Visión del desarrollo de energía eólica costa afuera en el mundo: desafíos y aprendizajes

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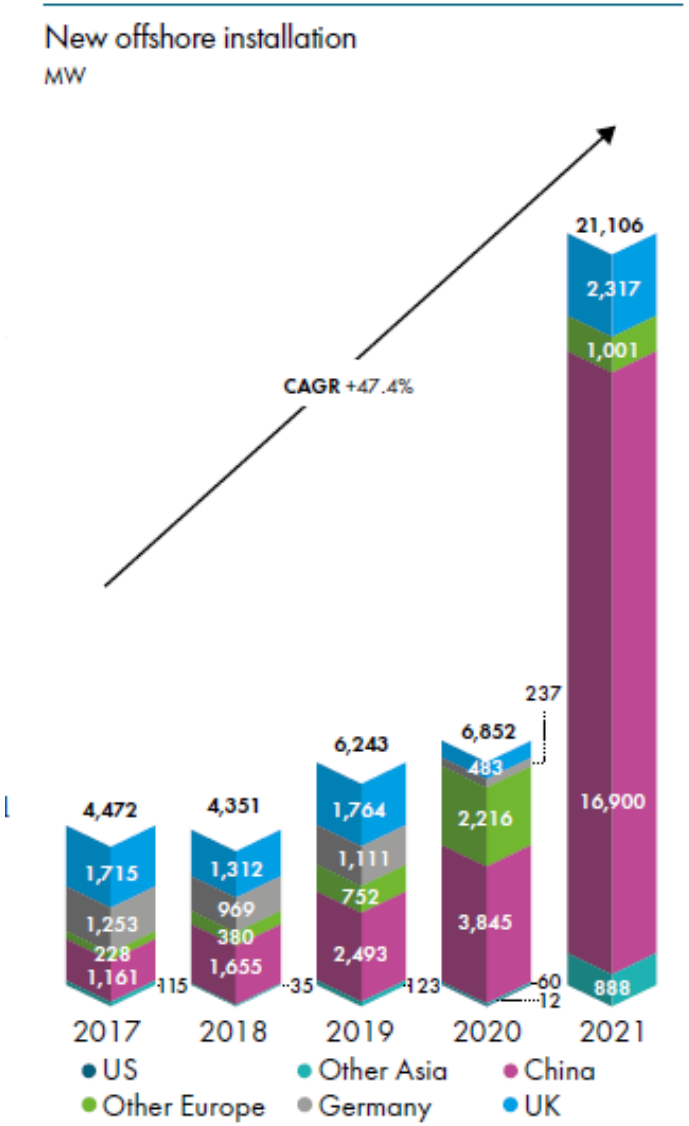
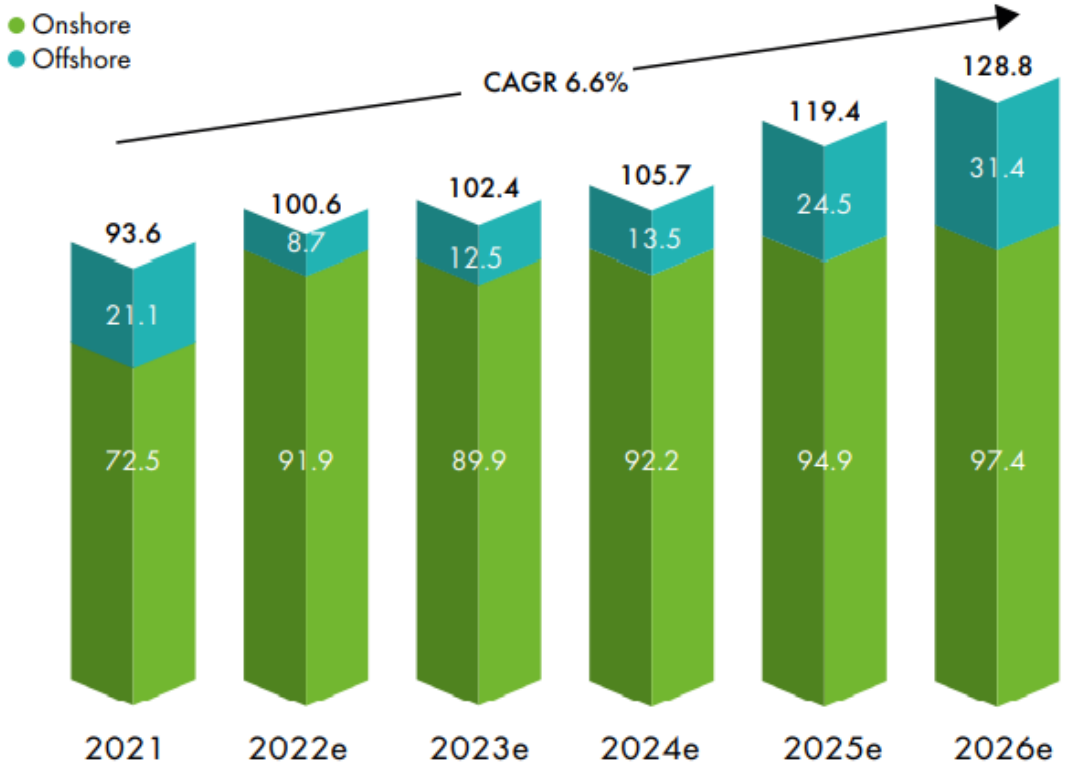
LA EÓLICA COSTA AFUERA TOMA IMPULSO





