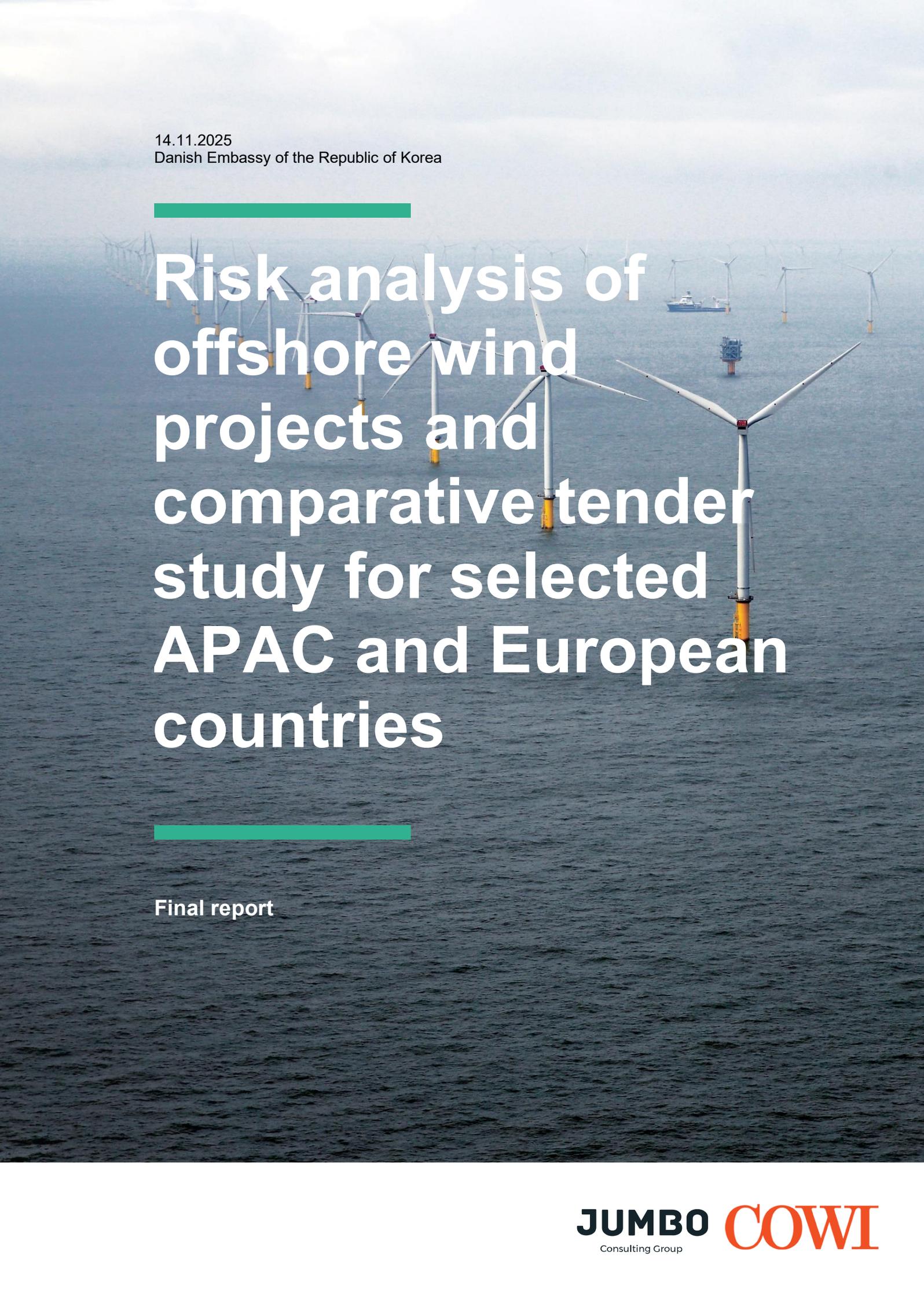


14.11.2025
Danish Embassy of the Republic of Korea

A large-scale offshore wind farm is visible in the background, with numerous wind turbines stretching across the horizon. The water is dark blue, and the sky is overcast. A small blue boat is visible in the distance. The text is overlaid on the image.

Risk analysis of offshore wind projects and comparative tender study for selected APAC and European countries

Final report

Risk analysis of offshore wind projects and comparative tender study for selected APAC and European countries

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Executive summary

Context and Purpose

This study, commissioned by the Danish Energy Agency (DEA) and the Ministry of Foreign Affairs of Denmark (MFA) through the Danish Embassy in Korea, provides a comprehensive risk assessment of offshore wind development in South Korea and a comparative analysis of tender frameworks in leading offshore wind markets, namely Denmark, the United Kingdom, Japan, and Taiwan. Its dual objective is to identify the principal risks affecting offshore wind project development from the developer's perspective and to extract lessons from international best practices to inform the design of future Korean tenders under the new Offshore Wind Special Act (2025). The broader goal is to strengthen government-to-government cooperation between Denmark and Korea and to help Korea accelerate offshore wind deployment in a predictable and investable manner.

Korea's Offshore Wind Landscape

Korea's offshore wind sector is at a critical inflection point. Korea's national targets - 14.3 GW of offshore wind by 2030 and 40.7 GW by 2038 - are among the most ambitious in Asia, reflecting the government's commitment to energy transition, industrial growth, and energy security.

Yet, despite strong political backing, only about 250 MW is currently operational, and multiple barriers continue to hinder large-scale build-out. The sector remains characterized by complex permitting procedures, lengthy approval times, grid bottlenecks, and social opposition. These factors elevate project risk, delay timelines, and discourage private investment.

The Offshore Wind Special Act represents an attempt to address these challenges, marking a shift from a developer-led "open-door" approach toward a centralized, government-driven zoning and auction framework. The law aims to streamline permitting, consolidate multi-agency responsibilities, and improve investor confidence.

Risk Landscape and Key Findings

The risk mapping exercise examined all phases of the offshore wind lifecycle, from early development to commissioning, and classified risks into regulatory, technical, financial, environmental, supply-chain, and stakeholder dimensions. Offshore wind projects globally follow a broadly consistent risk curve across their lifecycle, with risk exposure highest in the early development stages and decreasing as projects mature.

The most prominent category of risk is regulatory and permitting. Across global markets, unclear frameworks, overlapping authority, and sequential permitting procedures are recurrent barriers that prolong project lead times and inflate early-stage costs. In Korea, developers have faced one of the most complex permitting environments in Asia, requiring numerous parallel approvals. The Offshore Wind Special Act's "one-stop committee" offers a potential remedy, but the success of the reform depends on swift implementation, inter-agency coordination, and legally binding approval deadlines. Within permitting, grid connection is often a major bottleneck. In Korea, KEPCO's monopoly and limited anticipatory grid planning have led to protracted connection delays and insufficient capacity for designated zones. Aligning marine spatial planning with grid development and introducing transparent cost-sharing mechanisms could significantly mitigate this risk.

Financial and investment risks arise mainly during project maturation, when regulatory clarity and revenue stability are crucial for securing capital. These risks stem from offshore wind high capital intensity, long development periods, and dependence on stable revenue frameworks. Internationally, instruments such as the UK and Denmark's Contracts-for-Difference (CfD) frameworks have helped reduce exposure to price volatility.

Technical and supply-chain risks emerge later in the lifecycle, primarily from concept selection through execution planning. Technical risks, while universal in offshore wind, take distinct forms depending on local conditions. In Korea, typhoon exposure, seismic activity, and the introduction of floating wind amplify design complexity and certification uncertainty. Conservative engineering assumptions and lengthy approval processes increase costs and delay schedules, underscoring the need for early, high-quality site data and coordinated certification standards.

Supply-chain and logistics risks typically intensify during execution planning and construction, once procurement and fabrication are underway. High local-content requirements in tenders can strain a still-developing domestic supply base. Balancing localization goals with pragmatic procurement flexibility is therefore essential to maintain competitiveness and bankability.

Finally, environmental and community risks, particularly during early development and permitting, remain highly influential. While such risks are common globally, in Korea they are intensified by strong opposition from fishing communities and the absence of standardized compensation and benefit-sharing frameworks. Structured engagement and transparent communication are indispensable to securing local acceptance and maintaining project momentum.

International Benchmarking and Lessons Learned

The comparative tender study shows that transparent frameworks, predictable revenue support, and balanced risk allocation are decisive for investor confidence.

Denmark and the UK demonstrate that government-led site studies, clear permitting schedules, and revenue-stabilizing mechanisms (such as CfDs) substantially lower project risk and attract international capital.

Japan has evolved its framework after initial setbacks by extending lease durations, clarifying permitting deadlines, and introducing price-adjustment mechanisms to enhance investor security.

Taiwan has adjusted rigid local content rules and coupled auctions with state-backed financing and corporate PPAs, enabling steady capacity additions despite global cost pressures.

For Korea, these experiences underscore the need for iterative policy learning. The country's 2025 offshore wind tender round, dominated by public-sector entities, signals limited private participation due to perceived high risk. Addressing this imbalance will require transparent settlement rules, adaptable tender criteria, and a realistic balance between industrial policy and market competitiveness.

Conclusions and recommendations

If well implemented, Korea's Offshore Wind Special Act can establish a predictable and investor-friendly environment that catalyses Korea's transformation into a leading offshore wind market in Asia.

The report outlines a set of recommendations to reduce project risks and enhance market confidence:

- Enhance pre-development and tender preparation
- Clarify grid responsibilities and cost allocation
- Streamline and sequence permitting
- Strengthen community and stakeholder engagement
- Optimize tender design to attract investment

Collectively, these actions can improve bankability, reduce uncertainty, and align Korea's offshore wind market with proven international best practices, ultimately fostering a competitive and sustainable industry capable of meeting national energy and climate objectives.

List of abbreviations

Abbreviation	Description
AEO	Annual Energy Production
APAC	Asia-Pacific
AR7	Allocation round 7 (UK, 2025)
ASP	Administrative Strike Price
CAA	Civil Aviation Authority (UK)
CAPEX	Capital expenditure
CES	Crown Estate Scotland
CfD	Contract for difference
CIB	Clean Industry Bonus (UK)
CIP	Copenhagen Infrastructure Partners
ClassNK	Nippon Kaiji Kyokai, Japanese ship classification society
COD	Commercial Operation Date
COP	Copenhagen Offshore partners
CPPA	Corporate Power Purchase Agreement
CPS	Cable Protection System
DBT	Developer-Build-Transfer
DCO	Development Consent Order (UK)
DEA	Danish Energy Agency
EBL	Electric Business License
EDF	Electricité de France
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMF	Electromagnetic field
EPC	Engineering, Procurement and Construction
EU	European Union
FEED	Front-End Engineering Design
FiP	Feed-in Premium
FiT	Feed-in Tariff
GCA	Grid Connection Agreement
GW	Gigawatt
HRA	Habitat Regulations Assessment
HSSE	Health, Safety, Security and Environment
JOGMEC	Japan Oil, Gas and Metals National Corporation

KEA	Korean Energy Agency
KEPCO	Korea Electric Power Corporation
LCO	Local Content Obligation
LCOE	Levelized Cost of Energy
LDs	Liquidated Damages
M	Million euro
MCEE	Ministry of Climate, Energy and Environment (Korea)
METI	Ministry of Economy, Trade and Industry (Japan)
MFA	Ministry of Foreign Affairs of Denmark
MLIT	Ministry of Land, Infrastructure, Transport and Tourism (Japan)
Mo	Months
MOE	Ministry of Environment (Korea) Ministry of Environment (Japan)
MOF	Ministry of Oceans and Fisheries (Korea)
MOTIE	Ministry of Trade, Industry and Energy (Korea)
NESO	National Energy System Operator
NGESO	National Grid Electricity System Operator
OFTO	Offshore Transmission Owner
OPEX	Operational Expenditure
OSW	Offshore Wind
OWEIP	Offshore Wind Environmental Impact Plan (UK)
PPA	Power Purchase Agreement
QA/QC	Quality Assurance/Quality Control
R1/R3/R4	Japan offshore wind tender rounds
REC	Renewable Energy Certificate
RPS	Renewable Portfolio Standard
SCP	Supply Chain Plan
SLO	Social License to Operate
UK	United Kingdom
WTG	Wind Turbine Generator
WTIV	Wind Turbine Installation Vessel

1 Introduction

This report presents the findings of a study commissioned by the Danish Energy Agency (DEA) and the Ministry of Foreign Affairs of Denmark (MFA) through the Danish Embassy in Korea, focusing on two interlinked themes:

- A general risk analysis and mapping of offshore wind risks across all major stages of offshore wind development, with an emphasis on the Korean market and from the developer's perspective.
- A comparative tender design study between selected APAC (Korea, Japan, Taiwan) and European (Denmark, United Kingdom) countries.

The aim is to strengthen Denmark–Korea government-to-government cooperation in offshore wind by improving understanding of potential risks in the Korean offshore wind sector, supporting and informing well-designed tender processes, and sharing best practices from international experience. This study is intended to help reduce uncertainty for developers whilst supporting Korea's ambitions to accelerate offshore wind deployment.

1.1 Project background

Offshore wind development in Korea received a significant policy boost in March 2025 with the passing of the long-awaited Offshore Wind Special Act. This legislation streamlines regulatory processes, particularly in permitting, and is intended to help Korea achieve its ambitious capacity targets of 14.3 GW by 2030 and 40.7 GW by 2038.

Despite this progress, Korea's installed offshore wind capacity currently stands at around 250 MW, and the sector faces challenges in achieving the required momentum to meet its goals. A key issue for stakeholders is the uncertainty and risk present at all stages of project development and execution, from site identification and permitting to construction, commissioning, and operation. This report aims at supporting with managing these risks by mapping those of greatest concern from a developer's perspective and identifying mitigation measures. Furthermore, the comparative analysis of tender frameworks in selected APAC and European countries will highlight practices that either mitigate or exacerbate risk, offering lessons that can be adapted to the Korean context.

Together, these two parts form an integrated assessment aimed at enabling more efficient and effective offshore wind tender processes, fostering greater investor confidence, and promoting sustainable growth in Korea's offshore wind industry.

1.2 Report structure

This report is structured to provide a logical progression from contextual understanding to detailed analysis and actionable recommendations.

- Chapter 1 sets the scene by introducing the study, outlining the project background, defining the scope, and describing the methodology adopted. It provides the foundation for the subsequent analysis by clarifying objectives, intended outcomes, and the analytical framework.
- Chapter 2 presents an overview of Korea's offshore wind landscape and regulatory context. It examines national ambitions and policy drivers, describes the institutional and regulatory framework, and identifies current regulatory risks, barriers, and enablers. This section concludes with a synthesis of implications for offshore wind tender design in Korea.

- Chapter 3 details the risk mapping undertaken across the offshore wind project lifecycle in Korea. It explains the methodology used to identify, categorise, and assess risks, presents a structured analysis of key risks and their potential impacts, and proposes mitigation measures. This section also considers the allocation of risk ownership among stakeholders and summarises the implications for Korea's offshore wind sector.
- Chapter 4 provides the comparative offshore wind tender study. Drawing on the Korean risk analysis, it examines the design and implementation of tender processes in selected APAC and EU countries, specifically Japan, Taiwan, Denmark, and the United Kingdom. The section benchmarks risk allocation approaches, highlights differences in regulatory, technical, and commercial requirements, and identifies best practices with potential applicability to the Korean context.
- Chapter 5 delivers the conclusions and recommendations. It distils the key findings from the preceding sections into a set of practical, evidence-based recommendations intended to support policymakers, regulators, and industry stakeholders in accelerating offshore wind development in Korea while minimising project risk.

1.3 Methodology

The study is delivered through a structured, three-task approach integrating COWI's international technical and regulatory expertise with JUMBO Consulting Group's ('JUMBO's') deep local market insight and procurement experience in the Korean and wider APAC offshore wind sector.

- **Task 1 – Risk Analysis and Mapping in Korea:** Key risks across the offshore wind project lifecycle, with a focus on the developer's perspective, are identified and assessed. Risks are mapped across the areas of regulatory/permitting, technical, environmental, financial, supply chain, and community, supported by qualitative and quantitative tools. The selection of risk areas reflects the most critical and commonly encountered challenges across offshore wind projects globally.
- **Task 2 – Comparative Tender Study:** Tender framework design approaches are compared across Korea, Japan, Taiwan, Denmark, and the United Kingdom. Japan, Taiwan, Denmark and the United Kingdom represent leading offshore wind markets with developed tender frameworks and regulatory practices, thus offering valuable lessons for Korea. The analysis focuses on design maturity requirements, permitting integration, risk allocation, and cost implications. The findings from the tender study are, in an iterative process, included into the risk map for added insights.
- **Task 3 – Conclusions and Recommendations:** Findings from the aforementioned tasks are synthesized into targeted, practical recommendations for enhancing Korea's offshore wind tender framework. The recommendations are tailored to the Korean market and informed by proven international practices, providing decision-makers with practical guidance for informed and effective policy and investment choices.

2 Korea's offshore wind landscape and regulatory context

2.1 Overview

This section provides an overview of Korea's offshore wind ambitions and the regulatory framework that governs the sector. It first outlines the country's policy targets and their role in driving decarbonization, energy security, and industrial development. The section then examines the key institutions currently involved in planning and permitting, highlighting how their mandates shape offshore wind project development. Finally, it identifies the opportunities and challenges created by this regulatory landscape, setting the stage for our analysis of investment risks, international best practices, and pathways to accelerate offshore wind deployment.

2.2 Korea's offshore wind ambitions and policy drivers

Korea has set ambitious offshore wind targets as part of its national strategy to decarbonize its power sector and reduce reliance on imported fossil fuels. The country aims to reach 14.3GW of offshore wind capacity by 2030 and 40.7GW by 2038, making it one of the most significant offshore wind growth markets in Asia. These targets are anchored in multiple policy objectives: achieving net-zero emissions by 2050, strengthening energy security in a country heavily dependent on fuel imports, and positioning Korea as a global leader in clean energy industries such as floating wind, green hydrogen, and offshore engineering.

The offshore wind sector has also been designated a cornerstone of the Korean Green New Deal, with the government emphasizing industrial development, job creation, and technology export potential. Local supply chain development is a key driver, with policymakers seeking to leverage Korea's strong shipbuilding, steel, and manufacturing capabilities to establish a competitive domestic base for Wind Turbine Generators (WTGs), foundations, and installation services.

2.3 Institutional and regulatory framework

Delivering the aforementioned targets requires navigating a multi-layered regulatory environment, with several ministries and agencies sharing responsibilities across policy, planning, permitting, and implementation. This institutional landscape sets the framework within which developers, investors, and stakeholders must operate. Whilst the targets demonstrate strong government commitment, the institutional landscape also introduces challenges related to coordination, permitting timelines, and regulatory certainty. For example, overlapping jurisdiction between ministries can slow down project approvals, while limited grid capacity planning creates uncertainty for developers.

In this section, how Korea's offshore wind landscape is structured is reviewed, the roles of each of the key regulatory bodies are outlined, and the implications that this has on offshore wind project development is explored. Opportunities created by government support and international cooperation are highlighted, as are the bottlenecks that may hinder deployment if not addressed. This analysis provides the foundation for identifying policy measures and best practices that could help accelerate Korea's offshore wind ambitions, and the topics are elaborated on where needed in the subsequent risk mapping exercise – see Chapter 3.

- Ministry of Trade, Industry and Energy (MOTIE): Defines and oversees national energy policy, grid planning, and offshore wind deployment targets. MOTIE's leadership provides long-term direction, but its top-down approach can create rigidity, particularly when grid capacity

expansion lags behind development ambitions. Developers frequently cite uncertainty over transmission timelines and grid access as a critical risk.

