

Implications of The Crown Estate Round 4 results on ScotWind Leasing

Final report

Prepared for Crown Estate Scotland

02 March 2021



Executive Summary

Context

- The Offshore Wind Leasing Round 4 (R4) held in February 2021 by The Crown Estate (TCE) had resulted in lease option fees that exceeded industry expectations
- Aurora Energy Research (“Aurora”) was commissioned by the Crown Estate Scotland (CES) to analyse the implications of R4 on ScotWind Leasing (SWL)

Key findings

- The high R4 option fees are primarily a result of strategic bidders and low supply relative to demand
- **The R4 results suggests SWL would likely see a lot of interest** with most bids at the option fee cap
- **There is potentially room for the SWL price cap to increase.** An increase by a factor of 10 would still allow Scottish projects to compete favourably against English projects with R4 lease options
- **The current SWL price cap would allow the best Scottish projects to succeed in floating-only CfD tenders.** Increasing the cap by 10-fold will not likely change the relative competitiveness between English and Scottish floating projects
- On the option price menu, Aurora recommends the following:
 - **Increase price cap** by tenfold to £100,000/km²
 - **Distinguishing between fixed-bottom and floating might not be required** as long as the new price cap is not raised too high from the recommended new price cap
 - Retain the original £2k, £6k, and £10k/km² pricing structure, but introduce **evenly-spread intermediate price points with moderate size gaps** until the higher price cap
- Changes in the relative competitiveness of successful and non-successful bidders ex-post, and speculative bidders with arbitrage intention could encourage secondary option trading

- I. The Crown Estate Round 4 results and the impact for ScotWind Leasing**
- II. Potential implications of higher ScotWind Leasing option fees**
- III. Opportunity to differentiate option fee for floating offshore wind projects**
- IV. Review of ScotWind Leasing option price menu**
- V. Option contract arbitrage**

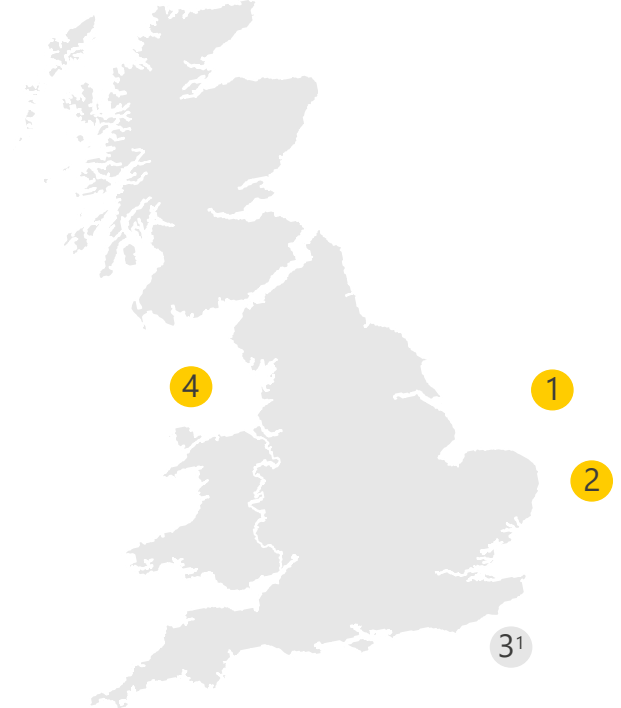
The Crown Estate announced the preferred bidders for Leasing Round 4. Option fees clearing significantly above expectations

Leasing Round 4 was highly competitive, with lower leasing capacity supplied, relative to Round 3, and high demand. Option fees were not fixed in this round, and instead, participants set bids on option fees. The combination of high demand and the introduction of bids, led to significantly high option payments, which are paid annually until a project reaches final investment decision.

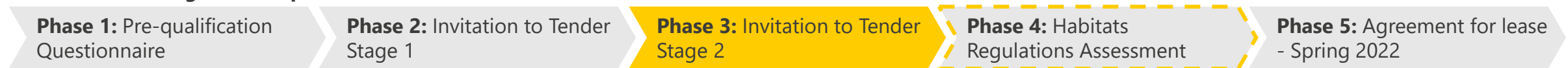
Information on succesful bids

Bidding area	Bidding area name	Capacity (MW)	Successful bidders	Option fee bid (£/MW/year)	Option fee bid in ScotWind Leasing equivalent units ² (£/km ²)
1	Dogger Bank	1,500	RWE Renewables	£76,203	£449,748 - £1,933,915
1	Dogger Bank	1,500	RWE Renewables	£88,900	£524,685 - £2,256,145
2	Southern North Sea	1,500	Green Investment Group and Total	£83,049	£490,153 - £2,107,656
4	Irish Sea	1,500	EnBW and BP	£154,000	£908,903 - £3,908,283
4	Irish Sea	480	Cobra Instalaciones y Servicios and Flotation Energy	£93,233	£550,258 - £2,366,110
4	Irish Sea	1,500	EnBW and BP	£154,000	£908,903 - £3,908,283

