



North Sea
Wind Power Hub
Programme

Regulatory & Market design

A strategy to establish an offshore bidding zone for hybrid projects

To efficiently integrate the increasing
amount of offshore wind energy

Discussion
paper

#3



Co-financed by the Connecting Europe
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About this paper

Why read this report

Early clarity on the market setup is crucial for the investment decisions of project developers of offshore wind farms. This paper discusses the pathway in current EU regulation to establish an offshore bidding zone for hybrid projects. The analysis provided in this document aims to empower policymakers in their decision-making by facilitating a balanced and structured discussion. In order to provide a deeper understanding of the current regulation on the (re)configuration of bidding zones, a comprehensive analysis in the relevant EU regulation was performed. Furthermore, an alternative approach is proposed that allows TSO to identify long-term structural congestion without following the cumbersome bidding zone review process. Finally, the paper points at additional research required to further clarify the operability of the established offshore bidding zones.

Highlights

In case policy-makers aspire to integrate the Offshore Wind Farms (OWFs) and hub-and-spoke projects using an Offshore Bidding Zone setup, a substantial part of achieving this implies a sound methodology on the implementation of that relevant market setup.

The bidding zone review process seems not to be compatible (yet) with the development of hybrid projects under an offshore bidding zone setup.

An alternative approach, which is partly based on the already existing procedure described in Electricity Regulation, allows a TSO to identify long-term, structural congestion with a congestion report which is expected to take place within a time span of 9 – 18 months.

Structure of the discussion paper



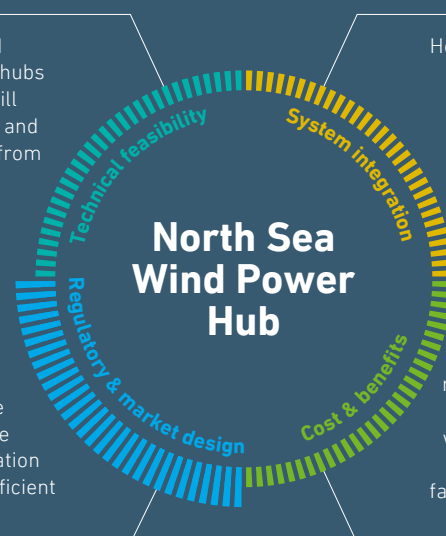
The big picture

The North Sea is a powerhouse of wind energy. Harnessing this power requires us to cooperate across countries and borders to build an efficient network. To show that a solution can be achieved in a cost-effective and secure manner, the North Sea Wind Power Hub is working within four key areas.

This discussion paper explores key topics within regulatory & market design.

How to design and build the physical hubs and spokes that will collect, transform and distribute energy from the North Sea.

How to ensure a stable and reliable investment climate by adapting regulation and creating an efficient market design.



How to adapt the energy systems in Northern Europe to integrate a large volume of offshore wind from the North Sea.

How to ensure that the chosen solution maximises benefits for society and climate while minimising costs and distributing them fairly between countries and stakeholders.

Executive summary

The increasing demand for renewable energy has driven ambitious goals for offshore wind power in Europe. Meeting this demand requires innovative solutions and a new, novel approach. The North Sea Wind Power Hub (NSWPH) is a consortium formed by TenneT Netherlands, TenneT Germany, Energinet and Gasunie to develop the energy infrastructure for integrating large-scale offshore wind from the North Sea into the European energy system. This paper discusses the pathway in current EU regulation to establish an offshore bidding zone market setup for offshore hybrid projects. Early clarity on the market setup is crucial for the investment decisions of project developers of offshore wind farms.

In case policy-makers aspire to integrate the Offshore Wind Farms (OWFs) and hub-and-spoke projects using an Offshore Bidding Zone setup, a substantial part of achieving this implies a sound methodology on the implementation of that relevant market setup. The EC has stated that “for the establishment of a new bidding zone, two pieces of legislation are relevant: the Electricity Regulation (EU) 943/2019 and the Guideline on Capacity Allocation and Congestion Management 1222/2015 (CACM Guideline)”. Both pieces of legislation refer to the bidding zone review (BZR) methodology: a methodology that was once developed for an onshore bidding zone split, but for which it is uncertain if and how well it fits to a to-be-developed hybrid project.

In order to provide a deeper understanding of the current regulation on the (re)configuration of bidding zones, a comprehensive analysis in the relevant articles of the Electricity Regulation and CACM Guideline was performed. This analysis identified three main barriers when it comes to the establishment of an offshore bidding zone for hybrid projects:

- **The bidding zone review process seems not to be compatible with the development of offshore hybrid projects under an Offshore Bidding Zone (OBZ)** | The review methodology only includes assets that will be operational within three years. This makes it impossible to establish an OBZ and provide clarity to OWF developers before wind farm tendering. Wind farm tendering for a hub-and-spoke project is expected to take place about 5-7 years before go-live.
- **The BZR is a lengthy and cumbersome process** | The BZR may take up 20-34 months. The consultation rounds in the review methodology, although important, might slow down the final decision on the bidding zone configuration significantly. Furthermore, there is no guarantee that the outcome of the BZR will result in the establishment of a new OBZ. This might result in a significant increase in investment risks for hub-and-spoke stakeholders. Furthermore, it is currently unclear which stakeholders need to be involved in the different steps of a BZR.
- **The BZR seems to be mainly focused on existing onshore bidding zones** | The BZR review assesses whether the existing configuration of the existing bidding zones is optimal and can be improved. As a result, various steps that are of no relevance to the creation of an (new) OBZ are included in the technical report and review process.

Hence, an alternative approach is proposed. This approach is partly based on the already existing procedure described in Electricity Regulation. In principle, this approach allows a TSO to identify long-term, structural congestion with a congestion report without following the process of a BZR. Thus, adopting the possibility to establish a new OBZ by a final decision from its Member State (MS). The whole process is expected to take place within a time span of 9 – 18 months based on earlier congestion reports and the Electricity Regulation. In addition, this paper provides additional insights into the next steps that can be expected when implementing an OBZ into the capacity calculation region. However, these steps are not exclusively for the establishment of OBZs.

In order to not delay hub-and-spoke project timelines, firstly a decision must be adopted by policymakers on the market setup and secondly – in case of an OBZ setup - also on the approach to establish an OBZ (for hybrid projects). Therefore, the NSPWH suggest the following next steps:

- It is recommended that policymakers make a decision on the approach to establish an OBZ (short term)
- It is recommend that the European Commission is to adopt a position on the approach to establish an OBZ (long term)

In addition, the analysis in this paper points to additional research required to further clarify the operability of an established OBZ in the respective capacity calculation region. This also implies, additional research to identify the requirements for an OWF developer to ensure a clear, calculable investment case. It is still unclear in what form the decision on the bidding zone configuration has to be provided as there is a difference in providing clarity (solely information), and for CCR amendments to go into effect (binding). Last, TSOs should be proactive in providing information regarding market coupling processes.

1 Introduction

In 2019, the European Commission (EC) published the European Green Deal¹ that states the aim to be climate neutral by 2050. Especially offshore wind will play a significant role in reaching this objective and has resulted in ambitious goals for the roll out of offshore wind throughout Europe. The EC introduced its offshore renewable energy strategy² in which a EU-wide target is set for 300GW of offshore wind by the end of 2050.

