CROSS BOrder management of variable renewable energies and storage units enabling a transnational Wholesale market

ELECTRICITY MARKET DEVELOPMENTS IN WESTERN BALKANS

24th National Conference Energy and Development,
Athens, 21 -22 November 2019

VESNA BOROZAN, UKIM

CROSSBOW STRATEGIC GOAL

- **CROSSBOW will propose the shared use of resources at regional/transnational level to foster cross-border management of variable renewable energies and storage units, enabling a higher penetration of clean energies whilst reducing network operational costs and improving economic benefits of RES and storage units**

CROSSBOW Project has recived funding from EU Horizon 2020 reserarch and inovation programme under grant nº 773430
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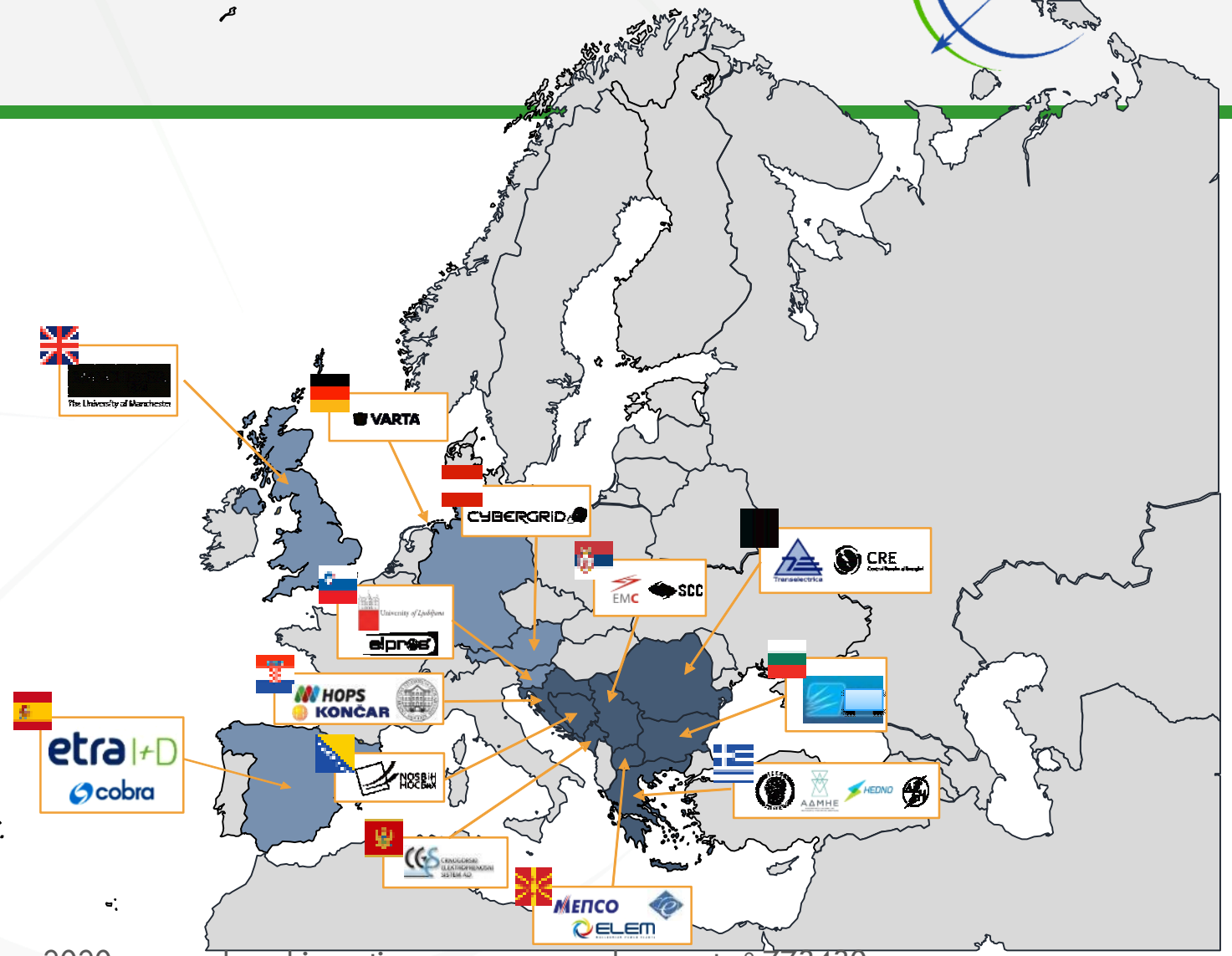
CROSSBOW CONSORTIUM

- 8 TSO
- 1 DSO
- 1 RSC
- 2 (+1) Large producers
- 5 (+1) Universities
- 6 Industrial partners
- 1 Industrial Association



