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

TRANSMISSION GRIDS AND ENERGY MARKET LEGISLATION AND REGULATORY FRAMEWORKS

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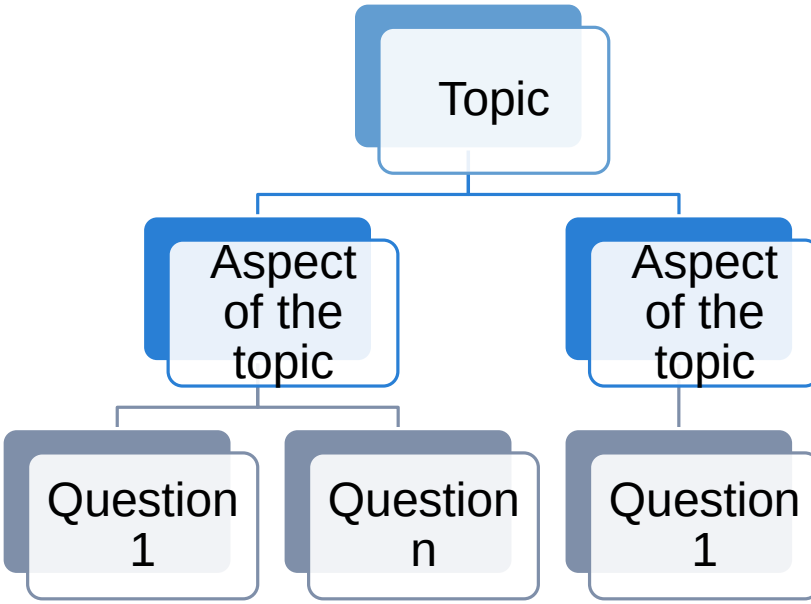
PURPOSE AND SCOPE

- 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 a region consisting of EU MSs and EnC CPs
  - Technical and regulative aspects of the electricity sector in the countries of the 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

QUESTIONNAIRE

- Topics addressed
  - Implementation of required legislation related to electricity markets development
  - Cross-border trading and balancing
  - Capacity allocation
  - System operation
  - Connection of generators and infrastructure
  - Level of penetration of renewable energy sources (RES), capabilities for demand response (DR) and storage
  - Development of Smart Grids



ANCILLARY SERVICES

- Current procurement of Ancillary Services (AS) by TSO/DSO

- ***BiH:*** Yearly and monthly auction. If necessary, additional arrangements with providers
- ***RS:*** TSO purchases all AS for a regulated price from one provider
- ***ME:*** TSO purchases all AS for a regulated price
- ***BG:*** TSO purchases all AS for a regulated price
- ***HR:*** TSO procures AS in a regulated way
- ***RO:*** TSO procures AS by auction
- ***GR:*** Primary and secondary reserves at the day-ahead market prices.
  Generators not compensated for providing tertiary reserve, volumes are determined on a day-ahead basis.
- ***MK:*** State owned company is obliged to provide all AS

AS Procurement

	Auction
	Procured at regulated prices
	Procured at regulated price from state owned company

CROSS BORDER BALANCING

- Status of implementation of a market-based balancing model

- ***BiH:*** Established in 2016
- ***RS:*** No balancing market, balancing capacity is procured by TSO, regulated price
- ***BG:*** Implemented in 2014
- ***GR:*** Network codes are prepared and given for public consultation
- ***MK:*** Dry-run is in progress

FORWARD CAPACITY ALLOCATION

- Use of capacity calculations from regional operational centre
  - ***RS***: Coordinated calculations are in dry-run phase
  - ***ME:*** Receive daily calculations but do not use them officially
  - ***BG:*** Yes
  - ***HR:*** Currently they get flow-based calculations from another company. Coordinated calculation is planned
  - ***GR:*** Methodologies to be finalised, approved and tested

- 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
  - **MK:** Founder and partner in SEE CAO

SYSTEM OPERATION

- System operation issues – the activities of the TSOs guided by ENTSO-E
- Participation of TSOs in Regional Security Coordination Initiatives
  - Founders and shareholders of SCC (EMS, NOS BiH and CGES) and service users (MEPSO, IPTO, ESO)
  - HOPS participates in TSCNET
  - Pending developments (information from TRANSELECTRICA)