To (cost-) efficiently integrate this large amount of offshore wind, innovative solutions are required. The answer might be found in so-called hybrid projects, or hub-and-spoke projects such as the North Sea Wind Power Hub (NSWPH). These projects aim to combine the conventional way of connecting offshore wind with cross-border interconnections to reduce costs for infrastructure and to increase, amongst others, the security of supply while reducing the environmental impact.

However, these projects require the willingness of offshore wind farm (OWF) developers to invest in it. This implies that, in order to realise these hybrid projects, it is crucial that clarity is provided on the market setup to enable a clear, calculable investment case for OWF developers. Ideally, this clarity is already provided before the tendering phase for an OWF area begins.

In previous discussion papers, the NSWPH extensively discussed the two relevant market setups: the Home Market (HM) setup and the Offshore Bidding Zone (OBZ) setup (see text box 1). In case policy-makers aspire to integrate the OWFs and hub-and-spoke projects using an OBZ setup, a substantial part of this clarity implies a sound methodology on the implementation of that relevant market setup. The EC has stated that “for the establishment of a new bidding zone, two pieces of legislation are relevant: the Electricity Regulation (EU) 943/2019 and the Guideline on Capacity Allocation and Congestion Management 1222/2015 (CACM Guideline)”. Both pieces of legislation refer to the bidding zone review methodology: a methodology that was once developed for an onshore bidding zone split, but for which it is uncertain if and how well it fits to a to-be-developed hybrid project.

This document adopts the goal to establish a common knowledge ground on the offshore bidding zone implementation methodology for hybrid projects. The relevant EU regulation will be discussed and the identified challenges imposed on hybrid projects will be presented. Furthermore, this document explains an alternative approach to establish an offshore bidding zone. By providing a common ground, this document aims to enable policy makers and other relevant stakeholders to start the discussion on the identified challenges and uncertainties.

Highlight
It seems unclear how well the current EU regulation on bidding zone (re)configuration fits to a to-be-developed (offshore) hybrid project.

¹ European Commission, COMMUNICATION FROM THE COMMISSION The European Green Deal, December 2019: [Link](#)

² European Commission, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future, November 2020. [Link](#)

Text box 1: Recap on the market designs for offshore hybrid projects

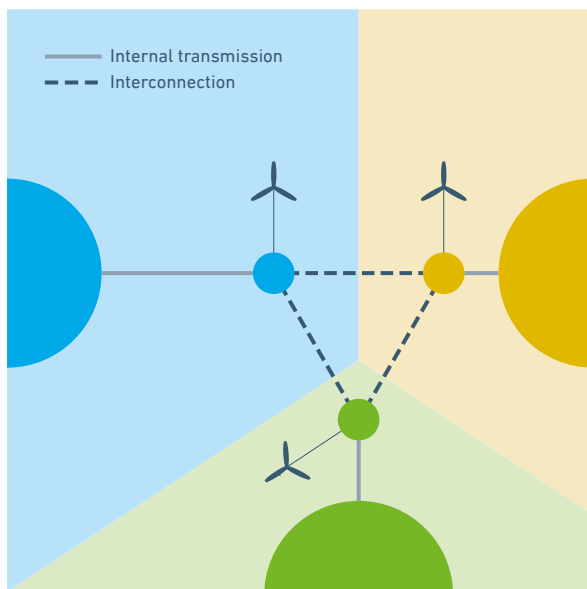
Before the analysis into the offshore bidding zone implementation strategy is performed, a brief recap on the two market setups predominantly discussed these days is presented. The market setup defines how offshore wind farms are allocated to specific bidding zones and subsequently how interconnection capacity between these bidding zones is allocated.

Figure 1 and the sections below summarises the insights in the market setups from the studies by the NSWPH^{3,4}, THEMA⁵ and ENTSO-E⁶. European electricity market principles funnel the market setups options down to only two market setups. The Home Market (HM) and Offshore Bidding Zone (OBZ) setup are regarded to be the only two possible market setup options for integrating offshore hybrid projects into the current electricity system. Figure 1, provides a brief description of the two market setups.

The view of the EC on the different market setups is found in the working staff document, EU strategy on Offshore renewable energy. Here it is stated that "it is the Commission's view that establishing offshore bidding zones provides a good approach to ensure compliance with the cross-border trading rules" and that "offshore bidding zones achieve a higher degree of overall efficiency than the 'home zone' approach". This is in line with the opinion of ENTSO-E which already uses offshore bidding zones as the working assumption. As a consequence, this paper adopts a starting point of a hybrid project under the offshore bidding zone market setup.

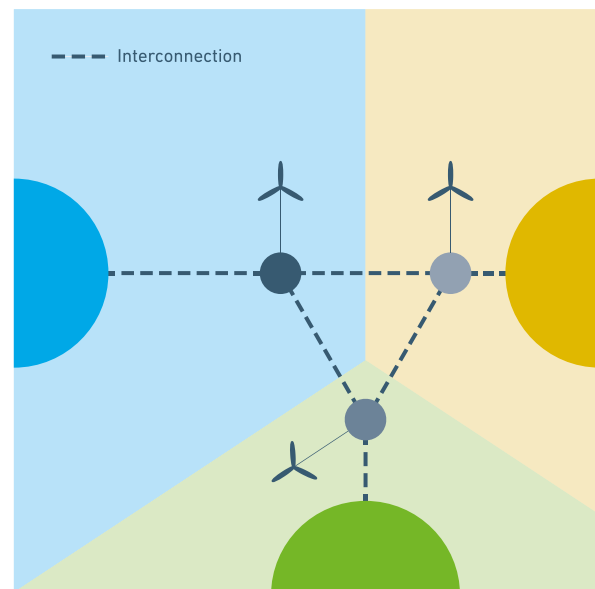
Figure 1: Hub-and-spoke project under a HM and OBZ Setup⁷

Figur 1a: Home Market setup



In the home market setup, the offshore wind farm bids and dispatches into its home market and receives the HM electricity price. The cable from the hub to shore is a hybrid asset within the home market, and is classified as an internal transmission cable, whereas the cables between the hubs in their respective home markets are cross-border interconnectors. In the HM setup it is assumed that the total offshore wind capacity involved is of the same order of magnitude as the total infrastructure capacity, thus involving implicit structural congestion with respect to either of the connections to the different energy markets.

Figur 1b: Offshore Bidding Zone setup



In the offshore bidding zone setup, each hub forms a separate offshore bidding zone in which the offshore wind farms submit bids and are dispatched. All cables between the hubs and from the hub-to-shore are interconnectors. Via market coupling, the offshore generation is matched with onshore demand, and the electricity prices within the OBZs are the result of market coupling.

³ NSWPH discussion paper (2020): "Market setup options to integrate hybrid projects into the European electricity market", [link](#)

⁴ NSWPH discussion paper (2021): "Market setup options for hybrid projects", [link](#)

⁵ Thema study for the European Commission (2020): "Market Arrangements for Offshore Hybrid Projects in the North Sea", [link](#)

⁶ ENTSO-E (2020), ENTSO-E Position on Offshore Development Market and Regulatory Issues, [link](#)

⁷ NSWPH discussion paper (2021): "Market setup options for hybrid projects", [link](#)

2 European regulation on bidding zones and bidding zone (re)configuration

This chapter will dive into the applicable EU regulation and their provisions on bidding zones, their configuration and how decide on adjustments of the current bidding zone configuration.

