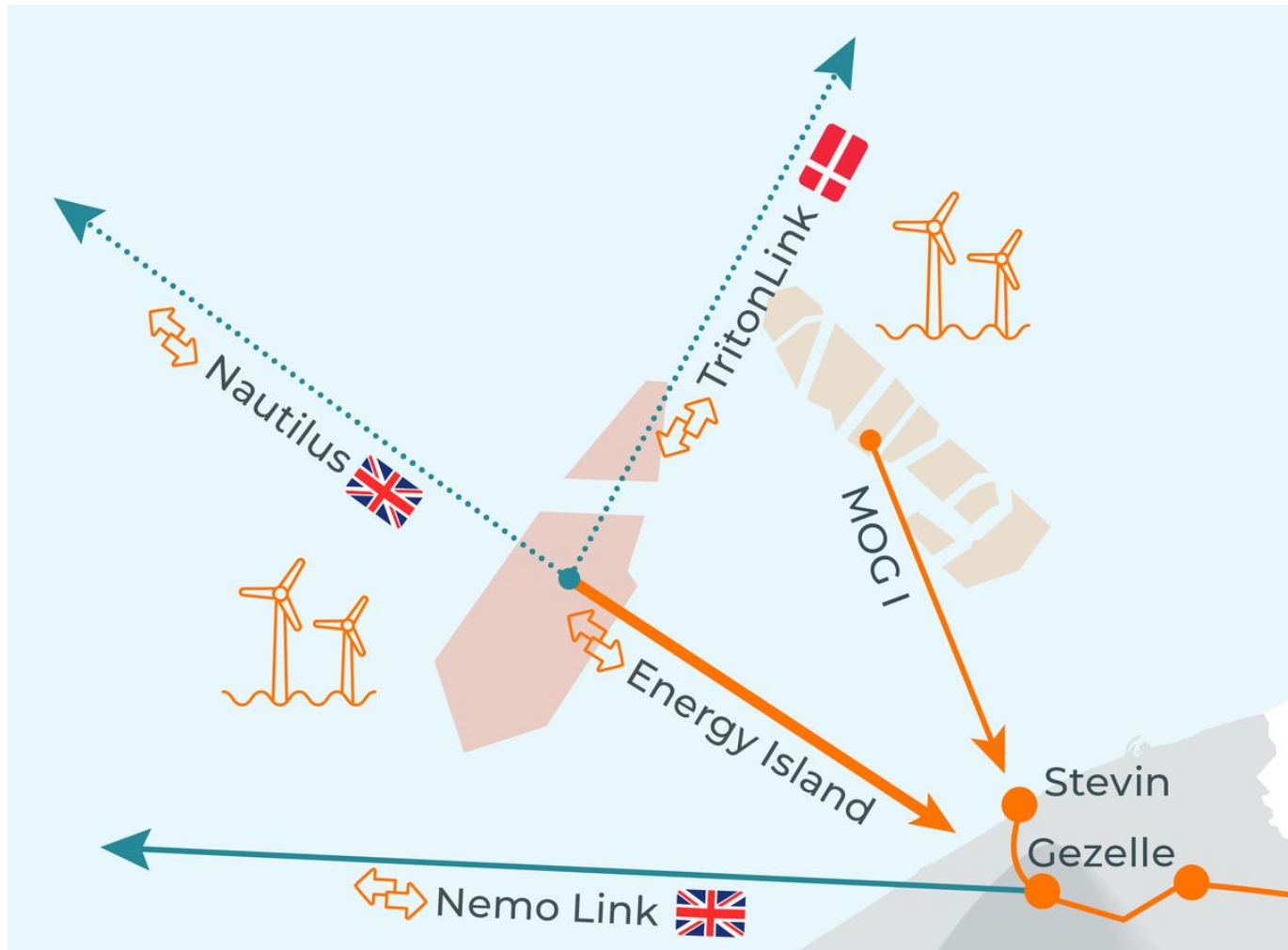


Workshop

Reflections on the implications of offshore bidding zone for balancing

Kristof De Vos
24th of June 2022

The Energy island, Nautilus and Triton Link together will evolve to a meshed offshore grid based on hybrid interconnectors and multi-terminal HVDC



