GLOBAL OFFSHORE WIND REPORT 2025

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The case for offshore has never been stronger, but the sector is at an inflection point

This year's report comes to you at a period of unprecedented change, as the world moves at speed towards what the IEA have coined the ''Age of Electricity''. In this next industrial revolution, countries that leverage their abundant wind resources to move fastest towards an electrified future will enhance their competitiveness and gain strategic advantage over their peers. We are beginning to see the world's first clean energy super powers move into view and, try as some countries might, there is no stopping the trend for electrification that has been unleashed.

At the same time, the world continues to suffer the effects of the long tail of the COVID pandemic the war in Ukraine, and the resulting impact on commodity prices. The memories of soaring gas import prices following Russia's invasion of Ukraine, and the continued weaponisation of gas supplies loom large. We have entered a time of geopolitical uncertainty, where accepted global norms on trade and international relations are being challenged, and long held political alliances are being redrawn and rewritten. With energy security of paramount importance, countries around the world are looking to bolster their supplies of clean, homegrown energy to insulate them against external shocks and strengthen a country's energy sovereignty. Wind power, by its nature, offers a new paradigm for energy security and a nation's resilience, while also emerging as a key energy source for the world's fastest growing industries. Once the technology is installed, the wind keeps blowing and the turbines can keep turning – you cannot turn the tap off, or stop the winds of change from blowing around the world.

Offshore wind therefore stands as a pivotal technology in this current era. Our report finds that there is now already 83 GW of offshore wind installed worldwide, keeping the lights on for 73 million households, and powering countries' economic development. There is currently a further 48GW of offshore wind current under construction worldwide. With its unique position in the marine space, and ability to produce large amounts of reliable, homegrown power, nations around the world are pushing forward the technology to enhance their energy independence and autonomy.

GWEC is seeing greater political support for offshore wind than ever (outside the US). Our report documents important and highly positive progress in a suite of markets across the world, from mature markets, such as the UK, through to ''emerging markets'' focused on a 'right first time' approach such as Poland, Japan, South Korea, The Philippines, Vietnam, Australia and Brazil. Notable developments even in the last few months include the launch of the first ever offshore wind auction in The Philippines (Jun 2025) which stands to become the first EMDE country in APAC to build out its offshore wind industry at scale; the passage of the EEZ Bill in Japan, which fires the starting gun on the regulatory framework for floating offshore wind; the announcement of the forthcoming auction in South Korea. Our report this year also

shows that 2024 was a key year for offshore wind auctions; a total of 56.3 GW of offshore wind capacity was awarded worldwide last year. Europe led the way, with 23.2 GW awarded in Europe and 17.4 GW in China. A next wave of markets also had landmark years with South Korea awarding 3.3 GW, Taiwan (China) 2.7 GW and Japan 1.4 GW.

Despite this positive momentum, there have been well documented challenges in the sector of late. Like other infrastructure sectors, macroeconomic headwinds have raised the cost of capital and impacted project economics. The industry has also endured increasing ideological attacks and a persistent and rising tide of disinformation. There has been a great deal of policy instability in the US market, typified by the recent issuing of a cessation of work order issued to the Empire Wind project (now thankfully lifted). In GWEC's view, such policy instability represents a dangerous precedent and sends the wrong message to the plethora of interested global investors, while also putting thousands of jobs, manufacturing capability and future economic growth at risk. These wider challenges have collided with ineffective policies, such as slow permitting and auction design. As a result, investors are left exposed and without clear pathways to returns, making them far more cautious about which projects really make economic sense.

So we find ourselves at an inflection point. This year's report comes to you at a time where the case for offshore wind has never been stronger, but also at a time where we need to work together to recalibrate and urgently evolve policy to more effectively share risk, and focus on delivery.

Our report, therefore, offers concrete recommendations on how government and industry can practically align to unlock and deliver the next stage of growth for offshore wind. Central to our recommendations this year is how we evolve auction regimes so that they achieve delivery, and how to unlock financing in key markets. With 2025 poised to be a pivotal year for offshore wind tenders across multiple jurisdictions, getting these fundamentals right will be essential to realising the sector's full potential on a global scale.

Offshore wind has ridden through tough periods before. These challenges give the industry and governments a chance to reevaluate expectations and define shared pathways for sustainable growth. At GWEC we will, as always, play our part in convening the global industry and governments to collaborate on achieving this next era of delivery and growth for offshore wind.

Steven B. Hedlund
Chair, President and Chief Executive Officer, The Lincoln Electric Company

Investing in the future of offshore wind fabrication

As the offshore wind industry accelerates towards its 2030 installed capacity targets, the transformation of steel into turbines, towers and foundations continues to drive global expansion. Despite regional uncertainties, final investment decisions made in 2024 and 2025 will increase fabrication capacity, enabling the production of larger, more complex structures for deeper offshore developments.

Industry leaders in Europe and Asia have commissioned facilities capable of producing the largest steel offshore structures ever engineered. Strategic investments in steel production, pipe mills, fabrication yards, and shipyards are bridging the gap between forecasted and actual global foundation capacity. This growth is underpinned by advanced manufacturing technologies and a renewed focus on local workforce development to improve efficiency and reduce costs.

Lincoln Electric, a global leader in welding and automation, emphasises innovation and skilled labour as the key drivers of supply chain resilience. Manufacturing automation, new production methods, and continuous training are essential to project profitability and future success.

The offshore wind sector has already demonstrated resilience in overcoming challenges of scale and complexity. Regional expansions in fixed-foundations and tower manufacturing are generating local economic benefits and highlight the importance of supportive policy alongside coordinated investment. As floating wind designs mature, standardisation will unlock further opportunities for steel structure production beyond 2030.

The offshore wind sector has already demonstrated resilience in overcoming challenges of scale and complexity.

To meet growing steel demand, the industry will require the continued alignment of key stakeholder goals, new factory capacity, higher utilisation and more investment in manufacturing innovation. Offshore wind is not just a pillar of the energy transition: it is a catalyst for industrial renewal worldwide.

Navigating offshore wind's complex landscape

After years of profound global uncertainty due to the COVID-19 pandemic, volatile commodity markets and persistent inflation, the offshore wind sector is at a crossroads. What was once a rapidly accelerating industry buoyed by ambitious climate targets and technological innovation is now facing an increasingly complex and uncertain landscape.

Challenges such as supply chain disruptions, rising capital costs and shifting geopolitical dynamics have tested the resilience of developers, investors, and policymakers. Yet the strategic importance of offshore wind has only grown. As countries strengthen their commitment to decarbonisation –driven not only by environmental concerns but also by competitiveness and energy security – offshore wind remains a cornerstone of the global energy transition.

Beyond providing clean, renewable energy, offshore wind is increasingly recognised as a key contributor to energy security and independence – both priorities in an era of geopolitical instability and supply vulnerability. By using this domestic marine resource, countries can reduce reliance on imported fossil fuels, stabilise energy prices and strengthen their resilience against external factors.

To unlock its full potential, the industry now calls for a renewed sense of reliability from all stakeholders: developers, supply chain partners, and, crucially, public authorities must work in concert to restore confidence and ensure long-term viability. We are entering a period of redefinition, in which the frameworks that have guided offshore wind development must evolve to meet new realities. For its part, the industry must recommit to the reliable delivery of projects, investment in manufacturing capacity, technology development and greater efficiency. Redesigning auction processes is a key part of this transformation. The industry demands competitive yet deliverable auctions, with balanced risk allocation that minimises speculation and aligns with realistic deployment ambitions. Transparency, long-term visibility of megawatt targets and predictable routes to market are essential for secure investment decisions and maintaining project pipeline momentum. In particular, developers are calling for reliable market frameworks based on Contracts for Difference (CfDs), which provide price stability and reduce exposure to market volatility – critical elements to unlock large-scale investments.

Despite these headwinds, 2024 has been a remarkable year for Iberdrola. We have continued to consolidate our offshore wind pipeline, taking yes (FIDs) on two major projects (East Anglia 2 and Windanker) and reaching completion on Baltic Eagle and Saint Brieuc. We have achieved 2.4 GW in operation and are on track to reach 5.9 GW by the end of 2028. These achievements reflect our long-term commitment to clean energy and our ability to deliver even in uncertain times.

Looking ahead, the choices made today by governments, industry leaders and investors will determine offshore wind's role as a scalable, sustainable and secure energy source. This report aims to inform those choices, guiding stakeholders through uncertainty to seize the opportunities beyond.

Álvaro Martínez Palacio
Managing Director, Iberdrola Global Offshore Wind Business, Iberdrola

Mr. Zhang Qiying
President & CTO, Mingyang Smart Energy

Strengthening global supply chain collaboration to drive the next wave of offshore wind growth

The urgency of the global climate crisis is intensifying. In 2024, the world recorded its hottest year, with average global temperatures surpassing the critical 1.5°C threshold for the first time annually. The need for clean, green energy has never been greater. Among renewable solutions, offshore wind stands out with its vast development potential, higher capacity factors, and stronger economic impact.

We are encouraged to see that, over the past year, many of the challenges that have hindered offshore wind development – including high interest rates, macroeconomic pressures and persistent permitting and auction-related issues – have begun to ease. Offshore wind capacity under construction and awarded through auctions reached record levels in 2024, reinvigorating momentum across the sector. Yet, we must remain clear-eyed: under current policies, the pace of new offshore wind deployment remains insufficient to meet global net-zero targets and the goal of tripling renewable energy capacity by 2030.

At this pivotal moment, fully realising offshore wind's potential at scale will require enhanced global supply chain collaboration. A strong, resilient and globally coordinated offshore wind supply chain can significantly improve value delivery across the industry. It can help unlock resource potential, cut development costs, boost production and installation efficiency, and ultimately improve global project delivery. This will serve as the primary driving force behind the next wave of offshore wind growth.

> A strong, resilient and globally coordinated offshore wind supply chain can significantly improve value delivery across the industry.

As a leading offshore wind player in China and globally, Mingyang Smart Energy is committed to driving the next wave of industry growth through technological innovation and excellence in project execution. We will continue to harness our supply chain and technology strengths to unlock new markets and accelerate the global expansion of offshore wind. We call on governments, developers, financiers and supply chain partners worldwide to act with urgency, pragmatism, and a shared commitment of working together to shape the future of offshore wind.

Together, let us accelerate the deployment of offshore wind – and ride the next wave faster, smarter and stronger.

MINGYANG SMART ENERGY
明阳智能

EXECUTIVE SUMMARY

Feng Zhao
Chief Research Officer,
Global Wind Energy Council

Delivering the Next Wave of Growth for Offshore Wind

Offshore wind's journey began with Denmark's first offshore wind turbines installed in 1991 off the island of Lolland. Since then it has evolved into a story of remarkable growth. Today, this technology delivers large-scale, cost-effective clean power around the globe – energising businesses, boosting economies and revitalising coastal regions. With 83 GW of capacity installed worldwide, offshore wind now supplies clean, affordable electricity to 73 million households.

The case for offshore wind has never been stronger. In addition to providing vast amounts of clean, renewable power, it adds billions in gross value to national economies and sustains hundreds of thousands of jobs. In Europe alone, offshore wind contributes approximately USD 3.2 billion GW installation in gross value added (GVA). Amid rising geopolitical uncertainty and shifting trade relations, offshore wind, with its unique position in the marine space, is gaining recognition as a strategic asset for nations seeking greater energy independence and resilience. By harnessing their marine resources, countries can reduce reliance on volatile fossil fuel imports, thereby stabilising energy costs and strengthening economic and energy security.

As the world enters the ''Age of Electrification'', offshore wind is expanding rapidly into new regions such as Asia Pacific, Southeast Asia and Latin America, where policymakers are increasingly recognising the technology's strategic value. Political support not only fosters economic growth and energy security but also advances progress towards the global 1.5°C climate target by helping developing countries access clean, affordable power that meets their energy needs and supports sustainable development.

However, despite the growing strategic importance of offshore wind, recent years have been marked by significant economy-wide headwinds. The sector now faces a perfect storm of macroeconomic factors, geopolitical tensions and industry-specific challenges.

Like many infrastructure sectors and other energy sources, offshore wind has been dealing with the long tail of the war in Ukraine and associated macroeconomic factors, which have raised interest rates and the cost of capital. Despite governments setting strong targets, the credible pipeline of development has been inconsistent and uncertain, resulting in a lack of effective investment signals. Longstanding issues such as slow permitting, poor auction design in

With 83 GW of capacity installed worldwide, offshore wind now supplies clean, affordable electricity to 73 million households.

mature markets and increasing policy instability in some markets have compounded this effect and led to an inflection point.

In 2024, new installations totalled 8 GW – down 26% from the previous year, though it still ranks as the fourth highest year on record for installations. The global pipeline remains strong, with 45 GW of offshore wind under construction and a record 56 GW auctioned. Nevertheless, adverse conditions – including the negative policy environment in the US, auction failures in the UK and Denmark, and grid transmission delays in Europe – have led us to downgrade our short-term forecast by 24% compared to our earlier 2024 forecast. In addition, delays in expected commissioning dates in APAC are pushing capacity additions further into the forecast period (see details on page 70).

Despite these setbacks, most governments and developers remain committed to offshore wind, and the global medium-term outlook remains resolutely optimistic. A huge opportunity lies ahead: with a compound average annual growth rate of 28% until 2029 and 15% up to 2034, global offshore wind annual capacity additions are expected to sail past the milestones of 30 GW in 2030 and 50 GW by 2033.

An inflection point for industry and policy

This report outlines a sector at a crossroads. To successfully deliver the growth projected in the medium term, both industry and government must adopt a laser-focused commitment to delivery and reliability.

Recent tender failures in established markets have prompted a recalibration of costs and risks. As we enter this transformative phase, the frameworks guiding offshore wind development must evolve to reflect shifting realities.

In response, mature-market governments and policymakers have started to align with industry on targeted measures, especially in auction and tender design, to stabilise and support the sector. Meanwhile, in emerging markets for offshore wind, governments and industry have the opportunity to work together on a ''right first time'' approach – prioritising effective risk sharing and auction reform to enable strong and sustainable growth.

Report Recommendations Overview

Redefining auctions for delivery

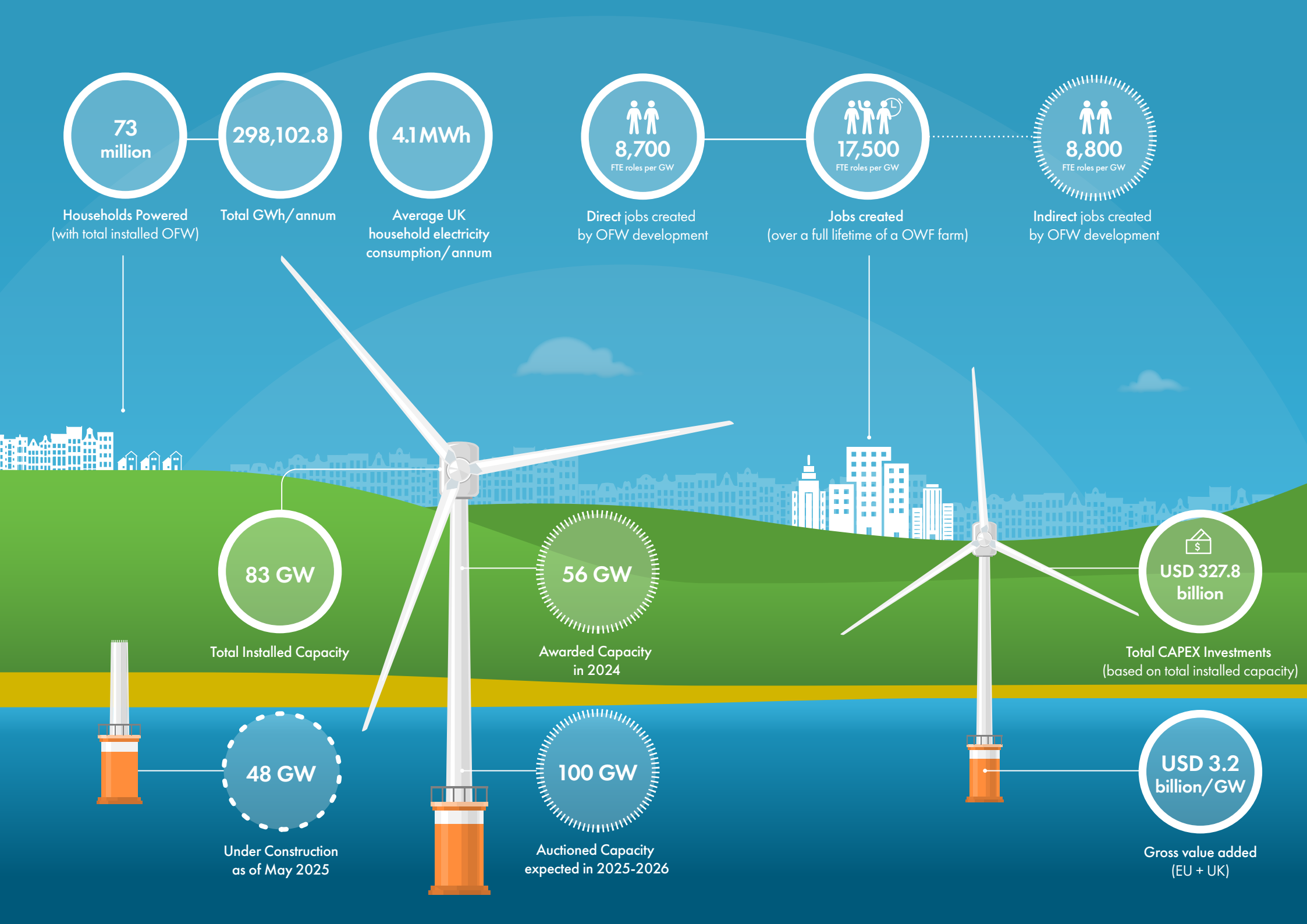
Auctions remain a cornerstone for offshore wind development, with 56 GW of projects auctioned last year and more planned for this year in several countries, including the UK, Germany, Denmark, the Netherlands, France, Ireland, Norway, Poland, Portugal, Estonia, Lithuania, South Korea, the Philippines, Vietnam and Colombia.

As large infrastructure projects, offshore wind farms present many complexities. Average project lead times range from six to ten years and require substantial investments alongside appropriate risk-sharing mechanisms.

While historically effective across various technologies, auctions have recently seen high-profile failures in the offshore wind sector due to poor design and weak risk sharing. Failed auctions and stalled projects contribute to uncertainty, reducing investor confidence and threatening both the industry's success and the global transition to clean energy.

This section recommends:

- Better risk sharing, based on collaborative government-industry efforts to ensure clarity over auction volumes and pipelines.
- Planning auctions within industry frameworks that enable predictable project timelines and clear planning for associated transmission and infrastructure.


73 million
Households Powered (with total installed OFW)
298,102.8
Total GWh/annum
4.1MWh
Average UK household electricity consumption/annum
8,700
FTE roles per GW
Direct jobs created by OFW development
17,500
FTE roles per GW
Jobs created (over a full lifetime of a OWF farm)
8,800
FTE roles per GW
Indirect jobs created by OFW development
83 GW
Total Installed Capacity
56 GW
Awarded Capacity in 2024
USD 327.8 billion
Total CAPEX Investments (based on total installed capacity)
48 GW
Under Construction as of May 2025
100 GW
Auctioned Capacity expected in 2025-2026
USD 3.2 billion/GW
Gross value added (EU + UK)

- Using mechanisms such as two-sided Contracts for Difference (CfDs), which help balance risk by providing long-term predictable revenues to developers and investors. The competitive award of such mechanisms delivers budgetary confidence for governments through transparency and price discovery. Because they reduce risk, CfDs decrease the cost of capital and deliver best value for money for bill payers.

- Treating critical infrastructure development such as grids and ports as long-term investments in public assets. Government-facilitated critical roadmaps and frameworks for these assets increase predictability and engender confidence in developers and investors.

Fast-tracking permitting

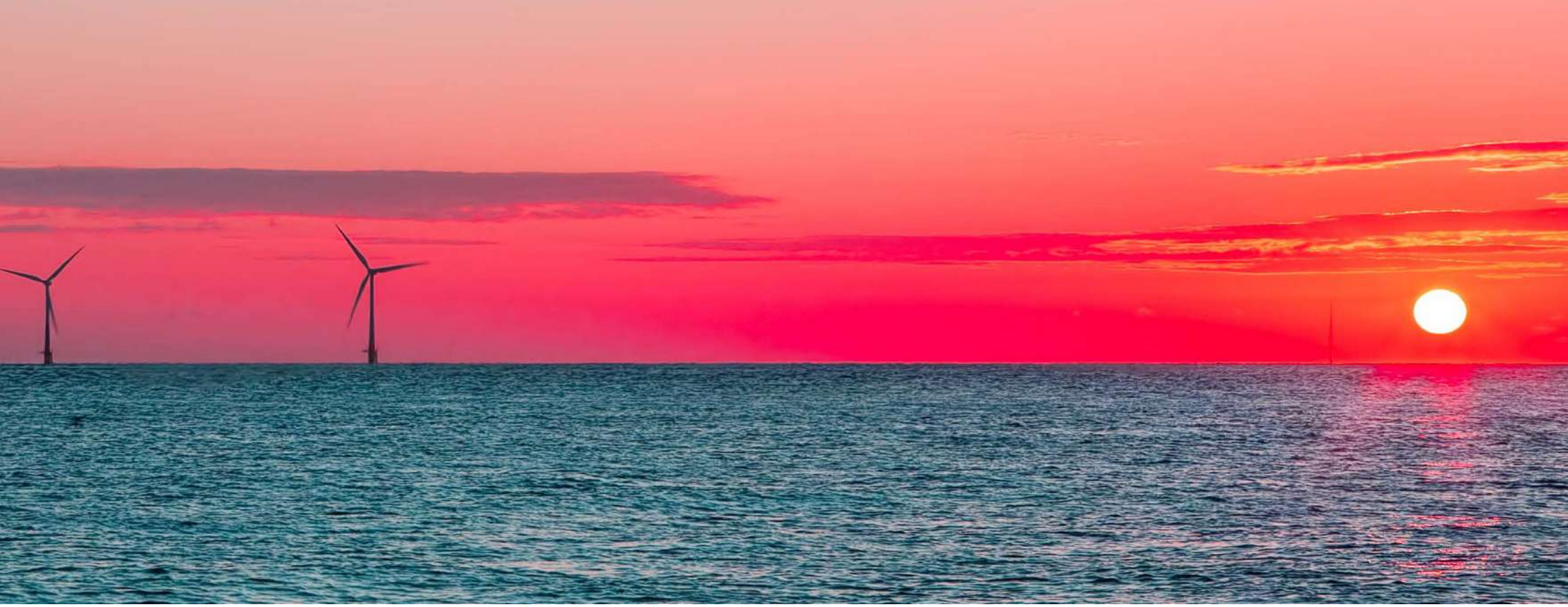
Permitting remains a major source of delay across markets, adding uncertainty, increasing project development costs and reducing investor confidence. To overcome complex, fragmented and under-resourced systems impacting project timelines, this section recommends that governments enact clear deployment mandates, centralise permitting reviews, embed ''overriding public interest'' in national law and facilitate early stakeholder engagement.

Making finance fit for purpose

The cost of capital significantly impacts offshore wind projects' overall cost. In emerging and developing economies (EMDEs), the perceived risks around currency volatility, political and regulatory uncertainty, lack of mature transmission systems and unfamiliarity with offshore wind cash flows can drive up the cost of capital and deter investors. Addressing these challenges can unlock offshore wind's full potential in the next wave of markets.

This section recommends:

- Encourage lenders to provide longer-tenor loans, more flexible repayment schedules and inflation-indexed revenue contracts.
- Multilateral development banks should support initial projects in EMDEs through concessional



capital, guarantees and other risk-sharing tools.
- Governments must issue bankable contracts (CfDs or REPAs, for example), clarify project pipelines and streamline permitting and grid development.

Strengthening supply chains through cooperation and standardisation

Fragmented global trade and limited standardisation across markets are undermining the resilience and scalability of offshore wind supply chains.

This section recommends regional trade and industrial policy coordination to balance supply chain efficiency, sustainability and resilience. It also calls for industry-wide dialogue to standardise components, manufacturing processes and operations, enhancing turbine reliability, reducing complexity and increasing interoperability.

Enabling grid and transmission readiness

Transmission infrastructure is a critical bottleneck for offshore wind. Even when projects are auctioned, permitted and ready to build, delays in offshore and onshore grid development risk derailing delivery. Far from being a mere technical requirement, transmission is strategic infrastructure essential to achieving climate and energy security goals.

This section recommends:
- Adopting anticipatory, centralised grid planning – as seen in Germany – for de-risked investments, reduced delays and better coordination across seabed leasing, permitting and auctions.

To successfully deliver the growth projected in the medium term, both industry and government must adopt a laser-focused commitment to delivery and reliability.

- Defining clear grid connection responsibilities and aligning offshore hubs with future interconnection needs.
- Addressing global supply chain constraints for essential components such as transformers, cables and substations.

Reclaiming the public narrative on offshore wind energy

Misleading claims about offshore wind have proliferated, swaying public opinion and complicating project development. The offshore wind value chain and the opportunity to unite around a common response, counteract disinformation and reclaim the narrative on wind energy's role in providing clean and secure energy for the future. By fostering transparent, fact-based dialogue with local communities, these efforts will also streamline permitting and accelerate project approvals.

PART 1: SUCCEEDING IN THE NEW ECONOMIC LANDSCAPE

Offshore wind's strategic value

As the world enters the "Age of Electrification" with renewed emphasis on energy autonomy and security, offshore wind is pivotal to the modernisation of economies across Asia Pacific, Europe and Latin America. In this global revolution, economies that rapidly transition to electrified systems will enhance their competitiveness and gain a strategic advantage. Offshore wind allows countries to utilise their marine space to produce large amounts of "variable baseload" clean and competitive electricity near urban demand centres, simultaneously fueling economic growth.

Amid rising geopolitical uncertainty and shifting trade norms, offshore wind is increasingly recognised as a direct path to energy independence. By leveraging marine resources, countries can reduce reliance on volatile fossil fuel imports, stabilising energy costs and enhancing resilience. The case for offshore wind has never been stronger.

Proven track record of delivery

The offshore industry has shown rapid growth since the first offshore wind turbines were installed in Denmark in 1991. Over the past decade, the technology has scaled up further, become more industrialised and reduced costs. With 83 GW installed globally, offshore wind already provides clean and cost-efficient power to 73 million households, powering businesses, driving economic growth and revitalising coastal communities.[1]

Economic growth and industrial opportunities

Offshore wind can be an engine of national and regional economic growth, especially for coastal communities. It offers significant infrastructure opportunities fuelling local jobs and investment when installed at scale. Each GW of offshore wind installed in the UK has added £2-3 billion[2] to the economy, while in Europe it has added €2.8 billion.[3]

According to Ocean Energy Pathway (OEP) each gigawatt of offshore wind capacity developed generates approximately 17,500 full-time equivalent (FTE) jobs over the full project lifetime, including both direct and indirect employment[4]. Similar impacts have been identified in emerging markets. According to the World Bank, offshore wind in Vietnam could generate at least $60 billion in economic value and support over 90,000 jobs by 2050.[4a] In Japan, a study by ERM and Ocean Energy Pathway found that Akita Prefecture offshore wind projects could generate ¥356 billion ($2.5 billion) in economic value and 34,000 jobs.[5] GWEC's 2024 report How Offshore Wind can/Can Support Coastal Regeneration[6] showed that offshore wind can make a significant contribution towards coastal community renewal in South Korea.[7]

Offshore wind anchors cluster-based industrial development, reviving post-industrial coastal communities and providing economic opportunities in areas facing population decline or industrial degrowth. Successful examples include the UK's Hull and Humber Cluster[9,10] and Esbjerg in Denmark, which are explored in GWEC's 2024 report How Offshore Wind Can Support Coastal Regeneration.[11, 12] The role of offshore wind in port infrastructure development, as well as offshore wind's role in the sustainable marine economy should be noted.[13]

Contributing to energy autonomy and security

Many countries rely heavily on imported fossil fuels, making them dependent on other countries for

1. GWEC Market Intelligence, based on European consumption
2. The Crown Estate, "Offshore wind industry unveils Industrial Growth Plan to create jobs, triple supply chain manufacturing and boost UK economy by £25 billion," https://www.thecrownestate.co.uk/news/offshore-wind-industry-unveils-industrial-growth-plan-to-create-jobs
3. ETIP & WindEurope, 2024, https://etipwind.eu/wp-content/uploads/files/publications/20240606-european-wind-energy-competitiveness-report.pdf
4. OEP, SYSTEMIQ, Capturing the offshore wind opportunity, 2025
4a. The World Bank, "Offshore Wind Development Program OFFSHORE WIND ROADMAP FOR VIETNAM" https://documents1.worldbank.org/curated/en/261981623120856300/pdf/Offshore-Wind-Development-Program-Offshore-Wind-Roadmap-for-Vietnam.pdf
5. ERM, https://www.erm.com/about/news/erm-japan-and-ocean-energy-pathway-study-finds-akita-prefecture-offshore-wind-projects-could-generate-356-billion-jpy-economic-value-and-34000-jobs/
6. GWEC HOW OFFSHORE WIND DEVELOPMENT CAN SUPPORT COASTAL REGENERATION (2024) https://www.carbontrust.com/our-work-and-impact/guides-reports-and-tools/how-offshore-wind-development-can-support-coastal-regeneration-global-overview-and-best-practices-for-south-korea
7. For more information on industrial and supply chain opportunities please see GWEC's body of supply chain work including Supply Chain report, "Mission Critical: Building the Global Wind Energy Supply CHain for a 1.5C World", https://marketintelligence.gwec.net/wp-content/uploads/2023/12/MISSION-CRITICAL-BUILDING-THE-GLOBAL-WIND-ENERGY-SUPPLY-CHAIN-FOR-A-1.5%C2%B0C-WORLD.pdf
9. Our Offshore Wind Impact in Coastal Communities | Ørsted UK
10. Siemens Gamesa, https://humberfreeport.org/case-studies/case-study-siemens-gamesa/
11. How Offshore Wind development can support coastal regeneration, GWEC and Carbon Trust (2024)https://www.gwec.net/reports/asia/how-offshore-wind-development-can-support-coastal-regeneration-global-overview-and-best-practices-for-apac-region
12. How Offshore Wind development can support coastal regeneration, GWEC and Carbon Trust (2024) https://www.gwec.net/reports/asia/how-offshore-wind-development-can-support-coastal-regeneration-global-overview-and-best-practices-for-apac-region
13. Ocean Renewable Energy Action Coalition, https://www.gwec.net/policy/offshorewind/oreac
14. Three facts that show how solar and wind strengthen energy security | Ember
15. IEA, Japan, https://www.iea.org/countries/japan/energy-mix
16. IEA, South Korea, https://www.iea.org/countries/korea/energy-mix

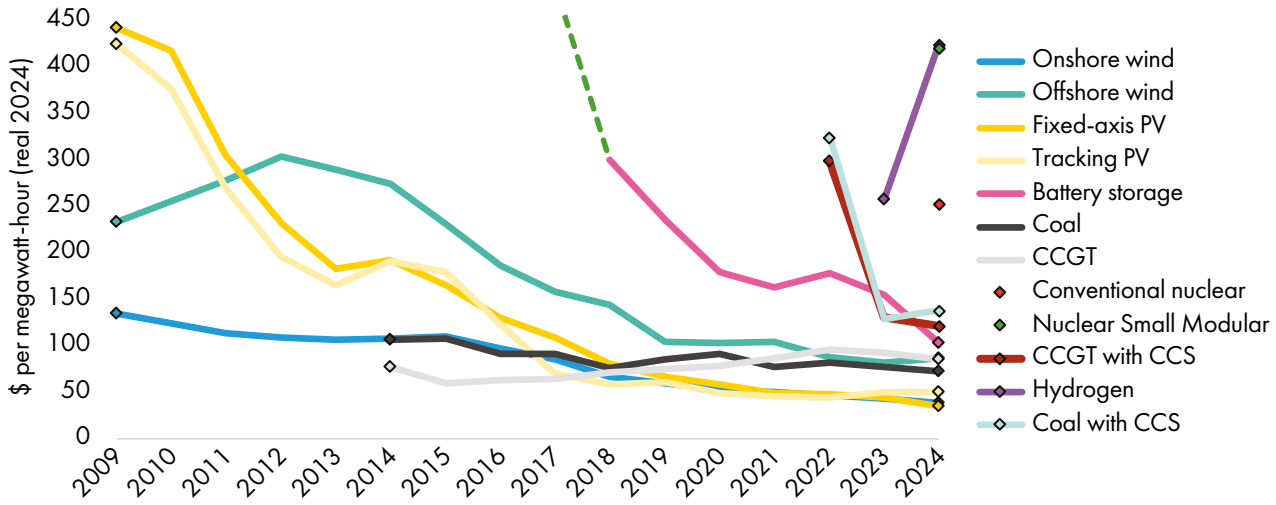
their energy needs. Recent research by Ember found that 74% of the global population lives in countries that are net importers of fossil fuels[14] and thereby dependent on other countries for their energy needs. For instance, Japan imports roughly 87%[15] of its energy, while South Korea imports around 85%.[16] See Figure on page 18 for reference

Such dependence is inherently risky and continued reliance on imported fossil fuels can increase trade-related energy-security risks.[17] Geopolitical upheavals such as Russia's invasion of Ukraine can send oil and gas prices soaring almost overnight – in Europe, between July 2021 and early 2022 gas prices rose by 145% and oil prices by 46%.[18] In Asia, where most economies are net energy importers, gas price hikes following the invasion of Ukraine have constrained economic growth and development.[19]

Offshore wind, in contrast, offers homegrown power at consistent prices, reducing reliance on fossil-fuel imports, stabilising energy costs and strengthening energy security.[20] Governments and utilities can hold onto foreign-currency reserves instead of spending them on coal, oil and LNG shipments, while households and businesses become less vulnerable to sudden spikes in commodity prices. Over time, adding gigawatts of local offshore capacity can improve a country's trade balance, stabilise electricity costs and increase overall energy security.

