Offshore Wind Energy Development in the Netherlands

Extended Abstract

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Abstract

Offshore wind energy is a critical component of the Netherlands' transition to a carbon-free energy supply. The country is on track to have at least 4.5 GW worth of offshore wind turbines in operation by the end of 2023. In its latest offshore wind roadmap, The Dutch government has set a target of having 21 GW worth of offshore wind farms in operation around 2030. This paper investigates how offshore wind tendering happens in the Netherlands and the direction it might take in the future. The offshore wind tendering process employed by the Dutch government has evolved from a subsidy-based, one-sided contract for difference scheme to a comparative assessment model with a financial bid. This unique model was designed to emphasize offshore wind's role in the conservation and restoration of the North Sea ecosystem and its integration into the Dutch energy system. To be successful, offshore wind developers will have to invest significant time and resources in developing solutions that satisfy these criteria while at the same time generating sufficient energy and remaining economically sound. Conversely, increasing costs, supply chain constraints, and multinational energy companies willing to pay extreme sums to reach their sustainability targets could threaten this tender model and shift the balance to a more lucrative financial auction model.

1. Introduction

The Netherlands' history of developing renewable wind energy offshore dates to 2007, when it commissioned the Egmond aan Zee project. At this time, the Netherlands did not have any concrete climate goals in place, and investment in offshore wind was relatively scarce. This was one of the primary drivers for the initial slow development of offshore wind in the Netherlands, despite government-provided subsidies.

The turning point came in 2013 when the Energy Agreement for Sustainable Growth was signed into law [5]. This agreement entailed concrete, binding targets for renewable energy penetration – 16% by 2023 – and the installation of an additional 1000 wind turbines next to Egmond aan Zee and Princes Amalia. In 2016, the government additionally transformed the permitting, licensing, and development processes of an offshore wind park from a fragmented approach to a centrally led "one-stop-shop" approach [2]. The responsibility for time-intensive processes like site selection and site investigation was allocated to different branches of government, and the permitting, subsidy allocation, and grid connection processes were combined into a single central tendering process. This effectively removed risk from the wind farm developer's side and significantly cut the time between site selection and wind farm commissioning. The key stakeholders involved in this are: the Netherlands Enterprise Agency, the Ministry of Economic Affairs and Climate Policy, the Ministry of Infrastructure and Water Management, Rijkswaterstaat and Dutch power grid operator TenneT.

These two comprehensive policy developments formed the foundation on which the Dutch government designed their first roadmap for large-scale offshore wind roll-out in 2016. The Roadmap 2023, as it came to be called, targets 4.5GW capacity by year-end 2023 through 5 wind farms within three studied and designated offshore wind zones. These zones are named: Borssele Wind Farm Zone, Hollandse Kust Zuid (HKZ) and Hollandse Kust Noord (HKN). More recently, the Dutch government has released an additional roadmap spanning the years 2023 – 2030. Originally, this targeted 11.5GW of offshore wind development by the end of the decade. In 2022 however, following the country's updated commitments with the Green Deal, this was upgraded to 21GW. This roadmap features 5 additional wind farm zones, listed here in chronological order of tendering (subject to change): Hollandse Kust West (HKW), Ijmuiden Ver, Nederwiek, Ten noorden van de waddeneilanden and Doordewind. The timeline, status, and location of these 8 windfarms is displayed in Figure 1 below. From 2016 onwards, Dutch offshore wind development has followed a stepwise approach, starting with the preparatory wind farm zone allocation and offshore wind rollout steps.

