Offshore Wind Energy Tenders: Global Trends and Recommendations for Türkiye

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SHURA Energy Transition Center, founded by the European Climate Foundation (ECF), Agora Energiewende, and Istanbul Policy Center (IPC) at Sabancı University, contributes to the decarbonisation of the energy sector via an innovative energy transition platform. It caters to the need for a sustainable and broadly recognized platform for discussions on technological, economic, and policy aspects of Türkiye's energy sector. SHURA supports the debate on the transition to a low-carbon energy system through energy efficiency and renewable energy by using fact-based analysis and the best available data. Taking into account all relevant perspectives by a multitude of stakeholders, it contributes to an enhanced understanding of the economic potential, technical feasibility, and the relevant policy tools for this transition.

Turkish Wind Energy Association
The Turkish Wind Energy Association (TWEA) was established with decision 92/2752 of the Council of Ministers on 10 February 1992 in order to follow scientific, technical, and applied research on wind energy, to carry out activities to expand the use of wind energy sources, and to increase the economic potential of the wind energy in our country. TWEA, a unifying organization in the field of wind energy in Türkiye, covers the entire wind value chain and is actively involved in all legal regulations related to the sector. TWEA is involved in the coordinated works of the Turkish Electricity Transmission, Directorate General of Energy Affairs, Energy Market Regulatory Authority, and Ministry of Energy and Natural Resources. TWEA, a member of the European Wind Energy Association (Wind Europe) and the Global Wind Energy Council (GWEC), is the most powerful non-governmental organization in Türkiye in the field of wind energy.

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ABBREVIATIONS

CAPEX	Capital Expenditure
CfD	Contracts for Difference (with purchase guarantees)
CRE	French Energy Regulatory Authority
DKK	Danish Krone
ECA	Export Credit Agencies
EIA	Environmental Impact Assessment
ESA	Energy Supply Agreement
EUR	Euro
FiT	Feed-in Tariff
GBP	Pound Sterling
GW	Gigawatt
IRENA	International Renewable Energy Agency
km2	Square kilometre
kWh	Kilowatt-hour
METI	Japanese Ministry of Energy, Trade and Industry
MWh	Megawatt-hour
PPI	Producer Price Index
TRY	Turkish Lira
TWEA	Turkish Wind Energy Association
TWh	Terawatt-hour
US	United States of America
USD	United States Dollar
YEKA	Renewable Energy Resources Area (Yenilenebilir Enerji Kaynak Alanı)
YEKDEM	Subsidy Mechanism for Renewable Energy Zones (Yenilenebilir Enerji Kaynakları Destek Mekanizması)

1. Introduction

As Türkiye aims to make the utmost use of its renewable energy potential in line with its increasing energy demand and in parallel with its economic growth and net-zero emissions targets, it aims to implement offshore wind energy auctions in Renewable Energy Resources Areas (YEKA) and increase its installed capacity in this field. The Ministry of Energy and Natural Resources announced the National Energy Plan detailing the targets until 2035, with a focus on achieving the net-zero emissions target by 2053. In this context, a total installed wind power capacity target of 29.6 GW has been set for 2035, which comprises 5 gigawatts (GW) offshore and 24.6 GW onshore wind installed capacity.

Moreover, on 4 August 2023, the Ministry of Energy and Natural Resources identified several offshore wind energy zones that are eligible to become YEKAs. Accordingly, 1,111 square kilometres (km^2) off the coast of Bandırma, 299 km^2 off the coast of Bozcaada, 75.6 km^2 off the coast of Gelibolu, and 410 km^2 off the coast of Karabiga were designated as candidate YEKAs to implement offshore wind energy plants. Preliminary feasibility studies consisting of meteorological and oceanographic analyses and measurements will be carried out in specific sites to be chosen after consultations with the relevant institutions and organisations. In addition, technical, legal, and economic analyses and studies to determine capacity levels will be carried out, and activities toward the installation of offshore wind energy will be conducted according to the results of the studies.

This study, carried out by SHURA Energy Transition Center and the Turkish Wind Energy Association (TWEA), presents an analysis and set of recommendations to contribute to the design of an effective auction system for the offshore wind energy YEKA mechanism in Türkiye. Through discussions and analyses of the relevant criteria with reference to international best practices, the study aims to identify potential implementation criteria applicable to Türkiye. Within the scope of this report, important criteria for and international experiences in how to design offshore wind energy auctions in Türkiye are presented to the stakeholders in the energy sector and policy makers. Addressing critical issues such as wind measurements, auction methods, and organisation, the study aims to contribute to the discussions on the development of a strong and efficient offshore wind energy sector in Türkiye.

2. An Overview of Offshore Wind Energy Tenders

Offshore wind energy has played an important role in the global renewable energy scene in recent years due to its potential for large-scale implementation and generating clean electricity. The strategic location of Türkiye, which has shores on the Mediterranean Sea, Black Sea, and Aegean Sea, offers a unique opportunity to tap into sustainable energy resources. In order to effectively design offshore wind energy auctions in Türkiye, it is important to analyse the lessons to be drawn from international offshore wind auction practices. Many countries have successfully implemented tendering mechanisms to achieve competitive prices, efficient project allocations, and other benefits. These experiences offer crucial lessons for Türkiye in designing its offshore YEKA auction mechanism.