Despite macroeconomic volatility, offshore wind remains cost-competitive with other forms of energy generation – as already demonstrated in mature markets such as the UK, Germany and China. Cost reductions in offshore wind are closely tied to market maturity. While Levelised Cost of Energy (LCOE) is initially higher in new markets, it typically declines as technical, regulatory, legal and financial capabilities develop. This downward trend usually reaches a tipping point after the first 2-3 GW as market confidence grows, full competition emerges, and access to lower-cost financing improves.[21]

LCOE Benchmark



Source: BloombergNEF, February 2025

The future role of offshore wind

As the world enters the "Age of Electrification", with a renewed emphasis on energy autonomy and security, offshore wind is essential to power the modernisation of economies across Asia Pacific, Europe and Latin America. Countries that rapidly transition to electrified systems

17. Cheng at all, "Trade risks to energy security in net-zero emissions energy scenarios", Nature Climate Change, 2025
18. https://www.ecb.europa.eu/press/economic-bulletin/articles/2022/html/ecb.ebart202204_01~7b32d31b29.en.html
19. Ukraine Crisis: Impact on Asia, 2022, https://ap.allianzgi.com/-/media/allianzgi/globalagi/editorial/ukraine-crisis-impact-on-asia/web-ukraine-crisis-impact-on-asia.pdf?hash=8BD75366577326CBEAFCD25A41F6931F&rev=0f1a1db21aa646ecb9733bf771a69751&utm_source=chatgpt.com
20. Orsted, "Reviving the industry to secure Europe's energy future" https://orsted.com/en/what-we-do/insights/white-papers/offshore-wind-at-a-crossroads
21. Financing Offshore Wind in APAC, GWEC, Jun 2025

Market dependence on fossil fuels: Net energy imports (%)

Source: IEA, 2022-2024

will enhance their competitiveness and gain a strategic advantage.

With its predictability and high-capacity factors – 41% weighted average[22] – offshore wind provides large amounts of stable and reliable clean power at GW scale. Its load profile and proximity to coastal demand centres can enhance grid reliability. According to the IEA, offshore wind can best be described as ''a variable baseload technology'' that complements the seasonal and daily generation profile of solar power.[23] As such, it can play an important role in the burgeoning demand for nighttime cooling and form the stable backbone of a modern electricity system.

In major scenarios through to 2030 and beyond, offshore wind will play a significant role. The IEA forecasts 212 GW of offshore wind capacity by 2030, with annual installations set to jump from about 9.5 GW in 2023 to 45 GW by 2030.[24] Under Announced Pledges (APS) and Net Zero Emissions (NZE) scenarios, offshore wind capacity reaches 1,600 GW and 1,950 GW by 2050, respectively.[25] Analysis by IEA and IRENA shows that 2000 GW of offshore wind will be necessary for a 1.5°C compliant pathway. This is the target that countries are signing up to as part of their commitment to the Global Offshore Wind Alliance.

Political support for offshore wind amongst non-traditional markets is gaining strong momentum underpinned by new legislative frameworks. This is being driven not only by ambitious climate targets but also a growing recognition of offshore wind's role in strengthening long-term energy security.

In Australia, the recent introduction by the federal government of key regulatory frameworks enabling offshore wind zones has spurred state-level ambition, with Victoria targeting 2 GW by 2032, 4 GW by 2035 and 9 GW by 2040. Under the 'Draft 2025 Victorian Transmission Plan', the state has committed to developing the grid infrastructure to support offshore wind integration. More than a dozen project feasibility licences have been issued within state waters off Victoria, with developers looking to bid into auctions scheduled to run from September 2025.

In Japan, the latest 7th Strategic Energy Plan envisions renewables becoming the country's main power source. A recent bill enables floating offshore wind development within Japan's Exclusive Economic Zone (EEZ), significantly expanding the geographical scope for projects. An imminent floating wind deployment target for 2040 will unlock GWs of deep-water potential and position Japan as a leader in floating wind.

South Korea has launched a competitive tender for 1.25 GW of fixed-bottom offshore wind, to be awarded through a two-stage evaluation process. This forms part of its broader plan to allocate 7–8 GW of offshore capacity by 2026. Under President Lee Jae-myung's administration, the push to harness domestic offshore wind resources aligns with a policy focus on local energy production and consumption. The expected creation of a dedicated Climate and Energy Ministry aims to further streamline and accelerate the country's renewable energy

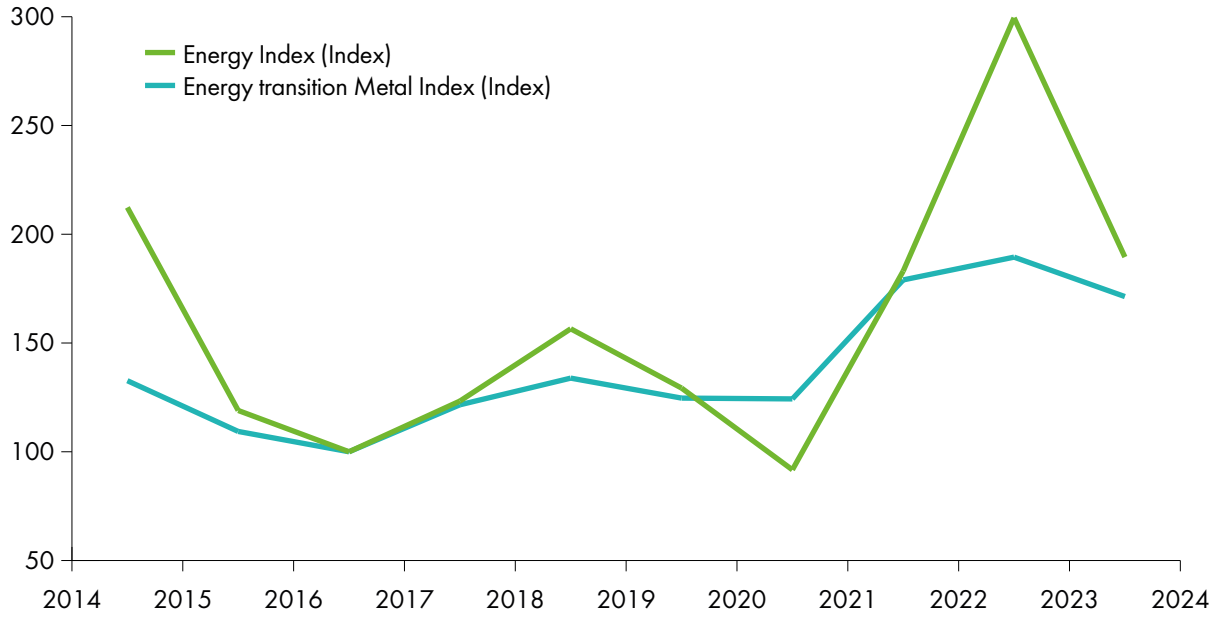
22. IRENA
23. Ember, Global Electricty REview (2025)
24. IEA, Renewables 2024, https://iea.blob.core.windows.net/assets/17033b62-07a5-4144-8dd0-651cdb6caa24/Renewables2024.pdf
25. IEA, World Energy Outlook 2024, https://iea.blob.core.windows.net/assets/140a0470-5b90-4922-a0e9-838b3ac6918c/WorldEnergyOutlook2024.pdf

expansion. The fast-growing economies of Southeast Asia are turning to offshore wind to provide for their increasing energy demands. The Philippines has identified 65 GW of suitable sites and will hold its first offshore wind bidding round in September 2025, with the aim of having turbines spinning in the water by 2028. Vietnam's updated Power Development Plan VIII (PDP8) has introduced a target of 6–17 GW of offshore wind capacity by 2035, signalling a strong long-term commitment to the sector. The government is also laying the groundwork for a structured auction process to guide future project allocation and pricing.

Regional cooperation on offshore wind is gaining traction. At the 46th ASEAN Summit held in Malaysia in 2025, government-linked energy companies from Singapore, Malaysia and Vietnam agreed to explore cross-border links for exporting offshore wind power from Vietnam.

As a fresh frontier for innovation and deployment, floating wind technology is capturing the interest of frontrunners such as the UK, Japan, South Korea,Norway, and France who are eyeing vast deep-water resources and new market opportunities.

Commodity Index by IMF, 2014-2023[28]



Source: IMF, 2024

Despite strong governmental targets, macroeconomic headwinds, the lack of credible policies and inconsistent development pipelines have resulted in a lack of effective investment signals. Longstanding issues such as slow permitting, poor auction design in mature markets and increasing policy instability have compounded this effect and led to an inflection point.

Headwinds have shaken the sector

Over recent years, the offshore wind sector has faced significant macroeconomic headwinds stemming from the war in Ukraine, the COVID-19 recession and surging inflation. As energy and commodity prices spiked, costs for equipment, steel, labour and other construction inputs rose sharply, with central banks hiking policy rates in response.

These shocks are not unique to offshore wind; many industries, including oil and gas, have also been impacted.[26] The IMF commodity index shows energy prices nearly tripled from around 90 in 2020 to almost 300 in 2022, while prices for transition metal climbed from roughly 120 to 185. Meanwhile,

26. The World Bank, https://blogs.worldbank.org/en/developmenttalk/commodity-prices-surge-due-war-ukraine

pipeline costs for US natural gas also doubled – from $5.75 million to $10.9 million per mile[27] – contributing to higher inflation and financing costs across the entire energy sector.

However, these impacts have been particularly hard-hitting in the offshore wind sector, due to the scale of investment required and the high proportion of total project costs driven by the cost of capital. Today, financing a new offshore wind farm or gas plant is more expensive than it was before the pandemic. Developers face both elevated interest costs and higher project-input prices, which delay investment decisions and put pressure on project budgets.

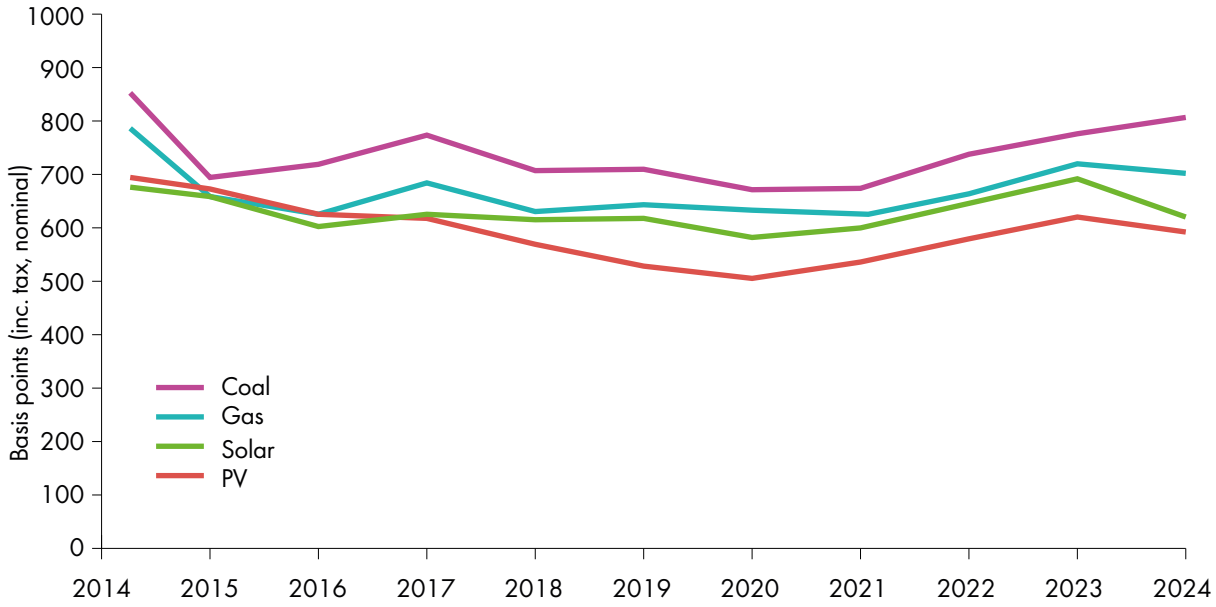
Structural challenges amplify risks

These macroeconomic headwinds have collided with longstanding structural challenges in offshore wind development, notably slow and inefficient permitting processes, amplifying risks and delaying progress. GWEC Market Intelligence reports the global average permit-to-commissioning timeframe is about nine years – a lengthy period that creates uncertainty and exposes projects and investors to risks. When the development roadmap is unclear and requires many touchpoints with different bodies and entities, project delays increase while investors reassess their commitments.

In addition, while many governments have set ambitious targets, the development pipeline has been lumpy and uncertain. In Europe, several recent tenders failed because the risk-reward balance was not attractive enough to spur investment. When auction and tender designs require developers to shoulder significant risks without clear visibility of stable returns, project viability suffers (see auction section below). This uncertainty also discourages investment in supply chains.

Although interest in offshore wind is strong in many emerging and developing economies, deployment remains constrained by persistent challenges. In particular, EMDEs face risk perception issues stemming from uncertain regulatory environments, underdeveloped local supply chains and unfamiliar permitting frameworks make investors wary. High upfront capital costs further deter projects, as financing large-scale offshore farms requires substantial equity and debt. At the same time, limited access to concessional finance can leave

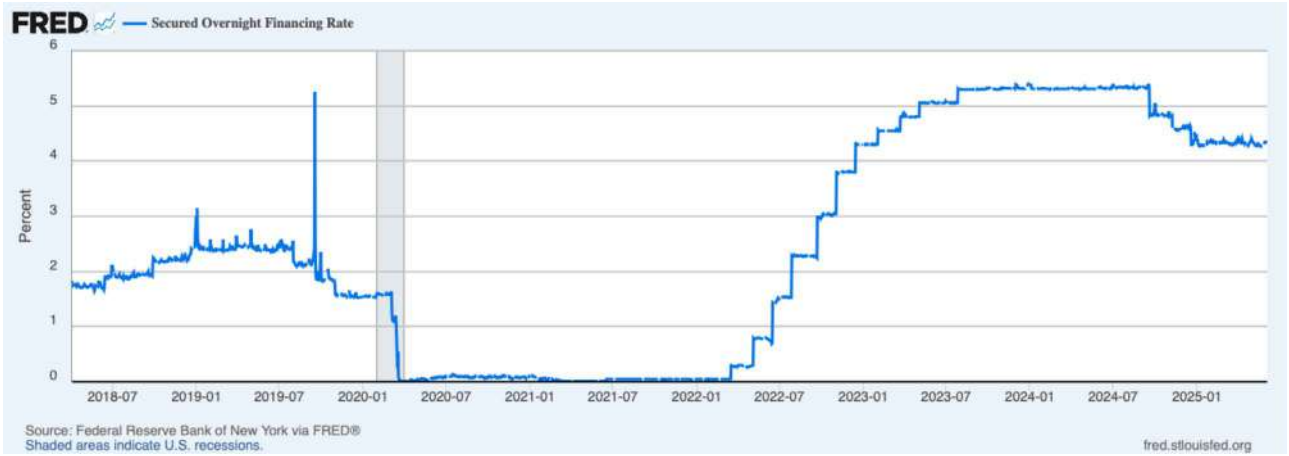
Weighted average cost of capital



Source: BNEF "LCOE update 2025"

27. https://insight.factset.com/rising-natural-gas-pipeline-prices-and-their-impact-on-tariff-rates
28. IMF, https://legacydata.imf.org/?sk=471dddf8-d8a7-499a-81ba-5b332c01f8b9

Secured Overnight Financing Rate (SOFR), 2018-2025[29]



EMDE markets without the funding support needed to bridge the gap between expensive commercial rates and viable project economics.

GWEC has also observed an uptick in ideologically driven attacks against offshore wind in some countries, further undermining its attractiveness by compounding existing macroeconomic challenges.

A new strategic era for offshore wind

Pre-2022, the offshore wind industry was like a teenager: inexperienced, a bit over-confident, underestimating risks and untested by downturns.

The post-2024 industry is like an adult with a few grey hairs and some bruises, but a lot more wisdom and perspective on what is important – especially sustainable profitability rather than a rush to acquire market share. The industry now understands what risks it is willing to take and manage, and what risks are best managed by other agents such as governments and offtakers. While inflation and interest rates peaked in 2023–24, most experts agree they will not return to pre-pandemic levels. Offshore wind must adapt to this "new normal", finding ways to operate profitably with higher baseline and financing costs.

Governments have gained deeper understanding of offshore wind's unique needs, particularly its capital intensity and multi-contracting nature. Many recognise that clear long-term signals, stable but flexible auctions, and realistic cost and timeline expectations are crucial.

Positive signals from policymakers reflect this understanding: better auction designs in mature markets including the UK, Denmark and the Netherlands; close consultation with industry in new markets including South Korea and the Philippines are designing their markets in close consultation with industry stakeholders.

Examples of positive policy signals include:

- Indexation of PPAs to account for inflation in UK CfD Round 6.
- National supply chain policy mandates across Asia Pacific such as Australia's Implementation Statement 4 in Victoria and South Korea's award of 7-8 GW of offshore wind by 2026.
- Regional cooperation frameworks such as the North Seas Energy Cooperation in Europe.

Increasingly recognised as a strategic national asset contributing to energy security, offshore wind is seen in many regions as a solution for reducing import reliance and price volatility, especially for economies that depend on fossil fuel imports.

After a difficult few years for the offshore wind industry, the tide is starting to turn. What we need now is a laser-like focus on the next steps, working hand-in-hand with governments to achieve delivery through policy frameworks that restore confidence and unlock the next stage of growth.

29. https://fred.stlouisfed.org/series/SOFR#

PART 2: DELIVERING FOR GROWTH – RECOMMENDATIONS

Designing auctions for capacity delivery

The year 2024 saw 56 GW of auctioned projects, with a further 100 GW expected in the next two years across diverse markets.

Later this year, the Philippines will hold its first offshore wind auction. In Japan, the Ministry of Trade and Industry (METI) is evaluating how to support floating wind in the country's Exclusive Economic Zone (EEZ). Vietnam is about to issue its auction mechanism, while South Korea has recently announced details of how wind power projects can participate in the competitive bidding process for fixed-price contracts under the Renewable Portfolio Standard (RPS) programme. Denmark and the UK will run revised tenders, with the Netherlands, France, Ireland, Norway, Poland, Estonia and Lithuania also announcing auctions. In short, 2025 promises to be another year of auctions.

Countries auctioning in 2025

Country	Announced or expected auction capacity (GW)
United Kingdom	>6
Germany	3.5
Denmark	3
The Netherlands	1
France	2.5
Ireland	0.9
Norway	1.5
Poland	4
Portugal	3.5
Estonia	0.9
Lithuania	0.7
South Korea	3-3.5
Japan	1
The Philippines	3.3
China	>15
Total	>50

Source: GWEC Market Intelligence, June 2025

The industry welcomes and appreciates these government initiatives but believes that a rethink of auctions is required. The past few years have seen a number of failed auctions, denting the confidence of both investors and governments while leading to write-downs and market exits affecting supply chain investments. Fortunately, several governments realise that their approach to offshore wind auctions needs to evolve – and many have adjusted.

Successful auctions depend on understanding risks and managing them effectively in the process of delivering projects. Stakeholders including developers and offtakers, as well as governments, need to feel that the risks are shared fairly. Lending banks must be confident that risks are allocated appropriately.

Offshore wind farms are large infrastructure projects involving significant investments and complexities. Average project lead times range between six and ten years, tens of millions of USD being invested before any revenues are realised. Appropriate risk-sharing mechanisms ensure that each risk is allocated to the entity that is best equipped to manage it.

A successful auction award does not guarantee successful project delivery: market conditions between award, construction, and completion can, and often do, change significantly. Because some risks are outside the industry's control, such as interest rates, commodity prices, and foreign exchange fluctuations, auction structures that prioritise lowest-cost bids can jeopardise both project viability and deliverability. Multiple governments' reluctance to set out long-term auction timetables and roadmaps has damaged investor confidence – investors prefer to see a schedule of planned auctions so they can align their readiness – contributing to underpriced bids, project delays and even cancellations.

It is equally important for auction plans to align with associated transmission, grids and other supporting infrastructure. This starts with a clear offshore wind deployment mandate that creates visibility into the size of the offshore wind pipeline and future demand, backed by a roadmap covering the development of supporting infrastructure.

Auction schedules should carefully consider project maturity: capacity allocations could be scaled up or down to reflect the number of projects that are close to a bid-ready status. Auction rules should be published as far in advance as possible to allow industry to see how bids will be evaluated and plan investments accordingly.

Two-sided Contracts for Difference (CfDs) are particularly effective at balancing risk, ensuring predictable and stable revenues for developers and predictable costs for offtakers. By awarding these contracts through a competitive process, governments

gain budgetary certainty via transparent price discovery. Importantly, by minimising project risk, CfDs reduce the cost of capital and ultimately deliver the best value for money to consumers.

Government-led frameworks for the development of enabling infrastructure such as grids and ports enhance predictability, boosting the confidence of investors, developers and banks.

The table below summarises the key recommendations for policymakers and regulators on offshore wind competitive procurement.

Key considerations	Recommendations
Effective allocation of auction risks	Risk and the corresponding risk allocation mechanisms in auction designs can differ significantly between mature and emerging markets, influencing the approach of governments, banks and developers in each market. Striking the right balance in these procedures ensures that projects are attractive to investors and that the risks are acceptable to lending banks and the host government. A collaborative process to develop effective risk-sharing strategies is encouraged.
Invest in enabling infrastructure (ports, grids, etc.)	A proactive and coordinated plan for the delivery of grid connections and port infrastructure is essential for the deployment of offshore wind (OFW) and for ensuring the scalability and timely delivery of projects. As noted above, government commitments to enable critical infrastructure investments will build confidence and encourage developers and banks to invest.
Non-price criteria (NPC)	When considering NPC in renewable energy procurement, a consultative process between government and industry must be conducted to ensure that the application of NPC aligns with wider policy goals, sector capabilities and market conditions.[29] GWEC encourages transparency in all NPC scoring, ideally with scoring criteria published in advance.
Incorporate capped penalty measures or milestone delivery dates to ensure timely project delivery	Incorporating capped penalty measures such as performance bonds and payments for delay/withdrawal – and other requirements such as inclusion of milestone delivery dates – can encourage developers to establish realistic schedules and prevent cost overruns. Conversely, governments may support this process by providing guarantees or other commitments on infrastructure, especially port and grid readiness, thereby aligning risks with developers.
Deploy MSP and unlock permitting bottlenecks	GWEC underscores the increasing urgency to address permitting bottlenecks and urges governments to prioritise simplifying and accelerating permitting timelines by establishing well-resourced, expert-led and coordinated permitting bodies. Developers and banks will be more confident in investing if they see that adequate resources are allocated to the agencies responsible for marine spatial planning (MSP) and permitting.
Broader industrial policies and growth strategies to support the ramp up the supply chain in parallel with auction delivery	GWEC encourages governments to collaborate with industry to align OFW auction designs with broader industrial policies and sector strategies, thereby creating a supportive ecosystem for the sector's growth. As reflected in our recent position paper on pro-business measures to drive local industrial development,[30] fostering supply chain value – including local content requirements – via wider incentive-based frameworks and industrial policies is far more effective than making these requirements specific to bid criteria within NPC processes.
Guidance for seabed leasing	GWEC cautions against the use of high seabed leasing fees (which pose high additional risk to the supply chain), especially for emerging OFW markets, and recommends adopting reasonable capped seabed leasing fees and NPC to capture wider benefits. For new OFW markets, GWEC encourages governments to set modest fees. Basing the fees on the recovery of administrative costs, as Australia does, may be a fruitful approach.
Guidance for procurement auctions	GWEC supports appropriate risk-sharing between developers and offtakers, including the introduction of predictable remuneration mechanisms such as CfDs and PPAs, ideally with some level of indexation. These mechanisms provide long-term revenue visibility, which is essential for attracting investment in large-scale infrastructure projects like OFW.

29. GWEC, Position Paper: A global wind energy industry perspective on integrating non-price criteria in auction frameworks, 2024.
30. GWEC, "Smarter localisation policy can deliver long-term economic stability and maximise benefits of wind energy, says new GWEC policy paper." 2025, https://www.gwec.net/gwec-news/gwec-statement-on-fostering-a-fair-open-and-transparent-trade-environment-for-global-wind-energy-1-0

Fast-tracking permitting

Smooth, efficient permitting is more than just a successful bureaucratic exercise: it is a strategic lever for governments to maximise offshore wind's economic and social benefits. Clear, predictable approval timelines reinforce the confidence created by transparent auction frameworks, attract long-term investment and signal a jurisdiction's openness to business and commitment to a stable regulatory environment. Faster approvals also stimulate local economic growth, as accelerated construction schedules bolster port activity, manufacturing and supply-chain jobs in coastal regions. It also supports efficient use of industrial manufacturing capabilities built by OEMs and their supply chain. In parallel, streamlined permitting enhances energy security and independence by ensuring domestic clean power comes online on schedule, rather than getting bogged down in delays. Ultimately, this approach delivers affordable, low-carbon electricity for citizens and industries—helping meet climate targets while keeping consumer prices in check. A well-designed permitting framework can thus transform a ''pain point'' into a competitive advantage.

Today, many OFW projects stall at the permitting gate, with aggressive bid levels and auction designs underestimating approval timelines. As projects sit idle awaiting permits, macroeconomic headwinds such as inflation, supply-chain spikes and financing volatility magnify capital costs or threaten cancellations, reinforcing the ''all-or-nothing'' risk that auction winners face. In other words, auction frameworks that set robust price signals must be matched by equally rigorous, transparent, and time-bound permitting rules.

Permitting regimes differ widely across jurisdictions, but the highest-performing frameworks share two key features: clarity of process and parallel track integration.

For example, South Korea's Offshore Safety and Security (OSS) Bill established a ''one-stop shop'' for offshore wind projects to simplify site selection, and permitting and licensing procedures. Site selection, grid expansion and interconnection planning, port and infrastructure investment, stakeholder engagement and the synchronisation of project development will all be coordinated

at the national level to accelerate offshore development. As a result of these reforms, the South Korean government announced plans to develop a 3.2 GW offshore wind cluster in South Jeolla Province through a public-private partnership. The project is expected to attract significant new investment and supply green energy to the region. It will also involve direct participation from local residents via regional development councils, setting a precedent for a transparent, inclusive and community-oriented approach to offshore wind development.

Similarly, in Germany, implementing the EU Renewable Energy Directive's ''overriding public interest'' principle has greatly streamlined renewable energy permitting. This legal provision mandates that renewable energy expansion be considered overriding public interest, reducing legal hurdles and expediting project approvals. This policy change helped Germany reduce its permitting backlog from 11 GW in 2019 to 3 GW in 2023. In 2023 alone, project approvals increased by 80% compared with 2022.[32] As a result, Germany commissioned 742 MW of new offshore wind capacity in 2024, more than in the previous year. Total operational offshore wind capacity reached 9.2 GW by the end of 2024.[33]

The accelerated permitting process has also driven substantial economic benefits. In 2024, wind energy sector job vacancies in Germany reached

31. https://www.rivieramm.com/news-content-hub/news-content-hub/koreas-offshore-wind-promotion-act-approved-by-national-assembly-84041
32. BNEF, ''Unlocking Investment to Triple Renewables by 2030'', 2024
33. https://strategicenergy.eu/germany-wind-turbine-approval-times/
34. ''Germany's green jobs double but staff shortage threatens growth, study shows,'' Reuters, 2025 https://www.reuters.com/world/europe/germanys-green-jobs-double-staff-shortage-threatens-growth-study-shows-2025-03-06/

53,000 – a 70% increase since 2019.[34] These examples demonstrate how well-designed permitting reforms can catalyse renewable energy deployment, attract investment and create jobs.

Policy recommendations

Accelerating permitting processes can unlock billions in investment, generate thousands of local jobs, and fast-track progress towards energy security and climate goals – as demonstrated by recent breakthroughs in South Korea and Germany.

1. **Enact clear deployment mandates and roadmaps:** Legislate offshore wind targets with milestones for both auction volumes and permitting timelines, giving industry long term visibility on pipeline size and schedule.
2. **Establish single-window or lead agency systems:** Centralise all permit reviews (environmental, safety, grid, maritime) under one authority (an example could be using a digital tool like the ''Easy Permitting'' portal[35]) to establish maximum review durations and reduce inter-agency fragmentation.
3. **Embed ''overriding public interest'' in national law:** Mirror Germany's implementation of the EU principle, ensuring courts value renewables expansion as highly as environmental standards, which helps reduce legal appeals and accelerates approvals.
4. **Designate permit-ready zones in advance:** Publish spatial plans with predetermined site areas and grid connection points (as Germany's 5th WindSeeG did with 2.5 GW) to give developers confidence that sites are technically and legally cleared for auction.
5. **Facilitate early stakeholder engagement:** Require pre-application consultations with fishing communities, coastal communities and environmental groups to identify and mitigate conflicts before formal review, minimising late-stage objections.

Permitting delays can translate into soaring financing costs, lost energy output, and potential grid integration bottlenecks. By adopting lessons from the likes of South Korea and Germany, and integrating permitting milestones into auction design, policymakers can de-risk project pipelines, bolster investor confidence, and secure a resilient domestic clean power supply.

35. WindEurope, ''Easy Permits,'' https://windeurope.org/easypermits/#:~:text=EasyPermits%20is%20a%20cloud%2Dbased,%2C%20transparent%2C%20and%20engaging%20way.

Making offshore wind finance fit for purpose

With larger project capacities and higher capacity factors, offshore wind is uniquely positioned to accelerate the energy transition by displacing fossil fuels at scale. This compelling narrative has driven investment in mature markets and prompted many emerging economies to rapidly develop frameworks to tap into this opportunity.

However, expanding into new frontiers, particularly emerging markets and developing economies (EMDEs), presents a set of new challenges. The inherent complexities of offshore wind development are compounded in EMDEs by higher costs of capital, currency volatility, political and regulatory uncertainty and limited government familiarity with the sector's risk-return profile. These factors inflate risk premiums, deterring both local and international financiers, and have led to affordability challenges and development concerns in otherwise promising markets.

Industry must evolve – as it has before

To unlock offshore wind's full potential in EMDEs, the industry must not stand still. As markets evolve and policies adjust, there are clear signs that stakeholders, including governments and financial institutions, are actively learning from recent headwinds.

This evolution is neither unprecedented nor insurmountable. The coal and gas independent power producer (IPP) wave of the 1990s and early 2000s saw banks and governments pivot – supported by indexed, long-term PPAs, sovereign guarantees and multilateral aid – to provide revenue certainty. Governments and multilateral development banks (MDBs) stepped in with sovereign guarantees, partial risk instruments and political risk insurance. Paired with standardised project finance structures such as SPVs and EPC-backed debt, these created replicable, bankable models. MDBs also built the capacity of local banks to co-finance projects, ultimately transforming power-sector finance in many regions. Offshore wind now requires a similar approach.

Why offshore wind needs a new generation of financial tools

Unlike other technologies, offshore wind is not a plug-and-play asset, nor does it fit easily into traditional infrastructure financing models. It demands billions in upfront capital and development timelines spanning as many as ten years, much longer than solar or onshore wind. Grid connection risks are higher, especially where offshore transmission systems are underdeveloped or non-existent. In addition, local financial institutions often lack the risk appetite or experience to underwrite such large and complex projects.

What is needed is a new generation of financial tools tailored for EMDEs:[37b]

- Longer-tenor loans and flexible repayment schedules that better align with offshore wind's extended development cycle.
- Revenue contracts indexed to inflation to hedge macroeconomic volatility.
- MDB support as risk mitigators, offering concessional capital, credit enhancement and political risk

Lessons from IPPs (coal/gas) and offshore wind requirements

What worked for IPPs (coal/gas)	What offshore wind needs now
Long-term indexed PPAs	Contract structures with tariff indexation and volume guarantees
Creditworthy offtakers or guarantees	Payment guarantees and grid or COD delay compensation or guarantees
Political risk insurance (Multilateral Investment Guarantee Agency (MIGA), World Bank (WB), Asian Development Bank (ADB)	Similar guarantees for marine spatial, permitting or curtailment risk
Standardised project finance templates	Adapted templates for offshore-specific risks (grid, vessels)
MDBs as lenders and risk takers	MDBs establishing early pipelines, infrastructure, and risk mitigation for foreign exchange (FX) and local currency risks

37b. Some of these instruments are also being deployed in advanced markets. For example, the European Investment Bank set up a *€5 billion counter-guarantee facility in December 2023 (part of the EU Wind Power Package) to back commercial bank guarantees for Europe's wind sector, aiming to unlock up to €80 billion in new investment, https://www.eib.org/en/press/all/2023-510-eib-commits-eur5-billion-to-support-europe-s-wind-manufacturers-and-approves-over-eur20-billion-in-financing-for-new-projects?

guarantees alongside risk mitigation tools that reduce private capital costs.
- Local capacity building to enable local and regional banks to co-finance projects and understand offshore wind risk profiles.

The role of smarter capital and smarter policy

Finance cannot evolve in isolation. Governments in EMDEs must shape a broader enabling environment by:
- Issuing **bankable revenue contracts** like CfDs or the Philippines' Renewable Energy Portfolio Agreement (REPA) that promote price stability and volume certainty.
- **Signalling predictable and transparent long-term steady project pipelines** to maintain investor confidence.
- **Streamlining permitting and grid development** to reduce project delays.