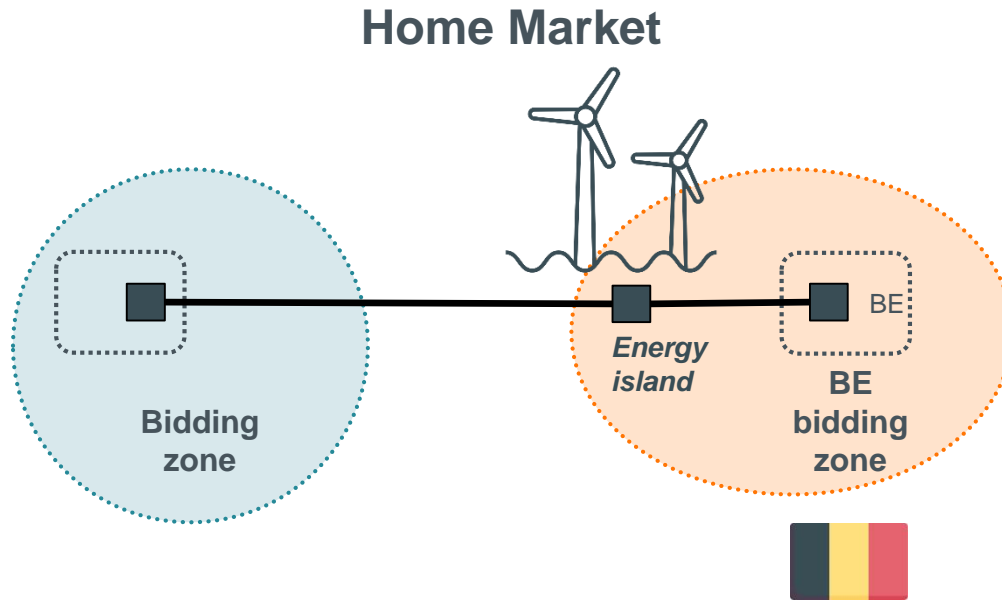
Creation of an offshore energy transmission hub in the form of an artificial island

- Grid connection for 3,15 to 3,5 GW of additional offshore wind farms in the Belgian North Sea
- Connection point for future offshore interconnections

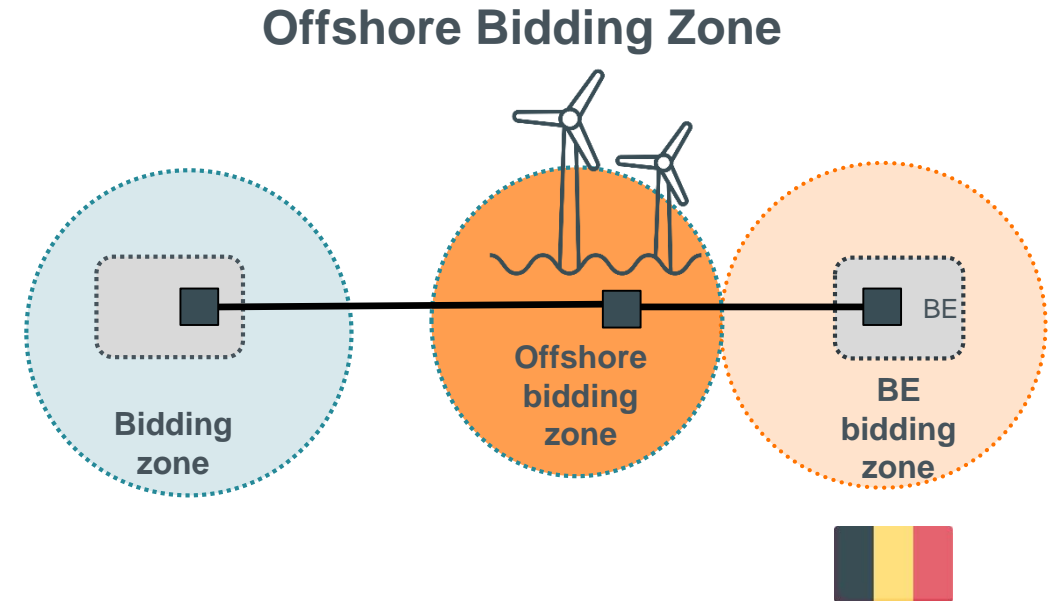
Main objective: to maximise integration of renewables into the Belgian electricity system

Island project to be validated by Ministerial Decree.