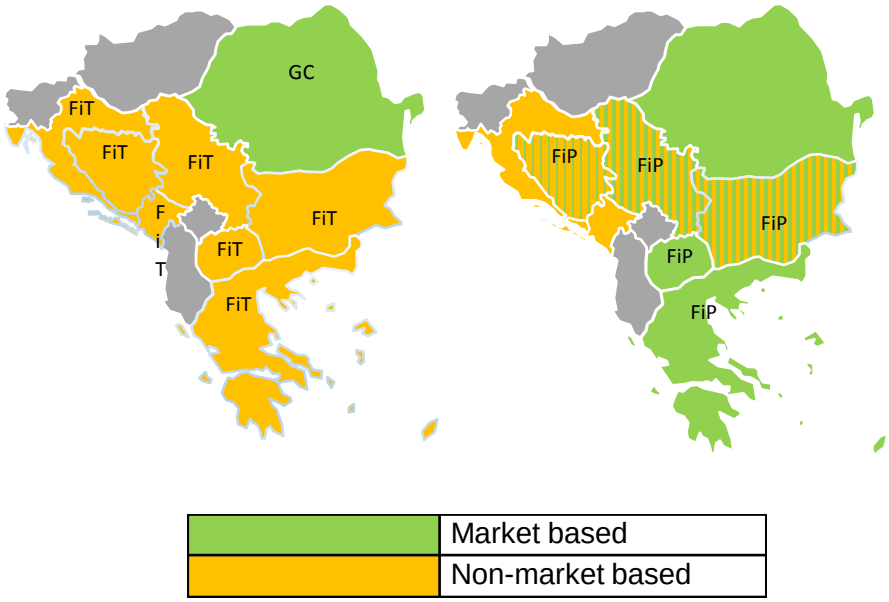
Participation in RSCI

	Not RSC shareholder/user
	RSC shareholder/user

RES SUPPORT

- Barriers to implementation of the support schemes:
  - too low or high installed capacities of certain RES technologies that receive support, which are administratively set by state bodies
  - frequent changes in the mechanisms may lead to low confidence of investors into state institutions responsible for implementation of RES support.

RES support schemes – current and future developments



RES CONNECTION & OPERATION

- Non-discriminatory connection of RES generators is applied in most of the countries in the region (except in BG and ME, where priority of connection is applied)
- As a general characteristic of the region, RES generating units have priority in dispatch
  - TSOs in the region have the right to send re-dispatch orders in case of congestion, but so far, this was rarely applied
  - No compensation for RES curtailment, except in ME and RS, the latter done by extending the duration of RES support scheme adequately to the curtailment time. GR plans to introduce compensation

RES balancing responsibility

	Balancing responsible
	Balancing responsibility transferred to other entity

FLEXIBILITY ASSETS

- Availability of flexibility assets

- ***BiH:*** Pumped storage hydro (2x220 MW), they lost one 180 MW
- ***ME:*** Manually activate up to 50 MW from an industrial consumer
- ***BG:*** 3 Pumped storage hydro (932 MW), 3 contracts with industrial consumers
- ***HR:*** 1 Pumped storage hydro (276 MW), no other storage facilities
- ***RO:*** Many pumped storage hydro (200-285 MW), 2 wind power plants with storage of 500 kV for 30mins, 1 wind with storage of 1,26 MW for 1h
- ***GR:*** 2 Pumped storage hydro exits, but the regulatory framework for them to operate in such way is not sufficient

STORAGE

- The region lacks regulation related to energy storage
  - **BIH, BG, RS:** connection rules for PSHP exist
  - **HR, RS:** storage units can participate in the market
  - **BG:** TSO/DSOs are not allowed to own storage
- Future developments
  - **RO:** regulation on storage to be adopted, along with energy storage support measures
  - **BG:** adoption of regulation on energy storage connection in 2018

