USEA EMI Webinar:
"Capacity Markets for Power Generation: Key Features and Potential Application to Southeast Europe

Capacity Markets: Lessons from Europe's first movers and application to Southeast Europe

Fabien Roques
Executive Vice President, Compass Lexecon
FRoques@compasslexecon.com

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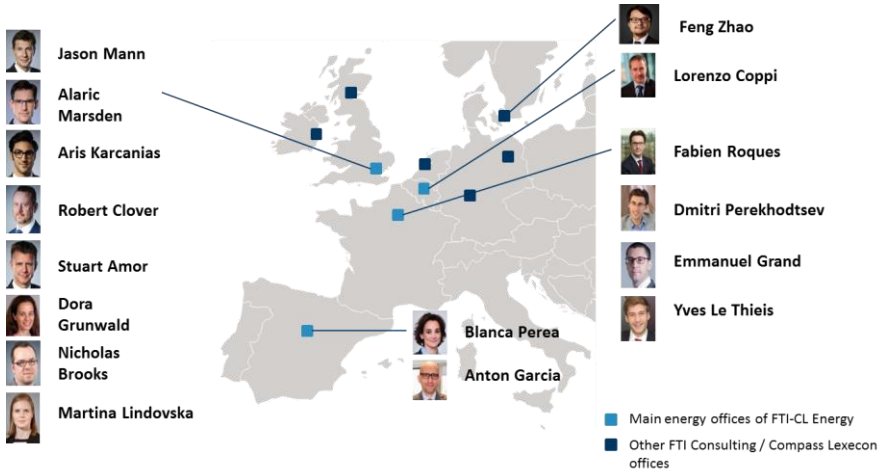
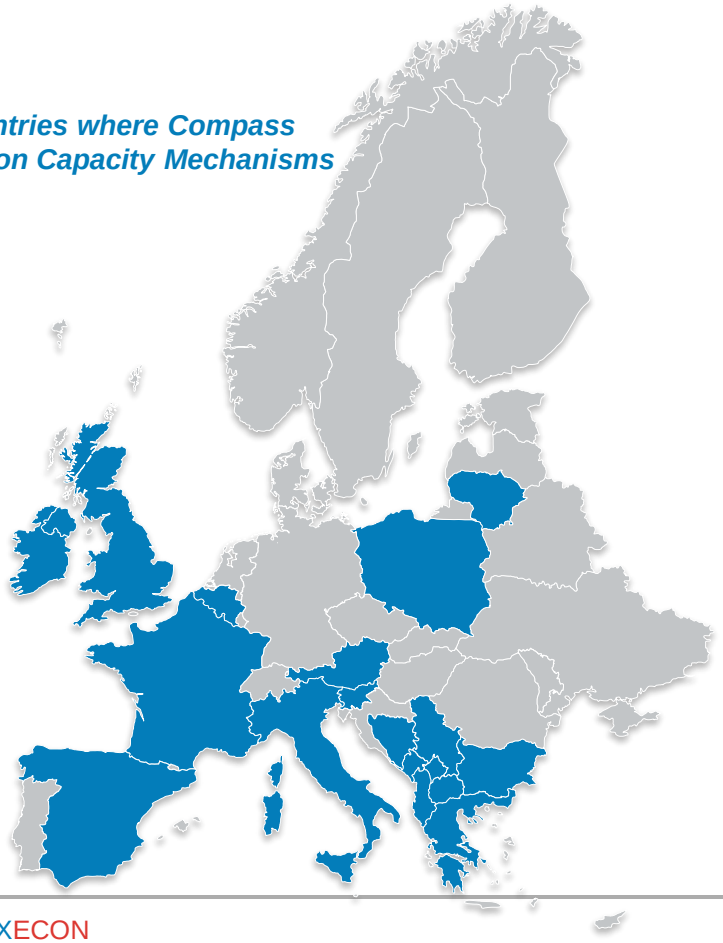


OUR TEAM HAS A SIGNIFICANT EXPERIENCE WITH THE IMPLEMENTATION OF CAPACITY MECHANISMS IN EUROPE

Our involvement in Capacity mechanisms in Europe

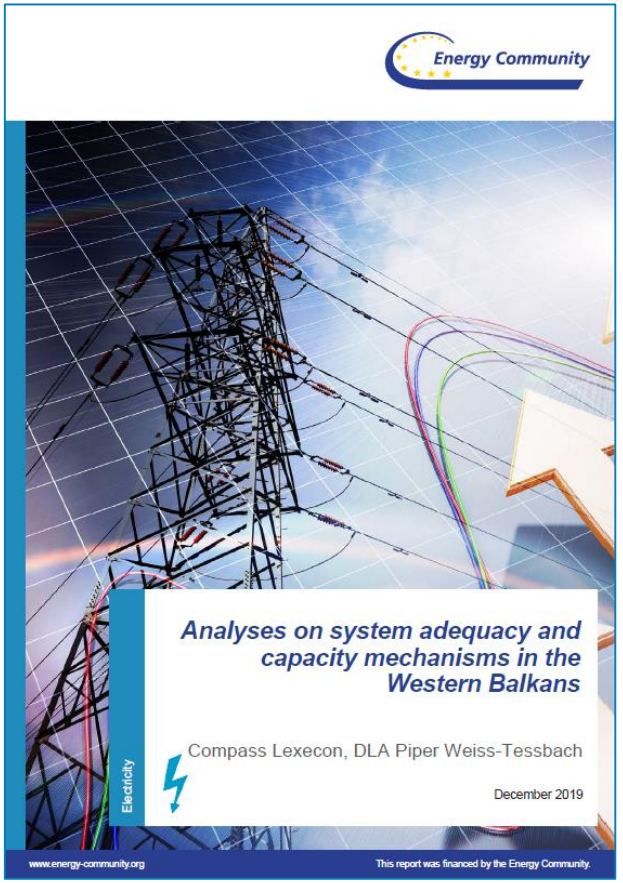
Over the last five years, our team of experts has participated in the discussion, design and state aid analysis of Capacity Mechanisms in at least 12 European countries.