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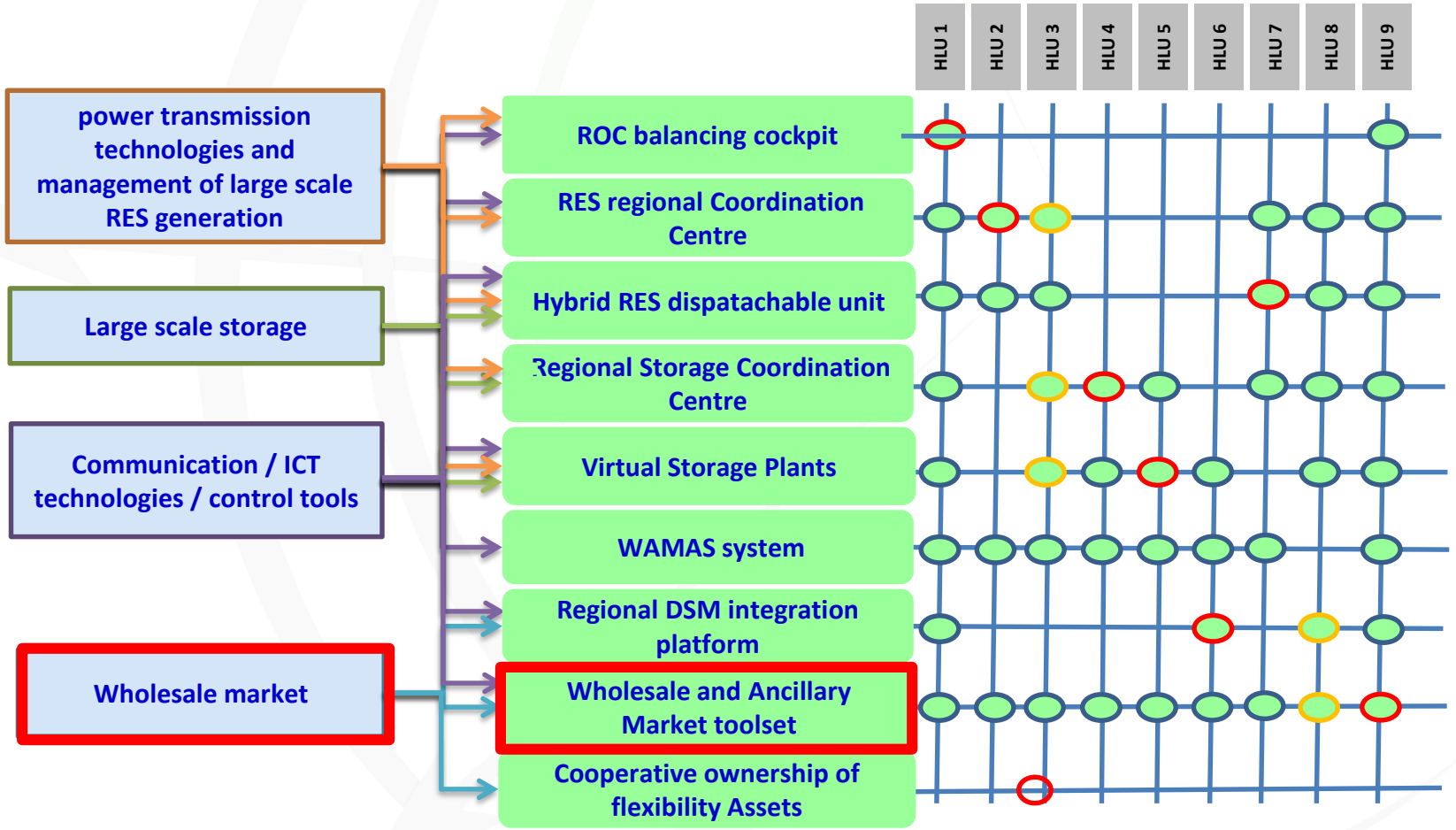
CROSSBOW PRODUCTS AND SCENARIOS



Each product has a clear **leading role** in a specific scenario – i.e. High Level Use Case

Additionally we have also identified secondary **key enabling products**

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PURPOSE AND SCOPE OF RESEARCH

- Objective - provide an overview of legislation and regulative framework for the region represented by the countries participating in the CROSSBOW consortium
  - A complex task for SEE region consisting of EU MSs and EnC CPs
  - Technical and regulative aspects of the electricity sector in the countries of SEE region are investigated to provide a representation of current state of play
- Purpose - investigate the regulative framework for implementation of the High Level Use Cases (HLUs)
  - Identify current obstacles and possible future developments to use of RES and flexibility assets for cross-border trading and balancing
  - Propose regulatory innovations to facilitate optimization of regional resources and implementation of new technologies

ELECTRICITY MARKET TIMEFRAMES

Timeframe	Years ahead up to 24 hours prior to hour of operation	12-36 hours prior to hour of operation	> 30 minutes prior to operation	Hour of operation
Market	FM	DAM	IDM	BM
Function	Managing risk - *Market players managing price risks* - *Forwards, futures and transmission rights*	Managing energy - *Market players balancing their physical positions* - *Operational planning, capacity allocation, congestion management*		System management - *TSO balancing the system in real time* - *Re-dispatching, frequency control and incidents management*
NC	FCA	CACM		EBGL

Source: CROSSBOW D1.1, WP1, 2018

FORWARD MARKET TIMEFRAME - CAPACITY ALLOCATION

- Participation in SEE CAO

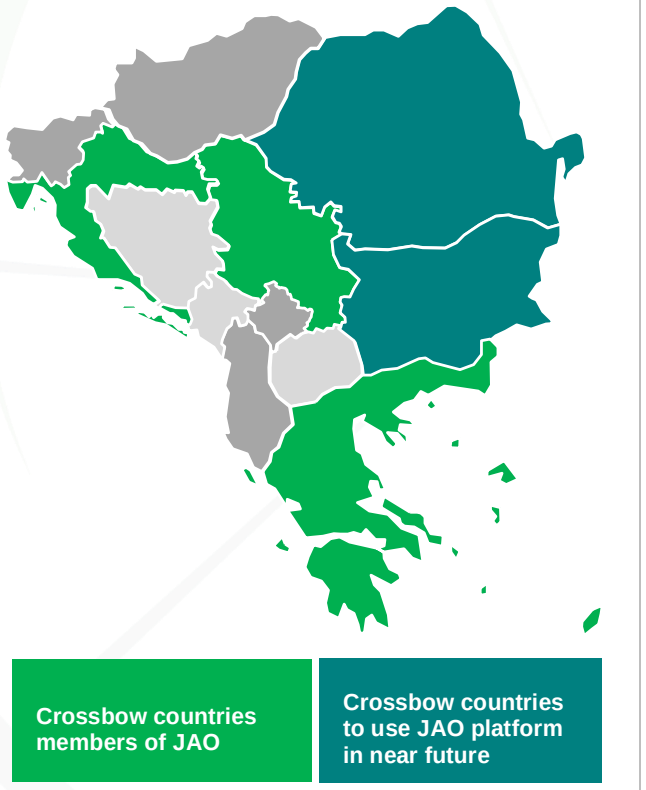
- TSOs from ME, BiH, HR, AL, GR & TR participate in SEE CAO
- Early implementation of FCA regulation in SEE has been conducted by Harmonised Allocation Rules in SEE CAO in 2017 for yearly and monthly auctions for 2018
- The next major **challenge in SEE**- Implementation of provision from CACM regarding **implicit short-term allocation and introduction of Financial Transmission Rights (FTRs)** in forward capacity allocation. It depends on the introduction of market coupling