Location of successful bidders and bidding areas for Leasing Round 4



Timeline of Leasing Round 4 process and status

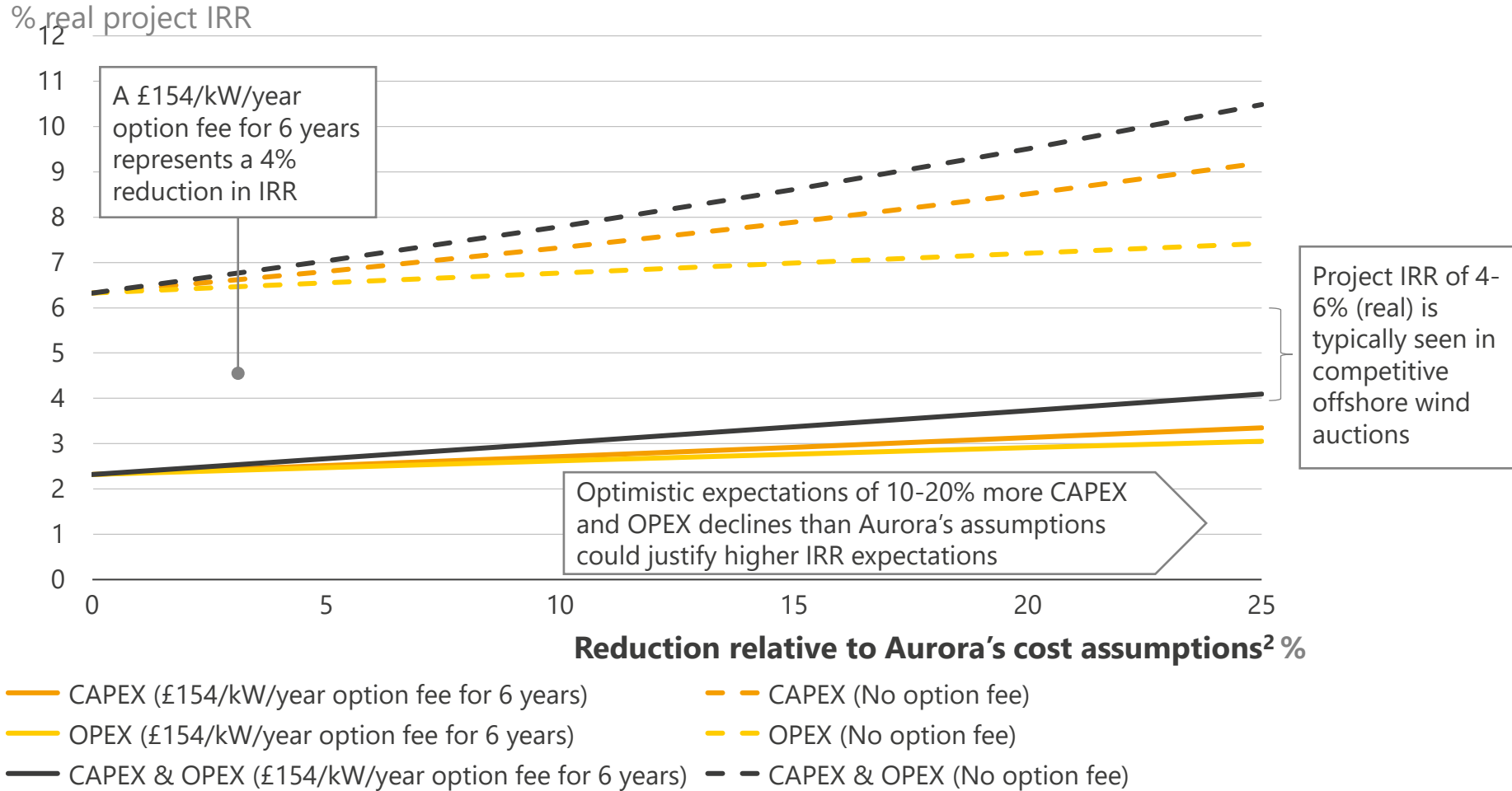


Next step

1) South East region; there were no successful bidders in this region. 2) Assuming a capacity density ranging from 1.16 to 5MW/km² and the present value of the option held for 6 years with a discount rate of 5%. This is comparable to the £2,000, £6,000 and £10,000/km² Scotwind Leasing option fees.

High option fees can be mitigated by optimistic expectations for CAPEX and OPEX declines as well as low return requirements

Offshore wind project IRR - English Best project with CfD contract at £39.7/MWh¹

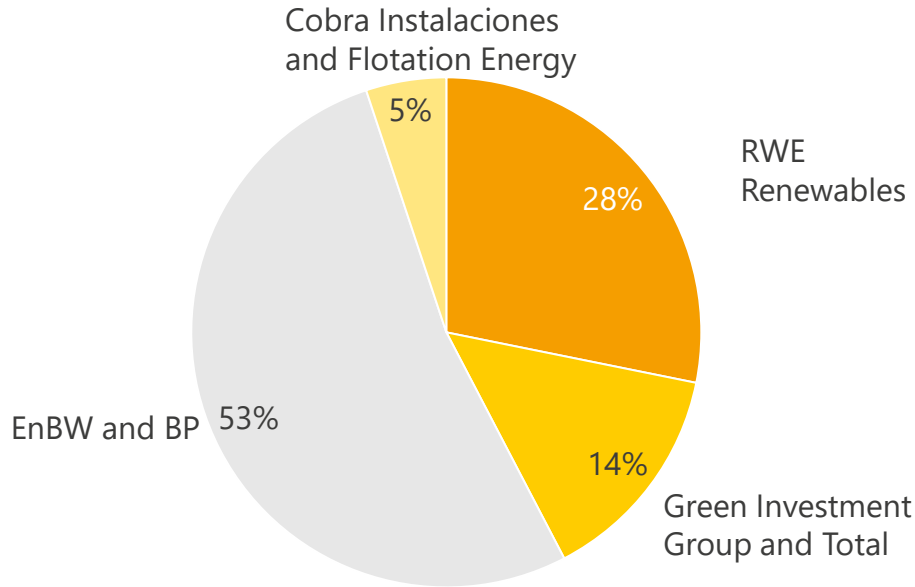


- Relative to Aurora's Central scenario assumptions, reductions in project costs and/or return requirements would be needed to justify the TCE Leasing Round 4 option fees
- As the lease option fees are paid ahead of project development, their impact on project IRRs can be significant. The range of Round 4 option fees represent between 2.5% to 4% in IRR reduction
- It is also plausible that bidders are expecting an increase in future CfD strike prices. The £39.7/MWh price from CfD Round 3 could have been due to one-off projects, with future projects expected to require at least CfD payments in the mid-£40s/MWh

1) The CfD AR3 tender for offshore wind cleared at a minimum of £39.7/MWh. 2) Assumptions for 2027 entry: CAPEX=£1440/kW; OPEX=44.5/kW/year

Strategic investments by fossil fuel companies and the low supply to demand balance could explain the high Round 4 option fees