Wind energy procurement is usually carried out under two different programmes. Two widely adopted methods are Purchase Guarantee (or feed-in-tariff) schemes (e.g., the Subsidy Mechanism for Renewable Energy Zones (YEKDEM)), which pay fixed prices per unit of electricity generated and provide a predictable investment environment for project developers, and Competitive Bidding Systems, in which the price is determined by the project developers through a competitive bidding process (as in the case of Dutch auctions adapted for YEKA).

A Purchase Guarantee provides the producers long-term confidence in the market and can ensure market access and higher profit margin potential for all producers, including small players. Purchase Guarantees can also have negative effects such as creating a risk of tariff changes as the market matures, leading to excess supply and potential production interruptions when the market is saturated.

With the adoption of green transition practices, which is the new development model globally, an acceleration in the transition to renewable energy sources in energy investments is observed. In the early years of renewable energy investments, the feed-in tariff (FiT) model was used worldwide to support renewable investments. In recent years, however, the FiT model has been replaced by the tender/auction method to manage strong interest in renewables and to increase installed capacity in a cost-effective manner in parallel to the declining technology costs.

On a commercial basis, the competitive tendering method often results in low-cost generation for suppliers. It may also push the market to try and find new and more economic financing solutions. However, aggressive auctions may result in unsustainable bidding prices. The tendering process may be laborious, time-consuming, and costly. This may also favour large-scale energy companies (due to costs and the need for economies of scale) as local companies are rendered uncompetitive.

Competitive bidding mechanisms in wind power auctions around the world can be characterised on the basis of the following three elements. Various combinations of these elements is also possible:

1. Price-based tenders (price being the only criterion) or multi-criteria auctions (price and additional criteria including pre-qualification requirements such as local equipment procurement rules, technical and financial competence, environmental impact, etc.).

2. Centralised (wind sites chosen by the government) or decentralised (sites proposed by the project developers) approach.
3. Sealed bids (submitted simultaneously and kept confidential), open bids, or mixed bids (two-stage Dutch auctions including sealed and open bids, etc.).

The most important risks in wind energy auction mechanisms are that the capacity allocated through the auction may not be utilised at all, or it may be utilised only with a delay. In both cases, the outcome falls short of the planned deployment targets. Thus, the tenders must strike the necessary balance between guaranteeing the optimal price for the supplier, on the one hand, and setting a rational price level for the investor to access finance, on the other. For this reason, it is of the utmost importance that bidders' technical, financial, and other competencies within the scope of the tender are assessed accurately and that the deployment of power plants is monitored from the bidding stage until commercial operations. To determine the competencies of the bidders as well as to avoid the possibility of inadequate implementation, various measures and assessment criteria can be established:

- Pre-qualification criteria: Preliminary licences, technical requirements, etc. that are specific to the project; certificates and proof of technical and/or financial competency specific to the bidders.
- Performance bonds: Determining the level of performance bonds and bid guarantees to ensure the realisation of the project (levels that are too high may discourage parties from participating, levels that are too low may result in low execution rates).
- Penalties (penalty payments, impoundment of performance bonds, reduction of subsidies or duration): Applied in cases where the project cannot be implemented within a set timeframe or is cancelled due to reasons attributable to the project developer, failure to deliver the agreed amount of electricity generation, etc.

3. Examples of Offshore Wind Energy Tender Practices

In 2015, the International Renewable Energy Agency (IRENA) published comprehensive guidelines on auction designs. The guidelines serve as an important pillar to understand the critical points and elements in the design of offshore wind energy tenders. IRENA's guidelines explore various design elements, such as technology-based tenders, tender volumes, and number of tender rounds. These elements change over time and adapt according to the dynamics and needs of the sector.

In 2017, IRENA prepared a price analysis report that examined the factors affecting the bidding/offer prices in tenders. This report has become a key guide for achieving a balance between price and project objectives. The report emphasises that bidders should not solely focus on obtaining the lowest price but should also consider other objectives such as system integration, socio-economic impact, project location, etc.

The report states that for system integration, it is important to effectively integrate offshore wind power plants into the grid and to ensure that they are located close to high demand areas. Considering the case in Türkiye, it appears that the announced potential offshore wind energy YEKAs are close to high electricity demand areas. The report also states that the offshore wind energy tenders can be designed to meet certain socio-economic objectives, such as job creation and supporting economic development in the selected regions. IRENA (2019) focuses on the risks beyond prices. This report analyses the impact of various risks such as changing exchange rates and disruptions to the supply chain of installations. These risks are also crucial for Türkiye's offshore wind projects.

The experience of Southeast Asian countries can provide valuable insights for Türkiye to design offshore wind energy tenders in a more effective way. The report titled "Renewable Energy Tender Design: Southeast Asia" discusses the design and implementation of renewable energy tenders in Southeast Asia (IRENA, 2020). The development and utilisation of renewable energy resources is of great importance in Southeast Asia, a region where energy demand is increasing rapidly. The report addresses the key factors to be considered in the design and implementation of renewable energy tenders in Southeast Asian countries. The effective design of tenders is crucial to access finance as well as to develop and operate renewable energy projects.

Some of the qualification criteria raised in this report can be summarised as follows:

Technical Capability and Experience: The presence of the technical capability and experience to construct, operate, and maintain offshore wind energy facilities is crucial. Previous experience in working on projects of a similar scale may increase the bidder's chances of success.