European countries where Compass Lexecon worked on Capacity Mechanisms



Our recent study of adequacy in the Western Balkans

Our team recently conducted a study for the Energy Community Secretariat on the need for capacity mechanisms given the context of transition in the Western Balkan countries



Section 1: Introduction to Capacity Remuneration Mechanisms (CRMs)

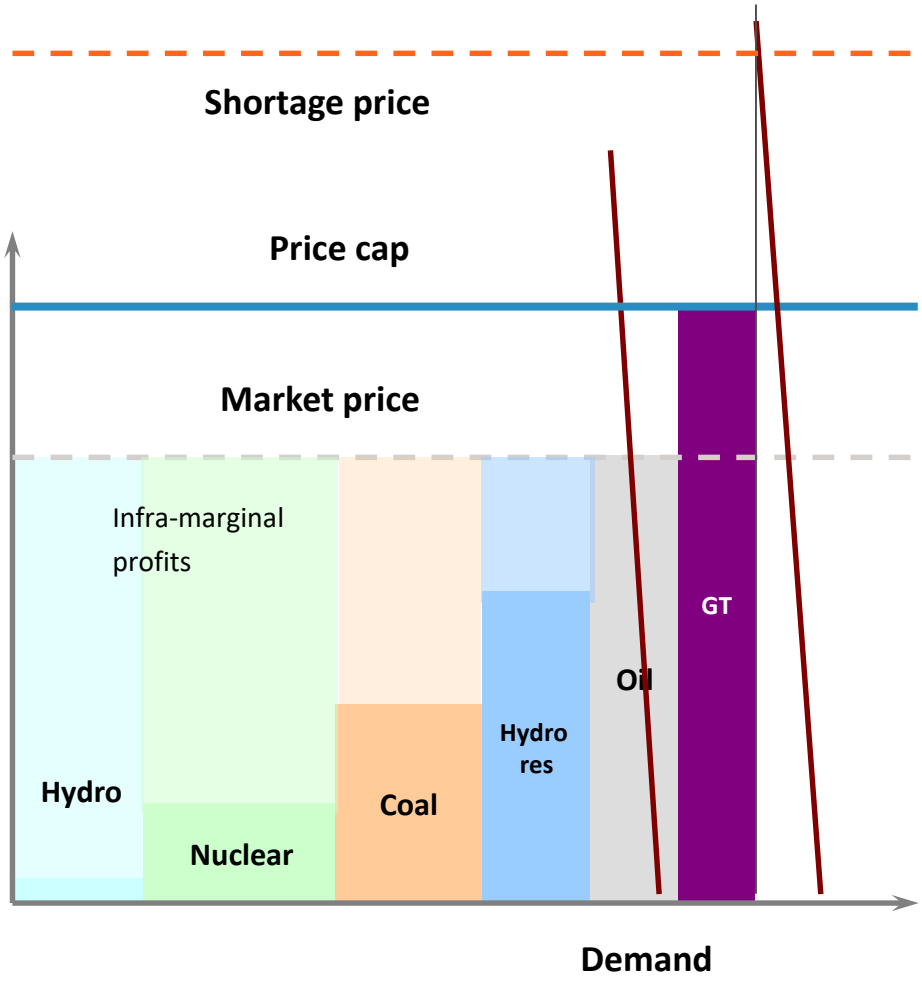
THE NEED FOR CRM IS DRIVEN BY THE "MISSING MONEY PROBLEM" DUE TO VARIOUS MARKET AND REGULATORY FAILURES

In theory in a perfect "energy only" market adequacy should be met

- Price should be able to reach VOLL in periods of scarcity
- In the long run, such prices should ensure reliability level of LOLE = CONE/VOLL

The "Missing money" problem

- Inability of the energy (and AS) markets alone to induce investment in necessary to meet the adequacy target (e.g. 3h LOLE)
- "Missing money" problem arise due to market failures suppressing the market prices at times of shortage
  - Price and bid caps, market power mitigation measures
  - Lack of demand response
  - Lack of scarcity pricing mechanisms
  - Inefficient balancing and ancillary services markets
  - Etc.



