

Designing an effective offshore wind market:

How competitive auctions can move beyond price to deliver the next frontier of offshore wind



About this policy briefing

This is the third in a series of policy briefings by the Carbon Trust, aiming to help policymakers design effective offshore wind markets. For many countries, offshore wind will hold the key to energy security and a cost-effective Net Zero transition. The first briefing introduced six policy pillars fundamental to approaching offshore wind development at a whole systems level. This edition dives into one of those pillars in detail and provides a guide to using non-price criteria to design effective auctions in maturing and emerging offshore wind markets.

This is a collaborative policy briefing written by the Carbon Trust's [offshore wind experts](#) with input from the [Net Zero Intelligence Unit](#). It draws on the Carbon Trust's experience providing offshore wind market insight and strategic advice across European, Asian and American markets. Additional thanks to Stefania Omassoli and Kieran Hymers.

Who we are

The Carbon Trust is a global climate consultancy of more than 400 experts with offices in the UK, the Netherlands, South Africa, China, Singapore and Mexico. As climate pioneers for more than 20 years, the Carbon Trust works at the forefront of the global offshore wind industry, collaborating with governments, developers and innovators to make fixed and floating offshore wind a viable commercial energy generation solution.

The Net Zero Intelligence Unit provides experience-led insights to accelerate global progress towards Net Zero. The Unit is a dedicated team focussed on raising ambition, awareness and action on Net Zero by drawing on the Carbon Trust's experience of working with businesses, governments and financial institutions globally.

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Executive summary

Competitive auctions are used by governments to award companies the rights to develop offshore wind projects. Traditionally, many governments selected bidders that offered to sell the electricity generated for the lowest cost as winners. These price-based auctions have significantly driven down the cost of offshore wind over the last decade. However, as offshore wind has become competitive with traditional forms of energy, many mature markets have started to use criteria other than price to assess bids. These **non-price criteria (NPC)** create more effective offshore wind markets as they can factor in social, environmental, and economic benefits. On top of that, NPC can be tailored to meet the needs of individual markets.

Building upon our experience supporting auction design, we have identified four principles governments should follow to successfully introduce NPC into competitive auctions:

1. Emerging offshore wind markets should use NPC to encourage the efficient delivery of projects, but avoid imposing excessive constraints or demands on developers and the supply chain.
2. NPC which introduce additional complexity for market participants, ('radical' NPC), should only be used in established offshore wind markets.
3. Policymakers should balance NPC with sufficient subsidies or other incentives to ensure their auctions remain attractive to market participants choosing between different international markets.
4. A transparent and robust framework for evaluating bids is a critical component of NPC auctions.

This policy briefing assesses the history of offshore wind auctions and the trend towards including NPC across seven countries. It outlines recommendations policymakers should consider for both maturing and emerging offshore wind markets.



The use of offshore wind auctions to deliver on market priorities

Offshore wind auctions determine the trajectory of a market's offshore wind development. Policymakers should design auctions according to what they want to incentivise most, from cost reduction to strengthening local supply chains.

An offshore wind subsidy auction (which we will refer to as an offshore wind auction for brevity) is a competitive bidding process conducted by governments or regulatory bodies to award subsidy support for the energy that developers generate from an offshore wind farm. In some cases, for example in Germany and the Netherlands, auctions are also used to award the rights to develop an area of sea bed, known as a site lease. However, in other cases (including in the UK and the US) subsidy auctions and site lease awards are separate processes. In this briefing, we focus primarily on subsidy auctions. Offshore wind auctions seek to ensure fair competition, drive down the cost of renewable energy generation, and maximise the efficiency of the development process. By carefully designing the evaluation criteria used to select auction winners, governments can use auctions to deliver on their specific priorities. In the process, governments can help secure the best deals for consumers, create a route to market for developers, attract private investment, support a thriving supply chain, and accelerate the deployment of offshore wind projects.