Financial Capacity: Projects should have the capacity to access substantial amounts of capital or finance. Financing plays a key part in the realisation of projects: financial viability is essential.

Environmental and Social Compliance: The design and implementation of projects should meet the environmental and social compliance requirements. Consideration of environmental and social impacts in the region can enhance the social acceptance of the project.

Technological Compatibility: The planned technologies used in the projects should be up-to-date and cost-effective. If project development processes take too long, the technology may become obsolete or too costly. For this reason, it is of great importance to duly manage the project development and authorisation processes.

Energy Generation Capacity: The energy generation capacity of the projects should be sufficient to achieve the set targets.

A brief summary of several international practices is presented below:

3.1 Japan

The implementation of offshore wind energy projects in Japan has been hampered by various factors in the past. These factors include uncertainties in regulations and offshore land-use rights, prolonged environmental impact assessments (EIAs) often taking longer than four years, and limitations due to poor grid infrastructure in areas with significant wind potential, mostly located in the northern parts of the country (IRENA, 2021).

The first attempt to alleviate regulatory uncertainties occurred in 2016, with the enactment of the "Port and Harbour Act". This law secures port usage rights for 20 years (with an extension option) reserved for the winning parties of future offshore wind tenders. Thus, this law has secured a significantly longer lifetime for tenders when compared to the previous practice, which required an extension every three to five years (IRENA, 2021). However, as the name of the law suggests, this law was only applicable to port areas controlled by the local port authorities on the coasts of Japan. Port areas not only provide existing infrastructure for projects but are also used for other economic activities (IRENA, 2021). In 2018, the area available for offshore wind energy projects was expanded with the adoption of the "Law on Incentivising the Use of Offshore Renewable Energy Generation Facilities". Furthermore, this law permits exclusive use of the "General Common Sea Area"[1] for offshore wind energy (JWPA, 2018). The contract period was also extended to 30 years, but project developers are required to conduct all relevant research as well as construction and decommissioning activities during this contract period (IRENA, 2021).

In Japan, offshore wind energy tenders are planned with specific reference to the characteristics of the region. Region-specific tenders are a more comprehensive variant of site-specific tenders and therefore bring many advantages and limitations (see IRENA, 2021). For example, having the government (in the case of Japan, this is conducted by a local authority) carry out the relevant measurements and field analyses can greatly reduce the costs and time required for an environmental impact assessment (EIA). Likewise, access to grids can be planned in parallel with tenders. These regions are organised in at least five different Subsidy Areas, which are selected by the national authorities based on information provided by local administrations. Local councils and relevant stakeholders analyse the requirements for project proposals in each region. Thereafter, the Ministry of Energy, Trade and Industry (METI) publishes tender guidelines for project developers. In addition, technical data on environmental conditions such as bathymetry and wind regime conditions are provided, which reduces the technical workload for the project developers (IRENA, 2021).

[1] General Common Sea Area

3.2 United Kingdom

In the United Kingdom (UK), offshore wind is supported by a system in which buyers compete under the Contract for Differences (CfD), a guaranteed power purchase scheme considering mature and comparable technologies, and are evaluated on different terms according to the project characteristics. Until the most appropriate bidding price is provided, marginal pricing continues to regulate offshore wind energy capacities. Each bidder may submit up to four confidential bids with different combinations of price, capacity, and project completion date. Successful bidders and the government then sign a two-way CfD[2] for 15 years. As a result, the producer is paid the difference between the CfD utilisation price and the wholesale electricity market price. Since 2012, CfDs have been indexed in the consumer price index to cover for inflation. The costs arising from CfDs are passed on to electricity end-users. In December 2021, a CfD tender with 12 gigawatts (GW) of installed capacity was held, 6 GW of which was allocated for offshore wind power projects. From 2023 onwards, a new CfD tender is expected to be held each year.

The tender is carried out in two stages. Prior to the CfD tender, offshore areas are tendered by a different organisation. The project developer who wins the right to lease the relevant area can then enter the CfD tender. In the case that any of the projects allocated in the tender cannot be completed within the specified time period, the relevant project developer will be barred from participating in any CfD tenders for the next two years.

In onshore wind tenders in the UK, the connection cost is borne by the grid operator. In offshore wind energy tenders, however, the cost of grid connection is borne by the project developer, who in turn, passes this cost on to the public through the CfD. In offshore wind projects, the project developer can build the transmission connection and then sell this transmission asset to another private transmission company. From 2006 to 2018, transmission costs remained constant at 10 to 12 Pounds Sterling (GBP) per megawatt-hour (MWh), while the distance of projects to the shore has increased nine-fold (Jansen et al., 2022).

In July 2023, the UK organised an offshore wind power tender for a capacity of 5 GW. However, no bids were received from the participants. The reason for the lack of bids in this tender was the low ceiling price. The ceiling price, which was set at 44 GBP/MWh and includes the cost of grid connection, was considered insufficient as the infrastructure costs have increased by up to 40% in the past two years. At the same time, the UK is also having a hard time prosecuting the companies that won earlier tenders. For instance, Vattenfall stopped work on the Norfolk Project, with a capacity of 1.4 GW, as the government only regulates the tender prices based on the retail price index and not on the actual increase in costs. In comparison, France has a better track record of continuing with existing projects for offshore wind energy due to its better implementation of price support and income stabilisation indexing (Wind Europe, 2023). In the UK, this current course is seen as a significant obstacle to realising the target of 50 GW installed offshore wind capacity by 2030 and is likely to undermine the country's leading position in offshore wind energy.