- Ministry of Oceans and Fisheries (MOF): Oversees marine spatial planning and allocates sea areas for offshore wind projects. While MOF’s role is essential for balancing offshore wind with fisheries and maritime uses, limited coordination with MOTIE has led to overlapping or conflicting priorities. Developers face delays when site allocation decisions are not fully aligned with national energy planning, raising early-stage project risk.
- Ministry of Environment (MOE): Reviews and approves Environmental Impact Assessments (EIAs). The process is thorough and aims to safeguard marine ecosystems, but long and unpredictable approval timelines can pose a bottleneck. Multiple rounds of review and limited inter-agency alignment can extend permitting to several years, undermining investor confidence and delaying financial close.
- Korea Electric Power Corporation (KEPCO): Plans and manages transmission infrastructure and project grid connections. KEPCO’s monopoly position ensures consistency but creates systemic risks: grid expansion is often reactive rather than anticipatory, leaving projects stranded or facing curtailment. The lack of clear cost-sharing mechanisms for grid upgrades further complicates financial planning for developers.
- Korean Energy Agency (KEA): Administers renewable energy support schemes, including Renewable Portfolio Standards (RPS) and other incentive schemes. While these mechanisms are vital to ensure bankability, frequent policy adjustments have created uncertainty about long-term revenue streams. Stability in KEA’s support framework will be key to attracting international financing.

The fragmentation of responsibilities across ministries and agencies creates coordination challenges. For developers, this means engaging with multiple authorities in parallel, often with limited clarity on sequencing and timelines. This complexity increases development risk, drives up transaction costs, and can deter international investors accustomed to more streamlined permitting regimes.

At the same time, Korea’s regulatory context provides clear opportunities. Strong central government commitment, industrial policy support, and international partnerships (e.g. the ‘EU and the Republic of Korea Green Partnership’) give developers confidence that offshore wind will remain a strategic priority. Furthermore, the Offshore Wind Special Act, promulgated in March 2025, which is to be the centrepiece of Korea’s regulatory evolution aims at streamlining permitting by pre-zoning development areas, consolidating multi-agency approvals, and providing clearer permitting pathways.

2.4 Barriers, Enablers and Recent Developments

The progress of the deployment of offshore wind in Korea has been hindered by a range of institutional, technical, and market challenges in recent years. A more detailed investigation and assessment of the risks is presented in Section 3. However, in terms of barriers, enablers and recent developments, this section will describe some of the main topics.

One of the most persistent barriers has been the fragmented and lengthy permitting process. Until now, developers have been required to apply to multiple ministries and agencies, bearing the full cost of early-stage studies and stakeholder consultations without assurance that projects would ultimately proceed. The process has often been further delayed by opposition from coastal communities, including the fishing industry, while uncertainty surrounding grid connection availability has added additional risk. These challenges, combined with a lack of clarity on local content requirements and declining REC (Renewable Energy Certificate) prices, have weighed heavily on investor confidence and contributed to a relatively slow pace of development.

Despite these barriers, Korea is well positioned to accelerate growth in offshore wind. The country's heavy industry, shipbuilding and steel sectors provide a strong foundation for a competitive supply chain, and several major domestic firms are already engaged in component manufacturing, installation and balance-of-plant works. Floating offshore wind represents another major enabler: with deep waters off the coast of Ulsan, Korea has the potential to emerge as a global leader in floating technology, drawing on its shipbuilding expertise. Partnerships with experienced European developers and suppliers also offer significant benefits, from knowledge transfer and technical credibility to reductions in the levelized cost of energy (LCoE).

Recent years have seen an increasing number of international players enter the Korean market. CIP has in excess of 5 GW of projects in its pipeline, Ørsted has announced projects of up to 1.4 GW off Incheon, while entities such as Corio Generation, Equinor, RWE and EDF have each secured development positions in various parts of the peninsula, including both bottom-fixed and floating projects (Wind Energy in South Korea, 29th August 2025 Webinar). As announced by MOTIE in August 2024, from the end of 2024, between 7-8GW of offshore wind Power Purchase Agreement (PPA) auctions are to be launched over the following two years. However, it must also be noted that the results of the latest offshore wind PPA auction in early September 2025 resulted in 689 MW of capacity being awarded exclusively to public-led projects. Privately-owned bidders, including CIP's Haesong 3, did not secure awards. The MOTIE emphasized the importance of energy security and the localization of the supply chain in explaining the outcome. The result is somewhat unexpected, as public-led projects are likely to carry higher costs compared with private-led developments. Nonetheless, the outcome is consistent with recent policy signals, including the introduction of reserved capacity for public entities and new scoring criteria linked to energy security. The implications for future auction rounds remain to be seen, particularly regarding the balance between cost competitiveness, energy security, and market participation from international developers.

A major institutional change occurred in October 2025, when the Korean government established the Ministry of Climate, Energy and Environment (MCEE), merging climate, environmental, and energy policy functions that had previously been split between MOTIE and the MOE. This marks the first major restructuring of Korea's energy governance in over three decades and signals a strategic pivot toward a more integrated approach to the climate and energy transition. The new ministry has assumed responsibility for renewable energy, hydrogen, and power-system planning, while industrial policy functions remain under MOTIE. The creation of MCEE is expected to improve coordination between climate objectives, permitting procedures, and grid planning—an area previously constrained by institutional fragmentation. The ministry's leadership has announced its commitment to accelerating renewables expansion and building a "renewable-energy expressway," integrating offshore wind development with national decarbonization goals. While industry response has been mixed, with some stakeholders welcoming clearer climate directions and others expressing concern over increased regulatory oversight, the reform underlines the government's determination to align energy policy with its net-zero trajectory.

In terms of recent developments, the most significant one is regulatory. In February 2025, the National Assembly passed the Offshore Wind Promotion Act (also referred to here as Offshore Wind Special Act), which was promulgated the following month and will come into force in March 2026. This legislation is expected to represent a turning point for the industry. It replaces the developer-led "open-door" system with a government-led approach based on designated offshore wind zones, bringing Korea closer to models adopted in certain European geographies. A central Offshore Wind Power Generation Committee, chaired by the Prime Minister and involving key ministries, will serve as a 'one-stop' authority for licensing and permitting. This is intended to consolidate more than two dozen permitting procedures into a single coordinated process and expected to significantly reduce uncertainty and timeframes for developers. The Offshore Wind Special Act also introduces important transitional provisions. Projects that had already secured an Electric Business License (EBL) or a Public Waters Occupancy Permit by March 2025 are "grandfathered," allowing them to proceed under the old regime for a limited period, up to March 2028. At the same time, new projects outside designated zones will no longer be permitted, with grid connection planning and infrastructure development to be integrated into the zone designation process from the outset. Preferential treatment is afforded to public entities such as KEPCO and its

generation subsidiaries, which will not be subject to the same feasibility requirements as private developers, thereby underlining the state's leading role in the sector's build-out.

Taken together, these measures mark a decisive shift in the enabling environment for offshore wind. While barriers remain, notably around community engagement, local content expectations and the pace of grid reinforcement, the Offshore Wind Special Act offers the prospect of streamlined processes, more predictable regulation, and better integration of offshore wind into national energy planning.

3 Risk mapping across offshore wind project lifecycle

3.1 Overview

Risk mapping is an essential process in offshore wind development. Its purpose is to identify and assess uncertainties that can affect cost, schedule, and overall project viability. From a developer's perspective, risk mapping supports early decision-making, informs contract structures, and improves competitiveness in tenders.

The approach applied here reflects practices used in established offshore wind markets, ensuring relevance for emerging markets such as Korea. By mapping risks across the lifecycle, developers can anticipate challenges and plan mitigation measures before they escalate.

In recent years, market and macroeconomic dynamics have emerged as overarching risk drivers across all stages of offshore wind development. Cost inflation, higher interest rates, and uncertainty in public-led or designated-zone project structures have materially affected project economics worldwide. Between 2022 and 2024, global offshore wind capital expenditure estimates increased by approximately 20-40%, driven largely by inflation in turbine and foundation materials (steel, copper, concrete), rising EPC and logistics costs, and higher financing costs due to elevated interest rates. These factors have contributed to project delays, renegotiations, and even cancellations in established markets such as the United Kingdom, the United States, and Taiwan.

For Korea, these macroeconomic pressures pose a growing risk given the market's reliance on imported equipment, relatively nascent supply chain integration, and exposure to foreign exchange fluctuations. Elevated borrowing costs and uncertainty around the timing and framework of state-led zone allocation can amplify the impact of schedule slippages, particularly during project maturation and financial close, by eroding project margins or delaying investment decisions. As such, market and macroeconomic volatility should be viewed as a cross-cutting risk influencing several categories in this mapping, including financial, supply chain, and stakeholder-related dimensions.

3.2 Risk mapping methodology

The methodology combines industry benchmarks, internal cost modelling, and expert judgment to evaluate risks across the project lifecycle.

Key steps include:

1. Phase-Based Structure: Risks are grouped by **lifecycle phase** – Early Development, Concept Selection, Project Maturation, Execution Planning, and Construction and Commissioning – and categorized by type:
 - **Regulatory and permitting:** Risks related to approvals, licenses, or compliance with local regulations.
 - **Financial & Investment:** Risks related to project funding, financing terms, or changes in economic assumptions impacting viability.
 - **Technical & Design:** Risks related to design, technology performance, or integration challenges.
 - **Supply Chain & Logistics:** Risks related to delays, shortages, or disruptions in materials, equipment, or transport.
 - **Environmental:** Risks arising from ecological impacts, permitting conditions, or unforeseen environmental constraints.

- **Stakeholder & Community:** Risks linked to opposition, public perception, or conflicts with local communities and interest groups.

2. Likelihood and Impact Scoring:

- Likelihood** is assigned using four qualitative categories - Unlikely, Possible, Likely, and Very Likely - drawing on a combination of expert judgment, historical experience from COWI’s work on offshore wind projects, and available specific data for Korea. The assessment considers which types of risks most frequently materialize in offshore wind projects as well as the Korean local context. The Likelihood categories are subsequently represented numerically as a percentage out of 100.
- Impact** is assigned a rank from 1–4: Minor (1), Moderate (2), Major (3), or Critical (4). Impact is quantified based on either the anticipated delay (in months) or associated cost (in €), with thresholds adjusted by project phase to account for cost escalation as the project advances. These thresholds can be seen in the following table, noting the trend that project delays become increasingly costly as the project progresses up to the construction phase

Table 3-1 Impact severity thresholds across project lifecycle. Mo= Months. M= million euro.

Project Lifecycle Stage	Minor (1)	Moderate (2)	Major (3)	Critical (4)
Early Development	≤ 3 mo €0-10m	3–6 mo €10–50m	6–12 mo €50–150m	>12 mo >€150m
Concept Selection	≤ 2 mo €0-15m	2–4 mo €15–75m	4–8 mo €75–200m	>8 mo >€200m
Project Maturation	≤ 2 mo €0-25m	2–4 mo €25–100m	4–8 mo €100–250m	>8 mo >€250m
Execution Planning	≤ 1 mo or €0–40m	1–3 mo €40–150m	3–6 mo €150–300m	>6 mo >€300m
Construction & Commissioning	≤ 1 mo or €0–50m	1–3 mo €50–250m	3–6 mo €250–500m	>6 mo >€500m
Operations & Maintenance	≤ 0.5 mo or €0–5m	0.5–2 mo €5–20m	2–4 mo €20–80m	>4 m >€80m

3. Risk Score Calculation:

- Each risk is given a “score”, calculated as:

$$Risk\ Score = Likelihood\ (\%) \times Impact\ Rank$$

This provides a uniform measure for risk prioritization across all project phases.

4. Prioritization and Reporting:

Risks for each project stage are ranked according to their score. The top five risks per stage are selected for detailed review in the following section, including suggested mitigation methods.

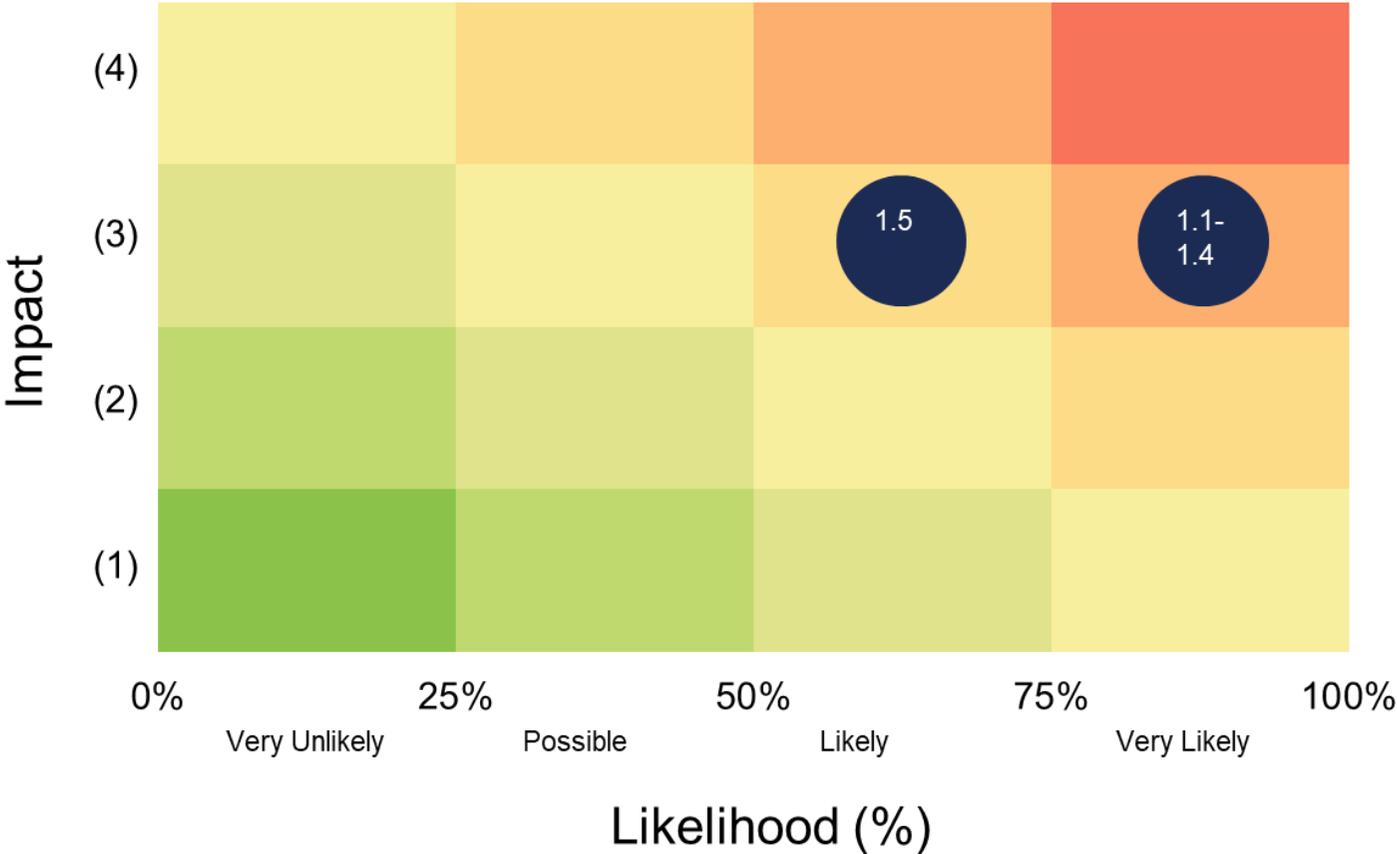
5. Korea-Specific Risk Flagging:

Risks with regional specificity to Korea are flagged in the risk register.

3.3 Risk and mitigation identification

The risk register below shows distinct profiles across an OSW project lifecycle.

3.3.1 Early development



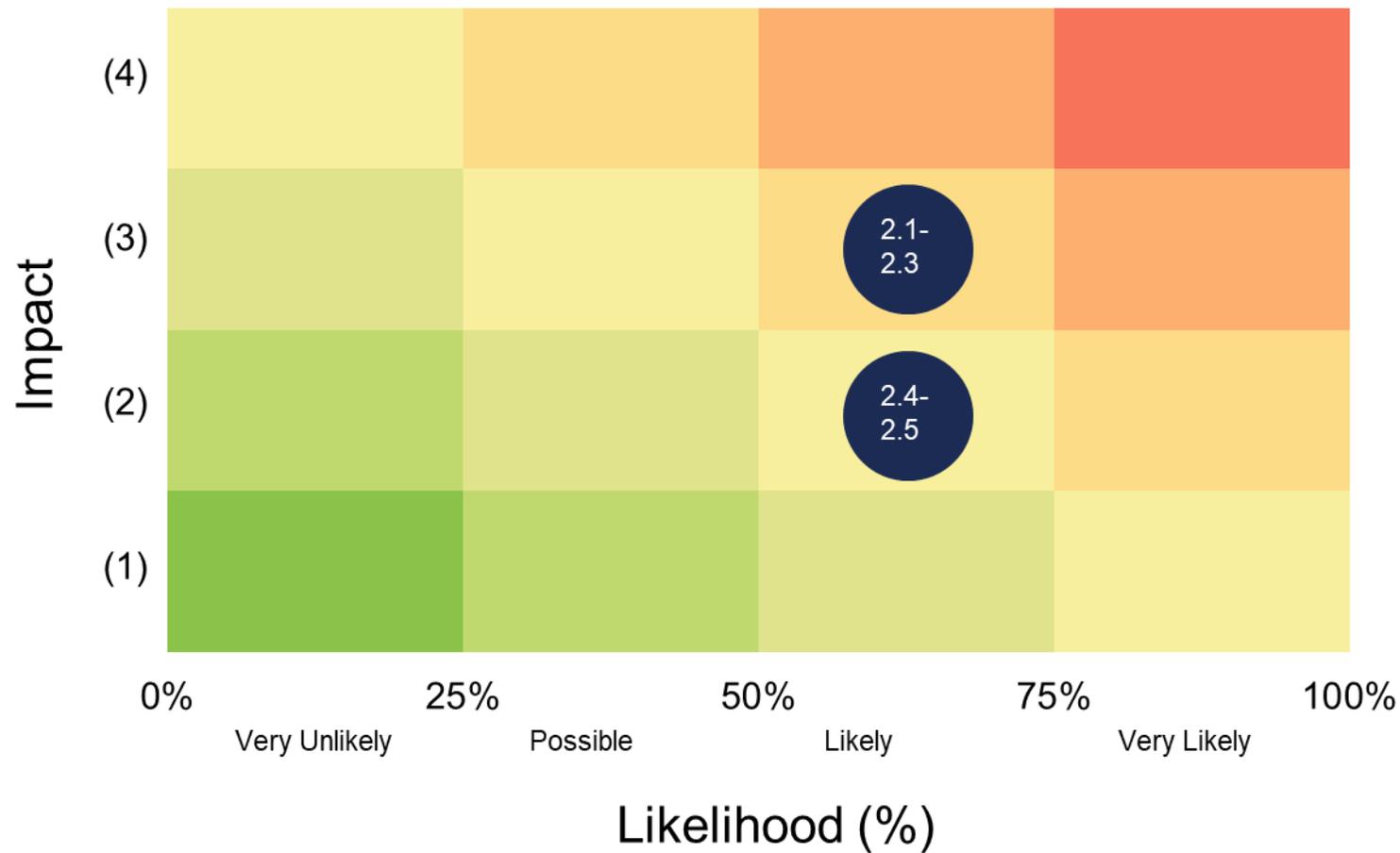
In the early development phase, risk likelihoods are high (60–90%) because the project is still exposed to unclear regulatory frameworks, complex permitting pathways, and evolving stakeholder expectations. The impacts mainly reflect schedule delays and increased development costs rather than major CAPEX overruns. These risks are typical of jurisdictions with immature or changing offshore frameworks where permitting can extend over many years.