Making finance fit for purpose is not about more capital – it is about deploying smarter capital and appropriate risk-sharing mechanisms, tailored to offshore wind's unique characteristics, to promote offshore wind in EMDEs where the greatest upside lies. When banks, MDBs and governments work together, offshore wind can thrive, transforming EMDEs into champions of clean energy and resilient, investable infrastructure hubs.

> The critical question is no longer whether offshore wind can succeed in EMDEs – it is how we reshape finance to make it viable and fit for purpose.

Strengthening supply chains through cooperation and standardisation

The potential of offshore wind to stimulate coastal economies and solidify the energy transition has ignited a global race to develop highly localised supply chain capabilities. However, these supply chains – especially for emerging technologies – rely heavily on a stable, predictable and expanding international trade system to remain price-competitive and support an affordable, secure and sustainable energy future. Recent shifts in global politics and trade policies have undermined these foundations, threatening trade and investment flows vital for achieving economies of scale and accelerating the expansion of offshore wind technologies across continents.

As the ad-hoc and unpredictable use of tariffs and other restrictive measures becomes more prevalent, efforts to bolster the resilience of offshore wind power supply chains must intensify. Integrating strategic sections of offshore wind manufacturing in global supply chains exposes the industry to mounting political risk. Conversely, outright localisation – establishing key manufacturing stages near local markets – undermines the efficiency and cost gains derived from the international allocation of manufacturing processes that make the industry price competitive.

Overcoming supply chain vulnerabilities: Regional frameworks and market strategies

The industry's response must involve creating regional trade, investment and industrial policy coordination frameworks that balance supply chain resilience, efficiency and sustainability. While open and fair international trade relations are

LCRs and their effect in the Taiwanese wind power market

Offshore wind played a key role in Taiwan's 2018 Green Economy Vision, which pledged to generate 20% of the country's electricity from renewable sources by 2025. The successful implementation of the first two rounds of offshore wind power procurement demonstrated the economic viability of the sector, prompting authorities in Taipei to raise their ambitions to 15 GW for the 2026–2035 period under Round 3 of public auctions for offshore wind development.

However, this growing confidence in offshore wind power development was accompanied by a severe supply chain localisation strategy. The 2021 ''Offshore Wind Power Zonal Development Capacity Allocation Rules'' introduced extensive local content requirements (LCRs) in the country's offshore wind auction processes. In the Round 3 documents, the Industrial Development Bureau (IDB) has specified a total of 26 items as ''key development items''. A bidder will have to commit to procure locally all these key development items for at least 60% of its proposed capacity. This led to close to unsustainably high development costs for the local industry. High localisation requirements therefore hurt both the development of the local industry and the final consumer, scaring off international investors and undermining the expansion of the industry.

Following the EU's request for consultations with the WTO in July 2024 over Taiwan's offshore auction designs, Brussels and Taipei have now reached a preliminary agreement to relax the stringent LCRs. Taiwan has committed to introducing greater flexibility in its offshore wind project implementation and removing localisation requirements in future allocation rounds (European Commission, 2024).

GWEC's Role in Creating a Unified Wind Industry: Supply Chain Development in APAC and Standardisation

In recent years, GWEC has contributed to and led efforts to deepen and expand collaboration on supply chains, finance and grid development across the Asia Pacific (APAC) region. Our market intelligence teams have produced comprehensive analyses and briefs to map the regional wind energy supply chain as accurately as possible.

One flagship publication, Mission Critical: Building the Asia Pacific Wind Energy Supply Chain for a 1.5°C World, launched at the GWEC APAC Summit last year, outlined our vision for how governments, civil society, industry and financial actors can jointly advance regional supply chain development to achieve net zero targets. This report marks GWEC's first regional supply chain study, with a second focused on Latin America expected to be released at COP30. We have also published country-specific analyses, such as the offshore wind supply chain study for the Philippines, among others.

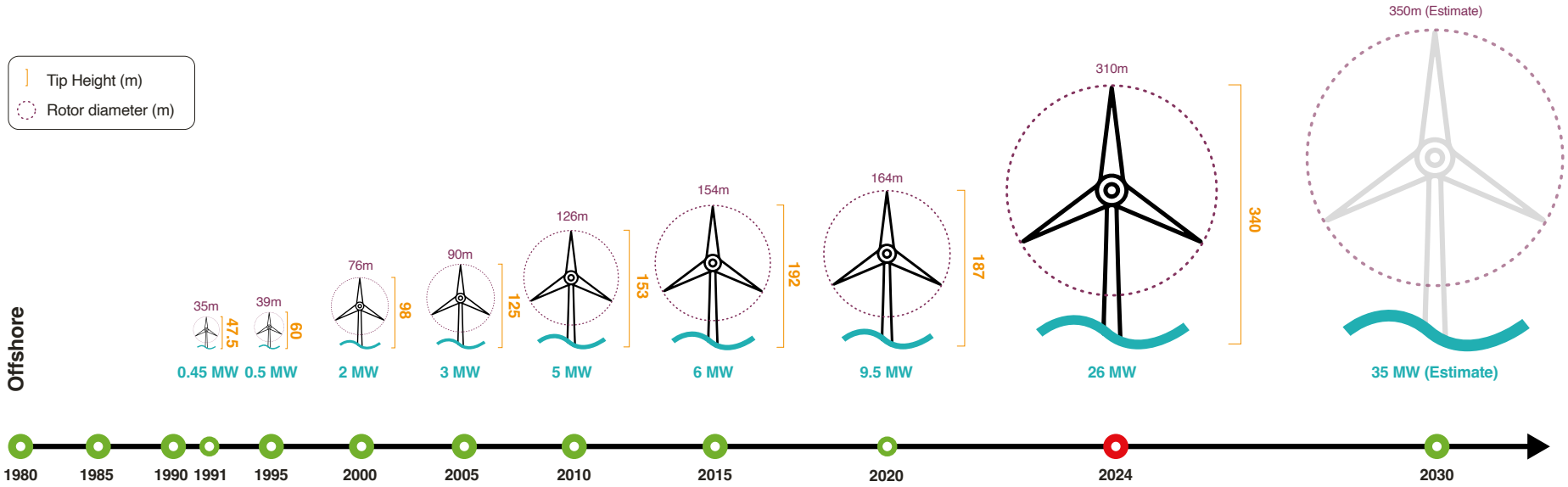
GWEC's working groups, including the Manufacturers and Developers Supply Chain Forums, alongside partner organisations like the Global Offshore Wind Alliance, have played a key role in fostering collaboration and promoting best practices for offshore wind supply chain growth in APAC. Strategic meetings in Dubai and Incheon have laid the foundation for future regional cooperation, while GWEC and Bolton Consulting Group (BCG) are working together to support component standardisation and industrialisation across the global wind industry.

The overarching goal of these discussions is to adapt the principles of the North Seas Energy Cooperation (NSEC) framework – originally designed for Europe – to Southeast Asia, under the umbrella of ASEAN's energy collaboration initiatives. This effort encompasses a set of interrelated and complementary objectives:

- Facilitating cross-border electricity trade and joint project development
- Promoting regional grid integration and optimisation
- Advancing region-specific marine spatial planning
- Developing supportive financial packages and frameworks
- Coordinating ambitious renewable energy targets
- Aligning on broader issues such as carbon markets and standardisation

Bornholm Energy Island is a strong example within the NSEC project network of the type of supply chain cooperation that could be replicated in other regions. It consists of a pioneering German-Danish project that will create a joint offshore wind power hub on Bornholm to deliver 3 GW of green electricity and enable cross-border energy trading via HVDC infrastructure. It represents a new model for international energy cooperation, integrating offshore wind into interconnected grids to accelerate the green transition across Europe.

Trend of Offshore turbine size, 1980-2030



Source: GWEC Market Intelligence

necessary, they are not sufficient to counteract the sector's supply chain vulnerabilities. These policies must be combined with market-driven industrial strategies that build local economies of scale aligned with each country's competitive advantages.

Regional coordination, collaboration, cooperation and dialogue between governments, international institutions and key companies in offshore wind power supply chains are crucial. Balancing fair trade practices with incentive-based industrialisation policies while ensuring a level playing field that fosters efficiency gains and technological innovation, requires regional leaders to maintain robust dialogue both among themselves and with industry representatives. It falls to policymakers to explore new methods and venues to coordinate the development of trade-friendly industrialisation policies capable of creating conductive market conditions where offshore wind power industries can prosper.

The economic and political synergies among members of regional blocs will make cooperation in strategically sensitive sectors such as offshore wind significantly more efficient. Frameworks such as the North Seas Energy Cooperation (NSEC) scheme as well we as Esbjerg, Ostend, Odense and Marjenborg declarations demonstrate how non-binding regional policy commitments can boost not only regional and local supply chain capabilities but also grid development.

These regional models of cooperation can be extended to new geographies, particularly in Southeast Asia and the broader Asia Pacific region, where the potential for the development of offshore wind supply chains is among the highest in emerging markets. However, it is essential to maintain a certain degree of interregional interoperability to ensure industry resilience against regional shocks. GWEC advocates for regional integration to be balanced with global dialogue among industry

Fujian Zhangpu Liu'ao Phase II offshore wind project

Case Study: Goldwind's Benchmark: The world's first commercially operational 16 MW offshore wind turbine

Provided by Goldwind

Goldwind has established a new global standard for offshore wind power with the deployment of its GWH252-16MW turbine, currently the world's largest-capacity offshore wind turbine in commercial operation.

At the Fujian Zhangpu Liu'ao Phase II offshore wind project, a fleet of 20 Goldwind V20-series turbines, including 7 units of GWH252-16MW and 13 units of GWH252-14.3MW, achieved full-capacity grid connection in July 2024. Meanwhile, the Guangdong Yangjiang Qingzhou Phase VI offshore wind project, equipped with 74 GWH252-13.6MW turbines, is scheduled for full-capacity grid connection by the end of June 2025.

The GWH252-16MW turbine is built on Goldwind's V20 platform, a flagship product customised for medium-to-high wind speed regions, which has already surpassed 1 GW in offshore installed capacity. The V20 series features an expandable rotor diameter from 252 meters to 266 meters, with unit capacities ranging from 13.6 MW to 16.7 MW. It offers high efficiency, exceptional reliability and strong grid compatibility, supporting hybrid systems including energy storage, hydrogen production, solar and aquaculture.

Engineered to withstand extreme weather, the GWH252-16MW

Yangjiang Qingzhou Phase VI offshore wind project

incorporates a typhoon-resilient smart control system along with robust, customised components. During Super Typhoon Doksuri in 2023 (wind speeds exceeding 45 m/s), it generated over 380,000 kWh daily. In 2024, more than 30 units of the 13.6 MW model operated safely through Super Typhoon Yagi, enabled by Goldwind's proprietary remote-control system that integrates BeiDou satellite communication and onboard generators for real-time yaw control and risk mitigation.

Validated through projects such as Zhangpu Liu'ao Phase II and Yangjiang Qingzhou Phase VI, Goldwind's 16MW offshore turbine has become a global benchmark, demonstrating superior efficiency, reliability and typhoon resilience – setting a valuable standard for large-scale, stable and efficient offshore wind development worldwide.

Goldwind

leaders to standardise key components and strengthen the sector's resilience in the face of regional disruptions.

Addressing technical and manufacturing challenges

As offshore wind turbine capacities continue to grow – unit power outputs have reached 26 MW and are likely to keep setting new records – blade lengths, tower heights, floating foundations and balance of plant (BOP) systems are also undergoing rapid upgrades and iterative advancements. However, the industry lacks a unified framework as the lack of well-balanced risk allocation along the value chain and the fierce competition among OEMs has increased design and manufacturing complexity. Frequent blade fractures and tower collapses highlight technical bottlenecks in materials and structural design. Blade materials struggle to meet the strength, stiffness and durability demands of longer blades, while higher towers face stress concentrations and localised structural instability.

38. DNV, https://www.dnv.com/news/dnv-launches-joint-industry-project-to-advance-offshore-wind-concrete-floaters-standards-250813/#:~:text=DNV%2C%20the%20independent%20energy%20expert,tailored%20for%20floating%20offshore%20wind

Recommendations

- **Foster industry-wide collaboration** among manufacturers, research institutes and other stakeholders to develop unified protocols for validating new materials and structural configurations.
- **Pool resources and expertise** to systematically tackle critical challenges through enhanced testing procedures and more robust standards.
- **Advance BOP-level components** such as substations, which transmit power from the offshore wind farm to the onshore grid, through initiatives such as DNV's joint industry project on floating offshore wind substation technology and standards.[38]

Standardisation and industrialisation for stability

The shortening life cycles of turbine models force component suppliers and developers into a cycle of high upfront investment and rapid product turnover, compressing inevitably reduce the number of foundations and towers that can be produced within a given timeframe.

Case Study: Boosting productivity in offshore wind fabrication

Provided by Lincoln Electric

Offshore wind monopile production demands both high throughput and weld quality due to the scale and complexity of components. Monopiles with diameters of 9 to 10 metres are common, with significantly larger designs already in development and new factories capable of producing diameters of up to 15 metres. Traditional welding methods – typically conventional submerged arc welding (SAW) using two to five wires – tend to offer limited productivity due to joint design constraints, low deposition rates (amount of weld metal deposited in the welding groove), and process speed inefficiencies. To meet future installed capacity targets, innovation in manufacturing welding technology is essential.

Industry challenges

Global fabricators of fixed and floating foundations face increasing pressure to reduce cycle times, maintain or improve quality and boost facility productivity – all without compromising weld integrity. Installed capacity targets will not be met without a technological breakthrough.

Conventional SAW setups with two to five wires typically yield deposition rates below 27 kg/hr, often involving joint designs that require high filler volumes. Increasing factory output is challenging because lower deposition rates in this range directly limit the maximum travel speed and volume of each weld pass. More weld passes and slower travel speeds

Tandem (LSO) process in operation and inside typical offshore monopile weld joint

Proven solution: Lincoln Electric's Long Stick-Out process

The Long Stick-Out (LSO) solution extends the contact tip-to-work distance (CTWD) up to 160 mm by

payback periods and sharply increasing financial pressure. The absence of standardisation has become a core constraint on the stable, efficient development of the offshore wind supply chain. Standardisation is essential to counteract this, focusing on three core areas:

- **Product design:** Modular architecture design and component standardisation to reduce customisation.
- **Process engineering:** Implement phased verification mechanisms based on Manufacturing Readiness Levels (MRL) and adopt Design for Manufacturing (DfM) processes to deepen R&D-manufacturing collaboration.
- **Organisational management:** Develop replicable, lean production systems through matrix collaboration between Agile Delivery Units (ADUs) and Centers of Excellence (CoEs).

The offshore wind industry can draw on the mature practices of the automotive and aerospace industries to strengthen cross-departmental collaboration and build a replicable and scalable industrial ecosystem. This will help the sector transition from conceptual innovation to standardised production, ensuring it develops competitively and sustainably.

preheating the wire through resistive heating (I^2R effect – see image below of wire exiting the contact tip). This patented process innovation enables higher melt-off rates at the same current, significantly increasing deposition rates while maintaining weld quality.

Higher melt-off rates enable faster travel speeds and/or fewer weld passesThe tandem two-wire LSO SAW process demonstrated more than a 30% increase in travel speed and deposited weld metal, while also reducing the number of welding passes – often by much more.

Key benefits for offshore wind foundation fabrication

Higher **deposition rates** mean more weld metal deposited, which reduces the manufacturing time for each monopile section. Industry benchmarks show deposition rates of up to 37 kg/hr with tandem (two-wire) SAW, and exceeding 40 kg/hr with triple-arc (three-wire) SAW, with some end users reporting even higher values. This places the LSO process at the top end of welding performance, representing **a minimum 30% – and up to 100% – improvement over conventional processes, typically achieve under** 27 kg/hr.

Key benefits for offshore wind foundation manufacturers:

Faster travel speeds exceeding 80 cm/min in 100 mm sections have been documented in typical offshore wind narrow groove weld joints.

Reduced **welding consumables:** The non-conductive and non-magnetic welding assembly of the LSO process allows access to narrower weld grooves (below 16°). This can reduce filler metal volume by up to 21%, with an estimated saving of approximately 125 kg per weld seam on 10metre-diameter-sections.

Plug-and-play retrofit or new system integration: Minimal equipment changes are required with the latest-generation Lincoln Electric SAW power source (Power Wave® AC/DC 1000SD Advanced Submerged Arc Welder). For new installations, the use of LSO is **well-established worldwide, with Lincoln Electric integrator partners in Europe, the Middle East, North America and Asia already using the technology.**

Unchanged operator experience: Minimal training is required, as operators see a familiar welding process moving at a faster speed and completing each full weld seam in less time. Increased deposition efficiency lowers consumable costs as the flux-to-wire ratio drops.

Conclusion

Lincoln Electric's LSO technology has been deployed worldwide by fixed foundation manufacturers. This process solution offers a transformative leap in foundation productivity for offshore wind fabrication. Thanks to higher deposition rates, faster travel speeds, and reduced joint volumes, fabricators can achieve significant cost savings, shorter lead times and improved weld consistency.

Enabling grid and transmission

Grid readiness is one of the defining challenges for offshore wind development. While governments and industry are scaling up offshore wind targets, the transmission infrastructure required to connect these projects is not keeping pace. Without significant and timely investment in both offshore and onshore grids, projects risk delay, curtailment, or cancellation – even when permits are secured and turbines are ready to install.

A narrowing bottleneck

According to the IEA, over **3,000 GW of renewable energy projects**[39] are currently queueing for grid connection globally – five times the wind and solar capacity added in 2022 alone. Offshore wind is particularly exposed to this bottleneck as projects tend to rely on long, dedicated transmission infrastructure and must coordinate across multiple permitting, regulatory and planning regimes.

Transmission development typically lags behind generation planning by years. In some regions, grid connection timelines have become a leading cause of project uncertainty. Offshore wind zones across Europe, Asia and the United States face mounting constraints from limited substation capacity, delays in grid reinforcements and the absence of anticipatory investment frameworks. Table 1 summarises recent delays in offshore transmission infrastructure, highlighting causes and lessons learned.

Transmission as a strategic enabler

Transmission is not merely a technical enabler – it is strategic infrastructure that determines how fast and how far offshore wind can grow. Without coordinated offshore and onshore grid development, even the most competitive projects cannot deliver power efficiently. In an increasingly electrified economy, inadequate grid infrastructure risks missed climate targets, higher energy insecurity, and underutilised industrial assets.

Modern offshore wind transmission planning must address:

- **Connection certainty:** Projects need timely, bankable connection points alitgned with auction timelines and seabed leasing.
- **System efficiency:** Smart grid design can reduce curtailment and minimise the need for costly redispatch measures.
- **Regional integration:** Cross-border interconnectors and offshore hubs enhance security of supply and optimise renewable dispatch.
- **Cost-effectiveness:** Clear cost-allocation rules avoid developer uncertainty and ensure efficient public-private financing.

As offshore wind becomes a central pillar of electricity systems, it must also contribute to grid stability and reliability. This means equipping offshore wind farms with grid-forming technologies and other system-support tools that allow them

Offshore transmission delays: Causes and lessons from key markets

Country	Project / area	Delay reason(s)	New timeline	lessons/Implications
Germany[40,41]	Borkum Riffgrund 3 (900 MW)	COVID-related supply chain issues	Q1 2026 (was Q4 2025)	Need for resilient procurement & early supply chain alignment
	NOR-9-1, NOR-9-2, NOR-11-2	HVDC supply chain bottlenecks, coordination delays	Up to 2-year delay	Importance of anticipatory grid planning and capacity buffers
Belgium[42]	Princess Elisabeth Island (HVDC components)	Surge in HVDC costs due to global supply chain issues	3-year delay	Financial agility needed to respond to price volatility
Netherlands[43]	National offshore programme	Grid and supply chain delays affecting target delivery	Target at risk	Need for integrated planning across grid and permitting
China	Connections in Guangdong and other coastal provinces (2024)	Insufficient grid infrastructure, complex approvals, deep-water transition	36% drop in additions compared to 2023	Need to accelerate grid buildout in tandem with capacity expansion

Source: GWEC Market Intelligence, June 2025

39. Electricity Grids and Secure Energy Transitions, IEA. 2023. https://iea.blob.core.windows.net/assets/70f2de45-6d84-4e07-bfd0-93833e205c81/ElectricityGridsandSecureEnergyTransitions.pdf
40. https://www.offshorewind.biz/2024/01/31/germany-facing-offshore-wind-grid-expansion-delays/
41. https://www.offshorewind.biz/2024/12/06/cod-for-900-mw-german-offshore-wind-farm-pushed-back-from-end-2025-to-early-2026/
42. https://www.elia.be/en/press/2025/02/20250204_elia-temporarily-postpones-signing-hvdc-contracts-for-princess-elisabeth-island
43. https://www.rechargenews.com/wind/dutch-to-miss-massive-offshore-wind-target-over-supply-chain-and-grid-delays/2-1-1635608?zephr_sso_ott=QzUpMx

to provide essential services such as inertia, frequency regulation and voltage control. Offshore assets will need to be designed not only to deliver clean power, but also to stabilise the grid as conventional generation retires.

The case for proactive grid planning

The most successful offshore wind markets are those that plan transmission infrastructure ahead of project development. Germany, Denmark and the Netherlands have adopted centralised models where the transmission operator is responsible for building offshore connections based on national or regional plans. These approaches offer faster timelines, lower costs and greater investor confidence.

In contrast, markets where developers must self-build or negotiate grid access on a case-by-case basis – such as in parts of Asia and North America – often face longer delays and higher risks. Anticipatory planning is not a luxury – it is a necessity for delivering the scale of offshore wind required by 2030 and beyond.

Case Study: Germany's pioneering centralised approach to offshore grid development

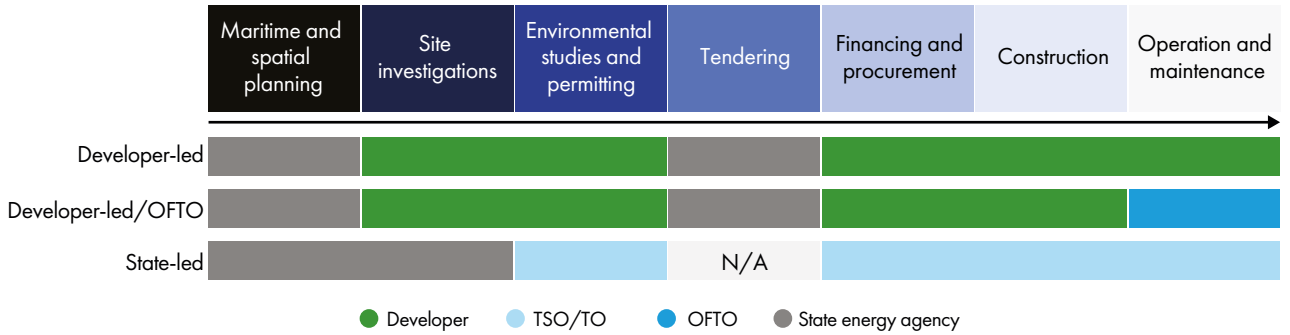
Under Germany's Renewable Energy Sources Act (EEG) and Energy Industry Act (EnWG), Transmission System Operators (TSOs) are legally required to connect offshore wind projects, plan grid expansion and recover costs via regulated tariffs. This model offers clear timelines, reduces investor risk and enables anticipatory grid planning.

A critical element is the Offshore Grid Development Plan, which integrates seabed leasing and grid infrastructure planning to ensure that grid connections are built in synchrony with offshore deployments. Germany's approach is influencing EU-level initiatives under the TEN-E regulation.

As part of its long-term strategy, Germany has already approved over 48 GW of offshore grid connection capacity to be delivered by 2045, supporting targets of 30 GW by 2030, 40 GW by 2035 and 70 GW by 2045. This scale of pre-approved capacity reflects Germany's commitment to transmission as a strategic enabler of offshore wind.

In addition to traditional models, new approaches are emerging to simplify procurement and accelerate grid buildout. One such example is the concept of functional tenders—procurement models built around system-level performance requirements rather than detailed technical prescriptions. These tenders aim to focus on key metrics such as rating, availability, reliability, and maintainability, allowing suppliers greater flexibility in how they meet those needs. By reducing complexity and documentation burden, functional tenders aim to lower costs, shorten delivery timelines, and help address one of the major bottlenecks facing offshore grid deployment.

Overview of offshore grid delivery models



Source: DNV

Comparing offshore grid connection models

While the need for anticipatory grid planning is widely recognised, countries continue to adopt different offshore grid delivery models depending on their regulatory structures, market maturity and strategic priorities. Table 2 provides a high-level comparison of three common approaches (centralised, developer-led and hybrid),highlighting respective responsibilities, cost recovery mechanisms, advantages and challenges.

The Figure belove illustrates how responsibilities for offshore grid delivery are distributed across different phases of development, from early spatial planning to long-term operation and maintenance. This reinforces how delivery models influence the pace, coordination and efficiency of offshore wind expansion.

Comparative Overview of Offshore Grid Connection Models				
Model	Responsibility for rid buildout	Cost recovery	Advantages	Challenges
Centralised (e.g. Germany)	TSO or public authority	Regulated tariffs	Lower risk, anticipatory planning	Requires strong governance
Developer-led (e.g. US)	Wind farm developer	PPA or negotiated terms	High flexibility for developers	Delays, risk fragmentation
Hybrid (e.g. UK OFTO)	Developer builds, OFTO operates	Competitive tender	Attracts private capital post-build	Timing and transfer complexity

Source: "Electricity Grids and Secure Energy Transitions," IEA. 2023

Unlocking effective grid solutions

To ensure that transmission enables the global expansion of offshore wind, governments and grid operators should:

- **Develop national offshore grid plans** that are fully integrated with seabed leasing and auction strategies.
- **Assign clear connection responsibilities** (e.g. centralised vs decentralised models), with transparent timelines and regulatory support.
- **Invest in onshore reinforcements and offshore hubs** that support project clusters and future interconnectors.
- **Accelerate permitting for transmission** using best practices from renewable energy permitting reforms (e.g. go-to zones, digitalisation).
- **Clarify cost-sharing mechanisms** between TSOs, developers and end-users to de-risk investments and ensure fair burden distribution.
- **Ensure supply chain readiness** for key components such as transformers, HVDC cables and substations, addressing global shortages.

Case Study: Harnessing Innovation: The Future of Offshore Wind Project Inspections

Provided by Bureau Veritas

As the offshore wind industry accelerates globally, robust and efficient project oversight becomes increasingly critical. Offshore wind farms require the seamless coordination and delivery of specialised components and systems from a wide array of suppliers and contractors. Any disruptions, quality issues or safety incidents can lead to costly delays and operational challenges, making effective project inspections a strategic imperative both during the CAPEX and OPEX stages

Traditional inspection methods are becoming obsolete. A recent industry study found that nearly 80% of leaders acknowledge that their current inspection processes are outdated. Fragmented data, manual workflows and a lack of real-time visibility are just some of the challenges that plague project developers and asset owners.

The big question is, how do we move the needle? The offshore wind industry can no longer afford to view inspections as just a necessary cost – it is a strategic lever for reducing risk, enhancing quality and unlocking value. By harnessing digitalisation, companies can take a more proactive, data-driven approach to managing their projects.

At the heart of this transformation is the integration of advanced technologies like 3D modelling, AI, machine learning and automated inspections. A centralised digital platform can consolidate data from across the supply chain and project sites, generating real-time insights to identify potential issues and bottlenecks before they impact delivery and operations. Digital data capture can drive the shift from traditional ''spot checks'' to continuous monitoring of on-site activities, covering everything from component manufacturing to turbine installation and commissioning right through the project's operational life.

Bureau Veritas is improving offshore wind turbine inspections through the use of automated drones and AI. The company's Drone Docks and certified flight plans enable autonomous data collection, generating digital assets (data structures with 3D Gaussian Splatting skins) and AI-tagged reports that clients can integrate into their systems. This approach supports digital asset and integrity management and eliminates reliance on subcontractors.

Key benefits

- Enhanced inspections with high-resolution drones and continuous monitoring support better decision making during OPEX stages.
- Significant cost savings through client-managed inspections and efficient drone operations.
- Future-proof solutions through scalable technologies that support extended reality (XR) and third-party payloads.
- Seamless integration with client systems for digital asset management and structural integrity monitoring.

However, digital capabilities alone are not enough. Unparalleled industry expertise is essential to maximising the value of offshore wind project inspections. A global network of specialised inspectors, engineers and technical experts can provide on-site support, leveraging advanced testing methodologies and best practices. Subject Matter Experts offer offsite support through remote access tools.

The offshore wind industry stands at a crossroads, facing ambitious growth targets that demand exceptional project performance and expanded supply chains, all while ensuring quality and safety. By harnessing the power of innovation, companies can position themselves to capitalise on the industry's immense potential.

Reclaiming the public narrative on offshore wind energy

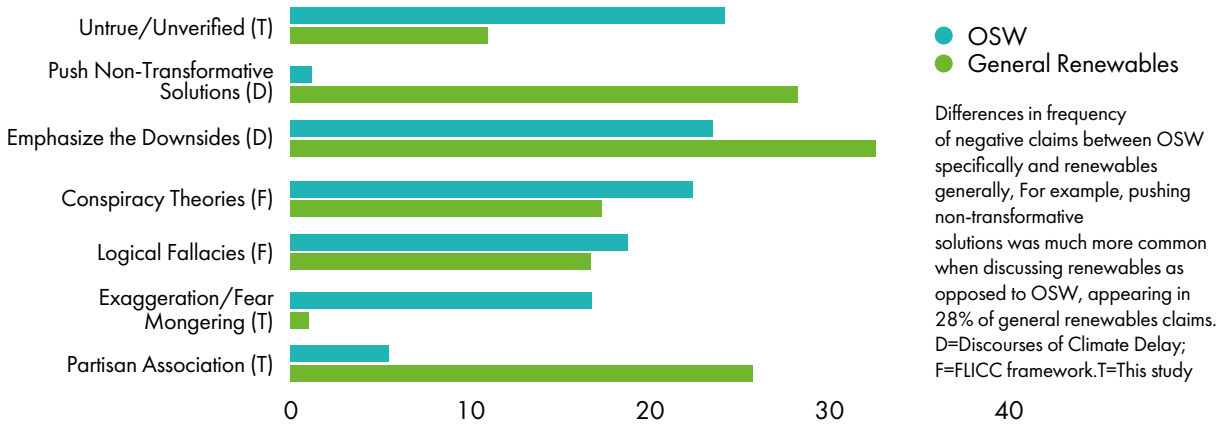
In recent years, misinformation and disinformation about offshore wind have become alarmingly widespread, appearing in local debates, online forums and even Congressional hearings. A Brown University study reviewed every mention of "offshore wind" in the first half of the 118th Congress (January–July 2023), cataloguing 441 claims. Of these, 165 targeted offshore wind with tactics like sensationalising costs, exaggerating environmental risks and repeating conspiracy theories.

This pattern is not unique to the US – similar disinformation rhetoric has emerged in other countries, undermining public trust and slowing project development globally. As these false narratives gain traction at the highest levels of leadership, they quickly permeate broader public discourse – fuelling distrust and contributing to project delays and cancellations and creating a chilling effect on future investment.

A vivid example of disinformation's real-world impact is New Jersey's much-anticipated first offshore wind farm. Originally expected to generate 2.2 GW of power, enough to supply more than one million homes, the project was ultimately cancelled.[49] While the official

48. NJ Spotlight News, "Offshore wind energy in New Jersey: On pause or dead in the water?" https://www.njspotlightnews.org/2025/05/questioning-if-nj-offshore-wind-energy-development-dead-in-water/
49. NJ Spotlight News, "Offshore wind energy in New Jersey: On pause or dead in the water?" https://www.njspotlightnews.org/2025/05/questioning-if-nj-offshore-wind-energy-development-dead-in-water/

Frequency of Negative Claims About Offshore Wind in U.S. Congress[48]



Source: Brown University Climate & Development Lab, "Spinning Negativity Discourses of Delay on Offshore Wind in the 118th Congress," Feb 2024, https://drive.google.com/file/d/1OUG27FPi37fxkE7otuexKN5-TaNO06BP/view

explanation cited macroeconomic challenges, viral reports falsely claimed turbines were killing whales. These misleading stories sparked fierce community opposition and rallied conservative media around a narrative that has already been repeatedly debunked by marine scientists. This narrative fuelled legal challenges and community backlash that lengthened timelines, increased costs and finally resulted in project cancellation.

Similar narratives have stalled projects in other countries as well. In late 2023, viral images of beached whales superimposed with wind turbines appeared on posters, billboards and social media across Illawarra and Port Stephens, Australia, stoking fear that turbines would kill whales, despite scientists' clear refutations these claims. Such emotive visuals, used by fishing groups and anti-wind coalitions, helped drive large community rallies (for example, roughly 1,000 attendees at Flagstaff Hill) and prompted politicians like Barnaby Joyce and former PM candidate Peter Dutton to echo unfounded concerns.[50] By February 2025, under mounting political pressure, particularly the Coalition's pledge to scrap the Illawarra zone if elected, the project developer formally requested that the Albanese government delay its feasibility application until after the federal election, citing "sovereign risk" and investment uncertainty created by fear-mongering rhetoric.[51] This sequence shows how disinformation can reshape public debate and directly stall project timelines – even before any turbines are installed.

Because these sensationalised stories continue to dominate public discourse, despite expert rebuttals, offshore wind developers must recognise misinformation and disinformation as systemic threats that demand urgent, coordinated attention. Left unaddressed, these deceptive narratives erode public trust, skew policy debates and deter investors – creating obstacles not just for individual projects but for the entire sector's growth.