[2] A two-way CfD is a contract signed between the electricity producer and the relevant government agency. In two-way CfD, if the current market price is below the usage price, the producer receives the difference; if it is above, the difference is reimbursed by the producer to the relevant government agency (European Commission, 2023).

3.3 France

In 2004, the French Energy Regulation Authority (CRE - Commission de Régulation de l'Énergie) commenced organising offshore wind energy tenders in order to reach the capacity targets set for renewables using closed tenders and the 'pay-as-bid' (payment over the bid price) method. Although France held the first tenders in 2004, these projects were not realised. Since then, three offshore wind energy tenders were held in 2011, 2013, and 2017.

For the first two tenders held in 2011 and 2013, with total installed capacities of 3 GW and 1 GW, respectively, subsidies were provided in the form of a FiT. All electricity generated was paid for through power purchase agreements undertaken by the EDF Purchase Obligation (EDF Obligation d'Achat), a regulated subsidiary of French Electricity Company EDF (Électricité de France). The costs were paid directly from the state budget. Project developers set their tender bid prices by considering all costs relevant to wind farm installation including the connection infrastructure. The price was dependent on the labour costs in the sector as well as the producer price index (PPI) and was updated according to the number of annual full capacity hours reached and the total installed capacity of the project. The selection process involved a multi-criteria assessment and was based on the following weighting function:

1. 40% – Industrial assessment (including investors' component manufacturing capacity, technical capability, risk analysis, and financial integrity);

2. 20% - Attention to existing activities and the environment; and

3. 40% - Bidding price.

In the first and second tenders, floor prices were set in the range of 115 to 140 EUR/MWh, while ceiling prices were set in the range of 175–220 EUR/MWh.

In the third tender conducted in 2017 (600 megawatts – MW), the tender procedure was modified by introducing a competitive dialogue phase and a consultation process before determining the final specifications. The subsidy mechanism was replaced with a two-way CfD. In the two-way CfD, the difference between the tender price and the monthly average price in the wholesale electricity market is paid (considering the hourly weighted average of monthly wind generation). In addition, all electricity retail companies are required to purchase "capacity guarantees" from power plants in order to meet peak demand in winter. The volume of capacity guarantees that can be sold by producers is determined by the transmission system operator. In the case of offshore wind energy projects, producers aim to increase their revenues by selling 25% of their capacity under a capacity guarantee.

Under this new subsidy scheme, the offshore wind farm can sell the generated electricity on the market and then receive monthly payments from the EDF Purchase Obligation. The subsidy period for the projects is set to 20 years. Unlike the previous tenders, the connection approach adopted in this tender is a 'shallow connection', whereby the transmission system operator bears the responsibility for the entire grid connection, including the costs.

The selection process was carried out according to the following criteria and weighting formula:

- 70% – Bid price (ceiling price 90 EUR/MWh with no floor price)
- 10% – Contract and financial conditions
- 11% – Area used and distance to shore
- 9% – The number of wind turbines and the budget allocated to environmental control

In the third tender, bid prices ranged between 44 EUR/MWh and 60.95 EUR/MWh (average bid price being 51.02 EUR/MWh), and the winning bid price was 44 EUR/MWh (Montel, 2019). The subsidy mechanism applied in the third tender was different from those applied in the previous tenders, making it difficult to analyse the evolution of prices. The average winning bid value decreased from 140 EUR/MWh in the first tender to 44 EUR/MWh in the third one. The main reason for this decrease is the cost reductions achieved in the offshore wind energy industry. However, more favourable conditions at the project site (high wind speed, proximity to the shore, shallower sites) have also played a role.

The plans for the upcoming tenders foresee a decrease in the ceiling prices (60 EUR/MWh in the 2020–2021 tender; 50 EUR/MWh in the 2023 call for tenders) (Jansen et al., 2022).

3.4 The Netherlands

Offshore wind energy tenders have been held in the Netherlands since 2009. In 2013, significant changes were introduced in competitive offshore wind energy tenders as a result of energy-climate agreements between the government and industry stakeholders. In this context, the government has set up an offshore wind team called “Wind op Zee”.

In order to minimise the risks for potential project developers during the tender phase, the government conducts site assessments covering wind data, oceanic conditions, and preliminary EIA and provides these data free of charge to all bidders. The Dutch transmission system operator, TenneT, is responsible for the development and operation of offshore wind energy substations and grid connections. TenneT committed to guaranteeing 350 MW of nominal power per site to be exported to the main grid. Wind projects can be overdeveloped by up to 8% of the rated capacity; however, the plant operators are obliged to curtail the power to 350 MW when instructed by TenneT. The cost of offshore electricity transmission is borne by the government/public authorities in order to accelerate the development of the sites. Site assessment costs, including preliminary EIA, are also borne by the government/public in order to attract potential investors and to lower the price levels of potential bids.

Initially, the cost of energy was used as the only selection criterion in the tenders. Financial guarantees (e.g., letters of guarantee) are required to ensure the construction and commissioning of the power plant within the agreed time frame. In the case of failure to meet these requirements, the government may reject the bid due to the potential risks involved in the project. For unsubsidised tenders, additional criteria have been introduced in addition to the cost of electricity. It was agreed that seabed leases would not be granted separately, but it was stated that the use of the seabed would be subject to a fee. In the event of failure to carry out a project, the awarded bidder would be required to pay a penalty to compensate for the damage caused to the public.