Table 3-2 Risk mapping for early development phase

ID	Risk category	Risk description	Korea specific?	Potential mitigation measures
1.1	Regulatory & Permitting	<p>Unclear permitting frameworks: Permitting requirements are not described or harmonised in a single, developer-friendly pathway (e.g., different licences, submission formats, and evidence requirements), creating instability and necessitating repeated studies or invalidating initial scoping work.</p> <p>Specifically for Korea, transition from developer-led/open door system to government-led zoning system under the Offshore Wind Special Act creates transitional regulatory ambiguity. Criteria for opting into government-designated zones, the status of “deemed permits,” (i.e. a provision that allows certain permits or approvals obtained under the old regime to be automatically recognised) and the treatment of overlapping legacy rights (e.g., existing wind measurement leases) have yet to be fully clarified through secondary legislation (e.g. decrees). This creates a risk of regulatory misalignment and procedural delays during the transition phase, expected to continue until the implementing decrees are finalised.</p>	No	<p>Initiate early, strategic government dialogue; allocate budget/schedule contingency for re-scoping.</p> <p>For Korea: Ensure clear and forward-looking implementation of the Offshore Wind Special Act through timely and transparent publication of secondary legislation, including detailed guidance on transitional arrangements, grandfathering provisions, and zone allocation criteria; close developer engagement with the one-stop permitting committee.</p>
1.2	Regulatory & Permitting	<p>Regulatory & permitting fragmentation: permitting process and responsibility is fragmented between multiple authorities with overlapping jurisdictions, potentially leading to conflicting requirements.</p> <p>Specifically for Korea, developers need to engage with multiple government authorities, including the Ministry of Trade, Industry and Energy (MOTIE), KPX, Korea Electric Power Corporation (KEPCO), local government, Korea Electrical Safety Corporation, NREC, the Ministry of Environment (MOE), the Public Waters Management Agency and the Ministry of Oceans and Fisheries (MOF), thus increasing coordination risk. The newly established Ministry of Climate, Energy and Environment (MCEE) aims to centralize climate and energy policy.</p>	Yes	<p>Parallel processing and one-stop shop permitting committee under Offshore Wind Special Act; early multi-ministry scoping workshops.</p>

1.3	Regulatory & Permitting	<p>Lengthy and complex permitting processes: the multi-stage sequential nature of the permitting process in Korea, where projects must pass through multiple statutory “gates” (e.g. site selection, marine surveys, EIA, fisheries consultations, grid connection approvals, etc.) can result in protracted approval schedules.</p> <p>Because of these long permit lead-times, project costs accumulate while financing is not yet secured or construction is not yet scheduled, and supply-chain pricing (for turbines, foundations, vessels) may escalate in the intervening period.</p>	Yes	Pre-zoned sites, standardized fisheries/community compensation frameworks, KEPCO grid roadmap.
1.4	Environmental, Stakeholder & Community	<p>Fisheries conflicts: Commercial fishing communities may lose access to traditional grounds or face new safety/operational constraints (e.g., maintenance exclusion zones, cable landfalls). Cumulative impacts from multiple projects (navigation, gear loss, displaced effort) increase litigation and negotiation risks. A consequence of this is protracted stakeholder negotiation, compensation claim, licence conditions that reduce usable area or require costly mitigation.</p> <p>Specifically for Korea, fisheries conflict is often the dominant social risk in OSW development early stages, with projects near fishing zones having experienced protests.</p>	No	Codify benefit-sharing frameworks (% revenue, fisheries fund); integrate with Marine Spatial Planning Act.
1.5	Environmental	<p>Negative impact on sensitive habitats (birds, mammals): OSW projects can pose a risk to sensitive marine habitats (e.g. migratory bird flyways, marine mammal aggregation zones) thus requiring detailed environmental studies and migration plans.</p> <p>Specifically for Korea, if project area sits adjacent to internationally-recognised tidal-flat/mudflat ecosystems and migratory bird corridors on Korea’s west coast, there is a heightened risk that turbine foundations, cable landfalls and export cable corridors will intersect sensitive habitats. Insufficient baseline ecological data and evolving regulatory standards mean the project may incur additional mitigation (e.g., seasonal curtailment of operations, rerouting cables, installing additional bird-collision monitoring) or face permit conditions delaying project realisation.</p>	No	Early EIA scoping, adaptive monitoring, adjust layouts for migratory routes.

3.3.2 Concept selection



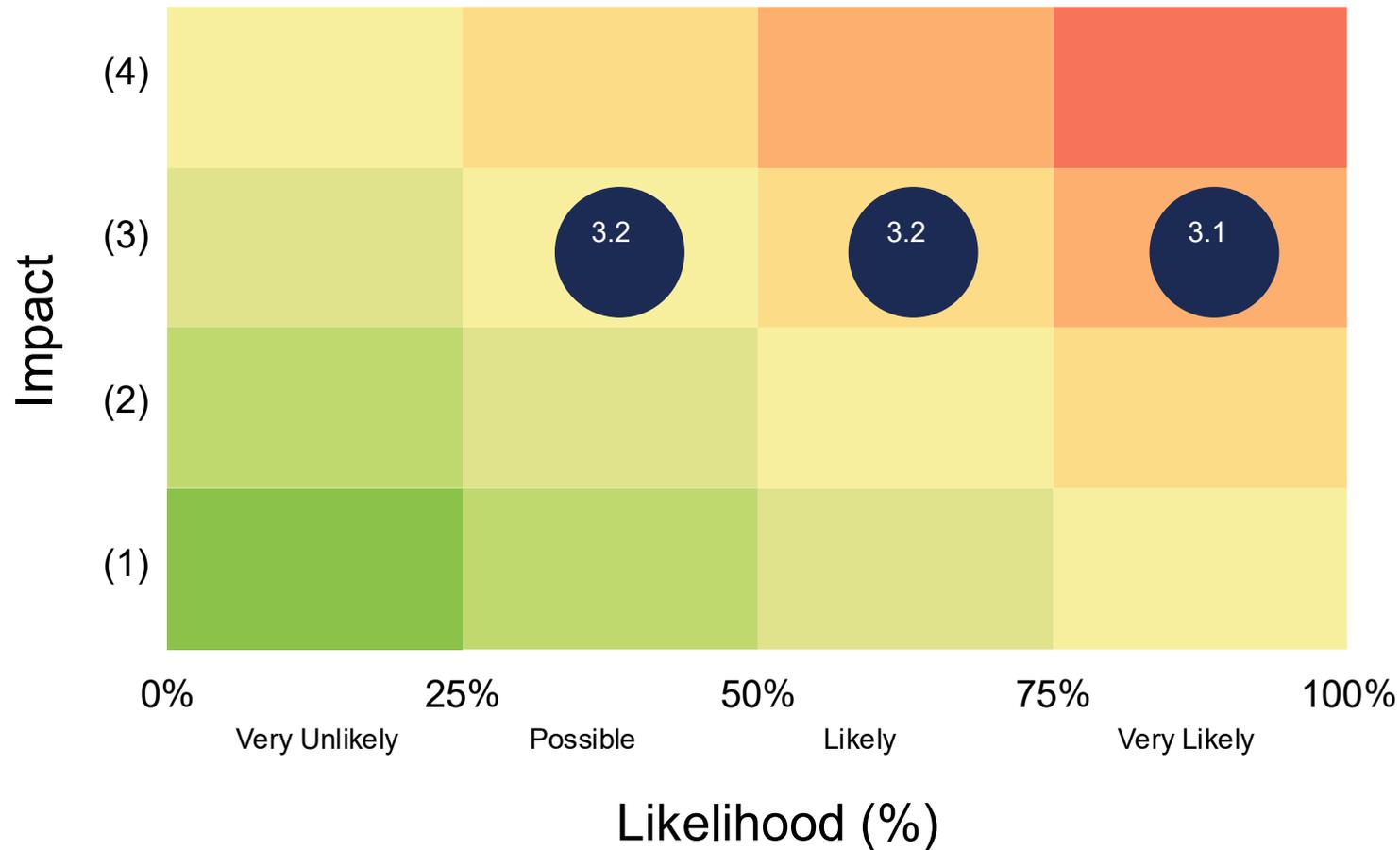
At this stage, risks remain moderate-to-high, as technical assumptions and regulatory requirements are still being defined. While many uncertainties are narrowed down through design and site studies, design modifications, grid-connection ambiguity, or inter-agency coordination can still delay progress or lead to cost increases.

Table 3-3 Risk mapping for concept selection phase

ID	Risk category	Risk description	Korea specific?	Potential mitigation measures
2.1	Regulatory & Permitting	<p>Design changes triggering new permitting rounds: Material changes to turbine layout, foundation type, export route, or visual/EMF impacts can be classed by regulators as “material” requiring updated or additional permit submissions and potentially restarting consultation period.</p> <p>Specifically for Korea, given the complexity of permitting, material changes in the project description can lead to a <i>de facto</i> start-over of lengthy regulatory steps.</p>	No	<p>Introduce formal design change protocol at bid stage; allow flexibility within defined design envelopes to minimize delays.</p>
2.2	Regulatory & Permitting	<p>Ambiguity over offshore grid connection arrangements: risk that the TSO has not confirmed final grid connection point, capacity allocation or the terms (e.g. cost, timing) for using common grid infrastructure, thus preventing firming up the electrical design and connection agreement.</p> <p>Specifically for Korea, one key regulatory uncertainty has, so far, concerned the grid connectivity arrangements with KEPCO, where developers have not been able to obtain the electricity business licence until KEPCO’s confirmation of sufficient grid capacity.</p>	Yes	<p>Early engagement with transmission system operators; clarify connection requirements and responsibilities; integrate grid interface considerations in early design and planning.</p> <p>Korea: early engagement with KEPCO and authorities; clarify ownership and cost-sharing rules.</p>
2.3	Regulatory & Permitting	<p>Conflicting priorities between central and local governments: There is a risk of clash between central government’s focus on achieving national decarbonization and offshore wind deployment targets and local governments’ priority on protecting regional interests (e.g. fisheries and local jobs). In Korea, local authorities are gatekeepers for social acceptance and site-specific permits (e.g., onshore cable and substation land use), allowing them to delay or condition projects that meet national criteria but do not sufficiently align with regional demands. This conflict has so far created unpredictable development timelines and project uncertainty.</p>	Yes	<p>Establish clear central-local coordination under Special Act (planned); implement robust local benefit-sharing frameworks (planned under Offshore Wind Special Act); engage local authorities early to align priorities and plan proactive stakeholder engagement</p>

<p>2.4</p>	<p>Technical & Design</p>	<p>Sub-optimal WTG/foundation choice: risk that the selected Wind Turbine Generator (WTG) or foundation system is mismatched to the specific geotechnical, metocean (typhoon/seismic), or bathymetric site conditions, leading to over-conservative design, excessive CAPEX, or long-term operational performance issues.</p> <p>While this is a general risk, it could be amplified by high seismic and cyclonic loading specific to the Korean offshore environment, thus demanding robust and validated designs.</p>	<p>No</p>	<p>Require FEED-level design envelopes; conduct early geotech surveys to inform technology choice; model different technology options to identify optimal WTG/foundation selection.</p>
<p>2.5</p>	<p>Technical & Design</p>	<p>Wake effects underestimated: Inaccurate aerodynamic modelling of turbine-to-turbine interaction (wake effects) due to simplified assumptions or proximity to other planned/existing projects, resulting in an overstated Annual Energy Production (AEP) and a flawed financial model. Recent industry analyses show wake losses in dense developments can be material (single-digit to double-digit % production losses).</p>	<p>No</p>	<p>Mandate validated wake models; require third-party review.</p>

3.3.3 Project Maturation



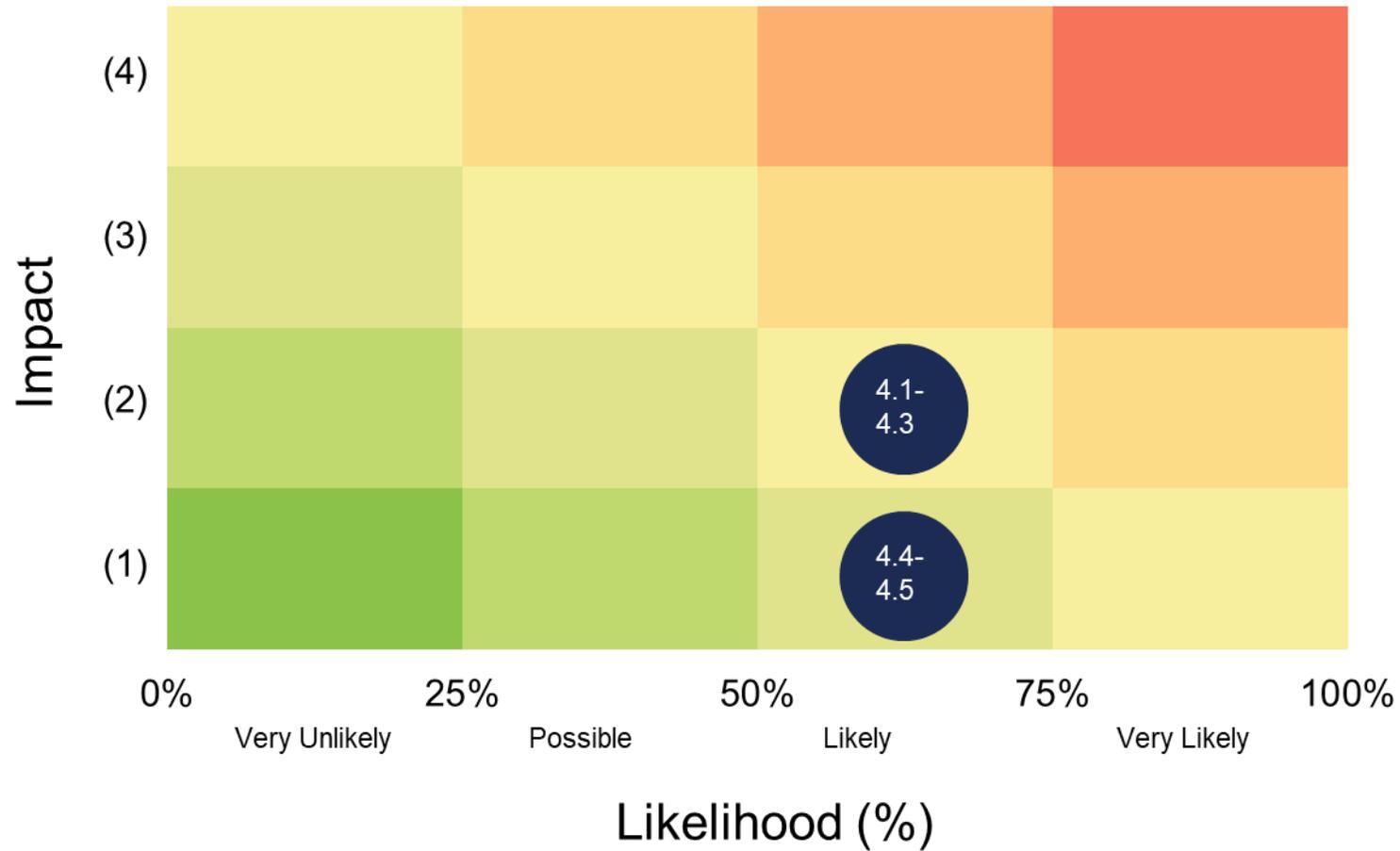
The issue of permitting continues into the Project Maturation stage, where collaboration with authorities, communities, and other stakeholders becomes both more intensive and more visible. By this point, the project has typically gained public attention and is known to local communities and the media, which increases the likelihood of challenges or opposition. Environmental groups may initiate legal actions, and new information or policy changes can lead regulators to impose additional permit conditions. Because many processes converge at this stage - finalising permits, negotiating grid connection, securing

financing, and closing supplier contracts - the number of interdependencies rises sharply. Consequently, even minor delays or objections in one area can cascade across the entire project schedule. This combination of heightened visibility, stakeholder scrutiny, and procedural complexity explains why the overall likelihood of risks during project maturation remains higher than in other phases, even though most technical uncertainties have already been resolved.

Table 3-4 Risk mapping for project maturation phase

ID	Risk category	Risk description	Korea specific?	Potential mitigation measures
3.1	Regulatory & Permitting	Permits delayed due to complexity and/or stricter conditions: As environmental monitoring and public consultation proceed, regulators may add conditional constraints (seasonal curtailment, stricter noise or habitat protection measures) or request new studies (e.g., extended bird/marine mammal surveys). Main consequence of this is delayed financial close, increased pre-construction costs, and potential need to re-negotiate bank covenants.	No	Implement detailed regulation with long-term validity to provide regulatory stability; fast-track clustered projects, early engagement with authorities to anticipate potential issues Korea: leverage Offshore Wind Special Act for streamlined approvals
3.2	Environmental, Stakeholder & Community	Legal challenges from NGOs: NGOs or affected stakeholders can bring judicial review claims or administrative appeals on environmental grounds (EIA adequacy, cumulative impact assessment). A key consequence of this are injunctions or suspended permits, multi-month court processes and reputational damage that can hamper financing.	No	Early engagement with NGOs; transparent EIAs
3.3	Environmental, Stakeholder & Community	Escalating opposition from communities: Opposition may intensify if perceived local benefits are insufficient, or if early construction impacts (noise, vessel traffic) are underestimated. The developer's Social License to Operate (SLO) can deteriorate, leading to organized physical disruption (e.g., port blockades, vessel interference) that causes material schedule delays and requires significantly escalated socio-economic expenditure and negotiation costs.	No	Structured benefit-sharing funds; proactive media campaigns; codify cumulative impact assessment standards

3.3.4 Execution planning



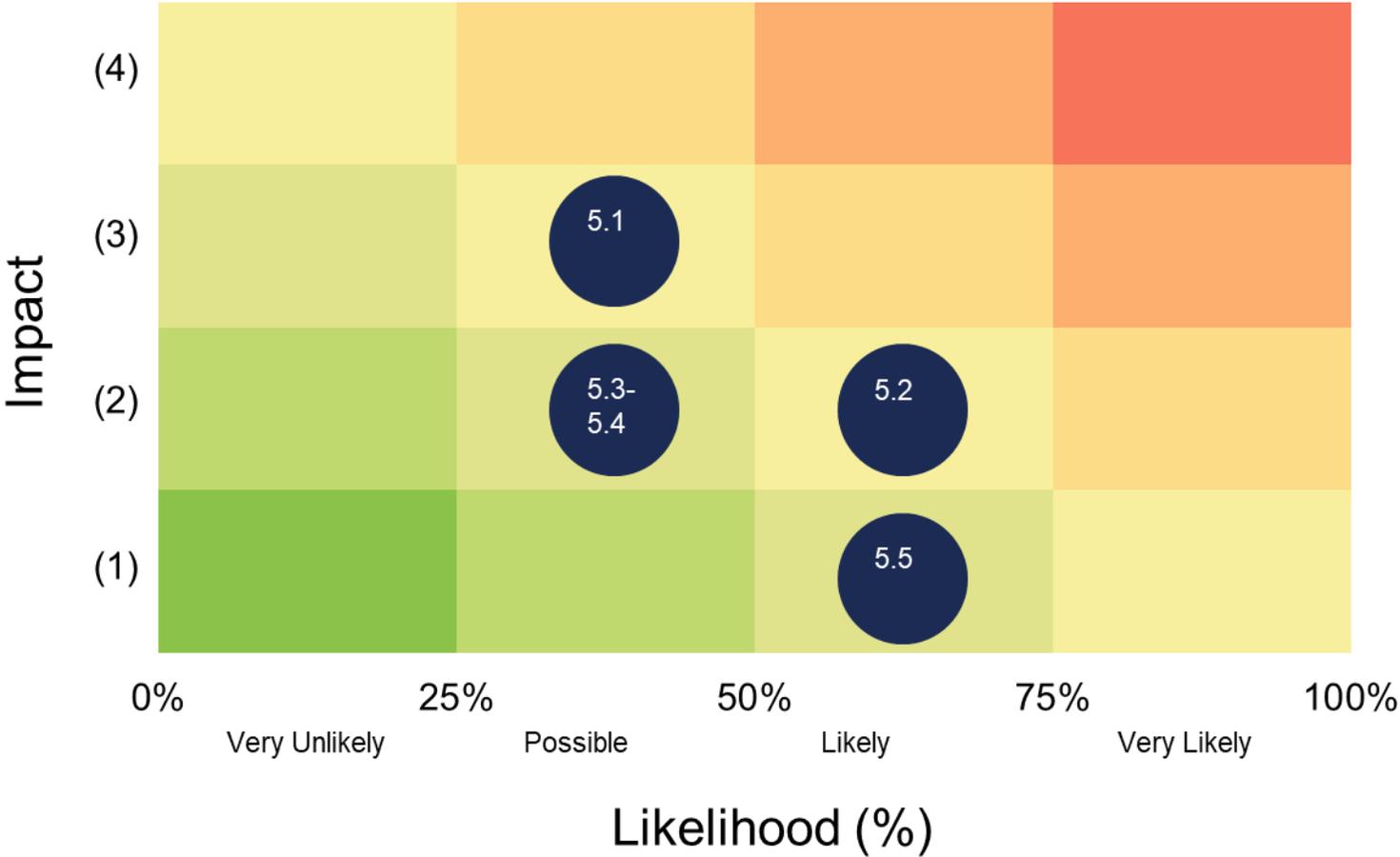
By the execution planning phase, most key permits and designs are in place, reducing the overall likelihood of new risks and their relative impact. The main risks relate to certification, contracting, and supply-chain readiness. Although the probability of major change is lower, misalignment at this stage can still cause cascading schedule effects.