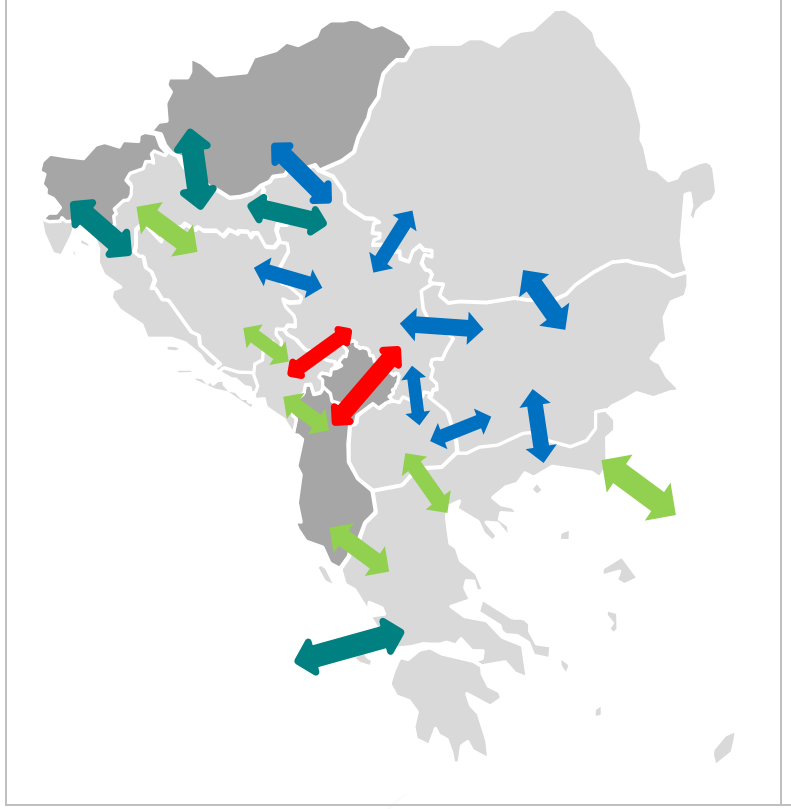
- Legal obstacles for TSO participation in Auction Office

- ***BiH:*** NOSBiH participates in SEE CAO
- ***RS:*** No legal obstacles for Serbian TSO
- ***ME:*** Member since 2015
- ***BG:*** JAO is chosen capacity auction agent. Planned for 2019.
- ***HR:*** Participates in SEE CAO
- **RO:** Will join JAO according to SAP document
- **GR:** Participates in SEE CAO
- **NMK:** Founder and partner in SEE CAO

Source: CROSSBOW TSO Questionnaire, WP1, 2018

FORWARD CAPACITY ALLOCATION

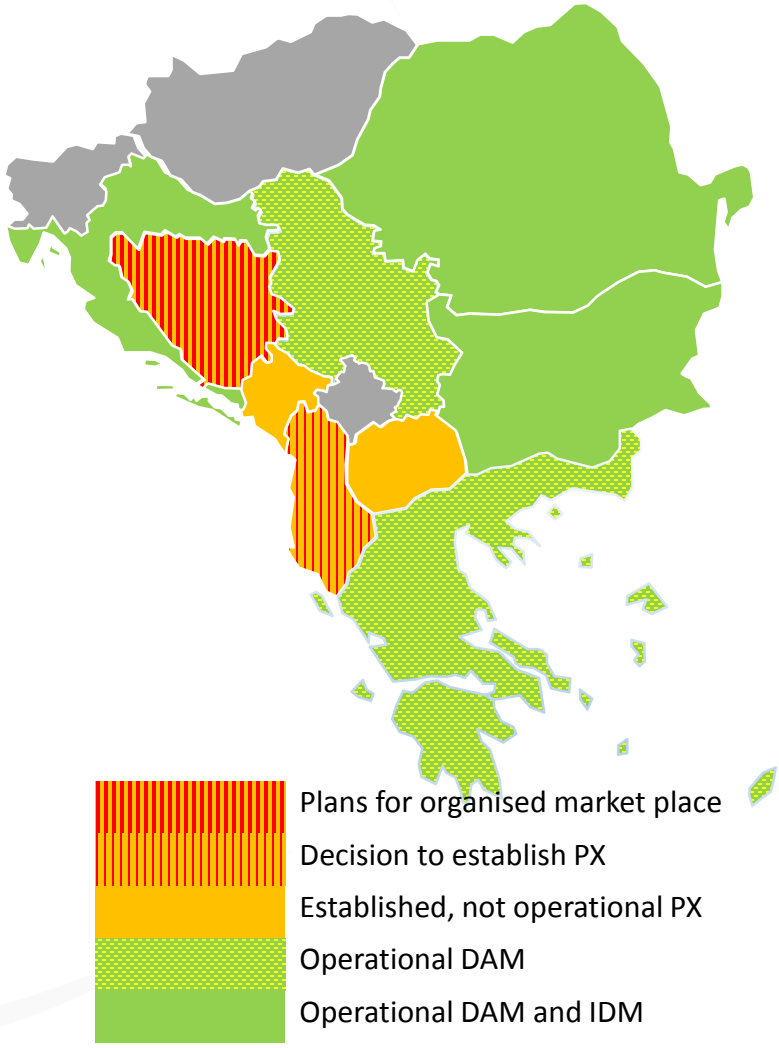




Source: CROSSBOW TSO Questionnaire, WP1, 2018

DAY-AHEAD AND INTRADAY MARKETS TIMEFRAME

- Organised market places
  - ***BiH:*** Some plans were announced in 2017
  - ***RS:*** SEEPEX operational DAM
  - ***ME:*** MEPX (BELEN) established, DAM will go live in early 2020
  - ***BG:*** IBEX operational DAM and IDM
  - ***HR:*** CROPEX operational DAM and IDM
  - **RO:** OPCOM operational DAM and IDM
  - **GR:** HEnEx operational DAM
  - **NMK:** MEMO established, DAM will go live in 2021
  - **AL:** Governmental decision to set up APEX