How an offshore wind auction works

Bidders (offshore wind developers, or consortia) compete to secure rights to develop an offshore wind project. The bidder that offers the most attractive bid based on the evaluation criteria secures the rights to the project. Depending on the type of tender, this may also include the bidder securing a subsidy or price per MWh produced to ensure the project's financial viability. The auction procedure may involve developers submitting bids specifying the minimum price they are willing to accept for the electricity they will produce, or the maximum downpayment they will make to secure rights to a site. Depending on the tender restrictions, this could also include other details about the proposed offshore wind project, for example, the capacity and location of the site.

Historically, auction design has prioritised cost reduction to make offshore wind competitive with traditional forms of power generation.

Throughout the last two decades, auctions focused on price criteria have contributed to the success of offshore wind. By awarding projects to bidders offering the lowest-cost energy, auctions have helped to drive cost down, often below traditional forms of generation, such as oil and gas. One example is the offshore wind strike prices in the UK. The strike price is the fixed price at which regulators buy electricity from a developer, which is determined by the cost of generating a unit of electricity.¹ Both the strike price and the cost of producing offshore wind energy have significantly decreased in the last decade.

During the UK's first contract for difference (CfD) auction round in 2014-2015, competition between developers brought the strike price down from £140/MWh² to £114.39/MWh.³ However, at the time, this was still almost twice as expensive as electricity produced by a combined cycle gas turbine (£63.07/MWh).⁴ By the fourth auction round in 2021, competition had driven offshore wind strike prices down to £37.35/MWh.^{5,6} This represents a 65% drop in strike prices in just six years. In comparison, electricity generation costs from gas in 2021 ranged from £44.33/MWh to £190.14/MWh.^{7,8} Electricity produced by offshore wind projects

commissioned in 2025 is expected to be almost two thirds cheaper than combined cycle gas turbine projects going live in the same year.⁹

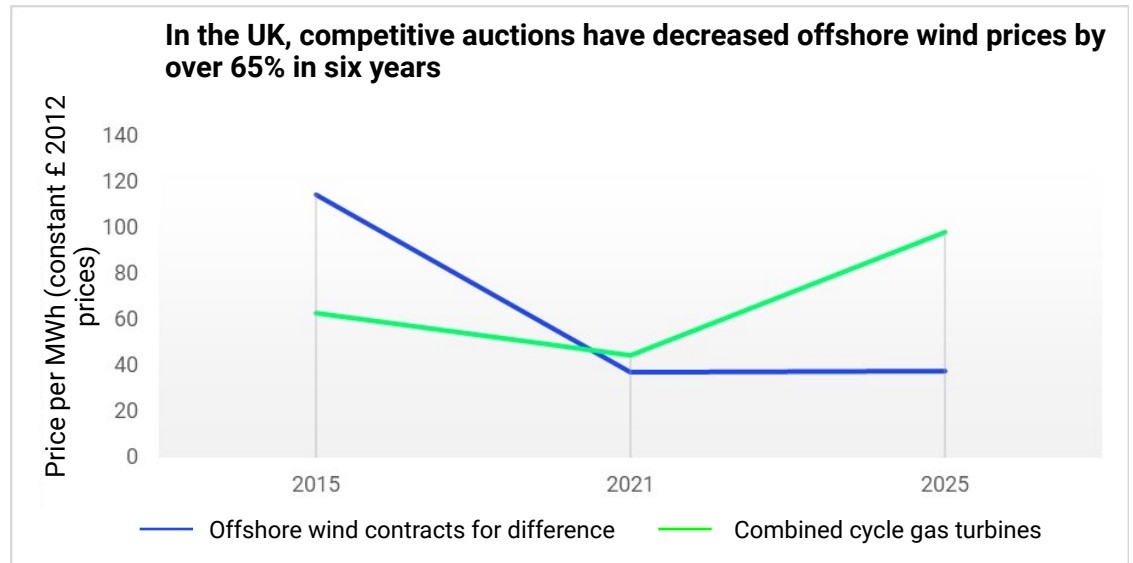


Figure 1: Combined Cycle Gas Turbine Levelised Cost of Energy vs UK offshore wind strike prices.