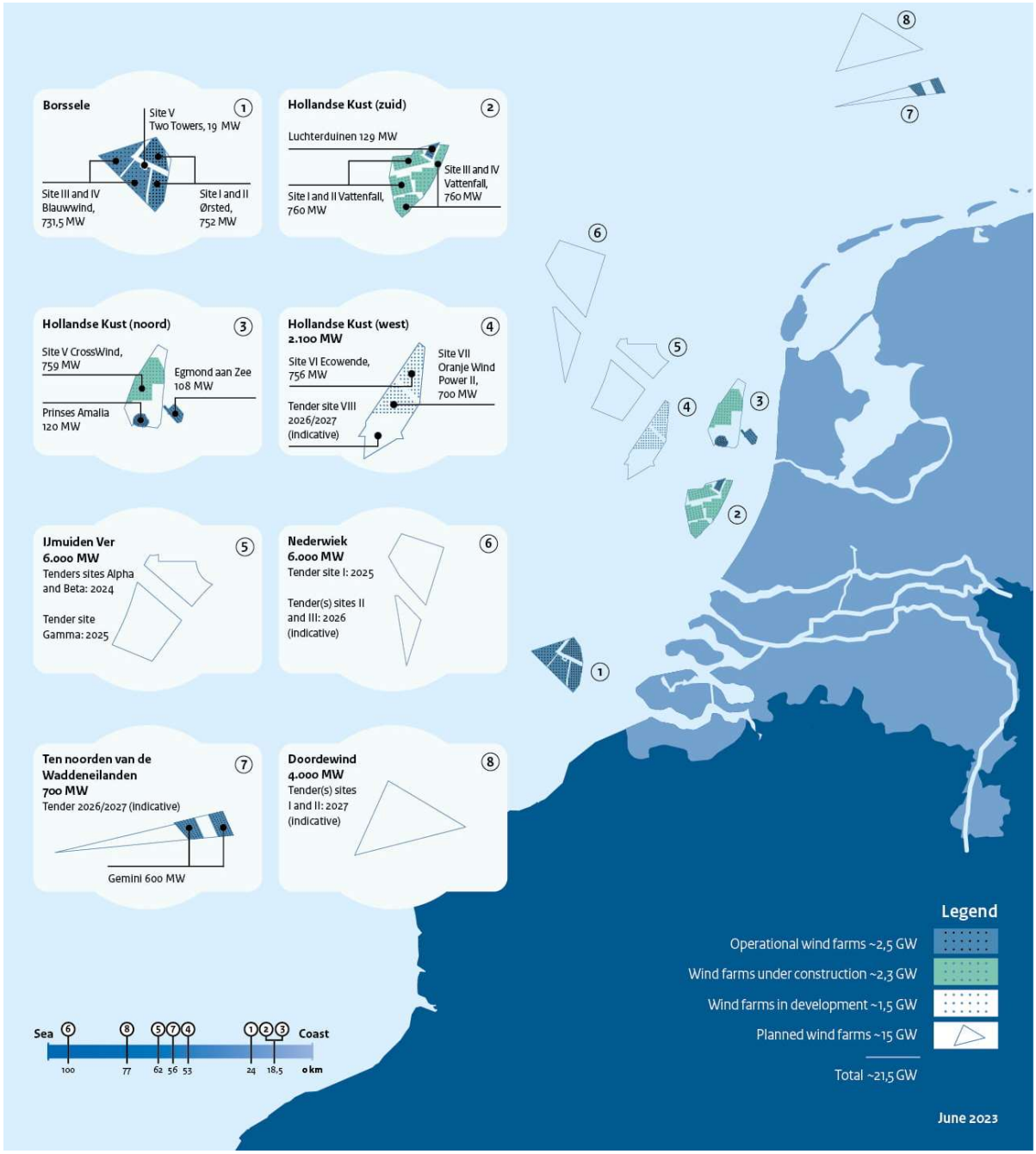

Figure 1: Annotated map of all the offshore wind zones and corresponding offshore wind farms in the Dutch pipeline as of September 2023. Note that dates for sites yet to be tendered are indicative. Source: [5]

Wind farm zone allocation

The Ministry of Infrastructure and Water Management, in cooperation with the Ministry of Economic Affairs and Climate Policy conducts rigorous spatial studies of the Dutch EEZ in the North Sea. These studies consider various factors, among which: the presence of other critical infrastructure (shipping lanes, pipelines, other offshore wind farms, …) and the restrictions imposed by conservation and nature protection areas. The result of these studies is an allocated offshore wind zone – for example Borssele.