Offshore bidding zone solution has to be considered to connect offshore wind parks in the presence of hybrid interconnectors following European regulations



- The **Home Market** model replicates the conventional arrangement as much as possible.
- In this conventional arrangement the offshore RES generation commercially and physically feeds into its home market, i.e. into the grid of the same country in whose territorial waters or Exclusive Economic Zone (EEZ) the park is located.



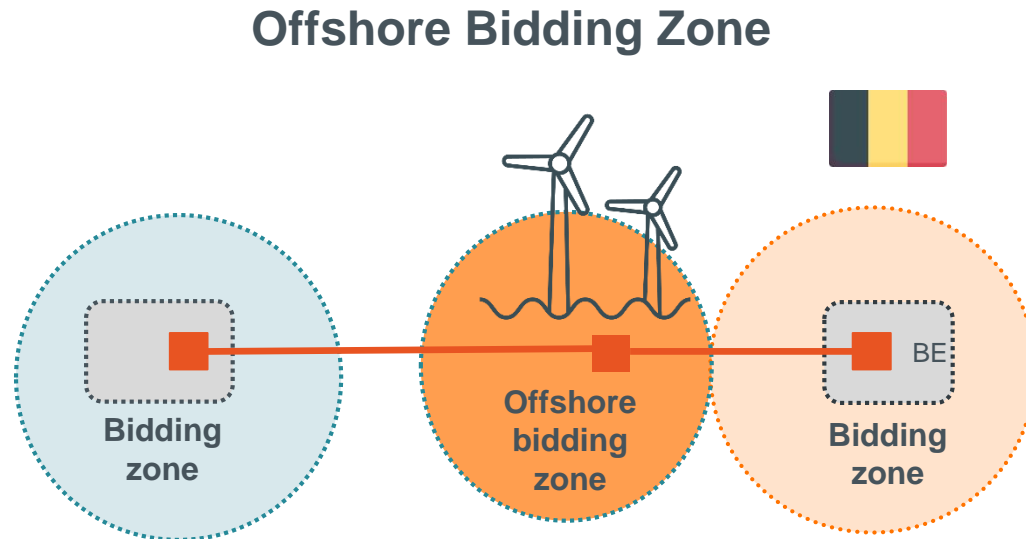
- In the **Offshore Bidding Zone** model the offshore RES generation is situated in a separate bidding zone, being physically connected to several bidding zones
- This ensures that RES generation can flow to where it is needed, and can be fully integrated into the market by simultaneously integrating renewable energy and using cross-border interconnections for trade.



Objective of the workshop

- **During the first task force, the benefits of the offshore bidding zone approach were presented, with a focus on the energy market**
 - ❑ Optimal market outcome (guaranteed optimal dispatch)
 - ❑ CEP 70% compliant (less need for TSO interventions RDCT)
 - ❑ Capacity allocation (no additional agreements needed, integration in the market via existing mechanisms)
- **The objective of this workshop is to initiate discussions on the implications of an offshore bidding zone on the balancing timeframe.**

Implications for balancing : how to balance a bidding zone with only generation assets ?



- The offshore bidding zone will be characterized by :
 - Generation forecast errors (due to variable wind power)
 - Transmission outage risks (cables)
 - **Limited local flexibility means (in principle limited to downward wind power regulation*)**

**If assuming no other technologies providing flexibility installed in the offshore bidding zone*

} Similar to the onshore bidding zone

} Particular for offshore bidding zone

- How to manage reserve activations ?
- How to manage the imbalance price ?
- How to manage reserve dimensioning ?

