Commission de Régulation
de l'Électricité et du Gaz

CREG

Note

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Note on Frequently Asked Questions regarding the scarcity pricing mechanism

carried out pursuant to Article 23, §2, second paragraph, of the Law of 29 April 1999 on the organisation of the electricity market

Non confidential

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1. INTRODUCTION

1. The goal of this note is to answer to frequently asked questions related to the scarcity pricing mechanism that the CREG is currently examining. Several papers have already been published on CREG webpage about this mechanism.

https://www.creg.be/sites/default/files/assets/Publications/Notes/Z1986EN.pdf

https://www.creg.be/sites/default/files/assets/Publications/Notes/Z1986Annex.pdf

https://www.creg.be/sites/default/files/assets/Publications/Notes/Z1707EN.pdf

https://www.creg.be/sites/default/files/assets/Publications/Notes/Z1707annex.pdf

http://www.creg.info/pdf/Divers/Z1527EN.pdf

2. Several additional papers and studies on this issue will be released in the coming months (September and October) by the CORE, CREG's Consultant on this issue. More information is expected on:

- the modelisation of cross-border interaction of balancing markets with a focus on scarcity pricing;
- the creation of a real time market for reserve (equivalently, a market for reserve imbalances) to ensure the back-propagation of reserve prices and the comparison of several design options to that goal
- the modelisation of optional BSP/BRP balancing market strategies

3. These reports/publications shall (also) be made available through CREG webpage.

2. WHICH IS TODAY'S CONTEXT OF THE IMPLEMENTATION OF A SCARCITY PRICING MECHANISM?

4. CREG's works on scarcity pricing started in 2015, at the time when Belgium experienced a lack of generation capacity (several nuclear units, totalling a capacity of up to 4000 MW, were out of the market for several reasons) and where some CCGT units were announced to be mothballed. Today, the implementation of a "shortage pricing function" and the timing for its implementation is related to the Opinion of the Commission related to the Belgian Implementation plan[1] related to adequacy concerns. This opinion stipulates that "*The Commission is of the view that the 'alpha component' already exhibits certain characteristics of a scarcity pricing function. The Commission, however, invites Belgium to consider whether the scarcity pricing function should apply not only to BRPs but also to balancing service providers (BSPs). This may support security of supply by ensuring that BRPs and BSPs face the same price for the energy produced/consumed, as price differentiation may result in inefficient arbitrage from market players. The Commission also considers that the scarcity pricing function should be triggered by the scarcity of reserves in the system and it should be calibrated to increase balancing*

[1] See https://ec.europa.eu/energy/sites/ener/files/documents/adopted_opinion_be_en_0.pdf page 4

energy prices to the Value of Lost Load when the system runs out of reserves. The Commission invites Belgium to consider amending its scarcity pricing scheme accordingly by no later than 1 January 2022."

5. Therefore, given this timing, CREG foresees, on the basis of the studies performed by Elia and the Core, and the consultation organised by Elia in the scope of the 2020 Incentive, to finalise a design beginning of November 2020, and to submit this design to consultation for a go no-go decision to be taken at the end of this year. If approved, 2021 will be devoted to the implementation of the mechanism (values of the adder are already published on Elia webpage in day+1) and to the modifications and the approval of the related terms and conditions (balancing, …) with a go-live beginning of 2022.

6. This opinion also indicates why several design parameters adopted by CREG and clearly considered (supported) by the Commission may not be considered as a legal obstacle to its implementation (scarcity pricing applied to BRP and BSP, scarcity pricing function triggered by the scarcity of reserves in the system and calibrated to increase balancing energy prices to the VOLL when the system runs out of reserves).

7. Finally, the CREG considers that the organization is competent for the design of balancing mechanisms and for tariff related issues, and hence also for deciding on the implementation of scarcity pricing.

3. WHICH ARE THE DIFFERENCES BETWEEN THE US AND EU MARKET DESIGN, AND IN PARTICULAR THE DIFFERENCES RELATED TO RESERVES

8. The main difference between the US design and the EU design are the management of all transmission network constraints (congestions) in the day-ahead and real time market mechanisms and the use of Locational Marginal Prices (LMP) applied at each node (substation) of the transmission system. Current US design also miss an intraday market with published prices.

9. Questions related to adequacy are zonal (covering a part of the area of an ISO) and scarcity price adders are the same for all the nodes of the same zone, as in Europe.