Understanding the source of disinformation

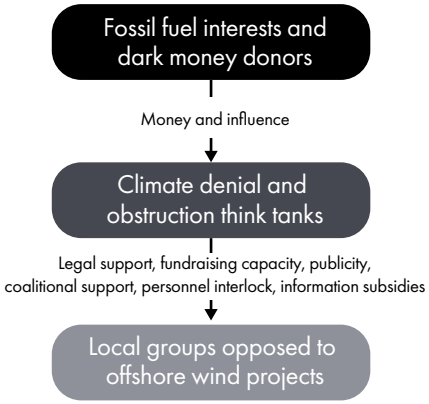
Disinformation campaigns targeting offshore wind do not emerge in a vacuum. A study by Slevin Kattrup and Marcil shows that, in the US, these campaigns are largely orchestrated by well-funded fossil-fuel interests exploiting national think tanks, astroturf coalitions and sympathetic politicians. Community-led "grassroots" groups are often the final link in a much larger network of funding and influence.

52

At the apex of these networks sit fossil-fuel interests and dark-money donors – oil and gas companies, petrochemical trade associations and billionaire foundations – that funnel millions of dollars into climate-denial and obstructionist think tanks. For example, from 2017 to 2021, the non-profit organisation State Policy Network (SPN) received over $24 million from DonorsTrust, the Charles Koch Foundation, and related "dark money" sources to produce reports and talking points emphasising offshore wind's alleged

50. The Guardian, "How a false claim about wind turbines killing whales is spinning out of control in coastal Australia," https://www.theguardian.com/environment/2023/nov/12/how-a-false-claim-about-wind-turbines-killing-whales-is-spinning-out-of-control-in-coastal-australia?utm_source=chatgpt.com
51. The Guardian, "Offshore windfarm developer asks Labor to delay application on Illawarra project until after election" https://www.theguardian.com/environment/2023/nov/12/how-a-false-claim-about-wind-turbines-killing-whales-is-spinning-out-of-control-in-coastal-australia?utm_source=chatgpt.com
52. https://www.theguardian.com/australia-news/2025/feb/28/bluefloat-energy-asks-labor-to-delay-illawarra-wind-farm-project-application-until-after-federal-election
53. Isaac Slevin, William Kattrup, Charlotte Marcil, and J. Timmons Roberts, "Beyond Dark Money: Information Subsidies and Complex Networks of Opposition to Offshore Wind on the U.S. East Coast," Energy Research & Social Science 119 (2024): article 103829, https://doi.org/10.1016/j.erss.2024.103829

Network of anti-offshore wind influence: From fossil fuel donors to local opposition[54]



Note. Schematic diagram of the initial understanding of the flow of influence in the anti-wind network in the Northeast United States. Arrows show the general direction of influence.

''downsides'' (e.g., inflated cost forecasts, exaggerated wildlife impacts).

These think tanks produce ''information subsidies'' – pre-packaged white papers, slide decks, social-media graphics and legal briefs – that local anti-wind groups can deploy at town hall meetings, community rallies or in op-eds. In effect, a local fishing-industry coalition or citizen watchdog group doesn't have to commission its own environmental studies or economic analyses; it can simply repurpose the think tank's talking points as if they were independent research. As a result, heated protests or lawsuits that appear to emerge spontaneously in places like coastal New Jersey or Illawarra, Australia, are often powered by ''ready-made'' disinformation that originated, much earlier, in a few well-funded policy shops.

54. Isaac Slevin, William Kattrup, Charlotte Marcil, and J. Timmons Roberts, ''Beyond Dark Money: Information Subsidies and Complex Networks of Opposition to Offshore Wind on the U.S. East Coast,'' Energy Research & Social Science 119 (2024): article 103829, https://doi.org/10.1016/j.erss.2024.103829

By the time these narratives reach local communities, they seem credible and authentic – with claims like ''our neighbors are worried about whales'', or ''our fishing communities say turbines will wreck their livelihoods''. In reality, they were seeded by national-level actors whose chief motive is to preserve fossil-fuel market share. In short, what looks like organic grassroots opposition is frequently the downstream product of a coordinated, multi-million-dollar campaign designed to stall or kill offshore wind projects before construction ever begins.

Reclaiming the public narrative demands a united, industry-wide effort. For decades, the fossil fuel sector has poured billions into shaping public discourse. Offshore wind – now a mature industry – must meet that scale with its own coordinated, proactive approach. Only by pooling resources, aligning messaging and engaging communities can the wind sector build the broad support needed to outpace disinformation and move projects forward.

Coordinated strategies to combat offshore wind disinformation

Given the prevalence of the issue, a lot is being done to fight disinformation

against offshore wind. GWEC is developing a Disinformation War Room – an AI-powered dashboard that tracks false narratives in real time, uses pattern recognition and predictive modeling to anticipate emerging threats, and integrates regional insights from national wind associations.

Meanwhile, the Climate Action Against Disinformation (CAAD) coalition – comprising more than 50 climate and anti-disinformation groups – researches how public narratives around wind energy (and renewables more broadly) evolve, identifying the triggers and tactics that shift opinion.

On the international stage, the UN's Global Initiative for Information Integrity on Climate Change brings together governments, NGOs and tech platforms to develop best practices for countering deceptive content and amplifying accurate, science-based messaging.

But tracking and research alone aren't enough. Offshore wind developers must lead outreach through consistent, fact-based communication – highlighting the benefits of offshore wind before falsehoods take hold. This requires a dual approach: global alignment on core talking points, coupled with local outreach tailored to resonate in local communities. The industry already collaborates with ports, schools and NGOs. It must now take the next step by partnering with local leaders and non-profits on tailored communications campaigns that reflect regional concerns and help curb the spread of disinformation.

At the same time, offshore wind's global image needs recalibration. As political rhetoric in some markets grows more charged, the sector must speak with one voice – responding swiftly to misleading claims. In addition to a rapid response, it is equally important to invest in positive storytelling. By spotlighting success stories and local champions – particularly in high-potential markets with limited wind-farm experience – the industry can actively reshape perceptions and build enduring trust.

MARKET STATUS 2024

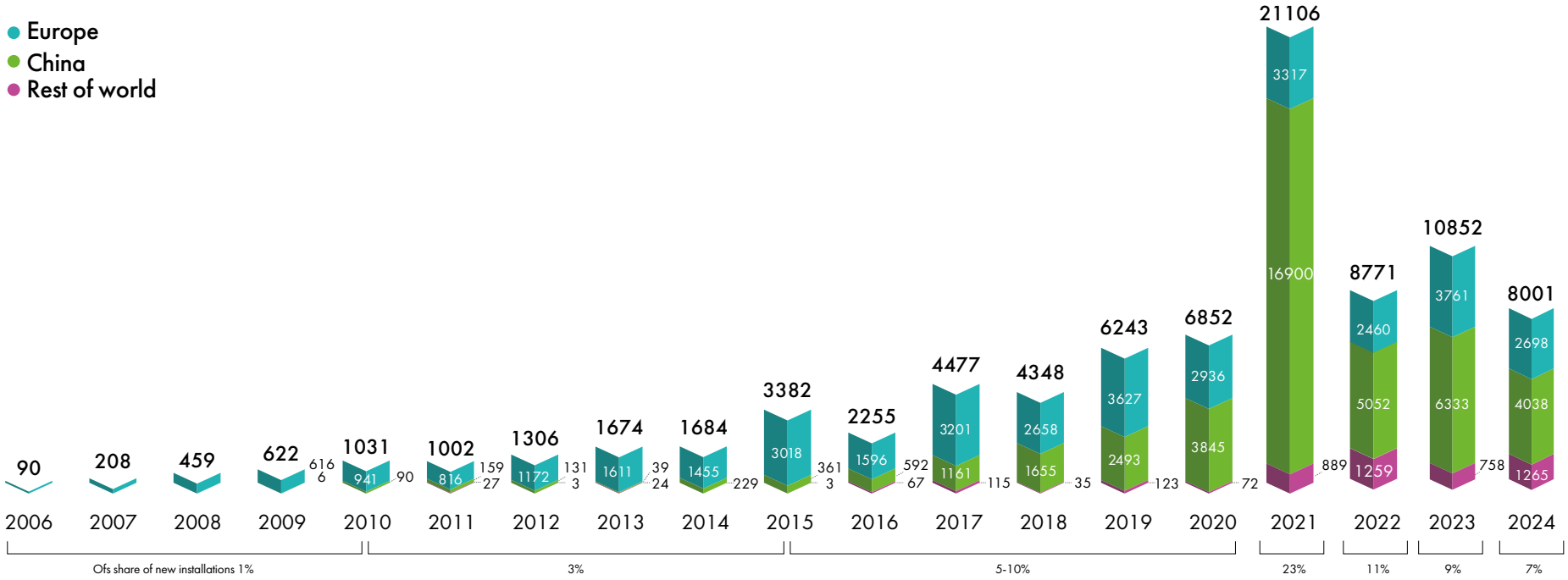
Annual Installations

At the end of 2024, global offshore wind capacity reached 83.2 GW, with 8 GW of additions being grid-connected last year – 26% lower than additions in 2023 – making 2024 the fourth-highest year for new installations in offshore wind history.

For the seventh consecutive year, China added the most offshore wind capacity of any country. With 4 GW added to the grid in 2024, the country reached 41.8 GW by the end of 2024. The era of 'grid parity' for offshore wind – whereby the electricity it generates receives the same remuneration as that from coal-fired power plants – has now entered its fourth year. Connecting new offshore wind capacity of 5 GW in 2022 and 6.3 GW in 2023 without the government's financial support has demonstrated the industry's resilience – although new additions fell 36% in 2024 compared to 2023. Insufficient grid connections and complex maritime approvals and coordination are the main reasons for the drop, alongside a slower-than-expected transition from nearshore to deep-water offshore wind development.

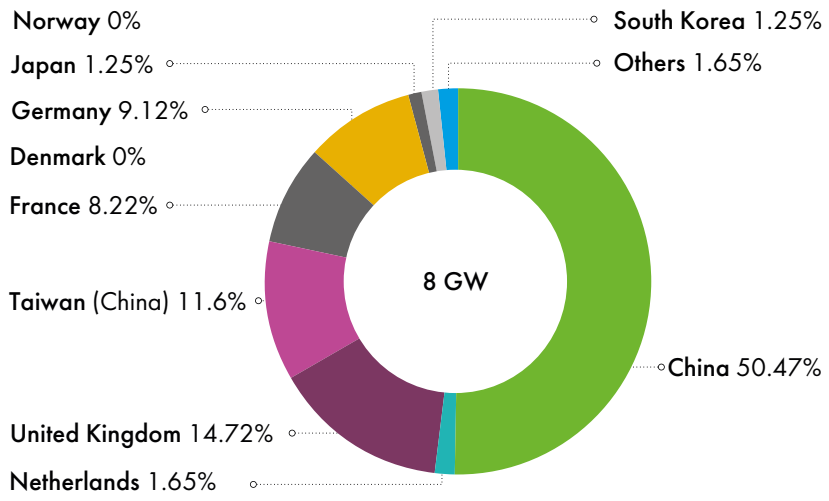
Europe commissioned 2.7 GW of new offshore wind from nine wind farms across four markets last year, accounting for one-third of additional offshore wind capacity globally.

New offshore wind installations (MW)

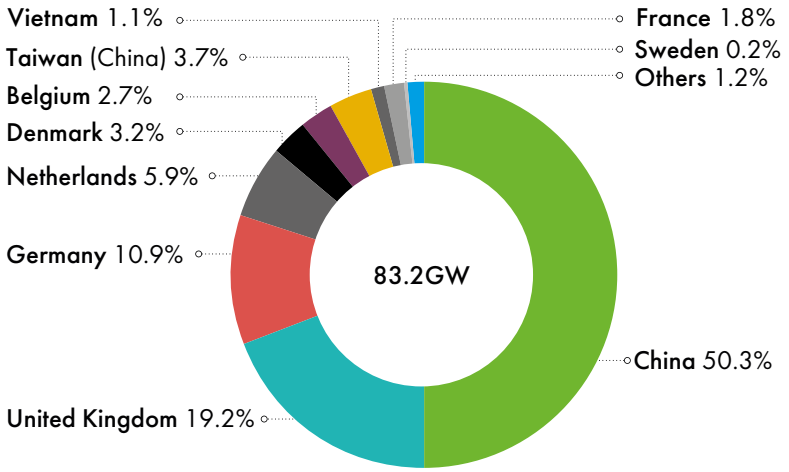


*Compound Annual Growth Rate.
Source: GWEC Market Intelligence, June 2025

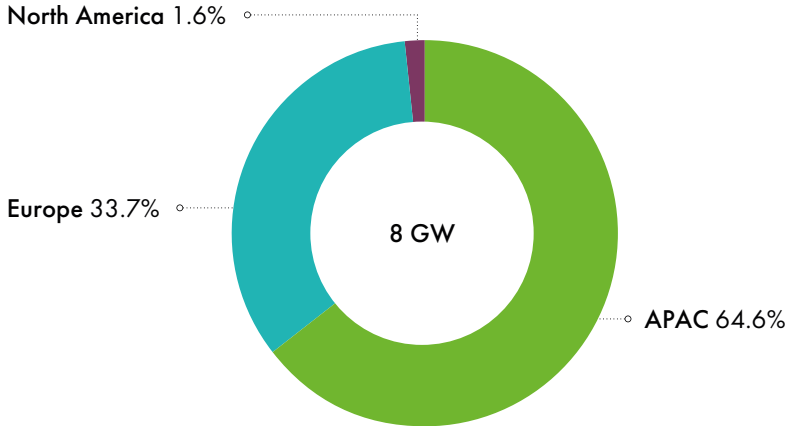
New offshore wind installations by market



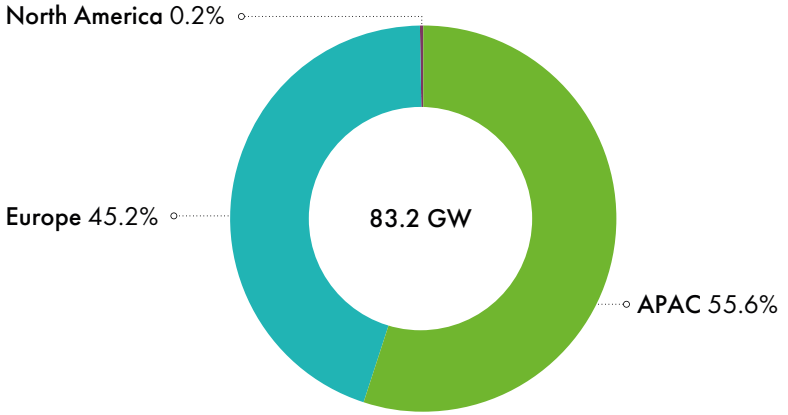
Total offshore wind installations by market



New offshore wind installations by region



Total offshore wind installations by region



Source: GWEC Market Intelligence, June 2025

- Adding 1.2 GW of offshore wind capacity in 2024, **the UK** recaptured its title as the region's largest market for new installations. In total, 88 SGRE offshore wind turbines were connected last year, of which 60 SG14-222 were at Moray West and 28 SG8.0-167 at Neart na Gaoithe. The 1.2 GW Dogger Bank Phase A project suffered delays, with only five GE Vernova Haliade-X turbines commissioned.
- **Germany** brought 730 MW online last year, including 477 MW at Baltic Eagle and 253 MW at Gode Wind 3. The Baltic Eagle project comprises 23 SGRE SG11-200 turbines, while Gode Wind 3 uses 50 Vestas V174-9.5 MW turbines.
- In the **Netherlands**, Vattenfall commissioned in March 2024 the 24 GE Cypress 5.5 MW turbines that replaced 28 Nordtank NKT 600 kW wind turbines at the Irene Vorrink nearshore wind farm, in Ijsselmeer.
- **France** commissioned 658 MW of offshore wind last year, with the remaining 85 SGRE turbines at the Fécamp and Saint-Brieuc fixed-bottom projects achieving full operation in May 2024. The 25.2 MW Provence Grand Large, with three SGRE 8.4 MW turbines, was Europe's only floating wind project to be commissioned in 2024.

Outside of China, three other markets commissioned new offshore wind capacity in the **Asia Pacific** region.

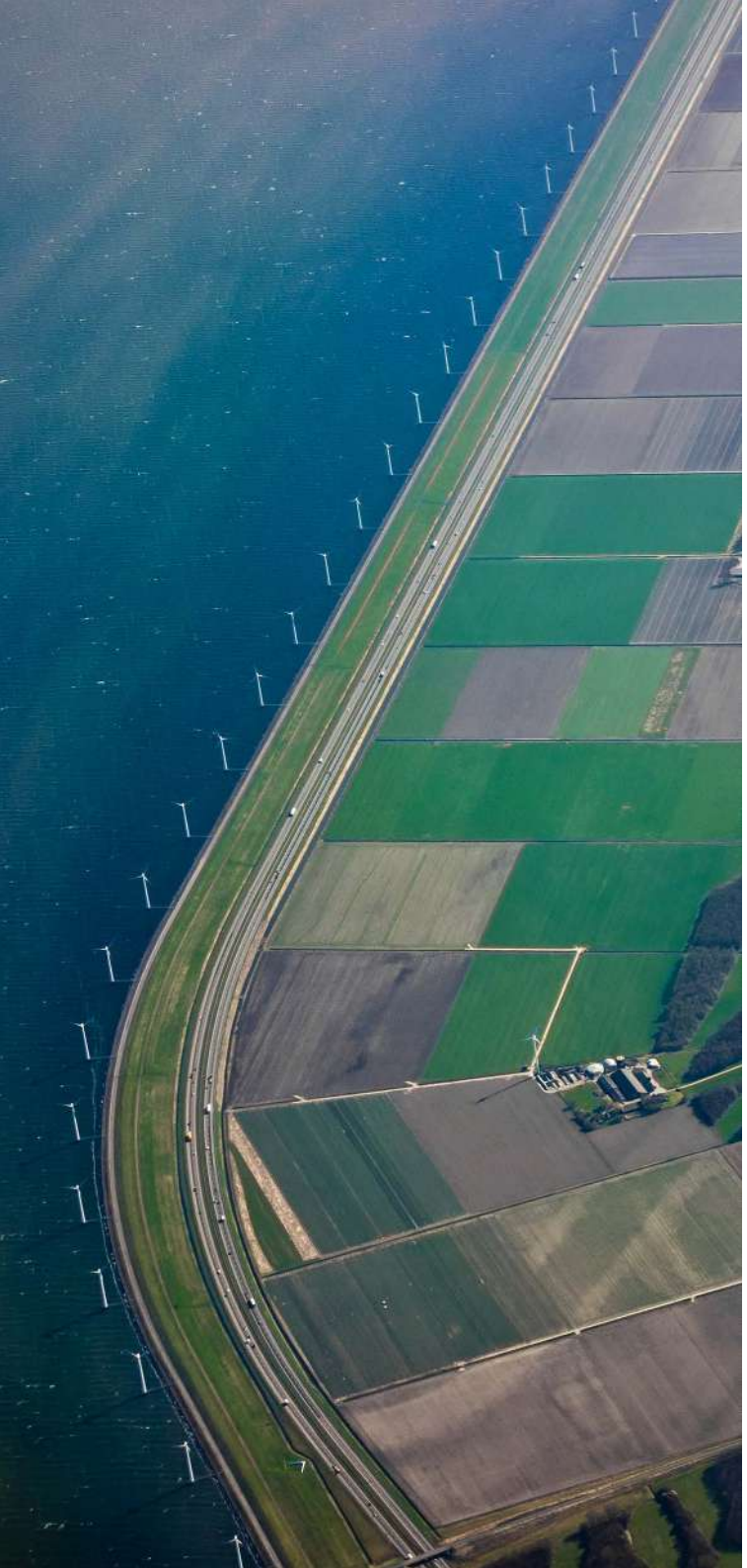
- **Taiwan** (China) commissioned 107 units (933 MW) across the Yunlin, Greater Changhua 1 & 2a, Changfang Phase 2 & Xiaodao, and ZhongNeng projects.
- In **Japan**, the 112 MW Ishikari Bay New Port Offshore Wind Farm began commercial operations in early 2024. It comprises 14 SGRE SG8.0-167 turbines.
- In **South Korea**, 18 of Doosan's 5.56 MW turbines were commissioned at the 100 MW Jeju Hallim Offshore Wind Farm – now the largest commercial offshore wind farm in the country.

In the **Americas**, only the **United States** has offshore wind turbines in operation. Last year it commissioned the 132 MW South Fork Wind Farm, comprising 12 SGRE SG 11-200 turbines, bringing the country's total capacity to 174 MW. At the 806 MW Vineyard Wind 1 project, ten Haliade-X turbines were installed early last year but a blade failure reported in July 2024 has delayed commissioning.

Cumulative capacity

The global offshore wind market has been growing by 10% on average each year over the past decade, with total installations of 83.2 GW representing 7.3% of total wind capacity at the end of 2024.

- **China** is the absolute market leader for cumulative installations, accounting for half of the global market share. Having taken the



crown from the UK in 2021, China has further consolidated its leadership over the past three years. Germany, the Netherlands and Taiwan (China) complete the top five. Offshore wind pioneer Denmark dropped out of the top five for the first time.

- Having overtaken Europe as the world's largest offshore wind region in 2022, by the end of 2024, **Asia** accounted for more than half of global capacity, with 46.3 GW of which 41.8 GW (90%) in China, 3.0 GW in Taiwan (China), 0.8 GW in Vietnam (intertidal), 0.3 GW in Japan and 0.2 GW in South Korea.
- Offshore wind installations in **Europe** surpassed 36 GW in 2024, making up 44% of global capacity.
- **North America** recorded 174 MW of offshore wind capacity by the end of last year, with all installations located in the US.

Floating wind

- **France** installed three SGRE SG 8.4-154 turbines on tension leg floaters at the 25.2 MW Provence Grand Large offshore wind project – the only floating wind project commissioned in Europe last year.
- Mingyang's 16.6 MW OceanX, a twin-rotor V-shaped floating turbine platform featuring two MySE8.3-180 hybrid drive turbines, was launched and installed in **China**. Altogether, a total of 41.8 MW of floating wind capacity was commissioned worldwide in 2024.
- At the end of 2024, a total of 278 MW net floating wind was installed globally, including 101 MW in Norway, 78 MW in the UK, 40MW in China, 27MW in France, 25 MW in Portugal, 5 MW in Japan and 2 MW in Spain.

56 GW of offshore wind capacity was awared last year, making 2024 a record year for offshore wind auctions

A record year for offshore wind auctions

Of the 56.3 GW of offshore wind capacity awarded worldwide last year, 17.4 GW was allocated in **China** under the 'grid-parity' mechanism. The remaining 38.9 GW was awarded via auctions, with 23.2 GW in Europe, 8.4 GW in the US, 3.3 GW in South Korea, 2.7 GW in Taiwan and 1.4 GW in Japan.

In **Europe**, Germany and the Netherlands awarded 8 GW and 4 GW of offshore wind, respectively, via negative bidding. The UK (5.3 GW), Norway (1.6 GW) and France (0.75 GW) awarded contracts via two-sided contracts for difference (CfDs).

The US awarded more than 8 GW of offshore wind capacity last year. In January, the New Jersey Board of Public Utilities (NJBPU) gave the green light to two large offshore wind projects with a combined capacity of 3,742 MW. In February, the New York State Energy Research and Development Authority (NYSERDA) selected Equinor's Empire Wind 1 (810 MW) and Ørsted's and Eversource's Sunrise Wind (924 MW) in the state's fourth offshore wind solicitation. Both projects had previously secured agreements with the state and rebid in the latest procurement round to negotiate a 25-year contract. In September, Massachusetts' and Rhode Island's first multi-state offshore wind solicitation selected nearly 2.9 GW of offshore wind.

Floating wind was awarded 1.9 GW of capacity in 2024, of which 750 MW was in **France** through the AO5 and AO6 tenders across three floating projects, 750 MW was in **South Korea** to the Bandibuli project and 400 MW was in **the UK** via CfD Allocation Round 6 to the Green Volt project.

MARKETS TO WATCH 2025

Asia Pacific

Japan - Building momentum towards floating success

With the support from JWPA

In 2024, Japan awarded over 1 GW of offshore wind capacity through its auction process, reaffirming its long-term commitment to the energy transition and its targets of 10 GW of offshore wind capacity by 2030 and up to 45 GW by 2040. By the end of 2024, the country had installed 253.5 MW of offshore wind capacity, supported by the release of the 7th Strategic Energy Plan on 27 December 2024 (approved by the Cabinet on 18 February 2025[55]) which, for the first time, envisions renewable energy as Japan's largest power source. This was complemented by the Green Transformation (GX) Promotion Strategy, a national roadmap integrating decarbonisation with broader economic and social reform[56]. Together, these developments signal sustained policy support for scaling renewables, particularly offshore wind.

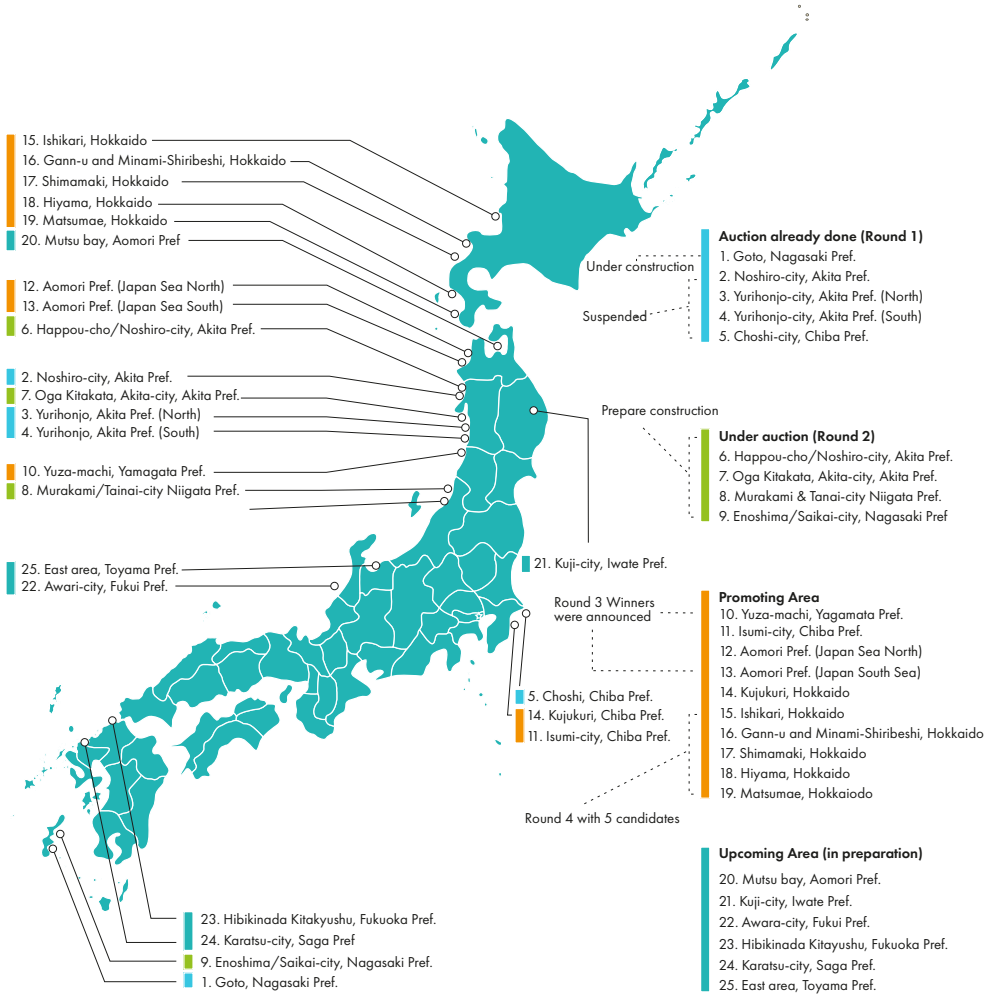
Key milestones for 2025

In 2025, several milestones are expected to accelerate progress. The Exclusive Economic Zone (EEZ) Bill is set to be passed shortly, enabling floating offshore wind by allowing development beyond territorial waters and streamlining regulatory coordination. Following the bill's passage, revisions to the Act on Promoting Utilisation of Sea Areas for Renewable Energy Generation are expected by year-end, with JOGMEC (Japan Organization for Metals and Energy Security) leading feasibility studies for early-stage[57] floating wind projects – a major step to reduce project risk. Developers have welcomed this function while stressing the importance of transparent coordination and data robustness.

The Ministry of Economy, Trade and Industry (METI) and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) are co-leaders in promoting floating wind, leveraging Japan's deep-water coastal geography. In March 2025, the Floating Offshore Wind Technology Research Association (FLOWRA) – a METI-endorsed organisation for accelerating floating wind commercialisation – signed a Memorandum of Understanding

55. https://practiceguides.chambers.com/practice-guides/renewable-energy-2024/japan/trends-and-developments?utm_source=chatgpt.com
56. https://grjapan.com/sites/default/files/content/articles/files/january_2024_gr_japan_update_on_gx_plans.pdf
57. https://www.wfw.com/articles/japans-offshore-wind-round-3-auction-results-and-proposed-changes-to-the-operational-auction-guidelines/?utm_source=chatgpt.com

Offshore wind power development at general sea area (as of March 2025)



Data Source: Ministry of Economy, Trade and Industry, Japan, 2025

with the UK's ORE Catapult[58] to enhance R&D, testing and knowledge exchange. These collaborations testify to Japan's commitment to a leading position in floating wind.

To address port and logistics bottlenecks, MLIT launched in January 2025 the Floating Wind Logistics and Construction Organisation (FLOWCON)[59] in January 2025. FLOWCON focuses on port readiness and offshore construction coordination.

Fine-tuning the auction framework

As for fixed-bottom offshore wind, Japan's auction framework is also evolving. The third auction round (December 2023), for sites off the coasts of Aomori and Yamagata,[60] incorporated both price and non-price factors such as project feasibility and stakeholder engagement, marking a shift away from simple cost competition and towards holistic project assessment.[61]

The upcoming late-2025 auction, which will include areas off Hokkaido, will further refine operational guidelines by introducing scoring reductions for projects with longer Commercial Operation Dates (CODs) beyond 5.5 years, promoting financial robustness and project management plans, and increasing security deposits with stepped penalties for delays. A new mechanism will also link the feed-in premium (FIP) to capital expenditure fluctuations, enabling more realistic price-setting that responds to macroeconomic conditions.[62] Although these reforms demonstrate the government's responsiveness to industry feedback, GWEC continues to advocate for more flexibility in delivery timelines to account for Japan's permitting complexities, supply chain constraints, and grid integration challenges.

Building on industry confidence

Together, these developments mark Japan's transition from an early-stage market to a more structured, sustainable and investable ecosystem for offshore wind. Policy evolution, institutional innovation and international collaboration are converging to support long-term project delivery and implementation. With the passage of the EEZ legislation, the imminent launch of the fourth auction round and deeper coordination across ministries and stakeholders, the country is well-positioned to advance towards its 2030 and 2040 offshore wind targets.

Sustained momentum will depend on clear regulatory processes, predictable timelines and investments in supply chain capacity and port infrastructure. If successfully delivered, Japan could emerge as a domestic offshore wind leader and a key hub for floating wind innovation in the Asia Pacific region.

South Korea – Building on transformation efforts to deliver growth ambitions

Over the past year, Korea's offshore wind sector has undergone a significant transformation. Moving away from a fragmented model led by private developers, the government has adopted a centralised approach supported by legislative reforms, structured auctions and strategic infrastructure planning – aligning with its goal of 14.3 GW of installed capacity by 2030.

Key legislative developments

Strongly supported by GWEC and the Korea Wind Energy Industry

58. https://ore.catapult.org.uk/media-centre/press-releases/ore-catapult-signs-mou-on-floating-offshore-wind-with-japans-flowra
59. https://www.penta-ocean.co.jp/english/updates/2025/pdf/20250120.pdf
60. https://www.whitecase.com/insight-alert/japan-offshore-wind-update-round-2-results-round-3-process?utm_source=chatgpt.com
61. https://www.wfw.com/articles/japans-offshore-wind-round-3-auction-results-and-proposed-changes-to-the-operational-auction-guidelines/?utm_source=chatgpt.com
62. https://www.nishimura.com/en/knowledge/newsletters/natural_resources_energy_finance_law_250509

Association, the Offshore Wind Power Promotion Act (OSS Bill, passed February 2025) replaces the ''open-door'' model with a government-led zonal system. The government will identify zones suitable for offshore development and allocate them through competitive auctions. This approach aims to streamline permitting processes, reduce regulatory risks and enhance public acceptance to achieve Korea's goal of renewables accounting for 21.72% of the energy mix by 2030, under the 11th Basic Energy Plan.

Sinan-gun, in South Jeolla Province, has been designated as the first official offshore wind development zone under the new framework. In April 2025, the Ministry of Trade, Industry and Energy (MOTIE) announced plans to develop a 3.2 GW wind power cluster of up to ten wind farms in the zone through a public-private partnership. The government will play an active role in site planning, permitting, environmental assessments and community engagement.

The Special Act for Grid Expansion (passed February 2025) facilitates accelerated investment in high-voltage transmission infrastructure, especially in wind-rich coastal regions in the southwest and southeast, addressing one of the sector's most persistent challenges. Korea already has 86 offshore wind projects with Electricity Business Licenses (EBLs), representing a total capacity of 27.8 GW.

Auction framework 2024–2026

Between 2024 and 2026, the Korean government plans to allocate 7–8 GW of wind power capacity across three or four auction rounds, with the first in late 2024, two scheduled for 2025, and one in early 2026.

The auctions cover both fixed-bottom and floating projects, with the majority expected to be fixed-bottom (4.5–5 GW), followed by floating wind (2.5–3 GW). Public-led auctions, set to launch this year, will require significant participation from state-owned companies.