Table 3-5 Risk mapping for execution planning phase

ID	Risk category	Risk description	Korea specific?	Potential mitigation measures
4.1	Technical & Design	Certification delays: Certification bodies may require additional evidence, load cases, or prototype testing (e.g., for new turbine models or floating substructures). Delays or conditional certificates can push procurement milestones and the right to install certain designs. A key consequence of this is hold on factory production, supplier penalties, and schedule/contractive exposures.	No	Early engagement with certification bodies to clarify requirements and timelines; build redundancy in suppliers to reduce single-point delays; monitor certification progress closely.
4.2	Financial & Investment	Delay in reaching FID: failure to satisfy all conditions in the financing agreement (e.g., all material permits secured, PPA/CfD executed, EPC contract signed) by the target date, might lead to lapsed contracts, price escalation clauses being triggered, and potential cancellation of vessel/equipment slots.	No	Simplify internal approval pathways; implement staged FID options with partial commitments; provide transparent and timely information to investors.
4.3	Stakeholder & Community	HSSE culture gaps in contractors: contractors might exhibit significant deficiencies in safety management systems, resulting in a serious offshore accident, fatality, or uncontrolled environmental release, leading to mandatory work stop-orders and severe reputational and legal consequences.	No	Capacity-building programs; enforce HSSE in contracts; conduct regular audits and safety inspections.
4.4	Regulatory & Permitting	Trade restrictions affecting supply chain: the unexpected imposition of new tariffs, import duties, or export controls on critical components from key global manufacturing hubs (e.g., China, Europe) due to geopolitical trade policy changes, significantly increasing CAPEX and causing procurement delays. Specifically for Korea, the country's wind sector remains heavily reliant on imported turbine components and specialist equipment, and the government is increasingly using bidding and sourcing criteria to favour domestic manufacturing. While large-scale tariff shocks have not yet been documented in offshore-wind supply chains, the imposition of localization rules or procurement scoring that disfavour foreign components (and the risk of global trade controls on key materials) present a credible supply-chain disruption risk in Korea.	No	Promote international partnerships; diversify suppliers to reduce reliance on single markets (including local ones); monitor trade policies.
4.5	Technical & Design	Serial defects: Quality assurance and control processes fail to prevent or detect systemic, repetitive design or manufacturing flaws in key components	No	Robust QA/QC programs at manufacturing sites; third party inspections and testing of critical

(e.g., foundation welds, pitch systems, power converters) across a large production batch, requiring a costly fleet-wide recall or rework. components; ensure insurance coverage.

3.3.5 Construction and commissioning



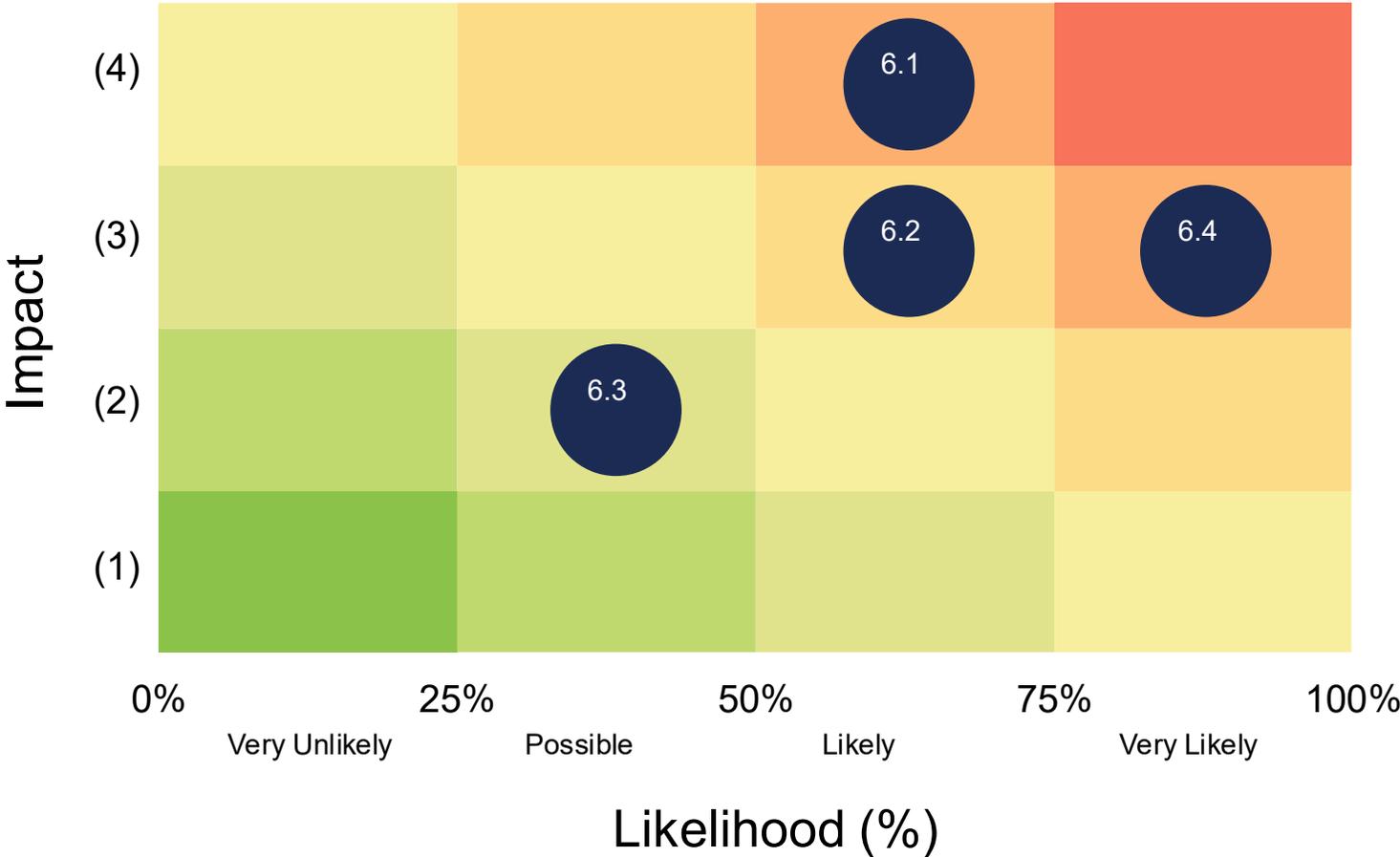
During construction and commissioning, risks are less frequent, but their potential impact is higher in absolute terms, since any disruption occurs after major capital deployment. Even a medium impact rating in this phase corresponds to significant monetary and schedule consequences. Typical high-impact risks include vessel unavailability, component defects, or breaches of permit conditions that can halt offshore works.

Table 3-6 Risk mapping for construction and commissioning phase

ID	Risk category	Risk description	Korea specific? (Y/N)	Potential mitigation measures
5.1	Regulatory & Permitting	Inaccurate, incomplete or delayed reporting: Failure to submit mandatory environmental or operational monitoring reports (e.g., noise limits, marine mammal sightings, fishing vessel traffic) to regulatory bodies in the required format or timeframe would lead to a technical breach of permit conditions. This can trigger enforcement actions, fines or withholding of operation permits.	No	Implement automated reporting tools; conduct regular compliance audits; train project personnel on reporting obligations and timelines.
5.2	Technical & Design	Defects in fabricated components upon delivery: Substantial quality non-conformities or transport damage are discovered on fabricated structures (e.g., transition pieces, foundations, offshore substation modules) upon arrival at the marshalling port or during pre-assembly would require extensive, high-cost, and schedule-disrupting remedial work.	No	Robust QA/QC programs at fabrication yards; third-party inspection; track supplier performance and implement corrective actions
5.3	Regulatory & Permitting	Breaches of permit conditions: Construction activities may actively or inadvertently violate key constraints (e.g., exceeding authorized pile driving noise limits, conducting activities outside approved hours/seasons, or failure to observe required marine traffic exclusion zones), resulting in immediate work stop-orders and financial penalties.	No	Compliance training for site personnel; internal audits and permit compliance checks.
5.4	Supply Chain & Logistics	Vessel breakdown: Unscheduled breakdown, damage, or delayed delivery/demobilization of a critical, highly specialized offshore installation vessels may halt the construction campaign, leading to late delivery penalties or re-chartering costs.	No	Maintain redundant vessels and backup transport capacity; implement preventive maintenance programs; ensure availability of spare parts and technical support.
5.5	Technical & Design	Failure to properly bury or protect cables: Inadequate burial depth, poor route selection or ineffective cable protection systems (CPS) increases risk of third-party damage (anchoring, fishing), exposure caused by seabed mobility, and cable fatigue.	No	Use proven cable burial tools; conduct pre-installation surveys to identify seabed challenges; monitor installation continuously and perform post-installation inspections.

While shallow burial risk is common, this can be amplified in Korea by the high density of fishing activity, making cable protection a top-tier operational risk.

3.3.6 Operations and Maintenance



Once a project is operational, key risks shift from construction-related issues to ensuring operational integrity, long-term asset performance, and reliable revenue streams. In Korea, these operational risks can be heightened by dense fishing activity around wind farm sites, evolving regulatory obligations related to marine and environmental monitoring, and the potential shortage of specialized offshore maintenance vessels and skilled technicians. Experiences in other international markets have shown that operational challenges, such as failures in subsea cables or lack of access to maintenance resources, can have major financial and technical impacts, including extended downtime or erosion of project returns even on projects that were successfully constructed.

Table 3-7 Risk mapping for O&M phase

ID	Risk Category	Risk Description	Korea Specific?	Potential Mitigation Measures
6.1	Technical & Design	<p>Subsea export or inter-array cable failure: due to fishing gear, anchoring, or trawling activity, resulting in extended downtime and costly repairs.</p> <p>Specifically for Korea: The high density of fishing activity around Korean wind farm sites increases the risk of cable strikes and damage.</p>	No	Specify cable burial depth and robust protection systems; implement real-time monitoring; engage local fishing communities in route planning.
6.2	Supply Chain & Logistics	<p>Limited availability of specialist O&M vessels (e.g., cable repair, large component exchange): this may cause protracted outages if a failure occurs, especially during seasonal weather windows.</p> <p>Specifically for Korea: Domestic O&M vessel supply is underdeveloped, making it difficult to source rapid-response assets locally.</p>	No	Secure long-term vessel access agreements; coordinate O&M resources with other operators; support development of local marine service providers.
6.3	Regulatory	<p>Increasing post-commissioning monitoring or insurance requirements (e.g., stricter environmental reporting, warranty exclusions): can reduce project availability and/or increase O&M costs.</p>	Partly	Regularly review regulatory updates; ensure O&M contracts allow compliance flexibility; maintain an ongoing insurance dialogue with Korean providers.
6.4	Supply Chain & Logistics, Financial	<p>Potential revenue loss from extended downtime: for example due to delayed parts/vessels or technical issues, aggravated by curtailment requests from grid operators or unforeseen regulatory constraints.</p> <p>Specifically for Korea: Supply chain gaps and grid curtailment, especially during high demand, are documented issues.</p>	No	Employ condition-based and predictive maintenance; negotiate robust warranty/availability terms; set aside contingency for downtime risks.

3.3.7 Most significant risks

Using the expected cost impact from Table 3-1 and risk likelihoods, the most cost-demanding risks have been summarized in the table below. These risks span all major project phases - from early development and permitting to construction and commissioning - reflecting the reality that delays, technical non-conformities, or regulatory uncertainties at any stage can propagate through subsequent activities, amplifying schedule, cost, and financing exposure.

Selection focused on risks that combine high financial consequence with a non-negligible probability, as identified in historical OSW project data, industry studies, and Korean-specific context analyses.

By explicitly considering risks across all phases, developers and investors can better anticipate cost drivers, vulnerabilities and operational bottlenecks, enabling targeted mitigation strategies that reduce the likelihood of cascading delays or cost escalation.

Table 3-8 Top risks across project lifecycles

Risk ID	Phase	Risk Description
3.1	Project Maturation	Permits delayed due to complexity and/or stricter conditions
5.1	Construction & Commissioning	Incomplete/delayed reporting
3.2	Project Maturation	Legal challenges from NGOs
5.2	Technical & Design	Defects in fabricated components upon delivery
1.1	Early Development	Unclear permitting frameworks

3.4 Floating offshore wind considerations

The increasing interest in floating offshore wind (FOW) in Korea brings a new set of risks that differ in nature and magnitude from those associated with fixed-bottom projects. The most significant floating-specific risks include:

- **Port and Yard Readiness:**

FOW platforms, which are typically assembled onshore and towed to site, require large fabrication yards, deep-water assembly quays, and specialized heavy-lift infrastructure. In Korea, most existing shipyards and ports are optimized for conventional shipbuilding or smaller scale offshore works and may not be equipped for the scale, draft, and throughput needs of floating wind foundations. Targeted upgrades or new investments may be required to enable large-scale serial production and efficient load-out for future projects.

- **Mooring and Anchoring in Busy Marine Areas:**

Mooring networks for floating turbines cover significant seabed area and create additional risk of interference with commercial shipping lanes, fishing routes, and aquaculture zones, all of which are relatively dense in several Korean sea areas (notably southern waters and around Jeju). There is an increased risk of anchor or mooring line failure from marine traffic or accidental trawler snagging, which can compromise safety and project uptime. Additional spatial planning and active engagement with marine user groups is critical to minimize operational conflicts.

- **Certification and Design Adaptation Timelines:**

Floating wind technology involves less-mature design codes and evolving certification processes compared to fixed-bottom turbines. Classification societies and standards bodies (e.g., DNV, IEC/IECRE) require additional model testing, prototype demonstrations or bespoke load-case analyses for many floating concepts. Such requirements can extend pre-certification and permitting schedules, affecting project finance and milestone risk.

- **Amplified Single-point Delays:**

In floating projects, modules such as the platform, turbine, and mooring system are often fabricated and integrated in parallel streams. Delays in a single element (for example, platform delivery or cable termination) can halt overall assembly and push back tow-out or commissioning for the entire string. This enhances the impact of supplier or fabrication disruptions, making close coordination and schedule buffer planning essential.

- **Supply Chain Maturity and Local Content Gaps:**

The supply chain for key floating wind components (such as synthetic mooring lines, specialized anchors, large-scale platforms, and dynamic cables) is still emerging globally and remains nascent in Korea, with limited domestic suppliers and lack of proven serial production. Sourcing from global suppliers can introduce additional lead times, exchange-rate risk, and vulnerability to global bottlenecks.

In summary, floating offshore wind projects in Korea will require tailored risk management strategies that recognise the tighter coupling between technology readiness, domestic infrastructure constraints and a busy marine environment. Early supply chain development, clear port and spatial planning, and sustained engagement with both regulators and marine stakeholders are essential to mitigate these floating-specific risks.

3.5 Conclusions

The risk mapping exercise demonstrates that risks in offshore wind projects vary in type, likelihood, and impact across the project lifecycle. In the early phases, including Early Development and Concept Selection, regulatory and permitting uncertainties are the most significant drivers of potential delays and cost escalation. Risks such as unclear permitting frameworks, fragmented authority, and lengthy permitting processes are particularly pronounced at this stage and can persist into Project Maturation if regulatory stability or coordination between authorities is insufficient.

In the Korean context, specific regulatory challenges such as the coexistence of multiple permitting regimes and conflicting priorities between government levels underscore the importance of early engagement with authorities and adoption of streamlined permitting frameworks, as those which form part of the Offshore Wind Special Act. While the act is expected to streamline permitting and improve regulatory predictability in the medium term, a transitional phase in 2025-26 will likely see an elevated level of risk before these benefits materialize. The shift from a developer-led “open-door” regime to a government-led zoning introduces short-term uncertainty around legacy project treatment, sequencing of zone designation, and the operational readiness of new institutions. Several industry observers note that issuance of new public waters occupancy permits has already slowed ahead of the transition, and that the full set of enforcement decrees and procedural guidelines are still in development. This creates a temporary window in which overlaps between legacy and new projects, potential prioritization of public-led initiatives, and institutional adaptation may delay or complicate development decisions. For developers, recognizing this transitional volatility is essential for effective planning: project timelines and budgets should account for possible schedule extensions, procedural revisions, or additional administrative review cycles during this period. Over the longer term, permitting risk levels are expected to decline, offering a more standardized and transparent pathway for project development in Korea.

Stakeholder and community-related risks are also critical across multiple phases. Escalating opposition from communities and NGOs can affect project timelines and viability. Specifically for Korea, local opposition from fishing communities has been a significant challenge to offshore wind (OSW) projects. For instance, in Goheung County, Jeollanam-do, coastal and aquaculture fishermen have strongly condemned and opposed offshore wind power projects in their waters. Similarly, in Wando County, over 130 fishermen staged, in 2024, a large-scale maritime protest against the Wando Geumil Offshore Wind Power Project, citing concerns about the potential devastation of local fisheries and the threat to their livelihoods. These instances underscore the importance of early and continuous engagement with local fishing communities, transparent communication of environmental impacts, and the development of fair and standardized compensation mechanisms to address their concerns and ensure the successful implementation of offshore wind projects in Korea.

Technical and design risks evolve over the lifecycle. During Concept Selection and Project Maturation, risks include sub-optimal turbine and foundation selection, underestimated wake effects, and delays in certification. As the project progresses into Execution Planning and Construction, attention shifts to defects in manufactured components. Mitigation at these stages relies on robust quality assurance and control programs, third-party inspections, safety capacity-building, and continuous monitoring.

Financial and investment risks, particularly delays in reaching Final Investment Decision (FID), are, in general, closely linked to regulatory complexity, technical uncertainties, and stakeholder opposition. Staged FID approaches, transparent communication with investors, and simplification of internal approval pathways are key mitigation strategies. Supply chain and logistics risks, such as vessel breakdowns, trade restrictions, and equipment shortages, become increasingly significant - and impactful - during later stages of the project. Redundancy in critical assets,

diversification of suppliers, preventive maintenance, and proactive monitoring of trade policies are identified as effective measures to manage these risks.

In addition to the above, as Korea moves toward developing floating offshore wind projects, additional risk factors, such as port and yard readiness, mooring arrangements in crowded marine areas, and evolving certification standards, warrant careful consideration. These floating-specific risks compound the complexity of permitting, supply chain coordination, and stakeholder engagement, highlighting the need for targeted mitigation and early infrastructure planning.

Overall, mitigation strategies must be carefully tailored to both the project stage and the local context. Early-stage measures focus on regulatory clarity, stakeholder engagement, and design flexibility, while later-stage measures emphasize quality assurance, supply chain reliability, and operational monitoring.

In Korea, specific mitigation approaches can include leveraging the *Offshore Wind Special Act*, implementing local benefit-sharing frameworks as well as early community engagement, and proactive government-industry coordination.