As demonstrated in Figure 1 earlier, a single offshore wind zone may hold multiple offshore wind farm sites. Offshore wind development outside of these designated offshore wind zones is not permitted. This is typically done for multiple zones at a time and constitutes a necessary input for the creation of an offshore wind roadmap like Roadmap 2023 and Roadmap 2030+. The two latest offshore wind roadmaps have been key to giving developers, investors, and other parties involved in offshore wind projects clarity on the timing and sizing of upcoming offshore wind projects. It allows for the simultaneous development of offshore wind farms, offshore infrastructure (substations, inter-array cables, and a connection to the onshore grid. The idea behind a concrete offshore wind pipeline is to effectively streamline development both spatially and temporally [5]. The legal basis of current offshore wind roadmaps is the Wind Energy at Sea law, which was drafted in 2015 as a cooperative effort between the Dutch government and the wind energy sector.

Upon conclusion of these preliminary steps, Roadmap 2023 and Roadmap 2030 wind farm tenders proceed according to the following order:

ideally resulting in increased competitiveness during the tendering step.

1. Study Phase

As a prerequisite for the publishing of a wind farm site decision, rigorous site-specific studies are conducted. These can be split into two categories: the environmental impact assessment and general site studies. General site studies serve to obtain subsurface data, metocean data (wind resource assessment, wave, and climate), ecological data and to map the presence of unexploded ordinance (Site surveys and investigations, 2023). The environmental impact assessment serves to determine both the ecological as well as socio-economic consequences of the realization of an offshore wind farm as stipulated in the relevant roadmap. Additionally, it includes necessary actions/precautions to handle adverse impacts on for example local bat and bird species [3]. These studies help project developers more accurately gauge costs and time requirements,

2. Grid Connection

The Dutch electricity transmission system operator (TSO), TenneT, is responsible for linking newly developed offshore wind parks to the Dutch onshore grid infrastructure. This process tends to be time intensive, typically taking up to 10 years to realize depending on factors like distance to the onshore connection point, permitting, and stipulations set out by the EIA. TenneT oversees the construction of the offshore substation, offshore cables, and land cables. The offshore substations used by TenneT is a standardized 700MW alternating current (AC) design for wind farms closer to shore and 2GW direct current (DC) design for wind farms further out such as Ijmuiden Ver (62km from shore).

3. Wind Farm Site Decision

The wind farm site decision (WFSD) marks the conclusion of government studies. It is a combination of the results of the EIA, site-specific studies, and the law Wind Energy at Sea. It delineates the exact location where wind turbines may be built and sets forth general criteria that developers must abide by.

4. Tendering

Upon publishing the WFSD, the Minister of Climate and Energy Policy initiates the tendering process by publishing a ministerial order detailing the offshore wind tender rules. Tender rules are criteria that developers aim to meet to be considered eligible and to score points. The highest-scoring eligible bid receives the tender award. Eligibility criteria are often surrounding the anticipated realization and start of operations of the projected wind farm. Scoring criteria generally pertain to pricing mechanisms, the amount of power expected to be delivered, developer experience and financial bids offered by developers. The Dutch government currently sets forth three distinct tender models:

1. Lowest Subsidy Bid Model

The Lowest subsidy bid model is the only of the three where subsidies are granted to offshore wind developers for a set period – maximally 15 years. Under the lowest subsidy bid model, Dutch offshore wind developers build financial models to determine and subsequently bid their most competitive price per unit energy. The winning bid will be that which offers the lowest price per unit energy, as this results in the lowest awarded subsidy following low wholesale electricity prices. Up to and including the Borssele Offshore Wind tenders (2019), all tendered offshore wind projects have been carried out via the lowest subsidy bid model.