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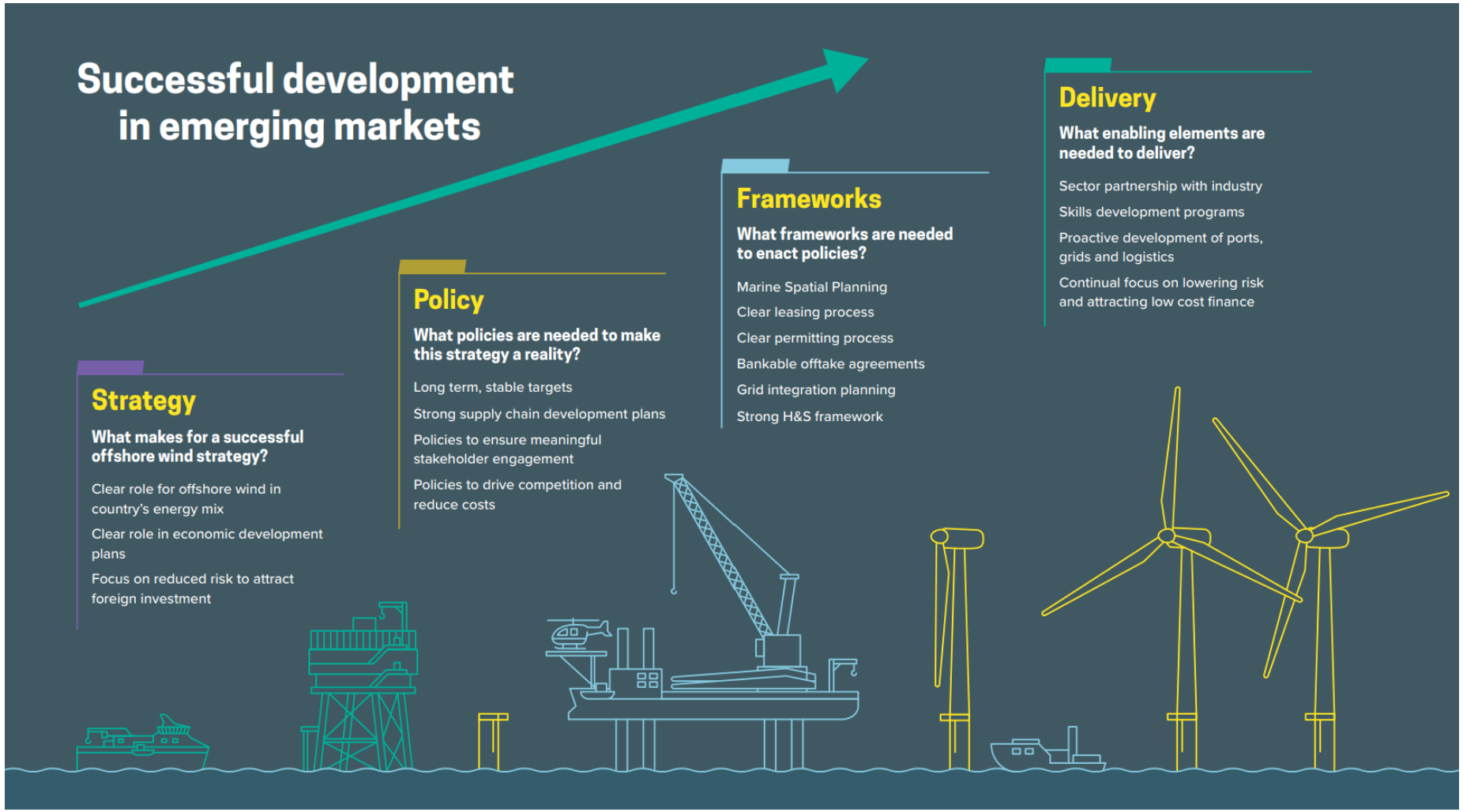
Broad enablers of offshore wind growth