A penalty of EUR 10 million should be paid if the investor is unable to continue the project or to provide the required bank guarantees; and a penalty of EUR 3.5 million (which can be increased up to ten-fold) per month of delay is applied for projects that are not operational on the agreed commissioning date.

Subsidies under the SDE+ system are implemented as one-way CfDs. A base market price of approximately 30 EUR/MWh is set. Price levels below this figure are considered risky. The subsidy is paid for 15 years starting from the commissioning date of the plant, without any adjustments for inflation (Jansen et al., 2022).

3.5 Denmark

In 2005, Denmark organised the first competitive offshore wind energy tender. Through nine tenders, a total 3.2 GW of installed capacity was allocated. All tenders were conducted individually through a political process involving the national parliament. Different tender designs were applied for each tender, with significant modifications between them. Most tenders covered a single offshore wind site with a pre-defined capacity in the range of 200 to 1,000 MW. For near-shore areas, a multi-site tender was launched in 2016 with a total capacity of 350 MW. As part of the tender and the authorisation processes, investors were granted use of the seabed at no additional cost.

The Danish Energy Agency, affiliated with the Danish Ministry of Energy and Climate, manages the licencing processes for the tenders, construction, and operation of the projects. The tender is conducted by providing a subsidy through two-way CfD in Danish krone (DKK)/kWh without any indexes. Since 2010, following the market practices that enabled negative spot prices in the electricity market, no subsidy has been paid during the hours of negative spot prices. As of 2016, the ceiling price defined in the tender for the near-shore areas (94 EUR/MWh) was well above the winning tender price (65 EUR/MWh). In the tender held in 2021, in addition to the general subsidy paid over the lifetime of the project, a cap is imposed on payments from project operators to the government during the periods when market prices are above the CfD price.

The subsidy is provided for 55,000 full-load hours over the lifetime of the project and is applied individually for each project for terawatt-hours (TWh) subsidised in the legislation. This corresponds to a subsidy period of approximately 10–15 years. In 2021, it was decided that the government would pay the subsidy for 20 years instead of defining full-load hours. This means that the duration of subsidies in Denmark was increased from approximately 12 to 20 years.

[3] SDE+: A form of operation subsidy. The applicant receives a subsidy based on the product created during the operational period of the project.

Static sealed-bids auctions are used in all tenders. Typically, bidders must be pre-qualified in addition to attending two preliminary auctions. The Danish procurement organisation conducts extensive stakeholder engagement activities. Many tenders involve a two-stage process with a “first indicative offer” and a “best final offer”, where tender design specifications are refined through individual meetings with bidders.

All offshore wind farms have grid access provided by the system operator, Energinet. For the offshore wind projects that are closer to the coast, the developers are responsible for connecting the plant to the onshore grid. From 2021 onwards, the grid connections to the onshore transformer substations have been included in the tenders and are being constructed by the project developers. Failure to realise a project is subject to a lump-sum penalty depending on the length of the delay. In some cases, the amount of the subsidy is also reduced.

Annex 1 provides a detailed comparison of the policies implemented by a total of eight countries conducting offshore wind energy tenders, including the countries presented in this section (Jansen et al., 2022).

4. General Criteria Applicable to Offshore Wind Energy YEKA Auctions

Allocating the capacity at the lowest bidding price should not be the only measure for implementing successful renewable energy auctions. To determine whether the auctions are successfully conducted, the rate of the completed projects over allocated capacities and the time period required to realise the projects should be examined. The auction scheme should strike the necessary balance between guaranteeing the optimal price for the supplier, on the one hand, and setting a rational price level for the investor to access finances, on the other. In the context of offshore wind auctions, which are costlier and technically more complex than onshore wind auctions, it is crucial to accurately evaluate the technical and financial competencies of the investors. In this regard, the general criteria that may be of importance for Offshore Wind Energy YEKA Auctions are as follows:

Met-Ocean[4] and Geotechnical Measurements of the Seafloor

The development of offshore wind power plant projects relies on met-ocean measurements, which lay the basis for sound planning and accurately managing decision-making processes. Determining the project site's meteorological and oceanographic conditions based on met-ocean measurements assures reliable conditions for the installation and maintenance of planned offshore power plants (AWS Truepower, 2015).

Geotechnical research on the seafloor is critical for project developers to ensure optimal siting of the offshore wind turbines, transformer substation, and cabling system (AWS Truepower, 2015).

It is important to gather relevant met-ocean and seafloor geotechnical data to support the bidding processes and to establish an accurate analysis system.

Tendering Approach

Choosing the right tendering approach, including whether the tender is technology-indexed or not, will affect the competitiveness of bids and success rates of projects.

Tender Organisation

Determining the structure of the tender, and choosing whether it is centralised or decentralised, will affect the efficiency of the processes.

Bidding Period

The duration of the bidding period is key to attract qualified bidders and to optimise the tender outcome.

Open vs. Sealed/Closed Bid

The choice of open or sealed bidding mechanisms will affect the level of transparency and competition in the tender.

Tender Volume

Defining the total installed capacity of the tender in GW is important to achieve energy-related targets and attract the interest of investors.