2. Comparative Assessment Model

As interest in Dutch offshore wind from developers increased, bid prices tended to zero – so called zero-subsidy bids. In 2018, price alone was no longer differentiating requiring the adoption of a new tendering model – the comparative assessment model. In the comparative assessment model, differentiating criteria spanning different areas of interest are set forth. These can be categorized as quantitative and qualitative criteria. Quantitative criteria entail topics such as, but not limited to:

- Lease Price – The financial bid offered for the lease.
- Security of realization of the wind farm – based on knowledge and experience of the developing parties, their financial strength, etc.
- Contribution of the wind farm to the Dutch energy system

Qualitative criteria on the other hand entail topics such as, but not limited to:

- Degree of ecological protection initiatives included in the tender.
- Knowledge sharing initiatives.
- Degree of integration into the Dutch energy system

3. Financial Auction Model

The third possible tendering model for Dutch offshore wind is a financial auction, much like in Germany. Competitors bid a price for the offshore wind lease in sequential rounds until only the highest bidder remains. To date, this model has not yet been implemented.

5. Permit award

The winner of the chosen tender model is awarded a permit to develop the proposed offshore wind farm

by the Minister of Climate and Energy Policy. This must be announced within 13 weeks of tender closure. Competing parties may object and request clarification on the winning conditions for a period of six weeks from the moment of award [6]. If no objection occurs, the permit becomes irrevocable, and first production of wind energy must occur within 48 months of permit irrevocability.

2. Methods

The Ijmuiden Ver (IJVER) offshore wind tender is currently ongoing and is the focus of this study. It is to be the largest wind farm commissioned by the Netherlands to date, with a projected capacity of 4GW. As can be seen from Figure 1, it is split up into two sites: IJVER Alpha and IJVER Beta. As for the preceding HKW VI-VII tenders, the Ministry of Climate and Energy Policy has selected a comparative assessment with financial bid as the tendering model.

The aim of this paper is to investigate what offshore wind developers are required to include in their bids to score a maximum number of points for both IJVER Alpha and IJVER Beta. This is done by deconstructing the official IJVER tender criteria published by the Netherlands Enterprise Agency into scoring categories and identifying the implications of said criteria for large scale developers like Shell, Orsted and TotalEnergies. The weighting of categories is also analyzed to determine where the focus of the Dutch government lies.

Additionally, this study looks at the evolution of the IJVER tender criteria and the reasons for this. This is done by comparing the IJVER draft tender criteria to the previous HKW VI-VII tender criteria. On top of that, the influence of the previously mentioned offshore wind developer input is studied by comparing the finalized IJVER tender criteria – published in July 2023 – to the draft IJVER tender criteria – published in March 2023. This gives insight into how the Dutch government reacts to stakeholder input, as well as to other market development such as other EU offshore wind tenders like the most recent German offshore wind auctions.

3. Results

As per regulation, the Dutch government first published the draft IJVER tender criteria, on the 31st of March 2023. Prospective developers then have a 30 day window to appeal criteria. The culmination of this is the IJVER final binding tender criteria, which were published in late July of 2023. These two tender criteria saw significant changes in response to developer input and market movements. An overview of the respective tender criteria breakdowns is shown in this section.

Draft IJVER tender criteria

The core scoring elements of the draft IJVER Alpha and Beta tender criteria are laid out in Figure 2 below. Common criteria are a financial bid, realization certainty, energy contribution, international responsible business conduct, circularity. Ecology is a criterium unique to site Alpha and is weighted the heaviest at 180 out of a possible 400 points. System integration (SI) and porpoise disturbance are criteria unique to site Beta. SI is Beta's heaviest weighted criteria, at 150 points out of a possible 400.