General introduction in this workshop

Topic subject to one of the next TF

Not straightforward questions, with no best practices, lacking literature and with a legal framework which requires interpretation for this context

Available sector reports (on balancing aspects of bidding zones)

ACER supports the European Commission's proposals on how to integrate offshore renewable energy into the internal energy market (namely with offshore bidding zones (OBZs))

- According to ACER, current market rules governing real-time trading, favor the home market approach more than OBZs.
- ACER and CEER therefore acknowledge that there is a wide range of challenges which will need consideration for the implementation of the OBZ model (e.g. BRP / BSP framework)
- ACER specifies that in the case of the OBZ approach, wind power curtailment is voluntary as the OWF would not be able to trade out its imbalance due to congestion
- ACER states that TSO responsible for operating the OWF needs to participate in the European platforms for the exchange of balancing energy. Balancing platforms provide a cross-border marginal clearing price for each participating bidding zone, and this can serve as a basis for defining the imbalance price.

ACER and CEER REFLECTION ON THE

EU STRATEGY TO HARNESS THE POTENTIAL OF
OFFSHORE RENEWABLE ENERGY FOR A CLIMATE
NEUTRAL FUTURE

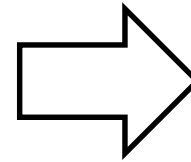
11 April 2022



Elia believes Home Market set-up is unfit for enabling an efficient functioning of the shorter-term market timeframes

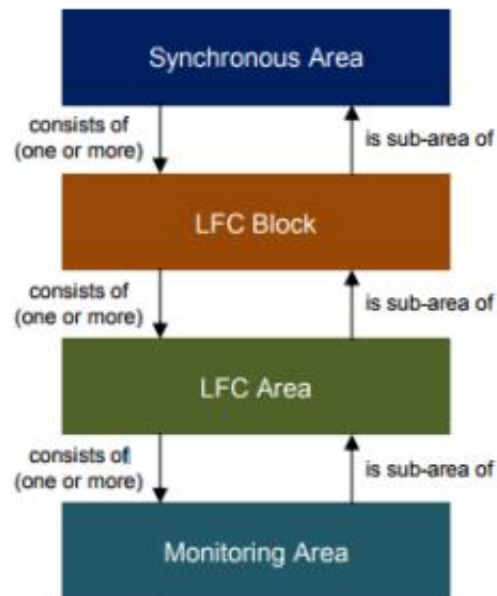
- Congestions result in constraints on shorter-term market activity to be imposed by TSOs
- Imbalance price will lose relevance and the ability to balance the portfolio may disappear
- Instead of having a market driven by prices, dispatching will frequently need to be driven by the TSO

- According to Article 2(13) of the Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing ‘imbalance price area’ is the area for the calculation of an [imbalance price](#).
- Article 6(6) of the said Regulation (EU) 2019/943 stipulates that each imbalance price area shall be equal to a [bidding zone](#), except in the case of a [central dispatching mode](#) where an imbalance price area may constitute a part of a bidding zone.
- *According to Article 2(18) of the Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing (Network Code on Electricity Balancing - NC EB) ‘central dispatching model’ is a scheduling and dispatching model where the generation schedules and consumption schedules as well as dispatching of power generating facilities and demand facilities, in reference to dispatchable facilities, are determined by a Transmission System Operator (TSO) within the integrated scheduling process.*
- *According to Article 2(17) of the Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing, ‘self-dispatching model’ is a scheduling and dispatching model where the generation schedules and consumption schedules as well as dispatching of power generating facilities and demand facilities are determined by the scheduling agents of those facilities.*



As Belgium is based on a self-dispatching model, an offshore bidding zone would legally require an imbalance price area

Most obvious approach to obtain separate imbalance price area is to implement separate LFC areas (1)