Price-based auctions have resulted in offshore wind cost reductions but have also contributed to significant financial pressure along the offshore wind supply chain.

The results of offshore wind auctions have ripple effects along the supply chain. A pressure to secure market share in a rapidly growing industry, coupled with a lowest-price-wins approach in offshore wind auctions, has resulted in increasingly squeezed margins for participants along the offshore wind supply chain. Some market participants have described this as a race to the bottom beyond cost efficiency and have called for reform to ensure the financial sustainability of the sector going forward.¹⁰ Rises in inflation and borrowing rates have revealed and exacerbated these pressures, which came to a head in the UK during the most recent renewable energy auction, where no offshore wind projects were successful.¹¹

Offshore wind is now one of the cheapest forms of electricity in the UK and the sole focus on cost is no longer suitable to nurture a productive industry in the long-term. Because of this, the UK and many other mature markets have now shifted the focus of their auctions from cost reduction to other criteria that can bring wider benefits to society.

¹ The levelized cost of energy (LCOE) is the metric used by the energy industry to represent the cost of generating a unit of electricity, usually in £ per MWh. Both the LCOE and the strike price have significantly decreased in the last decade.

² DECC 2015 – Contracts for Difference (CFD) Allocation Round One outcomes.

³ All prices shown in this section have been converted to 2012 prices.

⁴ BEIS 2016 – Electricity generation costs.

⁵ BEIS 2021 – Contracts for Difference (CFD) Allocation Round 4 : Results.

⁶ Although cost reduction has played a large part in the success of offshore wind, increasingly low strike prices against a backdrop of rising supply chain costs have had a negative impact on the industry. No offshore wind projects were awarded in the UK's Contract for Difference auction Round 5 in 2023, the first time this has occurred since Contracts for Difference were introduced.

⁷ Based on a combined cycle gas turbine project

⁸ UK electricity prices quadrupled in 2021 and fossil gas is to blame - REGlobal - Opinion & Perspective

⁹ BEIS Electricity generation costs 2020 (link), and Electricity generation costs 2023

¹⁰ Siemens Gamesa Why we need the European wind industry – and how to safeguard it.

¹¹ Contracts for Difference: Allocation Round 5 results

Why non-price criteria can help to craft more effective offshore wind markets

Assessing bids on price alone risks projects becoming undeliverable, meanwhile non-price assessment criteria are quickly becoming commonplace as a point of competition.

European auctions have been adopting more non-price criteria (NPC) as part of their assessments over the last decade. This is shown below in Figure 2.

Categories and definitions of NPC vary, but can be broadly divided into:

1. **Deliverability:** The likelihood of the project being realised in a timely manner. This is highly strengthened by previous experience in offshore wind, or offshore renewables projects.
2. **Innovation:** The potential for a project to make use of innovations which could scale up or speed up the production and installation of a site.
3. **Social/local benefits:** Making use of SMEs of local skilled workers, or the opportunity to grow these areas.
4. **Ecology:** The benefits a developer could bring to biodiversity through limiting negative impacts (e.g., noise pollution during installation) or promoting positive impacts (e.g., conserving marine habitats). Ecology criteria can entail investment, continued monitoring and/or successful knowledge sharing on these topics throughout the project's lifetime.
5. **Yield:** The amount of energy the wind farm is expected to produce annually.¹²
6. **Sustainability:** This can include a large range of criteria, including the project's carbon footprint, waste produced, recycling or reuse of materials, and its coexistence with other maritime industries. Sustainability criteria are likely to vary based on the requirements of the market and have so far only been applied in a Norwegian auction.

