Department of Energy & Climate Change

Contract length analysis for Feed-in Tariff with Contracts for Difference

Summary of onshore and offshore wind analysis

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What is the impact of different Feed-in Tariff with Contracts for Difference contract lengths on the investment decision for low carbon generation?

Summary of onshore and offshore wind analysis.

1. This paper reports on the summary conclusions of analysis conducted by DECC to answer the questions[1]:

    - How does the break even Feed-in Tariff with Contracts for Difference (CfD) strike price change with the contract length of the CfD for renewable generating technologies?

    - Which contract length gives the lowest net present value (NPV)[2] of support payments to generators?

2. The following factors are central to the results:

    - Investors discount future costs and returns at a higher rate than the social discount rate[3]. Other things being equal, this makes paying subsidies earlier through a shorter CfD contract length the cheaper NPV option for higher cost technologies which require substantial support payments through CfDs, rather than just revenue certainty.

    - CfDs reduce revenue risk for low carbon investments. In the modelling this is captured through an increase in gearing which lowers the weighted average cost of capital of a project . Other things being equal, this makes longer CfD contract lengths which allow higher gearing cheaper. However, this analysis has found that this effect is weaker than the NPV effect for higher cost technologies for CfDs of 12+ year life.

[1] Please note that this analysis was conducted in early 2012 to help inform the evidence behind a decision on CfD contract length. A summary of this analysis was then published in the draft Operational Framework (May 2012, page 55-57):
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48373/5358-annex-b-feedin-tariff-with-contracts-for-differe.pdf
The purpose of this note is to provide further information about the analysis published in this document.

[2] The net present value (NPV) is the discounted value of a stream of either future costs or benefits. In this context it represents the discounted value of support payments to generators under a CfD

[3] Please note that for this analysis we have used 3.5% in line with HMT Green Book guidance: http://www.hm-treasury.gov.uk/d/green_book_complete.pdf

- NPV of support costs to developers is not the only consideration in determining CfD contract length. While the primary focus of this analysis is the NPV of costs. Other considerations, such as affordability under the Levy Control Framework, and DECC's wider goals, may also come into consideration when determining a CfD contract length.

How the modelling was conducted

3. We assessed the investment decision for certain renewable generation technologies.
4. In order to do this we examined costs and revenue streams of an individual power project over time to determine the return on an investment by developers and debt providers:
   - Cost streams included capital (construction) and operational costs, interest payments, dividends, current and deferred taxes.
   - Revenue streams included contracted power, Levy Exemption Certificates (LECs)[4] and CfD payments.
5. The modelling of project financing was relatively sophisticated, as it included assumptions of gearing, interest margins, commitment fees and equity returns. We also ensured that minimum debt service cover ratios were met throughout the modelling. Projects were in keeping with current accounting requirements.
6. To examine the effect of CfD project length we found the level of incentive required to meet our assumptions of minimum return on debt and equity over a project lifetime. To do this we found the maximum gearing[5] available given set debt costs (i.e. interest margins) but while still maintaining a reasonable debt-service-cover ratio. If this was above 75%, we fixed a cap of 75% gearing throughout this analysis.
7. We then found the incentive level required to meet minimum equity returns over the life of the project (i.e. discounted equity cash flows equalled zero over the life of the project). To this extent the minimum requirements of both debt-providers and developers were met.

Background

8. The Contract for Difference (CfD) provides an additional payment to generators on top of wholesale market revenues (as long as the strike price is above the reference price). In order to model this we added a £/MWh incentive[6] for all electricity produced during the CfD period. This is illustrated in Chart 1 below. The shaded blue area represents the revenues received

[4] Levy Exemption Certificates are electronic certificates issued as evidence of Climate Change Levy exempt electricity supply which is generated from qualifying renewable sources.
[5] The ratio of debt to equity.
[6] The £/MWh incentive will represent the different between the strike price and the reference price.

by generators/ developers with a Power Purchase Agreement (PPA) under a CfD . The white “gap” reflects the discount to the wholesale electricity price received under the PPA.

9. For different CfD lengths the strike price can be adjusted so the project is still attractive[7] to an independent investor[8].