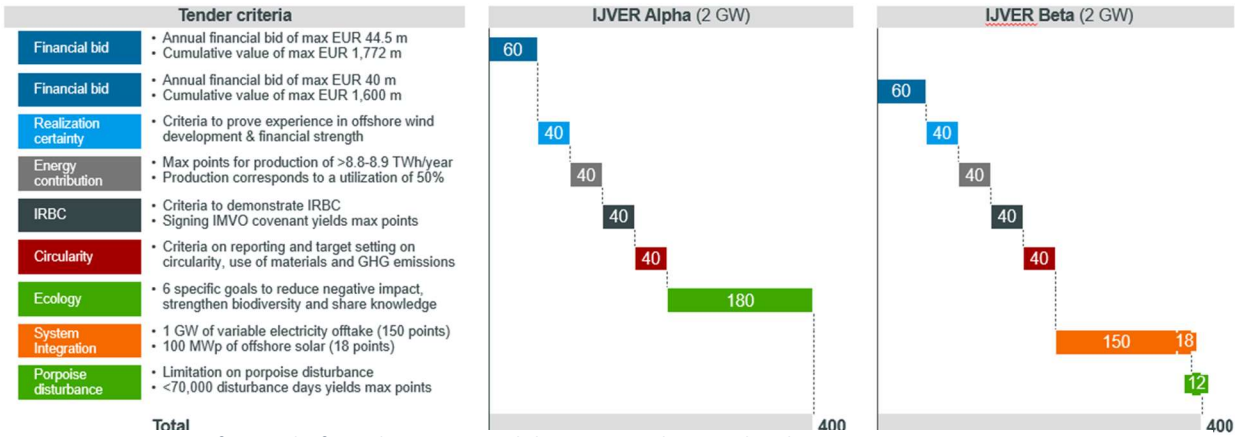

Figure 2: Summary of IJVER draft tender criteria and the associated points distribution.

IJVER Final Tender Criteria

The core scoring elements of the final IJVER Alpha and Beta tender criteria are laid out in Figure 2 below. The most significant changes from the draft criteria are also described. Most notably, the maximum scoring financial bid has been upgraded from roughly 40 million euros per year for 40 years to 420 million euros per year for 40 years.

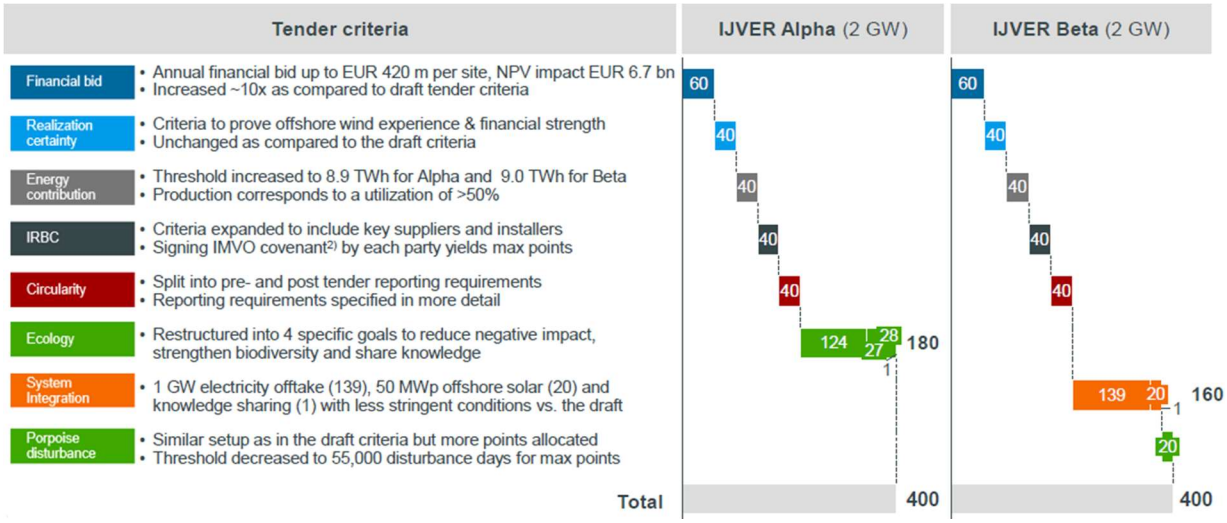

Figure 3: High level view of the final IJVER Alpha and Beta tender criteria with points breakdown and comment on the main changes from the draft tender criteria.