Proportion of each bidder to the annual option fee payment of £879m
%



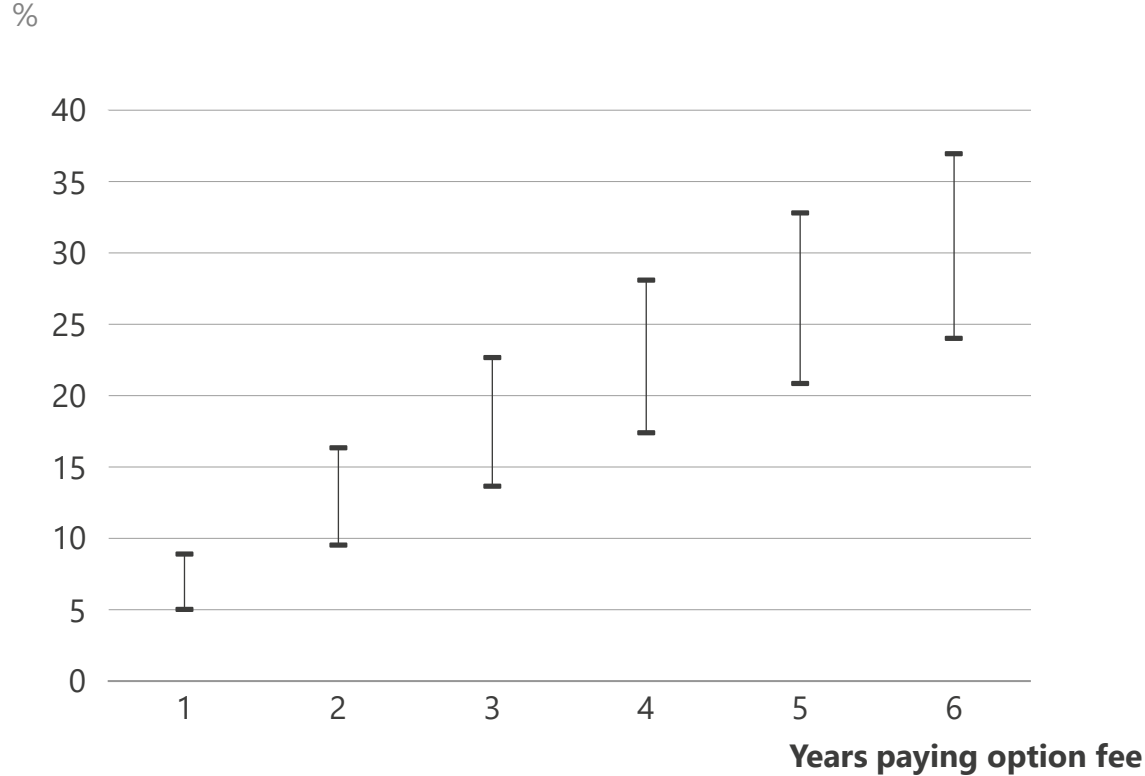
- Out of all the bidders, EnBW and BP will pay the largest portion of the annual payment, summing to 53% of the fees, equivalent to £462m/annum.
- Assuming EnBW and BP pay this for 6 years, it would incur a total cost of £2.8bn for the combination of both projects.

There are a number of potential reasons for the high Round 4 option fees

- **Strategic play (shift to RES)** – Traditional fossil fuel companies such as BP and Total have a strong incentive to switch to renewable energy. Such strategically important investments for them could justify high option fees
- **Larger balance sheets** – Oil and gas majors will have larger balance sheets and are therefore able to front large option fees where others might not
- **Low supply relative to demand** – Roughly 8GW of lease options were auctioned in Round 4. This is less than the Government target set out in the 2020 Energy White Paper of 40GW of offshore wind by 2030 (even accounting for the ~18GW of existing or committed offshore wind projects)
- **Low cost of capital environment** – The policies required to tackle the economic effects of COVID-19 has provided an expectation of low interest rates for the foreseeable future, resulting in low cost of capital for projects
- **Optimistic view on costs** – The increase in deployment due to the 40GW of offshore wind by 2030 target may have created more optimism in offshore wind technology learning rates and cost declines. Economies of scale can also play a role when the same developer builds multiple projects
- **Optimistic view on future CfD clearing prices** – CfD Round 3 prices could be interpreted as an outlier due to especially competitive one-off projects (e.g. Dogger Bank). Future CfD tender rounds may result in higher strike prices as the remaining projects are less competitive
- **Strategic play (reduced competitiveness in CfD auctions)** – Projects need to first secure lease options before bidding for a CfD. With fewer competitors in CfD auctions, strike prices could be higher to recover option fees. BEIS may be pressured to increase the CfD price cap in future tenders

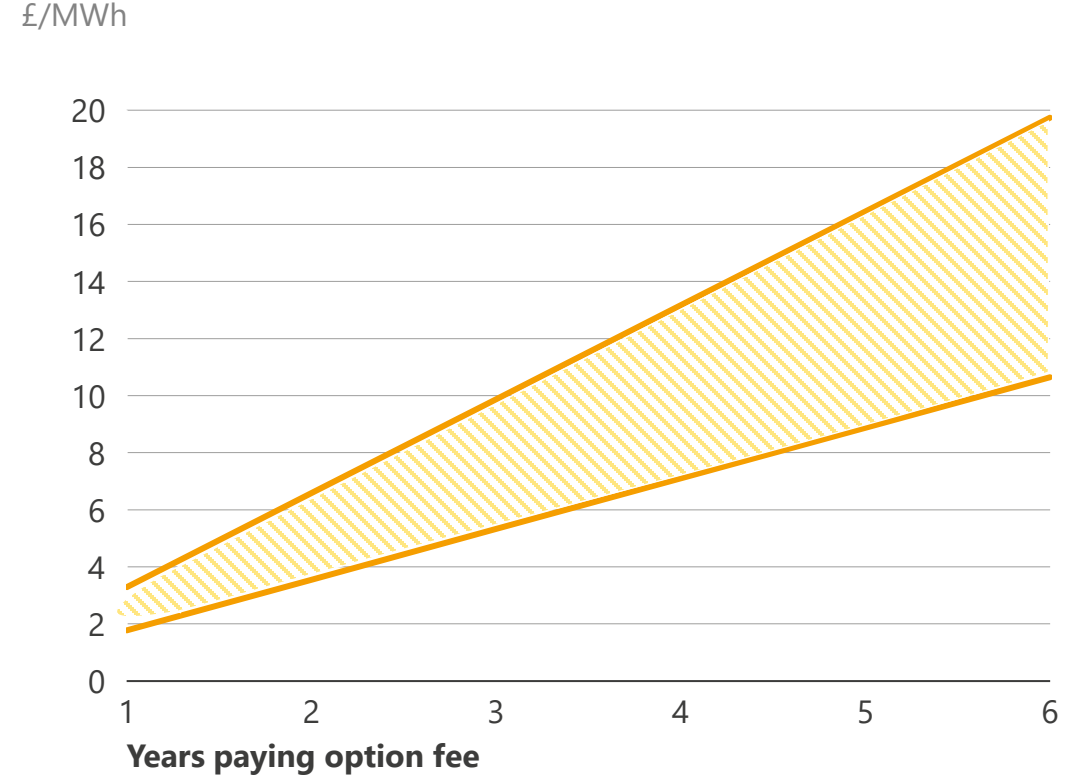
Option fees (which is up to 30% of CAPEX) could lead to a rise in CfD strike prices of £2 – 20/MWh if sunk cost is factored in CfD auction