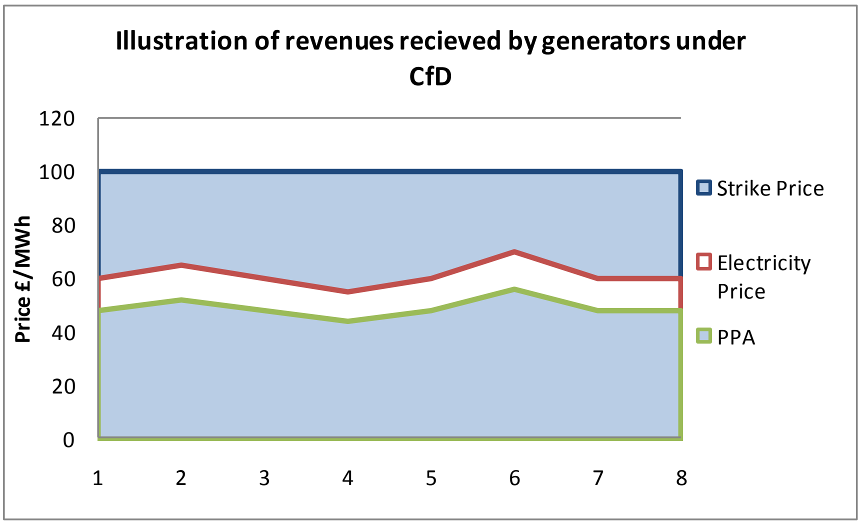

Figure 1: Illustrative revenues under a CfD

Interactions between CfD length, strike prices and attractiveness of project

10. We have identified three factors that affect the interaction between the CfD length, strike prices and the attractiveness of a project and therefore impact on which length is preferable:

- The differences between social and private discount rates – Under the CfD investors receive support payments for the duration of the CfD. When assessing these payments in ‘present value’ terms investors apply a higher discount rate (in line with the real cost of raising debt and equity capital) than the social discount rate (which captures ‘time preference’[9]). As a result of this difference, investors value future CfD revenue streams at a lower rate than society values the cost of paying them. Figure 2 below shows how an illustrative constant payment of £100 per annum appears once discounted at different rates over time. While the annual payment is the same, over time the future value (i.e the

[7] Attractive is defined as the point at which equity IRRs meet investors’ hurdle rates and debt coverage ratios are acceptable.
[8] The work has focused on independent investors rather than utilities for several reasons. Independent developers are likely to face higher financing costs than a utility, this means that they will require a higher strike price to meet the same level of return as a utility. They may also have higher hurdle rates. However, given the scale of investment required, the independent developer is likely to be the marginal investor, and this work has focused on them as they are likely to face more difficult financing so it is important to see how the CfD length affects their investment decisions.
[9] The ‘time preference’ factor captures the fact that people generally place more value on present costs and benefits than future ones.

discounted cost) of this revenue stream is higher in the view of society than perceived by investors. Therefore each additional year of CfD payments adds to the cost on society, at a value that outweighs the benefit perceived by investors. This would suggest that a shorter CfD is preferred.