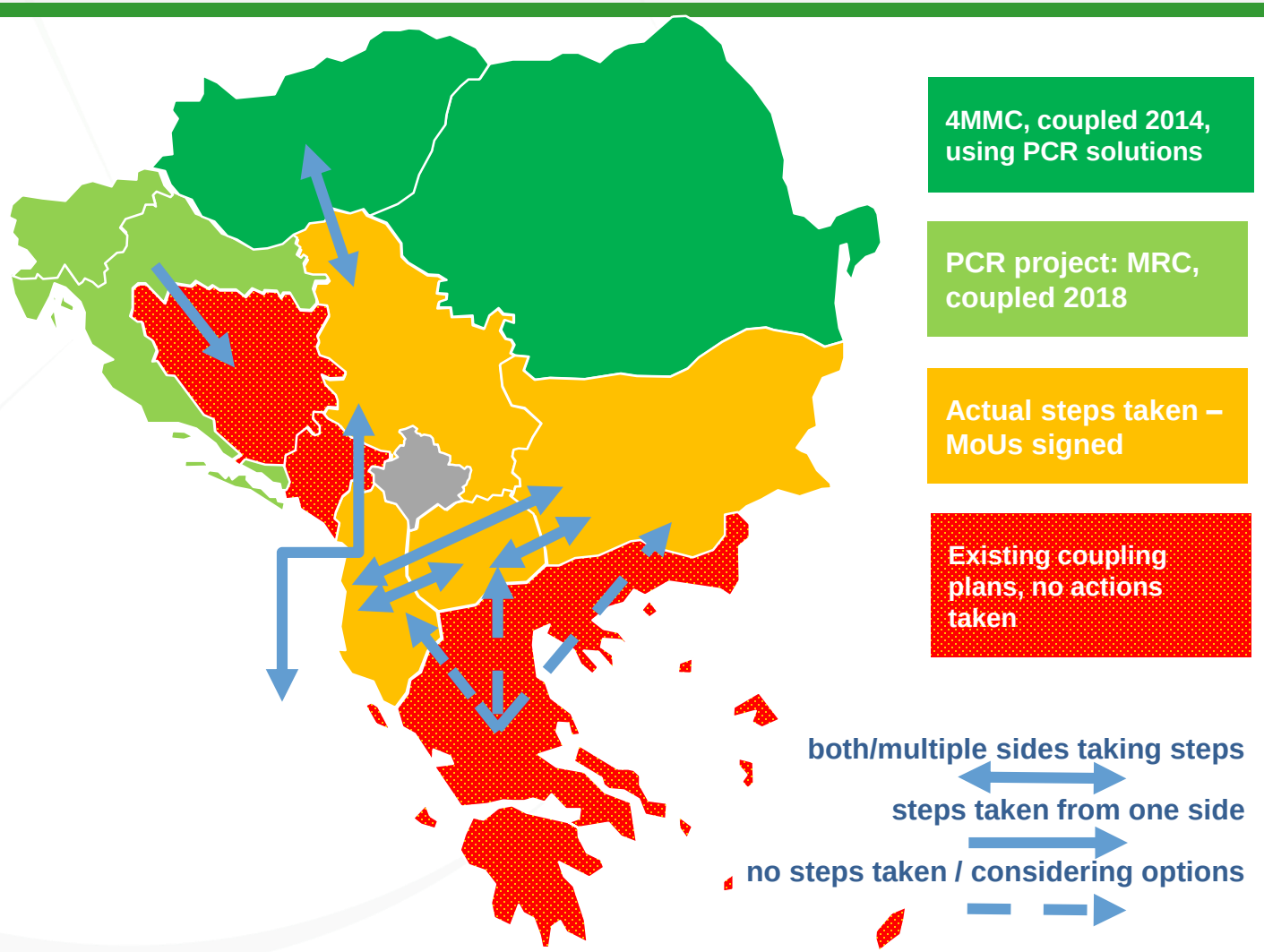
Source: CROSSBOW D1.1, WP1, 2018

MARKET COUPLING

- The objective of the Capacity Allocation and Congestion Management (CACM) Market Code is to enable establishment of cross-border EU electricity markets in the DAM and IDM timeframes, as well as methods for the calculation of cross-zonal capacity
- CACM envisages extension of market coupling beyond EU borders and inclusion of EnC CPs from SEE. WB countries receive technical assistance to provide conditions for early CACM implementation
- Market coupling
  - Opcom is coupled with PXs from CZ, SK, HU and PL
  - Slovenian – Croatian market coupling – 19 July 2018
  - Signed MoU for market coupling of SEEPEX and HUPX
  - Signed MoU for market coupling of NMK and BG
  - Signed MoU for market coupling of AL with NMK and BG

MARKET COUPLING

- The Price Coupling of Regions (PCR) Project is a key project contributing to European market integration and harmonisation; as such BSP Southpool, CROPEX, IBEX, SEEPEX, Opcom and HEnEx are all service users or members of PCR (algorithm)
- Slovenia and Croatia are already coupled within MRC; Romania is coupled within 4MMC
- Other regional or bilateral coupling projects are either planned, in negotiation or moving forward (MoUs)