Comparing their first auctions to their most recent, both the Netherlands and Germany have

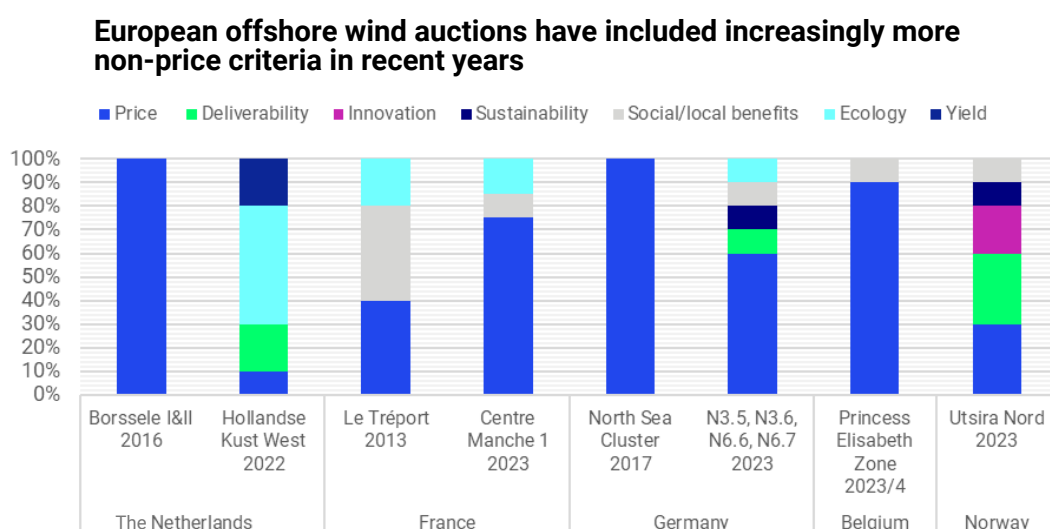


Figure 2: The evolution of auction assessment criteria in Europe.¹³

¹² This is expressed in terms of a P50 value, a volume of energy which has a 50% chance of being exceeded.

¹³ The Netherlands. Germany. Belgium. France. Norway

moved from full price criteria to including 90% and 40% NPC respectively. Norway and Belgium were able to introduce NPC from their very first auctions, as they both had strong existing offshore wind markets before they began using auctions. With less focus on price, NPC are an effective way to stimulate competition in auctions and encourage entrants.

Non-price criteria can help regulators compare the wider effectiveness of bids of the same price.

In Germany, Denmark, and most recently, Taiwan,¹⁴ auctions have proven so successful at driving down costs, they led to zero-subsidy bids. This means bidders receive no guaranteed subsidy from the government for the energy they will produce. Instead, they are exposed to the wholesale market for offtake, and seek 'Private Purchase Agreements' for certainty of sale. The first occurrence of zero-subsidy bidding was seen in the Netherlands in 2018. Government subsidies have not been awarded in a Dutch tender since.

In Denmark, the tender for the 2021 Thor project received multiple bids for maximum allowed capacity at zero subsidy. As per the tender rules, a lottery was used to select a winner.¹⁵ This highlighted the need for further assessment to decide winning bidders. One solution is to introduce non-price criteria, and a second option is to allow negative bidding, where companies pay governments for the right to develop offshore wind projects.

Policymakers should introduce potential negative bidding with caution. There is already continued unrest in the industry around the strike prices for offshore wind projects becoming too low. With the significant rise in inflation over the last four years, costs throughout the supply chain have risen. As a result, many projects are becoming unprofitable or undeliverable for developers at today's low strike prices. In July 2023, Vattenfall decided to halt the development of their 1400 MW Norfolk Boreas wind farm off the east coast of England, explaining that the financial incentives offered through the UK's Contracts for Difference auction no longer reflected the current market conditions.^{16,17} Negative bidding should be restricted to mature markets, with existing supply chains and market practices, to ensure bidders can make calculated and reasonable bids on lifetime costs. NPC provide an attractive and lower-risk alternative, particularly for emerging markets.

Non-price criteria provide opportunities to maximise co-benefits in each specific market.