For this subject, the following two EU regulation are relevant:

1. Regulation (EU) 2019/943 on the internal market for electricity⁸, part of the Clean Energy Package (hereafter Electricity Regulation).
2. Regulation (EU) 2015/2022 establishing a guideline on Capacity Allocation and Congestion Management⁹ (hereafter CACM Guideline).

It is important to note that the Electricity Regulation is higher in hierarchy than CACM Guideline, and therefore in case of contradictions, the provisions from the Electricity Regulations would supersede provisions from the CACM Guideline. The CACM Guideline is currently being revised in order to remove such contradictions and improve the provisions based on experience from the implemented terms and methodologies, which will eventually result in a "CACM 2.0". However, this paper is based the provisions from the currently applicable CACM Guideline.

2.1 Purpose and definition of Bidding zones

Bidding zones are the cornerstone of zonal market-based electricity trading. Bidding zones can be seen as individual market areas in which a separate forward, day-ahead and intraday market exist. Most of the current bidding zone configurations in central Europe are a result of formerly national networks and consequently, are often based on national borders of the MSs. The borders of these bidding zones are physically coupled by interconnectors that allow for cross-zonal trade between bidding zones. Bidding zone borders can also be defined within a Member State, in which case the borders are determined by identifying lines connecting certain critical network elements¹⁰.

Article 2 sub (65) Electricity Regulation provides the following definition for bidding zones | "A bidding zone means the largest geographical area within which market participants are able to exchange energy without capacity allocation".

The recital (19) of the Electricity Regulation describes the purpose of bidding zones | "Bidding zones should be defined in a manner to ensure market liquidity, efficient congestion management and overall market efficiency."

Highlight
Bidding zones are the cornerstone of zonal market-based electricity trading and can be seen as individual market areas in which a separate forward, day-ahead and intraday market exist.

⁸ Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity [Link](#)

⁹ Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management [Link](#)

¹⁰ Definition of a "critical network element" according to Article 2 sub (69) Electricity Regulation: "a network element either within a bidding zone or between bidding zones taken into account in the capacity calculation process, limiting the amount of power that can be exchanged."

The goal is to form a configuration of bidding zones in such a way to maximize economic efficiency and to maximize cross-zonal trading opportunities while maintaining security of supply.

2.2 Regulations on Bidding zone (re)configuration

Article 14 Electricity Regulation provides for fundamental principles for the review and (re-) configuration of bidding zones. As the basic principle, *bidding zone borders shall be based on long-term structural congestions in the transmission network*. Hence, as a general rule bidding zones shall not contain structural congestions.

Article 2(6) of the electricity Regulation defines structural congestion as |

“Congestion in the transmission system that is capable of being unambiguously defined, is predictable, is geographically stable over time, and frequently reoccurs under normal electricity system conditions.”

This legal definition of bidding zones formally neither corresponds nor relates to national borders. Bidding zones are therefore, at least by definition, independent of Member States’ borders, although in particular for historical reasons the current bidding zone borders in general correspond to national borders.

Following these provisions, the bidding zone configuration should be based on the analysis and identification of structural congestions in the transmission grid. Article 14 Electricity Regulation refers to three options how structural congestions can be identified:

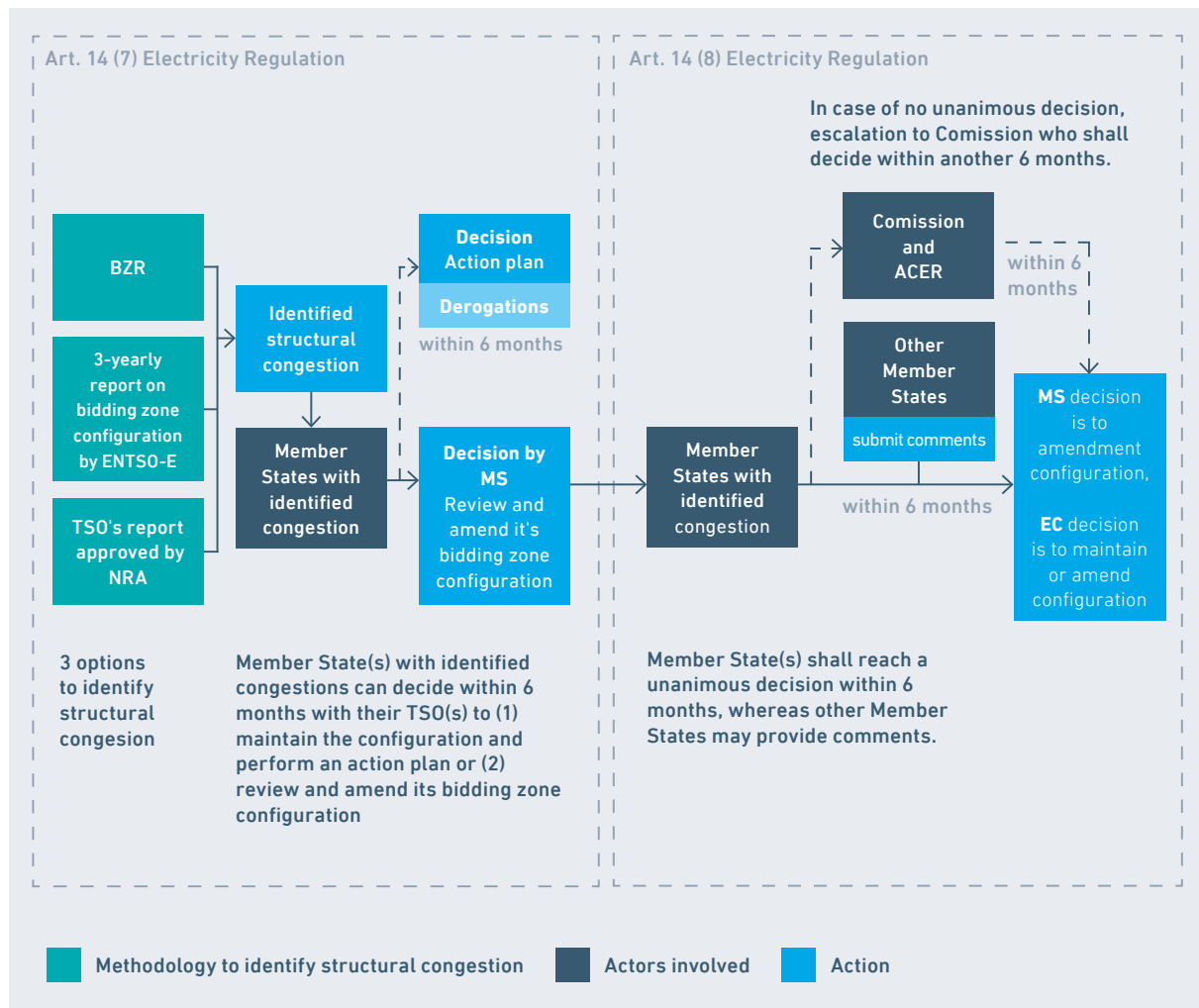
1. A technical report on structural congestions and other major physical congestions between and within bidding zones, drafted by ENTSO-E. This ENTSO-E report is a technical report that is drafted every three years. It analyses potential structural congestions and other major physical congestions, including their location and frequency, as well as on the cross-zonal capacity reached.
2. In a Bidding Zone Review (BZR) process. As part of the Bidding Zone Review process, structural congestions have to be identified and alternative bidding zone configurations have to be analysed.
3. Via a “structural congestion” report by one or more TSO(s) in their control areas, which has to be approved by the(ir) competent Regulatory Authority(ies).