Option fee portion of total CAPEX¹



- Option fee payments could make up a significant portion of an asset's total CAPEX¹, which could reach over 30% if projects are liable for the charge for 5-6 years
- However, it is highly dependent on the length of time that assets must pay the charge and how quickly they receive planning consent

Addition to strike price in future CfD rounds due to option fee payments



- Due to the high incurred costs from Leasing Round 4, assets could potentially bid higher in the future CfD rounds to recuperate those charges
- If assets pay option fees for three years, bidding in the future CfD rounds could increase by £5-10/MWh, solely as a result of the additional payments incurred from the leasing round

1) Total CAPEX is the sum of CAPEX at 2030 and option fees. Option fee bids for EnBW and BP and Green Investment Group and Total are used as min and max payments since they had the highest and lowest option fee bids per MW; 2) Assuming load factor of 55% for 15 years of CfD lifetime and discount rate of 6%. Calculations are done using option fee bids for EnBW and BP and Green Investment Group and Total as the boundary lines.

The high valuations of Round 4 lease options suggest likely high participation in ScotWind Leasing

Impact of the Round 4 high option fees on...

... behaviour in the ScotWind Leasing tender

- **High lease option valuations** – Round 4 has revealed that the market has high valuations for lease options. This suggests many bidders in ScotWind Leasing would reach the option fee cap (i.e. £10,000/km²), even after accounting for the disadvantages that Scottish projects face
- **Option leases awarded by detailed project evaluation** – With many applicants bidding at the option fee cap, the selection of most of the successful projects would be made at the detailed project evaluation stage. There is also a further consideration of whether to award the lease option to applicants based on how many other options they already own from R4
- **Large number of participants** – The emergence of new offshore wind entrants in Round 4 (e.g. BP and Total) gives further evidence to suggest there will be many developers participating in ScotWind Leasing
- **Strategic players bidding aggressively** – Oil and gas majors expanding into offshore wind may also participate in ScotWind Leasing with aggressive bids
- **Higher risk of a secondary market** – As the option fee cap is potentially below the true market value (as is suggested by the Round 4 results), the risk of resale of the lease options is now higher

... the relative competitiveness of Scottish vs English projects

- **Improved positioning of Scottish projects in future CfD tenders** – With English projects requiring higher CfD strike prices to recover their lease option fees, Scottish projects could be at an improved competitive position
- **Higher CfD strike prices** – High option fees for English projects could mean higher bids in the CfD tenders as those projects try to recover their option fees. This is possible due to the limited market depth in future CfD rounds, with capacity allocations expected to be high relative to the number of projects
- **Sunk cost of the options mitigate disadvantages to English projects** – By the time of the CfD tenders, the option fees already paid could be viewed as sunk costs. This may mean English CfD bids are not as affected by high option fees, if the option fees are seen as less relevant for the CfD bidding decision

Agenda

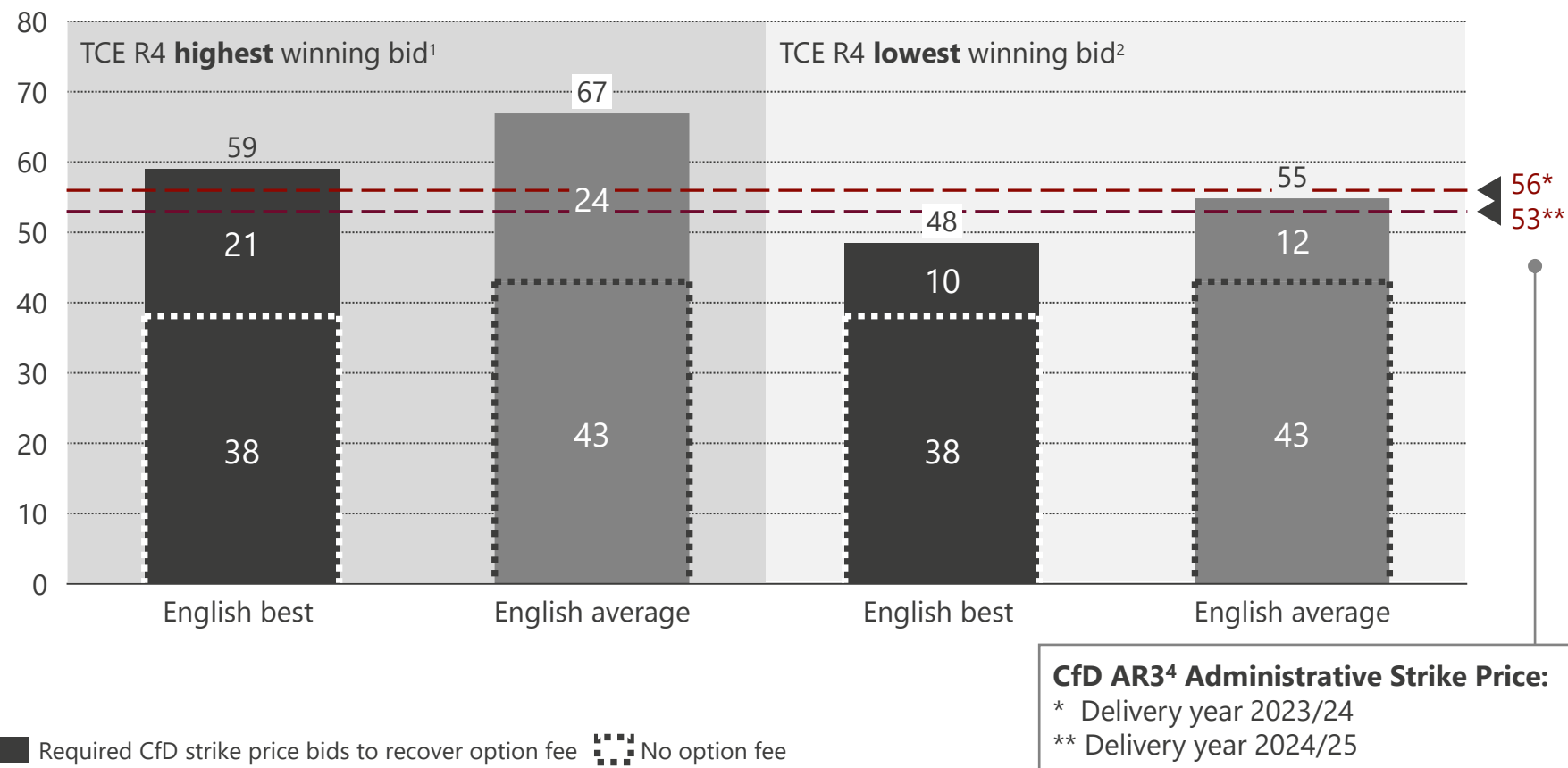
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To recover the R4 option fee, most English projects would require CfD strike prices above the AR3⁴ administrative strike price (ASP)

