Department for
Business, Energy
& Industrial Strategy

CONTRACTS FOR DIFFERENCE

Government response to the call for evidence on geothermal in the Contracts for Difference (CFD) Scheme

March 2017

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The call for evidence and the response can be found on the BEIS website: https://www.gov.uk/government/consultations/call-for-evidence-on-fuelled-and-geothermal-technologies-in-the-contracts-for-difference-scheme

Any enquiries regarding this publication should be sent to BEISContractsForDifference@beis.gov.uk .

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1. Background

1. An Administrative Strike Price for geothermal (with or without combined heat and power) for the second Contracts for Difference (CFD) Allocation Round (for Pot 2 'less established' technologies) opening in 2017 was not published alongside Administrative Strike Prices for all other eligible technologies in November 2016[1].

2. BEIS updated levelised cost assumptions for all electricity generation technologies under the CFD in November 2016[2]. This was accompanied by a report from Arup on the cost and technical assumptions on renewable technologies and a report from NERA Economic Consulting on hurdle rates for technologies[3]. Arup did not secure any robust new evidence on the cost of geothermal on a power-led basis or without combined heat and power (CHP). Therefore the Government issued a Call for Evidence on Fuelled Technologies and Geothermal[4] to collect, amongst other things, further information on geothermal project economics, specifically generation costs for projects on a power-led basis, and technology-specific parameters such as heat-to-power ratios, before determining the level at which to set the strike price for the forthcoming allocation round. The call for evidence closed on 20 December 2016.

3. This report provides a summary of the stakeholder responses received and the Government's response, **relating to geothermal only**. It also outlines the Administrative Strike Price which the Government has decided to set for geothermal (with or without CHP) for the second Allocation Round.

4. This Government response is being published separately from the response on the 'fuelled' technologies (biomass with CHP, anaerobic digestion and advanced conversion technologies) which were also the subject of the call for evidence. Questions posed about these technologies related to the future design of the CFD scheme and their treatment in future allocation rounds, rather than, as in the case of geothermal, in relation to the forthcoming allocation round. A separate Government response relating to the fuelled technologies will be published in due course.

[1] https://www.gov.uk/government/publications/draft-budget-notice-for-the-second-cfd-allocation-round
[2] https://www.gov.uk/government/publications/beis-electricity-generation-costs-november-2016
[3] https://www.gov.uk/government/publications/arup-2016-review-of-renewable-electricity-generation-cost-and-technical-assumptions
[4] https://www.gov.uk/government/consultations/call-for-evidence-on-fuelled-and-geothermal-technologies-in-the-contracts-for-difference-scheme

Analysis of consultation responses

5. Fourteen responses were received relating to the questions about geothermal from a range of stakeholders including independent generators, trade associations, a large energy supplier, a local Council and an environmental group. The list of respondents who addressed questions about geothermal is provided in Annex A.

6. This Government Response provides an overview of the feedback received in relation to the call for evidence questions, and explains the final decisions that have been taken. All responses received as part of this consultation were considered in developing the final policy positions in the areas covered. We would like to thank all those who engaged with the consultation.

Next steps

7. A CFD Budget Notice will be published alongside this Government Response confirming the Administrative Strike Prices that will apply in the second CFD Allocation Round for all eligible technologies including geothermal.

2. Summary of responses

Heat-to-power ratios and heat demand

8. Heat will always be a by-product of geothermal power generation. However, the ratio of heat to power (the proportion of generated heat to electrical power) will vary depending on the temperature of the geothermal resource. In general, stakeholder responses suggested usable heat to power ratios could be around 4:1 in the UK which aligns with the latest data collected by Arup[5].

9. Some responses from the call for evidence suggested that the majority of existing geothermal power plants around the world are power-led. They considered that deep geothermal power projects in the UK would also be financed on the basis of power-led production (i.e. assuming that none of the generated heat would be sold initially). They did however expect heat markets for projects to develop over time once the power plant was established and as customers moved into the area to benefit from the available heat. They noted that heat demand (the proportion of time when generated heat would be sold) would be dependent on a number of factors including geographical location and seasonal considerations.

Project costs

10. It was suggested that 'power only' projects will have lower project capital costs than those operating as CHP as they do not have to consider an investment in heat infrastructure. They also have lower operating costs as there is no need to maintain or contribute to the maintenance of the heat infrastructure. However some respondents noted that while projects may start life as 'power only', heat infrastructure could be built at a later point in a geothermal project's lifetime if heat markets develop over time.

11. It was suggested that that the cost of geothermal power may decline more rapidly than the Arup report suggests. The key driver of this was considered to be improved drilling techniques, and resulting reductions in borehole costs. As the costs of drilling boreholes in deep geothermal fields represent a significant proportion of the capital costs associated with a geothermal development, this reduction could have a significant impact on overall costs.

[5] https://www.gov.uk/government/publications/arup-2016-review-of-renewable-electricity-generation-cost-and-technical-assumptions

Other revenue streams

12. It was suggested that in addition to heat and power, geothermal wells may have the potential to benefit from revenues from processing the brines bringing the heat to the surface which may carry valuable minerals, such as lithium, zinc, magnesium and rare earth minerals. An example cited was a company in California that has developed technology that could extract these with a bolt-on processing plant.

Wider issues relating to geothermal

13. Some respondents raised broader issues about geothermal.

14. Some respondents suggested ring-fencing budget for 20-50MW of capacity (setting a 'minima') to allow geothermal projects in the pipeline to come forward, that may otherwise be out-competed by offshore wind projects in a competitive Allocation Round.