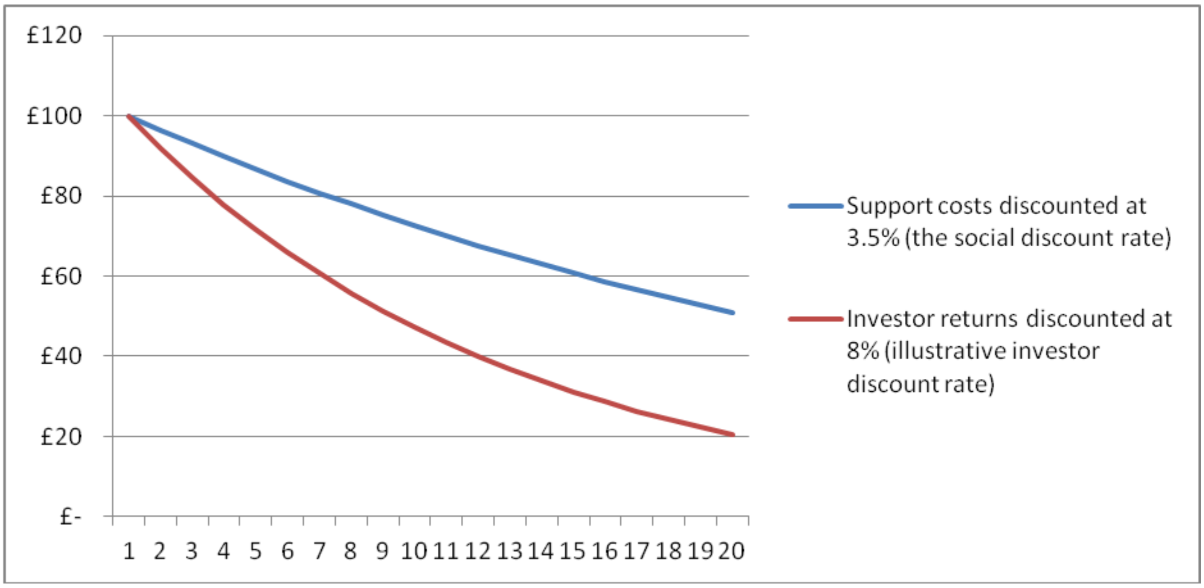

Figure 2: Support payments discounted at social discount rate and illustrative investor discount rate

- Expectations of future electricity prices – When a CfD ends, revenues will come solely from the wholesale electricity market. If these revenues are expected to be low by generators compared to the Government view, a longer CfD will appear beneficial to both Government and investors.

- Revenue Certainty – Debt providers are likely to only invest if they expect to be paid back while revenues are guaranteed (either under a PPA or potentially under the CfD). Projects are usually structured so that the debt is paid off initially, with equity providers being paid back later into the project (though there may be some payments to equity throughout). Longer CfDs and greater revenue certainty over the project life can therefore facilitate higher gearing and reduce the project's financing cost. However there are limits to the revenue certainty that CfDs can provide e.g. for wind uncertainty over load factors. Equity providers are more willing to take revenue risk and therefore it is unclear how far extending CfD lives beyond the point debt is paid back has a benefit.

11. To simplify this work in modelling projects we have ensured that they meet investment criteria (e.g. all projects pay off debt within the life of the CfD, achieve a minimum debt-service coverage ratio of 1.3 to ensure they do not default and meet a minimum amount of equity returns over the life of the project). These assumptions were based on advice from members of the investment community. We have then found the strike price required for the project to be attractive to investors (defined as the point at which both discounted cashflows and discounted equity flows are above or equal to zero).

Scenarios

12. The modelling has primarily looked at 4 scenarios for CfD length – 12, 15, 18 and 20 years. We have assumed that investors receive a 15 year PPA with a creditworthy offtaker which they are able to renew under the same terms after the initial 15 year period finishes[10].

13. Finally we have assumed that the maximum term of debt is either 12 or 15 years (the latter for 15, 18 and 20 year CfDs). We have assumed this because we believe debt investors will wish to be fully repaid (with interest) while they have revenue certainty and we believe the maximum term they will lend for is 12/15 years, even if CfD life is longer[11].

14. Initial modelling has focused on onshore wind and offshore wind.

Results

Illustrative Onshore Wind (>5MW project)

15. Using our central assumptions we have modelled the strike price required for a illustrative onshore wind project and then examined the support costs. As expected, under a shorter CfD a higher strike price is required for the investment to occur, however the NPV of the support payment is less overall as the overall discounted payments are less.

16. Current analysis has also considered the cost of NPV over (non-discounted[12]) generation during the contract. As the strike price is higher for shorter contracts we would expect the value of support paid per unit of generation to be higher. As contract lengths increase this value of NPV paid per unit of generation decreases, but the overall cost of support payments increases.

17. Chart 2 shows the percentage change of the strike price and NPV of the support payment and NPV of the support payment over (undiscounted) generation for each onshore windfarm as the CfD length changes. As you can see the size of the support payment is more

[10] We have been advised that developers may be able to expect to renew PPAs (though they may not account for this in their investment decision). In order to be conservative with our analysis we wanted to account for increased offtake risk post-PPA, but we do not know what offtake risks will be post an initial PPA term. Based on this we have assumed that it is similar to current offtake risk and therefore we have assumed that the PPA is renewed (i.e. offtake risk is the same throughout the project life).