As of 2025, qualitative, non-price criteria such as local benefits, community participation, environmental impact and supply chain localisation account for 50 out of 100 evaluation points, encouraging developers to value project feasibility and regional value alongside cost competitiveness.

The December 2024 auction awarded 2,085 MW, of which 1,886 MW was for offshore wind (four fixed-bottom and one floating) – the largest renewable energy auction in Korea's history. Fixed-price 20-year PPAs offer critical financial stability amid supply chain volatility and inflation. The auction's cap price was set at 176,565 KRW/MWh (approximately USD 121.90/MWh, based on SMP + 1 REC), and the oversubscription reflected strong market interest and the sector's growing maturity.

Challenges to deployment

As of May 2025, South Korea's installed offshore wind capacity remains under 0.2 GW – far short of the 14.3 GW target set for 2030. Development timelines are hampered by overlapping permitting requirements and limited institutional capacity to process applications. Rising capital costs, global supply chain disruptions and local opposition to projects – especially from fishing communities – continue to slow progress.

Limited port and installation vessel capacity is a concern, especially for larger turbines and floating technologies. While localising the supply chain is a political priority, manufacturers and service providers require greater demand visibility and investment support to scale up production.

Looking ahead

As GWEC's market outlook shows, several key developments are emerging in South Korea – from the deployment of large-scale projects and advances in floating technologies to new policy measures that strengthen grid integration.

Critical to this transition will be the expansion of the country's offshore wind supply chain, alongside the deeper strategic partnerships with international developers and manufacturers.

GWEC will continue to support policy dialogue, foster stakeholder collaboration, and promote global best practices to accelerate the sector's growth.

China – Growth and innovation powering market leadership

China's first commercial offshore wind project, the 102 MW Donghai Bridge Wind Farm, was commissioned in 2010. Large-scale development only accelerated after the National Energy Administration (NEA) introduced the first offshore feed-in tariff in 2014 and, in 2016, issued joint development guidelines with the State Oceanic Administration (SOA). By 2015, offshore wind installations surpassed 1 GW, and China has been the global leader in new offshore capacity since 2018. By the end of 2024, China's offshore wind capacity reached 41 GW, accounting for half of global cumulative offshore wind installations. In 2024, China added 4.04 GW of grid-connected offshore wind capacity, displaying slower growth than in 2023 but promising to rebound this year, thanks to the scale of projects under construction.

Building the world's largest offshore wind supply chain

Having initially focused on nearshore projects, China is actively expanding its deep-sea offshore wind capacity. In December 2024, the Ministry of Natural Resources issued mandated new offshore wind projects to be located at least 30 kilometers from shore or in waters deeper than 30 meters, marking a strategic shift towards deep-sea development. The government has also introduced a regulatory framework for up to 200 GW of potential capacity within China's Exclusive Economic Zone. The 200 MW first phase of China's first GW-scale floating wind farm in Hainan, 120 km off Wanning has begun construction.

Regional manufacturing hubs

Several coastal cities have emerged as manufacturing and logistics hubs for offshore wind. In Jiangsu Province, Yancheng and Nantong have developed strong industrial bases; further south, in Guangdong Province, Yangjiang and Shantou serve similar roles. These cities have established dedicated ports and supporting infrastructure, enabling China's annual offshore wind turbine manufacturing capacity to exceed an estimated 20 GW – a level sufficient to meet domestic demand for the next 5 to10 years.

China's coastal regions boast more than 20 offshore wind industrial bases. Projects launched in 2024 include the cities of Dalian (Taiping Bay), Yingkou, Qinhuangdao, Wenzhou and Beihai. In addition, at least 10 offshore wind ports have been completed or are under construction, with new developments in locations such as Yingkou, Tangshan (Caofeidian), Dongying and Wenzhou.

Non-stop technology innovation

According to GWEC's latest Global Supply Side Data report, the average offshore wind turbine size commissioned last year was 10 MW,

China's offshore wind power industrial bases (key provinces and cities)

Source: CWEA (Chinese Wind Energy Association), 2024

New offshore wind testing platforms in China	
Guangdong offshore wind power test site	Shantou, Guangdong
Fujian offshore wind power test site	Fuqing, Fujian
SEWPG 40 MW wind turbine test bench	Yancheng, Jiangsu
SANY 35 MW Six-DOF* test bench	Changping, Beijing
Guangdong 40 MW Six-DOF test bench	Shantou, Guangdong
Jiangsu wind blade test site	Dafeng, Jiangsu
CTC 25 MW wind blade test site	Lianyungang, Jiangsu

Source: GWEC Market Intelligence, June 2025

*Six-DOF: Six Degrees of Freedom

with the largest model — developed by Dongfang — reaching 26 MW. Goldwind launched its 22 MW turbine in December 2024 – and most of the leading Chinese OEMs can offer offshore turbines of 16 MW and above. Mingyang introduced its 143-metre wind turbine blades in February 2024, while the 147-metre blades manufactured by Goldwind and Sinoma Blades passed the static load test last September. Dongfang's 150-metre blades for the 26 MW turbine have set a new record for blade length.

China is also expanding its testing capacity through dedicated facilities to validate prototypes design and reliability standards prior to pilot deployment. Co-located within the offshore wind industrial bases and ports, these facilities are critical to advancing next-generation technologies and strengthening the supply chain.

Large-scale development and diversification

The previous shortage of wind turbine installation vessels (WTIVs) has eased with the delivery of orders placed in 2021–2022 for vessels that can install turbines rated at 20 MW and above. By Q3 2024, according to GWEC Market Intelligence's Global Offshore Wind Installation Vessel Database 2024, China had 65 jack-up vessels/barges and 47 heavy-lift vessels for offshore wind. In addition to supporting domestic growth, Chinese shipyards are building WTIVs for European EPC contractors and vessel operators.

China is further diversifying offshore wind development models by integrating marine ranching, green

fuel production (hydrogen, ammonia, methanol) and energy islands. Since 2021, floating offshore wind has been in the demonstration phase, with five projects totalling 39.55 MW in operation by Q2 2025) and another five under construction, including the 1 GW Wanning floating project planned for commissioning in 2027.

Ambitious targets for rapid growth

China plans to establish five large-scale offshore wind power bases in key regions: Shandong Peninsula, Yangtze River Delta, South Fujian, Guangdong and Beibu Bay. Decentralised approval processes have led more provincial governments to develop offshore wind plans since 2020. To date, 11 provinces have completed them, bringing China's total offshore wind development target to 300 GW. Industry projections estimated new installations in excess of 10 GW in 2025. GWEC Market Intelligence forecasts additions of 80 GW of offshore wind capacity in 2025-2030, contributing 51% of the world's offshore wind additions during this period.

Australia - Gearing up to become a key player while meeting domestic energy needs

With the support from Clean Energy Council

Australia's offshore wind industry is set for significant growth as ageing

coal-fired generators near retirement over the next decade. This transition presents a pivotal opportunity for offshore wind to meet domestic energy needs while positioning the country as a potentially key player in the APAC region and globally.

No offshore wind projects are currently operational, the World Bank Group-ESMAP estimates a technical potential of over 4,900 GW of offshore wind capacity – 1,572 GW fixed-bottom and 3,391 GW floating. GWEC forecasts that Australia is on track to install at least 1 GW by 2031, 2 GW by 2032 and 4 GW by 2033, depending on supply chain, market and policy conditions.[63]

Victoria leading the charge

While national offshore wind targets have yet to be established, the state of Victoria has set goals of 2 GW by 2032, 4 GW by 2035 and 9 GW by 2040, which are in line with GWEC's forecasts. In 2024, the Australian government granted 12 feasibility licences in Victoria's Gippsland region, representing up to 25 GW of potential capacity and surpassing state targets. Developers such as Copenhagen Infrastructure Partners, Iberdrola, Corio and Ørsted are advancing feasibility assessments, including site investigations and environmental studies.[64]

In 2025, the government offered feasibility licences for two projects totalling 3.2 GW, Spinifex off the Southern Ocean coast of Victoria, and Novocastrian Wind in the Pacific Ocean off the Hunter region in New South Wales. Spinifex, a collaboration between Parkwind (part of JERA Nex) and Alinta Energy, has accepted its feasibility licence, while a final decision on the licence for Novocastrian Wind, proposed by Equinor and Oceanex Energy, is expected in August 2025.[65]

Australia lacks a national route-to-market framework, but the Offshore Wind Energy Victoria Implementation Statement 4 advances plans for a first offtake auction in 2026 in the state for 2GW of capacity. Successful bidders will receive CfDs and availability payments to provide investment certainty, enhance energy security. A successful first auction in Victoria will be pivotal to demonstrating project viability and establishing investor confidence in the market for the long term.

Financial and policy support

To support offshore wind infrastructure, Victoria allocated AUD 18 million ($11.6 million) in the 2024–2025 budget to plan for projects and AUD 17 million to design a renewable energy terminal at the Port of Hastings.[66]

The federal government will provide an estimated AUS$19.7 billion over ten years from 2024-2025 to support priority industries such as the renewables sector, which can further help the local supply chain to grow.[67] The Future Made in Australia initiative aims to bolster domestic manufacturing, reducing reliance on imports and ensuring the timely delivery of materials essential for offshore wind projects.

Australia's supply chain strengths include critical materials (i.e., rare earth elements, steel and copper), skilled workforce and vessel services (excluding WTIV), with opportunities to transition existing industries to supply towers, subsea cables and ports services.[68]

Australia has also introduced robust policy frameworks to facilitate offshore wind development that can serve as models for other APAC markets. The Offshore Electricity Infrastructure Amendment Regulations 2024 offer guidance for developers on project design, management plans and feasibility activities.[69] The Offshore Electricity Infrastructure Amendment (Overlapping Applications) Regulations 2024 streamline the licensing process.[70]

Crucial stakeholder management

Community engagement and environmental stewardship are integral to the success of offshore wind projects. Developers in Australia are liaising with local communities, indigenous groups and other stakeholders to address concerns and ensure that projects align with regional values and environmental standards. The Gunaikurnai Land and Waters Aboriginal Corporation has established an engagement framework for developments in

63. "Mission Critical: Building the Asia Pacific Wind Energy Supply Chain for a 1.5c World," GWEC. 2024.
64. https://www.dcceew.gov.au/energy/renewable/offshore-wind/areas/gippsland
65. https://www.offshorewind.biz/2025/03/03/3-2-gw-offshore-wind-projects-secure-feasibility-licences-in-australia
66. https://www.dlapiper.com/en/insights/publications/navigating-new-horizons-offshore-wind-markets-in-emerging-jurisdictions/2024/offshore-wind-in-australia
67. https://www.kwm.com/au/en/insights/latest-thinking/australian-federal-budget-may-2024-25-green-energyand-advanced-manufacturing.html
68. "Mission Critical: Building the Asia Pacific Wind Energy Supply Chain for a 1.5c World," GWEC. 2024.
69. https://www.ashurst.com/en/insights/australia-finalises-new-regulations-for-offshore-wind-projects/
70. https://www.ashurst.com/en/insights/australia-finalises-new-regulations-for-offshore-wind-projects/

Gunaikurnai territories, including Gippsland offshore wind projects.[71]

Looking ahead, the successful integration of offshore wind into Australia's energy mix relies heavily on the outcome of Victoria's first auction, expected in 2026. Securing viable offtake contracts for early projects will be a crucial signal to investors and supply chain actors.

Establishing a clear, long-term auction schedule and market roadmap will be equally important to reduce financial uncertainty and build confidence. Over the longer term, sustained progress in policy development, infrastructure expansion, supply chain readiness, alongside transparent community engagement, will remain key pillars of success.

Vietnam – Preparing for offshore wind to take off

Vietnam's offshore wind sector is entering a new phase of development, supported by recent policy and regulatory improvements. These reforms position Vietnam as one Asia's most promising emerging markets, aligned with its ambitious targets for renewable energy, energy security and economic growth.

Key policy and regulatory reforms

The amended Electricity Law 2024 and Decree 58/ND-CP established a framework for offshore wind development through provisions that aim to attract private investment while safeguarding national interests.

Highlights include:

- Long-term contracted power output of at least 80% during the loan principal repayment term up to 15 years (increased from 12). This incentive mechanism does not apply if the project fails to generate the committed minimum power output or if power system issues prevent the entire output from being used or offtaken.
- State-Owned Enterprises (SOEs) or joint ventures (JVs) with majority SOE ownership will be awarded projects directly, while other companies must participate in a competitive process.
- Foreign companies must partner with an SOE to invest in offshore wind, with the SOE holding a minimum 5% share of the JV.
- Developers have up to 24 months from project award to conduct site surveys and up to 30 months to sign a power purchase agreement (PPA) with Vietnam Electricity (EVN).

Long-term planning and market outlook

Formally adopted in June 2024, the Resolution on Marine Spatial Planning (MSP) for 2021–2030, Vision to 2050, identifies renewable energy, including offshore wind, as one of six priority marine economic sectors, with coastal provinces in the north, centre and south designated as key zones. The MSP provides strategic guidance for long-term offshore infrastructure planning and serves as a basis for other sectoral policies, including seabed licensing and environmental protection.

Decree 65/2025/ND-CP (March 2025) introduces long-awaited guidelines for seabed allocation and site surveys for offshore wind. Site survey licenses will be exclusive for up to three years, reducing overlaps and uncertainty. In the case of overlapping project site proposals, the selection will be based on non-price criteria including financial capability, technical expertise, project experience, implementation plans and economic benefits. Seabed allocation licences are issued by the Ministry of Agriculture and Environment (MOAE) and are valid

71. https://gunaikurnai.org/landmark-agreement-ensuring-gunaikurnai-voice-in-offshore-wind-feasibility/

for a maximum of three years, renewable upon review.

The Revised Power Development Plan VIII (PDP8, April 2025) reflects Vietnam's growing energy demand and its strategic prioritisation of renewable energy. It increases the country's GDP growth forecast from 8% to 10% per year for the period 2026–2030 and sets a new offshore wind target of 6–17 GW between 2030 and 2035.

A market awaiting lift-off

Despite significant progress, two key components of the offshore wind framework are still under development:

- A competitive auction mechanism for site and CfD allocation
- A transparent pricing model and bankable PPA to underpin project financing.

Completion of these mechanisms, expected in 2026, will mark the final regulatory milestones necessary for full-scale market launch.

Throughout this process, GWEC has actively collaborated with the Vietnamese government and stakeholders, advocating for an inclusive, transparent and globally competitive offshore wind market in Vietnam. GWEC finalised a detailed 'competitive investor selection process for offshore wind in Vietnam', which was handed over to the Ministry of Industry and Trade (MOIT) in November 2024.

With exceptional wind resources, especially along the south and south-central coasts, combined with rising energy demand and an evolving legal framework, Vietnam is emerging as a compelling destination for offshore wind development. The period 2026–2030 is expected to see increased project development, international joint ventures and financial commitments. For investors, developers and supply chain actors, Vietnam offers a rare opportunity to participate in the early formation of one of Asia's most dynamic offshore wind markets.

The Philippines – Delivering from the ground up through stakeholder collaboration

The Philippines is poised to harness one of its most promising renewable energy resources, offshore wind, to meet its ambitious energy transition targets by 2050. With an estimated technical potential of over 178 GW and the Department of Energy (DOE) awarding sites totalling 65GW, offshore wind offers can transform the country's energy system, increasing energy security and generating long-term industrial and economic value.

Progress in policy and development

While still in the early stages, the Philippines has made significant progress over the past two years in navigating the complexities of offshore wind development by enacting key policies, initiating Marine Spatial Planning (MSP) to clarify environmental and development constraints, and streamlining permitting procedures to enable early-stage development.

A pivotal milestone was reached in June 2025 when the DOE launched its first offshore wind auction under Green Energy Auction 5 (GEA 5), offering 3.3 GW of capacity for delivery between 2028 and 2030. Focused on fixed-bottom technology, this landmark move signals the country's intention to build a robust pipeline of competitive, bankable offshore wind projects.

Unlike many countries, the Philippines did not choose Feed-in Tariff (FiT) mechanisms as a new entrant but instead moved directly to competitive auctions for offshore wind due to the success of its Green Energy Auction Program (GEAP) in driving down costs and attracting investment for onshore renewables. Given the capital intensity and technological complexity of offshore wind, especially in an emerging market, the current auction design requires refinement to ensure success.

Auction design and private sector engagement

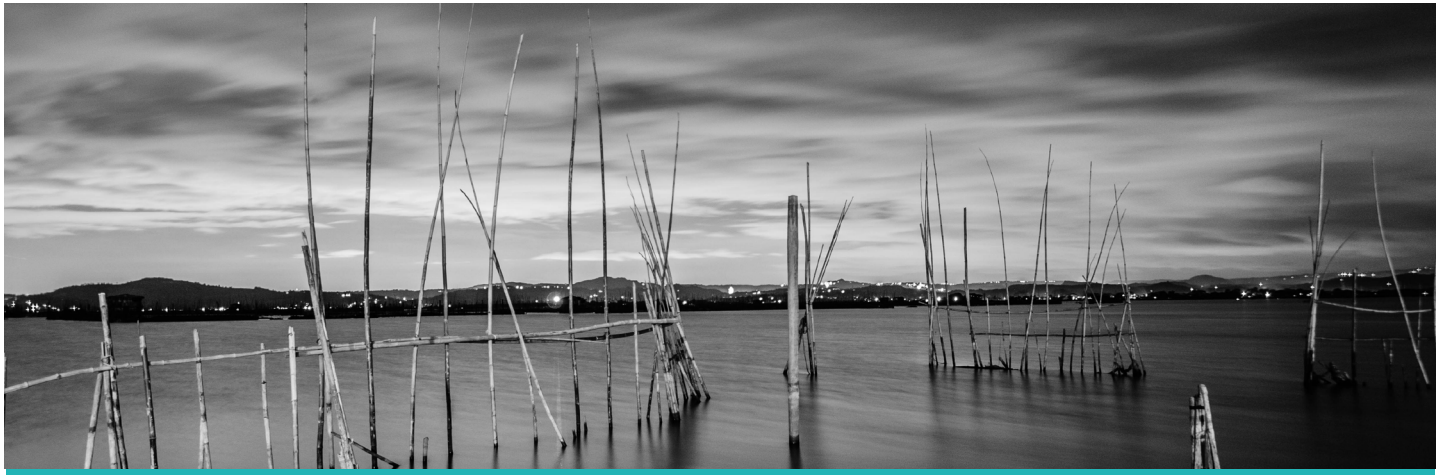
Through the Offshore Wind Technical Working Group (TWG) – a coalition of private developers and associations – the sector has provided concrete recommendations to strengthen the auction Terms of Reference (TOR) and the Renewable Energy Payment Agreement (REPA), the primary PPA for awarded projects. Many of these recommendations have been adopted by the DOE and the Energy Regulatory Commission (ERC), demonstrating the government's willingness to engage with the private sector and promote a commercially viable auction framework.

REPA improvements include:

- Releasing the PPA immediately upon award, rather than at 80% electromechanical completion to facilitate project financing.
- Ensuring step-in rights for lenders to enable financial close.
- Embedding provisions on indexation, infrastructure delay and Force Majeure, to reflect realistic risks and preserve project viability.

TOR improvements include:

- Balanced eligibility requirements that protect the government's



Case Study: Building a collaborative offshore wind ecosystem through the Offshore Wind Technical Working Group

In late 2024, the Global Wind Energy Council (GWEC), in collaboration with the Wind Energy Developers Association of the Philippines (WEDAP), established the Offshore Wind Technical Working Group (TWG) - a multi-stakeholder platform established to support the Philippine government's Green Energy Auction (GEA) initiatives for offshore wind.

This TWG initiative became a critical venue for aligning perspectives among developers, financial institutions, and policymakers. It brought together stakeholders to refine and strengthen two auction instruments: the Renewable Energy Purchase Agreement (REPA) and the Terms of Reference (TOR). The goal was clear – to ensure these documents are both bankable and implementable, enabling rea project delivery.

What makes this initiative remarkable is the level of openness and engagement from key government agencies. The Department of Energy (DOE), Energy Regulatory Commission (ERC), Philippine Ports Authority (PPA), and TransCo have all actively participated in the dialogue, taking on feedback on risk-sharing, permitting clarity, and tariff design. Their willingness to co-develop solutions with the private sector marks a commitment toward collaborative development.

Beyond the financial and technical stakeholders, GWEC has deliberately broadened the engagement map to include civil society organisations (CSOs), NGOs, and academic partners. Recognising that offshore wind sits at the intersection of environment, economy, and community, GWEC is using its platform to facilitate evidence-based discussions, inclusive dialogue, and knowledge exchange across all levels of society.

This case reflects a growing maturity in the Philippine offshore wind space – where enabling policies are not just designed in government halls, but shaped through collective insight, transparency and shared responsibility.

interest while enabling serious players to participate, including grid impact assessments and 12 months of wind measurements.
- Recalibrated performance bonds to cover infrastructure risks.
- Provisions distinguishing delays attributable to developers from those due to port or grid constraints, with penalties limited to the former.

These reforms aim to balance risk and foster investment confidence, both vital for timely project delivery. While the target of delivering first power by 2028 appears ambitious, the industry remains optimistic and committed.

The rollout of the first OFW Green Energy Auction this year is expected to deliver 3.3 GW by 2030. Beyond adding capacity, this auction will also signal to the wider supply chain that the Philippines is a viable market and a country ready to invest in local industries to support offshore wind construction.

Inclusive and community-driven development

Beyond policy, collaboration at the stakeholder level is vital. As developers move through the permitting process, environmental and social impact assessments serve as trust-building points with

TWG (GWEC, developers, MDBs and Banks) Meeting with DOE and ERC, 2025

coastal and fishing communities, civil society groups and local government. Many developers in the Philippines are embracing this approach – working with civil society and local authorities to address concerns and co-develop solutions. In a country rich in marine biodiversity, offshore wind must coexist with fragile ecosystems and complex marine livelihoods. Civil society groups, NGOs and academic institutions have stepped up to help inform and shape the energy transition. Their local knowledge can be instrumental in siting, designing and operating projects responsibly. Early engagment with these groups isn't just good practice – it's smart development.

While stakeholders may have different roles, perspectives and interests, they are ultimately working towards the same outcome – a just, inclusive and sustainable energy transition.

Europe

Provided by WindEurope

Germany – High volumes, rising costs and a move to CfDs

Germany operates 9.1 GW of offshore wind – the largest fleet in the EU – and plans to triple its capacity by 2030. In 2024, auctions awarded 8 GW, with successful bidders committing over €4 billion in concession fees. Developers showed limited interest, partly due to high costs and negative bidding requirements. Some capacity from these projects may be connected to the grid in 2030.

In 2025, a further 3.5 GW will be tendered through uncapped negative bidding. The government is determined to transition to two-sided Contracts for Difference (CfDs) from 2026 or 2027, although political support remains uncertain. Spatial plans by the Federal Maritime and Hydrographic Agency (BSH) envisage up to 70 GW by 2045.

Denmark – Relaunching tenders and supporting industry growth

Denmark is resetting after two failed tenders, with plans to re-tender 3 GW across three sites in autumn 2025. This round will feature 20-year capability-based two-sided CfDs, where projects are remunerated for their potential production rather than actual output, with more flexible timelines and reduced penalties.

The government is introducing new options such as overplanting and integration with Power-to-X (PtX) technologies, reflecting a more pragmatic approach to supply chain risks. Projects must meet sustainability and EU supply chain requirements, though awards will remain price-driven. Denmark is also reviewing future tenders for other sites and energy island projects, which remain on hold pending market and legal developments.

The Netherlands – Slowing down to reflect market realities

Over the past five years, the Netherlands has installed 3.8 GW of offshore wind, second only to the UK in Europe. In 2024, another 4 GW was awarded but plans are being scaled back in the short term due to low bid competition and cost concerns. The 2025 tender will cover just 1 GW (Nederwiek I-A), with two other 1 GW sites postponed.

The current round maintains negative bidding and non-price criteria (NPCs) but allows delayed payments. A potential return to CfDs alongside PPAs is being considered from 2027. The government was revisiting its long-term offshore wind strategy before the coalition collapsed in June 2025.

France – Fast-tracking floating wind and expanding general capacity

France is catching up after decades of delays. Since 2012, over 5.3 GW of offshore wind capacity has been awarded through auctions, with plans to award an additional 14 GW before 2026.

In 2024, three floating wind tenders (totalling 750 MW) were successfully completed, with strike prices of €85.5–€92.7/MWh ($98.4–106.6/MWh). While this shows75 progress in floating wind development, the prices do not reflect the true costs of the technology and are influenced by tender design specifics.

Looking ah75ead, France plans three more fixed-bottom auctions in 2025 (5 GW) and will award a further 9.2 GW in 2026. The government is streamlining permitting and grid connection processes while backing projects with a 20-year indexed two-sided CfD. In the long term, France is targeting 18 GW of offshore wind by 2035 and 45 GW by 2050.

Poland – Preparing for the next phase of growth

Poland is making steady progress in offshore wind. Projects from Phase I (totalling 6 GW) are advancing rapidly, with the first monopiles installed at Baltic Power and 3 GW reaching Final Investment Decision (FID) in 2025, including Baltica 2 and Baltyk II and III.

A 25-year CfD remains the main support mechanism, but regulatory and permitting hurdles remain. The country plans to support an additional 12 GW of capacity between 2025 and 2033, starting with a 4 GW CfD auction in December 2025. Legislative amendments are being finalised to facilitate the auction, requiring environmental permits and at least three project applicants.

Norway – Balancing floating ambition with political uncertainty

Norway held its first bottom-fixed auction in 2024, awarding Sørlige Nordsjø II (1.5 GW) at €99.4/MWh. The focus now shifts to floating wind with the Utsira Nord tender, where developers will compete first on qualitative criteria and later for a direct grant. Three sites will be awarded in 2025, but only one project of almost 500 MW will receive up to €3 billion in government support.

Political consensus on offshore wind remains fragile, especially for state funding and hybrid projects. Upcoming elections in September 2025 may reshape priorities, particularly around interconnection and project support models.

Baltics – Cautious progress amid grid and investor concerns

In Lithuania, one 700 MW project was awarded in 2023, with a second auction reopened in June 2025 offering a 15-year two-sided CfD backed by €193 million in state funding.

Estonia employs a two-step model – first awarding seabed leases, then providing support through CfDs. But many auctions saw low interest or no bids. The Saare 1 floating project (900 MW) was awarded with just one bidder, and more permits are under review.

The upcoming CfD auction is unlikely to be held in 2025, while the joint Estonian-Latvian ELWIND project (1 GW) is planned for 2026-27. Grid constraints and the need for long-term offtakers remain significant barriers to scaling up offshore wind in the region.

United Kingdom – Cementing a leadership position for the future

With the support from RenewableUK

Over the past two decades, the UK has commissioned 46 offshore wind farms and, since 2016, has channelled more than £50 billion (approximately $64.6 billion) into new developments at sea. To cement its position as an industry leader, the UK is launching a Global Clean Power Alliance and forging bilateral partnerships with countries such as India and Brazil.[72,73]

In 2024, the UK celebrated a milestone of 30 GW of installed wind

72. https://www.newkerala.com/news/o/uk-india-convene-4th-energy-dialogue-806
73. https://www.gov.uk/government/publications/international-climate-cooperation-joint-brazil-uk-statement/joint-brazil-uk-statement-on-international-climate-cooperation

capacity,[74] enough to power over 26 million homes and cut at least 35 million tonnes of carbon each year. About half of this capacity is offshore wind, with the full commissioning of Moray West in April 2025 boosting capacity past 15 GW.

Government policy and industry support

After the general election in July 2024, the new government introduced reforms designed to support up to 50 GW of offshore wind capacity by 2030. This is central to the Prime Minister's broader ''Clean Energy Mission'' to source at least 95% of the nation's electricity from low-carbon sources and build on the country's strong decarbonisation track record in the power sector.[75]

To reinforce this manufacturing and supply-chain boost, industry and government partners including RenewableUK, the Offshore Wind Industry Council, The Crown Estate and Crown Estate Scotland launched the Offshore Wind Industrial Growth Plan in April 2024. The framework sets out to triple domestic turbine and component manufacturing across nine regional clusters, create thousands of skilled jobs, and support £25 billion of gross value added to the economy. New port-infrastructure measures are to be delivered via the National Wealth Fund. In June 2025, the government announced a £300 million support package for the offshore wind supply chain.

Starting with Allocation Round 7 this year, the CfD Clean Industry Bonus further seeks to strengthen domestic manufacturing and low-carbon supply chains by enabling fixed and floating offshore wind projects to receive up to £20.1 million per GW of extra CfD revenue support if they invest in more sustainable supply chains. Projects totalling 27 GW of capacity submitted proposals for the first round of this scheme.

At least 13 UK offshore projects totalling 8.5 GW are eligible to bid in Allocation Round 7, with further projects likely to become eligible if forthcoming policy updates are enacted.

Overcoming deployment challenges

Deployment of new offshore wind capacity has been held back by a legacy ''first-come, first-served'' grid-connection queue that has swelled to around 700 GW, causing delays measured in years rather than months. In February 2025, Ofgem signalled its intent to approve NESO's revised connection regime, which promises clearer timetables and could unlock up to £15 billion of additional offshore wind investment.

In parallel, last year's transmission licence exemption for higher-voltage array cables paves the way for a modernised offshore transmission framework tailored to the sector's needs. To minimise ecological harm, the government published guidance for a Marine Recovery Fund in January 2025 – one strand of a broader compensation package designed to balance offshore wind development with the protection of marine biodiversity.

74. https://www.renewableuk.com/news-and-resources/press-releases/uk-wind-power-reaches-historic-30gw-milestone/
75. https://assets.publishing.service.gov.uk/media/677bc80399c93b7286a396d6/clean-power-2030-action-plan-main-report.pdf

Latin America

Brazil – Leveraging offshore wind to realise the country's potential

Brazil boasts a technical potential of over 1,200 GW of offshore wind capacity, along approximately 8,000 kilometers of coastline with an extensive continental shelf that enables fixed-bottom projects. The country's offshore winds are among the best in the world, surpassing even its robust onshore capacity factor.

Legislative milestone

In 2025, Brazil marked a significant milestone with the passage of Law n° 15.097/2025. Originating from PL n° 576/2021, this legislation establishes the legal framework for maritime use, defining procedures, governmental participation, authorisation grants and criteria for studies and planning. It aims to create a secure and predictable environment for investors, laying the groundwork for future auctions. To complement the law, the Energy Research Office (EPE) released two Technical Notes in 2024 on area leasing considerations.[76]

As of December 2024, 103 projects totalling 244 GW had environmental licensing requests with Ibama (Brazilian Institute of Environment and Renewable Natural Resources). Offshore wind expansion is seen as a catalyst for power Brazil's heavy industry, supporting climate change mitigation while attracting significant investments and stimulating the local economy via the development of supply chains, ports and logistics infrastructure in renewable energy hubs. It could create over 516,000 jobs by 2050, adding at least BRL 900 billion ($164 billion) to the economy.[77]

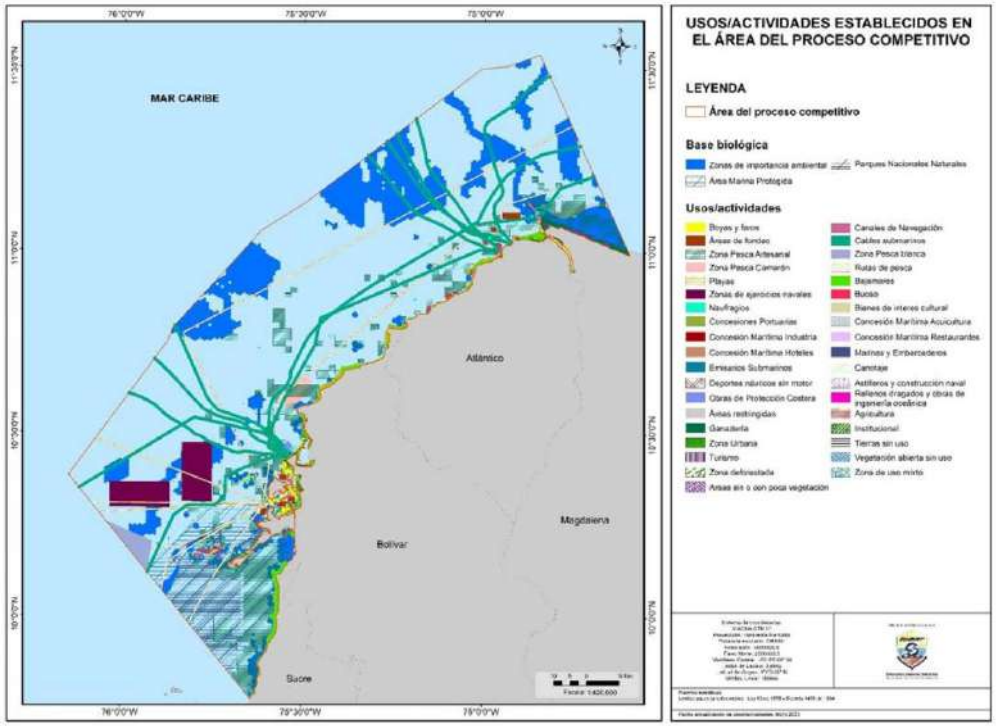
Advancing offshore wind in the context of broader decarbonisation

The Brazilian government is actively facilitating the implementation of its offshore wind framework. In June 2024, the Ministry of Mines and Energy (MME) formed an Interministerial Working Group (GT) to streamline offshore wind approval processes and licensing. In March, the EPE presented updated area selection methodologies, generating significant anticipation in the sector. The MME is expected to imminently launch a timeline for implementing

76. https://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/cessao-de-areas-para-geracao-eolica-offshore-consideracoes-sobre-valor-devido-a-uniao-e-area-maxima-a-ser-cedida

77.Cenários para o Desenvolvimento de Eólica Offshore no Brasil", publicado pelo Grupo Banco Mundial, em colaboração com a Empresa de Pesquisa Energética (EPE), em atendimento à solicitação do Ministério de Minas e Energia (MME) - Offshore Wind Development Program : Scenarios for Offshore Wind Development in Brazil

Uses/activities present in the Colombian Competitive Process Area[78]



the offshore wind law, outlining the steps toward Brazil's first area cession auction and a one-stop-shop portal designed to ensure predictable and agile processes.