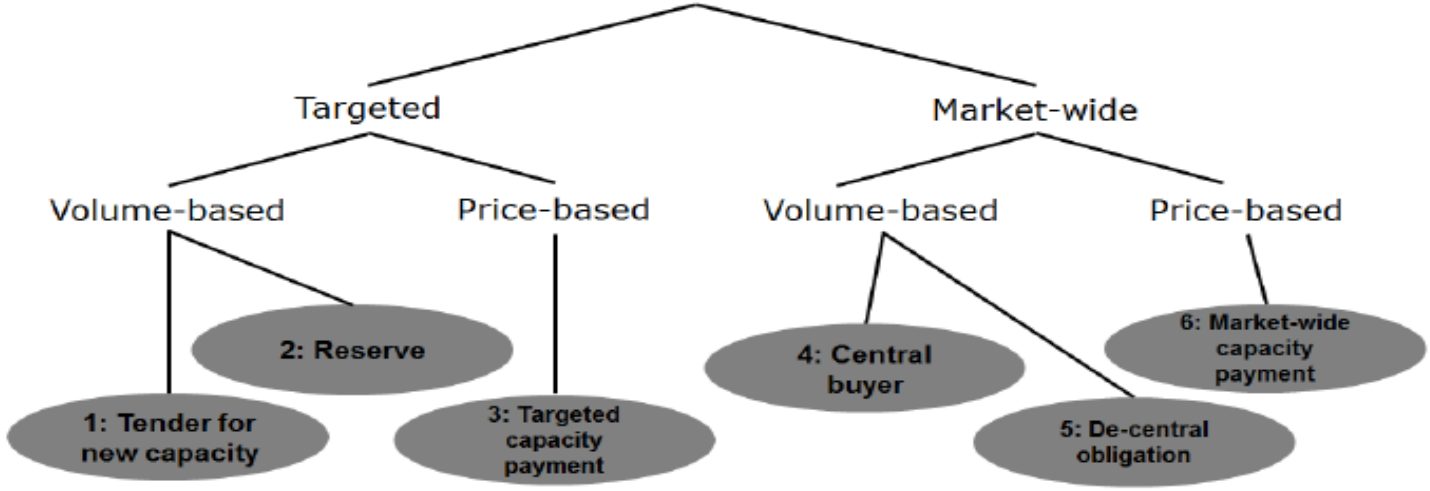
THE EC DISTINGUISHES TARGETED AND MARKET-WIDE CRM, THAT CAN BE EITHER VOLUME OR PRICE-BASED

The **EC 2016 Sector Inquiry defines Capacity Remuneration Mechanisms (CRM) as measures that enable revenues for capacity providers** and thus they may fall within the category of state aid measures and that can be subject to the Union's rules on state aid.

The EC Sector Inquiry groups the Capacity Mechanisms into **two broad categories:**

- **Targeted mechanisms that only benefit specified operators** (i.e. tenders for new capacity, strategic reserves and targeted capacity mechanisms);
- **Market-wide mechanisms,** which are in principle open to participation from all categories of capacity providers (i.e. central buyer obligations, de-central obligations and capacity payments).

Furthermore, within these two categories, the EC **distinguishes volume-based and price-based mechanisms**



Source: EC 2016, Final Report of the Sector Inquiry on Capacity Mechanisms. Commission Staff Working Document

THE EC CONSIDERS THAT CRMS CANNOT BE A SUBSTITUTE FOR REFORMS TO FIX THE ROOT CAUSES OF THE "MISSING MONEY"

Market developments that make the price more reflective of scarcity

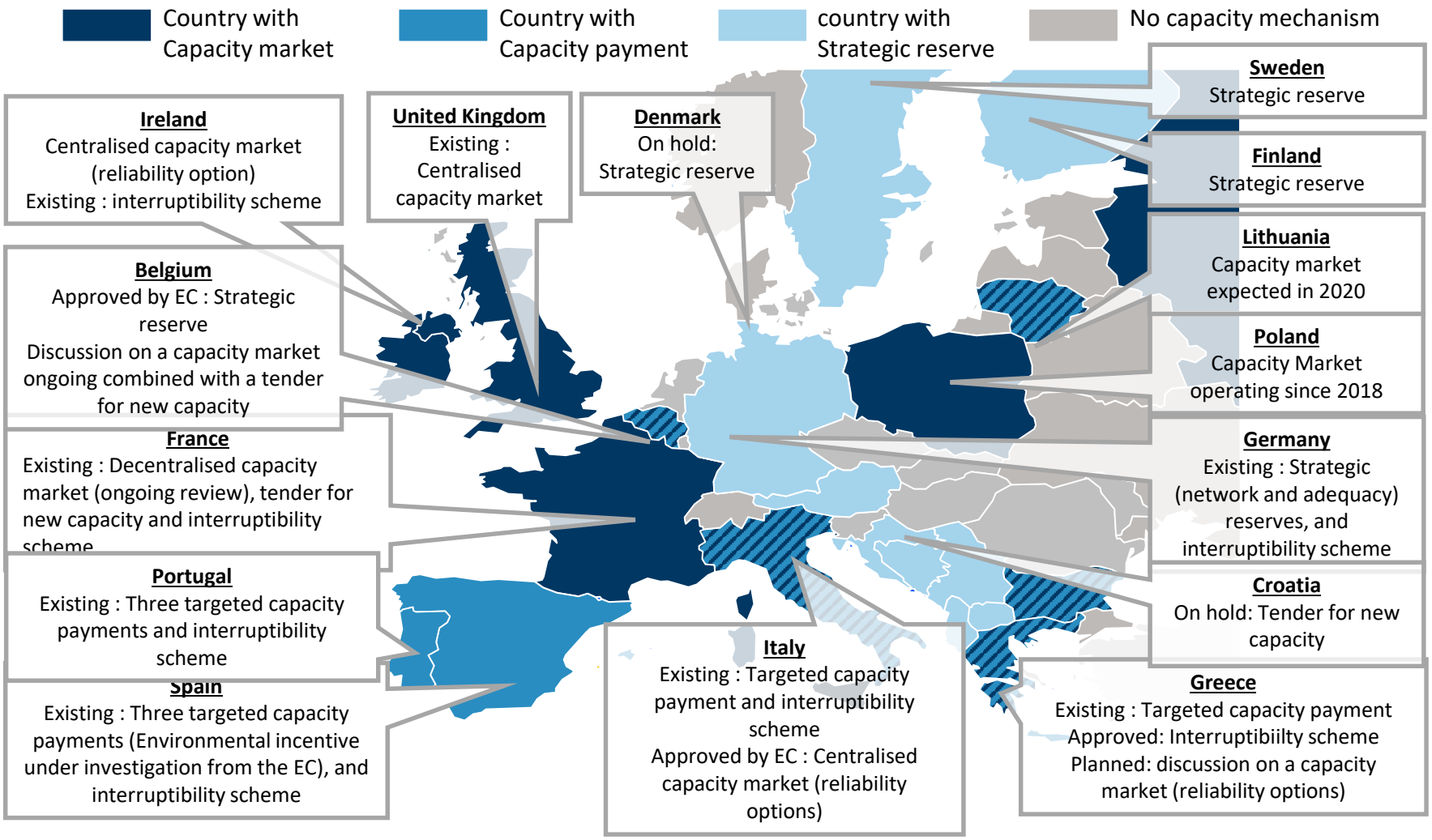
1. **Market coupling**
   - The implementation of market coupling should ensure that flows across borders go to the country with higher prices, i.e. where balance between supply and demand is scarcer.
2. **Short-term markets' improvements**
   - Improving intraday markets' functioning and fostering cross-border balancing allow exchanges to respond to outages and short term warnings
3. **Balancing price reforms and price cap harmonisation**
   - Making imbalance prices more cost-reflective / incentivising (marginal pricing…) facilitates scarcity pricing in all market prices
   - Price cap harmonisation (toward high prices) avoids wrong flows related to different price caps