4. Discussion

Financial Bid

The financial bid represents 15% of the total points to be earned in both IJVER tenders. From draft to final tender criteria, the maximum scoring bid is increased by a factor of 10.5. This increase in the financial bid makes it 10.5 times more expensive to score points in the financial bid category. The (non-discounted) cost per point for the financial bid of site Beta was raised from 26 million euros per point to 280 million euros per point. This theoretically encourages developers to prioritize other, cheaper scoring solutions in the ecology, system integration, circularity, etc. categories. On the 12th of July, 2 weeks before the final IJVER tender criteria were released, neighbouring country Germany held its biggest offshore wind auction to date. 7GW of new capacity was tendered in an uncapped financial auction tendering model for a record setting total financial bid of 12.6 billion euros for a lease lasting 20 years. This equates to about 1.8 billion euros per GW. In the Dutch draft tender criteria, the average price

per GW was roughly 845 million euros per GW, and this for a lease lasting 40 years. This is under the assumption that the maximum bid is reached in the Dutch tender. The implication of this is that the Dutch government would receive significantly less money from offshore wind activities than their German neighbours. It is likely that the Dutch government observed developer's appetite for the German offshore wind auctions and upgraded their own financial bid cap to capitalize on this whilst at the same time making other, more time intensive objectives such as ecology and system integration more attractive. Under the final tender criteria, the Dutch government could potentially collect 33,6 billion euros in financial bid revenue if the max bid is achieved in the winning bid. The Dutch government has communicated it does not expect this to happen, however. Integrated energy companies Total-Energies and bp were the two winners of the German auction, sharing the leased out offshore wind acreage. This is significant, as traditional offshore wind players such as Orsted and RWE were unable to compete and publicly denounced this uncapped financial bid style of tendering [4]. If the financial bid category of IJVER ends up being the differentiating criteria, a similar scenario could unfold in the Netherlands. This is possible as the Dutch government has clearly communicated that they aim to make tender criteria and their scoring more objective, making it clear what it takes to score maximum points in the different categories. This is in combination with significant appetite from affluent oil and gas companies looking to reach their 2030 decarbonization targets.

Realisation Certainty

The criteria outlined for realisation certainty encourage the forming of consortia amongst developers. This is particularly true for new players in the offshore wind development market such as TotalEnergies, Equinor, etc. Teaming up with experienced technical and knowledge partners allows for the scoring of maximum points in this category. Roadmaps 2023 and 2030 are time-constrained, and realisation certainty of projects is key if the government aims to meet climate commitments. This is why they attach points to a developer's ability to realise an offshore wind project.

Energy Contribution

An energy contribution of 8.9 TWh and 9.0 TWh for IJVER Alpha and Beta respectively represents a capacity factor of approximately 51% for a wind farm capacity of 2GW. Given that statistics of Dutch offshore wind show the average capacity of offshore wind farms back then amounted to 39%, this is a significant step up. Developers will need to rely on wind farm configuration optimization and potentially overplanting of the offshore wind farm. Overplanting refers to constructing wind turbines with a combined capacity exceeding 2GW to make sure energy contribution points can be maximized. In HKW, all top-ranking developers managed to score maximum points in the energy contribution category.

IRBC

On March 6th of this year, the Dutch government has signed the IRBC for the Renewable Energy Sector, committing to stringent human rights and due diligence practices (About the agreement, 2023). They aim to make the IRBC the universal standard of responsible business conduct in the country, explaining the inclusion in the IJVER tender Criteria. This also explains why self-due diligence scores limited points and their preferred IMVO covenant solution automatically scores maximum points. Requiring not only developers but also other parties

along the value chain to commit to IRBC for renewable energy helps the Dutch government in enforcing a universal RBC standard across the board. This is a new criteria that was not included in the HKW tender criteria.