Energy storage connection

	No specific regulation
	Regulation exists for PSHP

DEMAND RESPONSE

- Although in some countries there is no specific regulation on DR, also, no specific regulatory limitations to its use are observed
- In the region, in general, there are no existing consumer groups engaged in providing DR
  - **ME:** large consumers (aluminum industry) can provide up to 50 MW DR service
  - **BG:** In future, DSOs shall act as DR aggregators
  - **HR:** pilot project on aggregation of various consumers
  - **BH:** experience in use of large consumers for frequency restoration reserve in the past
  - **GR:** implement “Interruptible Load Service” which enables high and medium voltage consumers to auction for a pre-specified amount of power

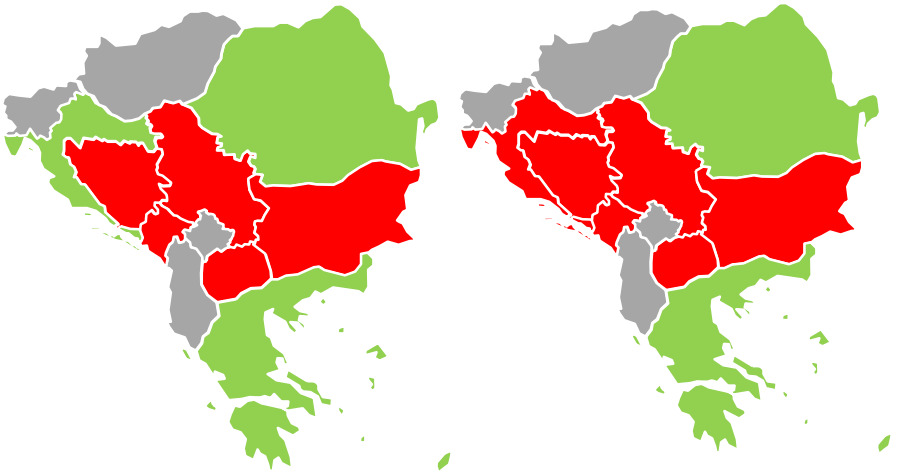
DR regulation

	No specific regulation
	Regulation exists – contracts between TSO & DR provider

SMART GRIDS

- Lack of funding of R&D Smart Grids projects
  - **HR, RO:** national funding
  - **GR:** mostly EU funded projects
- Greece may serve as an example for research, development and deployment of Smart Grids for the region
  - The continuous work of the universities, research centers and utilities in Greece under various EC funded projects has been a key to gain substantial experience in Smart Grids and contribute to the global progress of new smart technologies, applications and concepts
- Limited number of pilot projects

Smart Grids: R&D funding and pilot projects



	R&D – no national funds, lack of projects
	R&D projects

	No pilot projects
	Pilot projects

CONCLUSION -1

Electricity markets

- Markets are supposed to be fully opened; but there is no competition and the prices are mostly regulated
- Ancillary services are procured by the TSOs for a regulated price usually only one provider is available
- Flexibility assets are available and used in most of the countries, GR is an exception

Market trading codes

- RS as a good example with day-ahead spot market already in operation (No other non-EU WB country has such market
- RO, HR, BG have day-ahead markets
- MK, ME, BiH in preparations/talks

Forward capacity allocation

- Most countries are members of SEE CAO. RS is not present in SEE CAO from WB countries. BG and RO are in favour of JAO.
- Countries have calculations from regional operational centre but (except BG) do not use them. We suspect that lack of cooperation and some other political challenges arise.

Cross border balancing

- Market-based balancing model is mostly in the dry run phase, BiH and BG have already implemented it, RS does not plan it.

CONCLUSION - 2

- **System operation**
  - Membership in ENTSO-E has been an essential advantage for the whole region, driving the technical advances in system operation
- **Storage**
  - Lack of regulation on energy storage, except for PSHP. RO, BG plan to introduce regulation
- **Demand response**
  - No specific regulation on DR, also, no specific regulatory limitations to its use are observed. Low implementation of DR possibilities
- **RES support and operation**
  - Countries of the region promote and support RES. Mostly FiTs are in place, except in RO, where CGs are used.
  - Competitive procedures are generally not in place, except in some form in RO, GR and HR.
  - Costs for support are based on non-tax levies included in the electricity bills
- **Smart Grids**
  - Low penetration of SG, low number of R&D projects and pilot projects
  - Smart meter roll-out varies, higher penetration in EU MS

THANK YOU

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