10. In both systems, reserves have properties related to public good which correspond to a market failure where an administrative intervention is required. So in both systems, reserves correspond to ancillary services. Several EU designs already show some features of a scarcity pricing mechanism. And a scarcity pricing mechanism like the ORDC proposal is a way to address the market failure related to the public good property of reserves.

11. In both systems, nobody says how **producers** should reflect scarcity in their bids (sometimes called supra-competitive bids), as scarcity reflects the valuation, or the appetite of **demand** for reliability. With the way day-ahead markets are organized, there is a high competitive pressure to bid at marginal price. In addition, in an energy only market, it is extremely difficult for an NRA to distinguish between bids reflecting scarcity **and the exercise of market power**, which may be more acute in scarcity conditions. Note that the definition of market power is when a market player is able to manipulate the price away from competitive levels, and if these "supra-competitive" bids are able to influence the market price, this is an indication/exercise of market power. As long as market power may be considered as an issue, this difficulty may prevent efficient scarcity bidding and a scarcity pricing mechanism is a way to circumvent this tricky question.

12. Real-time markets in the US are very often settled on a 5' basis, where in Europe a 15' settlement is the target. The longer duration of the European balancing market time interval motivates an additional dilemma in the design of the mechanism, namely whether the offered reserve capacity should correspond to the leftover capacity before or after the activation of the balancing capacity (or some intermediate solution). This issue is currently examined. There is also no balancing obligation set on market players in the US design.

4. WHERE IS AN ORDC MECHANISM IMPLEMENTED?

13. For the moment, an ORDC mechanism is only implemented in Texas, which is based on an "energy only market design" with no CRM.

14. Potomac Economics is an independent company in charge of the monitoring of the functioning of the ERCOT wholesale electricity market. A lot of information can be found in the latest report produced: https://www.potomaceconomics.com/wp-content/uploads/2020/06/2019-State-of-the-Market-Report.pdf

15. FERC, the US federal energy regulator, has recently approved a proposal of PJM for the implementation of an ORDC like mechanism. MISO also uses "ORDC" curves. PJM and MISO have both implemented a CRM.

5. DOES THE ADDER CONSTITUTE A MECHANISM FOR SOLVING ADEQUACY ISSUES OR FLEXIBILITY CONCERNS?

16. Both in fact.

17. Reserves are required for maintaining the reliability of an electric system. In situations of scarcity, one may be tempted, before proceeding to curtailments, to reduce the amount of reserves necessary for the reliability of the system. This will have as a consequence that the system will evolve in a less reliable state. So, the amount of reserves that can be deployed in real time is a good indicator of the conditions of adequacy of a system.

18. A scarcity pricing mechanism, as demonstrated in the studies made for CREG, reduces the missing money issue, if any, and improves investment conditions.

19. It is good to recall here the importance of decentralised investment decisions. The market, and not a central planner, should decide to invest or not: this is at the core of the liberalisation process, and **price signals** are the key instruments to reach that goal. Investors would bear the risks of changes in market conditions, construction cost overruns or construction efficiencies, etc., rather than consumers as it was the case when all "prudent" generating costs were passed on to consumers before liberalisation with vertically integrated resource planning.

20. A scarcity pricing mechanism improves the short term signal providing an all-inclusive (including a better valuation of reserves) price signal and more frequent prices spikes (but less high). This encourages forward contracting and facilitates investment decisions.

21. The proposed mechanism should benefit reserves that are able to deliver on short notice (aFRR and mFRR) and so should reward flexibility in a technology neutral way. So a scarcity pricing mechanism also improves flexibility conditions in a system (for the amount of reserves needed in the system).

22. The studies published on CREG webpage clearly show the built-in 'pay for performance' attribute of the scarcity pricing mechanism, which constitutes a notable difference between scarcity pricing and capacity mechanisms. The adaptive nature of the adder explains why a scarcity pricing mechanism constitutes a no regret measure for the improvement of the functioning of the market.

23. A scarcity pricing mechanism (ORDC like) may coexist with a CRM (even if there is no CRM in Texas where the ORDC mechanism is implemented). Several academics, and the EU Commission[2], consider that in case of adequacy concerns, it is better to correct the price signal in a first stage and if the adequacy problem persists, to envisage a CRM in a second stage.