4 Comparative offshore wind tender study

4.1 Overview

This chapter presents a comparative analysis of offshore wind tender frameworks across key European (Denmark and UK) and Asian (Japan, Taiwan) markets. The primary objective is to examine how different tender designs influence project risk profiles and developer confidence, with the ultimate goal of informing the strategic development of Korea's offshore wind (OSW) sector. By identifying best practices and structural differences, this analysis aims to support the formulation of a robust and competitive tendering system tailored to Korea's unique regulatory, geographic, and market conditions.

Benchmarking international tender models is essential as it will enable Korean policymakers to reduce regulatory and financial uncertainties by learning from established frameworks and the experience gained by project developers. Avoiding common pitfalls and recent unsuccessful mechanisms that some countries tried to implement, Korea will be able to streamline offshore wind development, enhancing market attractiveness toward local and international investment. This support is aimed to facilitate a coherent and effective implementation of policy instruments, grounded in the experience from pioneering offshore wind markets like the UK and Denmark and rapidly growing neighbour markets such as Taiwan.

The selection of countries for this analysis represents a diverse spectrum of offshore wind maturity and regulatory approaches:

- **Korea:** Korea is transitioning from a developer-led open-door model to a centralized zoning framework under the Offshore Wind Special Act (2026). The first fixed-price PPA auction in 2025 awarded 689 MW to public-led projects, underscoring the government's emphasis on energy security and localization. Achieving the 14.3 GW by 2030 target will depend on clearer revenue mechanisms and streamlined permitting to secure broader private participation.
- **Denmark:** a global pioneer in offshore wind, known for its transparent tendering processes and long-sighted policy frameworks, which have made it a global frame of reference in the offshore wind industry since its early days almost 35 years ago.
- **United Kingdom:** a mature and highly competitive market, distinguished by policy instruments such as Contracts for Difference (CfD), which have facilitated accelerated growth and positioned the country as a global leader in installed capacity, second only to China.
- **Japan:** growing market with annual tender rounds. Recent regulatory developments (EEZ amendment) are aimed at developing its full offshore wind potential by unlocking the EEZ waters where the best win resource is located. Japan will be an important floating wind industrial hub. Local developers are gaining floating knowledge in international markets to transfer it in the coming tender rounds.
- **Taiwan:** the current offshore wind markets leaders in Asia with solid installed capacity and projects under operation, ambitious national objectives and challenges in the supply chain development, financing and grid integration.

This selection enables a broad comparison grounded in Europe's most mature offshore wind markets, where the industry has historically developed, such as the UK and Denmark. At the same time, it incorporates the distinct characteristics of the Asian market through the inclusion of Japan and Taiwan, allowing for a richer understanding of regional differences in tender design and risk management strategies.

4.2 Comparative tender methodology

Tender design plays a pivotal role in shaping the risk landscape of offshore wind projects. To assess how different markets address these challenges, the **first step** in this analysis is to develop country profiles that provide a compact but robust overview of each market. These profiles are structured around the following analytical pillars:

- **Institutional setup and lead agencies:** mapping key targets, policies and authorities responsible for offshore wind development.
- **Tender design and stages:** describing the tendering framework, auction format, stages, and evaluation criteria.
- **Regulatory and permitting process:** describing the timeline as well as key permitting and environmental approvals.
- **Technical requirements:** identifying obligations for pre-development studies, site characterization, or grid connection.
- **Risk sharing and guarantees:** examining how financial guarantees, bid bonds, or contractual penalties are allocated between public and private actors.
- **Supply chain and local content:** considering obligations and incentives for domestic participation, as well as availability of local supply chain (e.g. ports, logistics infrastructure, technology suppliers, etc.).
- **Cost and risk implications:** highlighting how tender design and regulatory structures affect overall project costs, financing conditions, and bankability.

The country profiles allow for a systematic understanding of each jurisdiction’s approach and provide the foundation for the comparative analysis.

The **second step** of the methodology is a cross-country comparison focused on major risk categories most relevant for project developers. For each country and tender element, risks are assessed and scored as low, medium, or high, highlighting how specific tender designs can either mitigate or amplify developer exposure. Three major risk categories are used here:

1. Regulatory Risk

- a. Permitting and streamlining: Fragmented responsibilities and long timelines increase regulatory risk. One-stop-shop systems or legally binding deadlines reduce uncertainty and facilitate smoother project progress.
- b. Policy clarity and stability: Unclear settlement rules, indexation methods, or evolving policy frameworks heighten uncertainty for developers, undermining long-term investment confidence.

2. Financial Risk

- a. Auction model: While CfDs mitigate income volatility, merchant exposure raises market risk.
- b. Payment schedules / milestones: Early-stage financial obligations can create strain if revenues are delayed or projects are unsuccessful.
- c. Cost of required studies: Developers often face significant upfront expenses (e.g., environmental or site assessments) that are sunk if the bid is unsuccessful.
- d. Bid bonds / performance guarantees: High guarantee requirements amplify liquidity and credit risk.

3. Operational Risk

- a. Pre-construction studies: Developer responsibility for site or grid studies increases exposure to failures or delays.

- b. Local content requirements and supply chain constraints: Mandated local sourcing can boost domestic industry but may also increase cost (financial risk) and delay risks if local supply chain capacity is limited.
- c. Design and construction obligations: Technology mandates or detailed construction requirements defined in tenders can shape long-term performance and maintenance risk.

By comparing these categories across the selected markets, the study aims to generate actionable insights to inform strategic discussions on the expansion of Korea's offshore wind industry.

It is important to note that the risk categories used in this cross-country comparison differ from those presented in Chapter 3, where risks are analysed across the full lifecycle of offshore wind projects. In Chapter 3, risks are categorized by type - regulatory and permitting, financial and investment, technical and design, supply chain and logistics, environmental, and stakeholder and community - to provide a detailed assessment of all potential project challenges.

For the purpose of this comparative analysis, however, risks have been grouped into broader, higher-level categories – namely, Regulatory, Financial, and Operational - to focus specifically on elements of offshore wind tenders that most directly affect developer exposure. This aggregation simplifies the framework, making cross-country comparisons more manageable while still capturing the key factors influencing project risk under different tender designs.

4.3 Country tender profiles

4.3.1 Denmark

Pillar	Description
<p>Institutional setup and lead agencies</p>	<p>Targets:</p> <ul style="list-style-type: none"> • 2030: Original ambition of 12.9 GW offshore wind (announced in 2022) with commitment to tender a minimum of 9 GW offshore wind capacity by 2030 (Climate Agreement on Green Power and Heat, June 2022). Recent developments have, however, pushed some of these ambitions beyond 2030, with upcoming tenders expected to cover at least 3 GW in the near term. • 2050: Long-term goal of 35 GW in the North Sea (Esbjerg Declaration, 2022) and 6 GW in the Baltic Sea (Marienborg Declaration, 2022). <p>Key authorities: The Danish Energy Agency (DEA) is the central authority, acting as a one-stop-shop for tenders, permits, and coordination with other bodies. Energinet, the state-owned TSO, is responsible for offshore grid connection.</p> <p>Policy and regulatory framework: Key legislation includes The Danish Act on the Promotion of Renewable Energy, the Planning Act, the Marine Environment Protection Act and the Continental Shelf Act. The institutional framework is centralized and aligned with EU climate policies. National spatial planning defines designated offshore areas.</p> <p>Open-door projects were an alternative to tendering for offshore wind construction licenses, allowing developers to propose sites for government approval. This mechanism was discontinued in 2024 (Lillebælt Syd & Jammerland Bay were the last projects awarded under this scheme) after operating for 25 years.</p>
<p>Tender design and stages</p>	<p>Tender stages: Denmark’s offshore wind tenders follow a structured process. The DEA and Energinet conduct preliminary investigations and environmental assessments, engage in a market dialogue with stakeholders, publish tender documents, prequalify bidders, evaluate final proposals, award contracts, and oversee project implementation and commissioning.</p> <p>Auction design:</p> <ul style="list-style-type: none"> • 6 GW offshore wind tender (2024-2025): Denmark’s most recent OW tender covered 6 GW of potential capacity across six offshore sites with possibility of overplanting. The tender was split in two parts: the first 3 GW (North Sea sites – with deadline December 2024) drew no bids, and the second 3 GW (Hesselø, Kattégat, Kriegers Flak II, with deadline April 2025) was later cancelled. The tender design was considered unattractive by developers, whose main features were:

Negative bidding model: there was no revenue support mechanism (e.g. CfD or Feed-in-Tariff). The developer bidding the highest annual concession payment would win the auction as price was the only competitive parameter.

State co-ownership: the Danish State retained a 20% ownership of the project and certain rights within project's decisions.

LDs and guarantees: developers faced strict COD deadlines, with substantial liquidated damages imposed for delays. Penalties increased incrementally every six months if delays persisted. Costly guarantees on defective performance were also established.

Electrical infrastructure responsibilities: under this auction model, developers were responsible for the construction and financing of the majority of the electrical infrastructure resulting in significantly higher CAPEX and OPEX, increasing overall project risk.

Overplanting: it was allowed to surpass the minimum capacity of 1 GW if deemed advantageous by the developer.

These factors, combined with adverse macroeconomic conditions, resulted in no bids for the December 2024 North Sea auction and led the Danish Energy Agency to suspend the January 2025 auction early after it failed to attract participants.

Reforms & planned changes:

- **Upcoming model (Autumn 2025 reboot, 3 GW)** featuring following modifications to gain bidders' interest back:

CfD model: two-sided, capacity-based CfD guaranteeing a fixed settlement price for potential electricity production over 20 years, based on the assessed capacity rather than actual generation. Subsidy cap of 55.2 billion DKK with different limits across the three parks (North Sea Mid, Hesselø and North Sea South).

New COD window: responding to developer's request of more flexibility, new expected COD for awarded projects will lie in the 2032-2034 period.

Changes in State co-ownership: Removal of mandatory state ownership in projects.

Relaxed penalties for delays: Penalties for project delays have been adjusted to align with realistic timelines, addressing industry concerns.

Non-price criteria: eligibility criteria will include environmental sustainability, social responsibility, and protection against security threats linked to critical infrastructure investments and third-country competition.

Regulatory and permitting process

Typical timeline and permitting process: Securing all necessary consents, permits and licenses takes an average of 4 years¹. The legislation is defined in the Promotion of Renewable Energy Act:

- *License to carry out preliminary investigations:* once the developer submits the initial project description and offshore activity plan, the DEA is responsible for coordinating with relevant authorities to issue the preliminary investigation permit, granting the developer the right to conduct further site investigations (tendered areas are pre-investigated by the DEA, which shares the data with developers ahead of the tender launch).
- *License to establish offshore wind turbines / Construction license:* with sufficient information and certainty regarding seabed characteristics and metocean conditions, the developer may apply for a construction permit, this time submitting a detailed project. DEA will again act as the central coordinating body with the relevant authorities. The grant of this license will be dependent on the approval of the Environmental Impact Assessment (Executive Order 68 of January 2012), which the developer must have submitted in advance.
- *License to exploit wind power and approval for electricity production:* prior to commissioning the offshore wind farm and commencing energy export, the developer must apply for an electricity generation license. This license requires verification that the installation fully complies with the specifications outlined in the construction permit and the detailed project documentation. Upon approval by the Danish Energy Agency and other competent authorities, the license is granted for a period of 25 years, with the possibility of extension. A direct increase to a 30-year term is currently under consideration.



¹ Estimated timeline in an optimistic project development scenario.

	<p>Streamlining initiatives: Danish tenders are structured to accelerate development and enhance efficiency by allowing multiple processes to run concurrently where feasible. Combined with the Danish Energy Agency’s one-stop-shop model, this approach has been widely recognized for its effectiveness, particularly in achieving comparatively short permitting timelines relative to other European markets.</p>
<p>Technical requirements</p>	<p>Level of design at bidding stage: Developers rely on pre-investigation data provided by the DEA prior to tendering to inform project design and build a business case. This enables a preliminary level of technical definition at the bidding stage, including indicative turbine count and size, site layout and electrical infrastructure.</p> <p>While bidding with limited technical certainty entails some risk, the pre-tender information generally offers sufficient insight to support a basic design that keeps risk at a tolerable degree.</p> <p>Grid connection: historically, developers financed and constructed offshore substations and export cables, which were later transferred to Energinet. Following the last auctions with limited bidder interest and given the feedback received by the DEA from market dialogues regarding infrastructure responsibilities, Energinet might reassume part of these obligations in the late 2025 tender reboot, based on results of market dialogue conducted by the DEA. This shift aims to lower upfront costs for developers and redistribute associated risks</p> <p>Environmental & site conditions: The DEA conducts and provides participants with pre-tender site studies including metocean, wind, and seabed data (costs of the studies will be refunded by the winner of the concession). Developers will complement this information with detailed seabed investigation campaigns post-award. Main design constraints include areas with strategic military defence value, special protection and/or conservation areas (e.g. Natura 2000), shipping lanes, fisheries, oil & gas overlaps and pre-existing pipelines or cables. Government pre-surveys reduce early-stage risk, but developers remain responsible for site-specific assessments.</p>
<p>Risk sharing and guarantees</p>	<p><i>Latest model (December 2024):</i> high developer risk due to no subsidy model, high penalties and state co-ownership <i>New proposed model (Autumn 2025):</i> more balanced risk sharing thanks to CfD, flexible COD windows and reduced upfront fees and penalties.</p>
<p>Supply chain and local content</p>	<p>Local content obligations: Denmark does not enforce any local content minimum requirements. Nonetheless, the strong track record and expertise of long-established industry players have fostered one of the most specialized offshore wind ecosystems globally, which developers rely on when taking their projects to construction.</p> <p>Supply chain:</p> <ul style="list-style-type: none"> • <i>Ports:</i> Esbjerg is one of the most important ports for offshore wind with prepared installations, big dimensions and good access to the sea. Thyborøn has been chosen as maintenance base for recent projects. • <i>Companies:</i> Denmark has well-established companies and suppliers, with important players along the whole offshore wind value chain. Some remarkable examples are: Bladt Industries (now part of CS Wind), Vestas,

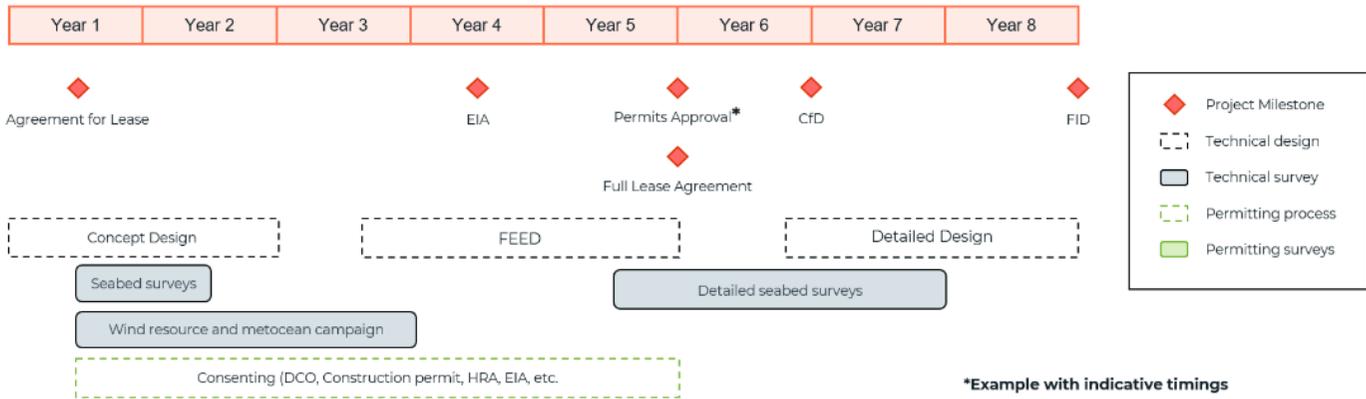
	<p>Maersk Supply Service, Semco Maritime, Ørsted, COP, Siemens Gamesa among many others. Vestas counts on several facilities in Denmark (Naksov, Ringkobing, Travemünde, etc.), BSC is set to build Europe’s largest monopile factory in Esbjerg by 2026. These are just some examples of the extensive offshore wind supply chain that can be found in Denmark.</p>
<p>Cost and risk implications</p>	<p>At this stage, cost estimations inevitably carry a significant degree of uncertainty, since detailed geotechnical surveys, full metocean assessments and final design decisions are only conducted after project award.</p> <p>The pre-tender site investigation package provided by the DEA reduces early-stage risks compared to markets where developers must procure this data themselves, but conservative assumptions and risk contingencies still need to be applied into their financial models. As a result, cost estimates at tender phase are typically indicative rather than definitive and can later deviate once the FEED and detailed site investigations are completed. The ability to price in these uncertainties while maintaining competitiveness is therefore a critical element in the auction strategy.</p>

4.3.2 United Kingdom

Pillar	Description
<p>Institutional setup and lead agencies</p>	<p>Targets:</p> <ul style="list-style-type: none"> • The UK Secretary of State for Energy Security and Net Zero set an installed offshore wind capacity target of 43–50 GW before 2030. Approximately 15 GW of offshore wind are operational or under construction, with more than 37 GW consented. • The Clean Power 2030 Action Plan (Dec 2024) highlights offshore wind as the backbone of the UK’s clean power ambitions. <p>Key authorities: Processes are managed by different public entities depending on the geographical location: Within the UK’s institutional framework, Scotland is the most devolved region, and all its processes are managed by its own government bodies (except for CfD awards and grid connection processes). There are slight differences among England, Wales, and Northern Ireland, but The Crown Estate (CES for Scotland) and the UK Secretary of State for Energy Security and Net Zero act as pivotal authorities for the four countries.</p> <p>Policy and regulatory framework: key policy documents are the Planning Act 2008, the Electricity Act 1989, Marine and Coastal Access Act 2009. Recent streamlining initiatives from the UK government are expected to accelerate offshore wind project timelines in order to meet 2030 targets. A strong political commitment has been demonstrated through CfD tariff adjustments, which reflect current socioeconomic challenges, such as reduced supply availability and increased project CAPEX. Most recently, Allocation Round 7 (AR7) of the UK CfD scheme introduced key reforms to support the delivery of renewable capacity needed by 2030.</p>
<p>Tender design and stages</p>	<p>Tender stages: Offshore wind projects are developed via a two-step process:</p> <ul style="list-style-type: none"> • <i>Leasing Rounds:</i> The Government selects sites after these are identified as areas of interest in the Marine Spatial Plans, and auctions seabed leases. Winners are awarded an Agreement for Lease (or option agreement) giving them the rights to proceed with development activities in the site within a given timeframe. The Agreement for Lease sets out the terms on which the lease is granted, provided that the developer succeeds in meeting all the regulatory requirements. After these are met, a full seabed lease is granted. • <i>Allocation Rounds (ARs):</i> The leasing round is followed by the competitive bidding process, where CfD contracts are assigned (normally happening after several years of development). Each AR can include several “pots” for different technologies and stages of maturity. Each pot is independent and has its own budget and there might be a minima or maxima cap regarding the installed capacity to be allocated.