EUROPE FEATURES A WIDE RANGE OF CRMS

Capacity mechanisms	Targeted	Market-wide
Volume-based	**Tender for new capacity** • The beneficiary of a tender **receives financing for the construction of a power plant**. • The top up capacity may run in the market as normal (without a guarantee that the electricity will be sold) • It would also be possible for the plant to be supported through a power purchase agreement.	**Central buyer** • T**he total amount of required capacity is set centrally, and then procured through a central bidding process** • Potential capacity providers compete in the auction so that the market determines the price.
	Strategic reserve • The top **up capacity is contracted and then held in reserve outside the market**. • This **aims to keep existing capacity available** to the system. • It is **only run when specific conditions are met** (e.g. when there is no more capacity available or electricity prices reach a certain level).	**De-centralised obligation** • **An obligation is placed on retail suppliers to secure the total capacity they need** to meet their consumers' demand • As opposed to the central buyer model in addition to the **central bidding process**, the model relies on bilateral trade of capacity.
Price-based	**Targeted capacity payment** • A **central body sets the price of capacity** • This price is then **paid to a subset of capacity operating in the market** • Eligibility to payment can depend on technology or other specific criteria	**Market-wide capacity payment** • **The price of capacity is set centrally**, at the level considered necessary to bring ensure sufficient total capacity. • The capacity price is **paid to all capacity providers** in the market.

Section 2: The experience with CRMs to date in Europe

CAPACITY MECHANISMS HAVE BECOME AN INTEGRAL PART OF THE EUROPEAN MARKET DESIGN



THE CHOICE OF A CRM MODEL HAS BEEN DRIVEN BY THE LOCAL SPECIFICITIES OF THE ELECTRICITY SYSTEM

	POLAND	FRANCE	GERMANY	BELGIUM	ITALY
Local specificities	Substantial mothballing and phasing-out of thermal units by 2020	Uncertainty of nuclear and mothballing of thermal capacity; peak demand growth	Grid constraints from North to South - Nuclear phase-out - Strong RES growth	Transition from over-capacity towards the need for new capacity to replace the phased-out nuclear plants	Massive phase out of thermal capacity; Internal zones and grid constraints; Strong RES growth Central dispatch
Key issues	Capacity shortfalls already experienced in 2015, and expected in 2020 and 2025	Peak demand growth (+25% in 10 years); Missing money for peak plants; Low profitability of CCGTs	Capacity needs in Southern Germany; Flexibility needs; Low profitability of CCGTs	High degree of interconnection but unwilling to depend on neighbours for security of supply	Overcapacity and low profitability of CCGTs; Coordination of generation and network investment; Flexibility needs
CRM design	Market-wide CRM centralised approach based on auctions for Certification obligations	Market-wide CRM Decentralised approach Tenders to address local issues	Strategic reserves aimed at security of supply in extreme events Network reserves for local issues	A market-wide CRM to replace the strategic reserve Centralised RO to address market power	Zonal market-wide CRM to maintain capacity and trigger investment RO to address zonal market power

THE EUROPEAN COMMISSION REQUIREMENTS - STATE AID GUIDELINES FOR CRMS

The European Commission has developed a **set of guidelines for the design of CM to ensure their compliance with State Aid regulations**. A CRM considered as State aid should meet the following criteria to be accepted:

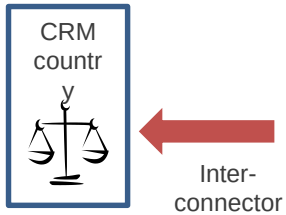
Key State Aid criteria	Implications	
1 Contribution to well-defined objective of common interest 2 Need for state aid intervention	**Justification**	• Must be clear need for state intervention and the objectives must be clearly defined • Objective must be consistent with phasing out environmentally harmful subsidies
3 Appropriateness of the aid measure 4 Incentive effect 5 Proportionality of the aid (aid to the minimum)	**Design**	• Aid should not change the behaviour of market players and be non discriminatory • Aid to the minimum: the amount paid should tend to zero as capacity available approaches the required level • Must have reasonable rates of return a competitive bidding process is encouraged
6 Avoidance of major undue negative effects on competition and trade between member states 7 Transparency of aid	**Impact on competition and internal market**	• Operators from other member states should be allowed to participate • Negative effects on the internal market should be avoided • Should not reduce incentives to invest in interconnection

KEY ISSUES FOR CRM IMPLEMENTATION

- **Eligibility.**
  - What capacity providers are eligible to participate in the CRM and on which conditions, especially, DSR, RES, and interconnection?
  - What are the arrangements for the DSR in CRM depending on their participation in other markets (e.g. obligation to participate in Balancing Market)?
- **Certification.**
  - What is the process for the capacity providers to certify their capacity and how the de-rating factors are established?
  - In particular, what is the practice relative to hydro capacity, pumped storage and other storage technologies?
- **Availability obligation.**
  - How does the mechanism induce the capacity providers to be available during the system stress conditions?
  - What drives the difference between these arrangements between the CRMs featuring Reliability Options and capacity obligations?
- **Auction parameters.**
  - How the overall capacity requirement is set based on adequacy analysis?
  - How the RES and interconnection are taken into account in setting the capacity target? How the shape of the demand curve is determined?
  - How the Cost of New Entry (CONE) and net CONE are determined for the calculation of various auction parameters?
  - How the price caps and bid caps for existing and new capacity are calculated and how the associated coefficients of (net) CONE are set?
- **Contractual conditions.**
  - What are the contract conditions and contract durations?
  - How are the contract duration terms associated with the amount of investment necessary for the capacity to remain in the market?
- **RO parameters.**
  - How the RO Strike Price is set, what is the underlying technology, assumptions, formula and update frequency?
  - What is the reference market?

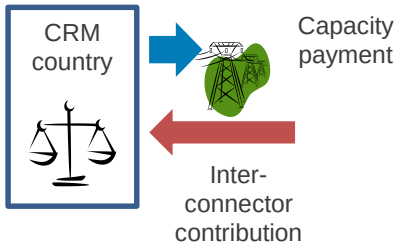
EXPLICIT CROSS-BORDER PARTICIPATION IS A REQUIREMENT FOR THE EUROPEAN COMMISSION

Implicit Interconnector



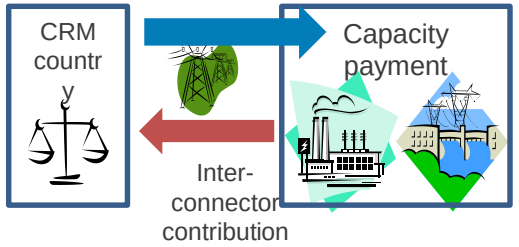
- **How does it work?**
  - TSO quantifies the expected contribution of interconnectors to the capacity requirement in national CM, and
  - TSO uses this to adjust the capacity to be procured from national resources.
- **What are the drawbacks?**
  - Interconnectors or XB capacity do not receive capacity payments.
- **Examples**
  - First CRM Auctions in GB and France

Explicit Interconnector



- **How does it work?**
  - Each interconnector is de-rated based on its expected contribution at times of system stress
  - Interconnector then bids for capacity – alongside other local providers and receives capacity payment if is selected
- **What are the drawbacks?**
  - XB capacity providers do not receive capacity payment.
- **Examples**
  - Implemented in GB as a permanent solution and was adopted in Ireland and Poland as a transitory solution

Explicit capacity provider



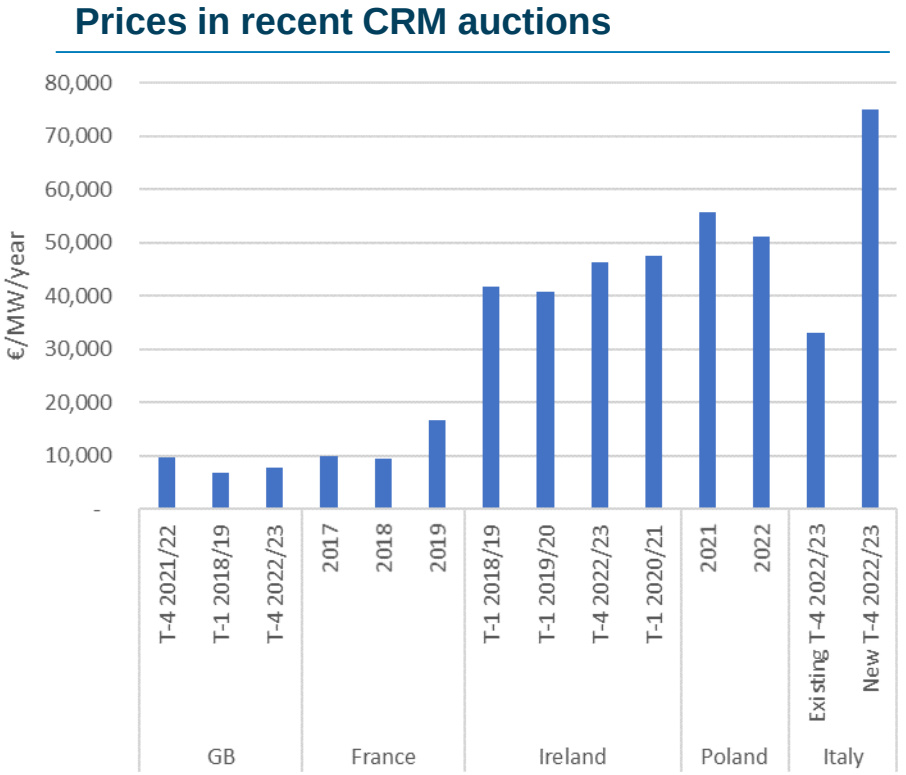
- **How does it work?**
  - Foreign providers are able to participate directly in the national CM
  - Mechanisms should be put in place to ensure national consumers do not pay for capacity if it does not deliver when required (simultaneous scarcity events)
- **What are the drawbacks?**
  - Requires agreements on design with neighbours on various levels: TSO, regulator, States.
- **Examples**
  - EC Targeted Model
  - Adopted as a enduring solution in France, Ireland, Poland