The three methods are displayed on the left side in figure 2 below. The Bidding Zone Review process and the specific Regulations for this process will be elaborated on in the next section

Highlight

The borders of bidding zones shall, by regulation, be based on long-term structural congestion.

Figur 2: A schematic of the process of identifying and addressing long-term, structural congestion as described in Art 14 of Electricity Regulation.



Article 14-(7) and 14-(8) of the Electricity Regulation describe the process of (re)configuration of bidding zones. Article 14-(7) describes the methods available to identify structural congestion and the options to address this by the MSs. The dotted line to the Action plan indicates that this is a temporary solution. Article 14-(8) further describes the process when a MS chooses to review and amend its bidding zone configuration.

In case structural congestions have been identified in accordance with the methodology applied in one (or more) of the three above options, the concerned MS(s) has two options to address the congestion. Pursuant to Article 14-(7) Electricity Regulation, such Member State has to decide within six months:

1. Either to establish an action plan with a concrete timetable for (notably grid expansion) measures and a linear trajectory to reach the 70% rule by ultimately 31 December 2025;
2. Or to immediately review and amend its bidding zone configuration.

The first option will not be further elaborated upon in this paper, as this is rather a temporary option which cannot be applied after 31 December 2025. It is not expected that there will be an offshore hub realised before this date. Therefore, the option of establishing an action plan is not relevant for deciding on the future bidding zone configuration of an offshore hub-and-spoke project such as NSWPH.

The Bidding Zone Review process of the second option, will be discussed in the next section.

When a decision has been made by the concerned Member State(s) on how to address the identified structural congestion(s), ACER and the EC have to be notified immediately. For those Member States that have opted to amend the bidding zone configuration, the relevant Member States will have to reach a unanimous decision within six months after the notification to the EC and ACER. In the event that the relevant Member States fail to reach a unanimous decision within those six months, they shall immediately notify the Commission thereof. As a measure of last resort, the Commission after consulting ACER shall adopt a decision whether to amend or maintain the bidding zone configuration in and between those Member States by six months after receipt of such a notification.

Highlight
Once long-term, structural congestion has been identified, a decision on how to address this must be adopted within six months.

2.3 Regulations on the bidding zone review process

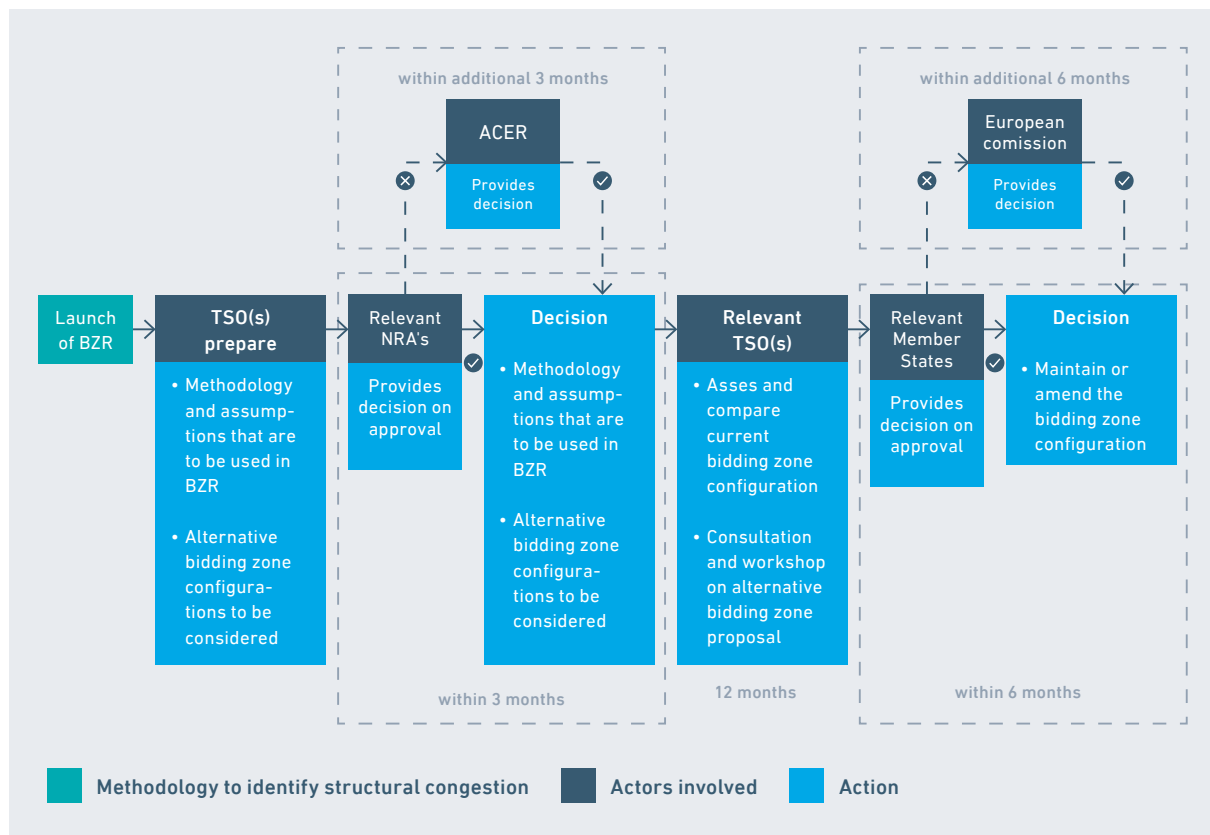
The Electricity Regulation and CACM Guideline together provide a comprehensive set of provisions for the execution of a bidding zone review process. The framework of the BZR is set out primarily by Article 14 Electricity Regulation, while articles 32 & 33 of CACM Guideline set out more detailed aspects on the review process and the criteria to be considered in the review¹¹. In addition, several open aspects have been further clarified by the decision of ACER on the methodology and assumptions that are to be used in the bidding zone review process¹² which has been triggered by article 14-(5) Electricity Regulation.

In figure 3, a high-level overview of the BZR process is given. It consists of multiple steps, including:

- The TSOs submitting a proposal for the methodology and alternative configurations to be considered in the review.
- Approval process by the relevant NRAs, or escalation of the decision to ACER in case the Regulators cannot find agreement on the proposal.
- Execution of the review, leading to a joint proposal to the relevant Member States or their designated competent authorities to amend or maintain the bidding zone configuration.
- Decision making process of the relevant Member States, following the reception of this joint proposal.

¹¹ Article 32 & 33 are part of the CACM Guideline, but are moved to Article 58 & 59 in CACM2.0.

¹² Decision No 29/2020 of the European Union Agency for the Cooperation of Energy Regulators of 24 November 2020 on the methodology and assumptions that are to be used in the bidding zone review process and for the alternative bidding zone configurations to be considered.

Figure 3: A schematic of the BZR process as described by the CACM Guideline.

Article 32 of the CACM Guideline provides a comprehensive description of the bidding zone review process. This process entails TSOs drafting a proposal on the methodology and assumptions to be used and an alternative bidding zone configuration. An approval step by the involved regulatory authorities or by ACER. An assessment by the TSOs to compare the different bidding zone configurations. The TSOs will also hold a consultation and a workshop regarding the alternative bidding zone configuration proposals compared to the existing bidding zone configuration. Last, the TSOs will submit a joint proposal to maintain or amend the bidding zone configuration to the participating Member States and regulatory authorities who in term, shall reach a final decision within 6 months on the final proposal of the TSOs.