The ASP is the maximum CfD support the government is willing to offer for each technology in a given delivery year. This has historically been changing between the different CfD auction rounds.

Required CfD strike price bids for project with R4 options³, 2027 entry

£/MWh (real 2012)



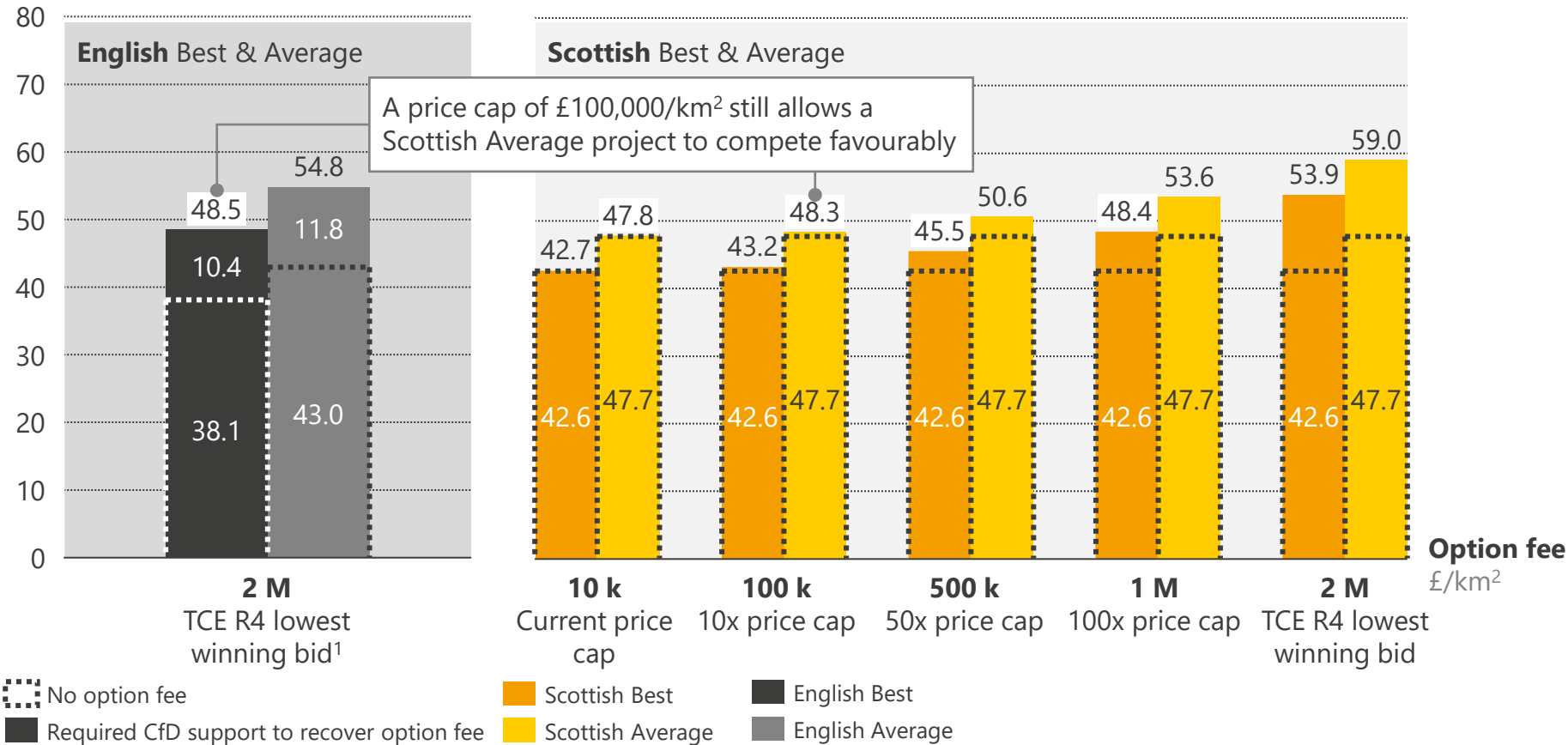
- Without the option fee, the required CfD strike price bids for the winning projects are at around £38-43/MWh, well below the ASP from CfD AR3
- In future CfD auctions, most R4 projects will need to bid for a strike price that is higher than the previous ASP to recover the full project costs
- However, the successful bidders might be leveraging on their existing marine operations experience or synergy through the consortium to reduce development and CAPEX costs. This would allow the projects to bid at a lower than expected strike price in the upcoming CfD auction and remain competitive

1) Option fee bids from EnBW and BP. 2) Option fee bids from RWE Renewables lowest option fee bids. 3) Assuming a capacity density of 5MW/km² and the present value of the option held for 6 years with a discount rate of 5%. 4) Allocation Round 3

An increase in the ScotWind Leasing price cap by a factor of 10 would still allow Scottish projects to compete favourably

The following analysis assumed capacity density of 5MW/km². A lower capacity density will translate into lower TCE R4 winning bids. With 1.16 MW/km², this is approximately £500k/km².

