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Submitted to **Enabling a High Renewable, Net Zero Electricity System: Call for Evidence**
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About you

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Are you happy for your response to be published?

Yes

Section 1 - Maintaining growth in renewable deployment to meet net zero targets

1 How is the industry currently approaching developing renewables projects without CfDs? In what ways might non-CfD backed projects obtain revenue from wholesale and other markets, and secure investment?

Please input response below:
We aren't - we're storage, which is excluded.

BEIS and OFGEM rules etc. (including the regulatory mis-definition of storage as generation) have for 8 years prevented any investment in one of our storage plants.

2 What do you consider to be the effects of increased low-carbon deployment on future wholesale power prices and renewable capture prices?

Please input response below:
Wholesale prices will continue to decrease but get much more volatile between highly positive and highly negative prices (both 3 figures) and 4-figure imbalance prices.

Renewable capture prices will continue to diminish but the cost to the system of running itself on renewables will continue to sky-rocket. The first Lockdown provided a trial run of a 2030s grid, with NG spending £10-30m per day and forecasting £1bn p.a. on services that would be produced as side-products of 2-4GW of Storelectric CAES plants.

The government has announced £10bn investment into East coast transmission lines to accommodate increasing offshore renewables to 40GW, at least half of which would be totally unnecessary if they were connected to the grid through Storelectric's TES CAES - and that's in addition to the savings of the last paragraph.

National Grid is exploring Distributed ReStart. Their initial analysis shows that in the few parts of the grid where it's possible, it will be highly costly (both capex and opex) and complex to manage. It is almost impossible for plants on the 33kV grid to energise 132kV; and other voltage step-ups and grid step-across (i.e. energising neighbouring grid sections) will take all available energy, delaying the re-energisation of customers by hours. If contracted pre-construction (because of the required specification), Storelectric's CAES can achieve Black Start on 33kV, 132kV and 400kV grids much more simply, cheaply and reliably.

In summary, because Ofgem and BEIS make it impossible to build our first CAES plants, the country is incurring >£10bn additional one-off costs and probably >£2bn p.a. ongoing costs by the late 2030s.

3 How viable will investment in new renewable projects based primarily on wholesale prices be in future? Could this investment case be supported if there was more extensive deployment of flexible assets such as storage?

Please input response below:
For the renewable farms, very viable.

For the grid, very un-viable as per our previous response.

Wholesale energy prices will continue to fall. It's the non-energy costs that have already doubled to ~50% of electricity price that will continue to sky-rocket.

If the renewable generation were required to connect through large-scale long-duration storage, this would be avoided. (Batteries can't do the job as they're too small, too short-duration, too resource scarce, and non-inertial.)

4 How much longer after the 2021 allocation round should the current CfD be used? Is a price based on a short-run marginal cost market the most effective basis for a long-term renewables contract?

Please input response below:
Short-run marginal cost market is a dreadful basis for a long-term renewables contracts. It has given rise to an enormous escalation in the non-energy price of electricity (levies, charges etc.) to pay for the disruption caused by not building in large-scale long-duration intertial storage.

CfDs should be let separately for with and without inertial large-scale long-duration storage (with a minimum duration 4 hours, though you may wish to say 6). You should cost the balancing, ancillary and stability services costs, and grid reinforcement costs, that will be required to support the renewable generation if it has no storage; that value should be added to the CfD price to generate an expected CfD price for renewables with such storage. (With batteries, remove the stability services costs as they can't provide real inertia and synthetic inertia is not equivalent, and some other costs; assume greater costs due to their short operating lives and high environmental costs of disposal.) Bids should therefore be invited for renewables plus such storage.

5 Are there any changes or alternatives to the wholesale market that might facilitate merchant deployment?

Please input response below:
1. Define storage as storage, based on interconnectors. It does not generate new electricity, so is not generation. You've reduced triple charging to double (not double to single) because grid access etc. charges are already in the price of purchased electricity. There are many more deliterious effects of this mis-definition that you don't even acknowledge, let alone address. Codes and regulations for generation are totally unsuited to storage, which is much closer to interconnectors: while the latter move electricity in space, the former moves it in time.