When looking into article 32 on the BZR, the guideline states that there are four entities than can launch a BZR resulting in a national or regional BZR:

- 1. National bidding zone review** | This can be initiated by a single NRA or TSO with approval of its NRA for the bidding zone(s) inside the TSO's control area, if the configuration has negligible impact on the TSOs' control areas. According to the CACM Guideline, only the national TSO(s) and NRA are participating in the review. Nevertheless, other stakeholders may provide comments that must be taken into account. Naturally, performing a review in a national manner greatly decrease the number of involved stakeholders and consequently a) speeding up the process and b) decreasing the risks for reaching clarity before the tendering process. It must be noted that this option is only available if the new bidding zone configuration has negligible impact on the neighbouring TSOs control areas. In addition, the new configuration must be necessary for to improve economic efficiency and maximise cross-zonal trading opportunities, or to maintain operational security.

2. Regional bidding zone review | As the name states, this review involves many stakeholders. When Electricity Regulation went into effect in 2019, a regional BZR was launched for all MSs in Europe (multiple Capacity Calculation Regions¹³ (CCR)), as to this day this review is still ongoing¹⁴. However, the options also allow of a review within a single CCR, meaning that all stakeholders within a specific CCR will participate in a review. According to the guideline presented in CACM, the BZR can take up to 20-34 months depending on if amendments and/or escalations steps on decisions are made during the consultation processes.

The entities that can launch this approach are:

- ACER pursuant to the technical report drafted by ENTSO-E.
- One or several regulatory authorities on recommendation of ACER, pursuant to the technical report by ENTSO-E¹⁵.
- TSOs of a Capacity Calculation Region (CCR) with all concerned TSOs whose geographic area are within the bidding zone configuration (including inter-connectors).

CACM2.0 adds the following to this list: MSs or their designated competent authorities.

Highlight
Performing a review in a national manner speeds up the process and decreases the risks for reaching clarity before the tendering process.

¹³ CCR consists of a set of bidding zone borders for which the capacity calculation is coordinated by TSOs in accordance with the CACM Regulation.

¹⁴ Current status of the bidding zone review: [Link](#)

¹⁵ CACM2.0 indicated that several regulatory authorities can launch a BZR without the need of ACER's recommendation but with evidences in the technical report on structural congestions .

3 Why the Bidding Zone Review process is not suitable for the roll out of hybrid projects

Current regulation seems to be relatively firm and clear about the methodologies to amend or maintain bidding zone configurations. Furthermore, the position of the EC is clearly presented in the commission working staff document¹⁶ as the document states: *“It is already possible under the current regulatory framework of the Clean Energy Package to establish offshore bidding zones...”*

Nevertheless, a number of barriers were identified within the relevant regulation that are potentially preventing the implementation of (offshore) hybrid projects. This chapter will briefly introduce the main barriers found in article 14 of the Electricity Regulation and the BZR methodology stated in the CACM Guideline.

This chapter highlights three aspects that may affect the realization of an OBZ market setup for offshore hybrid projects, namely:

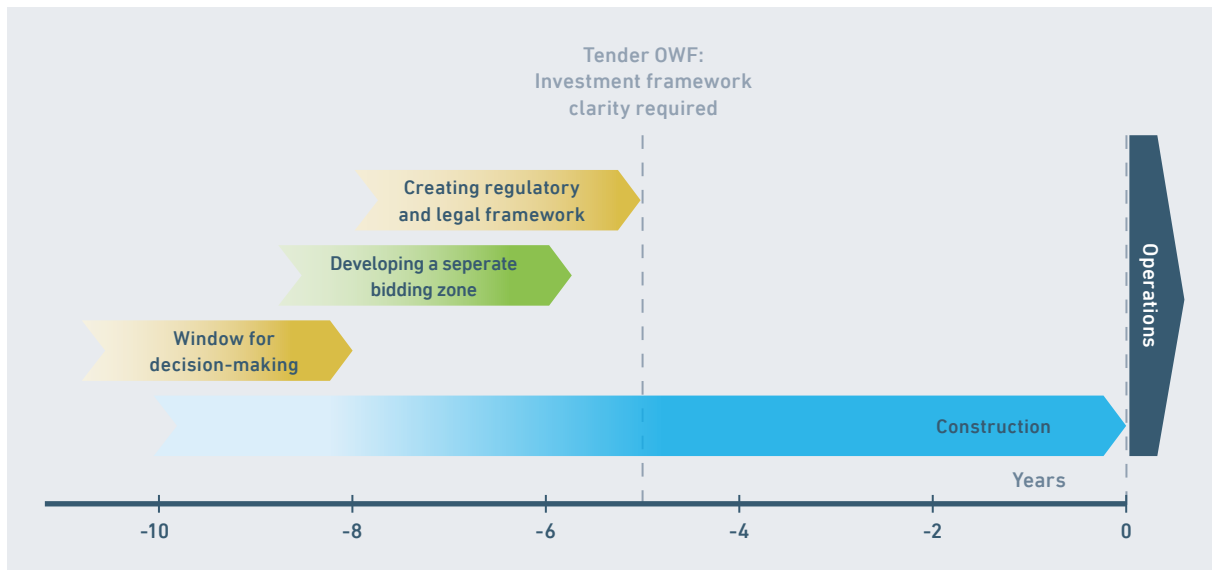
1. Discrepancy between review process and lead time of a hybrid project;
2. The BZR is a lengthy process and sensitive to the opinions of the relevant stakeholders;
3. The BZR is mainly focused on existing onshore bidding zones.

3.1 Discrepancy between review process and lead time of a hybrid project

The main barrier can be found when looking at the lead time of an hub-and-spoke project. According to the concept paper of the NSPWH¹⁷ the typical lead time (the time for a project to be completed) for a hybrid project is estimated to be 10-15 years, depending on the hub foundation. Figure 4 displays such a timeline. OWF tendering is expected to take place about 5-7 years before go-live. This implies that clarity on the commercial framework and thus on the market design, regulatory and legal framework is required even before that moment.

¹⁶ European Commission, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future, November 2020. [Link](#)

¹⁷ NSPWH, TOWARDS THE FIRST HUB-AND-SPOKE PROJECT Progress of the North Sea Wind Power Hub Consortium, May 2021. [Link](#)

Figure 4: Expected lead time of a hybrid project.

The establishment of a separate bidding zone is one of the various steps that have to be followed in order to realize an offshore hybrid project. Creating a regulatory and legal framework is estimated to take approximately three years. With the current view on timeline regarding the establishment of an OBZ, this leaves a time window for decision making to about five years before the tender for the OWF takes place.

Electricity Regulation article 14 shows this misalignment in time horizons:

- Electricity Regulation Article 14 states that infrastructure development projects that are expected to be realised within the following three years can be adopted in the review process¹⁸.
- As can be seen in Figure 4, the tendering date of the OWFs is expected to be 5-7 years before go-live.

As a consequence, this discrepancy between review process and lead time of a hybrid project would make it impossible to include new (hybrid) projects with an expected lead time of longer than three years. As a result, it is impossible to provide clarity on the market setup in time for the OWFs.

¹⁸ Electricity Regulation Article 14 (5): "The methodology shall be based on structural congestions which are not expected to be overcome within the following three years, taking due account of tangible progress on infrastructure development projects that are expected to be realized within the following three years."