24. If a CRM is implemented in Belgium, and if this mechanism is able to make reserves available when needed, then there is a high probability that the adders will most of the time be close to zero.

6. DOES A SCARCITY PRICING MECHANISM CONSTITUTE A DEPARTURE FROM THE CLASSICAL RULE OF FIXING ELECTRICITY PRICES AT THE INTERSECTION OF THE OFFER AND DEMAND CURVE?

25. No.

26. The "old", classical rule always applies. But the rule has to be adapted in order to cope with the massive introduction of renewables which may not provide reserves. In the past, the provision of reserves was a kind of side product always available in a system composed of thermal units. This is less and less the case today.

27. With the paradigm of an energy only market, and for systems with a large contribution of units with a low variable cost and not able to provide reserves, a price signal based on the intersection of the offer price curve and the demand cannot anymore constitute an "all inclusive"(namely energy and reserves) price for energy.

28. In an electric system, reserves are needed for ensuring reliability. Therefore, in order to get the price right, the energy price should be determined by the intersection of the offer curve and of the demand curve **augmented by the necessary volume of reserves**. Operating Reserve Demand Curves introduce price elasticity. With an ORDC mechanism, the demand curve for reserve (price versus volume) is determined on the basis of the (implicit) valuation of demand for reliability through the Value of Loss of Load and the Loss of Load Probability.

[2] See Regulation 2019/943 Art. 20. 3. (c)

7. WHICH ARE THE COMPONENTS OF THE MECHANISM AND HOW MY RESERVE CAPACITY WILL BE REMUNERATED WITH THE NEW CAPACITY MARKETS?

29. It is assumed that the procurement of reserves (auctions) is organised by Elia on a daily basis, for the two type (corresponding to aFRR and mFRR products) of reserves. No real time market for reserve currently exists.

30. The current design assumes that there is one price for the energy delivered in real time, but that reserves have different values given their different ramping capabilities. Each type of reserves contracted in day-ahead should receive the auction price.

31. The mechanisms should be composed of three adders calculated ex-post, one for the imbalance price (which should also apply to the balancing energy), and two adders for two new real-time markets for reserves (corresponding to the aFRR and mFRR products). These adders should have non-zero values when the volume of reserves available for deployment is below targets/ scarce.

32. Free bids for both type of reserves should be allowed in real time.

33. If there is scarcity in one of the type of reserves, prices adders will be triggered with:

- An imbalance and balancing energy price adder,
- A settlement for reserve imbalances (which also implies that free bids are paid by virtue of being on standby and thus enhancing system reliability)

34. The table below highlights the remunerations that a BSP should expect for providing reserves and energy. For simplicity reasons, only one type of reserves is considered in the table. It is also assumed here that the balancing energy and the imbalance price are equal in magnitude. In order to understand this table, the following notations are used:

DA Reserved Capacity: capacity (MW) of reserves auctioned in day-ahead to a BSP

RT Reserve Capacity: capacity (MW) of reserves of a BSP available in Real Time

Scarcity Adder: scarcity adder as a function of the VOLL and of the total volume of reserves available in the system in real time

MCP Res: reserves clearing price in the day-ahead auctions

Lambda: price of the balancing energy, equal to – imbalance price applied to BRPs

Cleared Q Bids: volume of bids activated in the balancing mechanism by the system operator

Remuneration of BSP		Reserve		Delta (Selected – not Selected)
		Selected in DA reserve market	**Not selected in DA Reserve market**	
Energy	**Selected to generate energy**	MCP_Res * DAReservedCapacity + ScarcityAdder * (RTReserveCapacity – DAReservedCapacity) + (Lambda + ScarcityAdder) * ClearedQBids	ORDCAdder * RTReserveCapacity + (Lambda + ScarcityAdder) * ClearedQBids	Being selected gains (MCP Res - ORDCAdder) * DAReservedCapacity compared with not being selected
	Not selected to generate energy	MCP Res* DAReservedCapacity	ORDCAdder * RTReserveCapacity	Assuming DAReserved equals RTReserveCapacity, being selected gains (MCP Res - ScarcityAdder)* DAReservedCapacity compared with not being selected

Finally, for the sake of completeness, BRPs are charged - Lambda + Scarcity Adder for their imbalances.