[4] Met-ocean: Combined effect of meteorological and oceanographic conditions

Power Purchase Agreement (PPA) Duration

Determining the duration of the Power Purchase Agreement is crucial to access finances and is one of the key factors that determines the attractiveness of the project for investors.

Local Component Requirements

Defining the local component requirements and determining the percentage of local equipment/material is important to support economic development and local industries. However, this element must be designed and considered carefully, especially in the initial phase, as this may increase the required investments and prolong the process.

Financial Support Mechanisms

Determining the type of subsidy mechanisms can help mitigate risks and encourage investments.

In the offshore wind energy auction held in the UK in July 2023, for a capacity of 5 GW, no bids were submitted by the participants due to the low ceiling price of 44 GBP/MWh. Hence, the tender was unsuccessful. Moreover, as the government indexed tender prices according to retail prices rather than the actual increase in costs, difficulties in completing the previously tendered projects are being reported.

A similar situation was experienced in the United States, when Orsted—a Danish offshore wind power plant developer—announced that it was preparing to withdraw from its projects if the government did not guarantee increased levels of support (Reuters, 2023).

In view of the examples provided, establishing proper financial support mechanisms for offshore wind energy projects is important for attracting investor interest as well as reducing the likelihood of projects being cancelled and the sites being returned to the state. Therefore, it is essential to provide price support for offshore wind energy and to index the tender prices according to actual increases in costs.

Penalties

It is possible to ensure the success of a project and reduce the risk of a project being incomplete by imposing pre-determined penalties and sanctions prior to the bidding processes, which would serve as a deterrent mechanism for investors. Penalties help reduce the likelihood of delays, underperformance, and project failures by increasing the cost of non-compliance with contractual obligations for the winning parties. Penalties also encourage bidders to submit more cost-reflective offers, thereby reducing the likelihood of unrealistic bidding prices. International experiences show that without adequate penalties, there is a higher risk of project delays and failures.

If the penalties are set too low, the bidders may be more likely to take risks in the process. However, if the penalties are set too high, then the risks for the bidders may increase, which would in turn increase the bidding prices. High levels of penalties may discourage project developers from participating and may reduce the level of competition. For this reason, penalties should be deterrent enough to reduce the risk of project delays and incompletions but not high enough to deter investors from participating in auctions and excessively increase the risks and costs of the project.

Quotations

The choice of pricing based either on capacity (TRY/MW) or generated electricity (TRY/MWh) affects the revenue model of the offshore wind projects.

When the initial investment costs (CAPEX) of the offshore wind farms are analysed globally, it is observed that there is a 10% to 30% increase in recent years (WFO, 2023). This increase is mainly due to issues like cost inflation, supply chain, and commodity price instabilities. The increasing CAPEX prevents investors in offshore wind projects from commencing with construction and prolongs the timeline of the project.

According to a survey conducted by the Westwood Global Energy Group on offshore wind energy, it is estimated that inflation will add USD 280 billion to the initial investment costs of the offshore wind industry over the next ten years. Approximately 75% of global participants stated that the feasibility of offshore wind projects are being reviewed due to the recent cost increases; meanwhile, more than 90% stated that the commercial decision-making process is becoming increasingly more difficult and uncertain due to the risks involved (Westwood Global Energy Group, 2023).

Therefore, to attract investor interest and avoid the risk of delays in projects, it is important to update purchase guarantees based in foreign currency in line with the trends in inflation and commodity prices. Reflecting these cost increases in electricity purchase guarantees will be crucial for the timely commissioning of projects.

Grid Infrastructure

It is essential to include information on the necessary infrastructure within the scope of the tender for the effective integration of offshore wind power plants into the grid.

5. Recommendations for Implementing Successful Offshore Wind Energy YEKA Auctions in Türkiye

Although international experiences can serve as a guide to determine the main criteria for organising a successful offshore wind auction model that can be implemented in Türkiye, the conditions and dynamics specific to Türkiye must also be considered. In this context, the key recommendations that can contribute to the discussions on the implementation of an offshore wind energy auction mechanism in Türkiye are summarised as follows:

- **To establish realistic bidding offers, the government should provide the relevant, comprehensive met-ocean analyses and seafloor measurements as well as the administrative and environmental assessments for the tender areas:** For a thorough assessment of offshore wind potential in the offshore YEKA regions subject to auctions, comprehensive offshore wind measurements that are representative of the auction area—which should be collected in accordance with international standards to be accepted by financial institutions—should be carried out. These measurements will provide a better understanding of the wind regime in the auction areas and the location of the planned power plants. It is also equally important to provide the oceanographic data (e.g., wave speed, height, period and direction, flow speed and direction, sea level, sea temperature, salinity, conductivity, etc.) required to place a viable bid on the project.

  It has been announced that pre-feasibility studies will be carried out focusing on the candidates for offshore YEKAs in Türkiye via the use of meteorological and oceanographic measurements and analysis in areas that may be selected following consultations with relevant institutions and organisations. Technical, legal, and economic analyses as well as activities will also be carried out to determine the total capacity levels that would serve as a basis for the actual implementation of the candidates for offshore wind energy YEKAs in Türkiye.

  In this regard, the government's provision of these measurements and data for the project developers in the context of Türkiye's first offshore wind energy auction will contribute to a more reliable bidding process. Site assessments such as wind data, geological analyses of the seabed, EIA, etc., can be provided to all bidders as an extension of the tender specifications in order to increase investor interest and reduce the risks for potential project developers. Risk sharing in this context may not only encourage investors but also contribute to more realistic and competitive bidding prices.