15. Some respondents said that any requirement to repay other sources of funding due to EU State aid anti-cumulation rules was deterring investment and represented a barrier to projects bidding for a CFD. On past experience, repayments were also difficult to implement. Further clarity about the rules was requested. They also suggested that if the requirement could not be avoided then any repayment should be phased over the 15 years of the contract rather than having to be repaid up-front as a lump sum.

16. Some respondents also suggested other ways of supporting the UK deep geothermal industry. These included:
    - Targeted funding for a demonstrator project, on the grounds that it was a more suitable way to support this technology, particularly given the financial risks faced by investors in the initial proving of a resource and technology.
    - Supporting demonstration-stage projects with a feed-in-tariff independently of a competitive process like the CFD and in such a way that doesn't breach state aid (Germany was suggested as having set a precedent here).
    - Providing incentives to attract suitable high heat-consuming customers (such as covered horticulture) to areas where geothermal power plants are planned to be developed.
    - Altering the mix of policy instruments that provide incentives to geothermal power and/or geothermal heat generators to allow them to be more complementary.
    - Developing a coherent framework for decarbonising heat and then providing support for geothermal and biomass fired CHP technologies through this.
    - Prioritising the development of low-carbon heat networks, with geothermal having an important role to play.

17. It was suggested that the CFD was not the right policy mechanism to incentivise this form of generation. Adjusting the CFD scheme to rectify challenges to delivering low carbon heat was considered distortive and inefficient. It was suggested that Government provides a firm steer for the exclusion of this technology from support for low carbon electricity.

18. Some respondents supported development of an electricity interconnector between the UK and Iceland to access potential deep geothermal resource, and adapting the CFD to make this viable.

Wider policy proposals

19. It was suggested that Government should consider the relative balance of decarbonisation costs that are funded through electricity bills and through gas (i.e. heating) bills. At present, it was felt that almost all decarbonisation initiatives are funded by electricity consumers, but that this would need to change as decarbonisation of heat progresses.

20. Respondents also set out a number of wider policy proposals including suggestions for changes to CFD pot structures (moving offshore wind into Pot 1 for example) or creating new pot structures for future CFD rounds (such as establishing an innovation pot for demonstration technologies such as geothermal and marine).

3. Government response

Administrative Strike Price for geothermal

21. The first CFD Allocation Round (held in 2014/15) offered support for some delivery years for which support under the Renewables Obligation (RO) remained available. Developers could therefore opt to apply for support either through the CFD or the RO. The Government therefore chose to set ASPs at broadly comparable levels to the RO until its closure. For subsequent years, ASPs were reduced in line with expected reductions in technology generation costs.

22. As there has been no deployment of deep geothermal power projects in the UK, we do not expect there to have been any reductions in generation costs for this technology. We do however accept that costs may fall over time, once deployment commences, including through improvements in borehole drilling, so we intend to keep this assumption under review.

23. Taking into account the evidence provided as part of this call for evidence, **the Government has decided to set the Administrative Strike Price at £140/MWh for both delivery years**. This is consistent with the approach taken for the first allocation round. The full list of strike prices for the second Allocation Round is provided in Table 1 below.

24. The assumed load factor for geothermal in our modelling is 91.2%. The methodology used to set this Administrative Strike Price is as described in the paper published in November 2016[6]. As with other technologies, the Administrative Strike Price for geothermal has been set to incentivise 19% of the supply curve.

25. **Minima**. Ministers decided previously not to extend the wave and tidal stream minima for this Allocation Round as this was not judged to offer best value for money. We do not intend to offer a minima for geothermal in this round.

26. **State aid**. We have recently published our decision on changes to the CFD contract ahead of the second allocation round[7]. This confirms our decision to bring the CFD fully into line with the European Commission's State aid approval for the scheme by prohibiting 'cumulation' with other State aid and EU funding aid so that CFD projects

[6] https://www.gov.uk/government/publications/contracts-for-difference-an-explanation-of-the-methodology-used-to-set-administrative-cfd-strike-prices-for-the-next-cfd-allocation-round
[7] https://www.gov.uk/government/consultations/consultation-on-amending-the-cfd-contract-and-regulations

are not over-compensated. This will apply to all CFDs awarded in the second Allocation Round, including demonstration projects.

Table 1: Administrative Strike Prices for Pot 2 'less established' technologies for delivery years 2021/22 and 2022/23

Administrative Strike Price (£2012; £/MWh)	Delivery Year 2021/22	Delivery Year 2022/23
Offshore Wind	105	100
Advanced Conversion Technologies (with or without CHP)	125	115
Anaerobic Digestion (with or without CHP; >5MW)	140	135
Dedicated Biomass with CHP	115	115
Wave	310	300
Tidal stream	300	295
Geothermal (with or without CHP)	140	140

27. **Other policy proposals.** These ideas are welcomed and, although not directly relevant to the specific questions asked about geothermal in this call for evidence, will be considered in the wider response to the call for evidence to be published in due course, and in future reviews of the CFD scheme.

Annex A:

List of respondents to the call for evidence addressing questions about geothermal

- Geothermal Engineering Ltd.
- Geo-Science Ltd.
- EGS Energy
- Cornwall County Council
- Renewable Energy Association
- Orthios
- Engie UK
- Atlantic Super Connection
- Low Carbon
- EDF
- WWF
- Real Ventures
- Association for Decentralised Energy
- JHA Abhishek (Architect)

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