Brazil has also enacted important legislation in the broader context of decarbonisation. Law n° 14.948/24 establishes a national policy for low-carbon hydrogen, setting guidelines for renewable hydrogen and aligning with the country's decarbonisation goals. The Brazilian Emissions Trading System (SBCE), established by Law n° 15.042/24, lays the foundation for a regulated carbon market.

To boost renewable energy and industrial decarbonisation, Law n° 15.103/25 established the Energy Transition Acceleration Program (PATEN), which leverages corporate tax credits to fund projects that replace fossil fuels and promote energy efficiency, technological innovation and environmental education.

Collectively, these laws position Brazil as a prominent player on the international stage for the development of a competitive low-carbon industry.

Colombia – Delivering on the promise of a just transition

Offshore wind energy presents a considerable opportunity for Colombia to diversify its energy sources and reduce emissions to achieve the climate targets set out in the Paris Agreement. The Colombian Caribbean region is particularly promising for offshore wind development due to favourable wind conditions.

Climate and energy action

With Law 1844 of 2017, Colombia has formally committed to addressing climate change through a framework that drives the energy transition while promoting intergenerational equity and safeguarding human rights, especially those of vulnerable groups, Indigenous peoples and local communities. It prioritises participatory decision-making, incorporating scientific evidence and traditional knowledge into socio-economic and environmental policies.

The National Energy Plan (PEN) 2020-2050 identifies non-conventional energy sources as democratising tools to empower communities and end users to manage their energy consumption, aligning with Colombia's energy transition goals and the Sustainable Development Goals (SDGs). The plan emphasises reducing energy gaps, fostering local leadership and creating energy communities.

The 2022 ''National Energy Transition Policy'' (CONPES 4075) lays the ground for a sustainable, inclusive energy system that prioritises renewable energy, energy efficiency and community involvement in the energy transition. It supports energy communities, strengthens project management capacities, and assists regions and workers transitioning from extractive industries.

As a key element of its political agenda, Colombia's just energy

78. Anexo_A._Ficha_Tecnica_-_Adenda_3.pdf - https://www.anh.gov.co/documents/25548/Anexo_A._Ficha_Tecnica_-_Adenda_3.pdf

transition aims to establish a socially and technically informed energy matrix with offshore wind energy at its core. The government plans to install between 1 GW and 3 GW of offshore wind capacity following the initial round of auctions, focusing on maritime areas in the departments of Atlántico, Bolívar, southern Magdalena and northern Sucre.

The Offshore Wind Energy Roadmap, launched in May 2022, estimates nearly 50 GW of potential across more than 12,000 square kilometers, with targets ranging from 1.5 GW to 9 GW. By January 2025, 69 areas were nominated by qualified companies for consideration by the Ministry of Mines and Energy, which is verifying their suitability for offshore wind development that benefits communities.

Promoting industry engagement

Colombia is emerging as a key hub for offshore wind energy, with all the companies that applied for its first tender already pre-qualified. In December 2024, the National Hydrocarbons Agency (ANH) confirmed that major energy companies from Belgium, the UK, Spain and China, along with Colombian companies Ecopetrol and Celsia, met the technical, financial and legal requirements. Pre-qualified companies include Copenhagen Infrastructure Partners (CIP), BlueFloat Energy, China Three Gorges Corporation, Powerchina, Dyna Energy, DEME and Jan De Nul, signalling strong confidence in Colombia's offshore wind potential.

Following area verification, qualified companies will be able to submit bids, with concessions possible for up to two areas. The goal is to award at least 1 GW of capacity.

The government is developing a Contracts for Difference (CfD) mechanism that promotes long-term energy contracts with low-emission technologies while establishing guidelines for Wholesale Energy Market (MEM) integration and stable investments in the sector.

Offshore wind energy offers Colombia a unique opportunity to diversify its energy mix, create jobs and mitigate the impacts of climate change, positioning the country among the pioneers in the global energy transition.

MARKET OUTLOOK

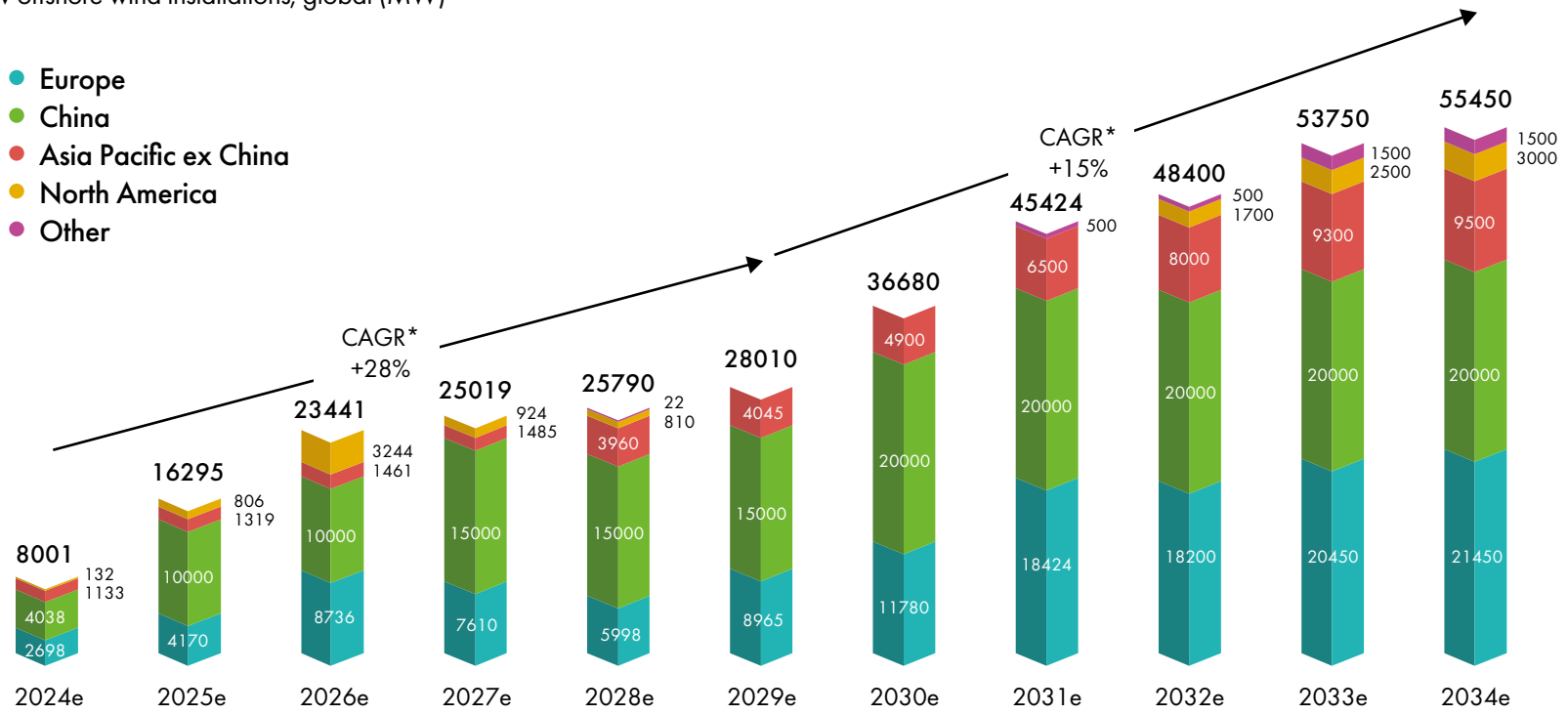
Global Offshore Market Outlook to 2034

Beyond the 'storm': Delivering the next wave of growth

2024 was a turbulent year for the offshore wind industry. In line with other capital-intensive sectors, the offshore wind industry was exposed to macroeconomic challenges including inflation, increased capital costs and supply chain constraints in 2024, damaging projects commercial viability.

The industry has had to grapple with the uncertainty deriving from geopolitical tensions and the radical energy and trade policies introduced by the US administration, adding risk to energy demand and price forecasts. In addition, stop-start government policies, permitting bottlenecks and complex auction criteria have contributed to a lack of predictability and visibility which discourages forward-looking investment in supply chains and offshore wind enablers including vessels, port infrastructure and grid transmission.

New offshore wind installations, global (MW)



* Compound Annual Growth Rate.
Source: GWEC Market Intelligence, June 2025

As a result of these headwinds, offshore wind has arrived at a crossroads where supportive intervention is necessary for the industry's revival, enabling it to help deliver energy security and achieve climate change targets.

Following stakeholder consultations in recent months, GWEC is confident that in the aftermath of failed tenders and project cancellations, governments, industry and policymakers are recalibrating their actions to respond to the new market conditions with targeted solutions in support of the offshore wind sector.

By the end of March 2025, GWEC Market Intelligence reported nearly 48 GW of offshore wind projects under construction. After a record 2024 for offshore wind auctions, with 56 GW of capacity awarded worldwide, more than 100 GW is expected to be auctioned over the next two years across an ever-growing number of markets. What the offshore wind industry and governments now need is a laser-like focus on delivering the next wave of growth.

In light of the near-term challenges described above, GWEC Market Intelligence has downgraded its global offshore wind outlook for total additions in 2025–2029 by 24% compared with our previous projection. The details of the adjustments are summarised below.

Despite the worsening short-term outlook, most governments and developers remain committed to offshore wind, the medium-term outlook remains resolutely positive. There is a huge opportunity in the second half of the forecast period. With a compound average annual growth rate of 28% until 2029 and 15% to 2034, annual capacity additions are expected to sail past 30 GW in 2030 and 50 GW in 2033.

GWEC Market Intelligence expects more than 350 GW of new offshore wind capacity to be added over the next decade (2025–2034), bringing total offshore wind capacity to 441 GW by the end of 2034. However, only one-third of this projected new volume will be added in 2025–2029, the first half of the forecast period.

Building on from the 8 GW added in 2024, annual installations are expected to double in 2025 and triple in 2027. By 2034, they are expected to reach 55 GW, bringing the offshore share of new wind power installations from today's 7% to about 25%.

Thanks to robust growth in China, APAC replaced Europe as the world's largest regional market in 2020 for new installations and in 2022 for cumulative installations. With strong growth expected in China and a flurry of activity in new markets including South Korea,

Region	**Additions 2025-2029** (GWOR2024)	**Additions 2025-2029** (GWOR2025)	**YoY growth**	**Rationale**
Europe	50,679 MW	35,479 MW	-30%	Entire auction round suffering no-shows in the UK and Denmark due to projects' poor commercial viability GW-scale project dropped in the UK due to insufficient returns Grid transmission delays in Germany, Belgium and the Netherlands
North America	11,150 MW	5,784 MW	-48%	Policy uncertainty including revocation hangs over already permitted projects Tariffs imposed or threatened on imports of goods from both allies and adversaries
China	76,000 MW	65,000 MW	-14%	Slower-than-expected transition from nearshore to deep-water development Transition from fixed-price to market-led pricing
APAC excluding China	18,872 MW	12,270 MW	-35%	Adjustment made based on projects awarded via latest auctions in South Korea. The COD deadline guideline has impact on installations beyond our near-term forecast (2025-2029) Commissioning delay for Round 2 projects and cancellation of a Round 3.1 project in Taiwan (China) Vietnam's revised PDP 8 pushing the 6 GW capacity targets beyond 2030 Delay to development plans in India
Total	156,723	118,555 MW	-24%	

Source: GWEC Market Intelligence, June 2025

Japan, the Philippines, Vietnam and Australia, APAC's lead in annual installations is unlikely to be challenged over the next decade. We forecast 60% of the additions predicted in 2025–2034 to come from this region.

Driven by the dual objectives of energy security and addressing climate change, growth in Europe remains stable, with annual additions predicted to triple in 2026 from 2024 levels. Having downgraded our outlook for 2025-2029 by 30%, we now do not expect Europe to surpass 10 GW milestone before 2030 or 20 GW before 2033 (see details on page 72).

In the US, the combination of a vulnerable local supply chain and macroeconomic challenges had already created a 'perfect storm' for offshore wind before the 2024 election. As a result of Presidential decisions to temporarily halt offshore wind leasing within the Offshore Continental Shelf (OCS), threaten the revocation of existing project permits and impose tariffs on imports, GWEC Market Intelligence has downgraded its projection to less than 6 GW of additional capacity for the first half of the forecast period. Notwithstanding these challenges, North America will remain the third-largest offshore wind market by 2034, followed by Latin America. No offshore wind installations are expected in Africa and the Middle East during the forecast period, as in our previous forecast.

China and Europe, which made up 94% of the world's total offshore wind installations by the end of 2024, will continue to dominate offshore wind growth but will see their global market share in cumulative installations drop to 89% in 2029 and 84% in 2034, primarily because of growth in new markets outside the two key markets in APAC and North America. With more than 100 projects totalling 245 GW having filed environmental investigation applications in Brazil and the first auction ready for launch in Colombia, we expect to see the first utility-scale offshore wind project online in Latin America in the early 2030s.

GWEC Market Intelligence develops its near-term outlook (2025–2029) using a bottom-up approach based on our global offshore wind project database, which covers projects currently under construction, global auction results and announced offshore wind tenders worldwide.

For the medium-term market outlook (2030–2034), we use a top-down approach that takes into account existing project pipelines, current policies, and national or regional targets.

There is currently an implementation gap between declared targets and the rate of annual installations. For the forecast growth to materialise, it is essential that permitting, finance, supply chain and grid challenges are addressed. This will propel offshore wind power development into a new phase of even faster growth.

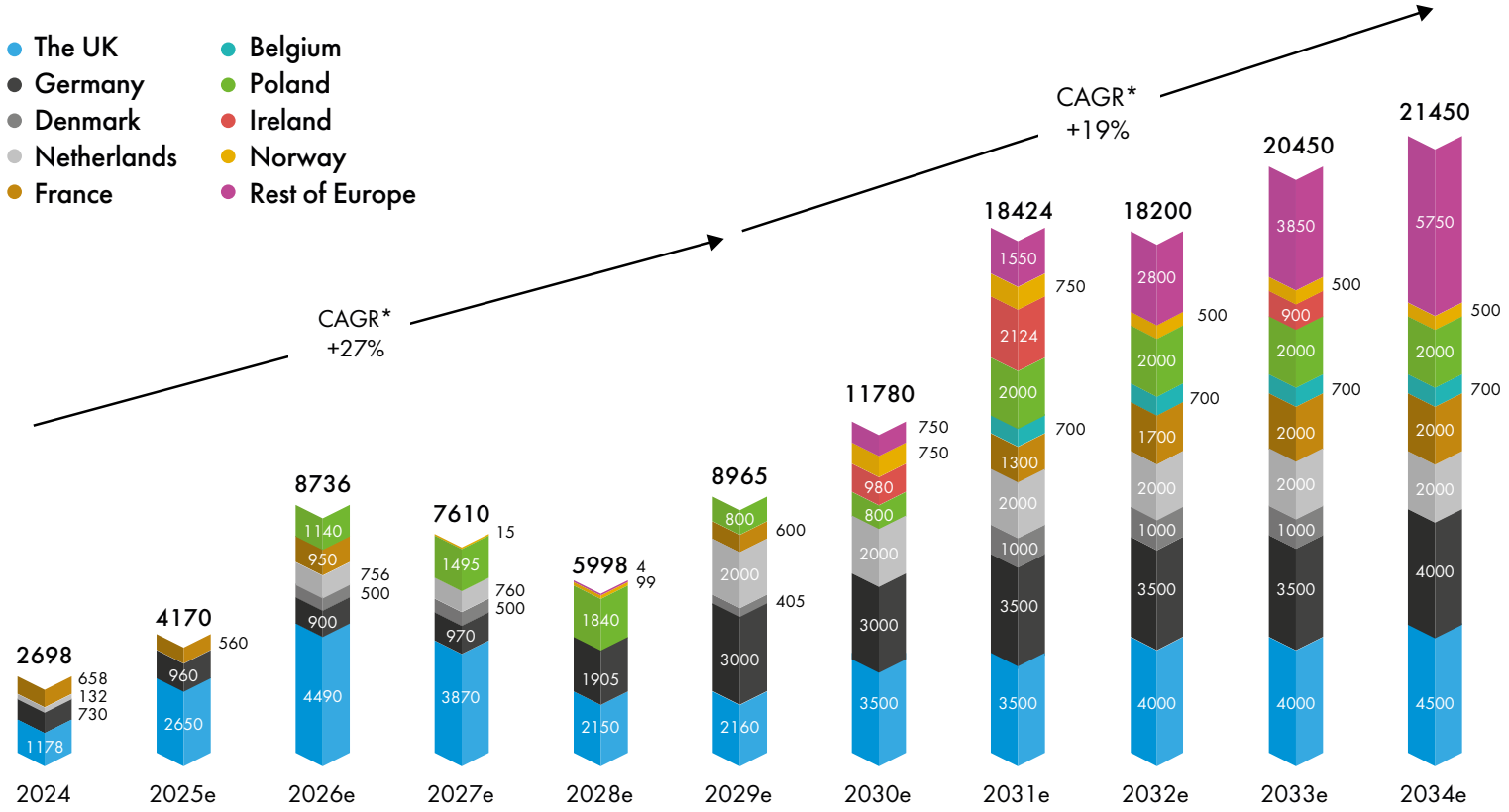
Europe

Europe is the birthplace of offshore wind: Denmark installed the world's first MW-scale fixed-bottom offshore wind project in 1991, while Norway installed the first floating wind project in 2009.

More than three decades later, fixed-bottom technology has matured, with supply chain and infrastructure well-established along the North and Baltic Sea coastlines – and many jobs have been created.

While losing its leading position to APAC in installed offshore wind capacity, Europe remains the world's largest market for floating wind and a technology hub for offshore wind technology including floating wind foundations.

New offshore wind installations, Europe (MW)



*Compound Annual Growth Rate. Source: GWEC Market Intelligence, June 2025

Following auction failures in Denmark and the UK, we have downgraded the near-term (2025-2029) offshore wind outlook for Europe by 30% compared with our previous year's forecast. But GWEC Market Intelligence retains a double-digit growth rate projection for Europe over the next ten years and expects annual offshore wind installations to exceed the 10 GW milestone by 2030.

Annual additions could reach 20 GW in 2033, but this is contingent on timely investment in the supply chain and in offshore wind enablers such as installation vessels, port infrastructure and grid transmission.

In total, 126 GW of offshore wind capacity is expected to be fed into the grid in Europe in 2025–2034, with more than two-thirds of that volume predicted to be added in the second half of this forecast period (2030–2034).

The following considerations underpin our ten-year growth projection for Europe:

Europe is accelerating renewables development to achieve energy security in the aftermath of Russia's invasion of Ukraine, with REPowerEU acting as the EU's new energy security strategy.

The EU Wind Power Package (October 2023) and the government/industry-endorsed European Wind Charter (late 2023) demonstrate a commitment to a more competitive wind value chain in Europe.

Offshore wind targets in Europe

Unit: GW	2027	2030	2035	2040	2045	2050
EU		111				317
UK		50*				
Germany		30	40		≥70	
Netherlands		22.2		50		70
Denmark		12.9				
Belgium		5.7		8		
France			18			45
Poland	10.9**					
Norway				30		
Ireland		7***		20		37
Spain		3				
Greece		2				
Portugal		2				

* Including 5 GW floating wind power
** Either in operation or under development by 2027
*** Including 2 GW floating wind development

A Communication under the Wind Power Package has increased EU offshore renewable energy targets to 111 GW (from 60 GW in 2020) for 2030 and to around 317 GW (up from 300 GW) for 2050.

The Clean Industrial Deal (early 2025) outlines a set of actions to turn decarbonisation into a driver of industrial growth, including in clean energy. WindEurope's Copenhagen Call to Action (April 2025) urges governments to address permitting and electrification – and to de-risk wind investments via two-sided CfD auctions – to enhance Europe's energy independence and industrial competitiveness.

The 'New Offshore Wind Deal for Europe', launched at WindEurope 2025, calls for immediate action to mitigate risks, eliminate stop-and-go policies and provide more regulatory certainty to support a steady, secure capacity pipeline.

Fixed-bottom offshore wind has become the most competitive electricity generation technology after onshore wind and solar PV, over which it has the considerable advantage of being able to deploy at scale.

The commercialisation of floating wind and power-to-X solutions will further unlock offshore wind's potential to support the global energy transition.

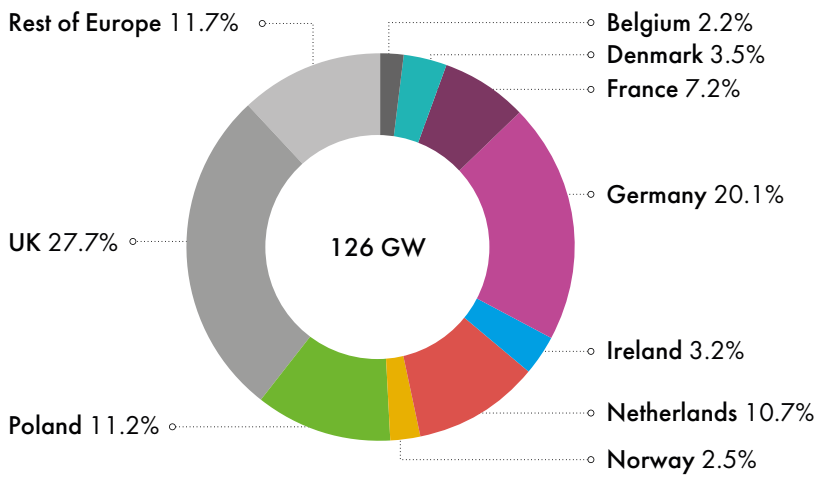
The UK

As of May 2025, the UK had 10.5 GW of offshore wind under construction and more than 90 GW (with 45% is floating wind) in development – making it the largest offshore wind market in Europe.

Excessively low strike prices set against rising costs caused by higher inflation and interest rates resulted in no developers submitting bids to the UK's 2023 CfD AR5 auction. For CfD AR6 (March 2024), the government increased the bid price ceilings to £73/MWh (€83.9/MWh) for bottom-fixed offshore wind and to £176/MWh (€202.3/MWh) for floating offshore wind, resulting in 5.3 GW of projects securing contracts later that year, with 400 MW awarded to a floating project in Scotland.

According to the Clean Power 2030 Action Plan (December 2024), the government intends to secure at least 12 GW across the next few

Total offshore wind added between 2025 and 2034



Source: GWEC Market Intelligence, June 2025

allocation rounds. It has reformed specific elements of the CfD mechanism to allow fixed-bottom projects awaiting full planning consent to participate in the auction and extending the CfD contract term beyond the current 15 years.

AR7 is expected to open in August 2025, with results due in late 2025 or early 2026.

With regards to seabed leasing, the Crown Estate increased the Celtic Sea floating wind leasing round (Round 5) from 4 GW to 4.5 GW (October 2023). The seabed leasing process opened in February 2024 with the winning bidders announced in June 2025. Space for up to a further 12 GW of offshore wind capacity is expected to be made available in the Celtic Sea.

In July 2024, the UK government introduced a bill to establish Great British Energy, a publicly owned clean energy company that will operate in partnership with The Crown Estate, leading to up to 30 GW in new offshore wind seabed leases by 2030.

Aside from supporting new clean energy projects, the two partners will invest in ports and supply chains to overcome bottlenecks and accelerate the delivery of existing projects. Funding of GBP 300 million has been earmarked (April 2025) for Great British Energy to invest in domestic offshore wind supply chains.

To achieve the offshore wind target of 50 GW by 2030, The Crown Estate has recently confirmed a 4.7 GW capacity boost at seven existing offshore wind farms awarded rights in Round 3 or under the 2017 Offshore Wind Extensions opportunity. In addition, the UK's electricity system operator (ESO) has proposed a GBP 58 billion grid investment to incorporate an additional 21 GW of offshore wind into the grid by 2035, potentially bringing the country's total capacity to 86 GW.

Germany

As the second-largest offshore wind market in Europe and third-largest in the world, in 2024 Germany started commissioning projects awarded through its first and second round of auctions, totalling 2.5 GW. GWEC Market Intelligence reports 1.9 GW of offshore wind projects under construction and 38 GW in development.

The Offshore Wind Energy Act (WindSeeG) as amended through the 'Easter Package' (April 2022), was approved by the EU in December 2022. It provides long-term visibility to the market via mandating targets of 30 GW by 2030, 40 GW by 2035 and at least 70 GW by 2045.

The amended WindSeeG allowed for negative bidding and introduced a two-track auction system, one for sites centrally developed by state authorities and another for non-predeveloped sites. From 2023, six 500 MW tenders procure offshore wind power for green hydrogen production each year.

Over the past two years, Germany has been Europe's market leader for annual awarded offshore wind capacity. Of the 8.8 GW it awarded via a zero-subsidy tender in 2023, 7 GW across four sites was not centrally pre-surveyed and featured a 'dynamic bidding' system. The remaining 1.8 GW, awarded across four sites in the North Sea, was centrally pre-surveyed. In 2024, Germany allocated 8 GW through two tenders, with 2.5 GW awarded in non-pre-surveyed areas with a negative bid component, and 5.5 GW awarded across three projects in pre-surveyed areas.

The German Federal Maritime and Hydrographic Agency (BSH) has published a new Site Development Plan for offshore wind (January 2025) under which ten sites with a total capacity of 12 GW will be auctioned over the next four years, starting this year.

To enable offshore wind energy to fulfil its role as an essential pillar in achieving Germany's energy security and climate targets, the Federal Maritime and Hydrographic Agency (BSH) has released a draft post-2030 maritime spatial plan targeting 60 GW of capacity by 2037, including 36 GW to be built in acceleration areas. BSH has warned of grid connection delays impacting the capacity scheduled to be online by 2030, citing supply chain shortages among the reasons for the expected delays in offshore grid expansion.

Denmark

As an offshore wind pioneer, Denmark is not only a hub for offshore wind technology but also home to the world's largest offshore wind turbine supplier, offshore wind turbine installation vessel operator and offshore wind port. The country has only just dropped out of the top five for total offshore wind installations for the first time. The 1 GW Thor project is currently the only offshore wind project under construction in Denmark.

As well as hosting three North Sea countries for the signing of the Esbjerg Declaration (May 2022) and eight Baltic Sea countries for the Marienborg Declaration (August 2022) to advance Europe's energy independence, Denmark announced plans in early 2022 for a 9 GW offshore wind tender. This plan materialised in April 2024 with 6 GW of capacity annouced across six sites in the North Sea I, Kattegat, Kriegers Flak II and Hesselø areas.

No offers were made for any of the three offshore wind farms in the North Sea, totalling 3 GW, due to high costs and uncertain returns.

After temporarily suspending offshore wind tenders, the government committed DKK 27.6 billion (EUR 3.7 billion) in state support with insurance coverage of up to DKK 55.2 billion (May 2025) to a new 3 GW offshore wind tender to be launched later this year. The tender under a two-sided CfD support scheme will cover three areas, two in the North Sea and one in the sea directly between Denmark from Sweden. The bid deadlines are early 2026 for Nordsøen Midt and

Hesselø, and late 2027 for Nordsøen Syd. Project completion is expected by 2032 and 2033, respectively.

The processing of offshore wind farm projects under the open-door scheme was suspended in February 2023. Nine projects totalling 3.6 GW were released and can proceed to development, while the remaining 24 projects proposed under the scheme have been cancelled. Two nearshore projects – the 240 MW Jammerland Bugt and 165 MW Lillebælt South – are now ready for construction after the Danish Energy Board of Appeal recently rejected all objections.

The Netherlands

With 4.9 GW of offshore wind capacity in operation by the end of 2024 and another two projects totalling 1.5 GW under construction, the Netherlands is Europe's third-largest market. It raised its 2030 target from 11.5 GW to 22.2 GW and disclosed tendering timelines and locations for nine offshore wind projects with a combined capacity of up to 13.4 GW (2022). Last year, it awarded 4 GW of capacity across two projects, with another 4 GW across four projects expected to be allocated this year. However, three out of these projects were postponed primarily due to deteriorating market conditions.

Since announcing targets of 50 GW by 2040 and 70 GW by 2050 (September 2023), the Dutch Ministry of Economic Affairs and Climate Policy (EZK) has identified further offshore wind areas, pending release of a draft roadmap. Permitting constraints, long lead times for grid connections and pressures on the supply chain have led EZK to delay the 2030 target to 2032 (April 2024).

Following a revision of the offshore wind roadmap including the elimination of one proposed development zone (April 2025), the government plans to install 21 GW by 2032 and to reach a total of 72 GW in the North Sea.

Belgium

Despite adding no projects to its pipeline since commissioning the 487 MW Seamade and 219 MW Northwester 2 in 2020, Belgium remains the fifth-largest offshore wind market in Europe by operational capacity.

The government increased the capacity to be tendered in the Princess Elisabeth offshore wind zone from 2.25 GW to 3.5 GW and approved connecting the wind farms in this zone to an energy island (October 2021). After Belgian

transmission system operator (TSO) Elia received an EU grant (December 2022) and secured an environmental permit (October 2023), foundation work on the world's first artificial energy island began in April 2024, with construction due to continue until 2027.

Following EU approval of Belgium's state aid, the tender for the first 700 MW project was launched in November 2024. Two 1.4 GW tenders are scheduled for 2026.

The rising cost of HVDC infrastructure forced Elia to temporarily postpone the signing of transmission contracts for Princess Elisabeth Island (February 2025). This is likely to delay the project by approximately three years. However, work on two (700 MW plus 1,400 MW) of the three planned projects supplying the energy island can proceed.

Once the Princess Elisabeth offshore wind zone is fully connected, Belgium's total offshore wind capacity will reach 5.76 GW.

France

By the end of 2024, France had 1.5 GW of offshore wind capacity installed and another 1.5 GW across five projects under construction. Of these five projects, two (30 MW each) are demonstration floating wind projects.

According to its PPE multiannual energy programme (2020), France will tender 8.75 GW of capacity by 2028. Further to a government consultation on accelerating offshore wind development, the Energy Regulatory Commission (CRE) recommended a 10 GW auction before 2027 (June 2023). An updated schedule for offshore wind tenders (mid-2024) includes plans for larger projects further out at sea and expanding existing sites by 2.5 GW.

Three fixed-bottom and three floating wind projects totalling 4.5 GW were auctioned before 2023, with awards made for the 1 GW AO4 (March 2023), the 250 MW AO5 (May 2024), and the two 250 MW AO6 projects (December 2024). Awards for the 1.2 GW AO7 and the 1.5 GW AO8 fixed-bottom projects are due later this year.

The 2.5 GW AO9 tender comprising a 400-550 MW floating wind farm in South Brittany, two 450–550 MW floating wind farms in the Mediterranean, and a 1–1.25 GW fixed-bottom project in the South Atlantic opened in July 2024. Commissioning is due between 2032 and 2034.

Announced in October 2024, the 9 GW AO10 tender across two fixed-bottom projects in the English Channel and three floating wind projects in the Atlantic Ocean and in the Mediterranean will launch this year, with commissioning expected by 2035.

Having raised its offshore wind target to 45 GW by 2050 – with an interim goal of 18 GW by 2035 (2023) – France needs to streamline its permitting process and create a more favourable investment climate.

Poland

While having no installed offshore wind turbines by the end of 2024, Poland boasts two projects under construction – the 1.1 GW Baltic Power (PKN Orlen and Northland) and 1.5 GW Baltica 2 (Ørsted and PGE). Financial close has been reached at the 1.44 GW Bałtyk 2 & 3 project.

A bill supporting offshore wind energy in the Baltic Sea (January 2021) targets 10.9 GW of capacity to be either operational or under development by 2027. The Energy Regulatory Office (ERO) has awarded a CfD to seven projects totalling 5.9 GW (2021). The next phase of development was expected to include two 2.5 GW auctions, in

2025 and 2027.After setting a more ambitious target (April 2023), the government now plans four auctions – two for 4 GW and two for 2 GW, resulting in 18 GW of capacity in development by 2030. In June 2025, the ERO announced that the first 4 GW offshore wind auction will be held in December this year.

Norway

Norway is the world's largest floating wind market. Three floating projects totalling 100.5 MW were in operation in Norway at the end of 2024, with two of the floating turbines operating in the Marine Energy Test Centre (METCentre) near Stavanger. In December 2023, the METCentre got the green light to test five new floating wind turbines. In May 2025, Aikido Technologies and the consortium consisting of Odfjell Oceanwind and Aikido Technologies secured slots, totalling 39 MW, at METCentre to test their new floating offshore wind technologies. In addition, the 75 MW Goliat Wind demonstration project, connected to the Goliat oil platform in the Barents Sea, has also been granted government approval. Commissioning of these three projects is expected in 2027–2028.

Norway's first offshore wind auction launched in March 2023, with an application deadline of 1 September 2023 for the 1.5 GW Sørlige Nordsjø II Phase 1 and the 1.5 GW Utsira Nord floating projects. The winners were due to be announced later that year, but due to the higher risk profile of floating wind, the government proposed that the sites in the Utsira Nord lease area be selected based on qualitative criteria, rather than through an auction. For reasons associated with state aid, the process got delayed and the winner for Sørlige Nordsjø II Phase 1 was announced in March 2024. Applications for the 1.5 GW Utsira Nord area opened in May 2025 with the deadline for submitting proposals set for 15 September 2025.