	<p>Auction design: In the UK, offtake support is mostly secured by developers through CfD Allocation Rounds², which are annually launched and administered by the Low Carbon Contracts Company.</p> <ul style="list-style-type: none"> • Strike prices offered by developers cannot surpass the Administrative Strike Price (ASP), which is set in advance by the Government and varies depending on the technology. • Sealed bids are classified from lowest to highest price and accepted in that order until either the maximum capacity and/or the annual budget cap for that delivery year is reached. The clearing price that all bidders will receive is set by the last accepted offer. The same process is repeated for the remaining delivery years. <p>Reforms & planned changes: AR7 reforms were announced in 2024 to boost offshore wind and renewable capacity by 20230. AR7 ASPs for fixed bottom OW have been raised from 102 to 113 £/MWh and from 245 to 271 £/MWh for floating OW (in 2024 prices). CfD strike prices are indexed to the Price Commodity Index along its duration. Key reforms introduced in the AR7 include:</p> <ul style="list-style-type: none"> • Extended Contract Duration: CfD contracts for fixed-bottom and floating offshore wind projects were extended from 15 to 20 years. • Relaxed Eligibility Criteria: Projects without full planning consent are now eligible, speeding up the development pipeline. • Separate pots for fixed-bottom and floating offshore wind: AR7 has established independent pots for fixed-bottom and floating offshore wind projects. • Clean Industry Bonus (CIB): A new £544 million bonus incentivizes projects that invest in sustainable supply chains. More on this under “Supply Chain and Local Content”. • Transparent budget publication: The monetary budget for AR7 has been published ahead of the auction, providing developers with clarity on the available funding and enabling them to make informed bidding decisions. • Separate Announcement of Offshore Wind Auction Results: The results for offshore wind projects in AR7 are expected to be announced separately from other technologies. . This approach allows for a more tailored assessment and quicker feedback for offshore wind developers. The AR7 application window ran from 7–27 August 2025, with results expected between November 2025 and February 2026.
<p>Regulatory and permitting process</p>	<p>Typical timeline and permitting process: securing all consents, permits, and licenses typically takes 4-6 years.</p>

² PPAs are also a mechanism used by some projects (e.g. Dogger Bank, East Anglia). However, current macroeconomic conditions and low energy prices are increasingly tipping the balance in favour of CfDs, which are, in many cases, essential to achieving a viable business case.



Key consents and permits are:

- Consent under Section 36: permit to construct and operate electricity generating station under Electricity Act 1989.
- Development Consent Order (DCO): for Nationally Significant Infrastructure Projects (Planning Act 2008).
- Marine License: under Marine and Coastal Access Act 2009.
- Onshore works: require planning permission for substations, land leasing, cable landfalls.
- Environmental Impact Assessment (EIA): follows standard methodology, conducted by specialized firm, results submitted as part of DCO.
- Habitat Regulations Assessment (HRA): complementary to EIA, focuses on SACs, SPAs, Ramsar sites.

Streamlining initiatives:

- Offshore Wind Environmental Improvement Package (OWEIP): reduces permitting from 4 years to 1 year via multi-project compensatory measures and Marine Recovery Fund.
- Fast Track DCOs: 12-month permitting for projects meeting the fast-track quality standards.
- Country-specific policies

Technical requirements

Level of design at bidding stage: A design envelope (Rochdale envelope) is used by developers during the permitting process to describe the design without locking it down too early. This envelope describes a range of technical parameters and assesses the potential worst-case scenario. If the final design lies within the envelope approved by the DCO, no further consent needs to be applied for. If any changes made to the design fall outside of the envelope introducing new or greater impacts, a DCO change must be filed (either material or non-material

	<p>depending on the scale). The design envelope will also affect the Marine License, which will need to be adjusted if any changes or technical refinements are expected by the developer.</p> <p>The design envelope typically sets and justifies ranges for turbines, foundations, offshore electrical infrastructure, onshore works and construction & operation.</p> <p>Grid connection: The National Energy System Operator (NESO) is the nationalized independent system planner and operator, which was transferred to public ownership in 2024 (previously NGESO, property of National Grid). Ofgem is the institution who runs the regulation of offshore transmission. The developer is the sole responsible for the development and construction of the electrical transmission infrastructure associated to the offshore wind farm. Once fully operational, the transmission assets are transferred to an Offshore Transmission Owner (OFTO), which are electrical companies that bid in a competitive tender (run by Ofgem) to take over these assets from wind farm developers. OFTOs are then responsible for operating and maintaining these assets and receive a fixed revenue stream in exchange.</p> <p>Environmental and site conditions:</p> <ul style="list-style-type: none"> • Pre-tender data availability: Used to be developer-led in the past, but more recently a package of metocean and wind resource measurements is made available for developers by The Crown Estate (e.g. Celtic Sea leasing). This is meant to inform the Offshore Wind Leasing Rounds and accelerate the decision-making processes of developers. Further seabed surveys may be necessary during the design stage of the wind farm, which will be financed and managed by developers. This indicates the Government push to facilitate offshore wind deployment and reduce the upfront costs developers have to face in early project stages. There are various options for developers to access desktop information like REPD or The Crown State Data Portal. • Design constraints: No height limit since 2024, but maximum tip height must be notified to the CAA. Use of noise reduction methods is mandatory during piling operations (e.g. bubble curtains), but there are no established legal noise limits yet. Unexploded ordnance (UXO) must be cleared using low-noise disposal methods, with underwater explosion clearance as a last resort. Other environment constraints that developers must take into account during design are IMO shipping lanes, O&G areas, existing pipelines and cables, protected environmental areas (especially Red Natura 2000), fishing grounds, etc.
<p>Risk sharing and guarantees</p>	<ul style="list-style-type: none"> • CfD scheme provides long-term revenue certainty for developers. • Developers bear upfront cost of seabed leasing, permitting, and electrical infrastructure construction until OFTO handover.
<p>Supply chain and local content</p>	<p>Local content obligations:</p> <ul style="list-style-type: none"> • Projects must submit a Supply Chain Plan questionnaire (SCP) as part of the application to qualify for an AR. In AR6 this was mandatory for fixed bottom projects over 300 MW and all floating projects. SCPs are evaluated against five main criteria: ambition, feasibility, measurable outcomes, evidence, and monitoring.

	<ul style="list-style-type: none"> • Clean Industry Bonus (CIB): AR7 has introduced a minimum threshold with the new CIB, which provides additional revenue support if developers choose to invest in more sustainable supply chains. All fixed bottom and floating offshore wind projects must deliver a CIB Statement that needs to fulfil minimum standards, basically setting a minimum rate of investment in ports and manufacturing, assembling or installing firms and/or facilities per GW. Those developers who submit proposals that go above the CIB Minimum Standards (known as CIB extra proposals) then enter a separate competitive process for the extra budget support. <p>Supply chain:</p> <ul style="list-style-type: none"> • Port readiness and availability of specialized vessels that can handle modern WTGs (15+ MW) are a luxury commodity in the international market and are a major concern for developers. Port of Tyne unveiled plans to upgrade its facilities to • Manufacturing facilities: important manufacturers with established factories in UK like Siemens Gamesa wind turbine blade manufacture, assembly and servicing facility at Hull's Alexandra Dock, JDR Cables factory in Cambois or Harland & Wolff jacket and metal structure's fabrication in Scotland.
<p>Cost and risk implications</p>	<ul style="list-style-type: none"> • Precision of CAPEX and OPEX estimates at the time of entering a CfD Allocation Round is highly project-specific and cannot be fully generalized. In cases where projects are awarded at a more advanced stage of maturity (typically following the completion of detailed geotechnical and geophysical surveys and with Detailed Design either completed or well progressed) cost estimates can achieve an accuracy level of approximately 85–90%. Conversely, it is not uncommon for projects to enter an Allocation Round without having finalized seabed investigations or without a fully developed design in place, resulting in lower estimation reliability and a potentially higher negative impact on project economics. • Reaching a sufficient level of technical maturity prior to participation is therefore critical. Developers must carefully balance the trade-off between assuming greater risk by bidding earlier with a less mature project or delaying entry into a later Allocation Round to improve design maturity, but at the expense of postponing the COD.

4.3.3 Taiwan

Pillar	Description
<p>Institutional setup and lead agencies</p>	<p>Targets:</p> <ul style="list-style-type: none"> • 2025 target: 5.7 GW, including projects from previous “Potential Site” rounds (Rounds 1 & 2). • 2030 interim target: ~10–13 GW (to be realized through Round 3 phases). • 2035 official target: 20.7 GW, including 15 GW from Round 3 and 5.7 GW from earlier rounds. <p>Key authorities: Ministry of Economic Affairs (MOEA), Energy Administration (EA), Industrial Development Administration (IDA), Ministry of Transportation and Communications (MOTC), Environmental Protection Administration (EPA), Taiwan Power Company (TPC).</p> <p>Policy and regulatory framework: Offshore wind is central to Taiwan’s net-zero by 2050 pathway, crucial for reducing energy imports (>97%) and replacing nuclear generation. Key documents include:</p> <ul style="list-style-type: none"> - Renewable Energy Development Act (REDA): mandates feed-in tariffs (FITs), sets procurement rules, empowers government to set targets. - Round 3 Zonal Development Regulations: outlines auction process, price caps, and localization requirements.
<p>Tender design and stages</p>	<p>Tender stages: the tender system is structured in phases, refined based on lessons learned.</p> <ul style="list-style-type: none"> • The Phase 3 Zonal Development, i.e. the third round of offshore wind capacity allocation, is subdivided into multiple stages, i.e. Round 3.1, 3.2, 3.3, each with capacity allocations and deadlines. Round 3.1 was held in 2023 and round 3.2 in 2024, while round 3.3 is planned for 2026. • Taiwan’s offshore wind tender process begins with <i>zonal development planning</i>, where the government designates specific offshore areas for wind farm development, taking into account environmental impact and grid capacity. Developers then undergo a <i>qualification review</i>, submitting technical, financial, and environmental documentation to demonstrate eligibility. Selected developers participate in a <i>price auction</i> to secure long-term power purchase agreements (PPAs) with TPC. Successful bidders proceed to <i>permitting and licensing</i>, which includes approval of the environmental impact assessment, construction permits, and an electricity license. Once permits are in place, <i>construction</i> begins, and the wind farm is connected to the grid. Finally, the project enters the <i>operational phase</i>, with ongoing monitoring to ensure compliance with environmental and operational standards. <p>Tender design:</p> <ul style="list-style-type: none"> • Taiwan’s offshore wind tender framework combines a fixed-tariff feed-in-tariff (FiT) path with competitive auctions, within a multi-phase rollout.

	<ul style="list-style-type: none"> • Projects allocated under the FiT path can secure a 20-year PPA with TPC at a predetermined rate, which may be structured as a flat rate or a tiered tariff depending on the round and signing year (e.g., TWD 5.5160/kWh for 2019 PPAs or a 10/10-year tiered structure). • The government operates a corporate PPA (CPPA) guarantee scheme, allowing eligible corporate offtakers to secure long-term agreements with some credit support, improving bankability. However, publicly documented coverage percentages vary by project and are not a standard feature for all projects. Broad state-backed financing is limited; support is primarily project-specific and involves supply chain, grid, and regulatory facilitation rather than direct universal debt guarantees. <p>Auction criteria have evolved throughout the three rounds:</p> <p><i>Round 3.1 (2023):</i></p> <ul style="list-style-type: none"> • Introduced competitive bidding and localization incentives; only 2.3 GW of 3 GW was allocated due to cost and financing challenges. Bids were evaluated on technical capability, financial soundness, and a localization score, with a minimum score required to qualify. Price auction had a cap of NT\$2.49/kWh, but developers could bid as low as NT\$0/kWh, with tie-breakers favouring higher localization scores. As of today, only the Fengmiao 1 (495 MW) project has achieved financial close. <p><i>Round 3.2 (2024):</i></p> <ul style="list-style-type: none"> • Capacity limits were increased (top-ranked developers up to 900 MW, second-ranked 700 MW, others 500 MW). Developers could group multiple projects under a single application if they shared a common shareholder (20%+ ownership). Bonus capacity (up to 100 MW) was offered for developers securing CPPAs with at least two domestic enterprises. Qualification review required ≥70 points in localization, technical, and financial assessments. Price auction rules remained similar to Round 3.1 (NT\$0–2.49/kWh), with ties resolved via localization scores. Only 1.9 GW of the planned 3 GW was allocated, and three development contracts were signed. <p>Planned reforms and changes: <i>Round 3.3</i> with up to 3 GW capacity is expected in 2026. While the specific date remains uncertain, the government is working to refine auction terms. Local-content requirements are expected to be further relaxed in response to supply-chain challenges and being shifted from mandatory to incentive-based. The MOEA is also overhauling offshore wind permitting process to reduce review times, introduce joint reviews, merge agency steps, and implement pre-screening for environmental assessments and construction permits. Tariff structures and auction rules may be updated to improve bankability and reflect evolving technical and financial realities, particularly for deeper-water projects.</p>
<p>Regulatory and permitting process</p>	<p>Typical timeline and permitting process: 2 - 4 years.</p> <p>Key steps include:</p>

	<ul style="list-style-type: none"> • Preparation & Permit: Environmental Impact Assessment (EIA) approval, local government consent, land use agreements, power connection agreement from TPC, financial institution financing intent letter, and opinions/consents from numerous agencies (e.g., Defence, Transportation, Fisheries, Coast Guard, Culture). This stage is complex and time-consuming, often taking years, as it involves navigating opinions from over a dozen different agencies. • Construction Permit Submission of detailed engineering plans, construction drawings and specifications, proof of land use change or permit, and permit for the route-laying of submarine cables. Demonstrating 15% of project funds are owned capital. • Electricity Business License Submission of as-built documents, enterprise opinion letter, revenue/expenditure estimates, engineering plans, personnel resumes, and post-construction compliance documents. Demonstrating 18% of project funds are owned capital. <p>Streamlining initiatives: The Taiwanese government has recognized administrative burdens and implemented reforms to accelerate the process, including joint agency reviews, reduced processing times, and increased transparency. For example, the government has streamlined reviews aiming to complete industry-related reviews in approximately 24-26 days, a significant reduction from before.</p>
<p>Technical requirements</p>	<p>Level of design at bidding stage: Bidders must submit comprehensive proposals including engineering design, construction plans, and operation and maintenance strategies. Engineering design stands at 20%.</p> <p>Grid connection: Developer-led and owned. The developer is fully responsible for building and financing the offshore and onshore grid connection, which is then transferred to the state utility (TPC) under the Developer-Build-Transfer Model at a predetermine price. Grid availability and infrastructure readiness remain concerns, especially with overlapping projects. Grid Connection Agreement (GCA) must be secured from TPC before bidding. Taiwan's model places a heavy burden of risk on the developer, particularly regarding the grid connection and strict timing milestones.</p> <p>Environmental and site conditions:</p> <ul style="list-style-type: none"> • Metocean data: typhoon patterns, wave heights, currents, seismic activity, provided by government or developer. • Site-specific geotechnical surveys conducted post-auction. • Design constraints: White Dolphin habitat, avian flight paths, fishing grounds, coral/benthic habitats, shipping lanes, military zones, 500 m buffer from cables/pipelines, radar/flight path restrictions, aquaculture zones, cultural/heritage sites. • Zonal constraints: pre-identified zones off Hsinchu, Taichung, Changhua, Yunlin; onshore substation capacity and designated grid connection points impose further limits.

<p>Risk sharing and guarantees</p>	<p>Developers carry high project risks, including grid connection, foundations, turbines, offshore/onshore cables, and compliance with environmental and technical standards. Assets are transferred to TPC after completion under the Developer-Build-Transfer (DBT) model.</p> <p>Early projects benefit from 20-year FiT PPAs; later projects rely on Corporate PPAs with partial government guarantees (60–80%) to reduce revenue risk.</p> <p>Developers must demonstrate minimum owned capital (15–18%) at permitting/construction stages. Weather, logistics, or regulatory delays remain significant financial risks.</p> <p>Government provides pre-auction data, zonal planning, and incentive schemes for localization to improve bankability, though developers retain the majority of operational, technical, and financial risk.</p>
<p>Supply chain and local content</p>	<p>Local content: Taiwan's localization policy, introduced in 2021, mandated that at least 60% of components used in offshore wind farm development be sourced locally. This aimed to foster a domestic supply chain and boost industrial competitiveness. Taiwan's local content obligations (LCOs) for offshore wind farms have been evolving since. Round 3.3 removes local content obligations to simplify supply chains, attract global players, and mitigate delays.</p> <p>Supply chain</p> <ul style="list-style-type: none"> • Taichung Port: main hub for pre-assembly and component storage; NT\$3.5B investment in piers (supports 1.5 GW/year from 2026), 30 ha backland for components, supports floating wind. • Offshore wind: Taiwan's domestic offshore wind supply chain includes established manufacturers such as Siemens Gamesa and Vestas for nacelles and blades. Submarine cables will be supplied by Walsin Energy Cable System, with operations expected to start in 2025. Foundations and steel structures are produced by local companies including CTCL, CSBC, and Century Steel. For installation, developers rely on Dong Fang Offshore's vessel Orient Adventurer. Taiwan's offshore wind sector relies on a limited mix of international and local installation vessels.
<p>Cost and risk implications</p>	<ul style="list-style-type: none"> • Lack of mature, site-adapted designs has been a primary driver of significant cost overruns and schedule delays in the early phases of project development. • High typhoon and seismic risk demand more robust design criteria, impacting everything from foundation design to installation vessel specifications. Standard European turbine models may not be fully validated for typhoon-force winds and high humidity, leading to unknown reliability issues and higher maintenance. The frequency and intensity of typhoons and monsoon seasons drastically reduce the number of days technicians can access turbines for planned maintenance, pushing more work into costly corrective maintenance. • The availability and cost of local service vessels and trained technicians are still emerging, creating uncertainty. • Lack of dedicated O&M ports near wind farms leads to longer transit times and higher vessel costs.

4.3.4 Japan

Pillar	Description
Institutional setup and lead agencies	<p>Targets:</p> <ul style="list-style-type: none"> • 2030: 10 GW offshore wind • 2040: 30-45 GW offshore wind (including floating) • 2050: carbon neutrality <p>Key authorities: Ministry of Economy, Trade and Industry (METI), Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Ministry of the Environment (MOE).</p> <p>Policy and regulatory framework: Marine Renewable Energy Act (2018, amended 2025); Green Growth Strategy launched in December 2020, together with the Offshore Wind Industry Vision setting the targets abovementioned; Operational Guidelines for the public offering system for occupancy in general waters; Shipping Act.</p>
Tender design and stages	<p>Tender stages: The Japanese policy and market environment encourages interested developers to engage local stakeholders and start characterizing potential offshore wind interest areas even before they are targeted as so by the authorities. In the past, it was mostly developers that showed interest in a specific area before it got designated as a “Preparation Zone” or “Promising Area”. There have been 3 rounds of tenders, with R4 coming soon on the Hokkaido Matsuyama and Hiyama areas, with a potential capacity of approx. 1.1-1.4 GW.</p> <p>The complete process is structured in the following steps:</p> <ol style="list-style-type: none"> 1. Zoning and Designation: a “Preparation Zone” is designated as “Promising Area”. 2. Council³ evaluation: if this area meets a series of minimum requirements for offshore wind development and that the area is apt for the development of this activity. 3. Promotion Area: the Promising Area becomes a Promotion Area, making it available for future public tendering. 4. Public tender: an operator is selected through a competitive auction. 5. Support regime accreditation & permitting. 6. Project start <p>Tender design</p>

³ The Council consists of different officials from the local governments (prefectural and municipal), METI, MLTI, Ministry of Agriculture, Forestry and Fisheries, academics, representatives of local fisheries and industry experts.

- Centralized vs de-centralized model: in the past three rounds, there have been several zones where pre-investigation studies (wind measurement campaigns, geotechnical & geophysical seabed surveys, environmental baseline assessments and grid connection planning studies) were carried out by the Government, while this responsibility was transferred to developers for other areas. A centralized model for R4 areas (Hokkaido) is expected.
- Tender model is a Feed-in-Premium (FiP) that is determined competitively. This is a fixed fee that developers receive on top of the market price. In R3, developers were allowed to sign Corporate PPAs and receive this FiP (3 JPY/kWh) to mitigate electricity market price volatility. Participation in the capacity market in order to improve the revenue in R4 is under discussion.
- Evaluation criteria: each bid is evaluated with a maximum of 240 points, divided into two main blocks: Price-criteria account for 50% of the score (max. 120 points); Non-price criteria (business plan ability to deliver in line with the project requirements, capacity to coordinate with local actors and promotion of spin-off effects.) represent the remaining 50% of the score. Scores are classified into 5 categories, being “top-runner” the highest and “inadequate” for an item receiving 0 points (if this occurs, the bid is disqualified).