World Bank Group, Key Factors

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Strategy and Policy

Growth drivers: Transition to sustainable economy

1. **Delivers affordable electricity prices:** Enormous cost reduction over the last decade has seen offshore wind delivered at below wholesale-market prices in many European markets. New offshore wind capacity will become cheaper than new fossil fuel capacity early this decade (BNEF).

2. **Delivers clean power to millions of homes**: Offshore wind farms offer incredible scale. The 1,200 MW Hornsea Project One in the North Sea powers more than 1 million households.

3. **Reduces carbon emissions:** 1,400 GW offshore wind by 2050 could save more than 2.5 billion tons of CO2 emissions per year, equivalent to taking more than half (800 million) of the world's cars off the road. An offshore wind farm pays back the carbon produced during construction within 8 months of operation (SGRE).

4. **Boosts economic growth:** Offshore wind generates a diverse value chain of jobs and revitalizes coastal communities. A 500 MW project creates 2.1 million person-days of work, or about 10,000 jobs over its 25-year lifetime (IRENA).

5. **Delivers energy security:** Reduces reliance on imported energy and fossil fuels, with high capacity factors and lower variability compared to other renewable sources. "Power to X" offers a path to carbon-neutrality.

6. **Reduces pollution:** As a replacement to fossil fuel, reduces air pollutants that create smog, asthma and health issues. The 96 GW onshore wind in the US generated $9.4 billion in public health savings in 2018 (AWEA).

7. **Saves water:** Fossil fuels consume an average of 15 million liters of water per GWh.1,400 GW of offshore wind could save 78 trillion liters of water annually.

Growth drivers: Large-scale job creation

Breakdown of typical job creation across a 500 MW offshore wind farm: 2.2 million person-days, or 8,643 FTE jobs, over 25 years