8. HOW IS THIS MECHANISM FINANCED?

35. Essentially, the mechanism is a market for (reserve) imbalances, so most of the cash flow takes place in the day-ahead reserve auctions.

36. The energy part of the mechanism (adder on imbalance price and balancing price) is automatically taken care of by the fact that the adder is applied both on the balancing price and the imbalance price: so the mechanism will mainly result in cash flows between BSPs and BRPs.

37. The reserve part of the mechanism (market for reserve imbalances) is actually expected to create a (slight) cash surplus for the TSO, because when the system has more reserve than the DA requirement, the system operator buys back surplus reserve capacity at a lower adder and when the system is tight, the system operator collects payments for reserve shortage at a higher price adder. This remains to be validated with numerical simulations.

9. HOW BACK PROPAGATION OF THE SCARCITY SIGNAL IS ENSURED?

38. First studies indicated that an energy adder only applied on balancing has no effect on the profitability of units providing reserves without back-propagation of this effect on the day-ahead time frame. Several tools were examined for ensuring this back propagation: Virtual Trading, co-optimisation and the creation of real-time market for reserves (in combination with already planned DA auctions for reserves).

39. Virtual trading between the day-ahead and the balancing time frame allows market players to buy (sell) in the day-ahead market and sell (buy) the same amount for the same moment in the balancing time frame. Given the many existing challenges related to this approach, such a modification was considered as out of reach.

40. Co-optimisation of energy and reserves in the day-ahead time frame corresponds to the simultaneous optimization of energy produced and reserves available in a zone given the available transmission capacities. In day ahead, this allows to choose some units for energy production in one country or zone, **given their low variable cost**, and rely more on more expensive units for the provision of reserves running at minimum load and **able to react quickly** in another bidding zone while at the same time providing enough transmission capacity to that goal. Co-optimisation of energy and reserve in day ahead necessitates a modification of the Euphemia algorithm which was considered not realistic.

41. A real time market for reserves was considered as the lowest hanging fruit for ensuring the back propagation of the scarcity signal in the day-ahead time frame. When MARI and PICASSO platforms mainly target imbalance and balancing energy, sufficient freedom is available at national level for the design of real-time markets for reserves.

42. On the basis of recent studies to be published shortly[3], it appears that the creation of real-time markets for reserves constitutes the most efficient (and maybe the necessary) way for giving an incentive to agents to back-propagate the average scarcity price to day-ahead reserve auctions. Therefore, a proper implementation of scarcity pricing mechanism requires a real-time market for reserve capacity.

43. It is also demonstrated in the same paper that a design based on the introduction an ORDC adder to the imbalance price only, and no creation of a real-time market for reserves did not provide an incentive strong enough for the valuation of reserves in the day-ahead auctions.

10. WHICH IS THE DIFFERENCE WITH THE ALPHA-COMPONENT?

44. In order to transfer increasing balancing responsibility to BRPs for managing their imbalances within their portfolios, ELIA has put in place an imbalance price that is characterized by penalties when the system experiences large imbalances. These penalties apply regardless of the balance of the BRP portfolio, just as long as the system imbalance is very long or very short.

[3] See the reports mentioned in the introduction

45. There is a clear incentive generated by the alpha component on BRPs behavior to avoid being on the wrong side of the imbalance price in case of enduring (two times 15') large system imbalances. Therefore, the alpha component may have an impact on the need on the volume of reserves in the system, as the volume of reserves is based on a distribution of imbalances.

46. But the alpha component does not reflect scarcities in the volume of available reserves, and does not alter significantly the profitability of making reserves available to the system.

47. Indeed, recent studies[4] to be published indicate that a strong back-propagation of the value of reserves and a better remuneration for the availability of reserves, cannot be achieved without the creation of short term markets for reserves as proposed in the scarcity pricing mechanism (see above).

48. On the other hand, with an alpha component (only, and no real time market for reserves), the problem of backpropagation of scarcity prices persists.

49. With the application of the new formula for the calculation of the alpha component since the first of January 2020, the average value of the Alpha component for the period until the 31/8/2020 was 3,9 €/MWh in case of negative imbalances. The alpha provided an average relative mark-up of around 5% on top of the marginal incremental price for restoring the balance of the system.

50. The question of a combination of both mechanisms (alpha and scarcity pricing) has not been addressed yet.

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[4] See the reports mentioned in the introduction