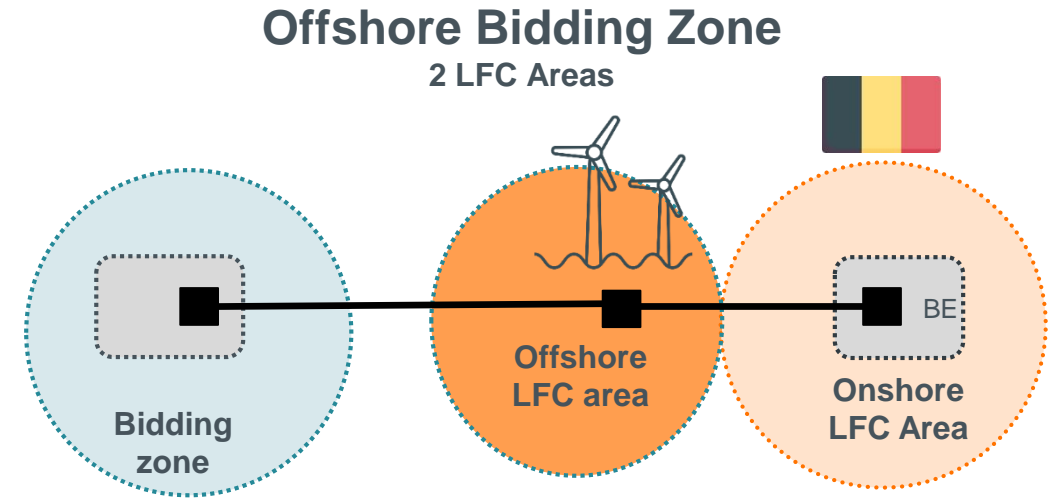
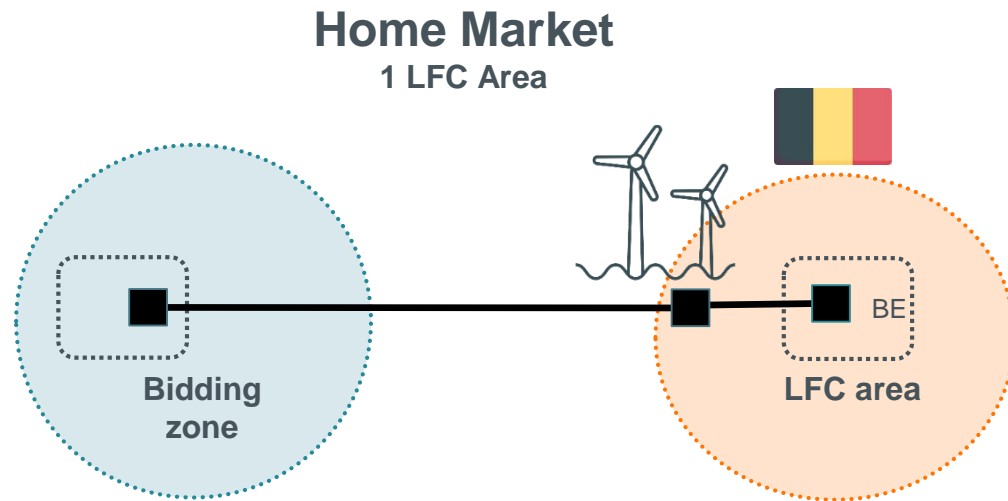


Creating separate prices through separating reserve activation processes

- The Synchronous Area has the obligation to fulfil the frequency quality target parameters by using the frequency containment process.
- A LFC Block is in addition responsible for the dimensioning of frequency restoration reserve (FRR) and replacement reserves (RR).
- A LFC Area has the additional obligation to fulfil the frequency restoration quality target parameters by using the frequency restoration process.
- A Monitoring Area has the obligation to calculate and measure the active power interchange in real-time in that area.

Figure 1. Types and hierarchy of areas operated by TSOs

Most obvious approach to obtain a separate imbalance price area is to implement separate LFC areas (2)



- As today, offshore prediction errors directly contribute to the system imbalances of the Belgium LFC area
- TSO activates available balancing energy bids in function of :
 - Demand (D) : the total system imbalance
 - Supply (S) : available contracted and non-contracted balancing energy bids in the EU balancing energy platforms
- The marginal price of the selected balancing energy bids determines the cross-border marginal prices (CBMP) for the BE LFC Area