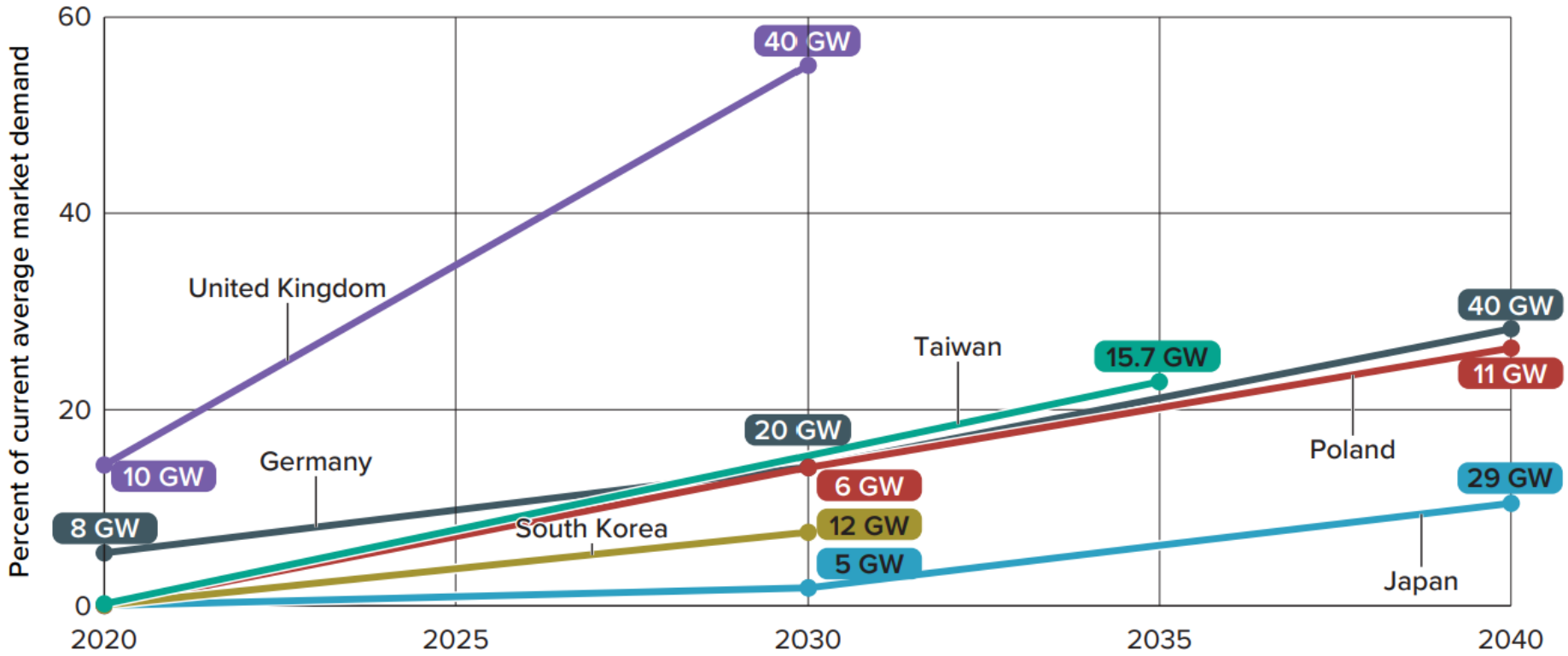
Segment of the Wind Value Chain	Example Activities	Example Jobs	Person-Days Required (% of total)	Person-Years Required (% of total)
Project planning and development	• Site Selection • Feasibility studies • Environmental impact assessments • Community engagement • Engineering design • Project development	• Legal, property and tax experts • Financial analysts • Naval engineers • Environmental and geotechnical scientists • Ship crew	23,838 (1.1%)	91.6 (1.1%)
Procurement	• Design specifications • Sourcing	• Sourcing specialists • Engineers	7,299 (0.3%)	28.1 (0.3%)
Manufacturing of components and systems	• Manufacturing and assembly of nacelles, blades and towers • Manufacuring of monitor and control systems	• Factory workers • Quality control • Marketing and sales • Engineers • Management	1,252,514 (55.7%)	4,817.4 (55.7%)
Transport	• Transport of components	• Drivers • Ship Crew • Technical personnel	2,159 (0.1%)	8.3 (0.1%)
Installation	• Project site preparation • Civil works • On-site assembly of components	• Construction workers • Technical personnel • Naval engineers • Ship Crew • Health and safety experts • Logistics and quality experts	236,634 (10.5%)	910.1 (10.5%)
Grid connection & commissioning	• Cabling and grid connection • Project commissioning	• Construction workers • Technical personnel • Engineers • Health and safety experts	615 (0.03%)	2.4 (0.03%)
O&M	• Ongoing O&M over project lifetime (typically 25 years)	• Operators • Electrical and naval engineers • Construction workers • Crane operators • Ship crew • Helicopter pilots • Technical personnnel • Lawyers • Management	626,825 (27.9%)	2,410.9 (27.9%)
Decommissioning (in the case of repowering, moving back to the start of the value chain)	• Planning or decommissioning or repowering • Dismantling the project on-site • Disposal and recycling of components • Site clearing	• Construction workers • Technical personnel • Drivers • Engineers • Ship Crew • Environmental scientists • Health and safety experts	97,453 (4.3%)	374.8 (4.3%)
		Total	2,247,327	8,643.6