A large-scale green investment plan to allocate sea areas for 30 GW of offshore wind capacity by 2040 was launched in May 2022, with the next round of licence awards expected this year. However, concerns over costs and grid connections led the government to postpone the awards.

Ireland

Ireland has only 25 MW of offshore wind in operation but is targeting 5 GW by 2030, along with 2 GW floating wind capacity in development.

Following the issuance of Maritime Area Consents (MACs) in December 2022 for the first phase of seven offshore wind projects, Ireland held its first offshore wind auction under the Renewable Electricity Support Scheme (RESS). In May 2023 ORESS 1, awarded four projects with a combined capacity of nearly 3,100 MW. The consultation process for ORESS 2 opened in the summer of 2023, but the 900 MW ORESS 2.1 at the Tonn Nua site, initially planned for 2024, has been postponed to 2025.

The Future Framework for Offshore Renewable Energy (May 2024) sets out Ireland's pathway to 20 GW of offshore wind by 2040 and at least 37 GW by 2050. In support of the roadmap, the draft South Coast Designated Maritime Area Plan (DMAP) – the country's first-ever spatial plan for renewable energy at sea – identifies four proposed areas off the south coast of Ireland for offshore wind projects. Metocean surveys for four offshore wind zones including Tonn Nua were completed in May 2025, but Wind Energy Ireland has warned that the country's offshore wind energy ambitions are in jeopardy unless the government takes immediate and decisive action.

Portugal

The 25 MW WindFloat Atlantic (WFA) floating wind farm, in operation since 2020, is Portugal's only installed offshore wind project to date. Initial plans to auction 3–4 GW of floating wind capacity (2022) was upgraded to 10 GW but postponed to 2023. After the government released draft areas in January 2023, an interministerial working group proposed a phased approach: three areas totalling 3.5 GW to be offered through one or more competitive procedures, and the remaining capacity to be allocated in subsequent phases through to 2030.

A call for expressions of interest for the first tender was launced in October 2023, covering Viana do Castelo (1 GW), Leixões (500 MW) and Figueira da Foz (2 GW). Fifty developers from ten countries responded. The first auction is expected later this year.

A Technological Free Zone off the coast of Viana do Castelo was announced in 2021, with a designation for offshore wind demonstration. Last December, the government approved procedural rules for the zone, which aims to provide a pre-consented, grid-connected area that allows for easier deployment and testing of renewable energy technology.

Spain

Spain has 12 MW of offshore wind capacity in operation, of which 2 MW is floating wind, but is targeting up to 3 GW by 2030 under the government's Roadmap for the Development of Offshore Wind and Marine Energy, published in December 2021.

Sweden

Since 1997, Sweden has commissioned five offshore wind projects. Following the decommissioning the 10.5 MW Utgrunden project in 2018, net offshore wind capacity stood at 202 MW at the end of 2024.

After the government set an annual offshore wind generation target of 120 TWh in 2022, the Swedish Energy Agency identified areas where the equivalent of 30 GW in generation capacity could be installed (April 2023). However, in response to objections by the Swedish Armed Forces, 13 projects with a potential capacity of nearly 32 GW were denied in November 2024.

Finland

With 71 MW of offshore wind capacity in operation, Finland is the

ninth-largest market in Europe. In December 2021, the Finnish government approved an auction model for the leasing of public water areas controlled by Metsähallitus, the enterprise in charge of managing the country's lands and waters. The leasing of state-owned sea areas for two commercial-scale offshore wind projects – one off the coast of Korsnäs and the other off Tahkoluoto, Pori (July 2022) – preceded a decision in November 2023 to launch the tendering procedure for five offshore wind projects in public waters.

After the transmission system operator Fingrid Oyj identified five areas where projects could connect to the onshore grid by the 2030s (May 2024) and the approval (December 2024) of legislation nabling an offshore wind tender in Finland's exclusive economic zone (EEZ), the government is looking to launch the first offshore wind tender this autumn.

Plans for a 30 MW demonstration project in early 2025 at the Tahkoluoto site have been scrapped due to cost pressures and uncertainty over taxation. Geophysical surveys and a shipping study to examine the seabed and identify navigational risks are ongoing at the Korsnäs site.

Estonia

Estonia has no offshore wind yet. Following a November 2023 tender announcement by the Consumer Protection and Technical Regulation Authority (CPTRA), the Liivi 2 offshore wind farm was awarded in December 2023 and Liivi 1 in January 2024.

After receiving 10 applications for three additional sites in April 2024, CPTRA awarded the Saare 2.1 and Saare 2.2 areas in June 2024 and the Saare 1 area in January 2025.

In December 2024, the European Commission (EC) approved a EUR 2.6 billion scheme to support the offshore wind development in Estonia under a 20-year CfD mechanism.

Lithuania

Lithuania has no offshore wind in operation. The National Energy Regulatory Council (NERC) launched the country's first offshore wind auction in March 2023, with the winner announced in October 2023 and commissioning of the 700 MW project scheduled by 2030.

NERC's second offshore wind tender in January 2024 for another 700 MW offshore wind project received only one bid and was

discontinued. Following approval of updated conditions, the second tender was launched on 9 June 2025, with bids accepted until 8 September. The tender will proceed if at least two proposals are received.

Greece

National legislation passed in 2022 initially targeted at least 2 GW of offshore wind by 2030. However, a revised strategy outlined in November 2023 by the Hellenic Hydrocarbons and Energy Resources Management Company (HEREMA) identified ten areas for development between 2030 and 2032, with a combined capacity of 4.9 GW – most of which for floating wind.

Romania

No offshore wind has yet been installed in the Black Sear. Under the Offshore Wind Energy Bill passed in April 2024, Romania plans to build the first offshore wind project by 2032. A draft law introduced in July 2023 enables the auctioning of 3 GW via a CfD support scheme.

A new offshore wind roadmap, released in September 2024, highlights a potential for up to 7 GW of offshore wind capacity in Romania's Exclusive Economic Zone in the Black Sea.

The Ministry of Energy has recently launched a call for expressions of interest to identify suitable areas for development in support of a target of at least 3 GW of capacity by 2035.

Türkiye

An invitation to apply for the development of a 1.2 GW offshore wind project (2018) was initially unsuccessful due to insufficient site preparations. In June 2023, The Ministry of Energy and Natural Resources (MENR) launched a tender for site investigations and consultancy services for three development zones in the Sea of Marmara, aiming to pave the way for the country's first offshore wind auction.

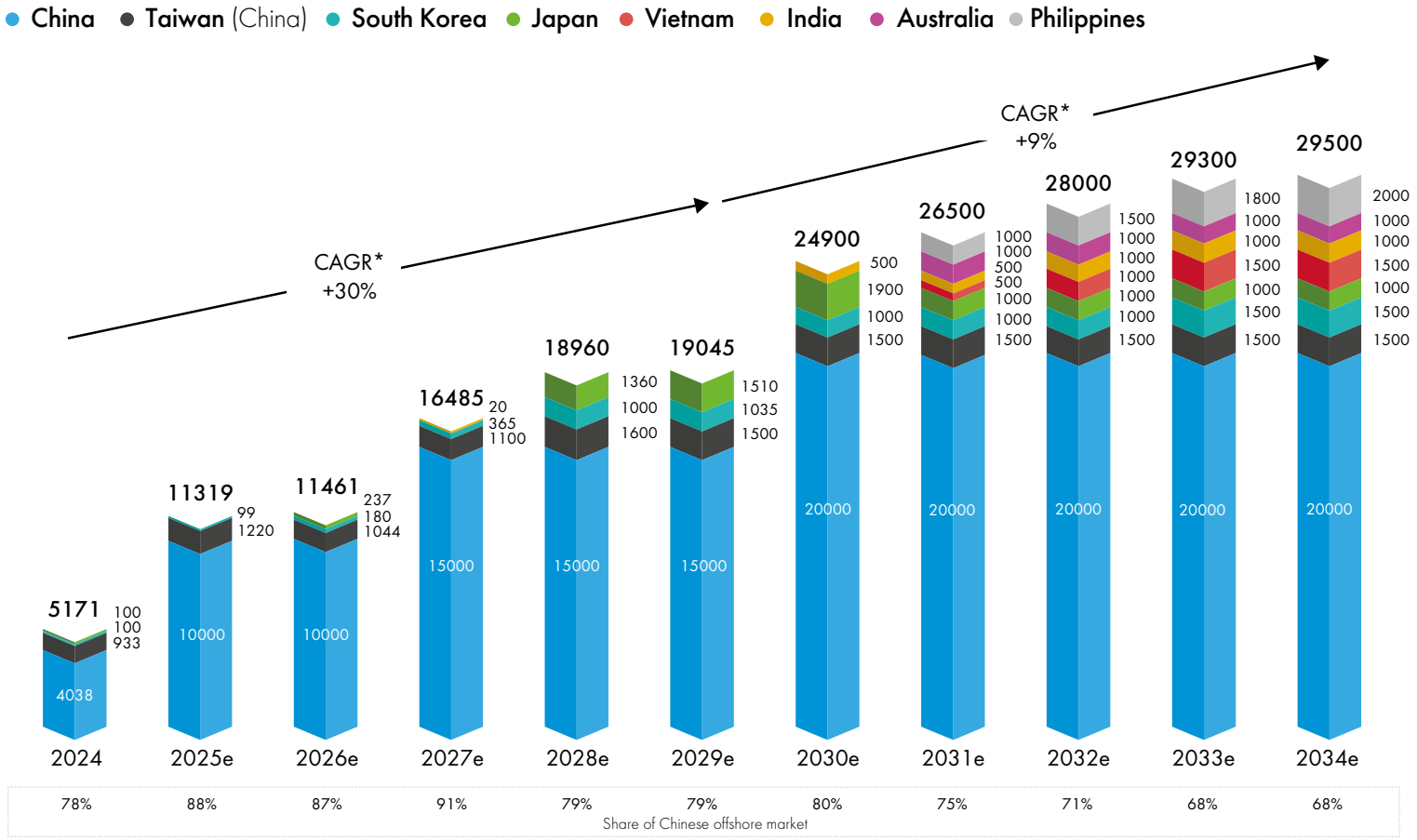
Türkiye is targeting 5 GW by 2035 under its National Energy Plan (2022). A World Bank Group offshore wind roadmap, released in collaboration with MENR in November 2024, outlines the potential for up to 7 GW by 2040.

Asia Pacific

Although Japan built the first offshore wind project in the APAC region more than two decades ago, the region had very little offshore wind development until 2017, when the Chinese offshore wind market started taking off. Thanks to outstanding growth in China, APAC replaced Europe as the leading regional offshore wind market in new installations in 2020 and in total installations in 2022.

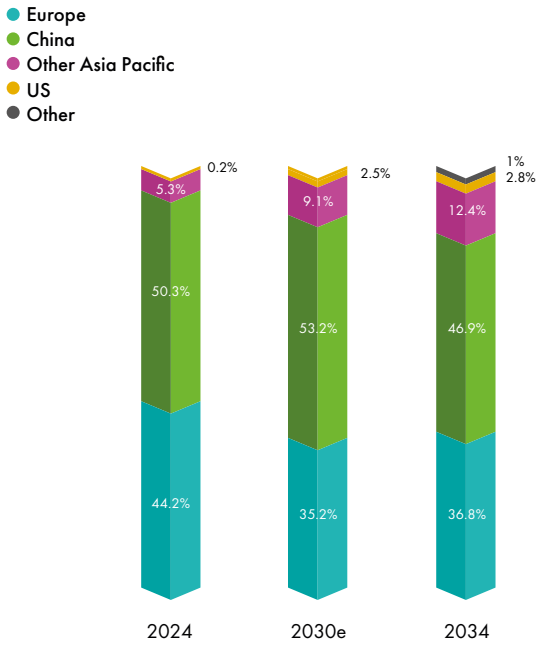
GWEC Market Intelligence sees China continuing as the dominant market in the region until 2027, with a market share of 87–91%. As the sector expands to other countries

Offshore wind growth to 2034 in Asia Pacific (MW)



*Compound Annual Growth Rate. Source: GWEC Market Intelligence, June 2025

Total added between 2025 and 2034



Source: GWEC Market Intelligence, June 2024

and GW-level offshore wind capacity starts coming online in Japan and South Korea, China's market share will drop to 79% in 2028 and 68% in 2034. A first batch of project development is likely to take place in emerging markets such as the Philippines, Vietnam, India and Australia towards the end of the forecast period.

In total, 215 GW of offshore wind capacity is predicted to be added in the next ten years, of which 36% will be in 2025–2029 and the remainder in 2030–2034. The top five markets in APAC for offshore wind additions over the next ten years will be China, Taiwan (China), South Korea, Japan and the Philippines.

China has the world's most mature offshore wind supply chain (see the China profile on page 56). Driven by local content requirements (LCRs), an offshore wind supply chain has been gradually established in Taiwan (China), where two European turbine suppliers – Siemens Gamesa and Vestas – are capable of producing offshore turbine nacelles. Governments' offshore wind ambitions and security concerns are likely to see local wind supply chains established in South Korean and Japan by 2030.

GWEC's and ERM's wind energy supply chain deep dive, Building the APAC Wind Energy Supply Chain for a 1.5°C World (November 2024) sees APAC wind industry demand being met by the existing regional wind supply chain in the open-door scenario. However, there is a high concentration risk, meaning that the region – excluding China – will struggle to install the amount of offshore wind power required to meet climate targets, with bottlenecks expected for all components except towers, foundations and cables. New markets including the Philippines, India and Australia, where offshore wind is in the early stages of development, are still facing the challenge of developing a local supply chain while building the necessary skills and workforce.

Scaling up local supply chains is critical to unlocking the growth potential of the APAC region and securing supply chain security. Although geopolitics hinder collaboration, political commitment and cooperation are essential to accelerating wind growth. Working together builds confidence in supply chain investment across the region and helps address shared challenges including grid systems, ports, vessels and workforce skills.

China

Although it underperformed in 2024, Chinese offshore wind deployment is likely to bounce back in 2025 and accelerate further once guidelines and regulations for deep-water project development are in place.

Under a market-oriented pricing scheme released by China's National Development and Reform Commission (NDRC) and NEA, projects commissioned before June 2025 will follow a price-difference settlement mechanism aligning grid connection pricing with current policy. New projects coming online after the deadline will have power purchase agreements adjusted dynamically, based on local renewable energy targets, with pricing set through competitive bidding. There are concerns that this pricing scheme may slow development in China due to uncertainty over rates of return, engendering caution about future investments.

The Chinese wind industry has seen all this before. After explosive growth in 2021 driven by the end of the Feed-in Tariff (FiT) regime, new offshore wind installations dropped dramatically but the market did not collapse. Connecting 5 GW in 2022 and 6.3 GW in 2023 without government financial support demonstrated the domestic industry's resilience and capability to maintain stable growth in the new era of 'grid parity'. GWEC Market Intelligence, therefore, believes that the local industry is capable of coping with the challenges posed by market reform, and that offshore wind will play a vital role in helping

China achieve the country's "30-60" goals. We expect China to retain its leading position with 165 GW added in 2025–2034.

Taiwan (China)

Taiwan commissioned 2.9 GW of new offshore wind capacity in 2021–2024, bringing its total offshore wind capacity above 3 GW – making it the second-largest offshore wind market in APAC.

Taiwan has 2.4 GW of capacity under construction across three projects but based on the updated CODs, is unlikely to reach its 5.6 GW by 2025 target.

The government officially announced its Round 3 offshore wind allocation plan for 2026–2035 in 2021 with seven projects totalling 3 GW allocated through Round 3, phase 1 in 2022. In Round 3.2, local content was still a focus. Six developers submitted bids for eight offshore wind projects totalling 3.6 GW of capacity in April 2024, with 2.7 GW of capacity across five projects won the auction in August.

In June 2025, two of the five winning projects under Round 3.2, with a combined capacity of 600 MW, had their development rights withdrawn. In addition to the 300 MW Haixia 1 project awarded under Round 3.1, Taiwan has now cancelled three projects totalling 900 MW for failing to meet established requirements.

Taiwan's use of local content requirements (LCRs) prompted the EU to request WTO dispute settlement in July 2024. As a result, LCRs were removed as eligibility conditions or award criteria in future offshore wind allocation rounds in November 2024.

GWEC Market Intelligence forecasts 14 GW of offshore wind capacity to be added in 2025-2034, making Taiwan the second largest offshore wind market in the APAC region.

Japan

With commissioning of the 112 MW Ishikari Bay New Port offshore wind farm in January 2024, Japan reached 300 MW of capacity in operation, of which 5 MW is floating wind.

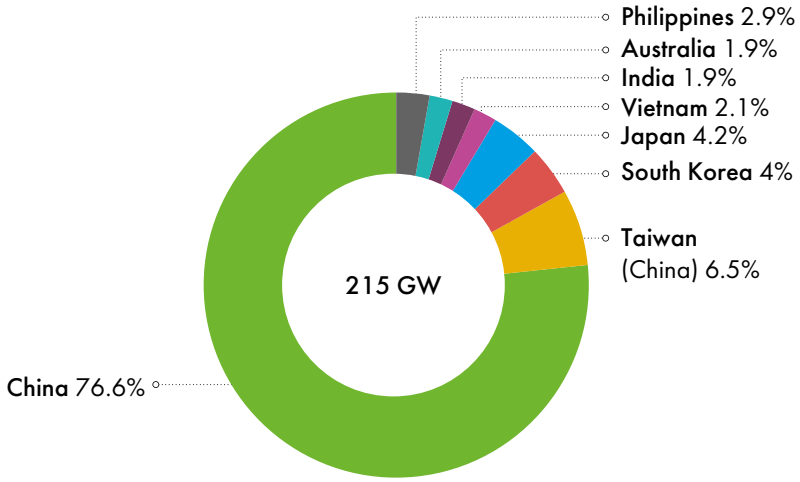
Despite building the region's first offshore wind project in 2003, Japan only established an offshore wind development target in late 2020. The 'Vision for Offshore Wind Industry' aims to auction 10 GW of offshore wind by 2030 and 30–45 GW by 2040.

The government plans to auction an average of 1 GW of offshore wind capacity each year until 2030. Rounds 1 (2021), 2 (2023) and 3 (2024) awarded approximately 4.6 GW in total. Future auctions will move to a centralised approach whereby the government will coordinate and publish pre-auction site surveys – currently managed by individual developers – in an attempt to minimise the burden on companies.

All the projects awarded so far are sited within territorial waters (12 nm from shore). The Renewable Energy Sea Area Utilisation Act was amended in March 2024 to allow for installation of offshore wind turbines within Japan's full EEZ. Approval of the EEZ bill (June 2025) enabling the government to designate and tender offshore wind areas in the EEZ significantly expands the potential area for offshore wind deployment, particularly using floating technologies.

Due to the rapidly increasing water depths off the Japanese coast, floating offshore wind is expected to be the dominant technology in the long term. A 16.8 MW floating

Total offshore wind added between 2025 and 2034



Source: GWEC Market Intelligence, June 2025

project off the coast of Goto City was awarded in the Round 1 auctions. Further demonstration projects are planned under NEDO's Green Investment Fund with two 15+ MW turbines to be installed off the coast of Akita Prefecture and one 15+ MW turbine to be installed off Aichi Prefecture.

If all of the awarded projects from the Round 1, 2 and 3 offshore wind auctions survive the current challenging macroeconomic environment, Japan is predicted to have 5 GW of offshore wind capacity by 2030 and 9 GW by 2034, making it the third largest market in the APAC region.

South Korea

With commissioning of the 96 MW Jeonnam 1 offshore wind project, South Korea has reached 355 MW of operational capacity. Under the 10th Basic Plan for Power Distribution released in 2023, the Ministry of Trade, Industry and Energy (MOTIE) targets 21.6% of renewable energy in South Korea's energy mix by 2030, and 14.3 GW of installed offshore wind capacity.

Under South Korea's developer-led, open-door system, more than 25 GW of projects have been granted Electricity Business Licences to begin preliminary site surveys. Approval of the so-called the One-stop Shop (OSS) Bill in February 2025 marks a pivotal shift in the country's renewable energy policy, introducing a government-led site development system and addressing the inefficiencies of the previous open-door model used by private developers.

The new law aims to streamline offshore wind deployment by allowing the government to designate planned offshore wind zones, ensuring development occurs in optimal locations for better community acceptance and environmental safeguards. It also seeks to overcome bureaucratic hurdles and complicated permitting procedures, which subjected developers to up to 29 regulations across 10 ministries, often resulting in projects taking more than eight years to complete.

South Korea's first offshore wind offtake auction was held in 2022, with the 96 MW Jeonnam 1 Offshore Wind Farm awarded a 20-year fixed price PPA with Korea Hydro & Nuclear Power. After a further 1.4 GW of capacity was allocated across four projects in early 2024, an accelerated auction timeline aiming to tender 7-8 GW of capacity in 2024–2026 was announced in August. MOTIE launched the first tender under this roadmap in October 2024, with 1.1 GW fixed bottom and 750 MW floating offshore wind awarded at the end of the year.

The Energy Agency announced a two-phase tender for offshore wind projects in May 2025, with 1.25 GW of fixed-bottom projects in the first phase and an as yet unspecified volume of floating capacity to be offered later this year.

GWEC forecasts annual offshore wind installations to ramp up from 2028, but the 14.3 GW by 2030 target is unlikely to be achieved. A total of 9 GW is expected to be added in 2025–2034, making South Korea the fourth-largest market in this region.

Vietnam

With 5 GW of wind energy installed, Vietnam is the fourth-largest wind market in APAC but has no real offshore wind projects in operation; all capacity installed so far is onshore (4 GW) and intertidal (1 GW).

The long-awaited Power Development Plan VIII (PDP 8) set a 6 GW offshore wind installation target for 2030 – excluding intertidal projects (May 2023). A revised PDP 8 (April 2025) acknowledges deployment delays and targets 6–17 GW between 2030 and 2035.

The Vietnamese government has made great strides in shaping a clear regulatory framework for offshore wind. Legislation introducing key provisions including the definition of offshore projects for those sited over 6 nm from the coast (Electricity Law 2024), guaranteeing the purchase of 80% of the power generated by offshore wind projects for 15 years (Decree 58/2025/ND-CP) and guidance on seabed allocation (Decree 65/2025/ND-CP) is now in place. Foreign companies are allowed to participate in offshore wind development provided they partner with a State-Owned Enterprise (SOE) or a joint venture majority-owned by an SOE.

GWEC Market Intelligence expects no real offshore wind capacity to be commissioned in Vietnam before 2030. To meet the 6–17 GW offshore wind target for 2030-2035, project development must commence this year. We forecast a total of 4.5 GW of capacity in 2031–2034, representing the lower end of the target set in the updated PDP8.

The Philippines

The Philippines' Department of Energy (DOE) launched the country's first offshore wind roadmap in 2022 and removed foreign ownership restrictions on renewable energy investment. There is significant interest in the country due to its very large offshore wind technical potential and high political appetite.

The DOE has approved 92 offshore wind energy service contracts with a potential capacity of 69 GW. It aims for a 35% share of renewables in the power mix by 2030 and 50% by 2040. The President has directed the DOE to establish a policy and administrative framework that supports offshore wind development and to commence grid development work. The goal is to have at least 10 projects with a combined capacity of 6.7 GW generating power by 2028. The fifth round (June 2025) of the Green Energy Auction (GEA-5), the first dedicated to offshore wind, targets 3.3 GW of fixed-bottom capacity for delivery between 2028 and 2030. Winners should be announced this year.

GWEC Market Intelligence does not expect offshore wind projects to be fully commissioned before 2030. It forecasts a total of 6.3 GW in 2031 and 2034, which would make the Philippines the fifth-largest market in APAC by 2034.

Australia

Australia has no installed offshore wind capacity, despite boasting some of the world's best wind resources.

It has yet to publish national offshore wind targets. The State of Victoria is spearheading development by targeting 2 GW by 2032, 4 GW by 2035 and 9 GW by 2040. Having awarded13 feasibility licences representing 25 GW of development capacity, Victoria is on track to reach its targets. Future development is expected off the Hunter and Illawarra regions of New South Wales, the Bass Strait off Northern Tasmania, and in the Indian Ocean off Bunbury in Western Australia.

No national route-to-market framework is in place yet, but the Offshore Wind Energy Victoria Implementation Statement 4 outlines plans for a tender process to be launched later this year, with contracts to be awarded by October 2026 and winning bidders supported through CfDs.

Victoria's state agency VicGrid has invited expressions of interest to help build and operate a 2 GW transmission system which will transport electricity generated off Gippsland to the state grid. Construction of the onshore transmission system is expected to begin in late 2027 and the new line is scheduled to enter operation in 2030.

North America

North America is the only region with offshore wind in operation outside of Europe and APAC: the 30 MW Block Island in Rhode Island and the 12 MW Dominion Virginia demonstration project.

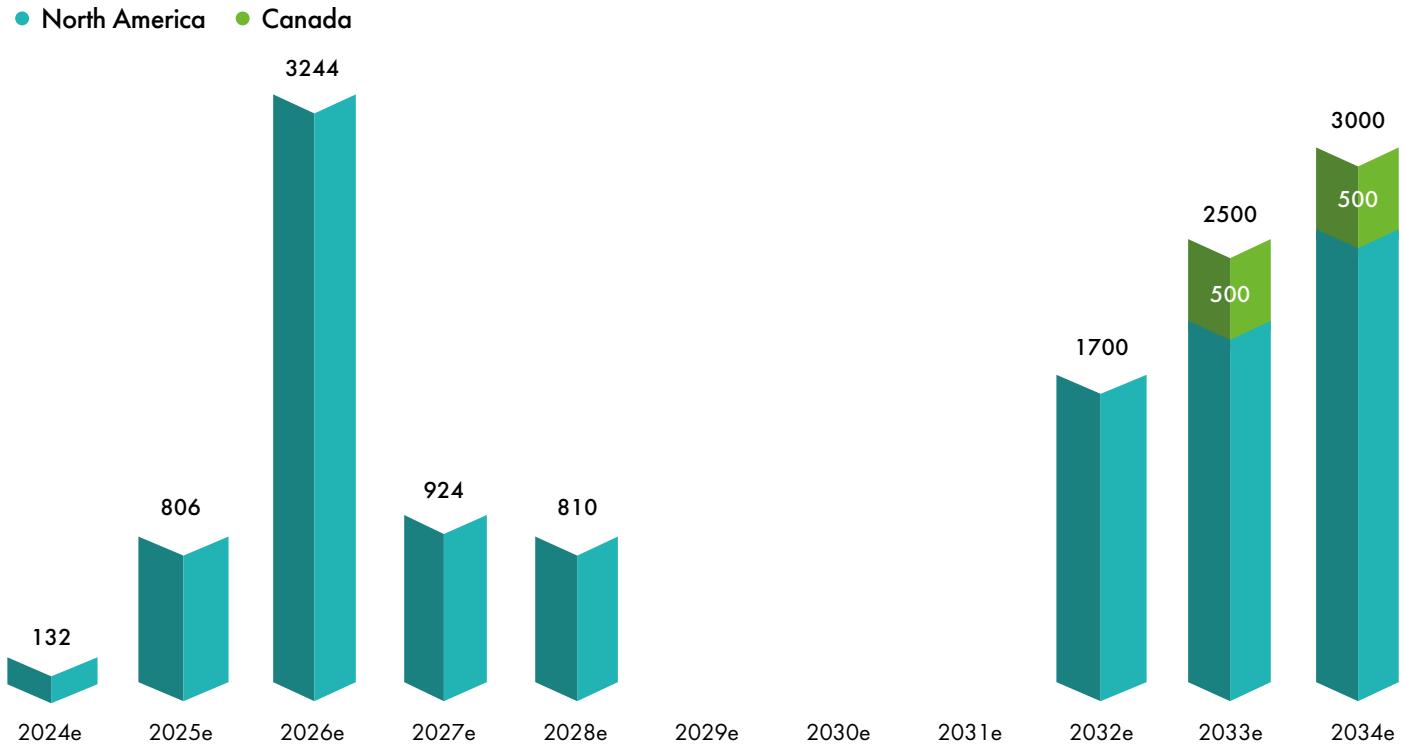
The first utility-scale offshore project, the 130 MW South Fork wind farm, was commissioned last year, bringing the region's total to 172 MW. As of May 2025, the US had 5 GW of offshore wind under construction across four projects. GWEC Market Intelligence forecasts 13 GW of offshore wind to be built in this region in 2025–2034, of which 45% is likely to be commissioned over the next five years. Around 12 GW (92%) of the predicted capacity is expected to be in the US, with Canada contributing only 1 GW.

United States

In the US, the combination of a vulnerable local supply chain with macroeconomic challenges had already created a 'perfect storm' for offshore wind before President Trump re-entered the White House in January 2025.

Challenges such as inflation, increased capital costs and supply

New offshore wind installations, North America (MW)



Source: GWEC Market Intelligence, June 2025

chain constraints – including for vessels – created uncertainty in the US offshore wind sector, forcing developers either to renegotiate signed offtake agreements or even terminate PPAs and cease project development.

By January 2024, 13 fixed-bottom offshore wind projects off the east coast totalling nearly 12 GW were affected, with nine projects, totalling 7.7 GW, having their offtake agreements terminated or being cancelled entirely.

President Trump's Executive Order to temporarily withdraw all offshore wind energy leasing within the Offshore Continental Shelf (OCS) will stop new offshore wind project development off the US coast. To compound matters, the threat of revocation hangs over project permits already awarded under the Biden Administration, as in the case of the 2.8 GW Atlantic Shores offshore wind project and the 810 MW Empire 1 offshore wind project (for which the stop-work order was lifted in May). The industry is also likely to suffer the effects of the tariffs that President Trump has been imposing on imports of goods from both allies and adversaries.

With all of this in mind, GWEC Market Intelligence has downgraded its 2030 US offshore wind growth projection to below 6 GW, compared to 15 GW in the previous year's outlook. We expect the additions to come from Vineyard 1, Revolution Wind, Coastal Virginia Offshore Wind (CVOW), Empire 1 and Sunrise offshore wind projects. The prospects for the US offshore wind market are uncertain. Even if the next administration supports offshore wind, it will likely take several years to get GW-level offshore wind projects online.

Floating Offshore Wind

Norway's 2.3 MW Hywind project became the world's first MW-scale floating offshore wind turbine in 2009. Following more than a decade of testing with demonstration projects in Europe, North America and Asia, floating wind technology entered the pre-commercial phase in the early 2020s.

Our near-term outlook (2025–2029) is primarily based on the existing global floating offshore wind project pipeline with announced commercial operation dates (CODs). For the medium-term outlook (2030–2034), we applied a top-down approach that considers national floating wind targets, announced auction plans, and project pipelines disclosed by major offshore wind developers.

Based on the existing global floating wind project pipeline of more than 270 GW and the announced project CODs, GWEC Market Intelligence previously predicted that floating wind would reach commercialisation by 2029. However, in light of more recent developments, we believe that annual floating wind installations are unlikely to reach the 1 GW milestone before 2030.

The reasons for our outlook adjustment include:

- Macroeconomic challenges such as inflation, increased capital costs and supply chain constraints creating headwinds for the commercial viability of bottom-fixed projects in the past two years. Floating wind is more expensive than bottom-fixed projects, making investors less confident in their delivery under such challenging conditions.
- Floating foundation technology is less mature than fixed-bottom solutions due to the insufficient standardisation of existing floating foundation designs, only a handful of which have been tested at full scale. This makes it hard to achieve scale while mitigating risk and reducing CAPEX and OPEX.
- Foundation manufacturing and assembly require huge upfront investment in port infrastructure, as well as mooring and anchoring vessels that can support the installation.
- A bottleneck in floating foundations is likely in the event of restrictive trade policies and LCRs.

GWEC Market Intelligence has therefore downgraded its global floating wind forecast and predicts 2.6 GW to be built globally by 2030, 69% lower than the previous year's projection.

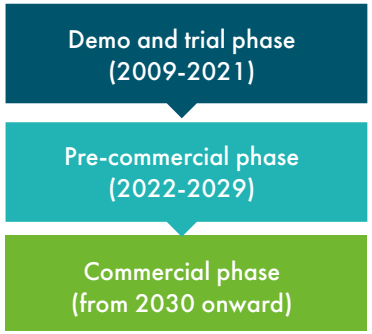
Norway, the UK, China, France and Portugal are the top five markets in net floating wind installations today. By the end of 2034, China, the UK, South Korea, Norway and Portugal are likely to be the top five floating markets.

GWEC Market Intelligence predicts floating wind to become fully commercialised by the end of this decade, with multi-GW levels of new installations expected from 2031 onward. Only 7% (1.3 GW) of the total projected new additions (18 GW) will be installed in the first half of the forecast period.