3.2 The BZR is a lengthy and cumbersome process

The BZR is, in general, a lengthy and cumbersome process that may take up to 20-34 months. A substantial part of the time is depending on the amount of involved stakeholders in the review process. From figure 3, it can be seen that two consultation rounds with neighbouring MSs, NRAs, TSOs and other stakeholders are held. These consultation rounds allow for amendments in the proposal and assessment drafted by the TSOs. For each of the two consultation rounds, CACM Guideline states that an unanimous decision amongst the NRAs is needed for the first round and an unanimous decision amongst the involved MSs for the last round. If no unanimous decision can be realised within the given time period, escalation steps to ACER (1st consultation round) and EC (2nd consultation round) can be taken.

The consultation rounds require coordination amongst all involved stakeholders. Naturally, when many stakeholders are involved, coordination becomes more complex and reaching an unanimous decision may take longer. Consultation rounds are an important feature, however it may cause uncertainty regarding the overall timeline and the outcome of the BZR process as NRAs and MSs could hypothetically decide against the introduction of new bidding zones. As a consequence, making it more difficult to provide timely clarity on the market setup to the OWFs, which in term, might result in increased investment risk for OWF developers.

In addition to the consultation rounds, it is unclear as to what stakeholders should be involved in this approach. The Commission staff working document¹⁹ states that the level of coordination and consultation with neighbouring TSOs depends on how big the impact of reconfiguring the bidding zones is likely to be on their bidding zones.

If the example is taken that in a single MS an amendment of its bidding zone(s) is launched pursuant to the third option in Electricity Regulation (via a report on congestion drafted by its NRA or TSO with approval from its NRA), it is unclear how to assess to what extent a new offshore bidding zone will impact the neighbouring TSOs control area²⁰. Furthermore, it is also uncertain who can make a decision regarding the involvement of the stakeholders. Both the CACM Guideline and Electricity Regulation do not further define a procedure that allows a MS, NRA or even a TSO to identify the relevant participants in an amendment process of bidding zones.

Highlight
The BZR is a lengthy and cumbersome process, which may take up to 20-34 months.

¹⁹ European Commission, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future, November 2020. [Link](#)

²⁰ A control area is defined in Electricity Regulation Article 2-(67) as: "a coherent part of the interconnected system, operated by a single system operator and shall include connected physical loads and/or generation units if any".

3.3 The BZR is mainly focused on the existing onshore bidding zones

The misalignment in the BZR process and the addition of a new bidding zone can partly be explained by the fact that the BZR initially served the purpose of optimizing the existing configuration of bidding zones in Europe rather than to establish new offshore bidding zones.

The focus of the BZR process can clearly be derived when focusing on the technical report by ENTSO-E mentioned in the CACM Guideline²¹. Recently, the ENTSO-E published its technical report²² for 2018-2020 in which four sections were presented:

1. Present congestions and their future evolution;
2. Power flows not resulting from capacity allocation;
3. Congestion income and firmness costs and volumes;
4. Implementation of the CEP's 70% minimum capacity to be available for cross-zonal trade.

The technical report is based on a substantial set of historical data describing congestions in various locations in the transmission grid within different time frames. When a new offshore bidding zone is to be established specifically for the integration of to-be-constructed generating assets, this data is not (yet) available. Furthermore, the second section focuses on power flows not resulting from capacity allocation or loop flows. This is an unnecessary step as the offshore hub will be solely interconnected via HVDC interconnectors to shore.

The Bidding Zone Review process requires to study a total of 22 indicators, which are all relevant in the context of reviewing and potentially amending the existing configuration, but are not all relevant for determining the optimal configuration for a future hybrid project. For example, the BZR process obliges an assessment of market concentration and market power, while a decision on the configuration needs to be taken before auctions for offshore wind will take place and therefore one cannot assess this indicator at that point in time.

Finally, the BZR includes an assessment on the removal of congestion by analysing and assessing new configurations of bidding zones. This seems not relevant to hybrid projects under an OBZ setup as this is done by creating a new bidding zone in the first place, based on already expected and foreseen structural, long-term congestion.

Highlight
The BZR process requires to study indicators which are not all relevant for a hybrid project.

²¹ More specifically, CACM Article 34: "Regular reporting on current bidding zone configuration by ENTSO for Electricity and the Agency" (Article 62 of CACM2.0).

²² ENTSO-E: Bidding Zone Configuration Technical Report, 2021, [Link](#)

3.4 Conclusion

Now that the most important barriers regarding the review process for hybrid offshore projects have been discussed, some observation can be made.

The review process seems not to be compatible (yet) with the development of hybrid projects under an OBZ due to three main issues: 1) a discrepancy between the time horizon of the review process and lead time of a hybrid project, 2) the BZR is a lengthy process where it is unclear which stakeholders should be involved, and 3) the review process seems predominantly focused on optimization of the onshore bidding zone configuration rather than creating new bidding zones.

The prolonged process for bidding zone review will most likely increase the incentive for market parties, TSOs and MSs to look for alternatives to carrying out this cumbersome process. Hybrid projects are complex matters already, and the bidding zone study makes what is otherwise one of the simple parts, significantly more complex.

Highlight
The review process seems not compatible yet with the development of hybrid projects under an OBZ.

4 An alternative approach

The current regulation makes the process to establish an OBZ for hybrid projects complex because of multiple reasons. This chapter, proposes an alternative approach based on the principles of the relevant regulation.

4.1 Principles of the EU regulation w.r.t. bidding zones

As was thoroughly described in chapter 3, the Electricity Regulation sets out several principles and provisions for network access and congestion management, as well as the configuration and review of bidding zones. The most important principles can be funnelled down to two principles following from the Electricity regulation:

First | as the basic principle under the Electricity Regulation, *bidding zones shall not contain long-term structural congestions in the transmission system*, i.e. bidding zone borders shall be based on structural congestions rather than national borders. Therefore, the decision whether to amend the bidding zone configuration is based on the analysis and identification of structural congestions in the transmission grid.

Second | Another basic principle under the Electricity Regulation is that *TSOs shall not unduly reduce cross-zonal capacity*, i.e. TSOs shall not limit the volume of interconnection capacity to be made available to market participants as a means of solving congestions inside their own bidding zone or as a means of managing flows resulting from transactions internal to bidding zones. This provision is considered to be complied with if a minimum level of 70% of the transmission capacity is offered for cross zonal trade, while respecting operational security limits (70% rule).

Foreseen non-compliance with the 70% rule can also serve as a basis to identify structural congestions. In 2019, TenneT TSO B.V. submitted a report²³ on structural congestion pursuant to Article 14-(7) Electricity Regulation to the Dutch regulator, the Authority for Consumers and Markets (ACM). The conclusion of the report is that – geographically stable over time, predictable and for a frequent number of timestamps – violations of thermal capacity (due to a temporary excess of power flow) will lead for multiple critical network element contingencies to a situation in which the 70% rule cannot be reached. This was seen as sufficient basis to identify structural congestions in the Dutch bidding zone, triggering the establishment of an action plan for the Netherlands.

²³ ACM approval on the congestion report (in Dutch): [Link](#)

4.2 A hybrid project by default contains structural congestion

As the offshore projects are expected to be developed in a cost-efficient manner, meaning that cables will not be over dimensioned, it is foreseen that structural, long-term congestion will arise on the cables between the offshore hub and the onshore grids.