2. For first-of-a-kind plants of new technologies that offer services that the grid is likely to want, offer (a) letters of intent to procure services at commercial rates (or, if you think fit, at subsidised rates), prior to planning permission; (b) Contracts when planning is granted, of long duration - this will enable private financiers to build a commercial first-off which is currently impossible in the UK.

3. Stop salami-slicing contracts: while it succeeds in bringing in new providers of narrow and small-scale capabilities, it makes large plants with broad capabilities very difficult to finance, contract and build, and makes them over-recover their costs on each contract as a hedge against losing some contracts next time round.

4. Let at least 1/3 of all contracts for at least 15-year durations with the proviso that only brand new plants qualify (and the same again for half that duration, for new plants or plants with major refurb / upgrade; the remainder of contracts can be short, for all plants), to provide financial stability for new investments in proven technologies: since privatisation, apart from a few that were planned pre-privatisation (and maybe a couple built to satisfy tied demand), no major new investment has been undertaken without 15+ year contracts to underwrite revenues (e.g. CATOs, OFTOs, ROCs, CfDs). Every such provision is a market distortion. By letting ordinary contracts for 15+ years, the market distortion is removed. With 1/3 of contracts at 15 years, the assumed plant life is 45 years, which is about right.

5. Encourage cleanness (emissions, pollution) by contract length: the above contract lengths apply to zero-carbon plants; contract lengths are halved for emissions equivalent to those of OCGTs; a sliding pro-rata scale operates between the two (and extrapolated at the ends; upwards if ultra-low manufacturing and end-of-life impacts; downwards if dirtier). This is a zero-subsidy way to incentivise clean electricity assets.

6. Provide much better rates for renewable generation with large-scale long-duration storage than without, as per my answer to Q4, because the net benefit to the system (and hence to the consumer) will dwarf the cost of these additional rates.

7. Change the OFTO rules that actively prevent offshore wind farms benefitting from storage, as you've been saying for 3 years that you'd be happy to do, but have never done.

8. Provide support for first-of-a-kind commercial plants to defray financiers' "technical risk" which they ALWAYS ascribe to such plants. This could be reduced or even eliminated if the letters of support (item 2 above) are sufficiently strong and enforceable.

9. Recognise that flexible plants (e.g. zero carbon generation, large-scale long-duration storage) provide immense beneits to the system that go well beyond the provision of energy, therefore the wholesale market alone will not ensure that they are built. And if they're not built, the capital and operational costs of a Net Zero grid will double or triple.

10. When inviting tenders for services, do so on a matrix so each plant can propose all the services that they can provide profitably. Let the hardest-to-let contracts first, then see what else those winning plants can deliver cost-effectively, and award all those contracts too. Then see what remains, and repeat. This will ensure that flexible plants bid their lowest prices without having to over-recover their costs because they know that if they get one contract, they get them all; thiswill greatly reduce the cost of the total electricity system (hence consumer value for money) and simplify grid operation as fewer, much more flexible plants can be called upon to operate optimally rahter than being sub-optimised because they won some contracts (eg FFR and BM Startup) but not others (e.g. STOR, which stands between the successful contracts). It also avoids the legal problem: if a plant can only deliver services A, B and C simultaneously (e.g. an inertial plant delivering inertia and voltage regulation) and wins the contract for A and C but not B, then does the grid:
(a) take B without paying for it, in which case the operator would sue for theft and the winning tenderer for B would sue for breach of contract;
(b) take B and pay for it, in which case the operator is happy but winning tenderer for B would sue for breach of contract; or
(c) penalise the operator for delivering B (even though it's impossible for them to deliver A and C without B) and compensate the winning tenderer for B, in which case the winning tenderer is happy but the operator would have to raise the price for A and C to pay for the fines on B - which would dramatically raise the price on every single tender for fear that it may have to compensate a loss on another tender, and thereby cost the entire system and consumer exponentially increased costs - not to mention losing the flexible plants, which would have to close, making the grid unstable and delivering a much less reliable grid to consumers much more expensively.