Source: IRENA, 2018

Source: IRENA, "Leveraging for Offshore Wind" (2018). Data originally provided by IRENA in person-days;
jobs were determined by dividing the person-day figure by 260, the typical number of working days in a year. One job is defined as one calendar year of full-time employment (260 working days) for one person. This assumes an 8-hour workday, 5-day working week and 52 working weeks in a year, in line with a standard calculation of one FTE year based on one individual working 2,080 hours in one year. A job can be considered to be equivalent to an FTE year.

The role of targets

Offshore wind targets can provide a clear signal for investment in emerging markets.



World Bank Group, Key Factors

Frameworks

Frameworks Required to Deliver Offshore Wind

Marine Spatial Planning

Deciding in broad terms where it is most beneficial to site offshore wind projects, taking a holistic view of marine resources, avoiding areas of high environmental and social risk.

Leasing

Giving rights to a project developer to survey a potential site, then eventually to construct and operate a wind farm.

Permitting

Providing permissions for a project developer to survey, construct, and operate a wind farm, following a robust Environmental and Social Impact Assessment (ESIA).

Offtake and Revenue

Lowering the risk of the revenue stream sufficiently to enable a final investment decision to be made by investors.

Export Systems and Grid Connection

Enabling timely and cost-effective grid connections.

Health and Safety

Keeping workers safe on industrial-scale projects both offshore and onshore.

Standards and Certification

The confirmation of the engineering suitability of a new wind farm.

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Offshore Wind Enablers - Case Studies and Best Practice

Best practices for offshore wind auctions

Best Practice	Example Geography	Lesson Learned
Open dialogue between administrator and developers	Denmark	Consultation between the administrator and potential developers, and flexible auction design, increases participation levels in auctions.
Separation of technologies	UK	Separation of technologies in auctions ensures fair competition for subsidy support.
Transparency and certainty of capacity targets and timelines	Netherlands	Transparency through publication of offshore wind policy roadmaps, as well as consistent delivery of timelines set out in roadmaps increases investor and developer certainty.
Avoid strict local content requirements	France	Strict and inflexible local content requirements lead to high strike prices and delays in project realisation; therefore, it is key to provide appropriate flexibility in these requirements, especially in the early stage of sector development.
Sizeable volume and early phase FiT to support the build up of supply chain	Taiwan	Creating a pipeline of offshore wind projects which has sufficient volume to create market competition and meet market needs is important in the development of early-stage markets.
Single window permitting	Denmark and UK	Depending on the approach to auctions for offshore wind, "single window permitting" (where one government organisation is responsible for obtaining or deciding upon different permits) can take different shapes; however, certainty and simplified procedures for developers help to streamline offshore wind procurements.

Different Auction Models for Offshore Wind

There is no one-size-fits-all auction scheme for offshore wind; the optimal tender design differs on a case-by-case basis, depending on the context and goals of the country borne by consumers.

One-stage auctions

The centralised or "one-stage" approach is where public authorities select wind farm sites and provide information to developers prior to the auction, at which both seabed lease ("concession") and offtake are awarded. **Denmark** is an example of a country that utilises one-stage auctions.

Site exclusivity and offtake secured in one auction process

Two-stage auctions

The decentralised approach or "two-stage" approach involves developers obtaining the rights to develop a site separately to the auction process for offtake agreements. **The UK** is an example of a country that utilises two-stage auctions with a concession auction, followed by an offtake auction. This approach involves higher developer risk: with site exclusivity secured, projects must undertake development activities in order to compete for an offtake, but have no guarantee of securing this.