Hybrid offshore projects combine the functionalities of connecting OWFs and cross-zonal interconnection. This means that wind energy flows and cross-zonal flows need to be co-optimised. As such, the 70% rule is a primary regulation for hybrid project meaning that 70% rule of the capacity between the bidding zones must be made available on the hub-to-shore transmission cables to facilitate trades from the market. As a consequence, in case of a 'home market approach', the network elements connecting the windfarms to the 'onshore or home bidding zone' will be fully used to transport the infeed of the OWF. As a consequence, the interconnector on the other side will not be able to transport at minimum 70% of its capacity and comply with the 70% target. Resulting in a situation that would be considered as unduly reduction of cross-zonal trade because of structural congestion on the network element connecting the offshore wind farms to their home zone. Essentially there are two options to order to overcome this :

- either over dimensioning of the cables is required which reduces the cost efficiency aspect of a hybrid project;
- or this results in structural congestion and requires costly curtailment or countertrading counteractions by the TSO.

As a result, offshore hybrid projects by default contain long-term, structural congestion. Naturally, this congestion must be addressed by the MS(s) (pursuant the Electricity Regulation) preferably before the OWF tendering and go-live of the hybrid project. In case these timelines are not feasible, the establishment of an OBZ still seems inevitable after go-live of the hybrid project as the congestion must be addressed with a new bidding zone border. An action plan will not be possible after December 2025.

4.3 Alternative approach: Decide on a OBZ on the basis of a congestion report

Following the principles of the Electricity Regulation, by default bidding zone borders need to be applied to deal with these structural congestions on the network elements. This leads to the creation of an OBZ for the offshore hub and all HVDC cables between the hub and the onshore grid become bidding zone borders.

Therefore, in order to establish an OBZ for the offshore hub in principle it should suffice to justify that all network elements between the hub and existing bidding zones contain structural congestion, and that there is no need to execute a full bidding zone review process.

Highlight

Due to cost-efficient development of hybrid project and its dual functionality, a hybrid project will contain structural congestion.

In order to justify the existence of structural congestions, a 'structural congestion report' in accordance with article 14-(7) of Electricity Regulation, would have to be drafted by the TSO(s) which will experience structural congestion(s) in their control areas. In case of a hub-and-spoke project, this is either the TSO for which the hub is in the EEZ of its Member State, or the set of TSOs involved in the connections between the onshore grids and the hub-and-spoke project. Depending on the preparation and resources of the responsible TSO the time expected to draft such a technical or congestion report is estimated to be 3 - 6 months based on earlier reports. It is suggested to notify the MS and NRA to ensure a smooth process.

The report drafted by the TSO requires approval from its NRA. Following the approach discussed in Electricity Regulation article 14-(7), a decision to approve or to request for amendments regarding the technical report shall be taken within six months, by the NRA. If the competent NRA(s) approve this report, the Member State(s) with identified structural congestion shall have to decide within six months of receipt of the report to review and amend its/their bidding zone configuration²⁴. The relevant Member State(s) would then be eligible to take a decision to amend the bidding zone configuration by the establishment of an OBZ. If it is decided to proceed with an OBZ, the TSO can start with the preparations. In addition, an additional notification to the EC and/or ACER might be necessary.

However, the Electricity Regulation does not specify the (minimum) contents of such a structural congestion report other than that it needs to be approved by the competent NRA(s). Based on the contents of earlier reports, a general understanding may be drawn that the report should contain at least, or some of the following to enable NRAs to approve the report and its conclusions:

1. The methodology & assumptions used
2. How the expected congestion is expected to take place
3. How the expected congestion will behave based on evolution of the (onshore) grid
4. A final conclusion

Nevertheless, this is not specified in regulation. Furthermore, the competent NRA should make a decision based on the contents whether it is sufficient to approve the report.

In order to identify the structural congestion, a technical report should be drafted, pursuant to option three of Electricity Regulation article 14-(7), by the TSO responsible for providing grid connection to the project. After approval on the technical report, the relevant MS shall make the decision to establish a (new) OBZ. As was described in chapter 3.2 such a decision should be taken within six months by the relevant MS. Last, when all preparation on the operation of the OBZ have been performed the project should be ready for operation.

Highlight

In order to identify structural congestion, a report on congestion should be drafted, which might suffice to justify the establishment of OBZs.

²⁴ Article 14-(7) also allows for the establishment of an action plan. However, for the time frame envisioned for NSWPH the option of establishing an action plan in accordance with Article 15 Electricity Regulation is not a possibility as article 15 (2) Electricity Regulation specifies that the minimum capacity provided for in article 16 (8) Electricity Regulation shall be reached by 31 December 2025.

5 Regulatory Steps after a bidding zone decision

The decision on the market design (i.e. between a Home Market or Offshore Bidding Zone setup) is an important decision for an offshore market design, however, it's not the final step in the implementation of an offshore market design. This chapter will illustrate the subsequent steps to be taken after such a decision is made. These steps will be necessary in all setups. In other words, this is required for both an offshore bidding zone as well as home market setup, with only minor differences, and therefore can be seen as a general indication of necessary work.

For the following steps, clarity on the zonal aspects of the offshore market design is a prerequisite. This requires, on MS level, that a decision on the creation of offshore bidding zones is taken and, if not, what the alternative solution will be, and hence the subsequent bidding zone borders are known. In all cases, the final setup to be implemented should be clear and definitive for TSOs and NEMOs.

The steps can be largely divided in the following parts:

- Update of the CCR determination to account for the new offshore transmission assets, potential new bidding zone borders and assign the relevant TSOs to bidding zone borders.
- Assessment of the all-TSO methodologies to accommodate the new offshore transmission assets and bidding zone borders.
- Assessment of the relevant regional methodologies to accommodate the new offshore transmission assets and bidding zone borders.
- Implementation of the amendments of both methodology categories above.
- Adopting market coupling processes (where necessary) to accommodate the new transmission assets and bidding zone borders.
- Develop system operation agreement which takes all the regional and pan-European methodologies into account.

The next sections will elaborate on each of these steps.

It is important to consider that all steps in this chapter can only start after a decision on the zonal outline and market design. Also, the implementation work needs to be finished before the offshore transmission assets to enter in operation. In practice, it means that all amendments and implementation do not limit the tendering process of the wind farms, and can be performed in parallel with the construction period of the offshore assets. As construction is expected to take multiple years, this should provide sufficient time to perform the amendments and implementation required.

5.1 Amendment of the CCR determination

As a first step, the (new) zonal outline should be incorporated in the 'determination of capacity calculation regions' (CCR determination), in accordance with article 15 of the CACM Guideline. This CCR determination registers which bidding zone borders belong to which capacity calculation regions (CCRs), and which TSOs are responsible for these borders. These CCRs are the basis for the subsequent regional methodologies as prescribed by the various guidelines.

Amendment of the CCR determination has been roughly a yearly recurring process since its first approval. Therefore, it is a well-known, but nevertheless rather lengthy process, where developments across Europe needs to be taken into account, ensuring all relevant amendments are included. Given it is a so-called 'all-TSO methodology' the methodology is amended through ENTSO-E, and, in line with CACM Guideline, should include a month-long public consultation. Depending on the impact and controversy of the foreseen amendments, this process could take between 6 and 12 months. As an all-TSO methodology, it needs to be submitted to and approved by all national regulatory authorities through ACER within a six-months approval timeline afterwards.

Afterwards, the bidding zone borders are formally assigned to CCRs, and the regional methodologies can be amended, where necessary, as described in section 5.3.