The EC has since the CEP excluded the possibility of transitional arrangements and explicit capacity participation is now the norm.

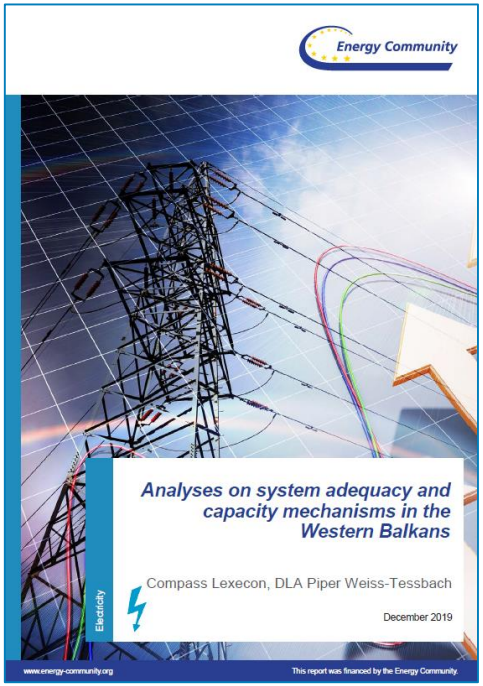
LESSONS FROM EXPERIENCE: CAPACITY MARKETS HAVE CLEARED AT DIFFERENT PRICES

The clearing capacity prices vary greatly across the recent capacity auctions depending on system conditions and CRM design

- Capacity adequacy situation and whether the adequacy target can be met with existing capacity or whether refurbished or new capacity is needed (new coal capacity cleared in both auctions in Poland)
- The fixed O&M cost of the existing capacity required for adequacy (e.g. relatively high in Ireland)
- The expected margins earned by the capacity in the energy and ancillary service markets (likely high in GB and France)
- Bid caps for the existing capacity (Irish cap being higher than GB and a possibility to derogate lead to a higher price)
- Italian capacity auction allows clearing at separate prices for Existing and New capacity.



Section 3: The case of the Western Balkans



STUDY CONTEXT: WB6 COUNTRIES ELECTRICITY SECTOR CHALLENGES

The Contracting Parties of the Energy Community in the Western Balkan countries (WB6) are Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia and Serbia.

Current electricity sector organization of WB6 countries

- **60%** of WB6 generation comes from **lignite plants**
- **Incomplete stage of liberalization of the wholesale market** which is shaped by ongoing reforms (e.g. market coupling) and with **significant involvement of the state** (through ownership, regulation, subsidies, state aid)
- 50 – 90% of electricity generated by incumbent utilities in the WB6 are **reserved for the suppliers of regulated customers**
- Volumes traded on the free market represent mainly the cross-border trade to **sell incumbents' surplus** or **procure volumes** to cover shortages for incumbents or network losses.

Conditions for EU accession: further liberalisation, implementation of emission standards and ETS

- WB6 countries are legally bound to implement the core EU energy legislation, the so-called "***acquis communautaire***"
- Most of WB6 **transposed the Third Energy Package** in their national legislation and must already comply with the Large Combustion Plants Directive **(LCPD)** and Industrial Emissions Directive **(IED) emission standards**
- In 2019 EC adopted an updated **Electricity Regulation 2019/943** which contains further emission standards that would affect WB6 thermal plants (e.g. the 550g CO2/kWh and 350 kg of CO2 thresholds for capacity mechanisms eligibility)
- WB6 have yet to implement carbon pricing and join the **EU ETS**