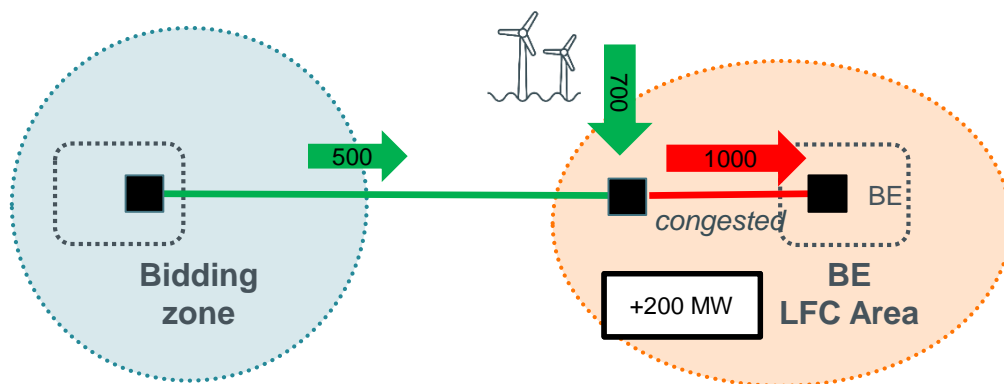
- Offshore prediction errors would contribute only to the Offshore LFC area
- TSO activates available balancing energy bids in function of :
 - The offshore (D1) and the onshore LFC Area (D2): the balancing energy platforms handle the netting with the onshore LFC Area when appropriate
 - Available contracted and non-contracted balancing energy bids in the EU balancing energy platforms
- The marginal price of the selected balancing energy bids determines the CBMP for the Offshore LFC Area and the Onshore LFC Area



As long as the connection between the offshore LFC area and the onshore LFC area is not congested, the cross-border marginal prices of both areas will be identical (when assuming access to the same balancing energy bids, i.e. via EU balancing energy platforms)

Use case 1: excess wind power during high import conditions

Home Market




In the home market solution, excess wind power will result in a positive system imbalance in Belgium (assuming no other variations)

- Activation of available downward balancing energy bids
- Marginal activation price determines one CBMP for entire LFC Area

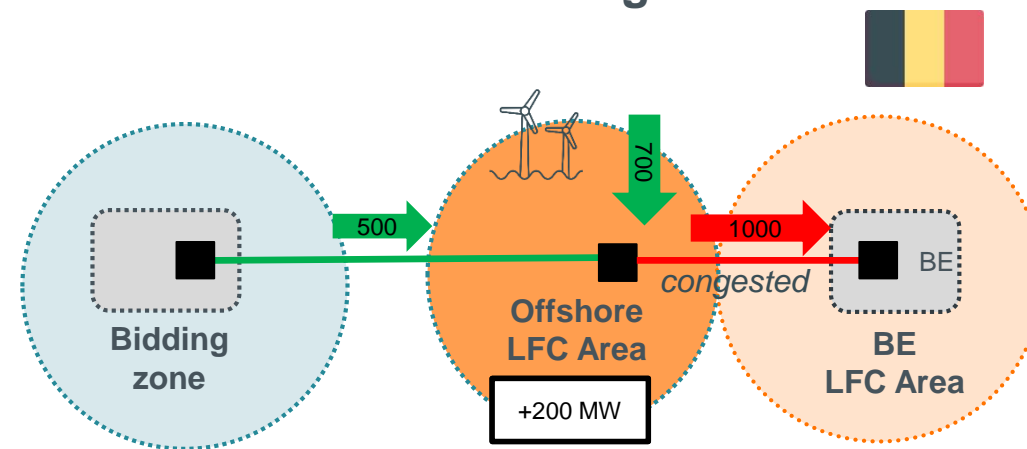
It is likely that the bids for balancing the offshore prediction error are activated onshore. The congested connection between the parks and Belgium needs to be managed by the TSO through :

- *Wind wind power curtailment*
- *Cross-border cross-border congestion management with the connected region*



Managing the hybrid interconnector requires TSO interventions while price signals in the balancing market can give wrongful incentives for BRPs (e.g. maintain offshore wind power production while facing excess energy in offshore grid)

Offshore Bidding Zone




In the offshore bidding zone solution, excess wind power will result in a positive system imbalance in the offshore LFC Area

- Activation of available balancing energy bids to the offshore LFC Area
 - Downward balancing energy bids from wind power
 - Cross-border balancing energy activations with the connected region
- Marginal activation price determines one CBMP for each LFC Area

The activation of balancing energy takes take into account available transmission capacity available transmission capacity between the two areas. No additional congestion management by the TSO is needed.