- **Projects should be designed and implemented in accordance with environmental and social compliance requirements:** Sustainability is among the most important concerns of foreign financial institutions and export credit agencies (ECA). In this context, the planning of potential sites for project implementation should prioritise environmental (marine spatial planning) and social impacts before assessing their energy production potentials. Special attention should also be given to developing projects in accordance with international environmental and social standards. It is also recommended that the environmental and social performance of the projects should be assessed and reported periodically. Consideration of the environmental and social impacts on the region can also enhance the social acceptance of the projects.

- **A region- and technology-specific auction approach should be chosen:** Given the diverse geographical conditions in the seas of Türkiye, it is recommended to choose a technology- and region-specific auction approach. This, in turn, could encourage the use of different wind turbine technologies and can help promote projects suitable for different areas.

  In this context, a tender approach specific to fixed and floating offshore wind power plant technologies should be taken based on the energy potential of the region and the bathymetric conditions. Considering that the majority of Türkiye's offshore wind energy potential is in deep waters with depths higher than 50–60 metres, it is also important to rapidly deploy floating power plant technology in Türkiye (World Bank, 2019). In this regard, including information on offshore wind energy capacity in tenders is essential as floating offshore wind energy installation capacity may play an important role in revealing Türkiye's true offshore wind energy potential.

- **Technical and financial qualification criteria should be defined for bidders:** For any auction system to be successful, it is necessary to ensure that the applicants have the appropriate technical and financial competence to implement the projects. This issue is particularly important for offshore wind energy investments, which require substantial financial competence, experience, know-how, and engineering capability. In this context, it is necessary to carefully identify the minimum technical and financial requirements that must be met by the potential investors applying to the auctions. From a technical point of view, investors can be required to demonstrate their technical competence and experience in the installation of offshore wind power plants similar to the scale of the project capacities being auctioned. Moreover, the projects should be viable to be able to access substantial amounts of capital or finance. In this context, company balance sheets, a letter of guarantee of funds and similar proof demonstrating investors' ability to realise the project may be requested. Accordingly, the selection process may involve an assessment based on multiple criteria that includes technical and financial aspects as well as the price.

- **Grid connection:** The responsibilities associated with the connection of offshore wind power plants to the electricity grid should be defined carefully. In that regard, it is recommended that the government carries out the assessments and planning of all relevant technical, environmental, and route issues regarding the connection to the electricity grid. Then, either the government or investors should construct electricity transmission lines. The establishment of grid connections by the government can reduce the risks for investors, increase the participation rate in auctions, and reduce the prices of power purchase agreements. However, it is extremely important that the grid connection is constructed simultaneously with the power plant. Significant losses may occur in case of delays in either the installation of power transmission lines or the power plants. Assigning the transmission line construction to the investor as part of its responsibilities may avoid the coordination risk in that regard. However, in Türkiye the number of companies that are technically eligible for constructing the transmission lines for an offshore wind power plant is limited. In an auction scheme in which the grid connection will be undertaken by the investor, it is recommended to assess and ensure the technical and financial competence of the investors through various pre-qualification criteria. If this obligation will be undertaken by the government, it will be important to complete construction within the project timeline and manage the construction in coordination with investors.

- **Local Component Requirements:** Local component requirements can be defined as components that support the local industrial production capacity of Türkiye. Although these requirements are important in terms of increasing local employment and promoting the development of associated industries in Türkiye, it will also increase the cost of financing and hence increase the total investment costs. The success in onshore wind projects is promising for planned offshore projects; however, given the different technological requirements in offshore wind plants and the need to attract foreign investors to Türkiye, this criterion should be considered more vigorously.

  If a local component requirement is introduced in the auctions, first, a required local component ratio should be established to allow investors to utilise ECA credits; then, to attract equipment manufacturers to Türkiye, sufficient offshore wind capacity should be allocated regularly within a predetermined timeline.

  One approach to ensure that the gradual expansion of local production does not pose a procurement risk can be to identify the components that Türkiye already has within its strong manufacturing competence. Supporting the domestic manufacturing of components in offshore wind energy projects and including these projects within the "Support and Incentive Program for Industrial Investments" introduced by the Ministry of Industry and Technology, which supports industrial investments, should also be considered. The relevant program of the Ministry of Industry includes a support scheme called the "Technology Accumulation Project," which aims to build competence in the manufacturing of products that are currently not produced domestically (Ministry of Industry and Technology, 2019).

- **Determining an auction schedule for the targeted offshore wind energy capacity:** An auction schedule and roadmap should be established in line with the established offshore wind energy capacity target in Türkiye. Uncertainties regarding a project's sustainability and predictability, attracting investors' interest in offshore wind energy, enabling the industry and supply side to consider further investments in manufacturing, and setting localisation targets based on domestic production levels can all be eliminated by establishing a project timeline and a relevant roadmap. Eliminating the uncertainties regarding this process will build confidence in establishing offshore wind energy targets and enabling access to low-interest loans from international financial institutions provided within the scope of mitigating climate change (World Bank, 2023).

- **The bidding period should be sufficient for project developers to finalise their preparations:** A sufficiently long bidding period will allow bidders to rigorously evaluate projects and hence submit competitive bids.