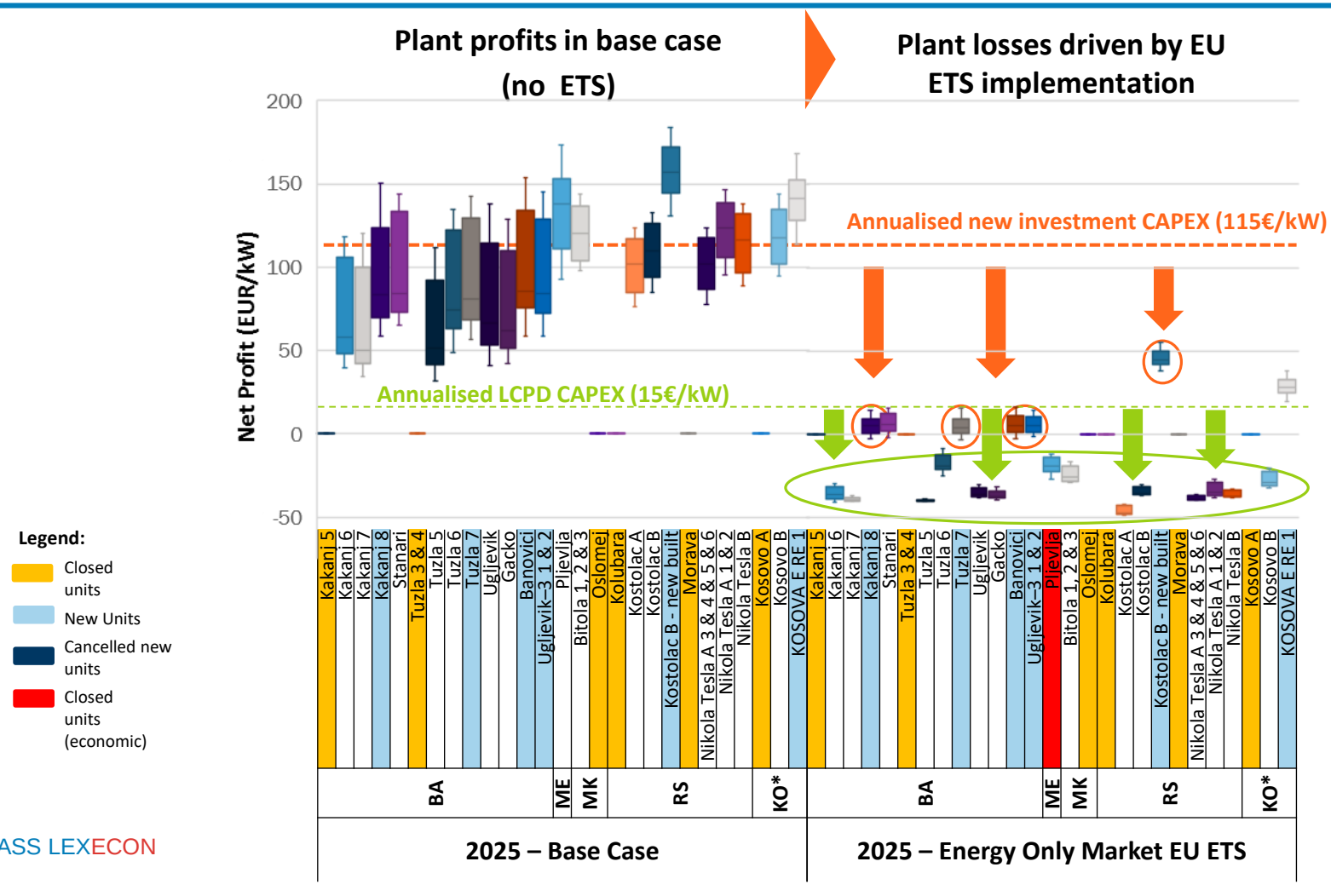
** This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.*

IMPLEMENTATION OF EU TARGET MODEL AND ETS WOULD IMPACT THE ECONOMICS OF THE WB6 POWER SYSTEMS

When the EU ETS is introduced, new and existing lignite plants will become unprofitable, leading to:

- **Closures of existing plants**: 0.9 GW in Bosnia, 0.4GW in North Macedonia and 3GW in Serbia.
- **Projects cancellations**: 1.5GW in Bosnia, 0.2GW in Montenegro, 0.7GW in North Macedonia and 0.3GW in Serbia

Net Profit = Energy Revenue + Reserve Revenue – Variable Cost – Fixed Cost



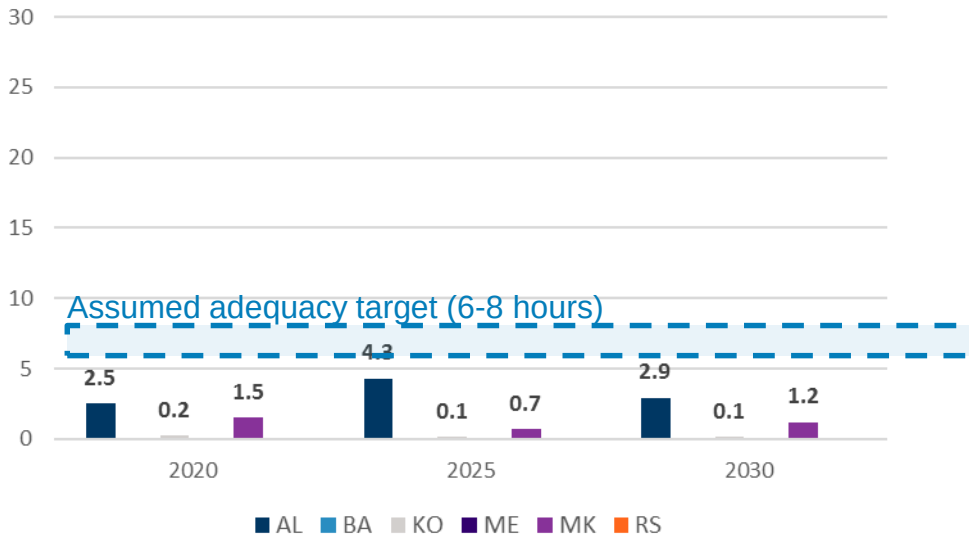
SIGNIFICANT CLOSURES OF THERMAL PLANTS IN WB6 COUNTRIES WOULD LEAD TO SECURITY OF SUPPLY ISSUES BY 2025