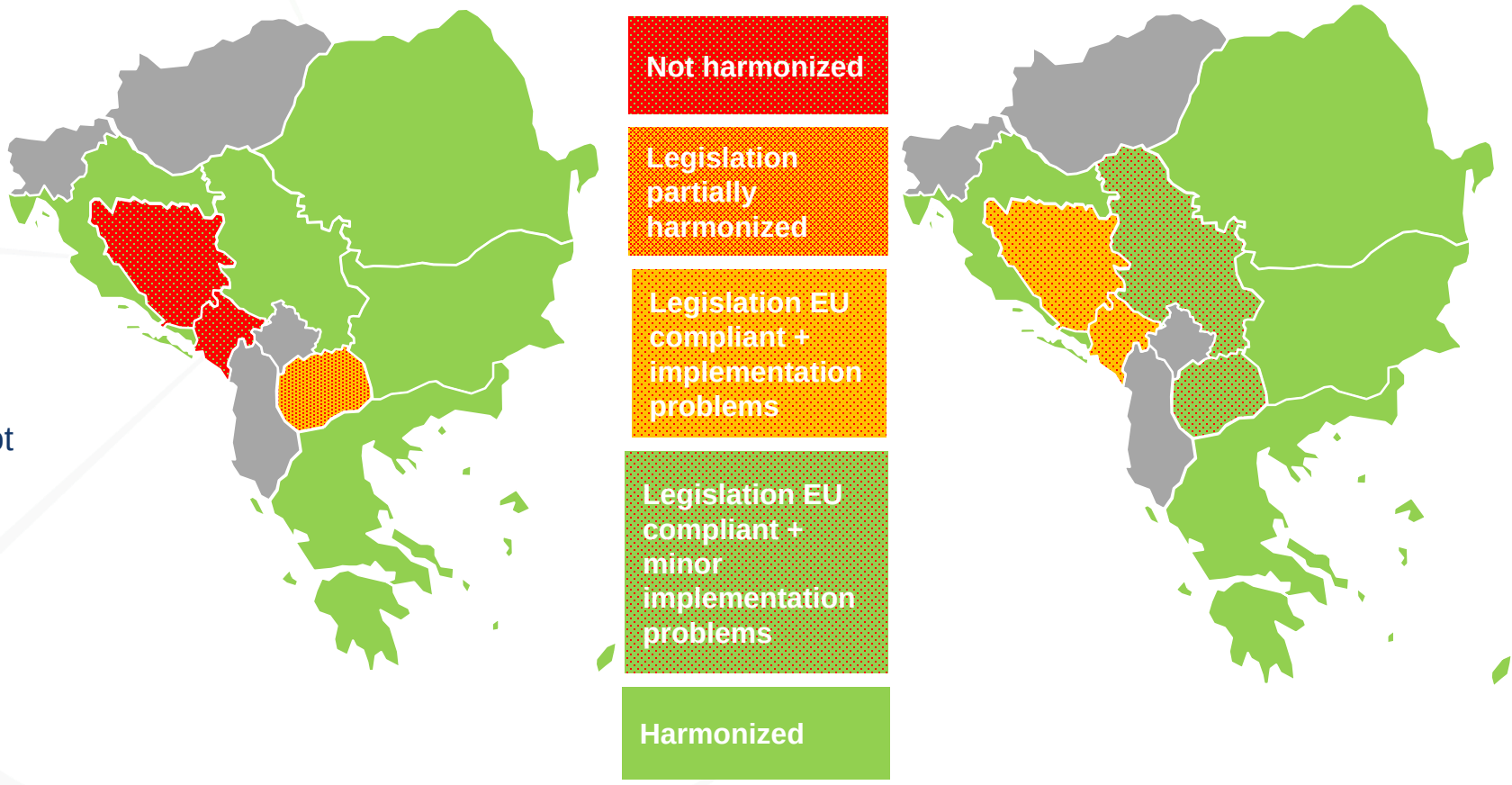


Source: CROSSBOW D1.1, WP1, 2018 updated Nov 2019

MARKET COUPLING OBSTACLES

- VAT and Public procurement harmonisation

- EnC Guidelines for amendments to Value Added Tax (VAT) and Public Procurement Law to facilitate transposition of EU legislation in WB6
- Harmonization of VAT rules in WB6 is a precondition to enable real market coupling and functional BMs
- Amendments introduced in RS and partially in NMK legislation, while Montenegro has not yet begun with required adjustments; BiH is preparing new VAT Law
- The national legislation on public procurement in the WB6 countries is in line with EU legislation, but the practical implementation remains a challenge
- The major obstacles in implementation of public procurement rules is the lack of market competition



a) VAT harmonization

b) Public procurement harmonization

Source: CROSSBOW D1.1, WP1, 2018

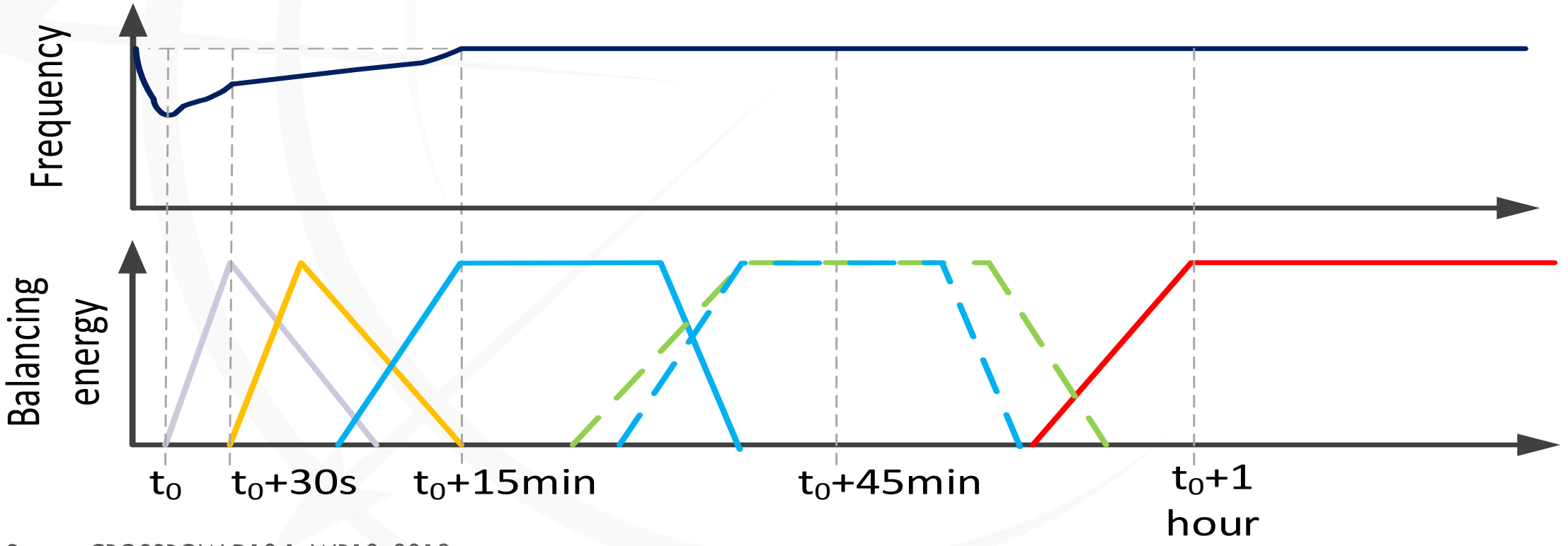
BALANCING MARKET TIMEFRAME

Balancing Market (BM)