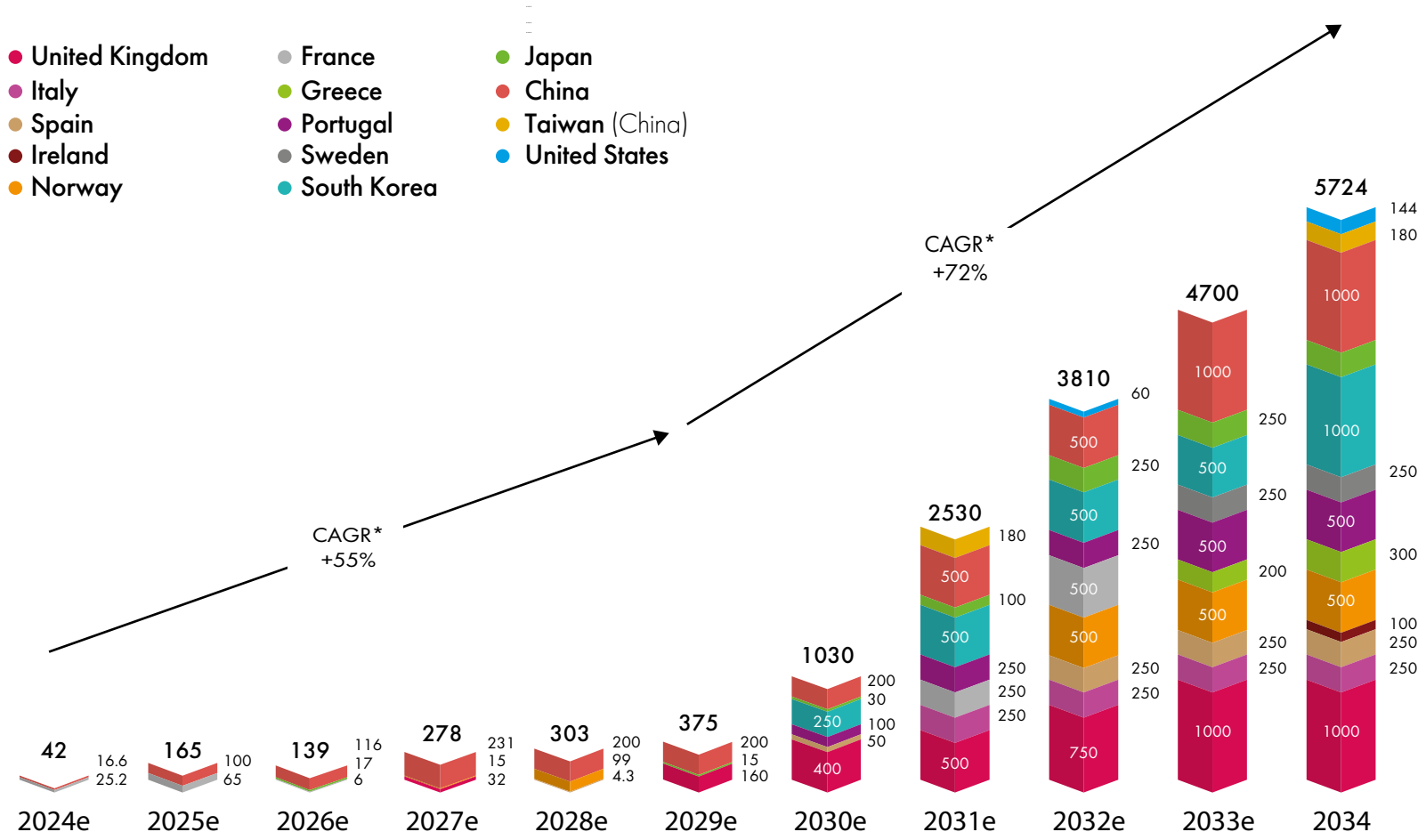
As for regional distribution, we expect Europe to contribute 57% of total installations by 2034, followed by APAC (42%) and North America (1%). By the end of 2034, a total of 19 GW of floating wind is likely to be installed worldwide, bringing its contribution to total offshore wind installations from today's 0.3% to 4%.

Promising policy progress has recently been made in markets such as Japan. GWEC Market Intelligence expects this to have a positive impact

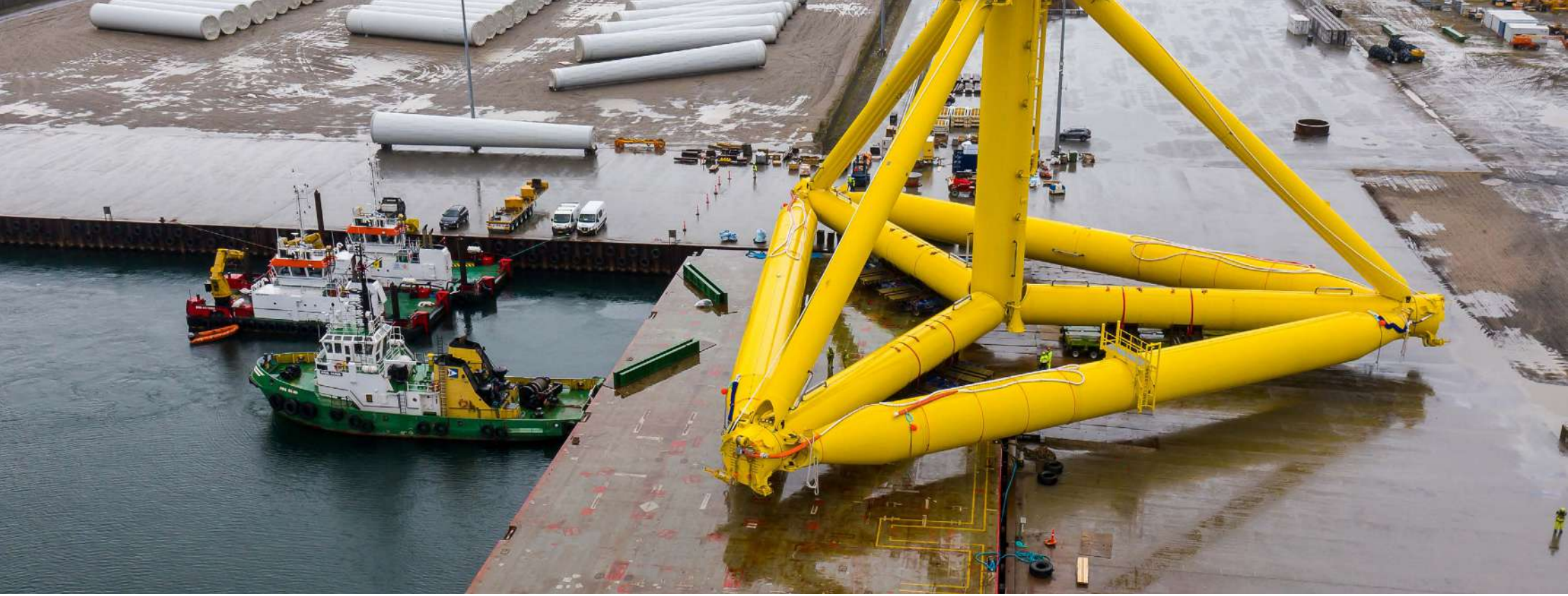
Roadmap of floating offshore wind commercialisation



New floating wind installations, Global (MW)**



*Compound Annual Growth Rate., **Note: this floating wind outlook is already included in GWEC's global offshore wind forecast.
Source: GWEC Market Intelligence, June 2025



on floating wind growth and will revisit the outlook in next year's report.

Global stocktake of floating wind development

Europe

The UK government has an ambitious target of 5 GW of floating wind capacity installed by 2030. It has already awarded nearly 18 GW of floating wind capacity through the ScotWind leasing round. Crown Estate Scotland selected 13 floating projects with a combined capacity of around 5.5 GW in the Innovation and Targeted Oil and Gas (INTOG) leasing round (March 2023). The Crown Estate's Celtic Sea floating offshore wind leasing round (Round 5) has increased from 4 GW to 4.5 GW (October 2024). The Round 5 seabed leasing process began in February 2024 and winning bidders should sign lease agreements during the northern hemisphere summer. Last November, the government confirmed its intention to award a further 12 GW of capacity in the Celtic Sea.

In response to the inflation and supply chain challenges that caused the CfD AR5 auction to fail, the government increased the maximum strike price for floating offshore wind by 52%, from GBP 116/MWh to GBP 176/MWh ahead of AR6, which opened in March 2024. A month later, the Green Volt floating wind farm secured all planning approvals. In September 2024, a single contract with a capacity of 400 MW (out of a possible 560 MW) was granted for this project with a strike price of GBP 139.9/MWh, making it likely to become Europe's first large-scale grid-connected floating offshore wind farm.

In **Norway**, the Marine Energy Test Centre (METCentre) received approval in 2023 for new test concessions for five wind turbines, supporting floating wind technology development and efforts to reduce the cost of energy. The award of 1.5 GW of floating wind capacity in the Utsira Nord lease area was delayed to 2025 due to concerns over the

project's risk profile. Applications are open until 15 September 2025. The government is offering a project capacity of 500 MW at each site through the tendering process, which will be carried out in two stages: the allocation of project sites and the competition for state aid, capped at NOK 35 billion (EUR 3 billion), with a maturation phase in between.

In December 2024, **France** received approval from the European Commission to support the construction and operation of two floating offshore wind farms, each with a capacity of 250 MW, in the Gulf of Lion, with funding of EUR 4.12 billion. In May 2024, Belgian Eolico and German company BayWa.r.e won France's first 250 MW commercial-scale floating wind tender off the coast of Brittany. The bid of EUR 86.45/MWh is just one cent/kWh higher than the strike price offered for fixed-bottom offshore wind in the UK's CfD AR6, demonstrating the developers' confidence in the commercial success of floating wind. At the end of 2024, the French government announced the winners of the AO6 tender, which offered two 250 MW floating wind sites in the Mediterranean Sea with prices as low as EUR 85.9/MWh.

Additionally, in July 2024, the French government opened the 2.5 GW AO9 tender comprising a 400–550 MW floating wind farm in South Brittany and two 450–550 MW floating wind farms in the Mediterranean. A few months later, the government announced the plan to launch the 9 GW AO10 tender for three floating wind projects: 1.2 GW or 2 GW on the North Atlantic-Western Channel coastline; 1.2 GW on the South Atlantic coast; and 2 GW in the Mediterranean.

North America

BOEM held lease sales off central and northern California, in **the US**, in December 2022, with more than 4.6 GW of floating wind capacity expected to be built, as part of efforts to achieve the Biden Administration's target of 15 GW of floating wind capacity by 2035. In July 2024, a decision by the California Public Utilities Commission (CPUC) could see the US state running three offshore wind solicitations to procure up to 7.6 GW of floating wind capacity, with the first projects in operation by 2035.

Last April, BOEM announced two proposals for offshore wind energy auctions off the coast of Oregon and in the Gulf of Maine for areas that are in deep water and will require floating wind. In August 2024, the federal agency issued the Final Sale Notice (FSN) for two lease areas offshore Oregon, but the US federal agency postponed this lease sale in September due to insufficient bidder interest. In the same month, BOEM issued the FSN for eight offshore wind areas in the Gulf of Maine, with four attracting bidders.

However, President Trump's Executive Order to temporarily withdraw all offshore wind energy leasing within the Offshore Continental Shelf (OCS) has stopped all new floating offshore wind project development off the US coast. Considering the policy uncertainty as well as the long lead time to develop a floating wind project, it is unlikely that floating wind will be built in the US before the early 2030s.

Asia Pacific

China's Renewable Energy Engineering Institute approved in September 2022 the feasibility study for phase one of the 1 GW Wanning floating wind demonstration project, consisting of a 100 MW prototype and a 100 MW demonstration project. In December 2023, four local wind turbine OEMs – Shanghai Electric, Dongfang, CRRC and Windey – were selected as the suppliers for the 100 MW prototype phase. With the

construction partners announced in April 2024, six wind turbines in the size range of 16-18 MW are scheduled to be connected by the end of 2025. According to the initial development plan, the remaining capacity of this project will be added by the end of 2027.

In addition, four small-scale floating demonstration projects, totalling 53 MW, are under development. A 16 MW demonstration project developed by CTG is expected online in 2026.

In **South Korea**, Europe-based developers have been joining forces with local companies to develop a floating wind project pipeline. In April 2023, together with the Ulsan Chamber of Commerce and Industry (UCCI), they launched the Ulsan Floating Offshore Wind Association to promote the development of the offshore wind industry in Ulsan. By the end of 2024, seven large-scale floating wind projects had received the EBL from the Electricity Regulatory Commission under the Ministry of Trade, Industry and Energy. Five of them, totalling more than 6 GW, have entered into Transmission Service Agreements (TSAs) with Korea Electric Power Corporation (KEPCO) and two have announced preferred turbine suppliers.

Last December, the government awarded the 750 MW Bandibuli floating wind project under its 1.9 GW offshore wind tender. With wind turbine, foundation and cable supplyr contracts already signed, this project is expected to be commissioned from the end of this decade, likely to mark the first commercial floating wind project in APAC excluding China.

In May 2025, South Korea's Energy Agency announced a 1.25 GW fixed-bottom offshore wind tender alongside a tender for an unspecified volume of floating offshore wind tender. This is planned for the second half of this year.

Japan is APAC's floating wind pioneer. The commissioning of the 16.8 MW Goto floating wind farm, which won Japan's first floating wind auction in 2021, has been postponed by two years, from 2024 to 2026, due to the discovery of defects in the floating structures to be used for the project. Nevertheless, progress has been made by the government in supporting floating wind development, notably by setting aside a JPY 85 billion ($58 million) subsidy to support two large-scale floating demonstration projects. In June 2024, two consortia secured public funding: the first will develop two 15 MW demonstration offshore wind turbines with semi-submersible floating foundations at the Southern Akita Floating Offshore Wind Demonstration Project; the second will test one 15 MW offshore wind turbine off the coast of Tahara City and Toyohashi City. Both projects are expected to be commissioned around the end of this decade.

In March 2024, the Japanese government passed an amendment to the ''Act on Promoting the Utilization of Sea Areas'', allowing offshore wind farms including floating wind to be deployed in the EEZ. Following this new legislation, a consortium of 14 Japanese companies has established the Floating Offshore Wind Technology Research Association (FLOWRA), with the goal of accelerating the large-scale commercialisation of floating offshore wind. Japan's Ministry of Economy, Trade and Industry has approved the initiative. The government has allocated JPY 4 billion ($27.1 million) to support floating offshore wind technology, plus up to another JPY 400 billion to be funded through so-called green transformation bonds to build related supply chains.

In June 2025, Japan's House of Representatives passed a new bill amending the Act on Promotion of Use of Marine Areas for Development of Marine Renewable Energy Power Generation Facilities to allow the government to designate and tender offshore wind areas in the EEZ. It is expected to serve as the cornerstone for floating wind development in Japan.

APPENDIX

Global Offshore Wind Report 2025 - Methodology and Terminology

Data definitions and adjustments

GWEC reports installed and fully commissioned capacity additions and total installations. New installations are gross figures not deducting decommissioned capacity. Total installations are net figures, adjusted for decommissioned capacity.

Historic installation data has been adjusted based on the input GWEC received. GWEC made the adjustments to both new and cumulative installations over the course of time.

All currency figures in $ are given in US Dollars.

Definition of regions

GWEC adjusted its definition of regions in 2018 and maintains these in the 2025 edition, specifically for Latin America and Europe.

Latin America: South, Central America and Mexico

Europe: Geographic Europe including Norway, Russia, Switzerland, Turkey,Ukraine

Sources for the report

GWEC collects installation data from regional or country wind associations. For the supply side data, GWEC collects directly from wind turbine OEMs and component suppliers.

Used terminology

GWEC uses terminology to the best of our knowledge. With the wind industry evolving certain terminology is not yet fixed or can have several connotations. GWEC is continuously adapting and adjusting to these developments.

Acronyms

ADB	Asia Development Bank
ADU	Agile Delivery Units
ANH	National Hydrocarbons Agency, Colombia
APAC	Asia Pacific
APS	Announced Pledges Scenario (IEA)
ASEAN	Association of Southeast Asian Nations
BCG	Boston Consulting Group
BNEF	Bloomberg New Energy Finance
BOEM	The Bureau of Ocean Energy Management
BOP	Balance of Plant
BPU	Board of Public Utilities
BSH	Federal Maritime and Hydrographic Agency, Germany
CAAD	Climate Action Against Disinformation
CAPEX	Capital Expenditure
CBAM	Carbon Border Adjustment Mechanism
CfD	Contract for Difference
COD	Commercial Operation Date
CoE	Centers of Excellence
CPTRA	Consumer Protection and Technical Regulation Authority, Estonia
CPUC	California Public Utilities Commission
CRE	Energy Regulatory Commission, France
CSO	Civil Society Ogranisation
CTWD	Contact tip-to-work distance
CTVs	Crew Transfer Vessels
CVOW	Coastal Virginia Offshore Wind
CWEA	Chinese Wind Energy Association
DC	Direct Current
DEEP	Department of Energy and Environmental Protection
DMAP	South Coast Designated Maritime Area Plan, Ireland
DfM	Design for Manufacturing
DFFE	Department of Forestry, Fisheries and the Environment
DGP	Gross Domestic Product
DOE	Department of Energy DOI Department of the Interior
EBL	Electricity Business License
EC	European Comission
EEG	Renewable Energy Sources Act
EEZ	Exclusive Economic Zone
EIAs	Environmental Impact Assessments
EIB	European Development Bank
EMDEs	Emerging and Developing Economies
ENTSO-E	The European Network of Transmission System Operators for Electricity
EnWG	Energy Industry Act
EPC	Engineering, Procurement, and Construct
EPE	Energy Research Office, Brazil
ERC	Energy Regulatory Commission
ERO	The Polish Energy Regulatory Office
ESG	Environmental Social Governance
ESIA	Environmental Social Impact Assessment
ESO	Electricity System Operator
ESMAP	Energy Sector Management Assistance Program
ETC	Energy Transitions Commission
ESO	UK's electricity system operator
EVH	Extra High Voltage
EVN	Electricity of Vietnam
EZK	Dutch Ministry of Economic Affairs and Climate Policy
FDI	Final Investment Decision
FDIs	Final Investment Decisions
FIP	Feed-in premium
FiT	Feed-in Tariff
FLOWCON	Floating Wind Logistics and Construction Organisation, Japan
FLOWRA	Floating Offshore Wind Technology Research Association
FSN	Final Sale Notice
FTE	Full-time equivalent
FX	Foreign Exchange
GEA	Green Energy Auction
GEAP	Green Energy Auction Program, Phillippines
GOWA	Global Offshore Wind Alliance
GVA	Gross Value Added
GW	Gigawatt
GWO	Global Wind Organisation
GWWO	Global Wind Workforce Outlook
HEREMA	Energy Resources Management Company
HEREMA	Hellenic Hydrocarbons and Energy Resources Management Company
HV	High Voltage
HVDC	High Voltage Direct Current
IEA	International Energy Agency
INTOG	Innovation and Targeted Oil and Gas
IPP	Independent Power Producer
IRA	Inflation Reduction Act
IRENA	International Renewable Energy Agency
ISTS	Inter State Transmission System
JOGMEC	Japan Organization for Metals and Energy Security
JV	Joint Ventures
KEI	The South Korea Environment Institute
KEPCO	Korea Electric Power Corporation
LCOE	Levelised Cost of Energy
LCRs	Local Content Requirements
LSO	Long Stick-Out
MACs	Maritime Area Consents
MDB	Multilateral Development Banks
MENR	Ministry of Energy and Natural Resources, Turkey
METCentre	Marine Energy Test Centre, Norway
METI	The Ministry of Economy, Trade and Industry, Japan
MLTI	Ministry of Land, Infrastructure, Transport and Tourism
MME	Ministry of Mines and Energy, Brazil
MOAE	Ministry of Agriculture and Environment, Vietnam
MOIT	Ministry of Industry and Trade, Vietnam
MOTIE	Ministry of Trade, Industry and Energy, South Korea
MRL	Manufacturing Readiness Levels
MSP	Marine Spatial Planning
MW	Megawatt
NDCR	China's National Development and Reform Commission
NEA	The Chinese National Energy Administration
NERC	National Energy Regulatory Council, Lithuania
NJBPU	New Jersey Board of Public Utilities
NPC	Non-price criteria
NSEC	North Seas Energy Cooperation
NYSERDA	New York State Energy Research and Development Authority
NZE	Net Zero Emissions Scenario, IEA
OCS	Offshore Continental Shelf
O&M	Operation & Management
OEM	Original Equipment Manufacturers
OFTO	Offshore Transmission Owner
OEP	Ocean Energy Pathway
OPEX	Operating Expenditure
OSS	South Korea's Offshore Safety and Security Bill
OFW	Offshore Wind
PATEN	Energy Transition Acceleration Program, BRAZIL
PDP8	Power Development Plan 8, Vietnam
PEN	National Energy Plan, Colombia
PEP	Philippine Energy Plan
PPA	Power Purchase Agreement
PRS	Renewable Portfolio Standard
R&D	Research & Development
REEs	Rare Earth Elements
REPA	Renewable Energy Portfolio Agreement
RESS	Renewable Electricity Support Scheme
SAW	Submerged arc welding
SBCE	Brazilian Emissions Trading System
SGRE	Siemens Gamesa Renewable Energy
Six-DOF	Six Degrees of Freedom
SOA	State Oceanic Administration, China
SOE	State-Owned Enterprises
SPN	State Policy Network
SPV	Special Purpose Vehicle
ToR	Terms of Reference
TSO	Transmission System Operator
TSAs	Transmission Service Agreements
TWG	Technical Working Group
TWh	Terawatt hour
UCCI	Ulsan Chamber of Commerce and Industry
WACC	Weighted Average Cost of Capital
WEDAP	Wind Energy Developers Association of the Philippines
WTIVs	Offshore Wind Turbine Installation Vessels
WFA	WindFloat Atlantic
XR	Extended Reality

About GWEC Market Intelligence

GWEC Market Intelligence provides a seriesof insights and data-based analysis on thedevelopment of the global wind industry. Thisincludes a market outlook, country profiles,policy updates, deep-dives on global windsupply chain and offshore wind among manyother exclusive insights.

GWEC Market Intelligence derives its insightsfrom its own comprehensive databases, localknowledge and leading industry experts.

The market intelligence team consists ofseveral strong experts with long-standingindustry experience across the world.

GWEC Market Intelligence collaborates withregional and national wind associations as wellas its corporate members and MI subscribers.

Who can access GWEC Market Intelligence?

- Wind energy associations
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Market statistics, market outlook, auction updates, project pipeline

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Asset Owners
Database of asset owners in key markets, investment trends

Technology/ Supply Chain
Wind turbine data, technology trends, component assessment, offshore wind installation vessels

Energy Transition
Shift to value-focused, new wind-based solutions, market design

O&M
ISP - OEM - Self Perform database for key markets

GWEC Market Intelligence is housed on a Members-only area on the GWEC website for our members and subscribers to have all of ourinsights on the global wind industry at their fingertips.

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GWEC Market Intelligence Products in 2025

Product	Frequency	Expected Release date
1. Wind Energy Stats/Market Data		
Wind Stats 2024 (historic annual, accumulative, decommision data)	Annual	April 2025
Global Wind Report 2025	Annual	April 2025
Wind Energy Statistics (wind energy penetration rate, jobs)	Annual	April 2025
2. Country Profiles/Policy Updates		
Country Profiles Onshores/Country Profiles Offshore	Annual	April 2025 (onshore)
Ad-hoc Policy Updates	Ad-hoc	September 2025 (offshore)
3. Market Outlook		
Global Wind Market Outlook 2025-2030 (Q1 and Q3) Database + Report	Semi-Annual	April 2025 (Q1 Outlook) November 2025 (Q3 Outlook)
India Market Outlook Report 2025-2030	Annual	TBC
4. Supply Side Data		
Global Wind Turbine Supply Side Data Report 2024 (by OEM, by technology, by turbine ratings, models and drive train, etc)	Annual	May 2025
5. Auctions/Tenders		
Global Wind Auction	Quarterly	Q4 2024 results - March 2025
Auction Trends and Learnings	Quarterly	Q1 2025 results - May 2025 Q2 2025 results - August 2025 Q3 2024 results - November 2025
6. Offshore Wind Market		
Global Offshore Wind Report 2025	Annual	June 2025
Market Entry Opportunities (database)	Annual/Quarterly	After each Global Offshore Wind Task Force meetting
Global Offshore Project Pipeline (database, in operation and under construction)	Annual/Quarterly	June 2025
Global Offshore Turbine Installation Vessel Database and Report	Annual/Quarterly	October 2025
7. Components Assessment		
Gearbox (Q4 2025), Generator (Q4 2024), Global Wind Supply Chain Deep Dive (Q4 2023), Blades (Q4 2020)	Special Report	December 2025
8. Wind Asset Owners/Operators		
Asset Owners and Operators Database (Onshore & Offshore Ranking)	Annual	July 2025
Asset Owners and Operators Status Report (including strategical trends)	Annual	
9. O&M		
O&M Service Provider Database (ISP - OEM - Self-perform)	Annual	February 2025
O&M Service Provider Status Report (including regional trends)	Annual	
10. Energy transition, Digitalisation, New Technologies		
Auction design and non-price criteria, community engagement and social acceptance for permitting, supply chain policy analysis, repowering	Special Report	Throughout the year

GWEC Global Leaders

The Global Wind Energy Council's Global Leaders are an exclusive leadership group of decision-makers and top-tier members who form the basis of the Association's Executive Committee, which drives the work programme and plays a major role in shaping GWEC's priorities for its efforts in the short and long-term strategy.

Siemens Energy

We are Siemens Energy – a global leader in energy technology. The energy transition is the greatest challenge our generation faces. How do we reduce emissions while also increasing energy supply? It is an uphill battle. And there is no silver bullet. But finding solutions has always been in our DNA. For more than 150 years our engineers have been spearheading the electrification of the world. Today we are a team of 100,000 sharing the same passion, vision and values. Our diversity makes us strong and helps us to find answers together with our partners. Located in 90 countries, Siemens Energy operates across the whole energy landscape. From conventional to renewable power, from grid technology to storage to electrifying complex industrial processes. Our mission is to support companies and countries with what they need to reduce greenhouse gas emissions and make energy reliable, affordable, and more sustainable. Let's energize society.

Ørsted

The Ørsted vision is a world that runs entirely on green energy. Ørsted develops, constructs, and operates offshore and onshore wind farms, solar farms, energy storage facilities, renewable hydrogen and green fuels facilities, and bioenergy plants. Moreover, Ørsted provides energy products to its customers. Ørsted is the only energy company in the world with a science-based net-zero emissions target as validated by the Science Based Targets initiative (SBTi). Ørsted ranks as the world's most sustainable energy company in Corporate Knights' 2022 index of the Global 100 most sustainable corporations in the world and is recognised on the CDP Climate Change A List as a global leader on climate action.

GE Vernova

Addressing the urgent need to build a more sustainable electric power system while improving the trajectory of climate change emissions are global priorities and we take our responsibility seriously. That is our mission at GE Vernova: continuing to electrify the world while simultaneously working to help decarbonize it. If we want our energy future to be different…we must be different. Our mission is embedded in our name. We retain our treasured legacy, "GE," in our name as an enduring and hard-earned badge of quality and ingenuity. "Ver" / "verde" signal Earth's verdant and lush ecosystems. "Nova," from the Latin "novus," nods to a new, innovative era of lower carbon energy that GE Vernova will help deliver. Together, we have The Energy to Change the World.

Iberdrola

With over 170 years of history behind us, Iberdrola is now a global energy leader, the number one producer of wind power, and one of the world's biggest electricity utilities in terms of market capitalisation. We have brought the energy transition forward two decades to combat climate change and provide a clean, reliable and smart business model, to continue building together each day a healthier, more accessible energy model, based on electricity

Vestas

Vestas is the energy industry's global partner on sustainable energy solutions. We design, manufacture, install, and service wind turbines across the globe, and with +151 GW of wind turbines in 86 countries, we have installed more wind power than anyone else.
Through our industry-leading smart data capabilities and +129 GW of wind turbines under service, we use data to interpret, forecast, and exploit wind resources and deliver best-in-class wind power solutions. Together with our customers, Vestas' more than 29,000 employees are bringing the world sustainable energy solutions to power a bright future.

Equinor

We are looking for new ways to utilise our expertise in the energy industry, exploring opportunities in new energy and driving innovation in oil and gas around the world. We know that the future has to be low carbon. Our ambition is to be the world's most carbon-efficient oil and gas producer, as well as driving innovation in offshore wind and renewables. We plan to reach an installed net capacity of 12-16 GW from renewables by 2030, two-thirds of this will be from offshore wind. With five decades of ocean engineering and project management expertise, focus on safe and efficient operations, in depth knowledge of the energy markets, skilled personnel and a network of competent partners and suppliers, Equinor is uniquely positioned to take a leading role in the offshore wind industry. From building the world's first floating wind farm to building the world's biggest offshore wind farm we are well underway to deliver profitable growth in renewables be a leading company in the energy transition.

Corio Generation

Corio Generation is a specialist offshore wind business dedicated to harnessing renewable energy worldwide. Our 20+ GW development portfolio is one of the largest in the world, spanning established and emerging markets, as well as floating and fixed-bottom technologies.

With our leading industrial expertise and deep access to long-term capital, we work closely with our partners in the creation and management of projects from origination, development and construction, and into operations.

Corio Generation is a Green Investment Group (GIG) portfolio company, operating on a standalone basis. GIG is a specialist green investor within Macquarie Asset Management, part of Macquarie Group.

Global Leaders

CIP
Founded in 2012, Copenhagen Infrastructure Partners P/S (CIP) today is the world's largest dedicated fund manager within greenfield renewable energy investments and a global leader in offshore wind. The funds managed by CIP focuses on investments in offshore and onshore wind, solar PV, biomass and energy-from-waste, transmission and distribution, reserve capacity, storage, advanced bioenergy, and Power-to-X.

CIP manages ten funds and has to date raised approximately EUR 19 billion for investments in energy and associated infrastructure from more than 140 international institutional investors. CIP has approximately 400 employees and 11 offices around the world

SSE Renewables
SSE Renewables is a leading developer and operator of renewable energy, headquartered in the UK and Ireland, with a growing presence internationally. Its strategy is to lead the transition to a net zero future through the world-class development, construction and operation of renewable power assets and it is building more offshore wind energy than any other company in the world. Part of the FTSE-listed SSE plc, SSE Renewables is taking action to double its installed renewable energy capacity to 8GW by 2026 as part of its Net Zero Acceleration Programme, and increase renewables output fivefold to over 50TWh annually by 2031.

Envision Energy
Envision Energy is a world-leading green technology company, providing renewable energy system solutions for global enterprises, governments, and institutions. With the mission of 'solving the challenges for a sustainable future', Envision Energy continuously reduces the production, storage, and synergy costs of renewable energy through technological innovation. Encompassing three major business sectors - Smart Wind Turbines, Energy Storage, and Green Hydrogen Solutions, Envision Energy collaboratively constructs comprehensive solutions for energy transformation. It also manages Envision-Hongshan Carbon-Neutral Fund and owns Envision Racing Formula E team, who conquered the Formula E Teams' Championship in 2023.

Today, Envision Energy leverages its global network of R&D and engineering centers across China, the United States, UK, France, Germany, Denmark, etc. to continuously lead global green technology development. Envision Energy joined the Science Based Targets initiative (SBTi) and committed to achieving the "Business Ambition for 1.5°C" in 2021. It has achieved carbon neutrality across its global operations by 2022 and will achieve carbon neutrality throughout its value chain by 2028.

Envision was ranked second in Fortune's 2021 "Change the World" list and was ranked among the Top 10 of the 2019 'World's 50 Smartest Companies' by the MIT Technology Review.

Masdar
Abu Dhabi Future Energy Company (Masdar) is the UAE's clean energy champion and one of the world's fastest-growing renewable energy companies, advancing the development and deployment of renewable energy and green hydrogen technologies to address global sustainability challenges. Established in 2006, Masdar has developed and partnered projects in over 40 countries, helping them to achieve their clean energy objectives and advance sustainable development. Masdar is jointly owned by Abu Dhabi National Oil Company (ADNOC), Mubadala Investment Company (Mubadala), and Abu Dhabi National Energy Company (TAQA), and under this ownership the company is targeting a renewable energy portfolio capacity of at least 100 gigawatts (GW) by 2030.

Suzlon
The Suzlon Group is one of the leading renewable energy solutions providers in the world with ~20.7 GW* of wind energy capacity installed across 17 countries. Headquartered at Suzlon One Earth in Pune, India; the Group comprises of Suzlon Energy Limited and its subsidiaries. A vertically integrated organisation, with in-house research and development (R&D) centres in Germany, the Netherlands, Denmark, and India, Suzlon's world-class manufacturing facilities are spread across multiple locations in India. With over 29 years of operational track record, the Group has a diverse workforce of over 6,200 employees. Suzlon is also India's No. 1 wind energy service company with the largest portfolio of over 14.7 GW in wind energy assets. The Group has ~6 GW of installed capacity outside India. Suzlon offers a comprehensive product portfolio led by the 2 MW and 3 MW series of wind turbines.

Octopus Energy
At Octopus Energy Generation, we're building green power for the future. From large solar projects to wind farms which harness the abundant wind on land and at sea, to more localised, people-led renewables in the form of the Fan Club, the Collective and onsite generation connected directly to businesses - we're committed to driving the green energy revolution faster than ever before. We've invested in energy projects and energy transition companies spanning 20 countries and 18 technologies. As one of the largest renewable energy investors in Europe, we manage more than 270 large-scale green energy projects with a combined capacity of 3.9 GW. That's enough energy to power 2.6 million homes every year – and we're building more by the minute.

Mingyang Smart Energy
Founded in 2006, Mingyang Smart Energy Group (601615.SL, MYSE.L) is a leading smart energy provider with a diverse portfolio including wind, solar, storage, and hydrogen. We offer cutting-edge equipment, engineering, and services, and have built a robust eco-system for sustainable energy solutions. Recognized among China's top 500 and the global new energy elite, Mingyang partners with clients to drive technological innovation and support a green, low-carbon energy future. Mingyang is steadfast in its corporate mission of "Innovating Clean Energy for All." Leveraging the surging trend of global green and digital economic development, the company is committed to creating "new quality productivity." It reshapes technological innovation and the industrial chain layout, actively steering towards "global clean energy intelligence" and "inclusive clean energy." Mingyang is dedicated to building a comprehensive circle and a cohesive group, completing the layout of the entire industry, ecology, and globalization of new energy. By constructing a high-quality and sustainable industrial ecosystem, Mingyang expands application scenarios and creates a "new model" of energy transformation. This not only aids the green and low-carbon transformation of global energy but also propels Mingyang forward on the global track of the green economy, striving to become a world-class enterprise.

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