Assuming a **security of supply target of 6-8 LOLE** hours in all WB6 countries:

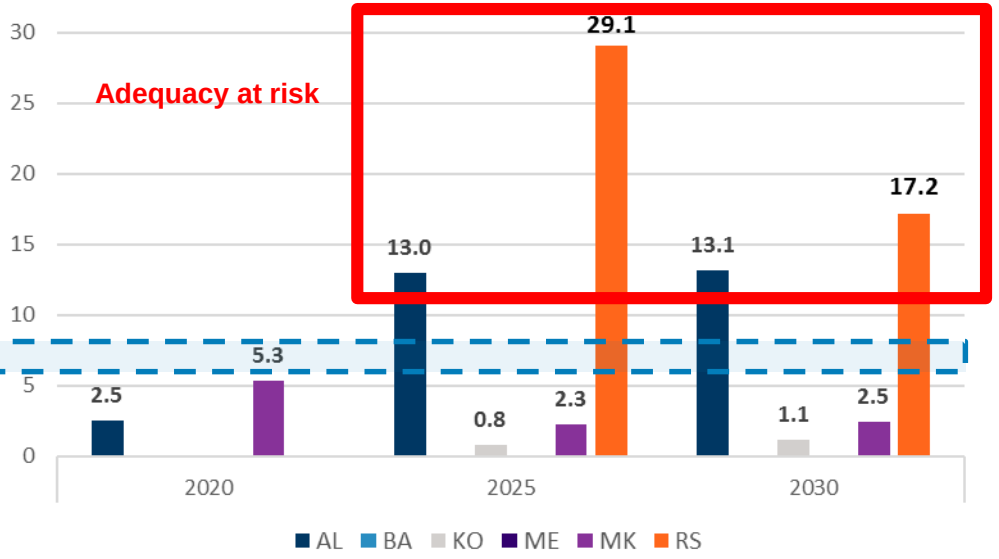
- No adequacy concerns in the Base case scenario if investment new and existing plants is forthcoming and if cross-border capacity is used efficiently;
- The **2025 ETS scenario would result in significant security of supply issues as soon as 2025**, in particular in **Albania and Serbia** due to (i) limited new investments in hydro (for Albania) and lignite (for Serbia) units, and (ii) closure of existing lignite plants (for Serbia).

➔ This raises the question of the **timing and compensation and investment framework** that would allow the **implementation of the ETS in WB6 countries**.

Loss of Load Expectation for WB6 countries, in the Base case scenario (number of hours per year)



Loss of Load Expectation for WB6 countries, in the EU ETS 2025 scenario (number of hours per year)



IMPLEMENTATION OF EU TARGET MODEL, EMISSION STANDARDS AND ETS COULD RAISE ADEQUACY ISSUES IN WB6 COUNTRIES

Further implementation of EU electricity target model, phasing out of existing state aids, implementation of RES targets, emission standards and EU ETS could reduce significantly profits of existing plants and make investment in new plants uneconomic.

- Thermal plants in WB6 countries will require significant investments to comply with LCPD and IED emission norms.
- Such scenario could induce adequacy issues as early as 2025 in WB6 induced by lignite plant closures and lack of new investments (closure of up to 4.4GW of lignite plants by 2030 in Serbia, Bosnia and Herzegovina and North Macedonia and 2.8 GW of cancelled investments).

➔ **This raises the question of the timing (gradual phasing in) and compensation framework (e.g. via free allowances, investment support, and compensation mechanisms) that would allow the implementation of the ETS in WB6 countries.**

Further development and efficient use of interconnection capacity is key to maintain generation adequacy in the region

- All WB6 countries, except Bosnia and Herzegovina, rely on import capacity during peak hours.
- In case available interconnection capacity is limited, Montenegro, North Macedonia, Serbia and Kosovo* will likely face adequacy issues at times of peak demand even without implementation of ETS.
- Because of the high reliance on interconnection, plant closures in one country may “spill over” and have regional impact (e.g. closures of lignite plants may have adequacy impact on hydro-dominated Albania).

CONCLUSION: AS A COMPLEMENT TO THE ONGOING MARKET REFORMS, A CRM COULD BE USEFUL TO MAINTAIN ADEQUACY IN THE TRANSITION

In order to maintain generation adequacy in the transition, WB6 countries could implement capacity mechanisms taking into account the local specificities and EU guidelines

Strategic reserve could be useful to manage pace of plant decommissioning

- According to the EC, when adequacy concerns are driven by the risk of retirement of existing plants, a temporary strategic reserve may be appropriate intervention
- This would be the case in a number of WB6 countries as a result of introduction of emission standards and EU ETS
- Cross-border participation of neighboring countries is important given the critical impact of interconnection between countries

Market-wide capacity mechanism could support new investment but WB6 regional coordination necessary

- **When new investment becomes needed**, a **market-wide CM** (e.g. a centralized capacity market with long term contracts) could be phased in to support new investment
- The CM design will need to **account for the specificities of the adequacy issues** across the WB6 region (e.g. Serbian critical role), …
- **…**Whilst ensuring that a **coordinated regional CM approach** is favored to allow for cross-border participation

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Fabien Roques
Executive Vice President, Compass Lexecon
FRoques@compasslexecon.com
+33 1 53 05 36 29