant with [30.1] and with transitional solution as explained in Task 4)</p> <p>Ensure that methodologies for common pricing and common settlement rules, are used in existing agreements concluded among CGES, and the EMS and NOSBiH and that are in line with at least transitional solutions envisaged in Task 4)</p> <p>Same bid prices should be used for both local and cross-border activations.</p>	<p>/</p>
<p>MEPSO</p>	<p>Task 1 ANNEX, page 207 Art 18: (Terms and conditions for BSP don't cover bid characteristics as it is envisaged in IF)</p> <p>Task 1 Report, page 48 Art 25: (definition of standard product is not fully compliant with definition envisaged by EBGL and IF)</p>	<p>Task 1 Report, page 49 Art 29: (MOL is used only within MEPSO control area)</p>	<p>Task 1 Report, page 48 Art 24: (BSP to TSO GCT is not explicitly defined, it will be defined in procurement rules issued by TSO)</p>	<p>Task 1 Report, page 49 Art 30: (envisaged "pay as bid" principle for pricing balancing energy bids is not compliant with [30.1] and with transitional solution as explained in Task 4, also there is possibility for NRA to regulate/limit bidding prices)</p>	<p>/</p>
<p>NOS BiH</p>	<p>Task 1 Report, page 70 Art 18: (Terms and conditions for BSP don't cover bid characteristics as it is envisaged in IF)</p> <p>Task 1 Report, page 71 Art 25: (There is no explicit definition of standard product. Some characteristics are defined but they are not fully compliant with definition envisaged by EBGL and IF)</p>	<p>Task 1 Report, page 69 Art 2: (MOL is defined only for tertiary regulation)</p> <p>Task 1 Report, page 71 Art 29: (Ensure that CMOL is used in existing agreements concluded among NOSBiH and the EMS and CGES)</p>	<p>Task 1 Report, page 71 Art 24: (BSP to TSO GCT is 2 hours, which is not in line with IF and transitional solution envisaged in Task 4)</p>	<p>Task 1 Report, page 71. Art 30: ("pay-as-bid" pricing for activation of balancing energy is not line with [30.1] and with transitional solution as explained in Task 4)</p> <p>Ensure that methodologies for common pricing and common settlement rules, are used in existing agreements concluded among NOSBiH and the CGES and EMS, and that are in line with</p>	<p>/</p>



Task 5 – Integration Roadmap

				at least transitional solutions envisaged in Task 4)		
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Severity level:

Red: blocker
Orange: important, but solvable, under resolution
White: related to EB GL; improves IN, but can work without it



3.3 Contractual arrangements

The contractual framework of regional mFRR energy exchange cooperation is required to follow the setup of MARI project. As said before, MARI project is not at maturity stage as IGCC, for which it was possible to use the explanatory documents, which provide the crucial elements of contractual framework, such as (4) and (5).

Available reference documents to define the contractual framework in case of mFRR cooperation are:

- EB GL (8)
- MFRRIF (11), (12)
- mFRR exchange model as described in Task 4 Report

The contractual framework of multilateral cross-border cooperation has general requirements that have to be provided, as well as specific technical and commercial requirements that have to be customised per each specific subject.

Knowing that the organisational structure of multilateral projects is in many terms similar, the analogy with IGCC structure and legislation is used where needed and possible, primarily through the “Stakeholder document” (4).

Below the necessary contractual framework of perspective regional mFRR energy exchange cooperation for acceding TSOs is provided, having in mind that the accession to MARI project will provide the final and pan-European framework to the mFRR cooperation.

3.3.1 Non-disclosure Agreement

Signing the Non-Disclosure Agreement (NDA) by/with all involved TSOs enables the acceding TSO to have an insight to confidential information, including the Multilateral Agreement.

3.3.2 Accession Agreement

When technical conditions are met, the acceding TSOs sign the Accession Agreement of the MLA, among/with all TSOs involved in mFRR energy exchange project. It is required for the start of initial testing. In case of new entrants to the process, with this the acceding TSO becomes a new party to the MLA. Besides the recognition of parties in the process, the Accession Agreement confirms the compliance with technical requirements of the process and transfers the propositions from MLA to acceding TSO.



3.3.3 Multilateral Agreement

Multilateral Agreement is the key legal act, which defines roles, responsibilities and all technical and organisational requirements of the cooperation in place; whether for regional cooperation for mFRR energy exchange, or globally on the level of MARI project. The main elements of such MLA are given in the table below.