Just before the announcement of the first two Norwegian offshore wind auctions,¹⁸ the government increased the country's ambition for emissions reduction, to at least 55% of 1990 levels by 2030.¹⁹ To support this goal, sustainability criteria were then announced for both offshore wind tenders. The sustainability criteria required bidders to submit a carbon footprint assessment of their proposed offshore wind project (including, where possible, the embodied carbon associated with manufacturing components). Meanwhile, the Netherlands has increasingly been focusing on ecology and biodiversity, aligning with their government's 'Framework for Assessing Ecological and Cumulative Effects'.²⁰ In 2022, this made up 50% of auction criteria (see Figure 2).

¹⁴ Although typically only seen in mature offshore wind markets, zero-subsidy bids were observed in Taiwan's auction Round 3.1 in 2022.

¹⁵ The correct link and format is: [The Danish Energy Agency invites bidders to draw lots to identify the bid winner for Thor Offshore Wind Farm | Energistyrelsen \(ens.dk\)](#)

¹⁶ [Vattenfall halts project, warns UK offshore wind targets in doubt | Reuters](#)

¹⁷ [Blow to UK renewable plans after Vattenfall halts wind farm project](#)

¹⁸ [The fixed bottom site of Sørlige Nordsjø II and the floating offshore wind site of Utsira Nord](#)

¹⁹ [Norway's new climate target: emissions to be cut by at least 55% - regjeringen.no](#)

²⁰ [Framework for Assessing Ecological and Cumulative Effects - Noordzeeloket UK \(Part A\)](#)

Non-price criteria can be targeted to alleviate bottlenecks in each specific market.

Markets have the opportunity to use NPC to develop areas which are currently lacking. A common bottleneck in offshore wind development is some national electricity grids being unable to transport all the renewable electricity the country produces. This is due to grids requiring upgrades to increase maximum load capacity. Because of this, countries often struggle to supply enough electricity to meet demand. Consequently, newly installed wind farms face long delays in connecting to the grid. Markets with grid constraints could adopt NPC related to efficient system integration, or projects which propose changes to make the grid stronger and more flexible. For example, auctions could reward projects that are co-located with facilities that store excess energy, or use any excess electricity to produce green hydrogen.

How to successfully incorporate non-price criteria

Competitive NPC can support effective offshore wind deployment. But, if implemented incorrectly, they can introduce market uncertainty and deter would-be participants. Our experience has highlighted four principles governments should use to drive sustainable offshore wind expansion through the inclusion of NPC in auction design:

1. Emerging offshore wind markets should use NPC to encourage the efficient delivery of projects but avoid imposing excessive constraints or demands on developers and the supply chain

NPC can help ensure projects are delivered on time and on-budget. However, they can also introduce complexity and additional requirements to project development, which affect the risk profile and investment case for market participants along the supply chain. Emerging offshore wind markets should be cautious in defining NPC that introduce significant deviations from a price-based auction. As a general rule, emerging markets should not implement strict rules around using domestically produced goods or services without sufficient additional subsidy support, or expect developers to trial novel installation methods that wouldn't otherwise be used. Instead, auction design should consider what a 'typical' development looks like and use NPC to promote its effective delivery.

This could include generic criteria on track-record or deliverability, but could also be tailored to meet specific market requirements. For example, the 2021 Japanese auction included criteria related to 'harmony and symbiosis with nearby shipping lanes and fisheries' to promote co-existence with important Japanese industries.²¹ Whilst this criterion is unique to Japan and not a common NPC, it is a prerequisite of successful Japanese offshore wind development and therefore not outside of a 'typical' offshore wind development plan for the Japanese market.

2. NPC which introduce additional complexity for market participants, ('radical' NPC), should only be used in established offshore wind markets

Projects which won the bidding process for the 2022 Dutch auction in the Hollandse Kust West zone will incorporate an array of innovative technologies and techniques outside of a usual design plan. These include floating solar, green hydrogen production, bird flight corridors and natural reef structures which will bring a broad range of co-benefits to the market. However, this was only possible because the Dutch government has spent several years de-risking offshore wind development in the country.