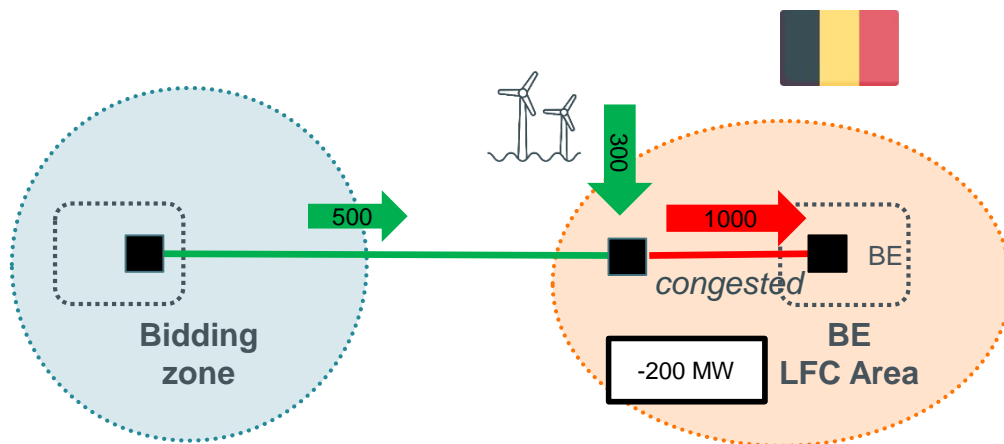
Constrained transmission capacity will result in a different CBMP per LFC area



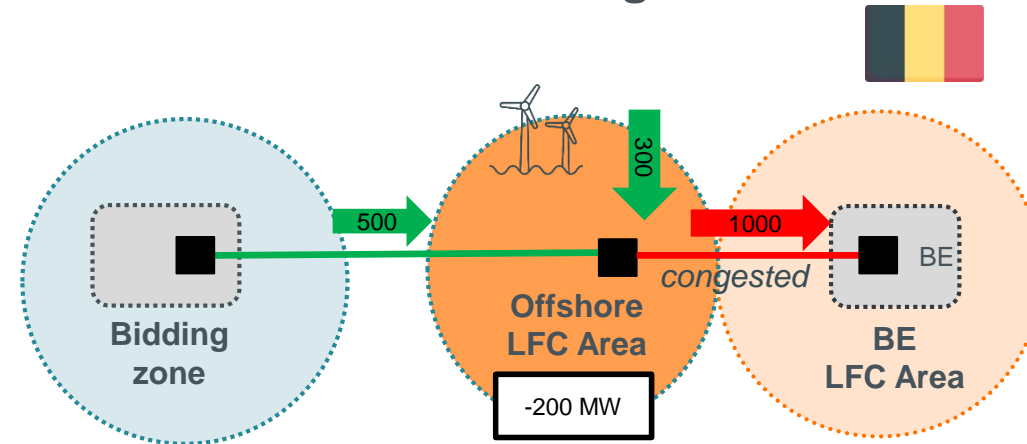
The access to flexibility (wind power reductions and / or cross-border platforms) is crucial to manage imbalances in the offshore bidding zone

Use case 2: shortage wind power during high import conditions

Home Market



Offshore Bidding Zone



- In the home market solution, shortage wind power will result in a negative system imbalance in Belgium (if assuming no other variations)

- Activation of available upward balancing energy bids
- Marginal activation price determines one CBMP for entire LFC Area

- In one LFC Area, it is likely that the reserves for balancing the offshore prediction error are activated onshore. However, this does not cause any congestions to be managed by the TSO

- CBMP also maintain correct incentives for BRP. Note that in an offshore grid with only generation assets, there are no local solutions for upward balancing