Required CfD strike price bids at different option fee levels, 2027 entry
£/MWh (real 2012)



- At the current £10,000/km² price cap, both Scottish Best and Average sites are competitive with English projects that secured the lowest winning bid in the TCE R4 auction
- If the price cap were to be raised to £1m/km² (or 100 times), the required CfD strike price bids for Scottish projects will reach parity with English projects that secured the lowest winning bid in the TCE R4
- As such, a price cap of £100,000/km² would still allow Scottish projects to compete favourably while maintaining a safety margin (i.e. in case costs of English projects are lower than Aurora expects)

1) Option fee bids from RWE Renewables' lowest option fee bids. Assuming a capacity density of 5MW/km² and the present value of the option held for 6 years with a discount rate of 5%.

Raising the price cap is a balancing act between enabling successful Scottish Project and revenue gained from options

Implication of raising current price cap on...

... Scottish offshore wind projects

- **Increased development cost** - Bidding at a higher price cap increases the total project development cost, hence, decreasing the projects' probability of success. However, even a higher £100,000/km² option fee only represents c.1-5% of total project costs¹
- **Deterring bids from smaller developers** - A higher price cap, combined with the unexpectedly high market valuation from the TCE R4 auction, can deter smaller-scale developers from succeeding in ScotWind Leasing
- **Encourage project completion** - A higher option fee payment translates into a larger initial commitment. This can further incentivise bidders to pursue the project to completion as mainly developers with a high expectation for success would be willing to bid higher option fees. But, the extent to which this will materialise into successful projects hinges on developers not bidding speculatively/over-optimistically in SWL
- **Removed the improved positioning of Scottish projects** - At the current price cap, Scottish projects could be at an improved competitive position relative to English projects. Raising the price cap removes such competitive advantage to some extent

... CES and ScotWind Leasing

- **Successful Scottish Projects** – The benefits from increasing the option price cap should be weighed against the ability for Scottish projects to succeed. A completed Scottish wind farm brings a lot of benefits to CES in lease rents and to the Scottish wind industry throughout the supply chain
- **Capital for reinvestment** – The additional revenue from the higher option fees can be redirected to provide support for the industry (e.g. industry studies and technical surveys) which can ultimately reduce developers' costs
- **Political considerations** –
 - A change in the ScotWind rules having already communicated them could have an effect on investor confidence and create backlash. Developers will need to re-evaluate their applications.
 - Keeping the existing price cap following the high payments received by TCE may raise questions around why CES is taking a different approach to TCE
- **Disincentive for post-auction arbitrage** – A higher price cap allows for better price discovery in the tender. This reduces the risk of the lease options being awarded below their true market value, and therefore reduces the risks of a secondary market

1) With an assumed capacity density of 1.16 - 5MW/km²

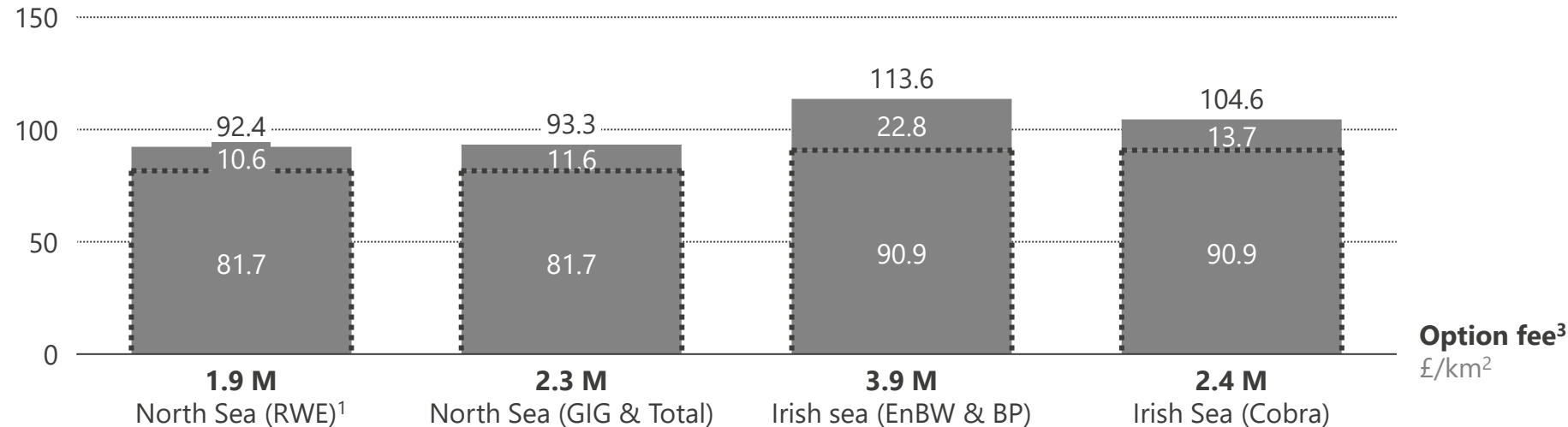
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With TCE R4 winning bids, projects that aim to pursue floating offshore wind (FOW) will require £93 - £114/MWh of CfD support

The following analysis shows the required CfD strike price bids if the winning project were a floating offshore wind project, given their respective winning option fee bid and region.

Required CfD strike price bids for floating offshore wind, 2027 entry

£/MWh (real 2012)



Assumed load factor

%



Assumed CAPEX²

£/kW (real 2019)



▨ No option fee ■ Required CfD support to recover option fee

- Even in the absence of an option fee, the required CfD support for a floating offshore wind (FOW) project is significantly higher than those with fixed-bottom, primarily due to higher CAPEX and other development costs
- This reaffirms the recent CfD amendment to make FOW a separate technology to fixed-bottom offshore wind in the next CfD round
- As such, FOW will no longer need to compete with fixed-bottom and will have its own, potentially higher, administrative strike price
- Developers⁴ with offshore oil/gas platform experience may have a lower construction cost than traditional fixed-bottom developers. This would allow them to bid more competitively in the upcoming CfD auction

1) RWE Renewables lowest winning bid. 2) CAPEX and other cost assumptions are anchored on estimates jointly published by the Crown Estate Scotland and Catapult in year 2018 (link: [here](#)). 3) Assuming a capacity density of 5MW/km² and the present value of the option held for 6 years with a discount rate of 5%. 4) For example, Total and BP.