In contrast – despite not having a mature offshore wind market – France included NPC in their 2013 auction which heavily impacted development plans, including stringent local content requirements. These projects have taken significantly longer to develop than other European counterparts. As such, France's early adoption of NPC was too ambitious too soon, and the government has chosen to give less weight to NPC in recent auctions.

²¹ Japanese OWP Tenders_Aquilo Energy GmbH_publication102022.pdf (europa.eu)

²² Advancing the Growth of U.S. Wind Industry: Federal Incentives, Funding, and Partnership Opportunities (energy.gov)

3. Policymakers should balance NPC with sufficient subsidies or other incentives to ensure their auctions remain attractive to market participants choosing between different international markets

NPC will increase the variation between global offshore wind markets, and auction design will be a point of difference that influences market participation and investment decisions. This increased variety and complexity within and between markets will result in offshore wind developers taking a critical approach to market participation, aligning their own strengths and priorities to specific markets. Policymakers should therefore consider NPC in the context of global markets to ensure auction design is attractive to global players. Acknowledging the maturity of their market, policymakers should ensure that NPCs maintain acceptable design parameters. For example, the use of radical NPC criteria should be balanced with risk mitigation and/or financial incentives to ensure the overall package is still attractive. In the case of the US, the country's Inflation Reduction Act offers bonus tax credits for developments which meet local content thresholds.²²

4. A transparent and robust framework for evaluating bids is a critical component of NPC auctions

NPC can introduce requirements which are open to interpretation. For example, bidders may be required to estimate the carbon footprint of their proposed offshore wind developments as part of sustainability criteria but may interpret carbon footprinting standards very differently. Unless there is a consistent measurement and assessment approach, this non-price criterion could discourage participation and competition, alienate unsuccessful bidders and, in extreme circumstances, result in legal challenges. Tender rules should therefore offer clear guidance on how to complete the required criteria. A consistent and transparent assessment process is not only important for the specific tender, but also provides a way to measure progress across multiple tenders and markets. Industry-wide collaboration can also ensure that developers take a uniformed approach. For example, the Carbon Trust's 'Offshore Wind Sustainability Joint Industry Project' aims to establish a standard way of attributing carbon emissions to an offshore wind development in any market.

²³ [Microsoft Word - SSE Renewables Position Paper on Non Price Criteria in Renewables Auctions, June 2023](#)

²⁴ [Independent report of the Offshore Wind Champion \(publishing.service.gov.uk\)](#)

Conclusion

The offshore wind sector is a remarkable success story of the past 20 years, largely thanks to competitive auctions which have spurred innovation and driven down costs. Offshore wind can now be delivered without subsidy in many markets, and assessing bids on subsidy allocation alone is no longer suitable. NPC and negative price bidding are two ways to differentiate between equally priced bids. Amid today's high inflation and supply chain constraints, allowing negative price bidding should be applied with caution. Instead, NPC offer an attractive alternative; they help to ensure that projects are deliverable, can alleviate bottlenecks and bring wider benefits to society.

NPC have received support from government advisors and industry players alike, but governments and regulators must ensure that NPC help rather than hinder offshore wind deployment. To attract competition and maximise benefits, governments need to understand their most pressing needs and implement targeted NPC to address these. NPC must then be communicated to developers well in advance of auctions, so that they can plan projects accordingly. Governments should also avoid introducing radical NPC until their offshore wind markets are sufficiently mature.

Although introducing NPC is a shift away from traditional price-based auctions, it does not change the fundamentals of designing a successful auction. NPC bring greater complexity and variation between auctions and can leave room for interpretation. As such, the core tenets of auction design – transparent guidelines, clear timelines and certainty of future requirements – are more important than ever.

This policy briefing is the third in a series aiming to help policymakers design effective offshore wind markets. All reports in the series, as well as further information on our strategic advisory work on offshore wind, will be available on the Carbon Trust website.