- **An open tendering approach should be adopted:** In order to increase transparency and competitiveness, an open tendering approach should be adopted. A mixed approach involving sealed bids in the first round and open tendering in the second may also be applied. This may encourage greater participation from potential bidders and help tenders receive competitive prices.

- **The duration of the Power Purchase Agreements (PPA) should be longer and steady:** The duration of PPAs is critical for investors to finance their projects. A long and steady PPA would help investors gain confidence in their projects. Best-practice international examples show that a PPA duration of approximately 20 years is appropriate for offshore wind energy projects. In view of the technological developments and the dynamics of Türkiye, it is recommended that this period range 15 to 20 years.

- **The winning bid price should be calculated under a competitive environment and protected against the exchange rate and inflation risks that would impede and prevent the realisation of investments:** Auctions should be based in foreign currency in order to facilitate the realisation of projects. If the currency base is Turkish Liras (TRY) in the auctions, it is important to apply a foreign currency-based price escalation formula.

  If this condition cannot be fulfilled, a similar approach to the current YEKA auctions, in which foreign currency exchange-based floor price protection is implemented, can also be adopted. Since any offshore wind auction will be the first of its kind in Türkiye, it is important to determine a ceiling price in the auction that will allow participants access to financing against the undertaken risks and provide a reasonable financial return. As the development of offshore wind energy projects takes a long time, updating the price by considering inflation and commodity prices until financial close can provide significant benefits for the realisation of projects, especially if the tender is held at an early stage.

- **The permit procedures should be clear, and to reduce the time required to obtain all permits, a coordination centre should be established:** The responsible parties for granting the permits for offshore wind energy projects, as well as other required permits (EIA, Technical Interaction Analysis, zoning and building permits, etc.), should be clarified through supporting communiqués and regulation amendments, which would reduce the uncertainties in the tendering process and enable participants to undertake risk analyses. The establishment of a coordination unit for the standardisation and shortening of permit procedures is also recommended.

- **Punitive sanctions should be carefully designed and effectively implemented:** Penalties should not act as a deterrent for the sound progress of the tender processes and the realisation of projects. In the case that projects cannot be commissioned on time, a certain penalty could be applied for each month of delay. If the projects fail to be commissioned at all, then a financial penalty may be directly applied, and the project developer may be prevented from participating in subsequent tenders.

ANNEX 1 Comparison of several countries conducting offshore wind power auctions (as of the end of 2021) (Jansen et al., 2022)

	Number of completed tenders (by the end of 2021)	Number of offshore wind farms (by the end of 2021)	Capacity weighted average prices (min.,max.) in$€_{2020}$ /MWh	Tendering years [1]	The party responsible for the grid connection	Financing mechanism	Indexing for inflation	Site development	Auction system for seafloor leasing	Penalty
United Kingdom	4	9	66.5 (44.9 , 146.4)	2015, 2017, 2019, 2021, 2023, 2024	Bidder	Two-way CfD [2]	Implemented	Bidder	Carried out prior to CfD tenders by a separate tender led by Crown Estate [3]	Failure to deliver: 2-year ban
France	5	8	133.7 (44.3 , 170.5)	2005, 2011, 2014, 2019, 2021-2024	Government	FiT, two-way CfD	Implemented	Bidder	N/A	CfD is reduced by the number of days delayed
The Netherlands	8	8	26.8 (0, 76.6)	2016-2022, 2026	Government	One-way CfD	Inapplicable	Government	Part of the auction criteria	Penalty for incompletion: EUR 10 million Late delivery: EUR 3.5 million/month
Denmark	8	8	89.4 (51.5 , 147.3)	2005, 2008, 2013, 2015, 2016, 2021, 2022, 2024	Government (up to year 2016), the bidder as of 2021	Two-way CfD	Inapplicable	Bidder	N/A	<0.15 EUR/MW + restriction on production subsidy in case of non-delivery or delay
China	7	21	103.1 (92.3 , 111.8)	2010, 2019, 2020	-	Administrative FiT/ Competitive FiT	Inapplicable	-	-	A minimum ban of two years in case of incompletion of the construction
Germany	3	13	15.1 (0, 100.5)	2017, 2018, 2021-2023	Government	One-way CfD	Inapplicable	Government	Inapplicable	Financial penalty of EUR 0.1 to EUR 0.2 per MW
Taiwan	2 [4]	14	90.8 (65.3 , 161.9)	2018, 2021-2023	Government	Administrative FiT/ Competitive FiT	Inapplicable	Government	Inapplicable	-
United States of America	9	13	75.5 (51.5 , 149.8)	2017-2021	Bidder	Fixed OREC & fixed price PPA	Implemented	Bidder	Previously awarded federal seafloor tenders are accepted	-

[1] *Tender announcements from 2021 onwards*

[2] *A two-way Contract for Difference (CfD) is a contract signed between the electricity producer and the relevant government agency. In two-way CfD, if the current market price is below the agreement price, the producer receives the difference; if it is above, the difference is reimbursed by the producer to the relevant government agency (European Commission, 2023).*

[3] *In the United Kingdom, the entire seafloor is considered to be under the Crown Estate (Gov.UK, 2023).*

[4] *The first round of 11 wind farms with a capacity of 3.8 GW were administratively eligible tenders. The second round of three offshore wind farms with a total capacity of 1.7 GW was auctioned primarily at the bidding price. The bid prices include both auction prices.*

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NOTES

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