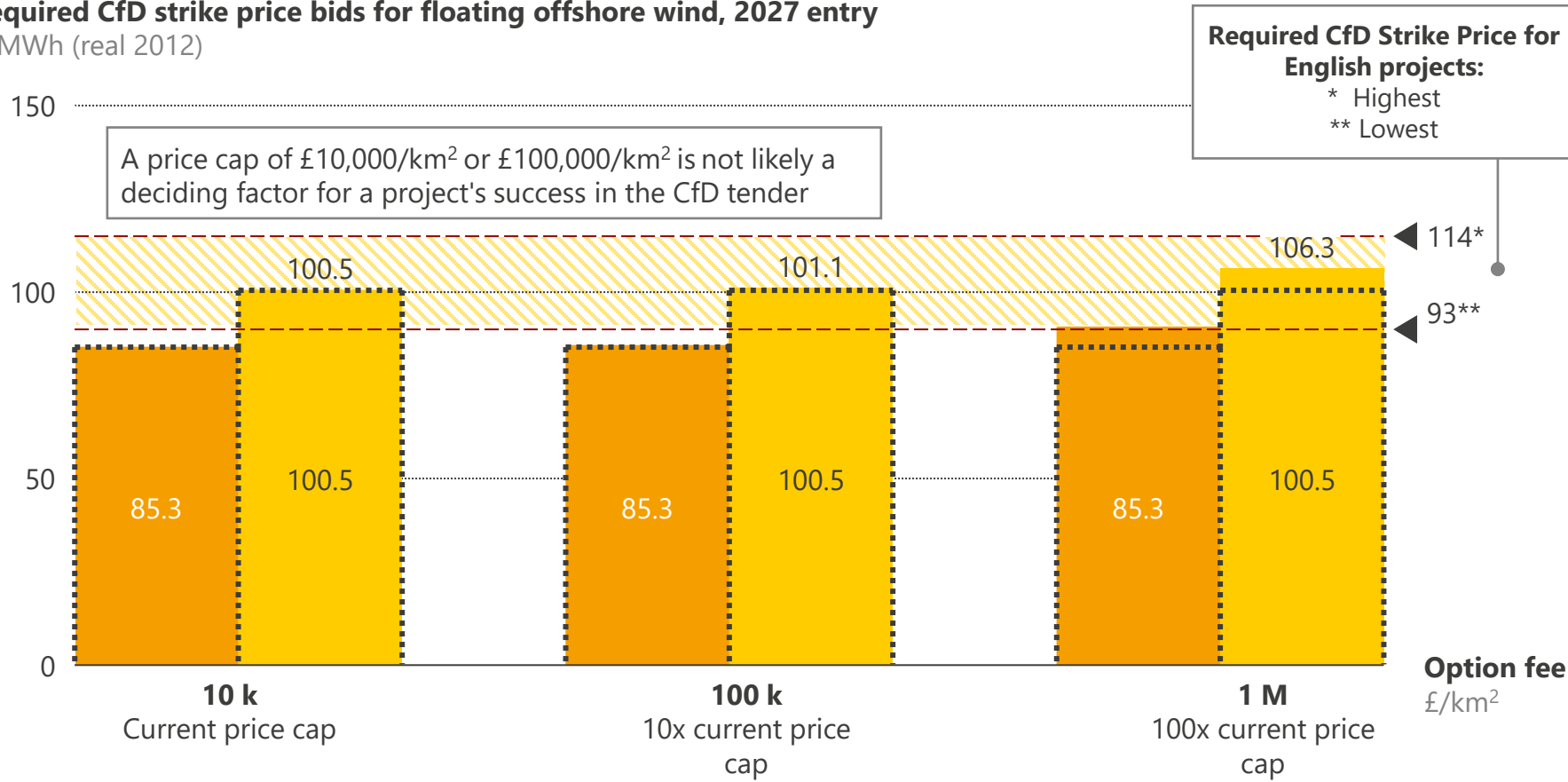
Sources: Aurora Energy Research, Crown Estate Scotland, and Catapult

An option fee at or below 10 times the current cap would still allow Scottish Best FOW¹ to compete with the English projects

Higher CAPEX and other development costs are the main drivers for the lack of competitiveness of Scottish projects. As option fees are only a small portion of the total costs, changing cap level might not necessarily help to improve competitiveness.

Required CfD strike price bids for floating offshore wind, 2027 entry

£/MWh (real 2012)



- At the current option fee cap, Scottish average FOW¹ projects are not competitive against English projects
- This suggests Scottish projects will need to significantly reduce cost (e.g., synergy through a consortium, leveraging on existing marine operations experience) to win the upcoming CfD auction
- Since the option fee is insignificant in the total cost stack, having a different price cap for floating offshore wind may not necessarily improve its competitiveness, as long as the new price cap is raised sufficiently less than 100 times

 No option fee
 Required CfD support to recover option fee
 Scottish Best
 Scottish Average

1) Floating offshore wind

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Given CES's objective of enabling Scottish projects, an increase of the price cap by 10 times is unlikely to compromise project success

Key considerations for ScotWind Leasing design

- Avoiding an auction structure that risked driving auction prices above a level that would give the best chances of successfully operating projects
- Open-ended auctions risk setting option prices too high for Scottish projects to remain competitive. A low maximum option price increases the chance of project success
- Too many price points create unneeded complexity if most projects default to a maximum price

1 Aurora's view on price cap

- The choice of price cap level is a balance between higher probability for a successful project vs higher CES option revenue
- Analysis from Section 2 has shown that **raising the price cap by 10 times (£100k/km²)** will unlikely compromise Scottish projects' competitiveness against English projects with R4 lease options. There is potential room to raise the cap by 50 times but this will be at the expense of risking Scottish floating offshore wind's competitiveness

2 Aurora's view on differentiation of fixed-bottom and floating

- As seen in Section 3, the competitiveness of Scottish floating offshore wind is constrained by its CAPEX and other development costs
- Since the option fee is insignificant for floating projects, **a different price cap for floating and fixed-bottom might not be required** as long as:
 - The price cap is not raised too high above 10 times. Doing so would reduce the relative competitiveness of Scottish Best FOW projects; and
 - Bidders can still opt for option fee below the price cap