- The BM is an efficient and transparent tool for TSOs to ensure access to sufficient amount of energy to balance the differences between supply and demand with least possible costs for customers
- Balancing services are offered by market players-balancing service providers (BSPs) under common BM framework and include **balancing energy** and **balancing capacity**
- The differentiation between these services emerges from the requirements for the TSOs to have access to sufficient amounts of energy when needed, thus providing adequate response of their system in normal or emergency states
- According to EBGL, **balancing capacity** refers to the volume of reserve capacity that a BSP has agreed to hold and has agreed to submit bids for a corresponding volume of energy
- **Balancing energy** refers to the energy activated and used by the TSO for balancing purposes and is provided by the BSP

BALANCING MARKET TIMEFRAME

FCR	aFRR	mFRR	RR	Balancing energy market
- Automatic activation - Up to 30s	- Automatic activation - 30s to 15min	- Semi-automatic/manual activation - Max time of activation 15min	- Semi-automatic/manual activation - Min time of activation 15min	- Cheaper than RR - For activations up to a couple of hours

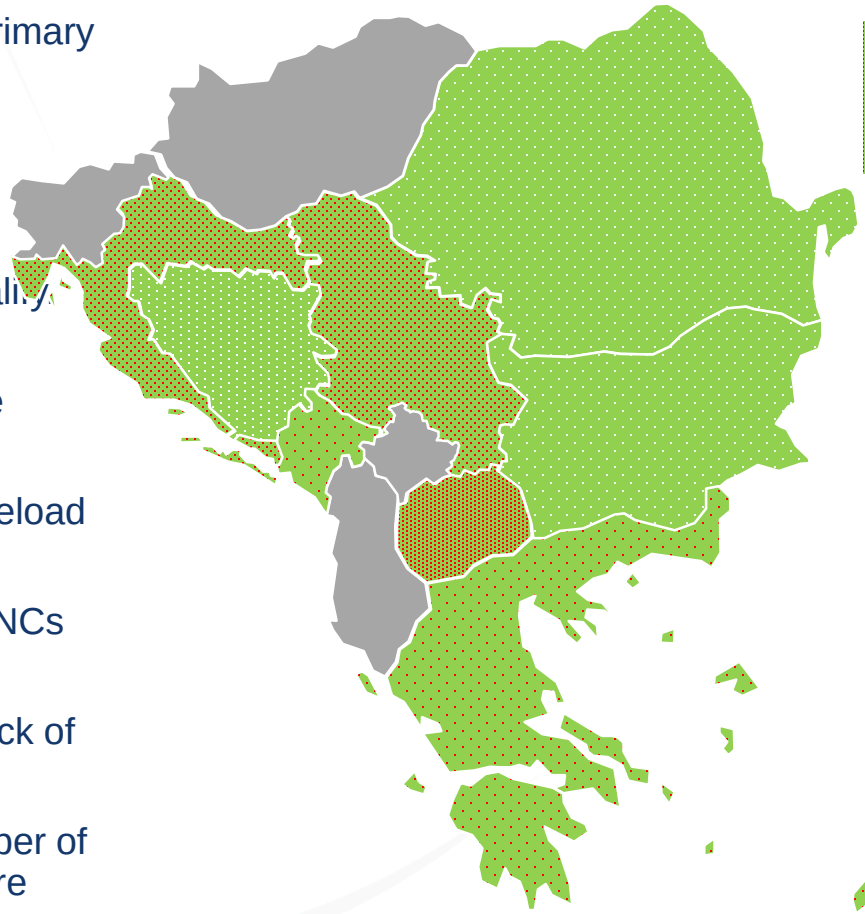


Source: CROSSBOW D10.1, WP10, 2019

BALANCING MARKET TIMEFRAME – CAPACITY/ENERGY PROCUREMENT

- Current procurement of balancing services

- ***BiH:*** Functional BM with 5 BSPs, some legal provisions in the primary legislation are missing, secondary legislation enables non-discriminatory procurement of balancing services
- ***ME:*** BM with 2 BSPs (incumbent generation and consumer)
- ***NMK:*** Secondary legislation and electronic platform in dry-run. Operation starts 1 January 2020. 3 - 4 BSPs expected to prequalify
- ***RS:*** BM with one domestic BSP – regulated price for balancing reserve capacity, market rules give preferences to BSPs that are obliged to offer balancing services (EPS)
- ***BG:*** BM with price cap for shortage set to 2.5 times of IBEX baseload DAM price and zero price for surplus
- ***GR:*** Implementation of Information System for BM according to NCs
- ***HR:*** BM with one domestic BSP – regulated prices for some balancing services, prices of balancing energy linked to DAM, lack of data from DSO hindering reserve procurement
- ***RO:*** Highly functional BM for balancing energy with a large number of participants. For example, in the beginning of October 2018, there were 67 licensed BSPs



Secondary legislation adopted, competitive BM starts 1 Jan 2020

Functional BM, no legal obstacles, no competition

Functional BM, no legal obstacles, low competition

Functional BM for balancing services

Functional BM (energy) + ancillary market (capacity)

Source: CROSSBOW D10.1, WP10, 2019

BALANCING MARKET TIMEFRAME – CAPACITY/ENERGY PROCUREMENT

Capacity

	FCR	aFRR	mFRR	RR
GR	Market	Market	Mandatory	N/A
ME	Mandatory	Bilateral	Bilateral	Bilateral
RS	Mandatory	Mandatory	Mandatory	N/A
BG	Mandatory	Mandatory	Mandatory	Auction procedure
HR	Mandatory	Bilateral market	Bilateral market	N/A
MK	/	Mandatory	Mandatory	N/A
BA	Market	Market	Market	N/A
RO	Mandatory	Market	Market	Market and Regulated