[11] Please note that we do not think a longer debt term will affect the analysis. This is because the driving factor is the difference in discount rates between investors and the social discount rate. A longer debt term does not materially affect this underlying driver.

responsive to changes in the CfD length than the required strike price. The strike price under a 20 year CfD is 5% lower than that under a 12 year CfD, but the size of the support payment paid to each wind farm is 8% higher. As expected the NPV of support per unit of generation diminished for longer contract lengths, but the overall cost of support payments increases.

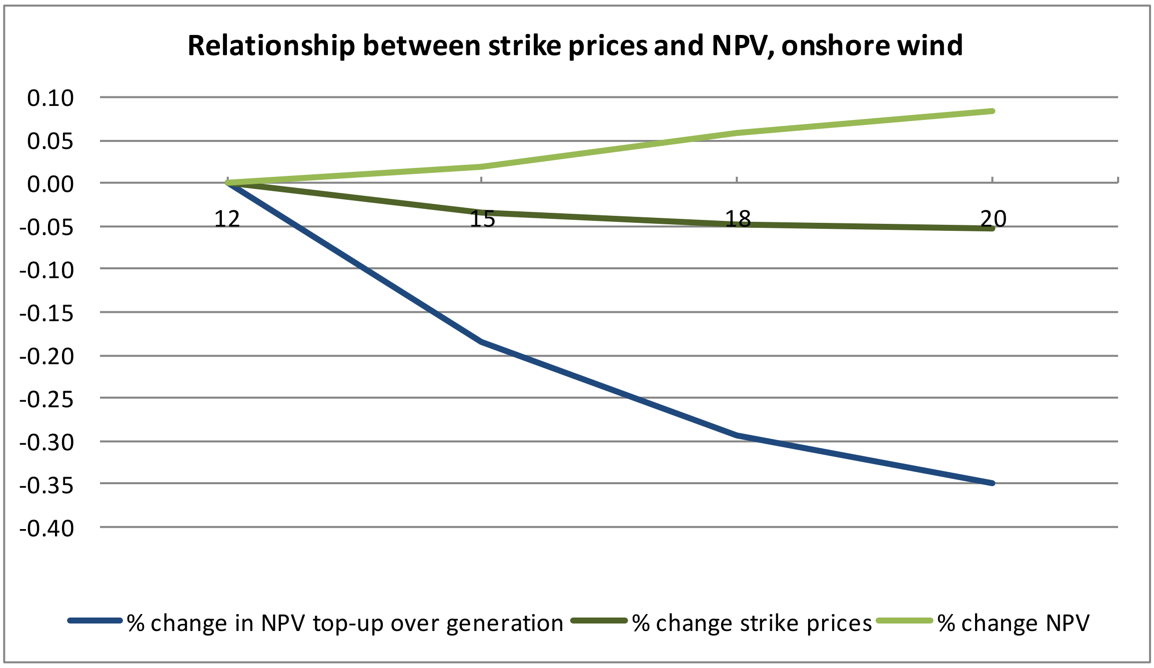

Figure3: Percentage change in strike prices and NPV of support payment for each onshore wind project under central assumptions

Source: DECC Analysis

18. Under the central assumptions debt is paid off within 11 and 12 years from financial decision depending on the CfD length. The length of debt payback under central scenarios is determined by our debt-service cover ratio assumptions.

19. The results for onshore wind suggest that a shorter CfD with a higher strike price, but lower NPV of the support payments, is preferred to a longer CfD. The impact of discounting future costs and returns at a different rate to investors who concentrate on near-term revenues outweighs the other considerations.

Illustrative R2 Offshore Wind

20. Using our central assumptions we have modelled the strike price required for a illustrative offshore wind project and then examined the support costs. As expected, under a shorter CfD a higher strike price is required for the investment to occur, however the NPV of the support payment is less overall as the overall discounted payments are less.

[12] We could discount generation (similar to the methodology for a levelised cost). This would reduce the rate of change of this measure, however it is unclear what discount rate is appropriate to use (i.e investor or government).