3 Aurora's view on intermediate price points

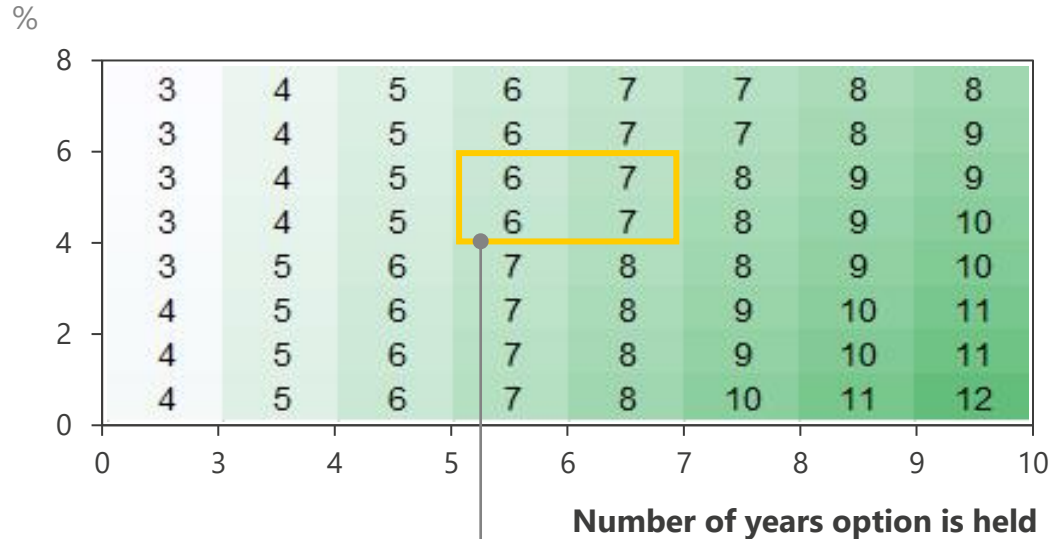
- The recent "40 GW of offshore wind by 2030" government target, together with the TCE R4 results has indicated that bidders would be willing to pay more for good seabed sites
- Adding new price points between the current and the new price cap while keeping the £2,000/km² reserve price and £6,000/km² option allows CES to capture these values without pushing out marginal projects
- While setting the level of fixed price points is subjective, the additional CfD support needed to recover the option fee does not increase materially within the price cap. For example, an increase from £10k/km² to £100k/km² would only raise the required CfD strike price bid by c.£0.5/MWh
- For simplicity, **evenly-spread intermediate price points with moderate size gaps** will be sufficient for good price recovery (for example, £20k/km² incremental gaps for a £100k/km² price cap)

While there is room to increase ScotWind reserve price, doing so would add avoidable complexity

Present value of TCE R4 reserve price in £'000/km²

At 5 MW/km² capacity density

Discount rate



TCE R4 reserve price is considerably higher than ScotWind's. For example, if the option is held for 6 years and with a discount rate of 5%, the reserve price is equivalent to c.£6,000/km²

4 Aurora's view on reserve price

- For a typical project, TCE R4's reserve price is comparably higher than the £2,000/km² minimum option fee in the ScotWind Leasing
- This suggests there is room to increase the reserve price to £3,000/km², which will raise CES's guaranteed minimum revenue by £8.6 M
- However, raising the reserve price from £2,000/km² to £3,000/km² might only bring CES immaterial/marginal benefits since most sites are likely to clear above the minimum price, given the price signals from the TCE R4
- **Hence, Aurora suggests keeping the minimum reserve price at £2,000/km²**

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Option arbitrage might happen if the price cap is sufficiently lower than market value

A secondary market might emerge if the true market value of the seabed rights is above the price cap. However, the decision to arbitrage does not depend solely on the option fee paid but also on the expectation of potential profit from developing the project.

Situations where option arbitrage might happen:

1 Successful bidders have no genuine intention to develop the proposed project

In such a case, successful bidders will be **willing to sell the option at a price that is slightly higher than the price cap** to recover both the option fee and other costs incurred in preparation for the auction, plus a desirable rate of return from the trade. While the pre-qualification process of ScotWind Leasing has created barriers to deter such participants, the extent to which this situation happens still depends on

- The value difference with the price cap and potential buyers' market valuation of the option lease – a big difference indicates higher demand for options in the secondary market
- Whether the pre-qualification process creates sufficiently high barriers

Implications for CES:

- The arbitrage value will be pocketed by the original winning developers instead of CES
- The costs to acquire the seabed rights will now likely be higher than the price cap. This has direct negative impacts on projects' margins and competitiveness relative to English projects.

Ex-post factors that change buyers' and option holders' expectation on project prospects can initiate secondary trading

Situations where option arbitrage might happen:

2 Potential buyers of secondary lease option are willing to offer a price higher than the successful bidders' expectation on project profitability

This could happen when:

- Potential buyers of a secondary market lease option bid below their true valuation in the ScotWind Leasing and do not secure the seabed rights
- Potential buyers failed to enter the ScotWind Leasing and are willing to pay more than the option fee cap
- Potential buyers have better financial and technical capability ex-post (e.g., lower cost of capital due to improved balance sheet, lower CAPEX due to new synergies, etc.)
- Potential buyers have more optimistic views on the expected projects' profitability than the successful bidders
- Successful bidders expect a higher rate of return from other investments

Implications for CES:

- Low likelihood of occurrence since ScotWind Leasing will select the best bidders with strong track records and expertise
- Reduces risk of CES choosing the eventually unsuccessful projects, since the secondary market allows lease options to be sold to more competitive developers if the relative competitiveness of bidders changes ex-post
- The arbitrage value will be pocketed by the original winning developers instead of CES

Measures:

- Stricter screening process to only select entities with established development plans
- Strengthen the clauses that prohibit reselling option at a higher price level than the successful bid (Allowing reselling if bidders are in an undesirable financial situation; a complete prohibition might deter potential bidders)
- Increase option fee cap to minimise the value of arbitrage and encourage only bidders with high expectation of success to participate

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