Circularity

The circularity criteria in the Dutch IJVER tender does not require any degree of circular design to score points. Rather, it requires detailed reporting on specified topics. It is likely that the Dutch government is gathering information to understand the current state of the market and circularity within offshore wind. It enables them to set future targets that are both ambitious and achievable. This is a new criteria that was not included in the HKW tender criteria.

Ecology

By assigning most points of the Alpha tender to ecology promoting solutions, the Dutch government makes clear its stance on offshore wind development. Offshore wind should not come at the cost of the environment. By clarifying how points can be scored from the already more objective IJVER Alpha draft criteria, it is made more likely that several offshore wind developers will score maximum points in this category. Next to demanding concrete solutions (visibility increases, start-stop measures, reef restoration, …) the tender criteria also request initiatives to solve ecological knowledge gaps in the context of offshore wind construction (effect of EMF, etc.). Additionally, monitoring of solutions is rewarded, allowing for the gaining of knowledge regarding the impact of solutions. This multi-faceted approach enables both ecological protection /restoration as well as the development of potentially new solutions in the future. Regarding porpoise disturbance days, the significantly reduced maximum point scoring limit will push developers to commit to quiet piling techniques for monopile installations.

System Integration

To score maximum points here, a combined 1GW of non-grid offtake solutions need to be included in the bid. This will stimulate investment in 100+MW electrolysers, such as those put forward by RWE for in their HKW winning bid [1], as well as storage technologies (batteries, compressed air storage, heat storage, etc.). When the windfarm generates more than a threshold value of power, these solutions need to come online, diverting excess electricity away from the grid. Whilst the Dutch government has very ambitious offshore wind targets, the onshore grid is not yet developed enough to accommodate for this much variable renewable electricity. This is the government's response to avoid future grid congestion.

Solar PV (offshore and onshore) has a different production profile to offshore wind. By developing both in tandem, the issue of variability of offshore wind energy would be somewhat mitigated. Offshore solar PV criteria were significantly relaxed from the draft criteria, halving and now earning developers more points. This is most certainly the result of feedback/appeal from developers, who communicated a lack of confidence in offshore solar PV's technological readiness for 100MW production. Most of the world's current floating solar PV is on reservoirs and lakes, not on the open ocean. The North Sea is notoriously rough and realizing an offshore floating solar farm with a life expectancy of 10 years in those conditions will be very expensive. As of now, this technology is in the pilot project phase, with the largest pilots approaching 5MW.

5. Conclusion

The Netherlands has committed to large scale offshore wind development to meet its climate commitments. Instrumental to this was their regulatory and tendering framework overhaul in the years 2013-2016. This allowed for the streamlining of development in such a way that interim targets are consistently met. Currently, the comparative assessment tender model is the model of choice for the Dutch government. It combines a financial bid with more qualitative scoring criteria. The latest Dutch offshore wind tender follows in the footsteps of its predecessor HKW. It is an extensive comparative assessment with criteria centered around protecting the North Sea ecology and stimulating integration of offshore wind energy into the Dutch energy. It is a more objective iteration of the relatively open ended HKW tender, giving clarity into what the government is looking for in each of the scoring categories. In response to proven appetite of oil and gas companies to invest in securing renewable energy projects, the government has also attached a significant financial component to the bid. This combination could lead to the financial bid being the differentiating category. If this is the case the Dutch tender will follow in the footsteps of the German one earlier this July where the highest bidder is awarded the offshore permit.

<u>Recommended future study:</u>

- Studying the results of the IJVER tender once it concludes in quarter 1 of 2024.
- What ended up being differentiating?
- The direction of future tenders is identified in Figure 1. What tendering model do they adopt? Does a financial auction model prevail over that of a comparative assessment?
- Cross-country analysis: a study looking into tender regimes in other EU countries with offshore wind ambitions: Germany, Denmark, Norway, UK, and France.

6. References

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