Planned reforms & changes:

- New “EEZ law” (June 2025): it is an amendment to the “Marine Renewable Energy Act” that will make possible to designate new offshore wind areas within the limits of the Japanese exclusive economic zone. This is essential to unlock the full potential of Japanese waters as it enables access to deeper areas where floating offshore wind is best suited. As these waters are outside the control of local governments, the designation of new Promotion Areas will fall under the responsibility of the central Government.
- METI/MLIT published revised auction/guideline material earlier in 2025 (announced 29 Jan 2025) and those revisions are explicitly intended to take effect from Round-4 onward (or be applied to later rounds). The revision package includes several risk-mitigation measures:
 - Price-adjustment / indexation scheme: a scheme to adjust the FIT/FIP reference price in line with price indices (to reduce developer exposure to sharp cost rises).
 - Deposit / bid bond increases (higher post-award deposits): the revised guidelines raise deposit/bond requirements (increasing forfeiture risk if projects are cancelled or delayed).
 - Delay penalties / performance bond deductions and stronger enforcement: the revised rules tighten penalties for COD delays (mechanisms to incrementally forfeit performance bonds for extended delays and to account for supply-chain disruptions).
 - Implementation of a deadline for the government to grant the final construction permit: mechanism to set a deadline for the government to grant the final construction permit (intended to avoid indefinite permit bottlenecks).
- METI & MLIT designated two Hokkaido Promotion Areas (Matsumae and Hiyama) on 30 July 2025, which is the concrete start of the Round-4 area designation process; the government said guidelines and a public tender process will follow. Some industry notes expect Round-4 tenders in autumn 2025 (timing reported variably).

	<ul style="list-style-type: none"> • In late Aug 2025 reporting, the ministries (METI/MLIT) proposed extending project lease durations from 30 to 40 years (to improve bankability and capital recovery given rising costs).
<p>Regulatory and permitting process</p>	<p>Typical timeline and permitting process: typically, 4-6 years, largely driven by EIA.</p> <p>After the winner of the Promotion Area is announced and the rights of use and occupation are granted, it has to secure the series of permits and agreements as stipulated under the Marine Renewable Energy Act. The main steps/ permits are:</p> <ul style="list-style-type: none"> • EIA: regulated under the Environmental Impact Assessment Act, it will include studies examining birds, noise, marine ecology, cumulative impacts and associated mitigations. It can be the longest administrative procedure (up to 4-5 years in some cases). • Fisheries & local stakeholder agreements: negotiation with fisheries and local communities is a key part of the Japanese offshore wind development process. Ensuring future coexistence of the wind farm and local economic activities through compensation schemes and mitigation measures is required to obtain the final construction license. • Grid connection agreement: developers must secure connection to the grid with the regional utility. Agreements must be reached regarding the export cable routing, potential grid upgrades that could be required and the substations' locations. • Construction license: once obtained the environmental approval, the grid connection agreement, maritime safety & navigation approvals, detail design approval and local stakeholder agreements, the MLIT in coordination with METI, local port authorities and Japan Coast Guard can grant the permit to construct the wind farm.
<p>Technical requirements</p>	<p>Level of design at bidding stage</p> <ul style="list-style-type: none"> • Preliminary technical design: detailed engineering is not required at bidding stage. However, it is required for this preliminary design to be fixed rather than an envelope (unlike UK's case). The reason is to ensure clarity and transparency with local stakeholders and fisheries while negotiations and early engagement are taking place. Major changes in design could delay these agreements and, if necessary, they would be subject to regulatory approval. • Preliminary risk and feasibility statement: proving constructability under local port facilities, grid connection availability, seabed and weather conditions. • Centralized seabed characterization: R4 will feature a centralized model that will enable developers to support their designs and plans with much more detailed information and avoid future delays and extended offshore campaigns.

	<p>Grid connection: developers are entirely responsible for financing and constructing all the electrical infrastructure of the project. This includes the export cables (offshore and onshore), substations (offshore and offshore) and any associated surveys, studies or mitigation measures that could be needed.</p> <p>Environmental and site conditions: the government conducts and provides participants with pre-tender site studies including metocean, wind, and seabed data and grid connection studies. These studies are entirely funded by the Japanese government and carried out by Japan’s Organization for Metals and Energy Security (JOGMEC). Cooperation agreement between JOGMEC and ClassNK was signed in 2023 to accelerate offshore wind development in the country. The centralized model also includes government implication in additional matters like negotiation and engagement with local communities (e.g. fisheries).</p>
<p>Risk sharing and guarantees</p>	<ul style="list-style-type: none"> • Developers carry primary responsibility for design, construction, and grid connection. • Revenue supported through FiP + corporate PPAs; partial state involvement in capacity market and incentives. • Government responsibility of early seabed/wind studies in R4 reduces upfront risk but developers still exposed to construction, operational, and financing risks. • Performance bonds and COD delay penalties increase financial exposure post-award.
<p>Supply chain and local content</p>	<p>Local content: There is not a legal minimum of local content required under the current regulations. However, domestic supply chain involvement is encouraged and valued positively through the non-price criteria evaluation. The supply chain plan will be evaluated under the “Project Feasibility and Implementation Plan”, raising the score of the proposal if the supply chain plan is credible, creates and employs local suppliers, and proposes port and fabrication innovative strategies.</p> <p>Supply chain</p> <ul style="list-style-type: none"> • Foreign vessel rules: under the Shipping Act, foreign vessels need MLIT special permits for offshore work; foreign crews not allowed on Japanese-flagged vessels. Unions strongly resist reforms, limiting flexibility. • Domestic supply chain: under development, but Japan still relies on a mix of international expertise and local players, especially for floating wind.
<p>Cost and risk implications</p>	<p>The centralized model greatly reduces design risk at bidding stage as it provides key information and government support for essential activities like securing grid connection, reaching agreements with fisheries, etc. As no major component changes are expected from the initial design, the cost estimations made at early stages should be close to the actual costs incurred during the project execution, although detail design will allow to narrow down the cost uncertainty.</p>

4.3.5 Korea

Pillar	Description
<p>Institutional setup and lead agencies</p>	<p>Targets</p> <ul style="list-style-type: none"> • 2030: 14.3 GW offshore wind • 2038: 40.7 GW total wind <p>Key authorities: MOTIE (energy strategy, licensing, grid), MOF (marine spatial planning, fisheries), MOE (EIA), KEPCO (grid), KEA (renewables programs), local govts (community acceptance).</p> <p>Policy and regulatory framework: Offshore wind is central to the 2050 Net Zero Roadmap, replacing coal/LNG imports, strengthening energy security, and building a domestic supply chain. Other key policies and regulations include: Offshore Wind Power Competitive Bidding Roadmap (Aug, 2024), a strategic plan unveiled by the Ministry of Trade, Industry and Energy (MOTIE) to accelerate offshore wind development, outlining auction capacities and introducing a two-stage evaluation process; the Renewable Energy Act (RPS) mandating electricity suppliers to source a certain percentage of their energy from renewable sources; the Offshore Wind Special Act (2025, effective 2026) streamlining permitting and introducing pre-zoned sites; the Marine Spatial Planning Act; the Environmental Impact Assessment Act; the National Power Grid Act (2025) underpinning grid expansion and compensation frameworks.</p>
<p>Tender design and stages</p>	<p>Tender stages</p> <p>South Korea’s offshore wind auctions follow a two-stage competitive process: developers first pass a non-price evaluation (technical, industrial, and feasibility criteria) before shortlisted bidders compete on price, with winners awarded contracts under set price ceilings. These auctions are embedded in a government-led zoning and permitting framework (strengthened under the Offshore Wind Special Act), with main tenders held annually in Q2 and supplementary rounds in Q4.</p> <p>Tender design</p> <ul style="list-style-type: none"> • Korea has historically relied on a developer-led “open-door” system. With the Offshore Wind Special Act (promulgated March 2025, effective March 2026), the framework is shifting to government-led pre-zoned development areas with auctions run by KEA/MOTIE. • The model is a fixed-price PPA (CfD-like), 15–20 years of duration; first auction (H1 2025) awarded 689 MW across 4 projects. Full contract details, including strike price indexation and settlement rules, have not been disclosed yet. • In the H1 2025 auction, non-price criteria evaluation increased to 50% of the total score, replacing the previous 60/40 price/non-price split. Stage 1 focused on non-price criteria such as industrial/economic effects (local supply

	<p>chain contribution and job creation), O&M planning and project progress, community acceptance, grid connection readiness, security. After this, Stage 2 ranked price offers: projects were assessed on strike price offers under a fixed-price contract framework, with limited transparency on indexation and settlement rules. The winners were determined by the highest total score, combining both price and non-price evaluations.</p> <p>Planned reforms and changes:</p> <ul style="list-style-type: none"> • Non-price factors are expected to play a larger role in upcoming tenders, in line with international practice: <ul style="list-style-type: none"> - Local content and supply chain participation: Provinces such as Jeollanam-do and Ulsan have pushed for higher localization. - Community benefit and fisheries engagement: Following strong opposition in Shinan and Jeju, benefit-sharing frameworks (compensation funds, job guarantees, local investment) are expected to become explicit evaluation criteria. - Grid readiness and alignment: With the National Power Grid Act (effective September 2025), KEPCO’s grid expansion will be tied to auctioned capacity. Future tenders are expected to include requirements for coordinated grid connection planning. - Environmental and stakeholder safeguards: EIA and marine spatial planning compatibility will likely become formal assessment categories to reduce permitting risk.
<p>Regulatory and permitting process</p>	<p>Typical timeline and permitting process: 7-10 years under former open-door system; targeted 5-6 years under Offshore Wind Special Act.</p> <p>Key permits include:</p> <ul style="list-style-type: none"> • Public Waters Occupancy & Use Permit (MOF): Grants legal rights to occupy and investigate designated marine areas. • Electricity Business License (EBL, MOTIE): Mandatory license to develop and operate power generation facilities; prerequisite for financing confirms the project’s site boundaries and capacity, allowing the commencement the key permitting process including geotechnical surveys on the site, environmental impact assessment, maritime safety assessment, and other key permitting procedures. • Environmental Impact Assessment (EIA, MOE): Legally required; covers marine ecology, birds, noise, and cumulative impacts. Typically takes 3–5 years and is the main source of delays. • Electricity Business License (EBL, MOTIE): Mandatory license to develop and operate power generation facilities; prerequisite for financing. • Grid Connection Agreement (KEPCO): Legally required before construction; confirms connection point and cost-sharing responsibilities. • Construction License (MOTIE/Offshore Wind Committee): Final permit for construction. From March 2026, the new Offshore Wind Committee under the Prime Minister will act as a one-stop-shop authority. • Pre-feasibility & site studies (wind, metocean, geophysical): Traditionally developer-led; from 2026, government-led pre-investigation will provide baseline data.

	<ul style="list-style-type: none"> Stakeholder consultations (NGOs, military, environmental groups): Required during EIA scoping; defence-related objections (e.g., radar interference) have led to project cancellations in the past. Land use & onshore permits: Required for substations and transmission routes; depend on local land zoning and environmental rules. <p>Streamlining initiatives: The Offshore Wind Special Act consolidates permits into a one-stop-shop system and introduces government-led pre-zoned sites (first designated: Sinan, 2023). The objective is to reduce average permitting from 7–10 years to 5–6 years by parallelizing approvals. While legal reform is promising, its effectiveness will depend on detailed enforcement decrees (due March 2026) and actual inter-agency coordination. Also, fisheries and local negotiations remain outside of the streamlined process.</p>
<p>Technical requirements</p>	<p>Level of design at bidding stage</p> <ul style="list-style-type: none"> At bidding stage, developers currently submit preliminary designs; no full FEED required. Under the Special Act (2026+), government-led pre-investigations (metocean, seabed) will support fixed preliminary designs rather than flexible envelopes, improving transparency for stakeholders. Current practice: design changes during permitting have led to delays and renegotiations (e.g., Jeju Hallim modifications) <p>Grid connection: EPCO owns/operates all transmission; developers pay reinforcement. National Power Grid Act (Sep 2025) allows anticipatory KEPCO investments, but cost-sharing rules are unclear.</p> <p>Environmental and site conditions: In Korea, offshore wind developers have traditionally been responsible for wind measurements, metocean campaigns, and geotechnical surveys, with fragmented and inconsistent data increasing costs and timelines. From 2026, the Offshore Wind Special Act will provide government-led pre-survey packages for baseline wind, metocean, and seabed data, while developers remain responsible for detailed geotechnical and design-level studies. Projects must navigate constraints including military areas, shipping lanes, protected habitats, and dense fisheries zones, particularly around Jeju and the southwest coast. Examples include Jeju’s design adjustments for migratory birds, Shinan’s multi-year delays from fisheries protests, Ulsan floating projects affected by naval zones, and Jeonnam 1 cable route delays due to local opposition.</p>
<p>Risk sharing and guarantees</p>	<ul style="list-style-type: none"> Developers in Korea retain significant project risks, including design, foundations, turbines, cables, and compliance with technical/environmental standards. Revenue risk partially mitigated through 15–20 year CfD-style fixed-price contracts (H1 2025 auction, 689 MW), though indexation/settlement rules remain unclear. Developers are responsible for grid connection agreements, reinforcement costs, and permitting/stakeholder negotiations, creating financial and schedule exposure. Government support (pre-survey packages, pre-zoned sites, standardized benefit-sharing frameworks) reduces early-stage risk, but developers retain most technical, financial, and regulatory responsibility.

<p>Supply chain and local content</p>	<p>Local content</p> <p>Korea does not impose a statutory minimum local-content requirement for offshore wind projects. However, the bidding rules emphasise non-price criteria (industrial economic effects, supply-chain localisation, community value) and the recent September 2025 award (689 MW) demonstrates strong preference for domestic turbine technology. At sub-national level (e.g., Jeollanam-do and Ulsan provinces) local governments are actively engaging with developers and structuring supply-chain partnerships, though explicit tender conditions on local hiring or supply-chain involvement vary by project and are not uniformly codified.</p> <p>Supply chain</p> <ul style="list-style-type: none"> • Mokpo, Ulsan, and Yeosu ports are being upgraded to support large turbine marshalling and offshore substation components, but current facilities remain insufficient for 15–20 MW turbines. • Domestic fabrication of foundations and jackets is possible (Samkang, HHI, DSME), but adaptation is needed for XL monopiles and serial jackets. • Cable manufacturing is competitive (LS Cable, Taihan), but there is no domestic offshore blade production; HVDC capabilities are still developing. • Korea lacks KR-flagged wind turbine installation vessels (WTIVs) for >15 MW turbines, requiring reliance on foreign vessels; cabotage restrictions add cost and regulatory complexity. • Global shortages of next-generation WTIVs (20+ MW) are expected late 2020s; HHI and SHI have conceptual designs but no firm deliveries yet.
<p>Cost and risk implications</p>	<ul style="list-style-type: none"> • Bid-stage designs remain preliminary, with frequent changes during permitting driving re-engineering and CAPEX/OPEX overruns (e.g., Jeju Hallim). • Localization pressures add cost volatility due to unproven domestic OEMs and port/yard adaptations. • Limited port and WTIV readiness inflates installation costs compared with e.g. UK/Taiwan benchmarks. • Fisheries and community compensation introduce Korea-specific OPEX burdens that are difficult to forecast. • Revenue visibility improves under CfD-like contracts, but indexation and settlement rules remain uncertain. • Grid, financing, and localization risks persist: KEPCO cost-sharing rules, cautious domestic banks on new OEMs/floating prototypes, and rigid local content requirements can raise LCOE and financing risk.

4.4 Comparative analysis and risk benchmarking

4.4.1 Overview of tender design elements in selected countries

The table provides a comparative overview of key offshore wind tender features, described in more detailed in 4.3 across Denmark, the United Kingdom, Japan, Taiwan, and Korea. It summarizes tender mechanisms, pre-tender information, electrical infrastructure responsibilities, guarantees and penalties, streamlining initiatives, and local content requirements.

Table 4-1 Overview of tender design elements per country

Tender features	Denmark	United Kingdom	Japan	Taiwan	Korea
Bidding mechanism & evaluation criteria	<p>Latest tender: Negative bidding model (annual concession payment by developer). 100% price criteria.</p> <p>Planned tender (Autumn 2025): Capacity-based CfD.</p>	<p>Leasing + CfD (lowest strike price wins). It is divided in Leasing Round (LR) & Allocation Round (AR).</p> <p>100% price criteria in ARs.</p>	<p>Feed-in-Premium (FiP): the lowest bid wins.</p> <p>50% price / 50% non-price criteria.</p>	<p>Feed-in-Tariff (FIT): the lowest bid wins.</p> <p>Price criteria but conditioned to meet non-price criteria requirements (local supply chain plan, technical and financial reviews).</p>	<p>CfD-like fixed-price auction (H1 2025, 689 MW, 4 projects). 50/50 price and non-price criteria.</p>
Pre-tender information (Centralized vs Developer-led)	<p>Centralized model: the Government provides site studies that must be refunded by the winner.</p>	<p>Developer-led mainly, although centralized models are being implemented in recent LRs.</p>	<p>Centralized model adopted for the next auction (R4) and expected in the future.</p>	<p>Developer-led.</p>	<p>Mainly developer-led until now; pilot government pre-investigations under Special Act (2025) but limited scope.</p>
Electrical infrastructure responsibility	<p>Developer constructs the electrical infrastructure. It is expected that Energinet (TSO) reassumes part of this responsibility.</p>	<p>OFTO model. Developers construct the infrastructure and then its ownership is transferred to an offshore transmission owner through a competitive tender.</p>	<p>Developer constructs the entire electrical infrastructure.</p>	<p>Developer constructs the entire electrical infrastructure to the onshore substations</p>	<p>KEPCO leads grid; split with developers unclear. National Power Grid Act (2025) underpins expansion/compensation.</p>
Guarantees & Penalties	<p>Strict COD deadline in the last auction with progressive delay penalties.</p>	<p>Standard performance bond and non-completion penalties.</p>	<p>Increasing penalties every 6 months of delay in COD.</p>	<p>Standard performance bond and non-completion penalties.</p>	<p>Framework evolving; COD enforcement uncertain.</p>
Streamlining initiatives	<p>Concurrent administrative processes, DEA as one-stop-shop.</p>	<p>Fast track DCOs, OWEIP.</p>	<p>Bringing back centralized model for R4.</p> <p>Target time for completion is 5 years and 6 months since award date.</p>	<p>Relaxation of local content requirements.</p> <p>Joint agency reviews, reduced processes and transparency</p>	<p>Special Act (2025) consolidates approvals, targets 5–6 years permitting. Fisheries compensation standard practice.</p>

			Implementation of a deadline for the government to grant the final construction permit.		
Local content requirements	No minimum requirements	In Supply Chain Plans the level of investment in UK based infrastructure is evaluated. The implementation of the CIB has introduced minimum requirements	No legal minimum requirements, but it is a positive factor in non-price criteria bid evaluation. Strong cabotage restrictions	2021 policy mandated a 60% of local content. These requirements have evolved since then and are expected to be removed for Round 3.3.	No statutory minimum local content requirement, but non-price criteria reward domestic supply-chain use. Reliance on foreign WTIVs; port upgrades ongoing.

4.4.2 Link between tender elements and risk

Tender design is a critical lever in shaping the allocation and management of risks in offshore wind projects. Across international experiences, specific tender elements - such as the bidding mechanism, pre-tender site information, infrastructure responsibilities, guarantees and penalties, and local content requirements -play a decisive role in either mitigating or exacerbating developer risk. Understanding these linkages is essential for designing tenders that foster competitive yet bankable offshore wind markets, as emerging markets such as Korea are now demonstrating.