6 How can market participants be encouraged to provide contracts to secure low-cost investment in renewables?

Please input response below:
By favouring (financially - capital and operational incentives) renewable generation with large-scale long-duration storage. This will enable you to halve (or better) the size of grid needed, and the amount of separately procured balancing and stability services, benefiting the sytem (and consumers) much more than any associated costs.

Section 2 - Ensuring overall system costs are minimised for electricity consumers

7 How could intermittent renewable generators change their operating or investment behaviour to respond to wholesale price signals?

Please input response below:
By changing those signals.

1. Contracts that pay for energy regardless of when it's dispatched should be ultra-cheap; much more should be paid for dispatchable energy, because the grid/consumer would save much more on balancing costs.

2. Contracts that provide non-inertial energy (i.e. natural inertia, not synthetic) should be much cheaper than those which don't, because the grid/consumer would save much more on stability costs.

3. Change the OFTO regime to enable renewable generation to benefit from connecting to the grid through storage.

8 What would be the impact on the cost of capital of introducing greater exposure to the market price for power?

Please input response below:
Without the other provisions I have listed, it would maybe triple the capital and operational costs of delivering a Net Zero grid while simultaneously reducing its reliability and resilience.

With the other provisions I have listed, it would deliver a Net Zero grid that is no dearer than today's while being more reliable (no 9/8/19 blackouts, no post-Brexit dependence on imports which cannot be relied upon: as we're leaving the Single Market and the jurisdiction of the ECJ, our neighbouring grid operators will not be able politically to say that a black-out in their country was because they earned money exporting to the UK, giving them a political imperative to cut us off in times of system stress - which are often concurrent in the UK and mainland Europe.

9 In your view which of the potential options for providing increased exposure to market signals offers the greatest benefit to the consumer? Are there any other options that we should be considering?

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10 Should CfD generators be incentivised to account for flexibility and wider system impacts, and/or to provide balancing services to the system operator? How could this be achieved

Please input response below:
Yes. As described by my previous answers, they should be paid more for electricity delivered with (a) dispatchability and (b) real inertia because the benefit for system and consumers is much greater.

And as described by my previous answers, the OFTO (and any other) regime that prevents renewable generation benefitting from connecting to the grid through storage should be revised to enable them to benefit fully. Such revisions are very easy indeed: just permit them (for grid connection and charging/levying purposes only) to select any point between their generation and the main grid to have their meter. But keep the meter where it is for purposes of compensating the OFTO and qualifying for existing CfDs (new ones should be valued to take storage into account, for which they should again be able to select their meter location).

11 Should the CfD mechanism incentivise minimum grid stability requirements (in CfD plants) to minimise system costs and help ensure secure and stable operation? How could this be achieved and what are the barriers?

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12 Do CfD projects receive the right incentives to locate in the optimum locations?

Please input response below:
No. Offshore farms are built where Crown Estates wants them, regardless of where the need is. OFTOs connect to the grid at the nearest point, regardless of need or capacity. There is no incentive to do otherwise.

13 Are there actions which Government should consider, outside of Ofgem's current electricity network charging reviews, to help incentivise efficient market behaviour regarding the location of renewable assets?

Please input response below:
Yes: make them bear at least a proportion of the costs of carriage of their electricity to where it's needed, including any grid reinforcement.

Also, define locations and cable routes to ensure that they come ashore closer to where needed, and by-pass grid contraints.

14 Should the CfD do more to enable the sustainable growth, cost reduction and competitivity of UK supply chains and how could this be achieved?

Please input response below:
The government could provide an uplift (e.g. 10%) in electricity price for plants built entirely with UK parts and services; reduced pro rata in proportion to imported goods and services.

The government should also commit to building a certain amount of large-scale long-duration storage, much as they did for offshore wind which led to much investment in UK capability.

Section 3 - Supporting and adapting to innovative technologies and business models

15 What are the benefits of renewable projects using multiple low carbon technologies or being co-located with low-carbon flexible assets? Should the CfD support these projects and why

Please input response below:
The benefits of multiple generation technologies are substantial but not game changing. Ditto renewable generation plus batteries. The benefits of building them with large-scale long-duration inertial storage are immense in comparison as such storage removes the need for separately procured balancing or stability services, and also removes the need to reinforce the grid between those service providers and the generation.