Energy

	FCR	aFRR	mFRR	RR
GR	N/A	Hybrid – free bids	Market - free bids	N/A
ME	Mandatory	Bilateral	Bilateral	Bilateral
RS	Mandatory	Mandatory	Mandatory	Free bids
BG	Pre-contracted bids	Pre-contracted bids	Pre-contracted bids	Pre-contracted bids
HR	Mandatory only	Bilateral market	bilateral market, organized market - pre-contracted bids	N/A
MK		Mandatory	Mandatory + market	
BA	N/A	Market - free bids	Market - free bids	N/A
RO	Mandatory only and not paid yet	Market – pre-contracted bids	Market – pre-contracted bids	Market – pre-contracted bids and regulated

Source: CROSSBOW D10.1, WP10, 2019

BALANCING MARKET TIMEFRAME – PRICING / BSPs SETTLEMENT

Capacity

	FCR	aFRR	mFRR	RR
GR	Marginal	Marginal	N/A	N/A
ME	Free of charge	Regulated	Regulated	Regulated
RS	N/A	Regulated	Regulated	N/A
BG	Regulated	Regulated	Regulated	Pay as bid
HR	N/A	Regulated	Regulated	N/A
NMK	N/A	Pay as bid	Pay as bid	N/A
BiH	N/A	Pay as bid	Pay as bid	N/A
RO	N/A	Marginal	Pay as bid	Pay as bid

Energy

	FCR	aFRR	mFRR	RR
GR	Pay as bid /Regulated	Pay as bid /Regulated	Pay as bid /Regulated	Pay as bid /Regulated
ME	/	Marginal pricing and hybrid	Pay as bid	Pay as bid
RS	Pay as bid	Pay as bid	Pay as bid	Pay as bid
BG	/	Regulated	Regulated	N/A
HR	/	Pay as bid	Pay as bid	
NMK	/	Pay as bid	Pay as bid	N/A
BiH	Not paid	Marginal	Pay as bid	Pay as bid
RO	Pay as bid /Regulated	Pay as bid /Regulated	Pay as bid /Regulated	Pay as bid /Regulated

Source: CROSSBOW D10.1, WP10, 2019

BALANCING MARKET TIMEFRAME – BALANCING MECHANISM / BRPs SETTLEMENT

	FCR	aFRR	mFRR	RR
GR	BRPs	BRPs	N/A	N/A
ME	Generators	TSO	TSO	TSO
RS	Grid users	Grid users	Grid users	N/A
BG	End users	End users	End users	End users
HR	Hybrid	Hybrid	Hybrid	N/A
NMK	Generators	BRPs	BRPs	/
BiH	N/A	Grid users	Grid users	N/A
RO	N/A yet	Consumers	Consumers	Consumers

Recovery of costs for each balancing capacity product

Recovery of costs for each balancing energy product

	FCR	aFRR	mFRR	RR
GR	N/A	N/A	N/A	N/A
ME	Generators	BRPs	BRPs	BRPs
RS	N/A	BRPs	BRPs	N/A
BG	BRPs	BRPs	BRPs	BRPs
HR	Hybrid	BRPs	BRPs	N/A
NMK	/	BRPs	BRPs	/
BiH	N/A	Grid users	Grid users	N/A
RO	NA yet	BRPs and dispatchable units/consumers	BRPs and dispatchable units/consumers	BRPs and dispatchable units/consumers

Source: CROSSBOW D10.1, WP10, 2019

CROSS BORDER BALANCING

- Functional national BM is a prerequisite, plus harmonization of market timeframes, gate closure times and standardization of products
- Drawbacks to cost-effective use of regional resources
  - Giving advantage to national resources
  - Insufficient generation capacity and flexibility resources, as well as cross-zonal transmission capacity
- EnCS projects/efforts
  - Platforms for imbalance netting and for cross-border exchange of balancing energy from mFRR and RR were developed
  - Dry-run of **the imbalance netting platform in WB6** shows that about **16 million EUR may be saved annually**, which will affect mostly the TSOs of Serbia, North Macedonia and Kosovo
  - Dry-run of **platform for mFRR and RR** was indicated that about **4.3 million EUR may be saved**

Source: CROSSBOW D1.1, WP1, 2018

- Cross-border exchange of balancing services
  - ***BiH:*** Balancing reserve exchange with EMS and CGES (domestic reserves are used firstly regardless of the price), cross border exchange of balancing energy in the SHB block
  - ***ME:*** Exchange of balancing energy and capacity with EMS and NOSBiH
  - ***NMK:*** Common sizing of reserves in SMM block – no cross-border purchase
  - ***RS:*** Exchange of balancing energy from mFRR with NOSBiH and CGES, common sizing of reserves in SMM block – no cross-border purchase
  - ***BG:*** No commercial exchange of balancing reserve or energy with neighbouring TSOs
  - ***GR:*** Not reported
  - ***HR:*** Cross border balancing in the SHB block and imbalance netting with Slovenia and Austria
  - ***RO:*** Not reported