Table 4: Contents of MLA for mFRR cooperation

ARTICLE/CHAPTER	DESCRIPTION	REFERENCE
Signatories	List of signatory parties Defining mFRR cooperation, members	General
Preamble	Introductory points	MFRRIF (11)
Definitions	Definitions of used terms and calculated values	EB GL (8) MFRRIF (11)
Objectives and principles	General objectives, goals and principles of mFRR energy exchange cooperation	MFRRIF (11), (12)
Governance structure	Establishment of governance structure on a two level: Steering Committee (SC) and Expert Group (EG)	MFRRIF (11), (12)
Decision making	Principles of decision making, representatives, voting	MFRRIF (11), (12)
Cost sharing	Principles of cost sharing among TSOs	MFRRIF (11), (12)
Responsibilities	Definition of responsibilities of member TSOs and host TSO (mFRR-Platform)	General
Reduction or suspension of participation	Describing situation of reduction or suspension of participation, by the mFRR platform, members, affected TSO	General
Standard product	Description of mFRR standard product for SA and DA	Task 4 Report MFRRIF (11), (12)
Algorithm	Description of the mFRR optimization algorithm <i>As described in Task 4 Report</i>	Task 4 Report MFRRIF (11), (12)



ARTICLE/CHAPTER	DESCRIPTION	REFERENCE
Limitations	Principles of and applying the transmission constraints, including CZC pricing	Task 4 Report MFRRIF (11), (12)
Data exchange	Data exchanged among participating TSOs and host TSO: <ol style="list-style-type: none">1. mFRR bids (up, down)2. TSO demands (up, down)3. CZC Limitations4. HVDC loss factors (<i>at MARI level</i>)5. Settlement and accounting data6. Outputs: activated bids, satisfied demand, XB marginal prices, social welfare gained, used CZC <i>As described in Task 4 Report</i>	Task 4 Report MFRRIF EN (12)
Settlement	Settlement and accounting principles <i>As described in Task 4 Report</i>	Task 4 Report MFRRIF (11), (12)
Non-disclosure rules	Principles of protection of confidential information	General
Liabilities	Liabilities towards other members and towards third parties	General
Force majeure	Recognising Force majeure situations and related suspension of MLA obligations	General
Adaptations	Recognizing the needs for adaptation of main MLA documents and Annexes, mainly in relation to future expansion	General
Termination	Principles of MLA termination by participating TSOs	General

3.3.4 Contractual model for cross-border supply of mFRR balancing energy

The Task 5 - ANNEX 2: Agreement Model on Mutual Cross-border Exchange of Balancing Energy, provides the contractual and governance framework of mFRR exchange at the regional level.



4. REFERENCES

- (1) Guide how to become an IGCC member, ENTSO-E
- (2) INIF: All TSOs' proposal for the implementation framework for a European platform for the imbalance netting process in accordance with Article 22 of EB GL, ENTSO-E, June 2018 (IGCC)
- (3) Explanatory Document to All TSOs' proposal for the implementation framework for a European platform for the imbalance netting process in accordance with Article 22 of EB GL, ENTSO-E, June 2018
- (4) Stakeholder document for the principles of IGCC, IGCC stakeholders, September 2016
- (5) Opportunity prices, IGCC stakeholders, 2016
- (6) RGCE Implementation Guide Accounting and Settlement, ENTSO-E, 2011
- (7) ENTSO-E Operational Handbook, Policy 1, Policy 2
- (8) Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a Guideline on Electricity Balancing (EB GL)
- (9) Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a Guideline on Electricity Transmission System Operation (SO GL)
- (10) All TSOs' proposal for the implementation framework for the exchange of balancing energy from frequency restoration reserves with automatic activation in accordance with Article 21 of GLEB (PICASSO)
- (11) mFRRIF/MARI: All TSOs' proposal for the implementation framework for a European platform for the exchange of balancing energy from frequency restoration reserves with manual activation in accordance with Article 20 of Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing, May 2018
- (12) mFRRIF EN/MARI: Explanatory Document to all TSOs' proposal for the implementation framework for a European platform for the exchange of balancing energy from frequency restoration reserves with manual activation in accordance with Article 20 of Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing, May 2018
- (13) RRIF/TERRE: The proposal of all Transmission System Operators performing the reserve replacement for the implementation framework for the exchange of balancing energy from Replacement Reserves in accordance with Article 19 of Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing, February 2018
- (14) RRIF/TERRE: ENTSO-E response to the public consultation on "All TSOs' performing the replacement reserve process as defined in the EBGL regulation for the implementation framework for the exchange of balancing energy from Replacement



- Reserves in accordance with Article 19 of Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing”, June 2018
- (15) RRIF/TERRE EN: Explanatory Document to all TSOs’ proposal for a methodology to determine prices for the balancing energy and cross-zonal capacity used for exchange of balancing energy or for operating the imbalance netting process in accordance with Article 30 of Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing
 - (16) An overview of the European balancing market and Electricity Balancing Guideline, ENTSO-E, November 2018
 - (17) All TSOs’ proposal on methodologies for pricing balancing energy and cross-zonal capacity used for the exchange of balancing energy or operating the imbalance netting process