Yes, CfDs should support those project but in a way to compensate for balancing, ancillary, stability and other services - not just for energy - because such technologies both provide such services and need such revenues to be profitable and cost-effective.

16 What are the benefits of projects with assets in different locations, including projects paired with flexible assets? Should the CfD support these and why?

Please input response below :
If the separation is not too far, the benefits cited in my previous answer would remain for the grid as a whole but not between the paired locations. If the separation is too far, that lack of benefit between the two would spill out over wider areas. CfD incentives should be reduced accordingly.

17 What changes would Government need to make to the Contract for Difference regime to facilitate the coordination of offshore energy infrastructure, what would be the benefits and costs of making them, and could there be a similar case for other renewable technologies?

Please input response below:
Compensate producers more highly for projects that deliver (a) dispatchable electricity and (b) real inertia, as discussed in my previous answers. Yes, this should apply to all intermittent renewables - not to biomass or AD as their feedstocks are globally limited.

18 What changes would Government need to make for the Contract for Difference to facilitate deployment of offshore wind as part of a hybrid offshore wind-interconnector project, and what would be the benefits and costs of making them?

Please input response below:
Yes. As described by my previous answers, they should be paid more for electricity delivered with (a) dispatchability and (b) real inertia because the benefit for system and consumers is much greater. Only large-scale long-duration storage can add these to intermittent renewable generation.

And as described by my previous answers, the OFTO (and any other) regime that prevents renewable generation benefitting from connecting to the grid through storage should be revised to enable them to benefit fully.

With these changes (and the others outlined in my answers), the overall system (therefore consumer) cost of a Net Zero system would be at or below today's cost. Without such changes, the overall capital and operational costs would be doubled or tripled.

19 What role could international renewable projects play in our future generation mix in GB? Are there benefits to supporting these projects with government schemes and how could this be achieved?

Please input response below:
Usually when the UK encourages foreign technologies into the country, what happens in reality is that you pick the best-proven / best-developed technologies (which are usually foreign) and ignore potentially better but less-developed British technologies, so the British ones die and most of the benefits of UK support go overseas. Thus, for example, we subsidised the development of Danish, German and American wind turbine manufacturers while killing British companies; the same happened in batteries and many, many other industries. Then when the UK decides to invest substantial, game-changing sums, we waste it on industries (such as batteries, in the Faraday Challenge) in which we are playing 20 years of catch-up in a crowded market.

The UK leads the world in large-scale long-duration storage projects, tidal and wave power. These should be prmoted vigorously: they're UK based and would give rise to extensive UK supply chains and export industries.

20 Should part-built project continue to be eligible to compete for CfDs after the fourth allocation round? Are we considering the right implications and what are your views on these?

Please input response below:
Only new projects should be allowed to bid for T-4 contracts. If a project is part built (but not completed) and has no CfDs, then there is no reason why it should not win CfDs.

The purpose of T-4 is to encourage new construction. All such contracts should be for at least 15 years. When 85% of such contracts are for 1 year (as happened in 2018-19), this means that it's being used merely as a second bite of the T-1 cherry.

And 4 years is not enough for T-4 because it forces plants to be built to 1950s grid connections and demand patterns. New grid connections (shamefully) take much longer than that to build. Such grid connection lead times should be allowed for in calculating the timescale to start of contract delivery.

21 Can cost savings be achieved by developing extensions to existing projects, if so, how great are these cost savings, and what is the justification for these projects being supported through CfDs or any other government mechanism?

Please input response below:
If an existing wind farm cable is put through large-scale long-duration storage, then a new wind farm of the same size can be connectd through the same grid connection without any grid reinforcement. This is of immense benefit to the grid / consumers. Therefore the old wind farm should be allowed to retain its CfDs while changing its connection arrangements in such ways. But this will only work in conjunction with the changes to the OFTO regime outlined in previous answers.

22 Similarly, can cost savings be achieved by repowering older projects, if so, how great are these cost savings, and what is the justification for these projects being supported through CfDs or any other government mechanism?

Please input response below:
No comment.