Site exclusivity secured – through auction or other means

Offtake secured in an auction

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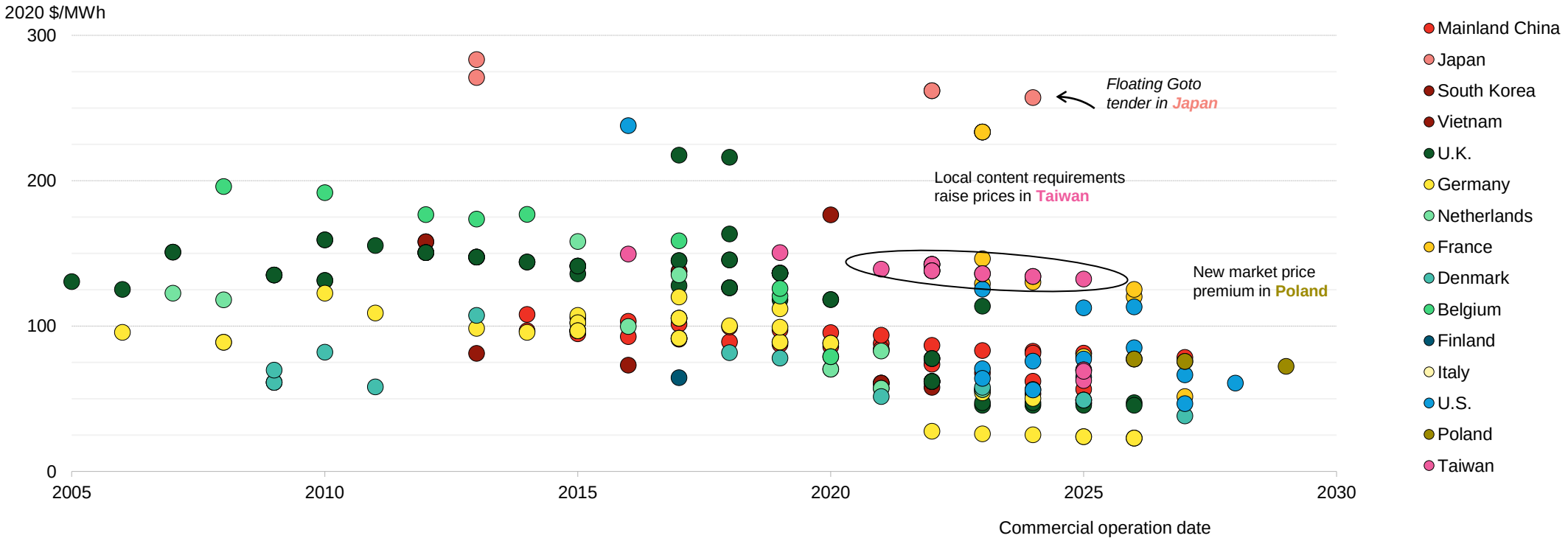
Actions to accelerate offshore wind: Effective procurement

Levelised offshore wind prices by market, 2005-2030 (BloombergNEF)



Source: BloombergNEF. Notes: Levelized price takes into account tariff price and length, inflation, a merchant tail assumption and a 25-year project lifetime. It is the average inflation-linked tariff over the full life of the project. For a merchant tail or zero-subsidy project, we assume that the previous three-year average power price stays flat in real terms.

Actions to accelerate offshore wind: Recommendations

- Limited volumes on offer are not in tune with climate targets or investor interest, creating distorted markets, e.g. overheated leasing tenders, negative bidding, undersubscribed auctions due to unrealistic conditions

- In many places, wholesale market design and the cannibalisation effect are leading to insufficient remuneration to generators to provide the massive working capital needed to invest in high-CAPEX offshore wind projects

- Auctioning is used as a procurement mechanism but the problem is how it is used (on-off switch), volume and predictability

- Early-stage markets have unrealistic expectations on LCOE and pricing, especially when combined with overly strict local content requirements where the supply chain is not in place

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Muchas gracias

Mas información en
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