21. Current analysis has also considered the cost of NPV over (non-discounted) generation during the contract. As the strike price is higher for shorter contracts we would expect the value of support paid per unit of generation to be higher. As contract lengths increase this value of NPV paid per unit of generation decreases, but the overall cost of support payments increases.

22. Chart 3 shows the percentage change of the strike price and NPV of the support payment for each offshore windfarm as the CfD length changes. The strike price under a 20 year CfD is 9% lower than that under a 12 year CfD, but the size of the support payment paid to each wind farm is 19% higher. As expected the NPV of support per unit of generation diminished for longer contract lengths, but the overall cost of support payments increases.

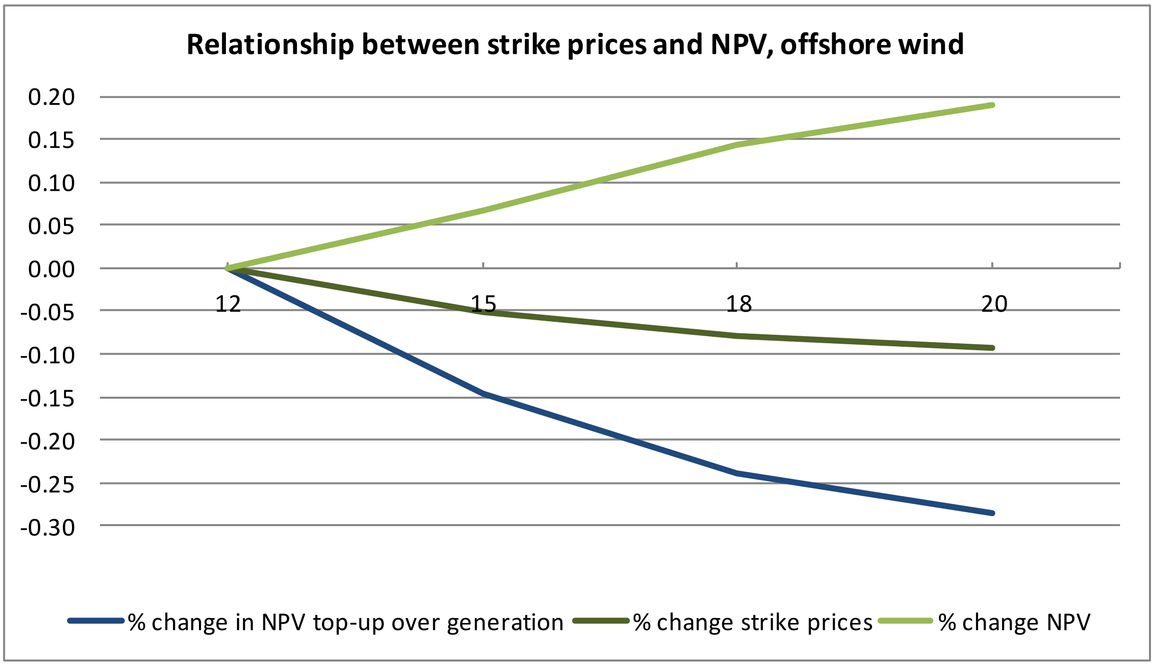

Figure 4: Percentage change in strike prices and NPV of support payment for each offshore wind project under central assumptions

Source: DECC Analysis

23. The results for offshore wind suggest that a shorter CfD with a higher strike price, but lower NPV of the support payments, is preferred to a longer CfD. The impact of discounting future costs and returns at a different rate to investors who concentrate on near-term revenues outweighs the other considerations.

Key findings

24. 12-15 year CfDs provide lower expected NPV support costs than longer contract lengths.

There are a number of assumptions/ caveats underlying the analysis:

- That the investment is financed on a project finance basis.
- That debt finance will be available for either the length of the CfD or 15 years (whichever is shorter).
- That financiers require debt to be repaid during the CfD life.
- That required debt returns are fixed as long as minimum cover ratios are met, and that equity investors' hurdle rates do not vary with gearing/variability of prospective equity returns.
- That the CfD has a fixed index linked strike price for its entire life.
- CfDs are output based.
- We have assumed investors have the same central view of wholesale electricity prices as Government.

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