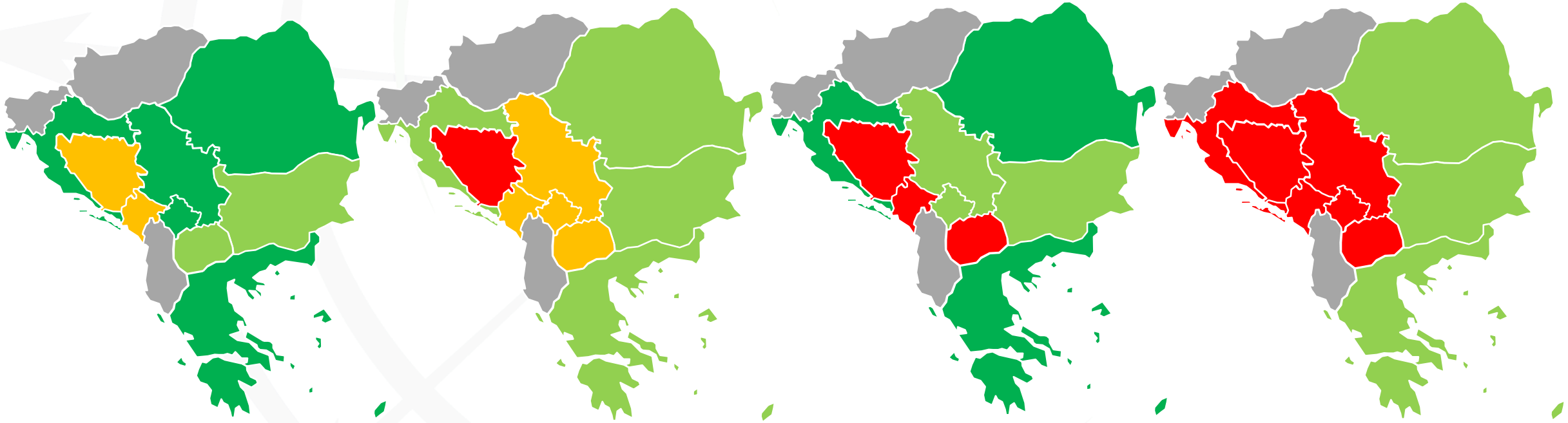
CROSS BORDER BALANCING

Imbalance netting: IGCC

aFRR: PICASSO

mFRR: MARI

RR: TERRE

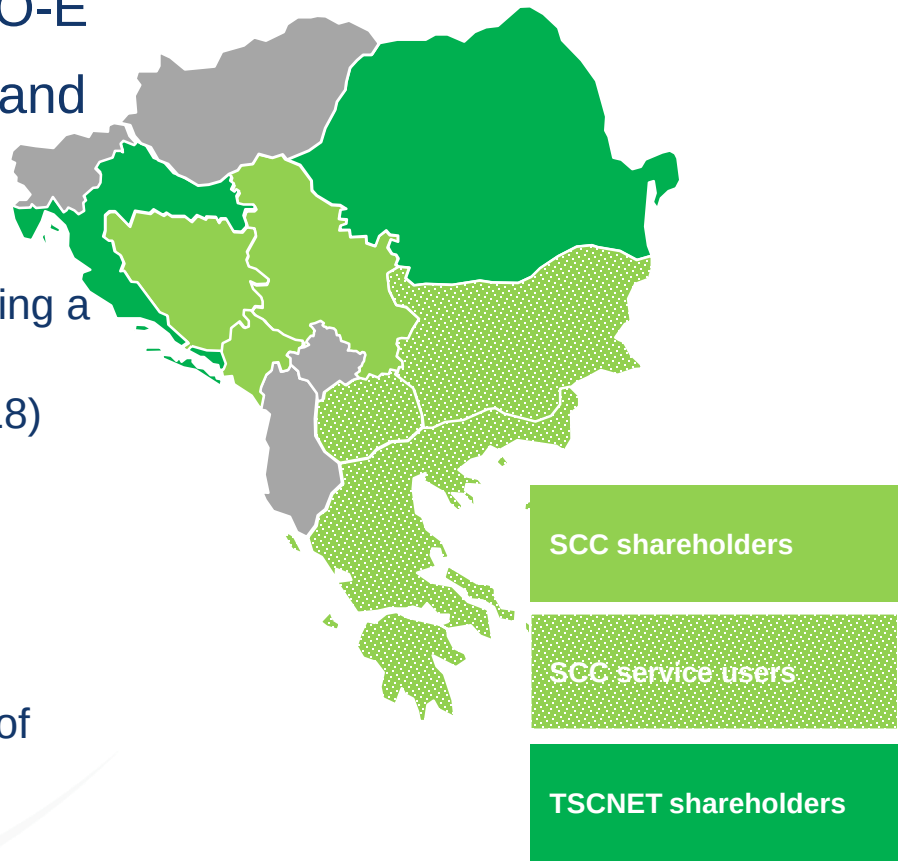


Source: CROSSBOW D1.1, WP1, 2018 and ENTSO-E Electricity Balancing in Europe, November 2018

SYSTEM OPERATION

- System operation issues –activities of the TSOs guided by ENTSO-E
- Founders and shareholders of SCC (EMS, NOS BiH and CGES) and service users (MEPSO, IPTO, ESO)
- Tasks of SCC
  - Validation and correction of Individual Grid Models for DACF and IDCF and creating a Common Grid Model for Continental Europe; (from January 2018)
  - Performing Security Analysis based on Common Grid Models; (from January 2018)
  - Coordinated Capacity Calculation; (dry run)
  - Short and Medium Term Adequacy
  - Outage Planning Coordination
  - Common Grid Model Alignment; (will start at a later stage)
  - Preparation and delivery of Monthly and Yearly statistical reports on overloading of transmission system elements
- HOPS and TRANSELECTRICA participate in TSCNET

Participation in RSCI



Source: CROSSBOW TSO Questionnaire, WP1, 2018

CONCLUSIONS

- **Forward market timeframe**
  - Most of the volumes at WB electricity markets are still traded at the **physical bilateral contract** forward markets
- **Day-ahead and Intraday market timeframe**
  - RS is a good example with DAM already in operation (no other WB country has such market)
  - NMK, ME, BiH and AL are in preparations/talks for establishing national DAMs and their coupling with the neighbouring markets
  - EU countries from SEE (Romania, Bulgaria, Croatia, Czech Republic, Hungary, Poland and Slovenia) recently entered into IDM coupling within project called LIP 15
- **Balancing market timeframe**
  - Most of the CROSSBOW Project participating countries have taken steps to establish national BMs and to participate in EU projects in support to the implementation of the balancing NCs
  - Nevertheless, a uniform implementation of all Market and System Operation NCs across all countries is a prerequisite for the establishment of a functional regional BM

THANK YOU

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Vesna Borozan

University Ss. Cyril and Methodius in Skopje

Faculty of Electrical Engineering and Information Technologies

vesnab@feit.ukim.edu.mk

For more information visit: crossbowproject.eu

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