Table 4-2 Table linking tender elements with risks for each assessed country

Tender element	Developer risk impact	Denmark	United Kingdom	Japan	Taiwan	Korea
Bidding mechanism & evaluation criteria	Financial risk: choice of CfD vs. merchant exposure directly affects revenue risk. Also, use of non-price criteria can help avoid “race to the bottom” where developers compete solely on the lowest bid, which can push prices unsustainably low and increase financial and operational risks.	Negative bidding model (last ‘24-‘25 tender) → High risk due to high exposure to market prices; aggressive bids increase risk of project cancellations New suggested model with CfD → Low risk	Two-step CfD with ASP adjustments provide predictable revenues → Low risk	FiP partially stabilizes revenue, 50/50 price & non-price evaluation → Moderate risk	FiT stabilizes revenue, non-price elements are included → Low risk	CfD-like PPA reduces volatility, but unclarity remains on indexation and settlement rules; non-price criteria included → Moderate risk
Pre-tender information/site investigations	Financial and operational risk: Pre-tender studies reduce early-stage operational risk; however, developer-led	Centralized data available but developers must	Centrally provided site surveys + staged rounds reduce technical	Centralized model for R4 (expected) reduces site and	Developer-led surveys; some zones pre-	Developer-led surveys, but from 2026, the Offshore Wind Special Act

	studies increase CAPEX and financial uncertainty (financial risk).	refund costs → Moderate risk	and CAPEX uncertainty → Low risk	grid uncertainties → Low risk	investigated → Moderate risk	introduces government-provided pre-survey packages → Moderate risk
Electrical infrastructure responsibility	Financial and operational risk: Responsibility for grid connections or offshore substations carries both operational and financial risks. Failures or delays impact finances.	<i>Latest tender:</i> Developers responsible for developing grid infrastructure → High risk	OFTO model transfers infrastructure post-construction, reducing CAPEX and operational exposure → Low risk	Electrical infrastructure is full developer responsibility → High risk	Electrical infrastructure is developer responsibility - then transferred to the state utility (TPC) under the Developer-Build-Transfer Model at a predetermine price → High risk	Developers must secure grid connection agreements and cover reinforcement costs; cost-sharing rules under the National Power Grid Act still undefined → High risk
Guarantees & penalties	Financial and operational risk: COD deadlines, performance bonds, and delay penalties create financial exposure (potential costly fines). Stricter or poorly aligned rules increase both financial and operational risk.	<i>Latest tender:</i> Strict progressive penalties and COD deadlines → High risk	Standard performance bond and non-completion penalties → Moderate risk	Progressive delay penalties → High risk	Standard performance bond and non-compliance penalties → Moderate risk	No clearly codified penalty regime specifying numeric values or conditions for COD delays; while partial provisions exist, their triggers and enforceability remain undefined, creating substantial uncertainty → High risk
Permitting/streamlining	Regulatory risk: Complex permitting processes and fragmented approvals increase regulatory risk.	Several permits and licenses with concurrent processes and timeline, but DEA one-stop shop contributes positively → Moderate risk	Jurisdictional fragmentation (England, Wales, Scotland and North Ireland), complex and evolving environmental impact requirements. On the other hand,	EIA is typically the longest administrative procedure. Introduction of government deadlines to grant final construction permit and new EEZ Law reduce	Multiple ministries and stakeholders involved leading to delays and cancellations; bureaucracy improvements underway → Moderate risk	Fragmented permitting and auction design uncertainty – potentially mitigated by streamlining initiatives → Moderate risk

			<p>streamlining initiatives (e.g. fast track DCOs) are currently being implemented → Moderate risk</p>	<p>uncertainty → Moderate risk</p>		
<p>Local content requirements</p>	<p>Operational and financial risk: Supply chain constraints - including requirements on local sourcing - may impact construction, increasing operational and financial risks (e.g. higher LCOE).</p>	<p>No minimum local content requirement → Low risk</p>	<p>Incentive-based Clean Industry Bonus → Moderate risk</p>	<p>No legal requirement of local content but domestic supply chain involvement as factor in non-price evaluation → Moderate risk</p>	<p>60% local content requirement removed for Round 3.3 → Low risk</p>	<p>No specific local content requirement, but strong localization expectations through non-price criteria in tenders → High risk</p>

Bidding Mechanisms and Evaluation Criteria

The structure of auctions is the single most important driver of financial risk for developers, as it defines both the competitive pressure and the stability of future revenues. Denmark's uncapped negative bidding model, where developers effectively pay the state for seabed rights without any accompanying revenue support, creates high financial risk. Developers must absorb wholesale price volatility and uncertain demand projections, which was a central factor behind the collapse of the country's recent 6 GW auction rounds. Japan's feed-in-premium model combined with lowest-bid evaluation criteria places similar financial pressure on bidders, pushing them toward overly aggressive offers and exposing them to execution risk if cost assumptions prove unrealistic, as demonstrated by Mitsubishi's withdrawal from R1 projects.

By contrast, the United Kingdom has developed a more balanced model that mitigates financial risk through two-sided CfDs. These provide predictable revenues for 15–20 years, stabilizing cash flows and reducing exposure to wholesale electricity markets. At the same time, the UK combines price competition with non-price criteria such as technical feasibility and supply chain engagement, which lowers the risk of speculative bids. Even so, the AR5 round in 2023 showed that misaligned strike price caps can undermine investor appetite, highlighting that even strong revenue support mechanisms require regular adjustment to remain effective. Taiwan represents another intermediate case: recent tender rounds combine corporate PPA-backed feed-in premiums with non-price evaluation elements, supported by government guarantees. This lowers bankability risks relative to Denmark or Japan, but developers still face moderate market risk as PPAs expose them to counterparty creditworthiness and price negotiation. Korea's fixed-price PPA framework resembles a simplified CfD and provides some revenue predictability, yet the absence of transparent rules on indexation and settlement leaves residual financial uncertainty.

Pre-Tender Information and Site Investigations

Access to reliable site data is a decisive factor in reducing early-stage technical and regulatory risk. Countries such as Denmark, the UK, and Japan have adopted centralized models where government agencies conduct seabed, metocean, and grid studies before tenders are launched. This reduces developers' upfront costs and lowers the probability of encountering unforeseen technical challenges that can delay permitting or construction. The UK goes further by structuring its process into two stages, where developers first secure seabed rights through a Leasing Round and only later compete for CfDs in an Allocation Round. This sequencing gives developers time to fully evaluate site conditions and grid integration, thereby lowering the risk of unrealistic bids and subsequent cancellations.

In contrast, Taiwan and Korea still rely largely on developer-led site investigations. While this approach reduces state expenditure, it increases technical and permitting risks for bidders, who must assume responsibility for securing environmental approvals and conducting costly geotechnical surveys before project economics are certain. In Korea, this challenge is compounded by fragmented permitting responsibilities across multiple ministries, creating additional regulatory uncertainty and lengthening timelines.

Infrastructure Responsibilities

Grid connection responsibility strongly influences both CAPEX and operational risk. Where developers are required to finance and deliver grid infrastructure, as in Japan and Taiwan, overall project costs rise substantially, and developers are exposed to delays that may be outside their control. This creates high operational risk, especially if the pace of grid expansion does not match the timing of awarded projects. Korea presents an even more challenging case: KEPCO's somewhat slow grid reinforcement and unclear cost-sharing mechanisms create major uncertainty about whether projects can be connected on time, raising both financial and operational risks and deterring private investment.

By contrast, the United Kingdom has developed a low-risk model by separating generation from transmission under the Offshore Transmission Owner (OFTO) regime. Developers are responsible for project-level infrastructure but can transfer ownership of offshore transmission assets to

regulated entities after construction, reducing long-term financial exposure. Denmark is also evaluating, as a result of the market dialogue conducted by the Danish Energy Agency, to shift export cable responsibilities back to Energinet (i.e. return to the old model before Thor Offshore Wind Farm tender), which would significantly reduce developer CAPEX and operational risks.

Guarantees and Penalties

Tender rules regarding guarantees and penalties are designed to ensure timely project delivery, but they also generate both regulatory and operational risks for developers. Denmark and Japan apply strict COD deadlines and heavy penalties for delays, which incentivize commitment but can deter investment if timelines are viewed as unrealistic. In Denmark's case, the requirement to bring large projects online before 2030 was widely seen as unattainable, compounding the failure of recent auctions. These requirements have been relaxed in the relaunch of the tender, expected in Autumn 2025. Japan is in the process of reforming its framework by introducing progressive penalty schemes and clearer permitting deadlines, which aim to strike a fairer balance between ensuring delivery and avoiding disproportionate financial risk for developers.

The UK again represents a more de-risked model, with streamlined permitting under Development Consent Orders (DCOs) and penalty schemes that are considered proportionate to project timelines. Korea is in transition: while the new Offshore Wind Special Act promises a one-stop-shop permitting framework from 2026 onwards, projects awarded under the current fragmented regime remain highly exposed to regulatory delays that can stretch over a decade. No clearly codified penalty regime creates substantial uncertainty. These examples show that guarantees and COD timelines are most effective when aligned with realistic delivery conditions, whereas overly strict rules can elevate execution and regulatory risks to unmanageable levels.

Local Content Requirements

Local content rules directly affect execution and supply chain risks by shaping how easily developers can access equipment, vessels, and skilled labour. Taiwan's earlier rounds illustrate the high-risk end of the spectrum: the 60% local content requirement in Round 3.2 proved unachievable given the limited capacity of domestic suppliers, creating bottlenecks, contractual disputes, and delays. In response, Taiwan has committed to remove this requirement for future rounds, signalling a shift toward more pragmatic and investor-friendly conditions.

Japan and Korea have both adopted moderate localisation strategies in offshore wind: neither applies statutory local-content quotas, but both embed non-price criteria in their tender evaluations. Japan rewards supply-chain development and community engagement through its points-based system, incentivising local participation while preserving project bankability. Korea similarly emphasises industrial and supply-chain effects in its auctions, with recent awards favouring domestic turbine technology and strong local-supply commitments. Provincial initiatives in Korea further reinforce localisation through partnership agreements rather than formal mandates.

The UK has pursued the lowest-risk model by using incentives rather than mandates: its *Clean Industry Bonus* rewards developers for contributing to domestic supply chain development, without jeopardizing bankability if targets are not met. Across these examples, it is clear that tender design must balance industrial policy objectives with the need to maintain predictable and achievable conditions for developers.

4.4.3 Cross-cutting insights and implications for Korea

The review of international experiences demonstrates that tender design is a balancing act between fostering competition and ensuring a fair distribution of risks between public authorities and developers. Countries that have leaned too far towards aggressive competition on price, such as Denmark with its uncapped negative bidding model or Japan with its FiP-based lowest-bid system, have faced setbacks that stalled market momentum. In both cases, placing excessive financial exposure on developers without sufficient safeguards led to cancellations, investor hesitation, and reduced confidence in the auction system. These outcomes underline that stable and transparent frameworks are as critical as competition itself in delivering offshore wind capacity.

The United Kingdom illustrates how combining price competition with long-term revenue stability can create a more durable system. Its two-sided CfD has consistently been regarded as one of the most bankable mechanisms in the sector, providing predictable income streams while maintaining competitive tension. Yet even this model has shown vulnerabilities: the AR5 round in 2023 attracted no bids, not because of the mechanism itself, but because the strike price ceilings were set below what developers considered feasible under prevailing cost conditions. The UK's response - raising Administrative Strike Prices and providing more transparency over auction budgets - demonstrates that even well-established frameworks need continual adjustment to remain credible.

Taiwan offers another instructive case. While its initial rounds included rigid local content rules that created supply chain bottlenecks and investor uncertainty, the government has since relaxed these requirements and coupled its auctions with CPPA guarantees and state-backed financing. This combination reduced financial and execution risk for developers, enabling 2.7 GW of capacity to be awarded in 2024 despite broader global market challenges. The lesson is clear: industrial policy goals must be carefully aligned with market realities, and tender schemes need the flexibility to evolve when rigid requirements risk undermining project viability.

Japan and Denmark also show the importance of learning from early difficulties. In Japan, the withdrawal of Mitsubishi from three projects in Round 1 prompted reforms to extend lease durations, clarify permitting deadlines, and introduce price-adjustment mechanisms. These measures directly address developer concerns about regulatory and operational uncertainty. Similarly, Denmark's market dialogue following the collapse of its 6 GW auction revealed that bidders considered the combination of negative bidding, lack of revenue support, strict COD deadlines, and unclear state co-ownership rules as unbankable. Planned reforms, including reintroducing CfD, relaxing COD timelines, and rethinking infrastructure responsibilities, highlight the need for open engagement with industry to recalibrate tender frameworks.

For Korea, these cross-cutting lessons are particularly relevant as the country transitions from open-door regime to the new Offshore Wind Special Act. The outcome of the first 2025 auction, where capacity was awarded only to public-led entities, suggests that private developers perceive the risk profile as disproportionately high. Several factors appear to influence the current situation. The lack of clearly defined indexation and settlement rules may increase financial uncertainty; permitting processes, which are currently fragmented, can extend regulatory timelines; and the pace of KEPCO's grid expansion contributes to technical and operational constraints. Combined with high local content expectations, these conditions amplify both financial and execution risk, making Korea's otherwise ambitious targets more difficult to achieve through private capital alone.

At the same time, Korea benefits from strong fundamentals that align with best practices observed abroad. The *Offshore Wind Promotion Act* introduces a centralized zoning scheme and annual tenders, which could replicate the advantages of the UK's staged process or Denmark's planned reforms by providing developers with clearer site information and more predictable regulatory oversight. Korea's industrial capacity also positions it well to develop local supply chains if requirements are phased in gradually, rather than imposed rigidly at early stages. By ensuring that its framework remains adaptive - taking into account evolving cost conditions, developer feedback, and supply chain maturity - Korea can avoid the pitfalls seen elsewhere.

In sum, the international experience underscores that offshore wind tendering succeeds when it combines transparency, predictability, and balanced risk allocation. The challenge for Korea will be to translate these lessons into its own context: ensuring that its competitive processes remain attractive to international investors while still supporting domestic industrial goals and maintaining state oversight of strategic resources. If implemented effectively, the Offshore Wind Special Act can provide the platform for this balance, turning Korea into one of Asia's leading offshore wind markets.

5 Conclusions and recommendations

5.1 Conclusions

The analysis shows that Korea's offshore wind sector is at a decisive turning point. With the Offshore Wind Special Act (2025) and ambitious capacity targets (14.3 GW by 2030, 40.7 GW by 2038), Korea has signalled strong political commitment. However, the transition from a developer-led open-door system to a government-led zoning and auction framework introduces both opportunities and risks for developers.

Regulatory and permitting risks dominate early phases

Korea's offshore wind sector has historically been characterized by a complex regulatory landscape, involving multiple agencies such as MOTIE, MOF, MOE, KEPCO and local authorities. This fragmentation has contributed to permitting processes that can extend up to 10 years, requiring over 20 individual permits. Such extended timelines can increase developer costs and introduce uncertainties into project planning.

The enactment of the Offshore Wind Special Act aims to streamline these procedures by establishing a one-stop committee to coordinate approvals. While this initiative holds promise, transitional challenges and coordination gaps remain, necessitating ongoing efforts to enhance efficiency and clarity in the permitting process.

Grid connection is a key bottleneck

KEPCO's role as the sole grid operator has led to concerns regarding the pace of grid expansion. Delays in grid infrastructure development have been identified as significant barriers to timely project execution. For instance, opposition from local residents has occasionally delayed major grid construction projects by up to 11 years.

International best practices, such as anticipatory grid planning and transparent cost-sharing mechanisms, have been shown to mitigate such delays and reduce project risks. Adopting similar approaches could enhance the efficiency and predictability of grid connections in Korea's offshore wind sector.

Stakeholder and Community opposition is material

Community opposition, particularly from fisheries and coastal communities, has been a notable challenge for offshore wind projects in Korea. This resistance often leads to project delays or legal disputes. The absence of standardized benefit-sharing or transparent compensation frameworks has exacerbated tensions.

Drawing from international experiences, early and formalized engagement with stakeholders - such as Japan's structured fisheries negotiations, the UK's community benefit funds, and Denmark's compensation schemes and coexistence planning with the fishing industry - has proven effective in reducing opposition and fostering collaborative relationships. Implementing similar strategies could enhance community acceptance and support for offshore wind initiatives.

Tender design and risk allocation are evolving

The 2025 offshore wind tender in South Korea allocated a significant portion of capacity to public-led projects. While this approach aims to promote domestic industry development and energy security, it has raised concerns regarding cost competitiveness and the participation of international developers.

A growing concern expressed by developers is the strong regulatory emphasis on localization within auction rounds. Current tender scoring heavily rewards domestic manufacturing and supply-

chain participation, which, in practice, limits developers' ability to leverage the global supply chain. As a result, projects face constrained procurement options and must often rely on components and services from a local industry that is still maturing in terms of know-how, quality, and capacity. This dynamic is driving up the LCOE and contributing to longer development timelines due to delays in certification, logistics, and component availability.

While localization is a legitimate policy objective to foster domestic industry, excessive weighting can inadvertently undermine competitiveness and delay deployment. Striking a balanced approach, where domestic capacity is developed in parallel with, rather than instead of, international collaboration, will be essential for accelerating build-out and ensuring bankability.

Denmark and the UK demonstrate that predictable revenue support (CfD), government-led site studies, and clear penalty/reward structures are essential for bankability and investor confidence. Incorporating such mechanisms, while gradually strengthening Korea's local supply base through targeted industrial policy rather than restrictive tender scoring, could help reconcile national industrial ambitions with cost and delivery efficiency.

5.2 Recommendations

The following recommendations outline potential areas where Danish expertise and experience could support the development of South Korea's offshore wind sector.

Enhance pre-development and tender preparation

- Government-led site investigations: Conducting geotechnical, metocean, and environmental baseline studies prior to tender launch can reduce sunk costs for developers and increase competition. Programs could include cost recovery mechanisms through concession fees post-award.
- Integrated zoning and grid planning: Align marine spatial planning with KEPCO's grid development roadmap to ensure that designated offshore wind zones have confirmed evacuation capacity and minimize later technical conflicts.

Clarify Grid Responsibilities and Cost Allocation

- Forward-looking grid investment: Consider anticipatory planning to ensure timely availability of substations and transmission lines, reducing operational bottlenecks.
- Transparent cost-sharing mechanisms: Establish clear rules for the allocation of costs related to offshore substations, export cables, and grid reinforcements. Transparent arrangements can support lower project-level financial risks.

Streamline and Sequence Permitting

- One-stop permitting authority: Ensure that the Offshore Wind Committee operates as a fully empowered coordinating body, with defined timelines and binding legal deadlines for permit approvals.
- Flexible design envelopes: Adopt approaches allowing design flexibility (e.g., turbine sizes, foundation types) within pre-approved ranges without restarting the permitting process, reducing delays and uncertainty.

Strengthen Community and Stakeholder Engagement

- Standardized fisheries compensation frameworks: National-level guidelines can provide consistent approaches to compensation, reducing ad-hoc disputes and supporting planning

certainty.

- Community benefit mechanisms: Encourage localized benefit-sharing through programs such as revenue allocation, port development, or workforce training initiatives.
- Transparent dialogue platforms: Establish forums or liaison councils that involve fisheries, local authorities, developers, and grid operators to promote structured and ongoing communication.

Optimize Tender Design to Attract Investment

- Revenue stability: Consider mechanisms similar to Contracts for Difference (CfDs) that provide transparent strike price indexation and settlement rules to enhance bankability.
- Balanced scoring criteria, especially in terms of localization: Reassess the current weighting of localization criteria in tender evaluations to ensure that industrial-policy objectives do not undermine cost efficiency or timely delivery. A way forward would be to introduce a phased approach, allowing developers to source key high-specification components internationally in early project rounds while supporting domestic capability building through targeted innovation and supplier-development programs.
- Flexible commissioning windows and proportional penalties: Realistic COD timelines as well as transparent and proportionate penalty structures help reduce financial risks and support investor confidence.

Korea's offshore wind sector stands at a pivotal moment, where careful alignment of regulation, industry initiative and stakeholder engagement will determine the pace and efficiency of its development. The measures outlined provide a pathway to a more predictable, transparent, and widely accepted framework for offshore wind development in the country, thereby strengthening Korea's position in the global offshore wind market.