5.2 Assessment of the all-TSO methodologies

The foreseen North and Baltic sea offshore transmission grid, with its constellation of interconnectors, largely consisting of HVDC-links and large OWFs, is significantly different from the onshore setup of meshed AC-grids.

Pursuant to the Electricity Guidelines currently in force, various methodologies have been developed, outlining conditions that are applicable to all TSOs and NEMOs in the internal electricity market. These methodologies are stated in:

- article 9(6) of CACM Guideline;
- article 4(6) of the Guideline on Forward Capacity Allocation (FCA Guideline);
- article 5(2) of Guideline on Electricity Balancing (EBGL)
- article 6(2) of Guideline on Electricity Transmission System Operation (SOGL) .

In addition, these methodologies are subject to approval by all regulatory authorities via ACER (since the entry-into-force of the ACER regulation).

Highlight

All described steps can start after the tendering process and therefore do not limit the process.

Since most of these methodologies are developed with meshed AC-grids in mind, they should at least be assessed on their compatibility with the new offshore (hybrid) transmission grid, and amended where necessary. This applies in both cases, for the home market approach as well as offshore bidding zone approach.

The CCR determination, mentioned in the previous section, is an example of such a methodology, to be amended through ENTSO-E and to be submitted to and approved by all NRAs through ACER. Hence, the timeline for any amendments of other methodologies is similar. The total process including approval can take between 9 and 18 months. These amendments can be done in parallel with the amendment of the CCR determination and the regional methodologies.

5.3 Assessment of the regional methodologies

The necessary decision on the CCR determination determines which capacity calculation regions are impacted by the new offshore transmission assets. Similar to section 5.2, within these regions various methodologies have been developed, outlining conditions that are applicable to the TSOs in those specific CCRs. These regional methodologies are stated in article 9(7) of CACM, article 4(7) of FCA, article 5(3) of EBGL and article 6(3) of SOGL. In this case, the methodologies need to be submitted to and are subject to approval by the regulatory authorities of the CCR.

Similar to section 5.1 and 5.2, the regional methodologies would have to be assessed on their compatibility with the new offshore transmission grid. Depending on the region's grid characteristics and the extent to which the current methodologies are applicable on the offshore transmission assets setup, amendments to the current methodologies might be necessary.

There is more variety in the regional methodologies with regards to complexity and maturity, so it is harder to assess up front, how much time and effort these amendments and their implementations will take. An upside is that generally, all regional methodologies can be assessed and amended in parallel within the CCR and the amount of TSOs and NRAs involved is lower than in a pan-European process, which often limits the complexity. However, given the required steps in the amendment process, at least 12 months should be expected for these amendments.

5.4 Implementation of methodology amendments

All amendments resulting from the previous three sections need to be implemented before the offshore transmission assets can enter into operation. International implementation projects have proven to be complicated, so it's fair to assume that implementation will take at least 12 months. Fortunately, the physical construction period seems to provide the time necessary for this. Implementation will however, inevitably require time and resources, and hence should be taken into account in the time planning.

5.5 Adopting the market coupling processes to the new situation

In the previous sections, the focus has mostly been on TSO-related methodologies. However, next to the TSO-focussed methodologies and implementation, future changes regarding bidding zone configurations and borders requires TSOs to be proactive and inform the Single Day Ahead Coupling (SDAC) and Single Intraday Coupling (SIDC) commissions and deliver change requests as early as possible in order to provide the market coupling projects with the necessary information to include the projects in the planning along with all the other changes that will be lined up.

Looking at the (offshore) market setups that are currently discussed, most are based on known concepts like (coordinated-)Net Transfer Capacity (NTC) or flow-based (FB) capacity calculation with standard (SHC) or advanced hybrid coupling (AHC). These should be (largely) compatible with the current market coupling processes for the various time frames. However, with the ever increasing complexity of the market coupling processes, this aspect should not be overlooked.

6 Conclusion and recommendations

The analysis provided in this paper assessed the existing methodology (provided in EU regulation) on the establishment of (new) offshore bidding zones. This topic is especially relevant for the realisation of offshore hybrid projects since it is crucial that clarity is provided on the market setup to enable a clear, calculable investment case for offshore wind farms.

However, a number of barriers were found that affect the establishment of offshore bidding zones for hybrid projects. The most important barriers are listed as below:

1. Discrepancy between review process and lead time of a hybrid project |

The review methodology only includes assets that will be operational within three years. This makes it impossible to establish an OBZ and provide clarity to OWF developers for projects that have a lead time longer than three years. Wind farm tendering is expected to take place about 5-7 years before go-live.

2. The BZR is a lengthy and cumbersome process |

The BZR may take up 20-34 months. The consultation rounds in the review methodology, although important, might slow down the final decision on the bidding zone configuration significantly. Furthermore, there is no guarantee that the outcome of the BZR will result in the establishment of a new OBZ. This might result in a significant investment risks for hub-and-spoke stakeholders. Furthermore, it is currently unclear which stakeholders need to be involved in the different steps of a BZR.

3. The BZR is mainly focused on the existing onshore bidding zones |

The BZR review assesses whether the configuration of the existing bidding zones is optimal and can be improved. As a result, various steps that are of no relevance to the creation of an (new) OBZ are included in the technical report.

Hence it seems that either a change of regulation is required to make the BZR process suitable for hybrid projects and the establishment of OBZs, and clarity is required on which stakeholders would need to be involved. Or the alternative approach can be considered that is proposed in this paper. This approach is partly based on the already existing procedure described in the Electricity Regulation and would therefore not require any overhaul of legislation. In principle this approach allows a TSO to identify long-term, structural congestion without following the process of a BZR. Thus, adopting the possibility to establish a new OBZ by a final decision from its MS within a time span of 9 – 18 months.

In order to not delay hub-and-spoke project timelines, firstly a decision must be adopted by policymakers on the market setup and secondly – in case of an OBZ setup - also on the approach to establish an OBZ (for hybrid projects). Therefore, the NSPWH suggest the following next steps:

- 1. It is recommended that policymakers make a decision on the approach to establish an OBZ (short term) |** In case the Member States prefer an offshore bidding zone market setup, it is recommended to soon take a decision on which implementation approach should be followed. The alternative approach takes approximately 9 - 18 months and an BZR can take up 20-34 months or even longer in case of delays. It is crucial for investors to have a clear view on the market setup as they require this to enable a clear, calculable investment case.
- 2. It is recommend that the European Commission adopts a position on the approach to establish an OBZ (long term) |** It may be crucial to obtain a clear statement regarding the approach to establish an OBZ by the EC to prevent MSs to all start formulating their own approach. A standardised approach is necessary to integrate the fast growing amount of offshore wind for the coming decade in a cost-efficient manner through hybrid projects (under an OBZ market setup).
- 3. Further identify key aspects for OWF developers regarding the market setup |** Further research is required to identify exactly what an OWF developer needs to ensure a clear, calculable investment case. Is providing clarity on the market setup enough, or do OWF developers also need further information about the operability in its respective CCR including its methodologies. In addition, it is unclear in what form this information has to be provided as there is a difference in providing clarity (solely information), and for amendments to go into effect (binding).
- 4. TSOs should be proactive in providing information regarding market changes in bidding zone configurations and borders |** Future changes regarding bidding zone configurations and borders requires TSOs to be proactive and inform the SDAC and SIDC commissions and deliver change requests as early as possible in order to provide the market coupling projects with the necessary information to include the projects in the planning along with all the other changes that will be lined up.



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