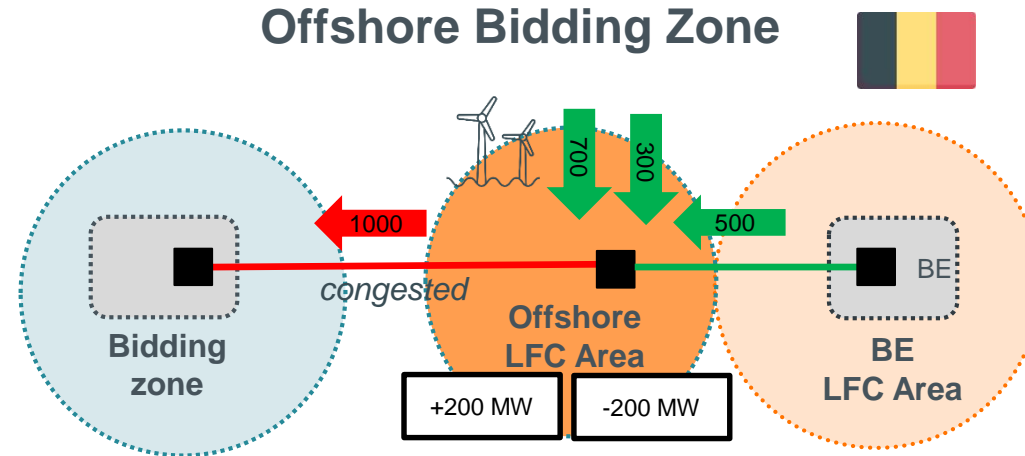
In the offshore bidding zone solution, shortage wind power will result in a negative system imbalance in the offshore LFC Area

- Reserve activation following available flexibility to the offshore LFC Area
 - Cross-border reserves with Belgium
 - Cross-border reserves with connected region
- Marginal activation price determines one CBMP for both LFC Areas



- Imbalance netting and common merit order will facilitate the same CBMP in both LFC areas
- Access to flexibility via EU balancing energy platforms is essential for successfully balancing the offshore bidding zone

Use case 3 and 4: excess or shortage wind power when Belgium is in high export conditions



In the offshore bidding zone solution, prediction errors of wind power will result in system imbalance in the offshore LFC Area :

- Activation of available balancing energy bids following available flexibility to the offshore LFC Area
 1. Wind power reductions (only in case of excess energy)
 2. Cross-border balancing with Belgium
 3. Cross-border balancing with the connected region (only in case of shortage of energy)
- Marginal activation price determines the CBMP for both LFC Areas
- Conclusions are similar to use case 2 : offshore LFC area will have the same cross-border marginal price as BE LFC Area

Summary : balancing implications for an offshore bidding zone

Belgian bidding zone positions (pre-balancing time frame)

High export

High import

OBZ Balancing position

Shortage

- Activation of upward balancing energy bids via Belgium or connected region
 - Identical CBMP in Onshore and Offshore LFC Area

Excess

- Activation of downward balancing energy bids via Belgium
- **Activation of downward balancing energy bids through local wind power**
- Identical CBMP in Onshore and Offshore LFC Area

- **Activation of downward balancing energy bids via local wind power or connected region**
- **Different CBMP in Onshore and Offshore LFC Area**

Compared to home market solution, no TSO intervention (re-dispatch) required

Compared to home market solution, CBMP provides a correct price signal

Beyond the legal obligations, defining a separate imbalance price area consistently with offshore bidding zone has clear advantage in terms of market and system efficiency.

- Article 6(6) of the said Regulation (EU) 2019/943 stipulates that each imbalance price area shall be equal to a [bidding zone](#), except in the case of a [central dispatching model](#)
- Analyses confirms multiple advantages in terms of system operation efficiency
 1. Avoid congestion management in Belgian LFC block during [high import during excess wind power prediction](#)
 2. Maintain correct imbalance price signals in Belgian LFC block during [high import during excess wind power prediction](#)+ Activation of reserves by the offshore bidding zone creates [clear control signals for the HVDC system](#)
- The CBMP origins from an offshore system imbalance (prediction error, forced outage), covered by means of :
 - European balancing energy platforms of MARI & PICASSO, subject to transmission capacity connected countries
 - Activation of flexibility, mainly downward activation of wind, or other flexibility installed (if any)

Thank you.

