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

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Introduction to our team

Section 1: Introduction to Capacity Remuneration Mechanisms (CRMs)

Section 2: The experience with CRMs to date in Europe

Section 3: The case of the Western Balkans

Conclusions
FTI-COMPASS LEXECON IS A GLOBAL CONSULTANCY GATHERING SENIOR EXPERTS ACROSS EUROPE

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FTI-CL Energy's senior energy experts in Europe

<table>
<thead>
<tr>
<th>Focus on our Energy practice</th>
<th>FTI-CL Energy’s senior energy experts in Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy and market design</td>
<td>Jason Mann</td>
</tr>
<tr>
<td>Investment decision support</td>
<td>Alaric Mansden</td>
</tr>
<tr>
<td>Energy markets modelling</td>
<td>Aris Kerkanias</td>
</tr>
<tr>
<td>Financial valuation of assets</td>
<td>Robert Clover</td>
</tr>
<tr>
<td>Business model development</td>
<td>Stuart Amor</td>
</tr>
<tr>
<td>Corporate strategy design</td>
<td>Dora Grunwald</td>
</tr>
<tr>
<td>Economic expertise in commercial litigations</td>
<td>Nicholas Brooks</td>
</tr>
<tr>
<td></td>
<td>Martina Lindovska</td>
</tr>
</tbody>
</table>

FTI-Compass Lexecon at a glance

- FCN: Publicly traded – NYSE
- Year founded: 1982
- Employees worldwide: 4,600+
- Senior Managing Directors: 460+
- Nobel Laureates: 2
- Advisor to the world's top 10 bank holding companies: 10/10
- Market Capitalization: $1.4 BLN
- Different disciplines: 80
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.

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)
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 NEED FOR CRM IS DRIVEN BY THE “MISSING MONEY PROBLEM” DUE TO VARIOUS MARKET AND REGULATORY FAILURES
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.

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**Diagram: A Tree Structure**

1. **Targeted**
   - **Volume-based**
     - 1: Tender for new capacity
     - 2: Reserve
     - 3: Targeted capacity payment
   - **Price-based**

2. **Market-wide**
   - **Volume-based**
     - 4: Central buyer
   - **Price-based**
     - 5: De-central obligation
     - 6: Market-wide capacity payment

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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

<table>
<thead>
<tr>
<th>Capacity mechanisms</th>
<th>Targeted</th>
<th>Market-wide</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volume-based</strong></td>
<td></td>
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</tr>
</tbody>
</table>
| 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  
• The 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

Country with Capacity market

- Spain
  - Strategic reserve

- Ireland
  - Centralised capacity market (reliability option)
  - Existing: Three targeted capacity payments (Environmental incentive under investigation from the EC), and interruptibility scheme

- Belgium
  - Approved by EC: Strategic reserve
  - Discussion on a capacity market ongoing combined with a tender for new capacity

- France
  - Existing: Decentralised capacity market (ongoing review), tender for new capacity and interruptibility scheme

- Portugal
  - Existing: Three targeted capacity payments and interruptibility scheme

- United Kingdom
  - Existing: Targeted capacity payment and interruptibility scheme
  - Approved by EC: Centralised capacity market (reliability options)

- Denmark
  - On hold: Strategic reserve

Country with Capacity payment

- Greece
  - Existing: Targeted capacity payment
  - Approved: Interruptibility scheme
  - Planned: Discussion on a capacity market (reliability options)

- Denmark
  - Centralised capacity market
  - Existing: Targeted capacity payments and interruptibility scheme

Country with Strategic reserve

- Germany
  - Existing: Strategic reserve, and interruptibility scheme

- Finland
  - Strategic reserve

- Lithuania
  - Capacity market expected in 2020

Approved by EC: Strategic reserve

- Croatia
  - On hold: Tender for new capacity

No capacity mechanism

- Ireland
  - Centralised capacity market (reliability option)

- Finland
  - Centralised capacity market (reliability option)

- Sweden
  - Strategic reserve

- Poland
  - Capacity Market operating since 2018

- Lithuania
  - Capacity market expected in 2020

- France
  - Decentralised capacity market (ongoing review), tender for new capacity and interruptibility scheme

- Spain
  - Strategic reserve

- Portugal
  - Existing: Three targeted capacity payments and interruptibility scheme

- Greece
  - Existing: Targeted capacity payment
  - Approved: Interruptibility scheme
  - Planned: Discussion on a capacity market (reliability options)

- Ireland
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  - Planned: Discussion on a capacity market (reliability options)
# The Choice of a CRM Model Has Been Driven by the Local Specificities of the Electricity System

<table>
<thead>
<tr>
<th>Local specificities</th>
<th>Poland</th>
<th>France</th>
<th>Germany</th>
<th>Belgium</th>
<th>Italy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substantial mothballing and phasing-out of thermal units by 2020</td>
<td>Uncertainty of nuclear and mothballing of thermal capacity; peak demand growth</td>
<td>Grid constraints from North to South - Nuclear phase-out - Strong RES growth</td>
<td>Transition from over-capacity towards the need for new capacity to replace the phased-out nuclear plants</td>
<td>Massive phase out of thermal capacity; Internal zones and grid constraints; Strong RES growth</td>
<td>Central dispatch</td>
</tr>
</tbody>
</table>

| Key issues                                               | Capacity shortages 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 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**

1. Contribution to well-defined objective of common interest
2. Need for state aid intervention
3. Appropriateness of the aid measure
4. Incentive effect
5. Proportionality of the aid (aid to the minimum)
6. Avoidance of major undue negative effects on competition and trade between member states
7. Transparency of aid

**Implications**

- **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

- **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

- **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
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.
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.

**Prices in recent CRM auctions**

![Prices in recent CRM auctions chart]

- T4 2021/22
- T1 2018/19
- T4 2022/23
- T1 2018/19
- T1 2019/20
- T4 2022/23
- T1 2020/21
- 2021
- Existing T4 2022/23
- New T4 2022/23
Section 3: The case of the Western Balkans
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.*
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, 0.4 GW in North Macedonia and 3 GW in Serbia.
- **Projects cancellations**: 1.5 GW in Bosnia, 0.2 GW in Montenegro, 0.7 GW in North Macedonia and 0.3 GW in Serbia

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

![Diagram showing plant profits and losses](image)

**Legend:**
- Closed units
- New Units
- Cancelled new units
- Closed units (economic)
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 in 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.
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).
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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